SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

March 11, 2020

Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, Alaska 99709

Attn: Mr. Shawn Tisdell

RE: FINAL CORRECTIVE ACTION REPORT, MAIL TRAIL ROAD AND DALE STREET, FAIRBANKS, ALASKA; ADEC FILE NO. 100.26.058

This report presents the results of Shannon & Wilson's a review of the environmental records associated with the former Crowley Marine Services, Inc. (Crowley) facility located at Mail Trail Road and Dale Street in Fairbanks, Alaska (the Property). A vicinity map is included as Figure 1 and a site plan is included as Figure 2.

Based on the information reviewed to date and our cumulative risk calculations, it is our opinion the remaining contamination at the Property does not pose an unacceptable risk to human health or the environment.

The purpose of this report is to gain a "Cleanup Complete with Institutional Controls" determination from the Alaska Department of Environmental Conservation (ADEC) for the Property. This report summarizes the Property history, cleanup actions and levels, and standard site closure conditions that apply.

Site Name and Location:
Mail Trail Facility
Corner Mail Trail Road & Dale Street
Fairbanks, Alaska 99701

Name and Mailing Address of Contact Party:
Daniel Smith, Crowley Marine Services, Inc.
1102 S.W. Massachusetts Street
Seattle, WA 98134

ADEC Site Identifier:
File No.: 100.26.058
Hazard ID: 24339

Regulatory Authority for Determination:
18 Alaska Administrative Code (AAC) 75 and
18 AAC 78

5430 FAIRBANKS STREET, SUITE 3
ANCHORAGE, ALASKA 99518-1263
907-561-2120 FAX: 907-206-695-6777
www.shannonwilson.com

SITE DESCRIPTION

The Property is located approximately 0.25 mile west of the Fairbanks International Airport and approximately 450 feet east of the Chena River, at the intersection of Mail Trail Road and Dale Street. According to the Fairbanks North Star Borough (FNSB), the Property is approximately 4 acres. Topography across the Property is generally flat with a gradual slope toward the west. Flood plain alluvium which consists of reworked glacial outwash sands, silt, and gravel underlies the Property.

DOCUMENT REVIEW

Environmental assessment and cleanup activities, including tank removal, groundwater monitoring, site characterization, and remedial actions, have been conducted at the Property between 1991 to 2018. These activities were summarized in documents prepared by America North/EMCON Alaska, Inc. (EMCON), SLR Alaska (SLR), and Shannon & Wilson, Inc. (S&W). These documents were provided by Crowley and reviewed and summarized below. The ADEC's online contaminated sites and leaking UST (LUST) databases were also reviewed for historical assessment activities conducted at neighboring contaminated and LUST sites. The following documents were reviewed

- America North/EMCON, *Mail Trail Road Property, Tank Removal/Site Assessment and Interim Corrective Action Report* (July 1992)
- EMCON, *Final Mail Trail Road Property, Corrective Action Report* (February 1994)
- EMCON, *Quarterly Groundwater Monitoring report, Crowley Maritime Corporation Property located at Mail Trail Road, Fairbanks, Alaska* (September 21, 1994)
- SLR Alaska – *Groundwater Monitoring Report, Crowley Maritime Corporation Lease Property Located at Mail Trail Road, Fairbanks, Alaska* (October 9, 2006)
- S&W *Groundwater Characterization, Mail Trail Road and Dale Street, Fairbanks, Alaska* (December 2012)
- S&W, *Additional Site Characterization, Mail Trail and Dale Street, Fairbanks, Alaska* (September 2017)
- S&W, *Groundwater Monitoring, Mail Trail and Dale Street, Fairbanks, Alaska* (December 26, 2018)

- S&W, *Revised Groundwater Monitoring Well Decommissioning Report, Mail Trail Road and Dale Street, Fairbanks, Alaska; ADEC File No. 100.26.058* (February 9, 2020)

SUMMARY OF PREVIOUS ASSESSMENT AND CLEANUP ACTIVITIES

Previous environmental investigations documented soil and groundwater impacted with diesel range organics (DRO), gasoline range organics (GRO), and volatile organic compound (VOCs) southeast of the cold storage warehouse on the Property. The primary VOC constituents documented were benzene, ethylbenzene, and xylenes, although the most recent groundwater samples collected in 2018 also contained concentrations of 1,2,4-trimethylbenzene exceeding the applicable ADEC cleanup level. Polynuclear aromatic hydrocarbons (PAHs), including naphthalene and 1-methylnaphthalene have also been measured in groundwater samples from Well MW13, which is located within the former UST excavation, at concentrations greater than ADEC cleanup levels. 1-methylnaphthalene and 2-methylnaphthalene has also been detected in the site's soil.

A brief summary of the previous assessment and cleanup activities relevant to the contaminated area follows. The summary is not comprehensive; however, it presents information pertinent to develop the Conceptual Site Model (CSM) and provide the basis for a potential Cleanup Complete designation from the ADEC.

1991-1994 Tank Removal/Site Assessments

In August 1991, EMCON advanced nine borings at the Property, prior to removal of the on-site 15,000-gallon diesel underground storage tank (UST). The borings ranged from 4 feet to 15 feet below ground surface (bgs). Five of the borings were competed as monitoring wells (Wells MW1 through MW5). The approximate locations of the wells are shown on Figure 2. At that time, the groundwater flow direction was determined to be toward the northwest. A water sample collected from Monitoring Well MW1, which was installed near the northwest corner of the UST, contained 66 milligrams per liter (mg/L) extractable petroleum hydrocarbons (EPH) and 0.0125 mg/L benzene, which exceeded the ADEC cleanup levels, applicable in 1991. Analytical groundwater results from Monitoring Wells MW2 through MW5 were either non-detect or contained concentrations of EPH and benzene less than the applicable ADEC cleanup levels.

On October 21, 1991, the 15,000-gallon diesel UST was removed from the ground. EPH-impacted soil was encountered in samples collected from the north and west sidewalls of the tank excavation. Free-phase product was also observed on water in the base of the excavation. Approximately 165 gallons of water were pumped from the excavation to attempts to recover the free-phase product prior to backfilling the excavation.

In October 1992, EMCON conducted additional site investigation activities. Seven borings were advanced and four additional monitoring wells (Wells MW6 through MW9) were installed to delineate the extent of petroleum contamination associated with the former UST. Analytical results showed petroleum hydrocarbon impacted soil and groundwater located upgradient of the former UST. Soil samples collected adjacent to the south sidewall of the UST excavation contained EPH concentrations greater than the ADEC cleanup level of 100 milligrams per kilogram (mg/kg).

In October 1993, EMCON excavated approximately 450 cubic yards of petroleum-impacted soil in the vicinity of the former UST location. The approximate excavation limits are shown on Figure 2. The excavated material contained EPH concentrations ranging from 790 mg/kg to 11,000 mg/kg. Confirmation soil samples collected from the excavation contained EPH concentrations ranging from non-detect to 85 mg/kg, which was less than the ADEC cleanup level of 100 mg/kg.

In 1993, EMCON conducted quarterly groundwater monitoring of the nine monitoring wells. Samples were analyzed for EPH and benzene, toluene, ethylbenzene, and xylenes (BTEX). During the April 1993 monitoring event, benzene was detected in samples collected from Wells MW1 and MW4 through MW9 at concentrations (0.0052 to 0.510 milligrams per liter [mg/L]) exceeding the ADEC cleanup level at the time of 0.005 mg/L.

In 1994, EMCON conducted quarterly groundwater monitoring. Volatile petroleum hydrocarbons (VPH), quantified as gasoline, were detected in samples collected from Wells MW1 and MW4 through MW8 at concentrations greater than the ADEC cleanup level at the time. EPH, quantified as diesel, was detected in samples collected from Wells MW1 through MW8 at concentrations greater than the ADEC cleanup level at the time. However, EPH was not detected in the Well MW9, located downgradient of the former UST. The analytical results of this sampling effort indicated that impacted groundwater was present at locations adjacent to the eastern Property boundary and upgradient of the former UST.

2006 Groundwater Monitoring

In 2006, SLR attempted to sample the on-site monitoring wells. At that time, SLR found only one monitoring well (Well MW4) intact and viable for sampling. Monitoring Well MW4, located to the north of the former UST location, was sampled and analyzed for GRO, DRO, residual range organics (RRO), VOCs, 1,2-dibromoethane (EDB), and PAHs. DRO, GRO, RRO, and several VOC analytes were detected at concentrations less than the applicable ADEC cleanup levels. No PAH analytes were detected.

2012 Groundwater Characterization

In May 2012, S&W advanced five soil borings (Borings B10 through B14), four of which were completed as groundwater monitoring wells (Wells MW10 through MW13), in the vicinity of the former UST. DRO was detected in soil samples collected from Borings B10 and B13 at concentrations (maximum of 9,890 mg/kg) exceeding the ADEC Method Two cleanup level (250 mg/kg). Several PAH analytes were also detected above the most stringent ADEC Method Two cleanup levels in the soil sample collected from Boring B10. DRO (13.6 mg/L) was detected in a groundwater sample collected from Well MW13 at a concentration exceeding the ADEC cleanup level of 1.5 mg/L. Benzene concentrations detected in the samples collected from Wells MW10 (0.014 mg/L) and MW11 (0.174 mg/L) were greater than the ADEC cleanup level of 0.0046 mg/L. DRO, BTEX, and several PAH analytes were detected in at least one sample at concentrations below ADEC cleanup levels.

2017 and 2018 Additional Site Characterization

In a letter dated July 21, 2016, the ADEC requested additional site characterization prior to evaluating the Property for closure. After meeting with the ADEC, it was agreed that Wells MW10 through MW13 would be sampled. In addition, it was agreed that additional site characterization would be conducted to further delineate the extent of the soil and groundwater contamination. In 2017, two soil borings (B14A and B15) were advanced and completed as monitoring wells (MW14 and MW15) by S&W. The soil samples from Borings B14A and B15 and the groundwater samples from Wells MW12, MW14, and MW15 did not contain target analyte concentrations exceeding the applicable ADEC cleanup levels. Groundwater samples from Wells MW10, MW11, and MW13 contained DRO, benzene, ethylbenzene, xylenes, 1-methylnaphthalene, and/or naphthalene at concentrations greater than the applicable ADEC cleanup levels.

After a March 13, 2018 meeting with the ADEC, it was agreed that Wells MW10, MW13, and MW15 would be sampled two additional times in 2018. During the July and October 2018 groundwater sampling events, concentrations of DRO, four VOCs, and two PAHs exceeding the applicable ADEC Table C cleanup levels were measured in the groundwater samples collected from Well MW13. The groundwater samples collected from Well MW10 also contained benzene exceeding the ADEC cleanup level. These concentrations were generally consistent with previous data. Well MW15, which is located downgradient Well MW13 and the former UST, did not contain target analytes above ADEC cleanup levels.

2019 Well Decommission Activities

During October 2019, with ADEC approval, Monitoring Wells MW12, MW13, and MW15 were decommissioned. Although Monitoring Wells MW4 and MW9 were also scheduled for decommissioning, the wells could not be located and were assumed destroyed.

Previous Assessments at Surrounding Sites

A soil gas survey conducted in 1987 at the U.S. Postal Service (USPS) Vehicle Maintenance Facility, located north of the Property beyond Mail Trail Road, discovered a soil gas plume in an approximately 40-foot by 75-foot area. Subsequent work performed at the USPS site has included free product recovery, UST removal, contaminated soil excavation, and groundwater monitoring. The 2008 groundwater monitoring results show concentrations of benzene, toluene, ethylbenzene, and xylenes exceeding ADEC cleanup levels. ADEC has requested soil vapor sampling in the source area at the USPS site to determine if outdoor air and sub-slab soil gas sampling is warranted.

In 2008, S&W conducted a groundwater investigation at the former MarkAir Warehouse site located adjacent to the east side of the Property. Diesel and gasoline contamination were documented in a former UST location about 200 feet east of the Property boundary. The groundwater flow direction was determined to be northwest, towards the Property. S&W concluded that the groundwater benzene plume from the former MarkAir site likely migrated to the northwest and onto the Property. A groundwater sample collected from Monitoring Well MW12, located just east of the Property boundary on the former MarkAir site, contained 0.113 mg/L benzene, which exceeds the ADEC Table C cleanup level of 0.0046 mg/L. Monitoring Well MW-16, located approximately 365 feet southeast of the Property's main warehouse, contained 4.67 mg/L benzene.

The Fairbanks International Airport (FIA) hydrant fueling system was used for fueling aircraft on the FIA south apron until the Alaska Department of Transportation & Public Facilities (ADOT&PF) discovered free-phase liquid product during replacement of a sewer line. The FIA hydrant fueling system is located about 1,000 feet northeast of the Property. A 6-inch jet fuel pipeline associated with the FIA hydrant fueling system extends to the former Mapco/Texaco bulk fuel terminal located south of the Property. Three areas where leaking had occurred were identified and free product recovery was conducted. Ongoing data from groundwater monitoring indicate groundwater flow in the area is toward the north or northwest in the fall, flat in December and January, and southwest to southeast in late winter through late August.

The former Mapco/Texaco bulk fuel terminal began operation in July 1969 and was purchased by North Pole Refining (NPR) in 1979. The Property contained a warehouse building and three 25,000-gallon aboveground storage tanks (ASTs). Mapco acquired NPR in 1983 and removed the tanks and structures in 1989. The former Mapco/Texaco site is located south of the Property and is currently vacant. Seven documented spills or releases occurred at the former bulk fuel terminal including more than 1,000 gallons of Jet-A and JP-4 fuel. In 2009, free product was observed at the Mapco/Texaco site in Monitoring Well MW1, located adjacent to a 6-inch jet fuel pipeline associated with the FIA hydrant fueling system. A 2011 groundwater sample from MW1 contained 10 mg/L GRO, 57 mg/L DRO, and 0.180 mg/L benzene which exceed the ADEC cleanup levels. Contaminant concentrations in other wells were below cleanup levels.

CONTAMINANTS OF CONCERN

During the site characterization and cleanup activities conducted at the Property, soil and groundwater samples have been analyzed for GRO, DRO, RRO, PAHs, VOCs, and BTEX. Based on these analyses, the following contaminants were detected above the applicable cleanup levels and are considered Contaminants of Concern (CoCs) at this site:

- DRO (soil and groundwater)
- Benzene (groundwater)
- Ethylbenzene and Xylenes (soil and groundwater)
- 1,2,4-Trimethylbenzene (groundwater)
- 1-Methylnaphthalene and 2-Methylnaphthalene (soil)
- Naphthalene (groundwater)

Cleanup Levels

Contamination has been identified in soil above the Method 2 Migration to Groundwater (MTG) cleanup levels for the under 40-inch precipitation zone, established in 18 AAC 75.341(c), Table B1, and 18 AAC 75.341 (d), Table B2. In addition, contamination has been identified in groundwater above the cleanup levels established in 18 AAC 75.345 Table C. The maximum remaining contaminant concentrations compared to the most stringent ADEC cleanup levels are shown in Table 1. A summary of historical groundwater data is included in Table 2.

Table 1 – Cleanup Levels

Contaminant	Soil - MTG CUL* (mg/Kg)	Soil - Human Health CUL* (mg/Kg)	Soil - Maximum Remaining^ (mg/Kg)	Groundwater - CUL* (mg/L)	Groundwater - Maximum Remaining^^ (mg/L)
DRO	250	12,500	**9,890**	1.5	**5.59**
Benzene	0.022	11	-	0.0046	**0.0106**
Ethylbenzene	0.13	49	**0.439**	0.015	**0.211**
Xylenes	1.5	57	**2.3**	0.19	**0.343**
1,2,4-Trimethlbenzene	0.61	43	-	0.056	**0.178**
1-Methylnaphthalene	0.41	68	**10.3**	0.15	-
2-Methylnaphthalene	1.30	310	**11.7**	0.15	-
Naphthalene	0.038	2,000	-	0.0017	**0.122**

mg/Kg = Milligrams per kilogram
mg/L = Milligrams per liter
ND = Not detected
MN = Not measured
5.59 = Reported concentration is greater than the most stringent ADEC cleanup level.
CUL = Cleanup level
MTG = Migration to groundwater
* = Soil cleanup levels from Table B1 or B2, and groundwater cleanup levels from Table C, 18 AAC 75.345 (October 2018)
^ = The most recent soil analytical data for target analytes from 2017 & 2018, with the exception of DRO 1-Methylnaphthalene, and 2-Methylnaphthalene from 2012, downgradient of the contamination source.
^^ = The most recent groundwater analytical data from is from 2017 and 2018.
- = Not a contaminant of concern

Cumulative Risk Evaluation

Pursuant to 18 AAC 78.600(d), when detectable contamination remains onsite following a cleanup, a cumulative risk determination must be made that the risk from hazardous substances doesn't exceed a cumulative carcinogenic risk standard of 1 in 100,000 across all exposure pathways. The calculated cumulative risk for the Property was determined to be at 6.6×10^{-4}. The cumulative non-carcinogenic risk standard hazard index of 1.0 across all exposure pathways is exceeded with a calculated hazard index of 156.8.

It is assumed that the exposure pathways are controlled as the remaining contamination at the site is sub-surface and institutional controls will be put in place to prevent future residential use unless vapor intrusion risks are addressed and to prevent the installation of water wells without prior ADEC approval and demonstrating that the groundwater is suitable for its intended use. It is noted that according to the Fairbanks North Star Borough, the Property is currently zoned "Heavy Industrial/Airport Noise Sensitive Area". Therefore, it is anticipated that the Property will not be re-zoned "Residential".

CONCEPTUAL SITE MODEL

A CSM was prepared to identify known and potential exposure pathways at the Property. The CSM was developed using the ADEC's guidance CSM Scoping Form and Graphic Form, which are included as Attachment 1.

Contaminant Sources and Transport Mechanisms

The historical assessment, characterization and remedial efforts conducted on the Property show that the former diesel UST and off-site activities are considered the source of contamination at the Property. This scenario explains why the highest DRO concentrations were measured in the soil and groundwater directly beneath the former UST location off-site. Contamination sources identified to the north, east, and south of the Property are also contributing to areawide contamination. Based on groundwater flow direction to the northwest and soil and groundwater data from the Property and surrounding parcels, in our opinion the benzene plume identified at the Property is not associated with the former 15,000-gallon UST source-area.

Extent of Contamination

Data suggests the extent of impacted soil and groundwater is presently confined to the vicinity of the former UST. The benzene impacted groundwater in the vicinity of Wells MW10 and MW11,

located upgradient of the former UST, was not accompanied by detectable benzene in the corresponding boring soil samples. Groundwater samples from Monitoring Well MW13, located within the former UST excavation, historically and currently contain DRO and ethylbenzene concentrations greater than ADEC cleanup levels. VOC and/or DRO concentrations in soil and groundwater samples from Borings/Monitoring Wells B14/MW14 and B15/MW15, advanced south (upgradient) and northwest (downgradient) of the former UST excavation, respectively, were not detected or measured one to two orders of magnitude less than the concentrations in the samples from Wells MW10 and MW13. Therefore, the benzene and DRO plume characterized by Wells MW14 and MW15 and is limited to the former on-site UST location.

Exposure Pathways

Discussions of the potential exposure pathways are provided below. The narrative includes descriptions of site-specific considerations that increase or decrease the viability of each pathway at the Property. The Property is located in a commercial/industrial area therefore residents are not considered viable current or future receptors. Note this CSM reflects only the known, documented CoCs, and should be revised as warranted if additional site assessment is conducted to address data gaps regarding the nature and/or extent of impacted media.

Soil – Direct Contact

The presence of petroleum hydrocarbon contaminants and PAH and VOC compounds, within the top 15 feet bgs indicates the incidental ingestion and dermal absorption exposure pathways are complete. Based on current site use, however, viable receptors are likely limited to future construction workers.

Groundwater

Concentrations of DRO, benzene, ethylbenzene, and xylenes in groundwater exceed ADEC Table C cleanup levels. Although there are no known on-site drinking water wells, ADEC regulation stipulates groundwater must be addressed as a potential drinking water source unless a groundwater use determination is conducted in accordance with 18 AAC 75.350, and that determination finds that the groundwater is not "a currently or reasonably expected future source of drinking water." Because a "350 determination" has not been conducted, groundwater at the Property needs to be considered a potential future drinking water source, and ingestion and dermal absorption of groundwater are considered potentially complete exposure pathways for

future receptors. Future potential receptors include commercial workers, construction workers, and site visitors.

It is noted that a water connection is offered by the City of Fairbanks for the Property due to the perfluoroalkyl and polyfluoroalkyl substances (PFAS) project; therefore, it is unlikely the groundwater at that site will be used as a future drinking source.

Air

Volatile hydrocarbon constituents have the potential to impact receptors through outdoor air inhalation. Based on the soil sample results, outdoor air inhalation is a complete exposure pathway, with potential receptors including site visitors, commercial workers, and construction workers. Because none of the measured contaminant concentrations in the 2017 soil samples exceed the ADEC cleanup levels for this pathway, additional mitigation measures for outdoor air are likely not required.

The indoor air inhalation (vapor intrusion) pathway is not presently complete because the cold warehouse building is greater than 30 feet from the former UST excavation area. However, if future buildings are constructed in the former UST excavation area, the indoor inhalation pathway could be complete for site visitors, commercial workers, and construction workers.

Other

Other impacted media, including biota, were not identified at the Property. Based on the commercial/industrial site use, ecological receptors are assumed incomplete and were not considered for this assessment.

CSM Summary

Multiple complete or potentially complete exposure pathways have been identified at the Property. Exposure to impacted soil is currently mitigated by the Property's commercial use. The groundwater ingestion pathway is potentially complete for on-site commercial workers and site visitors, although city water services are available and therefore the groundwater at the Property is not a likely a current or future drinking water source. Based on the historic soil and groundwater samples, both outdoor air and indoor air inhalation remain viable exposure pathways, however, as the indoor air inhalation pathway is not presently complete because the main warehouse building is greater than 100 feet from the former UST excavation area.

It is noted that changes in the Property use or other site conditions may affect the viability of potential exposure pathways. In particular, the CSM will need to be re-evaluated and revised as necessary if construction occurs at the Property, a change in land use occurs, or additional information is obtained regarding either the previously documented contaminated media and/or potential on-site sources.

RECOMMENDATIONS

Based on the most recent site characterization activities, impacted soil and groundwater remains in the vicinity of the former UST. DRO, ethylbenzene, xylenes, 1-methylnaphthalene, and 2-methylnaphthalene remain in soil at concentrations exceeding the ADEC Method Two migration to groundwater soil cleanup levels, but less than the ADEC Method Two Human Health soil cleanup levels. DRO, benzene, ethylbenzene, and xylenes remain in groundwater at concentrations exceeding the ADEC Table C groundwater cleanup levels. Groundwater at the site is not currently used as a source of drinking water. The Property is connected to city water services, which are also available to all parcels in the vicinity of the Property due to areawide PFAS contamination; therefore, it is unlikely the groundwater at that site, or neighboring parcels, will be used as a future drinking source. Based on currently available data, contaminated soil or groundwater does not extend off site. Based on these conclusions, we recommend the Property receive a "Cleanup Complete with Institutional Controls" designation by the ADEC and be subject to the following conditions:

- Any proposal to transport soil or groundwater from a site that is subject to the Property cleanup rules or for which a written determination from the department has been made under 18 AAC 78.600(h) that allows contamination to remain at the Property above method two soil cleanup levels or groundwater cleanup levels listed in Table C requires ADEC approval in accordance with 18 AAC 78.600(h). A "site" as defined by AAC 78.995(134) means an area that is contaminated, including areas contaminated by the migration of hazardous substances from a source area, regardless of property ownership.
- Movement or use of contaminated material in a manner that results in a violation of Alaska Water Quality Standards (18 AAC 70) is prohibited.
- Groundwater throughout Alaska is protected for use as a water supply for drinking, culinary and food processing, agriculture including irrigation and stock watering, aquaculture, and industrial use. Contaminated site cleanup complete determinations are based on groundwater being considered a potential drinking water source. In the event

that groundwater from this site is to be used in the future, additional testing and treatment may be required to ensure the water is suitable for its intended use.

If you have questions or comments concerning this letter, please contact Dan P. McMahon the undersigned at (907) 561-2120.

Sincerely,

SHANNON & WILSON, INC.

for:

Jessa Tibbetts
Environmental Scientist

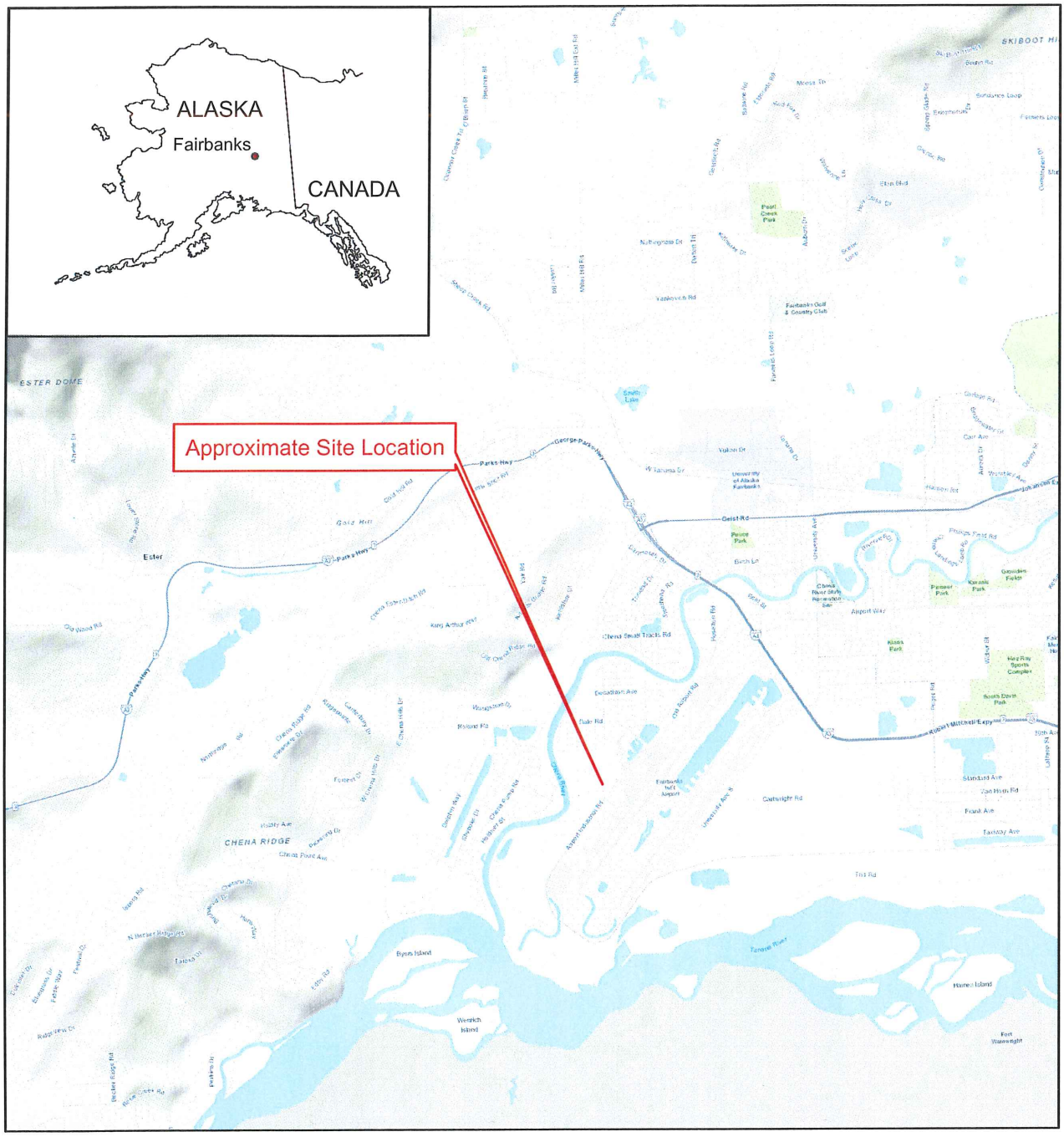
Encl.: Table 2; Figures 1 & 2; and Attachment 1

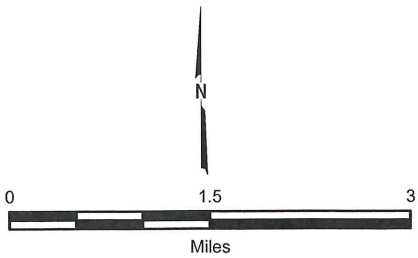
TABLE 2
SUMMARY OF HISTORICAL GROUNDWATER DATA

Monitoring Well	Date	Water Depth bgs (Feet)	Target Analyte and Cleanup Level* (mg/L)					
			GRO 2.2	DRO 1.5	Benzene 0.0046	Toluene 1.1	Ethylbenzene 0.015	Xylenes 0.19
MW10	8/29/2012	8.25	**0.103**	**0.514 J**	**0.014**	**0.016**	**0.00167**	**0.00927**
	7/12/2017	7.42	**0.900**	**2.19**	**0.528**	**0.000560 J**	**0.0200**	**0.0246**
	7/24/2018	7.56	-	**0.779 B**	**0.0697**	<0.000500	**0.000650 J**	**0.00365**
	10/23/2018	8.90	-	**0.315 J**	**0.0106**	<0.000500	<0.000500	<0.00150
MW11	8/30/2012	8.79	**1.02**	**1.10**	**0.174**	**0.282**	**0.016**	**0.0639**
	7/12/2017	7.93	**0.954**	**0.237 J**	**0.142**	**0.000930 J**	**0.158**	**0.212**
MW12	8/30/2012	8.60	<0.0620	**0.695**	**0.000350 J**	<0.001 B	<0.000620	<0.00186
	7/12/2017	7.70	<0.0500	**0.244 J**	**0.000210 J**	<0.000500	<0.000500	<0.00150
	7/24/2018	7.82	-	**0.856 B**	<0.000200	<0.000500	<0.000500	<0.00150
	10/23/2018	9.24	-	**1.12**	<0.000200	<0.000500	<0.000500	<0.00150
MW13	8/30/2012~	8.46	**0.599**	**13.6**	**0.0042**	**0.00251**	**0.088**	**0.140**
	7/12/2017~	7.48	**1.76 J+**	**3.09**	**0.00360**	**0.00139**	**0.218**	**0.519**
	7/24/2018	7.82	-	**5.61**	**0.00118**	**0.000480 J**	**0.155**	**0.312**
	10/23/2018~	9.17	-	**5.59**	**0.00153**	**0.000440 J**	**0.211**	**0.343**
MW14	7/13/2017	7.92	<0.0500	**0.281 J**	<0.000500	<0.000500	<0.000500	<0.00150
MW15	7/13/2017	7.84	**0.0607 J**	**0.595 J**	**0.00175**	<0.000500	**0.00856**	**0.0150**
	7/24/2018~	8.76	-	**0.878 B**	<0.000200	<0.000500	**0.000310 J**	**0.00291 J**
	10/23/2018	10.00	-	**0.290 J**	<0.000200	<0.000500	<0.000500	<0.00150

Notes:

*	= Soil cleanup levels from Table B1 or B2, and groundwater cleanup levels from Table C, 18 AAC 75.345 (September 2018)
~	= Higher of the sample and duplicate results is listed.
bgs	= Below Ground Surface
mg/L	= Milligrams per liter
0.103	= Bold indicates that analyte was detected.
2.19	= Reported concentration is greater than the cleanup level.
<0.00150	= Analyte not detected; laboratory reporting limit of 0.00150 mg/L.
B	= Reported concentration potentially impacted by method blank detection.
J	= Estimated concentration less than the limit of quantitation.
J+	= Analyte result is potentially biased high due to surrogate failure.





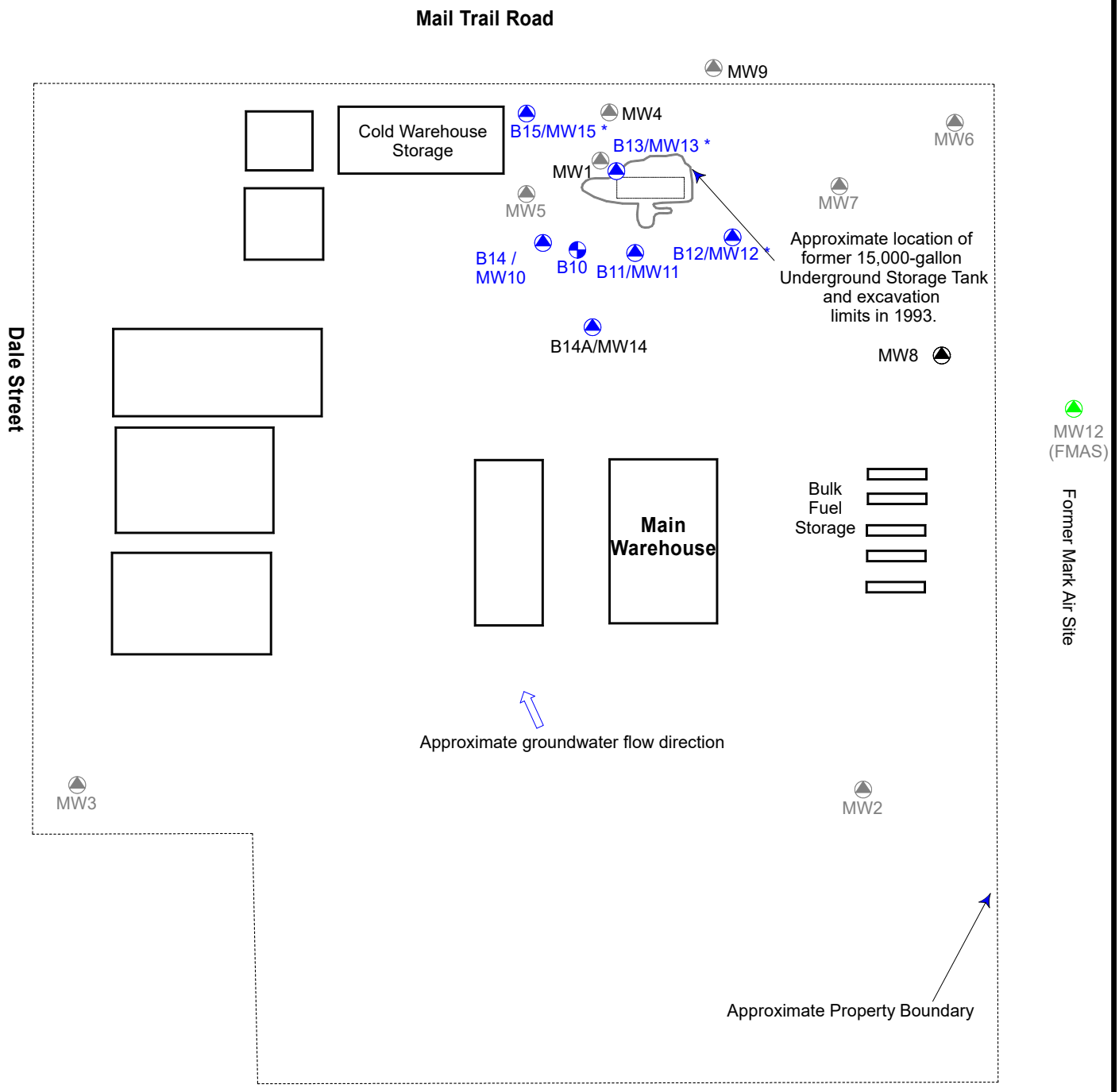
Mail Trail Road and Dale Street
Fairbanks, Alaska

VICINITY MAP

March 2020 100294-002

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1



LEGEND

B10 — Approximate location of Boring B10 installed by Shannon & Wilson in 2012.

B14/MW10 — Approximate location of Boring B14 and Monitoring Well MW10 installed by Shannon & Wilson in 2012 or 2017. * = Well Decommissioned in 2019.

MW4 — Approximate location of Monitoring Well MW4 installed by America North/EMCON in 1991 - 1993.

MW2 — Approximate location of Monitoring Well MW2 installed by America North/EMCON in 1991 - 1993. Assumed destroyed.

MW12 (FMAS) — Approximate location of Monitoring Well MW12 installed by Shannon & Wilson at Former Mark Air Site in 2008.

Former Mapco/Texaco Bulk Fuel Facility

N

0 50 100 200

APPROXIMATE SCALE IN FEET

Mail Trail Road and Dale Street
Fairbanks, Alaska

SITE PLAN

March 2020 100294-002

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 2

ATTACHMENT 1

ADEC CONCEPTUAL SITE MODEL

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: Crowley Marine Services, Inc.
Mail Trail Road and Dale Street, Fairbanks, Alaska

Completed By: Jessa Tibbetts

Date Completed: March 2020

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1)

Check the media that could be directly affected by the release.

(2)

For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.

(3)

Check all exposure media identified in (2).

(4)

*Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5)

Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.

Current & Future Receptors

Media	Transport Mechanisms	Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☐ Surface Soil (0-2 ft bgs)	☐ Direct release to surface soil — check soil ☐ Migration to subsurface — check soil ☐ Migration to groundwater — check groundwater ☐ Volatilization — check air ☐ Runoff or erosion — check surface water ☐ Uptake by plants or animals — check biota ☐ Other (list):	☑ soil	☑ Incidental Soil Ingestion				F			
			☑ Dermal Absorption of Contaminants from Soil				F			
			☐ Inhalation of Fugitive Dust							
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil ☑ Migration to groundwater — check groundwater ☑ Volatilization — check air ☐ Uptake by plants or animals — check biota ☐ Other (list):	☑ groundwater	☑ Ingestion of Groundwater		F	F	F			
			☑ Dermal Absorption of Contaminants in Groundwater		F	F	F			
			☐ Inhalation of Volatile Compounds in Tap Water							
☑ Ground-water	☑ Direct release to groundwater — check groundwater ☑ Volatilization — check air ☐ Flow to surface water body — check surface water ☐ Flow to sediment — check sediment ☐ Uptake by plants or animals — check biota ☐ Other (list):	☑ air	☑ Inhalation of Outdoor Air		C/F	C/F	C/F			
			☑ Inhalation of Indoor Air		F	F	F			
			☐ Inhalation of Fugitive Dust							
☐ Surface Water	☐ Direct release to surface water — check surface water ☐ Volatilization — check air ☐ Sedimentation — check sediment ☐ Uptake by plants or animals — check biota ☐ Other (list):	☐ surface water	☐ Ingestion of Surface Water							
			☐ Dermal Absorption of Contaminants in Surface Water							
			☐ Inhalation of Volatile Compounds in Tap Water							
☐ Sediment	☐ Direct release to sediment — check sediment ☐ Resuspension, runoff, or erosion — check surface water ☐ Uptake by plants or animals — check biota ☐ Other (list):	☐ sediment	☐ Direct Contact with Sediment							
		☐ biota	☐ Ingestion of Wild or Farmed Foods							

Revised, 10/01/2010

Print Form

Human Health Conceptual Site Model Scoping Form

Site Name: Crowley Marine Services, Inc.

File Number: 100.26.058

Completed by: Jessa Tibbetts

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☒ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☐ Other:

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☐ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☒ Air
- ☐ Sediment
- ☒ Groundwater
- ☐ Surface water
- ☐ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☐ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☐ Subsistence harvester (i.e. gathers wild foods)
- ☐ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

The most recent soil sampling from the source area was in 2012, when DRO, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected in soils samples from depth of 5 to 10 feet bgs at concentrations greater than the ADEC cleanup levels. Confirmation soil samples down gradient from the source did not contain target analyze concentrations greater than ADEC CULs.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

1-methylnaphthalene, 2-methylnaphthalene, and naphthalene have the potential to permeate the skin

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

It is noted that area wide PFAS groundwater contamination has been identified at the Fairbanks International Airport, located south east of the site. Residents in the area have been advised on the the health risks of the contamination it has been recommended that the groundwater not be used as potable source.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☐

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☐

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☐

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Benzene, ethylbenzene, and xylene contaminated groundwater is present approximately 50 feet southeast and 60 feet east of the cold warehouse storage building in Wells MW10 and MW13, respectively. It is not known whether benzene contamination exists within 30 feet of the main warehouse.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS OF POTENTIAL CONCERN

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table B-1 of 18 AAC 75.341 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greather than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000).

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS OF POTENTIAL CONCERN

A chemical is identified here as sufficiently volatile and toxic for further evaluation if the Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater, the molecular weight is less than 200 g/mole (EPA 2004a), and the vapor concentration of the pure component posed an incremental lifetime cancer risk greater than 10^{-6} or a non-cancer hazard quotient of 0.1, or other available scientific data indicates the chemical should be considered a volatile. Chemicals that are solid at typical soil temperatures and do not sublime are generally not considered volatile.

Acetone	Mercury (elemental)
Benzene	Methyl bromide (Bromomethane)
Bis(2-chloroethyl)ether	Methyl chloride (Chloromethane)
Bromodichloromethane	Methyl ethyl ketone (MEK)
Bromoform	Methyl isobutyl ketone (MIBK)
n-Butylbenzene	Methylene bromide
sec-Butylbenzene	Methylene chloride
tert-Buytlbenzene	**1-Methylnaphthalene**
Carbon disulfide	**2-Methylnaphthalene**
Carbon tetrachloride	Methyl *tert*-butyl ether (MTBE)
Chlorobenzene	**Naphthalene**
Chlorodibromomethane (Dibromochloromethane)	Nitrobenzene
Chloroethane	n-Nitrosodimethylamine
Chloroform	**n-Propylbenzene**
2-Chlorophenol	**Styrene**
1,2-Dichlorobenzene	1,1,2,2-Tetrachlorethane
1,3-Dichlorobenzene	Tetrachloroethylene (PCE)
1,4-Dichlorobenzene	**Toluene**

Dichlorodifluoromethane	1,2,4-Trichlorobenzene
1,1-Dichloroethane	1,1,1-Trichloroethane
1,2-Dichloroethane	1,1,2-Trichloroethane
1,1-Dichloroethylene	Trichloroethane
cis-1,2-Dichloroethylene	2,4,6-Trichlorophenol
trans-1,2-Dichloroethylene	1,2,3-Trichloropropane
1,2-Dichloropropane	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)
1,3-Dichloropropane	Trichlorofluoromethane (Freon-11)
Ethylbenzene	**1,2,4-Trimethylbenzene**
Ethylene dibromide (1,2-Dibromoethane)	**1,3,5-Trimethylbenzene**
Hexachlorobenzene	Vinyl acetate
Hexachloro-1,3-butadiene	Vinyl chloride (Chloroethene)
Hexachlorocyclopentadiene	**Xylenes (total)**
Hexachloroethane	GRO (see note 3 below)
Hydrazine	DRO (see note 3 below)
Isopropylbenzene (Cumene)	RRO (see note 3 below)

Notes:

1. Bolded chemicals should be investigated as volatile compounds when petroleum is present. If fuel containing additives (e.g., 1,2-dichloroethane, ethylene dibromide, methyl *tert*-butyl ether) were spilled, these chemicals should also be investigated.
2. If a chemical is not on this list, and not in Tables B of 18 AAC 75.345, the chemical has not been evaluated for volatility. Contact the ADEC risk assessor to determine if the chemical is volatile.
3. At this time, ADEC does not require evaluation of petroleum ranges GRO, DRO, or RRO for the indoor air inhalation (vapor intrusion) pathway.