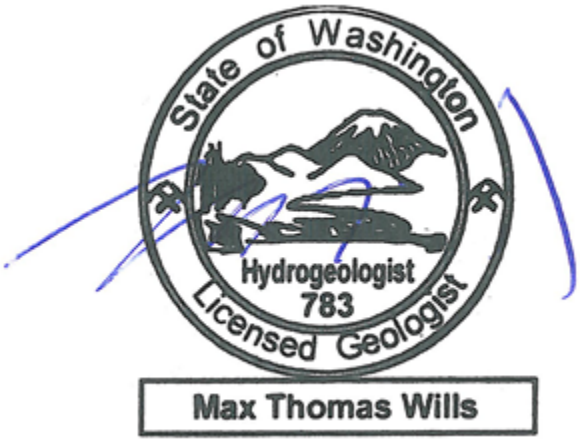
ROBINSON NOBLE

LOVE'S TRAVEL STOP and COUNTRY STORE No. 448
1501 PORT OF TACOMA ROAD, FIFE, WASHINGTON
SUPPLEMENTAL REMEDIAL INVESTIGATION
AND DRAFT CLEANUP ACTION PLAN
(VCP Project No. SW1625)
April 23, 2021
(Revised May 11, 2021)

by

Max T. Wills, LHG
Principal Hydrogeologist

John F. Hildenbrand
Principal Environmental Scientist
Environmental Services Manager



2105 South C Street
Tacoma, Washington 98402
P: 253.475.7711 | F: 253.472.5846

www.robinson-noble.com

17625 130th Avenue NE, Suite 102
Woodinville, Washington 98072
P: 425.488.0599 | F: 425.488.2330

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LOVE'S TRAVEL STOP and COUNTRY STORE No. 448
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1.0 Introduction

Love's Travel Stops and Country Stores, Inc. (Love's) contracted with Robinson Noble to provide environmental consulting services to remediate soil and groundwater contamination at Love's Travel Stop and Country Store No. 448 (site). The site is located at 1501 Port of Tacoma Road in Fife, Washington. A vicinity map of the site is presented as Figure 1. An aerial map showing the current configuration of the site is presented as Figure 2. The site is developed with a truck stop/commercial-fueling facility that has been operated by Love's since it purchased the property from Pilot Travel Centers, LLC (Pilot) in 2010. The site has been used for commercial-fueling operations by various owners since the early 1970s.

Soils and groundwater beneath the site are known to be impacted with petroleum and associated volatile organic compounds (VOCs) from releases associated with past fueling operations. The site is currently listed with the Washington State Department of Ecology (Ecology) as having confirmed soil and groundwater contamination (gasoline- and diesel-range hydrocarbons and benzene) and is identified by Ecology Facility/Site No. 94359448. Site investigations and remediation are currently being addressed under the auspices of Ecology's Voluntary Cleanup Program (VCP) and the regulatory authority of the Tacoma Pierce County Health Department (TPCHD). The site is assigned VCP Project No. SW1625 and TPCHD Permit Number RO0004753. Table 1 summarizes key regulatory information for the site. Pertinent regulatory documents are provided in Appendix A.

During 2018 and 2019, Love's completely demolished and subsequently reconstructed all the site's facilities. As part of the demolition, all the underground storage tanks (USTs) at the site were decommissioned and removed along with the fuel piping and other miscellaneous underground infrastructure. With the site vacant, Love's also used the opportunity to excavate all accessible contaminated soil. This effort is documented in Robinson Noble's April 2020 UST removal and interim remedial action-remedial investigation (IRA-RI) report, which is presented in Appendix B. As documented in our 2020 report, the majority of the contaminated soil was successfully removed, but some residual soil contamination remains at depth (below the water table interface) and in the area of a City of Fife sewer main (near the existing truck scale; see Figure 2), which could not be unearthed during the remedial excavation.

Following the construction of Love's new fueling facility, Robinson Noble directed the installation of an updated groundwater monitoring network and has been conducting quarterly groundwater monitoring at the site since November 2019. The groundwater monitoring completed to date is the subject of the supplemental remedial investigation (RI) portion of this report and is discussed in greater detail in Section 3. Based on the interim remedial actions and remedial investigations completed to date, Robinson Noble has also completed a draft cleanup action plan (CAP) with the eventual goal of obtaining a no-further-action (NFA) determination or

similar regulatory closure from Ecology. Details of the draft CAP, which utilizes model remedies developed by Ecology under the authority of the Model Toxic Control Act (MTCA; Chapter 173-340-390 WAC) are presented in Section 4 of this report.

Table 1. Key Regulatory Information

Site Name	Love's Travel Stop and Country Store No. 448			
AKA	Flying J Travel Plaza			
Site Address	1501 Port of Tacoma Road, Fife, Washington 98424			
Facility/Site No.	94359448			
VCP Project No.	SW1625			
TPCHD Permit No.	RO0004753.			
Contact Information				
Name		**Address**	**Phone #**	**Email**
Chris Maurer, (Ecology)	Site Manager	PO Box 47600, Olympia, WA 98504-7775	(360) 407-7223	cmau461@ ecy.wa.gov
Rob Olsen (TPCHD)	TPCHD Site Manager	3629 South D Street Tacoma, WA 98418	(253) 798-2855	Rolsen@tpchd.org
Michael Key, (Love's)	Property Owner's Representative	10601 N. Pennsylvania Ave. Oklahoma City, OK 73120	(405) 302-6640	Michael.Key@ loves.com
John Hildenbrand, (Robinson Noble)	Consultant, Project Manager	2105 S. C St., Tacoma, WA 98402	(253) 475-7711	JHildenbrand@ robinson-noble.com

2.0 Site Description and Background

2.1 General

The Love's site is located in Pierce County within the incorporated limits of the City of Fife. The site is situated in an industrial area adjacent to the Port of Tacoma that is generally referred to as the Tacoma Tide Flats. As shown on Figures 1 and 2, the site is located just north of Pacific Highway East (Washington State Highway 99) and is bounded on the west by Port of Tacoma Road, on the east by 34th Avenue East, and on the north by 12th Street East. The address assigned to the site by the Pierce County Assessor-Treasurer is 1501 Port of Tacoma Road, Fife, Washington 98424. The site is located in Section 2 of Township 20 North, Range 3 East (Willamette Meridian).

The site is comprised of six contiguous tax parcels identified by Pierce County Assessor-Treasurer records as parcel numbers 7085000182, 7085000250, 7085000260, 7085000270, 0320024109, and 0320024110, which are identified on Figure 3 as parcels A through F, respectively. Since the completion of our 2020 UST removal and IRA-RI report (Appendix B), the Pierce County Assessor-Treasurer has updated parcel boundaries for the site. The current total land area of the site is approximately 7.38 acres as outlined below in Table 2, which is slightly larger than the 7.31 acres previously reported (see Section 2.1 of Robinson Noble 2020 UST removal and IRA-RI report; Appendix B). Current parcel information from the Pierce County Assessor-Treasurer is provided in Appendix C of this report.

Table 2. Parcel Information

Parcel ID (see Figure 2)	Parcel Number	Area (acres)
A	7085000182	0.40
B	7085000250	0.88
C	7085000260	0.73
D	7085000270	0.59
E	0320024109	4.37
F	0320024110	0.41
Total Area of the Site		7.38

The site is developed with Love's Travel Stop and Country Store No. 448, which currently consists of a convenience store/restaurant-complex, a tire-repair facility, a multi-island diesel-fueling center for commercial trucks, a smaller gasoline-fueling center for passenger vehicles, a truck scale, a large asphalt parking lot, and minor decorative planter areas (Figure 2). The surface elevation of site is approximately 15 feet above sea level, and the topography at the site is generally flat. There are no surface water bodies on or adjacent to the site. The closest surface water bodies include the Blair Waterway (one of several man-made inlets to Commencement Bay at the Port of Tacoma) located approximately ½ mile north of the site and the Puyallup River which is located approximately ½ mile southwest of the site.

2.2 Geology and Hydrogeology

The United States Geological Survey (USGS; Troost and others, in preparation) maps the surface geology in the area of the site as Quaternary-age alluvium (Qal) associated with the nearby Puyallup River. However, it is known from our recent remediation work that the site is almost entirely underlain by made-land (fill), which the USGS maps in the areas just north of the site.

During the recent removal of the USTs and subsequent remedial excavation (Robinson Noble, 2020; Appendix B), the materials encountered in the various areas of the excavation include fill to a depth of approximately eight feet. These fill materials included brown and gray silty sand with gravel from near surface (just below the original asphalt and base course) to depths of between three to six feet. This, in turn, is underlain by a layer of sawdust (or a sawdust and soil mixture), which extends to the base of the fill at about eight feet. The fill material is underlain by dark gray silt and silty sand, which is consistent with (and interpreted to be) Qal. The Qal was encountered to a maximum depth of 14 feet in the remedial excavation; however, borings and monitoring wells installed at the site show it to a maximum depth of 30 feet. The locations of the monitoring wells currently installed at the site are shown on Figure 4. Monitoring well installation is documented in Section 4.6.1 of our 2020 UST removal and IRA-RI report (Appendix B).

A large portion of the fill and Qal materials described above were removed during the UST decommissioning and subsequent remedial excavation, and the excavated area was subsequently backfilled with clean imported fill material derived from recycled concrete (see Section 4.5 of Robinson Noble's 2020 UST removal and IRA-RI report; Appendix B). The areas of the remedial excavation and the extent of the backfill are shown on Figure 4.

Groundwater impacts at the site are constrained to the shallowest groundwater system. This represents the unconfined (water table) aquifer that saturates approximately the lower half of the fill material and the underling Qal. Deeper, confined aquifer systems are known to be present in the area of the site but are not impacted and, therefore, not addressed in the site inves-

tigations. The depth to the shallowest groundwater (the top of the water table), as measured in the various monitoring wells, ranges from four to seven feet below ground surface (bgs) depending on specific location. The gradient of the shallow groundwater system varies across the site. Groundwater elevation (potentiometric surface) maps of the shallow groundwater system are presented in Figure 5. Despite near-sea level water level elevations and the proximity of the site to nearby Puget Sound (Commencement Bay and the Port of Tacoma), the shallow groundwater system does not appear to be tidally influenced. Hydrographs of the shallow groundwater system, measured at select wells, are presented in Figure 6. Groundwater and groundwater monitoring are discussed in greater detail below in Section 3.

2.3 Site History and Previous Remediation

A comprehensive discussion of the development history and previous cleanup actions that have been completed at the site is provided in Sections 3.0 and 3.1 of Robinson Noble's 2020 UST removal and IRA-RI report (Appendix B). Following is a summary of this information.

Prior to 1950, the site and surrounding area were used predominately for agriculture (Applied Geotechnology, Inc., 1992 and 1995). Between 1950 and 1970, the site was used by the Anderson Fuel Company for the storage of hog-fuel (sawdust) and other wood products, and as a stockpiling area for gravel during the construction of nearby Interstate 5 (Hart Crowser, Inc., 1989). The site was first developed as a truck stop circa 1970. At this time, the site was occupied by the Husky Car/Truck Stop and Truckoma, Inc. (both service stations), and the A-1 Truck Wash. Broadway Truck Services, Inc. purchased the property in 1980 and then sold it to Flying J Enterprises (aka Pilot) in 1992. Love's purchased the property from Pilot in 2010 and has continued to operate it as a commercial truck stop/travel plaza through the present time.

Up until Love's 2018/2019 reconstruction of the site, the five original steel USTs (installed in 1974) were used for fuel storage by the various owners/operators of the fueling facility. These tanks included five 12,000-gallon single-wall steel tanks (three for the storage of diesel fuel and two for the storage of gasoline). In 1993, the fuel islands, along with most of the product piping, were replaced (Applied Geotechnology, Inc., 1995). Ecology records also indicate that in 1998 the five original 12,000-gallon fuel USTs were retrofitted with cathodic protection and an automatic line-leak detection (ALLD) system.

During Love's 2018/2019 reconstruction of the site, the five original steel USTs were decommissioned and removed, along with the fuel islands, associated product piping, and as much of the impacted soil as was feasible. The locations of the former USTs (identified as Diesel (1) through Diesel (3) and Gasoline (4) and Gasoline (5)) and the extent of the remedial excavation are shown on Figure 4. During remedial excavation, two smaller waste-oil USTs were also discovered and subsequently removed, along with two oil/water separators and other miscellaneous underground infrastructure. The locations of the two waste-oil tanks, designated as WO-UST-Tank and Tank 8, and the oil/water separators are also shown on Figure 4.

During the 2018/2019 reconstruction, the original fuel USTs were replaced with six new 20,000-gallon double-wall fiberglass tanks (identified as T1 through T6). Tanks T1 and T2 were installed in the area of the passenger vehicle fueling islands and are being used to store gasoline and diesel fuel. Tanks T3 through T4 were installed in the area south of truck scales and are being used to store diesel fuel. A seventh UST (identified as DEF) was also installed in the tank nest south of the truck scale and is being used to store diesel exhaust fluid. The locations of new USTs are shown on Figures 2 and 4. A copy of Ecology's UST system summary report is provided in Appendix A.

2.3.1 Previous Investigations and Cleanup Actions

As stated previously in Section 1.0, soil and groundwater at the site are known to be contaminated with petroleum hydrocarbons (gasoline and diesel) and petroleum-related VOCs (primarily benzene). The contamination at the site, as documented in various reports by earlier investigators, is attributed to the extended use of the site as a commercial-fueling facility since the early 1970s. Before Love's 2018/2019 reconstruction of the site, some site characterization and remediation work had been accomplished, but it was relatively limited in scope due to the fact that the site is an active truck stop/commercial-fueling facility.

A comprehensive discussion of the previous investigations and cleanup actions completed at the site prior to Love's 2018/2019 reconstruction effort is provided in Section 3.1 of Robinson Noble's 2020 UST removal and IRA-RI report (Appendix B). Following is a list of the previous investigations and cleanup actions that have been completed to date at the site.

- Hart Crowser, Inc., 1989; *Underground Storage Tank Assessment Phase One:* This study included reviews of tank-fit tests and interviews with site managers that indicated potential contamination issues at the site.
- Target Environmental Services, Inc., 1992; *Soil Gas Survey, Broadway/Flying J Travel Plaza:* This investigation found high VOC concentrations in soils around the pump islands and former USTs.
- Applied Geotechnology, Inc., 1992; *Environmental Site Assessment and Subsurface Investigation, Broadway/Flying J Travel Plaza:* This investigation included the installation of numerous monitoring wells and the first effort to delineate petroleum impacts at the site.
- Applied Geotechnology, Inc., 1995; Interim Report, Soil and Groundwater Remediation*, Broadway/Flying J Travel Plaza:* This report documents the excavation and in-situ treatment of 4,000 cubic yards of petroleum contaminated soil from the area of the pump islands.
- Camp Dresser and McKee, Inc., 2002; *Remediation Program Proposal, Flying J Travel Plaza:* Camp Dresser and McKee (CDM), formerly Applied Geotechnology, Inc. (AGI), reported that in 1995 they installed an active groundwater-treatment system to address groundwater impacts and an in-situ vapor extraction system to address soil impacts, and that both systems were operated through 1999.
- Camp Dresser and McKee, Inc., 2009; *Status Report, Site Monitoring Activities, Flying J Travel Plaza:* CDM reported that the operation of the groundwater-treatment system was terminated in 1999 because it was ineffective largely due to the presence of free-phase petroleum contamination. CDM conducted additional groundwater monitoring up through 2002 and then again once in 2009. CDM continued to find free-phase petroleum contamination in the groundwater at the site up through 2009. Ecology issued an early notice letter dated June 2, 2009 to Flying J regarding its obligation to address the identified contamination at the site.
- Terracon Consultants, Inc., 2010; *Limited Subsurface Investigation, Love's Travel Stops & Country Stores, Inc.:* Terracon Consultants (Terracon) conducted a limited subsurface investigation of the site as part of Love's due diligence during their acquisition of the property. Chemical analyses of soil samples obtained from 15 soil borings installed during this investigation found petroleum-related VOCs and/or gasoline- through diesel-range hy-

drocarbons at concentrations above applicable State cleanup levels in 11 of the 15 soil borings. Terracon also installed three temporary monitoring wells, and chemical analyses of groundwater samples from these wells found petroleum-related VOCs and/or gasoline-through oil-range hydrocarbons at concentrations above applicable State cleanup levels in all three wells.

- Broadbent and Associates, Inc., 2013; *Subsurface Investigation Report, Love's Travel Stop and Country Store #448:* This was a limited subsurface investigation conducted in the area of the former USTs to investigate a possible release of diesel fuel caused by a malfunctioning pump in one of the original 12,000-gallon USTs (Diesel (3); see Figure 4). Broadbent and Associates concluded that some diesel fuel may have been released as a result of the pump malfunction but that it was incidental and comingled with previously documented soil and groundwater impacts in this area of the site.
- Robinson Noble, Inc., 2020; *Love's Travel Stop and Country Store No. 448, Underground Storage Tank Removal and Interim Remedial Action/Remedial Investigation:* During Love's 2018/2019 reconstruction of the site, Robinson Noble oversaw the removal/decommissioning of the five original USTs, several waste-oil USTs, and other miscellaneous underground infrastructure; and the excavation and removal of approximately 28,000 tons (~18,700 cubic yards) of petroleum-contaminated soil from the site. Robinson Noble then directed the installation of a new groundwater monitoring network and began conducting regular quarterly groundwater monitoring. Robinson Noble concluded that the remediation effort was successful at removing the majority of the contaminated soil. Some residual soil and groundwater impacts are still present but are constrained to the Love's property. A complete copy of this report is provided in Appendix B.

3.0 Supplemental Remedial Investigation

This supplemental remedial investigation (RI) was completed to further evaluate groundwater impacts at the site through the completion of additional groundwater monitoring. Additional groundwater monitoring is being conducted to evaluate groundwater impacts that appear to correspond, and are likely associated, with residual soil contamination that could not be completely removed during recent remedial excavation efforts (Robinson Noble, 2020; Appendix B).

3.1 Overview

The remedial excavation completed during Love's 2018/2019 site reconstruction, as described in Section 4.4 of Robinson Noble's 2020 UST removal and IRA-RI report (Appendix B), was expanded to remove as much impacted soil as practicable. The remedial excavation generally proceeded to the horizontal limits of the contamination or to the boundaries of the property (or as close to the boundaries as was feasible without undermining adjacent roadways) and vertically to the depth of the water table (8 to 14 feet depending on specific location and/or the effectiveness of dewatering). In the area adjacent to the south of the original tank nest (see Figure 4), a City of Fife sewer main traverses the property from east to west, and Love's was not authorized to unearth or otherwise disturb this sewer line.

Remedial excavation reached the horizontal extent of the contamination in all areas of the site except the area along the City's sewer main. The vertical extent of the soil contamination could also not be reached in some areas of the site, particularly near the center of the excavation, primarily because of dewatering limitations. However, considering that the specific gravity of petroleum is less than 1.0 (fuels tends to float) and the fact that the water table was lowered

during remedial excavation, it is our opinion that the vertical extent of the remaining soil contamination at the site is likely minimal (relatively thin).

During remedial excavation, soil contamination levels were compared to MTCA Method A soil cleanup levels for unrestricted land uses. Residual soil contamination above cleanup levels includes gasoline- through diesel-range hydrocarbons and various gasoline-related VOCs (primarily benzene). Figure 16 of the 2020 UST removal and IRA-RI report (Appendix B), which is represented in this report as Figure 7, shows the distribution of residual soil contamination at the conclusion of the 2020 remediation effort.

Following the completion of Love's 2018/2019 site reconstruction, Robinson Noble directed the installation of a new groundwater monitoring network and began conducting regular quarterly groundwater monitoring to characterize the shallow groundwater at the site. Quarterly groundwater monitoring conducted in November 2019 and February 2020 and documented in Section 4.6 of our 2020 UST removal and IRA-RI report (Appendix B) found that shallow groundwater at the site is impacted by petroleum contamination and the groundwater impacts generally correspond to the area of residual soil impacts.

Chemical analyses of groundwater samples collected during the November 2019 and February 2020 monitoring events were compared to MTCA Method A groundwater cleanup levels. Exceedances were found for gasoline-range hydrocarbons, benzene, and 1,2-dibromoethane (EDB). Figure 17 of the 2020 UST removal and IRA-RI report (Appendix B), which is represented in this report as Figure 8, shows the distribution of groundwater impacts for the November 2019 and February 2020 monitoring events.

3.2 Additional Quarterly Groundwater Monitoring

In addition to the November 2019 and February 2020 monitoring events (see Section 4.6; Appendix B), Robinson Noble has conducted four additional monitoring events. These were completed in June, September, and July 2020 and March 2021. They are discussed in more detail below in Sections 3.2.1 through 3.2.4.

The current monitoring network is comprised of 17 individual monitoring wells. Monitoring well installation is documented in Section 4.6.1 of our 2020 UST removal and IRA-RI report (Appendix B). The locations of the various monitoring wells, designated as MW-1 through MW-18, are shown on Figure 4. Between the November 2019 and February 2020 monitoring events, a construction worker damaged the monument of MW-10. Groundwater samples were collected from MW-10 during the February 2020 monitoring event, but it has not been used since that time.

3.2.1 Water Level Monitoring and Hydrologic Assessment

Before sample collection during each of the various monitoring events, water levels were measured in each of the monitoring wells. Tables 3 through 6 below present the measured depths to water below the surveyed top of casing (TOC) elevations for each well and the corresponding water level elevations that were calculated from these measurements. The water level elevations presented in Tables 3 through 6 were then used to construct water level contour (potentiometric surface) maps for the shallow water table aquifer in the area of the site. Similar potentiometric surface maps were constructed for the November 2019 and February 2020 monitoring events (see Section 4.6.3 and Figures 10A and 10B in Appendix B). The November 2019 and February 2020 potentiometric surface maps are re-presented in this report as

Figures 5A and 5B. The potentiometric surface maps constructed for the June, September, and July 2020 and March 2021 monitoring events are presented as Figures 5C through 5F.

Table 3. June 10, 2020 Groundwater Elevations

Monitoring Well	TOC Elevation (feet)	Depth to Water$_{TOC}$ (feet)	Groundwater Elevation (feet)
MW-1	14.71	5.61	9.10
MW-2	16.35	7.29	9.06
MW-3	15.45	5.33	10.12
MW-4	16.14	5.45	10.69
MW-5	16.16	6.15	10.01
MW-6	15.58	4.89	10.69
MW-7	16.39	5.69	10.70
MW-8	16.15	5.43	10.72
MW-9	16.43	6.63	9.80
MW-11	15.63	5.13	10.50
MW-12	15.43	5.22	10.21
MW-13	14.74	4.99	9.75
MW-14	15.61	5.03	10.58
MW-15	16.31	5.71	10.60
MW-16	16.53	6.00	10.53
MW-17	15.41	4.87	10.54
MW-18	15.65	5.25	10.40

Table 4. September 10, 2020 Groundwater Elevations

Monitoring Well	TOC Elevation (feet)	Depth to Water$_{TOC}$ (feet)	Groundwater Elevation (feet)
MW-1	14.71	6.09	8.62
MW-2	16.35	7.48	8.87
MW-3	15.45	6.64	8.81
MW-4	16.14	6.52	9.62
MW-5	16.16	6.81	9.35
MW-6	15.58	6.05	9.53
MW-7	16.39	6.58	9.81
MW-8	16.15	6.81	9.34
MW-9	16.43	7.08	9.35
MW-11	15.63	6.30	9.33
MW-12	15.43	6.36	9.07
MW-13	14.74	5.72	9.02
MW-14	15.61	6.20	9.41
MW-15	16.31	6.90	9.41
MW-16	16.53	7.32	9.21
MW-17	15.41	6.23	9.18
MW-18	15.65	6.55	9.10

Table 5. December 3, 2020 Groundwater Elevations

Monitoring Well	TOC Elevation (feet)	Depth to Water$_{TOC}$ (feet)	Groundwater Elevation (feet)
MW-1	14.71	4.65	10.06
MW-2	16.35	6.27	10.08
MW-3	15.45	5.25	10.20
MW-4	16.14	5.87	10.27
MW-5	16.16	5.76	10.40
MW-6	15.58	5.26	10.32
MW-7	16.39	6.10	10.29
MW-8	16.15	5.86	10.29
MW-9	16.43	6.09	10.34
MW-11	15.63	5.33	10.30
MW-12	15.43	5.55	9.88
MW-13	14.74	4.92	9.82
MW-14	15.61	5.30	10.31
MW-15	16.31	6.03	10.28
MW-16	16.53	6.39	10.14
MW-17	15.41	5.18	10.23
MW-18	15.65	5.50	10.15

Table 6. March 25, 2021 Groundwater Elevations

Monitoring Well	TOC Elevation (feet)	Depth to Water$_{TOC}$ (feet)	Groundwater Elevation (feet)
MW-1	14.71	4.26	10.45
MW-2	16.35	5.80	10.55
MW-3	15.45	4.72	10.73
MW-4	16.14	4.95	11.19
MW-5	16.16	5.21	10.95
MW-6	15.58	4.36	11.22
MW-7	16.39	5.20	11.19
MW-8	16.15	4.79	11.36
MW-9	16.43	5.49	10.94
MW-11	15.63	4.88	10.75
MW-12	15.43	4.88	10.55
MW-13	14.74	4.38	10.36
MW-14	15.61	4.68	10.93
MW-15	16.31	5.39	10.92
MW-16	16.53	5.69	10.84
MW-17	15.41	4.50	10.91
MW-18	15.65	4.86	10.79

As shown in Figures 5A and 5B, and as previously described in our 2020 UST removal and IRA-RI report (Appendix B), shallow groundwater below the site appears to be mounded roughly over the same area that was excavated and backfilled during the remediation work. As shown

by the flow arrows, shallow groundwater flows radially outward from the mounded area in several directions, but predominately south and westward on the southern and western portions of the site and overall eastward along a trough in the area of MW-2 on the northern part of the site. Figures 5C through 5F show similar mounding and flow patterns for each of the subsequent monitoring events. The mounding measured during the December 2020 monitoring event is less pronounced than the other events and is shifted slightly to the west, but still generally corresponds to the excavation area and reflects a similar pattern of flow.

The mounding and the associated flow patterns depicted in Figure 5 may be influenced, at least to some degree, by the large volume of fill that was placed during remediation. But because the site is situated approximately midway between Commencement Bay to the north-northeast and the Puyallup River to the south and west, the observed mounding may also represent a natural groundwater divide for this area.

Given the relatively low elevation of the site and its proximity to Commencement Bay, it was initially presumed that groundwater levels at the site might be influenced by tidal fluctuations. To assess potential tidal influence at the site, electronic data loggers were installed in monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-7, MW-13, MW-14, MW-15, MW-16, and MW-17 (see Figure 4). An additional data logger was set above ground at the site to record barometric pressure. The data loggers were initially set to record water levels at one-minute intervals throughout the month of February 2020, and hydrographs generated from these data were used to assess potential tidal influence. The initial hydrographs are presented as Figure 9 in our 2020 UST removal and IRA-RI report (Appendix B) and do not show any indications that water levels in the shallow aquifer in the area of the site are influenced by tidal fluctuations.

In March 2020, the data loggers were reprogramed to record water levels at one-hour intervals and have been recording through the present time. Hydrographs generated from these data (up through March 2021) are presented as Figure 6. These hydrographs show that water levels in the shallow aquifer in the area of the site generally parallel the annual precipitation trend. In 2020/2021, precipitation (and water levels in general) show a stable to slightly declining trend between February and June 2020, followed by a distinct declining trend through the summer months (late June to early September 2020), and then an increasing trend through the winter months (October 2020 to January 2021). Precipitation between January and March 2021 again show a stable to slightly declining trend. The total annual water level fluctuation in the shallow aquifer measured during 2020/2022 is between two and three feet depending on the specific monitoring well.

In addition to seasonal water-level fluctuations, the hydrographs presented in Figure 6 also show a shorter term response to fluctuations in the barometric pressure. This generally appears as "background noise" on the various hydrographs and is less prominent when compared to the longer-term seasonal fluctuations. Data loggers are currently still recording water levels in designated shallow system wells at one-hour intervals and will continue to be operated to assess seasonal water level fluctuation at the site.

3.2.2. Groundwater Sampling and Analytical Procedures

Groundwater samples collected during the June, September, and December 2020 and March 2021 monitoring events were submitted to Libby Environmental, Inc. (Libby) for analysis of gasoline- through oil-range hydrocarbons and fuel-related VOCs (MTCA VOCs; benzene, toluene, ethylbenzene, and xylenes (BTEX), 1,2-dichloroethane (EDC), 1,2-dibromoethane (EDB), methyl *tert*-butyl ether (MTBE), and naphthalenes). Libby is accredited with the State of Washington to perform each of these analyses. The primary contaminants of concern (COC) and the

analytical methods utilized to conduct each analysis are summarized below in Table 7. Summaries of analytical results from each monitoring event are provided in Tables E1 through E4 in Appendix E. Complete laboratory reports for each monitoring event are provided in Appendix F.

Table 7. Contaminants of Concern (COC) and Analytical Methods

Contaminants of Concern	Analytical Method
Gasoline-Range Hydrocarbons	Ecology NWTPH-Gx
Diesel- through Oil-Range Hydrocarbons	Ecology NWTPH-Dx/Dx Extended
VOCs	EPA Method 8260C

Before sample collection, each monitoring well was purged to ensure that representative groundwater samples were obtained. During the purging process, various field parameters - including pH, temperature, conductivity, total dissolved solids, dissolved oxygen, and oxidation-reduction potential (ORP) - were monitored and recorded on individual field data sheets. Groundwater samples were obtained after the measured field parameters reached stabilization or a minimum of three well volumes had been purged. On occasion, more than three well volumes were purged to try to reach better stabilization or clear turbidity. Our review of the measured field parameters did not indicate any discrepancies that might be considered as diminishing to the quality of the collected groundwater samples. Copies of the individual field data sheets are provided in Appendix D.

All groundwater samples were collected using a bladder pump and Ecology prescribed low-flow sampling protocols. New pump tubing and bladders were used between each sampling location, and the pump was decontaminated using an Alconox® wash and a double-distilled water rinse. All groundwater samples were collected into appropriate pre-cleaned, laboratory supplied sample containers, immediately placed in a cooler containing Blue Ice®, and maintained at temperatures below 4° Celsius pending delivery to the laboratory. All groundwater samples were delivered to the laboratory and analyzed within prescribed holding times.

3.2.3 Groundwater Monitoring Analytical Results

As discussed above in Section 3.1, analytical results for groundwater samples collected during the November 2019 and February 2020 monitoring events (documented in our 2020 UST removal and IRA-RI report; Appendix B) were compared to MTCA Method A groundwater cleanup levels, and exceedances were found for gasoline-range hydrocarbons, benzene, and EDB. Analyses of the groundwater samples collected during the June, September, and December 2020 and March 2021 monitoring events found similar exceedances for these same analytes. Analytical results from each of these additional monitoring events are summarized below in Tables 8 through 15. In addition to the exceedances for gasoline, benzene, and EDB, EDC was also detected at a concentration above the MTCA Method A groundwater cleanup level in MW-2 during the September 2020 monitoring event (see Table 11).

The aerial distribution of gasoline- and VOC-impacted groundwater for the November 2019 and February 2020 monitoring events is presented as Figure 8. In addition to the data presented in Tables 8 through 15, and for comparison with the results from the two initial monitoring events, the aerial distribution of gasoline and VOCs for the June, September, and December 2020 and March 2021 monitoring events is presented as Figure 9. Summaries of the analytical results for the June, September, and December 2020 and March 2021 monitoring events are also provided in Tables E1 through E4 in Appendix E, and the complete laboratory reports are provided in Appendix F.

Table 8. June 2020 Groundwater Analytical Results (TPH, BTEX, and Naphthalenes)

Well	Gasoline (µg/L)	Diesel (µg/L)	B	T	E	X	Total Naphthalenes (µg/L)
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	
MW-1	<100	<200	<1	<1	<1	<2	<5
MW-2	550	<200	<1	<1	<1	175	<5
MW-3	110	<200	<1	<1	<1	<2	<5
MW-4	<100	<200	<1	<1	<1	<2	<5
MW-5	<100	<200	<1	<1	<1	<2	<5
MW-6	160	<200	3.6	<1	<1	<2	<5
MW-7	680	<200	10	2	28	64	7
MW-8	2,700	<200	2.7	2.9	134	406	15
MW-9	260	<200	<1	<1	<1	<2	<5
MW-11	180	<200	<1	<1	<1	<2	5.2
MW-12	420	<200	<1	<1	<1	4	<5
MW-13	<100	<200	<1	<1	<1	<2	<5
MW-14	540	<200	52	9.5	12	59	7.5
MW-15	120	<200	<1	<1	<1	<2	<5
MW-16	220	<200	<1	<1	<1	<2	<5
MW-17	<100	<200	<1	<1	<1	<2	<5
MW-18	<100	<200	2.1	<1	<1	<2	<5
MTCA[1]	800[2]	500	5	1,000	700	1,000	160

1: MTCA Method A groundwater cleanup level
2: Cleanup level for gasoline with benzene present
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 9. June 2020 Groundwater Analytical Results (Detected EDC, EDB, and MTBE)

Well	EDC (µg/L)	EDB (µg/L)	MTBE (µg/L)
MW-2	<1	<0.01	8.5
MW-8	<1	0.51	<5
MTCA[1]	5	0.01	20

1: MTCA Method A groundwater cleanup level
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 10. September 2020 Groundwater Analytical Results (TPH, BTEX, and Naphthalenes)

Well	Gasoline (µg/L)	Diesel (µg/L)	B	T	E	X	Total Naphthalenes (µg/L)
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	
MW-1	<100	<200	<1	<1	<1	<2	<5
MW-2	660	<200	<1	<1	<1	<2	6.6
MW-3	180	<200	<1	<1	<1	<2	<5
MW-4	190	<200	1.4	<1	<1	<2	12.1
MW-5	<100	<200	<1	2.1	<1	<2	<5
MW-6	730	<200	26	1.5	3.6	6.3	<5
MW-7	770	<200	12	1.6	20	63	9.2
MW-8	4,400	<200	5.9	6	210	570	65.6
MW-9	310	<200	<1	<1	<1	<2	19.8
MW-11	440	<200	<1	<1	<1	2.2	24.7
MW-12	310	<200	7	1.2	2.5	17	<5
MW-13	<100	<200	<1	<1	<1	<2	<5
MW-14	640	<200	50	8.8	11	49	<5
MW-15	350	<200	<1	<1	<1	<2	11.1
MW-16	150	<200	1.2	<1	<1	<2	5.5
MW-17	550	<200	<1	<1	<1	<2	12
MW-18	120	<200	3	1.1	<1	<2	<5
MTCA[1]	800[2]	500	5	1,000	700	1,000	160

1: MTCA Method A groundwater cleanup level
2: Cleanup level for gasoline with benzene present
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 11. September 2020 Groundwater Analytical Results (Detected EDC, EDB, and MTBE)

Well	EDC (µg/L)	EDB (µg/L)	MTBE (µg/L)
MW-2	167	<0.01	6.9
MTCA[1]	5	0.01	20

1: MTCA Method A groundwater cleanup level
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 12. December 2020 Groundwater Analytical Results (TPH, BTEX, and Naphthalenes)

Well	Gasoline (µg/L)	Diesel (µg/L)	B	T	E	X	Total Naphthalenes (µg/L)
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	
MW-1	220	<200	<1	<1	<1	<2	<5
MW-2	510	<200	19	2.3	17	48	5.6
MW-3	<100	<200	<1	<1	<1	<2	<5
MW-4	<100	<200	1.1	<1	<1	<2	<5
MW-5	<100	<200	<1	<1	<1	<2	<5
MW-6	370	<200	19	1.4	1.8	3.3	<5
MW-7	<100	<200	1.1	<1	<1	<2	<5
MW-8	3,000	<200	4	3.8	160	560	46.9
MW-9	160	<200	<1	<1	<1	<2	28
MW-11	210	<200	<1	<1	<1	<2	24
MW-12	170	<200	<1	<1	<1	6.4	<5
MW-13	<100	<200	<1	<1	<1	<2	<5
MW-14	380	<200	40	8.4	9.6	51	<5
MW-15	<100	<200	4.7	<1	<1	<2	<5
MW-16	270	244	<1	<1	<1	<2	<5
MW-17	<100	<200	1.5	<1	<1	<2	<5
MW-18	<100	<200	3.4	1.2	<1	<2	<5
MTCA[1]	800[2]	500	5	1,000	700	1,000	160

1: MTCA Method A groundwater cleanup level
2: Cleanup level for gasoline with benzene present
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 13. December 2020 Groundwater Analytical Results (Detected EDC, EDB, and MTBE)

Well	EDC (µg/L)	EDB (µg/L)	MTBE (µg/L)
MW-1	<1	0.017	<5
MW-5	<1	0.025	<5
MW-16	<1	0.046	<5
MTCA[1]	5	0.01	20

1: MTCA Method A groundwater cleanup level
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 14. March 2021 Groundwater Analytical Results (TPH, BTEX, and Naphthalenes)

Well	Gasoline (µg/L)	Diesel (µg/L)	B	T	E	X	Total Naphthalenes (µg/L)
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	
MW-1	<100	<200	<1	<1	<1	<2	<5
MW-2	720	<200	<1	<1	<1	100	<5
MW-3	250	<200	<1	<1	<1	<2	<5
MW-4	<100	<200	1.2	<1	<1	<2	<5
MW-5	<100	<200	<1	<1	<1	<2	<5
MW-6	210	<200	**6.3**	<1	<1	<2	<5
MW-7	710	<200	**9.9**	1.7	8.8	30	<5
MW-8	**3,600**	<200	**6.7**	3.6	110	300	5.7
MW-9	300	<200	<1	<1	<1	<2	74
MW-11	160	<200	<1	<1	<1	<2	17
MW-12	470	<200	<1	1.3	1.1	7.5	<5
MW-13	<100	<200	<1	<1	<1	<2	<5
MW-14	**1,200**	<200	**69**	15	19	84	<5
MW-15	160	<200	<1	<1	<1	<2	<5
MW-16	400	<200	<1	<1	<1	<2	23.2
MW-17	270	<200	1.4	<1	<1	<2	<5
MW-18	170	<200	4.1	1.5	<1	<2	<5
MTCA[1]	800[2]	500	5	1,000	700	1,000	160

1: MTCA Method A groundwater cleanup level
2: Cleanup level for gasoline with benzene present
Red bolded values indicate results that exceed the applicable MTCA cleanup level

Table 15. March 2021 Groundwater Analytical Results (Detected EDC, EDB, and MTBE)

Well	EDC (µg/L)	EDB (µg/L)	MTBE (µg/L)
MW-2	<1	**0.02**	<5
MTCA[1]	5	0.01	20

1: MTCA Method A groundwater cleanup level
Red bolded values indicate results that exceed the applicable MTCA cleanup level

As shown on Figure 8A, gasoline- and benzene-impacted groundwater (above cleanup levels) during the two initial monitoring events (November 2019 and February 2020) is constrained to a relatively narrow area of the site that extends from MW-14 northwest to MW-6. This generally corresponds to the primary area of residual soil contamination that could not be removed during the recent remedial excavation (see Section 3.1 and Figure 7). An additional area of EDB-impacted groundwater is also shown on Figure 8A that extends in a narrow band from MW-4 northeast to MW-2. EDB-impacted groundwater in this area is also likely related to residual soil contamination that had to be left in place during the recent remedial excavation (see samples C265 and C269 on Figures 7B and 7C).

Figures 8B and 8C show that the highest gasoline concentrations found during the initial groundwater monitoring were constrained to the area of MW-8 (with concentrations ranging between approximately 4,100 and 6,400 µg/L), and that lower concentrations were detected in adjacent wells MW-7 and MW-14 (with concentrations ranging between approximately 1,100 and 1,500 µg/L). Figures 8D and 8E show a similar pattern for benzene but with highest concentrations at MW-14, adjacent to the south of MW-8 (ranging between 39 and 81 µg/L). Lower

concentrations of benzene were also detected at MW-6 and MW-7 (with concentrations ranging between 9 and 17 μg/L).

Figure 9, which incorporates the additional analytical data from the June, September, and December 2020 and March 2021 monitoring events, shows a similar pattern of groundwater impact for the site, with overall slightly lower gasoline and VOC concentrations. Figure 9A shows the general extent of gasoline and VOCs (benzene, EDB, and EDC) groundwater impacts that were above cleanup levels during the additional 2020 and 2021 monitoring events. As shown on Figure 9A, gasoline and VOC impacts are still constrained to approximately the same narrow area of the site corresponding to the residual soil contamination (see Figures 7 and 8A). However, as shown by the concentration patterns presented in Figures 9B through 9I, some dispersion of the groundwater contaminants, outward from the original areas of higher impact, appears to be occurring.

Figures 9B through 9E show that the highest gasoline concentrations in groundwater during the additional 2020 and 2021 monitoring events again occurred in the area of MW-8 (with concentrations ranging between approximately 2,700 and 4,400 μg/L). A lower concentration of 1,200 μg/L was detected at adjacent well MW-14 during the March 2021 monitoring event alone (see Figure 9E). This generally reflects a decrease in gasoline concentrations at these wells as compared to the initial two monitoring events (see Figures 8B and 8C).

Figures 9F through 9I show that the highest benzene concentrations during the additional monitoring events occurred again at MW-14 (with concentrations ranging between 40 and 69 μg/L), which is a slight decline from the initial two monitoring events (see Figures 8D and 8E). Exceedances of benzene were also again detected at adjacent wells MW-6 and MW-7 (with concentrations ranging between 6 and 26 μg/L), which is generally about the same as compared to the initial two monitoring events. Additional exceedances of benzene were also detected at wells MW-2, MW-8, and MW-12, which again reflects the fact that some dispersion of contaminants is occurring.

Overall, the groundwater plume appears to be relatively stable, with some minor dispersion of contaminants, but highest concentrations are still constrained to a narrow area within the former remedial excavation. Groundwater contamination is also still constrained to the boundaries of the Love's property. As discussed below in Sections 4.2 and 8.0, additional quarterly groundwater monitoring should continue for at least one additional year (as a component of the cleanup action plan) to fully characterize seasonal groundwater fluctuations and groundwater impacts at the site.

3.2.4 Quality Assurance/Quality Control

Each of the laboratory reports presented in Appendix F provide narratives and the analytical data for required quality assurance/quality control (QA/QC). Our review of the QA/QC data provided in the various laboratory reports did not identify any discrepancies that would significantly alter our interpretations of the analytical data provided.

4.0 Draft Cleanup Action Plan

Based on the remedial actions completed to date for the Love's site, in particular the recent tank removal and remedial excavation effort documented in Robinson Noble's 2020 UST removal and IRA-RI report (Appendix B) and the additional groundwater monitoring documented in this report (see Section 3), Robinson Noble has devised a draft (proposed) cleanup action

plan (CAP) to facilitate regulatory closure for the site. The proposed CAP is based on Ecology's model remedies (WAC 173-340-390).

Model remedies are a set of specific cleanup actions that have been developed by Ecology and can be applied to a given site if it meets certain pre-established criteria. Ecology's intent in developing model remedies is to provide a more expedient (and therefore cost-effective) means of obtaining regulatory closure for sites contaminated with petroleum (and other common contaminants). The CAP proposed herein will specifically utilize Ecology Groundwater Model Remedy 4 as described in Ecology Publication No. 16-09-057 (Washington Department of Ecology, December 2017). As the proposed CAP utilizes an established model remedy, a feasibility study and disproportionate cost analysis (DCA) are not required and will therefore not need to be completed for this project per WAC 173-340-390(3).

4.1 Model Remedy Justification

As described in Chapter 6 of Ecology Publication No. 16-09-057 (Washington Department of Ecology, December 2017), Ecology Groundwater Model Remedy 4 has been selected because the site meets all of the following criteria:

- The selected soil cleanup level (CUL) for the site is the MTCA Method A soil cleanup level for unrestricted land uses. Note; the MTCA Method A soil CULs for total petroleum hydrocarbons (TPH) have the same values for both unrestricted land use and industrial properties, and there are no other established soil CULs for TPH under MTCA (Washington Department of Ecology, February 2021). The site also does not currently meet the criteria to be evaluated under the industrial standards (WAC 173-340-200 and WAC 173-340-745).

- Source removal (removal of all free product and/or contaminated soil) has been implemented to the greatest degree practicable; in total, 28,000 tons of petroleum impacted soils were excavated and removed from the site (see Section 2.3.1). However, the implemented remedial actions completed to date are not sufficient to fully comply with the selected soil CUL due to one or more structural impediments (remedial soil excavation could not be conducted in the area of a City of Fife sewer main and was constrained in some areas of the site by dewatering limitations).

- The 1,500 mg/kg generic total petroleum hydrocarbon (TPH) CUL for soils is not appropriate for this site based on the presence of benzene in excess of the MTCA Method A soil cleanup level for unrestricted land uses (0.03 mg/kg).

- Groundwater monitoring completed to date, which included the sampling of 17 monitoring wells during six separate quarterly monitoring events between November 2019 and March 2021, confirms that petroleum impacts are constrained to the Love's property (there are no off-property exceedances). Groundwater monitoring also demonstrates that gasoline and VOC concentrations (the primary contaminants of concern) are constant and/or diminishing and consistently occur at the same locations (i.e. the plume is stable to receding). Petroleum groundwater impacts at the site do not currently meet applicable MTCA Method A groundwater CULs, however. Note; the MTCA Method A groundwater CULs are the only established CULs for TPH (Washington Department of Ecology, February 2021).

- The proposed CAP intends to use conditional points of compliance for the ongoing evaluation of groundwater impacts at the site (namely the monitoring wells that define the margins of the existing groundwater plume; see Figure 9). These conditional points of compli-

ance are located as close as practicable to the hazardous substance (namely the residual soil contamination and/or the impacted groundwater).

- Empirical demonstration or other statistical methods of evaluating contamination levels at the site have not been used. The evaluation of contaminant levels at the site are all based on direct laboratory analyses of individual soil and groundwater samples.
- Regulatory closure of the site is dependent on the implementation of institutional controls (namely an environmental covenant with long-term monitoring of the groundwater plume and maintenance of the asphalt parking areas and buildings as a protective soil cap). As described in Section 5 of Robinson Noble's 2020 UST removal and IRA-RI report (Appendix B), Love's incorporated an under-slab drain system and a sub-slab vapor barrier in the construction of the new convenience store/restaurant-complex building to mitigate potential vapor-intrusion issues that might be associated with the residual soil and groundwater contamination. The installation of the under-slab drain system and vapor barrier, combined with the four-inch thickness of the building's concrete slab, essentially eliminated the risk of vapor intrusion.

4.2 Cleanup Action Plan Implementation

Following Ecology review and approval of the proposed CAP, Robinson Noble (on behalf of Love's Travel Stops and Country Stores, Inc.) will complete a draft environmental covenant using Ecology's prescribed environmental covenant template (Ecology Publication Number 15-09-054). Along with the draft covenant, Robinson Noble will also compile a draft long-term monitoring plan, which will cover regular maintenance inspections of the contamination cap and long-term groundwater monitoring. The completed draft environmental covenant, along with the draft monitoring plan, will then be submitted to Ecology for review and comment.

Based on the groundwater monitoring completed to date at the site (see Section 3), Robinson Noble recommends that at least one additional year of quarterly groundwater monitoring (four additional quarters) be completed to better characterize seasonal groundwater fluctuations and groundwater impacts at the site. Following the completion of the additional year of quarterly groundwater monitoring, the data will be reassessed to determine if the frequency of groundwater monitoring at the site can be reduced. Depending on the regulatory status of the project at that time, Robinson Noble may solicit input from Ecology regarding appropriate monitoring frequency.

Following Ecology's review of the draft environmental covenant and long-term monitoring plan, Robinson Noble will finalize both documents, incorporating any requested changes from Ecology. The final environmental covenant will then be submitted to the Pierce County Auditor for recording. Upon receipt of a subsequent NFA determination letter from Ecology, Robinson Noble will coordinate with Love's to begin implementing the established monitoring plan in accordance with the environmental covenant.

5.0 Terrestrial Ecological Evaluation (TEE)

As described in Section 6 of our 2020 UST removal and IRA-RI report (Appendix B), the site (and the existing soil and groundwater contamination) are completely covered by the asphalt parking lot and the site buildings and, therefore, qualifies for an exclusion from performing a terrestrial ecology evaluation (TEE) under WAC 173-340-7491(1)(b). Because the site and surrounding area are completely developed, the site also qualifies for an exclusion from performing a TEE under WAC 173-340-7491(1)(c). As such, a TEE was not required nor completed for this

project. A completed TEE evaluation form (ECY 090-300) is included in Appendix N of Robinson Nobles 2020 UST removal and IRA-RI report (see Appendix B).

6.0 EIM Submission

For VCP projects, Ecology requires that all data collected on site be submitted via their Electronic Information Management (EIM) portal prior to issuance of any closure determination. All analytical data collected during this project have been, or are in the process of being, uploaded to Ecology via the EIM portal. As additional work is completed for this project, the new data will also be uploaded to the EIM system as it is acquired.

7.0 Summary and Findings

Love's Travel Stop and Country Store No. 448 is located at 1501 Port of Tacoma Road in Fife, Washington (Figure 1). The site is developed with a truck stop/commercial fueling facility (Figure 2) that has been operated by Love's since it purchased the property in 2010. The site, however, has been used for commercial fueling by various owners since the 1970s. Ecology lists the site as having confirmed soil and groundwater contamination (gasoline- and diesel-range hydrocarbons and benzene) associated with past fueling operations. The site is identified by Ecology Facility/Site No. 94359448. Site investigations and remediation are currently being addressed through Ecology's VCP and the regulatory authority of the TPCHD. The site is assigned VCP Project No. SW1625 and TPCHD Permit Number RO0004753 (Section 1.0).

In 2018 and 2019, Love's completely demolished and then reconstructed the facility. During the reconstruction effort, the original steel USTs were decommissioned and removed from the site, and subsequently replaced with new fiberglass tanks. During the remediation effort, several previously unidentified tanks and other structures were also removed, along with all the product piping and approximately 28,000 tons of petroleum contaminated soil. Some soil contamination was inaccessible during remedial excavation and remains in place (see Sections 2.3, 3.1, and Figure 7). Following the reconstruction of the site, Robinson Noble directed the installation of a groundwater monitoring network (Figure 4) and conducted two initial quarters of groundwater monitoring (November 2019 and February 2020). Initial groundwater monitoring identified groundwater impacts above MTCA Method A groundwater cleanup levels for gasoline-range hydrocarbons and gasoline-related VOCs (benzene and EDB). Groundwater impacts are constrained to a narrow area of the site that corresponds with the residual soil impacts (see Sections 3.1, 3.2.3, and Figure 8). UST removal and the subsequent remediation effort are documented in Robinson Noble's April 2020 UST removal and IRA-RI report (Appendix B).

For the current investigation, Robinson Noble completed four additional quarters of groundwater monitoring in June, September, and December 2020 and March 2021 to further characterize groundwater impacts at the site. Chemical analyses of groundwater samples collected during the four additional monitoring events found similar results as the initial monitoring (November 2019 and February 2020). The primary contaminants of concern remain gasoline-range hydrocarbons and gasoline-related VOCs (benzene, EDB, and EDC), which were found in exceedance of MTCA Method A groundwater cleanup levels in approximately the same areas as during the initial monitoring events. Gasoline concentrations currently appear to be declining slightly, and VOC concentrations appear to be relatively consistent. The groundwater plume is currently constrained to the Love's property and, aside from minor seasonal fluctuations, appears to be stable (see Section 3.2.3 and Figures 8 and 9).

8.0 Recommendations

Based on the remedial actions and investigations completed to date, specifically Robinson Noble's recent tank removal and remedial excavation effort (Robinson Noble, 2020; Appendix B) and the additional groundwater monitoring documented in this report (Section 3), Robinson Noble recommends implementing a cleanup action plan (CAP) based on Ecology model remedies (WAC 173-340-390) to facilitate regulatory closure of the Love's site. As discussed in Section 4.1, the Love's site meets all of the criteria for a cleanup action under Ecology Groundwater Model Remedy 4 per Ecology Publication No. 16-09-057 (Washington Department of Ecology, December 2017).

Under Model Remedy 4, regulatory closure of the site will require the use of institutional controls. This will specifically include an environmental covenant that incorporates a maintenance and inspection program for the existing site cap (the buildings and asphalt that currently cover the site) and a long-term groundwater monitoring program. As discussed in Section 4.1, the risk of vapor intrusion in the site buildings (specifically the convenience store) was mitigated with the installation of a sub-slab drain system and the vapor barrier. It is our opinion that additional indoor-air quality monitoring is not currently warranted.

We recommend that this RI/CAP be submitted to Ecology for formal review and comment regarding the use of model remedies, and specifically the use of Ecology Groundwater Model Remedy 4, to obtain regulatory closure for the site. If Ecology concurs with this recommendation, we then further recommend the preparation of a draft environmental covenant and a draft maintenance and long-term monitoring plan, which will also be submitted to Ecology for their review and comment. Upon Ecology's approval of the draft covenant and proposed maintenance and monitoring plan, final versions will be prepared and the final environmental covenant will be submitted to the Pierce County Auditor for recording. This should facilitate the issuance of an NFA determination from Ecology for the Love's site.

At the present time, we also recommend that quarterly groundwater monitoring continue to be conducted for at least one additional year (four additional quarters) to further assess flow patterns in the shallow groundwater system and the stability of the contamination plume. During at least one of the four additional quarterly monitoring events, we recommend submitting an additional suite of groundwater samples for analyses of natural attenuation parameters in order to evaluate the current effectiveness of natural attenuation on existing groundwater impacts. At the conclusion of the one additional year of quarterly groundwater monitoring, an assessment will be made whether to reduce the groundwater monitoring frequency. The next quarterly groundwater monitoring event is scheduled to be completed in June 2021.

9.0 References

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The statements, conclusions, and recommendations provided in this report are to be exclusively used within the context of this document. They are based upon generally accepted hydrogeologic and environmental practices and are the result of analysis by Robinson Noble, Inc. staff. This report, and any attachments to it, is for the exclusive use of Love's Travel Stops and Country Stores, Inc. Unless specifically stated in the document, no warranty, expressed or implied, is made.