

**RFQ 042026-1029 Parcel 1A TOTE USTS Site  
Closure Investigation**

**ATTACHMENT C – PROJECT SPECIFIC  
INFORMATION**

- 1. Summary of Comments and Responses  
Letter Dated 9/27/2023**
- 2. Data Gaps Investigation Work Plan**

September 27, 2023

Aaren Fiedler, LG  
Toxics Cleanup Program, SWRO  
Department of Ecology  
P.O. Box 47775  
Olympia, WA 98504-7775

Re: Port of Tacoma/TOTE Facility 500 Alexander Ave  
Facility/Site ID: 3468881; Cleanup Site ID: 7619; VCP Project ID: SW1588  
Incorporation of Ecology Comments and Planned Implementation of Data Gaps Work Plan

Dear Aaren,

Thank you for your opinion letter dated February 22, 2023, regarding Ecology's review of the Data Gaps Investigation Work Plan (DGWP) for the TOTE Property USTs Project (Project). The Port of Tacoma (Port) and Anchor QEA have reviewed the letter and have incorporated your comments into the planned data gaps investigation and next steps for the overall Project.

This letter summarizes how your comments have been and will be incorporated during the upcoming work at the TOTE Facility (Site). In submitting this response, we are not asking for an opinion letter at this time. For clarity, this letter documents our plan for addressing your comments.

We plan to submit a Data Report and the associated EIM data deliverables following completion of the planned work. If no further data gaps are defined, then a remedial investigation and feasibility study (RI/FS) will be subsequently prepared proposing next steps for the Project. If additional data gaps are defined, then these will be addressed prior to preparing the RI/FS.

## Summary of Comments and Responses:

**Description of the Site:** The description of the site contained on page 2 of your letter is consistent with the available information, with one exception. To date there have been no confirmed releases of PCBs in soil or groundwater at the Site. PCBs have been tested for in former waste oil releases, but none were detected.

*Planned Response:* PCBs have been absent in the Site investigation work conducted to date. But further testing will be performed for PCBs to ensure that Table 830-1 requirements have been met for all tank areas with petroleum releases from tanks formerly containing potential waste oil or unknown oil. These plans are further addressed in our responses to comment 1d.

**Comment 1a – Delineation of the Alexander Site Benzene Plume:** Your comment requested further information regarding whether additional investigation work is planned to define the extent of the benzene plume originating from the Alexander Avenue Petroleum Tank Facilities Site (Alexander Site).

*Planned Response:* The benzene plume noted in your comment has migrated from the Alexander Site. Additional work has been conducted to delineate the extent of that plume under existing Agreed Order No. DE-9835 with Ecology. The Port plans to remediate the benzene plume with Tank N-11 area as part of cleanup of the Alexander Site. The TOTE Data Report to be prepared following implementation of the DGWP will include an up-to-date summary description and will include attachments from the benzene plume delineation activities as performed by the Port and other potentially liable parties (PLPs) for the Alexander Site.

**Comment 1b-1 – Cleanup Level Applicability:** Your comment noted that Method C cleanup levels should remain as a possibility until the site has been defined sufficiently to establish site cleanup levels, and that Method A cleanup levels for TPH can be used along with either Method B or Method C cleanup levels.

*Planned Response:* We currently anticipate using Method A cleanup levels for TPH in soil and groundwater, along with Method B or C cleanup levels as applicable for other parameters. The selection of final cleanup levels will be made at the time the future RI/FS is developed, following completion of the data gaps investigations.

**Comment 1b-2 – Group 2 Tank Area Wells:** Your comment noted concurrence with the plan to install a single well in the Group 2 tank area, with the caveat that additional work could be required if hazardous substances exceed cleanup levels in that well.

*Planned Response:* We plan to proceed with implementation of the DGWP and summarize the results in a Data Report. The need any additional groundwater investigations in the Group 2 tank area (T-21/22) will be reassessed once the new groundwater data are available.

**Comment 1c – Potential Need for Additional Site Delineation:** Your comment notes that the proposed work is responsive to the data gaps noted in prior Ecology 2017 and 2021 opinion letters. But your comment also notes that, depending on the outcome of the current testing, some additional work could be required to complete the delineation of hazardous substances under the Project.

*Planned Response:* Your comment is noted. We plan to proceed with the implementation of the DGWP and will reassess the need for any follow-up investigations once the new data are

available. The horizontal and vertical extent of Site contaminants will be characterized before developing an RI/FS and evaluating cleanup alternatives.

**Comment 1d – Ensuring Compliance with Table 830-1 Testing Requirements:** Your comment emphasized the need to fully comply with MTCA Table 830-1 testing requirements for petroleum-contaminated sites. You also provided a table in Enclosure A listing Ecology’s current understanding of the types of petroleum historically located in the tanks at the Site.

*Planned Response:* We have reviewed the table provided as Enclosure A and find it mostly accurate. Two minor clarifications should be noted:

- For Tank Area N-20/21/22 there were five tanks. Three tanks in this area contained gasoline. The other two tanks are appropriately described as having contained waste oil or unknown oil.
- For tank areas A-1/2, B-1/2/3, and the Wax Tank, there is currently no information indicating that a petroleum release has occurred. Testing will be performed consistent with Ecology guidance (i.e., use of HCID testing) to evaluate the potential presence of petroleum contamination. If a petroleum release is confirmed in one or more of these areas, follow-up testing will be performed to evaluate the presence of waste oils or unknown oil (Tank areas A-1/2 and B-1/2/3), or heavy oils (Wax Tank) as indicated in Enclosure A. That testing will comply with Table 830-1 requirements.

We have reviewed the planned testing program along-side the requirements of Table 830-1. Following this review, we have added PCB testing of soils for the waste oil/unknown oil tanks at tank areas N-9/10, N-20/21/22, A-1/2 and B-1/2/3. This includes the addition of PCBs to planned boring N9-GP-01 at tank area N-9/N-10, the addition of two additional soil borings (N20-GP-05 and N20-GP-06) with Table 830-1 testing requirements at tank area N-20/21/22 and the addition of PCB testing to contingent soil testing at tank areas A-1/2 and B-1/2/3. A copy of revised Table 7 describing the updated testing plan is attached to this letter.

**Comment 1e – Concern About the Bank Cutback Area:** Your comment expressed concern regarding the potential tanks located in the bank cutback area along the Blair Waterway and requested specific information regarding the status of these tank areas in the next report submitted to Ecology.

*Planned Response:* The tanks located in the planned bank cut-back area are the same tanks discussed in our DGWP. The planned bank cutback was never performed due to changes in terminal development needs. However, the testing performed during early planning for that cut-back furthered the investigation of the Site, benefiting the current Project. The data collected in the bank cutback area helped define current conditions at tank areas N-12, N-

9/10, N-20/21/22 and N-17 described in the DGWP. Additional clarifying information will be provided in the Data Report to clear up any confusion regarding the history and status of the tank areas in the planned (but never completed) bank cutback area.

**Comment 1f – Evaluation of Terrestrial Ecological Risks:** Your comment noted that additional information is needed to demonstrate that the Site qualifies for use of a terrestrial ecological evaluation (TEE) exclusion. In that comment you noted that portions of the Occidental Chemical Site and the Alexander Site located northwest of the Site are currently undeveloped. You requested that the area of contiguous undeveloped land located within 500 feet of any area of the Site be re-evaluated after the full extent of the Site has been defined.

*Planned Response:* The Data Report and/or the future RI/FS will include a re-evaluation of the applicability of TEE exclusions after the full extent of the Site has been defined in accordance with WAC 173-340-200 and WAC 173-340-350.

**Comment 1g – Addressing Isobaric Interferences During Arsenic Analysis:** Your comment recommended that Anchor QEA document how isobaric interferences will be controlled during sampling of arsenic in groundwater at Tank Area N-9/10.

*Planned Response:* Isobaric interference can occur in ICP-MS analysis of groundwater that contains elevated salinity levels. During the MS portion of the analysis, the atoms from the salt are split, with some of the resulting daughter ions matching the normal signature of those from arsenic. The proposed response to correct for this potential interference is to utilize an ICP-MS that has a collision cell with appropriate reaction gasses. This additional verification step allows arsenic and salt signatures to be differentiated and an accurate arsenic concentration measured, even at relatively high salt concentrations. Anchor QEA has selected a laboratory with the appropriate equipment and operator experience to perform ICP-MS analysis on groundwater with elevated salt concentrations. The appropriate ICP-MS/collision cell method will be used for all analysis of arsenic in groundwater during DGWP testing. The Data Report will include a clarifying discussion documenting the details of the methods used to control potential isobaric interference.

**Comment 1h – Status of Guidance for Use of Silica Gel Cleanup During TPH Analysis:** Your comment recommended that Anchor QEA review the *Draft Guidance for Silica Gel Cleanup in Washington State* (Ecology Publication No. 22-09-059).

*Planned Response:* Data evaluation for TPH will be performed in accordance with applicable guidance issued by Ecology, including the updated guidance regarding the use of silica gel cleanup. We understand that the draft guidance on that topic was recently issued for public comment and may be updated by Ecology in the near future. Consistent with the DGWP, groundwater testing for NWTTPH-Dx parameters will be performed both with and without

silica gel cleanup. This will ensure that any necessary data are available for evaluation, regardless of potential changes in the guidance.

**General Comment 1 – Recommendation to Proceed with Site Investigations:** Your final comment in Section 1 noted that the proposed Work Plan may be able to address any or all of the issues noted in comments 1a through 1h and recommended proceeding with Site investigations.

*Planned Response:* The DGWP investigation will be implemented, with the updated to analytical procedures as noted above and in the attached revised version of DGWP Table 7. The need for follow-up investigations to address any potential remaining data gaps will be re-evaluated once the Data Report is available.

**Comment 2 – Selection of Cleanup Standards:** Your comments 2a, 2b and 2c communicated MTCA requirements for establishing cleanup levels and points of compliance and for considering applicable relevant and appropriate requirements (ARARs) during definition of cleanup standards and remedy selection.

*Planned Response:* MTCA requirements for establishing cleanup levels and points of compliance and for considering of ARARs will be followed during development of the RI/FS for the Site. Cleanup standards will be defined at that time, following delineation of the extent of hazardous substances at the Site. The RI/FS will include a discussion of how MTCA requirements were addressed, including a review of ARARs and how they potential effect the proposed cleanup.

**Comment 3 – Selection of Cleanup Action:** Your final comment in Section 3 clarified that additional investigation is necessary at the Site before selecting a cleanup action.

*Planned Response:* We concur with your comment. Implementation of the DGWP is a necessary first step at the Site. This work will be performed, and the results will be summarized in a Data Report. If further work is required, such additional work will be performed to fully delineate the extent of hazardous substances at the Site prior to development of MTCA RI/FS and selection of a cleanup action.

Anchor QEA appreciates the review comments provided by Ecology for this Project. We look forward to sharing the results of the upcoming investigations with you in the near future.

Sincerely,



Niklas Bacher, LG  
Senior Managing Geologist



Mark Larsen  
Principal Scientist

cc: Rob Healy and Audrey Hackett, Port of Tacoma  
Rebecca Desrosiers, P.E., Anchor QEA

## Attachments

Table 7 (Revised June 2023) Summary of Data Gaps Sampling

## References

Anchor QEA, 2021: Remedial Investigation and Remedial Plan, TOTE USTs Project. Prepared for Port of Tacoma, January 2021

Anchor QEA, 2022: Data Gaps Investigation Work Plan, TOTE USTs Project. Prepared for Port of Tacoma, June 2022

Ecology (Washington Department of Ecology), 2017. Further Action Letter for Port of Tacoma/TOTE Facility 500 Alexander, VCP Project No. SW1588. August 9, 2017.

Ecology, 2021. Re: Further Action at the following site: Port of Tacoma/TOTE Facility 500 Alexander, Letter to Sarah Weeks from Aaren Fiedler, July 29, 2021

Ecology, 2023. Re: Further Action at the following site: Port of Tacoma/TOTE Facility 500 Alexander, Letter to Sarah Weeks from Aaren Fiedler, February 22, 2023

Port of Tacoma, 2017. TOTE Property USTs (Summary Report). Prepared by the Port of Tacoma for the Washington State Department of Ecology and Tacoma Pierce County Health Department. May 5, 2017.

# Attachments

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**Table 7**  
**Summary of Data Gaps Sampling (Revised June, 2023)**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix			Target Sample Depth (feet bgs) <sup>2</sup>		Testing Type															Sample ID					
						GW	Soil	PW	Start	End	Soil Testing						Groundwater Testing						Porewater Testing								
											RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCs <sup>3</sup>	
<b>Group 1 Tank Areas</b>																															
N-12	Geoprobe	N12-GP-01	--	1168294.89	713049.91	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	--	N12-GP-01-GW-YYMMDD		
N-13		N13-GP-01	--	1168619.82	713360.97	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	--	N13-GP-01-GW-YYMMDD		
N-17		N17-GP-01	--	1166531.2	714776.33	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	--	N17-GP-01-GW-YYMMDD		
T-23/24		T23-GP-01	--	1166886.67	714785.99	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	--	--	--	--	--	T23-GP-01-GW-YYMMDD		
<b>Group 2 Tank Area</b>																															
T-21/22	New Permanent Well	T21-MW-01	HC-1	1166845.81	714690.81	1	--	--	Mon Well		--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	T21-MW-01-GW-YYMMDD		
			HC-1	1166845.81	714690.81	--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T21-MW-01-SO-9-10-YYMMDD	
	Geoprobe	T21-GP-01	HORUS-12	1166861.88	714689.12	--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	T21-GP-01-SO-9-10-YYMMDD		
<b>Group 3 Tank Areas</b>																															
N-9/10	Existing Permanent Well	HC-N910-9	HC-N910-9	1167154.26	714169.35	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	1	--	1	--	--	--	HC-N910-9-GW-YYMMDD		
		N9-MW-05	HC-MW-05	1167116.29	714283.2	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	--	N9-MW-05-GW-YYMMDD	
		N9-MW-06	HC-MW-06	1167071.53	714289.55	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	--	N9-MW-06-GW-YYMMDD	
		N9-MW-07	HC-MW-07	1167115.02	714345.99	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	--	N9-MW-07-GW-YYMMDD	
		N9-MW-08	HC-MW-08	1167058.32	714366.61	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	--	N9-MW-08-GW-YYMMDD	
	Geoprobe	N9-GP-01	--	1167087.73	714371.89	--	1	--	5	6	--	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-5-6-YYMMDD		
		N9-GP-02	--	1167080.93	714301.85	--	1	--	9	10	--	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-9-10-YYMMDD		
						--	1	--	5	6	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-02-SO-5-6-YYMMDD			
--	1	--	9	10	--	1	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N9-GP-02-SO-9-10-YYMMDD				
N-20/21/22	Existing Permanent Well	HC-N202122-9	HC-N202122-9	1167342.54	714012.74	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	--	HC-N202122-9-GW-YYMMDD		
		N20-MW-05	HC-MW-05	1167373.3	714067.8	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	--	N20-MW-05-GW-YYMMDD	
		N20-MW-07	HC-MW-07	1167428.47	714122.43	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	--	N20-MW-07-GW-YYMMDD	
		N20-MW-08	HC-MW-08	1167360.52	714126.33	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	--	N20-MW-08-GW-YYMMDD	
	Geoprobe	N20-GP-01	--	1167401.82	714145.95	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-6-7-YYMMDD		
		N20-GP-02	--	1167354.26	714032.93	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-10-11-YYMMDD	
						--	1	--	10	11	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	N20-GP-02-SO-6-7-YYMMDD	
		N20-GP-03	--	1167428.12	714272.93	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	N20-GP-02-SO-10-11-YYMMDD	
						1	--	--	20	25	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--
		N20-GP-04	--	1167508.29	714195.5	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	N20-GP-03-GW-B-YYMMDD	
						1	--	--	20	25	--	--	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	N20-GP-04-GW-A-YYMMDD
		N20-GP-05	--			--	1	--	6	7	--	1	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	N20-GP-04-GW-B-YYMMDD
						--	1	--	10	11	--	1	1	1	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--
		N20-GP-06	--			--	1	--	6	7	--	1	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	N20-GP-05-SO-10-11-YYMMDD
--	1					--	10	11	--	1	1	1	1	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-06-SO-6-7-YYMMDD	
Porewater	N20-PW-01	--		1167326.23	713992.51	--	--	1	-1	-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	N20-GP-06-SO-10-11-YYMMDD		
						--	--	1	0	-1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
<div style="display: flex; justify-content: space-between;"> <span>N20-GP-06-SO-10-11-YYMMDD</span> <span>N20-PW-01-B-YYMMDD</span> </div>																															

**Table 7**  
**Summary of Data Gaps Sampling (Revised June, 2023)**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Target Sample Depth (feet bgs) <sup>2</sup>					Testing Type															Sample ID								
						Matrix			Soil Testing		Groundwater Testing										Porewater Testing													
						GW	Soil	PW	Start	End	RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDX (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDX (w/SGC)	NWTPHDX (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCs <sup>3</sup>				
P-27/28 & U-1	Geoprobe	P27-GP-01	HC-1	1167330.19	714384.9	1	--	--	10	15	--	--	--	--	--	--	--	--	1	1	1	1	--	--	--	--	--	--	--	--	P27-GP-01-GW-YYMMDD			
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-01-SO-9-10-YYMMDD			
		P27-GP-02	HC-2	1167369.03	714409.41	1	--	--	10	15	--	--	--	--	--	--	--	--	--	1	1	1	1	--	--	--	--	--	--	--	--	P27-GP-02-GW-YYMMDD		
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-02-SO-9-10-YYMMDD			
		P27-GP-03	HC-3	1167379.25	714461.13	1	--	--	10	15	--	--	--	--	--	--	--	--	--	1	1	1	1	--	--	--	--	--	--	--	--	P27-GP-03-GW-YYMMDD		
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-03-SO-9-10-YYMMDD			
		P27-GP-04	HC-4	1167332.22	714483.03	1	--	--	10	15	--	--	--	--	--	--	--	--	1	1	1	1	--	--	--	--	--	--	--	--	P27-GP-04-GW-YYMMDD			
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-04-SO-9-10-YYMMDD			
		P27-GP-05	HC-5	1167298.24	714447.56	1	--	--	10	15	--	--	--	--	--	--	--	--	1	1	1	1	--	--	--	--	--	--	--	--	P27-GP-05-GW-YYMMDD			
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-05-SO-9-10-YYMMDD			
		New Permanent Well	P27-MW-01	P-3	1167351.2	714470.73	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	1	--	--	--	--	P27-MW-01-GW-YYMMDD			
	--						1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-01-SO-9-10-YYMMDD
						--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-01-SO-14-15-YYMMDD		
			P27-MW-02	P-2	1167335.95	714436.05	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	1	--	--	--	--	--	P27-MW-02-GW-YYMMDD		
--	1						--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-02-SO-9-10-YYMMDD	
					--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-02-SO-14-15-YYMMDD			
	P27-MW-03	--	1167324.24	714364.6	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	1	--	--	--	--	--	P27-MW-03-GW-YYMMDD				
								--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-03-SO-9-10-YYMMDD	
				--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-03-SO-14-15-YYMMDD				
<b>Group 4 Tank Areas</b>																																		
A-1/2	Geoprobe	A1-GP-01	--	1167183.81	714509.87	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	A1-GP-01-GW-A-YYMMDD					
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-5-6-YYMMDD	
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-9-10-YYMMDD	
			A1-GP-02	--	1167172.18	714497.06	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	A1-GP-02-GW-YYMMDD			
		--					1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-5-6-YYMMDD	
		--					1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-9-10-YYMMDD
			A1-GP-03	--	1167155.87	714484.43	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	A1-GP-03-GW-YYMMDD		
		--					1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-03-SO-5-6-YYMMDD
		--					1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			A1-GP-04	--	1167165.29	714475.37	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	A1-GP-04-GW-YYMMDD		
		--					1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-04-SO-5-6-YYMMDD
		--					1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Table 7**  
**Summary of Data Gaps Sampling (Revised June, 2023)**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Target Sample Depth (feet bgs) <sup>2</sup>					Testing Type															Sample ID									
						Matrix			Soil Testing							Groundwater Testing								Porewater Testing											
						GW	Soil	PW	Start	End	RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCs <sup>3</sup>					
B-1/2/3	Geoprobe	B1-GP-01	--	1166915.67	714489.35	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	B1-GP-01-GW-YYMMDD			
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-5-6-YYMMDD			
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-9-10-YYMMDD			
		B1-GP-02	--	1166873.39	714481.63	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	B1-GP-02-GW-YYMMDD			
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-5-6-YYMMDD				
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-9-10-YYMMDD				
		B1-GP-03	--	1166891.32	714464.21	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	B1-GP-03-GW-YYMMDD			
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-9-10-YYMMDD				
		B1-GP-04	--	1166909.25	714446.78	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	B1-GP-04-GW-YYMMDD			
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-04-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-SB-04-SO-9-10-YYMMDD				
		B1-GP-05	--	1166866.97	714439.06	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	B1-GP-05-GW-YYMMDD			
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-9-10-YYMMDD				
Wax Tank	Geoprobe	WT-GP-01	--	1167135.83	714574.05	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	WT-GP-01-GW-YYMMDD					
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-9-10-YYMMDD				
		WT-GP-02	--	1167099.92	714554.54	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	WT-GP-02-GW-YYMMDD					
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-9-10-YYMMDD				
		WT-GP-03	--	1167119.5	714536.38	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	WT-GP-03-GW-YYMMDD					
						--	1	--	5	6	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-5-6-YYMMDD					
						--	1	--	9	10	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-9-10-YYMMDD				
<b>Total Samples by Type</b>						<b>38</b>	<b>49</b>	<b>2</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--					
Planned Analyses																24	12	25	25	21	12	17	40	9	24	24	25	17	1	1	3	2	2	2	
Planned QC Analyses																2	1	2	2	2	1	1	2	1	2	2	2	1	1	1	1	1	1	1	
<b>Total Planned Analyses</b>																<b>26</b>	<b>13</b>	<b>27</b>	<b>27</b>	<b>23</b>	<b>13</b>	<b>18</b>	<b>42</b>	<b>10</b>	<b>26</b>	<b>26</b>	<b>27</b>	<b>18</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>	
Max Potential Conditional Analyses Using Archived Samples																0	24	24	24	24	24	18	0	12	12	12	12	12	0	0	0	0	0	0	
Max Potential Conditional QC Samples																0	2	2	2	2	2	1	0	1	1	1	1	1	0	0	0	0	0	0	
<b>Max Potential Conditional Analyses</b>																<b>0</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>19</b>	<b>0</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	

## Table 7

### Summary of Data Gaps Sampling (Revised June, 2023)

Notes:

1. For new DGWP sampling locations to be resampled based on a historical location, sample collection will occur 3 to 5 feet of historical station to allow for drilling.
2. Depth intervals may be adjusted in the field based on observations of soil-groundwater interface or depths of obvious contamination.
3. VOCs will include CVOC compounds, EDC, EDB, MTBE and naphthalenes.
4. Field parameters will be measured for all groundwater samples and include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.
5. Natural attenuation parameters include: nitrate as nitrogen, methane, dissolved oxygen sulfate, iron, and TOC.

PAH: polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC-1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

GW: groundwater

MTBE: methyl tert-butyl ether

MNA: natural attenuation

NWTPH-Dx: the qualitative and extended quantitative method for semi-volatile ("diesel") petroleum products in soil and water

NWTPH-G: the qualitative and extended quantitative method for volatile ("gasoline") petroleum products in soil and water

NWTPH-HCID: a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist in water or soil

PW: porewater

VOC: volatile organic compound



June 2022  
TOTE Property USTs Project



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# Data Gaps Investigation Work Plan

Prepared for Port of Tacoma

June 2022  
TOTE Property USTs Project

# Data Gaps Investigation Work Plan

**Prepared for**  
Port of Tacoma  
One Sitcum Plaza  
Tacoma, WA 98401-1837

**Prepared by**  
Anchor QEA, LLC  
1119 Pacific Avenue, Suite 1600  
Tacoma, WA 98401-1837

## CERTIFICATION

This report was prepared by the staff of Anchor QEA, LLC, under the supervision of the Geologist whose seal and signature appears hereon, as required by Chapter 308-15-075 of the Washington Administrative Code (WAC).



A handwritten signature in black ink, appearing to read "Niklas Per Bacher", written in a cursive style.

Niklas P. Bacher, LG  
Senior Managing Geologist  
Anchor QEA, LLC

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## ABBREVIATIONS

µg/L	micrograms per liter
µg/kg	micrograms per kilogram
Alexander Site	Alexander Avenue Tank Facilities Site
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CBC	Commencement Bay Corrugated
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CVOC	chlorinated volatile organic compounds
DCE	dichloroethane
DGWP	Data Gaps Investigation Work Plan
EBC Site	Earley Business Center Site
Ecology	Washington State Department of Ecology
EDB	1,2-dibromoethane or ethylene dibromide
EDC	1,2-dichloroethane or ethylene dichloride
GPR	ground-penetrating radar
HCID	hydrocarbon identification
mg/kg	milligrams per kilogram
MNR	monitored natural attenuation
MTBE	methyl tert-butyl ether
MTCA	Model Toxics Control Act
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons – Diesel Range Organics
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons – Gasoline Range Organics
Occidental Site	Occidental Chemical Corporation Site
PCB	polychlorinated biphenyl
PCE	perchloroethylene
Port	Port of Tacoma
PQL	practical quantitation limit
Project	TOTE Property UST Project
Site	TOTE lease property
SQAPP	Sampling and Quality Assurance Project Plan
TCE	trichloroethene
TEQ	toxic equivalents
TPCHD	Tacoma Pierce County Health Department
UST or tanks	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
WAC	Washington Administrative Code

# 1 Introduction

This Data Gaps Investigation Work Plan (DGWP) was prepared by Anchor QEA, LLC, on behalf of the Port of Tacoma (Port). It documents the current understanding of soil and groundwater contamination related to the TOTE Property Underground Storage Tank (UST or tanks) Project (Project), summarizes data gaps required to determine an appropriate remedial plan, and describes sampling activities designed to complete the dataset.

The TOTE lease property (Site) is located at 500 Alexander Avenue, Tacoma, Washington. The Site is part of the Commencement Bay Nearshore Tidelands area and is south of the Hylebos Waterway and north of the Blair Waterway (Figure 1). The Site and vicinity are zoned for Port Maritime and Industrial Uses.

The Project was initiated by the Port to resolve the remediation status of tanks that were either 1) of unknown removal status, or 2) that had been removed but contamination of soil or groundwater was known or suspected. Including tanks that have been managed under separate remediation projects, the Project addresses a total of 26 tanks formerly located at the Site (Table 1). Only four Project tanks were registered USTs regulated under Washington's UST regulations (Washington Administrative Code [WAC] 173-360). The other tanks historically contained heating oil or fuel and were removed or closed in place prior to promulgation of the UST regulations. The assessment and remediation of tanks that are not regulated under WAC 173-360 are overseen by the Washington State Department of Ecology (Ecology) under Model Toxics Control Act (MTCA) regulations, as well as by the Tacoma Pierce County Health Department (TPCHD) under County regulations.

In 2017, the Port prepared a summary report describing the status of tank removal and cleanup work at the Site (Port 2017). The report was submitted to Ecology for review under the Voluntary Cleanup Program. Ecology provided written comments to the Port in a Voluntary Cleanup Program Opinion Letter (Ecology 2017a; Appendix C). That letter stated that Further Action was required. Between 2019 and 2020, Anchor QEA was retained by the Port to review the Ecology opinion letter, develop updated information regarding the tanks and associated environmental quality, and prepare a *Remedial Investigation and Remediation Plan* (Anchor QEA 2021). Ecology's subsequent comments on the *Remedial Investigation and Remediation Plan* indicated the need for additional data to complete an adequate site characterization prior to evaluating alternatives for Site remediation (Ecology 2021a; Appendix C). Refer to Table C-1 in Appendix C for an itemized summary of Ecology's written comments from 2017 and 2021.

## 1.1 Document Scope and Purpose

Prior to evaluation of potential alternatives to complete remediation of the Site, consistent with MTCA requirements for remedy selection, a round of environmental testing is necessary to resolve

data gaps and ensure that an adequate site characterization has been completed. The data collection described in this DGWP will supplement the existing Site information and comply with Ecology's 2017 and 2021 Further Action letters (Ecology, 2017; Ecology 2021a; Appendix C).

This DGWP summarizes the current understanding of Site conditions, discusses identified data gaps, and then describes field sampling and analysis activities to be performed to resolve those data gaps. The sampling proposed in this DGWP was developed in consideration of Ecology's comment letters (Ecology 2017 and 2021; summarized in Appendix table C-1) and current MTCA requirements for investigation of petroleum releases (WAC 173-340-830).

To facilitate review and continuity with previous Project documentation, the Site information has been organized in a series of Tank Areas (Figure 2, Table 1). Each Tank Area includes one or more former tanks and associated soil and groundwater in the vicinity. Tank nomenclature has also been retained consistent with prior Project reports as described in Section 2.2.

## **1.2 Document Organization**

This report is organized into the following sections:

- Section 2: Background
- Section 3: Site Conditions
- Section 4: Conceptual Site Model
- Section 5: Remedial Investigation Data Gaps
- Section 6: Phasing and Scheduling
- Section 7: References

## 2 Site Background

This section provides important background information for the Site. This information is intended to orient the reader to the Site and vicinity and provide historical information regarding the tanks that are managed under the Project.

### 2.1 Site History

The Site is located within the current Tacoma city limits. In 1916, Todd Dry Dock & Construction Company established a shipyard at the end of the Blair/Hylebos peninsula to support the World War I effort (Bradford, 1981). In 1939, the shipyard was restarted as the Seattle-Tacoma Shipbuilding Corporation, initially a venture involving both Todd shipyards and Kaiser Shipyards and funding from the U.S. Navy. The shipyard was later reabsorbed into the Todd Dry Dock & Construction Company and was sold to the Navy after the war ended (Bradford, 1981).

The Port acquired the property in 1960. Many of the buildings from the Navy operations remained in place at that time. No documents have been identified specifically listing tanks present or operational at the time of the property transfer. But various maps and photographs from the prior period of Navy operations (see Appendix A of Anchor QEA 2021) are available documenting certain tanks that were present at that time. These are discussed further in Section 2.2.

Between 1960 and the development of the TOTE Terminal in the 1980s, the Port leased portions of the Site out to various tenants. The TOTE Terminal was initially developed between 1983 and 1984. A Port demolition project from 1983 (Project EP-3826; see Appendix B of Anchor QEA, 2021) supported terminal development activities and included engineering drawings for the removal of several tanks, as described in Section 2.2.

A maintenance shop was constructed in support of TOTE operations around 1984. Four tanks were installed to support the operation of the shop. These tanks were registered as regulated USTs under WAC 173-360. These tanks were later removed in 1998 (see Appendix B of Anchor QEA, 2021) when TOTE removed the maintenance shop and converted to the use of aboveground fuel storage tanks.

Environmental testing and remediation activities were conducted during several rounds of tank removals at the Site between 1996 and 1999. These included the following:

- 1996 Tank Removals: In 1996, three tanks were removed from Tank Area P-27/28, located immediately south of former Building 397 (Nowicki & Associates 1996). That building was initially part of the Navy shipyard complex. Between 1983 and 1985 the building was used by Commencement Bay Corrugated (CBC), a company that manufactured cardboard boxes. The tank removal included environmental testing and remediation activities. Additional groundwater testing was performed by others as described in Sections 2.3 and 3.4.

- 1998 TOTE UST Removals: Removal of four regulated USTs from the TOTE equipment maintenance shop was performed in late 1998. Environmental testing and remediation activities were performed at that time (Horus 1999a).
- 1999 U-2 Tank Removal and No Further Action Letter: In the late 1990s, the TOTE Terminal was expanded to the southeast of East 11th Street. The street was vacated, and the 11th Street bridge over the Blair Waterway was removed. The terminal expansion included land that was a former service station. One waste oil tank (Tank U-2) was discovered during the redevelopment work at that property. The tank was removed in 1999, and all contaminated soils were removed (Horus 1999b). TPCHD issued a No Further Action letter for that work (TPCHD 1999). Ecology confirmed in its 2017 comment letter (Ecology, 2017; p. 11) that the NFA determination remains in place.

Between 2006 and 2009, the Port conducted a planning study to develop a multiparcel terminal redevelopment project, which included the Site. In support of planning for that project, which was never implemented, the Port developed an inventory of historical tanks known or suspected to have been at the Site. The Port retained GeoEngineers to conduct targeted soil testing in and around a number of former tank locations (GeoEngineers 2008). Results of that testing documented the presence of some gasoline contamination in one Tank Area (Tank Area N-9/10) and trichloroethylene (TCE) contamination in a second Tank Area (Tank Area N-20/21/22) (see section 2.2.3).

Between 2010 and 2015 the Port undertook a series of follow-up environmental testing activities as described in this report. Those investigations were intended to assess environmental quality in areas where either the status of former tanks was not known, or where the presence of contamination was known or suspected.

In parallel with the tank removal and investigations completed at the Site, environmental investigations have been completed at numerous adjacent Port-owned properties and properties owned by others. This includes work at three adjacent cleanup sites, as shown in Figure 3:

- Alexander Avenue Tank Facilities Site (Alexander Site)
- Occidental Chemical Corporation Site (Occidental Site)
- Earley Business Center Site (EBC Site)

## 2.2 Project Tank Areas

Former tank locations are shown in Figure 2. Based on available records, there were a total of 26 tanks previously located in 13 different Tank Areas at the Site. None of these tanks remain at the Site. The Tank Area locations have been verified and mapped through extensive compilation and review of historic maps, aerial photographs and environmental testing reports. The accuracy of the tank locations as shown in the figures attached to this Work Plan is estimated to be within +/- 10 feet.

Based on the available information regarding environmental quality, the different Tank Areas have been organized into the following five groups:

- **Group 1 Tank Areas:** No identified contamination: Group 1 Tank Areas are those that have been investigated with soil and groundwater testing, and for which no soil or groundwater contamination has been identified to date.
- **Group 2 Tank Areas:** Confirmed soil contamination: Group 2 Tank Areas are those that have been investigated with both soil and groundwater testing, and the presence of soil contamination has been confirmed but no groundwater contamination has been detected in excess of current MTCA Method A cleanup levels.
- **Group 3 Tank Areas:** Confirmed soil and groundwater contamination: Group 3 Tank Areas are those that have been investigated with both soil and groundwater testing, and the presence of both soil and groundwater contamination has been confirmed.
- **Group 4 Tanks:** No identified contamination but require additional data: Group 4 Tank Areas are those where no contamination was identified during tank removal, but limited information exists regarding the size, contents, or history of the tanks. As a result, additional data are needed to support tank close-out.
- **Tank Areas Addressed Separately:** These include Tank Areas that were resolved prior to the current Project, or are being currently addressed under separate cleanup projects (e.g., Tank N-11, which is being addressed as part of the cleanup of the Alexander Site and Tank U-2, which received an NFA in 1999; Figure 2).

Naming conventions for individual tanks have not been consistent over time. However, many of the tanks were identified by an older Port alpha-numeric code. That code system is retained in this DGWP for those tanks, and includes the following:

- Tank A-## and Tank B-##: These prefixes represent Group 4 tank designations. The historical presence of these tanks was confirmed during a 2019 review of Port engineering records. Port records confirmed that all of these tanks have been removed (see Appendix B in Anchor QEA, 2021).
- Wax Tank: This prefix represents a Group 4 tank identified during a 2019 review of Port engineering records (see Appendix B in Anchor QEA, 2021). This tank is understood to be removed but documentation is lacking.
- Tank N-##: The N-prefix indicates a tank identified in former Navy documents available to the Port. This numbering system may not capture all tanks that operated during the period of Navy ownership.
- Tank T-##: The T-prefix indicates a tank specifically identified as a tenant responsibility at the time it was removed.

- Tank P-##: The P-prefix indicates a tank that was removed by the Port without tenant involvement.
- Tank U-##: The U-prefix indicates a tank that was of unknown origin by the Port at the time it was removed.

### 2.2.1 Group 1 Tank Areas

There are currently four Group 1 Tank Areas (Tank Areas with no identified contamination) located at the Site. Five tanks were historically located within these four Group 1 Tank Areas:

- **Tank Area N-12:** One former Navy heating oil tank was located adjacent to former Building 205. That building was a heating plant during the period of Navy operations. The tank location was clearly shown on Navy maps from 1949 and 1952.
- **Tank Area N-13:** One former Navy heating oil tank was located adjacent to former Building 208. That building was a heating plant during the period of Navy operations. The tank location was clearly shown on Navy maps from 1949 and 1952.
- **Tank Area N-17:** One former Navy oil tank was located adjacent to former Building 344. The tank location was shown on a Navy map from 1952. It was removed in 1983 as part of Port project EP-3826.
- **Tank Area T-23/24:** This Tank Area included Tanks T-23 and T-24. Tank T-23 was a 1,000-gallon welded steel tank storing unused motor oil, and Tank T-24 was a 1,000-gallon welded steel tank storing waste oil. These two tanks were Underground Storage Tanks subject to regulation under WAC 173-360 and associated MTCA requirements for the cleanup of regulated USTs (WAC 173-340-450). These two tanks were removed in 1998 under Port Project EP-5142.

### 2.2.2 Group 2 Tank Areas

There is only one Group 2 Tank Area (Tank Area with soil-only contamination) located at the Site. Two tanks were historically located within this Tank Area:

- **Tank Area T-21/22:** This Tank Area included two fueling tanks that were installed in 1984 adjacent to the TOTE shop building. These two tanks were Underground Storage Tanks subject to regulation under WAC 173-360 and associated MTCA requirements for the cleanup of regulated USTs (WAC 173-340-450). Tank T-21 was a 12,000-gallon fiberglass diesel tank, and Tank T-22 was a 4,000-gallon fiberglass gasoline Tank. The tanks were located under a pump island to the southeast of the TOTE shop building. Removal of the tanks was initiated in 1998, not because a release had occurred, but because the tanks did not meet the pending UST tank requirements and TOTE was changing their fueling practices to rely on aboveground storage tanks rather than underground tanks. The removal work and the associated cleanup activities are both described in a tank removal report (Horus 1999a) and in associated project

drawings (Project EP-5142). Though the tank removal work documented compliance with MTCA Method A cleanup levels in place at the time of the work, some low-level benzene remained in soil at the base of the excavation. Since that time the MTCA Method A cleanup level for benzene has been lowered by Ecology. Subsequent work confirmed the presence of residual benzene contamination in soil, but no groundwater contamination has been detected to date.

### 2.2.3 Group 3 Tank Areas

There are three Group 3 Tank Areas at the Site. These Group 3 Tank Areas formerly contained a total of 11 former tanks. These areas have been shown to contain both soil and groundwater contamination. At Tank Areas N-9/10 and N-20/21/22, groundwater contamination is limited to chlorinated volatile organic compounds (CVOCs). Tank Area P-27/28 contains petroleum contamination in groundwater. Available information on these tanks is summarized below.

- **Tank Area N-9/10:** This area contained three former tanks. Two heating oil tanks were previously associated with former Navy Building 361. The tank locations were shown on maps from 1949 and 1952. Later in 1983 when these two tanks were removed by the Port, an additional tank was identified and removed. The drawings from the 1983 removal project showed the tank to contain three inches of toluene at the time it was removed. Later investigations (between 2008 and 2024) have confirmed the presence of soil and groundwater contamination in this Tank Area.
- **Tank Area N-20/21/22:** This area previously contained five former tanks. Three gasoline tanks were previously associated with a service station operated by the Navy. The approximate location of the three tanks is shown on a Navy map from 1952. The tank locations were near aboveground service station structures, including a small operator's shack and two overhead canopy structures. The shack and canopy structures are visible in a 1950 oblique aerial photograph and a 1969 plan-view aerial photograph (operator's shack only). The three gasoline tanks were removed some time prior to 1983. In 1983, two additional tanks not noted on the 1952 Navy map were removed from same service station area as part of Port project EP-3826. The use of the two additional tanks is not known. Later investigations between 2008 and 2014 confirmed the presence of soil and groundwater contamination in this Tank Area.
- **Tank Area P-27/28:** This Tank Area contained three former tanks. CBC, a Port tenant, operated this portion of the property between 1983 and 1985. Project drawings from 1983 indicate that three tanks (including P-27/28) were to be preserved for use as wax tanks by CBC. Tanks P-27/28 are understood to have been heating oil tanks prior to their use for wax storage. During subsequent removal in 1996, the third tank was identified as Tank U-1. The third tank was smaller and was thought to be a startup tank. Soil and groundwater

contamination with petroleum was confirmed during the tank removal work and follow-up groundwater investigations.

#### 2.2.4 *Group 4 Tank Areas*

There are three Tank Areas where no contamination was discovered during tank removal, but additional data are required to determine if any hazardous substances are present in these areas and to support tank close-out. These include the following tanks:

- **Tank Area A-1/2:** A total of two tanks were removed from this Tank Area in 1983. No contamination was noted during those removals. Former tank locations are shown in Figure 2 based on Port Drawings from Port project EP-3826.
- **Tank Area B-1/2/3:** A total of three tanks were removed from this Tank Area in 1983. No contamination was noted during those removals. Former tank locations are shown in Figure 2 based on Port Drawings from Port project EP-3826.
- **Former Wax Tank:** Use of this tank was terminated in the mid-1980s after CBC relocated to Orting, Washington. However, the Port has not yet identified any detailed records regarding the disposition of this tank. No geophysical testing has been performed to evaluate the potential presence of this tank. Further assessment is warranted (historical research or geophysical testing) to verify the tank is not present.

#### 2.2.5 *Tanks Addressed Separately*

There are two Tank Areas that have been addressed separately by the Port. These include the following:

- **Tank N-11 Area (Alexander Avenue Petroleum Tank Facilities Site):** Tank N-11 was a former heating oil tank identified on Navy drawings from 1949 and 1952. This tank was located within the groundwater plume that originates from the adjacent Alexander Site (Figure 3). Geophysical testing has confirmed that the tank is no longer present. Contamination is present in surrounding soils and groundwater, but the contamination source is most likely associated with the Alexander Site plume, rather than the tank (Hart Crowser 2015a). The Port is addressing cleanup of this area under the ongoing Alexander Site cleanup.
- **Tank U-2 Area (1100 Alexander Avenue No Further Action Site):** In 1999, the Port conducted the cleanup of a 500-gallon waste oil tank identified during building footing excavations for the TOTE Terminal expansion. The tank had apparently been missed during prior tank removals conducted by the previous property owner. Contaminated soil associated with the tank was removed (Horus 1999b). The TPCHD conducted review of the cleanup and issued a No Further Action Letter (TPCHD 1999). Ecology confirmed in its 2017 letter to the Port (Ecology 2017a) that Ecology did not intend to reopen that No Further Action decision. No further work is required for this Tank Area under the TOTE UST Project.

## 2.3 Project-Related Environmental Studies

### 2.3.1 Tank Removal and Cleanup Reports

Tank removal, assessment and initial cleanup activities have been documented in consultant reports for three Tank Areas within the Property:

- **Tank Areas T-21/22 and T-23/24:** A single tank removal and cleanup report (Horus 1999a) describes the work performed in 1998 in these two Tank Areas. Port engineering department drawings associated with the tank removal project are also available (Port Project EP-5142) documenting the work performed.
- **Tank Area P-27/28 (includes Tank U-1):** A total of four consultant reports are available and describe initial tank removal, cleanup, and testing activities for this Tank Area:
  - 1996 Removal of Tanks P-27, P-28 and U-1: A 1996 report (Nowicki & Associates 1996) describes the removal of the three tanks from this Tank Area and completion of initial cleanup actions.
  - 1997 Follow-up Investigations: Two subsequent reports (Horus 1997; Noll 1998) documented groundwater investigations conducted in 1997, including six well installations within and upgradient of the Tank Area.
  - 2012 Well Abandonments: All six wells were later removed in 2012 (Greylock 2012).

### 2.3.2 Recent Tank Area Investigations

Recent Tank Area investigations have been completed by the Port to fill data gaps and supplement available information. These investigations are described in detail in Section 4 of this Report. These recent investigations have included the following:

- **2008 GeoEngineers Soil Testing Study:** In 2008, the Port retained GeoEngineers to conduct soil sampling near former tank locations. This work was conducted in support of a proposed shoreline cut-back project that was never implemented. That work included soil testing in four of the Project Tank Areas (Tank Areas N-9/10, N-12, N-17 and N-20/21/22).
- **2010–2014 Hart Crowser Soil and Groundwater Studies:** The Port retained Hart Crowser to conduct a series of follow-up studies of soil and groundwater quality in the Group 1, 2, and 3 Tank Areas. These investigations were conducted between 2010 and 2014, with the data reports published between 2012 and 2015.

## 2.4 Adjacent Cleanup Sites

There are three other cleanup sites that are located adjacent to the Site. In two cases, these adjacent sites have affected current environmental conditions within the Site:

- **Alexander Avenue Petroleum Tank Facilities Site (Alexander Site):** The Alexander Site is a MTCA cleanup site located across Alexander Avenue from the TOTE Terminal. The

development of a Remedial Investigation/Feasibility Study for the Alexander Site is current being led by the Port and Mariana Properties under an Agreed Order with Ecology. The cleanup work there focuses on petroleum and related contaminants originating from the former petroleum tank farms located at 1001 and 709 Alexander Avenue. Based on the data collected during the Alexander Site Remedial Investigation (Aspect 2016), two groundwater plumes extend from the Alexander Site onto the TOTE Property:

- **Alexander Site Benzene Plume:** The contamination associated with the Alexander Site extends onto portions of the 1001 Alexander property and onto the TOTE Property. A contaminated groundwater plume containing benzene extends onto the Property as shown in Figure 3. The benzene plume surrounds former Tank Area N-11. As described in Section 2.2.5, the cleanup of Tank Area N-11 is to be completed as part of the cleanup of the Alexander Site.
- **B-123 Vinyl Chloride Plume:** Chlorinated solvents including vinyl chloride are present in groundwater at the Occidental Site (see below). These Occidental Site contaminants have become co-mingled with petroleum contamination at the Alexander Site. During Alexander Site investigations, vinyl chloride (VC) was detected in several borings, including B-123 (Figure 3) located adjacent to the Alexander Site benzene plume. Vinyl chloride was detected at a depth of 25 feet (measured concentration 160 micrograms per liter [ $\mu\text{g/L}$ ]) in Boring B-123. The VC at this location is associated with the Occidental Site CVOC plume.
- **Occidental Site:** The Occidental Chemical Corporation Site (Occidental Site) is a cleanup site regulated under both MTCA regulations and federal Superfund regulations (Comprehensive Environmental Response, Compensation and Liability Act). Ongoing cleanup actions for soil and groundwater are being led by Occidental Chemical Corporation, Glenn Springs Holdings, Inc., and Mariana Properties, Inc., under an Agreed Order issued by Ecology. That Order addresses work required under the cleanup authorities of MTCA and the corrective action requirements of the Washington Dangerous Waste regulations. Cleanup investigations have documented the presence of two groundwater plumes extending from the Occidental Site onto the TOTE Property as shown in Figure 3:
  - **Occidental CVOC Plume:** The Occidental Site cleanup is focused primarily on the cleanup of certain CVOC compounds. The CVOC plume originating at the Occidental Site contains both parent CVOC compounds (perchloroethylene [PCE] and trichloroethylene) and CVOC biodegradation byproducts (dichloroethenes and VC). Occidental Site investigations have included placement of multiple groundwater monitoring wells (including tiered wells placed at multiple depths) on the TOTE Property as part of plume bounding. The groundwater data from the *Final Draft Site Characterization Report* (CRA 2015) documented the presence of cis-1,2-dichloroethene (DCE) at concentrations of 0.09 to 0.78  $\mu\text{g/L}$  at three of the plume bounding wells (wells

85-C, 44, and 88-C) shown in Figure 3. At the remaining three wells (wells 86-C, 87-C and 92-C) all CVOCs were below method reporting limits (lowest reporting limit 0.5 µg/L). The contamination was present primarily at depths of 25 feet. No sampling was performed at the water table, which is typically present at depths of approximately 15 feet.

- **Occidental pH Plume:** The Occidental Site cleanup also is addressing an area of highly alkaline (high-pH) groundwater associated with releases of caustic chemicals from the former chemical manufacturing facility. This extent of this “pH plume” was mapped at different depths in the *Final Draft Site Characterization Report* (CRA 2015). The pH plume boundary as shown in Figure 3 is the outer extent of pH 8.5 groundwater identified in that report at any depth sampled.
- **Early Business Center Site:** The EBC Site is located to the northwest of the TOTE Property. The Port is currently developing a Remedial Investigation/Feasibility Study for the EBC Site under an Agreed Order with Ecology. To date, no EBC Site soil or groundwater contamination has been shown to extend onto the TOTE Site.

## 3 Site Conditions

This section summarizes environmental investigations at the Site to date. The geology and hydrogeology of the Site is discussed in Section 3.1. Current environmental data for each of the Tank Areas are presented in Sections 3.2 through 3.5, along with relevant historical information. Figure 4 provides the historical sample locations discussed for each Tank Area. These data are incorporated into the Conceptual Site Model further described in Section 4 (Figure 5).

Historical soil and groundwater data have been screened against applicable cleanup levels in soil, groundwater, and surface water (Table 2).

### 3.1 Geologic and Hydrogeologic Conditions

Geologic and hydrogeologic conditions at the Site and vicinity have been extensively investigated via various environmental studies implemented as part of the Project and as part of ongoing environmental studies at the Occidental Site (CRA 2015) and Alexander Site (Aspect 2016).

Native soils at the Site consist of tideflat deltaic deposits. These are overlain by dredge fill materials placed during initial development of the Blair and Hylebos Waterways in the early 1900s. This is in turn overlain by other surficial fill materials.

Groundwater is typically encountered at depths of between 7 and 10 feet below ground surface (bgs) within the tideflat deposits and overlying fill materials. The groundwater elevation is subject to seasonal fluctuations of 1 to 2 feet. Tidal influences are observed near the shoreline.

Groundwater gradients in the surficial water-bearing zone are subject to a number of potential anthropogenic influences. These include different degrees of paving at the Site and vicinity, and the effects of groundwater pumping systems associated with the Occidental Site:

- At the TOTE Site, all surface areas are paved and drained as part of terminal operations. In contrast, the adjacent Occidental Site and portions of the Alexander Site remain unpaved. Differential infiltration rates may influence current observed groundwater gradients.
- The Occidental Site has included operation of an extensive hydraulic containment system since the 1980s. That system extracts and treats groundwater within portions of the Occidental Site plume. The operations of this hydraulic containment system have resulted in intentional modifications to groundwater gradients in the vicinity of the TOTE Site. Apparent influences of the containment system have been summarized in Occidental Site documents (CRA 2015).

Relevant observations of groundwater gradients have been measured at the Site as part of work performed under the current Project, as well as during work associated with the Alexander Site:

- Within the Alexander Site, groundwater gradients were found to follow a divide located to the east of and generally parallel with Alexander Avenue. Groundwater gradients in surficial water-bearing zones tended to flow from the southwestern portions of the former tank farm facilities, across Alexander Avenue and toward the Blair Waterway. The migration of the Alexander Site benzene plume toward the Blair Waterway (Figure 3) is consistent with these observed gradients across the TOTE Site.
- Local groundwater gradients have been measured under the current Project within three Group 3 Tank Areas where groundwater monitoring wells have been installed and monitored:
  - At Tank Area N-9/10, four groundwater wells were installed in 2011 and a fifth downgradient well located near the Blair Waterway shoreline was installed in 2014. Groundwater gradients measured using these five wells in 2014 are shown in Figure 5. These gradients show a southerly direction toward the Blair Waterway shoreline.
  - At Tank Area N-20/21/22, three groundwater wells were installed in 2011, and a fourth well located near the Blair Waterway shoreline was installed in 2014. Groundwater gradients measured using these four wells in 2014 are shown in Figure 5. These gradients show a southwesterly direction toward the Blair Waterway shoreline.
  - At Tank Area P-27/28, a total of six groundwater wells were installed in 1996 and 1997. Groundwater gradients measured in these six wells are shown in Figure 5. These gradients show a southerly direction toward the Blair Waterway.

Interpolation of groundwater gradients near the Occidental Site is more complex given the historical operations and expansion of the hydraulic containment system following the 1980s. Groundwater gradients within and adjacent to the Occidental Site are likely to have varied over time, resulting from the active groundwater remediation system. Residual CVOC and pH plumes have extended onto the TOTE Site as a result of past and potential ongoing groundwater migration from the Occidental Site.

Groundwater use within and adjacent to the Occidental Site is subject to an existing environmental covenant. That covenant prohibits the consumptive use of groundwater from areas of Port-owned property located northwest of East 11th Street, including the majority of the TOTE Site. This environmental covenant was originally established in response to the discovery of groundwater contamination associated with the Occidental Site.

## 3.2 Environmental Conditions in Group 1 Tank Areas

There are currently four Group 1 Tank Areas (Tank Areas with no identified contamination) located at the Site. Known environmental conditions within each of these areas are described in Table 3 and shown in Figure 6 through Figure 9.

### 3.2.1 Tank Area N-12

Available environmental testing data in Tank Area N-12 are summarized in Figure 6. Tank N-12 was a former oil tank located adjacent to Building 205, which was used as a heating plant during Navy operations.

The location of the tank as shown in Figure 6 is based on historical Navy maps from 1949 and 1952 showing the tank and building locations and is estimated to be within approximately 10 feet of its true former location. An oblique aerial photograph from 1950 also shows the locations of Buildings 205 and 203, and plan-view aerial photographs from 1946 and 1969 show the same building locations.

No soil or groundwater contamination has been detected within Tank Area N-12. This conclusion is based on two rounds of testing, and a total of 10 soil borings as shown in Figure 6:

- **2008 GeoEngineers Soil Borings:** Petroleum and CVOC testing was conducted at six soil borings installed by GeoEngineers in 2008. Two of the GeoEngineers borings were located in the immediate vicinity of the former tank location. No petroleum or CVOC contamination was present in any of the six borings.
- **2012 Hart Crowser Soil and Groundwater Testing:** Hart Crowser conducted soil and groundwater testing for petroleum in 2012 using four geoprobe borings. No petroleum was detected in excess of MTCA Method A cleanup levels in soil or groundwater in any of the four borings (Hart Crowser 2012a). Limited geophysical testing was also conducted during 2012 using ground penetrating radar and a magnetometer, but that work was erroneously conducted approximately 50 feet to the northeast of where the tank is known to have been historically located and was not useful.

As noted by Ecology in its Opinion Letter (Ecology 2017a), there remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2012 testing conducted by Hart Crowser included the use of silica gel cleanup. Ecology's default position in current petroleum remediation guidance (Ecology 2016) is that compliance with groundwater cleanup levels for extractable petroleum hydrocarbons in groundwater must be measured using the Northwest Total Petroleum Hydrocarbons – Diesel Range Organics (NWTPH-Dx) analysis without silica gel cleanup unless otherwise approved by Ecology. This uncertainty will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### 3.2.2 Tank Area N-13

Available environmental testing data in the Tank Area N-13 are summarized in Figure 7. Tank N-13 was a former oil tank located adjacent to Building 208, which was used as a heating plant during Navy operations.

The location of the tank as shown in Figure 7 is based on historical Navy maps from 1949 and 1952 and is estimated to be within approximately 10 feet of its true former location. The locations of Buildings 208 and 209 are clearly shown in an oblique aerial photograph from 1950 and in plan-view aerial photographs from 1946 and 1969.

No soil or groundwater contamination has been detected in the vicinity of Tank Area N-13. This conclusion is based on the following information:

- **Hart Crowser Geophysical Testing (2010 and 2015):** Geophysical testing was performed by Hart Crowser, including the use of both ground-penetrating radar (GPR) and a magnetometer. Hart Crowser also conducted geophysical testing at Tank Area N-13 in 2010 and again in 2015. The follow-up geophysical testing did not confirm the findings of the 2010 work. Two anomalies identified in the 2015 work were investigated by potholing. That work confirmed the anomalies to be pieces of buried metal debris (Hart Crowser 2015b).
- **2010 Hart Crowser Soil and Groundwater Testing:** Hart Crowser conducted soil and groundwater testing for petroleum using four geoprobe borings. No petroleum (gas, diesel, oil or benzene, toluene, ethylbenzene, and xylenes [BTEX] compounds) was detected in excess of MTCA Method A cleanup levels in soil or groundwater (Hart Crowser 2012b).

As noted by Ecology in its Opinion Letter (Ecology 2017a), there remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2010 NWTPH-Dx testing included the use of silica gel cleanup. This uncertainty will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### 3.2.3 Tank Area N-17

Available environmental testing data in Tank Area N-17 are summarized in Figure 8. Tank N-17 was a former oil tank located adjacent to former Building 344. The tank was removed in 1983 as part of Port Project EP-3826.

The former location of Tank N-17 as shown in Figure 8 is based primarily on engineering drawings from Port Project EP-3826, which included the tank's removal. This location is consistent with information derived from historical Navy maps from 1949 and 1952 that show the location of the tank and former Building 344, and is estimated to be within approximately 10 feet of its true former location. An oblique aerial photograph from 1950 shown the location of Building 344, and plan-view aerial photographs from 1946 and 1969 showing the same building location.

No soil or groundwater contamination has been detected in the vicinity of Tank Area N-17. This conclusion is based on two rounds of testing:

- **2008 GeoEngineers Soil Borings:** Petroleum and CVOC testing was conducted at six soil borings installed by GeoEngineers in 2008. Two of the GeoEngineers borings were located in the immediate vicinity of the former tank location. No petroleum (gas, diesel, oil or BTEX compounds) or CVOC contamination was present in any of the six borings.
- **2010 Hart Crowser Soil and Groundwater Testing:** Hart Crowser conducted soil and groundwater testing for petroleum in 2010 using a single geoprobe boring. No petroleum (gas, diesel, oil or BTEX compounds) was detected in excess of MTCA Method A cleanup levels in soil or groundwater (Hart Crowser 2012c).

As noted by Ecology in its Opinion Letter (Ecology 2017a), there remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2010 testing included the use of silica gel cleanup. This uncertainty will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### *3.2.4 Tank Area T-23/24*

Available environmental testing data in Tank Area T-23/24 and shown in Figure 8. These tanks consisted of 1,000-gallon welded steel tanks used for motor oil (T-23) and waste oil (T-24). They were originally installed in 1984 adjacent to the TOTE equipment shop. These two tanks were Underground Storage Tanks subject to regulation under WAC 173-360 and associated MTCA requirements for the cleanup of regulated USTs (WAC 173-340-450).

The former locations of Tanks T-23 and T-24 as shown in Figure 6d are based on engineering drawings from Port Project EP-5412, which included removal of the tanks and associated piping. The location is also based on plan-view aerial photographs from 1985 and 1990 that show the location of the former TOTE equipment shop. The locations of Tanks T-23 and T-24 as shown in Figure 9 are estimated to be within approximately 10 feet of their true former locations.

Tanks T-23 and T-24 were removed in 1998 (Horus 1999a). No soil contamination was detected at the former location of Tank T-23. One soil sample at the base of Tank T-24 excavation contained diesel at 2,000 milligrams per kilogram (mg/kg) and oil at 6,300 mg/kg. This soil contamination was over-excavated and resampled. Confirmation sampling demonstrated that the diesel and oil concentrations in the remaining soils were below 200 mg/kg. Testing was also conducted for polychlorinated biphenyls (PCBs) and lead. PCBs were not detected. Lead concentrations were below applicable Method A cleanup levels for unrestricted land uses.

The absence of soil or groundwater contamination in Tank Area T-23/24 was further confirmed with an additional round of testing performed by Hart Crowser. Hart Crowser conducted soil and

groundwater testing for petroleum in 2010 using a single geoprobe boring. No petroleum constituents (gas, diesel, oil or BTEX compounds) were detected in excess of MTCA Method A cleanup levels in soil or groundwater (Hart Crowser 2012d).

As noted by Ecology in its Opinion Letter (Ecology 2017a), there remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2010 testing included the use of silica gel cleanup. Ecology also noted the need for additional testing to verify the absence of MTCA Table 830-1 contaminants not previously tested, in this case VOCs (including CVOCs, 1,2-dichloroethane (EDC), 1,2-dibromoethane (EDB), methyl tert-butyl ether (MTBE) and PAHs (PCBs and lead were previously tested and found to be absent). This uncertainty will be resolved as part of the Data Gaps Investigation, as described in Section 5. Environmental Conditions in Group 2 Tank Areas

There is currently only one Group 2 Tank Area (soil-only contamination) located at the Site. Two tanks were historically located within this Group 2 Tank Area. Known environmental conditions in this Tank Area are described in Table 4 and shown in Figure 10.

### 3.2.5 Tank Area T-21/22

This Tank Area included two fueling tanks that were installed in 1984 adjacent to the TOTE shop building (Figure 7). Tank T-21 was a 12,000-gallon fiberglass diesel tank, and Tank T-22 was a 4,000-gallon fiberglass gasoline Tank. The tanks were located under a pump island to the southeast of the shop building. These two tanks were Underground Storage Tanks subject to regulation under WAC 173-360 and associated MTCA requirements for the cleanup of regulated USTs (WAC 173-340-450).

Removal of the tanks was initiated in 1998, not because a release had occurred, but because the tanks did not meet the pending UST tank requirements, and TOTE was changing their fueling practices to rely on aboveground storage tanks rather than underground tanks. The removal work and the associated cleanup activities are both described in a tank removal report (Horus 1999a) and in Port engineering project drawings (Port project EP-5142).

Both tanks were removed from a common tank excavation. Tank T-21 (12,000-gallon diesel) was removed without evidence of tank leakage. However, some diesel was detected at a concentration of 1,500 mg/kg in the base of the excavation. The diesel-contaminated soil was over-excavated. At the time the MTCA Method A cleanup level for extractable petroleum hydrocarbons was 200 mg/kg (it has since been raised to 2,000 mg/kg). During the removal action, diesel was noted dripping from a disconnected fuel line to the fuel island. The line was capped and petroleum-impacted water resulting from this drippage was removed from the excavation prior to backfill of the excavation. The

fuel line and the associated fuel island were removed as called for in the construction drawings for Port Project EP-5142.

Though the tank removal work documented compliance with MTCA Method A cleanup levels in place at the time of the work, some low-level benzene (230 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ]) remained in soil at the base of the excavation, as shown in Figure 10. Since that time the MTCA Method A cleanup level for benzene has been lowered to 30  $\mu\text{g}/\text{kg}$  by Ecology.

The presence of residual soil contamination with benzene was confirmed in subsequent work, performed by Hart Crowser. Hart Crowser conducted soil and groundwater testing for petroleum in 2010 using two geoprobe borings. With the exception of benzene, no petroleum constituents (gas, diesel, oil or BTEX compounds) were detected in excess of MTCA Method A cleanup levels in soil. Benzene was detected at a concentration of 130  $\mu\text{g}/\text{kg}$  in one soil boring at a depth of approximately 9 feet bgs. This sample was at the same depth and immediately adjacent to the soil sample collected by Horus Environmental more than 10 years prior. No petroleum constituents (gas, diesel, oil, carcinogenic polycyclic aromatic hydrocarbon [cPAH] or BTEX compounds) were detected in excess of MTCA Method A cleanup levels in groundwater (Hart Crowser 2012e).

Ecology noted a number of data gaps in its Opinion Letter (Ecology 2017a; Appendix C). These include the following:

- There remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2010 testing included the use of silica gel cleanup.
- Ecology also noted the need for monitoring wells to be used at regulated UST sites where either groundwater is impacted (not demonstrated to date) or where the deepest samples exceed cleanup levels. At Tank Area T-21/22 two soil samples exceed the current benzene MTCA Method A cleanup level for soil.
- Ecology also noted the need for additional testing to verify the absence of MTCA Table 830-1 contaminants not previously tested, in this case PAHs, and the need to assess whether groundwater at this location is influenced by the pH or CVOC plumes from the adjacent Occidental Site.

These uncertainties will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### **3.3 Environmental Conditions in Group 3 Tank Areas**

There are currently three Group 3 Tank Areas (Tank Areas with both soil and groundwater contamination) located at the Site. A total of 11 tanks were historically located within these Group 3 Tank Areas. Available information for Group 3 tanks is presented in Table 5 and shown in Figures 11a through 13.

### 3.3.1 Tank Area N-9/10

Available environmental testing data in Tank Area N-9/10 Area are summarized in Figures 11a and 11b. This Tank Area included a total of three historical tanks, all of which were removed in 1983 by the Port.

The first two tanks (N-9 and N-10) were listed as oil tanks on Navy drawings from 1949 and 1952. They were located adjacent to former Building 361. In 1983, three tanks were removed from Tank Area N-9/10. These included the two original Navy oil tanks and one additional tank. The installation date for the third tank is not known. Port engineering drawings from Project EP-3826 indicate that the third tank contained 3 inches of toluene at the time it was removed.

The former locations of the three tanks in Tank Area N-9/10 are based on Port engineering drawings from Project EP-3826 and Navy drawings from 1949 and 1952. Both maps show the location of the tanks relative to former Building 361. The location of Building 361 was confirmed using an oblique aerial photograph from 1950, and plan-view aerials from 1946 and 1969. The locations of the three former tanks in Tank Area N-9/10 as shown in Figures 11a and 11b are estimated to be within approximately 20 feet of their true former locations.

The extent of soil and groundwater contamination in Tank Area N-9/10 was defined in four rounds of environmental testing, performed by GeoEngineers and Hart Crowser. Results of testing documented the presence of limited soil-only contamination for petroleum constituents and groundwater-only contamination for CVOC compounds:

- **2008 GeoEngineers Soil Testing:** In 2008 GeoEngineers sampled soils from six soil borings placed within Tank Area N-9/10 and from two locations to the east of this Tank Area.
  - **Petroleum Testing Data:** In one of the six soil borings at Tank Area N-9/10, gasoline was detected (570 mg/kg) in excess of the current MTCA Method A soil cleanup level (Figure 11a). This gasoline contamination was detected at a depth of 6-8 feet in the boring nearest the former tank locations. No contamination exceeding MTCA Method A cleanup levels was noted for in the other five borings within Tank Area N-9/10 or the two soil borings located farther the east.
  - **CVOC Testing Data:** No CVOC contamination was detected in excess of MTCA Method A cleanup levels at Tank Area N-9/10 (Figure 11b). However, trace levels of several CVOC compounds including PCE, trichloroethene (TCE), and DCE were noted in soils at concentrations below the applicable MTCA Method A cleanup levels. These trace CVOC concentrations were not detected in the two soil borings located farther to the east of Tank Area N-9/10.
- **2010–2014 Hart Crowser Soil and Groundwater Testing:** Hart Crowser conducted several rounds of soil and groundwater testing. That work included the use of test pits, geoprobe borings, and installation and sampling of a total of five groundwater monitoring wells. The

work was performed in 2010, 2011, 2013, and 2014, and was summarized in reports dated 2012 and 2015 (Hart Crowser 2012f, 2012g, 2013, 2015c). A summary of key observations includes the following:

- **Petroleum Soil Testing Data:** Hart Crowser tested soil quality for petroleum at three test pit locations and four soil boring locations (Figure 11a). Exceedances of MTCA Method A cleanup levels were noted at two locations (HC-TP-1 and soil boring HC-3). At location HC-TP-1, the contamination included cPAH (reported concentration 0.67 mg toxic equivalents [TEQ]/kg). At location HC-3 the contamination included diesel at a concentration of 2,400 mg/kg.
- **Petroleum Groundwater Testing Data:** Hart Crowser tested groundwater quality at four geoprobe boring locations and at five monitoring well locations (Figure 11a). No exceedances of MTCA Method A cleanup levels were noted for any petroleum-related constituents (gas, diesel, oil, BTEX or cPAH) at these nine sampling locations.
- **CVOC Groundwater Testing Data:** Hart Crowser tested groundwater for CVOC compounds during sampling of the five groundwater monitoring wells (Figure 11b). Exceedances of MTCA Method A groundwater cleanup levels were reported only for VC. Concentrations of VC in the Tank Area N-9/10 groundwater ranged from 0.25 to 6.9 µg/L. No VC was detected at a downgradient well (HC-N910-9) installed and sampled in 2014 near the shoreline of the Blair Waterway.
- **Groundwater Testing for Heavy Metals:** During 2011 and 2013, groundwater within the Tank Area was tested for both total and dissolved heavy metals. The downgradient well was tested for heavy metals in 2014. No exceedances of MTCA Method A cleanup levels were noted for lead or arsenic in the Tank Area. In the downgradient well total and dissolved arsenic were detected at 8 ug/L and 5 ug/L, respectively, indicating the presence of a turbidity artifact in that sample. A second data quality concern is that groundwater contained elevated electrical conductivity values, but the heavy metals analysis did not take measures to correct for potential isobaric (salinity-associated) interferences with the arsenic analysis. This isobaric interference problem is particularly significant for arsenic in water containing elevated sodium chloride. Ecology has also recently confirmed that natural background concentrations of arsenic in Puget Sound area groundwater range up to 8 ug/L (Ecology, 2022).
- **Groundwater Testing for Monitored Natural Attenuation (MNA) Parameters:** During 2013, Hart Crowser analyzed groundwater for MNA parameters, including dissolved oxygen, redox, sulfate, nitrate, iron and methane. Evidence of anaerobic biodegradation activity was observed, including the production of methane, depressed oxygen and redox levels, and the production of VC. VC is a degradation product of PCE and TCE, both of which were detected at trace levels during the 2008 GeoEngineers soil boring investigation. Groundwater chemistry showed the presence of residual sulfate in

groundwater, indicating the presence of available electron acceptors as necessary to support continued anaerobic microbial activity.

Ecology noted a number of data gaps in its Opinion Letters (Ecology 2017a, Ecology 2021a; Appendix C). These included the following:

- There remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the groundwater testing performed by Hart Crowser included the use of silica gel cleanup.
- Additional information is needed to bound the extent of soil gasoline contamination at U4-F and soil cPAH contamination at HC-TP-1 (Figure 11a).
- Ecology also noted the need for additional testing to verify the absence of MTCA Table 830-1 contaminants not previously tested in groundwater, in this case MTBE and PAHs, and the need to assess whether groundwater at this location is influenced by the pH or CVOC plumes from the adjacent Occidental Site.
- Ecology also expressed to conduct follow-up work regarding the reported concentrations of arsenic in the shoreline downgradient well.

These uncertainties will be resolved as part of this Data Gaps Investigation, as described in Section 5.

### 3.3.2 *Tank Area N-20/21/22*

Available environmental testing data in Tank Area N-20/21/22 are summarized in Figures 12a and 12b. This Tank Area included a total of five tanks, two of which were removed in 1983 by the Port and three of which were removed previously.

The first three tanks (N-20, N-21 and N-22) were listed as gasoline tanks on Navy drawings from 1952. They were associated with a former service station. The service station included a small operator's shack (Figure 12a) and a pair of overhead canopies. The canopies are visible in a 1950 oblique aerial photograph, and the operator's shack is visible both in that photograph and in a subsequent plan-view aerial photograph from 1969.

In 1983, two additional tanks were removed from Tank Area N-20/21/22. One was located adjacent to the operator's shack, and the other was located along the northwestern side of the former canopy areas, approximately 30 feet from former Building 391. The use of the two additional tanks is not documented in available records, but they may have been tanks for storage of motor oil or waste oil.

The locations shown in Figures 12a and 12b for the five former tanks are based on Port engineering drawings from Project EP-3826 and Navy drawings from 1952. The tank locations as shown are estimated to be within approximately 20 to 30 feet of their true former locations.

The extent of soil and groundwater contamination in Tank Area N-20/21/22 was defined in four rounds of environmental testing, performed by GeoEngineers and Hart Crowser. Results are summarized in Figure 12a for petroleum and related constituents and in Figure 12b for CVOC compounds. Results of testing documented the presence of limited soil-only contamination for petroleum constituents and both soil and groundwater contamination for CVOC compounds:

- **2008 GeoEngineers Soil Testing:** In 2008 GeoEngineers sampled soils from three soil borings placed within Tank Area N-20/21/22.
  - **Petroleum Testing Data:** No petroleum contamination in excess of the MTCA Method A soil cleanup levels were detected in any of the soil borings (Figure 12a).
  - **CVOC Testing Data:** CVOC contamination was detected in excess of MTCA Method A cleanup levels at only one location in Tank Area N-20/21/22 (Figure 12b). At location U-6B, TCE was detected at a concentration of 130 µg/kg at a depth of 6-8 feet. TCE was below Method A cleanup levels in a deeper sample from that boring. Trace levels of several CVOC compounds including PCE, TCE, and DCE were noted in soils at concentrations below the applicable MTCA Method A cleanup levels.
- **2010–2014 Hart Crowser Soil and Groundwater Testing:** Hart Crowser conducted several rounds of soil and groundwater testing. That work included the use of test pits, temporary geoprobe borings, and installation and sampling of a total of four groundwater monitoring wells. The work was performed in 2010, 2011, 2013, and 2014, and was summarized in reports dated 2012 and 2015 (Hart Crowser 2012h, 2012i, 2013). Key observations from that work include the following:
  - **Petroleum Soil Testing Data:** Hart Crowser tested soil quality for petroleum at three test pit locations and four soil boring locations (Figure 12a). Exceedances of MTCA Method A cleanup levels were noted for gasoline (900 mg/kg) and for benzene (0.99 mg/kg) at location HC-2 and a depth of 10 to 12 feet. This location was very close to the former gasoline tank location. No contamination was detected in the other soil testing locations.
  - **Petroleum Groundwater Testing Data:** Hart Crowser tested groundwater quality at four geoprobe boring locations and at four monitoring well locations (Figure 12a). No exceedances of MTCA Method A cleanup levels were noted for petroleum-related constituents (gas, diesel, oil, BTEX, or cPAH) at any of these eight sampling locations.
  - **CVOC Groundwater Testing Data:** Hart Crowser tested groundwater for CVOC during sampling of the four groundwater monitoring wells (Figure 12b). Exceedances of MTCA Method A groundwater cleanup levels were reported for VC in all of the wells, and for

TCE in well HC-MW-7. Concentrations of VC in the Tank Area N-20/21/22 groundwater ranged from 1.6 to 20 µg/L. The lowest concentration was detected at the downgradient well placed near the Blair Waterway shoreline. TCE exceeded MTCA Method A cleanup levels only in one location, HC-MW-7. TCE concentrations ranged from 28 to 44 µg/L in that well.

- **Groundwater Testing for Heavy Metals:** During 2014, groundwater was tested for both total and dissolved heavy metals. No exceedances of MTCA Method A cleanup levels were noted any of that testing.
- **Groundwater Testing for MNA Parameters:** During 2014, Hart Crowser analyzed groundwater for MNA parameters, including dissolved oxygen, redox, sulfate, nitrate, iron, and methane. Evidence of anaerobic biodegradation activity was observed, including the production of methane, depressed oxygen/redox levels, and the production of VC (a degradation product of PCE and TCE, both of which were detected at trace levels during the 2008 GeoEngineers soil boring investigation). Groundwater chemistry showed the presence of residual sulfate in groundwater, indicating the presence of available electron acceptors to support continued anaerobic microbial activity.

Ecology in noted a number of data gap concerns in its Further Action letters (Ecology 2017a, Ecology 2021a; Appendix C) including the following:

- There remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the groundwater testing performed by Hart Crowser included the use of silica gel cleanup.
- Additional information is needed to bound the extent of soil gasoline contamination near HC-2 and soil TCE contamination near U6B using two temporary soil borings to (Figure 12a & 12b).
- Ecology also noted the need for additional testing to verify the absence of MTCA Table 830-1 contaminants not previously tested in groundwater, in this case MTBE, and the need to assess whether groundwater at this location is influenced by the pH or CVOC plumes from the adjacent Occidental Site.
- Ecology also expressed concern regarding potential impacts to the Blair waterway with CVOCs (principally VC). The Further Action letter referenced a need for shoreline seep and sediment testing. Anchor QEA conducted follow-up outreach with Ecology's sediments unit (Adolphson, 2021). In that outreach, Ecology emphasized the need to evaluate sediment pore-water, because CVOC compounds do not partition strongly to sediments and the aqueous phase of the contamination is what is needed to compare to applicable regulatory values for protection of aquatic receptors and human health.

These uncertainties will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### 3.3.3 Tank Area P-27/28

Available environmental testing data in Tank Area P-27/28 are summarized in Figure 13. This Tank Area included a total of three tanks, all of which were removed in 1996 by the Port.

The first two tanks are understood to have been heating oil tanks that were later used for wax storage on behalf of a Port Tenant, Commencement Bay Corrugated. During subsequent removal in 1996, a third smaller tank thought to be a startup tank, identified as U-1, was identified in this area.

The former locations of the three tanks in Tank Area P-27/28 are based on the tank removal report (Nowicki & Associates 1996) and the 1983 Port engineering drawings from Project EP-3826. The heating oil tanks are not identified on the Navy drawings from 1949 or 1952. The tank locations as shown in Figure 13 are estimated to be within approximately 10 feet of their true former locations.

The extent of soil and groundwater contamination in Tank Area P-27/28 was defined in several rounds of environmental testing. Early work was performed just after tank removal and included work by three different consultants. Later work was performed by Hart Crowser. Results are summarized in Figure 13 for petroleum and related constituents:

- **Data from 1996 Tank Removal:** When the three tanks were removed in 1996, contaminated soils were removed from the excavation to the extent practicable. Petroleum (measured using the NWTPH-Dx extended analysis) was encountered in soil and groundwater. The soil contamination was removed to the extent practicable without damaging existing utilities and building foundations. Remaining soil concentrations in two sidewall samples exceeded current MTCA Method A cleanup levels, with extractable total petroleum hydrocarbons (TPH) concentrations of 3,800 and 7,900 mg/kg, respectively.
- **February 1997 Groundwater Investigation:** A subsequent report (Horus 1997) documented the installation and testing of three wells. These were installed within the former tank excavation and in adjacent locations immediately north and southwest of the excavation. That study documented the presence of petroleum hydrocarbon product “droplets” in the upgradient well (well P-3), located within the footprint of former Building 397. No product was detected in the well located within the former tank excavation (well P-2) or in the southwesterly well (well P-1). Measured TPH concentrations exceeded the current MTCA Method A groundwater cleanup level in well P-2 but were below the MTCA Method A cleanup level in well P-1.
- **November 1997 Groundwater Investigation:** A later report (Noll 1998) documented the installation and testing of three additional upgradient wells, and the resampling of wells P-1, P-2, and P-3. No petroleum contamination was detected in the three upgradient wells (MW-1, MW-2, MW-3; Figure 13). Product was again encountered in upgradient well P-3, with the

product thickness reported as 0.1 inch. No product was detected in the other wells. Measured TPH concentrations were lower than previously measured, but remained in excess of the current MTCA Method A groundwater cleanup level in wells P-3 and P-2. Groundwater petroleum concentrations were below the current MTCA Method A cleanup level in well P-1.

- **2010 Geoprobe Investigation:** Follow-up testing performed by Hart Crowser in 2010 included placement of five geoprobe borings and testing of soil and groundwater around the former tank removal location. No diesel or oil contamination was detected in excess of MTCA Method A cleanup levels. But benzene in downgradient boring HC-1 was detected at 44 µg/L, in excess of the current MTCA Method A cleanup level. Gasoline was also detected, but at a concentration (440 µg/L), which is below the applicable MTCA Method A cleanup level (800 µg/L; Hart Crowser 2012j).
- **2012 Well Abandonments:** All six wells were removed in 2012 prior to completion of any supplemental monitoring (Greylock 2012).

Ecology noted several data gap concerns in their Further Action letters (Ecology 2017a, Ecology 2021a; Appendix C), including the following:

- There remains some uncertainty regarding extractable petroleum concentrations in groundwater, because the 2012 testing included the use of silica gel cleanup.
- Given the past presence of free-phase hydrocarbon contamination within and immediately upgradient of the former tank removal excavation, monitoring wells are needed for further definition of the potential ongoing presence of the product and/or groundwater contamination in this area.
- Ecology also noted the need for additional testing to verify the absence of MTCA Table 830-1 contaminants not previously tested in soils and groundwater. For heavy oil this includes PAHs and PCBs.
- Ecology noted the need to assess whether groundwater at this location is influenced by the pH or CVOC plumes from the adjacent Occidental Site.
- Additionally, Ecology noted that further information is required to verify the lateral and vertical boundaries of contamination, including potential Table 830-1 contaminants not previously delineated.

These uncertainties will be resolved as part of the Data Gaps Investigation, as described in Section 5.

### 3.4 Environmental Conditions in Group 4 Tank Areas

There are three Group 4 Tank Areas (Tank Areas where no contamination was identified during tank removal, but limited information exists regarding the size, contents, or history of the tanks and additional data are needed to support tank close-out) located at the Site. Information on the

environmental conditions within Group 4 Tank Areas is limited. Available information for the Group 4 Tank Areas is presented in Table 6 and shown in Figures 14 through 16.

### **3.4.1 Tank Area A-1/2**

Tank Area A-1/2 (Figure 2) is located near three Oxy Site plume bounding wells (wells 86-C, 87-C and 92-C; Figure 3) that did not contain any CVOC contamination at depths of 25 feet, 50 feet and greater, and near one that did (well 88-C; Figure 3). Two tanks were removed from Tank Area A-1/2 in 1983 as part of Port Engineering project EP-3826 (Appendix B of Anchor QEA, 2021). No contamination was noted during the tank removal. No additional information is available regarding the environmental conditions or historical use of these tanks. In its 2021 Further Action letter, Ecology noted the need to investigate this Tank Area and confirm whether or not a potential petroleum release occurred, and if so to determine its nature and extent and whether the Tank Area was influenced by pH or CVOC from the adjacent Occidental Site.

### **3.4.2 Tank Area B-1/2/3**

Tank Area B-1/2/3 is located downgradient from known portions of the Oxy Site CVOC plume and portions of the Oxy Site pH plume (Figure 3). Three tanks were removed from this location in 1983 as part of Port Engineering project EP-3826 (Appendix B of Anchor QEA, 2021). No contamination was noted during the tank removal. No additional information is available regarding the environmental conditions or historical use of these tanks. In its 2021 Further Action letter, Ecology noted the need to investigate this Tank Area and confirm whether or not a potential petroleum release occurred.

### **3.4.3 Former Wax Tank Area**

The former wax tank is located downgradient from known portions of the Oxy Site VOC plume but is located within the estimated extent of the pH plume. One former wax tank was retained in use by CBC as a wax tank during the 1983 tank removal and demolition project (Port project EP-3826; Figure 16). No other information is available regarding historical use of the tank, and no information has been identified to date indicating that the tank has been removed. In its 2021 Further Action letter, Ecology noted the need to investigate this Tank Area and confirm whether or not a potential petroleum release occurred, and if so to determine its nature and extent and whether the Tank Area was influenced by pH or CVOC from the adjacent Occidental Site.

## **3.5 Tanks Addressed Separately**

The locations of Tanks U-2 and N-11 are shown in Figure 2. As previously noted, these Tank Areas are being managed by the Port outside of this Project, and no action is necessary for data gaps sampling.

## 4 Conceptual Site Model

This section consolidates and summarizes existing information and presents a preliminary Conceptual Site Model for the TOTE Site, focusing on the extent of soil and groundwater contamination identified in the Group 1, 2, 3, and 4 Tank Areas (Table 1). The conceptual site model is shown in Figure 5, and detailed data for each tank is provided in Figures 6 through 16.

### 4.1 Four Areas of Remaining Petroleum Contamination

Residual petroleum contamination has been confirmed in excess of MTCA Method A soil cleanup levels for unrestricted land use in four Tank Areas, which are highlighted in Figure 5. Areas of potential petroleum contamination in groundwater are identified with blue cross-hatching on the same figure. In three cases (Tank Areas T-21/22, N-9/10, and N-20/21/22) the remaining petroleum contamination is limited to soils, and no contamination has been detected in groundwater. In the other case (Tank Area P-27/28) petroleum contamination was previously observed in both soil and groundwater.

- **Tank Area T-21/22 (Soil Contamination Only):** Based on the results of two groundwater samples collected from geoprobe borings in 2010, no groundwater contamination is present at Tank Area T-21/22. Contamination in soil is limited to two samples containing benzene (reported concentrations 130 and 230 µg/kg) at concentrations exceeding the MTCA Method A unrestricted cleanup level (currently 30 µg/kg). Both samples are located at depths of approximately 9 feet bgs and are consistent with the base of the excavation conducted at the time the tanks were removed. Overlying soils consist of clean backfill placed during the tank removal activities. The area is capped by the paving of the TOTE Terminal, and no buildings are located in the vicinity.
- **Tank Area N-9/10 (Soil Contamination Only):** No petroleum contamination in groundwater has been detected at Tank Area N-9/10 in any of the multiple rounds of groundwater testing. This has included testing from temporary borings as well as testing from permanent groundwater monitoring wells. However, several localized areas of soil contamination have been detected. These three localized areas include the presence of gasoline (570 mg/kg) near the former tank location, one detection of diesel (2,400 mg/kg), and one detection of cPAH compounds (0.67 mg TEQ/kg).
- **Tank Area N-20/21/22 (Soil Contamination Only):** No petroleum contamination in groundwater has been detected at Tank Area N-20/21/22, in any of the multiple rounds of groundwater testing. This has included both testing from temporary borings, as well as testing from permanent groundwater monitoring wells. However, some residual gasoline (900 mg/kg) and benzene contamination (0.99 mg/kg) has been detected in soil near the location of the former gasoline tanks.

- **Tank Area P-27/28 (Both Soil and Groundwater Contamination):** Localized soil and groundwater contamination with petroleum are both present in this Tank Area. Most impacted soil was removed from this Tank Area in 1996 when the former tanks were removed. However, small deposits of diesel and oil contamination remain in localized areas of soil that could not be removed at the time of tank removal due to the presence of building foundations and underground piping. Testing in 1997 and in 2012 showed that some petroleum contamination is present in groundwater. Droplets of a waxy hydrocarbon product were present in one groundwater well during 1997. Groundwater diesel concentrations exceeded MTCA Method A cleanup levels in that well and in one additional well. No contamination was detected in three wells installed further upgradient. In five soil and groundwater borings installed in 2012, benzene was noted at a concentration of 44 µg/L in the downgradient boring.

As noted in Ecology's 2017 and 2021 comment letters (Appendix C), the above conclusions are subject to uncertainties associated with existing data gaps. These include the following:

- Groundwater conclusions for extractable petroleum hydrocarbons (diesel and oil as measured by NWTPH-Dx extended analysis) remain subject to some uncertainty pending completion of follow-up testing of groundwater without the use of silica gel cleanup. Silica gel cleanup was included in the NWTPH-Dx analyses performed during the Hart Crowser investigations in 2010 to 2014.
- Not all petroleum testing requirements of MTCA Table 830-1 have been satisfied. Further testing is required to ensure that all petroleum-related constituents have been appropriately sampled.
- Further soil testing is required at Tank Areas N-9/10 and N-20/21/22 to verify the lateral extent of petroleum-related soil contamination.
- At Tank Area P-27/28 further work is required to assess the presence of hydrocarbon product and to confirm the vertical and lateral extent of soil and groundwater contamination.

Plans for follow-up testing to address these data gaps are described in Section 5.

## 4.2 Two Areas of Apparent Project-Related CVOC Contamination

Two of the Tank Areas discussed in Section 3 also contain contamination with CVOC Compounds. Based on available information, it appears most likely that this contamination is related to the individual Tank Areas, though there is some uncertainty with this conclusion given the nearby groundwater CVOC plume from the Occidental Site:

- **Tank Area N-9/10 (Groundwater Contamination Only):** Several CVOC compounds were detectable in soils in Tank Area N-9/10, but none of these soil concentrations exceeded MTCA Method A cleanup levels. In groundwater VC was detected at concentrations between 0.25

and 6.9 µg/L, exceeding the MTCA Method A cleanup level (0.2 µg/L). The VC contamination was limited in areal extent, with no VC detected in a downgradient well located adjacent to the Blair Waterway shoreline.

- **Tank Area N-20/21/22 (Soil and Groundwater Contamination):** CVOC compounds were detectable in low levels in multiple soil samples from this Tank Area, but only one soil sample contained CVOC concentrations (TCE at 130 µg/kg) in excess of MTCA Method A soil cleanup levels (30 µg/kg). In groundwater, both TCE and VC exceeded Method A groundwater cleanup levels. TCE exceeded MTCA Method A cleanup levels in only one location. VC was detected in all five wells in this Tank Area. VC concentrations ranged between 1.6 and 10 µg/L, exceeding the MTCA Method A cleanup level (0.2 µg/L). The lowest concentration of VC was detected in the downgradient well located adjacent to the Blair Waterway shoreline.

Testing for MNA parameters has been performed at both of these Tank Areas. At both locations, evidence of anaerobic biodegradation activity was observed, including the production of methane, depressed redox and dissolved oxygen levels, and the production of chlorinated biodegradation products (including VC). Groundwater chemistry showed the presence of residual sulfate in groundwater, indicating the presence of available electron acceptors to support continued anaerobic microbial activity.

As noted in Ecology's 2017 and 2021 comment letters (Appendix C), the above conclusions are subject to uncertainties associated with existing data gaps. These include the following:

- Not all petroleum testing requirements of MTCA Table 830-1 have been satisfied, and some Tank Areas could potentially be comingled with contamination from the adjacent Occidental Site. Further testing is required to ensure that all petroleum-related constituents have been appropriately sampled. This work could potentially identify additional CVOC-contaminated areas at the Site.
- Further work is required to assess whether the CVOC contamination at Tank Areas N-9/10 and N-20/21/22 may be influenced by migration of off-site contamination from the OCC site.
- Further testing at Tank Area N-20/21/22 is required to assess whether CVOC contamination is affecting aquatic receptors in the Blair Waterway.

Plans for follow-up testing to address these data gaps are described in Section 5.

### 4.3 Three Tank Areas with Insufficient Data

No environmental assessment data are available for the three Group 4 Tank Areas:

- Tank Area A-1/2,
- Tank Area B-1/2/3
- The Former wax tank

Given the limited extent of historical information available for these three Tank Areas, targeted assessments are warranted in each of these three areas, including placement of geoprobe borings to collect and test groundwater and soil for petroleum and petroleum constituents.

#### 4.4 Screening Levels

Proposed screening levels are listed in Table 2. MTCA Method A cleanup levels for groundwater and soil, as well as applicable screening levels and guidance for surface water will be used for screening.

Groundwater screening levels will include MTCA Method A Screening Levels as well as Practical Quantitation Limits (PQLs).

For soils, the MTCA Method A soil cleanup levels for unrestricted land use will be used as soil screening levels for the RI. In most cases the corresponding industrial soil cleanup levels for the Site-related contaminants (petroleum and CVOC compounds) are the same as for unrestricted land uses. For gas, diesel, oil, BTEX compounds and most of the CVOC compounds the same soil cleanup levels apply to industrial and unrestricted land uses (Table 2), as they are based on the protection of groundwater quality. The only difference is for cPAH compounds. For those compounds, the MTCA Method A cleanup level for industrial sites is 2.0 mg TEQ/kg, whereas it is 0.1 mg TEQ/kg for unrestricted land uses.

Final cleanup levels will not be established until after completion of the remedial investigation. Application of industrial cleanup levels requires a demonstration that the Site meets the definition of an industrial property under WC 173-340-200 and WAC 173-340-745. Application of industrial cleanup levels also requires implementation of appropriate environmental covenants. Given the industrial characteristics of the Site (i.e., industrial zoning, lack of residential use, restricted property access, no food growing, extensive truck traffic, ground surface covered by structures and paving, support facilities limited to serving the TOTE employees), it may be appropriate to consider application of industrial cleanup levels as part of the future Feasibility Study. But screening levels based on unrestricted land uses will continue to be applied during the RI activities to determine the nature and extent of contamination.

For surface water, screening levels will consider applicable water quality criteria for surface water, natural background, PQLs, and Ecology's guidance as contained in *Implementation Memorandum No. 23* (Ecology 2021b). That memo describes gasoline and diesel surface water concentrations that Ecology predicts to be protective of aquatic receptors in marine and freshwater using the NWTPH-Gx and NWTPH-Dx methods. These concentrations satisfy the requirements for establishing Method B or Method C surface water cleanup levels that are protective of aquatic receptors under WAC 173-340-730 (3)(b)(ii) or 173-340-730(4)(b)(ii) using the NWTPH-Gx and NWTPH-Dx methods. Federal surface water criteria implemented under 40 CFR 131.45 are not currently available for site-related

constituents. The availability and applicability of criteria under 40 CFR 131.45 will be revisited at the time the RI and cleanup plan are developed for the site.

Following this sampling event, data will also be screened for potential impacts to indoor air quality. That screening will consider both vadose zone soil concentrations and shallow groundwater concentrations and will be performed consistent with the latest Ecology guidance.

Screening levels applicable to performance of a Terrestrial Ecological Evaluation (TEE) are not considered because the Site qualifies for a TEE exclusion under the criteria in WAC 173-340-7491. The basis for the exclusion is that there is less than 1.5 acres of contiguous undeveloped land within 500 feet of any area of the Site, and none of the following chemicals are known to be present at the Site: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

## 5 Data Gaps Investigation

Prior to evaluation of potential alternatives to complete remediation of the Site, environmental testing is necessary to resolve data gaps, ensure that an adequate site characterization has been completed, and to finalize the conceptual site model. The testing described in this DGWP was developed in consideration of Ecology's current model remedies for sites with petroleum contamination in groundwater (Ecology 2016), and in compliance with MTCA requirements. This work is expected to be completed in 2022.

An overview of the sampling design is presented in the following subsections. Data collection will be conducted using existing groundwater monitoring wells, new groundwater monitoring wells, temporary soil borings, and porewater monitoring. Samples will be analyzed for conventionals, metals, VOCs, petroleum constituents, and petroleum products, as detailed in Tables 3 through 6 and summarized in Table 7.

Most borings and well depths will target a depth of 10 to 15 feet bgs, with the exception of four deep borings as discussed below. Groundwater samples will be collected from the soil-water interface, with temporary screens placed between 10 and 15 feet bgs. All groundwater and porewater collection will include monitoring of field parameters, including pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.

Procedures for sample collection, testing, and field and laboratory quality control and quality assurance methods are documented in the are provided in the Field Sampling and Quality Assurance Project Plan (Appendix A). Health and safety procedures are detailed in the Health and Safety Plan (Appendix B).

### 5.1 Group 1 Tank Areas

Table 3 summarizes the current available data, data needs, and planned sampling activities to address data gaps in the four Group 1 Tank Areas. These activities address Ecology-identified data gaps (see Appendix C-1 for a detailed summary of Ecology comments). No soil or groundwater contamination has been detected at Group 1 locations, but follow-up testing is required to resolve the following data gaps:

- Conduct follow-up magnetometer testing to verify that Tank N-12 has been removed.
- Resolve uncertainties related to the effects of silica gel cleanup on the prior NWTPH-Dx testing results for extractable hydrocarbons in groundwater.
- At Tanks T-23/24, perform analyses in groundwater to confirm absence of Ecology-required Table 830-1 testing parameters not previously tested in groundwater including VOCs and PAHs.

- Additionally, at Tanks T-23/24, use CVOC and pH testing of groundwater sample to confirm the absence of CVOC and pH contamination originating from the Occidental Site.

Testing will be performed using one geoprobe borings at each Tank location, as shown in Figures 6 through 9. Samples will be collected and analyzed as shown in Table 7.

## 5.2 Group 2 Tank Areas

Table 4 summarizes the current available data, data needs, and planned sampling activities to address data gaps in the Group 2 Tank Area (T-21/22). These address Ecology-identified data gaps (see Appendix C-1 for a detailed summary of Ecology comments). At this area, tank removal work documented compliance with MTCA Method A cleanup levels in place at the time of the work, but some low-level benzene contamination in soil remained that exceeds current, more-stringent MTCA Method A cleanup levels. Sampling and analysis will be performed to address the following data gaps:

- Install a groundwater well as requested by Ecology.
- Resolve uncertainties related to the effects of silica gel cleanup on the prior NWTPH-Dx testing results for extractable hydrocarbons in groundwater.
- Test groundwater for lead and potential gasoline additives (VOCs and PAHs) to confirm absence of Ecology-required Table 830-1 testing parameters not previously tested.
- Use CVOC and pH testing of groundwater sample to confirm the absence of CVOC and pH contamination originating from the Occidental Site.
- Test soil from two locations (one using a geoprobe and one during installation of the monitoring well) to verify current soil benzene concentrations where elevated concentrations of benzene were detected in 2000 and 2010.

Soil and groundwater will be collected during installation of the permanent monitoring well at historical sample location HC-1. One additional soil sample will be collected using a geoprobe will be located near historical station Horus-12. Figure 10 shows the proposed sampling locations. Samples will be analyzed as shown in Table 7.

## 5.3 Group 3 Tank Areas

Table 5 summarizes the current available data, data needs, and planned sampling activities to address data gaps in Group 3 Tank Areas. These areas have been shown to contain both soil and groundwater contamination.

At Tank Areas N-9/10 (Figure 11) and N-20/21/22 (Figure 12), groundwater contamination is limited to CVOCs. Sampling and analysis in those Tank Areas will be performed to address the following data gaps:

- Bound areas of soil contamination in each Tank Area.

- Resolve uncertainties related to the effects of silica gel cleanup on the prior NWTPH-Dx testing results for extractable hydrocarbons in groundwater at each of the Tank Areas.
- Confirm the absence of other potential petroleum-related constituents at each of the Tank Areas as required in Table 830-1.
- Document current groundwater quality in existing monitoring wells at tank areas N-9/10 and N-20/21/22.
- Resample the downgradient well at Tank Area N-9/10 for total and dissolved arsenic, while ensuring that potential turbidity and isobaric interferences are controlled.
- Confirm that CVOCs in groundwater are not impacting surface waters through porewater sampling at a location downgradient of Tank Area N-20/21/22; this porewater sampling approach was developed in accordance with direction from Ecology's sediment management unit (Adolphson, 2021).

Tank Area P-27/28 (Figure 13) contains petroleum contamination in groundwater. Sampling and analysis will be performed to address the following data gaps:

- At P-27/28, install three monitoring wells within the defined plume area to assess the potential ongoing presence of free-phase hydrocarbon product and to define the current quality of groundwater in those wells.
- Document the horizontal and lateral extent of petroleum contamination in soils and groundwater.
- Confirm the absence of other potential petroleum-related constituents and additives at the Tank Area as required by Ecology (from Table 830-1 in WAC 173-340-900).
- Assess potential CVOC groundwater contamination originating from the Occidental Chemical site through groundwater testing within Tank Area P-27/28.
- Conduct groundwater testing for monitored natural attenuation parameters at P-27/28.

To address these data gaps, sample collection will be performed for the purposes detailed in Table 5. Testing will be performed as described in Table 7. Sampling locations are shown in figures 11, 12 and 13.

## 5.4 Group 4 Tank Areas

Table 6 summarizes the current available data, data needs, and planned sampling activities to address data gaps in Group 4 Tank Areas. Figures 14 through 16 show the proposed sampling locations.

In the three Group 4 Tank Areas, no soil or groundwater contamination has been detected. However, data gaps testing of groundwater and soil is required to determine if any hazardous substances are present in these areas, and to support tank close-out.

To address these data gaps, groundwater will be collected and tested at all stations. Collection will be completed via four, five, and three geoprobe borings located in Tank Areas A-1/2, B-1/2/3, and the Former Wax Tank Area, respectively. Testing parameters are identified in Tables 6 and 7.

Soil testing should be conducted 5 to 6 feet bgs and at the soil-groundwater interface (approximately 9-10 feet bgs). Initial soil analytical testing will be performed on a rush basis using the hydrocarbon identification (HCID) screening to evaluate the potential presence of petroleum, and if present to identify the type of petroleum products present. Results of the HCID tests will be used to trigger required soil and groundwater testing as described below:

- **Contingent Soil Testing:** If gasoline contamination is identified, then soil samples will be analyzed for NWTPH-g, VOCs (including EDB, EDC, MTBE and naphthalenes) and lead. If diesel or oil contamination is identified, archive samples of soil will be tested for NWTPH-Dx, VOCs and PAHs. If potential waste oil is identified, then testing will include NWTPH-Dx, VOCs, PAHs, lead and PCBs.
- **Contingent Groundwater Testing:** Groundwater testing will initially include analysis of pH and field parameters and the collection of archive samples. If petroleum contamination is detected in soils. Then appropriate tests specified by MTCA Table 830-1 for groundwater will be triggered. If gasoline contamination is identified, then groundwater samples will be analyzed for NWTPH-g, VOCs (including EDB, EDC, MTBE and naphthalenes) and lead (total and dissolved). If diesel or oil contamination is identified, archive samples of soil will be tested for NWTPH-Dx, VOCs and PAHs. If potential waste oil is identified, then testing will include NWTPH-Dx, VOCs, PAHs and lead. PCB testing will not be performed on groundwater samples from temporary soil borings, as that test is extremely sensitive to turbidity artifacts. If PCBs are confirmed to be present in Tank Area soils, then PCB testing of groundwater would be addressed separately with the installation and testing of monitoring wells.

Additionally, a magnetometer survey will be conducted in the vicinity of the Former Wax Tank as shown in the 1983 EP-3826 project drawings to confirm and document the absence of the tank. The planned survey area is shown in Figure 16.

## **5.5 Summary of Planned Work**

A summary of sampling and testing to be performed during DGWP implementation is provided in Table 7. Site-wide sampling locations and types are shown in Figure 17. Information on sample collection and testing methods and quality assurance and quality control measures and health and safety procedures are described in detail in Appendices A and B, respectively.

## 6 Phasing and Scheduling

Work will be implemented following authorization and coordination with the tenant. The work is expected to be implemented in phases accommodating the different types of work and the tiered analytical testing program.

Following completion field, completed planned and contingent analytical testing and data validation, and compile in electronic database. Data will be available for development of an updated remedial investigation report and cleanup plan.

Detailed information of the field collection methods, sample quality assurance and quality control measures, and health and safety procedures are described in detail in Appendices A and B.

## 7 References

- Adolphson, 2021. Personal communication between Mark Larsen of Anchor QEA and Pete Adolphson of Ecology's Sediment Management Unit regarding appropriate methods to address concerns about potential impacts to the Blair Waterway adjacent to Tank Area N-20/21/22. November, 2021.
- Anchor QEA, 2021. Remedial Investigation and Remedial Plan. Prepared for the Port of Tacoma. January 2021.
- Aspect, 2016. Remedial Investigation Report. Alexander Avenue Petroleum Tank Facilities Site, Tacoma, Washington. Ecology Facility Site No. 1377/Cleanup Site No. 743. Prepared for Port of Tacoma and Mariana Properties, Inc. December 2016.
- Bradford, 1981. Every Kind of Shipwork: A History of Todd Shipyards Corporation, 1916-1981. Bradford C. Mitchell. Published by Todd Shipyard Corporation.
- CRA (Conestoga-Rovers & Associates), 2015. Final Draft Site Characterization Report Groundwater and Sediment Remediation, Occidental Chemical Corporation, Tacoma, Washington. September 2015.
- Ecology (Washington State Department of Ecology), 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.
- Ecology, 2017. Further Action Letter for Port of Tacoma/TOTE Facility 500 Alexander Ave, VCP Project No. SW1588; August 9, 2017.
- Ecology, 2021a. Further Action Letter for Port of Tacoma/TOTE Facility 500 Alexander Ave, VCP Project No. SW1588; August 9, 2017.
- Ecology, 2021b. Implementation Memorandum No. 23: Concentrations of Gasoline and Diesel Range Organics Predicted to be Protective of Aquatic Receptors in Surface Waters. Arthur Buchan, Toxics Cleanup Program, Publication Number 19-09-043. Revised August 2021.
- Ecology, 2022. Natural Background Groundwater Concentrations in Washington State. Ecology Publication No. 14-09-044. January 2022.
- GeoEngineers, 2008. Final Dredge Material Characterization Report, Blair-Hylebos Terminal Redevelopment Project, Port of Tacoma, Tacoma, Washington; November 24, 2008.
- Greylock (Greylock Consulting LLC), 2012. Decommissioning of Groundwater Monitoring Wells at Port Parcel 1A, E. 500 Alexander Avenue, Tacoma, Washington, March 27, 2012.

Hart Crowser, 2012a. UST N-12 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, June 19, 2012.

Hart Crowser, 2012b. Revised Final UST N-13 Site-Specific Summary Report; Port of Tacoma UST Remediation Program Sampling; Tacoma, Washington, June 27, 2012.

Hart Crowser, 2012c. Revised Final UST N-17 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, July 19, 2012.

Hart Crowser, 2012d. Revised Final USTs T-23 and T-24 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, July 23, 2012.

Hart Crowser, 2012e. Revised Final USTs T-21 and T-22 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 13, 2012.

Hart Crowser, 2012f. Revised Final USTs N-9 and N-10 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 10, 2012.

Hart Crowser, 2012g. UST N-9 and N-10 Site-Specific Summary Report Addendum; Port of Tacoma UST Remediation Program; Tacoma, Washington, May 10, 2012.

Hart Crowser, 2012h. Revised Final USTs N-20, 21, and 22 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 10, 2012.

Hart Crowser, 2012i. USTs N-20, 21, and 22 Site-Specific Summary Report Addendum; Port of Tacoma UST Remediation Program; Tacoma, Washington, May 24, 2012

Hart Crowser, 2012j. Revised Final USTs U-1, P-27, and P-28 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 14, 2012.

Hart Crowser, 2013. USTs N-9 and N-10 and USTs N-20, 21, and 22 Groundwater Sampling and Analysis Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 8, 2013.

Hart Crowser, 2015a. Groundwater Sampling Results; Port of Tacoma UST N-11; Tacoma, Washington, December 30, 2015.

Hart Crowser, 2015b. MEMORANDUM; RE: Results of UST GPR Survey; Port of Tacoma UST N-13; Tacoma, Washington, December 29, 2015.

Hart Crowser, 2015c. MEMORANDUM; RE: Results of Additional Environmental Sampling and UST Locating; UST Sites N-9/-10 and N-20/-21/-22, Port of Tacoma, January 6, 2015.

HORUS (HORUS Environmental, Inc.), 1997. Port Of Tacoma Tote Expansion Area, Underground Storage Tank Removal Project Groundwater Study, April 21, 1997.

HORUS, 1999a. Port of Tacoma; Underground Storage Tank Removal; Tote Facility, March 19, 1999.

HORUS, 1999b. Port of Tacoma Underground Storage Tank Removal; 1100 Alexander Avenue, March 2, 1999.

Noll (Noll Environmental, Inc.), 1998. Additional Exploration Work Former Tote UST Area (Former Building 9397), January 15, 1998.

Nowicki & Associates, Inc., 1996. UST Closure Site Characterization Report, July 11, 1996.

TPCHD (Tacoma Pierce County Health Department), 1999. Underground Storage Tank Removal: 1100 Alexander Avenue, Tank AA-1; Removal Date: 11/98, Permit #: 9899, October 28, 1999.

# Tables

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**Table 1**  
**Summary of Tank Areas**

Tank Area	Number of Former Tanks	Known Groundwater Contamination <sup>1</sup>	Known Soil Contamination <sup>1</sup>
<b>Group 1 Tank Areas</b>			
N-12	1	No	No
N-13	1	No	No
N-17	1	No	No
T-23/24	2	No	No
<b>Group 2 Tank Areas</b>			
T-21/22	2	No	<b>Yes</b> Benzene
<b>Group 3 Tank Areas</b>			
N-9/10	3	<b>Yes</b> Vinyl chloride	<b>Yes</b> Gasoline, Diesel, cPAH
N-20/21/22	5	<b>Yes</b> TCE and Vinyl chloride	<b>Yes</b> Gasoline, Benzene, TCE
P-27/28 & U-1	3	<b>Yes</b> Diesel, Oil, Benzene	<b>Yes</b> Diesel, Oil
<b>Group 4 Tank Areas</b>			
A-1/2	2	Undetermined	Undetermined
B-1/2/3	3	Undetermined	Undetermined
Former Wax Tank	1	Undetermined	Undetermined
<b>Tank Areas Addressed Separately</b>			
N-11	1	Area is being addressed as part of the Alexander Avenue Tank Facilities Site cleanup	
U-2	1	Existing No Further Action letter	
<b>Total Tanks</b>	<b>26</b>		

Notes:

1. A "Yes" indicates that soil or groundwater concentrations exceed screening levels in Table 2 in at least one sample.

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

TCE: trichloroethene

**Table 2**  
**Site Screening Levels**

Contaminant	Groundwater (µg/L)		Soil (mg/kg)		Surface Water (µg/L)			
	MTCA Method A Cleanup Level	Natural Background Concentrations	MTCA Method A Cleanup Level Unrestricted Land Use	MTCA Method A Cleanup Level for Industrial Land Use	173-201A WAC			Ecology Implementation Memo #23
					Marine Aquatic Life		Marine Water	
					Acute	Chronic	Human Health <sup>1</sup>	
<b>Metals</b>								
Arsenic	5	8 <sup>2</sup>	20	20	69	36	10	--
Lead	15	--	250	1000	210	8.1	--	--
<b>Volatile Organic Compounds</b>								
<i>CVOCs</i>								
cis/trans-1,2-Dichloroethene	--	--	--	--	--	--	--	--
Tetrachloroethene	5	--	0.05	0.05	--	--	7.1	--
Trichloroethene	5	--	0.03	0.03	--	--	0.86	--
Vinyl Chloride	0.2	--	--	--	--	--	0.26	--
1,2-Dibromoethane (EDB)	0.01	--	0.005	--	--	--	270	--
1,2-Dichloroethane (EDC)	5	--	--	--	--	--	120	--
<i>BTEX</i>								
Benzene	5	--	0.03	0.03	--	--	1.6	23
Toluene	1000	--	7	7	--	--	410	102
Ethylbenzene	700	--	6	6	--	--	270	21
Total xylenes	1000	--	9	9	--	--	--	106
<i>MTBE</i>	20	--	0.1	0.1	--	--	--	--
<b>Petroleum Constituents</b>								
Naphthalene	160	--	5	5	--	--	--	--
Total cPAH (TEQ)	0.1	--	0.1	2	--	--	0.0021 <sup>3</sup>	--
<b>Petroleum Products</b>								
Gasoline range organics	800/1,000 <sup>4</sup>	--	30/100 <sup>5</sup>	30/100 <sup>5</sup>	--	--	--	1,700
Diesel range organics	500 <sup>6</sup>	--	2000	2000	--	--	--	50 / 2,100 <sup>7,8</sup>
Motor oil range organics					--	--	--	--
<b>Polychlorinated Biphenyls (PCBs)</b>								
Total PCB Aroclors	0.1	--	1.0	10	10	0.03	0.00017	--

**Table 2**  
**Site Screening Levels**

Notes:

Screening-levels shall also include the method PQL or equivalent for each parameter.

Ecology, 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.

Ecology, 2021a. Natural Background Groundwater Arsenic Concentrations in Washington State: Results of a Study. Toxics Cleanup Program Washington State Department of Ecology Olympia, Washington. July 2021.

Ecology, 2021b. Implementation Memorandum No. 23: Concentrations of Gasoline and Diesel Range Organics Predicted to be Protective of Aquatic Receptors in Surface Waters. Arthur Buchan, Toxics Cleanup Program, Publication Number 19-09-043. Revised August 2021.

1. Consistent with Ecology Interim Policy 730, the status of federal regulation 40 CFR 131.45 will be reviewed at the time the RI is completed. If values more stringent than those listed in Washington regulation are in force at the time the RI and cleanup plan are completed, they will be incorporated into the site screening levels and cleanup levels.
2. Value is natural background of arsenic in Puget Sound groundwater according to Ecology 2021 Draft natural background study (Ecology 2021a).
3. The applicable criteria provided for benzo(a)pyrene is below the PQL.
4. The lower value must be used when benzene is not present.
5. The lower value must be used when BTEX compounds make up more than 1% of the gasoline mixture.
6. For groundwater the comparison of NWTPH-dx results to the cleanup level shall be made without use of silica gel cleanup unless otherwise directed by Ecology.
7. These gasoline and diesel surface water concentrations are predicted by Ecology (Ecology 2021b) to be protective of aquatic receptors in marine and freshwater using the NWTPH-Gx and NWTPH-Dx methods. These concentrations satisfy the requirements for establishing Method B or Method C surface water cleanup levels that are protective of aquatic receptors under WAC 173-340-730 (3)(b)(ii) or 173-340-730(4)(b)(ii) using the NWTPH-Gx and NWTPH-Dx methods.
8. The criteria of 50 µg/L is concentration determined to be protective of marine value for unweathered diesel range organics. The criteria of 2,100 µg/L is concentration determined to be protective of marine value for weathered diesel range organics.

µg/kg: micrograms per kilogram

µg/L: micrograms per liter

BTEX: refers to the chemicals benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compounds

CVOC: chlorinated volatile organic compounds

Ecology: Washington State Department of Ecology

mg/kg: milligrams per kilogram

MTBE: methyl tert-butyl ether

MTCA: Model Toxics Control Act

PQL: practical quantitation limit

TEQ: toxicity equivalent

**Table 3**  
**Available Data, Data Gaps, and Planned Sampling for Group 1 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Summary of Recent Testing Data	Data Gaps	Planned Sampling	Planned Analysis
N-12	Heating Oil (No contamination detected)	No	Former heating oil tank located adjacent to west side of Building 205. Used as a heating plant during Navy operations.	No	Section 3.2.1: No TPH contamination detected in 6 soil borings analyzed for NWTPH-G, NWTPH-Dx and VOCs (2008). Absence of TPH contamination confirmed in 2010 with 4 soil and groundwater borings analyzed for NWTPH-G and NWTPH-Dx and BTEX.	1. Verify the absence of tank at Tank Area N-12 (previous geophysical testing was performed in the wrong area). 2. Resolve certainty regarding extractable petroleum concentrations in groundwater (2010 NWTPH-Dx groundwater testing included the use of SGC <sup>2</sup> ).	1. Verify the absence of a tank at Tank Area N-12 using a magnetometer prior to sampling. 2. Collect 1 groundwater sample from a temporary boring in each of the three areas (Figures 6, 7 and 8).	Groundwater Samples: 1. Analyze for pH and field parameters. 2. Analyze groundwater for NWTPH-Dx (both with and without SGC) to address data gap 2.
N-13	Heating Oil (No contamination detected)	No	Former heating oil tank located adjacent to Building 208; used as a heating plant during Navy operations. Verified absent during two prior rounds of geophysical testing.	No	Section 3.2.2: No TPH contamination detected in 4 soil and groundwater borings analyzed for NWTPH-G, NWTPH-Dx and BTEX.			
N-17	Heating Oil (No contamination detected)	No	Former heating oil tank located adjacent to former Building 344. Removed in 1983 as part of Port Project EP-3826.	No	Section 3.2.3: No TPH or CVOC contamination detected in 6 soil borings analyzed for NWTPH-g, NWTPH-Dx and CVOCs (2008). Absence of TPH contamination confirmed in 2010 with 1 soil and groundwater boring analyzed for NWTPH-G, NWTPH-Dx and BTEX.			
T-23/24	T-23 Fresh Motor Oil (No contamination detected)	No	Two regulated USTs consisting of 1,000-gallon welded steel tanks. Originally installed in 1984 adjacent to the TOTE equipment shop. Removed in 1998 from a single excavation under Port project EP-5412. No groundwater was encountered. No soil contamination detected at Tank T-23. Small quantity of diesel and oil (waste oil) contamination (overfills) detected and removed at Tank T-24. Completeness of removal confirmed with excavation bottom sampling. No PCBs or heavy metals contamination detected in T-24 TPH-contaminated soils at time of removal.	Yes (Near OCC Site CVOC and pH Plumes)	Section 3.2.4: No contamination detected in 1 groundwater sample collected from temporary soil boring and analyzed for BTEX, NWTPH-G and NWTPH-Dx in 2010.	1. Resolve uncertainty regarding extractable petroleum concentrations in groundwater (previous testing included the use of SGC <sup>2</sup> ). 2. Confirm absence of Table 830-1 parameters not tested (VOCs, naphthalene and cPAHs) in groundwater. 3. Confirm the absence of CVOC or pH contamination originating from the Occidental Chemical site.	Collect 1 groundwater sample from a temporary boring adjacent to former tanks (Figure 9).	Groundwater samples: 1. Analyze for pH and field parameters. 2. Analyze for NWTPH-Dx (both with and without SGC) to address data gap 1. 3. Analyze for VOCs and PAHs to address data gaps 2 and 3.
	T-24 Waste Oil (Overfill release cleaned up at time of removal)	Yes - Waste Oil (Soil-only contamination; cleaned up completely at time of UST removal)						

**Table 3**  
**Available Data, Data Gaps, and Planned Sampling for Group 1 Tank Areas**

Notes:

Ecology, 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.

1. Field parameters include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC: 1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

MTBE: methyl tert-butyl ether

MTCA: Model Toxics Control Act (WAC 173-340)

MNA: MNA parameters include nitrate as nitrogen, methane, nitrate, sulfate, iron, and TOC.

NWTPH-G: Northwest total petroleum hydrocarbon test for gasoline

NWTPH-Dx: Northwest total petroleum hydrocarbon test for diesel and oil hydrocarbons

SGC: Silica gel cleanup

VOC: Volatile organic compound

**Table 4**  
**Available Data, Data Gaps, and Planned Sampling for Group 2 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Summary of Recent Testing Data	Data Gaps	Planned Sampling	Planned Analysis
T-21/22	T-21: Diesel T-22: Gas	Yes - Diesel (Diesel fuel and benzene were detected in soils during tank removal; water was encountered during excavation)	Tank Area included two regulated USTs that were installed in 1984 adjacent to the TOTE shop building. Tank T-21 was a 12,000-gallon fiberglass diesel tank, and Tank T-22 was a 4,000-gallon fiberglass gasoline Tank. Removal of the tanks was conducted in 1998 from a joint excavation. Contaminated soil removal was completed to the MTCA Method A criteria applicable at that time. The benzene criteria have subsequently become more stringent. Some benzene contamination not removed in 1998 exceeds current MTCA Method A cleanup levels.	Yes - Near OCC Site CVOC and pH Plumes	Section 3.3.1: Two soil and groundwater borings were tested for NWTPH-G, NWTPH-Dx and BTEX in 2010. Benzene was detected in one soil sample above MTCA Method A cleanup levels. No contamination was detected in groundwater from either of the two borings.	<ol style="list-style-type: none"> <li>1. Address Ecology requirement for groundwater wells at certain regulated UST release areas.</li> <li>2. Assess current benzene concentrations in water table soils at the 2 locations where it was previously detected.</li> <li>3. Resolve uncertainty regarding extractable petroleum concentrations in groundwater (2010 NWTPH-Dx testing used SGC).</li> <li>4. Confirm absence of Table 830-1 parameters not tested (PAHs).</li> <li>5. Confirm the absence of CVOC or pH contamination originating from the OCC site.</li> </ol>	<ol style="list-style-type: none"> <li>1. Install one monitoring well to address data gaps 1 and 2 and one temporary soil boring to address data gap 2 (Figure 10).</li> <li>2. Collect soil samples from smear zone soils at the base of prior tank excavation (8-10 ft bgs) for analysis of VOCs to confirm current benzene concentrations (also analyze for Table 830-1 parameters as required).</li> <li>3. Collect groundwater samples from both the temporary boring and the groundwater well for chemical analysis to address data gaps 3, 4 and 5.</li> </ol>	<p>Soil Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze one sample each from the new well and temporary boring for NWTPH-Dx, VOCs and PAHs (to address data gaps 2 and 4).</li> </ol> <hr/> <p>Groundwater Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze for pH and field parameters to address data gap 5.</li> <li>2. Analyze for NWTPH-Dx (with and without silica gel) to address data gap 3.</li> <li>3. Analyze for VOCs and PAHs to address data gaps 4 and 5</li> </ol>

Notes:

Ecology, 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.

1. Field parameters include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC: 1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

MTBE: methyl tert-butyl ether

MTCA: Model Toxics Control Act (WAC 173-340)

MNA: MNA parameters include nitrate as nitrogen, methane, nitrate, sulfate, iron, and TOC.

NWTPH-G: Northwest total petroleum hydrocarbon test for gasoline

NWTPH-Dx: Northwest total petroleum hydrocarbon test for diesel and oil hydrocarbons

SGC: Silica gel cleanup

VOC: Volatile organic compound

**Table 5**  
**Available Data, Data Gaps, and Planned Sampling for Group 3 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Summary of Recent Testing Data	Data Gaps	Planned Sampling	Planned Analysis
N-9/10	N-9 & 10: Heating Oil (Gas also detected)  Third Tank: Toluene	Yes -Confirmed detections of gas, diesel and cPAH in soil.  Also confirmed detections of CVOC in groundwater.	Two heating oil tanks previously associated with former Navy Building 361 were removed by the Port in 1983 as part of project EP-3826. At that time an additional tank containing 3 inches of toluene was identified and removed.	Yes - Near OCC Site CVOC and pH Plumes	<p>Petroleum testing data (Section 3.4.1 and Figure 11a):</p> <ol style="list-style-type: none"> <li>Six soil borings were installed during 2008 and tested for NWTPH-G and NWTPH-Dx and VOCs. Gasoline contamination detected in 1 of 6 soil borings, but BTEX compounds were not detected.</li> <li>In 2010 4 soil/groundwater borings were tested for NWTPH-G, NWTPH-Dx and BTEX. Diesel exceeded MTCA Method A in one of four soil borings; TPH and BTEX were below MTCA Method A in groundwater.</li> <li>In 2011 four soil test pits were tested for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB) and PAH. cPAH exceeded MTCA Method A in one location.</li> <li>In 2011 four monitoring wells were installed and sampled for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB) and heavy metals. No TPH, BTEX or heavy metals exceedances of MTCA Method A were detected.</li> <li>In 2013 the four wells were resampled for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB), heavy metals and MNA parameters. No TPH, BTEX or heavy metals exceedances of MTCA Method A were detected. MNA parameters demonstrated evidence of anaerobic biodegradation.</li> <li>In 2014 a downgradient well was installed and sampled for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB) and heavy metals. No MTCA Method A exceedances were noted for any petroleum-related constituents. Total and dissolved arsenic were detected at 8 ug/L and 5 ug/L, respectively.</li> </ol>	<ol style="list-style-type: none"> <li>Bound soil gasoline contamination at U4-F and soil cPAH contamination at HC-TP-1 (Figure 11a) using two soil borings.</li> <li>Resolve uncertainty regarding extractable petroleum concentrations in groundwater (2010-2014 NWTPH-Dx testing used SGC) by resampling existing wells.</li> <li>Confirm absence of petroleum-associated Table 830-1 groundwater parameters not already tested (MTBE, PAHs) by resampling existing wells.</li> <li>Document current concentrations of CVOC and pH in groundwater to monitor the progress of natural attenuation since 2013-2014 and to assess potential OCC site influences.</li> <li>Resample shoreline well to confirm current arsenic concentrations and resolve potential turbidity and/or isobaric interferences with this analysis.</li> </ol>	<ol style="list-style-type: none"> <li>Install two temporary soil borings as shown in Figure 11a and collect soil samples from two depths in each boring (5-6ft and 9-10 ft bgs).</li> <li>Redevelop and then resample groundwater from the five existing monitoring wells.</li> </ol>	<p>Tank Area Soil Samples:</p> <ol style="list-style-type: none"> <li>Analyze soils for NWTPH-g, NWTPH-Dx, VOCs (including EDC, EDB and MTBE), PAHs and lead to address data gap 1.</li> </ol>
					<p>CVOC testing data (Section 3.4.1 and Figure 11b):</p> <ol style="list-style-type: none"> <li>Six soil borings were installed during 2008 and tested for VOCs. Trace CVOC compounds (PCE, TCE, DCE and VC) were detected below MTCA Method A cleanup levels.</li> <li>In 2011 four soil test pits were tested for VOCs. There were no Method A exceedances, though trace CVOC were detected in two borings.</li> <li>In 2011 four monitoring wells were installed and sampled for VOCs. Multiple CVOCs were detected. Vinyl chloride exceeded MTCA Method A in all four wells.</li> <li>In 2013 all four monitoring wells were sampled for VOCs and MNA parameters. Multiple CVOCs were detected. Vinyl chloride exceeded MTCA Method A in all four wells. MNA parameters indicated ongoing anaerobic biodegradation.</li> <li>In 2014 a downgradient well was installed and sampled for VOCs. No CVOCs were detected in that well.</li> </ol>			<p>Groundwater Samples:</p> <ol style="list-style-type: none"> <li>Analyze groundwater samples for pH, field parameters to assess data gap 3.</li> <li>Analyze groundwater samples for NWTPH-Dx (with and without SGC) to address data gap 2.</li> <li>Analyze groundwater samples for NWTPH-g,VOCs (including EDC, EDB and MTBE) and PAHs to address data gaps 3 and 4.</li> <li>Analyze groundwater from shoreline well for total and dissolved arsenic to resolve data gap 5. Given high conductivity values in this well, ensure that the lab compensates for isobaric interferences.</li> </ol>

**Table 5**  
**Available Data, Data Gaps, and Planned Sampling for Group 3 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Summary of Recent Testing Data	Data Gaps	Planned Sampling	Planned Analysis
N-20/21/22	<p>N-20/21/22: Gasoline tanks for Navy service station</p> <p>Two Additional Tanks: Suspected Motor Oil</p>	<p>Yes: Gasoline present in soil (no diesel or oil) near former service station.</p> <p>Also CVOCs present in groundwater.</p>	<p>Three gasoline tanks present in 1940s and removed some time prior to 1983. In 1983 two additional tanks were removed from the same area as part of Port project EP-3826.</p>	<p>Yes - Near OCC Site CVOC and pH Plumes</p>	<p>Petroleum testing data (Section 3.4.2 and Figure 12a):</p> <ol style="list-style-type: none"> <li>1. Three soil borings were installed during 2008 and tested for NWTPH-G and NWTPH-Dx and VOCs. No petroleum or BTEX compounds were detected.</li> <li>2. In 2010 4 soil/groundwater borings were tested for NWTPH-G, NWTPH-Dx and BTEX. Gasoline and benzene exceeded MTCA Method A in one of four soil borings; TPH and BTEX were below MTCA Method A in groundwater.</li> <li>3. In 2011 four soil test pits were excavated and three test pits were tested for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB) and PAH. No exceedances of Method A cleanup levels were observed for petroleum-related constituents..</li> <li>4. In 2011 three monitoring wells were installed and sampled for NWTPH-G, NWTPH-Dx and VOCs (including EDC and EDB). No TPH, BTEX or EDC/EDB exceedances of MTCA Method A were detected.</li> <li>5. In 2013 the three wells were resampled for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB), heavy metals and MNA parameters. No TPH, BTEX or heavy metals exceedances of MTCA Method A were detected. MNA parameters demonstrated evidence of anaerobic biodegradation.</li> <li>6. In 2014 a downgradient well was installed and sampled for NWTPH-G, NWTPH-Dx, VOCs (including EDC and EDB) and heavy metals. No MTCA Method A exceedances were noted for any petroleum-related constituents or heavy metals.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bound soil gasoline contamination near HC-2 and soil TCE contamination near U6B using two temporary soil borings to (Figure 12a &amp; 12b).</li> <li>2. Evaluate upgradient pH and CVOC plume impacts from the OCC site by sampling two temporary borings at 15ft bgs and 25 ft bgs (Figure 12b).</li> <li>3. Resolve uncertainty regarding extractable petroleum concentrations in groundwater (2010-2014 NWTPH-Dx testing used SGC) by resampling existing wells.</li> <li>4. Confirm absence of petroleum-associated Table 830-1 groundwater parameters not already tested (MTBE) by resampling existing wells.</li> </ol>	<ol style="list-style-type: none"> <li>1. Install two temporary soil borings within the former Tank Area as shown in Figure 12a and 12b and collect soil samples from two depths in each boring (6-7ft and 10-11 ft bgs).</li> <li>2. Install two temporary borings in upgradient locations as shown in Figure 12b. Sample for pH and CVOCs in groundwater at 15ft bgs and 25 ft bgs.</li> </ol>	<p>Tank Area Soil Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze soils for NWTPH-G, NWTPH-Dx, VOCs (including EDC, EDB and MTBE) and lead.</li> </ol>
					<p>CVOC testing data (Section 3.4.2 and Figure 12b):</p> <ol style="list-style-type: none"> <li>1. Three soil borings were installed during 2008 and tested for VOCs. TCE exceeded MTCA Method A cleanup levels in one location. Trace CVOC compounds (PCE, TCE, DCE and VC) were detected below MTCA Method A cleanup levels in the other borings.</li> <li>2. In 2011 four soil test pits were excavated and three were tested for VOCs. There were no Method A exceedances, though trace CVOC were detected in two of the test pits.</li> <li>3. In 2011 three monitoring wells were installed and sampled for VOCs. Multiple CVOCs were detected. Vinyl chloride exceeded the MTCA Method A cleanup level in all three wells, and TCE exceedances were noted in one well.</li> <li>4. In 2013 all three monitoring wells were sampled for VOCs and MNA parameters. Vinyl chloride exceeded MTCA Method A in all three wells, and TCE exceedances were noted in one well. MNA parameters indicated ongoing anaerobic biodegradation.</li> <li>5. In 2014 a downgradient well was installed and sampled for VOCs. Vinyl chloride was detected in that well above the MTCA Method A cleanup level. No other CVOCs were detected in that well.</li> </ol>	<ol style="list-style-type: none"> <li>5. Document current concentrations of CVOC and pH in groundwater to monitor the progress of natural attenuation since 2013-2014 and to evaluate potential impacts from the OCC site plumes.</li> <li>6. Conduct pore-water testing for CVOCs in the Blair Waterway sediment just offshore of well HC-N202122-9 to assess protectiveness to aquatic receptors in sediments and surface water (Figure 12b).</li> </ol>	<ol style="list-style-type: none"> <li>3. Redevelop and then resample groundwater from the four existing monitoring wells.</li> <li>4. Conduct porewater sampling at station N20-PW-01 (Figure 12b)</li> </ol>	<p>Groundwater Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze groundwater samples for pH, and field parameters to address data gap 5.</li> <li>2. Analyze groundwater samples for NWTPH-Dx (with and without SGC) to address data gap 3.</li> <li>3. Analyze groundwater samples for NWTPH-G, VOCs (including CVOCs and MTBE) to address data gaps 2, 3, 4 and 5.</li> </ol> <p>Porewater Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze porewater samples for pH, field parameters and VOCs (including CVOCs and MTBE).</li> </ol>

**Table 5**  
**Available Data, Data Gaps, and Planned Sampling for Group 3 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Summary of Recent Testing Data	Data Gaps	Planned Sampling	Planned Analysis
P-27/28	P-27/28: Heating Oil and Sealing Wax U-1: Startup Tank	Yes: (Diesel and oil detected in soil and groundwater; benzene detected in groundwater)	Tank Area contained three former Tanks that contained heating oil prior to their use for wax storage (P-27/28) were removed in 1996. During removal a third smaller startup tank (Tank U-1) was discovered. Groundwater was encountered during removal. Soil contamination was removed to the extent practicable, but some diesel/oil contamination remained.	Yes - Near OCC Site CVOC and pH Plumes	Petroleum testing data (Section 3.4.3 and Figure 13): 1. Three groundwater wells (P-1, 2 and 3) were installed and sampled in 1997. Droplets of hydrocarbon product were observed in the upgradient well (P-3), and Method A exceedances were noted for diesel and oil in the middle well (P-2). 2. Three additional wells (MW-1, MW-2 and MW-3) were installed and sampled for WPH-G, WTPH-Dx and BTEX in 1997 along with the first three wells. No contamination was noted in MW-1, 2 or 3. A thin layer of waxy product and diesel fuel contamination were detected in well P-3. Diesel and oil contamination were detected in well P-2. 3. In 2010 five temporary soil/groundwater borings were installed and sampled for WTPH-G, WTPH-Dx and BTEX. MTCA Method A was exceeded for benzene in groundwater from one downgradient boring. No exceedances were noted in the other borings. 4. All six monitoring wells were abandoned in 2012.	1. Assess the presence of free-phase product and provide for groundwater monitoring by installing three groundwater wells within and downgradient of the former Tank Area (Figure 13). 2. Bound the lateral and vertical extent of soil and groundwater contamination. 3. Evaluate the potential presence of Table 830-1 contaminants (PCBs, PAHs) not previously tested by collecting soil samples during new well installation (above) and temporary soil borings (below). 4. Resolve uncertainty regarding extractable petroleum concentrations in groundwater (2010 NWTPH-Dx testing used SGC) by resampling groundwater at the previous locations of HC-1 through HC-5. 5. Confirm absence of petroleum-associated Table 830-1 groundwater parameters not already tested (PAHs) by sampling groundwater from temporary borings and monitoring wells. (Note: No PCB testing of groundwater will be performed as the PCB analysis is subject to artifacts from turbidity from temporary borings.) 6. Document current concentrations of CVOC and pH in groundwater to assess potential influences from the OCC site. 7. Assess the potential for MNA to address remaining contamination by sampling MNA parameters in new monitoring wells.	1. Install three monitoring wells at the locations shown in Figure 13. 2. During well installation, collect source-area soil samples to define the vertical limits of contamination and allow for Table 830-1 parameter testing. 3. Develop and sample the new monitoring wells. 4. Collect and analyze soil and groundwater from five temporary soil borings at the locations shown in Figure 13 to resolve soil and groundwater data gaps.	Soil Sampling: 1. Screen soils from the new monitoring wells and five soil borings for the potential presence of petroleum hydrocarbons. 2. Collect soils from the new monitoring wells at two sampling depths (9-10 feet at the base of former excavation and from underlying interval 14-15 feet bgs). Collect soils from the five soil borings at 9-10 feet). 3. Analyze soil samples for NWTPH-Dx, VOCs, PAHs and PCBs (resolves data gap 2).  Groundwater Sampling (Temporary Borings and Monitoring Wells): 1. Analyze groundwater samples for pH and field parameters. 2. Test for product accumulations in the three monitoring wells (resolves data gap 1). 3. Test groundwater from the wells and temporary borings for NWTPH-Dx (with and without SGC), PAHs, and VOCs (resolves data gaps 3, 4, 5 and 6). 4. Analyze groundwater samples from the new monitoring wells for MNA parameters.

Notes:  
Ecology, 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.

1. Field parameters include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC: 1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

MTBE: methyl tert-butyl ether

MTCA: Model Toxics Control Act (WAC 173-340)

MNA: MNA parameters include nitrate as nitrogen, methane, nitrate, sulfate, iron, and TOC.

NWTPH-G: Northwest total petroleum hydrocarbon test for gasoline

NWTPH-Dx: Northwest total petroleum hydrocarbon test for diesel and oil hydrocarbons

SGC: Silica gel cleanup

VOC: Volatile organic compound

**Table 6**  
**Available Data, Data Gaps, and Planned Sampling for Group 4 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Data Gaps	Planned Sampling	Planned Analysis
A-1/2	A-1: Use not documented A-2: Use not documented	No	Two tanks were removed from a single Tank Area in 1983 as part of Port project EP-3826. No contamination was noted during those removals.	Yes - Near OCC Site CVOC and pH Plumes	<p>1. Assess whether a petroleum release has occurred by testing soils from the Tank Area by NWTPH-HCID.</p> <p>2. If a petroleum release is detected, assess the presence of MTCA Table 830-1 parameters by conducting chemical analysis of archived samples of soil and groundwater.</p> <p>3. If a petroleum release is detected, assess the potential influence of the OCC site plume by testing groundwater for pH and VOCs.</p>	<p>1. Install four temporary soil and groundwater borings as shown in Figure 14.</p> <p>2. Collect soil samples from two sampling depths (5-6 ft and the water table at approximately 9-10 ft bgs, or as adjusted based on the results of field screening) in each boring for HCID testing and archive additional samples for contingent testing.</p> <p>3. Collect groundwater samples from each of the four soil borings for analysis of pH and field parameters and contingent archive testing.</p>	<p>Tank Area Soil Samples:</p> <p>1. Analyze soils initially on a rush basis for NWTPH-HCID to resolve data gap 1. Use results to determine further testing needs.</p> <p>2. Trigger additional soil testing as appropriate to the release identified based on the parameters in MTCA Table 830-1 (resolves data gap 2). Testing may include NWTPH-G, NWTPH-Dx, VOCs, PAHs, PCBs and lead.</p> <hr/> <p>Groundwater Samples:</p> <p>1. Analyze groundwater samples for pH, field parameters to assess data gap 3.</p> <p>2. If a petroleum release is identified, trigger additional soil testing as appropriate to the type release identified in the soil HCID data. Analyze appropriate parameters in archived samples consistent with MTCA Table 830-1. Testing may include NWTPH-G, NWTPH-Dx (with and without silica gel), VOCs, PAHs, and/or lead (total and dissolved).</p> <p>3. If a petroleum release is identified, trigger analysis of groundwater for VOCs to assess potential OCC site plume influence (resolves data gap 3).</p>

**Table 6**  
**Available Data, Data Gaps, and Planned Sampling for Group 4 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Data Gaps	Planned Sampling	Planned Analysis
B-1/2/3	B-1: Use not documented B-2: Use not documented B-3: Use not documented	No	Three tanks were removed from a single Tank Area in 1983 as part of Port project EP-3826. No contamination was noted during those removals.	No	<ol style="list-style-type: none"> <li>1. Assess whether a petroleum release has occurred by testing soils from the Tank Area by NWTPH-HCID.</li> <li>2. If a petroleum release is detected, assess the presence of MTCA Table 830-1 parameters by conducting chemical analysis of archived samples of soil and groundwater.</li> <li>3. If a petroleum release is detected, assess the potential influence of the OCC site plume by testing groundwater for pH and VOCs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Install five temporary soil and groundwater borings as shown in Figure 15.</li> <li>2. Collect soil samples from two sampling depths (5-6 ft and the water table at approximately 9-10 ft bgs, or as adjusted based on the results of field screening) in each boring for HCID testing and archive additional samples for contingent testing.</li> <li>3. Collect groundwater samples from each of the four soil borings for analysis of pH and field parameters and contingent archive testing.</li> </ol>	<p>Tank Area Soil Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze soils initially on a rush basis for NWTPH-HCID to resolve data gap 1. Use results to determine further testing needs.</li> <li>2. Trigger additional soil testing as appropriate to the release identified based on the parameters in MTCA Table 830-1 (resolves data gap 2). Testing may include NWTPH-G, NWTPH-Dx, VOCs, PAHs, PCBs and lead.</li> </ol> <p>Groundwater Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze groundwater samples for pH, field parameters to assess data gap 3.</li> <li>2. If a petroleum release is identified, trigger additional soil testing as appropriate to the type release identified in the soil HCID data. Analyze appropriate parameters in archived samples consistent with MTCA Table 830-1. Testing may include NWTPH-G, NWTPH-Dx (with and without silica gel), VOCs, PAHs, and/or lead (total and dissolved).</li> </ol>

**Table 6**  
**Available Data, Data Gaps, and Planned Sampling for Group 4 Tank Areas**

Tank Area	Tank Use	Known or Suspected Release?	Tank History and Removal Information	Near/Within Off-Site Plumes?	Data Gaps	Planned Sampling	Planned Analysis
Former Wax Tank	Sealing Wax (May also have been used for heating oil)	No	Former wax tank located northwest of Tanks A-1 and A 2. The wax tank is understood to have been removed, but detailed documentation is not available.	Yes - Near OCC Site CVOC and pH Plumes	<ol style="list-style-type: none"> <li>1. Confirm that the tank was previously removed using a magnetometer survey.</li> <li>2. Assess whether a petroleum release has occurred by testing soils from the Tank Area by NWTPH-HCID.</li> <li>3. If a petroleum release is detected, assess the presence of MTCA Table 830-1 parameters by conducting chemical analysis of archived samples of soil and groundwater.</li> <li>4. If a petroleum release is detected, assess the potential influence of the OCC site plume by testing groundwater for pH and VOCs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Conduct a magnetometer survey in the former Wax Tank area to verify it is no longer present.</li> <li>2. Install three temporary soil and groundwater borings as shown in Figure 16.</li> <li>3. Collect soil samples from two sampling depths (5-6 ft and the water table at approximately 9-10 ft bgs, or as adjusted based on the results of field screening) in each boring for HCID testing and archive additional samples for contingent testing.</li> <li>4. Collect groundwater samples from each of the four soil borings for analysis of pH and field parameters and contingent archive testing.</li> </ol>	<p>Tank Area Soil Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze soils initially on a rush basis for NWTPH-HCID to resolve data gap 2. Use results to determine further testing needs.</li> <li>2. Trigger additional soil testing as appropriate to the release identified based on the parameters in MTCA Table 830-1 (resolves data gap 3). Testing may include NWTPH-G, NWTPH-Dx, VOCs, PAHs, PCBs and lead.</li> </ol> <p>Groundwater Samples:</p> <ol style="list-style-type: none"> <li>1. Analyze groundwater samples for pH, field parameters to assess data gap 4.</li> <li>2. If a petroleum release is identified, trigger additional soil testing as appropriate to the type release identified in the soil HCID data. Analyze appropriate parameters in archived samples consistent with MTCA Table 830-1 (resolves data gap 3). Testing may include NWTPH-G, NWTPH-Dx (with and without silica gel), VOCs, PAHs, and/or lead.</li> <li>3. If a petroleum release is identified, trigger analysis of groundwater for VOCs to assess potential OCC site plume influence (resolves data gap 4).</li> </ol>

Notes:

Ecology, 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.

1. Field parameters include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC: 1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

MTBE: methyl tert-butyl ether

MTCA: Model Toxics Control Act (WAC 173-340)

MNA: MNA parameters include nitrate as nitrogen, methane, nitrate, sulfate, iron, and TOC.

NWTPH-G: Northwest total petroleum hydrocarbon test for gasoline

NWTPH-Dx: Northwest total petroleum hydrocarbon test for diesel and oil hydrocarbons

SGC: Silica gel cleanup

VOC: Volatile organic compound

**Table 7**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type															Sample ID		
						GW	Soil	PW	Start	End		Soil Testing							Groundwater Testing							Porewater Testing			
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>
<b>Group 1 Tank Areas</b>																													
N-12	Geoprobe	N12-GP-01	--	1168294.89	713049.91	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N12-GP-01-GW-YMMDD	
N-13		N13-GP-01	--	1168619.82	713360.97	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N13-GP-01-GW-YMMDD	
N-17		N17-GP-01	--	1166531.2	714776.33	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N17-GP-01-GW-YMMDD	
T-23/24		T23-GP-01	--	1166886.67	714785.99	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	--	--	--	--	T23-GP-01-GW-YMMDD	
<b>Group 2 Tank Area</b>																													
T-21/22	New Permanent Well	T21-MW-01	HC-1	1166845.81	714690.81	1	--	--	Mon Well		--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	T21-MW-01-GW-YMMDD	
			HC-1			--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Geoprobe	T21-GP-01	HORUS-12	1166861.88	714689.12	--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	T21-GP-01-SO-9-10-YMMDD	
<b>Group 3 Tank Areas</b>																													
N-9/10	Existing Permanent Well	HC-N910-9	HC-N910-9	1167154.26	714169.35	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	1	--	1	--	--	HC-N910-9-GW-YMMDD	
		N9-MW-05	HC-MW-05	1167116.29	714283.2	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-05-GW-YMMDD
		N9-MW-06	HC-MW-06	1167071.53	714289.55	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-06-GW-YMMDD
		N9-MW-07	HC-MW-07	1167115.02	714345.99	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-07-GW-YMMDD
		N9-MW-08	HC-MW-08	1167058.32	714366.61	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-08-GW-YMMDD
	Geoprobe	N9-GP-01	--	1167087.73	714371.89	--	1	--	5	6	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-5-6-YMMDD	
		N9-GP-01	--	1167087.73	714371.89	--	1	--	9	10	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-9-10-YMMDD	
		N9-GP-02	--	1167080.93	714301.85	--	1	--	5	6	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-02-SO-5-6-YMMDD	
N-20/21/22	Existing Permanent Well	HC-N202122-9	HC-N202122-9	1167342.54	714012.74	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	HC-N202122-9-GW-YMMDD	
		N20-MW-05	HC-MW-05	1167373.3	714067.8	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-05-GW-YMMDD
		N20-MW-07	HC-MW-07	1167428.47	714122.43	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-07-GW-YMMDD
		N20-MW-08	HC-MW-08	1167360.52	714126.33	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-08-GW-YMMDD
	Geoprobe	N20-GP-01	--	1167401.82	714145.95	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-6-7-YMMDD	
		N20-GP-01	--	1167401.82	714145.95	--	1	--	10	11	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-10-11-YMMDD	
		N20-GP-02	--	1167354.26	714032.93	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-02-SO-6-7-YMMDD	
		N20-GP-02	--	1167354.26	714032.93	--	1	--	10	11	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-02-SO-10-11-YMMDD	
		N20-GP-03	--	1167428.12	714272.93	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	N20-GP-03-GW-A-YMMDD
						1	--	--	20	25	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	--	N20-GP-03-GW-B-YMMDD
		N20-GP-04	--	1167508.29	714195.5	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	N20-GP-04-GW-A-YMMDD
						1	--	--	20	25	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	--	--
Porewater	N20-PW-01	--	1167326.23	713992.51	--	--	1	-1	-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1	N20-PW-01-A-YMMDD	
					--	--	1	0	-1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1

**Table 7**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type															Sample ID					
						GW	Soil	PW	Start	End		Soil Testing						Groundwater Testing						Porewater Testing								
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCS <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCS <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCS <sup>3</sup>	
P-27/28 & U-1	Geoprobe	P27-GP-01	HC-1	1167330.19	714384.9	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	--	P27-GP-01-GW-YMMMDD	
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-01-SO-9-10-YMMMDD	
		P27-GP-02	HC-2	1167369.03	714409.41	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	--	P27-GP-02-GW-YMMMDD	
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-02-SO-9-10-YMMMDD	
		P27-GP-03	HC-3	1167379.25	714461.13	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	--	P27-GP-03-GW-YMMMDD	
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-03-SO-9-10-YMMMDD		
	P27-GP-04	HC-4	1167332.22	714483.03	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	--	P27-GP-04-GW-YMMMDD		
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-04-SO-9-10-YMMMDD		
	P27-GP-05	HC-5	1167298.24	714447.56	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	--	P27-GP-05-GW-YMMMDD		
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-GP-05-SO-9-10-YMMMDD		
		New Permanent Well	P27-MW-01	P-3	1167351.2	714470.73	1	--	--	Mon Well		--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	1	--	--	--	P27-MW-01-GW-YMMMDD	
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-01-SO-9-10-YMMMDD	
						--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-01-SO-14-15-YMMMDD	
					1	--	--	Mon Well		--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	1	--	--	--	P27-MW-02-GW-YMMMDD		
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-02-SO-9-10-YMMMDD		
				--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-02-SO-14-15-YMMMDD			
				1	--	--	Mon Well		--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	1	--	--	--	P27-MW-03-GW-YMMMDD			
				--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-03-SO-9-10-YMMMDD			
				--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-03-SO-14-15-YMMMDD			
<b>Group 4 Tank Areas</b>																																
A-1/2	Geoprobe	A1-GP-01	--	1167183.81	714509.87	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	A1-GP-01-GW-A-YMMMDD			
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-5-6-YMMMDD
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-9-10-YMMMDD
		A1-GP-02	--	1167172.18	714497.06	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	A1-GP-02-GW-YMMMDD	
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-5-6-YMMMDD
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-9-10-YMMMDD
		A1-GP-03	--	1167155.87	714484.43	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	A1-GP-03-GW-YMMMDD	
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-03-SO-5-6-YMMMDD
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-03-SO-9-10-YMMMDD
		A1-GP-04	--	1167165.29	714475.37	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	A1-GP-04-GW-YMMMDD	
--	1					--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-04-SO-5-6-YMMMDD		
--	1					--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-04-SO-9-10-YMMMDD		

**Table 7**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type																				Sample ID						
						GW	Soil	PW	Start	End		Soil Testing							Groundwater Testing							Porewater Testing												
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic	MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCs <sup>3</sup>								
B-1/2/3	Geoprobe	B1-GP-01	--	1166915.67	714489.35	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-9-10-YMMMDD	
		B1-GP-02	--	1166873.39	714481.63	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-9-10-YMMMDD		
		B1-GP-03	--	1166891.32	714464.21	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-9-10-YMMMDD		
		B1-GP-04	--	1166909.25	714446.78	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-04-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-04-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-SB-04-SO-9-10-YMMMDD	
		B1-GP-05	--	1166866.97	714439.06	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-9-10-YMMMDD	
Wax Tank	Geoprobe	WT-GP-01	--	1167135.83	714574.05	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-GW-YMMMDD	
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-9-10-YMMMDD		
		WT-GP-02	--	1167099.92	714554.54	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-9-10-YMMMDD	
		WT-GP-03	--	1167119.5	714536.38	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-5-6-YMMMDD		
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-9-10-YMMMDD	
<b>Total Samples by Type</b>						<b>38</b>	<b>45</b>	<b>2</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--							
Planned Analyses						24	8	21	21	17	8	11	40	9	24	24	25	17	1	1	3	2	2	2														
Planned QC Analyses						2	1	2	2	1	1	1	2	1	2	2	2	1	1	1	1	1	1	1														
<b>Total Planned Analyses</b>						<b>26</b>	<b>9</b>	<b>23</b>	<b>23</b>	<b>18</b>	<b>9</b>	<b>12</b>	<b>42</b>	<b>10</b>	<b>26</b>	<b>26</b>	<b>27</b>	<b>18</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>														
Max Potential Conditional Analyses Using Archived Samples						0	24	24	24	24	24	0	0	12	12	12	12	12	12	0	0	0	0	0	0													
Max Potential Conditional QC Samples						0	2	2	2	2	2	0	0	1	1	1	1	1	1	0	0	0	0	0	0													
<b>Max Potential Conditional Analyses</b>						<b>0</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>														

**Table 7**  
**Summary of Data Gaps Sampling**

- Notes:
1. For new DGWP sampling locations to be resampled based on a historical location, sample collection will occur 3 to 5 feet of historical station to allow for drilling.
  2. Depth intervals may be adjusted in the field based on observations of soil-groundwater interface or depths of obvious contamination.
  3. VOCs will include CVOC compounds, EDC, EDB, MTBE and naphthalenes.
  4. Field parameters will be measured for all groundwater samples and include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.
  5. Natural attenuation parameters include: nitrate as nitrogen, methane, dissolved oxygen, sulfate, iron, and TOC.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC-1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

GW: groundwater

MTBE: methyl tert-butyl ether

MNA: natural attenuation

NWTPH-Dx: the qualitative and extended quantitative method for semi-volatile ("diesel") petroleum products in soil and water

NWTPH-G: the qualitative and extended quantitative method for volatile ("gasoline") petroleum products in soil and water

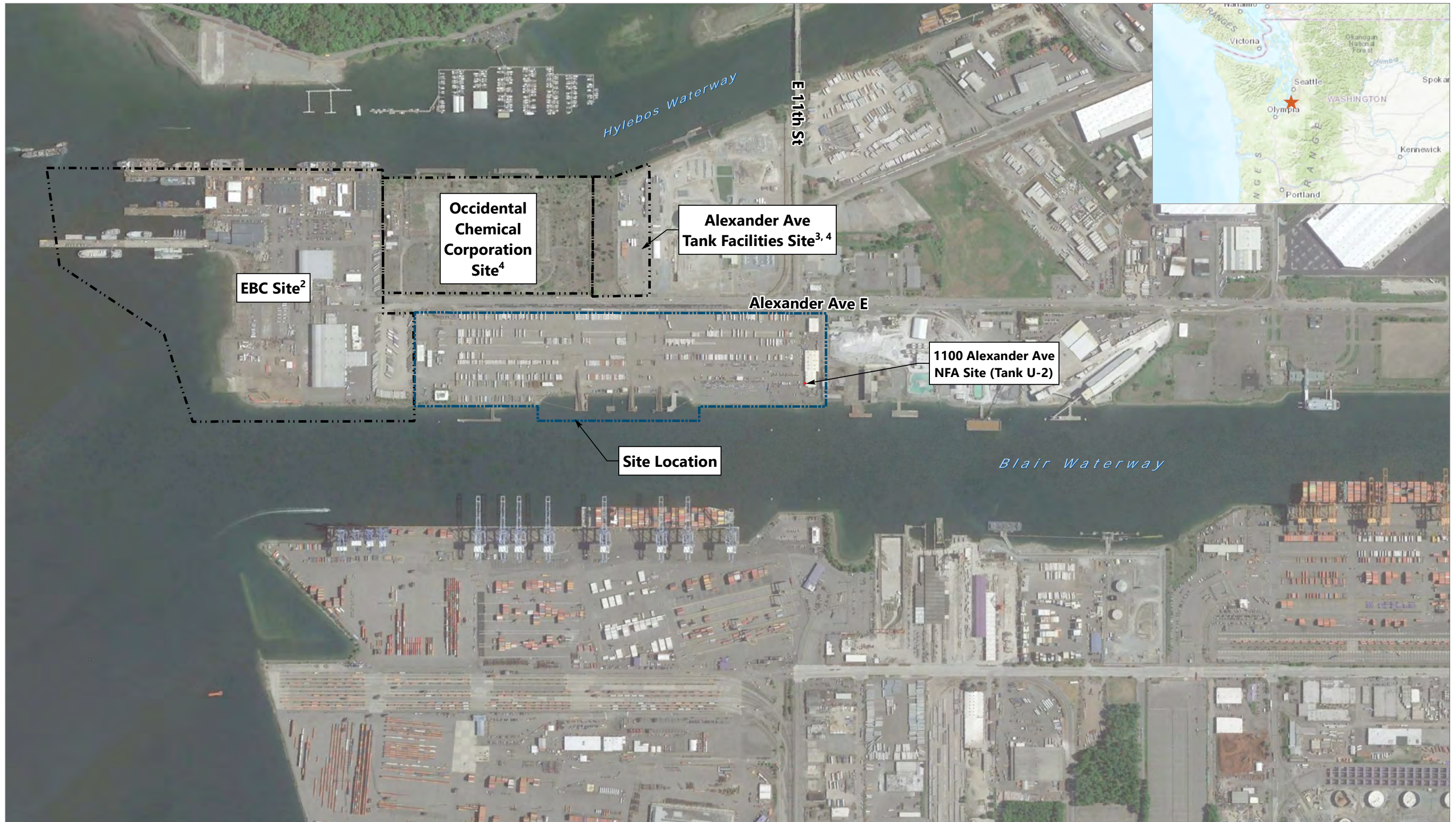
NWTPH-HCID: a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist in water or soil

PW: porewater

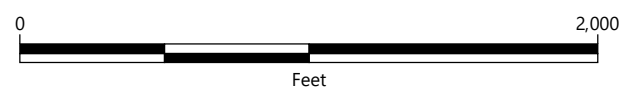
VOC: volatile organic compound

## Figures

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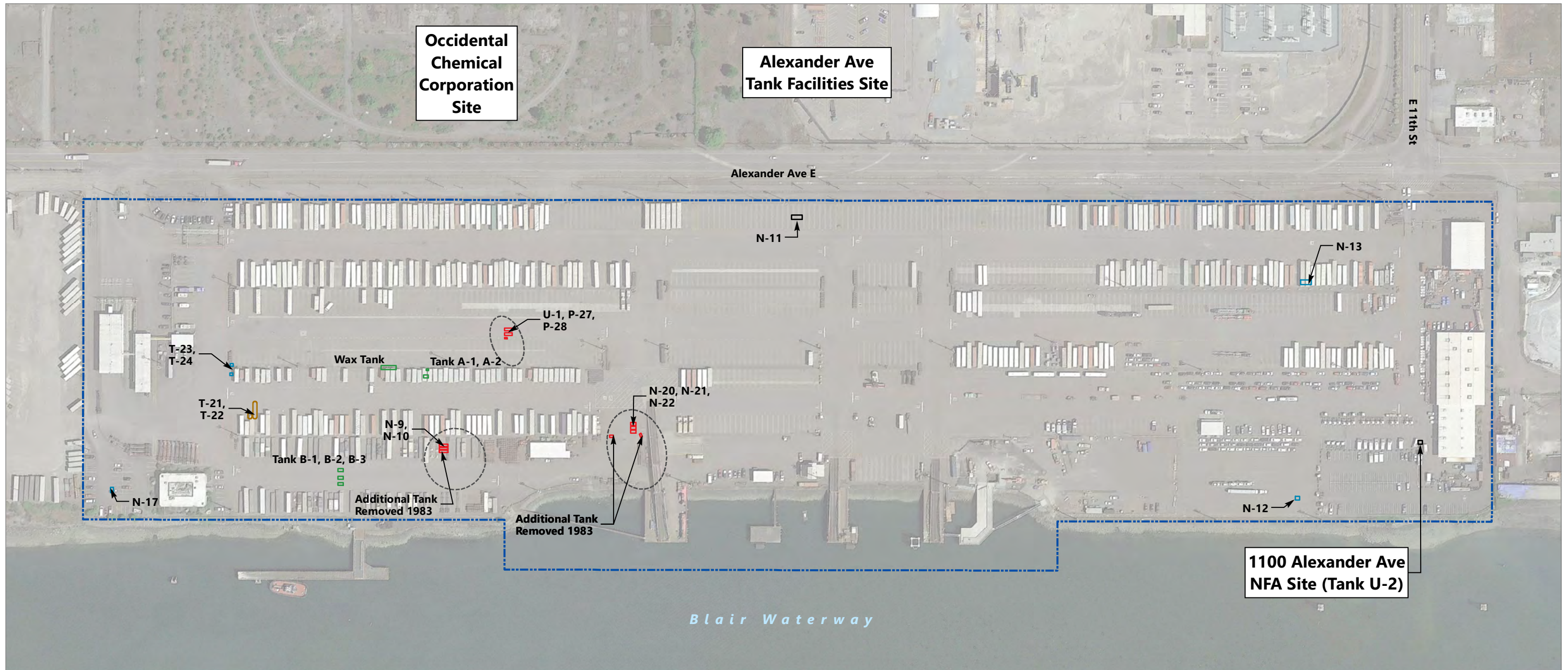


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**NOTE:**  
 1. Aerial imagery sourced from Google Earth Pro, May 2019.  
 2. EBC Site digitized from EBC Previous Investigation Report, 2013  
 3. Alexander Ave Tank Tank Facility Site digitized from Alexander Avenue Petroleum Tank Facility Site Feasibility Study, 2019  
 4. Refer to Figure 3 for the extent of the Occidental and Alexander Ave plumes.

**Figure 1  
 Vicinity Map**  
 Data Gaps Work Plan  
 Port of Tacoma TOTE USTs

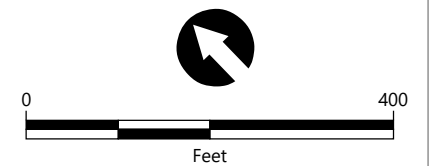


**LEGEND:**

- Yard Lease Lines
- Tank Location and Group**
- Group 1 Tanks
- Group 2 Tanks
- Group 3 Tanks
- Group 4 Tanks
- Tanks Addressed Separately
- Estimated Extent of Groundwater Impacts

**NOTES:**

1. Aerial Imagery from Google Earth Pro, May, 2018.

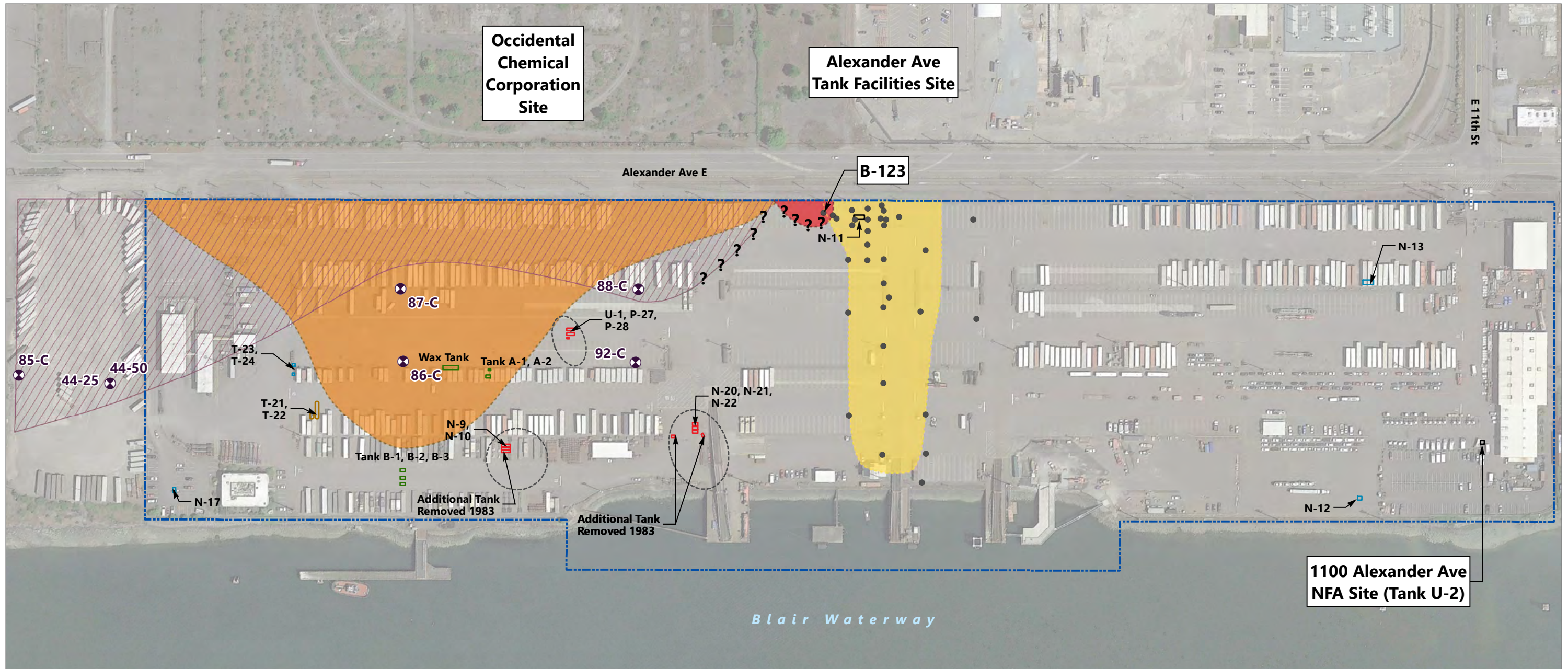


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**Figure 2**  
**Summary of Former Tank Locations**

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs

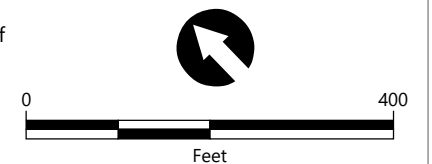


**LEGEND:**

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li> Yard Lease Lines</li> <li> Alexander Ave Groundwater Benzene Plume Testing Locations</li> <li> Monitoring Well – Occidental Site</li> </ul> | <p><b>Interpolated Plume Type</b></p> <ul style="list-style-type: none"> <li> Estimated Extent of Alexander Site Benzene Plume</li> <li> Estimated Extent of Occidental Chemical Site pH Plume</li> <li> Estimated Extent of Vinyl Chloride in B-123 25' Groundwater</li> <li> Estimated Extent of Occidental Chemical Chlorinated Solvent Plume</li> </ul> | <p><b>Tank Location and Group</b></p> <ul style="list-style-type: none"> <li> Group 1 Tanks</li> <li> Group 2 Tanks</li> <li> Group 3 Tanks</li> <li> Group 4 Tanks</li> <li> Tanks Addressed Separately</li> <li> Estimated Extent of Groundwater Impacts</li> </ul> |
|---|---|---|

**NOTES:**

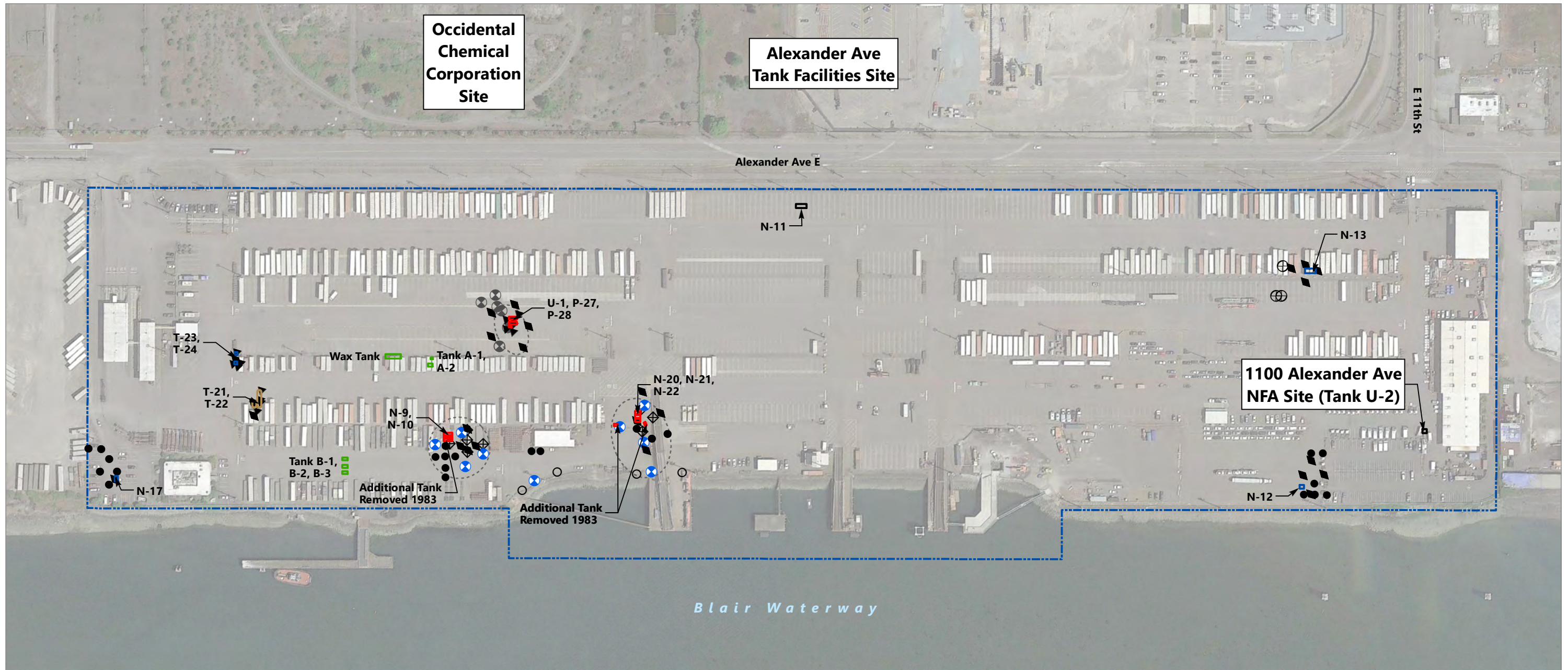
1. Aerial Imagery from Google Earth Pro, May, 2018.
2. Occidental Chemical Site chlorinated solvent plume extent represents maximum extent of detected PCE, TCE, DCE or vinyl chloride in Occidental Chemical Site groundwater monitoring wells at any depth. Final Draft Site Characterization Report, September, 2015, CRA.
3. Occidental Chemical Site pH plume represents the maximum interpolated extent of the > pH 8.5 plume at any depth. Final Draft Site Characterization Report, September, 2015, CRA.
4. Vinyl chloride was detected at boring B-123 installed as part of the Alexander Avenue Tank Farms Site testing program. This area is associated with the Occidental Chemical chlorinated solvent plume.
5. The Alexander Avenue Tank Farms Site benzene plume represents the estimated extent of groundwater exceeding 5 ug/L benzene in the 25-foot water bearing zone. Final Agency Review Draft RI Report, Alexander Avenue Petroleum Tank Facility Site, December 2016, Aspect Consulting.



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**Figure 3**  
 Interpolated Extent of Groundwater Contamination Associated with Other Sites

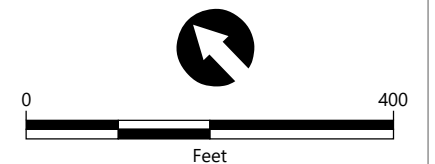


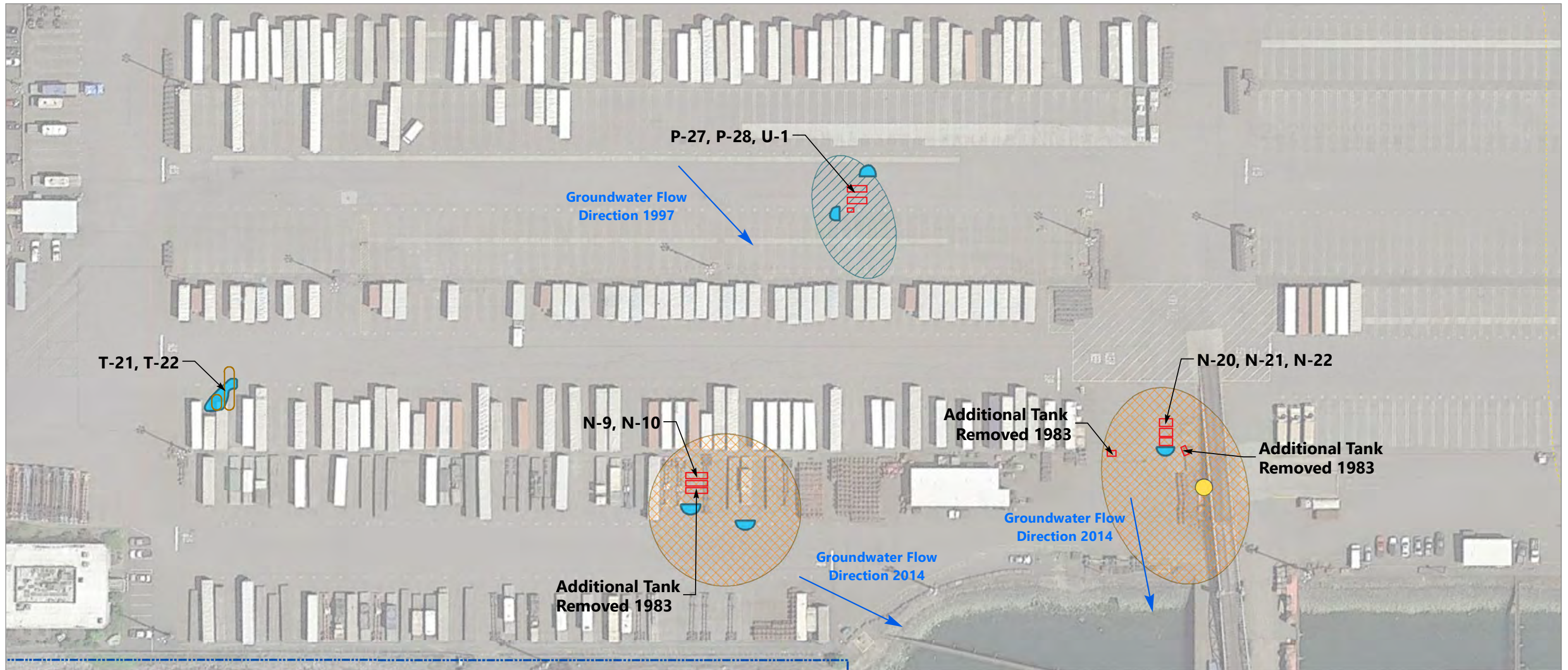
**LEGEND:**

Yard Lease Lines	<b>Sample Type</b>	<b>Tank_Group</b>
	Confirmation Sample	Group 1 Tanks
	Monitoring Well – Abandoned	Group 2 Tanks
	Monitoring Well – Active	Group 3 Tanks
	Potholing	Group 4 Tanks
	Soil Boring (Field Screening Only)	Tanks Addressed Separately
	Soil Boring (with Soil Data)	Estimated Extent of Groundwater Impacts
	Soil and Groundwater Boring	
	Test Pit	

**NOTES:**

1. Aerial Imagery from Google Earth Pro, May, 2018.
2. This figure shows sampling locations relied upon to determine the nature and extent of contamination associated with the TOTE UST Project Group 1, Group 2, Group 3, and Group 4 tank areas.
3. Tank area N-11 is being addressed as part of the Alexander Avenue Tank Farms Site.



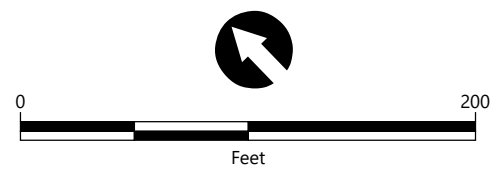


**LEGEND:**

- |   |                                |
|---|--------------------------------|
| Yard Lease Lines                                      | <b>Tank Location and Group</b> |
| Area with Petroleum or BTEX in Soil                   | Group 2 Tank Area              |
| Area with Petroleum or BTEX in Groundwater            | Group 3 Tank Area              |
| Area with Low-level CVOC Contamination in Soil        |                                |
| Area with Low-level CVOC Contamination in Groundwater |                                |

**NOTES:**

1. Aerial Imagery from Google Earth Pro, May, 2018.





**LEGEND:**

Yard Lease Lines

Former Building Location

**Tank Location and Group**

Group 1 Tanks

**Historical Sampling Methods and Data**

Soil Boring (with Soil Data)

Soil and Groundwater Boring

Soil Complies with MTCA Method A

Soil and Groundwater Comply with MTCA Method A

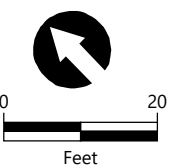
**Proposed Monitoring Locations**

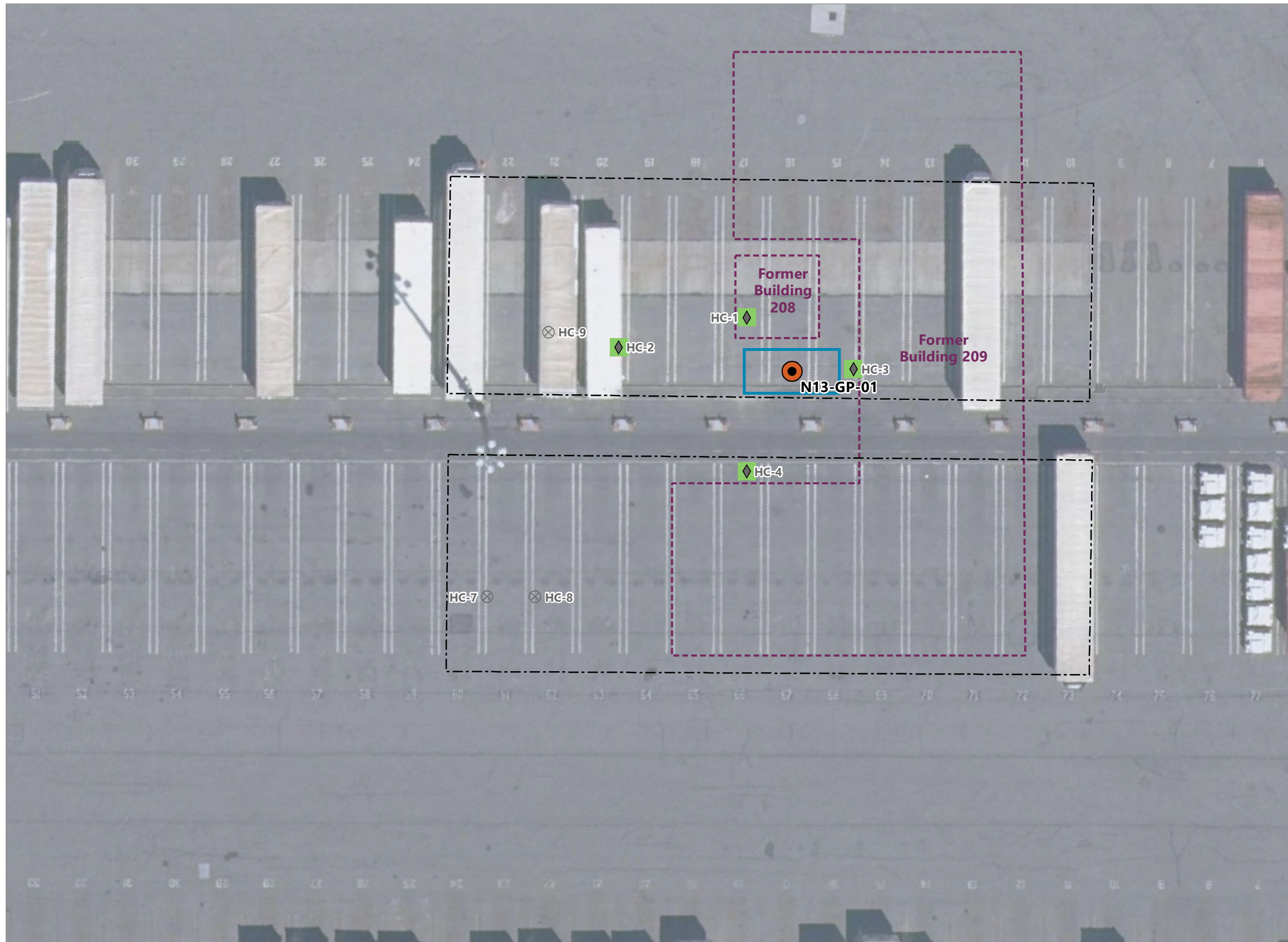
*Geoprobe Locations*

Groundwater Sampling

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. Six soil borings tested by GeoEngineers in 2008.
3. Four soil borings were tested for soil and groundwater by Hart Crowser in 2010.
4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.





**LEGEND:**

- Yard Lease Lines
- Former Building Location
- Geophysical Testing Area

**Tank Location and Group**

- Group 1 Tanks

**Historical Sampling Methods and Data**

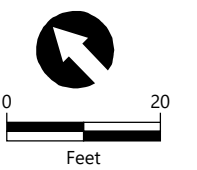
- X Potholing
- ◆ Soil and Groundwater Boring
- Soil and Groundwater Comply with MTCA Method A

**Proposed Monitoring Locations**

*Geoprobe Locations*

- Groundwater Sampling

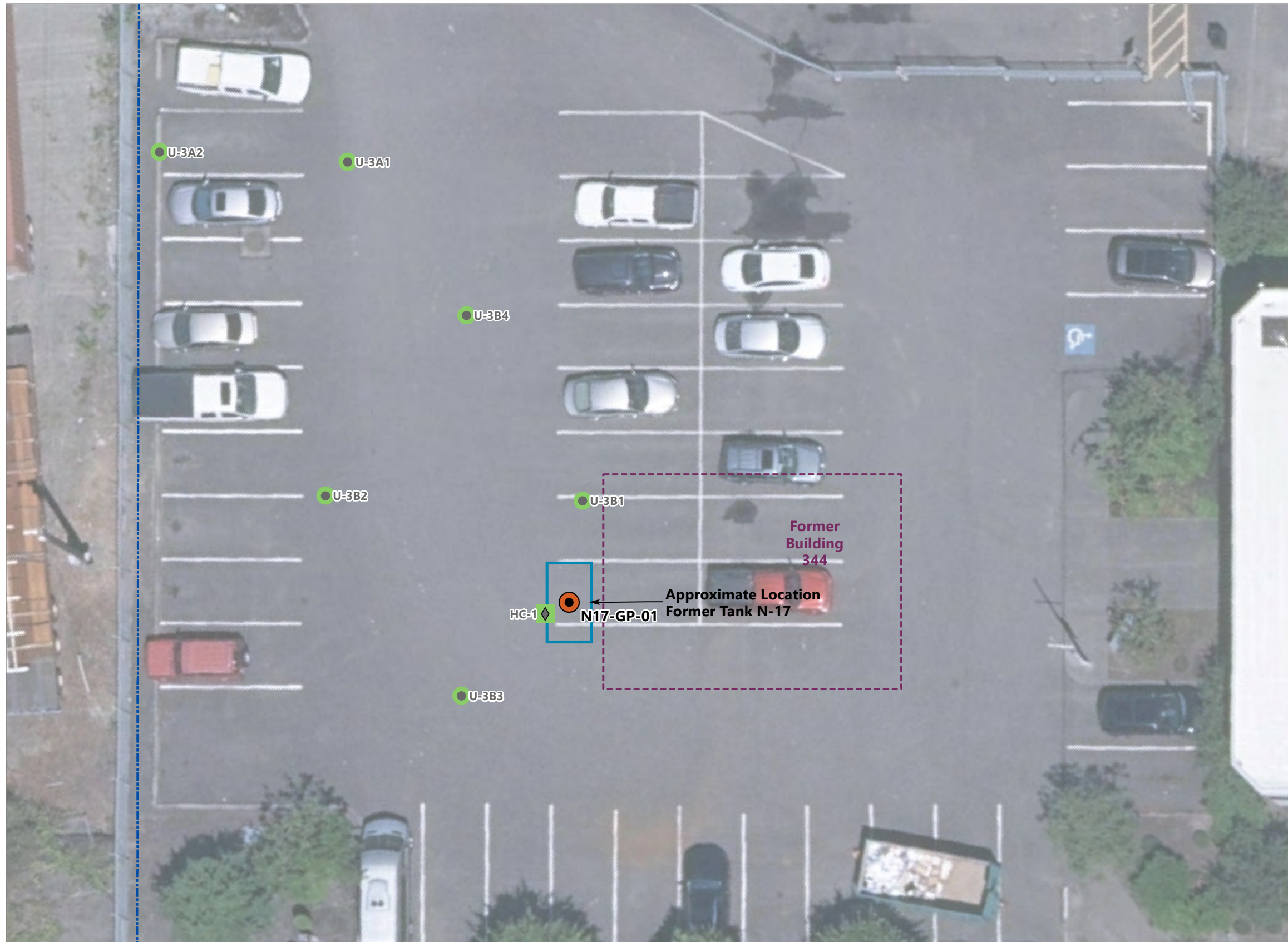
- NOTES:**
1. Aerial Imagery from City of Tacoma 2018.
  2. Four soil borings were tested for soil and groundwater by Hart Crowser in 2010.
  3. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.
  4. Hart Crowser performed geophysical surveys and potholing (visual soil screening only) in 2015.
  5. Sample types without color coding were not submitted for chemical testing.



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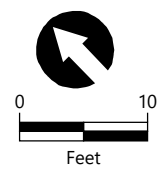


**Figure 7**  
**Group 1 Tank Area: N-13 Planned Sample Locations**  
 Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



- LEGEND:**
- Yard Lease Lines
  - Former Building Location
  - Tank Location and Group**
  - Group 1 Tanks
  - Historical Sampling Methods and Data**
  - Soil Boring (with Soil Data)
  - ◆ Soil and Groundwater Boring
  - Soil Complies with MTCA Method A
  - Soil and Groundwater Comply with MTCA Method A
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater Sampling

- NOTES:**
1. Aerial Imagery from City of Tacoma 2018.
  2. Six soil borings tested by GeoEngineers in 2008.
  3. One soil boring was tested for soil and groundwater by Hart Crowser in 2010.
  4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



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**Figure 8**  
**Group 1 Tank Area: N-17 Planned Sample Locations**  
 Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location
- Geophysical Testing Area

**Tank Location and Group**

- Group 1 Tanks

**Historical Sampling Methods and Data**

- Confirmation Sample
- Soil and Groundwater Boring
- Soil Complies with MTCA Method A
- Soil and Groundwater Comply with MTCA Method A

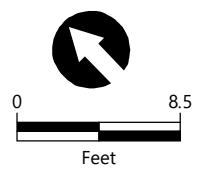
**Proposed Monitoring Locations**

*Geoprobe Locations*

- Groundwater Sampling

**NOTES:**

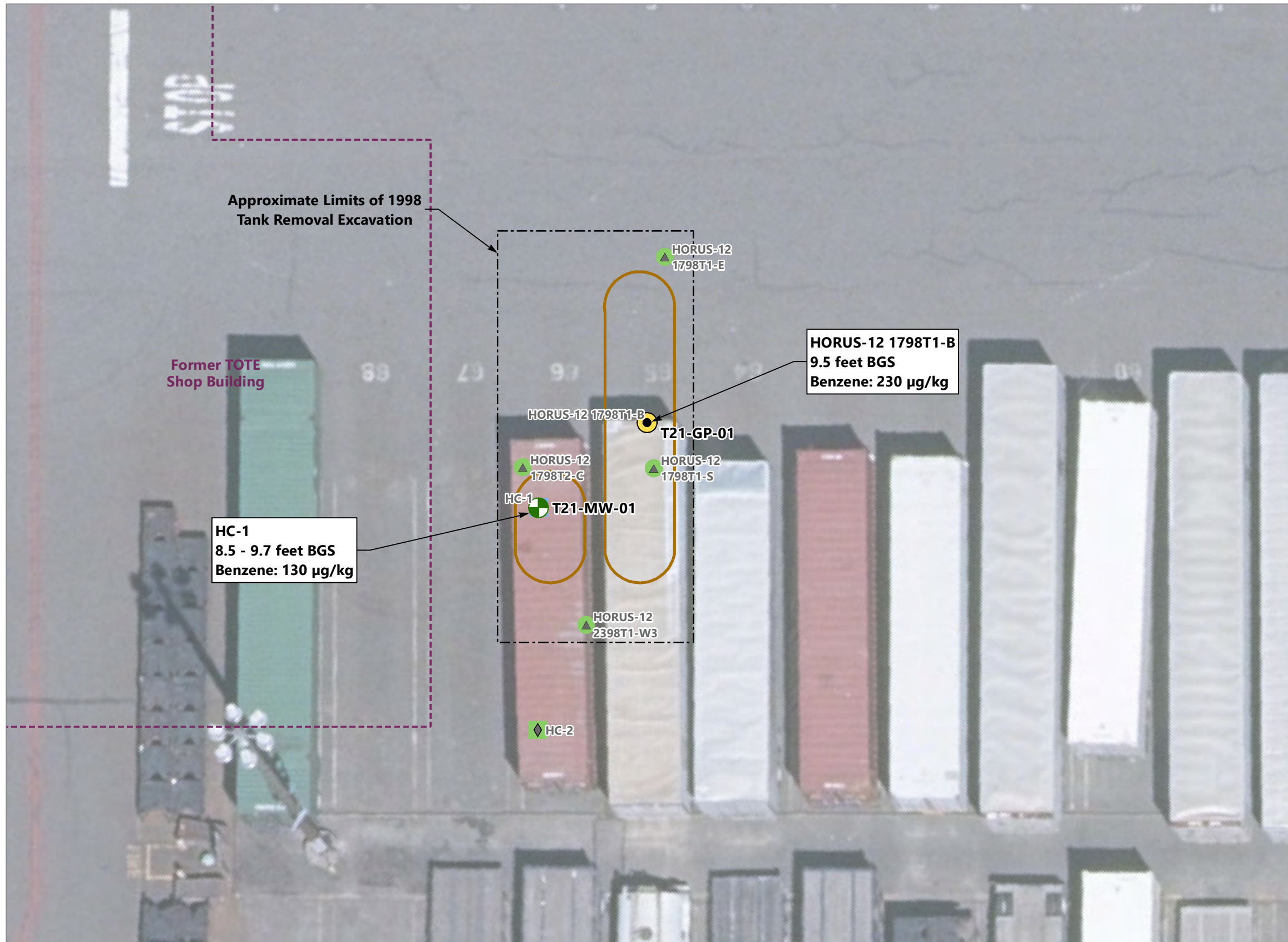
1. Aerial Imagery from City of Tacoma 2018.
2. Tanks 23 and 24 were removed along with a small amount of oil contaminated soil in 1998 by Horus Environmental. Final confirmation samples collected by Horus demonstrated compliance with cleanup levels.
3. One soil boring was tested for soil and groundwater by Hart Crowser in 2010.
4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



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**Figure 9**  
**Group 1 Tank Area: T-23/24 Planned Sample Locations**



**LEGEND:**

Yard Lease Lines

Former Building Location

Geophysical Testing Area

**Tank Location and Group**

Group 2 Tanks

**Historical Sampling Methods and Data**

Confirmation Sample

Soil and Groundwater Boring

Soil Complies with MTCA Method A

Soil and Groundwater Comply with MTCA Method A

Soil Exceeds MTCA Method A

Soil Exceeds but Groundwater Complies MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

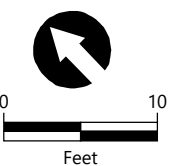
Install and Sample Groundwater and Soil at New Well

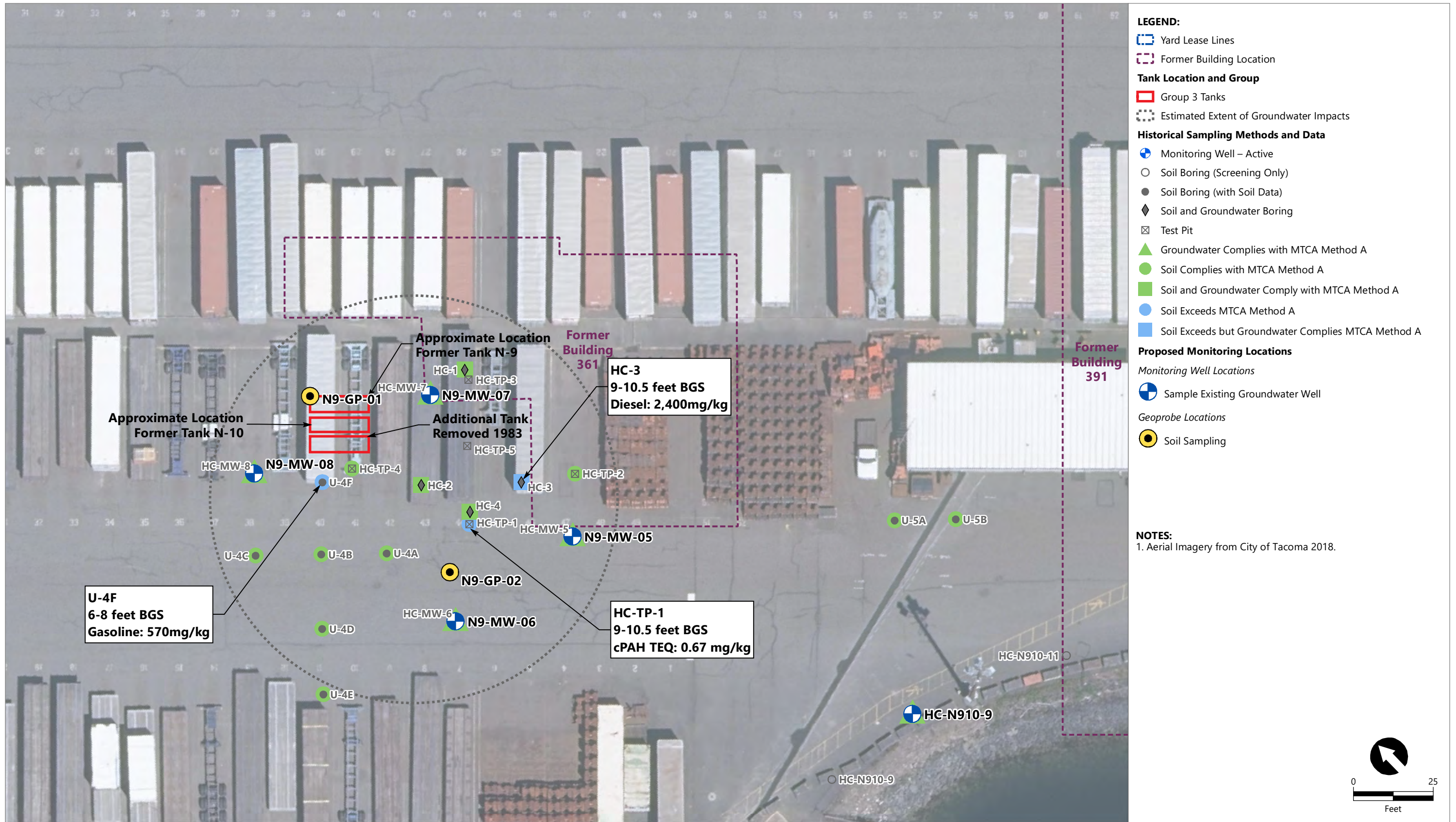
*Geoprobe Locations*

Soil Sampling

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. Tanks 21 and 22 were removed along with a small amount of oil contaminated soil in 1998 by Horus Environmental.
3. Final confirmation samples collected by Horus demonstrated compliance with cleanup levels except for one bottom sample that contained elevated benzene.
4. Two soil borings were tested for soil and groundwater by Hart Crowser in 2010. Benzene exceeded cleanup levels in soil in one boring.
5. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



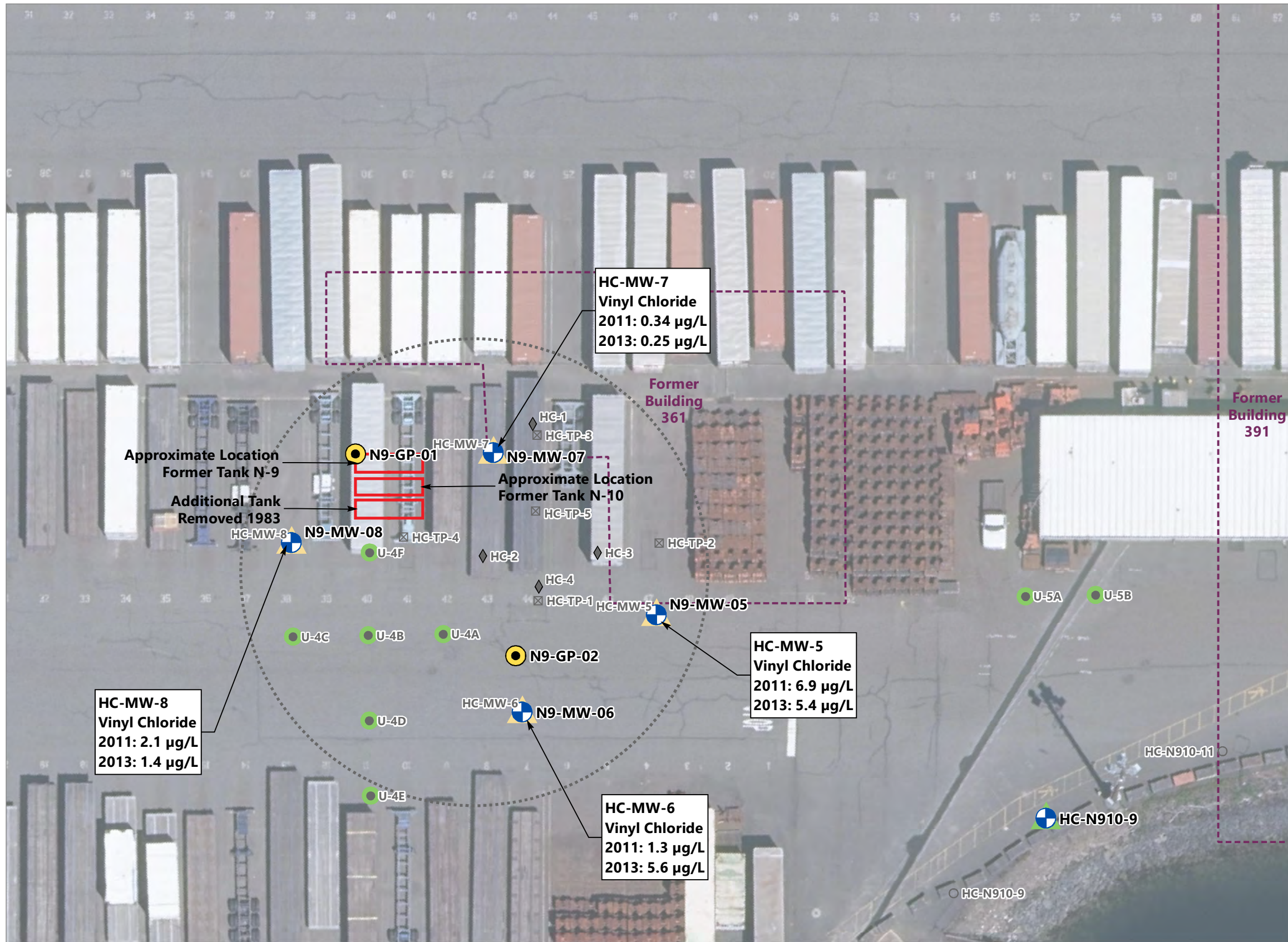


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**Figure 11a**  
**Group 3 Tank Area: N-9/10 Planned Sample Locations and Petroleum Constituents**

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs

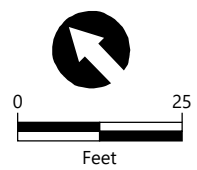


**LEGEND:**

- Yard Lease Lines
- Former Building Location
- Tank Location and Group**
- Group 3 Tanks
- Estimated Extent of Groundwater Impacts
- Historical Sampling Methods and Data**
- Monitoring Well – Active
- Soil Boring (Screening Only)
- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Test Pit
- Groundwater Complies with MTCA Method A
- Groundwater Exceeds MTCA A
- Soil Complies with MTCA Method A
- Proposed Monitoring Locations**
- Monitoring Well Locations*
- Sample Existing Groundwater Well
- Geoprobe Locations*
- Soil Sampling

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. No heavy metals contamination (total or dissolved) was detected in the four initial tank-area groundwater monitoring wells (MW-5, MW-6, MW-7 and MW-8). During 2015 groundwater testing at well HC-N910-9, detected dissolved arsenic concentrations at 5 u/L and total arsenic concentrations at 8 ug/L. The total arsenic concentrations may be the result of turbidity in the collected samples. All arsenic concentrations were at or below background concentrations as documented in Ecology's assessment of background groundwater quality for the Puget Sound basin (Ecology, 2021).

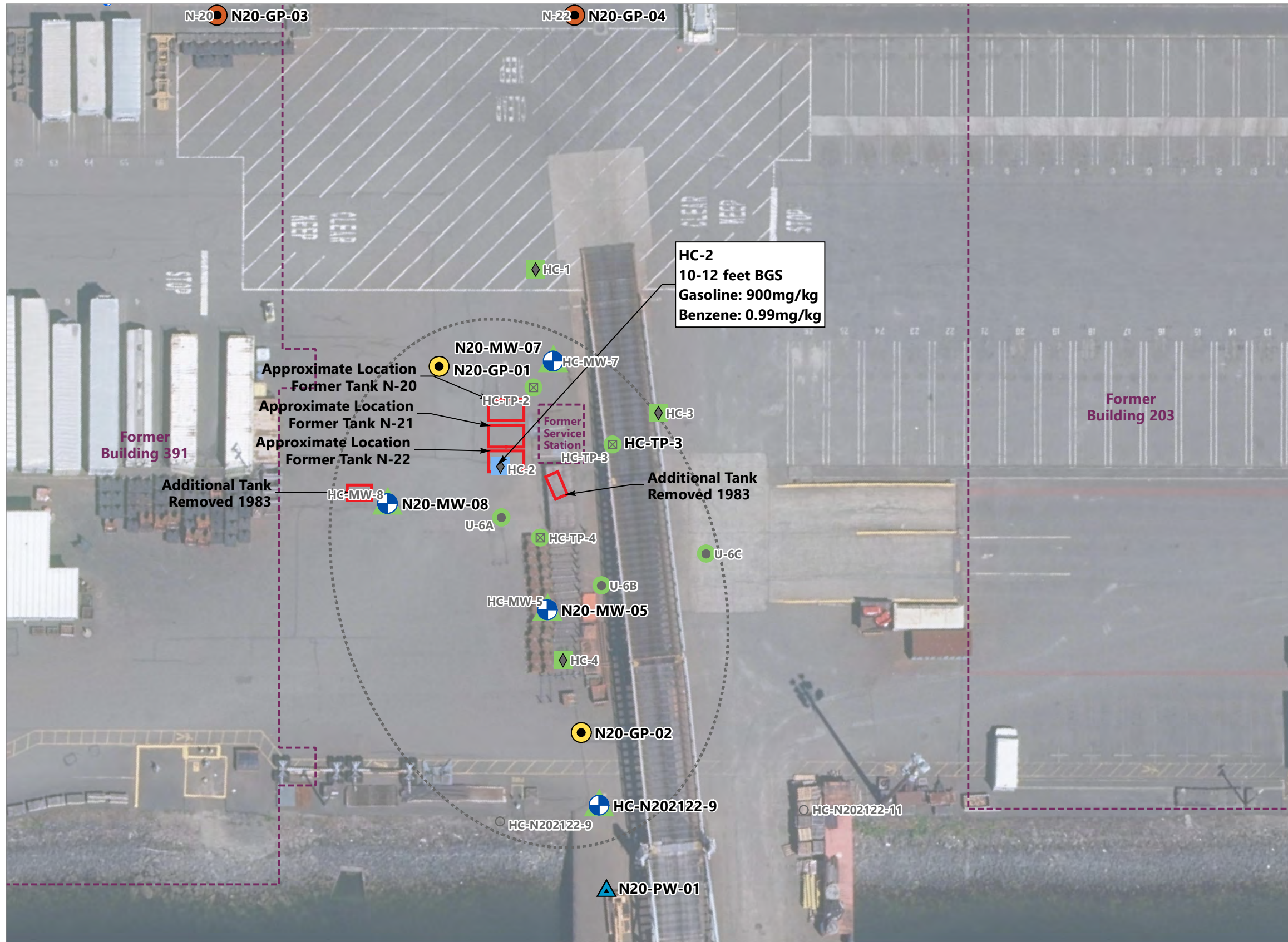


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**Figure 11b**  
 Group 3 Tank Area: N-9/10 Planned Sample Locations and CVOC Compounds

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location

**Tank Location and Group**

- Group 3 Tanks
- Estimated Extent of Groundwater Impacts

**Historical Sampling Methods and Data**

- Monitoring Well – Active
- Soil Boring (Screening Only)
- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Test Pit
- Groundwater Complies with MTCA Method A
- Soil Complies with MTCA Method A
- Soil and Groundwater Comply with MTCA Method A
- Soil Exceeds but Groundwater Complies MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

- Sample Existing Groundwater Well

*Geoprobe Locations*

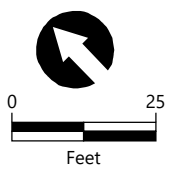
- Groundwater Sampling
- Soil Sampling

*Porewater Locations*

- Porewater Sampling Location

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. Porewater will be collected at two elevations at the designated sampling location.
3. Arsenic was detected at 5 ug/L (dissolved) and 8 ug/L (total) at shoreline well location HC-N202122-9 in 2014. The arsenic is likely a turbidity artifact. The concentrations are also within the range identified by Ecology as typical of background Puget Sound area groundwater (Ecology, 2022).

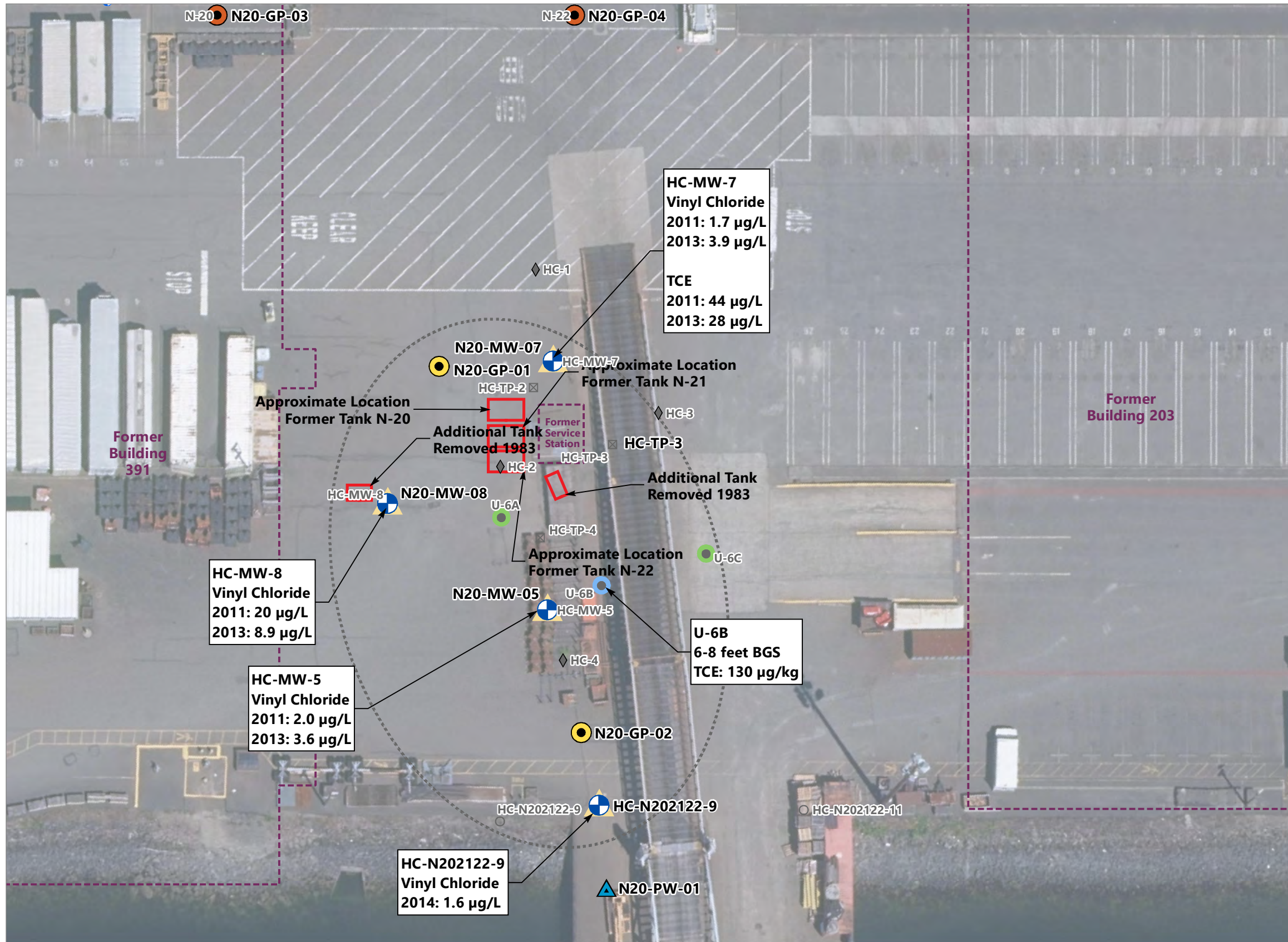


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**Figure 12a**  
**Group 3 Tank Area: N-20/21/22 Planned Sample Locations and Petroleum Constituents**

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location

**Tank Location and Group**

- Group 3 Tanks
- Estimated Extent of Groundwater Impacts

**Historical Sampling Methods and Data**

- Monitoring Well – Active
- Soil Boring (Screening Only)
- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Test Pit
- Groundwater Exceeds MTCA A
- Soil Complies with MTCA Method A
- Soil Exceeds MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

- Sample Existing Groundwater Well

*Geoprobe Locations*

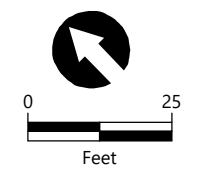
- Groundwater Sampling
- Soil Sampling

*Porewater Locations*

- Porewater Sampling Location

**NOTES:**

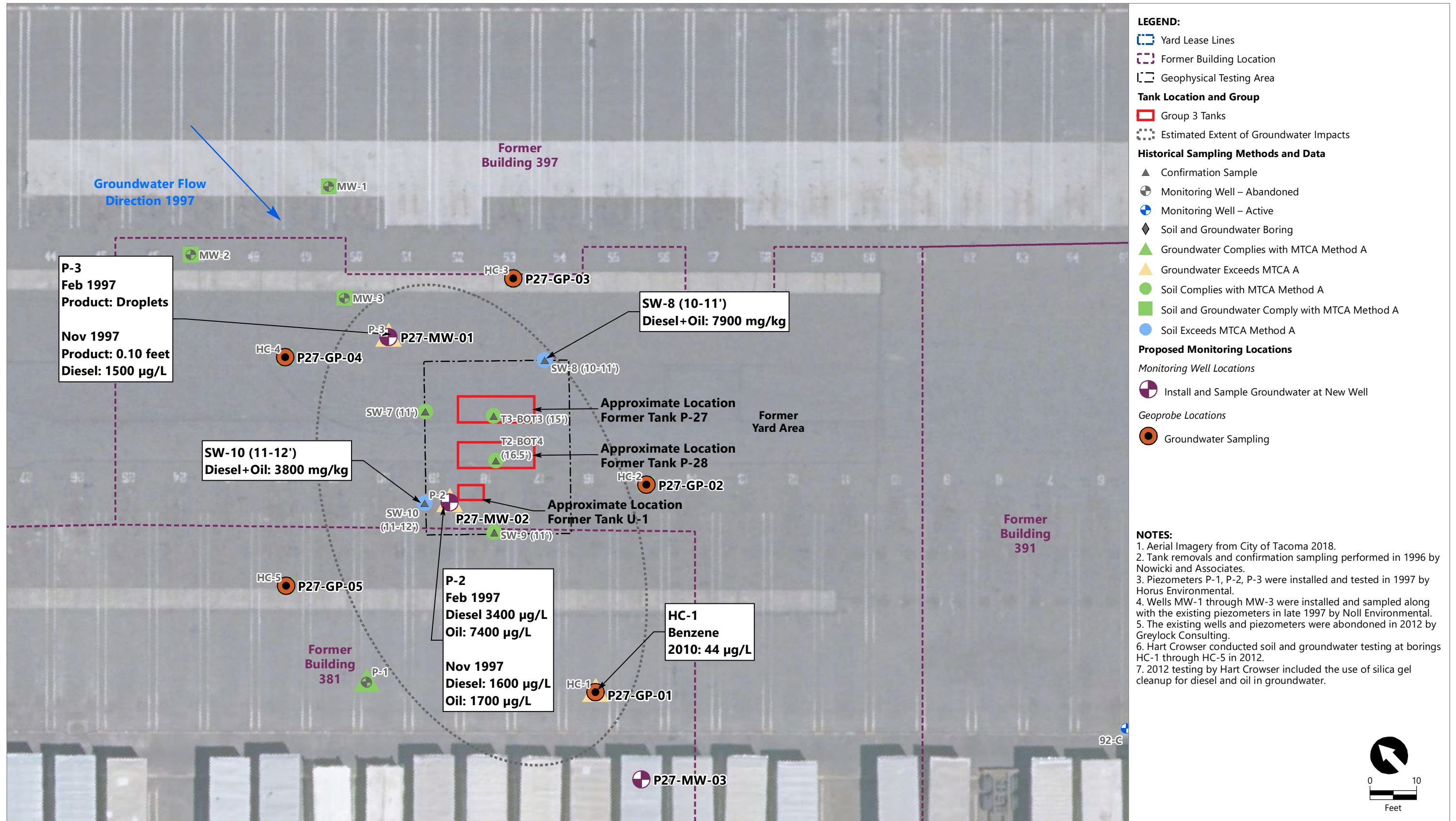
- Aerial Imagery from City of Tacoma 2018.
- Porewater will be collected at two elevations at the designated sampling location.



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**Figure 12b**  
**Group 3 Tank Area: N-20/21/22 Planned Sample Locations and CVOC Compounds**

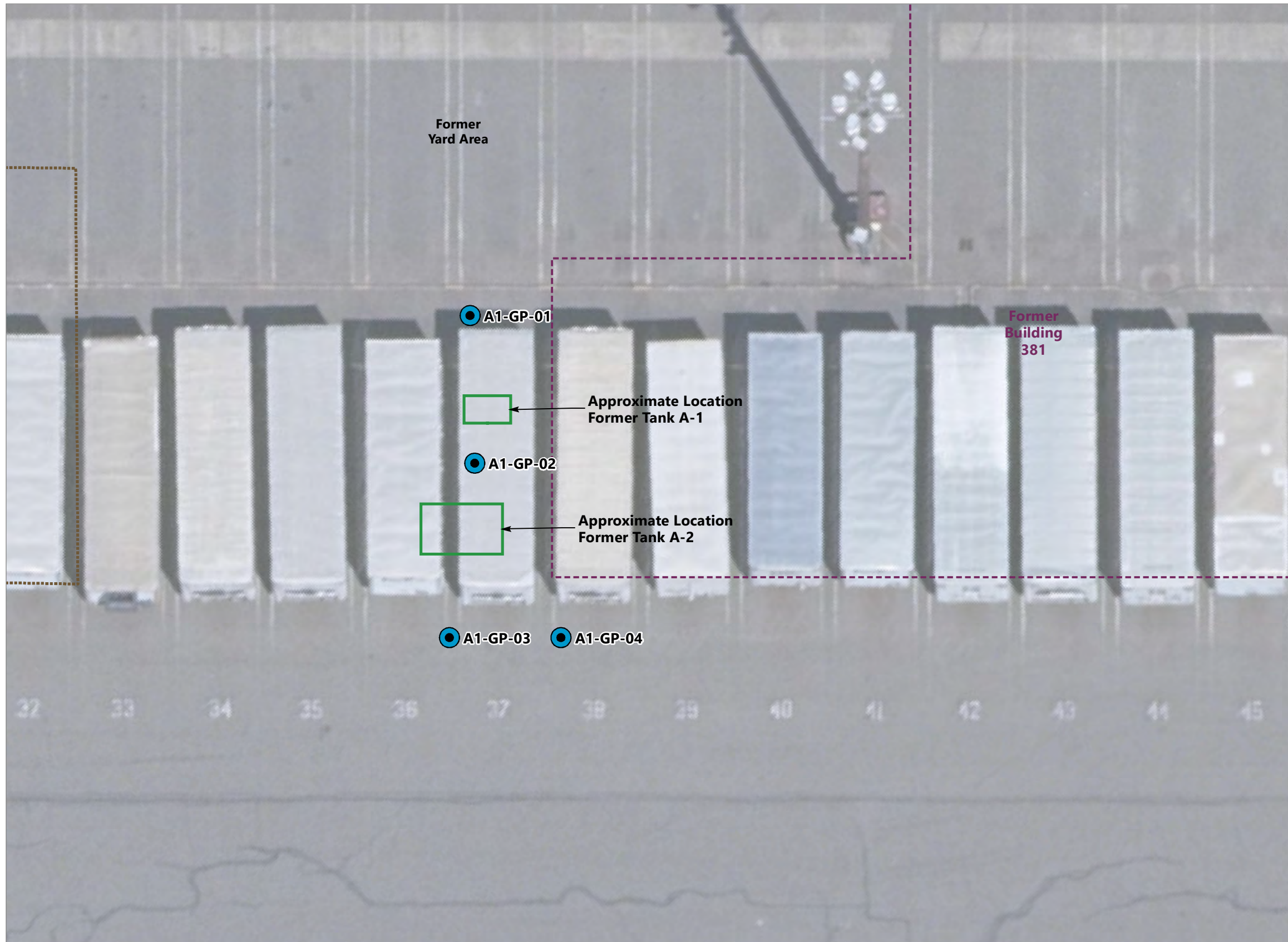


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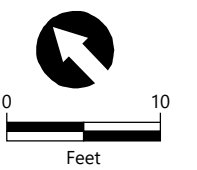
**Figure 13**  
**Group 3 Tank Area: P-27/P-28 Planned Sample Locations**

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



- LEGEND:**
- Yard Lease Lines
  - Former Building Location
  - Tank Location and Group**
  - Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater and Soil Sampling
  - Magnetometer Survey Area

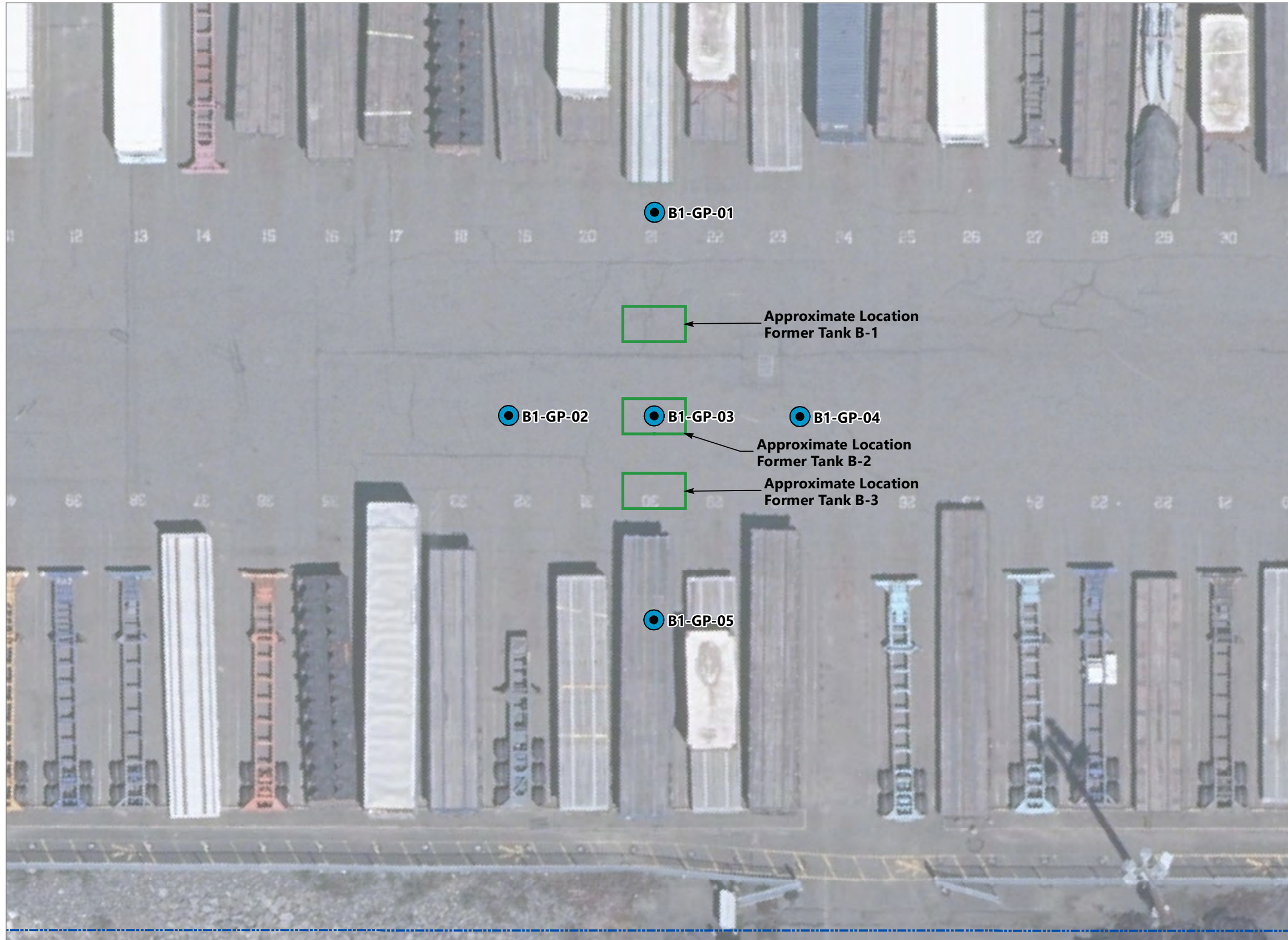
**NOTES:**  
 1. Aerial Imagery from City of Tacoma 2018.



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**Figure 14**  
**Group 4 Tank Area: A-1/2 Planned Sample Locations**  
 Data Gaps Work Plan  
 Port of Tacoma TOTE USTs



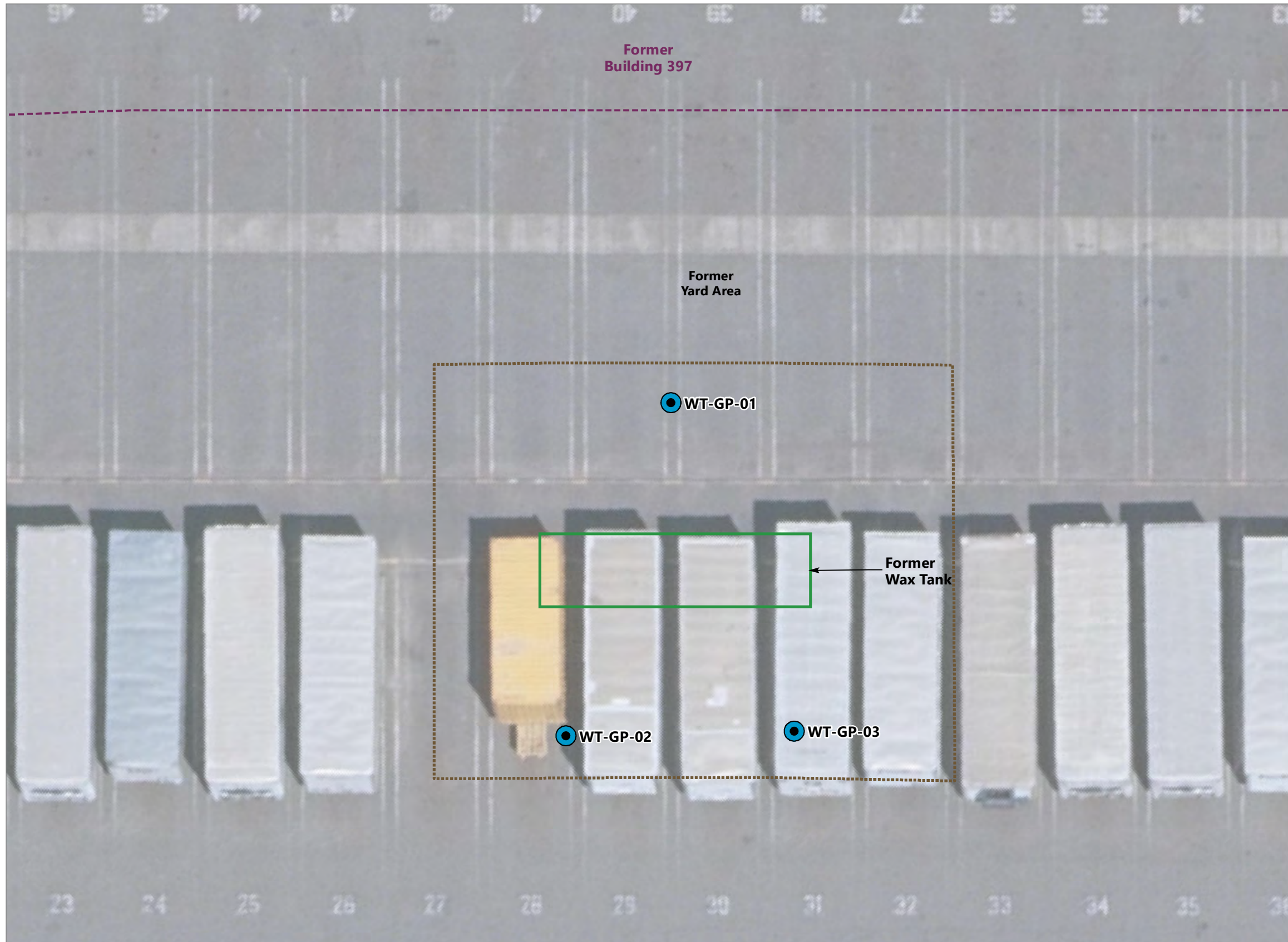
- LEGEND:**
- Yard Lease Lines
  - Tank Location and Group**
  - Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater and Soil Sampling

**NOTES:**  
 1. Aerial Imagery from City of Tacoma 2018.

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**Figure 15**  
**Group 4 Tank Area: B-1/2/3 Planned Sample Locations**



- LEGEND:**
- Yard Lease Lines
  - Former Building Location
  - Tank Location and Group**
  - Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater and Soil Sampling
  - Magnetometer Survey Area

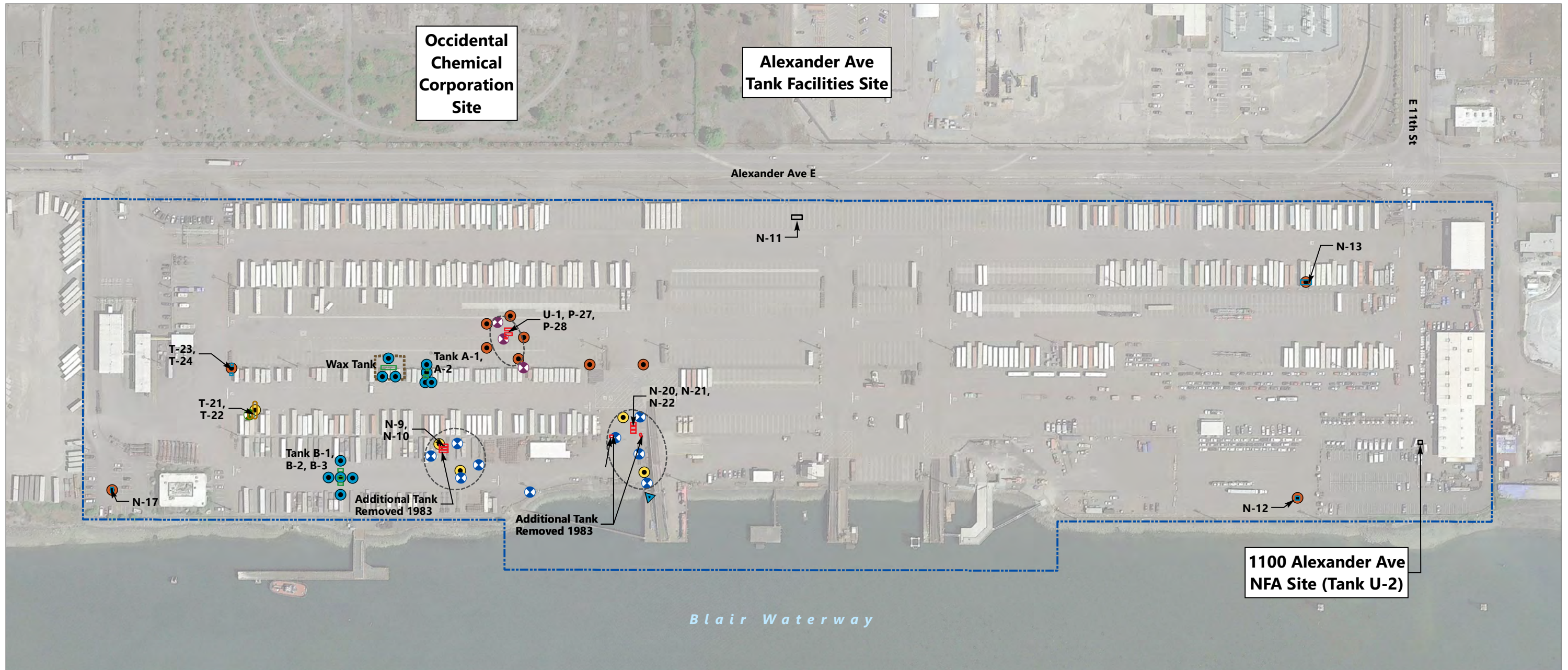
**NOTES:**  
1. Aerial Imagery from City of Tacoma 2018.

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**Figure 16**  
**Group 4 Tank Area: Wax Tank Planned Sample Locations**

Data Gaps Work Plan  
Port of Tacoma TOTE USTs



**LEGEND:**

Yard Lease Lines

**Tank Location and Group**

- Group 1 Tanks
- Group 2 Tanks
- Group 3 Tanks
- Group 4 Tanks
- Tanks Addressed Separately
- Estimated Extent of Groundwater Impacts

**Proposed Monitoring Locations**

*Monitoring Well Locations*

- Install and Sample Groundwater and Soil at New Well
- Sample Existing Groundwater Well
- Install and Sample Groundwater at New Well

*Geoprobe Locations*

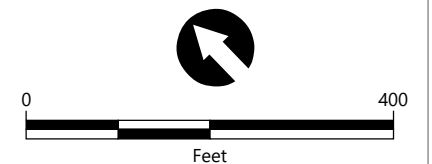
- Groundwater and Soil Sampling
- Groundwater Sampling
- Soil Sampling

*Porewater Locations*

- Porewater Sampling Location
- Magnetometer

**NOTES:**

1. Aerial Imagery from Google Earth Pro, May, 2018.



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**Figure 17**  
**Summary of Planned Field Investigations**

Data Gaps Work Plan  
 Port of Tacoma TOTE USTs

# Appendix A

## Sampling and Quality Assurance Project Plan

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June 2022  
TOTE Property USTs Project



---

# Appendix A

## Sampling and Quality Assurance Project Plan

Prepared for Port of Tacoma

June 2022  
TOTE Property USTs Project

# Appendix A

## Sampling and Quality Assurance Project Plan

**Prepared for**  
Port of Tacoma  
One Sitcum Plaza  
Tacoma, WA 98401-1837

**Prepared by**  
Anchor QEA, LLC  
1119 Pacific Avenue, Suite 1600  
Tacoma, WA 98401-1837

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## ATTACHMENTS

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## ABBREVIATIONS

ASTM	ASTM International
bgs	below ground surface
CCV	continuing calibration verification
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CVOC	chlorinated volatile organic compounds
DGWP	Data Gaps Investigation Work Plan
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EQIS	Environmental Quality Information System
GC	gas chromatography
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act
NFG	National Functional Guidelines
PAH	polycyclic aromatic hydrocarbon
QA/QC	quality assurance/quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
Site	TOTE Property UST Site
SQAPP	Sampling and Quality Assurance Project Plan
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington Administrative Code

# 1 Introduction and Purpose

This *Sampling and Quality Assurance Project Plan* (SQAPP) has been prepared as Appendix A of the Data Gaps Investigation Work Plan (DGWP) for the TOTE Property UST Site (Site) in Tacoma, Washington (Figure 1). It documents sample collection and analysis methods, as well as quality assurance and quality control (QA/QC) procedures to be followed during the implementation of the DGWP for the TOTE Property Underground Storage Tank (UST) Project (Project). Upland portions of the Site are regulated by the cleanup process under the Model Toxics Control Act (MTCA), Revised Code of Washington 70.105D, and Washington Administrative Code (WAC) 173-340, administered by the Washington State Department of Ecology (Ecology).

The Project was initiated by the Port of Tacoma (Port) to resolve the remediation status of Tanks that were either: 1) of unknown removal status; or 2) that had been removed but contamination of soil or groundwater was known or suspected.

The objective of this SQAPP is to ensure that data of sufficiently high quality are generated to support the Project data quality objectives (DQOs). All materials necessary to complete the sampling for soil, groundwater, and porewater are included in this SQAPP. This includes tables describing the sample collection and analysis details, figures displaying the sample locations, detailing sampling procedures, and forms to record field information. Sample collection and analysis details regarding sample quality (i.e., sample containers, hold times, and quality control/quality assurance requirements) are also included.

The analytical methods and QA procedures described here will be followed by the Port and its contractors during sample collection activities described in the DGWP and the associated SQAPP. Analytical QA/QC procedures were developed based on the analytical protocols and QA guidance of the U.S. Environmental Protection Agency's (EPA's) *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA 1986) and the EPA Contract Laboratory Program National Functional Guidelines (NFG) for Data Review (EPA 2020a, 2020b).

## 2 Data Gaps Work Plan Investigation

Prior to evaluation of potential alternatives to complete remediation of the Site, environmental testing is necessary to resolve data gaps, assure that an adequate site characterization has been completed, and to finalize the conceptual site model. The testing described in this DGWP was developed in accordance with Ecology's Further Action letters (Ecology 2017, 2021), current guidance for the remediation of petroleum contaminated sites (Ecology 2016) and in compliance with applicable MTCA requirements.

Procedures for sample collection, testing, and field and laboratory QA/QC methods are documented in this SQAPP. Health and safety procedures are provided in the Health and Safety Plan (Appendix B).

### 3 Sample Collection and Processing

This SQAPP describes the procedures that will be used to collect groundwater, soil, and porewater samples needed to provide the additional data described in the DGWP. The target sampling locations and coordinates are included in Table 1 and depicted in Figure 2. Detailed sampling location figures are provided in Figures 3 through 13.

Samples will be collected from a combination of temporary geoprobe borings, existing groundwater monitoring wells, new groundwater monitoring wells, and push-point probes deployed from a vessel for porewater monitoring. Samples will be analyzed for the analytes listed in Table 1. Groundwater samples to be analyzed for lead or arsenic will be analyzed at a laboratory capable of correcting for isobaric matrix interferences.

A public and private utility locate will be conducted prior to the start of field work to clear any buried utilities in the vicinity of the sampling locations. Magnetometer surveys will be performed prior to push-point probe testing in two areas (Tank Area N-12, Figure 3; and the Wax Tank, Figure 13).

For three tank areas (Tank Areas A-1/2, B-1/2/3, and the Wax Tank) the analytical program is tiered. For those areas both soil and groundwater samples will be collected in one field mobilization. Soil samples will be initially tested on a rush turnaround basis for NWTPH-HCID. The results of that testing will guide the analysis for the remaining archived soil and groundwater samples as noted in Table 1 and in the following sections.

The following subsections describe field sampling methods and procedures for the DGWP.

#### 3.1 Station and Sample Identification

Station and sample identifications are provided in Table 1. Each sample will be assigned a unique alphanumeric identifier. The identifier will have the format of "Project Identifier-Location ID-Media Code-Station Number-Sample Interval-Date."

Naming conventions for tanks have not been consistent over time, but many of the tanks were identified by an older Port alpha-numeric code. That code system is retained in the DGWP as the Project Identifier for those tanks, and includes the following:

- **Tank A-##** and **Tank B-##**: These prefixes represent Group 4 tanks where tank removals have been confirmed.
- **Wax Tank**: This prefix represents a Group 4 tank identified as part of the current effort where tank is understood to be removed but documentation is lacking.
- **Tank N-##**: The N-prefix indicates a tank identified in former Navy documents available to the Port. This numbering system may not capture all tanks operated during the period of Navy ownership.

- **Tank T-##:** The T-prefix indicates a tank specifically identified as a tenant responsibility at the time it was removed.
- **Tank P-##:** The P-prefix indicates a tank that was removed by the Port without tenant involvement.
- **Tank U-##:** The U-prefix indicates a tank that was of unknown origin by the Port at the time it was removed.

Details on the specific location ID, media code, and sample depths are located in Table 1 and shown on Figure 2. Detailed figures for sampling at each tank area are provided in Figure 3 through Figure 13.

## 3.2 Sample Access and Positioning

Prior to mobilization to the site, the Port of Tacoma (Port) will assist in obtaining access to the proposed stations. The work areas will be cordoned off and a traffic plan implemented to direct traffic, as necessary.

Once access is established, the proposed locations will be subject to utility clearance and marking by a licensed surveyor prior to initiation of DGWP activities.

On-site, a Differential Global Positioning System (DGPS) will be used to navigate to the desired sampling location. Target GPS coordinates for sampling stations are provided in Table 1. Collection at the sampling location will be guided by the navigation system with an accuracy of  $\pm 10$  feet. The actual sampling coordinates will be recorded after completion of each sampling location. Coordinates will be recorded in Washington State Plane Coordinates, South Zone, North American Datum of 1983.

Following completion of the DGWP investigation, a licensed surveyor will be contracted to provide vertical and horizontal coordinates for the monitoring well locations (Section 3.3.1), allowing for the development of groundwater gradient maps.

## 3.3 Groundwater Sampling

Groundwater sample locations are shown in Table 1 and Figures 3 through 13. Samples to be initially collected and archived pending the results of rush soil analysis are indicated with an "A" in the table. Samples to be analyzed immediately are indicated with an "I" in the table. Testing will be performed for the parameters and analytical methods described in Table 2.

Groundwater will be sampled from a combination of newly installed groundwater wells, existing groundwater monitoring wells, and direct-push geoprobe borings. Target sample coordinates are provided in Table 1, and shown in detail in Figures 3 through 13.

### *3.3.1 Monitoring Well Installation Methods*

New groundwater wells will be installed at the 4 stations at the locations identified in Table 1 and shown in Figures 7 through 10. Wells will be installed using a hollow-stem auger drill rig. The installations will conform to Washington State Department of Ecology (Ecology) specifications. Heavy duty casings will be used at each location to extend well longevity (due to heavy truck traffic at the TOTE Site).

Installation of monitoring wells will be conducted according to the following general procedures:

- Blank casing will extend from the top of the screen to approximately 0.5 foot below ground for flush mounting. The flush-thread riser pipe will be connected to the well screen and continue to the surface.
- The well screen will be installed across the water table based on observations during installation, with the water table approximately centered within the screened interval.
- After the screen is installed, a pack will be incrementally placed around the screen and the rods pulled back until the sand pack extends approximately 2 to 3 feet above the top of the screen.
- A filter sand pack seal will be placed above the filter sand pack until at least a 1-foot-thick seal is placed.
- A flush-mount type surface completion will be installed, with a concrete surface seal and vented, secure well cap. Well details will be logged in the Well Log (Attachment A).
- After monitoring well installation, the depth to groundwater and the total depth of the well will be measured from a surveyed mark at the top of the well using a water level indicator, and these data will be recorded in the field notes. The well shall be labeled permanently and clearly with a well identification.
- The drilling subcontractor will decontaminate drilling equipment prior to moving to the next monitoring well installation.
- Completed monitoring wells will be surveyed by a licensed surveyor to establish the elevation of the well casing for use in long-term monitoring.

### *3.3.2 Monitoring Well Redevelopment Methods*

All nine existing monitoring wells at the Site will be redeveloped and the four newly installed monitoring wells will be redeveloped prior to sampling. Any well damage or other defects will need to be corrected at that time prior to development and sampling.

Well development will be used to restore, to the extent possible, the natural hydraulic conditions around each well. Well development methods include pumping, over pumping, bailing, and/or backwashing, in combination with some form of surging.

Redevelopment will be conducted according to the following general procedures:

- Record static water level and total well depth. The pump intake should be placed close to, or within, the well screen interval.
- Set the pump and record pumping rate and turbidity. Pump until turbidity reaches desired level or stabilizes.
- Discontinue pumping and surge the well.
- Measure depth to the bottom of the well. If more than 10 percent of the screen is occluded by sediments, remove excess sediment by bailing
- Reset the pump, recording pumping rate and turbidity. The pumping rate used during development must be greater than the highest rate expected to be used during subsequent purging and sampling.
- Pump until turbidity reaches desired level or stabilizes. If the well has been properly designed, the amount of pumping required to achieve the desired turbidity level will be substantially less than required in the first pumping cycle.
- Repeat surging and pumping until the well yields water of acceptable turbidity at the beginning of a pumping cycle. A good way to ensure that development is complete is to shut the pump off during the last anticipated pumping cycle, leaving the pump in place, and restarting it sometime later. The turbidity of the discharge water should remain low.

Development should continue until clear, artifact-free, formation water is produced. Water quality parameters should stabilize before development is stopped. If water was added during well construction or development, two to three times the volume of water added must be removed. Finally, the well should be producing visually clear water before development is stopped.

After development is completed, wells should be allowed to stabilize and re-equilibrate before sampling. The time necessary for stabilization depends on the characteristics of the aquifer and the geochemistry of the parameters to be modified. Generally, high-permeability formations require less time (i.e., several days) than low-permeability formations (i.e., several weeks). Therefore, groundwater level measurements and groundwater samples will be collected from the installed wells no sooner than 24 hours after development.

### *3.3.3 Geoprobe Boring Methods*

Temporary borings for groundwater (and soil) will be advanced by a direct push (Geoprobe) drill rig. Geoprobe borings will be used to soil and groundwater samples at the locations identified in Table 1 and shown in detail in Figures 3 through 13. Geoprobe groundwater sampling will be conducted using a core sampler with a retractable screen. The screened interval will straddle the observed groundwater level at the time of installation, and groundwater will be collected at that depth.

Groundwater sampling via geoprobe will be conducted according to the following general procedures:

- A core sampler with a retractable screen will be loaded in the drill rig. The piston tip will be loosened, and the sampler advanced into the ground, moving soil aside and into the sampler's disposable, single-use plastic liner.
- The screened interval at which groundwater will be collected will straddle the observed groundwater level at the time of installation. Groundwater is expected to be encountered at the Site within 10 feet below ground surface (feet bgs), and most cores will be advanced to approximately 15 feet bgs.
- Once groundwater is observed, the sampler will be withdrawn in order to expose the screen at the level of the soil-groundwater interface.
- Narrow-diameter tubing will be lowered to the depth of the screen, and groundwater will be sampled using a peristaltic pump according to methods described in Section 3.3.4.
- For geoprobe locations where groundwater is to be collected at multiple depths, the core sampler will be decontaminated between samples and a new liner will be placed inside the core sampler. The core sampler will be advanced to the top of the next sample interval with the piston tip locked, then released and allowed to advance to obtain the next sample.
- Temporary boreholes will be decommissioned in accordance with state regulations (Chapter 173-160 WAC). Each borehole will be abandoned by filling it with bentonite chips and hydrating, or by filling with bentonite grout, concrete, cement grout, or neat cement.

### *3.3.4 Groundwater Collection Methods*

Groundwater samples will be collected using a peristaltic pump with dedicated polyethylene tubing at each well location and in accordance with low-flow groundwater purging and sampling methodology. Groundwater from new monitoring wells, existing monitoring wells, or geoprobe borings using the following procedures:

- If sampling from a permanent well, check the well for any damage or evidence of tampering and record the observations on the field data sheet. Unlock and open the well monument and remove the well cap.
- Measure and record the depth to water and record the measurement on the field data sheet. Measure water level from a reference point to the nearest 0.01 foot.
- Attach and secure the polyethylene tubing to the peristaltic pump. Lower the tubing slowly into the well. Set the end of the tubing at approximate middle of the well screen. Be careful not to place the end of the tubing on the bottom of the well because this may disturb any sediment present in the bottom of the well.
- Start pumping the well by selecting the lowest pump speed. Ideally, the pump rate should equal the well recharge rate with little or no water level drawdown in the well (drawdown shall

be 0.3 foot or less). If the recharge rate of the well is very low, do not purge the well dry. The water level in the well should stay above the level of the tubing inlet to prevent air entrainment. If air bubbles are observed in the purge stream, lower the flow rate. If air bubbles are still observed, turn off the pump and allow the well to recover before sampling.

- During purging, the ultimate low-flow rate should be from 0.1 to 0.5 liter per minute. Measure the pumping rate using a graduated cylinder and stopwatch or similar device. Record the pumping rate and depth to water on the field data sheet or in the logbook.
- Begin measuring field parameters after the flow-through cell has been “flushed” with purged groundwater twice. Record field parameter data (temperature, pH, turbidity, ORP, conductivity, and DO) approximately every 3 to 5 minutes.
- The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:
  - $\pm 0.1$  for pH
  - $\pm 3$  percent for conductivity
  - $\pm 10$  percent for DO
  - $\pm 10$  percent for turbidity
  - $\pm 10$  mV for ORP
- Once the field parameters have stabilized, collect the samples directly from the end of the tubing. The tubing must not be removed from the well between purging and sampling.
- Samples will be collected in pre-cleaned, laboratory-provided sample jars. Fill all sample bottles by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Cap each bottle as it is filled. The bottles should be preserved and filled according to the procedures specified in Table 4, including the following special conditions:
  - CVOCs must be collected first.
  - For cPAHs, fill each 1-liter amber bottle to nearly the top and cap thereafter.
  - Samples collected for dissolved metals analysis will be field-filtered during collection.
  - Duplicate groundwater samples will be collected by filling an identical set of sampling containers simultaneously from the sampling device.
- Once container filling is completed, disconnect the tubing from the pump and dispose of it. The tubing will be dedicated to each well. Measure the total depth of the well, then close and lock the well and decontaminate sampling equipment.

Samples will be submitted for laboratory analyses as shown in Table 1. Laboratory methods and reporting limits for sample parameters are presented in Table 2.

### 3.4 Soil Sampling

Soil samples will be collected during the installation of both monitoring wells and geoprobe borings as described in Table 1. In some cases soils are to be archived pending the results of rush NWTPH-

HCID analyses. Samples to be archived are indicated with an “A” in the table. Samples to be analyzed initially are indicated with an “I” in the table. Testing will be performed for the parameters and analytical methods described in Table 2.

### *3.4.1 Hollow-stem Auger Soil Collection Methods*

Soil samples to be collected during well installation by hollow-stem auger will be sampled consistent with ASTM International (ASTM) procedures (ASTM D 1452). The hollow-stem auger will be advanced into the soil to the target monitoring well depth, and soil will be collected by advancing a decontaminated split spoon or Shelby tube. Decontamination procedures are presented in Section 5.3.

Cement coring may be required for access to areas where geoprobe and/or hollow stem auger samples will be collected. If needed, cement coring will be conducted by a subcontractor. Cement coring methods will be determined by the subcontractor but may include jack hammering, concrete drilling, and/or geoprobe drilling.

Samples will be submitted for laboratory analyses as shown in Table 1. Laboratory methods and reporting limits for sample parameters are presented in Table 2.

### *3.4.2 Geoprobe Soil Collection Methods*

Temporary borings for soil (and groundwater) will be advanced by a direct push (Geoprobe) drill rig. Geoprobe borings will be used to collect soil samples at the locations identified in Table 1 and shown in detail in Figures 3 through 13.

Soil sampling via geoprobe will be conducted according to the following general procedures:

- A core sampler with a retractable screen will be loaded in the drill rig. The piston tip will be loosened, and the sampler advanced into the ground, thereby coring the soil into the inside of the sampler’s disposable, single-use plastic liner.
- For each geoprobe sample, a new liner will be placed inside the core sampler. The core
- sampler with the piston tip locked will be advanced to the top of the next sample interval. The piston tip will then be released and the core sampler advanced to obtain the next sample. This process will be repeated until refusal is met or sufficient depth is encountered. Target penetration depths and sampling depths are indicated in Table 1.
- The sampler will be withdrawn to retrieve the liner and the soil sample. The liner will be cut in half lengthwise to remove the soil sample.
- Temporary boreholes will be decommissioned in accordance with state regulations (Chapter 173-160 WAC). Each borehole will be abandoned by filling it with bentonite chips and hydrating, or by filling with bentonite grout, concrete, cement grout, or neat cement.

Samples will be submitted for laboratory analyses as shown in Table 1. Laboratory methods and reporting limits for sample parameters are presented in Table 2.

### ***3.4.3 Soil Logging and Classification***

Geoprobe and hollow stem auger core samples will be continuously examined to develop a lithologic boring log. The samples will be described in the field as to their color, structure, texture, mineral composition, moisture, and percent recovery, according to ASTM D-2488. Field staff will also examine samples for evidence of possible contamination, including presence of anthropogenic material, chemical odor, or staining. Field staff will note all observations on field forms (see Attachment 1). These procedures will be applied to all soil collection.

### ***3.4.4 Soil Processing Methods***

Soil samples will be collected via hollow-stem auger or geoprobe boring as described in the previous section.

Soil processing will be conducted according to the following general procedures:

- Discrete soil samples will be taken directly from the selected depth interval indicated in Table 1.
- Samples will be photographed, with respective boring identification and sample location markers visible in the photos.
- The following information, at a minimum, will be logged by the field sampler: sample depth, Unified Soil Classification System description, soil moisture, occurrence of groundwater, and physical indications of potential contamination (e.g., odor or staining).
- Prior to homogenization, soil sampling for volatile compounds will be performed using ASTM 5035A, in which the soil sample is collected from an undisturbed core using an EnCore sampling device or similar.
- After soil sampling is complete for volatile compounds, soil will be spooned into a clean stainless steel bowl for homogenization. The soil will be mixed until homogenous in color and texture and then spooned into laboratory-supplied jars for testing.
- Each soil sample will be transferred to a decontaminated stainless steel bowl, homogenized to a uniform color and consistency, and placed into laboratory-supplied sample containers.

Samples will be submitted for laboratory analyses as shown in Table 1. Laboratory methods and reporting limits for sample parameters are presented in Table 2.

## **3.5 Porewater Sampling**

A total of 3 porewater samples will be collected, including 2 normal porewater samples and 1 porewater duplicate sample, as shown in Table 1. Testing will be initiated for both normal samples

and the single duplicate sample. Testing will be performed for the parameters and analytical methods described in Table 2.

Porewater will be collected using a push-point sampling device deployed from a vessel in low-tide. Sample collection will be performed at one location for two elevations as shown in Table 1 and Figures 9a and 9b. Porewater sampling will include monitoring of field parameters, including pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity plus additional analyses listed in Table 1.

Push-point porewater sampling will include the following procedures:

- A push-point sampler will be pushed to the target depth in the sediment by hand.
- A depth-to-water reading from the top of the push-point sampler and total depth of the sampler will be measured using a water level indicator. The depth-to-water measurement and the diameter and total depth of the push-point sampler will be used to calculate the volume of the water column in the sampler (i.e., the “well volume”) before purging and sampling.
- Clean polyethylene tubing will be lowered to the approximate vertical midpoint of the push-point sampler screen for porewater sampling using a peristaltic pump.
- The push-point sampler temporary well will be purged until at least one well volume has been purged and field water quality parameters have stabilized as follows (for three consecutive measurements):
  - $\pm 0.1$  for pH
  - $\pm 3\%$  for specific conductance (conductivity)
  - $\pm 10$  millivolts for ORP
  - $\pm 10\%$  for DO and turbidity
- While purging, a water quality meter will also be lowered through the surface water outside the push-point sampler temporary well to a depth of approximately 1 foot above the mudline. Surface water quality parameters will be monitored during purging for comparison with porewater field parameters.
- Samples will be collected once readings have stabilized. If the push-point sampler temporary monitoring well becomes evacuated or the purging rate falls below 50 mL per minute, purging will be stopped and the well allowed to recover (with periodic water level monitoring) for up 30 minutes. Once the temporary well has recovered, porewater sample collection can resume.
- Once sampling is complete, the push-point sampler will be removed.

Samples will be submitted for laboratory analyses as shown in Table 1. Laboratory methods and reporting limits for sample parameters are presented in Table 2.

## 3.6 Field Quality Assurance/Quality Control

### 3.6.1 *Field QC Samples*

Field duplicate samples will be collected to evaluate the variability attributable to the nature of the sample matrix, homogenization procedures, and subsequent sample handling. Field duplicate samples will be collected from the same homogenized material as the original sample, if sufficient sample volume or mass is available, and analyzed as a separate sample. Field duplicate collection frequencies are listed in Table 5. Field duplicates will be screened against a relative percent difference (RPD) value of 50% when parent and duplicate sample results are greater than five times reporting limits. Results that are less than five times the reporting limit will be evaluated by the difference between them and screened against a control limit of plus or minus two times the reporting limit for solid matrices and plus or minus the reporting limit for aqueous matrices.

### 3.6.2 *Field and Rinse Blanks*

Field blank samples will be collected at the start of each sampling program to evaluate the efficiency of field decontamination procedures. One rinse blank and one field blank will be collected for each type of sampling technique used. The rinse blank will consist of rinsing down the soil coring equipment with distilled water after sample collection and decontamination and collecting the rinsate. The field blank will be collected by pouring distilled water directly into the sampling containers. The field blank samples will be submitted to the laboratory as blind samples for dioxin/furan analysis.

## 4 Sample Management

### 4.1 Sample Custody and Transfer

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. A COC form will accompany all samples to the analytical laboratory. Copies of all COC forms will be retained in the project files.

All samples will be delivered to the analytical laboratory no later than 1 day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this delay does not jeopardize any holding time requirements.

Specific sample packing procedures are as follows:

- Ice will be sealed in separate plastic bags and placed in the shipping containers.
- Sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- COC forms will be completed prior to transfer to laboratory. Photocopies or photographs of original signed copies will be documented after laboratory receipt.
- Upon transfer of sample possession to the analytical laboratory, the person(s) transferring custody of the sample container will sign the COC form.

### 4.2 Sample Handling Requirements

Sample container requirements, holding times, and preservation requirements are shown in Table 4. Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample material must meet high standards of cleanliness. All equipment and instruments that will be used and are in direct contact with various media collected for chemical analyses must be made of glass, stainless steel, high density polyethylene, or polytetrafluoroethylene and will be cleaned prior to each day's use and between sampling or compositing events.

### 4.3 Investigation-Derived Waste

All soil cuttings obtained from drilling activities will be disposed of in 55-gallon drums and consolidated. Any groundwater or porewater waste generated during the purging process and sample collection will be collected in 5-gallon buckets or similar, drummed up and stored on site until analytical data is received, at which time disposal will be coordinated with the Port. After completion of field sampling activities, the drums will be transported for appropriate disposal.

All disposable sampling materials and personal protective equipment used in sample collection and processing (e.g., disposable gloves and paper towels) will be placed in heavy-duty garbage bags for

disposal as non-hazardous solid waste. No hazardous materials requiring disposal will be used during fieldwork for this study.

#### **4.4 Decontamination Procedures**

The following decontamination steps will be used to decontaminate sampling equipment that comes into contact with sample media. Decontamination of all items will follow the *Field Branches Quality Management Plan* (USEPA 2009) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846 protocols; USEPA 2013). The decontamination procedure is as follows:

- Residual sample media on equipment will be rinsed and scrubbed off
- Pre-wash rinse with tap water.
- Wash with solution of tap water and soap (use scrub brush).
- Rinse with tap water.
- Rinse with DI water.
- Use immediately or cover all decontaminated items with aluminum foil.

All used decontamination fluids will be collected and placed in labeled, designated containers suitable for disposal.

#### **4.5 Laboratory Analytical Methods**

Chemical analyses will be conducted at Eurofins Test America Seattle, a laboratory accredited by Ecology and the National Environmental Laboratory Accreditation Program.

Table 2 presents the proposed analytes, analytical methods, and target detection and reporting limits for the evaluation of soil, groundwater, and porewater samples. MTCA screening levels for the TOTE Site are listed in DGWP Table 2. All sample analyses will be conducted in accordance with methods approved by Ecology, as applicable. Prior to analyses, all samples will be maintained according to appropriate holding times and required temperatures for each matrix and analysis (Table 3).

## 5 Quality Assurance/Quality Control

Requirements for QA/QC will include the collection of field QC samples as well as laboratory QC analyses. Laboratory QC analyses are described in detail in Section 3.4. Field and laboratory QA/QC analytical frequencies are provided in Table 4. The overall DQO for field sampling and laboratory analyses is to produce data of known and acceptable quality to support the Project objectives. Laboratory DQOs for precision, accuracy, and completeness are listed in Table 5.

Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, Anchor QEA, LLC, will be contacted and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

### 5.1 Data Quality Objectives and Criteria

The DQOs for this program are to provide results of known quality to inform the remedial plan. The parameters used to assess data quality are precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity. These parameters are discussed in greater detail in the following subsections. QA/QC results will be reviewed by the laboratory analysts, Project QA manager, and data validator. Re-extraction and/or re-analysis may be warranted in some instances for results outside of control limits, as required by the analytical methods and laboratory standard operating procedures. Data will be qualified accordingly by the validator if DQOs described herein and presented in Table 5 are not met for final data.

#### 5.1.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sample collection, sample handling, and laboratory analyses. ASTM International (ASTM) recognizes two levels of precision:

1. **Repeatability** is the random error associated with measurements made by a single test operator on identical aliquots of test material in a laboratory with the same apparatus under constant operating conditions.
2. **Reproducibility** is the random error associated with measurements made by different test operators in different laboratories using the same method but different equipment to analyze identical samples of test material.

In a laboratory, "within-batch" precision is measured using duplicate sample or QC analyses and is expressed as the RPD between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analyses of standard solutions or laboratory control samples from multiple analytical batches.

Field precision will be evaluated by the collection of one field duplicate for every 20 chemistry samples, if sufficient sample volume is available. Field chemistry duplicate precision will be screened against an RPD of 50%. Data qualification based on field duplicate precision will be at the discretion of the validator.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. Results that are less than five times the reporting limit will be evaluated by the difference between them and screened against a control limit of plus or minus two times the reporting limit for solid matrices and plus or minus the reporting limit for aqueous matrices.

Equation 1 is used to express precision.

**Equation 1**

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

where:

- $RPD$  = relative percent difference
- $C_1$  = larger of the two observed values
- $C_2$  = smaller of the two observed values

### 5.1.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the value of results from analyses of laboratory control samples, standard reference materials, and standard solutions. In addition, matrix spike (MS) samples are also measured, which indicate the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery of the measured value, relative to the true or expected value. If a measurement process produces results that are not the true or expected values, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net (or total) bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated using quantitative laboratory control sample, MS, and surrogate spike standard recoveries compared with method or laboratory specified performance criteria or criteria listed in Table 5. Accuracy can be expressed as a concentration compared to the true or reference value or as a percent recovery in analyses where spiked samples are analyzed. Equation 2 is used to express accuracy.

**Equation 2**

$$\%R = 100\% \times (S - U) / Csa$$

where:

- $\%R$  = percent recovery
- $S$  = measured concentration in the spiked aliquot
- $U$  = measured concentration in the unspiked aliquot
- $Csa$  = actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in the SAP.

### 5.1.3 *Representativeness*

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the Site, the sample locations were selected based on previous site investigations, and the list of analytes are the chemicals of concern described in the DGWP.

### 5.1.4 *Comparability*

Comparability expresses the confidence with which one dataset can be evaluated in relation to another dataset. For this program, comparability of data will be established through the use of standard collection, processing, and logging procedures; standard analytical methodologies and reporting formats; and common traceable calibration standards and reference materials.

### 5.1.5 Completeness

Completeness is a measure of the amount of data determined to be valid in proportion to the amount of data collected. Completeness will be calculated as shown in Equation 3:

**Equation 3**

$$C = \frac{(\text{Number of acceptable data points}) \times 100}{\text{Total number of data points}}$$

where:

C = completeness

The DQO for completeness for all components of this Project is 95%. Data that have been qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been rejected will not be considered valid for the purpose of assessing completeness.

### 5.1.6 Sensitivity

Sensitivity is a measure of MDLs and method reporting limits (MRLs). In general, the lowest technologically achievable MDLs and MRLs will be targeted for this Project.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The laboratory MRL is defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and MRLs will be used to evaluate the sensitivity or applicability of a method prior to its acceptance for this program.

Sample-specific MDLs and MRLs will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase these limits (e.g., dilution factor, percent moisture, and analytical mass or volume). If MDLs and MRLs are elevated due to matrix interferences and subsequent dilutions or reductions in sample aliquots, the data will be evaluated by Anchor QEA and the laboratory to determine whether an alternative course of action is required or possible. The sample-specific MDLs and MRLs will be the values stored in the Project database.

## 5.2 Laboratory Quality Control

Laboratory QC procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, MSs, surrogate spikes (for

organic analyses), and method blanks. A summary of the DQOs is provided in Table 5. QA/QC sample analytical frequencies are provided in Table 5.

The analyst will review the results of the QC samples from each sample group immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits have been exceeded. If control limits are exceeded in the sample group, the QA manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

### *5.2.1 Laboratory Instrument Calibration and Frequency*

An initial calibration will be performed on each laboratory instrument to be used prior to the start of the Project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analyses of samples. Continuing calibration verifications (CCVs) will be analyzed at method-required frequencies to track instrument performance. The frequency of CCVs varies with method. For gas chromatography (GC)/mass spectrometer methods (i.e., for polycyclic aromatic hydrocarbons [PAHs] and volatile organic compounds [CVOCs]), one CCV will be analyzed every 12 hours. For GC and inorganic methods that use instrumentation, one will be analyzed for every 10 samples analyzed and at the end of each run. If the continuing calibration is out of control, the analysis will be terminated until the source of the control failure is eliminated or reduced to meet control specifications, which may include analyzing a new initial calibration. Any project samples analyzed while the instrument calibration was out of control will be re-analyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to or immediately following a CCV at the instrument for each type of applicable analysis.

### *5.2.2 Laboratory Duplicates and Replicates*

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as separate samples.

### *5.2.3 Matrix Spikes and Matrix Spike Duplicates*

Analyses of MS samples provide information on the extraction efficiency of the method on the sample matrix, as well as any interferences introduced by the sample matrix. By analyzing MS samples in duplicate, information on the precision of the method is also provided. Matrix spike duplicates (MSDs) may be analyzed in place of laboratory duplicates.

#### **5.2.4 Method Blanks**

Method blanks are prepared and analyzed in the same manner as project samples to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the MRL of any single target analyte. If a laboratory method blank exceeds this criterion for any analyte, and the concentration of the analyte in any of the samples is above detection and less than five times the concentration found in the blank (10 times for common contaminants), analyses must stop and the source of contamination must be eliminated or reduced. Affected samples should be re-prepared and re-analyzed, if possible.

#### **5.2.5 Laboratory Control Samples**

Laboratory control samples are analyzed to assess possible laboratory bias at all stages of sample preparation and analyses. The laboratory control sample is a matrix-dependent spiked sample prepared at the time of sample extraction when the sample to be analyzed, the MS, and the method blank are prepared. The laboratory control sample will provide information on the precision of the analytical process and, when analyzed in duplicate, will provide accuracy information as well.

### **5.3 Instrument and Equipment Testing, Inspection, and Maintenance Requirements**

This section describes procedures for the testing, inspection, and maintenance of field and laboratory equipment.

#### **5.3.1 Field Instruments and Equipment**

In accordance with the QA program, Anchor QEA will maintain an inventory of field instruments and equipment. The frequency and types of maintenance performed on this equipment will be based on the manufacturer's recommendations or Anchor QEA's experience with the equipment.

The Anchor QEA field coordinator will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. The equipment maintenance information will be documented in the instrument's calibration log. The frequency of maintenance depends on the type and stability of the equipment, methods used, intended use of the equipment, and manufacturer's recommendations. Detailed information about the calibration process and the frequency of equipment calibration is provided in each manufacturer's instruction manuals.

All maintenance records will be verified prior to each sampling event. The field coordinator will be responsible for verifying that required maintenance has been performed before the equipment is used in the field. Any problems will be noted in the field logbook and corrected prior to continuing sampling, observation, and installation operations.

### **5.3.2 Laboratory Instruments and Equipment**

In accordance with the QA program, the laboratory will maintain an inventory of instruments and equipment, and the frequency of maintenance will be based on the manufacturer's recommendations or the laboratory's experience with the equipment.

The laboratory preventative maintenance program, as detailed in the Laboratory QA Plan, is organized to maintain proper instrument and equipment performance and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics; the availability of spare parts; and the frequency at which maintenance is required. Any equipment that has been overloaded, has been mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to verify that it is in proper operational condition. The client will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The client will also be notified immediately regarding any delays due to instrument malfunctions that could affect holding times.

Laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. Maintenance records will be checked according to the laboratory's internal schedule and recorded by laboratory personnel. The Laboratory QA manager or designee will be responsible for verifying compliance.

#### **5.3.2.1 Laboratory Instrument and Equipment Calibration**

As part of their QC programs, laboratories perform two types of calibrations. Periodic calibration (of, for example, scales, drying ovens, refrigerators, and thermometers) is performed at prescribed intervals. Operational calibrations are performed daily at a specified frequency or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the Laboratory QA Plan. Calibrations are discussed in the laboratory standard operating procedures for analyses.

The Laboratory QA manager will be responsible for ensuring that the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program will be the responsibility of the respective laboratory Group Supervisors. Recognized procedures (EPA, ASTM, or manufacturer's instructions) will be used when available.

Physical standards (i.e., weights or certified thermometers) will be traceable to nationally recognized standards such as the National Institute of Standards and Technology. Chemical reference standards will be National Institute of Standards and Technology standard reference materials or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions will be accessible, either in the laboratory standard operating procedures or in the Laboratory QA Plan for each instrument or analytical method in use. All calibrations will be preserved on electronic media.

## 6 Assessments and Oversight

Once data are received from the laboratory, several QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

### 6.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Audits will not be conducted as part of this study. However, laboratory audit reports will be made available to the Project QA manager upon request.

The laboratory is required to have written procedures addressing internal QA/QC. When these procedures have been submitted, the Project QA manager will review them to ensure compliance with this SQAPP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training.

### 6.2 Response and Corrective Actions

The Project manager, QA manager, and field coordinator will work together to determine actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this SQAPP.

#### 6.2.1 *Field Activities*

The field coordinator will be responsible for correcting equipment malfunctions during the field sampling effort. The QA manager will be responsible for resolving situations identified by the field coordinator that may result in noncompliance with this SQAPP. All corrective measures will be immediately documented in the field logbook.

#### 6.2.2 *Laboratory*

The laboratory is required to comply with their standard operating procedures. The laboratory managers will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this SQAPP. All laboratory personnel will be responsible for reporting problems that may compromise quality data.

The laboratory managers will be notified if any QC sample grossly exceeds the laboratory in-house control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. If the anomaly cannot be corrected, the laboratory manager will notify the QA manager. A narrative describing the anomaly, steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, re-analysis, and re-extraction) will be submitted with the data package.

### **6.3 Reports to Management**

QA reports to Project management will include verbal status reports, written reports on field sampling activities and laboratory processes, data validation reports, and final project reports. These reports shall be the responsibility of the Project manager.

## 7 Documentation and Records

Records will be maintained documenting all activities and data related to site surveys, sample collection, and laboratory analyses. Results of data verification and validation activities will also be documented. Procedures for documentation of these activities are described in this section.

### 7.1 Field Records

Field surveys and sample collection activities will be documented using a custom field application or field collection logs. Additionally, the field coordinator or designee will keep a daily record of significant events, observations, and measurements on a daily log. Entries for each day will begin on a new page. The person recording information must enter the date and time and initial each entry.

In general, sufficient information will be recorded during sampling and surveys to reconstruct the event without relying on the memory of the field personnel.

The daily log will contain the following information, as applicable to the task:

- Project name
- Field personnel on site and time(s) present on site
- Site visitors
- Weather conditions
- Field observations
- Maps and/or drawings
- Sample collection date and time
- Sample collection method and description of activities
- Deviations from the DGWP
- Conferences associated with field activities

### 7.2 Analytical Records

The laboratory will retain analytical data records. Additionally, Anchor QEA will retain them in its central Project files. For all analyses, the data reporting requirements will include those items necessary to complete data validation, including copies of all raw data. The analytical laboratory will be required, where applicable, to report the following:

**Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary will discuss, but not be limited to, QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate.

**Chain-of-Custody Records.** Legible copies of the chain-of-custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample

received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.

**Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:

- Field sample identification code and the corresponding laboratory identification code
- Sample matrix
- Date of sample extraction
- Date and time of analysis
- Weight and/or volume used for analysis
- Final dilution volumes or concentration factor for the sample
- Identification of the instrument used for analysis
- MDLs
- MRLs accounting for sample-specific factors (e.g., dilution)
- Analytical results with reporting units identified
- Data qualifiers and their definitions

**QA/QC Summaries.** This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The following are required summaries; additional information may be requested:

- **Calibration Data Summary:** This summary will report the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent relative standard deviation, percent difference, and retention time for each analyte will be listed, as appropriate. Results for standards to indicate instrument sensitivity will be documented.
- **Internal Standard Area Summary:** The stability of internal standard areas will be reported.
- **Method Blank Analysis:** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
- **Surrogate Spike Recovery:** This will include all surrogate spike recovery data for associated organic analyses. The names and concentrations of all compounds added, percent recoveries, and acceptable range of recoveries will be listed.
- **Matrix Spike Recovery:** This will report all MS recovery data for all analytes. The names and concentrations of all analytes added, percent recoveries, and range of recoveries will be listed. The RPD for all duplicate analyses will be included.
- **Matrix Duplicate:** Percent recoveries and associated RPD values for all MSD analyses will be reported.

- **Laboratory Control Sample:** All laboratory control sample recovery data for organic and metal analytes will be reported. The name and concentration of all analytes added, percent recoveries, and acceptable range of recoveries will be listed. The RPD values for all duplicate analyses will be reported.
- **Relative Retention Time:** This will include a report of the relative retention time of each analyte detected in the samples for both primary and confirmational analyses.

**Original Data.** Legible copies of the original data generated by the laboratory will include the following:

- Sample extraction, preparation, identification of extraction method used, and cleanup logs
- Instrument specifications and analysis logs for all instruments used on days of calibration and analysis
- Calculation worksheets for inorganic analyses
- Reconstructed ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
- Original printouts of full scan chromatograms and quantitation reports for all GC and/or GC/mass spectrometry samples, standards, blanks, calibrations, spikes, replicates, and reference materials
- Enhanced spectra of detected compounds with associated best-match spectra for each sample

All instrument data shall be fully restorable at the laboratory from electronic backup. The laboratory will be required to maintain all records relevant to Project analyses for a minimum of 5 years. Data validation reports will be maintained in the central Project files with the analytical data reports.

### 7.3 Data Reduction

Data reduction is the conversion of raw data to final results. Methods or procedures for data reduction shall be documented. The following procedures will be implemented to verify the accuracy of data reduction:

- Technical staff will document, review, and QC their own work to ensure accuracy.
- Major calculations will be subject to an independent senior technical review to ensure that both the methods and the calculations are correct and consistent with the approved DGWP, including approved supplementals to the DGWP.
- The Project manager will be responsible for ensuring that data reduction is conducted in a manner that produces high-quality data via review and approval of concepts, methods, assumptions, and calculations.

## 8 Data Validation and Usability

Data generated in the field and at the laboratories will be verified and validated according to methods and procedures described in this section.

### 8.1 Data Review, Validation, and Verification

During the validation process, analytical data will be electronically and/or manually evaluated for method and laboratory QC compliance, and their validity and applicability for program purposes will be determined.

Based on findings of the validation process, data validation qualifiers may be assigned. Validated Project data, including qualifiers, will be entered into the Project database, thus enabling this information to be retained or retrieved as needed.

### 8.2 Validation and Verification Methods

Laboratory data will be provided in both PDF and Environmental Quality Information System (EQIS) electronic format and uploaded to Anchor QEA's Project database. Once data are received from the laboratory, several QC procedures will be followed to provide an accurate evaluation of data quality and accuracy.

Stage 2B validations (EPA 2009) will be performed for all testing parameters. Data quality review will be completed by Anchor QEA (or a subconsultant) in accordance with the EPA NFG for Data Review (EPA 2020a, 2020b) by considering the following:

- Data completeness
- Holding times
- Method blanks
- Surrogates
- Detection and reporting limits
- Laboratory control samples
- Replicates
- MS/MSD samples
- Initial and continuing calibrations
- Internal standard area counts
- Standard reference materials

Data will be validated in accordance with the Project-specific DQOs (Table 5), analytical method criteria, and the laboratory's internal performance standards based on its standard operating procedures. The results of the data quality review, including assigning qualifiers in accordance with

the NFG and a tabular summary of qualifiers, will be generated by the database manager and submitted to the QA/QC manager for final review and confirmation of data validity.

Laboratory data, which will be electronically provided and loaded into Anchor QEA's Project database, will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables and reports will be exported from EQUIS to Excel tables.

Field datasheets or data entries will be checked for completeness and accuracy prior to database entry. Data generated in the field will be documented electronically or on hard copy and provided to the database manager, who is responsible for data entry into the database. Manually entered data will be checked by a second party. Field documentation will be filed in the main Project file after data entry and checking are complete.

### **8.3 Reconciliation with User Requirements**

The QA manager will review data at the completion of the task to determine if DQOs have been met.

If data do not meet the Project's specifications, the QA manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action, as appropriate. The problem will be corrected by retraining, revising techniques, or replacing supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA manager will recommend appropriate modifications. If matrix interference is suspected to have attributed to the exceedance, adequate laboratory documentation must be presented to demonstrate that instrument performance and/or laboratory techniques did not bias results. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per NFG. In these instances, the usability of data will be determined by the extent of the exceedance.

Rejected data will be assigned an "R" qualifier and will not be used for any purposes. Data qualified with a "J" flag will be used, but the basis for the J flag will be documented in the data validation report, and data uncertainties will be considered during use of the data for Project reporting.

## 9 References

- Ecology (Washington State Department of Ecology), 2016. Guidance for Remediation of Petroleum Contaminated Sites. Publication No. 10-09-057. June 2016.
- Ecology, 2017. Further Action Letter for the Port of Tacoma/TOTE Facility 500 Alexander. Cleanup Site Number 7619. August 9, 2017.
- Ecology, 2021. Further Action Letter for the Port of Tacoma/TOTE Facility 500 Alexander. Cleanup Site Number 7619. July 29, 2021.
- EPA (U.S. Environmental Protection Agency), 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA-530/SW-846.
- EPA, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. EPA 540-R-08-005. January 2009.
- EPA, 2020a. National Functional Guidelines for Organic Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. United States Environmental Protection Agency. EPA-540-R-20-005. November 2020.
- EPA, 2020b. National Functional Guidelines for Inorganic Superfund Methods Data Review. Office of Superfund Remediation and Technology Innovation. United States Environmental Protection Agency. EPA-540-R-20-006. November 2020.

# Tables

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**Table 1**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type															Sample ID		
						GW	Soil	PW	Start	End		Soil Testing							Groundwater Testing							Porewater Testing			
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCs <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCs <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>
<b>Group 1 Tank Areas</b>																													
N-12	Geoprobe	N12-GP-01	--	1168294.89	713049.91	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N12-GP-01-GW-YMMDD	
N-13		N13-GP-01	--	1168619.82	713360.97	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N13-GP-01-GW-YMMDD	
N-17		N17-GP-01	--	1166531.2	714776.33	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	--	--	--	--	--	--	N17-GP-01-GW-YMMDD	
T-23/24		T23-GP-01	--	1166886.67	714785.99	1	--	--	10	15	--	--	--	--	--	--	--	1	--	1	1	1	1	--	--	--	--	T23-GP-01-GW-YMMDD	
<b>Group 2 Tank Area</b>																													
T-21/22	New Permanent Well	T21-MW-01	HC-1	1166845.81	714690.81	1	--	--	Mon Well		--	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	T21-MW-01-GW-YMMDD	
			HC-1			--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Geoprobe	T21-GP-01	HORUS-12	1166861.88	714689.12	--	1	--	9	10	--	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	T21-GP-01-SO-9-10-YMMDD		
<b>Group 3 Tank Areas</b>																													
N-9/10	Existing Permanent Well	HC-N910-9	HC-N910-9	1167154.26	714169.35	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	1	--	1	--	--	HC-N910-9-GW-YMMDD	
		N9-MW-05	HC-MW-05	1167116.29	714283.2	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-05-GW-YMMDD
		N9-MW-06	HC-MW-06	1167071.53	714289.55	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-06-GW-YMMDD
		N9-MW-07	HC-MW-07	1167115.02	714345.99	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-07-GW-YMMDD
		N9-MW-08	HC-MW-08	1167058.32	714366.61	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	1	--	--	--	--	N9-MW-08-GW-YMMDD
	Geoprobe	N9-GP-01	--	1167087.73	714371.89	--	1	--	5	6	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-5-6-YMMDD	
		N9-GP-01	--	1167087.73	714371.89	--	1	--	9	10	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-01-SO-9-10-YMMDD	
		N9-GP-02	--	1167080.93	714301.85	--	1	--	5	6	--	1	1	1	1	1	--	--	--	--	--	--	--	--	--	--	--	N9-GP-02-SO-5-6-YMMDD	
N-20/21/22	Existing Permanent Well	HC-N202122-9	HC-N202122-9	1167342.54	714012.74	1	--	--	Mon Well		--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	HC-N202122-9-GW-YMMDD	
		N20-MW-05	HC-MW-05	1167373.3	714067.8	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-05-GW-YMMDD
		N20-MW-07	HC-MW-07	1167428.47	714122.43	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-07-GW-YMMDD
		N20-MW-08	HC-MW-08	1167360.52	714126.33	1	--	--	Mon Well		--	--	--	--	--	--	--	--	1	1	1	1	1	--	--	--	--	--	N20-MW-08-GW-YMMDD
	Geoprobe	N20-GP-01	--	1167401.82	714145.95	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-6-7-YMMDD	
		N20-GP-01	--	1167401.82	714145.95	--	1	--	10	11	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-01-SO-10-11-YMMDD	
		N20-GP-02	--	1167354.26	714032.93	--	1	--	6	7	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-02-SO-6-7-YMMDD	
		N20-GP-02	--	1167354.26	714032.93	--	1	--	10	11	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	N20-GP-02-SO-10-11-YMMDD	
		N20-GP-03	--	1167428.12	714272.93	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	N20-GP-03-GW-A-YMMDD
						1	--	--	20	25	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	N20-GP-03-GW-B-YMMDD
		N20-GP-04	--	1167508.29	714195.5	1	--	--	10	15	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	N20-GP-04-GW-A-YMMDD
						1	--	--	20	25	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	--
Porewater	N20-PW-01	--	1167326.23	713992.51	--	--	1	-1	-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	1	
					--	--	1	0	-1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1

**Table 1**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type															Sample ID				
						GW	Soil	PW	Start	End		Soil Testing						Groundwater Testing						Porewater Testing							
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCS <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCS <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic		MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCS <sup>3</sup>
P-27/28 & U-1	Geoprobe	P27-GP-01	HC-1	1167330.19	714384.9	1	--	--	10	15	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	P27-GP-01-GW-YMMMDD		
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-GP-01-SO-9-10-YMMMDD		
		P27-GP-02	HC-2	1167369.03	714409.41	1	--	--	10	15	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	P27-GP-02-GW-YMMMDD		
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-GP-02-SO-9-10-YMMMDD		
		P27-GP-03	HC-3	1167379.25	714461.13	1	--	--	10	15	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	P27-GP-03-GW-YMMMDD		
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-GP-03-SO-9-10-YMMMDD			
	P27-GP-04	HC-4	1167332.22	714483.03	1	--	--	10	15	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	P27-GP-04-GW-YMMMDD			
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-GP-04-SO-9-10-YMMMDD			
	P27-GP-05	HC-5	1167298.24	714447.56	1	--	--	10	15	--	--	--	--	--	--	1	--	1	1	1	1	1	--	--	--	--	--	P27-GP-05-GW-YMMMDD			
					--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-GP-05-SO-9-10-YMMMDD			
		New Permanent Well	P27-MW-01	P-3	1167351.2	714470.73	1	--	--	Mon Well		--	--	--	--	--	--	1	--	1	1	1	1	--	--	1	--	--	P27-MW-01-GW-YMMMDD		
								--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-MW-01-SO-9-10-YMMMDD
								--	1	--	14	15	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--
		P27-MW-02	P-2	1167335.95	714436.05	1	--	--	Mon Well		--	--	--	--	--	--	1	--	1	1	1	1	--	--	1	--	--	P27-MW-02-GW-YMMMDD			
						--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	P27-MW-02-SO-9-10-YMMMDD		
						--	1	--	14	15	--	--	1	1	1	--	1	1	1	1	1	--	--	--	--	--	P27-MW-02-SO-14-15-YMMMDD				
	P27-MW-03			1167324.24	714364.6	1	--	--	Mon Well		--	--	--	--	--	--	1	--	1	1	1	1	--	--	1	--	--	P27-MW-03-GW-YMMMDD			
							--	1	--	9	10	--	--	1	1	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	P27-MW-03-SO-9-10-YMMMDD
						--	1	--	14	15	--	--	1	1	1	--	1	1	1	1	1	--	--	--	--	--	P27-MW-03-SO-14-15-YMMMDD				
<b>Group 4 Tank Areas</b>																															
A-1/2	Geoprobe	A1-GP-01	--	1167183.81	714509.87	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	A1-GP-01-GW-A-YMMMDD			
								--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-5-6-YMMMDD
								--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-01-SO-9-10-YMMMDD
		A1-GP-02	--	1167172.18	714497.06	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	A1-GP-02-GW-YMMMDD		
								--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-5-6-YMMMDD	
				--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-02-SO-9-10-YMMMDD			
		A1-GP-03	--	1167155.87	714484.43	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	A1-GP-03-GW-YMMMDD		
								--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	A1-GP-03-SO-5-6-YMMMDD	
				--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-03-SO-9-10-YMMMDD		
		A1-GP-04	--	1167165.29	714475.37	1	--	--	10	15	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	A1-GP-04-GW-YMMMDD		
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	A1-GP-04-SO-5-6-YMMMDD			
		--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	A1-GP-04-SO-9-10-YMMMDD				

**Table 1**  
**Summary of Data Gaps Sampling**

Tank(s)	Monitoring Type	Location ID	Historical ID <sup>1</sup>	Easting (feet)	Northing (feet)	Matrix					Target Sample Depth (feet bgs) <sup>2</sup>	Testing Type																			Sample ID							
						GW	Soil	PW	Start	End		Soil Testing							Groundwater Testing							Porewater Testing												
												RUSH NWTPH-HCID	NWTPH-Gx	NWTPHDx (w/SGC)	VOCS <sup>3</sup>	PAHs	Total Lead	PCB Aroclors	pH and Field Parameters <sup>4</sup>	NWTPH-Gx	NWTPHDx (w/SGC)	NWTPHDx (wo/SGC)	VOCS <sup>3</sup>	PAHs	Total and Dissolved Lead	Total and Dissolved Arsenic	MNA Parameters <sup>5</sup>	pH and Field Parameters <sup>4</sup>	Total Suspended Solids	VOCS <sup>3</sup>								
B-1/2/3	Geoprobe	B1-GP-01	--	1166915.67	714489.35	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-GW-YMMMDD	
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-01-SO-9-10-YMMMDD	
		B1-GP-02	--	1166873.39	714481.63	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-GW-YMMMDD	
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-02-SO-9-10-YMMMDD	
		B1-GP-03	--	1166891.32	714464.21	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-03-SO-9-10-YMMMDD
		B1-GP-04	--	1166909.25	714446.78	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-04-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-04-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-SB-04-SO-9-10-YMMMDD	
		B1-GP-05	--	1166866.97	714439.06	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	B1-GP-05-SO-9-10-YMMMDD	
Wax Tank	Geoprobe	WT-GP-01	--	1167135.83	714574.05	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-GW-YMMMDD		
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-01-SO-9-10-YMMMDD	
		WT-GP-02	--	1167099.92	714554.54	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-02-SO-9-10-YMMMDD	
		WT-GP-03	--	1167119.5	714536.38	1	--	--	10	15	--	--	--	--	--	--	--	1	A	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-GW-YMMMDD
						--	1	--	5	6	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-5-6-YMMMDD	
						--	1	--	9	10	1	A	A	A	A	A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WT-GP-03-SO-9-10-YMMMDD	
<b>Total Samples by Type</b>						<b>38</b>	<b>45</b>	<b>2</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
Planned Analyses						24	8	21	21	17	8	11	40	9	24	24	25	17	1	1	3	2	2	2														
Planned QC Analyses						2	1	2	2	1	1	1	2	1	2	2	2	1	1	1	1	1	1	1														
<b>Total Planned Analyses</b>						<b>26</b>	<b>9</b>	<b>23</b>	<b>23</b>	<b>18</b>	<b>9</b>	<b>12</b>	<b>42</b>	<b>10</b>	<b>26</b>	<b>26</b>	<b>27</b>	<b>18</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>														
Max Potential Conditional Analyses Using Archived Samples						0	24	24	24	24	24	0	0	12	12	12	12	12	12	0	0	0	0	0	0													
Max Potential Conditional QC Samples						0	2	2	2	2	2	0	0	1	1	1	1	1	1	0	0	0	0	0	0													
<b>Max Potential Conditional Analyses</b>						<b>0</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>														

**Table 1**  
**Summary of Data Gaps Sampling**

- Notes:
1. For new DGWP sampling locations to be resampled based on a historical location, sample collection will occur 3 to 5 feet of historical station to allow for drilling.
  2. Depth intervals may be adjusted in the field based on observations of soil-groundwater interface or depths of obvious contamination.
  3. VOCs will include CVOC compounds, EDC, EDB, MTBE and naphthalenes.
  4. Field parameters will be measured for all groundwater samples and include: pH, dissolved oxygen, oxidation reduction potential [redox], and turbidity.
  5. Natural attenuation parameters include: nitrate as nitrogen, methane, dissolved oxygen, sulfate, iron, and TOC.

BTEX: benzene, toluene, ethylbenzene and xylene

cPAH: carcinogenic polycyclic aromatic hydrocarbon compound

CVOC: chlorinated volatile organic compound

EDC-1,2-dichloroethane

EDB: 1,2-dibromoethane

feet bgs: feet below ground surface

GW: groundwater

MTBE: methyl tert-butyl ether

MNA: natural attenuation

NWTPH-Dx: the qualitative and extended quantitative method for semi-volatile ("diesel") petroleum products in soil and water

NWTPH-G: the qualitative and extended quantitative method for volatile ("gasoline") petroleum products in soil and water

NWTPH-HCID: a qualitative and semi-quantitative screen to determine the presence and type of petroleum products that may exist in water or soil

PW: porewater

VOC: volatile organic compound

**Table 2**  
**Testing Parameters, Analytical Methods, and Reporting Limits**

Parameter	Analytical Method	RL	MDL
<b>Groundwater</b>			
<b>Conventional Parameters</b>			
pH (SU)	Field test	N/A	N/A
Dissolved oxygen (mg/L)	Field test	N/A	N/A
Redox potential (mV)	Field test	N/A	N/A
Turbidity (NTU)	Field test	N/A	N/A
Total organic carbon (mg/L) <sup>1</sup>	EPA 9060A	0.500	0.500
Nitrate as N (mg/L) <sup>1</sup>	EPA 300.0	0.100	0.100
Sulfate (mg/L) <sup>1</sup>	EPA 300.0	0.100	0.100
<b>Dissolved Gases (µg/L)</b>			
Methane <sup>1</sup>	EPA RSK-175	0.654	0.340
<b>Total and Dissolved Metals (µg/L)</b>			
Arsenic	EPA 6020B UCT-KED	0.200	0.0373
Iron <sup>1</sup>	EPA 6010D	10.7	50.0
Lead	EPA 6010D	2.40	20.0
<b>Volatile Organic Compounds (µg/L)</b>			
1,2-Dibromoethane	EPA 8260D	0.200	0.0861
1,2-Dichloroethane	EPA 8260D	0.200	0.0756
Benzene	EPA 8260D	0.200	0.0531
cis-1,2-Dichloroethene	EPA 8260D	0.200	0.0811
Ethylbenzene	EPA 8260D	0.200	0.0509
m,p-Xylene	EPA 8260D	0.600	0.219
1,2-Dichloroethane	EPA 8260D	0.200	0.0756
Methyl tert-butyl Ether	EPA 8260D	0.500	0.140
o-Xylene	EPA 8260D	0.200	0.0788
Naphthalene	EPA 8260D	0.500	0.274
Tetrachloroethene	EPA 8260D	0.200	0.0911
Toluene	EPA 8260D	0.200	0.0485
trans-1,2-Dichloroethene	EPA 8260D	0.200	0.0692
Trichloroethene	EPA 8260D	0.200	0.0698
Vinyl Chloride	EPA 8260D	0.200	0.0817
<b>Polycyclic Aromatic Hydrocarbons (µg/L)</b>			
1-Methylnaphthalene	EPA 8270E-SIM	0.100	0.020
1-Methylphenanthrene	EPA 8270E-SIM	0.100	0.021
2-Methylnaphthalene	EPA 8270E-SIM	0.100	0.026
Acenaphthene	EPA 8270E-SIM	0.100	0.020
Acenaphthylene	EPA 8270E-SIM	0.100	0.023
Anthracene	EPA 8270E-SIM	0.100	0.023
Benzo(a)anthracene	EPA 8270E-SIM	0.100	0.046
Benzo(a)pyrene	EPA 8270E-SIM	0.100	0.056
Benzo(b)fluoranthene	EPA 8270E-SIM	0.100	0.085
Benzo(g,h,i)perylene	EPA 8270E-SIM	0.100	0.072
Benzo(j)fluoranthene	EPA 8270E-SIM	0.100	0.031
Benzo(k)fluoranthene	EPA 8270E-SIM	0.100	0.086
Chrysene	EPA 8270E-SIM	0.100	0.055
Dibenzo(a,h)anthracene	EPA 8270E-SIM	0.100	0.090

**Table 2**  
**Testing Parameters, Analytical Methods, and Reporting Limits**

Parameter	Analytical Method	RL	MDL
Fluoranthene	EPA 8270E-SIM	0.100	0.016
Fluorene	EPA 8270E-SIM	0.100	0.016
Indeno(1,2,3-cd)pyrene	EPA 8270E-SIM	0.100	0.084
Naphthalene	EPA 8270E-SIM	0.100	0.017
Phenanthrene	EPA 8270E-SIM	0.100	0.024
Pyrene	EPA 8270E-SIM	0.100	0.025
<b>Total Petroleum Hydrocarbons (mg/L)</b>			
Gasoline Range Organics	NWTPHGx	0.100	0.0136
Diesel Range Organics	NWTPHDx (with SGC)	0.100	0.0330
Motor Oil Range Organics	NWTPHDx (with SGC)	0.200	0.0560
Diesel Range Organics	NWTPHDx (without SGC)	0.100	0.0330
Motor Oil Range Organics	NWTPHDx (without SGC)	0.200	0.0560
<b>Soil</b>			
<b>Conventional Parameters (%)</b>			
Percent solids	SM 2540G	0.10	0.10
<b>Metals (mg/kg)</b>			
Lead	EPA 6020B	0.100	0.0520
<b>Volatile Organic Compounds (µg/kg)</b>			
1,2-Dibromoethane	EPA 8260D	1.00	0.308
1,2-Dichloroethane	EPA 8260D	1.00	0.234
Benzene	EPA 8260D	1.00	0.165
cis-1,2-Dichloroethene	EPA 8260D	1.00	0.257
Ethylbenzene	EPA 8260D	1.00	0.227
m,p-Xylene	EPA 8260D	2.00	0.494
Methyl tert-butyl Ether	EPA 8260D	1.00	0.254
Naphthalene	EPA 8260D	5.00	2.46
o-Xylene	EPA 8260D	1.00	0.239
Tetrachloroethene	EPA 8260D	1.00	0.198
Toluene	EPA 8260D	1.00	0.247
trans-1,2-Dichloroethene	EPA 8260D	1.00	0.525
Trichloroethene	EPA 8260D	1.00	0.255
Vinyl Chloride	EPA 8260D	1.00	0.336
<b>Polycyclic Aromatic Hydrocarbons (µg/kg)</b>			
1-Methylnaphthalene	EPA 8270E-SIM	5.00	0.401
2-Methylnaphthalene	EPA 8270E-SIM	5.00	1.100
Acenaphthene	EPA 8270E-SIM	5.00	0.571
Acenaphthylene	EPA 8270E-SIM	5.00	1.080
Anthracene	EPA 8270E-SIM	5.00	0.871
Benzo(a)anthracene	EPA 8270E-SIM	5.00	0.824
Benzo(a)pyrene	EPA 8270E-SIM	5.00	0.614
Benzo(b)fluoranthene	EPA 8270E-SIM	5.00	1.370
Benzo(g,h,i)perylene	EPA 8270E-SIM	5.00	1.060
Benzo(j)fluoranthene	EPA 8270E-SIM	5.00	0.680
Benzo(k)fluoranthene	EPA 8270E-SIM	5.00	0.760
Chrysene	EPA 8270E-SIM	5.00	1.050
Dibenzo(a,h)anthracene	EPA 8270E-SIM	5.00	0.891

**Table 2**  
**Testing Parameters, Analytical Methods, and Reporting Limits**

Parameter	Analytical Method	RL	MDL
Fluoranthene	EPA 8270E-SIM	5.00	0.470
Fluorene	EPA 8270E-SIM	5.00	0.631
Indeno(1,2,3-cd)pyrene	EPA 8270E-SIM	5.00	1.050
Naphthalene	EPA 8270E-SIM	5.00	1.280
Phenanthrene	EPA 8270E-SIM	5.00	0.718
Pyrene	EPA 8270E-SIM	5.00	0.626
<b>Total Petroleum Hydrocarbons (mg/kg)</b>			
Gasoline Range Organics	NWTPH_HCID	10.0	10.0
Diesel Range Organics	NWTPH_HCID	25.0	25.0
Motor Oil Range Organics	NWTPH_HCID	50.0	50.0
Gasoline Range Organics	NWTPHGx	2.50	5.00
Diesel Range Organics	NWTPHDx	2.34	5.00
Motor Oil Range Organics	NWTPHDx	2.99	10.0
<b>Polychlorinated Biphenyl Aroclors (µg/kg)</b>			
Aroclor 1016	EPA 8082A	20.00	8.00
Aroclor 1221	EPA 8082A	20.00	8.00
Aroclor 1232	EPA 8082A	20.00	8.00
Aroclor 1242	EPA 8082A	20.00	8.00
Aroclor 1248	EPA 8082A	20.00	8.00
Aroclor 1254	EPA 8082A	20.00	8.00
Aroclor 1260	EPA 8082A	20.00	9.28
<b>Porewater</b>			
<b>Conventionals (mg/L)</b>			
Total suspended solids	SM 2540D	1.0	2.0
<b>Volatile Organic Compounds (µg/L)</b>			
1,2-Dibromoethane	EPA 8260D	0.200	0.0861
1,2-Dichloroethane	EPA 8260D	0.200	0.0756
Benzene	EPA 8260D	0.200	0.0531
cis-1,2-Dichloroethene	EPA 8260D	0.200	0.0811
Ethylbenzene	EPA 8260D	0.200	0.0509
m,p-Xylene	EPA 8260D	0.600	0.219
Methyl tert-butyl Ether	EPA 8260D	0.500	0.140
Naphthalene	EPA 8260D	0.500	0.274
o-Xylene	EPA 8260D	0.200	0.0788
Tetrachloroethene	EPA 8260D	0.200	0.0911
Toluene	EPA 8260D	0.200	0.0485
trans-1,2-Dichloroethene	EPA 8260D	0.200	0.0692
Trichloroethene	EPA 8260D	0.200	0.0698
Vinyl Chloride	EPA 8260D	0.200	0.0817

**Table 2**  
**Testing Parameters, Analytical Methods, and Reporting Limits**

Parameter	Analytical Method	RL	MDL
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Notes:

1. Natural attenuation parameters

µg/kg: micrograms per kilogram

µg/L: micrograms per liter

EPA: U.S. Environmental Protection Agency

MDL: method detection limit

mg/kg: milligrams per kilogram

mg/L: milligrams per liter

mV: millivolt

N/A: not applicable

NTU: nephelometric turbidity unit

NWTPH-HCID: Washington State Department of Ecology Northwest Total Petroleum Hydrocarbon - Hydrocarbon Identification method

NWTPHDx: Washington State Department of Ecology Northwest Total Petroleum Hydrocarbon Diesel Range Extended method

NWTPHGx: Washington State Department of Ecology Northwest Total Petroleum Hydrocarbon Gasoline Range Extended method

PAH: polycyclic aromatic hydrocarbon

RL: reporting limit

SGC: silica gel cleanup

SM: Standard Method

SU: standard unit

TPH: total petroleum hydrocarbons

UCT-KED: universal cell technology – kinetic energy discrimination

VOC: volatile organic compound

**Table 3**  
**Sample Storage, Preservation, and Holding Times**

Parameter	Sample Size <sup>1</sup>	Container Size and Type <sup>1</sup>	Holding Time	Sample Preservation Technique
<b>Groundwater</b>				
Total organic carbon	10 mL	250-mL Amber glass	28 days	2°C - 6°C; H2SO4 to pH < 2
Nitrate as N	10 mL	500-mL HDPE	48 hours	2°C - 6°C
Sulfate	10 mL		28 days	2°C - 6°C
Methane	10 mL	3 x 40-mL VOA vial	14 days	2°C - 6°C; HCl to pH < 2
Total metals	50 mL	500-mL HDPE	180 days	2°C - 6°C; HNO3 to pH < 2
Dissolved metals	50 mL	500-mL HDPE	180 days	Field filter; 2°C - 6°C; HNO3 to pH < 2
VOCs	10 mL	3 x 40-mL VOA vial	14 days	2°C - 6°C; HCl to pH < 2
PAHs	500 mL	2 x 500-mL Amber glass	7 days to extraction	2°C - 6°C
			40 days to analysis	
TPHGx	10 mL	2 x 40-mL VOA vial	14 days	2°C - 6°C; HCl to pH < 2
TPHDx (w/SGC)	500 mL	2 x 500-mL Amber glass	14 days to extraction	2°C - 6°C; HCl to pH < 2
			40 days to analysis	
TPHDx (wo/SGC)	500 mL	2 x 500-mL Amber glass	14 days to extraction	2°C - 6°C; HCl to pH < 2
			40 days to analysis	
<b>Soil</b>				
Total solids	10 g	4-oz glass	14 days	< 6°C
			6 months	< -10°C
Lead	10 g		6 months	< 6°C
			2 years	< -10°C
VOCs	5 g	3 x 40-mL VOA vial	14 days	< 6°C; NaHSO4 (2 vials); MeOH (1 vial)
TPHGx	5 g	2 x 40-mL VOA vial	14 days	< 6°C; MeOH
PAHs, TPHDx, TPH-HCID	90 g	16-oz glass	14 days to extraction	< 6°C
			1 year to extraction	< -10°C
			40 days to analysis	< 6°C
PCBs	30 g		None	< 6°C or < -10°C
<b>Porewater</b>				
TSS	1L	1L HDPE	7 days	2°C - 6°C
VOCs	10 mL	3 x 40-mL VOA vial	14 days	2°C - 6°C; HCl to pH < 2

### **Table 3**

#### **Sample Storage, Preservation, and Holding Times**

Notes:

1. Sample sizes and containers should be confirmed with the laboratory prior to sample collection.

g: gram

HDPE: high density polyethylene

mL: milliliter

N/A: not applicable

oz: ounce

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

SGC: silica gel cleanup

TPHDx: total petroleum hydrocarbons - diesel range extended

TPHGx: total petroleum hydrocarbons - gasoline range extended

TPH-HCID: total petroleum hydrocarbons - hydrocarbon identification

TSS: total suspended solids

VOA: volatile organic analysis

VOC: volatile organic compounds

**Table 4**  
**Data Quality Objectives for Chemical Testing**

Analysis Type	Rinsate Blank	Field Duplicate	Initial Calibration <sup>1</sup>	Ongoing Calibration	LCS/SRM	Laboratory Duplicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes
TS, TSS	N/A	1 per 20 samples	Daily <sup>2</sup>	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A
Total organic carbon	N/A	1 per 20 samples	Daily	Every 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
Nitrate, sulfate	N/A	1 per 20 samples	Daily	Every 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
Methane	N/A	1 per 20 samples	Daily	Every 15 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
Metals	1 per collection method	1 per 20 samples	Daily	Every 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
VOCs, PAHs	1 per collection method	1 per 20 samples	As needed <sup>3</sup>	Every 12 hours	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
TPH, PCBs	1 per collection method	1 per 20 samples	As needed <sup>3</sup>	Every 10 samples	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:

1. Initial calibration verification and calibration blank must be analyzed after initial calibration and before samples are analyzed.
2. Calibration and certification of drying ovens and weighing scales are conducted bi-annually.
3. Initial calibrations are considered valid until the ongoing continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.

LCS: laboratory control sample

N/A: not applicable

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

SRM: standard reference material

TPH: total petroleum hydrocarbons (includes gasoline, diesel, and motor oil range organics)

TS: total solids

TSS: total suspended solids

VOC: volatile organic compounds

**Table 5**  
**Quality Control Analysis Summary for Chemical Testing**

Parameter	Precision	Accuracy	Completeness
<b>Groundwater</b>			
Total organic carbon	± 25% RPD	75 – 125% R	95%
Nitrate/Sulfate	± 25% RPD	75 – 125% R	95%
Sulfate	± 25% RPD	75 – 125% R	95%
Methane	± 25% RPD	75 – 125% R	95%
Metals	± 25% RPD	75 – 125% R	95%
VOCs	± 30% RPD	60 – 140% R	95%
TPH	± 30% RPD	60 – 140% R	95%
<b>Soil</b>			
Total solids	± 20% RPD	N/A	95%
Metals	± 30% RPD	70 – 130% R	95%
VOCs	± 35% RPD	50 – 150% R	95%
PAHs	± 35% RPD	50 – 150% R	95%
TPH	± 30% RPD	50 – 150% R	95%
PCBs	± 35% RPD	50 – 150% R	95%
<b>Porewater</b>			
Total suspended solids	± 30% RPD	60 – 140% R	95%
VOCs	± 20% RPD	80 – 120% R	95%

Notes:

% R: percent recovery

PAH: chemical compound class of polycyclic aromatic hydrocarbons

PCB: polychlorinated biphenyl

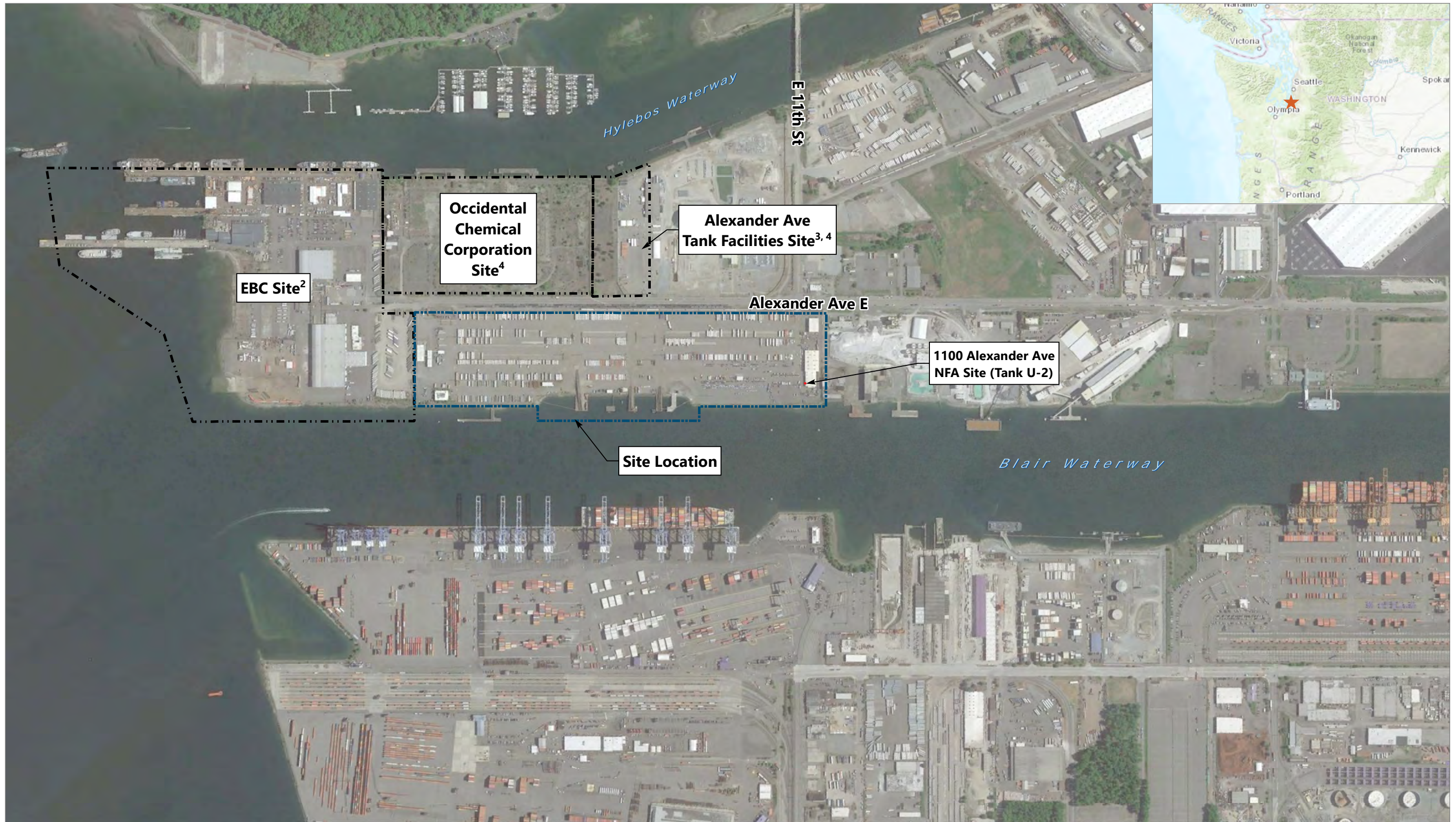
RPD: relative percent difference

TPH: total petroleum hydrocarbons

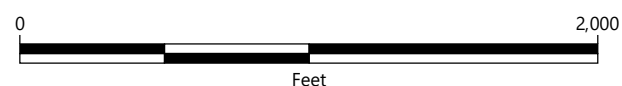
VOC: volatile organic compounds

## Figures

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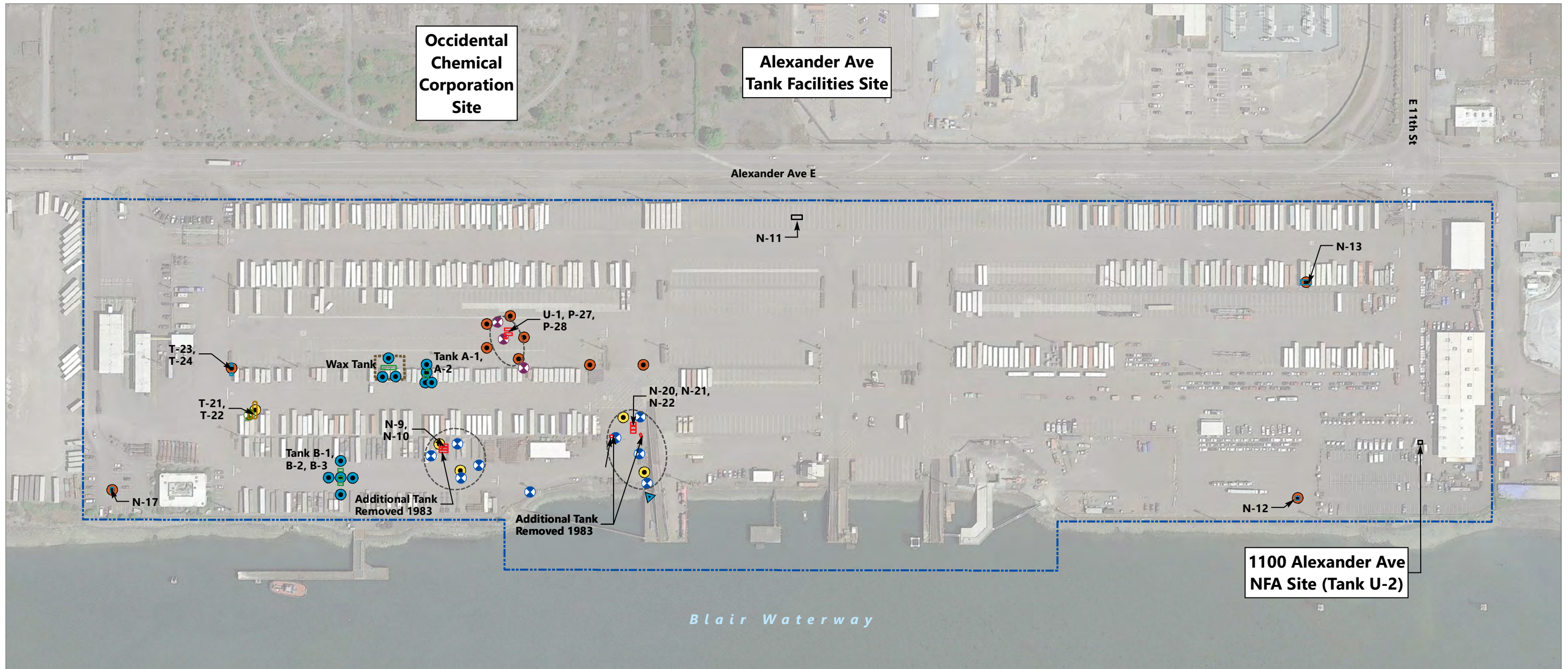


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**NOTE:**  
 1. Aerial imagery sourced from Google Earth Pro, May 2019.  
 2. EBC Site digitized from EBC Previous Investigation Report, 2013  
 3. Alexander Ave Tank Farms Site digitized from Alexander Avenue Petroleum Tank Facility Site Feasibility Study, 2019  
 4. Refer to Figure 3 for the extent of the Occidental and Alexander Ave plumes.

**Figure 1**  
**Vicinity Map**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs

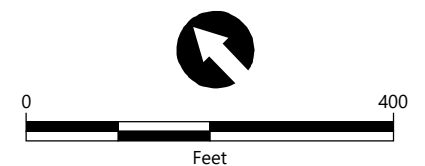


- LEGEND:**
- Yard Lease Lines
  - Tank Location and Group**
  - Group 1 Tanks
  - Group 2 Tanks
  - Group 3 Tanks
  - Group 4 Tanks
  - Tanks Addressed Separately
  - Estimated Extent of Groundwater Impacts

- Proposed Monitoring Locations**
- Monitoring Well Locations*
- Install and Sample Groundwater and Soil at New Well
  - Sample Existing Groundwater Well
  - Install and Sample Groundwater at New Well

- Geoprobe Locations*
- Groundwater and Soil Sampling
  - Groundwater Sampling and Soil Archive
  - Soil Sampling
- Porewater Locations*
- Porewater Sampling Location
  - Magnetometer

**NOTES:**  
1. Aerial Imagery from Google Earth Pro, May, 2018.



Publish Date: 2022/04/27, 10:12 AM | User: tweldy  
Filepath: \\orcas\GIS\Jobs\Port\_of\_Tacoma\_0092\TOTE\_USTs\_Cleanup\_Plan\Maps\Reports\DataGapsWorkPlan\SQAPP\AQ\_TOTEUST\_DGWP\_Fig02\_PlannedMonitoringSummary.mxd



**Figure 2**  
**Summary of Planned Field Investigations**  
Sampling and Quality Assurance Project Plan  
Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location

**Tank Location and Group**

- Group 1 Tanks

**Historical Sampling Methods and Data**

- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Soil Complies with MTCA Method A
- Soil and Groundwater Comply with MTCA Method A

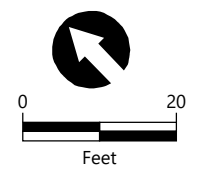
**Proposed Monitoring Locations**

*Geoprobe Locations*

- Groundwater Sampling

**NOTES:**

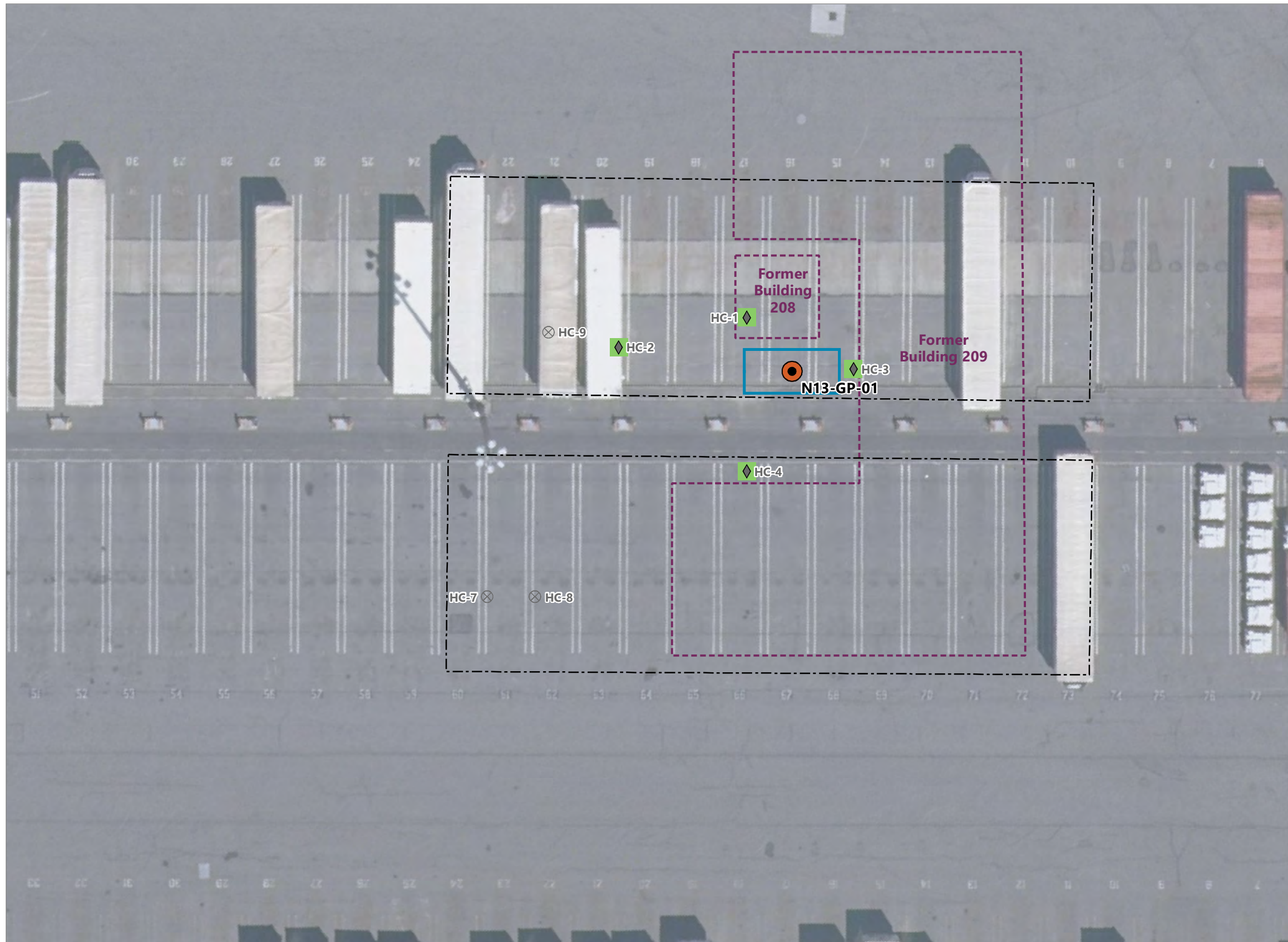
1. Aerial Imagery from City of Tacoma 2018.
2. Six soil borings tested by GeoEngineers in 2008.
3. Four soil borings were tested for soil and groundwater by Hart Crowser in 2010.
4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



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**Figure 3**  
**Group 1 Tank Area: N-12 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location
- Geophysical Testing Area

**Tank Location and Group**

- Group 1 Tanks

**Historical Sampling Methods and Data**

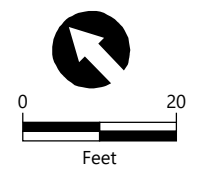
- Potholing
- Soil and Groundwater Boring
- Soil and Groundwater Comply with MTCA Method A

**Proposed Monitoring Locations**

*Geoprobe Locations*

- Groundwater Sampling

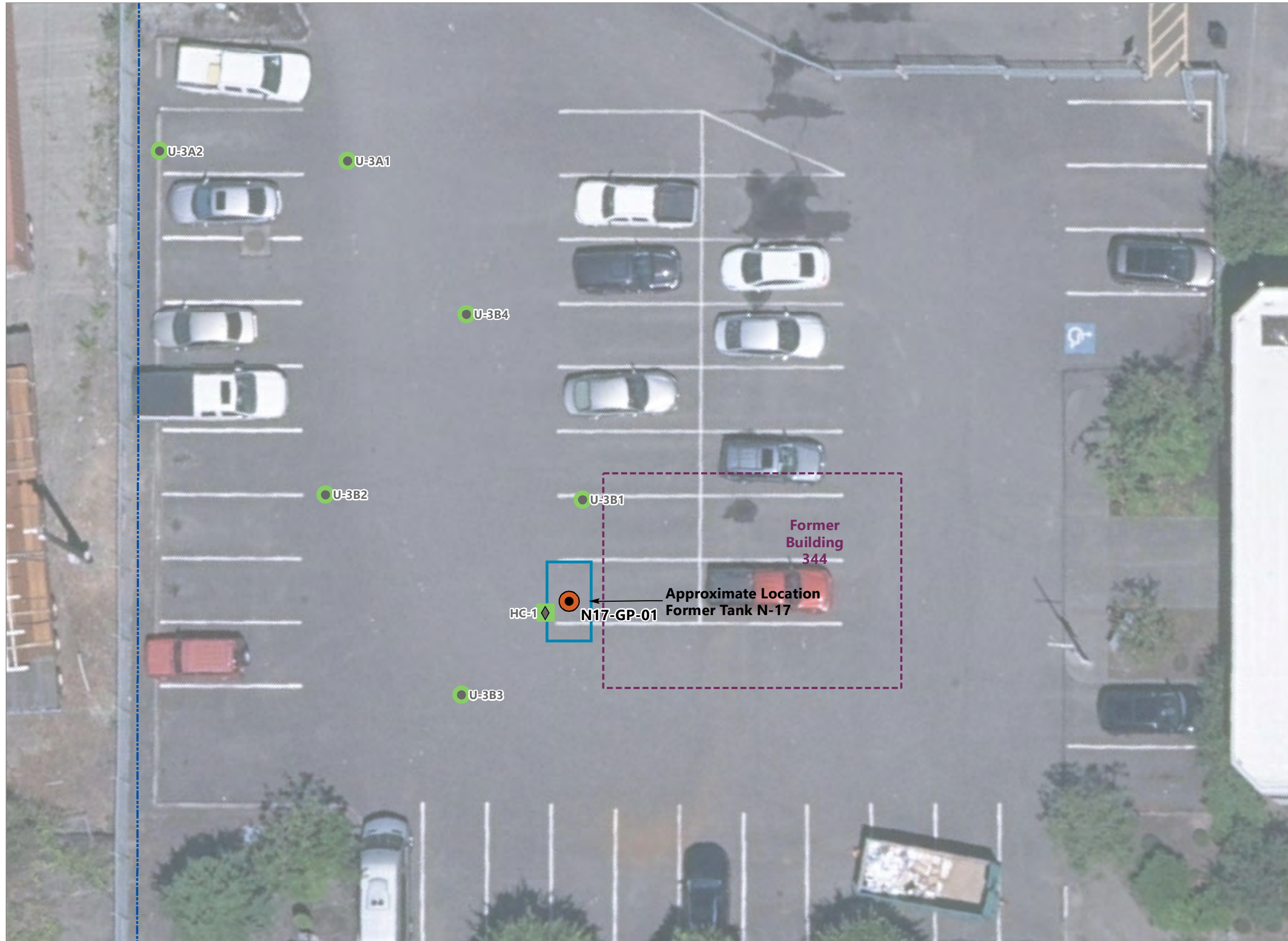
- NOTES:**
1. Aerial Imagery from City of Tacoma 2018.
  2. Four soil borings were tested for soil and groundwater by Hart Crowser in 2010.
  3. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.
  4. Hart Crowser performed geophysical surveys and potholing (visual soil screening only) in 2015.
  5. Sample types without color coding were not submitted for chemical testing.



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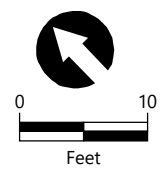


**Figure 4**  
**Group 1 Tank Area: N-13 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



- LEGEND:**
- Yard Lease Lines
  - Former Building Location
- Tank Location and Group**
- Group 1 Tanks
- Historical Sampling Methods and Data**
- Soil Boring (with Soil Data)
  - Soil and Groundwater Boring
  - Soil Complies with MTCA Method A
  - Soil and Groundwater Comply with MTCA Method A
- Proposed Monitoring Locations**
- Geoprobe Locations*
- Groundwater Sampling

- NOTES:**
1. Aerial Imagery from City of Tacoma 2018.
  2. Six soil borings tested by GeoEngineers in 2008.
  3. One soil boring was tested for soil and groundwater by Hart Crowser in 2010.
  4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



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**Figure 5**  
**Group 1 Tank Area: N-17 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location
- Geophysical Testing Area

**Tank Location and Group**

- Group 1 Tanks

**Historical Sampling Methods and Data**

- ▲ Confirmation Sample
- ◆ Soil and Groundwater Boring
- Soil Complies with MTCA Method A
- Soil and Groundwater Comply with MTCA Method A

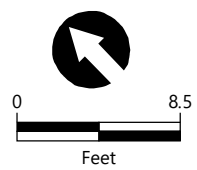
**Proposed Monitoring Locations**

*Geoprobe Locations*

- Groundwater Sampling

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. Tanks 23 and 24 were removed along with a small amount of oil contaminated soil in 1998 by Horus Environmental. Final confirmation samples collected by Horus demonstrated compliance with cleanup levels.
3. One soil boring was tested for soil and groundwater by Hart Crowser in 2010.
4. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.

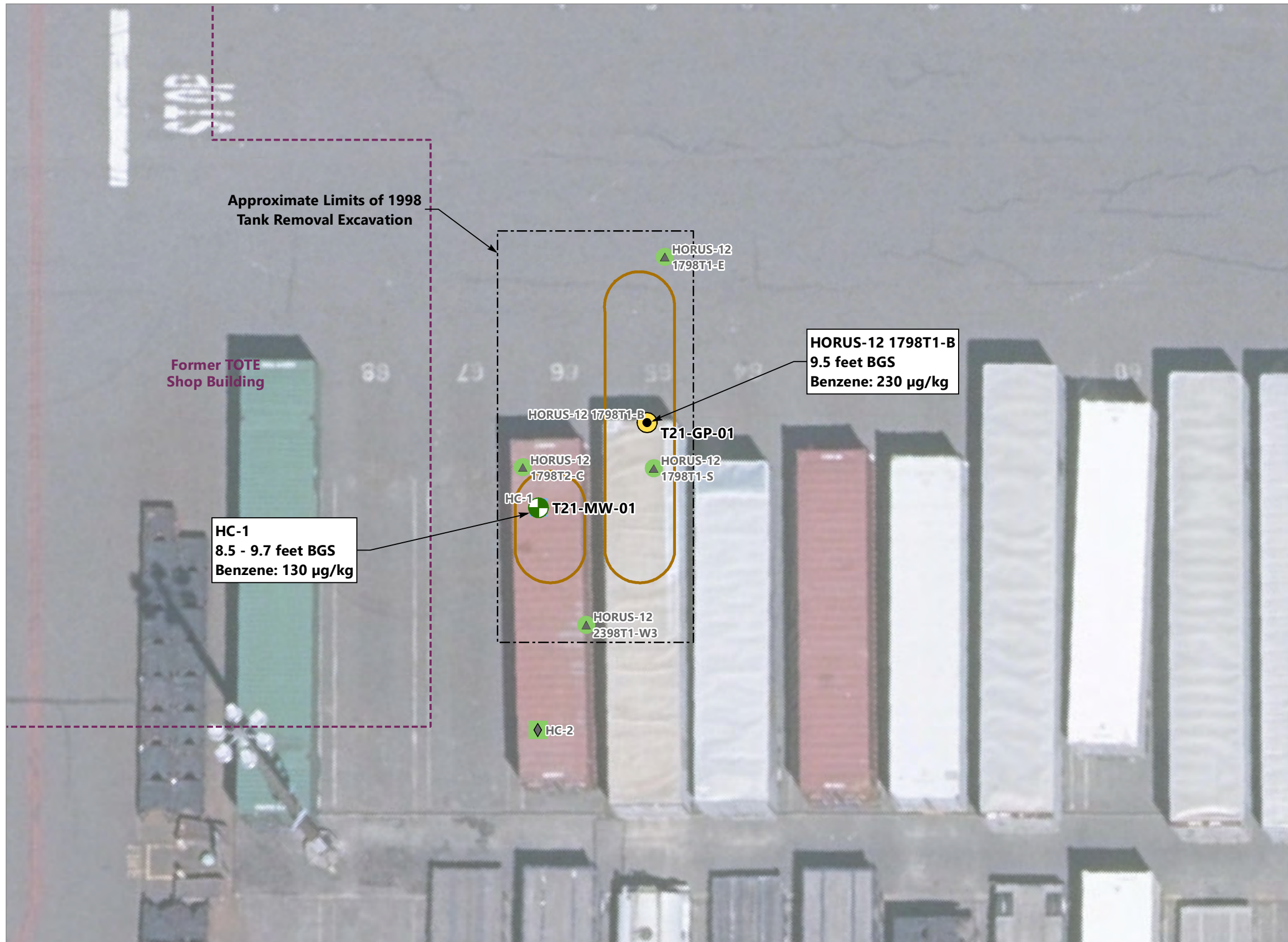


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**Figure 6**  
**Group 1 Tank Area: T-23/24 Planned Sample Locations**

Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

Yard Lease Lines

Former Building Location

Geophysical Testing Area

**Tank Location and Group**

Group 2 Tanks

**Historical Sampling Methods and Data**

Confirmation Sample

Soil and Groundwater Boring

Soil Complies with MTCA Method A

Soil and Groundwater Comply with MTCA Method A

Soil Exceeds MTCA Method A

Soil Exceeds but Groundwater Complies MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

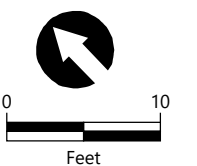
Install and Sample Groundwater and Soil at New Well

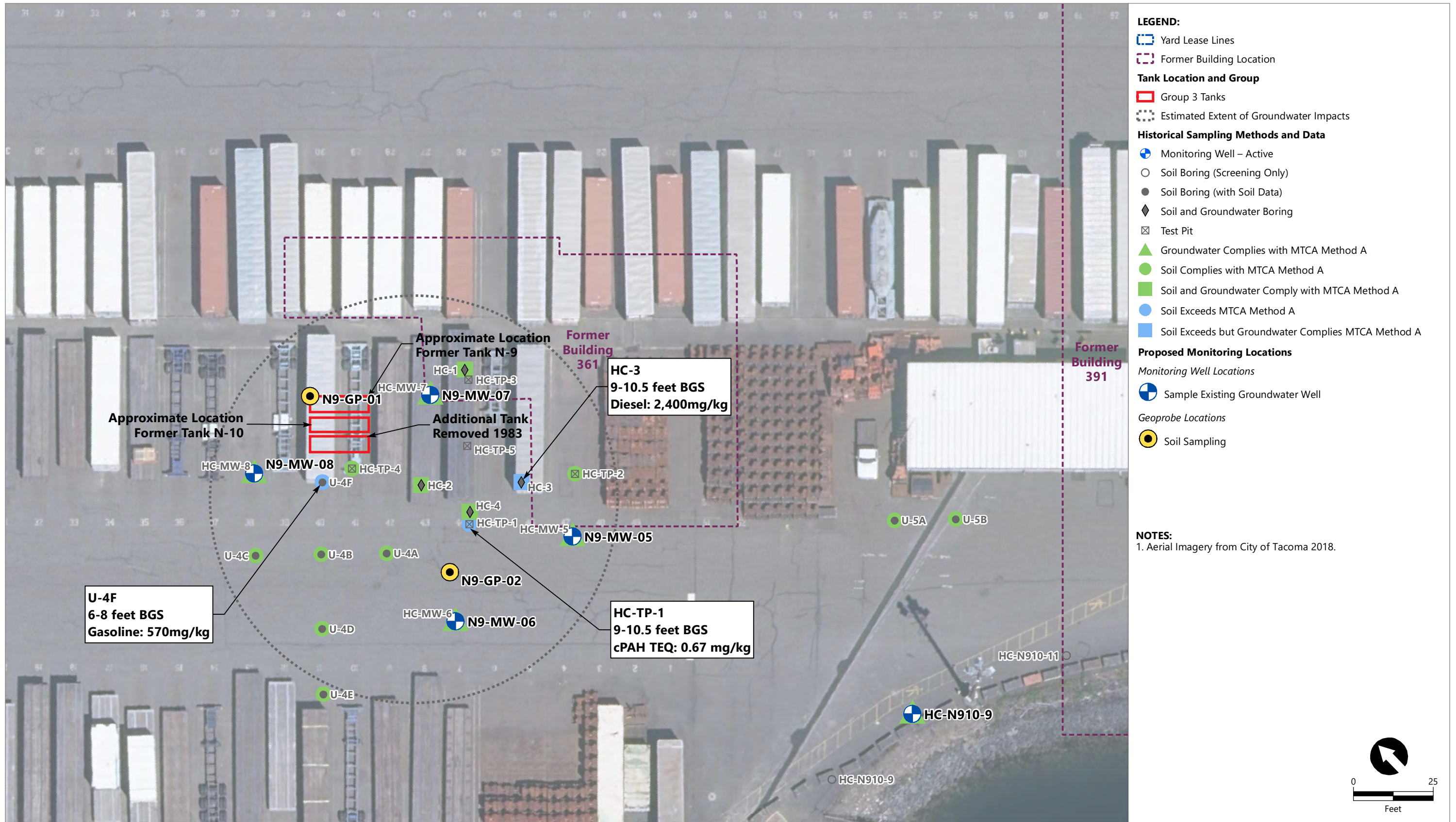
*Geoprobe Locations*

Soil Sampling

**NOTES:**

1. Aerial Imagery from City of Tacoma 2018.
2. Tanks 21 and 22 were removed along with a small amount of oil contaminated soil in 1998 by Horus Environmental.
3. Final confirmation samples collected by Horus demonstrated compliance with cleanup levels except for one bottom sample that contained elevated benzene.
4. Two soil borings were tested for soil and groundwater by Hart Crowser in 2010. Benzene exceeded cleanup levels in soil in one boring.
5. Groundwater testing for diesel and oil hydrocarbons was performed using NWTPH-Dx extended with silica gel cleanup.



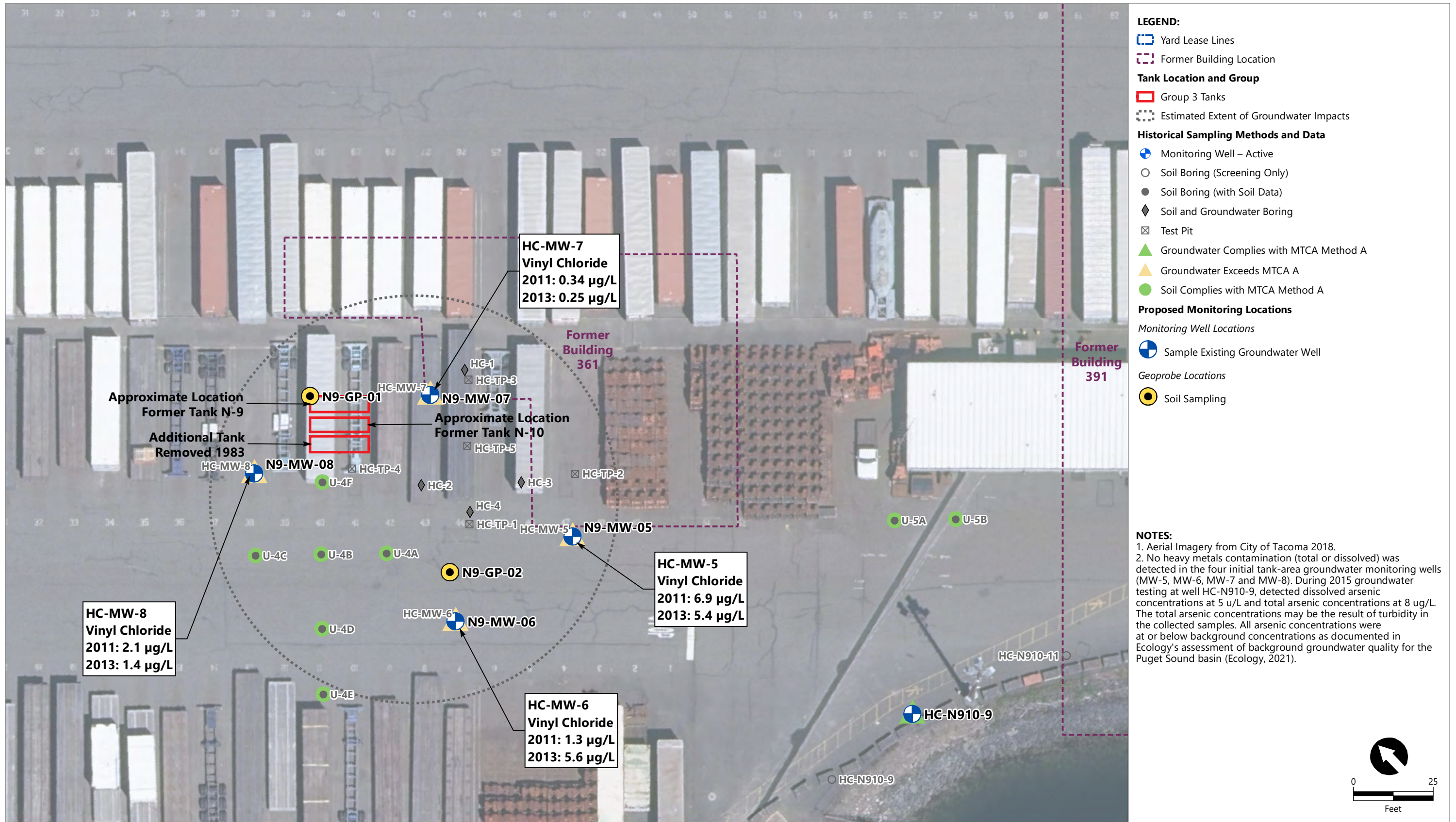


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**Figure 8a**  
**Group 3 Tank Area: N-9/10 Planned Sample Locations and Petroleum Constituents**

Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs

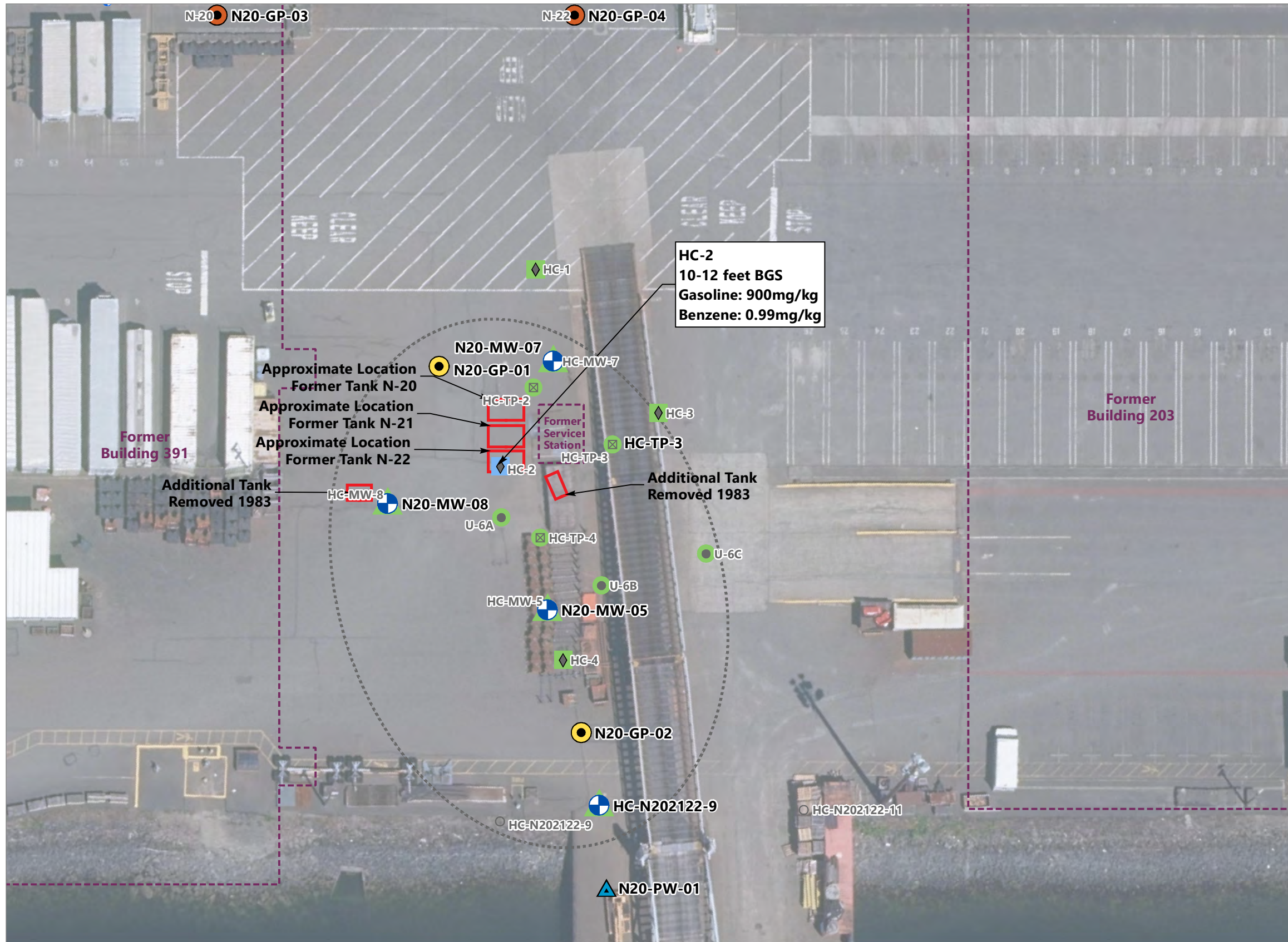


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**Figure 8b**  
**Group 3 Tank Area: N-9/10 Planned Sample Locations and CVOC Compounds**

Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location

**Tank Location and Group**

- Group 3 Tanks
- Estimated Extent of Groundwater Impacts

**Historical Sampling Methods and Data**

- Monitoring Well – Active
- Soil Boring (Screening Only)
- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Test Pit
- Groundwater Complies with MTCA Method A
- Soil Complies with MTCA Method A
- Soil and Groundwater Comply with MTCA Method A
- Soil Exceeds but Groundwater Complies MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

- Sample Existing Groundwater Well

*Geoprobe Locations*

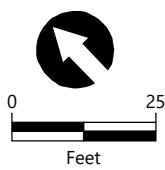
- Groundwater Sampling
- Soil Sampling

*Porewater Locations*

- Porewater Sampling Location

**NOTES:**

- Aerial Imagery from City of Tacoma 2018.
- Porewater will be collected at two elevations at the designated sampling location.
- Arsenic was detected at 5 ug/L (dissolved) and 8 ug/L (total) at shoreline well location HC-N202122-9 in 2014. The arsenic is likely a turbidity artifact. The concentrations are also within the range identified by Ecology as typical of background Puget Sound area groundwater (Ecology, 2022).

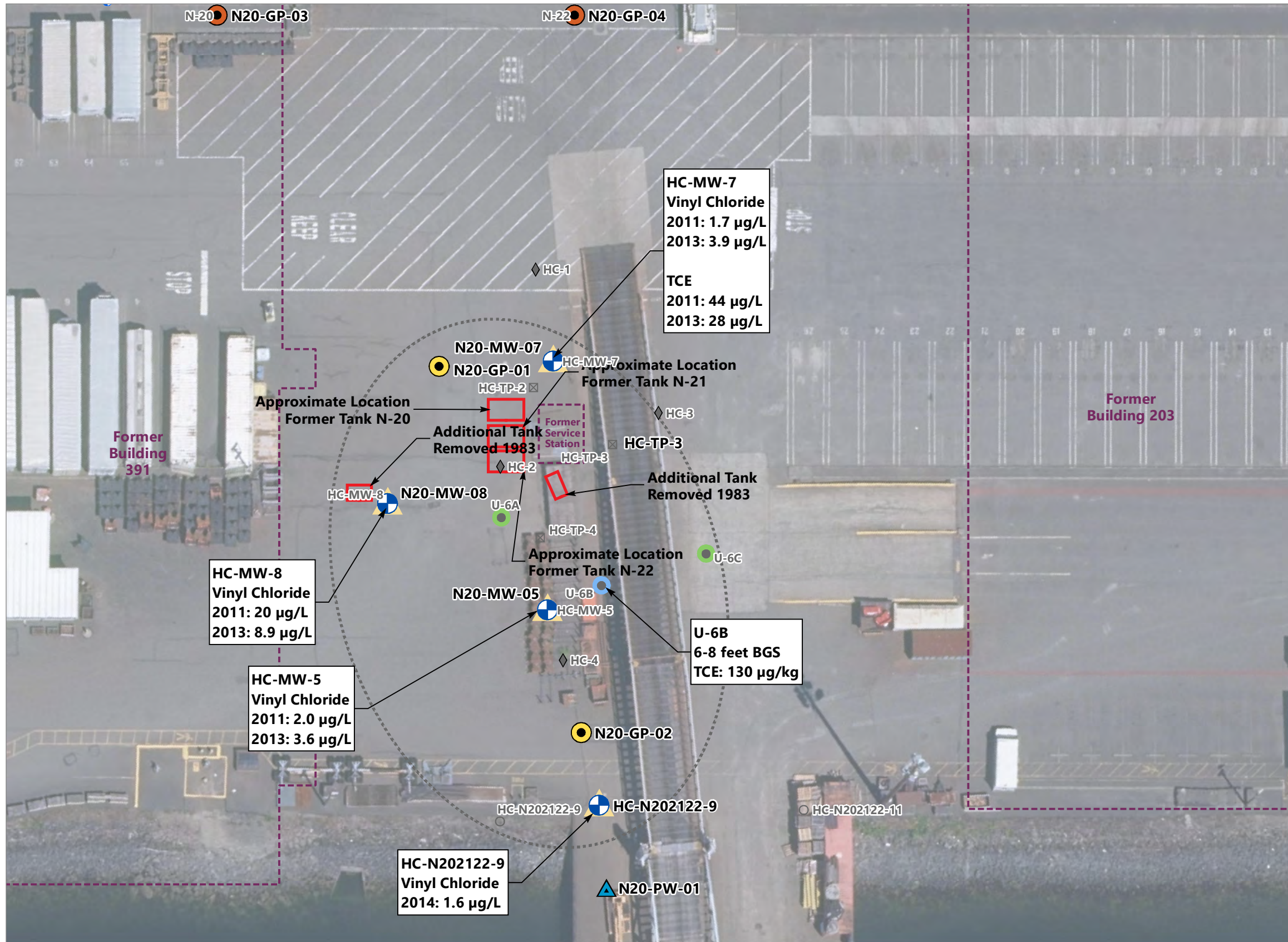


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**Figure 9a**  
**Group 3 Tank Area: N-20/21/22 Planned Sample Locations and Petroleum Constituents**

Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



**LEGEND:**

- Yard Lease Lines
- Former Building Location

**Tank Location and Group**

- Group 3 Tanks
- Estimated Extent of Groundwater Impacts

**Historical Sampling Methods and Data**

- Monitoring Well – Active
- Soil Boring (Screening Only)
- Soil Boring (with Soil Data)
- Soil and Groundwater Boring
- Test Pit
- Groundwater Exceeds MTCA A
- Soil Complies with MTCA Method A
- Soil Exceeds MTCA Method A

**Proposed Monitoring Locations**

*Monitoring Well Locations*

- Sample Existing Groundwater Well

*Geoprobe Locations*

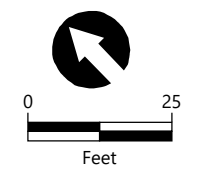
- Groundwater Sampling
- Soil Sampling

*Porewater Locations*

- Porewater Sampling Location

**NOTES:**

- Aerial Imagery from City of Tacoma 2018.
- Porewater will be collected at two elevations at the designated sampling location.

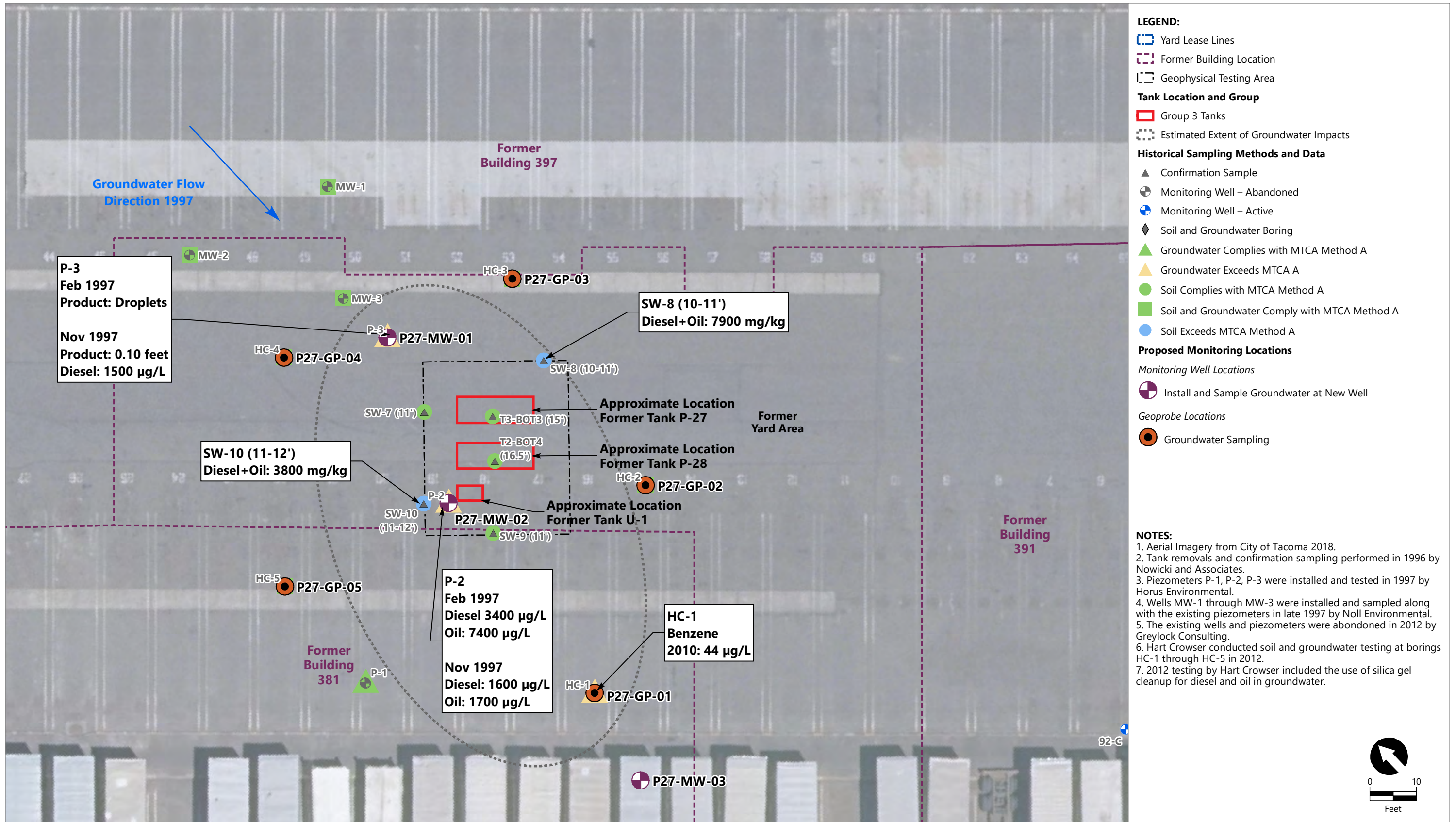


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**Figure 9b**  
**Group 3 Tank Area: N-20/21/22 Planned Sample Locations and CVOC Compounds**

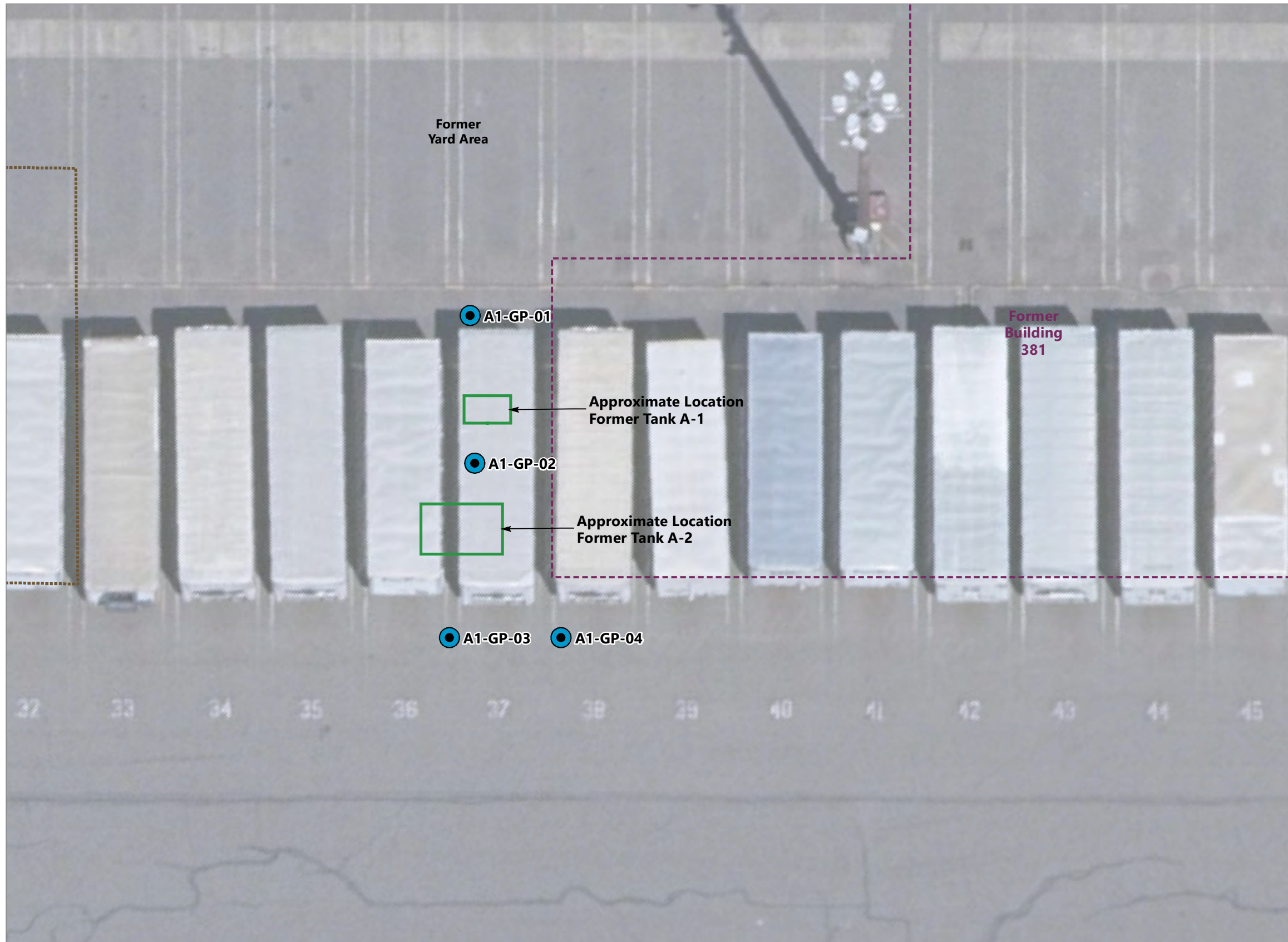
Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



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**Figure 10**  
**Group 3 Tank Area: P-27/P-28 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



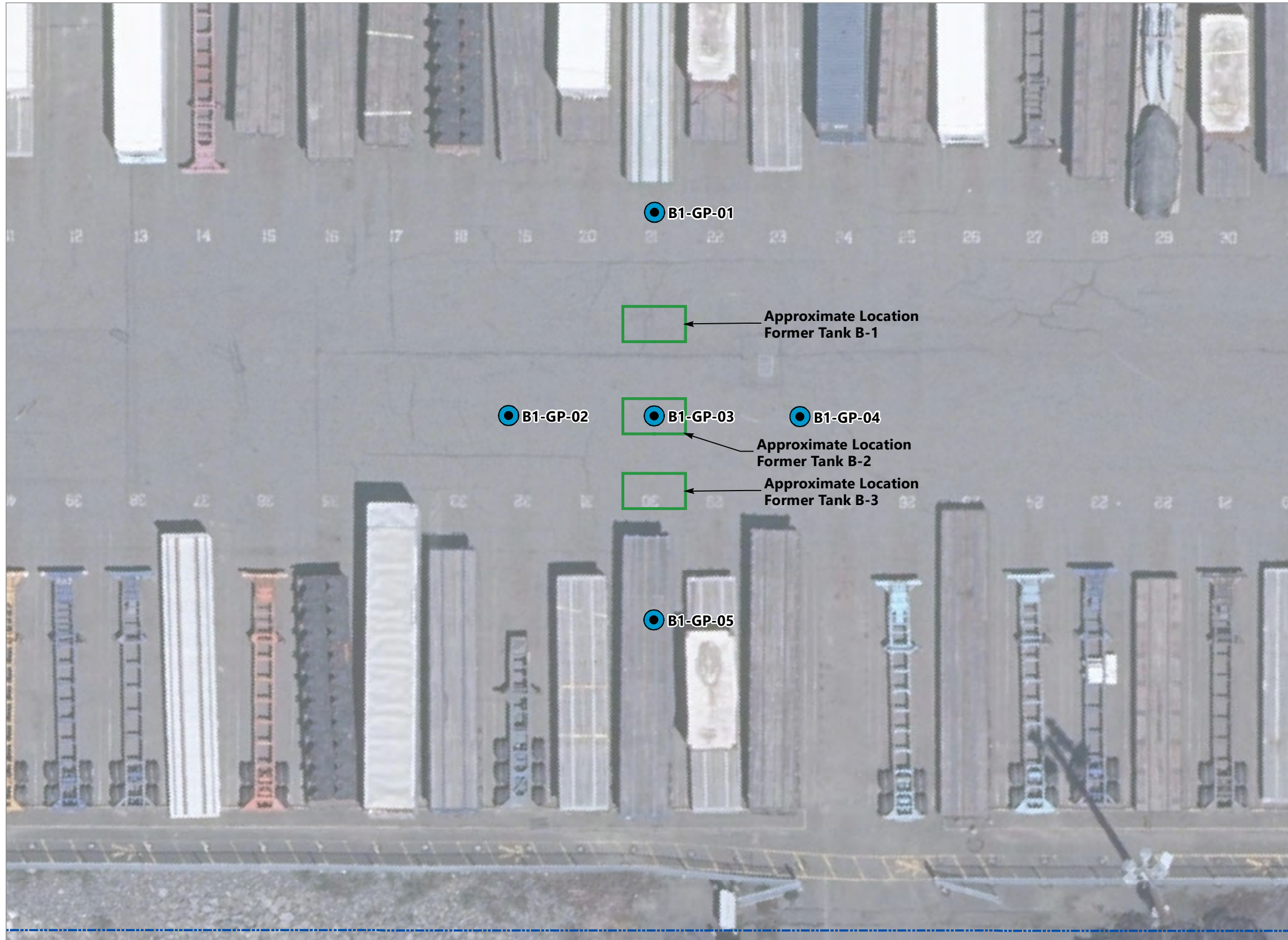
- LEGEND:**
- Yard Lease Lines
  - Former Building Location
  - Tank Location and Group**
  - Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater and Soil Sampling
  - Magnetometer Survey Area




**NOTES:**  
 1. Aerial Imagery from City of Tacoma 2018.

Publish Date: 2022/04/27, 10:30 AM | User: tweldy  
 Filepath: \\orcas\GIS\Jobs\Port\_of\_Tacoma\_0092\TOTE\_USTs\_Cleanup\_Plan\Maps\Reports\DataGapsWorkPlan\SQAPP\AQ\_TOTEUST\_DGWP\_Fig03to13\_TankAreaMonitoring.mxd

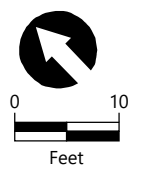


**Figure 11**  
**Group 4 Tank Area: A-1/2 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



- LEGEND:**
-  Yard Lease Lines
  - Tank Location and Group**
  -  Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  -  Groundwater and Soil Sampling

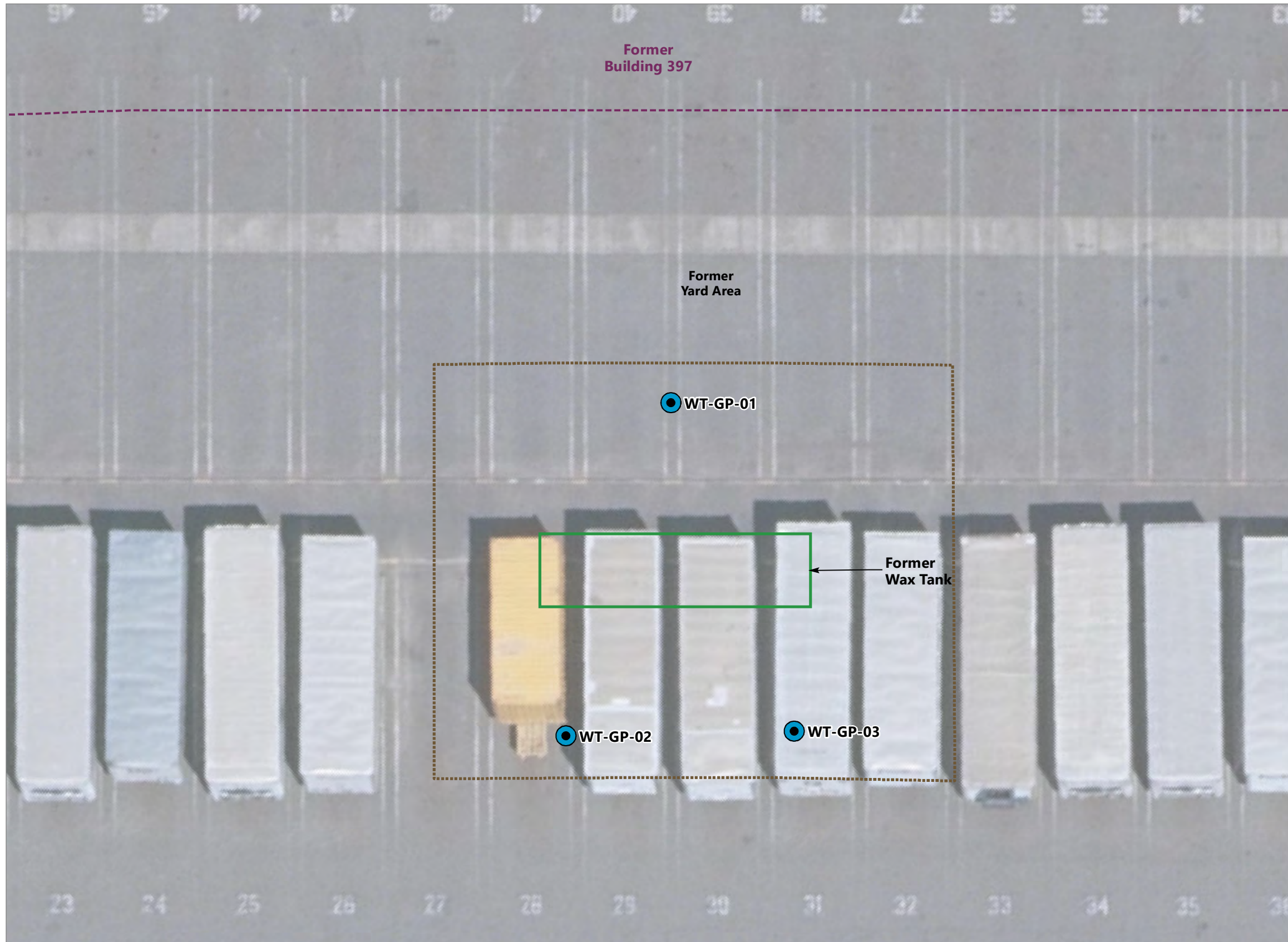
**NOTES:**  
 1. Aerial Imagery from City of Tacoma 2018.



Publish Date: 2022/04/27, 10:31 AM | User: tweldy  
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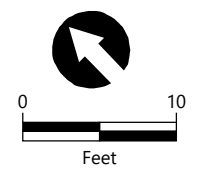


**Figure 12**  
**Group 4 Tank Area: B-1/2/3 Planned Sample Locations**  
 Sampling and Quality Assurance Project Plan  
 Port of Tacoma TOTE USTs



- LEGEND:**
- Yard Lease Lines
  - Former Building Location
  - Tank Location and Group**
  - Group 4 Tanks
  - Proposed Monitoring Locations**
  - Geoprobe Locations*
  - Groundwater and Soil Sampling
  - Magnetometer Survey Area

**NOTES:**  
1. Aerial Imagery from City of Tacoma 2018.



Publish Date: 2022/04/27, 10:31 AM | User: tweldy  
Filepath: \\orcas\GIS\Jobs\Port\_of\_Tacoma\_0092\TOTE\_USTs\_Cleanup\_Plan\Maps\Reports\DataGapsWorkPlan\SQAPP\AQ\_TOTEUST\_DGWP\_Fig03to13\_TankAreaMonitoring.mxd



**Figure 13**  
**Group 4 Tank Area: Wax Tank Planned Sample Locations**

Sampling and Quality Assurance Project Plan  
Port of Tacoma TOTE USTs

Attachment A

Forms

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**Visual soil descriptions consist of the following:**

GROUP NAME AND MODIFIER (GROUP SYMBOL): @Depth Interval: Moisture content, density/consistency, color, % major constituent (structure descriptions as needed), % minor constituent (minor modifier, structure descriptions [as needed]); amount of minor constituents (e.g., organics and anthropogenics, shape, size as needed); biota (type, size as needed); odor and intensity; sheen (color and distribution as needed); color, amount, and viscosity of nonaqueous phase liquid (NAPL).

Depths are in recovered units = measured in the field, actual soil depth from sampler

Soil Description Terminology		
<b>1. Moisture Content</b>		
Dry	Absence of moisture, dusty, dry to the touch	
Moist	Damp, but no visible water	
Wet	Visible free water	
<b>2. Density (Boring Drive Penetration and Finger Pressure)</b>		
<b>SAND or GRAVEL</b>		
<b>Density</b>	<b>Visual</b>	<b>Notes</b>
Very loose	Freefall	May occur at the top
Loose	Easy penetration	
Medium dense	Moderate penetration	Typically down boring due to compaction or compression
Dense	Hard penetration	Bottom of a boring, typical to glacial deposits or bedrock
Very dense	Refusal	
<b>SILT or CLAY</b>		
<b>Consistency</b>	<b>Visual</b>	<b>Notes</b>
Very soft	Freefall	Soupy, not cohesive
Soft	Easy penetration	Easily penetrated, just starting to be cohesive
Medium stiff	Moderate penetration	Cohesive, molded by finger pressure
Stiff	Hard penetration	Can indent and mold by stiff finger pressure
Very stiff/hard	Refusal	Modeling clay (rolls to a ball)
<b>3. Color and Shading</b>		
<b>Example Colors</b>		<b>Shades</b>
Black		Light
Browns (olive, yellow, red)		Dark
Grays (gray, olive, brown)		Very dark
Mottling: Streaks or spots of a minor color within the larger color unit		
<b>4. Minor and Major Group Name</b>		
GRAVEL, POORLY GRADED GRAVEL, WELL GRADED GRAVEL		SILT, ELASTIC SILT CLAY, LEAN CLAY, FAT CLAY
SAND, POORLY GRADED SAND, WELL GRADED SAND		ORGANIC SILT, ORGANIC SOIL, PEAT
BACKFILL		ASPHALT
BEDROCK		CEMENT
<p>*Group name defined by soil component greater than 50%. MAJOR is written in all CAPITAL LETTERS in draft field logs, in final logs the GROUP NAME including MODIFIERS and SYMBOL are CAPITALIZED. If the soil may fall into one of two groups, a borderline major group name may be used (e.g., CLAYEY SILT). Minor constituent modifiers are included in descriptions following the percentage. See Pattern Key below for Unified Soil Classification System (USCS) symbols associated with group names.</p>		

Major Group Name Modifiers	Percent
<b>Coarse Grained Soil</b>	
WITH SILT, WITH CLAY	10-15 (fine grained)
WITH SAND, WITH GRAVEL	Greater than 15 (coarse grained)
SILTY, CLAYEY	Greater than 15 (fine grained)
<b>Fine Grained Soil</b>	
WITH SAND, WITH GRAVEL	15-30 (coarse grained)
SANDY, GRAVELLY	Greater than 30 (coarse grained)
*Multiple major group modifiers can be used based upon the relative percentages of soil components.	
<b>Soil Description Terminology</b>	
<b>Descriptors</b>	
Sand and Gravel	Rounding (subrounded, subangular, etc.)
	Grading (poorly = homogenous, well = wide range of sizes)
	Grain color (black, white, gray, yellow, etc.)
<b>5. Other Minor Constituents: % by volume (e.g., organics and anthropogenics)*</b>	
<b>Other Minor Constituents*</b>	
Trace	0 to 5
Occasional	5 to 10
Moderate	10 to 30
Substantial	30 to 50
*Separate major from other minor constituents with a period	
<b>6. Biota</b>	
Marsh grass, shells, worms, etc.	
<b>7. Odor Descriptions (No odor detected unless noted)</b>	
<b>Intensity</b>	
<b>Odor Types</b>	
Trace (faint)	Petroleum-like
Moderate (obvious)	Naphthalene-like
Strong (overwhelming)	H2S-like (hydrogen sulfide-like)
	Septic-like
	Solvent-like
	Metallic-like
<b>8. Visual Impacts</b>	
<b>8a. Sheen (No sheen observed unless noted)</b>	
(Modified from ASTM F2534-06)	
<b>Components of a sheen description:</b> Start and end depths, modifier describing relative sample surface area with sheen, sheen color, description of sheen distribution.	
Silvery	Metallic, silver/gray colored
Rainbow	Multicolored
Dark Rainbow	Multicolored with some dark metallic or brown/black coloring
Dark	Dark metallic or brown/black colored
<b>Sheen Distribution Terminology</b>	
Streaks	Flat, lines of sheen (describe size and number)
Florets	Semi-circular, flat, spots of sheen (described size and number)
Covered	Sheen appears continuous over a portion of the sample surface
<b>Distinguishing hydrocarbon-sheen from biological-sheen:</b> If disturbed, a hydrocarbon-sheen will typically coalesce, where an inorganic sheen will break apart and has a blocky appearance	

Modifiers	
Amount	Percent
Trace	Less than 2
Slight	2 to 15
Moderate	15 to 40
Moderate to heavy	40 to 70
Heavy	Greater than 70
Soil Description Terminology	
8b. NAPL	
<b>Components of a NAPL description:</b> Start and end depths, color, amount (blebs, coated, saturated); bleb frequency/percent of sample covered or soaked; viscosity	
<b>Note:</b> As noted in the FSAP, shake tests will be performed to confirm NAPL observations as required based on the field program. Observations of sheen or NAPL on the sampling equipment during sampling will be recorded on the sampling log. Observation of sheen only is not considered NAPL.	
Blebs	Observed discrete sphericals of NAPL but for the most part, the soil matrix was not visibly contaminated or saturated. Typically this is residual product. The estimated size and number of blebs should be reported.
Coated	Soil grains are coated with NAPL. There is not sufficient NAPL material present to saturate the pore spaces. The degree of coating should be described as light, moderate, or heavy.
Saturated	The entirety of the pore space for a sample is saturated with the NAPL. Care should be taken to ensure that water saturating the pore spaces is not observed when using this term. Depending on viscosity, NAPL-saturated materials may freely drain from a soil sample.
Relative Viscosity	
High viscosity	Taffy-like
Viscous	No. 6 fuel oil or bunker crude-like (molasses-like)
Low viscosity	No. 2 fuel oil-like
Soil Description Terminology	
Structure and Other Soil Descriptions	
Hummocky	Cohesive soil that can be broken down into smaller lumps
Gummy	Cohesive, pliable soil with high percentage of clay
Holds Shape/Does Not Hold Shape	When soil is shaped it either is cohesive and holds shape or does not
Bed	Greater than or equal to 0.5 inch thick
Thin bed	Less than 0.5 inch thick
Pockets	Semi-circular to circular inclusion/deposit
Laminated beds	Thin beds (less than 0.5 inch thick) lying between or alternating within a greater unit
Stratified beds	Beds (greater than 0.5 inch thick) lying between or alternating within a greater unit
Organic matter	Mass of leaves, twigs, wood, etc.
Anthropogenic material	Material originated from industrial activity such as coal fragments, slag, etc.
Aggregates/Slag	Industrial waste products
Anthropogenic debris	Debris originated from human activity such as trash, plastic, etc.
Decomposed	Visible sign of decomposition or discoloration
Fresh	No visible sign of decomposition or discoloration
Winnowed	Loss of material that occurred during coring, creating a washed-out void space

Contacts	
@	Compositional change or presence of minor constituent, if an organic or anthropogenic change the line is indented and the description is not repeated
-----	Major unit change/non-discrete, gradational contact (dashed line), not included for contacts within one group symbol
=====	Major unit change/visually discrete, abrupt contact (solid line)
Stratigraphic Units	
Soil	Brown to black material containing decomposed organic material, clay, and rock particles lying above bedrock
Bedrock	Solid rock underlying loose deposits such as soil or alluvium
Fill	Soils and anthropogenic miscellaneous materials placed during industrialization of an area, consisting of a wide range of materials including sand, gravel, coal ash, bricks, concrete, wood, or other types of debris

**Notes:**

\*Classification of soil on boring logs is based on visual field observations, which include density/consistency, grain size, and plasticity estimates, and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification method ASTM D-2488 for the description and identification of soils was used as an identification guide.

Station IDs: Multiple borings may be taken at each sampling station to collect adequate volume for analysis. Co-located borings are labeled with sequential letters (A-H) within the station identification (ID) to differentiate each accepted attempt. Attempt numbers reflect the attempt count for each co-located boring (A-H) and not the overall station attempt count.

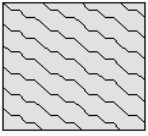
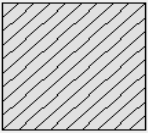
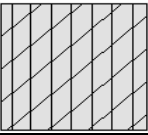
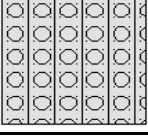
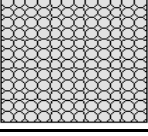
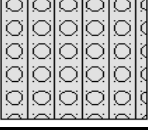
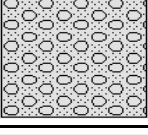
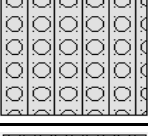

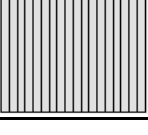
**Acronyms/terms used in boring logs:**

NAD83 NYLI = North American Datum of 1983 New York Long Island  
 NAPL = nonaqueous phase liquid  
 NAVD88 = North American Vertical Datum of 1988  
 PID = Photo-ionization detector, measures volatile organic compounds (VOCs)  
 ppmv = parts per million by volume  
 SO = soil boring

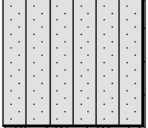
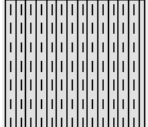

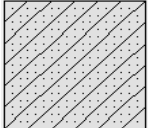
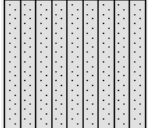
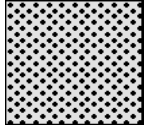
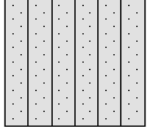
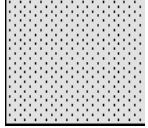
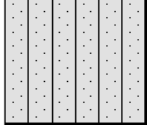

**Note:**

Summary sketch column may include a graphical depiction of the soil description, including the USCS major group name pattern

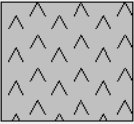

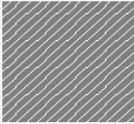
## Physical Description of Soil Key

Pattern Key (Recovered Interval Column)		
Major Group Name	Symbol	Pattern
Fat Clay, Fat Clay with Sand, Sandy Fat Clay	CH	
Lean Clay, Lean Clay with Sand, Sandy Clay	CL	
Clayey Silt, Sandy Clayey Silt	ML/CL	
Silty Gravel, Silty Gravel with Sand	GM	
Poorly Graded Gravel, Poorly Graded Gravel with Sand	GP	
Poorly Graded Gravel with Silt, Poorly Graded Gravel with Silt and Sand	GP-GM	
Well Graded Gravel, Well Graded Gravel with Sand	GW	
Well Graded Gravel with Silt and Sand	GW-GM	
Elastic Silt, Elastic Silt with Sand, Sandy Elastic Silt, Sandy Elastic Silt with Gravel, Elastic Silt with Gravel, Gravelly Elastic Silt, Gravelly Elastic Silt with Sand	MH	
Silt, Silt with Sand, Sandy Silt, Sandy Silt with Gravel, Silt with Gravel, Gravelly Silt, Gravelly Silt with Sand	ML	

## Physical Description of Soil Key

Pattern Key		
Major Group Name	Symbol	Pattern
Organic Soil, Organic Soil with Sand, Organic soil with Gravel, Sandy Organic Soil, Sandy Organic Soil with Gravel, Gravelly Organic Soil, Gravelly Organic Soil with Sand	OL/OH	
Organic Silt	OL	
Peat	PT	
Clayey Sand, Clayey Sand with Gravel	SC	
Silty Sand, Silty Sand with Gravel	SM	
Poorly Graded Sand, Poorly Graded Sand with Gravel	SP	
Poorly Graded Sand with Silt, Poorly Graded Sand with Silt and Gravel	SP-SM	
Well Graded Sand, Well Graded Sand with Gravel	SW	
Well Graded Sand with Silt, Well Graded Sand with Silt and Gravel	SW-SM	
Backfill	NA	

## Physical Description of Soil Key

Pattern Key		
Major Group Name	Symbol	Pattern
Bedrock	NA	
Asphalt	NA	
Cement	NA	







# Appendix B

## Health and Safety Plan

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June 2022  
Tote Property USTs Project



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# Health and Safety Plan

Prepared for Port of Tacoma



June 2022  
Tote Property USTs Project

# Health and Safety Plan

**Prepared for**  
Port of Tacoma  
One Sitcum Plaza  
Tacoma, Washington 98401

**Prepared by**  
Anchor QEA, LLC  
1119 Pacific Avenue Suite 1600  
Tacoma, WA 98402

# Certification Page

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Project Manager  
Anchor QEA, LLC

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Stephen Strehl  
Field Lead  
Anchor QEA, LLC

Date: [Click here to enter a date.](#)

Date: [Click here to enter a date.](#)

The information in this Health and Safety Plan has been designed for the Scope of Work presently contemplated by Anchor QEA, LLC (Anchor QEA). Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Anchor QEA only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

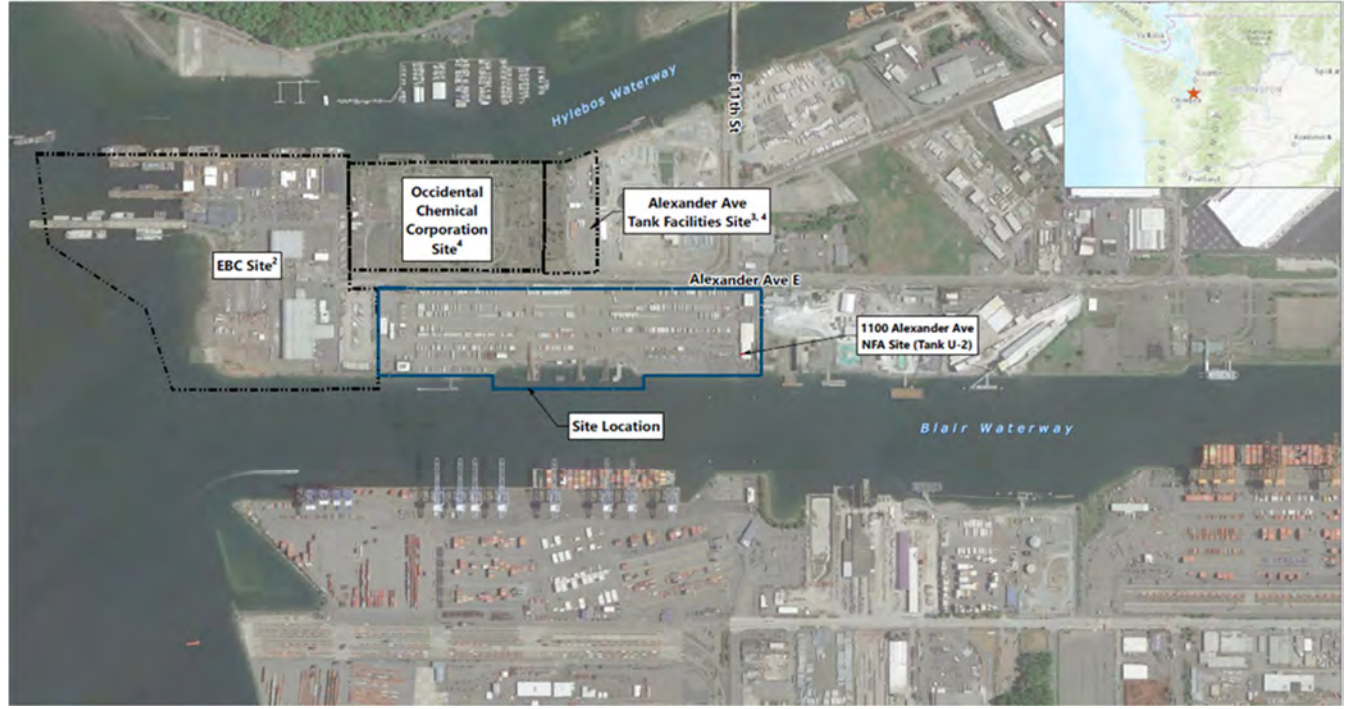




# Site Emergency Procedures

## Site Map

**Figure A**  
**General Site Location Overview**



## Emergency Contact Information

**Table A**  
**Site Emergency Form and Emergency Phone Numbers\***

Category	Information
Possible Chemicals of Concern	PAHs, vinyl chloride, petroleum products, benzene, TCE
Minimum Level of Protection	Modified Level D
Site(s) Location Address	500 Alexander Ave, Tacoma, WA 98421
<b>Emergency Phone Numbers</b>	
Ambulance	911
Fire	911
Police	911
Poison Control	(800) 222-1222

Category	Information	
Client Contacts	Sarah Weeks	Cell: (253) 383-9450 Cell: (360) 319-1413
Project Manager (PM)	Niklas Bacher	Office: (206) 903-3376 Cell: (206) 351-0951
Field Lead (FL)	Stephen Strehl	Office: (206) 219-5908
Corporate Health and Safety Manager (CHSM)	David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279
Health and Safety Program Lead	Tim Shaner	Office: (251) 375-5282 Cell: (251) 281-3386
State Emergency Response System	(800) 258-5990	
EPA Emergency Response Team, <sup>1</sup> Region 10	(800) 424-4EPA	

Notes:

\* In the event of any emergency, contact the PM and FL.

1. For local resources, please visit: <http://www2.epa.gov/emergency-response/emergency-response-my-community>. The National Response Center hotline is 1-800-424-8802.

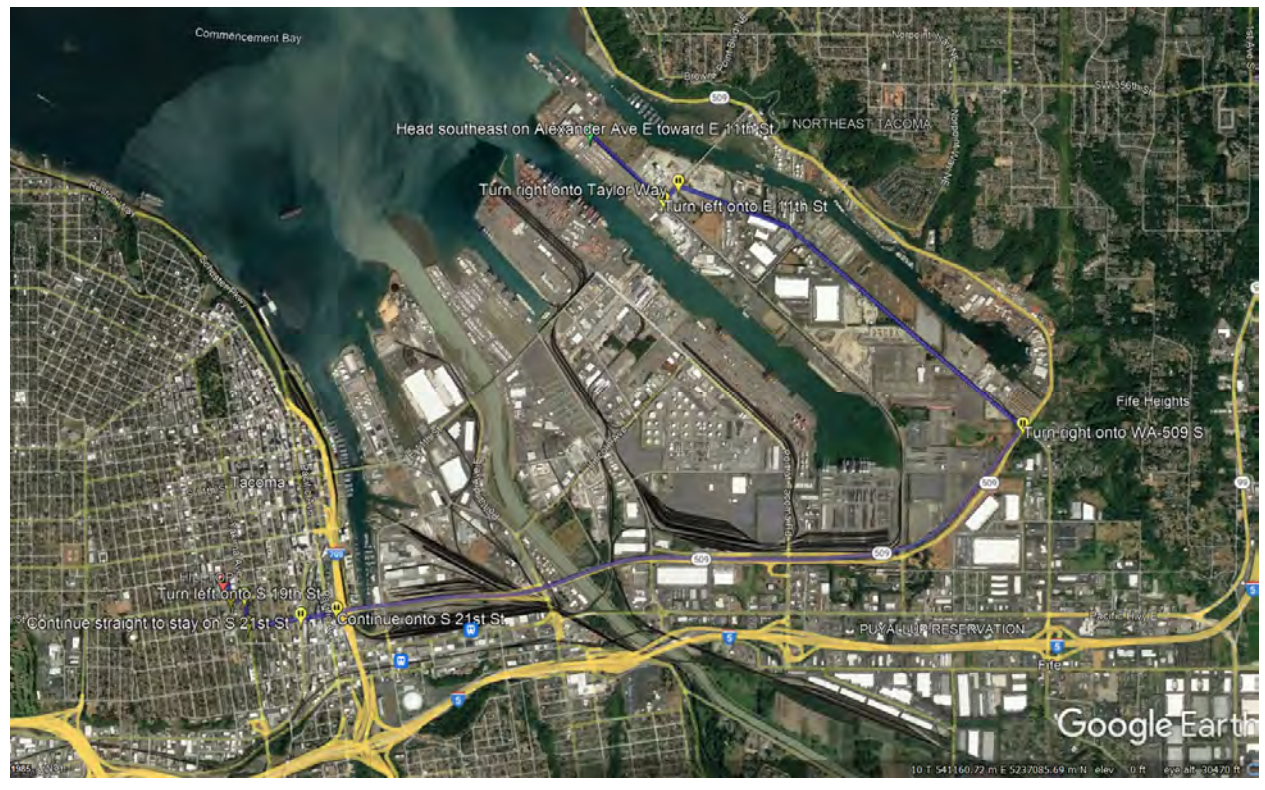
**Table B**  
**Hospital Information**

Category	Information
Hospital Name	Saint Joseph's Hospital
Address	1717 S J St
City, State	Tacoma, WA 98405
Phone	(253) 426-4101
Emergency Phone	911

## Hospital Route Map and Driving Directions

1. Head southeast on Alexander Ave E toward E 11th St (0.2 mi)
2. Turn left onto E 11th St (0.1 mi)
3. Turn right onto Taylor Way (2.2 mi)
4. Turn right to onto WA-509 S toward City Center (3.9 mi)
5. Continue straight onto S 21<sup>st</sup> St (0.9 mi)
6. Turn right onto Jefferson Ave (120 ft)
7. Slight left onto Market St (0.1 mi)
8. Turn left at the 1<sup>st</sup> cross street onto S 19<sup>th</sup> St (0.4 mi)
9. Turn right onto S J St (450 ft)
10. 1717 S J St on right

**Figure B  
Hospital Route Map**



## Care Management - WorkCare Incident Intervention

Anchor QEA has an additional Incident Intervention resource from WorkCare to help answer questions, alleviate uncertainty and stress in a potential injury situation, and maintain the health and safety of its employees. Incident Intervention is an injury and illness management tool that provides employees with 24/7 immediate telephone access to a member of WorkCare’s clinical staff of nurses and physicians who intervene at the time of a workplace injury or illness. Contact information is provided below:

- **Access WorkCare 24/7 from anywhere using the toll free number: 1-888-449-7787**

At the time of a workplace injury or illness, the employee, manager or another employee at the scene notifies WorkCare using the toll free number listed above. The caller provides information on the type of incident, possible cause, and the scope of the situation. With the details of the incident recorded, an experienced nurse or physician provides the following:

- Responsive evaluation of the incident
- Direction on the appropriate course of action

- Consultation with the employees' treating physician to design a quality care treatment plan that meets the needs of the employee and employer

All employees are encouraged to utilize this service should a workplace injury or illness occur.

## Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this Health and Safety Plan (HASP) for a description of the role and responsibility of each.

Client Contacts: Sarah Weeks	Office: (253) 383-9450 Cell: (360) 319-1413
Project Manager (PM): Niklas Bacher	Office: (206) 903-3376 Cell: (206) 351-0951
Field Lead (FL): Stephen Strehl	Office: (206) 219-5908
Corporate Health and Safety Manager (CHSM): David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279
Health and Safety Program Lead	Office: (251) 375-5282 Cell: (251) 281-3386

## Personal Incident Response Procedures

In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline and refer to Figure C:

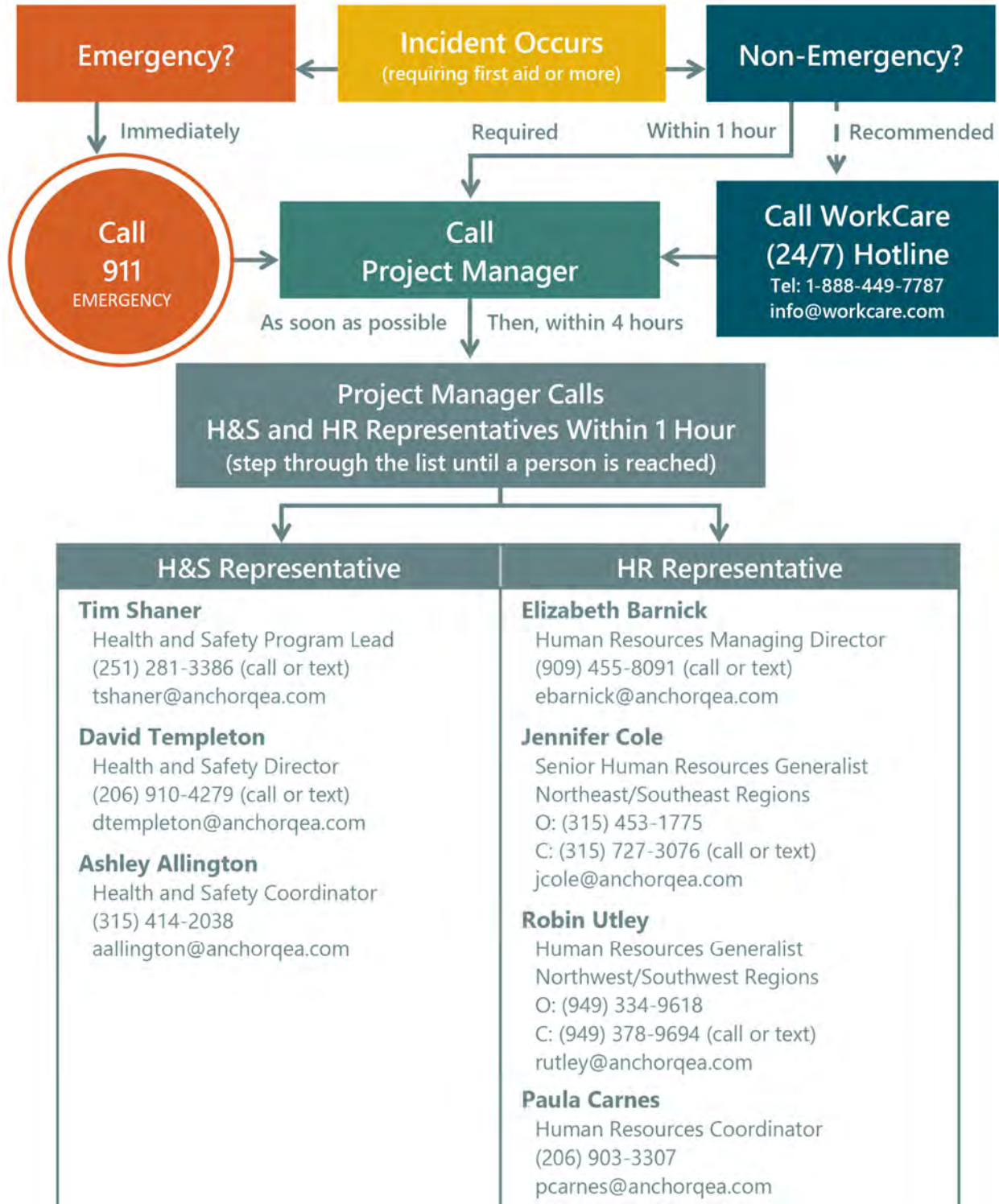
11. Survey the situation to verify that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Verify that all protocols are followed. If applicable, review Safety Data Sheets (SDS) to evaluate response actions for chemical exposures.
12. Call the appropriate emergency number (911, if available) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
13. Have someone retrieve the nearest first aid kit (containing appropriate items for the particular work scope) and Automated External Defibrillator (AED), if available. Note: Only use an AED if you have been properly trained and are currently certified to do so.
14. Decontaminate the victim without delaying life-saving procedures (see Section 8).
15. Administer first aid and cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.<sup>1</sup>

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<sup>1</sup> Personnel qualified and currently certified in basic first aid or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught. Do not perform first aid or CPR tasks if you have not been trained in first aid or CPR.

16. In the event that evacuation is required, the FL must perform a head count to verify that all Anchor QEA personnel are accounted for.
17. Notify the Field Lead (FL) and Project Manager (PM); the PM will notify the client contact. The PM will also contact the Corporate Health and Safety Manager (CHSM). The CHSM will facilitate the incident investigation. All client requirements pertinent to personal incident reporting will also be adhered to.
18. Complete the appropriate incident investigation reports.

Health and Safety: Incident Flowchart—What To Do If You Are Injured



## **Non-Personal Incident Response Procedures**

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific HASP. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided within 72 hours.

### *Spills and Releases of Hazardous Materials*

When required, notify the National Response Center and local state agencies. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of incident location
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside the facility

The emergency telephone number for the National Response Center is (800) 424-8802. If hazardous waste is released or produced through control of the incident, verify the following:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed

Verify that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

## **Near-Miss Reporting**

All near-miss incidents (i.e., those that could have reasonably led to an injury, environmental release, or other incident) must be reported to the FL and PM immediately, so action can be taken to verify that such conditions that led to the near-miss incident are readily corrected to prevent future occurrences.

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Appendix B	Job Safety Analysis (JSA) Documents
Appendix C	Safety Data Sheets (SDS)

## ABBREVIATIONS

° C	degrees Celsius
° F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
ASTM	ASTM International
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
COC	chemical of concern
CPR	Cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dB	A-weighted decibel
dB	decibel
DOT	U.S. Department of Transportation
DPT	Direct Push Technology
EPA	U.S. Environmental Protection Agency
eV	electron volts
EZ	Exclusion Zone/Hot Zone
FL	Field Lead
GFCI	Ground-fault Circuit Interrupter
H:V	horizontal to vertical
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HMIS	Hazardous Material Information System
IDLH	Immediately Dangerous to Life or Health
IP	Ionization Potential
JSA	Job Safety Analysis
kV	kilovolts
LEL	Lower Explosive Limit
LO/TO	Lockout/Tagout
mg/m <sup>3</sup>	milligrams per cubic meter
MHR	Maximum Heart Rate
MLLW	mean lower low water
MUTCD	Manual of Uniform Traffic Control Devices

NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
NRR	Noise Reduction Rating
O <sub>2</sub>	oxygen
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Act or Administration
OV	Organic Vapor
OVM	Organic Vapor Monitor
PAHs	polycyclic aromatic hydrocarbon
P.E.	Professional Engineer
PEL	Permissible Exposure Limit
PFD	personal flotation device
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	parts per million
PRCS	Permit-Required Confined Spaces
PVC	Polyvinyl Chloride
QLFT	Qualitative Fit Test
REL	Recommended Exposure Limits
RCRA	Resource Conservation and Recovery Act
SDS	Safety Data Sheets
STEL	Short Term Exposure Limit
SZ	Support Zone/Clean Zone
TLV	Threshold Limit Value
TSD	Treatment, Storage, and Disposal Facility
tsf	ton per square foot
TWA	time-weighted average
TWIC	Transportation Worker Identification Credential
USCG	U.S. Coast Guard
UV	ultraviolet
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature

# 1 Introduction

This Health and Safety Plan (HASP) has been prepared on behalf of Port of Tacoma and presents health and safety requirements and procedures that will be followed by Anchor QEA, LLC personnel and at a minimum by its subcontractors during work activities at the Sitcum Waterway Remediation Project Site (the site). This HASP has been developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120 (b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.1 for HASP modification procedures.

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project. A copy of this HASP must be maintained on site and available for employee review at all times. Anchor QEA subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the project site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of the HASP.

Subcontractors are ultimately responsible for the health and safety of their employees. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Corporate Health and Safety Manager (CHSM).

Issuance of this approved plan documents that the workplace has been evaluated for hazards. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d) – Personal Protective Equipment, General Requirements (general industry); 1910.134 – Respiratory Protection; 1926.28 – Personal Protective Equipment (construction industry); and 1926.55 – Gases, vapors, fumes, dusts and mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

## **1.1 Health and Safety Plan Modifications**

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the "Modification to Health and Safety Plan" form included in Appendix A. Modifications will be reviewed by the Health and Safety Program Lead or authorized representative and approved by the PM.

## 2 Site Description and Background Information

### 2.1 Site Description and Background

The project site (Site) is currently leased by TOTE from the Port of Tacoma. During the early 1900s, the Site and surrounding areas were developed for industrial use as a shipyard and sawmill complex. Since this initial industrial development in the early 1900s, the Site and vicinity have remained in industrial use. The Site and vicinity are zoned for Port Maritime and Industrial Uses.

The historic shipyard and sawmill complex at the Site was run by the Navy during World War II. The Port acquired the Property in 1960. Many of the buildings from the Navy operations remained in place at that time. No documents have been identified specifically listing Tanks present/operational at the time of the property transfer. But various maps and photographs from the prior period of Navy operations are available documenting certain Tanks that were present at that time.

The purposed of the DGWP activities is to resolve the remediation status of Tanks that were either 1) of unknown removal status, or 2) that had been removed but contamination of soil or groundwater was known or suspected. Excluding Tanks that have been managed under separate remediation projects, the Project addresses a total of 18 Tanks formerly located at the Site. Proposed activities for the Data Gaps Work Plan (DGWP) consist of groundwater well installation and monitoring, soil boring, and porewater sampling.

## 3 Scope of Work

### 3.1 Project Scope of Work

This plan addresses health and safety issues associated with the following field tasks:

- Travel to and from the site
- Working in and around water
- Operation of research vessel
- Installation of groundwater monitoring wells
- Conduct sampling of new and existing monitoring wells
- Conduct soil borings and sampling of soil
- Conduct porewater sampling

## 4 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Emergency Site Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911**, and should be used for all medical, fire, and police emergencies.

### 4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the FL and CHSM to ensure that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM performs the following tasks:

- Oversees the preparation and organization of background review of the project, the work plan, and the field team
- Ensures that the team obtains permission for site access and coordinates activities with appropriate officials
- Briefs the FL and field personnel on specific assignments
- Together with the FL, sees that health and safety requirements are met
- Consults with the CHSM regarding unsafe conditions, incidents, or changes in site conditions or the Scope of Work

### 4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, will coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field crew have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if

conditions arise that warrant revision or amendment of this HASP. It is critical that both the FL and PM communicate regularly to proactively identify and address any safety-related concerns that may arise. The following include, but are not necessarily limited to, the functions of the FL related to this HASP:

- Conduct and document daily safety meetings, or designate an alternate FL in his or her absence
- Execute the work plan and schedule
- Conduct periodic field health and safety inspections to ensure compliance with this HASP
- Oversee implementation of safety procedures
- Implement worker protection levels
- Enforce site control measures to help ensure that only authorized personnel are allowed on site
- Notify, when necessary, local public emergency officials (all personnel on site may conduct this task as needed)
- Follow-up on incident reports to the PM
- Periodically inspect protective clothing and equipment for adequacy and safety compliance
- Ensure that protective clothing and equipment are properly stored and maintained
- Perform or oversee air monitoring (if required) in accordance with this HASP
- Maintain and oversee operation of monitoring equipment and interpretation of data from the monitoring equipment
- Monitor workers for signs of stress, including heat stress, overexertion, cold exposure, and fatigue
- Require participants to use the “buddy” system in performing tasks
- Provide (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers for the local hospital, poison control center, fire department, and police department
- Communicate incidents promptly to the PM
- Maintain communication with the CHSM on site activities
- If applicable, ensure that decontamination and disposal procedures are followed
- Maintain the availability of required safety equipment
- Advise appropriate health services and medical personnel of potential exposures
- Notify emergency response personnel in the event of an emergency and coordinate emergency medical care

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day’s entries must include the following information:

- Project name or location
- Names of all on-site personnel

- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

### 4.3 Corporate Health and Safety Manager

The CHSM (or his/her designee) will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety issues. The following are specific duties of the CHSM:

- Provide technical input into the design and implementation of this HASP
- Advise on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards
- Ensure that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document
- Consult with the FL on matters relating to suspending site activities in the event of an emergency
- Verify that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form
- Verify that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective

The CHSM or his/her designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates as well as the 8-hour Supervisor training, and will have medical monitoring clearance. In addition, the CHSM or his/her designee will have current training in first aid and CPR.

### 4.4 Project Field Team

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work on site. All field crew, including subcontractors, must be familiar with and comply with this HASP. The field crew has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL, and all members of the field crew have **STOP WORK AUTHORITY**—the authority to stop or suspend work if

conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if conditions arise that warrant revision or amendment of this HASP. It is critical that all field team members proactively communicate with the FL to identify potential unsafe conditions. The field team reports to the FL for on-site activities and is responsible for the following:

- Reviewing and maintaining a working knowledge of this HASP
- Safe completion of on-site tasks required to fulfill the work plan
- Compliance with the HASP
- Attendance and participation in daily safety meetings
- Notification to the FL of existing or potential safety conditions at the site
- Reporting all incidents to the FL
- Demonstrating safety and health-conscious conduct

Per OSHA 1910.120(e)(3)(i)<sup>2</sup>, newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (preferably an individual with HAZWOPER Supervisor training). It is the responsibility of the PM to identify such “short service” personnel and ensure that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Appendix A).

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<sup>2</sup> “General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.”

## 5 Project-specific Requirements

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the Scope of Work and the chemicals of concern (COCs).

### 5.1 Activity-specific Level of Protection Requirements

Refer to Section 10 of this plan for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs (i.e., if the results of air monitoring reveal that action levels have been exceeded). Hearing protection must be worn when there are high noise levels. Workers must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1, Project Job Tasks and Required PPE, describes the specific means of protection needed for each identified work activity.

### 5.2 Project Air Monitoring Requirements

Particulates and volatile chemicals are not at high enough levels to require air monitoring of the Site. If conditions change, the PM and Health and Safety Lead will be consulted.

**Table 5-1**

**Project Job Tasks and Required PPE**

Job Tasks	PPE Requirements
<ul style="list-style-type: none"> <li>• Loading and unloading sample coolers</li> <li>• Operation of sampling equipment but with no anticipated direct contact with groundwater or decontamination chemicals</li> <li>• Groundwater Sampling</li> </ul>	<input checked="" type="checkbox"/> Standard work uniform/coveralls
	<input checked="" type="checkbox"/> Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
	<input checked="" type="checkbox"/> Traffic safety vest
	<input type="checkbox"/> Chemical-resistant clothing <u>check appropriate garments:</u> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <input type="checkbox"/> One-piece coverall  <input type="checkbox"/> Disposable chemical coveralls  <input type="checkbox"/> Bib-style overalls and jacket with hood                 </div> <div style="width: 45%;"> <input type="checkbox"/> Hooded one- or two-piece chemical splash suit  <input type="checkbox"/> Chemical-resistant hood and apron                 </div> </div> <p><b>Fabric Type:</b> Tyvek</p> <p>NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with polycyclic aromatic hydrocarbons (PAHs) or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.</p>
	<input type="checkbox"/> Disposable inner gloves (latex or equivalent "surgical")
	<input checked="" type="checkbox"/> Disposable chemical-resistant outer gloves <b>Material Type:</b> Nitrile
	<input type="checkbox"/> Chemical-resistant boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots <b>Material Type:</b> Rubber or leather
	<input type="checkbox"/> Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	<input type="checkbox"/> Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	<input type="checkbox"/> Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	<input type="checkbox"/> Splash-proof safety goggles
	<input checked="" type="checkbox"/> Safety glasses
	<input type="checkbox"/> Hard hat
	<input type="checkbox"/> Hard hat with face shield
	<input type="checkbox"/> Hearing protectors ( <b>REQUIRED</b> if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). <b>Type:</b>
<input type="checkbox"/> Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)	
<input type="checkbox"/> Long cotton underwear	

Job Tasks	PPE Requirements
	<input checked="" type="checkbox"/> High-visibility, U.S. Coast Guard (USCG)-approved personal flotation device (PFD) (if working on any water vessel or without fall protection within 10 feet of water)
	<input type="checkbox"/> USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90° F
	<input type="checkbox"/> Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)
	<input type="checkbox"/> Full-face APR (OSHA/NIOSH-approved)
	<input type="checkbox"/> <b>Type of Cartridges to be Used:</b> <input type="checkbox"/> OV or <input type="checkbox"/> OV/HEPA (if samples are dry)

## 6 Risk Analysis and Control

The following sections discuss the potential worker health and safety hazards associated with the field tasks described in the Scope of Work. Controls of these hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the Scope of Work covered by this HASP must be communicated to the PM and CHSM, and an amendment to this HASP must be created as needed (see Section 1.1). Any task conducted beyond those identified in the Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

### 6.1 Job Safety Analysis

Anchor QEA work tasks have been evaluated for their hazards, and JSA documents have been developed that detail the chemical, physical, and biological hazards associated with these tasks, along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to ensure that these tasks are conducted in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for communicating such information to the CHSM. The CHSM will provide support, as needed, to the PM and/or the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project are located in Appendix B of this HASP and include the following field tasks:

- General field activities
- Motor vehicle operation
- Sample and laboratory glass handling

#### 6.1.1 *Augmented Job Safety Analysis Process*

If significant work tasks are identified during the course of the project that were not previously addressed in the JSA documentation supplied in Appendix B, then a task-specific JSA document must be developed at the project site prior to conducting the work. The PM and/or FL shall develop this document(s) with input from the CHSM, as needed, and this HASP will be modified to include the JSA document (see Section 1.1 for HASP modification procedures). Project personnel shall be trained

on the contents of the developed task-specific JSA prior to its implementation. A copy of the task-specific JSA form used in this process is supplied in Appendix B of this HASP.

## **6.2 Exposure Routes**

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

### **6.2.1 Inhalation**

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the sampling location. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. Section 5.2 describes potential OVM action levels and response procedures.

### **6.2.2 Dermal Contact**

Dermal contact with potentially contaminated soil, sediment, or groundwater during field activities is possible. Direct contact will be minimized through the use of appropriate PPE and decontamination procedures.

### **6.2.3 Ingestion**

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

## **6.3 Chemicals of Concern Profile**

Table 6-1 provides a summary profile for the COCs for this project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific information, always refer to the Safety Data Sheet (SDS) or equivalent information for the chemical (see Appendix C).

**Table 6-1  
Chemicals of Concern Profile**

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
PAHs – as coal tar pitch volatiles. (Includes benzo(a)pyrene, chrysene, phenanthrene, fluoranthene, pyrene, acenaphthene, methylnaphthalenes, and anthracene)	Skin, eye, inhalation, and ingestion hazard	Direct contact or exposure to the vapors may be irritating to the eyes. Direct contact can be highly irritating to the skin and can cause dermatitis. Exposure to high vapor concentrations may cause headaches, nausea, vomiting, and other symptoms. Includes human carcinogens. Exposure to all routes should be carefully controlled to levels as low as possible. Confirmed Animal Carcinogen.	Respiratory system, skin, bladder, kidneys	0.2 mg/m <sup>3</sup> TWA8 0.1 mg/m <sup>3</sup> TWA8 (Cyclohexane-extractable fraction)  IDLH / Ca – 80 mg/m <sup>3</sup>	-- Varies	--	--
Gasoline CAS#8006-61-9	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen	Eyes, skin, respiratory system, central nervous system, liver, kidneys	300 ppm (900 mg/m <sup>3</sup> ) TWA8 ST 500 ppm (1500 mg/ m <sup>3</sup> ) OSHA PEL	Varies	1.4%	N/A
Trichloroethylene CAS#79-01-6	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	OSHA PEL 100 ppm TWA Ceiling 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	N/A	8% (77°F)	9.45 eV

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Vinyl chloride CAS#75-01-4	Inhalation, skin and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	OSHA PEL 1 ppm TWA (8 hour)	N/A	3.6%	9.99 eV

Notes:

eV: electron volts

LEL: Lower Explosive Limit

OSHA: Occupational Safety and Health Administration

NIOSH: National Institute for Occupational Safety and Health

PEL: Permissible Exposure Limit

ppm: parts per million

<https://www.cdc.gov/niosh/npg/npgd0145.html>

<https://www.cdc.gov/niosh/npg/npgd0299.html>

<https://www.cdc.gov/niosh/npg/npgd0629.html>

<https://www.cdc.gov/niosh/npg/npgd0658.html>

## 7 Site Control and Communications

The primary purposes for site controls are to establish the hazardous area perimeter, reduce migration of contaminants into clean areas, and prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

### 7.1 General Site Control Safety Procedures

The following standard safe work practices apply to all Anchor QEA site personnel and subcontractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, cell phone, or hand signals will be established to maintain communication.
- During site operations, each worker will consider himself/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on site when performing potentially hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and (if required) medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy as established in this HASP may be subject to corrective action, potentially including but not limited to, being reprimanded or immediate dismissal.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

### 7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the workers and the public. Access control to the work area will be accomplished by the use of a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas

### 7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contamination Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

Site work zones will include:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the “hot zone” or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contamination Reduction Zone (CRZ).** The CRZ, also known as the “warm zone,” is a transitional zone between the EZ and the SZ (also known as the “cold zone” or “clean zone”). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the CRZ. If the CRZ is compromised at any time, a new CRZ will be established.
- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f) (and 29 CFR 1926.1101(k)(9), (m) if appropriate). Visitors will attend a site orientation given by the FL and sign the HASP.

### 7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when working from a boat, in a roadway, or at an excavation site.

### **7.4.1 Vessel Sampling Work Zones**

This subsection contains guidelines concerning health and safety aboard marine sampling vessels. The vessel captain and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field team of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas. Both the collection and processing areas on the vessel and onshore will have a SZ outside the CRZ to stage clean equipment, don PPE, take rest breaks, or perform any other site activities that do not involve potentially contaminated materials.

#### **7.4.1.1 Vessel Decontamination Area**

A station will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. Decontamination fluids will be stored in sealable containers and will be properly disposed of.

#### **7.4.1.2 Access Control**

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

#### **7.4.1.3 Safety Equipment**

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subconsultants will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to verify its readiness for use.

### **7.4.2 Working in a Roadway**

Work conducted in public streets may require coordination with local governments and development and submittal of a traffic control plan in accordance with the U.S. Department of Transportation

(DOT) Manual on Uniform Traffic Control Devices (MUTCD). Use of personnel qualified as Flaggers may also be required to provide temporary traffic control.

Observe the following site control practices and procedures when working in roadways:

- Plan and conduct work in a manner that traffic may be continuously observed. This may require having a spotter equipped with a noise-making device such as an air horn or a whistle, as appropriate.
- Wear a high-visibility traffic vest and hardhat when a vehicle hazard exists<sup>3</sup>. Include lighted elements when possible in high hazard environments.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Protect the work area with a vehicle or piece of heavy equipment if this does not pose an additional hazard. The vehicle should have a strobe light and operating headlights or running lights (if equipped).
- Develop a traffic flow plan for high-traffic situations (as appropriate):
  - Use a flag person
  - Use a flashing arrow sign
  - Use “WORKER AHEAD” signs liberally
  - Obtain lane closing permits
  - Engage police details

See Sections 12.1.15 and 12.1.16 for additional information regarding motor vehicle operation and vehicular traffic.

### *7.4.3 Working at Excavation or Trenching Sites*

Observe the following site control practices and procedures when working around excavation and trenching sites:

- A “competent person” is required per Occupational Safety and Health Act (OSHA), 29 CFR 1926.P.
- Safeguard open excavations by restricting unauthorized access.
- Highlight the work area using prominent warning signs (e.g., cones, sawhorses, or other barricades, and signage) placed a minimum of 10 feet back from the excavation opening.
- Maintain zone definition along the perimeter with a continuous string of high-visibility caution tape.

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<sup>3</sup> The 2009 MUTCD (ANSI 107-2004) federal standard for High-Visibility Apparel and Headwear stipulates specific requirements for, among other characteristics, reflectivity of work vests and headwear. This standard must be reviewed and provisions included if work covered by this HASP includes work in controlled roadways.

### 7.4.3.1 Excavations Left Unattended or Overnight

Use one of the following methods for excavations left unattended or overnight:

- Surround the entire perimeter with plastic or cloth construction net fencing. Anchor the fencing to the ground using steel posts driven into the ground. Space out posts no greater than 8 feet apart. The fence should be a minimum of 4 feet high. Fence material must be of a quality capable of withstanding a pressure of 200 pounds. Place the fencing a minimum of 10 feet back from the excavation opening.
- Place 8-foot-long barricades affixed with flashing lights end to end with 4-foot-high construction net fence attached to barricades.
- Use temporary curbing or concrete "jersey" barriers affixed with flashing signal lights or other effective warning signs.

## 7.5 Field Communications

Communications between all Anchor QEA employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 7-1 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to ensure proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

**Table 7-1  
Field Communication Methods**

Type of Communication	Communication Device	Signal
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Two-way Radio	Initiate radio communication with Code Red message
Hailing site personnel for non-emergency	Compressed Air Horn	One long blast, one short blast
Hailing site personnel for emergency evacuation	Compressed Air Horn	Three long, continuous blasts
Hailing site personnel for distress, need help	Visual	Arms waved in circle over head
Hailing site personnel for emergency evacuation	Visual	Arms waved in criss-cross over head
Contaminated air/strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

## 8 Decontamination Procedures and Practices

### 8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

#### **Personnel**

- Do not walk through spilled materials.
- Do not handle, touch, or smell sample media directly.
- Make sure PPE has no cuts or tears prior to use.
- Protect and cover any skin injuries.
- Stay upwind of airborne dusts and vapors.
- Do not eat, drink, chew tobacco, or smoke in the work zones.

#### **Sampling Equipment and Vehicles/Vessels**

- Use care to avoid getting sampled media on the outside of sample containers.
- If necessary, bag sample containers before filling with sampled media.
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media.
- Keep contaminated equipment and tools separate from clean equipment and tools.
- Fill sample containers over a plastic tub to contain spillage.
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel.

### 8.2 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools will be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Paper towels and plastic garbage bags

### **8.3 Personnel Decontamination**

The FL will verify that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
- If suit is heavily soiled, rinse it off.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove inner gloves.
- Thoroughly wash hands and face before leaving CRZ.
- Sanitize respirators and place in a clean plastic bag.

### **8.4 Sampling and Processing Equipment Decontamination**

To prevent sample cross-contamination, sampling and processing equipment in contact with soil, sediment, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

19. Rinse with potable water and wash with scrub brush.
20. Wash with phosphate-free detergent (Alconox).
21. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox is insufficient to remove visually observable tar-related contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
22. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

### **8.5 Handling of Investigation-Derived Waste**

All remaining soil, groundwater, or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

#### ***8.5.1 Disposable Personal Protective Equipment***

Disposable PPE may include Tyvek suits, inner latex gloves, and respirator cartridges. Dispose of PPE according to the requirements of the client and state and federal agencies.

### **8.5.2 Non-Disposable Personal Protective Equipment**

Non-disposable PPE may include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out the respirator with a disinfecting pad prior to donning.
- Decontaminate the respirator on site at the close of each day with an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate the boots or gloves outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect the boots or gloves from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

## **8.6 Sanitizing Personal Protective Equipment**

Respirators, reusable protective clothing, and other personal articles must be not only decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

## **8.7 Emergency Personnel Decontamination**

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

## **8.8 Containment of Decontamination Fluids**

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

## **8.9 Pressure Washing**

The following procedure is required when using high-pressure washing equipment for decontamination purposes:

- Wear modified Level D protection, including a face shield and safety goggles.
- Verify that other personnel are out of the area prior to decontamination.

- Secure the area around the decontamination pad with cones, caution tape, or barricades.
- Verify that safe work practices and precautions are taken to minimize the potential for physical injury from high-pressure water spray. Follow the manufacturer's operating instructions.
- The pressure washer wand must be equipped with a safety release handle.
- Verify that the area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.

## 9 Health and Safety Training and Informational Programs

This section describes the health and safety training and informational programs with which Anchor QEA project site personnel must comply. All certifications required in this section will be kept on internal file.

### 9.1 Initial Project Site Orientation

Work on all Anchor QEA project sites will require participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all Anchor QEA personnel assigned to the project.
- Anchor QEA subcontractors are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign the Liability Waiver.

### 9.2 Daily Safety Meetings

Daily safety meetings (“tailgate meetings”) make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The Daily Safety Briefing form in Appendix A will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on site during the course of the project.

### 9.3 End-of-Day Wellness Checks

Similar to the daily safety meetings, field staff will gather at the end of the day to verify group health and wellness and discuss any near misses that occurred that day. The wellness checks will be recorded on that day’s Daily Safety Briefing form.

## 9.4 Hazardous Waste Operations Training

Personnel working on project sites that present a potential exposure to hazardous wastes or other hazardous substances shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if the time lapse since their previous training has exceeded 1 year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel shall be current in first aid/CPR training offered by the American Red Cross or equivalent.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

## 9.5 Transportation Worker Identification Credential (TWIC)

All Anchor QEA field personnel will maintain current TWIC status, pursuant to the Maritime Transportation Security Act of 2002, unless this requirement is waived specifically in writing by relevant property owners.

## 9.6 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors according to 29 CFR 1926.59. Refer to the Anchor QEA Hazard Communication Program document for additional information.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a SDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must contain similar types of information. Maintain manufacturer labels if at all possible. The label may use words or symbols to communicate the following:

- Introduction
- Hazard(s) identification
- Composition/information on ingredients
- First-aid measures

- Fire-fighting measures
- Accidental release response measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity properties
- Toxicological properties
- Ecological properties
- Disposal considerations
- Transport considerations
- Regulatory information
- Other information, including at a minimum, label preparation or last revision date

SDS for all chemicals brought onto the site or anticipated to be used on site shall be provided in Appendix C of this HASP. These SDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if for immediate use only, the contents (e.g., acetone or gasoline) of the portable container must be identified.

## 10 General PPE Requirements

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and C). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Workers must maintain proficiency in the use and care of PPE. Damaged or defective PPE must be replaced and may not be used. Anchor QEA will provide all necessary PPE for its employees as described in this HASP.

Refer to Section 5 of this plan for site-specific job task and level-of-protection requirements.

### 10.1 Minimum Requirements – Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles (meets ANSI Z87.1 – 2010 requirements for eye protection)
- Hard hat (meets ANSI Z89.1 – 1986 requirements for head protection)
- Traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

#### 10.1.1 Modified Level D Protection Requirements

Depending on the Scope of Work and the potential hazards to be encountered, Level D protection shall be modified to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, and disposable gloves of varying materials depending on the chemical substances involved. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform, or if unique, site-specific hazards exist.

# 11 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Appendix B of this HASP, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

## 11.1 Physical Hazards and Controls

### 11.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- Personnel working within 10 feet of bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and property owner as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and operating equipment, should not be conducted during severe storms.
- All temporary electrical power must have a Ground-fault Circuit Interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

### 11.1.2 Slips, Trips, and Falls

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip, trip, and fall potential prior to each work task.

- Slip, trip, and fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

### *11.1.3 Ergonomic Considerations*

Certain field tasks may involve workers in fixed positions (e.g., observing subcontractor work) or performing repetitive motions over a period of time (e.g., groundwater sample processing). It is important that workers self-monitor for ergonomic fatigue (e.g., soreness, tightness, stiffness, or pain in muscles) and make adjustments to work tasks, body positions, or work areas so that ergonomic stressors are minimized. Suggestions for decreasing the likelihood of ergonomic stress include the following:

- Limit fixed positions. Periodically vary standing and sitting positions, take frequent short walks, and modify observation locations when possible.
- Minimize extreme postures. Conduct work tasks using comfortable postures (particularly if the tasks are repetitive), and use tools or structures to minimize the need to hold or work with materials or access the work area.
- Limit contact stress. Be aware of soft tissue resting on hard surfaces, and limit these occurrences (e.g., use comfortable footwear, and use tools to hold materials).
- Contact the Field Mobilization Team in advance for prolonged field efforts that involve a field trailer. This group can set up field staff with a monitor, mouse, and keyboard so they are not working solely on laptops.
- Take breaks from work tasks, particularly repetitive ones.
- Consider performing stretching exercises before and during work activities, if those tasks are anticipated to be long in duration and/or strenuous.

### *11.1.4 Corrosive Material Handling Procedures*

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face, air-purifying respirator equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.

- Avoid mixing strong acids and bases. Consult the CHSM for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids and bases, add the acid or base to water in small quantities and mix cautiously.

### 11.1.5 *Electric Safety*

Observe the following procedures and practices to prevent electric shock:

- General
  - Use only appropriately trained and certified electricians to perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
  - Each circuit encountered will be considered live until proven otherwise.
  - Only proper tools will be used to test circuits.
  - No wire will be touched until the circuit is determined to be de-energized.
- Extension Cords
  - All extension cords used on any project will be three-pronged.
  - All extension cords will be in good working order.
  - Each extension cord ground will be tested for continuity on at least a quarterly basis and marked to indicate when the inspection occurred.
  - Each extension cord will be visually inspected before each use.
  - If any extension cord is found in disrepair or fails the continuity test, it will be taken out of service.
  - Any extension cord that does not have the grounding pin will be taken out of service and not used.
  - Extension cords will not be used in place of fixed wiring.
  - Extension cords will not be run through holes in walls, ceilings, or floors.
  - Extension cords will not be attached to the surface of any building.
  - No extension cord will be of the “flat wire” type. Every extension cord will have each individual wire insulated and further protected by an outside cover.
  - Be sure to locate extension cords out of traffic areas or, if this is unavoidable, flag cords and protect workers from tripping over them (i.e., use barricades and tape the cord down).
  - Do not stage extension cords or powered equipment in wet areas, to the degree possible. Elevate cords, connections, and equipment out of puddles.
- Power Tools/Plug and Cord Sets
  - Any cord that is cut in a way that exposes insulation will be removed from service.
  - All tools and plug and cord sets will be tested for continuity.
  - If grounding pins are missing, the plug and cord will be removed from service.

- Any tool or plug and cord set failing the continuity test will be removed from service.
- All power tools will have three-pronged plugs unless double insulated.
- Ground-fault Circuit Interrupters
  - Each 120-volt electrical wall receptacle providing power to the job site will be protected by a portable GFCI.
  - Each GFCI will be tested quarterly and marked to indicate when the inspection occurred.
  - Each 120-volt, single-phase, 15- and 20-ampere receptacle outlet, including those on generators, will have an approved GFCI.
  - GFCIs will be located in line as close to the piece of equipment as possible.
- Specific
  - If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL prior to proceeding.
  - If subsurface work is to be performed, follow the guidelines in Section 12.1.6 and conduct utility locating prior to work and in accordance with local ordinances.
  - If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL prior to doing so.
  - Maintain appropriate distance from overhead utilities (see Table 12-1).
  - If unexpected electrical equipment is encountered (i.e., buried wire) assume it is live, stop work, and contact the PM and FL immediately.
  - If working in enclosed or restricted areas where electrical hazards may be present, contact a licensed electrician or other suitably trained party to provide barriers, shields, or insulating materials to prevent electric shock.
  - If working in areas where electrical hazards are present, verify that conductive clothing and jewelry is replaced with non-conductive clothing, or removed.

### *11.1.6 Drilling with Direct Push Technology*

General rules associated with direct push technology (DPT) intrusive activities are as follows:

- Maintain all equipment in a safe condition.
- Keep all guards in place during use.
- Before DPT sampling is started, verify that everyone who operates the rig has had adequate training and is thoroughly familiar with the DPT rig, its controls, capabilities, and operating manual.
- Set-up on stable and level terrain.
- Outriggers shall be extended per the manufacturer's specifications.

- Do not place outriggers on underground structures such as vaults, manholes, stormwater inlets, catch basins, or well boxes.
- Use proper dunnage, cribbage, plates, or wooden blocks between outriggers and supporting surfaces.
- The Driller and helper must be present during all active operations and TEST THE TWO KILL SWITCHES DURING EACH STARTUP.
- The DPT rig helper and other site personnel must know the location of the two emergency shutoff switches.
- The area around the drilling operation must be cordoned off/barricaded.
- When hazardous conditions are deemed present, the operation must be shut down.
- Team members shall not wear loose clothing, free long hair, jewelry, or equipment that might become caught in moving machinery. Secure PPE close to the body to avoid getting caught in moving parts.
- Unauthorized personnel must be kept clear of the DPT rig.
- Shut down, lock, and tag out the DPT rig to make repairs or adjustments or to lubricate fittings. Release all pressure on the hydraulic systems, the drilling fluid system, and the air pressure systems of the drill rig prior to performing maintenance.
- Identify and understand parts of the equipment that may cause crushing, pinching, rotating, or similar injuries.
- Neatly stack pipe, rods, or similar on racks or sills to prevent spreading, rolling, or sliding.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Establish a system of responsibility for the operator and helpers to follow during the series of various activities, such as connecting and disconnecting sections and inserting and removing the sections.
- Never reach behind or around rotating equipment for any reason.
- Clean equipment only when the DPT rig is in neutral and the equipment has stopped.
- Don't place hands, feet, and/or limbs into or through openings of equipment frames or structures that were not intended to be used in such a fashion.

### *11.1.7 Drilling with a Hollow Stem Auger Drill Rig*

All operations involving the use of powered drilling rigs will follow generally accepted drilling practices. One person will be assigned the responsibility of Lead Driller. Additional personnel will assist with equipment as needed. The Lead Driller will be responsible for operating the drilling rig and ensuring safety.

General rules associated with drilling rig operations will be as follows:

- An Exclusion Zone will be established around the drilling rig using barricade tape as a physical barrier.
- While drilling, all non-essential personnel shall remain at a distance that is past the radius of the boom, whenever possible. Workers (e.g., drillers, hydrogeologists, etc.) remaining around the drill rig will be kept to a minimum.
- All vehicles and heavy equipment must be parked at least 50 feet from the drill rig when lowering the mast.
- All operators and team members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.
- Hard-hats, steel-toed boots conforming to ASTM F2412-05/ASTM F2413-05, goggles or safety glasses with side shields, hearing protection, and gloves for hand protection are required.
- As project conditions dictate (i.e., the presence of puncture or crushing risks to the feet), protective shanks and/or metatarsal guards conforming to ASTM F2412-05/ ASTM F2413-05 must be worn.
- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- Before leaving the controls, the Lead Driller will shift the transmission controlling the rotary drive into neutral and place the feed level in neutral. Before leaving the vicinity of the drill, the Lead Driller will shut down the drill engine.
- Drilling must cease immediately if combustible gas concentrations greater than 20% of the LEL are detected in the work area.
- A first aid kit and fire extinguisher will be available at all times.
- If lubrication fittings are not accessible with guards in place, machinery must be stopped for oil and greasing.
- The work area around the borehole shall be kept free of obstructions and undue accumulations of oil, water, ice, or circulating fluids.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- The driller will not attempt to reach a well or borehole location in a manner that compromises the safety of the rig or team.
- All well or borehole locations will be inspected by the drill team to verify that a stable surface exists.

- Before raising the drill mast, the Lead Driller will check for overhead obstructions.
- Before the mast of a drill rig is raised, the drill rig must first be leveled and stabilized with leveling jacks and/or cribbing. Re-level the drill rig if it settles after initial setup. Lower the mast only when the leveling jacks are down, and do not raise the leveling jack pads until the mast is lowered completely.
- The drill rig shall be driven or moved only after the mast has been lowered.
- The leveling jacks shall not be raised until the derrick is lowered.
- Adequately cover or protect all unattended boreholes to prevent drill rig personnel or site visitors from stepping or falling into the borehole.
- Maintain professional behavior at all times in the work area, even when the rig is shut down.

### **Rotary Drill Rig Operations:**

- Drillers must never engage the rotary clutch without watching the rotary table and ensuring that it is clear of personnel and equipment.
- Unless the drawworks is equipped with an automatic feed control, the brake must not be left unattended without first being tied down.
- Drillers will not add or remove pipe from the drill stem without assistance from the driller's helper.
- Drill pipe must not be hoisted until the driller is sure that the pipe is latched and the drilling assistant has signaled that he/she may safely hoist the load.
- During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller will be on the rig floor and no one will be on the rig or derrick.
- The brakes on the drawworks of every drilling rig must be tested at the beginning of each shift to determine whether they are in good order.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment unless it has been specifically designed for line contact.
- Hoisting control stations must be kept clean and controls shall be labeled as to their functions.
- Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

### ***11.1.8 Hand and Power Tools***

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the "teeth" in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.

- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to “mushroom.” Keep them dressed to avoid flying spalls, and use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Verify that there is adequate lighting, inspect tools for proper lubrication, and relocate tools or material that could “vibrate into trouble.”
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be “bled down” before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before startup. Remove cranks, keys, or wrenches used in service work.

### *11.1.9 Motor Vehicle Operation*

All drivers are required to have a valid driver’s license, and all vehicles must have appropriate state vehicle registration and inspection stickers. **Anchor QEA prohibits the use of hand-held wireless devices while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.** Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Before leaving, inspect fuel and fluid levels and air pressure in tires, and adjust mirrors and seat positions appropriately.
- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Fill up when the fuel level is low (not near empty).
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.

- Stop driving the vehicle, regardless of the speed (e.g., even 5 miles per hour) or location (e.g., a private road), when the potential of being distracted by conversation exists.
- Using hand-held communication devices (e.g., cell phones) while operating any motor vehicle is prohibited.
- Get adequate rest prior to driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions prior to driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

#### *11.1.10 Vehicular Traffic*

Observe the following procedures and practices regarding vehicular traffic:

- Wear a traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block the work area (if conditions allow).
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

#### *11.1.11 Lifting and Material Handling*

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, drums, etc.).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.

- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Ensure that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

### *11.1.12 Working Over or Near Water*

#### **11.1.12.1 Personal Flotation Devices**

PFDs are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts, or other applicable provisions.

Type I, II, III or V USCG-approved, high-visibility PFD shall be provided and properly worn by all personnel in the following circumstances:

- On or within 10 feet of water
- On floating pipelines, pontoons, rafts, or stages
- On structures extending over or next to the water, except where guard rails or safety nets are provided for employees
- Working alone at night where there are drowning hazards, regardless of other safeguards provided
- In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit
- Whenever there is a drowning hazard

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.

- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. Onshore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

#### **11.1.12.2 Cold Water Work**

When the combined air and water temperature is below 90°F, field personnel working on or near water shall wear either a float coat and bib overalls (e.g., a full two-piece “Mustang” survival suit or similar) or a one-piece survival suit. Suits or float coats shall be USCG approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed. Work activities will be continually reviewed and adjustments made if wearing a survival suit during work activities potentially poses a hazard due to warm air temperatures, or limited mobility or agility. In addition, proximity of water work to shore and scope/duration/timing of work activities will be considered when stipulating the above requirement. Overall, if water craft will be used during work, or work will be conducted near water, it is imperative that site-specific conditions are considered and evaluated so that proper safeguards and procedures are in place prior to beginning work.

In addition to considering the use of apparel appropriate for anticipated air, weather, and water conditions, field teams shall identify any procedures necessary for cold-water “man-overboard” scenarios. These procedures should be identified in the site-specific HASP, described in the JSA used for boating activities and, if prudent, practiced before work.

#### **11.1.13 Noise**

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to ear protection with a Noise Reduction Rating of not less than 30.
- Ear protection must be worn in any environment where site personnel must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear protection must be worn by any personnel observing or operating concrete cutting or sawing equipment, pile driving, or other loud noise-generating activities.

Hearing protection is required for site personnel operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dBA) (time-weighted average

[TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Site personnel and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 12-3 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device's effectiveness is as follows:

<p><b>Equation 1</b></p> <p>Noise reading <math>dBA - (NRR - 7dB) &lt; 90dBA</math></p> <p>where:</p> <p><math>dB</math> = decibel</p> <p><math>dBA</math> = A-weighted decibel</p> <p>NRR = Noise Reduction Rating</p>
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**Table 12-3**  
**Noise Exposure Action Levels**

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or Dosimeter	> 80 dBA to 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	> 85 dBA to 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.
	> 90 dBA to 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts.
	> 115 dBA	Stop work. Consult CHSM.

### 11.1.14 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, or drums).

- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Verify that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

### *11.1.15 Fire Control*

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Ensure fire safety integrity of equipment installations according to National Electrical Code (NEC) specifications.

## 11.2 Environmental Hazards and Controls

### 11.2.1 *Fatigue Management*

Because Anchor QEA personnel may be working during both daytime and nighttime hours several days per week, depending on the activity, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and reduced ability to concentrate. Fatigued workers may have a reduced ability to recognize or avoid risks on the work site, which may lead to an increase in the number and severity of injuries and other incidents. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include the following:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (e.g., weather conditions and ambient noise) in which it is performed
- The quantity and quality of rest obtained prior to, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as the following:

- Slower movements
- Poor coordination
- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Employees are strongly encouraged to get sufficient pre-work rest, maintain sufficient nutritional intake during work (i.e., eat and drink at regular intervals), and communicate with team members and leaders if their level of fatigue elevates.

Use the following procedures to help detect and address fatigue-related issues:

- Periodically observe and query coworkers for signs or symptoms of fatigue.
- Workers that express concern over their level of fatigue, or that are observed to be fatigued such that elevated worker risk is evident, will be relieved or their work tasks adjusted so that they may rest sufficiently.
- Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. In case of an emergency or operational difficulties (e.g., limited access due to water levels or boat repairs), work hours may require adjustment.
- Maintain a routine exercise program and regular sleep schedule as much as possible over the course of the work.
- Avoid heavy meals or caffeine and minimize or eliminate the consumption of alcohol and nicotine before sleeping.

## 11.2.2 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate site personnel in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.2.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.
- Verify that employees have access to potable drinking water and shade.
- During conditions exceeding 95°F, verify that the following additional procedures are adhered to:
  - Establish effective communication by voice, observation, or electronic means.
  - Observe employees for alertness and signs or symptoms of heat illness.
  - Designate one or more employees on each work site as authorized to call for emergency medical services.
  - Remind employees to drink water throughout the shift.
  - Conduct pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-down rest when necessary.

### 11.2.2.1 Signs, Symptoms, and Treatment

The FL will be trained in heat stress prevention, including the following, prior to supervising employees:

- Procedures to prevent heat illness.
- Procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

The information provided below addresses these training requirements.

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn because they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

**Heat Rash.** Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

**Heat Cramps.** Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, move the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

**Heat Exhaustion.** Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, move the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

**Heat Stroke.** Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105°F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Because heat stroke is a true medical emergency, transport the individual to a medical facility immediately. Prior to transport, remove as much clothing as possible

and wrap the individual in a sheet soaked with water. Fan the individual vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the individual in a cool-water bath (however, be careful not to over-chill the individual once body temperature is reduced below 102°F). If this is not possible, keep the individual wrapped in a sheet and continuously douse with water and fan.

### 11.2.2.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid should be kept cool, 50°F to 60°F, and it should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All site personnel are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

### 11.2.2.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. The Heat Stress Monitoring Record form (see Appendix A) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

**Wet Bulb Globe Temperature (WBGT).** The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body

temperature and other physiological responses to heat. When WBGT exceeds 25°C (77°F), the work regimen in Table 12-4 should be followed.

**Table 12-4**  
**Permissible Heat Exposure Threshold Limit Values**

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% work, 25% rest each hour	87°F (30.6°C)	82°F (28.0°C)	78°F (25.9°C)
50% work, 50% rest, each hour	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% work, 75% rest, each hour	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)
These TLVs assume that nearly all acclimated, fully-clothed site personnel with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F (38°C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-4 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-5.

**Table 12-5**  
**Wet Bulb Globe Temperature Correction Factors**

Clothing Type	WBGT Correction
Summer lightweight working clothing	0°F (0°C)
Cotton coveralls	-3.6°F (-2°C)
Winter work clothing	-7.2°F (-4°C)
Water barrier, permeable	-10.8°F (-6°C)
Fully encapsulating	-14.4°F (-10°C)

**Physiological.** Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Because individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate:** The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her

radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of his/her calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of his/her calculated MHR.

- **Temperature:** Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4°F.

#### 11.2.2.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

### 11.2.3 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40° F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32° F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.

- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.

### 11.2.3.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

**Frostbite.** Frostbite is characterized by pain in the extremities and loss of manual dexterity. “Frostnip,” or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

**Hypothermia.** Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Move the patient to a warm, dry place. If the patient’s clothing is wet, remove it and replace it with dry clothing. Keep the patient warm. Re-warming of the patient should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the patient is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the patient warm and calm and move them to a medical facility as soon as possible.

### 11.2.4 Sunlight and Ultraviolet Exposure

Observe the following procedures and practices regarding ultraviolet (UV) exposure:

- Protect against extended exposure to sunlight with shade, long clothing, sunscreen, and high-SPF, broad-spectrum sunscreen applied frequently.
- Plan work to avoid unnecessary UV exposure (see Section 12.2.4.2).
- During peak daylight months, plan work for early morning or evening.
- Many factors affect the hazards associated with UV exposure, including the following:
  - **Time of day:** UV rays are strongest between 10 am and 4 pm.
  - **Season of the year:** UV rays are stronger during spring and summer months. This is less of a factor near the equator.
  - **Distance from the equator (latitude):** UV exposure goes down as you get farther from the equator.
  - **Altitude:** More UV rays reach the ground at higher elevations.

- **Cloud cover:** The effect of clouds can vary. Sometimes cloud cover blocks some UV from the sun and lowers UV exposure, while some types of clouds can reflect UV and increase UV exposure. What is important to know is that UV rays can get through, even on a cloudy day.
- **Reflection off surfaces:** UV rays can bounce off surfaces like water, sand, snow, pavement, or grass, leading to an increase in UV exposure.
- Cloud cover does not necessarily protect from UV exposure. Consider monitoring the UV index for your work area: <http://www2.epa.gov/sunwise/uv-index>.
- Evaluate site-specific factors affecting UV exposure and address work practices as appropriate.

#### 11.2.4.1 Signs, Symptoms, and Treatment

The best way to treat sunburn is to prevent it using the guidelines listed in the bullets above and in Section 12.2.4.2. Signs of sunburn include the following:

- Pinkness or redness
- Skin that feels warm or hot to the touch
- Pain, tenderness, or itching
- Swelling
- Small, fluid-filled blisters, which may break
- Headache, fever, chills, and fatigue if the sunburn is severe

If signs of sunburn are noticed, avoid further exposure and immediately implement treatment. If the sunburn is blistering *and* covers 15% or more of the body, seek medical attention.

#### 11.2.4.2 Prevention

UV exposure hazards and their impacts on each worksite should be evaluated to determine the best practices for risk mitigation. The most effective way to prevent skin damage from UV exposure is to protect bare skin from the exposure. This can be accomplished with shade, clothing (e.g., pants, long sleeves, or hats), sunscreen, and sunglasses. Plan work to either create shade or take advantage of natural shade, and avoid peak UV times during the day when possible.

#### 11.2.5 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Evaluate the worksite for hazards that may be amplified during inclement weather, such as traction issues, ingress and egress, slope stability, or wind-driven hazards (e.g., dust, debris, or falling trees).
- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold.

- Take cover indoors or in a vehicle that will provide adequate protection. In some cases, this may require exiting the worksite, such as during windstorms in areas with overhead hazards (e.g., trees or power lines).
- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
- Verify that on-site equipment and resources are adequately protected from inclement weather.
- If working in an unfamiliar geographic location, consult with local resources for unique weather hazards.



### *11.2.6 Insects/Spiders*

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Table 12-6.

**Table 12-6  
North American Hazardous Spider Identification Guide**

<b>Hazardous Spider Identification Guide</b>	
<p><b>Black Widow Spider</b></p> <ul style="list-style-type: none"> <li>• Abdomen usually shows hourglass marking</li> <li>• Female is 3 to 4 centimeters in diameter</li> <li>• Have been found in well casings and flush-mount covers</li> <li>• Not aggressive, but more likely to bite if guarding eggs</li> <li>• Light, local swelling and reddening are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea</li> <li>• If bitten, see a physician as soon as possible</li> </ul>	
<p><b>Brown Spiders (aka Brown Recluse or Fiddleback)</b></p> <ul style="list-style-type: none"> <li>• Found in the central and southern United States, although in some other areas, as well</li> <li>• 1/4-to-1/2-inch-long body, and size of a silver dollar</li> <li>• Hide in baseboards, ceiling cracks, and undisturbed piles of material</li> <li>• Bite may either go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of the affected tissue, and very slow healing</li> <li>• If bitten, see a physician as soon as possible</li> </ul>	

### 11.2.7 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger and, if present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

### 11.2.8 *The Public at Large*

The community residents around worksites may pose their own specific hazards. These conditions may include the following:

- Unintentional disruption of work
- Benign or malicious trespass
- Criminal intent

Scenarios may include the following:

- Pedestrians, cyclists, or motorists disregarding site boundaries due to distraction or willful disobedience.
- Public use of private site facilities for shelter, relief, and other reasons with no ill-intention.
- Public use of private site facilities for mischievous or criminal activity, such as loitering, vandalism, or theft.
- Encounters with community members who are disgruntled with the project activity.
- Encounters with criminal activities on or near a project site.

If any of the above are anticipated to be likely, take the following precautions as appropriate:

- Verify that the site is adequately marked and barricaded to limit unintentional disruptions of the work by the public.
- Review the site for attractive nuisances (e.g., hazards or conditions that are likely to attract children), and mitigate those.
- Secure all equipment and site facilities to prevent unauthorized access or use.
- Remove valuable items from the site or adequately secure them on site to limit the temptation for potential criminals.
- Have contact information for the client's or owner's public relations office while on site, and direct disgruntled community members to that office. If necessary, vacate the site to relieve the situation and notify the PM or FL.
- Work in pairs when uncertain of the public safety situation at a site. In questionable situations, postpone work as necessary until a plan of action can be developed to verify a safe working environment.

### 11.2.9 *Personal Health and Safety*

In addition to hazards associated with chemicals of concern, equipment, operations or site conditions discussed above, there may be additional personal safety issues to consider at a site, including those related to one or multiple protected classes, such as race, gender, religion, ability, sexual orientation,

or gender identity. These conditions may involve the following, perpetrated by the public or those associated with the work:

- Malicious disruption of work
- Harassment, including unwanted comments, gestures, or actions
- Threats of violence, either implied (using derogatory language) or explicit
- Assault

It is critical that the work environment be discussed within the project team to evaluate risks, ways to avoid those risks, and communication protocols. Anchor QEA requires that work be performed in teams.

Specifically, if any of the above are anticipated, take the following precautions as appropriate:

- Alert the PM, FL, CHSM, and/or Human Resources Department of potential issue(s).
- Formulate a plan of action to verify and maintain a safe working environment prior to field work, which may include the following:
  - Working in pairs and/or within a certain physical distance of other work groups.
  - Coordinated check-ins (calls to or from the office or visual check-ins with other field members).
- Whenever possible, schedule work only within daylight hours (which fluctuate seasonally) or on weekends when questionable scenarios may be more minimal.
  - If night work is required, maintain a minimum of two field personnel at all times, and potentially increase the total number of personnel.
  - If working in high-risk areas, discuss the possibility of hiring security if work needs to be performed at night, in low light, or near potentially dangerous areas (e.g., abandoned buildings, public displays of hostility, discrimination, or gang-related activity).
- Maintain a field phone with active GPS and non-locking 911 capability at all times while out in the field.
- If a need arises for a change in field work (e.g., additional sampling or moving to an area that was not planned) or travel plans (e.g., dead battery or flat tire), immediately alert the FL and PM as to the event.

In addition, practice active awareness of your environment. Discuss personal health and safety concerns at the daily tailgate meeting. If you feel unsafe based on the potential behavior of others, immediately bring it up to field team coworkers. If the issue is not resolved to your satisfaction, alert the PM, FL, CHSM, and/or Human Resources Department to assist in resolving any potential issue(s).

## 12 Medical Surveillance Program

This section describes the medical surveillance program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

### 12.1 General Requirements

Anchor QEA employees shall be enrolled in a medical surveillance program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances.

If they are involved with any of the following operations:

- *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained)
- *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq)
- *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
- *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations
- *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard

And, if they meet the following criteria:

- Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year

In addition, employees are required to be enrolled in the medical surveillance program if they meet any of the following conditions:

- Wear a respirator for 30 days or more per year
- Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations

- Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical surveillance program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical surveillance and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

## 12.2 Team Self Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Skin chafing from damp or wet clothing
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

## Appendix A

### Health and Safety Logs and Forms

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# Incident Report Form



Please immediately contact your manager when a work-related incident has occurred. It is your responsibility (or your manager's if you are not able) to contact Human Resources (HR) (Elizabeth Barnick) and Health and Safety (H&S) (Tim Shaner) ASAP when an incident happens.

This Incident Report is the first form you must complete when a work-related incident has occurred. Once completed, forward this form to the HR and H&S contacts listed above.

**Incident Type:**  Injury  Illness  Near Miss  Spill  Fire  Other \_\_\_\_\_

## Employees Involved in Incident

**Was anyone injured?**  Yes  No

(If **Yes**, complete **a** and **b** below)

### a. Information Regarding Injured or Ill Employee

**Full name:** \_\_\_\_\_  
**Street:** \_\_\_\_\_  
**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip:** \_\_\_\_\_  
**Date of birth:** \_\_\_\_\_ **Sex:** \_\_\_\_\_  
**Date hired:** \_\_\_\_\_ **Job title:** \_\_\_\_\_

### b. Information about the Physician or Health Care Professional

**Was medical treatment required?**  Yes  No

**First aid only:**  Yes  No

**Name of physician/health care professional:** \_\_\_\_\_

**If treatment was given away from the worksite, where was it given?**

**Facility:** \_\_\_\_\_  
**Street:** \_\_\_\_\_  
**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip:** \_\_\_\_\_

**Was employee treated in emergency room?**  Yes  No

**Was employee hospitalized overnight as an in-patient?**  Yes  No

**Did the employee miss a full day of work following the incident?**  Yes  No

**Date of last day worked:** \_\_\_\_\_

**Date of return to work:** \_\_\_\_\_

**Number of restricted days of work:** \_\_\_\_\_

# Incident Report Form



**Information about the Incident:**

**Date of incident:** \_\_\_\_\_

**Time of incident:** \_\_\_\_\_

**Location of incident:** \_\_\_\_\_

**Were there any witnesses?**     Yes    No

**Name and phone number of witness:** \_\_\_\_\_  
\_\_\_\_\_

**What was employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific (e.g., climbing a ladder while carrying roofing materials, spraying chlorine from hand sprayer, daily computer key-entry).

**What happened?** Tell us how the injury occurred (e.g., when ladder slipped on wet floor, worker fell 20 feet; worker was sprayed with chlorine when gasket broke during replacement; worker developed soreness in wrist over time).

# Incident Report Form



**If an injury or illness, what was it?** Tell us the part of the body that was affected and how it was affected.

**Employer Use Only:**

**Date Recorded in Incident Log:** \_\_\_\_\_ **By:** \_\_\_\_\_

**Investigation:**

**Date Investigation Started:** \_\_\_\_\_ **Date Investigation Concluded:** \_\_\_\_\_

**Investigation Team Leader and Title:** \_\_\_\_\_

**Investigation Team Member Names and Titles:**

Name	Title
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

# Incident Report Form



**Root Cause Determination** (attach other sheets as necessary)

Any statements, photographs, sketches, or other documents should be attached to this document.

# Incident Report Form



**Corrective Actions:** \*Documentation supporting completion of corrective actions should be attached to this report.

Corrective Action	Person Responsible	Due Date	Completion Date	Completion Notes	Completed By



## Field Safety Equipment Checklist

The following is a list of safety-related gear that may be appropriate depending on the type of work being conducted. The purpose of this checklist is twofold: 1) ensure that all field crew members think about appropriate safety gear needs before heading to the worksite; and 2) provide an extensive list of gear to consider in order to serve as a reminder of potential safety gear needs during a field effort.

### Safety Briefing Log or Notebook

#### Personal Protective Gear

- Rain pants and jacket
- Hard hats
- Boots (steel-toed, if appropriate)
- Safety glasses
- Ear protection
- Nitrile gloves (inner and outer pair)
- Tyvek overalls
- H<sub>2</sub>S sensor
- Flashlight
- EpiPen (inquire if any field staff use one)
- Other:

#### Communications

- Notify office staff of day's field plan
- Walkie Talkies
- Cell phones
- Satellite phone (if appropriate)
- Contact numbers (e.g., for other field crew members, the PM, or others to notify that you are accessing site)

#### Boat Safety Gear

*U.S. Coast Guard Required Gear:*

- 1. Personal flotation device (PFD), preferably life jacket, for each occupant
- 2. Fire extinguisher (filled to operable range)
- 3. Flares (unexpired)
- 4. Horn
- 5. Navigation lights
- First aid kit
- Bowline and stern line
- Anchor and anchor line
- Paddle

#### Warm Weather Safety Gear

- Sunscreen
- Water
- Hat
- Light clothes

#### Cold Weather Safety Gear

- Warm clothes (preferably synthetics)
- Hat
- Gloves
- Boot warmers
- Thermos of warm drink/soup

#### General Gear for Work Near Water

- Life jacket
- Boots or waders (hip or chest)
- Throwline
- Spare propeller and linchpin
- Appropriate personal protective gear (boots or waders) to step onto shore if necessary
- Drain plug (and spare)
- Boat fuel and oil
- Weather radio (if appropriate)
- Weather, tides, and currents forecasts
- Warm clothes/blanket in dry bag

# Modification to Health and Safety Plan

Date: \_\_\_\_\_

Project No: \_\_\_\_\_

Project Name: \_\_\_\_\_

Modification: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Reason for Modification: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Site Personnel Briefed

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Approvals

Field Lead: \_\_\_\_\_  
Printed Name Signature Date

Project Manager: \_\_\_\_\_  
Printed Name Signature Date

# Heat Stress Monitoring Record



**Date:** \_\_\_\_\_  
**Project No:** 201439-00.01  
**Project Name:** 2021 Phase 2 ESA  
**Location:** Sequim, Washington

Employee Name	Monitoring Results												
	Initial Reading Time:	First Work Period Time:		Second Work Period Time:		Third Work Period Time:		Fourth Work Period Time:		Fifth Work Period Time:		Sixth Work Period Time:	
	WBGT (°F):	WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):	
	Air Temp (°F):	Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):	
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
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	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
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	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:

**Notes:**

*Completed by:*

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

# Utility Contact Prevention Checklist

*NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.*

**Purpose:** This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

**INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT  
SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA**

**Project Name/No:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Field Lead:** \_\_\_\_\_ **Project Address:** \_\_\_\_\_

**Project Manager:** \_\_\_\_\_ **Health & Safety Officer:** \_\_\_\_\_

**Emergency Contact Information for One Call:** \_\_\_\_\_

**Duration/Summary of Work to be Performed:** \_\_\_\_\_

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are any as-built drawings available? If so, do they show any utilities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Has a visual inspection of the work area(s) been completed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		

# Utility Contact Prevention Checklist

*NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.*

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Other considerations:				

**NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.**

**Confirmation Number:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Organization:** \_\_\_\_\_

**Contact Date:** \_\_\_\_\_ **Contact Time:** \_\_\_\_\_

**Response:** \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

*Completed by:*

\_\_\_\_\_  
 Printed Name Signature Date

*Contractor:*

\_\_\_\_\_  
 Printed Name Signature Date

## Appendix B

### Job Safety Analysis (JSA) Documents

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# Job Safety Analysis



## Field Activities

<b>Project Name:</b> Tote Property USTs Data Gaps Work Plan	<b>Project Number:</b> 200092-01.20	<b>JSA Number:</b> 001	<b>Issue Date:</b> September 28, 2021
<b>Location:</b> Tacoma, WA	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sara Potter	<b>Analysis Date:</b> October 25, 2021
<b>Work Operation:</b> Field activities	<b>Superintendent/Competent Person:</b> Sara Potter	<b>Revised by:</b> Sara Potter	<b>Revised Date:</b> October 25, 2021
<b>Required Personal Protective Equipment (PPE):</b>		<b>Reviewed by:</b> Tim Shaner	<b>Reviewed Date:</b> October 27, 2021
<ul style="list-style-type: none"> <li>Modified Level D – Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)</li> </ul>		<b>Approved by:</b> Nik Bacher	<b>Approved Date:</b> October 27, 2021

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		<ul style="list-style-type: none"> <li>Follow the Job Safety Analysis (JSA) for boating activities.</li> </ul>	
Outdoor, physical activity	Slips, trips, and falls	<ul style="list-style-type: none"> <li>Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction.</li> <li>Maintain good housekeeping practices. Clean up all spills immediately.</li> <li>Be aware of weather effects on the work area, including wet and/or frozen ground.</li> <li>Jumping, running, and horseplay are prohibited.</li> <li>Keep all areas clean and free of debris to prevent any trips and falls.</li> <li>Be aware of and limit loose clothing or untied shoelaces that may contribute to slips, trip, and falls</li> <li>Notify the field team members of any unsafe conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Routinely inspect work area for unsafe conditions.</li> </ul>

# Job Safety Analysis



## Field Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Heat stress	<ul style="list-style-type: none"> <li>Adjust work schedules, as necessary, to avoid the hottest part of the day.</li> <li>Take rest breaks as warranted.</li> <li>Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.</li> <li>Maintain body fluids at normal levels.</li> <li>Train workers to recognize the symptoms of heat-related illness.</li> </ul>	<ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions.</li> <li>Monitor outside temperature versus worker activity.</li> </ul>
Outdoor, physical activity (continued)	Cold stress	<ul style="list-style-type: none"> <li>Provide shelter (enclosed, heated environment) to protect personnel during rest periods.</li> <li>Educate workers to recognize the symptoms of frostbite and hypothermia.</li> <li>Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations.</li> <li>Consider additional precautions if working near water in cold weather.</li> <li>Have a dry change of clothing available.</li> <li>Train workers to recognize the symptoms of cold-related illness.</li> </ul>	<ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Monitor workers' physical conditions and PPE.</li> <li>Monitor outside and water temperature versus worker activity and PPE.</li> </ul>
	Rain/snow	<ul style="list-style-type: none"> <li>Wear appropriate PPE (rain gear).</li> <li>Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.</li> <li>If extremely cold conditions are forecast, consider additional precautions or postponing work activity.</li> </ul>	<ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Inspect PPE daily prior to use.</li> <li>Routinely inspect work area for deteriorating conditions.</li> </ul>
	Sunshine	<ul style="list-style-type: none"> <li>Have sunscreen available for ultraviolet protection.</li> <li>Have abundant water available to prevent dehydration.</li> <li>Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that sunscreen and water are available.</li> </ul>
	Lightning	<ul style="list-style-type: none"> <li>Do not begin or continue work until lightning subsides for at least 20 minutes. Disconnect and do not use or touch electronic equipment.</li> <li>Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.</li> </ul>	<ul style="list-style-type: none"> <li>Obtain weather forecast and updates as needed.</li> </ul>

# Job Safety Analysis



## Field Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	High winds	<ul style="list-style-type: none"> <li>Wear goggles or safety glasses if dust or debris are visible.</li> </ul>	<ul style="list-style-type: none"> <li>Review weather forecast prior to field work.</li> <li>Ensure that goggles or safety glasses are available.</li> </ul>
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, mosquitoes, and snakes])	<ul style="list-style-type: none"> <li>Be aware of likely biological hazards in the work area.</li> <li>Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent.</li> <li>Wear hand and arm protection when clearing plants or debris from the work area.</li> <li>Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or deer with young).</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that insect repellent is available.</li> <li>Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.</li> </ul>
	Noise exposure	<ul style="list-style-type: none"> <li>Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that hearing protection is available.</li> </ul>

## Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

<b>Project Name:</b> Tote USTs Data Gaps Work Plan	<b>Project Number:</b> 200092-01.20	<b>JSA Number:</b> 002	<b>Issue Date:</b> September 28, 2021
<b>Location:</b> Tacoma, WA	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sara Potter	<b>Analysis Date:</b> October 25, 2021
<b>Work Operation:</b> Anchor QEA motor vehicle operation	<b>Superintendent/Competent Person:</b> Vehicle Driver	<b>Revised by:</b> Sara Potter	<b>Revised Date:</b> October 25, 2021
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Wear seat belt at all times</li> <li>Make sure that clothing will not interfere with driving</li> </ul>		<b>Reviewed by:</b> Tim Shaner	<b>Reviewed Date:</b> October 27, 2021
		<b>Approved by:</b> Nik Bacher	<b>Approved Date:</b> October 27, 2021

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation	Unfamiliar with the vehicle	<ul style="list-style-type: none"> <li>Allow yourself some time to get familiar with an Anchor QEA vehicle, a rental vehicle, or one not used very often.</li> <li>Test the lights, windshield wipers, hazard lights, horn, parking brake, and other important functions.</li> <li>Review the dashboard controls, steering radius, and overhead and side clearances.</li> <li>Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle.</li> <li>Adjust mirrors and the seat while the vehicle is in park.</li> <li>Drive slowly in confined locations, as in a parking garage, parking lots, or industrial settings. Confirm adequate clearances by sight before turning or backing up in tight or unfamiliar locations.</li> <li>Use a second person to be a spotter outside the vehicle if needed in tight spaces.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, monitor the fuel level, and fill up when the fuel level is low</li> </ul>
	Speed and braking	<ul style="list-style-type: none"> <li>Fasten and properly adjust the seat belt.</li> <li>Obey all posted speed limits.</li> <li>Radar detectors are prohibited in all company-owned, leased, or rented vehicles.</li> <li>Reduce travel speed during hazardous conditions (e.g., rain, fog, or snow).</li> <li>Identify whether your vehicle has Anti-Lock Brakes (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, pump the brakes to stop during slippery conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> <li>Identify designated speed limits</li> <li>Determine if vehicle has ABS</li> </ul>

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Distance spacing	<ul style="list-style-type: none"> <li>Continually check your rear and side view mirrors.</li> <li>Use the 3-second rule to keep a safe distance between vehicles.</li> <li>Increase the 3-second rule as necessary during hazardous travel conditions.</li> <li>Regularly scan the area you will be entering in the next 10 to 12 seconds.</li> <li>Always leave yourself an "out" during travel.</li> <li>When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front when stopped.</li> <li>Obey the speed limit and traffic regulations.</li> <li>When at a red light and it turns green, use the "delayed start" technique, by counting to three before you take your foot off the brake.</li> <li>DO NOT TAILGATE.</li> <li>Keep headlights (and running lights, if available) on for maximum visibility.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Skids	<ul style="list-style-type: none"> <li>If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary.</li> <li>Reduce speed during hazardous travel conditions.</li> <li>Use 4-wheel drive, if available, when driving vehicles off-road, on steep inclines, or in muddy conditions.</li> <li>Do not take vehicles off-road if they cannot be operated safely.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Blind spots	<ul style="list-style-type: none"> <li>Become familiar with any blind spots associated with your vehicle.</li> <li>Adjust mirrors to give the maximum viewing area.</li> <li>Use your directional devices to signal all turns and when changing lanes; check rear and side view mirror and glance over your shoulder to check that the lane is clear.</li> <li>Avoid other driver's blind spots; slow down and let the other vehicle pass.</li> <li>If parked for an extended period and staying in the vehicle, be sure to inspect the area for changed conditions (e.g., a car that moved in behind you) before leaving.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> <li>Mirrors</li> </ul>
	Backing	<ul style="list-style-type: none"> <li>Back into parking spaces upon arrival whenever possible.</li> <li>Perform a 360-degree walk around the vehicle before backing to identify any new conditions or obstructions.</li> <li>Use a spotter when backing whenever possible.</li> <li>Understand hand signals.</li> <li>Sound the horn prior to backing.</li> <li>Check the rear and side view mirrors prior to backing.</li> <li>Back slowly in areas of obstructed vision.</li> <li>Anticipate others who may be backing out into your pathway and adjust accordingly.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> <li>Mirrors</li> </ul>

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Distractions (e.g., cell phones, reading maps or directions, eating)	<ul style="list-style-type: none"> <li>Obey state or local laws regarding cell phone use, at a minimum.</li> <li>Certain clients prohibit cell phone use regardless of the state you are operating in— know your client’s policy.</li> <li>Use hands-free devices (not hand-held cellular phones) while driving.</li> <li>Pull over to the side of the road when making a call or checking directions.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> <li>Hands-free devices connected and ready for use</li> </ul>
	Accidents	<ul style="list-style-type: none"> <li>In the event of an accident, use the following procedures:                             <ul style="list-style-type: none"> <li>Stop, call for medical assistance, notify police, and complete an accident report and submit it to your supervisor.</li> <li>Notify the Project Manager (PM) and Field Lead (FL).</li> <li>Complete the appropriate incident investigation reports.</li> <li>Contact Sara Weiskotten, Operations Liaison, at (857) 445 4987.</li> <li>Contact Diana Reynolds, Insurance Liaison, at (302) 236-8403.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Influenced by drugs or alcohol	<ul style="list-style-type: none"> <li>NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.</li> <li>Keep in mind that the person in another vehicle may be under the influence of controlled substances, and be prepared for erratic or sudden driving changes on their part.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Driver attitude	<ul style="list-style-type: none"> <li>Do not operate any vehicle when abnormally tired, temporarily disabled (i.e., injured), or under the influence of drugs or alcohol.</li> <li>Keep an even temper when driving. Do not let the actions of others affect your attitude.</li> <li>Do not allow yourself to become frustrated, rushed, distracted, or drowsy.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Fatigue	<ul style="list-style-type: none"> <li>Stop and rest if fatigued. Exit the road and enter a safe area. Rest until fully refreshed.</li> <li>Be aware that certain medications (such as cold or allergy medicines) may make you drowsy when driving a vehicle.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>
	Vehicle loading	<ul style="list-style-type: none"> <li>DO NOT OVERLOAD the vehicle.</li> <li>Secure all equipment and supplies within the body of the vehicle using proper tie-downs.</li> <li>Do not block side view mirrors with the load.</li> <li>Do not transport U.S. Department of Transportation (DOT)-manifested hazardous materials.</li> <li>Dispatch all equipment and personnel with proper forms and identification.</li> </ul>	<ul style="list-style-type: none"> <li>Seatbelt</li> </ul>

# Job Safety Analysis



## Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Equipment failure	<ul style="list-style-type: none"> <li>• Perform daily inspections of your vehicle.</li> <li>• Maintain vehicle safety equipment (e.g., mirrors, alarms, horns, wipers, lights, and brakes).</li> <li>• Maintain the vehicle (e.g., tire pressure and fluid levels).</li> <li>• Any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public shall not be used.</li> <li>• Ensure that appropriate safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks.</li> <li>• Ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident forms.</li> </ul>	<ul style="list-style-type: none"> <li>• • Inspect and maintain the vehicle</li> </ul>

### Training Requirements:

- All drivers are required to have a valid driver’s license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.
- **If operating a vehicle or vehicle and trailer with a capacity greater than 10,000 pounds, U.S. Department of Transportation regulations may apply. Contact the PM prior to any travel in this configuration.**
- All assigned employees are required to read, familiarize themselves with the contents of this Job Safety Analysis, and sign the signature page before the operation of an Anchor QEA vehicle, and review it with their supervisor during their daily safety meeting.
- All assigned employees are required to complete the annual driver training assigned by the company.





# Job Safety Analysis



## Sample and Laboratory Glassware Handling

<b>Project Name:</b> Tote Property USTs Data Gaps Work Plan	<b>Project Number:</b> 200092-01.20	<b>JSA Number:</b> 003	<b>Issue Date:</b> September 28, 2021
<b>Location:</b> Tacoma, WA	<b>Contractor:</b> Anchor QEA, LLC	<b>Analysis by:</b> Sara Potter	<b>Analysis Date:</b> October 25, 2021
<b>Work Operation:</b> Sample and laboratory glassware handling	<b>Superintendent/Competent Person:</b> Sara Potter	<b>Revised by:</b> Sara Potter	<b>Revised Date:</b> October 25, 2021
<b>Required Personal Protective Equipment (PPE):</b> <ul style="list-style-type: none"> <li>Modified Level D – Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05</li> <li>Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, and nitrile outer gloves and, if boating, U.S. Coast Guard-approved personal flotation device (PFD)</li> </ul>		<b>Reviewed by:</b> Tim Shaner	<b>Reviewed Date:</b> October 27, 2021
		<b>Approved by:</b> Nik Bacher	<b>Approved Date:</b> October 27, 2021

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Transporting and using glassware	Breakage of containers during field activities	<ul style="list-style-type: none"> <li>Use appropriately sized tubs or bottle carriers with dividers to prevent bottle-to-bottle contact during transport.</li> <li>Consider using coated glassware, if practicable.</li> <li>Carry oversize bottles in tubs or bottle carriers using both hands during transfer to the sampling vessel and whenever the vessel is underway.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure dividers are sufficient and will remain in place during transport.</li> </ul>
	Faulty glassware	<ul style="list-style-type: none"> <li>Replace any glassware that is chipped, nicked, or cracked.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect glassware before use.</li> </ul>
	Impact with equipment and other objects	<ul style="list-style-type: none"> <li>Use care when loading and unloading sampling equipment.</li> <li>Minimize the handling of individual containers to the extent possible.</li> </ul>	
Filling sample containers	Over-tightening of bottle lids causing breakage	<ul style="list-style-type: none"> <li>Avoid use of excessive force to tighten bottle caps (i.e., finger tight).</li> <li>Secure lids with clear tape to prevent opening during transport.</li> </ul>	
	Breakage during sample collection	<ul style="list-style-type: none"> <li>Place containers in plastic tubs between aliquots to limit contact with hard surfaces.</li> <li>Place containers on a stable and non-slip surface during collection.</li> <li>Use the buddy system as needed to hold bottles during filling.</li> </ul>	

# Job Safety Analysis



## Sample and Laboratory Glassware Handling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Filling sample containers (continued)	Contact with sample preservatives (generally HCL or H <sub>2</sub> SO <sub>4</sub> to lower pH to less than 2)	<ul style="list-style-type: none"> <li>Wear nitrile gloves and protective eyewear to prevent skin and eye contact if a container is damaged.</li> <li>Do not open preserved bottles until necessary.</li> </ul>	
Packing samples for shipment	Breakage during packing and shipment	<ul style="list-style-type: none"> <li>Use bottle wraps, foam sleeves, or bubble wrap to prevent bottle contact in the cooler.</li> <li>Pack coolers snugly, but do not over pack.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure glass bottles do not touch to minimize potential breakage during transport.</li> </ul>

### Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

# Appendix C

## Safety Data Sheets (SDS)

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**Safety Data Sheet**  
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and  
GHS

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### 1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· Trade name: **ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**  
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**

· **Manufacturer/Supplier:**

Alconox, Inc.  
30 Glenn St., Suite 309  
White Plains, NY 10603  
Phone: 914-948-4040



· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**

ChemTel Inc.  
(800)255-3924, +1 (813)248-0585

### 2 Hazards identification

· **2.1 Classification of the substance or mixture**

· Classification according to Regulation (EC) No 1272/2008



GHS05 corrosion

Eye Dam. 1; H318: Causes serious eye damage.



GHS07

Skin Irrit. 2; H315: Causes skin irritation.

· Classification according to Directive 67/548/EEC or Directive 1999/45/EC



Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.

· **Information concerning particular hazards for human and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

· **Classification system:**

The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**

The product is classified and labelled according to the CLP regulation.

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· **Hazard pictograms**



GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**

sodium dodecylbenzene sulfonate

· **Hazard statements**

H315: Causes skin irritation.

H318: Causes serious eye damage.

· **Precautionary statements**

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P264: Wash thoroughly after handling.

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310: Immediately call a POISON CENTER or doctor/physician.

P321: Specific treatment (see on this label).

P362: Take off contaminated clothing and wash before reuse.

P332+P313: If skin irritation occurs: Get medical advice/attention.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

· **Hazard description:**

· **WHMIS-symbols:**

D2B - Toxic material causing other toxic effects



· **NFPA ratings (scale 0 - 4)**



Health = 1

Fire = 0

Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**



HEALTH 1 Health = 1

FIRE 0 Fire = 0

REACTIVITY 0 Reactivity = 0

· **HMIS Long Term Health Hazard Substances**

None of the ingredients is listed.

· **2.3 Other hazards**

· **Results of PBT and vPvB assessment**

· **PBT:** Not applicable.

· **vPvB:** Not applicable.

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### 3 Composition/information on ingredients

· **3.2 Mixtures**

· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate ☒ Xn R22; ☒ Xi R36 ⚠ Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate ☒ Xi R36 ⚠ Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate ☒ Xn R21/22; ☒ Xi R36/38 ⚠ Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

### 4 First aid measures

· **4.1 Description of first aid measures**

· **After inhalation:** Supply fresh air; consult doctor in case of complaints.

· **After skin contact:**

Immediately wash with water and soap and rinse thoroughly.

If skin irritation continues, consult a doctor.

· **After eye contact:**

Remove contact lenses if worn.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

· **After swallowing:**

Rinse out mouth and then drink plenty of water.

Do not induce vomiting; call for medical help immediately.

· **4.2 Most important symptoms and effects, both acute and delayed**

No further relevant information available.

· **4.3 Indication of any immediate medical attention and special treatment needed**

No further relevant information available.

### 5 Firefighting measures

· **5.1 Extinguishing media**

· **Suitable extinguishing agents:**

CO<sub>2</sub>, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

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- **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
- **5.3 Advice for firefighters**
- **Protective equipment:**  
Wear self-contained respiratory protective device.  
Wear fully protective suit.
- **Additional information:** No further relevant information available.

## 6 Accidental release measures

- **6.1 Personal precautions, protective equipment and emergency procedures**  
Product forms slippery surface when combined with water.
- **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
- **6.3 Methods and material for containment and cleaning up:**  
Pick up mechanically.  
Clean the affected area carefully; suitable cleaners are:  
Warm water
- **6.4 Reference to other sections**  
See Section 7 for information on safe handling.  
See Section 8 for information on personal protection equipment.  
See Section 13 for disposal information.

## 7 Handling and storage

- **7.1 Precautions for safe handling**  
Prevent formation of dust.  
Keep receptacles tightly sealed.
- **Information about fire - and explosion protection:** No special measures required.
- **7.2 Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:** No special requirements.
- **Information about storage in one common storage facility:** Not required.
- **Further information about storage conditions:** Protect from humidity and water.
- **7.3 Specific end use(s):** No further relevant information available.

## 8 Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.

- **8.1 Control parameters**

- **Ingredients with limit values that require monitoring at the workplace:**

7722-88-5 tetrasodium pyrophosphate

REL (USA) 5 mg/m<sup>3</sup>

TLV (USA) TLV withdrawn

EV (Canada) 5 mg/m<sup>3</sup>

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:**

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing.

Wash hands before breaks and at the end of work.

Avoid contact with the skin.

Avoid contact with the eyes and skin.

· **Respiratory protection:**

Not required under normal conditions of use.

In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.

· **Protection of hands:**



Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

· **Material of gloves**

Butyl rubber, BR

Nitrile rubber, NBR

Natural rubber, NR

Neoprene gloves

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.

· **Penetration time of glove material**

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

· **Eye protection:**



Safety glasses

· **Body protection:** Protective work clothing

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**9 Physical and chemical properties**

· **9.1 Information on basic physical and chemical properties**

· **General Information**

· **Appearance:**

Form:	Powder
Colour:	White
Odour:	Odourless
Odour threshold:	Not determined.

· pH-value (10 g/l) at 20 °C: 9,5 (- NA for Powder form)

· **Change in condition**

Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.

· Flash point: Not applicable.

· Flammability (solid, gaseous): Not determined.

· **Ignition temperature:**

Decomposition temperature: Not determined.

· Self-igniting: Product is not self-igniting.

· Danger of explosion: Product does not present an explosion hazard.

· **Explosion limits:**

Lower:	Not determined.
Upper:	Not determined.

· Vapour pressure: Not applicable.

Density at 20 °C:	1,1 g/cm <sup>3</sup>
Relative density	Not determined.
Vapour density	Not applicable.
Evaporation rate	Not applicable.

· Solubility in / Miscibility with water: Soluble.

· Partition coefficient (n-octanol/water): Not determined.

· **Viscosity:**

Dynamic:	Not applicable.
Kinematic:	Not applicable.

· **Solvent content:**

Organic solvents: 0,0 %

Solids content: 100 %

· **9.2 Other information** No further relevant information available.

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## 10 Stability and reactivity

- **10.1 Reactivity**
- **10.2 Chemical stability**
- **Thermal decomposition / conditions to be avoided:**  
No decomposition if used according to specifications.
- **10.3 Possibility of hazardous reactions**  
Reacts with acids.  
Reacts with strong alkali.  
Reacts with strong oxidizing agents.
- **10.4 Conditions to avoid:** No further relevant information available.
- **10.5 Incompatible materials:** No further relevant information available.
- **10.6 Hazardous decomposition products:**  
Carbon monoxide and carbon dioxide  
Phosphorus compounds  
Sulphur oxides (SO<sub>x</sub>)

## 11 Toxicological information

- **11.1 Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **On the skin:** Irritant to skin and mucous membranes.
- **On the eye:** Strong irritant with the danger of severe eye injury.
- **Sensitization:** No sensitizing effects known.
- **Additional toxicological information:**  
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:  
Irritant  
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

## 12 Ecological information

- **12.1 Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **12.2 Persistence and degradability:** No further relevant information available.
- **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
- **12.4 Mobility in soil:** No further relevant information available.
- **Additional ecological information:**
- **General notes:**  
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.  
Do not allow product to reach ground water, water course or sewage system.  
Danger to drinking water if even small quantities leak into the ground.
- **12.5 Results of PBT and vPvB assessment**
- **PBT:** Not applicable.

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- vPvB: Not applicable.
- 12.6 Other adverse effects: No further relevant information available.

### 13 Disposal considerations

- 13.1 Waste treatment methods
- Recommendation  
 Smaller quantities can be disposed of with household waste.  
 Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.  
 The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
- Uncleaned packaging:
- Recommendation: Disposal must be made according to official regulations.
- Recommended cleansing agents: Water, if necessary together with cleansing agents.

### 14 Transport information

- |  |                 |
|--|-----------------|
| · 14.1 UN-Number<br>· DOT, ADR, IMDG, IATA, ICAO                               | Not Regulated   |
| · 14.2 UN proper shipping name<br>· DOT, ADR, IMDG, IATA, ICAO                 | Not Regulated   |
| · 14.3 Transport hazard class(es)<br>· DOT, ADR, IMDG, IATA, ICAO<br>· Class   | Not Regulated   |
| · 14.4 Packing group<br>· DOT, ADR, IMDG, IATA, ICAO                           | Not Regulated   |
| · 14.5 Environmental hazards:<br>· Marine pollutant:                           | No              |
| · 14.6 Special precautions for user  | Not applicable. |
| · 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable. |
| · UN "Model Regulation":   | Not Regulated   |

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**15 Regulatory information**

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

· **Section 355 (extremely hazardous substances):**

None of the ingredients is listed.

· **Section 313 (Specific toxic chemical listings):**

None of the ingredients is listed.

· **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**

None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for females:**

None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for males:**

None of the ingredients is listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**

None of the ingredients is listed.

· **IARC (International Agency for Research on Cancer)**

None of the ingredients is listed.

· **TLV (Threshold Limit Value established by ACGIH)**

None of the ingredients is listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

None of the ingredients is listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**

None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**

All ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**

None of the ingredients is listed.

· **Canadian Ingredient Disclosure list (limit 1%)**

497-19-8 Sodium Carbonate

7722-88-5 tetrasodium pyrophosphate

151-21-3 sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**

H302: Harmful if swallowed.

H312: Harmful in contact with skin.

H315: Causes skin irritation.

H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.

R22: Harmful if swallowed.

R36: Irritating to eyes.

R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)



# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**  
US GHS

**Synonyms:** Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

## \*\*\* Section 1 - Product and Company Identification \*\*\*

### Manufacturer Information

Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS  
Emergency # 800-424-9300 CHEMTREC  
[www.hess.com](http://www.hess.com) (Environment, Health, Safety Internet Website)

## \*\*\* Section 2 - Hazards Identification \*\*\*

### GHS Classification:

Flammable Liquid - Category 2  
Skin Corrosion/Irritation - Category 2  
Germ Cell Mutagenicity - Category 1B  
Carcinogenicity - Category 1B  
Toxic to Reproduction - Category 1A  
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)  
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)  
Aspiration Hazard - Category 1  
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

### GHS LABEL ELEMENTS

#### Symbol(s)



#### Signal Word

DANGER

#### Hazard Statements

Highly flammable liquid and vapour.  
Causes skin irritation.  
May cause genetic defects.  
May cause cancer.  
May damage fertility or the unborn child.  
May cause respiratory irritation.  
May cause drowsiness or dizziness.  
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.  
May be fatal if swallowed and enters airways.  
Harmful to aquatic life.

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## Precautionary Statements

### Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking  
Keep container tightly closed.  
Ground/bond container and receiving equipment.  
Use explosion-proof electrical/ventilating/lighting/equipment.  
Use only non-sparking tools.  
Take precautionary measures against static discharge.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Wash hands and forearms thoroughly after handling.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Do not breathe mist/vapours/spray.  
Use only outdoors or in well-ventilated area.  
Do not eat, drink or smoke when using this product.  
Avoid release to the environment.

### Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.  
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.  
IF exposed or concerned: Get medical advice/attention.  
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.  
Get medical advice/attention if you feel unwell.  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

### Storage

Store in a well-ventilated place.  
Keep cool. Keep container tightly closed.  
Store locked up.

### Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

## \* \* \* Section 3 - Composition / Information on Ingredients \* \* \*

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

110-54-3	Hexane	0.5-4
----------	--------	-------

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

## \* \* \* Section 4 - First Aid Measures \* \* \*

### First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

### First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

### First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

### First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

## \* \* \* Section 5 - Fire Fighting Measures \* \* \*

### General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

### Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitroresols that can decompose violently.

### Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

### Unsuitable Extinguishing Media

None

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## Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

## \* \* \* Section 6 - Accidental Release Measures \* \* \*

### Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

### Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

### Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

### Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

### Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

### Prevention of Secondary Hazards

None

## \* \* \* Section 7 - Handling and Storage \* \* \*

### Handling Procedures

USE ONLY AS A MOTOR FUEL.  
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

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Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

## Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

## Incompatibilities

Keep away from strong oxidizers.

## \* \* \* Section 8 - Exposure Controls / Personal Protection \* \* \*

### Component Exposure Limits

#### Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA  
500 ppm STEL

#### Toluene (108-88-3)

ACGIH: 20 ppm TWA  
OSHA: 200 ppm TWA; 375 mg/m<sup>3</sup> TWA  
150 ppm STEL; 560 mg/m<sup>3</sup> STEL  
NIOSH: 100 ppm TWA; 375 mg/m<sup>3</sup> TWA  
150 ppm STEL; 560 mg/m<sup>3</sup> STEL

#### Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)  
OSHA: 800 ppm TWA; 1900 mg/m<sup>3</sup> TWA  
NIOSH: 800 ppm TWA; 1900 mg/m<sup>3</sup> TWA

#### Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA  
150 ppm STEL  
OSHA: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
150 ppm STEL; 655 mg/m<sup>3</sup> STEL

#### Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m<sup>3</sup> TWA

#### Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL  
OSHA: 1000 ppm TWA; 1900 mg/m<sup>3</sup> TWA  
NIOSH: 1000 ppm TWA; 1900 mg/m<sup>3</sup> TWA

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## Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA  
OSHA: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
125 ppm STEL; 545 mg/m<sup>3</sup> STEL  
NIOSH: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
125 ppm STEL; 545 mg/m<sup>3</sup> STEL

## Benzene (71-43-2)

ACGIH: 0.5 ppm TWA  
2.5 ppm STEL  
Skin - potential significant contribution to overall exposure by the cutaneous route  
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA  
NIOSH: 0.1 ppm TWA  
1 ppm STEL

## Hexane (110-54-3)

ACGIH: 50 ppm TWA  
Skin - potential significant contribution to overall exposure by the cutaneous route  
OSHA: 500 ppm TWA; 1800 mg/m<sup>3</sup> TWA  
NIOSH: 50 ppm TWA; 180 mg/m<sup>3</sup> TWA

## Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

## Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

## Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

## PERSONAL PROTECTIVE EQUIPMENT

### Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

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## \*\*\* Section 9 - Physical & Chemical Properties \*\*\*

<b>Appearance:</b>	Translucent, straw-colored or light yellow	<b>Odor:</b>	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
<b>Physical State:</b>	Liquid	<b>pH:</b>	ND
<b>Vapor Pressure:</b>	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C))	<b>Vapor Density:</b>	AP 3-4
<b>Boiling Point:</b>	85-437 °F (39-200 °C)	<b>Melting Point:</b>	ND
<b>Solubility (H2O):</b>	Negligible to Slight	<b>Specific Gravity:</b>	0.70-0.78
<b>Evaporation Rate:</b>	10-11	<b>VOC:</b>	ND
<b>Percent Volatile:</b>	100%	<b>Octanol/H2O Coeff.:</b>	ND
<b>Flash Point:</b>	-45 °F (-43 °C)	<b>Flash Point Method:</b>	PMCC
<b>Upper Flammability Limit (UFL):</b>	7.6%	<b>Lower Flammability Limit (LFL):</b>	1.4%
<b>Burning Rate:</b>	ND	<b>Auto Ignition:</b>	>530°F (>280°C)

## \*\*\* Section 10 - Chemical Stability & Reactivity Information \*\*\*

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

### Incompatible Products

Keep away from strong oxidizers.

### Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

## \*\*\* Section 11 - Toxicological Information \*\*\*

### Acute Toxicity

#### A: General Product Information

Harmful if swallowed.

#### B: Component Analysis - LD50/LC50

##### Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

##### Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

##### Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

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**Xylenes (o-, m-, p- isomers) (1330-20-7)**

Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

**Benzene, 1,2,4-trimethyl- (95-63-6)**

Inhalation LC50 Rat 18 g/m<sup>3</sup> 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

**Ethyl alcohol (64-17-5)**

Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

**Ethylbenzene (100-41-4)**

Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

**Benzene (71-43-2)**

Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

**Hexane (110-54-3)**

Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

## Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

## Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

## Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

## Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

## Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

## Generative Cell Mutagenicity

This product may cause genetic defects.

## Carcinogenicity

### A: General Product Information

May cause cancer.

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IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

## **B: Component Carcinogenicity**

### **Gasoline, motor fuel (86290-81-5)**

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

### **Toluene (108-88-3)**

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

### **Xylenes (o-, m-, p- isomers) (1330-20-7)**

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

### **Ethyl alcohol (64-17-5)**

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

### **Ethylbenzene (100-41-4)**

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

### **Benzene (71-43-2)**

ACGIH: A1 - Confirmed Human Carcinogen

OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA

NIOSH: potential occupational carcinogen

NTP: Known Human Carcinogen (Select Carcinogen)

IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

## **Reproductive Toxicity**

This product is suspected of damaging fertility or the unborn child.

## **Specified Target Organ General Toxicity: Single Exposure**

This product may cause drowsiness or dizziness.

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## Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

## Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

## \* \* \* Section 12 - Ecological Information \* \* \*

### Ecotoxicity

#### A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

#### B: Component Analysis - Ecotoxicity - Aquatic Toxicity

##### Gasoline, motor fuel (86290-81-5)

Test & Species	Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L
24 Hr EC50 Daphnia magna	170 mg/L

##### Toluene (108-88-3)

Test & Species	Conditions	
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

##### Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]

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96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi- static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

## Benzene, 1,2,4-trimethyl- (95-63-6)

### Test & Species

96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

### Conditions

## Ethyl alcohol (64-17-5)

### Test & Species

96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

### Conditions

## Ethylbenzene (100-41-4)

### Test & Species

96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi- static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow- through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

### Conditions

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96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

## Benzene (71-43-2)

### Test & Species

### Conditions

96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

## Hexane (110-54-3)

### Test & Species

### Conditions

96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

## Persistence/Degradability

No information available.

## Bioaccumulation

No information available.

## Mobility in Soil

No information available.

## \* \* \* Section 13 - Disposal Considerations \* \* \*

### Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

### Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

# Safety Data Sheet

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## \*\*\* Section 14 - Transportation Information \*\*\*

### Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

### DOT Information

Shipping Name: Gasoline

UN #: 1203 Hazard Class: 3 Packing Group: II

Placard:



## \*\*\* Section 15 - Regulatory Information \*\*\*

### Regulatory Information

#### A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

##### Toluene (108-88-3)

SARA 313: 1.0 % de minimis concentration  
CERCLA: 1000 lb final RQ; 454 kg final RQ

##### Xylenes (o-, m-, p- isomers) (1330-20-7)

SARA 313: 1.0 % de minimis concentration  
CERCLA: 100 lb final RQ; 45.4 kg final RQ

##### Benzene, 1,2,4-trimethyl- (95-63-6)

SARA 313: 1.0 % de minimis concentration

##### Ethylbenzene (100-41-4)

SARA 313: 0.1 % de minimis concentration  
CERCLA: 1000 lb final RQ; 454 kg final RQ

##### Benzene (71-43-2)

SARA 313: 0.1 % de minimis concentration  
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

# Safety Data Sheet

Material Name: Gasoline All Grades

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## Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration

CERCLA: 5000 lb final RQ; 2270 kg final RQ

## SARA Section 311/312 – Hazard Classes

Acute Health

X

Chronic Health

X

Fire

X

Sudden Release of Pressure

--

Reactive

--

## Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

## State Regulations

### Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

# Safety Data Sheet

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## Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

## Additional Regulatory Information

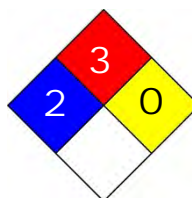
## Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

## \*\*\* Section 16 - Other Information \*\*\*

**NFPA® Hazard Rating**

Health	2
Fire	3
Reactivity	0



**HMIS® Hazard Rating**

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal

\*Chronic

## Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

## Literature References

None

# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**

## Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet



## Safety Data Sheet

Material Name: CARBON PITCH SOLID

SDS ID: 00227841

### Section 1 - PRODUCT AND COMPANY IDENTIFICATION

#### Material Name

CARBON PITCH SOLID

#### Synonyms

CARBON PITCH; CARBON PITCH HARD PENCIL; CARBON PITCH PENCIL; DISTRESSED PITCH; ELECTRODE, AROMATIC, BINDER, TARGET,CORE, COAL TAR PITCH; HARD CARBON PITCH - PENCIL; MISCELLANEOUS PITCH - IMPORT; PITCH FINES; TARGET PITCH PENCIL

#### Chemical Family

polynuclear aromatic hydrocarbons

#### Product Use

process chemical. Component in the manufacture of electrodes and anodes for aluminum, metallurgic and electro-steel industries, activated carbon, carbon refractory blast furnace linings, and clay target manufacture.

#### Restrictions on Use

None known.

#### Details of the supplier of the safety data sheet

KOPPERS INC.  
436 Seventh Avenue  
Pittsburgh, PA 15219-1800  
Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)  
Emergencies: (Medical in USA): 877-737-9047  
Emergencies: (Medical Outside of USA): 651-632-9269  
E-mail: naorgmsds@koppers.com

### Section 2 - HAZARDS IDENTIFICATION

#### Classification in accordance with paragraph (d) of 29 CFR 1910.1200.

Combustible Dust  
Skin Sensitization - Category 1  
Germ Cell Mutagenicity - Category 1B  
Carcinogenicity - Category 1A  
Reproductive Toxicity - Category 1B  
Hazardous to the Aquatic Environment - Chronic - Category 4

#### GHS Label Elements

##### Symbol(s)



#### Signal Word

Danger

#### Hazard Statement(s)

May form combustible dust concentrations in air.  
May cause an allergic skin reaction.



## Safety Data Sheet

**Material Name: CARBON PITCH SOLID**

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May cause genetic defects.  
May cause cancer.  
May damage fertility or the unborn child.  
May cause long lasting harmful effects to aquatic life.

### Precautionary Statement(s)

#### Prevention

Avoid breathing dust.  
Contaminated work clothing should not be allowed out of the workplace.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Avoid release to the environment.

#### Response

IF exposed or concerned: Get medical advice/attention.  
IF ON SKIN: Wash with plenty of soap and water.  
If skin irritation or rash occurs: Get medical advice/attention.  
Wash contaminated clothing before reuse.

#### Storage

Store locked up.

#### Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

#### Other Hazards

None known.

### Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
65996-93-2	Coal tar pitches	100
-	The above listed complex substance contains the following constituents	-
50-32-8	Benzo[a]pyrene	1.05-1.67
206-44-0	Fluoranthene	0.37-1.59
189-64-0	Dibenzo(a,h)pyrene	0.12-1.49
53-70-3	Dibenzo(a,h)anthracene	1.06-1.39
192-97-2	Benzo(e)pyrene	0.75-1.36
191-24-2	Benzo(ghi)perylene	0.83-1.34
129-00-0	Pyrene	0.40-1.30
205-99-2	Benzo(b)fluoranthene	0.79-1.30
218-01-9	Chrysene	0.56-1.30



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56-55-3	Benz[a]anthracene	0.48-1.11
120-12-7	Anthracene	0.04-0.77
207-08-9	Benzo(k)fluoranthene	0.46-0.75
205-82-3	Benzo(j)fluoranthene	0.39-0.66
238-84-6	Benzo(a)fluorene	0.07-0.49
243-17-4	Benzo[b]fluorene	0.06-0.41
189-55-9	Dibenzo(a,i)pyrene	0.11-0.35
85-01-8	Phenanthrene	0.05-0.31
192-65-4	Dibenzo(a,e)pyrene	0.16-0.28
193-39-5	Indeno(1,2,3-cd)pyrene	0.15-0.26
217-59-4	Triphenylene	0.09-0.20
83-32-9	Acenaphthene	0.00-0.18
132-64-9	Dibenzofuran	0.12-0.14
86-74-8	9H-Carbazole	0.00-0.13
86-73-7	Fluorene	0.00-0.06

### Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Aromatic hydrocarbons, polycyclic (130489-29-2).

### Section 4 - FIRST AID MEASURES

#### Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

#### Skin

Wash all affected skin areas with warm soapy water. Skin contact causes photosensitization which can last for 36-72 hours after exposure. Keep out of direct sunlight for the next two to three days to avoid sunburn to the photosensitized skin areas. Use a broad spectrum blockout cream to protect against UV alpha ray exposure. Get medical attention, if needed.

#### Eyes

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.

#### Ingestion

Not a likely route of exposure. Do NOT induce vomiting. If a large amount is swallowed, get medical attention. Do not give anything by mouth to unconscious or convulsive person. If vomiting occurs, keep head lower than hips to help prevent aspiration.



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### **Most Important Symptoms/Effects**

#### **Acute**

allergic reactions

#### **Delayed**

allergic reactions, mutagenic effects, Reproductive Effects, lung cancer, bladder cancer, skin cancer, scrotal cancer

### **Indication of any immediate medical attention and special treatment needed**

Treat symptomatically and supportively.

## **Section 5 - FIRE FIGHTING MEASURES**

### **Extinguishing Media**

#### **Suitable Extinguishing Media**

regular dry chemical, carbon dioxide, regular foam, water spray, fog or mist

#### **Unsuitable Extinguishing Media**

Do not use high-pressure water streams.

### **Special Hazards Arising from the Chemical**

Dust/air mixtures may ignite or explode. Minimum dust concentration required is 0.35 oz/ft<sup>3</sup>. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. During fire conditions, vapors and decomposition products may be released, forming toxic and/or flammable/explosive mixtures in air.

### **Hazardous Combustion Products**

Oxides of carbon, oxides of nitrogen, oxides of sulfur, polynuclear aromatic hydrocarbons

### **Fire Fighting Measures**

Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Directly spraying water or foam onto hot burning product may cause frothing. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. When the solid material is heated (as in a fire) it will melt and begin to flow. The molten material may be chilled and solidified using a water fog or fine water spray.

### **Special Protective Equipment and Precautions for Firefighters**

Wear full protective firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

## **Section 6 - ACCIDENTAL RELEASE MEASURES**

### **Personal Precautions, Protective Equipment and Emergency Procedures**

Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment.

### **Methods and Materials for Containment and Cleaning Up**

Stop leak if possible without personal risk. Shovel solidified material into containers for recycle if clean or disposal if contaminated. The solid or solidified spillage should be cleaned up as quickly as possible. Spilled material in a traffic area will break down with mechanical contact (e.g. vehicle tires) and become a wind borne dust. Solid material spillage may be wet down with a fine water spray to suppress dust during cleanup. If sweeping of a contaminated area is necessary, use a dust suppressant agent. Collect spill using a vacuum cleaner with a HEPA filter or wet and scoop up dry spills. Avoid sweeping spilled dry material. Eliminate ignition sources including sources of electrical, static or frictional sparks. Collect spilled material in appropriate container for disposal. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. Due to the concentration of Benzo(a)pyrene and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 60 pounds (5.5



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gallons) of this product requires National Response Center notification. See Section 13 for waste disposal information.

## Section 7 - HANDLING AND STORAGE

### Precautions for Safe Handling

Avoid breathing dust. Avoid contact with eyes, skin and clothing. When using do not eat, drink or smoke. Wear protective gloves/clothing and eye/face protection. Wash exposed areas thoroughly with soap and water, or a waterless hand cleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion can also be applied prior to application of a protective cream. Contaminated clothing should be removed and laundered before reuse. Contaminated work clothing should not be allowed out of the workplace unless laundered or decontaminated. After working with the product use warm soapy water and a wash cloth to thoroughly wash all areas of skin that have been contacted with product. After washing, apply a broad spectrum UV blockout cream on exposed skin areas before going into sunlight. Keep out of strong sunlight for two to three days after being affected by the product. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions.

### Conditions for Safe Storage, Including any Incompatibilities

Store locked up.

Store and handle in accordance with all current regulations and standards. Label all containers. Store in metal containers. Avoid use of plastic containers. Keep in a well-ventilated place. Keep away from heat, sparks and naked flames. Protect from physical damage. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

### Incompatible Materials

oxidizing materials

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### Component Exposure Limits

Coal tar pitches	65996-93-2
ACGIH:	0.2 mg/m3 TWA as benzene-soluble aerosol
OSHA (US):	0.2 mg/m3 TWA (benzene soluble fraction )

### ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

#### Coal tar pitches (65996-93-2)

Medium: urine Time: end of shift at end of workweek Parameter: 1-Hydroxypyrene with hydrolysis (nonquantitative )

### Engineering Controls

Provide local exhaust or process enclosure ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Ensure compliance with applicable exposure limits.

### Individual Protection Measures, such as Personal Protective Equipment

#### Eye/face protection

ANSI Z87.1-1989 approved safety glasses with side shields. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. At elevated temperatures: A face shield is recommended.



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### Skin Protection

Wear protective clothing to prevent contact. Wear long sleeved shirt or overalls fastened at wrists and neck, with long legged trousers with trouser legs worn outside over boot tops, boots, socks, and safety hat plus gloves. Use protective skin cream on exposed skin before and during work shift. Protective clothing must be changed when it shows signs of contamination. Remove and launder contaminated clothing separately from other laundry before reuse. When material is at an elevated temperature, wear appropriate heat resistant clothing.

### Respiratory Protection

If the applicable TLVs and/or PELs are exceeded, use NIOSH-approved multipurpose air-purifying cartridge respirators, for organic vapors and P-100 particulate. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are not known, or any other circumstance where air-purifying respirators may not provide adequate protection.

### Glove Recommendations

Wear appropriate chemical resistant gloves. When material is at an elevated temperature, wear appropriate heat resistant gloves.

### Protective Materials

protective skin creams, chemical resistant material, heat resistant material

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance</b>	black solid	<b>Physical State</b>	solid
<b>Odor</b>	none at room temperature	<b>Color</b>	black
<b>Odor Threshold</b>	Not available	<b>pH</b>	Not available
<b>Melting Point</b>	40 - 180 °C	<b>Boiling Point</b>	>240 °C
<b>Boiling Point Range</b>	Not available	<b>Freezing point</b>	Not available
<b>Evaporation Rate</b>	Not available	<b>Flammability (solid, gas)</b>	Not flammable
<b>Autoignition Temperature</b>	>399 °C	<b>Flash Point</b>	>470 °F
<b>Lower Explosive Limit</b>	Not available	<b>Decomposition temperature</b>	Not available
<b>Upper Explosive Limit</b>	Not available	<b>Vapor Pressure</b>	(Negligible )
<b>Vapor Density (air=1)</b>	>1	<b>Specific Gravity (water=1)</b>	>1.297
<b>Water Solubility</b>	(Insoluble, Almost )	<b>Partition coefficient: n-octanol/water</b>	Not available
<b>Viscosity</b>	Not available	<b>Kinematic viscosity</b>	Not available
<b>Solubility (Other)</b>	Not available	<b>Density</b>	Not available



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<b>Log KOW</b>	5.98 (approximate )	<b>Physical Form</b>	solid at room temperature , changes from solid to liquid as temperature increases
<b>Molecular Weight</b>	Not available	<b>OSHA Flammability Category</b>	4

### Other Information

None known.

### Section 10 - STABILITY AND REACTIVITY

#### Reactivity

No reactivity hazard is expected.

#### Chemical Stability

Stable at normal temperatures and pressure.

#### Possibility of Hazardous Reactions

Will not polymerize.

#### Conditions to Avoid

Avoid accumulation of airborne dusts. Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials. Contact with water at elevated temperatures may cause violent foaming or explosion. Keep out of water supplies and sewers.

#### Incompatible Materials

oxidizing materials

#### Hazardous decomposition products

oxides of carbon, oxides of nitrogen, oxides of sulfur, polynuclear aromatic hydrocarbons

### Section 11 - TOXICOLOGICAL INFORMATION

#### Information on Likely Routes of Exposure

##### Inhalation

lung cancer, bladder cancer

##### Skin Contact

sensitivity to sunlight, allergic reactions, Reproductive Effects, skin cancer, scrotal cancer

##### Eye Contact

sensitivity to sunlight

##### Ingestion

No information on significant adverse effects.

#### Acute and Chronic Toxicity

#### Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

##### Coal tar pitches (65996-93-2)

Oral LD50 Rat 3300 mg/kg

Dermal LD50 Rat >5000 mg/kg (no deaths occurred )

#### Product Toxicity Data

#### Product Analysis LD/LC 50 Toxicity Values



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Oral LD50:	Rat >15000 mg/kg LD50
Dermal LD50:	Rat >2000 mg/kg

### Acute Toxicity Estimate

No data available.

### Immediate Effects

allergic reactions.

### Delayed Effects

allergic reactions, mutagenic effects, Reproductive Effects, lung cancer, bladder cancer, skin cancer, scrotal cancer

### Irritation/Corrosivity Data

Erythema/eschar score: 0, Oedema score: 0

### Respiratory Sensitization

No test data available.

### Dermal Sensitization

Component data indicate the substance is sensitizing.

### Component Carcinogenicity

Coal tar pitches	65996-93-2
ACGIH:	A1 - Confirmed Human Carcinogen
IARC:	Monograph 100F [2012] ; Supplement 7 [1987] ; Monograph 35 [1985] (Group 1 (carcinogenic to humans))
NTP:	Known Human Carcinogen
NIOSH:	potential occupational carcinogen

May cause cancer. NOAEL: 400 mg/kg oral-rat. An animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches.

### Germ Cell Mutagenicity

Available data characterizes this substance as mutagenic. May cause genetic defects.

### Tumorigenic Data

No data available

### Reproductive Toxicity

Available data characterizes this substance as a reproductive hazard. May cause harm to the unborn child. Possible risk of impaired fertility.

### Specific Target Organ Toxicity - Single Exposure

No data available.

### Specific Target Organ Toxicity - Repeated Exposure

No data available.

### Aspiration hazard

No data available.



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### **Medical Conditions Aggravated by Exposure**

respiratory disorders, skin disorders

### **Additional Data**

This product is coal tar pitch. Volume 35 of the IARC monograph states that there is sufficient evidence that coal tar pitches are carcinogenic in humans. IARC's conclusion is based upon studies suggesting an association between skin cancer and chronic occupational dermal exposure to coal tar pitches and upon other historical studies and anecdotal reports showing an association between dermal exposure to coal tar pitch and scrotal cancer in the absence of good hygiene practices. Epidemiological studies of aluminum reduction workers showed an excess risk of developing bladder cancer for workers with chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. Studies also suggest an association between lung cancer and chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. An animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches.

## **Section 12 - ECOLOGICAL INFORMATION**

### **Ecotoxicity**

May cause long-term adverse effects in the aquatic environment.

### **Component Analysis - Aquatic Toxicity**

No LOLI ecotoxicity data are available for this product's components.

### **Fish Toxicity**

Not considered toxic to fish. Not toxic at limit of water solubility.

### **Invertebrate Toxicity**

HIGH-TEMP. COAL TAR PITCH: >100 mg/l 48 hours EC50 Daphnia magna. EL50 96 hours ~100 mg/l Daphnia. EL50 48 hours >100 mg/l Algae. EL50 72 hours >100 mg/l Daphnia. ~100 mg/l Daphnia - NOELR 21 days. ~10 mg/l Algae - NOELR 72 hours.

### **Algal Toxicity**

HIGH-TEMP. COAL TAR PITCH: >8000 mg/l 72 hours EC50 Scenedesmus subspicatus.

### **Persistence and Degradability**

This substance is not expected to biodegrade. Insoluble in water.

### **Bioaccumulative Potential**

Not bioaccumulating due to solubility and chemical structure. This material is believed not to bioaccumulate. Highly insoluble in water.

### **Mobility**

This substance is expected to be immobile in soil. Insoluble in water.

### **Other Toxicity**

No data available.

## **Section 13 - DISPOSAL CONSIDERATIONS**

### **Disposal Methods**

Dispose in accordance with all applicable regulations.

### **Component Waste Numbers**

The U.S. EPA has not published waste numbers for this product's components.

## **Section 14 - TRANSPORT INFORMATION**

### **US DOT Information:**

**Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , ( Contains:



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**Material Name: CARBON PITCH SOLID**

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BENZO(A)PYRENE , BENZO(B)FLUORANTHENE ) RQ

**Hazard Class:** 9

**UN/NA #:** UN3077

**Packing Group:** III

**Required Label(s):** 9

**Further information:** This material contains reportable quantity (RQ) Hazardous Substances.

**IATA Information:**

**Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , ( Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE ) RQ

**Hazard Class:** 9

**UN#:** UN3077

**Packing Group:** III

**Required Label(s):** 9

**Further information:** Passenger & Cargo Aircraft - Ltd. Qty. - (Packing Instruction / Max. Net Qty. per Pkg.): Y956 / 30 kg G, Passenger Aircraft (Packing Instruction / Max. Net Qty. per Pkg.): 956 / 400 kgs, Cargo Aircraft (Packing Instruction / Max. Net Qty. per Pkg.): 956 / 400 kgs, ERG Code: 9L

**TDG Information:**

**Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. , ( Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE ) RQ

**Hazard Class:** 9

**UN#:** UN3077

**Packing Group:** III

**Required Label(s):** 9

**International Bulk Chemical Code**

This material contains one or more of the following chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Coal tar pitches	65996-93-2
IBC Code:	Category X (molten )

**Further information**

STCC Code: 2899868; HAZ STCC Code: 4966997, ERG: 171 US DOT Reportable Quantities

BENZO(A)PYRENE (50-32-8) 1 lbs RQ; 0.454 kg RQ BENZO(B)FLUORANTHENE (205-99-2) 1 lbs RQ; 0.454 kg RQ

**Section 15 - REGULATORY INFORMATION**

**U.S. Federal Regulations**

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Benzo[a]pyrene	50-32-8
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
Fluoranthene	206-44-0



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SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
<b>Dibenzo(a,h)pyrene</b>	<b>189-64-0</b>
SARA 313:	0.1 % Supplier notification limit
<b>Dibenzo(a,h)anthracene</b>	<b>53-70-3</b>
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
<b>Benzo(ghi)perylene</b>	<b>191-24-2</b>
SARA 313:	1 % Supplier notification limit
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
<b>Pyrene</b>	<b>129-00-0</b>
SARA 302:	1000 lb lower TPQ ; 10000 lb upper TPQ
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
SARA 304:	5000 lb EPCRA RQ
<b>Benzo(b)fluoranthene</b>	<b>205-99-2</b>
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
<b>Chrysene</b>	<b>218-01-9</b>
SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
<b>Benz[a]anthracene</b>	<b>56-55-3</b>
SARA 313:	0.1 % Supplier notification limit
CERCLA:	10 lb final RQ ; 4.54 kg final RQ
<b>Anthracene</b>	<b>120-12-7</b>
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
<b>Benzo(k)fluoranthene</b>	<b>207-08-9</b>



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SARA 313:	0.1 % Supplier notification limit
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
<b>Benzo(j)fluoranthene</b>	<b>205-82-3</b>
SARA 313:	0.1 % Supplier notification limit
<b>Dibenzo(a,i)pyrene</b>	<b>189-55-9</b>
SARA 313:	0.1 % Supplier notification limit
CERCLA:	10 lb final RQ ; 4.54 kg final RQ
<b>Phenanthrene</b>	<b>85-01-8</b>
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
<b>Dibenzo(a,e)pyrene</b>	<b>192-65-4</b>
SARA 313:	0.1 % Supplier notification limit
<b>Indeno(1,2,3-cd)pyrene</b>	<b>193-39-5</b>
SARA 313:	0.1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
<b>Acenaphthene</b>	<b>83-32-9</b>
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
<b>Dibenzofuran</b>	<b>132-64-9</b>
SARA 313:	1 % de minimis concentration
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
<b>Fluorene</b>	<b>86-73-7</b>
CERCLA:	5000 lb final RQ ; 2270 kg final RQ

**SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories**

Combustible Dust; Carcinogenicity; Reproductive Toxicity; Respiratory/Skin Sensitization; Germ Cell Mutagenicity

**U.S. State Regulations**

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
<b>Coal tar pitches</b>	<b>65996-93-2</b>	Yes	Yes	Yes	Yes	Yes

**California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)**

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**WARNING**

This product can expose you to chemicals including Benzo[a]pyrene, which is known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

### Canada Regulations

#### Canadian WHMIS Ingredient Disclosure List (IDL)

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

<b>Coal tar pitches</b>	<b>65996-93-2</b>
	0.1 %
<b>Benzo[a]pyrene</b>	<b>50-32-8</b>
	0.1 %
<b>Fluoranthene</b>	<b>206-44-0</b>
	1 %
<b>Dibenzo(a,h)pyrene</b>	<b>189-64-0</b>
	0.1 %
<b>Dibenzo(a,h)anthracene</b>	<b>53-70-3</b>
	0.1 %
<b>Pyrene</b>	<b>129-00-0</b>
	1 %
<b>Benzo(b)fluoranthene</b>	<b>205-99-2</b>
	0.1 %
<b>Chrysene</b>	<b>218-01-9</b>
	0.1 %
<b>Benz[a]anthracene</b>	<b>56-55-3</b>
	0.1 %
<b>Dibenzo(a,i)pyrene</b>	<b>189-55-9</b>



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	0.1 %
<b>Indeno(1,2,3-cd)pyrene</b>	<b>193-39-5</b>
	0.1 %

**WHMIS Classification**

D2A , D2B

**Component Analysis - Inventory**

**Coal tar pitches (65996-93-2)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

**Benzo[a]pyrene (50-32-8)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	No	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes

**Fluoranthene (206-44-0)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes

**Dibenzo(a,h)pyrene (189-64-0)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

**Dibenzo(a,h)anthracene (53-70-3)**



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US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

**Benzo(ghi)perylene (191-24-2)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

**Pyrene (129-00-0)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

**Benzo(b)fluoranthene (205-99-2)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes

**Chrysene (218-01-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	No	No	No	Yes	No	No	No	Yes	No	Yes	Yes

**Benz[a]anthracene (56-55-3)**



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US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes

**Anthracene (120-12-7)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

**Benzo(k)fluoranthene (207-08-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

**Benzo(j)fluoranthene (205-82-3)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	No	Yes	Yes

**Dibenzo(a,i)pyrene (189-55-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

**Phenanthrene (85-01-8)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI -	KR KECI -	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
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							Annex 1	Annex 2						
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

**Dibenzo(a,e)pyrene (192-65-4)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	No	No	Yes	No

**Indeno(1,2,3-cd)pyrene (193-39-5)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

**Acenaphthene (83-32-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes

**Dibenzofuran (132-64-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes

**Fluorene (86-73-7)**



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US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes

**U.S. Inventory (TSCA)**

Listed on inventory.

**Section 16 - OTHER INFORMATION**

**NFPA Ratings**

Health: 2 Fire: 1 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

**Summary of Changes**

Updated: 07/19/2018; MSDS SUMMARY OF CHANGES: SECTION 15 - CA Proposition 65

**Key / Legend**

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania\*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC - European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX - Mexico; Ne - Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL - Non-Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL - Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH - Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA - Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW - Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

**Other Information**

**Disclaimer:**

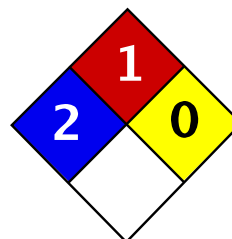


## Safety Data Sheet

**Material Name: CARBON PITCH SOLID**

**SDS ID: 00227841**

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.



Health	2
Fire	1
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Trichloroethylene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Trichloroethylene

**Catalog Codes:** SLT3310, SLT2590

**CAS#:** 79-01-6

**RTECS:** KX4560000

**TSCA:** TSCA 8(b) inventory: Trichloroethylene

**CI#:** Not available.

**Synonym:**

**Chemical Formula:** C<sub>2</sub>HCl<sub>3</sub>

**Contact Information:**

**Sciencelab.com, Inc.**  
14025 Smith Rd.  
Houston, Texas 77396

US Sales: **1-800-901-7247**  
International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**  
1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

**Toxicological Data on Ingredients:** Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse].  
DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

**MUTAGENIC EFFECTS:** Not available.

**TERATOGENIC EFFECTS:** Not available.

**DEVELOPMENTAL TOXICITY:** Not available.

The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 420°C (788°F)

**Flash Points:** Not available.

**Flammable Limits:** LOWER: 8% UPPER: 10.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>), halogenated compounds.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the

product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

### Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 50 STEL: 200 (ppm) from ACGIH (TLV)

TWA: 269 STEL: 1070 (mg/m<sup>3</sup>) from ACGIH

Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 131.39 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 86.7°C (188.1°F)

**Melting Point:** -87.1°C (-124.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.4649 (Water = 1)

**Vapor Pressure:** 58 mm of Hg (@ 20°C)

**Vapor Density:** 4.53 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 20 ppm

**Water/Oil Dist. Coeff.:** The product is equally soluble in oil and water;  $\log(\text{oil/water}) = 0$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol, diethyl ether, acetone.

**Solubility:**

Easily soluble in methanol, diethyl ether, acetone.

Very slightly soluble in cold water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:**

Extremely corrosive in presence of aluminum.

Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 2402 mg/kg [Mouse].

Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Passes through the placental barrier in human. Detected in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Trichloroethylene : UN1710 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

Trichloroethylene

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene

Pennsylvania RTK: Trichloroethylene

Florida: Trichloroethylene

Minnesota: Trichloroethylene

Massachusetts RTK: Trichloroethylene

New Jersey: Trichloroethylene

TSCA 8(b) inventory: Trichloroethylene

CERCLA: Hazardous substances.: Trichloroethylene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**

R36/38- Irritating to eyes and skin.

R45- May cause cancer.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves.

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:54 PM

**Last Updated:** 11/06/2008 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# SAFETY DATA SHEET

## Vinyl Chloride

### Section 1. Identification

<b>GHS product identifier</b>	: Vinyl Chloride
<b>Chemical name</b>	: vinyl chloride
<b>Other means of identification</b>	: chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC
<b>Product type</b>	: Gas.
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC
<b>SDS #</b>	: 001067
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas CARCINOGENICITY - Category 1 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2

#### GHS label elements

##### Hazard pictograms



##### Signal word

: Danger

##### Hazard statements

: Extremely flammable gas.  
May form explosive mixtures with air.  
Contains gas under pressure; may explode if heated.  
May cause frostbite  
May displace oxygen and cause rapid suffocation.  
May cause cancer.  
May cause damage to organs through prolonged or repeated exposure. (liver)

#### Precautionary statements

##### General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

##### Prevention

: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not breathe gas.

## Section 2. Hazards identification

- Response** : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
- Storage** : Store locked up. Protect from sunlight. Store in a well-ventilated place.
- Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Hazards not otherwise classified** : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

## Section 3. Composition/information on ingredients

- Substance/mixture** : Substance
- Chemical name** : vinyl chloride
- Other means of identification** : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC
- Product code** : 001067
- CAS number/other identifiers**
- CAS number** : 75-01-4

Ingredient name	%	CAS number
vinyl chloride	100	75-01-4

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : As this product is a gas, refer to the inhalation section.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : No known significant effects or critical hazards.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Ingestion** : As this product is a gas, refer to the inhalation section.

#### Over-exposure signs/symptoms

## Section 4. First aid measures

- Eye contact** : No specific data.  
**Inhalation** : No specific data.  
**Skin contact** : No specific data.  
**Ingestion** : No specific data.

### Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide  
halogenated compounds

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

## Section 6. Accidental release measures

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not breathe gas. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Store locked up. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
vinyl chloride	<b>ACGIH TLV (United States, 3/2017).</b> TWA: 1 ppm 8 hours. <b>OSHA PEL (United States, 6/2016).</b> STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. <b>OSHA PEL 1989 (United States, 3/1989).</b> STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours.

**Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

## Section 8. Exposure controls/personal protection

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Gas. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]
- Color** : Colorless.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -153.8°C (-244.8°F)
- Boiling point** : -13.4°C (7.9°F)
- Critical temperature** : 158.45°C (317.2°F)
- Flash point** : Closed cup: -78°C (-108.4°F)  
Open cup: -78°C (-108.4°F)
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Lower: 3.8%  
Upper: 29.3%

## Section 9. Physical and chemical properties

<b>Vapor pressure</b>	: Not available.
<b>Vapor density</b>	: 2.2 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 6.25
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 0.16129 (21.1°C / 70 to °F)
<b>Relative density</b>	: Not applicable.
<b>Solubility</b>	: Not available.
<b>Solubility in water</b>	: 1.1 g/l
<b>Partition coefficient: n-octanol/water</b>	: 1.38
<b>Auto-ignition temperature</b>	: 472°C (881.6°F)
<b>Decomposition temperature</b>	: Not available.
<b>Viscosity</b>	: Not applicable.
<b>Flow time (ISO 2431)</b>	: Not available.
<b>Molecular weight</b>	: 62.5 g/mole
<b><u>Aerosol product</u></b>	
<b>Heat of combustion</b>	: -18924336 J/kg

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
<b>Incompatible materials</b>	: Oxidizers
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Not available.

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

## Section 11. Toxicological information

### Classification

Product/ingredient name	OSHA	IARC	NTP
vinyl chloride	+	1	Known to be a human carcinogen.

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
vinyl chloride	Category 2	Not determined	liver

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : As this product is a gas, refer to the inhalation section.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : No specific data.
- Ingestion** : No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

#### Long term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

- General** : May cause damage to organs through prolonged or repeated exposure.
- Carcinogenicity** : May cause cancer. Risk of cancer depends on duration and level of exposure.
- Mutagenicity** : No known significant effects or critical hazards.
- Teratogenicity** : No known significant effects or critical hazards.
- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.

## Section 11. Toxicological information

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Not available.

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
vinyl chloride	1.38	-	low

### Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.






### United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Vinyl chloride; Ethene, chloro-	75-01-4	Listed	U043

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
<b>UN number</b>	UN1086	UN1086	UN1086	UN1086	UN1086
<b>UN proper shipping name</b>	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED

## Section 14. Transport information

Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

### Additional information

#### DOT Classification

: **Reportable quantity** 1 lbs / 0.454 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

**Limited quantity** Yes.

**Quantity limitation** Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.

**Special provisions** 21, B44, T50

#### TDG Classification

: Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).

**Explosive Limit and Limited Quantity Index** 0.125

**ERAP Index** 3000

**Passenger Carrying Road or Rail Index** Forbidden

#### IATA

: **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL and the IBC Code** : Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined  
**Clean Water Act (CWA) 307:** vinyl chloride  
**Clean Air Act (CAA) 112 regulated flammable substances:** vinyl chloride

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

## Section 15. Regulatory information

### SARA 311/312

**Classification** : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

### SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	vinyl chloride	75-01-4	100
Supplier notification	vinyl chloride	75-01-4	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

### State regulations

**Massachusetts** : This material is listed.

**New York** : This material is listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

### California Prop. 65

**⚠ WARNING:** This product can expose you to Vinyl chloride, which is known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Ingredient name	No significant risk level	Maximum acceptable dosage level
Vinyl chloride	Yes.	-

### International regulations

#### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

#### Montreal Protocol (Annexes A, B, C, E)

Not listed.

#### Stockholm Convention on Persistent Organic Pollutants

Not listed.

#### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

#### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

### Inventory list

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : **Japan inventory (ENCS):** This material is listed or exempted.  
**Japan inventory (ISHL):** This material is listed or exempted.

**Malaysia** : This material is listed or exempted.

**New Zealand** : This material is listed or exempted.

**Philippines** : This material is listed or exempted.

**Republic of Korea** : This material is listed or exempted.

**Taiwan** : This material is listed or exempted.

**Thailand** : Not determined.

**Turkey** : This material is listed or exempted.

## Section 15. Regulatory information

**United States** : This material is listed or exempted.

**Viet Nam** : Not determined.

## Section 16. Other information

### Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		4
Physical hazards		2

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

### National Fire Protection Association (U.S.A.)



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2	Expert judgment

### History

**Date of printing** : 7/9/2018

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**Date of previous issue** : 10/11/2016

**Version** : 0.02

### Key to abbreviations

: ATE = Acute Toxicity Estimate  
 BCF = Bioconcentration Factor  
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
 IATA = International Air Transport Association  
 IBC = Intermediate Bulk Container  
 IMDG = International Maritime Dangerous Goods  
 LogPow = logarithm of the octanol/water partition coefficient  
 MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
 UN = United Nations

## Section 16. Other information

**References** : Not available.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

# Appendix D

## Certifications

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To be added prior to fieldwork start.

Appendix E  
COVID HASP

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## Field Program COVID-19 Management Plan

Date: \_\_\_\_\_  
Project No: \_\_\_\_\_  
Project Name: \_\_\_\_\_

In response to the global situation regarding Coronavirus Disease 2019 (COVID-19), Anchor QEA, LLC, has compiled the following guidance to support our ongoing field efforts, whether sediment sampling efforts, wetland delineations, groundwater evaluation, site visits, or construction management. Anchor QEA strongly encourages all staff to be fully vaccinated when they are eligible in the location where they reside. Anchor QEA also requests that, while not required, staff upload a record of their vaccination into the WorkCare screening portal.

This Field Program COVID-19 Management Plan (Plan) is an addendum to the existing project-specific Health and Safety Plan (HASP) for field activities and shall remain a portion of the HASP until superseded by other notification. All personnel who have previously signed acknowledging the HASP must sign off acknowledging this Plan. Acknowledgement of this Plan will be included with future acknowledgements of the overall HASP.

***We must keep in mind that our underlying social distancing requirements and responsibilities are the foundation of all our activities. Do not come to work if you are feeling sick, and contact your Manager immediately if you have symptoms consistent with COVID-19, have tested positive for COVID-19, and/or suspect you have been exposed.*** We also need to be cognizant of changing state and local orders and directives (or removal of restrictions) associated with COVID-19. Specific field efforts will require discussions between the Project Manager, field staff, and client to address availability, travel, and other considerations. If necessary, specific state, local, or project-specific orders and directives can be included with this Plan after review by Health and Safety.

1. Field programs will follow this Field Program COVID-19 Management Plan unless the client, prime contractor, federal, state, or local government establish more restrictive measures, in which case the more restrictive measures will be followed.
2. For projects that do not have an established daily screening, the WorkCare screening portal is to be used.
3. Updated information can be found at the U.S. Centers for Disease Control and Prevention (CDC) website (<https://www.cdc.gov/>), as well as state and local health agency websites.
4. Staff traveling to certain locations may need to comply with specific testing or vaccination requirements. The company will coordinate with staff as appropriate to meet these requirements, realizing that staff selection for a specific project may be determined by these factors.
5. Nationwide, our community defense is to slow the spread of COVID-19, which may include not traveling between impacted areas and less impacted areas. Therefore, we will evaluate limiting

**Responsibility is taken, not given. Take responsibility for safety.**

## Field Program COVID-19 Management Plan

travel for field work on a case-by-case basis consistent with this community defense approach and following appropriate national, state, and local guidance. We expect that this situation will be fluid as conditions change in the country.

6. Field project schedules, modifications, and regulatory requirements will be discussed with the client representatives.

The objective of this Plan is to provide additional operational guidelines to the team that address the challenges presented by COVID-19 and ensure consistency in our response actions across the project team. These guidelines are consistent with and based on recommendations from the CDC, with multiple links provided throughout. All personnel have Stop Work Authority. If you should have questions or concerns, please direct those to your Field Lead, Staff Manager, or Project Manager.

Some site owners or prime contractors may conduct temperature screening prior to entering a site, which is in accordance with some current guidance. Some site owners or prime contractors may want to record actual temperature readings, test results, or information other than general yes or no questions related to travel, symptoms, vaccination status, etc. If you choose not to participate in the recording of screening information, the site owner or prime contractor may not allow you to access the site. You should immediately contact your Field Lead, Staff Manager, or your Project Manager to discuss alternative work and available options.

The following describes minimum measures to be followed by the project team:

### Prior to Coming to the Site

- Travel is allowed.
- Understand the community exposure and travel history of all staff. If a staff member has traveled to an affected country outside the United States or has had close contact with an infected individual within the United States, we require that they be cleared by WorkCare.
  - The following link provides the CDC list of countries with Travel Health Notices in Place: <https://wwwnc.cdc.gov/travel/notices>
  - The following link provides CDC information on cases within the United States: <https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html>
- If masks (i.e., N 95) are used, they should be used in accordance with OSHA 1910.120, stating, in part, that the user must be fit-tested and in a surveillance program.
- Prior to departing for the site, the Site Safety Officer should obtain enough supply of U.S. Environmental Protection Agency (EPA)-registered disinfectants, wipes, hand sanitizers, and gloves.
- Some projects may require temperature readings prior to entry to a project site. Anchor QEA supports privacy concerns, and if a temperature reading or vaccination status is recorded

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## Field Program COVID-19 Management Plan

(vs. a green light/red light approach based on a temperature threshold) we will take steps to document the confidentiality of that information. However, in some cases Anchor QEA cannot control the procedure nor document confidentiality. In these situations, Anchor QEA staff will need to acknowledge that if they choose to not comply in the future that is their right. If a staff member chooses to not comply, the Project Manager, Regional Lead, and Human Resources should be consulted.

- Some projects may require procedures to document a 14-day look-back period that is absent of symptoms consistent with COVID-19.
- Staff should be self-isolated, as necessary, prior to coming to the site in accordance with current federal, state, and local orders. Any staff member who has been exposed to any household member (including healthcare professionals) exhibiting COVID-19 symptoms or has tested positive for COVID-19 will not report to the site for work unless they have met the guidelines contained in this Plan.
- Exposure to, or close contact with, means being within 6 feet of an individual for 15 minutes or greater in a 24-hour period or being exposed to their cough or sneeze.
- If you meet the criteria listed for Primary or Secondary Exposure, listed below, do not report to work; contact your Manager, contact the Health and Safety representatives, and stay home until the appropriate return to work criteria are met.
- **Regardless of vaccination status, if staff feel that they are sick or showing symptoms, they are required to stay home and not report to work (office or field).** They should call their Manager immediately and notify them that they are sick. Showing up to work with symptoms will result in the staff being asked to leave to avoid potentially exposing others to the virus.
- If staff are showing symptoms, they are to contact WorkCare and their healthcare provider for medical advice. If staff feel the need to visit a medical professional, it is recommended that the medical office be contacted first to determine when it is appropriate to visit.
- If staff show any symptoms while on site, they will be asked to leave and not return until they have been cleared by WorkCare. They may be requested submit a physician's note, by WorkCare, releasing them back to work. The exception to this would be if their primary physician recommends more restrictive measures.
  - [https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html](https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html)

### Fully Vaccinated

The CDC defines “fully vaccinated” as greater than or equal to 2 weeks following the final dose in a two-dose series or following the initial dose in a single-dose vaccine.

**Responsibility is taken, not given. Take responsibility for safety.**

## Field Program COVID-19 Management Plan

Anchor QEA will follow CDC and Occupational Safety and Health Administration (OSHA) recommendations regarding fully vaccinated staff being able to forgo the face covering and social distancing requirements both in the office and field. For field work, reference the latest version of this Plan. Fully vaccinated staff must comply with the following guidelines:

- Complete an acknowledgement in Bamboo regarding the updated requirements as well as consent to share with Project Managers, Field Leads, Office Leads, and Staff Managers (who have a need to know) information related to being fully vaccinated if that information has been in accordance with the updated requirements.
- Vaccination information is uploaded into the WorkCare portal. This is to help us meet various state requirements for the employer to determine if the staff member is fully vaccinated.
- Staff who are fully vaccinated, even if information is uploaded to WorkCare, may still use face coverings and follow social distancing if they desire.
- Out of respect, all staff will have face coverings available and fully vaccinated staff will use face coverings if requested by others in close contact situations.
- Fully vaccinated staff are not required to use face coverings or follow social distancing during meetings, meals, or other close contact situations unless requested.
- All staff will still be required to complete the WorkCare daily screening or other project-specific screening.
- All laws, regulations, client requirements, field work requirements, building requirements, and other company requirements apply to all staff (e.g., air travel requirements).
- Fully vaccinated staff that have notified the company may sit together without social distancing or face coverings for meals.
- Food and beverages are allowed to be brought to the project site for sharing, if they are individually packaged.
- Travel is allowed to include sharing vehicles with others who are fully vaccinated.
- Staff must be considerate of others.
- If asymptomatic following close contact with a Primary Exposure, staff do not need to isolate but do need to follow up with WorkCare.

Staff are not required to obtain the vaccination or to notify the company if they have been vaccinated unless they wish to follow the above process. Fully vaccinated staff who have had close contact with a Primary Exposure or who have symptoms consistent with COVID-19 must be cleared to return to work following the processes outlined in the Case Response section below.

### Not Fully Vaccinated

The CDC defines “fully vaccinated” as greater than or equal to 2 weeks following the final dose in a two-dose series or following the initial dose in a single-dose vaccine.

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## Field Program COVID-19 Management Plan

Anchor QEA will follow CDC and OSHA recommendations for staff who are not fully vaccinated regarding face covering and social distancing requirements both in the office and field. For field work, reference the latest version of this Plan. Staff who are not fully vaccinated must comply with the following guidelines:

- All staff will still be required to complete the WorkCare daily screening or project-specific screening.
- All laws, regulations, client requirements, field work requirements, building requirements, and other company requirements apply to all staff (e.g., air travel requirements).
- Avoid close contact (i.e., handshakes or other physical contact) and practice social distancing (stay at least 6 feet away from others).
- Meetings are allowed; however, those who are not fully vaccinated must adhere to social distancing requirements.
- If there is a chance that an unvaccinated staff member might have close contact with someone, such as being within 6 feet of an individual for 15 minutes or greater in a 24-hour period, or being exposed to their cough or sneeze, the staff member must wear a face covering in accordance with CDC guidance.
- Common areas (i.e., kitchens, break areas, conference rooms, entryways, restrooms, and copier and printer stations) are to be avoided to the greatest extent possible and social distancing must be observed by those not fully vaccinated.
- The use of communal coffee pots, microwaves, refrigerators, and similar items are allowed.
- Food and beverages are allowed to be brought to the project site for sharing, if they are individually packaged.
- Travel is allowed.
- Travel is preferred to be in individual vehicles.
- Staff should wear cloth face coverings in public settings, in addition to social distancing measures, including travel to the site or office, grocery stores, and picking up to-go food.
- Avoid restaurants if open; use drive-in or take-out services.
- The CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery stores and pharmacies) especially in areas of significant community-based transmission.
- Staff must be considerate of others.

Staff are not required to obtain the vaccination or to notify the company if they have been vaccinated unless they wish to follow the process for fully vaccinated staff.

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## Field Program COVID-19 Management Plan

### Visitors

- Visitors are allowed but must complete a WorkCare visitor screening or project-specific screening. They additionally must sign an affirmation statement if they wish to forgo the face covering and social distancing requirements.
- Meetings with outside parties should take place virtually, when possible.
- Delivery personnel should not remain in indoor settings for longer than 15 minutes without completing the visitor screening.
- For visitors to forgo the face covering and social distancing requirement, they must attest that they are fully vaccinated when signing in.
- All laws, regulations, client requirements, field work requirements, building requirements, and other company requirements apply to all visitors (e.g., air travel requirements).

### On-Site Preventative Measures and Cleaning Requirements

- All staff who work on the site will be required to undergo a site safety orientation (tailgate meeting), which will include information on specific measures to be followed to address efforts to prevent the spread of COVID-19. All field staff are required to vocalize concerns and ensure that protective measures that will slow the spread of COVID-19 are employed.
- Follow the site-specific HASP Personal Protective Equipment (PPE) requirements.
- One step to control spread of the virus at the project job site is focused on hygiene. All staff and management staff will follow CDC guidance regarding hand washing.
  - <https://www.cdc.gov/handwashing/index.html>
  - Hand wash stations and/or sanitizing wipes/sanitizing gel will be made readily available around the job site and within project office trailers. If these supplies are insufficient, work should be stopped until additional supplies are procured.
- Office trailers will also be cleaned at least twice a day using disinfectant to wipe all surfaces that may be touched by hand including desk and table surfaces. In addition, office trailer personnel (as directed by the Field Lead) will be responsible for multiple daily cleaning of the various field offices and related workspaces.
- Smart phones and radios should be wiped down frequently throughout the day and should not be shared to the greatest extent possible. If these items are shared, they are to be wiped down prior to handing off to another individual or placing in storage for the day.
- Field support areas, boats/vessels, and equipment cabs will be cleaned throughout the day and at every shift change. All “touch” surfaces will be thoroughly wiped clean using a disinfectant.
- Staff should follow published guidance to limit transmission at home and outside of work: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html>

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## Field Program COVID-19 Management Plan

- The following links provide a list of U.S. Environmental Protection Agency recommended cleaning products able to kill the virus, as well as some initial guidance with alternatives if supplies run out. ***“Note: Inclusion on this list does not constitute an endorsement by EPA. Additional disinfectants may meet the criteria for use against SARS-CoV-2. EPA will update this list with additional products as needed.”***
  - <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>
  - If these products are not available, then either a diluted bleach solution or 70% alcohol solution will work.
  - <https://www.cdc.gov/coronavirus/2019-ncov/community/home/cleaning-disinfection.html>
- If a staff member becomes ill while on site, they should return to their hotel room or local home, contact their healthcare provider, and follow their guidance. The staff member’s Manager should be contacted immediately. Our Health and Safety representatives will follow up with the staff member. If the staff member has a confirmed or presumed case as determined by a healthcare provider, we will follow our procedures as outlined in this document. If the staff member is not able to transport themselves, local emergency responders will be called as per company protocol.

## Case Response, and Equipment and Facility Decontamination

According to the CDC, symptoms can appear 2 to 14 days after exposure. Symptoms or combinations of symptoms that may be consistent with COVID-19 include cough, shortness of breath, difficulty breathing, fever (100.4°F [37.8°C] or greater), chills, repeated shaking with chills, muscle pain or body aches, headache, sore throat, congestion or runny nose, nausea or vomiting, diarrhea, or new loss of taste or smell.

If you have symptoms that are consistent with COVID-19 but have not tested positive, regardless of what your primary physician concludes, you are to self-isolate until you have been released to return to work by WorkCare. Immediately contact your Regional Lead and Project Manager. WorkCare may ask you to submit a physician’s note releasing you back to work. The exception to this would be if your primary physician recommends more restrictive measures. In this case there is no need to alert or self-isolate any other staff.

Regarding COVID-19 exposures, there are three general scenarios:

- **Primary Exposure:** These are staff who have tested positive for the virus. If you have tested positive for COVID-19, you must be in self-isolation and an effort will be made to contact those people you had direct contact with in the last 14 days. You must not return to the work site until you have been released to return by WorkCare. The exception to this would be if your primary physician recommends more restrictive measures.

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## Field Program COVID-19 Management Plan

- **Secondary Exposure:** These are staff who, within the last 14 days, have had direct contact with someone who has tested positive for COVID-19. You must self-isolate until released by WorkCare to return. You are encouraged to seek medical care. If you start to have symptoms or test positive, follow the appropriate guidance for Primary Exposure noted above.
- **Tertiary Exposure:** These are staff who have had direct contact with someone that meets Secondary Exposure criteria or have been in the same general area. In this scenario, there is no requirement to isolate; however, the staff should self-monitor for the development of symptoms.

In the event there is a documented case of a staff member becoming infected with COVID-19 (Primary Exposure) the field management team will take immediate action as follows:

- The staff member should immediately self-isolate until they have been released to return by WorkCare.
- Notify the Project Manager, Human Resources, and Regional Lead immediately.
- The staff member's work steps will be traced back 14 days to identify work areas the individual may have contacted. All identified areas will be isolated and marked off limits to all site personnel, until a decontamination process can be implemented.
- All identified areas will be disinfected by qualified individuals following CDC guidelines.
- Staff who came in direct contact with the individual will be notified. The Regional Lead will work with the Project Manager and Human Resources to notify the Anchor QEA staff who were identified.
- The Project Manager, in coordination with the client, will notify subcontractors and vendors on the site who had direct contact with the individual.
- The Project Manager should notify the client immediately and inform them of our backup staffing plan as well as our notification plan.
- Confidentiality for the staff member should be maintained.

If a staff member, within the last 14 days, has had direct contact with someone diagnosed with COVID-19 (Secondary Exposure), the field management team will take immediate action as follows:

- Send staff home immediately and have them coordinate with WorkCare for their return.
- Let the Regional Lead and Project Manager know immediately.
- Continue cleaning of common touch areas with recommended disinfectants.
- If staff tests positive, this becomes a Primary Exposure scenario, and that guidance should then be followed.

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## Field Program COVID-19 Management Plan

Situations where a staff member may have had Tertiary Exposure are more difficult to manage. This involves having direct contact with someone who has had Secondary Exposure. In the event of Tertiary Exposure, the field management team will take immediate action as follows:

- Let the Regional Lead and Project Manager know immediately.
- No further notifications are necessary with this scenario.
- Continue cleaning of common touch areas with recommended disinfectants.
- This becomes a Secondary Exposure scenario if the acquaintance is confirmed to be infected, and that guidance should then be followed.

When staff are in self-isolation, their Manager or designee will follow up with them two times per week.

### General Measures / Guidance

- Staff must follow the same prevention guidelines off site, which includes travel, hotel, and other activities, in order to address potential exposures outside the workplace.
- Travel, whether by train or plane, will be reviewed on a case-by-case basis. Mass transit should be avoided where social distancing is difficult.
- The virus may live on a variety of surfaces for some period of time; closely follow the cleaner/disinfectant contact time. Avoid combining products that are incompatible and may create toxic byproducts.
- When at hotels, disinfect your own room with EPA-registered cleaners or alternatives, and use the NO HOUSEKEEPING sign to minimize the people coming into your room.
- Catch coughs and sneezes with a disposable tissue, etc. and throw away, then wash hands. If tissues are not available, direct coughs and sneezes into elbow.
- Avoid touching your own mouth, nose, or eyes.
- Hand washing stations with soap and water will be available at all restroom facilities. Frequent hand washing is recommended throughout the day. Washing hands thoroughly for a minimum of 20 seconds with soap and water is one of the most effective ways to prevent the spread of germs. Personnel should wash their hands regularly, before and after going to the bathroom, before and after eating, and after coughing, sneezing, or blowing their nose.
- If soap and water are not available, use hand sanitizer with a minimum of 60% alcohol content.
- Anchor QEA will provide staff with face coverings that can be used for field projects and staff may also use their own face covering if they choose.
- Some projects, municipalities, counties, and states may implement additional requirements for the use of face coverings, gloves, or other items. Those requirements should be followed.

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## Field Program COVID-19 Management Plan

- Time spent in large groups in enclosed spaces will be avoided. Potential alternatives could include phone conferences or holding meetings outside (i.e., field crew safety meetings). Field activities, whether inside or outside, should be planned to minimize staff density in that location.
- Avoid use of shared beverage containers (e.g., coffee pots, water coolers) or food setups (e.g., pizza, buffets). For instance, bring an individual water bottle.
- Work requiring several or more staff will need to be evaluated and a determination will need to be made on how the work can be done safely with a few staff, if at all. If the work cannot be conducted safely, then it may have to be rescheduled for a later time.
- Disinfecting wipes will be located throughout the site for wiping down hard surfaces as required. Alternatives, such as bleach/water solutions, may be used in addition to or in place of disinfecting wipes.
- The frequency and scope of the cleaning program for project facilities (office trailers, bathrooms, other buildings, and work areas) will be reviewed and increased, as necessary.
- Areas where staff eat should be a focus of cleaning efforts.
- Field team equipment operators, vessel operators, and vehicle drivers (whether Anchor QEA equipment or subconsultant equipment) will be provided with disinfecting wipes to clean the enclosed spaces daily. Emphasis should be on hard surfaces that are commonly touched (steering wheel, door handles, levers, buttons).
- Alternates for critical job functions should be available.
- All staff will have their own PPE and will not share with others. Respirators and PPE will be cleaned/disinfected when doffing, along with a thorough arm, hand, and face washing when exiting.
- All staff need to be vigilant regarding potential exposure and transmission of COVID-19. Avoiding any complications related to this outbreak will be a team effort as much as any safety or production concerns related to the project.

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# Appendix F

## Wildfire HASP

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## Field Program Wildfire Management Plan

Date: \_\_\_\_\_  
Project No: \_\_\_\_\_  
Project Name: \_\_\_\_\_

Wildfires can be a common threat in many areas of the country and we need to recognize this threat. If a local wildfire could endanger the field team, the non-essential work should be rescheduled. This Management Plan is intended to provide information needed to prepare and respond to a situation where wildfire smoke has inundated the area and the safety of outdoor activities needs to be evaluated. According to *Wildfire Smoke: A Guide For Public Health Officials* (California Air Resources Board et al. 2019), wildfire smoke is a mixture of air pollutants where particulate matter is the main concern. A large population can be exposed to smoke from a wildfire event; however, most healthy adults and children will recover quickly from wildfire smoke exposure. Certain portions of the population may be at greater risk of experiencing health effects.

“Wildfire behavior will vary depending on natural fuel type; fires in forest fuels can range from mild to severe and can spread very slowly or extremely rapidly depending on weather and fuel conditions. Wildfires in forests can last for weeks or months and are often the type that results in the most severe and longest duration air quality impacts. Smoke levels in populated areas can be difficult to predict” (California Air Resources Board et al. 2019).

### Determining Potential for Harmful Exposure

When there are wildfires and/or smoke in the area where outdoor work is to be performed, the Field Lead, or designee, will access air quality conditions at the beginning of each shift at a minimum. This will occur more frequently depending on conditions.

The current and forecasted Air Quality Index (AQI) can be found at <https://www.airnow.gov/>. The AQI is a metric that ranges from 0 to 500. The AQI value increases as the amount of particulate matter in the air increases (Air Now 2020).

Anchor QEA’s policy will be to avoid non-essential field work when the AQI is 101 or greater. The use of controls (N95 masks) during smoky conditions in order to continue with field work will not be implemented when the AQI is greater than 150. For work to continue with an AQI between 101 and 150, justification must be established as to why the work cannot be delayed until conditions improve.

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# Field Program Wildfire Management Plan

## Recommended Response Based on AQI Values

QI Category (AQI Values)	Anchor QEA Recommended Response *
<b>Good (0-50)</b>	None
<b>Moderate (51-100)</b>	For most employees, no action. Employees who are aggravated by conditions should take appropriate actions. Continue to monitor situations.
<b>Unhealthy for Sensitive Groups (101-150)</b>	For most employees, no action. Employees who are part of sensitive groups should take appropriate actions. Continue to closely monitor situations.
<b>Unhealthy (151-200)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.
<b>Very Unhealthy (201-300)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.
<b>Hazardous (&gt; 300)</b>	Outdoor work in these locations should be discontinued without the use of additional controls. ** Closely monitor situations.

**NO  
outdoor  
work or  
activities  
should  
continue**

Source: Air Now 2020

\* For any conditions where smoke and ash are present in the air, tight-fitting dust-resistant safety glasses or chemical goggles should be used as necessary to prevent or minimize eye irritation.

\*\* N95 or P100 respirators can help protect your lungs from smoke or ash (if fit tested and properly worn) (California Department of Public Health et al., not dated, *Wildfire Smoke Factsheet*).

If it is believed a respirator is needed for this purpose, work must be stopped and re-evaluated. Additionally, the Project Manager and Health and Safety should be consulted prior to proceeding.

## Evacuation Levels and Response

### LEVEL I (1)

“EVACUATION or PROTECTION ALERT: A wildfire threat is in your area. It would be wise to consider planning and/or packing, in the event an evacuation becomes necessary” (U.S. Forest Service 2020).

### LEVEL II (2)

“EVACUATION WARNING or NOTICE: High probability of a need to evacuate. You should prepare now by packing necessary items and preparing your family, pets, and vehicle for potential departure” (U.S. Forest Service 2020).

### LEVEL III (3)

“EVACUATION REQUEST or ORDER: Occupants of the affected area(s) are asked to leave within a specified time period, by pre-designated route(s). Perimeter roadblocks are typically established” (U.S. Forest Service 2020).

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## Field Program Wildfire Management Plan

When a Level I (1) is issued, work should be evaluated. Only essential necessary work should be performed with a pre-evacuation plan in place. If work is continued, conditions are to be re-evaluated at least every hour. No work is to be performed under a Level II (2) or III (3). Staff should not enter or evacuate areas designated as a Level II (2) or III (3).

### General Measures / Guidance

- Conditions should be monitored for wildfires in the area where work is to be performed.
- Wildfire discussions are to be part of the daily safety briefing when conditions are present.
- Evacuation plans should be in place prior to needing to evacuate.
- If planning to use respirators, fit testing must be accomplished prior to needing to use them.
- When unsure about conditions, pause work and evacuate, as necessary.
- Pre-evacuation plans must include a primary and alternate route in addition to items that must be taken with the team.
- Everyone has "Stop Work Authority."

### References

Air Now, 2020. AQI Basics. Accessed July 2020. Available at: <https://www.airnow.gov/aqi/aqi-basics/>.

California Department of Public Health, Department of Health & Human Services, Centers for Disease Control and Prevention, U.S. Forest Service, California Air Resources Board, Office of Environmental Health Hazard Assessment, U.S. Environmental Protection Agency. (n.d.). *Wildfire Smoke Factsheet: Protect Your Lungs from Wildfire Smoke or Ash*. EPA-452/F-18-002. Available at: [https://www3.epa.gov/airnow/smoke\\_fires/respiratory-protection-508.pdf](https://www3.epa.gov/airnow/smoke_fires/respiratory-protection-508.pdf).

California Air Resources Board, California Office of Environmental Health Hazard Assessment, U.S. Centers for Disease Control and Prevention, U.S. Forest Service, and U.S. Environmental Protection Agency, 2019. *Wildfire Smoke: A Guide for Public Health Officials*. Research Triangle Park, North Carolina: United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Health and Environmental Impacts Division. EPA-452/R-19-901. Revised August 2019. Available at: <https://www3.epa.gov/airnow/wildfire-smoke/wildfire-smoke-guide-revised-2019.pdf>.

U.S. Forest Service, 2020. *General Descriptions for the Three Evacuation Levels*. Accessed July 2020. Available at: [https://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprd3852749.pdf](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3852749.pdf).

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## Appendix C

# Ecology Further Action Letters and Comment Summary

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**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
<b>Overall Site Comments</b>								
	2017	1 (p. 8)	NWTPH-Dx & SGC	Do not use SGC for evaluating compliance of NWTPH-Dx samples with MTCA cleanup levels in groundwater.	N	--	<b>Y - Testing</b>	Supplemental groundwater testing without SGC to replace/augment historic groundwater NWTPH-Dx data that were generated with SGC.
	2017	2 (p. 8)	TPH totaling (diesel & oil)	Apply the MTCA TPH cleanup level to the sum of diesel and oil range hydrocarbons.	Partial	Existing data have been evaluated in the DGWP using the sum of diesel and oil-range hydrocarbons.	Y - Reporting	Appropriate TPH totaling methods will be applied during all future work at the Site.
	2017	3 (p. 9)	Mapping of Tank Areas	Further information is required to demonstrate that historic Tank Area locations have been appropriately mapped.	Y	Anchor QEA conducted extensive historical research to document tank locations (+/- 10 feet) using historic maps and aerial photographs (DGWP Section 2.2).	N	--
	2017	4-6 (p. 9)	Method C cleanup levels	Method C cleanup levels should not be used unless all appropriate requirements for their use have been addressed.	Partial	Screening levels applied have been updated to the Method A cleanup levels for unrestrictive land use pending completion of the RI (DGWP Section 4.4).	Y - Reporting	Final cleanup levels will need to be revisited following completion of the RI and development of the FS or cleanup plan.
	2017	7 (p. 9)	TEE evaluation	Terrestrial ecological concerns must be considered.	Y	Anchor QEA documented that the Site qualifies for a TEE exclusion (DGWP Section 4.4).	N	--
	2017	8 (p. 9)	Vapor intrusion	Potential need to consider vapor intrusion pathway.	N	Vapor intrusion pathway will be screened once data gaps have been resolved (DGWP Section 4.4).	Y - Reporting	Screen vapor intrusion pathway following resolution of data gaps.
	2017	9 (p. 9)	EIM data submittal	Site data need to be submitted in EIM.	Partial	Historic sampling data have been submitted to EIM.	Y - Reporting	Future sampling data will require submittal to EIM.
	2017	10 (p. 10)	Licensed professional	Future reports must be submitted under the seal of a licensed professional.	Partial	DGWP has been prepared under the direction of a licensed professional.	Y - Reporting	Future work to be conducted under the seal of a licensed professional.
	2017	11 (p. 10)	Table 830-1 testing needs	Future sampling of soil and groundwater should address Table 830-1 testing requirements, including EDB, EDC and lead for gasoline release areas.	Partial	The sampling defined in the DGWP incorporates testing to address Table 830-1 requirements for petroleum releases where releases are known or suspected to have occurred.	<b>Y - Testing</b>	Testing for VOCs and lead consistent with MTCA Table 830-1 will be required in gasoline release areas where these data have not been previously collected.
	2017	12 (p. 10)	CVOC testing	Future sampling is needed to resolve the source and distribution of CVOC compounds present at the site (i.e. to distinguish between OCC Site and Tank Area sources of these compounds).	Partial	The Site CSM has been updated to better resolve where OCC Site contamination is known or suspected to be present. The DGWP includes targeted CVOC testing where appropriate to resolve open questions about the presence and source of contamination.	<b>Y - Testing</b>	Future testing should include CVOCs as necessary to distinguish between OCC Site and Tank Area sources of these chemicals.
	2017	13 (p. 10)	pH testing	Future sampling is needed to resolve the source and distribution of alkaline pH present in groundwater at the site (i.e. to distinguish between OCC Site and Tank Area sources of alkaline conditions).	Partial	The Site CSM has been updated to better resolve where OCC Site pH contamination is known or suspected to be present. The DGWP includes pH testing of groundwater.	<b>Y - Testing</b>	Future testing should include pH in groundwater.

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
	2017	14 (p. 10)	CSM development	A CSM needs to be developed documenting the sources, pathways and text of contamination present at the Site, including the extent of contamination remaining above proposed cleanup levels.	Partial	A CSM has been developed and included in the DGWP	Y - Reporting	The CSM will need to be updated in the RI following filling of data gaps.
	2017	15 (p. 10)	Groundwater compliance testing	Where groundwater is present above cleanup levels, four consecutive quarters of sampling below the CULs will be required to receive an NFA determination.	N	Comment to be addressed with cleanup plan following completion of RI	Y - Reporting	Where groundwater contamination is present future work will need to address Ecology monitoring requirements.
	2017	2 (p. 13)	Cleanup standards	Cleanup standards cannot be established until the Site is fully defined for all constituents of concern known or suspected to be present at the Site.	Partial	The DGWP uses appropriate screening levels based on unrestricted land uses and proposes RI activities to address all identified data gaps.	Y - Reporting	CULs and points of compliance will be revisited following completion of the RI.
	2017	3 (p. 14)	Selection of cleanup action	Compliance with Site cleanup standards cannot be determined. Site characterization will need to be completed before a cleanup option and Site cleanup standards can be established.	Partial	The DGWP uses appropriate screening levels based on unrestricted land uses and proposes RI activities to address all identified data gaps. The nature of the final cleanup action is not presumed at this time.	Y - Reporting	CULs and the selection of a cleanup remedy will need to be revisited following completion of the RI and during development of the FS or cleanup plan.
	2021	1a (p. 3)	Vapor intrusion pathway	After the extent of contamination has been determined the vapor intrusion pathway may need to be revisited.	N	Vapor intrusion pathway will be screened once data gaps have been resolved	Y - Reporting	Screen vapor intrusion pathway following resolution of data gaps.
	2021	1a (p. 3)	CSM development	After the extent of contamination has been determined, provide figures in plan view and cross-section and tables that demonstrate the extent of hazardous substances released from on-Site sources and their relationship to hazardous substances released from other nearby sites.	Partial	A CSM has been developed and included in the DGWP	Y - Reporting	The CSM will need to be updated (including plan view and cross section figures and associated tables) following filling of data gaps.
	2021	1b (p. 4)	Tanks in Blair cutback area	Ecology questioned whether tanks are/were present to the south/southwest of the present day shoreline following implementation of the Blair bank cutback.	Y	Anchor QEA has clarified in the DGWP (Section 2.1) that the Blair cutback project was never implemented. The Tank Areas evaluated in previous characterization reports are the same as those discussed in the DGWP (i.e., Tank Areas N-17, N-9/10, N-20/21/22 and N-12). These Tank Areas are all located in upland portions of the Site.	N	--
	2021	1c (p. 4)	Industrial cleanup levels	Ecology understands that the Site is more likely than not to be designated as an industrial property; however it needs to be demonstrated that the Site meets the definition of an industrial property under WAC 173-340-200 and WAC 173-340-745.	Partial	The DGWP discusses the industrial characteristics of the Site relative to WAC 173-340-200 and WAC 173-340-745 (Section 4.4). However Site screening levels are based on unrestricted land use pending completion of the RI and selection of a cleanup remedy.	Y-Reporting	For the RI report, use the screening levels contained in the DGWP which are based on unrestricted land use. The appropriateness of using industrial cleanup levels should be revisited after completion of the RI.

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
	2021	1e (p. 4)	Table 830-1 testing needs	Ecology does not concur with the methodology used to define the extent of contamination for each Tank Area. The required testing parameters provided in MTCA Table 830-1 have not been met.	Partial	The DGWP has included expanded testing provisions to address the requirements of Table 830-1 for all new data collection activities in areas where petroleum releases are known or suspected to have occurred.	Y-Testing	New DGWP testing in petroleum release areas must address the requirements of Table 830-1 where these requirements have not already been met.
	2021	1e (p. 4)	Industrial cleanup levels	The extent of hazardous substances in both soil and groundwater need to be defined to the extent of contamination; this should not rely on the application of industrial cleanup levels, irrespective of eventual cleanup levels.	Partial	Screening levels applied have been updated in the DGWP (Section 4.4) to the Method A cleanup levels for unrestricted land use pending completion of the RI. Final cleanup levels will be defined in the cleanup plan for the Site.	Y-Reporting	The RI will use the screening levels contained in the DGWP (based on unrestricted land use). Final cleanup levels will be defined in the future cleanup plan for the Site.
	2021	1f (p. 5)	Model remedies	Ecology does not concur that use of a Model Remedy is appropriate for this Site due to the presence of comingled contaminants and Ecology's determination that this is not a "routine site".	Partial	Discussion of the future cleanup of the Site has been removed from the DGWP. The DGWP is solely focused on defining the nature and extent of contamination at the Site.	Y-Reporting	The future cleanup decision for the Site will not rely on model remedies unless MTCA regulatory changes address Ecology's stated concerns as applied to the Site.
	2021	1g (p. 5)	Cleanup of comingled contamination	Ecology needs clarification of how total Site cleanup will be completed and what you expect final Site cleanup to look like. Please clarify how you are attempting to define the Site, including tanks cleaned up as part of adjacent Site cleanup activities and how comingled contamination will be addressed.	Partial	The DGWP (Section 2.2.5) clarifies that Tank N-11 has been formally included within the cleanup scope of the Alexander Avenue Tank Facilities Site. The other work described in the DGWP will also resolve remaining questions about potentially comingled contamination from off-site sources as necessary for defining the Site and future cleanup requirements.	Y-Reporting	The RI report will need to clearly define the extent of the Site, including tanks cleaned up as part of adjacent Site cleanup activities and how comingled contamination will be addressed.
	2021	1h (p. 5)	Use of wells versus Geoprobes for groundwater testing	Each tank release location should be evaluated to determine if permanent wells are required by MTCA (WAC 173-340-450(3)(a)(iii)). For any tank nests where previous groundwater grab samples showed the presence of hazardous substances, permanent monitoring wells will likely be necessary to demonstrate that the nature and extent of contamination has been defined across seasonal groundwater level changes.	Partial	The DGWP (Sections 3.2 and 3.3) clarifies that only tanks T-21/22 and T-23/24 were registered USTs subject to WAC 173-340-450(3)(a)(iii). No soil or groundwater contamination is present at Tank Area T-23/24. A new monitoring well will be installed at Tank Area T-21/22. New wells are also being installed at Tank Area P-27/28 (not regulated USTs). Wells are already present at Tank Areas N-9/10 and N-20/21/22 where the presence of soil and groundwater contamination has been confirmed.	Y-Testing	The DGWP includes installation or reinstallation of wells at all Tank Areas where 1) groundwater contamination is known to be present, and 2) groundwater wells do not currently exist. This includes well installation and sampling at Tank Areas T-21/22 and P-27/28 (see Figures 10 and 13, respectively).
	2021	1i (pp. 5-6)	Testing for comingled contamination and Table 830-1 parameters	Ecology concurs with your plan to include pH and CVOC testing for tank locations that have the potential to be impacted by contamination migrating from other nearby sites. The Site still needs to be defined for required petroleum constituents listed in MTCA Table 830-1.	Partial	The DGWP has been updated to incorporate Table 830-1 requirements for all new testing in areas where petroleum releases are known or suspected to have occurred where these requirements have not already been met.	Y-Testing	New DGWP testing in petroleum release areas must address the requirements of Table 830-1 where these requirements have not already been met.

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
	2021	1j (p. 6)	Environmental covenants	Ecology cannot concur with the use of an environmental covenant prior to the development of a Feasibility Study. The Feasibility Study should not assume that engineering controls with a Covenant is the only option.	Partial	The DGWP (Section 4.4) has been updated to clarify that the Site qualifies for a TEE exclusion. The DGWP does not rely on industrial cleanup levels or an associated environmental covenant.	Y- Reporting	The potential for use of an Environmental Covenant as part of the final cleanup will be reconsidered during future development of an FS or Cleanup Plan for the Site.
	2021	1k (p. 6)	Environmental covenants	If the Site continues to rely on industrial CULs and engineering controls and the use of a Covenant is determined to be appropriate by an FS/DCA, please include a draft Covenant with any future submittal for Ecology to review and provide concurrence.	Partial	The DGWP (Section 4.4) has been updated to clarify that the Site qualifies for a TEE exclusion. The DGWP does not rely on industrial cleanup levels or an associated environmental covenant.	Y- Reporting	The potential for use of an Environmental Covenant as part of the final cleanup will be reconsidered during future development of an FS or Cleanup Plan for the Site.
	2021	1l (p. 7)	Potential additional monitoring wells	Additional monitoring wells may be necessary to demonstrate continued compliance at your established points of compliance. These would be in addition to those discussed previously in item 1h for RI purposes.	N	--	Y-Reporting	The need for potential additional monitoring wells will be evaluated as part of future FS or Cleanup Plan development after determination of points of compliance.
	2021	2a (p. 8)	Points of compliance	A conditional point of compliance is not permitted without an Environmental Covenant supported by an FS/DCA.	Partial	The DGWP does not rely on industrial cleanup levels or an associated environmental covenant.	Y-Reporting	Points of compliance will be revisited as part of the future FS or cleanup plan for the Site.
	2021	2b (p.9)	Industrial cleanup levels	The use of Method A industrial cleanup levels may be appropriate, but this requires the establishment of institutional controls in the form of a covenant on the property. When proposing industrial CULs for a Site , the draft covenant should be included for Ecology review and concurrence.	Partial	Screening levels applied have been updated in the DGWP (Section 4.4) to the Method A cleanup levels for unrestricted land use pending completion of the RI. Final cleanup levels will be defined in the cleanup plan for the Site.	Y-Reporting	The RI will use the screening levels contained in the DGWP (based on unrestricted land use). Final cleanup levels will be defined in the future cleanup plan for the Site. If industrial CULs are selected, then appropriate environmental covenants will be developed and provided to Ecology for review and concurrence.
	2021	2c (p. 10)	Applicable laws and regulations	All cleanup actions conducted under MTCA shall comply with applicable local, state and federal laws. Report to Ecology how applicable laws and regulations specifically effect the proposed cleanup.	Partial	Applicable state and federal laws have been considered in development of the porewater sampling scope for Tank Area N-20/21/22 (Section 4.4). Other ARARs relevant to the final cleanup decision will be considered following completion of the RI.	Y-Reporting	Include discussion of applicable laws and regulations in the RI report and in future FS or Cleanup Plan documentation.
	2021	3 (p. 10)	Further investigation prior to selecting cleanup action	Ecology has determined that additional remedial investigation is necessary at the Site before selecting a cleanup action.	Partial	The DGWP describes the work necessary to address all RI-related data gaps. Remedy selection will be performed at a later date with development of an FS or Cleanup Plan.	Y-Reporting	Final remedy decisions will be addressed in the future after completion of the RI. This will be addressed in an FS or Cleanup Plan.

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
<b>Group 1 Tank Area Comments</b>								
N-12	2017	21a (p. 12)	WTPH-Dx testing & SGC	Because tank N-12 was listed as an oil tank, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Partial	Additional groundwater testing with NWTPH-Dx without SGC at Tank Area N-12 has been included in the DGWP.	<b>Y-Testing</b>	Groundwater testing with NWTPH-Dx without SGC at Tank Area N-12 to confirm the absence of oil contamination.
	2017	21b (p. 12)	Add'l tank locating efforts	Address why no further efforts were made to determine if a tank is present at the location indicated in the geophysical survey.	Partial	Anchor QEA compiled additional information to verify the historical location of tank N-12. It was confirmed that the previous geophysical testing was performed erroneously in a different location.	<b>Y-Testing</b>	Use magnetometer to verify the absence of a buried tank at the correct historic Tank N-12 tank location during planned groundwater testing.
N-13	2017	22a (p. 12)	WTPH-Dx testing & SGC	Because tank N-13 was listed as an oil tank, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Partial	Additional groundwater testing with NWTPH-Dx without SGC at Tank Area N-13 has been included in the DGWP.	<b>Y-Testing</b>	Groundwater testing with NWTPH-Dx without SGC at Tank Area N-13 to confirm the absence of oil contamination (Fig. 7).
	2017	22b (p. 12)	Add'l tank locating efforts	Address why no further efforts were made to determine if tanks are present at the locations indicated in the geophysical survey. Discuss how the 14 potential locations identified in the 2012 report were reduced to the two locations explored further in the 2015 report.	Y	A follow-up survey was performed in 2015. That survey did not detect the previous anomalies. Two anomalies were detected in 2015 and investigated by potholing. They were shown to be caused by buried metal debris.	N	--
N-17	2017	23a (p. 12)	WTPH-Dx testing & SGC	Because tank N-17 was listed as an oil tank, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Partial	Additional groundwater testing with NWTPH-Dx without SGC at Tank Area N-17 has been included in the DGWP.	<b>Y-Testing</b>	Groundwater testing with NWTPH-Dx without SGC at Tank Area N-17 to confirm the absence of oil contamination (Fig. 8)
T-23/24	2017	18b (p.11)	WTPH-Dx testing & SGC	Because motor oil was stored in tanks T-23 and T-24, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Partial	Additional groundwater testing with NWTPH-Dx without SGC at T-23/24 has been included in the DGWP.	Y	Groundwater testing with NWTPH-Dx without SGC at Tank T-23/24 to confirm the absence of oil contamination (Fig 9).
<b>Group 2 Tank Area Comments</b>								
T-21/22	2017	18a (p. 11)	T-21/22 product line	The product line associated with tanks T-21/22 should be removed and examined for leaking along its pathway.	Y	Anchor QEA confirmed that the product line and pump islands were removed as part of prior Port engineering project EP-5142.	N	--
	2017	18b (p.11)	WTPH-Dx testing & SGC	Because diesel fuel was stored in tank T-21, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Partial	Additional groundwater testing with NWTPH-Dx without SGC at T-21 has been included in the DGWP.	<b>Y-Testing</b>	Groundwater testing with NWTPH-Dx without SGC at Tank T-21 to confirm the absence of diesel contamination (Fig 10).

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
<b>Group 3 Tank Area Comments</b>								
N-9/10	2017	19a (p. 11)	Add'l tank locating efforts	Due to geophysical observations and the push probe refusals northeast of sample point HC-3, additional exploration efforts will need to be conducted to determine if the tanks remain present.	Y	Anchor QEA confirmed that the tanks located in this area (3 tanks) were removed as part of Port engineering project EP-3826.	N	--
	2017	19b (p. 12)	WTPH-Dx testing & SGC	Because the tanks likely contained fuel oil and there was a TPH-D exceedance in soil at location HC-3, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.	Y	Additional groundwater testing with NWTPH-Dx without SGC at Tank Area N-9/10 has been included in the DGWP.	<b>Y-Testing</b>	Groundwater testing with NWTPH-Dx at Tank Area N-9/10 to confirm the absence of groundwater diesel/oil contamination (Fig 11a).
	2021	1m (p. 7)	Sediment and surface water issues	Because of the close proximity of Tank Areas N-9/10 and N-21/21/22 to the Blair Waterway and the presence of hazardous substances in near shore sample points, sampling of sediments and surface water in the Blair Waterway will need to be included as part of the RI. Hazardous substances detected in soil and groundwater samples collected near these tanks and hazardous substances required by MTCA Table 830-1 that have not already been defined should be included. Ecology recommends reviewing WAC 173-204 and SCUM2 for additional guidance.	Y	The DGWP clarifies that no hazardous substances associated with Tank Area N-9/10 are found at the downgradient sampling point adjacent to the Blair Waterway and testing addressed all requirements of MTCA Table 830-1. Arsenic contamination detected in monitoring well HC-910-9 was the result of turbidity (was not present in dissolved samples) and was at a concentration equal to natural background levels in Puget Sound area groundwater. No sediment or porewater testing is proposed for Tank Area N-9/10.	N	--
N-20/21/22	2017	24a (p. 12)	Extent of petroleum contamination	Further delineation of petroleum constituents needs to be done north of sample HC-2.	N	--		The DGWP includes additional testing for petroleum constituents north of sample HC-2 at Tank Area N-20/21/22 (see Figure 12a).
	2021	1m (p. 7)	Sediment and surface water issues	Because of the close proximity of Tank Areas N-9/10 and N-21/21/22 to the Blair Waterway and the presence of hazardous substances in near shore sample points, sampling of sediments and surface water in the Blair Waterway will need to be included as part of the RI. Hazardous substances detected in soil and groundwater samples collected near these tanks and hazardous substances required by MTCA Table 830-1 that have not already been defined should be included. Ecology recommends reviewing WAC 173-204 and SCUM2 for additional guidance.	Y	CVOC contamination (vinyl chloride) from Tank Area N-20/21/22 has been detected at the downgradient well located near the Blair Waterway (DGWP Figure 12b). Anchor QEA consulted with Ecology's sediment management unit (Pete Adolphson) to confirm the appropriate approach for Blair Waterway testing. Consistent with that direction, porewater samples from the Blair Waterway location offshore of HC-N202122-9 will be tested for CVOC constituents.	Y	The DGWP includes porewater testing for CVOC constituents offshore of Tank Area N-20/21/22, as directed by Ecology's sediment management unit (see Figure 12b).

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
P-27/28	2017	16a (p. 11)	Evaluation of product type	If free phase product is present, the type of product will need to be determined and the source/extent of contamination defined.	Partial	Additional information regarding the tank use has been developed in the DGWP, including the use of the tank for sealing wax by Commencement Bay Corrugated (a cardboard box making company) (Section 3.4.3).	<b>Y-Testing</b>	The potential ongoing presence of product contamination will need to be evaluated.
	2017	16b (p. 11)	Well replacements	Monitoring wells that have shown CUL exceedances or free product will need to be replaced. Additional monitoring wells may be required to determine the extent of contamination.	Partial	History of product and CUL exceedances has been summarized in detail. DGWP (Section 3.4.3 and Figure 13) includes installation of three wells addressing Ecology comments.	<b>Y-Testing</b>	DGWP includes 3 well installations to test for product and dissolved-phase contamination (Figure 13).
	2017	16c (p. 11)	Extent of soil contamination	The vertical and horizontal extent of contamination in soil needs to be determined.	Partial	The history of soil contamination testing has been summarized in detail. Previous testing has defined the lateral limits of soil contamination.	<b>Y-Testing</b>	DGWP includes additional soil testing during well installations to confirm the vertical limits of soil contamination.
<b>Group 4 Tank Area Comments</b>								
Tank Area A-1/2	2021	1d (p. 4)	Testing in new Tank Areas	Tanks A-1/2 and B-1/2/3 and the Former Wax Tank were not discussed in the May 2017 report. Need to determine if contamination from these tanks has comingled with other contamination.	Partial	Available information regarding Tank Area A-1/2 has been summarized in the DGWP (Section 3.5). Testing has been included to assess the potential presence of contamination in this area and determine extent.	Y	Soil in groundwater testing is included in the DGWP for Tank Area A-1/2 (see Fig 14).
Tank Area B-1/2/3	2021	1d (p. 4)	Testing in new Tank Areas	Tanks A-1/2 and B-1/2/3 and the Former Wax Tank were not discussed in the May 2017 report. Need to determine if contamination from these tanks has comingled with other contamination.	Partial	Available information regarding Tank Area B-1/2/3 has been summarized in the DGWP (Section 3.5). Testing has been included to assess the potential presence of contamination in this area and determine extent.	Y	Soil in groundwater testing is included in the DGWP for Tank Area B-1/2/3 (see Fig 15).
Former Wax Tank	2021	1d (p. 4)	Testing in new Tank Areas	Tanks A-1/2 and B-1/2/3 and the Former Wax Tank were not discussed in the May 2017 report. Need to determine if contamination from these tanks has comingled with other contamination.	Partial	Available information regarding the former Wax Tank has been summarized in the DGWP (Section 3.5). Testing has been included to assess the potential presence of contamination in this area determine its extent.	Y	Soil in groundwater testing is included in the DGWP for the Former Wax Tank (see Fig 16).

**Table C-1**  
**Summary of Ecology Investigation-Related Comments by Tank Area**

Tank Area	Date of Ecology Further Action Letter	Ecology Comment and Page Numbers	Comment Topic	Summary of Comment	Resolved? (Y/N)	Summary of Resolution	Remaining Work Required? (Y/N)	Description of Future Work
<b>Comments on Tank Areas Addressed Separately</b>								
U-2	2017	17a (p. 11)	Existing NFA	Unless additional information is presented to Ecology, the U-2 tank can remain with its No Further Action determination in place.	Y	No additional work required. This NFA remains in place.	N	--
N-11	2017	20a (p. 12)	Source determination	If Tank N-11 was used as an oil tank, the source of the TPH-G contamination in the 2010 soil testing data needs to be determined.	Y	The DGWP clarifies that Tank Area N-11 has been formally included within the scope of the Alexander Avenue Tank Facilities Site. Remediation of the area will be performed as part of that project.	N	--
	2017	20b (p. 12)	Extent of soil data	The trenches and their soil samples do not replace the boring sample results or count as proof of remediation. Soil in probe locations demonstrating CUL exceedances will need to be addressed.	Y		N	--
	2017	20c (p. 12)	Extent of contamination	The extent of soil and groundwater contamination needs to be determined.	Y		N	--

Notes:

- CSM: Conceptual site model
- CUL: Cleanup level
- CVOC: Chlorinated volatile organic compounds
- DGWP: Data Gaps Investigation Work Plan for the TOTE Site (Anchor QEA, 2022)
- EIM: Ecology's Environmental Information Management database
- MTCA: Model toxics control act, WAC 173-340
- NFA: No Further Action
- NWTPH-Dx: Northwest total petroleum hydrocarbon testing for diesel and extended range hydrocarbons; used to test for diesel and oil-range TPH contamination.
- RI: Remedial investigation
- SCUM2: Sediment cleanup users manual, volume 2 (Ecology, 2021)
- SGC: Silica-gel cleanup; SGC can be used to remove polar hydrocarbons from NWTPH-Dx sample extracts.
- TPH: Total petroleum hydrocarbons



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

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**Electronic Copy**

August 9, 2017

Ms. Sarah Weeks  
Port of Tacoma  
P.O. Box 1837  
Tacoma, WA 98401

**Re: Further Action at the following Site:**

- **Site Name:** Port Of Tacoma/TOTE Facility 500 Alexander
- **Site Address:** 500 Alexander Ave Tacoma, 98421-4217, Pierce County
- **Facility/Site No.:** 3468881
- **Cleanup Site No.:** 7619
- **VCP Project No.:** SW1588

Dear Ms. Weeks:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the Port Of Tacoma/TOTE Facility 500 Alexander facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

**Issue Presented and Opinion**

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**Ecology has determined that further remedial action is necessary to clean up contamination at the Site.**

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

**Description of the Site**

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This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following releases:

- Gasoline range total petroleum hydrocarbons (TPH-G) into the Soil and Groundwater.
- Diesel range and oil range total petroleum hydrocarbons (TPH-D and TPH-O, collectively; NWTPH-Dx) into the Soil and Groundwater.

- Benzene, toluene, ethylbenzene, and xylene (BTEX) constituents into the Soil and Groundwater.
- Polychlorinated biphenyls (PCBs) into the Soil and Groundwater.
- Chlorinated solvents (trichloroethylene (TCE)) and degradation daughter products (vinyl chloride, 1,1-dichloroethane, cis-1,2-dichloroethene) into the Groundwater.

**Enclosure A** includes a detailed description and diagram of the Site, as currently known to Ecology.

Please note the Occidental Chemical Corp facility (# 1212) also affects the parcel(s) of real property associated with this Site. This opinion does not apply to any contamination associated with the Occidental Chemical Corp facility.

### **Basis for the Opinion**

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This opinion is based on the information contained in the documents listed in **Enclosure B**. Those documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. You can make an appointment by calling the SWRO resource contact at (360) 407-6365.

This opinion is void if any of the information contained in those documents is materially false or misleading.

### **Analysis of the Cleanup**

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Ecology has concluded that **further remedial action** is necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

#### **1. Characterization of the Site.**

Ecology has determined your characterization of the Site is not sufficient to establish cleanup standards and select a cleanup action. The Site is described above and in **Enclosure A**.

The activities performed to date are not sufficient to characterize the Site. HartCrowser has performed limited horizontal and vertical delineation of the contamination present on the Site in soil and groundwater at each of the nine underground storage tank (UST) nests. Because this Site consists of nine separate tank nests, Site wide issues will be addressed followed by issues specific to each of the individual tank nest. For clarity purposes, included Figures and Tables and the list of documents used to form this opinion will all be grouped by the USTs that they apply to.

The UST naming convention established in the Port of Tacoma (PoT) TOTE Property USTs report (2017) is used as the standard naming convention in this letter. Alternate UST designations are noted. Although HartCrowser primarily uses directions relative to the Site (e.g. Site north or project north), only cardinal directions will be used in this letter. A Site location map and a map showing the location of each tank nest (Port of Tacoma's Figure 1) is included in **Enclosure A**. Maps specific to each UST nest are located in the associated UST sections in **Enclosure A**.

Site-wide issues as Ecology currently understands it are;

- Silica gel cleanup (SGC) was used for all NWTPH-Dx analysis performed by HartCrowser except for the NWTPH-Dx analysis performed in the HartCrowser 2015 report for UST N-11.
- The MTCA Method A CULs for TPH-D and TPH-O are intended for the total of TPH-D and TPH-O. The NWTPH-Dx results should not be split into the specific fractions<sup>1</sup>.
- The Site has gone through drastic surficial changes since the 1949 and 1952 U.S. Naval maps were made. These maps seem to be the primary source for indicating that UST were present and for determining their locations. It has not been clearly demonstrated how the tank nests have been located within the Site as it currently exists. The one clear exception is for the U-1, P-27, and P-28 tank nest where monitoring wells were installed around the time the tanks were removed and served as a permanent monument to the UST nest location.
- Groundwater analytical results are being compared to MTCA Method C surface water for human health marine waters.
- Demonstration of the calculation of MTCA Method C CUL using updated information from the sources specified in WAC 173-340-708(7) was not provided.
- Institutional controls are not discussed and an Environmental Covenant was not submitted to Ecology as is required if using MTCA Method C cleanup levels<sup>2</sup>.
- A Terrestrial Ecological Evaluation (TEE) has not been submitted to Ecology.
- No information has been presented showing the relationship of contamination to buildings on the property, and a Vapor Intrusion (VI) study has not been submitted.

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<sup>1</sup> Department of Ecology State of Washington, Guidance for Remediation of Petroleum Contaminated Sites, Toxics Cleanup Program Publication No. 10-09-057, Revised June 2016.

<sup>2</sup> WAC 173-340-700 (5)(c)

- In general, the Site has been inconsistently sampled for the constituents of concern listed in MTCA Table 830-1, Required Testing for Petroleum Releases.
- Chlorinated solvents and degradation daughter products that exceeded the selected CULs were seen at some of the UST nests. Although these constituents of concern may be the result of contamination migrating onto the property from the Occidental Chemical Corp facility (FSID 1212), they are present on the Site and have not been fully delineated.
- Additionally, there is a known pH issue in groundwater associated with the Occidental Chemical Corp facility. Although this pH issue may be the result of contamination migrating onto the property from the Occidental Chemical Corp facility, it has not been determined if this pH issue is present at any of the UST nests.

UST nest specific issues as Ecology currently understands it are;

- UST nest containing tanks U-1, P-27, and P-28 (a.k.a T-1, T-2 & T-3);
  - Samples taken by Nowicki & Associates, Inc., in 1996, showed NWTPH-Dx contaminated soils exceeding CULs were left in place at the east and west corners of the excavation.
  - HORUS Environmental, in 1997, showed NWTPH-Dx CUL exceedances in groundwater in wells P1 and P2 and free product was observed in well P3.
  - Noll Environmental, Inc., in 1998 installed three new monitoring wells. Sampling of all six monitoring wells showed NWTPH-Dx CUL exceedances in wells P2 and P3. Due to elevated detection limits, the detection limit for P1 exceeded the CUL.
  - Greylock Consulting LLC decommissioned the six monitoring wells in 2012. At the time of decommissioning, wells P2 and P3 were reported to “contain thick black oil with a viscosity that prevented recovery by pumping.”
  - The HartCrowser 2012 report for this tank nest reported that the free phase petroleum was a different material than what was stored in the USTs. Groundwater sampling was conducted, using grab samples from new borings being advanced on the property. HartCrowser’s 2012 map showing the boring and well locations associated with this UST nest is included in the relevant section of **Enclosure A**.

- UST nest containing tank U-2 (a.k.a AA-1);
  - The UST was removed in 1998 by HORUS Environmental. Sufficient soil samples were taken from the excavation to demonstrate that soils were removed to below the method detection limits (U-2 Figure and Tables by HORUS Environmental; Figure 2, Table 1 and Table 2).
  - No groundwater samples were collected.
  - UST U-2 has a No Further Action determination letters from both Ecology and Tacoma-Pierce County Health Department (TPCHD).
- UST nests containing tanks T-21 & T-22, T-23 & T-24
  - The UST was removed in 1998 by HORUS Environmental. There were two separate excavation areas, one for tanks T-21 and T-22 and one for tanks T-23 and T-24. Final excavation soil samples did not show any exceedances of the MTCA Method A CULs. Excavation water samples did show exceedances for TPH-G, NWTPH-Dx, benzene, and xylene. It was also noted that product lines were seen dripping into the excavation for tanks T-21 and T-22. The product lines were capped, but not removed.
  - HartCrowser advanced borings in the suspected areas of these tanks in October of 2010. One boring was advanced in the vicinity of T-23 and T-24, and two borings were advanced in the vicinity of T-21 and T-22. Based on field screening evidence, only one soil sample was submitted for analyses from each tank pair. Only the soil sample from tanks T-21 and T-22 showed a CUL exceedance (benzene at 0.13 mg/Kg). Each of the borings associated with tanks T-21 and T-22 had groundwater samples taken and analyzed for TPH-G, NWTPH-Dx, and BTEX. Although there were no CUL exceedances, the NWTPH-Dx analysis was done with SGC. HartCrowser figures showing the sampling locations and assumed former tank locations are included in the relevant section of **Enclosure A**.
- UST nest containing tanks N-9 & N-10
  - HartCrowser had a geophysical survey conducted in 2010 that indicated possible UST locations near the perimeter of the survey area, and noted push probe refusals in the area of two of the possible UST locations indicated on the northeast edge of the geophysical survey area.
  - Only one of the possible UST locations was further explored to determine if an UST was still in place. This was the area between sample points U-4F and HC-1. No additional exploration was conducted near sample point HC-3 or the northwest side of the geophysical survey area.

- HartCrowser identified a NWTPH-Dx soil exceedance was present at sample point HC-3.
- HartCrowser noted a sheen present at the bottom of test pit TP-1 which is reported as being in the vicinity of historical sample U-4F which showed a TPH-G exceedance.
- HartCrowser showed a CUL exceedance of vinyl chloride in groundwater at monitoring well MW-5 and MW-6, and test pit TP-2, and the presence of vinyl chloride and trichloroethylene below the CUL at locations MW-6, MW-7, and MW-8.
- One monitoring well near the Blair Waterway, and south of the suspected UST nest area was sampled. This well (HC-N910-9) showed no detectible concentrations of petroleum constituents or chlorinated solvents, but did show an exceedance of the CUL for Arsenic. HartCrowser figures showing the sampling locations and assumed former tank locations are included in the relevant section of **Enclosure A**.
- UST nest containing tank N-11
  - Petroleum constituents were seen in excess of the soil CULs in boring locations HC-1, HC-2, and HC-3, and test pit location TP-1.
  - Although it has been determined that UST N-11 was used to hold oil, soil results from boring location HC-2 showed a TPH-G concentration of 4,300 mg/Kg.
  - TPH-G exceedances were also seen in groundwater at all four boring locations (HC-1 through HC-4) as well as monitoring wells MW-5, MW-6, and MW-8.
  - In the HartCrowser 2015 report for UST N-11, groundwater was analyzed for NWTPH-Dx with and without SGC, and clearly shows the differences in the results between the two methods. The tables showing these results are included in the N-11 Tables section of **Enclosure A** (HartCrowser Tables 1 and 2 for UST N-11; November 2011 and November 2015 sampling).
- UST nest containing tank N-12
  - The soil and groundwater samples taken by HartCrowser in 2010 do not show any MTCA Method A CUL exceedances for TPH-G, NWTPH-Dx, or BTEX constituents. Silica gel cleanup was used on the groundwater NWTPH-Dx analysis.

- UST nest containing tank N-13
  - The soil and groundwater samples taken by HartCrowser in 2010 do not show any MTCA Method A CUL exceedances for TPH-G, NWTPH-Dx, or BTEX constituents. Silica gel cleanup was used on the groundwater NWTPH-Dx analysis.
- UST nest containing tank N-17
  - The soil and groundwater samples taken by HartCrowser in 2010 do not show any MTCA Method A CUL exceedances for TPH-G, NWTPH-Dx, or BTEX constituents. Silica gel cleanup was used on the groundwater NWTPH-Dx analysis.
- UST nest containing tanks N-20, N-21, & N-22
  - HartCrowser's borings and test pits from 2010 and 2011 along with the historical borings conducted by GeoEngineers in 2008 show limited contamination present in soil and groundwater. Only one boring (HC-2) shows petroleum contamination in excess of the MTCA Method A CULs. Three of the wells have groundwater samples that show CUL exceedances for chlorinated solvents (vinyl chloride in MW-5 and MW-8, and TCE and vinyl chloride in MW-7).
  - Vinyl chloride was also detected above the groundwater CUL in a sample taken near the Blair Waterway, southwest of the suspected tank nest location (HC-N202122-9).
  - TPH-G, NWTPH-Dx, and BTEX constituents were not present above the laboratory detection limit in this near shore sample.

The exposure pathways for the Site as Ecology currently understands them are;

Soil-Direct Contact:

Complete. Contaminated soil with exceedances of established CULs remains in place at depths shallower than 15 feet below ground surface.

Soil-Leaching:

Potentially Complete. Areas of the Site still show both soil and groundwater CUL exceedances indicating that the soil-leaching pathway is still complete.

Soil-Vapor:

Potentially Complete. Chlorinated solvents and their degradation daughter products are present on the Site. The full nature and extent has not been defined at this time, and there may be potential vapor intrusion (VI) impacts to the buildings located on the Site.

No information has been submitted showing the relationship of petroleum contamination in soil and groundwater to buildings on the Site. A Tier I VI study should be conducted.

Groundwater:

Complete. Contaminated groundwater with exceedances of established CULs is still present at the Site. Demonstration of MTCA Method C applicability will need to be demonstrated using WAC 173-340-706, and calculation of CULs will need to be demonstrated using updated and current information from the sources specified in WAC 173-340-708.

Surface Water:

Complete. Although MTCA Method C CULs protective of surface water were used, exceedances of these CULs were present. Additionally, it needs to be demonstrated that the Site qualifies for the use of Method C CULs under WAC 173-340-706, and that the CULs being used are calculated using updated and current information from the sources specified in WAC 173-340-708.

Ecological:

Potentially Complete. A Terrestrial Ecological Evaluation (TEE) needs to be completed for this Site to determine the status of the Ecological pathway.

These pathways are evaluated for the Site as a whole. Specific individual UST nests may have incomplete pathways. Use of Method C CULs will require the use of institutional controls and an Environmental Covenant to limit exposure to contamination on the appropriate pathways.

Based on a review of the available information, Ecology has the following comments;

1. Ecology does not accept the use of silica gel cleanup (SGC) in the NWTPH-Dx analyses of groundwater samples unless uncontaminated background samples show that naturally occurring organic matter is a significant component of the total petroleum hydrocarbons detected in the groundwater samples<sup>1</sup>. Because all but one of the groundwater sampling events used NWTPH-Dx analysis using SGC, Ecology considers all TPH-D and TPH-O results to be biased low. Groundwater at each of the tank nests that were known to contain a UST containing diesel or heating oil, or that have previously shown the presence of NWTPH-Dx constituents, will need to be evaluated using NWTPH-Dx without SGC. For all future report submittals, please clearly identify which NWTPH-Dx results are with SGC used and which are without SGC used.
2. When presenting TPH-D and TPH-O results using MTCA CULs, the total of TPH-D and TPH-O should be evaluated against the CUL.

3. Given the drastic physical changes that have occurred to the Site, please demonstrate how the UST locations were determined for all tanks except for U-1, P-27, and P-28.
4. For a Site to use MTCA Method C cleanup levels (CULs) for surface water or groundwater, you will need to demonstrate that you meet the criteria outlined in WAC 173-340-706(1)(a)(i-iii).
5. The use of MTCA Method C to establish CULs for a Site requires the calculation of CULs using current information from the sources specified in WAC 173-340-708(7).
6. If it is demonstrated that the use of MTCA Method C CULs are appropriate for this Site, please note that the use of MTCA Method C CULs requires the specific use of institutional controls (WAC 173-340-440) to limit or prohibit activities that may result in exposure to hazardous substances at a Site. If you do plan to demonstrate that MTCA Method C CULs are appropriate for the Site, an Environmental Covenant will be necessary to get a No Further Action (NFA) determination for the Site. For guidance on establishing an Environmental Covenant, please see Procedure 440A at Ecology's web site;  
<http://www.ecy.wa.gov/programs/tcp/policies/tcppoly.html>
7. Submit a Terrestrial Ecological Evaluation (TEE). A TEE needs to be completed for the Site. Information on performing a TEE can be found at Ecology's web site;  
<http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm>
8. Once the extent of contamination in soil and groundwater has been defined, it may be necessary to determine impacts to soil vapor and indoor air. Ecology recommends a Tier I VI assessment to determine if contamination has a reasonable potential to effect any of the buildings currently present, or is present in soil vapor beneath any on-Site buildings and in the indoor air inside the buildings if necessary. Ecology recommends using the guidance document for VI located at Ecology's web site;  
<https://fortress.wa.gov/ecy/publications/documents/0909047.pdf>
9. In accordance with WAC 173-340-840(5) and Ecology Toxics Cleanup Program Policy 840 (Data Submittal Requirements), data generated for Independent Remedial Actions shall be submitted simultaneously in both a written and electronic format. For additional information regarding electronic format requirements, see the website listed below. Be advised that according to the policy, any reports containing sampling data that are submitted for Ecology review are considered incomplete until the electronic data has been entered.

Please ensure that data generated during on-Site activities is submitted pursuant to this policy. Data must be submitted to Ecology in this format for Ecology to issue a No Further Action determination. Please be sure to submit all soil and groundwater data collected to date, as well as any future data, in this format. Data collected prior to August 2005 (effective date of this policy) is not required to be submitted; however, you are encouraged to do so if it is available. Be advised that Ecology requires up to two weeks to process the data once it is received.

<http://www.ecy.wa.gov/eim>

10. Submit all future reports containing geologic, hydrogeologic, or engineering work with a seal of a licensed professional as required in RCW 18.43 and RCW 18.220.
11. For all future sampling activities conducted at the Site, soil and groundwater should be sampled for constituents of concern indicated in MTCA Table 830-1. Given the age of the gasoline tanks on the Site, the volatile organic compounds (VOCs) ethylene dibromide (EDB) and 1,2-dichloroethane (EDC) as well as the metal lead should be examined in the soils and groundwater in the vicinity of any UST known or suspected to hold gasoline. Please assure the laboratory method detection limits capture the cleanup level (CUL).
12. Additionally, the chlorinated solvent (TCE) and degradation daughter products (vinyl chloride, 1,1-dichloroethane, cis-1,2-dichloroethene) need to be defined for the Site. Any future groundwater sampling should include these constituents of concern, and it may be necessary to sample for them in soil as well, particularly along Alexander Ave., if contaminated soils are believed to be present at the Site.
13. The presence of the pH issue in groundwater needs to be determined for the Site, and if present, will also need to be defined and addressed on the Site before a No Further Action can be issued for the Site.
14. A conceptual site model needs to be developed, either for the Site as a whole or for each UST nest, demonstrating the sources, pathways and extents of the contaminants present at the Site. Clearly identify source areas, areas remaining above proposed cleanup levels, and areas remediated in both plan view and cross section figures.
15. After applicable groundwater CULs are determined, the UST nests where groundwater contamination is above the applicable CULs will need to demonstrate four consecutive quarters of sampling results that are below the CULs to receive an NFA determination.

16. For the UST nest containing tanks U-1, P-27, and P-28 (a.k.a T-1, T-2 & T-3), Ecology recommends the following;
  - a. If the free phase product seen in wells P2 and P3 is from a different source than what was being stored in the three USTs, the source of that material will need to be determined and the extent of the contamination defined.
  - b. The reasoning behind decommissioning the six groundwater monitoring wells has not been clearly explained, and the bore-hole grab samples obtained by HartCrowser in 2012 are not a suitable replacement. The monitoring wells that have shown CUL exceedances or free product (P1, P2, and P3) will need to be replaced. Additional monitoring wells may be required to determine the horizontal extent of both non-dissolve phase and dissolve phase contamination associated with this tank nest.
  - c. The vertical and horizontal extent of contamination in soil needs to be determined.
17. For the UST nest containing tank U-2 (a.k.a. AA-1), Ecology recommends the following;
  - a. Although no groundwater samples were taken, all soil appears to have been removed down to below laboratory detection limits for TPH-D and TPH-O (U-2 Tables by HORUS Environmental; Table 1 and Table 2). Unless additional information is presented to Ecology, the U-2 tank can remain with its No Further Action determination in place.
18. For the UST nests containing tanks T-21 & T-22, T-23 & T-24, Ecology recommends the following;
  - a. The product line associated with tanks T-21 and T-22, that was left in place and containing product should be removed and examined for leaking along its pathway.
  - b. Because diesel fuel was stored in tank T-21, and motor oil was stored in tanks T-23 and T-24, impacts to groundwater will need to be assessed using method NWTPH-Dx without SGC.
19. For the UST nest containing tanks N-9 & N-10, Ecology recommends the following;
  - a. Because of the geophysical results and the push probe refusals northeast of sample point HC-3, additional exploration efforts will need to be conducted northeast of sample point HC-3 to determine if an UST is present.

- b. Because it has been determined that the tanks likely contained fuel oil and there was a TPH-D exceedance in soil at sample location HC-3, groundwater NWTPH-Dx concentrations will need to be assessed using method NWTPH-Dx without SGC.
20. For the UST nest containing tank N-11, Ecology recommends the following;
- a. If the UST was used as an oil tank, the source of the TPH-G contamination shown in all four probe locations (HartCrowser Tables 1 and 2 for UST N-11; September 2010 sampling) will need to be determined.
  - b. The trenches and their soil samples do help in defining the extent of the contamination; however, they do not replace the boring sample results or count as proof of remediation. Probe sample locations demonstrating CUL exceedances will still need to be addressed.
  - c. The extent of the soil and groundwater contamination needs to be determined.
21. For the UST nest containing tank N-12, Ecology recommends the following;
- a. Because UST N-12 was listed as an oil tank, groundwater samples will need to be analyzed using method NWTPH-Dx without SGC.
  - b. Address why no further efforts were made to determine if a tank is present at the location indicated in the geophysical survey.
22. For the UST nest containing tank N-13, Ecology recommends the following;
- a. Because UST N-13 was listed as an oil tank, groundwater samples will need to be analyzed using method NWTPH-Dx without SGC.
  - b. Address why no further efforts were made to determine if tanks are present at the locations indicated in the geophysical survey. Specifically, how were the 14 potential locations identified in the HartCrowser 2012 report for tank N-13, reduced to the two locations that were explored further in the HartCrowser 2015 report for tank N-13 particularly given the lack of agreement between the magnetometer readings and the ground penetrating radar readings?
23. For the UST nest containing tank N-17, Ecology recommends the following;
- a. Because UST N-12 was listed as an oil tank, groundwater samples will need to be analyzed using method NWTPH-Dx without SGC.
24. For the UST nest containing tanks N-20, N-21, and N-22, Ecology recommends the following;
- a. Further delineation of petroleum constituents needs to be done north of sample HC-2.

## 2. Establishment of cleanup standards.

Ecology has determined the cleanup levels and points of compliance you established for the Site do not meet the substantive requirements of MTCA.

The Site has not been fully defined. Cleanup standards cannot be established until the Site is fully defined in the vertical and horizontally direction for all constituents of concern known or suspected to be present on the Site. Additional efforts are necessary to define the Site that will include the chlorinated solvents and daughter degradation products, pH, and the petroleum constituents associated with the Sites leaky underground storage tanks. Additional groundwater sampling will also be required, specifically analyzing NWTPH-Dx without using SGC.

Standards points of compliance are currently being used for the Site.

- The point of compliance for protection of groundwater is established in the soils throughout the Site.
- For soil cleanup levels based on human exposure via direct contact or other exposure pathways where contact with the soil is required to complete the pathway, the point of compliance is established in the soils throughout the Site from the ground surface to 15 feet below ground surface (bgs).
- The point of compliance for the groundwater is established throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the Site.
- The point of compliance for indoor air and soil gas is throughout the Site.

The Site is using MTCA Method C surface water CULs for human health and marine waters as groundwater screening levels for BTEX constituents, and chlorinated solvents and daughter degradation products, and MTCA Method A industrial CULs for TPH-G and NWTPH-Dx constituents. It has not been demonstrated by WAC 173-340-706 that use of Method C CUL is appropriate for the Site. The reason given for using the Method C CULs instead of the Method A CULs is that Method A CULs are protective of drinking water, and the groundwater at the Site is considered non-potable. Although Method A CULs are considered protective of drinking water, this does not mean that they are only usable in situations where the groundwater is considered a potable water source.

The Site is using MTCA Method A industrial soil CULs for petroleum constituents.

It has not been determined if soil vapor is an issue at the Site, and no soil vapor CULs have been established.

**3. Selection of cleanup action.**

Ecology has determined the cleanup action you selected for the Site does not meet the substantive requirements of MTCA.

Cleanup actions at the Site to date have included removal of underground storage tanks and contaminated soils surrounding the USTs in the vicinity of each of the nine identified UST nests.

Compliance with Site Cleanup standards cannot be determined because Site characterization is not sufficient to establish the Site cleanup standards. Site characterization will need to be completed before a cleanup option and Site cleanup standards can be established.

Exceedances of the selected CULs are still present at the Site in both soil and groundwater, and will need to be addressed

**Limitations of the Opinion**

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**1. Opinion does not settle liability with the state.**

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

**2. Opinion does not constitute a determination of substantial equivalence.**

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

Ms. Sarah Weeks  
August 9, 2017  
Page 15

**3. State is immune from liability.**

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

**Contact Information**

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Thank you for choosing to clean up the Site under the Voluntary Cleanup Program (VCP). After you have addressed our concerns, you may request another review of your cleanup. Please do not hesitate to request additional services as your cleanup progresses. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our web site: [www.ecy.wa.gov/programs/tcp/vcp/vcpmain.htm](http://www.ecy.wa.gov/programs/tcp/vcp/vcpmain.htm). If you have any questions about this opinion, please contact me by phone at (360) 407-6437 or e-mail at [aaren.fiedler@ecy.wa.gov](mailto:aaren.fiedler@ecy.wa.gov).

Sincerely,



Aaren Fiedler  
SWRO Toxics Cleanup Program

AF: kb

By Certified Mail: [91 7199 9991 7037 1758 8891]

Enclosures:       A – Description, Diagrams, and Tables of the Site  
                      B – Basis for the Opinion: List of Documents

cc:     Rob Olsen, TPCHD  
       Stephanie Bussell, Ecology  
       Nicholas Acklam, Ecology



## **Enclosure A**

### **Description, Diagrams and Tables of the Site**



## Site Description

### Site Location:

The Site, identified as Port Of Tacoma/TOTE Facility 500 Alexander is located at 500 E Alexander Ave. on the western corner of the intersection of E Alexander Ave. and E 11<sup>th</sup> St. The Site is part of the Port of Tacoma and is in a heavily industrial area. The Site is adjacent to the Blair Waterway on the southwest side. Commencement Bay is to the northwest, and Hylebos Waterway is to the northeast. Multiple industrial facilities surround the Site on the northwest, northeast, and southeast side of the Site. A Map showing the Site location and relevant submitted Site figures are included in the Site Diagrams section of **Enclosure A**.

### Site Use and Contamination:

TOTE is a maritime shipping company, and the Site is specifically operated as Totem Ocean Trailer Express which handles Roll On/Roll Off (RO/RO) cargo. This includes, for the most part, semi-truck (18-wheeler) trailers. The Site is mostly paved. Some support buildings are present at the Site; though a map showing their location relative to the contamination has not been submitted. Multiple UST nest have been present at the Site. Contamination focused around each tank nest is specify petroleum constituents that consist of TPH-G, TPH-D, or TPH-O depending on what the specific tanks were used for as well as petroleum related VOCs, mostly consisting of BTEX. Some metals and PCBs are also present at specific individual tank nests. Chlorinated solvents and degradation daughter products are also present at the Site. Specifically, trichloroethylene (TCE), dichloroethane, and vinyl chloride have been reported. It is assumed that the chlorinated solvents are from the adjacent Occidental Chemical Corp (Occidental) Site (FSID 1212). It has not been determined if the pH issues associated with the Occidental Site are effecting any of the tank nest areas associated with the Port Of Tacoma/TOTE Facility 500 Alexander Site.

### Geology:

The Site is comprised of dredge material that was removed to make the surrounding water ways sometime in the early 1900s followed by a native silt. The fill material is typically 1.5 feet thick to 10 feet thick depending on the location. The total depth of the native silts is unknown, but exceeded the typical exploration depths of 12 to 15 feet. The groundwater flow direction is typically toward the Blair Waterway, but some tidal fluctuations have been observed.

# Site History

## Pre-1979

The Site was part of the Tacoma Naval Station during which, multiple USTs were being utilized to store different petroleum products across the Site.

## 1979

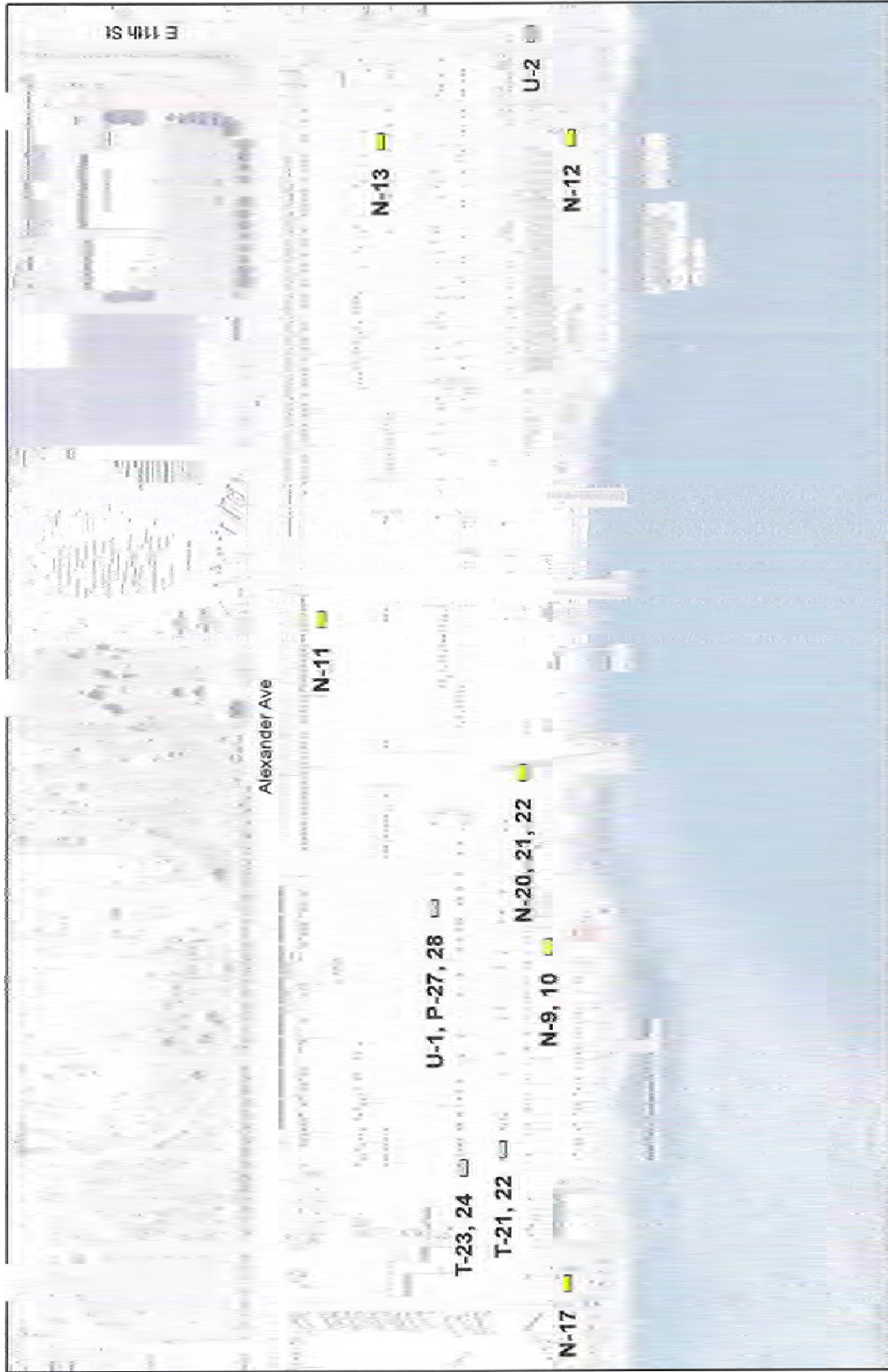
The current Totem Ocean Trailer Express Terminal (TOTE) opened on the Site in 1979. In the years following, most, and eventually all of the buildings on the property have been removed. The last of the original buildings was removed sometime after 1990. The Totem Ocean Trailer Express Terminal does not operate on the entirety of its county parcel (5000350011). The Northwest end of the parcel is operated on by the neighboring facility which is also part of the Port of Tacoma. Reportedly, all of the USTs within the TOTE operational facility have been removed, though all removals have not been documented. Current cleanup activities are documented to have begun in 1996 with the removal of tanks U-1 (a.k.a T-1), P-27, and P-28 (a.k.a. T-2, and T-3, though it was not clear which tank was which). Currently there are nine separate UST nest known on the Site with the number of tanks in each nest numbering from one single tank to as many as four tanks in a grouping. Each of the nine UST tank nest is being investigated individually, though they are all included as a single Site. The tank designated as U-2 (a.k.a. AA-1), located at the far southeast end of the property has a No Further Action opinion letter from Ecology dated August 26, 1999, and from the Tacoma-Pierce County Health Department (TPCHD) dated October 28, 1999. All suspected tank nest areas except U-2 were sampled for soils and groundwater contamination between April 2012 and December 2015.

## **Site Diagrams**

# TOTE Site Location Map



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, URCS, East Asia, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), Swisstopo, Mapbox, NGCC, OpenStreetMap contributors, and the GIS User Community



**Figure 1. TOTE Property (500 East Alexander) USTs**



Copyright © from Anasquaist March 2014  
 Municipal Products  
 Aerial Photo Date: Sept 2014  
 All other data from Port of Tacoma

- UST location - Documented removed
- UST location - Investigation confirmed removal



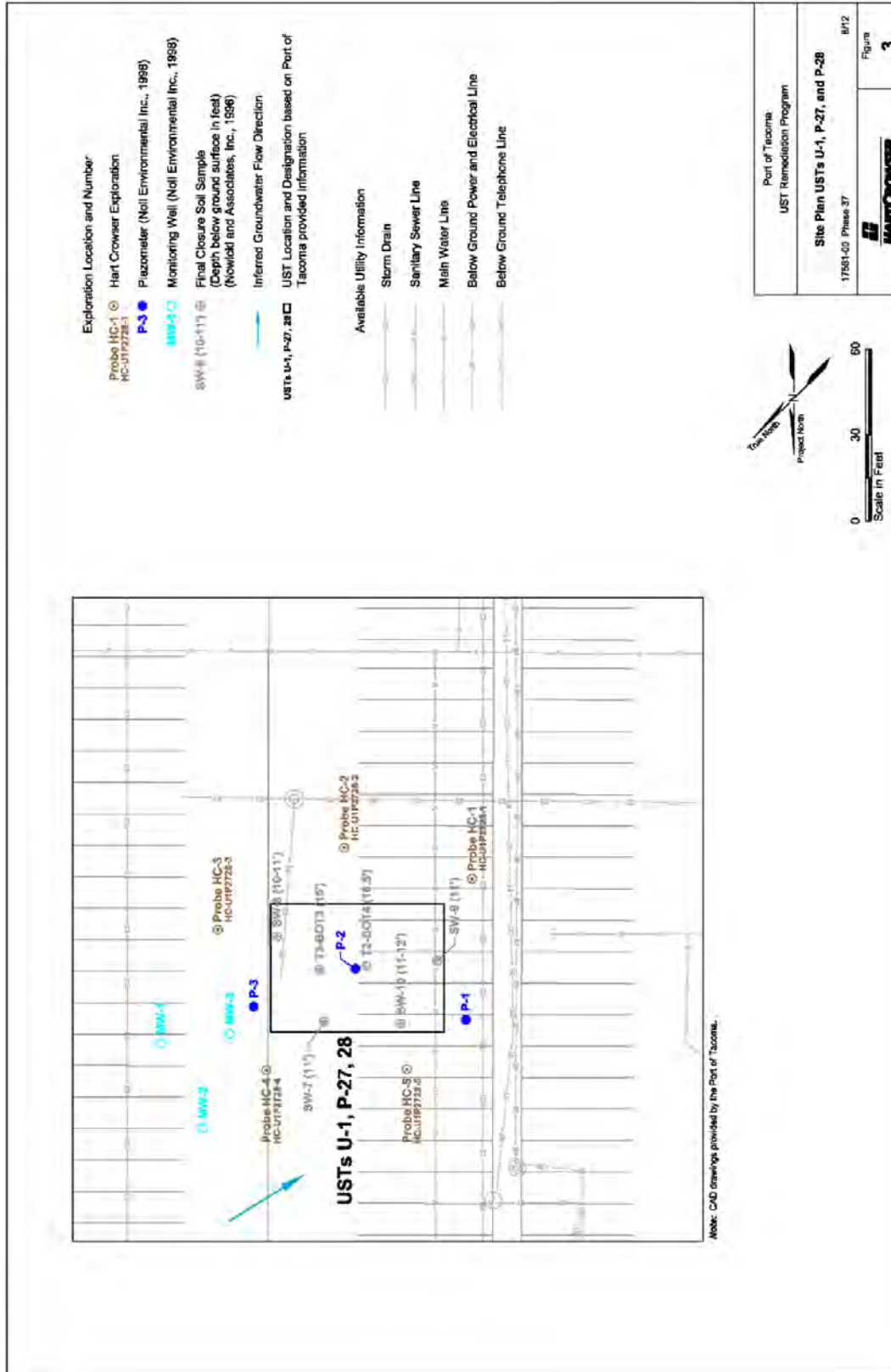
Map Date: 2/23/2016  
 Author: Jen Kaddler

**DISCLAIMER:** The information included on this map has been compiled from various sources. The Port of Tacoma does not warrant the accuracy of the information. These data are provided for informational purposes and should not be considered authoritative for engineering, navigational, legal and other site-specific uses. The Port of Tacoma makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information.

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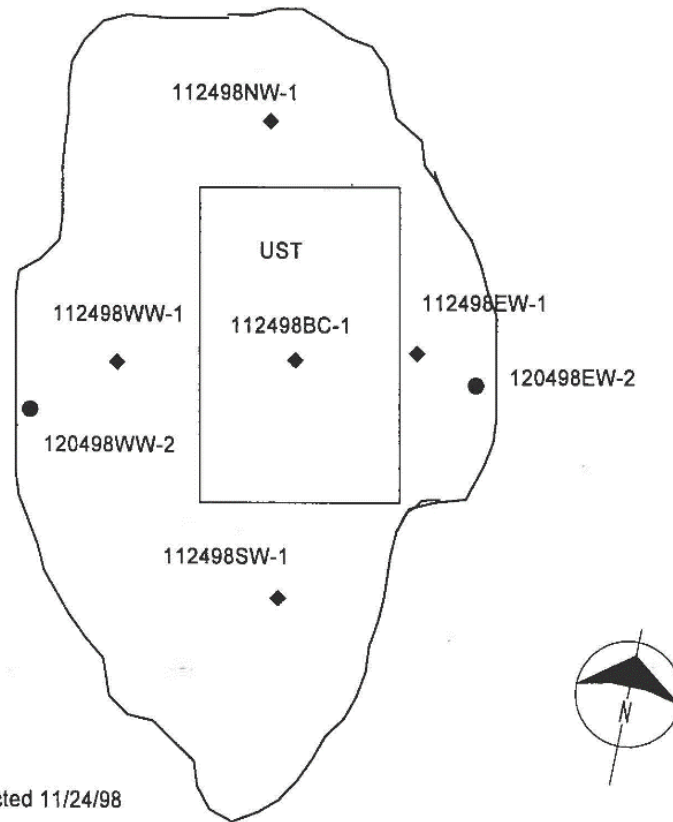


U-1, P-27, and P-28 Figures



**Figure 2**

**Port of Tacoma  
UST Removal  
1100 Alexander Avenue  
11/30/98**



◆ 112498BC-1 -- Sample collected 11/24/98

● 120498WW-1 -- Sample collected 12/4/98



**HORUS**  
ENVIRONMENTAL, Inc.  
Environmental Consulting Services

Figure T-21 and T-22

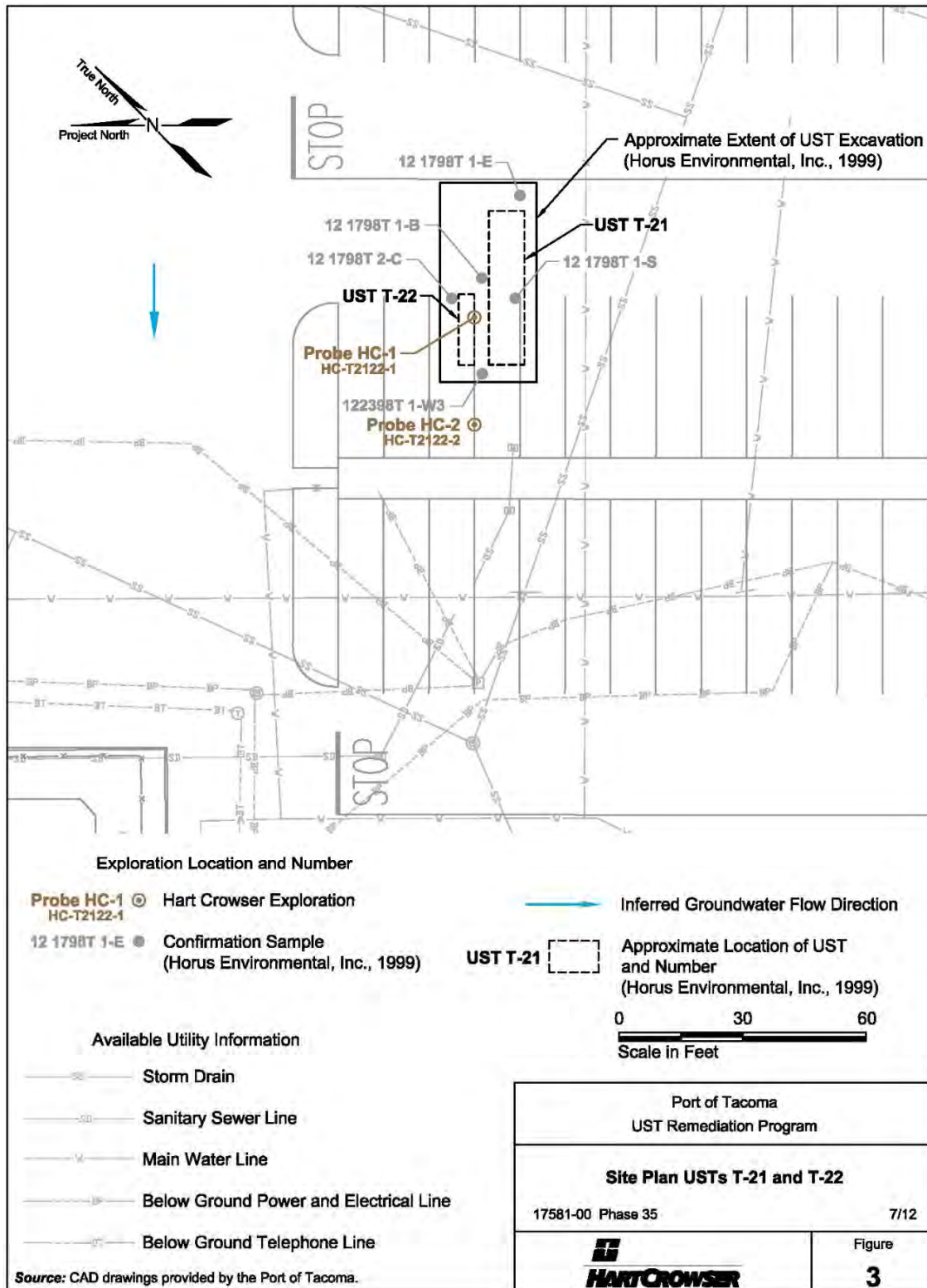
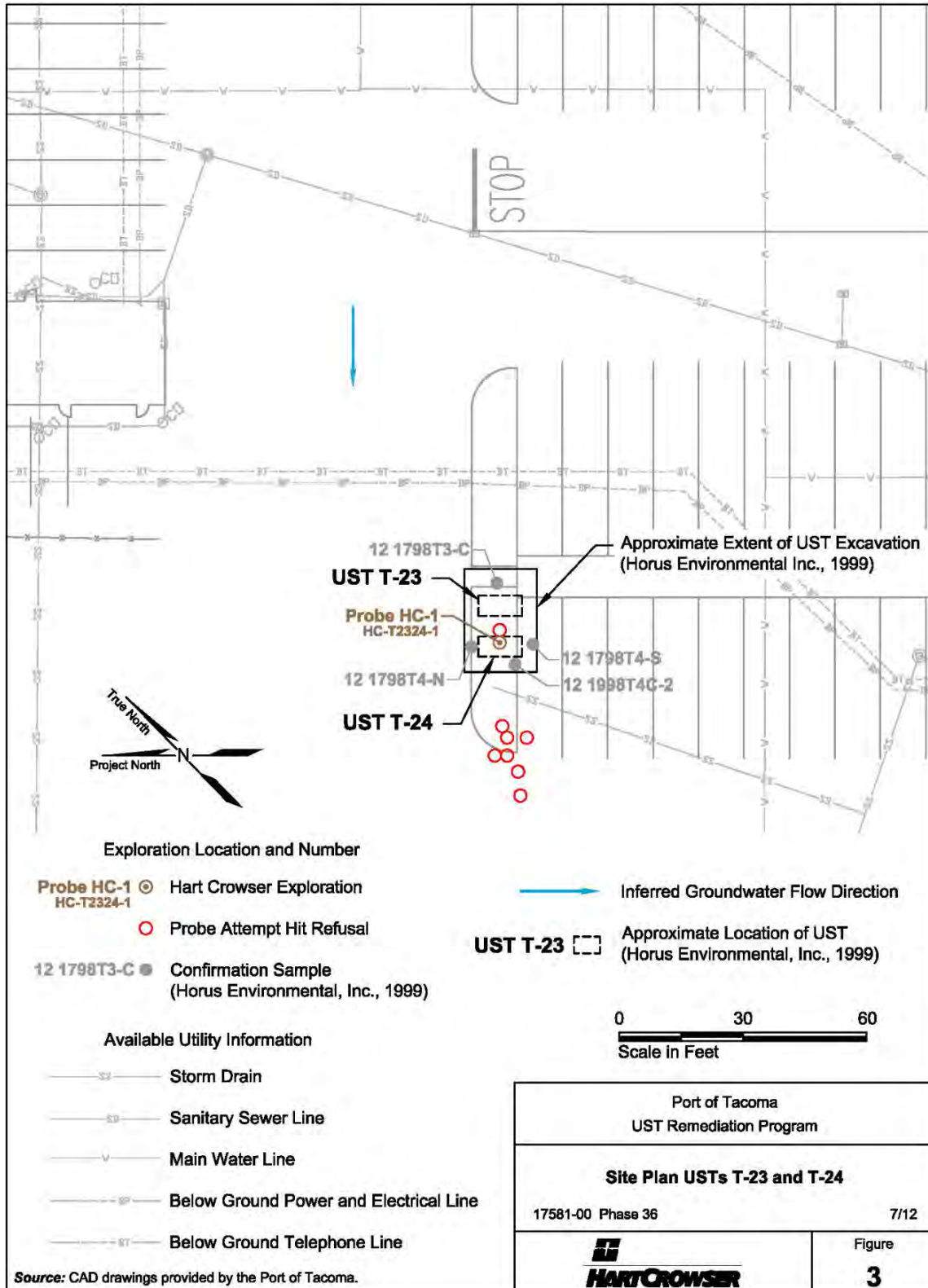


Figure T-23 and T-24



Source: CAD drawings provided by the Port of Tacoma.

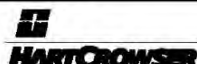
Port of Tacoma UST Remediation Program	
<b>Site Plan USTs T-23 and T-24</b>	
17581-00 Phase 36	7/12
 <b>HARTCROWSER</b>	Figure <b>3</b>

Figure. Sites N-9 and N-10 and N-20, N21, and 22

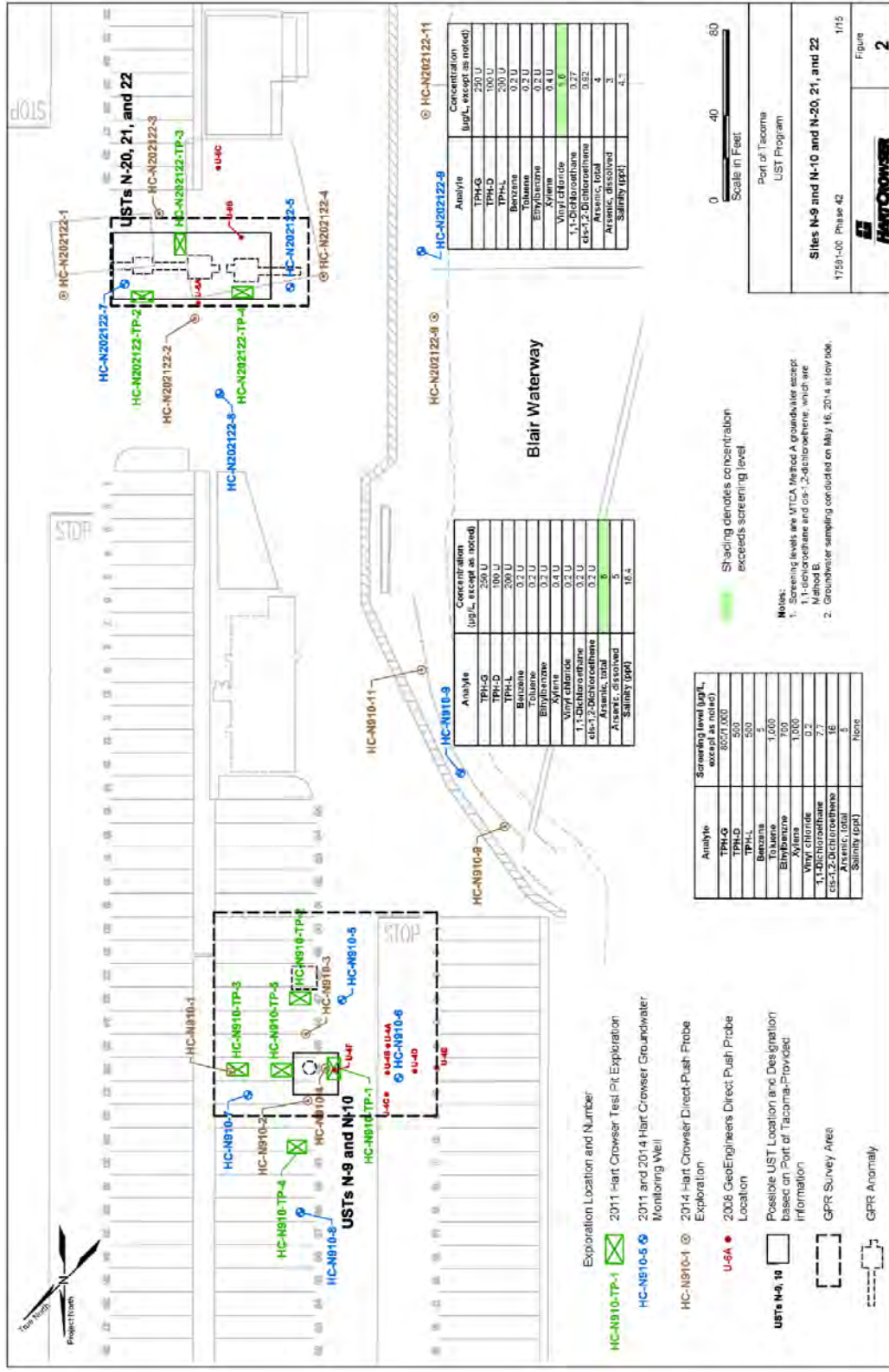
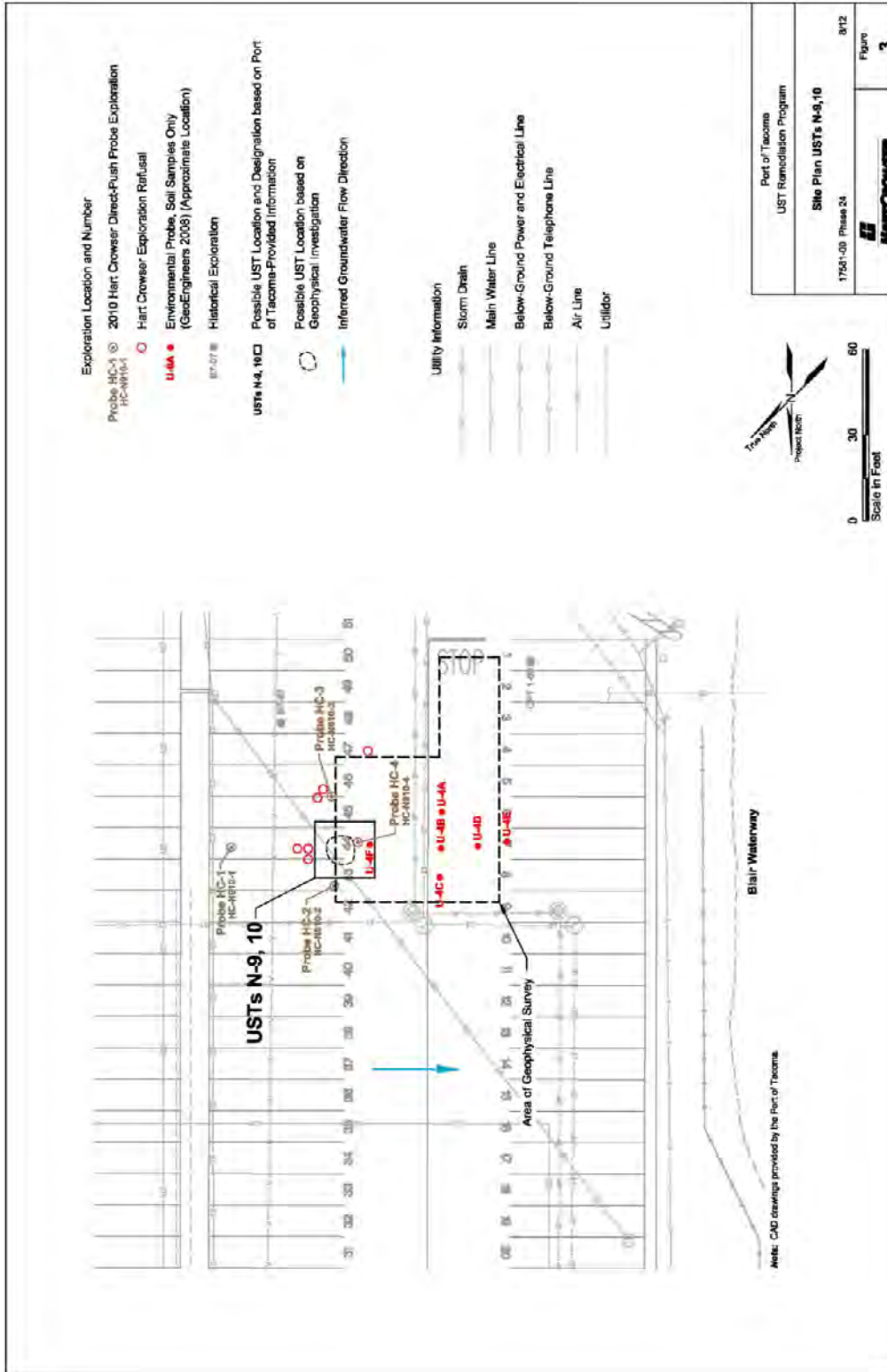
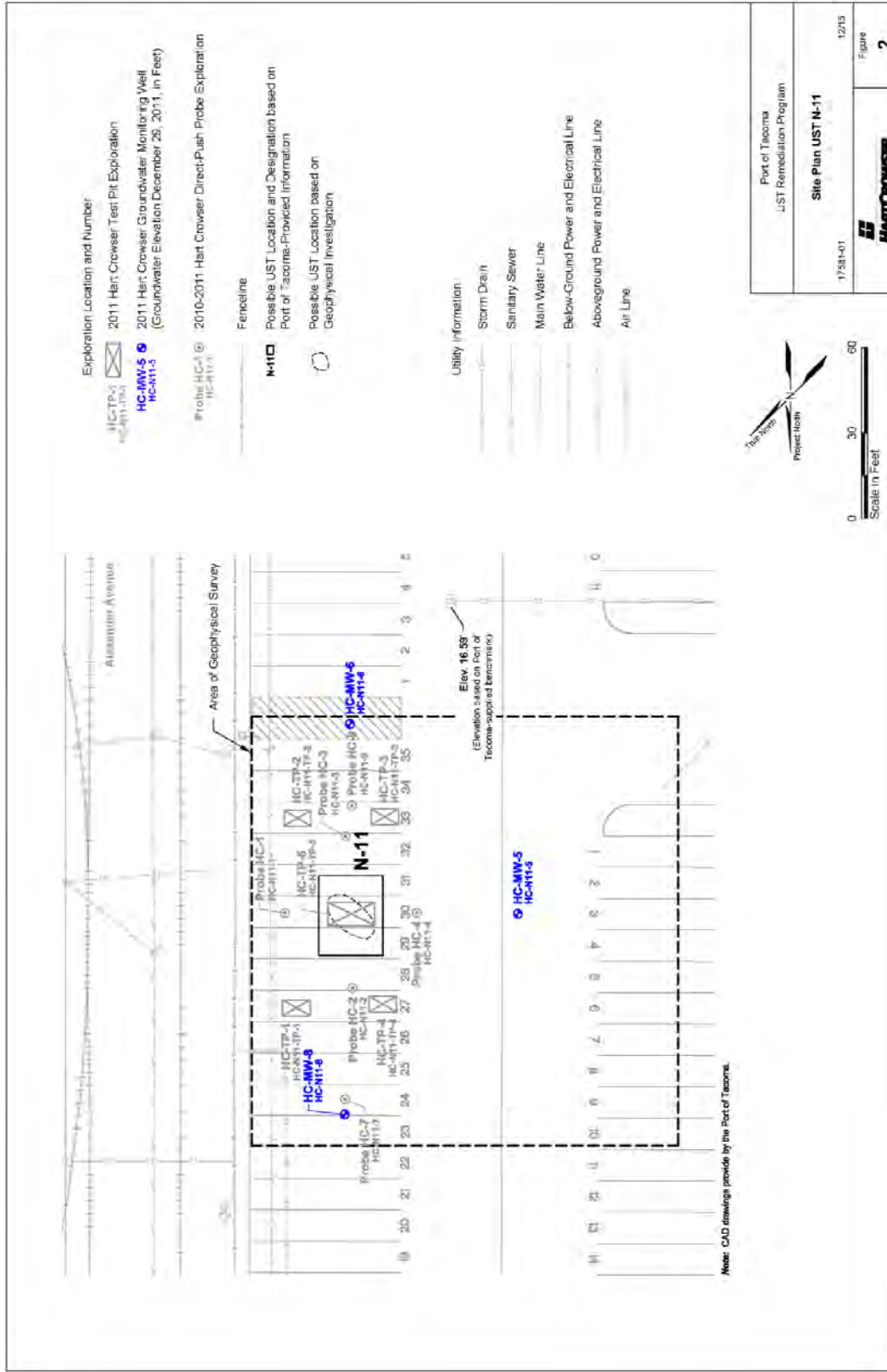


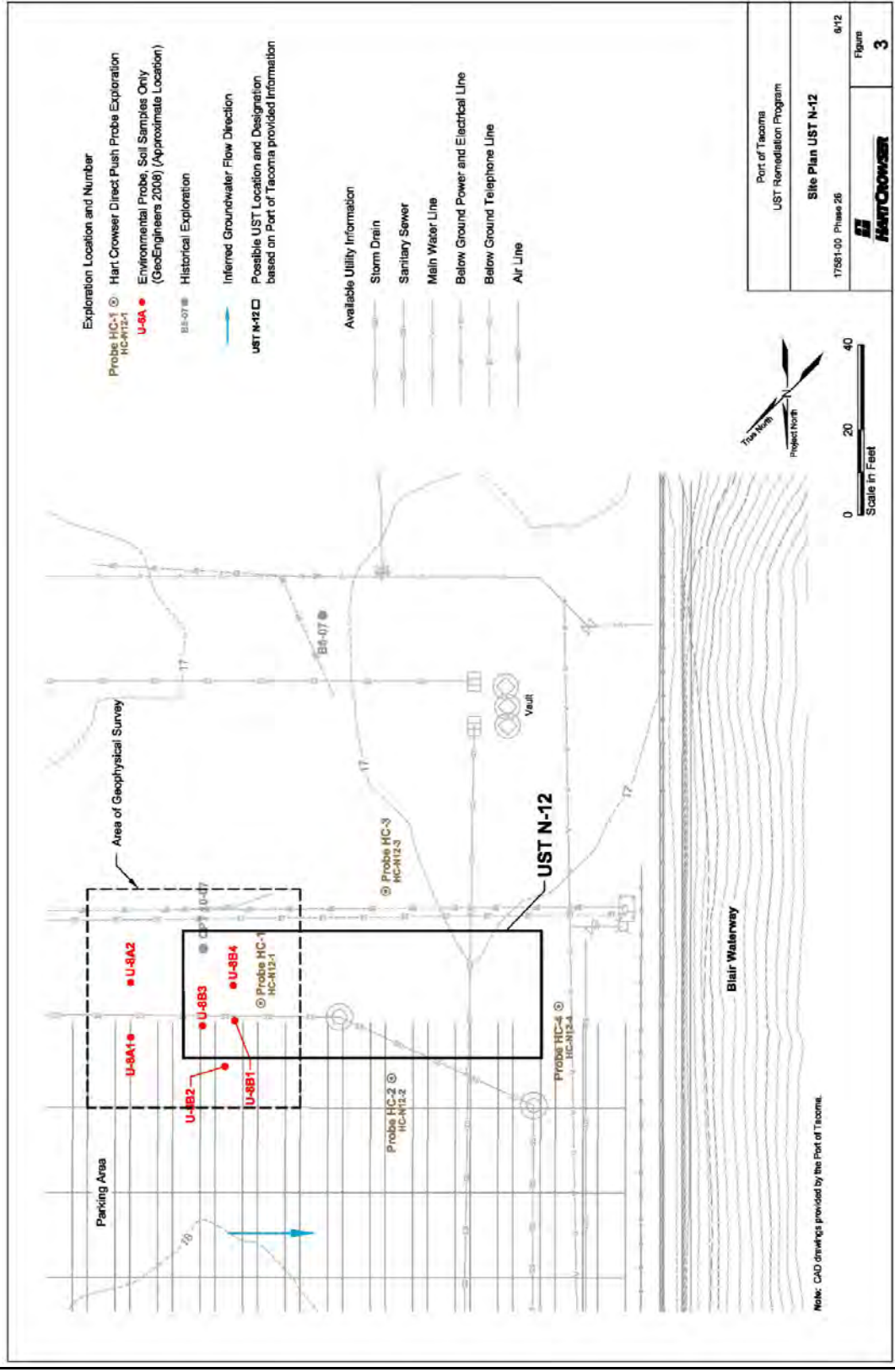
Figure. Site Plan USTs N-9, 10



N-11 Figures

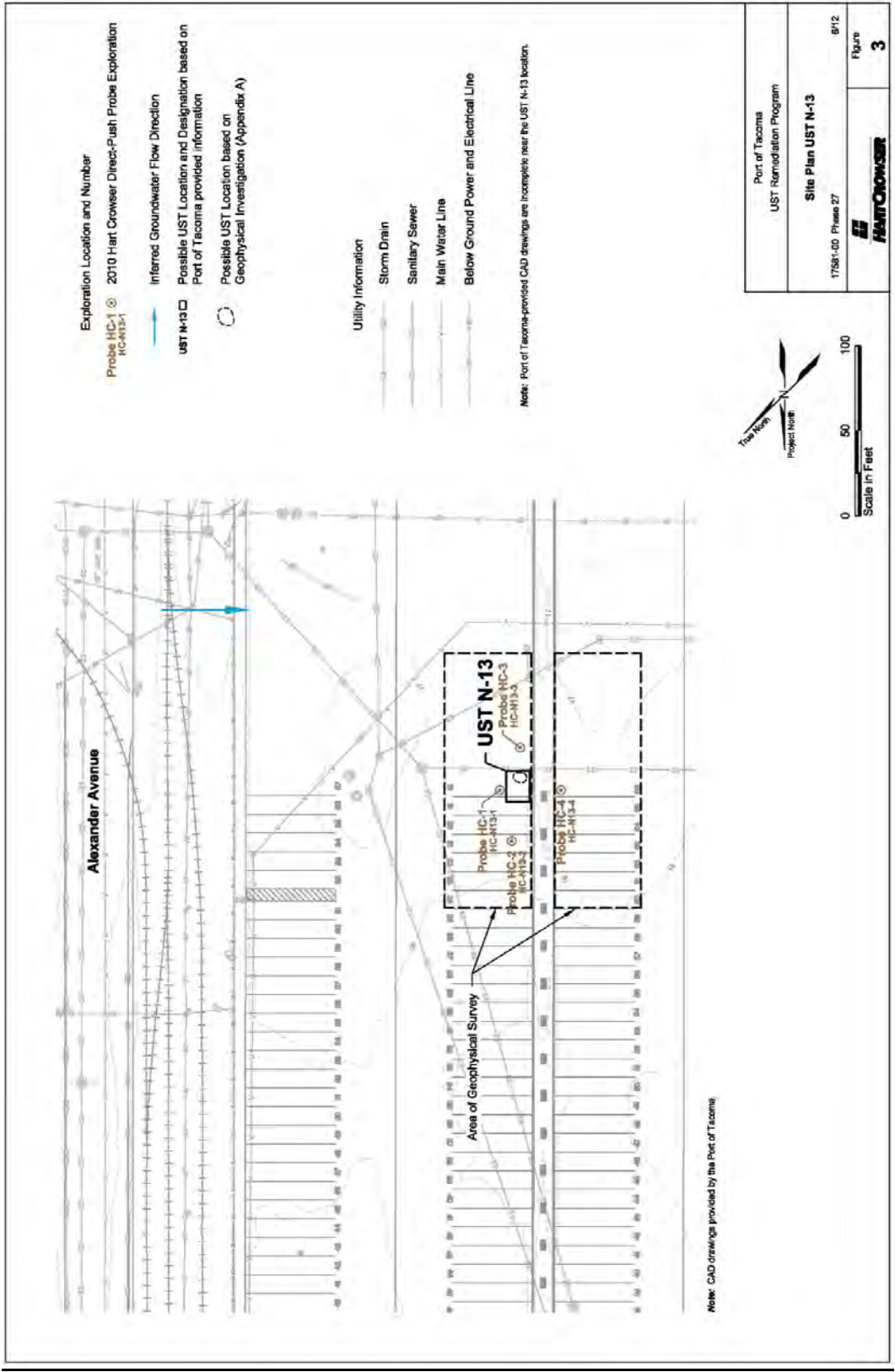


N-12 Figures

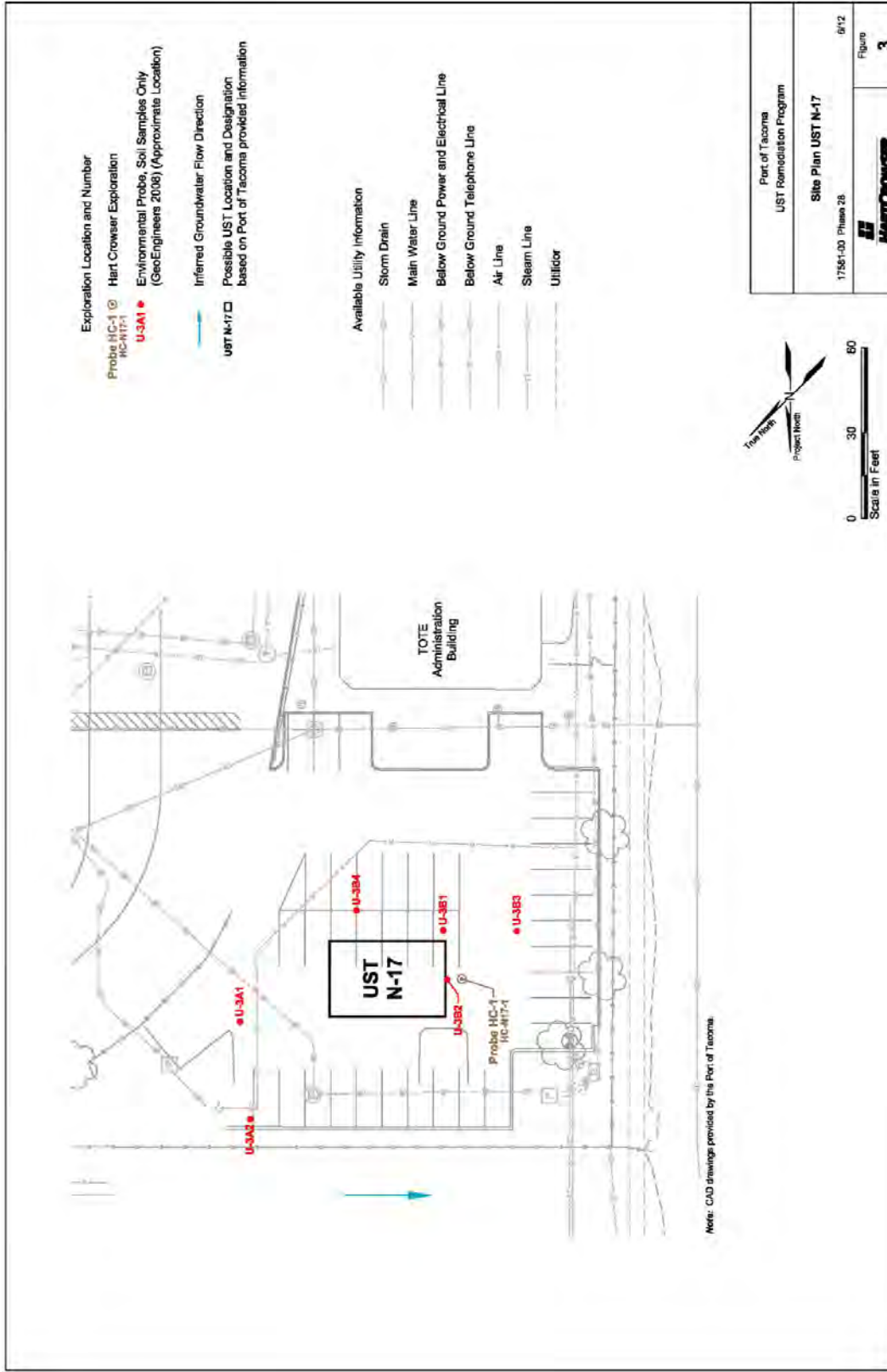


Port of Tacoma UST Remediation Program	
Site Plan UST N-12	
17581-00 Phase 26	6/12
<b>HART-CROWSER</b>	Figure <b>3</b>

N-13 Figures

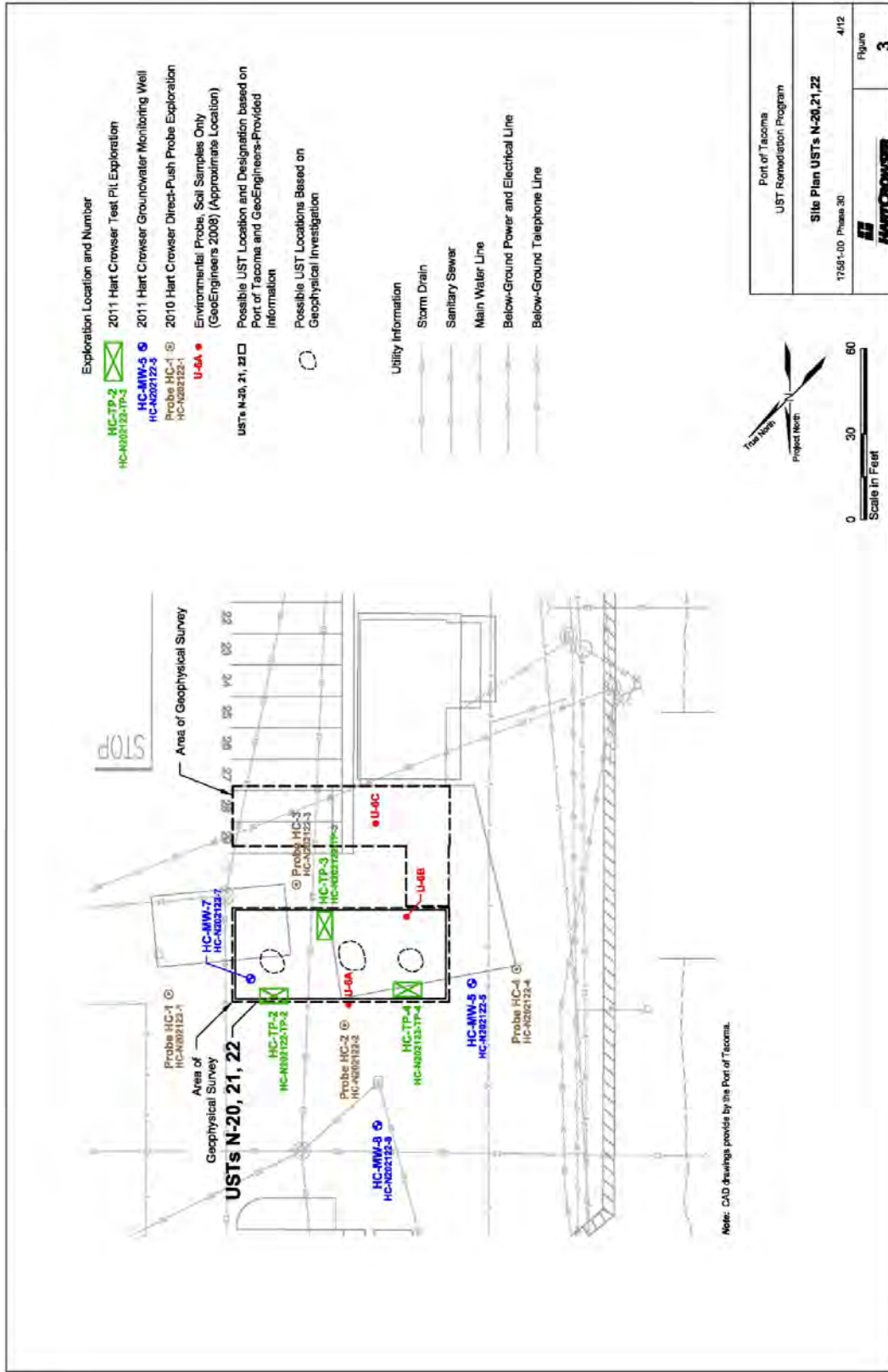


N-17 Figures



Note: CAD drawings provided by the Port of Tacoma.

N-20, N-21, and N-22 Figures



## **Site Tables**

**U-2 Tables**

**Port of Tacoma  
1100 Alexander Avenue UST Removal**

**Table 1. UST Pit Samples -- 11/24/98**

Parameters		HCID Gasoline	HCID Diesel	HCID Motor Oil	WTPH Gasoline	WTPH-D	WTPH-Motor Oil	Total Arsenic	Total Lead	PCBs
MTCA Method A Ind. Std. (mg/kg)		100	200	200	100	200	200	20	250	2
Sample Identification	Sample Date									
112498BC-1	11/24/98	<26	<64	<130	NT	NT	NT	2.8	1	ND
112498SW-1	11/24/98	<27	<66	<130	NT	NT	NT	1.4	2	ND
112498WW-1	11/24/98	NT	NT	NT	2.9	99	470	NT	NT	ND
112498NW-1	11/24/98	NT	NT	NT	ND	ND	ND	NT	NT	NT
112498EW-1	11/24/98	NT	NT	NT	ND	390	3100	NT	NT	NT

**Table 2. Stockpiled Soil Samples -- 11/24/98**

Parameters		HCID Gasoline	HCID Diesel	HCID Motor Oil	WTPH Gasoline	WTPH-D	WTPH-Motor Oil	Total Arsenic	Total Lead	PCBs
MTCA Method A Ind. Std. (mg/kg)		100	200	200	100	200	200	20	250	2
Sample Identification	Sample Date									
112498SP-1	11/24/98	>23	>57	>110	78	2600	13000	2.7	26	ND
112498SP-2	11/24/98	NT	NT	NT	30	1100	5700	NT	NT	NT
112498SP-3	11/24/98	NT	NT	NT	7.7	830	690	NT	NT	NT

**Table 3. UST Pit Soil Samples -- 12/4/98**

Parameters		HCID Gasoline	HCID Diesel	HCID Motor Oil	WTPH Gasoline	WTPH-D	WTPH-Motor Oil	Total Arsenic	Total Lead	PCBs
MTCA Method A Ind. Std. (mg/kg)		100	200	200	100	200	200	20	250	2
Sample Identification	Sample Date									
120498EW-2	12/04/98	NT	NT	NT	NT	ND	ND	NT	NT	NT
120498WW-2	12/04/98	NT	NT	NT	NT	ND	ND	NT	NT	NT

ND = Analyte Not Detected  
NT = Analyte Not Tested For



## N-11 Tables

Table 1 – Groundwater Analytical Results

Analyte (results in µg/L)	Screening Level (MTCA Method A) <sup>a</sup>	GW Values Protective of Surface Water <sup>f</sup>	N-11 HC-MW-5	N-11 HC-MW-6		N-11 HC-MW-8		N-11 HC-MW-COMP <sup>b</sup>
			(11/9/2011)	(11/9/2011)	(11/23/2015)	(11/9/2011)	(11/23/2015)	(11/23/2015)
Diesel-range – without silica gel cleanup	500		900 U	1,100 U	<b>5,600</b>	310 U	<b>1,900</b>	–
Lube oil-range – without silica gel cleanup	500		410 U	410 U	<b>1,400</b>	410 U	<b>290</b>	–
Gasoline-range petroleum hydrocarbons	800/1,000 <sup>c</sup>		<b>2,000</b>	<b>2,200</b>	<b>3,600</b>	<b>620</b>	<b>860</b>	–
Benzene		51	<b>87</b>	<b>190</b>	<b>250</b>	<b>0.69</b>	<b>1.0</b>	–
Toluene	15,000	12	10.0 U	7.4	1 U	0.32	–	–
Ethylbenzene	2,100	5.8	9.4	6.4	0.23	0.22	–	–
Total xylenes	15,000	6.6	19.0	27.6	1	0.74	–	–
Arsenic <sup>d</sup>		0.14 (6) <sup>e</sup>	3 U	3 U	NA	3 U	NA	0.6
Cadmium <sup>d</sup>		9	4 U	4 U	NA	4 U	NA	0.1 U
Chromium <sup>d</sup>		50	11 U	11 U	NA	11 U	NA	0.5 U
Lead <sup>d</sup>		8.1	1 U	1 U	NA	1 U	NA	0.1
Mercury <sup>d</sup>		0.25 (25) <sup>e</sup>	0.5 U	0.5 U	NA	0.5 U	NA	0.1 U

Notes:

- a. There are no screening levels for surface water criteria for TPH, so Metho A values for protection of drinking water are provided as screening levels.  
b. Surface water screening levels were selected using the most conservative numbers based on protection of drinking water and the environment.  
Screening levels were derived from the Nation Toxics rule (40 CFR 131), Section 304 of the Clean Water Act; Chapter 173-201A WAC, as presented in the CLARC database.  
c. Sample N-11 HC-MW-COMP is a composite sample for disposal.  
d. 800 µg/L when benzene present, 1,000 µg/L when no benzene present.  
e. Total.  
f. The number in parenthesis is the screening criteria based on PQL.

U = not detected at the reporting limit indicated.

NA = not analyzed

**Bold values are detected**

**Shaded values exceed MTCA Method A screening levels**

Table 2 – Diesel- and Oil-Range Petroleum Hydrocarbon Analytical Results with Silica Gel Cleanup

Analyte (results in µg/L)	Screening Level (MTCA Method A)	N-11 HC-MW-6	N-11 HC-MW-8
		(11/23/2015)	(11/23/2015)
Diesel-range – with silica gel cleanup	500	100 U	<b>190</b>
Lube oil-range – with silica gel cleanup	500	200 U	200 U

Notes:

U = not detected at the reporting limit indicated

**Bold values are detected**

**Table 1 - Analytical Results for Soil Samples, UST N-11**

Sample Location Sample ID Sampling Date Sample Depth in Feet	MTCA Method A Industrial Screening Level	Probe HC-1 HC-N11-1-S3 9/30/2010 8 to 10	Probe HC-2 HC-N11-2-S3 9/30/2010 8 to 10	Probe HC-3 HC-N11-3-S2/3 10/1/2010 6.5 to 9	Probe HC-4 HC-N11-4-S2/3 9/30/2010 6.5 to 9
<b>TPH in mg/kg</b>					
Diesel Range Organics	2000	<b>19000</b>	1400	220	30 U
Lube Oil	2000	790	220	60 U	59 U
Gasoline Range Organics	100/30 <sup>a</sup>	4.7 U	<b>4300</b>	6.3 U	6.1 U
<b>BTEX in mg/kg</b>					
Benzene	0.03	0.02 U	<b>0.99</b>	<b>0.05</b>	0.02 U
Ethylbenzene	6	0.047 U	<b>20</b>	1	0.061 U
m, p-Xylene	9	0.047 U	6.4	1.1	0.061 U
o-Xylene	9	0.047 U	3 U	0.63 U	0.061 U
Toluene	7	0.047 U	0.18	0.063 U	0.061 U

**Notes:**

U = Not detected at the reporting limit indicated.

<sup>a</sup> 100 mg/kg when no benzene present, 30 mg/kg when benzene present.

Bold boxed entry indicates concentration exceeds MTCA screening level.

**Table 2 - Analytical Results for Groundwater Samples, UST N-11**

Sample Location Sample ID Sampling Date Screen Interval in Feet	MTCA Screening Level Method A <sup>c</sup>	GW Values Protective of Surface Water <sup>d</sup>	Probe HC-1 HC-N11-1 GW 9/30/2010 9 to 12	Probe HC-2 HC-N11-2 GW 9/30/2010 9 to 12	Probe HC-3 HC-N11-3 GW 10/1/2010 9 to 12	Probe HC-4 HC-N11-4 GW 9/30/2010 9 to 12
<b>TPH in ug/L<sup>b</sup></b>						
Diesel Range Organics	500		<i>1500 U</i>	<i>1200 U</i>	<i>1100 U</i>	<i>1200 U</i>
Lube Oil	500		420 U	420 U	420 U	420 U
Gasoline Range Organics	1,000/800 <sup>a</sup>		<b>2800</b>	<b>1900</b>	<b>2400</b>	<b>2500</b>
<b>BTEX in ug/L</b>						
Benzene		51	<b>530</b>	30	<b>440</b>	<b>210</b>
Ethylbenzene		2100	51	8.6	62	40
m, p-Xylene		15,000	49	12	43	31
o-Xylene			4.9	1.2	2.7	2.4
Toluene		15,000	25	3.7	21	14

U = Not detected at the reporting limit indicated.

Bold boxed entry indicates concentration exceeds MTCA Method A screening level.

Shaded entry indicates concentration exceeds surface water protection criteria.

Blank entry indicates no applicable criteria established or sample not analyzed for specific analyte.

Reporting limits that exceed screening criteria are in italics.

a) 1,000 ug/L when no benzene present, 800 ug/L when benzene present.

b) There are no screening levels for surface water criteria for TPH, so Method A values for protection of drinking water are provided as screening levels.

c) Method A values are based on protection of drinking water.

d) Surface water screening levels were selected using the most conservative numbers based on protection of human health and the environment. Screening levels were derived from the National Toxics rule (40 CFR 131); Section 304 of the Clean Water Act; Chapter 173-201A WAC, as presented in the CLARC database.

## **Enclosure B**

### **Basis for the Opinion: List of Documents**

To maintain clarity across the multiple tank nests located at this Site, the list of documents are grouped by the tanks that they directly reference. Sections will be noted by the common usage designations of the Port of Tacoma (PoT) as well as alternate names used in individual historical documents to the best that it could be determined which historical names matched with current PoT designations.

### **ALL TANK NEST**

1. Port of Tacoma (PoT), TOTE Property USTs, May 5, 2017.

### **U-1 (T-1), P-27, P-28 (T-2 & T-3, Unknown which is which)**

2. HartCrowser, *Revised Final USTs U-1, P-27, and P-28 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 14, 2012.
3. Greylock Consulting LLC (Greylock), *Decommissioning of Groundwater Monitoring Wells at Port Parcel 1A, E. 500 Alexander Avenue*, Tacoma, Washington, March 27, 2012.
4. Noll Environmental, Inc. (Noll), *Additional Exploration Work Former Tote UST Area* (Former Building 9397), January 15, 1998.
5. HORUS Environmental, Inc. (HORUS), *Port Of Tacoma Tote Expansion Area Underground Storage Tank Removal Project Groundwater Study*, April 21, 1997.
6. Nowicki & Associates, Inc. (NAI), *UST Closure Site Characterization Report*, July 11, 1996.

### **U-2 (AA-1)**

7. Tacoma-Pierce County Health Department (TPCHD), *Underground Storage Tank Removal: 1100 Alexander Avenue, Tank AA-1*; Removal Date: 11/98, Permit #: 9899, October 28, 1999.
8. State of Washington Department of Ecology (Ecology), 1100 Alexander Avenue Project, Tacoma WA (No Further Action Opinion Letter), August 26, 1999.
9. HORUS, *Port of Tacoma Underground Storage Tank Removal*; 1100 Alexander Avenue, March 2, 1999.

### **T-21, T-22, T-23, T-24**

10. HartCrowser, *Revised Final USTs T-21 and T-22 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 13, 2012.
11. HartCrowser, *Revised Final USTs T-23 and T-24 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, July 23, 2012.
12. HORUS, Port Of Tacoma; *Underground Storage Tank Removal*; Tote Facility, March 19, 1999.

### **N-9, N-10**

13. HartCrowser, *MEMORANDUM; RE: Results of Additional Environmental Sampling and UST Locating*; UST Sites N-9/-10 and N-20/-21/-22, Port of Tacoma, January 6, 2015.

14. HartCrowser, *USTs N-9 and N-10 and USTs N-20, 21, and 22 Groundwater Sampling and Analysis Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 8, 2013.
15. HartCrowser, *Revised Final USTs N-9 and N-10 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 10, 2012.
16. HartCrowser, *UST N-9 and N-10 Site-Specific Summary Report Addendum*; Port of Tacoma UST Remediation Program; Tacoma, Washington, May 10, 2012.

#### **N-11**

18. HartCrowser, *Groundwater Sampling Results*; Port of Tacoma UST N-11; Tacoma, Washington, December 30, 2015.
19. HartCrowser, *Revised Final UST N-11 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 8, 2012.
20. HartCrowser, *UST N-11 Site-Specific Summary Report Addendum*; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 27, 2012.

#### **N-12**

21. HartCrowser, *UST N-12 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, June 19, 2012.

#### **N-13**

22. HartCrowser, *MEMORANDUM; RE: Results of UST GPR Survey*; Port of Tacoma UST N-13; Tacoma, Washington, December 29, 2015.
23. HartCrowser, *Revised Final UST N-13 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program Sampling; Tacoma, Washington, June 27, 2012.

#### **N-17**

24. HartCrowser, *Revised Final UST N-17 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, July 19, 2012.

#### **N-20, N-21, N-22**

25. HartCrowser, *MEMORANDUM; RE: Results of Additional Environmental Sampling and UST Locating*; UST Sites N-9/-10 and N-20/-21/-22, Port of Tacoma, January 6, 2015.
26. HartCrowser, *USTs N-9 and N-10 and USTs N-20, 21, and 22 Groundwater Sampling and Analysis Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 8, 2013.
27. HartCrowser, *Revised Final USTs N-20, 21, and 22 Site-Specific Summary Report*; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 10, 2012.
28. HartCrowser, *USTs N-20, 21, and 22 Site-Specific Summary Report Addendum*; Port of Tacoma UST Remediation Program; Tacoma, Washington, May 24, 2012.



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July 29, 2021

Sarah Weeks  
Port of Tacoma  
PO Box 1837  
Tacoma, WA 98401  
[sweeks@portoftacoma.com](mailto:sweeks@portoftacoma.com)

**Re: Further Action at the following Site:**

- **Site Name:** Port of Tacoma/TOTE Facility 500 Alexander
- **Site Address:** 500 Alexander Ave, Tacoma, Pierce County, WA 98421-4217
- **Facility/Site ID:** 3468881
- **Cleanup Site ID:** 7619
- **VCP Project ID:** SW1588

Dear Sarah Weeks:

On January 4, 2021, the Washington State Department of Ecology (Ecology) received your request for an opinion on the proposed independent cleanup of the Port of Tacoma/TOTE Facility 500 Alexander (Site). On March 16, 2021, your submittal, including printed copies of your submitted report, was complete and ready for our review. This letter provides our opinion. We are providing this opinion under the authority of the [Model Toxics Control Act \(MTCA\)](#),<sup>1</sup> [chapter 70A.305 Revised Code of Washington \(RCW\)](#).<sup>2</sup>

## Issue Presented and Opinion

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Ecology has determined that further remedial action is necessary to clean up contamination at the Site.

This opinion is based on an analysis of whether the remedial action meets the substantive requirements of MTCA, chapter 70A.305 RCW, and its implementing regulations, Washington Administrative Code (WAC) chapter 173-340 (collectively "substantive requirements of MTCA"). The analysis is provided below.

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<sup>1</sup> <https://apps.ecology.wa.gov/publications/SummaryPages/9406.html>

<sup>2</sup> <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.305>

## Description of the Site

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This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following releases:

- Gasoline range total petroleum hydrocarbons (TPH-G) into the soil, and groundwater.
- Diesel range and oil range total petroleum hydrocarbon (TPH-D and TPH-O; collectively, TPH-D/O) into the soil and groundwater.
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents into the soil and groundwater.
- Polychlorinated biphenyls (PCBs) into the soil and groundwater.
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) into the groundwater.
- Chlorinated solvents (Trichloroethylene [TCE]) and degradation products (vinyl chloride, 1,1-dichloroethane, cis-1,2-dichloroethene) into the groundwater.
- Arsenic into the groundwater.

The parcel of real property associated with this Site are also located within the projected boundaries of the Tacoma Smelter Plume Pierce County Site (# FSID62855481). At this time, we have no information that the parcel is actually affected. This opinion does not apply to any contamination associated with the Tacoma Smelter Plume Pierce County Site.

The Glenn Springs Holdings Inc. facility (FSID# 1246) also affects the parcel of real property associated with this Site. This opinion does not apply to any contamination associated with the Glenn Springs Holdings Inc. facility.

## Basis for the Opinion

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This opinion is based on the information contained in the documents listed in **Enclosure B**.

Those documents are kept in the Central Files of the Southwest Regional Office of Ecology (SWRO) for review by appointment only. Information on obtaining those records can be found on [Ecology's public records requests web page](#).<sup>3</sup> Some site documents may be available on [Ecology's Cleanup Site Search web page](#).<sup>4</sup>

This opinion is void if any of the information contained in those documents is materially false or misleading.

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<sup>3</sup> <https://ecology.wa.gov/About-us/Accountability-transparency/Public-records-requests>

<sup>4</sup> <https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=7619>

## Analysis of the Cleanup

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Ecology has concluded that **further remedial action** is necessary to clean up contamination at the Site. That conclusion is based on the following analysis:

### 1. Characterization of the Site.

Ecology has determined your characterization of the Site is not sufficient to establish cleanup standards and select a cleanup action.

No additional sampling, for any media, was conducted between the issuance of Ecology's August 2017 opinion letter<sup>5</sup> and the submitted Report from Anchor QEA (Anchor).<sup>6</sup> Ecology believes that the pathways, as assessed in the August 2017 opinion letter, are still valid.

The Report identifies historical Site use as well as past remedial activities conducted for each of the underground storage tank (UST) nests or groups. The Report also identifies two potential cleanup options for the Site; however, the Report does not adequately address all issues identified in the August 2017 Further Action opinion letter. Some of these issues are further addressed below.

**All issues discussed in this opinion and the August 2017 Further Action opinion letter will need to be evaluated in order for Ecology to concur with a final cleanup action.**

#### Site Wide Requirements:

- a. Remedial actions completed prior to determining the full nature and extent of the Site are considered interim actions for independent cleanup sites enrolled in the Voluntary Cleanup Program (VCP). Independent cleanup sites are highly encouraged to conduct interim actions to safely reduce hazardous substances. However, Ecology cannot evaluate the effectiveness of your cleanup alternatives until you have determined the full nature and extent of all hazardous substances in soil, groundwater, sediments, and surface water. After the extents of contamination have been determined the vapor intrusion (VI) pathway may need to be revisited, in particular at tank locations T-23 and T-24, T-21 and T-22, and N-17.

Once the full nature and extent of all hazardous substances for all relevant media has been characterized, generate figures (in both plain view and cross-section) and tables that clearly demonstrate the extents of hazardous substances released from on Site sources and their relationship to hazardous substances from other nearby sites. Provide these figures and tables to Ecology for review in a future submittal.

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<sup>5</sup> Ecology, *Further Action at the following Site*, letter, addressed to Ms. Sarah Weeks (Port of Tacoma), August 9, 2017.

<sup>6</sup> Anchor, Remedial Investigation and Remedial Plan, January 2021.

- b. In the Report, Anchor states "... some of the historical tanks had been located within a proposed bank-cutback project along the Blair Waterway..."<sup>7</sup> Ecology would like additional information regarding these tanks and their potential areas of contamination. Specifically, Ecology has the following questions:
- i. Is there potential that USTs are present south-southwest of the present day shoreline and within the current Blair Waterway?
  - ii. Has it been determined whether contaminated soil remains south-southwest of the present-day shoreline and within the current Blair Waterway?
  - iii. What were the historical identification designation (name or ID) and use of these tanks? Are there nearshore upland hazardous substances that will need to be assessed?
  - iv. Were any of these tanks removed as part of the previous dredge project?<sup>8</sup>
- c. Ecology understands that the Site is more likely than not to be designated as an industrial property; however, it needs to be demonstrated that the Site meets the definition of an industrial property under [WAC 173-340-200](#)<sup>9</sup>, and [WAC 173-340-745](#)<sup>10</sup> and reported to Ecology for concurrence.
- d. Tanks A-1/2 and B-1/2/3 and the Former Wax Tank were not discussed in the May 5, 2017, report. Along with previously reported tank N-11, you will need to determine if contamination from these tanks has comingled with contamination from the tanks being addressed in your cleanup effort.
- e. Ecology does not concur with the methodology used to define the extents of contamination for each specific tank area. Though you do acknowledge the issue of silica gel cleanup (SGC) in defining the extent of contamination in groundwater, the required testing parameters provided in MTCA Table 830-1 have not been met.<sup>11</sup>

Anchor is also defining the extent of hazardous substances in soil with respect to the MTCA Method A industrial cleanup levels (CULs). The extents of hazardous substances in both soil and groundwater need to be defined in accordance with [WAC 173-340-200](#) and [WAC 173-340-350](#).<sup>12</sup> Generally, a MTCA toxic cleanup Site can be thought of as the lateral and vertical extents of hazardous substances released to the environment, *irrespective of property boundaries or eventual cleanup levels.*

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<sup>7</sup> Report, p. 4.

<sup>8</sup> GeoEngineers, Final Dredge Material Characterization Report; Blair-Hylebos Terminal Redevelopment Project, November 24, 2008.

<sup>9</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-200>

<sup>10</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-745>

<sup>11</sup> WAC 173-340-900

<sup>12</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-350>

- f. Ecology does not concur that use of a Model Remedy is appropriate for this Site. The use of Model Remedies is limited to routine cleanups and explicitly restricts sites with petroleum comingled with contaminants not normally found at petroleum contaminated sites;<sup>13</sup> specifically, for this Site, chlorinated solvents. Given the potential various sources of contamination and possible sediment or surface water contamination, this Site does not meet Ecology's requirements of a routine site.

Once the Site has been adequately characterized, the Site's applicability for model remedies should be reconsidered on a release-by-release area basis.<sup>14</sup> Ecology does not concur with your use of proposed updates to MTCA, as these are neither regulation nor guidance.<sup>15</sup>

- g. Ecology needs clarification of how total Site cleanup will be completed and what you expect final Site cleanup to look like. Specifically, how will final cleanup of the entire Site be assessed and determined? Please clarify how you are attempting to redefine the Site to exclude how those tank locations are going to be cleaned up as part of the adjacent Site cleanup activities. Specifically, how will releases from USTs located on-Site that have comingled with releases from off-Site sources be cleaned up? Will the comingled releases be cleaned up as part of this Site cleanup or as part of the off-Site source cleanup?
- h. You are proposing to use a Geoprobe to collect groundwater grab samples from tank locations where monitoring wells are not installed. Per [WAC 173-340-450\(3\)\(a\)\(iii\)](#)<sup>16</sup> monitoring well installation is required for releases from USTs if contaminated soil is found in contact with the groundwater or soil contamination appears to extend below the lowest soil sampling depth. Each tank release location should be evaluated to determine if permanent wells are required by MTCA. Make sure this assessment is made using the full extents of hazardous substances as discussed previously (in item e.), and not solely the extents of a regulatory limit exceedance and the highest likely groundwater levels.

For any tank nests where previous groundwater grab samples showed the presence of hazardous substances, permanent monitoring wells will likely be necessary to demonstrate that the nature and extent of hazardous substances in groundwater has been defined across seasonal groundwater level changes.

- i. Ecology concurs with your plan to include pH and chlorinated volatile organic compounds (VOCs) as part of the sampling plan for tank locations that have the potential to be impacted by contamination migrating from other nearby sites.

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<sup>13</sup> Ecology, Model Remedies for Sites with Petroleum Impacts to Groundwater, December 2017. Chapter 2 and Chapter 3, Contaminant Types.

<sup>14</sup> Ecology, Model Remedies for Sites with Petroleum Impacts to Groundwater, December 2017. Chapter 3, Contaminant Types, c.

<sup>15</sup> Report, p. 30, referencing a Summer and Fall 2020 Stakeholder and Tribal Advisory Group for MTCA Phase 1 Rule Updates.

<sup>16</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-450>

Please note, the Site still needs to be defined for required petroleum hazardous substances provided on MTCA Table 830-1,<sup>17</sup> and not just TPH-D/O to determine if areas of this Site are comingled with hazardous substances from adjacent sites.

### **Environmental Covenant (Covenant):**

- j. The remedial actions and cleanup levels you have proposed, as well as the terrestrial ecological evaluation (TEE) selection you have indicated on your submitted TEE form, rely on the use of options that will require institutional controls to protect the Site's status as an industrial property, as well as engineering controls in perpetuity.

Ecology cannot concur with your use of a Covenant at this time. The need for use of a Covenant will need to be demonstrated by a Feasibility Study (FS)<sup>18</sup> and supported by a Disproportionate Cost Analysis (DCA).<sup>19</sup> For additional guidance on what Ecology expects from an FS, refer to the [Feasibility Study Report checklist](#)<sup>20</sup> found on Ecology's [Working with the Voluntary Cleanup Program](#)<sup>21</sup> web page.

Ecology acknowledges that a limited FS/DCA was included in the Report; however, that FS/DCA would likely be considered incomplete when assessed using Ecology's Remedial Investigation (RI) Checklist. When fully assessing the feasibility of cleanup options for the Site, do not assume that engineering controls with a Covenant is the only option. The cleanup options you presented can be incorporated into a complete FS/DCA that also compares cleanup options that do not rely on engineering and institutional controls to achieve the cleanup and that directly compares the feasibility and costs of the cleanup options.

- k. If the Site continues to rely on industrial CULs and engineering controls in the form of barriers to limit exposure to both human and terrestrial ecological receptors and the use of a Covenant is determined to be appropriate by an FS/DCA, please include a draft Covenant with any future submittal for Ecology to review and provide concurrence.

Ecology recommends reviewing [Procedure 440A: Establishing Environmental Covenants under the Model Toxics Control Act](#)<sup>22</sup> for guidance on completing a Covenant. A complete list of the necessary items for Ecology to review a draft Covenant is also included in **Enclosure A**. Generally, submittals to Ecology that rely on a Covenant are considered incomplete without a draft Covenant to provide Ecology will all the information necessary to assess the Site.

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<sup>17</sup> WAC 173-340-900

<sup>18</sup> WAC 173-340-350

<sup>19</sup> WAC 173-340-360(3)(e)

<sup>20</sup> <https://apps.ecology.wa.gov/publications/SummaryPages/1609007.html>

<sup>21</sup> <https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Voluntary-Cleanup-Program/Working-with-VCP>

<sup>22</sup> <https://apps.ecology.wa.gov/publications/SummaryPages/1509054.html>

- I. Additional monitoring wells may be necessary to demonstrate continued compliance at your established points of compliance. These would be in addition to those discussed previously (in item h.) for remedial investigation purposes. Points of compliance are discussed further in section 2a.

### **Sediment and Surface Water Issues:**

- m. Because of the close proximity of some USTs (N-9, N-10, N-20, N-21, and N-22) to the Blair Waterway and the presence of hazardous substances in near shore sample points (HC-N910-9 and HC-N202122-9), sampling of sediments and surface water in the Blair Waterway will need to be included as part of the Site's remedial investigation.

Hazardous substances detected in soil and groundwater samples collected near these tanks and hazardous substances required by MTCA Table 830-1 that have not already been defined should be included in the sampling schedule for sediments located in the Blair Waterway.<sup>23</sup> The groundwater pathways and discharge seeps should be investigated near the shoreline and sediment surface samples should be collected to determine if the sediments have been impacted by the groundwater seeps. Ecology recommends reviewing [WAC 173-204](#)<sup>24</sup> and the [Sediment Cleanup User's Manual \(SCUM\)](#)<sup>25</sup> for additional guidance on determining sediment issues at the Site.

Given the Site's location and scope of this investigation component, Ecology recommends the submittal and review of a work plan. Work plan reviews provide Ecology's written technical assistance and guidance on how planned work may achieve MTCA requirements.

## **2. Establishment of Cleanup Standards.**

Ecology has determined the cleanup levels and points of compliance you established for the Site do not meet the substantive requirements of MTCA.

**Cleanup Standards:** Under MTCA, cleanup standards consist of three primary components; (a.) points of compliance,<sup>26</sup> (b.) cleanup levels,<sup>27</sup> and (c.) applicable local, state, and federal laws.<sup>28</sup> Ecology will need you to propose specific:

- Applicable local, state, and federal laws.
- Points of compliance.

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<sup>23</sup> WAC 173-340-900

<sup>24</sup> <https://apps.leg.wa.gov/WAC/default.aspx?cite=173-204>

<sup>25</sup> <https://apps.ecology.wa.gov/publications/SummaryPages/1209057.html>

<sup>26</sup> WAC 173-340-200 "Point of Compliance."

<sup>27</sup> WAC 173-340-200 "Cleanup level."

<sup>28</sup> WAC 173-340-200 "Applicable state and federal laws," WAC 173-340-700(3)(c)

- Cleanup screening levels used for all hazardous substances detected at all points of compliance.
  - Appropriate cleanup levels for all applicable hazardous substances.
- a. **Points of Compliance.** Points of compliance, that you need to propose, are the specific locations at the Site where cleanup levels must be attained. For clarity, Ecology provides the following table of standard points of compliance:

Media	Points of Compliance
Soil-Direct Contact	Based on human exposure via direct contact, the standard point of compliance is throughout the Site from ground surface to fifteen feet below the ground surface. <sup>29</sup>
Soil- Protection of Groundwater	Based on the protection of groundwater, the standard point of compliance is throughout the Site. <sup>30</sup>
Soil-Protection of Plants, Animals, and Soil Biota	Based on ecological protection, the standard point of compliance is throughout the Site from ground surface to fifteen feet below the ground surface. <sup>31</sup>
Groundwater	Based on the protection of groundwater quality, the standard point of compliance is throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the Site. <sup>32</sup>
Groundwater-Surface Water Protection	Based on the protection of surface water, the standard point of compliance is all locations where hazardous substances are released to surface water. <sup>33</sup>
Air Quality	Based on the protection of air quality, the point of compliance is indoor and ambient air throughout the Site. <sup>34</sup>
Sediment	Based on the protection of sediment quality, compliance with the requirements of 173-204 WAC. <sup>35</sup>

You have proposed a conditional point of compliance for soil at the Site. Under [WAC 173-340-740\(6\)](#)<sup>36</sup> a conditional point of compliance is not permitted. If achieving CULs at the point of compliance defined in paragraph 740(6) is not practicable, a Covenant will need to be developed for the Site and supported by a FS/DCA.

<sup>29</sup> WAC 173-340-7490(4)(b)

<sup>30</sup> WAC 173-340-747

<sup>31</sup> WAC 173-340-7490(4)(b)

<sup>32</sup> WAC 173-340-720(8)(b)

<sup>33</sup> WAC 173-340-730(6)

<sup>34</sup> WAC 173-340-750(6)

<sup>35</sup> WAC 173-340-760

<sup>36</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-740>

- b. Cleanup Levels.** Cleanup levels are the concentrations of a hazardous substance in soil, water, air, or sediment that are determined to be protective of human health and the environment. At this Site, MTCA Method A Industrial cleanup screening levels were used to evaluate contamination detected at the Site. MTCA Method A Industrial cleanup levels may be appropriate for the releases, depending on the completion of the remedial investigation, updating of the terrestrial ecological evaluation, and demonstration of the Sites industrial status.

The use of industrial CULs does also require the establishment of institutional controls in the form of a covenant on the property.<sup>37</sup> No draft covenant or evidence that the property has already had institutional controls established was included for Ecology review. When proposing industrial CULs for a Site, the draft covenant or previously established covenant should also be included for Ecology review and concurrence.

- c. Applicable Laws and Regulations.** In addition to establishing minimum requirements for cleanup standards, applicable local, state, and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in [WAC 173-340-710](#).<sup>38</sup> An [online tool](#) is currently available to help you evaluate the local requirements that may be necessary.<sup>39</sup>

All cleanup actions conducted under MTCA shall comply with applicable local, state, and federal laws.<sup>40</sup> The person conducting a cleanup action shall identify all applicable local, state, and federal laws. The department shall make the final interpretation on whether these requirements have been correctly identified and are legally applicable or relevant and appropriate.<sup>41, 42</sup>

There are three general groups of applicable local, state, and federal laws that need to be included:

- i. Chemical-Specific:** Examples of chemical-specific laws include promulgated concentrations from another rule that result in adjusting proposed cleanup levels. Method A is inclusive of these laws. For Methods B or C, additional evaluation of chemical-specific applicable state and federal laws is required.

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<sup>37</sup> WAC 173-340-745(1)(a)(ii)

<sup>38</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-710>

<sup>39</sup> <https://apps.oria.wa.gov/opas/index.asp>

<sup>40</sup> WAC 173-340-710(1)

<sup>41</sup> WAC 173-340-710(2)

<sup>42</sup> Note – MTCA Method A includes ARARs and concentration-based tables (WAC 173-340-700(5)(a)) If MTCA Method A remains in use as proposed Site cleanup levels, identify non-concentration based technical and procedural requirements. If Method B or C cleanup levels are proposed, also include concentration-based requirements.

- ii. **Action-Specific:** Examples of action-specific laws include requirements for obtaining local permits to excavate and/or dispose of contaminated soil, stormwater construction permits, or the requirement to notify local law enforcement in case human remains are discovered during excavation. All MTCA cleanups require evaluation of action-specific applicable state and federal laws.
- iii. **Location-Specific:** Examples of location-specific laws include specific requirements for working near wetlands or archeologically important areas. All MTCA cleanups require evaluation of location-specific applicable state and federal laws.

After you have identified appropriate applicable local, state, and federal laws, report to Ecology the applicable local, state, and federal laws applicable to this cleanup, and how those laws and regulations specifically effect the proposed cleanup.

### 3. Selection of Cleanup Action.

Ecology has determined that additional remedial investigation is necessary at the Site before selecting a cleanup action.

The two cleanup options discussed in the Report along with many of the Site remedial action plan decisions rely on the implementation of institutional controls in the form of a covenant to protect the Site's status as an industrial property<sup>43</sup> and certain engineering controls at the Site.<sup>44</sup> It has not been demonstrated to Ecology that a covenant is necessarily the best or only option to achieve a no further action determination (NFA) for this Site.

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<sup>43</sup> WAC 173-340-745

<sup>44</sup> WAC 173-340-440

## Limitations of the Opinion

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### 1. Opinion Does Not Settle Liability with the State.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70A.305.040(4).

### 2. Opinion Does Not Constitute a Determination of Substantial Equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination. See RCW 70A.305.080 and WAC 173-340-545.

### 3. State is Immune from Liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. See RCW 70A.305.170(6).

## Contact Information

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Thank you for choosing to clean up the Site under the Voluntary Cleanup Program (VCP). After you have addressed our concerns, you may request another review of your cleanup. Please do not hesitate to request additional services as your cleanup progresses. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our [Voluntary Cleanup Program web site](#).<sup>45</sup> If you have any questions about this opinion, please contact me at (360) 584-6212 or [aaren.fiedler@ecy.wa.gov](mailto:aaren.fiedler@ecy.wa.gov).

Sincerely,



Aaren Fiedler, LG  
Toxics Cleanup Program  
Southwest Regional Office

AF/tm

Enclosures: A –Environmental Covenants: Specific Requirements  
B – Basis for the Opinion: List of Documents

cc by email: Rob Olsen, TPCHD, [ROlsen@tpchd.org](mailto:ROlsen@tpchd.org)  
Nicholas Acklam, Ecology, [nicholas.acklam@ecy.wa.gov](mailto:nicholas.acklam@ecy.wa.gov)  
Pete Adolphson, Ecology, [pete.adolphson@ecy.wa.gov](mailto:pete.adolphson@ecy.wa.gov)  
Joanna Richards, Ecology, [joanna.richards@ecy.wa.gov](mailto:joanna.richards@ecy.wa.gov)  
Ecology Site File

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<sup>45</sup> <https://www.ecy.wa.gov/vcp>

# Enclosure A

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## Environmental Covenants

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## Specific Requirements

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Draft Environmental Covenant (Covenant): If deemed necessary and feasible, Ecology will need a draft Covenant memorializing proposed institutional and engineered controls for all impacted properties. Also provide the Covenant in electronic word-processing-compatible format.<sup>46</sup> Include the following information *with the draft covenant*:

1. Plan View Maps and Geologic Cross Sections: Include delineated concentration (1) isopleth plan view maps and (2) geologic cross sections showing the extents of remaining contamination at the Site. Include the boundaries of the MTCA facility, the affected Properties, and the location of any rights of way or easements. Indicate where insufficient data are available to delineate to natural background concentrations or laboratory method detection limits (MDLs). These maps will be used to indicate where contamination remains at the Site after closure. For consistency with other sites in our program, Ecology prefers that data for these maps are provided in units of milligrams per kilogram (mg/kg) for soil, micrograms per liter ( $\mu\text{g/L}$ ) for groundwater, and microgram per cubic meter ( $\mu\text{g/m}^3$ ) for air.
2. Title Search: Provide a complete title search as part of Exhibit A, legal description.
3. Land Survey: Provide a land survey of impacted properties and rights-of-way, including platting and dedications.
4. Review the title search and land survey to determine if existing easements include any area of proposed engineered or institutional controls:
  - a. Develop a plan view map or sketch of the locations of existing easements sufficient for Ecology to concur with your evaluation of whether any easements include the areas of proposed engineered or institutional controls. Please be specific as to whether the entire parcel is being designated as the area of control or if only a smaller subsection of the parcel is being designated as the area of control.
  - b. For each easement that intersects proposed controls at the Site, provide either of the following:
    - i. A signed subordination agreement.
    - ii. Sufficient evaluation of specific easement terms for Ecology to concur that the easement will not impact the integrity of the cleanup.

Ecology recommends contacting easement owners prior to completing a draft Covenant. When reviewing easements, Ecology assumes that Property boundaries extend to the centerline of the adjacent rights-of-way.

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<sup>46</sup> See the word processing formatted document at: <https://fortress.wa.gov/ecy/publications/SummaryPages/1509054.html>.

5. Financial Assurance Requirements: Ecology recommends that you review the financial assurance requirements of [WAC 173-340-440\(11\)](#)<sup>47</sup> and contact our Financial Assurance Officer Joanna Richards at [joanna.richards@ecy.wa.gov](mailto:joanna.richards@ecy.wa.gov) or (360) 407-6754 for direction on evaluating financial assurance requirements.<sup>48</sup> Include any needed financial assurance mechanisms and implementation of financial assurances based on the requirements. If financial assurances are determined to be unnecessary, include sufficient explanation for Ecology to concur.
6. Local Government Notification Requirements: Please document how the local government notification requirements of [WAC 173-340-440\(10\)](#)<sup>49</sup> are completed. Ecology suggests providing the draft covenant and enclosure package to the local land use planning authority for review and comment. If comments are provided, update the draft covenant based on comments, and provide Ecology the correspondence, local government comments, and how those comments were addressed. If no response is received, include sufficient information for Ecology to concur that the correct local government agency was notified, the date they were notified, and that comments were sought. At this Site, Ecology believes that the appropriate local land use planning authority is likely the [City of Tacoma Planning and Development Services](#).<sup>50</sup>
7. Long-Term Groundwater Monitoring and Cap Monitoring Plan: Ecology will need long-term monitoring of the existing groundwater monitoring well network to ensure the remedy is effective. A long-term groundwater and cap monitoring and reporting plan will be needed. That plan needs to also include contingency planning, in the event that the remedy is not effective.

Ecology suggests proposing a fifteen month confirmation groundwater monitoring frequency for the first five years of post-closure monitoring, so that four quarters of seasonal groundwater results are obtained over the five years prior to Ecology's first required regular review.

Reporting on the cap condition may be conducted at the same time as long term monitoring, and should be detailed in the monitoring plan. An initial inspection with photographs and description of the cap to be monitored should be included with the plan.

The plan should also include provisions to ensure that all environmental data is provided in accordance with [WAC 173-340-840\(5\)](#)<sup>51</sup> and [Ecology Toxics Cleanup Program Policy 840](#)<sup>52</sup> (Data Submittal Requirements).

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<sup>47</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-440>

<sup>48</sup> <https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Dangerous-waste-guidance/Dispose-recycle-or treat/Financial-assurance>

<sup>49</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-440>

<sup>50</sup> <https://www.cityoftacoma.org/cms/one.aspx?portalId=169&pageId=12002>

<sup>51</sup> <https://apps.leg.wa.gov/wac/default.aspx?cite=173-340-840>

<sup>52</sup> <https://fortress.wa.gov/ecy/publications/SummaryPages/1609050.html>

8. Contingency Plan: A long-term contingency plan will be required for all applicable media. That plan should describe those actions that will be conducted if issues arise that could potentially pose a risk to the environment or that signals additional issues with the Site. Specifically, Ecology recommends establishing a contingency plan for the following potential issues:
- a. Long-term monitoring results exceeding predetermined levels.
  - b. Monitoring well maintenance or replacement will be necessary and how it will be conducted.
  - c. Upland soil disturbance is necessary for work, maintenance, or construction, or occurs by some spontaneous event, including how it will be handled or mitigated.
  - d. Erosion of contaminated bank soils into the sediments.

A soil vapor contingency plan may be required, depending on the results of the completed remedial investigation. That plan should describe those actions that will be conducted if long-term monitoring results exceed predetermined levels for specific wells located near buildings, or when cap maintenance or other maintenance is needed.

The contingency plan may be triggered during regular inspection of the cap and monitoring well integrity, or by exceedances of cleanup levels at a point of compliance during long-term monitoring. A simple and adequate contingency plan would include and detail, as applicable, that when specific levels are detected during long-term monitoring, additional confirmation sampling would be performed within 30 days of the initial receipt of results. If the cap were damaged, indoor air sampling and analysis would be conducted if soil gas is determined to be an issue at the Site, and the cap is repaired.

Additional follow-up groundwater sampling would include all required testing for detected hazardous substances and related compounds. The contingency plan should include proposed analytes for contingency sampling in an analytical schedule. Results of performance and confirmation sampling for a contingency plan would be provided to Ecology within 90 days of the laboratory result date if no exceedances of criteria are detected, or within 30 days of the laboratory report result date if exceedances are detected, or for follow-up confirmation sampling.

If confirmation sampling reveals the continued presence of contaminants above predetermined levels, the contingency plan should include that a work plan to further evaluate conditions beneath the Site would be submitted to Ecology within 60 days of receipt of results of confirmation sampling.

9. Rights-of-Way: If contamination is proposed to be left in rights-of-way exceeding cleanup standards, or exceeding soil vapor cleanup screening levels where an engineered control is needed to reduce human exposure or exposure by terrestrial ecological receptors to contaminated soil vapor, a subordination agreement with the right-of-way holder would be required for implementing a Covenant.

Grantor and/or subordinate agreements may be required with adjacent Property owners or right-of-way holders, determined by the extents of the Site. Alternately, consider a property-specific no further action approach excluding rights-of-way. Ecology recommends contacting rights-of-way holders (and adjacent property owners) prior to completing a draft Covenant and submittal to Ecology.

- 10. Adjacent Property(s):** If contamination is proposed to be left on additional parcels exceeding cleanup standards, or exceeding soil vapor cleanup screening levels where an engineered control is needed to reduce human exposure to contaminated soil vapor, a separate Covenant would be required.

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## **Enclosure B**

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Basis for the Opinion

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## List of Documents

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To maintain clarity across the multiple tank nests located at this Site, the list of documents are grouped by the tanks that they directly reference. Sections will be noted by the common usage designations of the Port of Tacoma (PoT) as well as alternate names used in individual historical documents to the best that it could be determined which historical names matched with current PoT designations.

### **ALL TANK NESTS**

1. Anchor QEA, *Remedial Investigation and Remedial Plan*, January 2021.
2. State of Washington Department of Ecology (Ecology) Toxics Cleanup Program, *Terrestrial Ecological Evaluation Form*, form, completed by Mark Larsen (Anchor QEA), January 2021.
3. Ecology, *Further Action at the following Site*, letter, addressed to Ms. Sarah Weeks, (Port of Tacoma), August 9, 2017.
4. Port of Tacoma (PoT), *TOTE Property USTs*, May 5, 2017.

### **U-1 (T-1), P-27, P-28 (T-2 & T-3, Unknown which is which)**

5. HartCrowser, *Revised Final USTs U-1, P-27, and P-28 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington*, August 14, 2012.
6. Greylock Consulting LLC (Greylock), *Decommissioning of Groundwater Monitoring Wells at Port Parcel 1A, E. 500 Alexander Avenue, Tacoma, Washington, memorandum, addressed to Leslee Conner (Port of Tacoma)*, March 27, 2012.
7. Noll Environmental, Inc. (Noll), *Additional Exploration Work Former Tote UST Area (Former Building 9397)*, January 15, 1998.
8. HORUS Environmental, Inc. (HORUS), *Port Of Tacoma Tote Expansion Area Underground Storage Tank Removal Project Groundwater Study*, April 21, 1997.
9. Nowicki & Associates, Inc. (NAI), *UST Closure Site Characterization Report*, July 11, 1996.

### **U-2 (AA-1)**

10. Tacoma-Pierce County Health Department (TPCHD), *Underground Storage Tank Removal: 1100 Alexander Avenue, Tank AA-1; Removal Date: 11/98, Permit #: 9899*, letter, addressed to Tina Stotz (Port of Tacoma), October 28, 1999.
11. Ecology, *1100 Alexander Avenue Project, Tacoma WA*, letter, addressed to Ms. Susan Moen (Port of Tacoma), August 26, 1999.
12. HORUS, *Port of Tacoma Underground Storage Tank Removal; 1100 Alexander Avenue*, March 2, 1999.

### **T-21, T-22, T-23, T-24**

13. HartCrowser, *Revised Final USTs T-21 and T-22 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 13, 2012.*
14. HartCrowser, *Revised Final USTs T-23 and T-24 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, July 23, 2012.*
15. HORUS, Port Of Tacoma; Underground Storage Tank Removal; Tote Facility, March 19, 1999.

### **N-9, N-10**

16. HartCrowser, *Results of Additional Environmental Sampling and UST Locating; UST Sites N-9/-10 and N-20/-21/-22, Port of Tacoma, memorandum, addressed to Stuart Currie (Port of Tacoma), January 6, 2015.*
17. HartCrowser, *USTs N-9 and N-10 and USTs N-20, 21, and 22 Groundwater Sampling and Analysis Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 8, 2013.*
18. HartCrowser, *Revised Final USTs N-9 and N-10 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 10, 2012.*
19. HartCrowser, *UST N-9 and N-10 Site-Specific Summary Report Addendum; Port of Tacoma UST Remediation Program; Tacoma, Washington, May 10, 2012.*

### **N-11**

20. HartCrowser, *Groundwater Sampling Results; Port of Tacoma UST N-11; Tacoma, Washington, memorandum, addressed to Stuart Currie (Port of Tacoma), December 30, 2015.*
21. HartCrowser, *Revised Final UST N-11 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, August 8, 2012.*
22. HartCrowser, *UST N-11 Site-Specific Summary Report Addendum; Port of Tacoma UST Remediation Program; Tacoma, Washington, April 27, 2012.*

### **N-12**

23. HartCrowser, *UST N-12 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington, June 19, 2012.*

### **N-13**

24. HartCrowser, *Results of UST GPR Survey; Port of Tacoma UST N-13; Tacoma, Washington*, memorandum, addressed to Stuart Currie (Port of Tacoma), December 29, 2015.
25. HartCrowser, *Revised Final UST N-13 Site-Specific Summary Report; Port of Tacoma UST Remediation Program Sampling; Tacoma, Washington*, June 27, 2012.

### **N-17**

26. HartCrowser, *Revised Final UST N-17 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington*, July 19, 2012.

### **N-20, N-21, N-22**

27. HartCrowser, *Results of Additional Environmental Sampling and UST Locating; UST Sites N-9/-10 and N-20/-21/-22, Port of Tacoma*, memorandum, addressed to Stuart Currie (Port of Tacoma), January 6, 2015.
28. HartCrowser, *USTs N-9 and N-10 and USTs N-20, 21, and 22 Groundwater Sampling and Analysis Report; Port of Tacoma UST Remediation Program; Tacoma, Washington*, April 8, 2013.
29. HartCrowser, *Revised Final USTs N-20, 21, and 22 Site-Specific Summary Report; Port of Tacoma UST Remediation Program; Tacoma, Washington*, August 10, 2012.
30. HartCrowser, *USTs N-20, 21, and 22 Site-Specific Summary Report Addendum; Port of Tacoma UST Remediation Program; Tacoma, Washington*, May 24, 2012.