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From:
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Date: April 28, 2020
Arcadis Project No.: 30042811.00005

Subject:
RACER Pontiac North Campus LNAPL Recovery Well RW/SB-08-14
Interim Measures Implementation, System Installation and Operation
Update

INTRODUCTION

On behalf of Revitalizing Auto Communities Environmental Response (RACER) Trust, Arcadis of Michigan, LLC (Arcadis) has prepared this memorandum to summarize the light non-aqueous phase liquid (LNAPL) Removal Interim Measure (IM) Work Plan implementation activities conducted at the location of recovery well RW-08-14 at the RACER Pontiac North Campus Site in Pontiac, Michigan (Site) (**Figures 1 and 2**). Proposed LNAPL Removal IM Work Plan measures were included in Arcadis' *Additional LNAPL Pre-Design / Transmissivity Testing and Interim Measure Removal Work Plan Technical Memorandum* (Arcadis 2018) which was submitted to the United States Environmental Protection Agency (USEPA) on August 27, 2018 and approved by USEPA on September 11, 2018. Recovery well RW-08-14 is located within Area of Interest (AOI) W-1 and LNAPL Area 2A at the Site (**Figure 2**).

RECOVERY WELL RW-08-14 INSTALLATION

Based on the results of transmissivity testing conducted at monitoring well SB-08-14 as detailed in the IM Work Plan, it was determined that LNAPL recovery was an appropriate interim remedial measure at this location. Upon USEPA approval of the IM Work Plan, Arcadis scheduled work activities to install a 6-inch diameter recovery well in the immediate vicinity of monitoring well SB-08-14. Arcadis retained GPRS, Inc.

(GPRS) to perform a private utility clearance, and Cascade Drilling, LP (Cascade) of Flint, Michigan to install the recovery well. As required for planned well drilling activities, Cascade contacted Michigan MISS-DIG prior to 72 hours before mobilization to perform a public utility clearance.

Arcadis mobilized to the Site with GPRS and Cascade to perform field activities on October 22nd, 2018. Public utilities were marked by MISS-DIG upon arrival, with the nearest marked utilities being underground and overhead electric lines along the paved entrance roadway to the east. GPRS performed a private utility clearance which did not result in identification of private utilities in the immediate vicinity of monitoring well SB-08-14. Following the utility clearance, Cascade first removed the three concrete protective bollards from the ground which surrounding monitoring well SB-08-14. Due to the layout of the area and to ensure proper placement of the recovery well in the location of recovery testing, it was then determined that SB-08-14 would be over-drilled rather than installing a new adjacent recovery well. Cascade proceeded with over-drilling monitoring well SB-08-14 down to 25 feet below ground surface (bgs), and a 6-inch recovery well was installed using sonic drilling methods. The recovery well (herein referred to as RW-08-14) was screened from 5-25 feet bgs based on lithology and previous monitoring well construction. RW-08-14 was completed as a flush mounted well with a concrete pad. The well construction log can be found in **Attachment 1**.

LNAPL REMOVAL EQUIPMENT & RECOVERY SHED SPECIFICATIONS, PURCHASE AND INSTALLATION

Upon installed of recovery well RW-08-14, Arcadis purchased LNAPL recovery equipment as proposed in the IM Work Plan. Components purchased from Geotech Environmental Equipment, Inc. included a Geotech A.C. Sipper with NEMA-3R enclosure and pressure/vacuum pump and gauge, well controller, canister pump, tank full shut off assembly, desiccant dryer kit, skimmer assembly, and other fittings and tubing to complete assembly. A transfer pump was also purchased for moving fluid from storage tanks to drums for disposal.

Upon USEPA approval of the IM Work Plan, Arcadis completed preliminary layout plans to facilitate secure operation of the LNAPL recovery system within a shed enclosure. Arcadis evaluated several pre-packaged and custom-built shed alternatives available on the market for purchase. Arcadis then retained Job Site Services (JSS) of Bay City, Michigan to complete the purchase, installation, and customization of the recovery shed which included ground anchoring, lockable double entry doors, heater, insulation, two louvers/dampers with vents, lighting, and two 275-gallon intermediate bulk containers (IBC) with a plastic-lined fabricated sheet metal secondary containment tub capable of containing the contents of both IBC's.

During the period of February 2-4, 2019, JSS installed a pre-constructed fabricated woodshed and subcontracted an electrician to fit the building with an electric meter, breaker box, control panel, electric heater, thermostat, lighting, and electric feed to Geotech A.C. Sipper System components. In preparation for the work activities, JSS contacted MISS-DIG to perform the public utility clearance to supplement prior private utility clearance activities conducted in the area. Prior to placement of the shed, JSS leveled the underlying ground surface with a back-hoe, and placed and leveled 21AA gravel on the ground surface to provide additional support for the shed. JSS then situated the shed into place, confirmed positioning and level surfaces, and anchored it into the ground at four corners.

To facilitate access to the recovery well and AC Sipper assembly, JSS cut-out an approximate 16-inch square section of the wood floor, and sealed the space under the shed surrounding the well with expanding spray foam. In addition, JSS ran an underground conduit to a nearby electric pole to facilitate connection by DTE Energy. Once the shed was anchored in place and simultaneous with JSS' inside

customization and electrician's work activities, Arcadis personnel installed the AC Sipper LNAPL removal system components to prepare the system for operation upon connection to DTE electrical service.

With the exception of the external electric meter with outdoor disconnect and grounding rod, all other electrical control panels, LNAPL recovery equipment, and tote storage containers are housed within the recovery shed. Details of the as-built recovery shed layout are depicted in **Figure 3**.

ELECTRICAL SERVICE CONNECTION

A connection with DTE Energy was arranged to provide electrical service to the LNAPL recovery shed. The initial request for 120 V single phase 60 amp service was placed with DTE in September 2018, and a meeting was held on-site with a DTE representative to verify the nearest connection point. DTE inspected the electrical meter, disconnect, ground and control panel in the shed as well as the conduit connection point upon installation in February. At that time, it was determined that the installation was sufficient, but DTE was required to install a step-down transformer on an existing DTE-owned electrical pole across the entrance road and run an overhead line to an electrical pole near the recovery shed which serviced a General Motors (GM) facility further to the north. This work was completed in mid-April 2018, which was shortly followed by DTE extending the line down the GM service pole and connecting it to the ground conduit extension previously installed by JSS. The locations of the poles are shown in **Figure 2**.

LNAPL RECOVERY SYSTEM STARTUP AND WASTE CHARACTERIZATION

Mounted above and inside of recovery well RW-08-14, the Geotech A.C. Sipper has a 4-inch skimmer that automatically adjusts to keep the pump intake in line with the LNAPL level in the well using a floating specific gravity intake to minimize water from being drawn up with the LNAPL. This skimmer is attached to a down well pneumatic pump. This pump is attached to both a 0.17-inch inner diameter (ID) airline that runs to the control panel and a 0.375-inch ID hose that discharges into two 275-gallon IBCs with secondary containment. The Geotech A.C. Sipper control panel is enclosed in a weather-proof NEMA 3R enclosure and mounted on the shed wall adjacent to the well. The well control panel includes the well controller, pump, and pressure gauge. It is also connected to an automatic shutoff switch for when the tank is full. Components and equipment in the recovery shed are depicted in photos located in **Attachment 2**.

After electrical service was established in late April 2019, Arcadis commenced trial start-up of the AC Sipper recovery system to ensure proper operation. In addition, Arcadis collected LNAPL samples to verify 3-point temperature testing for viscosity, density, and specific gravity on April 26, 2019. Samples were submitted to PTS Laboratories, Inc. Laboratory results are included in **Attachment 3**. The results show specific gravity within the range of 0.8795 - 0.8874, density within the range of 0.8734 – 0.8795 grams per cubic centimeter (g/cc), and viscosity within the range of 21.3 – 56.67 centipoise within a temperature range of 35 to 70 degrees Fahrenheit. Based on the laboratory results, LNAPL properties were within the skimmer unit's capacity for recoverability.

During trial operation, it was determined that the skimmer component of the AC Sipper system was not working properly and needed replacement. On May 2, 2019, a replacement skimmer component was

installed, and after the intake air and outlet fluid lines were cleared of debris, the LNAPL recovery system was found to be fully functional.

After installation of the recovery well and shed, and before startup of trial operations, Arcadis completed waste profiles and obtained competitive pricing reflecting characterization of the LNAPL waste as a liquid Toxic Substances Control Act (TSCA) waste but non-hazardous under the Resource Conservation and Recovery Act (RCRA) consistent with that specified in the approved IM Work Plan. A decision to utilize Clean Harbors for transportation and treatment/disposal (via incineration) at its Deer Park, LLC licensed TSCA liquid waste facility in La Porte, Texas. A copy of the waste profile and February 22, 2019 Clean Harbors approval are included in **Attachment 4**.

OPERATIONS & MAINTENANCE

The LNAPL Recovery System has been regularly monitored since the commencement of trial operations on April 26, 2019. Key operational parameters were established and have been consistently recorded once fluent operations were achieved on May 2, 2019. Initially over the first four months of operation, the system was monitored on the average of three days per week. Objectives were to not only ensure proper operation of the recovery system, but also to adjust the compressor operation duration and frequency based on the thickness and volume of LNAPL being recovered from the well. This included minimization of the amount of water being recovered, for which the primary adjustments were made in the first week of trial operation. As operations have stabilized since August 2019, the system has been monitored less frequently typically once per week. The skimmer set point is periodically adjusted based on the fluctuating groundwater table and LNAPL levels. Based on steady state operations, LNAPL thickness has been typically maintained at an average of approximately 0.1 inch.

From startup to March 17, 2020, the system has recovered 235 gallons of total fluids. Of this amount recovered, approximately 120 gallons separated to the top of the IBCs over time and is identified as LNAPL. The balance represents groundwater. Monitoring data related to system operation is documented in **Table 1**.

On November 7, 2019, Clean Harbors, removed three 55-gallon drums of liquid TSCA waste for transportation and disposal at its TSCA-licensed treatment, storage and disposal (TSD) facility in La Porte, Texas. The executed waste manifest associated with the drum shipment is included in **Attachment 4**.

LNAPL TRANSMISSIVITY AND CUMULATIVE RECOVERY

LNAPL transmissivity represents the volumetric rate of LNAPL flow through a unit width of porous media per unit time under a unit hydraulic gradient. LNAPL transmissivity is an ideal parameter for assessing LNAPL recoverability, inherently accounting for the combined effects of aquifer matrix permeability, LNAPL physical properties, and the relative proportion of pore space occupied by LNAPL within a specified vertical interval of aquifer material.

Prior to installation of the recovery well, monitoring well SB-08-14 produced transmissivity testing results which exceeded the Interstate Technology and Regulatory Council (ITRC) practical lower limit of LNAPL recoverability range of 0.1 to 0.8 square feet ft²/day (ITRC 2009) and the Michigan Department of Environment, Great Lakes and Energy (EGLE; formerly the Michigan Department of Environmental Quality (MDEQ)) lower limit LNAPL transmissivity value of 0.5 ft²/day (MDEQ 2014) which indicated that removal activities were feasible.

As outlined in the approved Arcadis 2018 IM Work Plan, the system will be shut down when data from the field indicates that transmissivity values drop below the EGLE lower limit LNAPL transmissivity value of 0.5 ft²/day. LNAPL volume removal was tracked from system operation start-up in May 2019 and LNAPL recovery volumes and cumulative LNAPL recovery volumes are shown in **Attachment 5**. The recovery system fluid measurements and LNAPL volumes recovered were used to calculate monthly transmissivity estimates (ASTM International 2013; Equations 16 and 17) which are included in **Attachment 5**. Details of the ASTM equations including inputs, definitions and an example calculation are also included behind the transmissivity chart in **Attachment 5**.

Overall, transmissivity at RW-08-14 has been decreasing since operation start-up in May 2019. Transmissivity has fallen, and currently remains below EGLE threshold of 0.5 ft²/day.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations based on the results of system operation and monitoring include the following:

- Continue normal operations and maintenance of the recovery system through the end of July 2020. If recovery system data continues to indicate that transmissivity remains below the EGLE threshold through this time (after 15 months of operation since start-up), the system will be temporarily turned off to allow for additional accumulation of LNAPL in the recovery well sufficient to conduct a short-term transmissivity test via manual skimming or baildown methods. The purpose of the testing is to evaluate the feasibility of continued LNAPL system operation at the RW-08-14 location.

The preferred or target thickness of LNAPL accumulation to conduct the testing is approximately 0.5 ft (6 inches of LNAPL). Per ASTM (ASTM 2013) and EGLE (MDEQ 2014), a minimum in-well accumulation of 0.2 foot (2.4 inches) is recommended as the threshold value for performing short-term transmissivity. Testing will be conducted upon accumulation of 6 inches of LNAPL, or after three months of temporary shut down if at least 2.4 inches of LNAPL accumulates. If the minimum thickness has not been achieved after six months of shut down, available system monitoring data will be utilized to estimate transmissivity and make a recommendation regarding continued LNAPL system operation.

Please contact us if you have any questions regarding this memo or its attachments.

Sincerely,

Arcadis of Michigan, LLC



Brad Saunders, P.E.

Principal Engineer/ Certified Project Manager

Table

Table 1 RW-08-14 LNAPL Recovery System Log 2019-2020

Figures

Figure 1 Site Layout Map

Figure 2 Area of Interest Location

Figure 3 Recovery Shed Layout

Attachments

Attachment 1 RW-08-14 Recovery Well Construction Log

Attachment 2 Photographic Log

Attachment 3 LNAPL Laboratory Report

Attachment 4 Approved Waste Profile and Executed Waste Manifest

Attachment 5 LNAPL Recovery and Transmissivity Charts

References

Arcadis. 2018. RACER Pontiac North Campus – 2018 Additional LNAPL Pre-Design / Transmissivity Testing and Interim Measure Removal Work Plan Memorandum. August 27, 2018.

ASTM. 2013. Standard Guide for Estimation of LNAPL Transmissivity. ASTM Standard E2856 -13. ASTM International, West Conshohocken, Pennsylvania.

Interstate Technology & Regulatory Council (ITRC). 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org

Michigan Department of Environmental Quality (MDEQ). 2014. Non-Aqueous Phase Liquid (NAPL) Characterization, Remediation, and Management for Petroleum Releases. RRD Resource Materials-25-2014-01. June 2014.

TABLES

Table 1
RW-08-14 LNAPL Recovery System Log 2019-2020
RACER Trust Pontiac North Campus
Pontiac, MI

Date	RW-08-14 Depth to Product (ft)	RW-08-14 Depth to Water (ft)	RW-08-14 LNAPL Thickness (ft)	Depth to Center of Skimmer Guide (ft)	East IBC Tote Total Fluid Recovered (Gal)	East ICB Tote Total LNAPL Volume Separated (Gal)	West IBC Tote Total Fluid Recovered (Gal)	West IBC Tote LNAPL Volume Separated (Gal)	Total Fluid Recovered (Gal)	Total LNAPL Volume Separated (Gal)	Vacuum Setpoint (Min:Sec)	Pressure Setpoint (Min:Sec)	Delay Setpoint (Min:Sec)	Dessicant Status, Change Required? (Y/N)	Notes
04/26/19	--	--		--	--	--	--	--	--	--	*	*	*		Electricity service on, trial operation begins, LNAPL samples collected for laboratory analysis
05/02/19	8.88	10.15	1.27	9.50	--	--	--	--	--	--	*	*	*		AC Sipper skimming unit replaced
05/06/19	8.74	9.01	0.27	9.50	--	--	--	--	--	--	*	*	*		* Multiple settings/adjustments
05/09/19	8.10	8.70	0.60	9.50	--	--	--	--	--	--	*	*	*		
05/13/19	8.61	8.65	0.04	9.50	--	--	--	--	105	25	0:30	0:30	9:00	N	
05/21/19	8.81	8.88	0.07	9.75	--	--	--	--	106	26	0:30	0:30	14:00	N	
05/23/19	8.66	8.71	0.05	9.75	--	--	--	--	107	27	0:30	0:30	14:00	N	Ordered dessicant for stock
05/28/19	8.45	9.10	0.65	9.75	--	--	--	--	--	--	0:30	0:30	9:00	N	
05/30/19	8.53	9.58	1.05	9.25	--	--	--	--	--	--	0:30	0:30	9:00	N	
06/04/19	8.56	8.65	0.09	9.25	--	--	--	--	111	35	0:30	0:30	9:00	N	
06/07/19	8.57	8.60	0.03	9.25	--	--	--	--	111	35	0:30	0:30	9:00	N	
06/10/19	8.55	8.64	0.09	9.25	--	--	--	--	111	35	0:30	0:30	9:00	N	
06/14/19	8.14	8.21	0.07	9.25	--	--	--	--	115	40	0:30	0:30	9:00	N	
06/18/19	7.79	7.81	0.02	9.25	--	--	--	--	--	40	0:30	0:30	9:00	N	
06/21/19	8.00	8.10	0.10	9.25	--	--	--	--	116	40	0:30	0:30	9:00	N	
06/24/19	8.00	8.09	0.09	9.25	--	--	--	--	116	40	0:30	0:30	9:00	N	
06/28/19	8.45	8.50	0.05	9.25	--	--	--	--	116	40	0:30	0:30	9:00	N	
07/01/19	8.64	8.70	0.06	9.25	--	--	--	--	--	--	0:30	0:30	9:00	N	
07/02/19	8.71	8.79	0.08	9.25	--	--	--	--	118	43	0:30	0:30	9:00	N	
07/05/19	8.95	9.05	0.10	9.25	--	--	--	--	118	43	0:30	0:30	9:00	N	
07/08/19	9.14	9.28	0.14	9.25	--	--	--	--	118	43	0:30	0:30	9:00	N	
07/11/19	9.28	9.39	0.11	9.25	--	--	--	--	119	44	0:30	0:30	9:00	N	
07/15/19	9.64	9.73	0.09	9.25	--	--	--	--	120	45	0:30	0:30	9:00	N	
07/17/19	9.43	9.50	0.07	9.25	--	--	--	--	120	45	0:30	0:30	9:00	N	
07/19/19	9.45	9.53	0.08	9.25	--	--	--	--	120	45	0:30	0:30	9:00	N	
07/22/19	9.52	9.76	0.24	9.25	--	--	--	--	120	45	0:30	0:30	9:00	N	
07/25/19	9.73	9.83	0.10	9.25	--	--	--	--	123	48	0:30	0:30	9:00	N	
07/29/19	9.81	9.95	0.14	9.25	--	--	--	--	123	48	0:30	0:30	9:00	N	
07/31/19	9.92	10.03	0.11	9.25	--	--	--	--	124	49	0:30	0:30	9:00	N	
08/05/19	10.30	10.41	0.11	9.25	--	--	--	--	--	--	0:30	0:30	9:00	N	
08/06/19	10.03	10.15	0.12	9.25	50	20	75	30	125	50	0:30	0:30	9:00	Y	Opened fluid equalization valve to second ICB
08/09/19	10.29	10.44	0.15	9.25	50	20	75	30	125	50	0:30	0:30	9:00	N	
08/14/19	10.38	10.64	0.26	9.25	50	20	75	30	125	50	0:30	0:30	9:00	N	
08/16/19	10.40	11.00	0.60	9.25	50	20	76	31	126	51	0:30	0:30	9:00	N	
08/20/19	10.01	10.15	0.14	9.25	50	20	77	32	127	52	0:30	0:30	9:00	N	
08/23/19	9.99	10.02	0.03	9.25	50	20	77	32	127	52	0:30	0:30	9:00	N	
08/26/19	9.90	10.02	0.12	9.25	50	20	79	33	129	53	0:30	0:30	9:00	N	
08/30/19	10.18	10.32	0.14	9.25	50	20	80	34	130	54	0:30	0:30	9:00	N	
09/03/19	10.22	10.36	0.14	9.25	50	20	80	34	130	54	0:30	0:30	9:00	N	
09/06/19	10.32	10.60	0.28	9.25	50	20	82	35	132	55	0:30	0:30	9:00	N	
09/10/19	10.45	11.12	0.67	9.25	50	20	82	35	132	55	0:30	0:30	9:00	N	

Table 1
RW-08-14 LNAPL Recovery System Log 2019-2020
RACER Trust Pontiac North Campus
Pontiac, MI

Date	RW-08-14 Depth to Product (ft)	RW-08-14 Depth to Water (ft)	RW-08-14 LNAPL Thickness (ft)	Depth to Center of Skimmer Guide (ft)	East IBC Tote Total Fluid Recovered (Gal)	East ICB Tote Total LNAPL Volume Separated (Gal)	West IBC Tote Total Fluid Recovered (Gal)	West IBC Tote LNAPL Volume Separated (Gal)	Total Fluid Recovered (Gal)	Total LNAPL Volume Separated (Gal)	Vacuum Setpoint (Min:Sec)	Pressure Setpoint (Min:Sec)	Delay Setpoint (Min:Sec)	Dessicant Status, Change Required? (Y/N)	Notes
09/13/19	10.10	10.22	0.12	9.25	50	20	82	35	132	55	0:30	0:30	9:00	N	
09/17/19	9.53	9.65	0.12	9.25	50	20	85	36	135	56	0:30	0:30	9:00	N	
09/20/19	9.52	9.64	0.12	9.25	50	20	85	36	135	56	0:30	0:30	9:00	N	
09/24/19	9.73	9.85	0.12	9.25	50	20	87	37	137	57	0:30	0:30	9:00	N	
09/27/19	9.94	10.02	0.08	9.25	50	20	87	37	137	57	0:30	0:30	9:00	N	
09/30/19	9.83	9.98	0.15	9.25	50	20	88	38	138	58	0:30	0:30	9:00	N	
10/04/19	9.58	9.70	0.12	9.25	50	20	89	39	139	59	0:30	0:30	9:00	N	
10/08/19	9.40	9.53	0.13	9.25	50	20	90	40	140	60	0:30	0:30	9:00	N	
10/10/19	9.42	9.55	0.13	9.25	50	20	90	40	140	60	0:30	0:30	9:00	N	
10/14/19	9.64	9.78	0.14	9.25	50	20	92	42	142	62	0:30	0:30	9:00	N	
10/21/19	9.97	10.14	0.17	9.25	50	20	95	45	145	65	0:30	0:30	9:00	N	
10/24/19	10.30	10.48	0.18	9.25	50	20	95	45	145	65	0:30	0:30	9:00	N	
10/28/19	10.10	10.25	0.15	9.25	50	20	95	45	145	65	0:30	0:30	9:00	N	
11/04/19	9.18	9.27	0.09	9.25	50	20	97	47	147	67	0:30	0:30	9:00	N	Transfer Liquid TSCA Waste to 3 Drums for off site TSD shipment
11/11/19	9.37	9.50	0.13	9.25	0	0	4	4	4	4	0:30	0:30	9:00	N	
11/14/19	9.57	9.62	0.05	9.25	0	0	5	5	5	5	0:30	0:30	9:00	N	
11/18/19	9.62	9.78	0.16	9.25	0	0	6	6	6	6	0:30	0:30	9:00	N	
11/25/19	9.82	9.97	0.15	9.25	0	0	10	10	10	10	0:30	0:30	9:00	N	
12/04/19	9.30	9.40	0.10	9.25	0	0	10	10	10	10	0:30	0:30	9:00	N	
12/09/19	9.29	9.38	0.09	9.25	0	0	15	10	15	10	0:30	0:30	9:00	N	
12/16/19	9.75	9.83	0.08	9.25	0	0	20	15	20	15	0:30	0:30	9:00	Y	
12/24/19	10.13	10.30	0.17	9.25	0	0	20	15	20	15	0:30	0:30	9:00	N	
12/30/19	10.28	10.42	0.14	9.25	0	0	21	16	20	16	0:30	0:30	9:00	N	
01/06/20	9.95	10.08	0.13	9.25	0	0	25	17	25	17	0:30	0:30	9:00	N	
01/16/20	8.01	8.10	0.09	9.25	0	0	26	25	26	25	0:30	0:30	9:00	N	
01/20/20	8.75	8.83	0.08	9.25	0	0	28	25	28	25	0:30	0:30	9:00	N	
01/30/20	7.22	7.32	0.10	9.13	0	0	75	40	75	40	0:30	0:30	9:00	N	Clean/Rinse Skimmer Unit, Adjust Setting
02/06/20	7.55	7.70	0.15	9.13	0	0	80	45	80	45	0:30	0:30	9:00	N	
02/13/20	8.11	8.26	0.15	9.13	0	0	81	46	81	46	0:30	0:30	9:00	N	
02/25/20	8.55	8.65	0.10	9.13	0	0	85	48	85	48	0:30	0:30	9:00	Y	
03/04/20	8.40	8.52	0.12	9.13	0	0	87	52	87	52	0:30	0:30	9:00	N	
03/09/20	8.61	8.72	0.11	9.13	0	0	89	54	89	54	0:30	0:30	9:00	N	
03/17/20	8.96	9.07	0.11	9.13	0	0	92	57	92	57	0:30	0:30	9:00	N	

Abbreviations

ft = feet

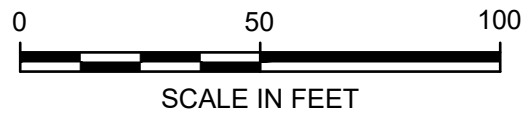
gal = gallon

Notes:

1. Depth measurements taken from top of casing
2. The skimmer guide is 4 feet long from top centralizer to bottom centralizer.
3. When adjusting the skimmer position, the center of the guide rod is set to the product/water interface depth.

FIGURES

CITY: DIV/GRUP: DB: LD: PIC: PM: TM: LVR:ON=OFF=REF- DIGIS/Project Files/Motors/Liquidation/Company/PontiacNorthCampusCAD_Data/StormDesign/PNC_01_SiteLayout.dwg LAYOUT: LNAPL_SHED_LOCATION SAVED: 4/9/2020 3:30 PM ACADVER: 25.05 (LMS TECH) PAGES: 1 PLOTSTYLETABLE: ARCADIS_NOV1.CTB PLOTTED: 4/10/2020 11:27 AM BY: YARBROUGH, TOBI



THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
1	7/5/2018	General revisions to all sheets. Removed Sheet M-5	TRY	MW

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Project Mgr.
BS
Designed by
DMS
Drawn by
TRY
Checked by
MRW



RACER TRUST
PONTIAC NORTH CAMPUS

LNAPL SHED LOCATION

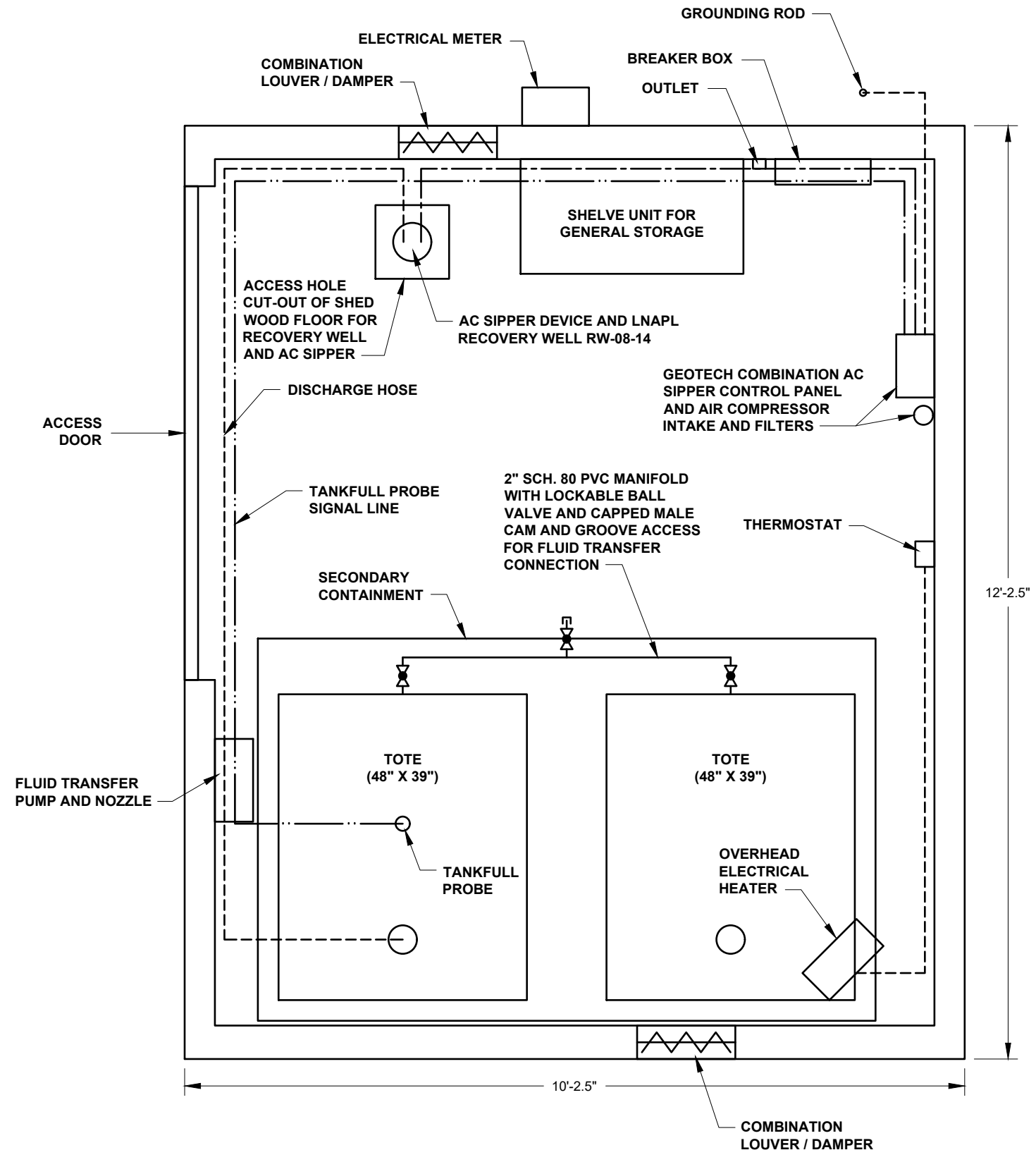
GENERAL

ARCADIS Project No.
30042811.00005

Date
APRIL 2020

ARCADIS
ARCADIS OF MICHIGAN, LLC.
300 S. WASHINGTON
SQUARE, STE 315
LANSING, MICHIGAN 48933

CITY: DIV/GRU/UP: DB: LD: PIC: PM: TM: LYR:ON=OFF=REF- D:\GIS\Project Files\MotoristsLiquitation\Company\PontiacNorthCampus\CAD_Data\StormDesign\PNC_01_SiteLayout.dwg LAYOUT: LNAPL_SHED_DETAILS_SAVED: 4/19/2020 3:30 PM ACADVER: 23.05 (LMS TECH) PAGES: 1/1 PLOT: 4/10/2020 11:26 AM BY: YARBROUGH, TOBI



- NOTES**
1. PRE-FABRICATED WOOD CONSTRUCTION 10' X 12' X 7' HIGH SHED WITH OSB WALLS AND R-13 FACED 2X4 INSULATION ANCHORED INTO GROUND AT 4 LOCATIONS.
 2. VENTILATION PROVIDED BY MEANS TWO MANUAL MECHANICAL COMBINATION LOUVER / DAMPERS ON NORTH AND SOUTH SIDES.
 3. TWO 275-GALLON CAPACITY PLASTIC IBC TOTES FOR LNAPL COLLECTION & TEMPORARY STORAGE. TOTES ARE PLUMBED TOGETHER WITH VALVES TO ALLOW FOR CONTROLLABLE FLUID TRANSFER. A TRANSFER PUMP FACILITATES EXTERNAL TRANSFER TO DRUMS FOR OFF-SITE TRANSPORTATION TO A TSCA-LICENSED TSD FACILITY.
 4. SECONDARY CONTAINMENT CONSISTS OF A FABRICATED SHEET METAL SEALED TUB (96" X 60" X 24" HIGH) EXISTING BELOW AND AROUND THE STORAGE TOTES AND IS ALSO EQUIPPED WITH AN INTERNAL PLASTIC LINER. CONTAINMENT CAPACITY IS APPROXIMATELY 600 GALLONS CAPABLE OF CONTAINING THE CONTENTS OF BOTH TOTES.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:		USE TO VERIFY FIGURE REPRODUCTION SCALE	
No.	Date	Revisions	By
1	7/5/2018	General revisions to all sheets. Removed Sheet M-5	TRY MW
THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.			

Project Mgr. BS
 Designed by DMS
 Drawn by TRY
 Checked by MRW

ARCADIS OF MICHIGAN, LLC.

RACER TRUST
 PONTIAC NORTH CAMPUS

LNAPL RECOVERY SHED DETAILS

GENERAL

ARCADIS Project No. 30042811.00005
Date APRIL 2020
ARCADIS ARCADIS OF MICHIGAN, LLC. 300 S. WASHINGTON SQUARE, STE 315 LANSING, MICHIGAN 48933

Attachment 1

RW-08-14 Recovery Well Construction Log

Soil Boring Log

Project Name: RACER PNC Date Started: 10/22/2018 Logger: K. Briggs
 Project Number: 30042811 Date Completed: 10/22/2018 Editor: C. Barton
 Project Location: Pontiac, MI Weather Conditions: Sunny, 60F

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1							***Lithology taken from SB-08-14. Location was overdrilled for RW-08-14 installation (0.0-2.0') PEBBLES, medium to large, subangular to angular; and SAND, fine to medium; poorly sorted; dry; dark brown (10YR 4/3). NOTE: Slag at 1.0' bgs.	(0.0-0.5') Cement (0.5-1.0') Fill Sand	
2							(2.0-9.0') CLAY, low plasticity; some very fine to fine sand; trace small to medium pebbles, subrounded to subangular; moist; soft; dark olive gray (5Y 3/2). NOTE: Moderate odor from 2.0'-4.0' bgs.	(1.0-3.5') Bentonite Pellets	
3								(0.5-5.0' bgs) 2" Sch 40 PVC Well Casing	
4									
5									
6									
7									
8									
9							NOTE: Moist at 8.5' bgs.		
10							(9.0-11.0') SAND, very fine; some silt; well sorted; wet; gray (5Y 5/1). NOTE: Moderate odor.		
11									
12							(11.0-15.0') SAND, very fine to fine; little silt; poorly sorted; wet; olive gray (5Y 4/2). NOTE: Moderate odor.	(3.5-25.5') Filter Pack Sand	
13		306			NA				
14									
15									
16							(15.0-25.0') SAND, fine to medium; trace silt; poorly sorted; wet; olive (5YR 4/3). NOTE: Strong odor; oily residue.		
17									
18							NOTE: Little coarse to very coarse sand at 18.0' bgs. Some silt at 18.5'-19.0' bgs.		
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: NA Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): NA
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: Lithology taken from SB-08-14. Location was overdrilled for RW-08-14 installation. Converted to Well: Yes No
 Surface Elev.: _____
 North Coor.: _____
 East Coor.: _____

SOIL BORING LOG - 2013 C:\USERS\AVIESTHUIS\DESKTOP\RACER PNC - RW-08-14_04162020.GPJ ARCADIS_2013.GDT 4/16/20

Soil Boring Log

Project Name: RACER PNC Date Started: 10/22/2018 Logger: K. Briggs
 Project Number: 30042811 Date Completed: 10/22/2018 Editor: C. Barton
 Project Location: Pontiac, MI Weather Conditions: Sunny, 60F

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]					[Dotted pattern]	(15.0-25.0') SAND, fine to medium; trace silt; poorly sorted; wet; olive (5YR 4/3). NOTE: Strong odor; oily residue.	(3.5-25.5') Filter Pack Sand (5.0-25.0') 6" PVC 10-Slot Well Screen (5.0-25.0') 6" PVC 10-Slot Well Screen	[Well diagram]
22									
23									
24									
25									
26						[Diagonal hatched pattern]	(25.0-25.5') CLAY, high plasticity; little silt, moist; soft; gray (10YR 5/1).		
27							End of boring at 25.5' bgs.		
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Attachment 2

Photographic Log

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 1

Date:

September 5, 2018

Description:

Monitoring well SB-08-14
protected by concrete
bollards

Location:

South end of Proastio-
owned property



Photo: 2

Date:

October 23, 2018

Description:

Recovery well RW-08-14
installation location, facing
South

Location:

South end of Proastio-
owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 3

Date:

October 23, 2018

Description:

RW-08-14 completed well pad

Location:

South end of Proastio-owned property



Photo: 4

Date:

February 6, 2019

Description:

Pre-constructed recovery shed as purchased and set in place over RW-08-14, prior to anchoring and build-out

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 5

Date:

February 6, 2019

Description:

Pre-constructed recovery shed after anchoring in place with electrical devices installed, facing east

Location:

South end of Proastio-owned property



Photo: 6

Date:

February 6, 2019

Description:

Pre-constructed recovery shed with electrical external disconnect, meter, and underground conduit extension, facing south

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 7

Date:

February 6, 2019

Description:

Electrical grounding rod installed near base of north side of recovery shed.

Location:

South end of Proastio-owned property



Photo: 8

Date:

February 6, 2019

Description:

Underground conduit connection emerging at nearby electrical pole servicing GM.

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI

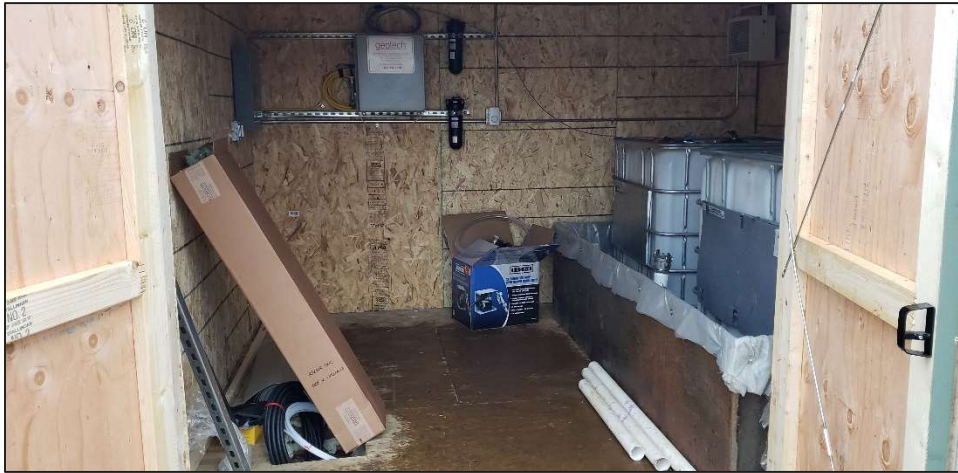


Photo: 9

Date:

February 6, 2019

Description:

Inside view of recovery shed during build-out

Location:

South end of Proastio-owned property



Photo: 10

Date:

February 6, 2019

Description:

RW-08-14 cut-out in recovery shed wood floor for access

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 11

Date:

February 6, 2019

Description:

Breaker box, Geotech A.C. Sipper control panel, air compressor intake, and desiccant filters inside recovery shed

Location:

South end of Proastio-owned property



Photo: 12

Date:

February 6, 2019

Description:

Tank full shut off assembly connected to A.C. Sipper control unit and mounted on IBC container

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 13

Date:

February 6, 2019

Description:

View of two IBCs staged inside plastic lined sheet metal secondary containment tub during build-out

Location:

South end of Proastio-owned property



Photo: 14

Date:

February 6, 2019

Description:

View of shut-off valves and IBC plumbing connections as installed during build-out for controllable fluid transfer

Location:

South end of Proastio-owned property

Project Photographs

RACER Pontiac North Campus
Pontiac, MI



Photo: 15

Date:

March 27, 2020

Description:

Transfer pump on wall allows for external transfer of LNAPL to drums for off-site transportation to a licensed TSCA TSD facility

Location:

South end of Proastio-owned property

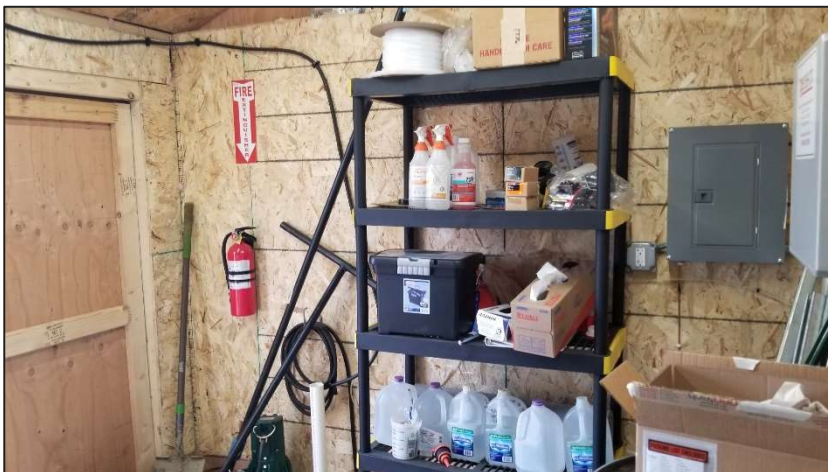


Photo: 16

Date:

March 27, 2020

Description:

View of shelving unit placed along recovery shed north wall for equipment storage

Location:

South end of Proastio-owned property

Attachment 3

LNAPL Laboratory Report



6016 Centralcrest St. • Houston, TX 77092
Telephone (713) 316-1800 • Fax (877) 225-9953

May 3, 2019

Brad Saunders,
Project Manager,
Arcadis.
28550 Cabot Dr. Suite 500,
Novi, MI 48377.

Re: PTS File No: 49057
Project Name: Racer PNC,
Project Number: B0064607.2019.00005
Site Location: Pontiac, MI

Subject: **3-Point Viscosity / Density & Specific Gravity of LNAPL – (2 Samples)**

Dear Brad Saunders,

Please find enclosed report for Physical Properties analyses conducted upon samples received from your **Racer PNC** project. All analyses were performed by applicable ASTM, EPA, or API methodologies. The samples are currently in storage and will be retained for thirty days past the completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples.

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please contact me or Emeka Anazodo at (713) 316-1800.

Sincerely,
PTS Laboratories, Inc.

C.A.Umeh

Chidi Umeh
Flow Laboratory Supervisor

Encl.

Project Name: Racer PNC
Project Number: B0064607.2019.00005

PTS File No: #####
Client: Arcadis

TEST PROGRAM - 20190501

FLUID ID	Date	Time	Fluid Type	3-Point	Fluid	Comment
				Viscosity / Density & Specific Gravity (35°F,55°F,70°F)	Cleaning	
				Method: LNAPL / DNAPL	Proprietary	
Date Received: 20190430				ASTM D445, D1481		
TOTE_LNAPL_042619	4-26-19	1400	NAPL	X	X	6- 40ml vial bottles
SB-08-14_LNAPL_042619	4-26-19	1410	NAPL	X	X	6- 40ml vial bottles
TOTALS:			12 Vials	2	2	2

Laboratory Test Program Notes

Standard TAT for basic analysis is 10-15 business days. completion of analyses.

Viscosity: LNAPL ;3 Temperatures(35°F,55°F,70°F)-includes density and Specific gravity

PTS File No: 49057
 Client: Arcadis
 Report Date: 05/03/19

VISCOSITY, DENSITY, and SPECIFIC GRAVITY DATA
 (METHODOLOGY: ASTM D445, ASTM D1481, API RP40)

Project Name: Racer PNC
 Project No: B0064607.2019.00005

SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY	
					centistokes	centipoise
TOTE_LNAPL_042619	LNAPL	35	0.8874	0.8872	63.87	56.67
		55	0.8853	0.8792	36.14	31.78
		70	0.8858	0.8734	24.44	21.35
SB-08-14_LNAPL_042619	LNAPL	35	0.8874	0.8872	60.55	53.72
		55	0.8852	0.8790	34.02	29.91
		70	0.8795	0.8734	24.39	21.30

QUALITY CONTROL DATA

Date: 05/02/19
 FLUID TYPE: Cannon® CVS S3
 TEMPERATURE, °F: 70
 DENSITY, MEASURED: 0.8614
 DENSITY, PUBLISHED: 0.8615
 RPD: -0.01
 VISCOSITY, MEASURED: 4.49
 VISCOSITY, PUBLISHED: 4.47
 RPD: 0.45

CVS Lot #: 17301

CVS = Certified Viscosity Standard

COMPANY
Arcadis

ADDRESS CITY ZIP CODE
28550 Cabot Dr. Ste 500 Novi MI 48377

PROJECT MANAGER email
Brad Saunders Brad.Saunders@arcadis.com

PROJECT NAME PHONE NUMBER
Racer PNC 517-974-4441

PROJECT NUMBER FAX NUMBER
~~200616~~ B0064607.2019.0005 248-944-7241

SITE LOCATION
Pontiac, MI

SAMPLER SIGNATURE
Matthew Williams

ANALYSIS REQUEST

PO# B0064607.2019.0005

TURNAROUND TIME
24 HOURS 5 DAYS
72 HOURS NORMAL

OTHER: _____

SAMPLE INTEGRITY (CHECK):
INTACT _____ TEMP(F) _____

PTS QUOTE NO. _____

PTS FILE:
49057

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	3-POINT VISCOSITY, DENSITY ASTM D445, D1431, API RP40	COMMENTS
TOTE_LNAPL_042619	4-26-19	14:00	NA																					X	@ 70, 55, 35°F
SB-08-14_LNAPL_042619	4-26-19	14:10	NA																					X	@ 70, 55, 35°F
																									*SAMPLES CONTAIN PCBs *

1. RELINQUISHED BY <i>Matthew Williams</i>	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY <i>Omyeka</i>
COMPANY Arcadis	COMPANY	COMPANY	COMPANY PTS Labs
DATE 4-26-19	TIME 17:30	DATE	TIME 4/30/19 9:45am

Attachment 4

Approved Waste Profile and Executed Waste Manifest



WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No. CH1794196

A. GENERAL INFORMATION

GENERATOR EPA ID #/REGISTRATION #	MICESQG	GENERATOR NAME:	RACER Trust
GENERATOR CODE (Assigned by Clean Harbors)	RA25579	CITY	Pontiac
ADDRESS	501 North Glenwood Avenue	STATE/PROVINCE	MI
		ZIP/POSTAL CODE	48340
CUSTOMER CODE (Assigned by Clean Harbors)	AR2252	CUSTOMER NAME:	Arcadis
ADDRESS	28550 Cabot Drive Suite 500	CITY	Novi
		STATE/PROVINCE	MI
		ZIP/POSTAL CODE	48377

B. WASTE DESCRIPTIONWASTE DESCRIPTION: **TSCA PCB OILS (<500 PPM PCB)**

PROCESS GENERATING WASTE:

IS THIS WASTE CONTAINED IN SMALL PACKAGING CONTAINED WITHIN A LARGER SHIPPING CONTAINER ? **No****C. PHYSICAL PROPERTIES (at 25C or 77F)**

PHYSICAL STATE SOLID WITHOUT FREE LIQUID POWDER MONOLITHIC SOLID <input checked="" type="checkbox"/> LIQUID WITH NO SOLIDS LIQUID/SOLID MIXTURE % FREE LIQUID % SETTLED SOLID % TOTAL SUSPENDED SOLID SLUDGE GAS/AEROSOL	NUMBER OF PHASES/LAYERS <input checked="" type="checkbox"/> 1 2 3 TOP 0.00 % BY VOLUME (Approx.) MIDDLE 0.00 BOTTOM 0.00			VISCOSITY (If liquid present) 1 - 100 (e.g. Water) <input checked="" type="checkbox"/> 101 - 500 (e.g. Motor Oil) 501 - 10,000 (e.g. Molasses) > 10,000	COLOR <u>VARIES</u>
	ODOR <input checked="" type="checkbox"/> NONE MILD STRONG Describe:	BOILING POINT °F (°C) <= 95 (<=35) 95 - 100 (35-38) 101 - 129 (38-54) <input checked="" type="checkbox"/> >= 130 (>54)		MELTING POINT °F (°C) < 140 (<60) 140-200 (60-93) > 200 (>93)	TOTAL ORGANIC CARBON <= 1% 1-9% <input checked="" type="checkbox"/> >= 10%
FLASH POINT °F (°C) < 73 (<23) 73 - 100 (23-38) 101 - 140 (38-60) 141 - 200 (60-93) <input checked="" type="checkbox"/> > 200 (>93)	pH <= 2 2.1 - 6.9 <input checked="" type="checkbox"/> 7 (Neutral) 7.1 - 12.4 >= 12.5	SPECIFIC GRAVITY < 0.8 (e.g. Gasoline) <input checked="" type="checkbox"/> 0.8-1.0 (e.g. Ethanol) 1.0 (e.g. Water) 1.0-1.2 (e.g. Antifreeze) > 1.2 (e.g. Methylene Chloride)	ASH < 0.1 > 20 <input checked="" type="checkbox"/> 0.1 - 1.0 Unknown 1.1 - 5.0 5.1 - 20.0	BTU/LB (MJ/kg) < 2,000 (<4.6) 2,000-5,000 (4.6-11.6) 5,000-10,000 (11.6-23.2) <input checked="" type="checkbox"/> > 10,000 (>23.2) Actual:	

D. COMPOSITION (List the complete composition of the waste, include any inert components and/or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN	MAX	UOM
MINERAL OIL DIELECTRIC FLUID	100.0000000	100.0000000	%
POLYCHLORINATED BIPHENYLS	50.0000000	499.0000000	PPM

DOES THIS WASTE CONTAIN ANY HEAVY GAUGE METAL DEBRIS OR OTHER LARGE OBJECTS (EX., METAL PLATE OR PIPING >1/4" THICK OR >12" LONG, METAL REINFORCED HOSE >12" LONG, METAL WIRE >12" LONG, METAL VALVES, PIPE FITTINGS, CONCRETE REINFORCING BAR OR PIECES OF CONCRETE >3")? YES NO

If yes, describe, including dimensions:

DOES THIS WASTE CONTAIN ANY METALS IN POWDERED OR OTHER FINELY DIVIDED FORM? YES NODOES THIS WASTE CONTAIN OR HAS IT CONTACTED ANY OF THE FOLLOWING; ANIMAL WASTES, HUMAN BLOOD, BLOOD PRODUCTS, BODY FLUIDS, MICROBIOLOGICAL WASTE, PATHOLOGICAL WASTE, HUMAN OR ANIMAL DERIVED SERUMS OR PROTEINS OR ANY OTHER POTENTIALLY INFECTIOUS MATERIAL? YES NO

I acknowledge that this waste material is neither infectious nor does it contain any organism known to be a threat to human health. This certification is based on my knowledge of the material. Select the answer below that applies:

The waste was never exposed to potentially infectious material. YES NO

Chemical disinfection or some other form of sterilization has been applied to the waste. YES NO

I ACKNOWLEDGE THAT THIS PROFILE MEETS THE CLEAN HARBORS BATTERY PACKAGING REQUIREMENTS. YES NO

I ACKNOWLEDGE THAT MY FRIABLE ASBESTOS WASTE IS DOUBLE BAGGED AND WETTED. YES NO

SPECIFY THE SOURCE CODE ASSOCIATED WITH THE WASTE. **G19**SPECIFY THE FORM CODE ASSOCIATED WITH THE WASTE. **W206**

E. CONSTITUENTS

Are these values based on testing or knowledge? Knowledge Testing

If constituent concentrations are based on analytical testing, analysis must be provided. Please attach document(s) using the link on the Submit tab.

Please indicate which constituents below apply. Concentrations must be entered when applicable to assist in accurate review and expedited approval of your waste profile. Please note that the total regulated metals and other constituents sections require answers.

RCRA	REGULATED METALS	REGULATORY LEVEL (mg/l)	TCLP mg/l	TOTAL	UOM	NOT APPLICABLE	
D004	ARSENIC	5.0				<input checked="" type="checkbox"/>	
D005	BARIUM	100.0				<input checked="" type="checkbox"/>	
D006	CADMIUM	1.0				<input checked="" type="checkbox"/>	
D007	CHROMIUM	5.0				<input checked="" type="checkbox"/>	
D008	LEAD	5.0				<input checked="" type="checkbox"/>	
D009	MERCURY	0.2				<input checked="" type="checkbox"/>	
D010	SELENIUM	1.0				<input checked="" type="checkbox"/>	
D011	SILVER	5.0				<input checked="" type="checkbox"/>	
VOLATILE COMPOUNDS			OTHER CONSTITUENTS		MAX	UOM	NOT APPLICABLE
D018	BENZENE	0.5		BROMINE			<input checked="" type="checkbox"/>
D019	CARBON TETRACHLORIDE	0.5		CHLORINE			<input checked="" type="checkbox"/>
D021	CHLORO BENZENE	100.0		FLUORINE			<input checked="" type="checkbox"/>
D022	CHLOROFORM	6.0		IODINE			<input checked="" type="checkbox"/>
D028	1,2-DICHLOROETHANE	0.5		SULFUR			<input checked="" type="checkbox"/>
D029	1,1-DICHLOROETHYLENE	0.7		POTASSIUM			<input checked="" type="checkbox"/>
D035	METHYL ETHYL KETONE	200.0		SODIUM			<input checked="" type="checkbox"/>
D039	TETRACHLOROETHYLENE	0.7		AMMONIA			<input checked="" type="checkbox"/>
D040	TRICHLOROETHYLENE	0.5		CYANIDE AMENABLE			<input checked="" type="checkbox"/>
D043	VINYL CHLORIDE	0.2		CYANIDE REACTIVE			<input checked="" type="checkbox"/>
SEMI-VOLATILE COMPOUNDS							
D023	o-CRESOL	200.0		CYANIDE TOTAL			<input checked="" type="checkbox"/>
D024	m-CRESOL	200.0		SULFIDE REACTIVE			<input checked="" type="checkbox"/>
D025	p-CRESOL	200.0					
D026	CRESOL (TOTAL)	200.0					
D027	1,4-DICHLORO BENZENE	7.5					
D030	2,4-DINITROTOLUENE	0.13					
D032	HEXACHLORO BENZENE	0.13					
D033	HEXACHLOROBUTADIENE	0.5					
D034	HEXACHLOROETHANE	3.0					
D036	NITROBENZENE	2.0					
D037	PENTACHLOROPHENOL	100.0					
D038	PYRIDINE	5.0					
D041	2,4,5-TRICHLOROPHENOL	400.0					
D042	2,4,6-TRICHLOROPHENOL	2.0					
PESTICIDES AND HERBICIDES							
D012	ENDRIN	0.02					
D013	LINDANE	0.4					
D014	METHOXYCHLOR	10.0					
D015	TOXAPHENE	0.5					
D016	2,4-D	10.0					
D017	2,4,5-TP (SILVEX)	1.0					
D020	CHLORDANE	0.03					
D031	HEPTACHLOR (AND ITS EPOXIDE)	0.008					

HOCs NONE <input checked="" type="checkbox"/> < 1000 PPM <input type="checkbox"/> >= 1000 PPM	PCBs NONE <input checked="" type="checkbox"/> < 50 PPM <input type="checkbox"/> >=50 PPM IF PCBs ARE PRESENT, IS THE WASTE REGULATED BY TSCA 40 CFR 761? <input checked="" type="checkbox"/> YES NO
---	--

ADDITIONAL HAZARDS
 DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?
 YES NO (If yes, explain)

CHOOSE ALL THAT APPLY

DEA REGULATED SUBSTANCES	EXPLOSIVE	FUMING	OSHA REGULATED CARCINOGENS
POLYMERIZABLE	RADIOACTIVE	REACTIVE MATERIAL	<input checked="" type="checkbox"/> NONE OF THE ABOVE

F. REGULATORY STATUS

YES NO USEPA HAZARDOUS WASTE?

YES NO DO ANY STATE WASTE CODES APPLY?
731 B001 B002 CR01 IL05 M001 MA02 MN03
 Texas Waste Code

YES NO DO ANY CANADIAN PROVINCIAL WASTE CODES APPLY?

YES NO IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268?
 LDR CATEGORY: **Not subject to LDR**
 VARIANCE INFO:

YES NO IS THIS A UNIVERSAL WASTE?

YES NO IS THE GENERATOR OF THE WASTE CLASSIFIED AS VERY SMALL QUANTITY GENERATOR (VSQG) OR A STATE EQUIVALENT DESIGNATION?

YES NO IS THIS MATERIAL GOING TO BE MANAGED AS A RCRA EXEMPT COMMERCIAL PRODUCT, WHICH IS FUEL (40 CFR 261.2 (C)(2)(II))?

YES NO DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?

YES NO IS THIS WASTE STREAM SUBJECT TO THE INORGANIC METAL BEARING WASTE PROHIBITION FOUND AT 40 CFR 268.3(C)?

YES NO DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?

YES NO DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?

YES NO DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE > 77 KPA (11.2 PSIA)?

YES NO IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?

YES NO IS THE WASTE SUBJECT TO ONE OF THE FOLLOWING NESHAP RULES?
 Hazardous Organic NESHAP (HON) rule (subpart G) Pharmaceuticals production (subpart GGG)

YES NO IF THIS IS A US EPA HAZARDOUS WASTE, DOES THIS WASTE STREAM CONTAIN BENZENE?
 YES NO Does the waste stream come from a facility with one of the SIC codes listed under benzene NESHAP or is this waste regulated under the benzene NESHAP rules because the original source of the waste is from a chemical manufacturing, coke by-product recovery, or petroleum refinery process?
 YES NO Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) >10 Mg/year?
 What is the TAB quantity for your facility? Megagram/year (1 Mg = 2,200 lbs)
 The basis for this determination is: Knowledge of the Waste Or Test Data Knowledge Testing
 Describe the knowledge :

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:
NON-RCRA HAZARDOUS WASTE, LIQUIDS, (<1LB PCB)
UN2315, POLYCHLORINATED BIPHENYLS, LIQUID, 9, PG II

H. TRANSPORTATION REQUIREMENTS

ESTIMATED SHIPMENT FREQUENCY ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER Other

<input checked="" type="checkbox"/> CONTAINERIZED 8-10 CONTAINERS/SHIPMENT STORAGE CAPACITY: 20 CONTAINER TYPE: PORTABLE TOTE TANK BOX/CARTON/CASE CUBIC YARD BOX <input checked="" type="checkbox"/> DRUM OTHER: DRUM SIZE: 55	BULK LIQUID GALLONS/SHIPMENT: 0 Min - 0 Max GAL. BULK SOLID SHIPMENT UOM: TON YARD TONS/YARDS/SHIPMENT: 0 Min - 0 Max
--	---

I. SPECIAL REQUEST

COMMENTS OR REQUESTS:

GENERATOR'S CERTIFICATION

I certify that I am authorized to execute this document as an authorized agent. I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE: NAME (PRINT): Brad Saunders TITLE: Associate VP - Arcadis of Mt, LLC DATE: 02/18/2019
on behalf of RACER Trust

Addendum

G. DOT/TDG INFORMATION

DOT/TDG PROPER SHIPPING NAME:

UN2315, POLYCHLORINATED BIPHENYLS, LIQUID, 9, PG III

LNAPL Characteristics – Recovery System RW-08-14

RACER Pontiac North Campus – Pontiac, MI

Generator ID EPA ID # MID005356886

RACER Trust

Pontiac North - 200 E Columbia Ave

Pontiac, MI 48340

Investigation Derived Waste LNAPL generated in 2018 in April and August 2018 transported to:

Veolia Environmental Services (706-736-2821) – TXD000838896

Highway 73 W 3.5 Miles W of Taylor's Bayou

Port Author, TX 77640

Description: RQ, UN2315, PCBs, liquid, 9, PGII (PCBs), ERG#171

The location of generated light non-aqueous phase liquid (LNAPL) waste is defined as AOI W-10 at the location of a groundwater recovery well (RW-08-14 or SB-08-14) in the ground floating on the groundwater table in the vicinity of a former railroad car staging location operated by General Motors from the 1940s through the early 1980s for machined iron/steel scrap (cutting and chips) which was stored in open top rail cars which dripped residual coolant/oils/distillate fuels over this period of time.

Of note, analytical results from LNAPL fingerprinting conducted by ENCORE in December 2001 indicated that LNAPL in AOI W-10 / SB-08-14 consisted of mildly weathered #2 diesel fuel or #2 fuel oil with a small amount of heavy hydrocarbons (possibly highly degraded crude oil).

Based on waste characterization testing performed at SB-08-14 (see summaries below), waste generated during removal activities have been characterized as a liquid TSCA regulated waste. Laboratory reporting limits were elevated for certain VOCs and SVOCs which exceeded RCRA hazardous waste thresholds due to required dilution for analysis, but no detections of such contaminants occurred and there is no indication that such contaminants exist. Therefore, based on recent characterization data and prior LNAPL physical characterization data and disposal facility approvals, the waste will remain characterized as RCRA non-hazardous.

LNAPL PROPERTIES TESTING

On January 17, 2018, LNAPL samples were collected from SB-08-14 and SB-43-14 for physical properties analyses.

Parameter	Units	Temperature (°F)	SB-08-14 (AOI W-10)
LNAPL Density	g/cm ³	70	0.8700
LNAPL Density	g/cm ³	100	0.8589
LNAPL Density	g/cm ³	130	0.8475
LNAPL Viscosity *	cP	70	19.57
LNAPL Viscosity *	cP	100	10.02
LNAPL Viscosity *	cP	130	5.81
LNAPL Specific Gravity	unitless	70	0.8718
LNAPL Specific Gravity	unitless	100	0.8649
LNAPL Specific Gravity	unitless	130	0.8596

Notes:

g/cm³ – grams per cubic centimeter

cP - centipoise

* Viscosity averages and ranges for common liquids (cP at appr 70 deg F): gasoline: 0.48; water: 0.8; mineral spirits: 1.6; kerosene: 2.0; #2 Diesel: 2.40; #2 Fuel Oil: 3.20; Transformer Oil: 16.2; Hydraulic Oil: 34.6; Lighter Motor Oils: 175 (range 25 – 325); Heavier Lube Oils: 550 (range 100 – 1000); #6 Fuel Oil / Bunker Oil: 3,456.

WASTE CHARACTERIZATION

On July 16, 2018, LNAPL was collected from SB-08-14 and sent to Merit Laboratories (Merit) of East Lansing, Michigan for analysis of toxicity characteristic leaching procedure (TCLP) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). These analyses supplemented previously reported characterization data from samples obtained in January-February 2018 and analyzed for total polychlorinated biphenyls (PCBs), TCLP metals, flashpoint, and pH. Results are compared to Resource Conservation and Recovery Act (RCRA) hazardous waste limits specified in 40 CFR Part 261.21-.24 and Toxic Substances Control Act (TSCA) regulatory limits specified in 40 CFR 761.61 (a)(5)(i)(B)(2) and are summarized in the table below. Laboratory analytical results are included as **Attachment 1**.

Parameter	Units	SB-08-14	TSCA limit	RCRA limit
PCBs		02/19/2018		
Aroclor-1016	mg/kg	< 17 Y	> 50	--
Aroclor-1221	mg/kg	< 17 Y	> 50	--
Aroclor-1232	mg/kg	< 17 Y	> 50	--
Aroclor-1242	mg/kg	< 17 Y	> 50	--
Aroclor-1248	mg/kg	83 Y	> 50	--
Aroclor-1254	mg/kg	< 17 Y	> 50	--
Aroclor-1260	mg/kg	< 17 Y	> 50	--
Total PCBs	mg/kg	83	> 50	--
Volatile Organics		07/16/2018		
Benzene	mg/L	< 5	--	> 0.5
Carbon Tetrachloride	mg/L	< 5	--	> 0.5
Chlorobenzene	mg/L	< 5	--	> 100
Chloroform	mg/L	< 5	--	> 6
1,4-Dichlorobenzene	mg/L	< 5	--	> 7.5
1,2-Dichloroethane	mg/L	< 5	--	> 0.5
1,1-Dichloroethane	mg/L	< 5	--	> 0.7
2-Butanone (MEK)	mg/L	< 50	--	> 200
Tetrachloroethene	mg/L	< 5	--	> 0.7
Trichloroethene	mg/L	< 5	--	> 0.5
Semi-Volatile Organics		07/16/2018		
o-Cresol	mg/L	< 100	--	> 200
p,m-Cresol	mg/L	< 200	--	> 200
Pentachlorophenol	mg/L	< 100	--	> 100
2,4,5-Trichlorophenol	mg/L	< 100	--	> 400

2,4,6-Trichlorophenol	mg/L	< 100	--	> 2
2,4-Dinitrotoluene	mg/L	< 100	--	> 0.13
Hexachlorobenzene	mg/L	< 100	--	> 0.13
Hexachlorobutadiene	mg/L	< 100	--	> 0.50
Hexachloroethane	mg/L	< 100	--	> 3
Nitrobenzene	mg/L	< 100	--	> 2
Pyridine	mg/L	< 100	--	> 5
Inorganics 01/17/2018				
Arsenic	mg/L	4.18	--	> 5.0
Barium	mg/L	1.18	--	> 100.0
Cadmium	mg/L	< 0.20	--	> 1.0
Chromium	mg/L	1.60	--	> 5.0
Lead	mg/L	< 0.30	--	> 5.0
Mercury	mg/L	< 0.0005	--	> 0.2
Selenium	mg/L	< 0.40	--	> 1.0
Silver	mg/L	< 0.20	--	> 5.0
Waste Characteristics 01/17/2018				
Flash point	°F	ND up to 180°	--	< 140°
pH	STD units	5.56	--	< 2.0, > 12.5

Notes:

°F - degrees Fahrenheit

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

ND - nondetect

STD - standard

Y - Elevated reporting limit due to high target concentration

Bold - exceeds one or more listed limits.

Flash Point Interpretation: Samples did not ignite at temperatures up to 180 °F

Saunders, Brad

From: Clean Harbors <NOREPLY@Cleanharbors.com>
Sent: Friday, February 22, 2019 4:04 AM
To: Saunders, Brad
Subject: Clean Harbors Profile Approval Notification



Profile Approval Notification

The profile(s) listed below are approved* and ready for shipment. You can schedule your drum pick up online or contact your account representative for support.

You can reach us at 1-877-333-4244.

Click here to [Login](#) to your account.

Generator code	Generator Name	Profile #	Waste Description	Waste Classification Code
RA25580	RACER Pontiac North Campus	CH1794207	Light Non-Aqueous Phase liquid (LNAPL) Waste	DH3

**Profile approval is based upon information provided, you are required to notify Clean Harbors immediately of any change.*

Thank you for choosing Clean Harbors. We appreciate your business.

This email was sent from a notification only address that cannot accept incoming email. Please do not reply to this message.

You are receiving this message because you have submitted a profile for approval and are a registered user of Clean Harbors Online Services. We do not rent or sell your information to any third parties. For more information, please read our [Privacy Policy](#). Our address is 42 Longwater Drive, Norwell, MA 02061.

Please print or type.

D5 1905827723

SC PPW 12/9/2008

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number MID005356886	2. Page of 1 of 3	3. Emergency Response Phone (800) 483-3718	4. Manifest Tracking Number 013497627 FLE
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5. Generator's Name and Mailing Address RACER Pontiac North Campus Pontiac North - 200 E Columbia Ave Pontiac, MI 48340 Generator's Phone: (517) 974-4441	Generator's Site Address (if different than mailing address) SAME
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6. Transporter 1 Company Name Clean Harbors Environmental Services, Inc.	U.S. EPA ID Number MAD039322250
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7. Transporter 2 Company Name Action Resources, Inc.	U.S. EPA ID Number ALR0000057237
--	--

8. Designated Facility Name and Site Address Clean Harbors Deer Park, LLC 2027 Independence Parkway South La Porte, TX 77571 Facility's Phone: (281) 930-2300	U.S. EPA ID Number TXD055141378
---	---

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
		No.	Type				
X	1. RQ, UN2315, POLYCHLORINATED BIPHENYLS, LIQUID, 9, PG III	003	DM	615	K		outs2191

14. Special Handling Instructions and Additional Information
1. CH1794207 ERG171 (3xDM55)
G.S.D. 11/07/19 ID# 7627-01; #7627-02; #7627-03

Contract retained by generator confers agency authority on initial transporter to add or substitute additional transporters on generator's behalf for purposes of transportation efficiency, convenience, or safety.

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offoror's Printed/Typed Name Brad Saunders	Signature <i>Brad Saunders</i>	Month 11	Day 07	Year 19
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16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S.	Port of entry/exit: Date leaving U.S.:
--	---

17. Transporter Acknowledgment of Receipt of Materials Transporter 1 Printed/Typed Name Cory DeCamus	Signature <i>Cory DeCamus</i>	Month 11	Day 07	Year 19
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Transporter 2 Printed/Typed Name Randy Haley	Signature <i>Randy Haley</i>	Month 11	Day 19	Year 19
--	---------------------------------	--------------------	------------------	-------------------

18. Discrepancy 18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection

18b. Alternate Facility (or Generator) Manifest Reference Number:	U.S. EPA ID Number
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Facility's Phone:	18c. Signature of Alternate Facility (or Generator)	Month	Day	Year
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19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. H040	2.	3.	4.
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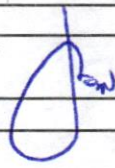
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a Printed/Typed Name Terrysha Woods	Signature <i>Terrysha Woods</i>	Month 12	Day 11	Year 19
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UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)		21. Generator ID Number MID002356880	22. Page 20	23. Manifest Tracking Number 01349702799		
24. Generator's Name RACER Pontiac						
25. Transporter 3 Company Name Clean Harbors Environmental Services Inc.			U.S. EPA ID Number MAD039322250			
26. Transporter 4 Company Name Robbie D Wood Inc			U.S. EPA ID Number ALD067138891			
27a. HM	27b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	28. Containers		29. Total Quantity	30. Unit Wt./Vol.	31. Waste Codes
		No.	Type			
	T P O					
32. Special Handling Instructions and Additional Information						
33. Transporter 3 Acknowledgment of Receipt of Materials Printed/Typed Name Stephanie Matheny (Agent for CHES)						Signature <i>Stephanie Matheny</i>
34. Transporter 4 Acknowledgment of Receipt of Materials Printed/Typed Name Jason Knight						Signature <i>Jason Knight</i>
35. Discrepancy						
36. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)						

GENERATOR

TRANSPORTER

DESIGNATED FACILITY

UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)		21. Generator ID Number MC001356846	22. Page 3	23. Manifest Tracking Number 013497627 FUE		
24. Generator's Name Aacer Pontiac North Campus						
25. Transporter 5 Company Name CLEAN HARBORS ENV. SERVICES INC.				U.S. EPA ID Number MAD039322250		
26. Transporter _____ Company Name				U.S. EPA ID Number		
27a. HM	27b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	28. Containers		29. Total Quantity	30. Unit Wt./Vol.	31. Waste Codes
		No.	Type			
	TRANSPORTATION					
	PURPOSES					
	ONLY					
32. Special Handling Instructions and Additional Information						
33. Transporter 5 Acknowledgment of Receipt of Materials						
Printed/Typed Name ROXAN B. WIENER				Signature 		Month Day Year 12 3 19
34. Transporter _____ Acknowledgment of Receipt of Materials						
Printed/Typed Name				Signature		Month Day Year
35. Discrepancy						
36. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)						

GENERATOR

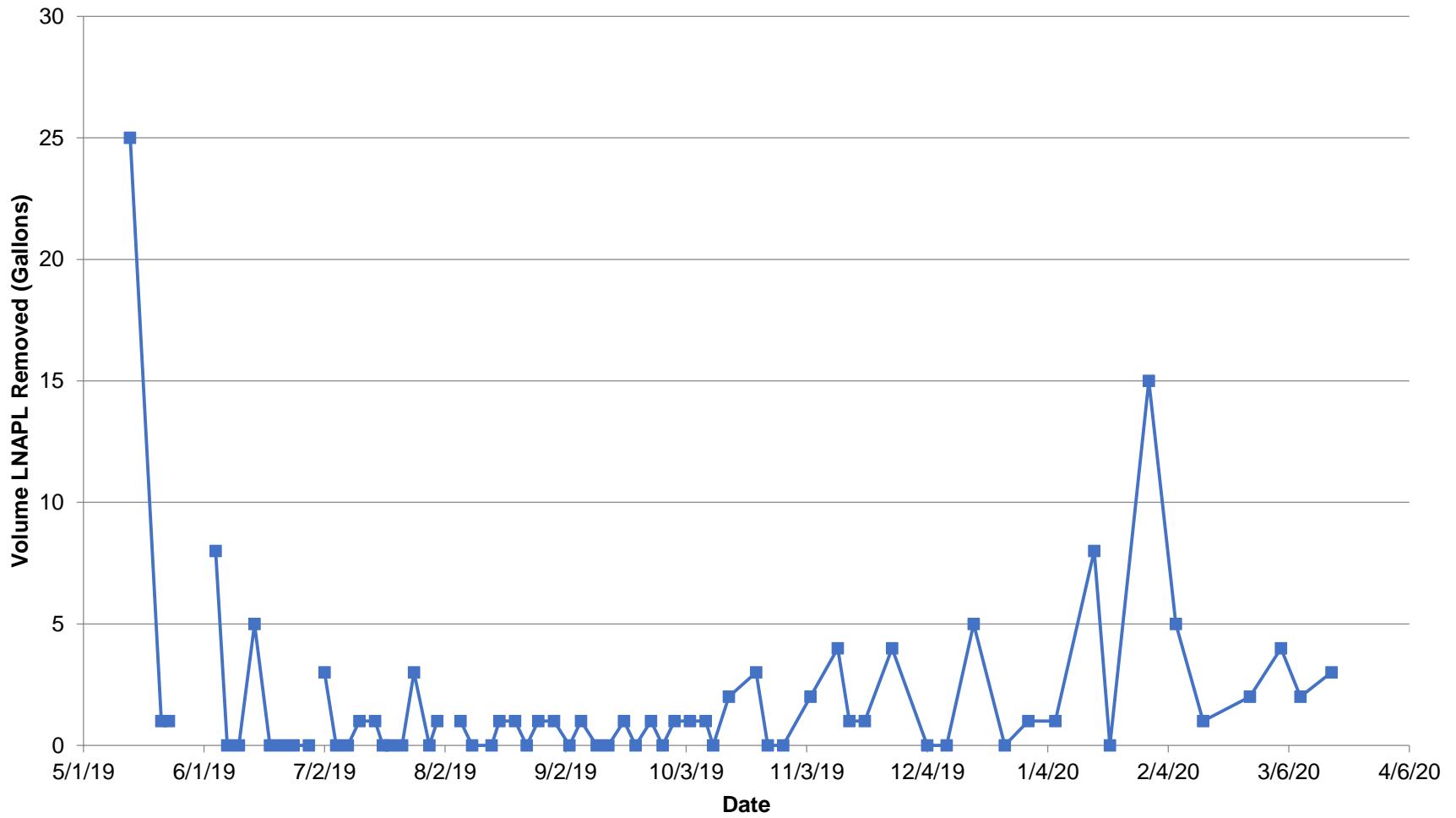
TRANSPORTER

DESIGNATED FACILITY

Attachment 5

LNAPL Recovery and Transmissivity Charts

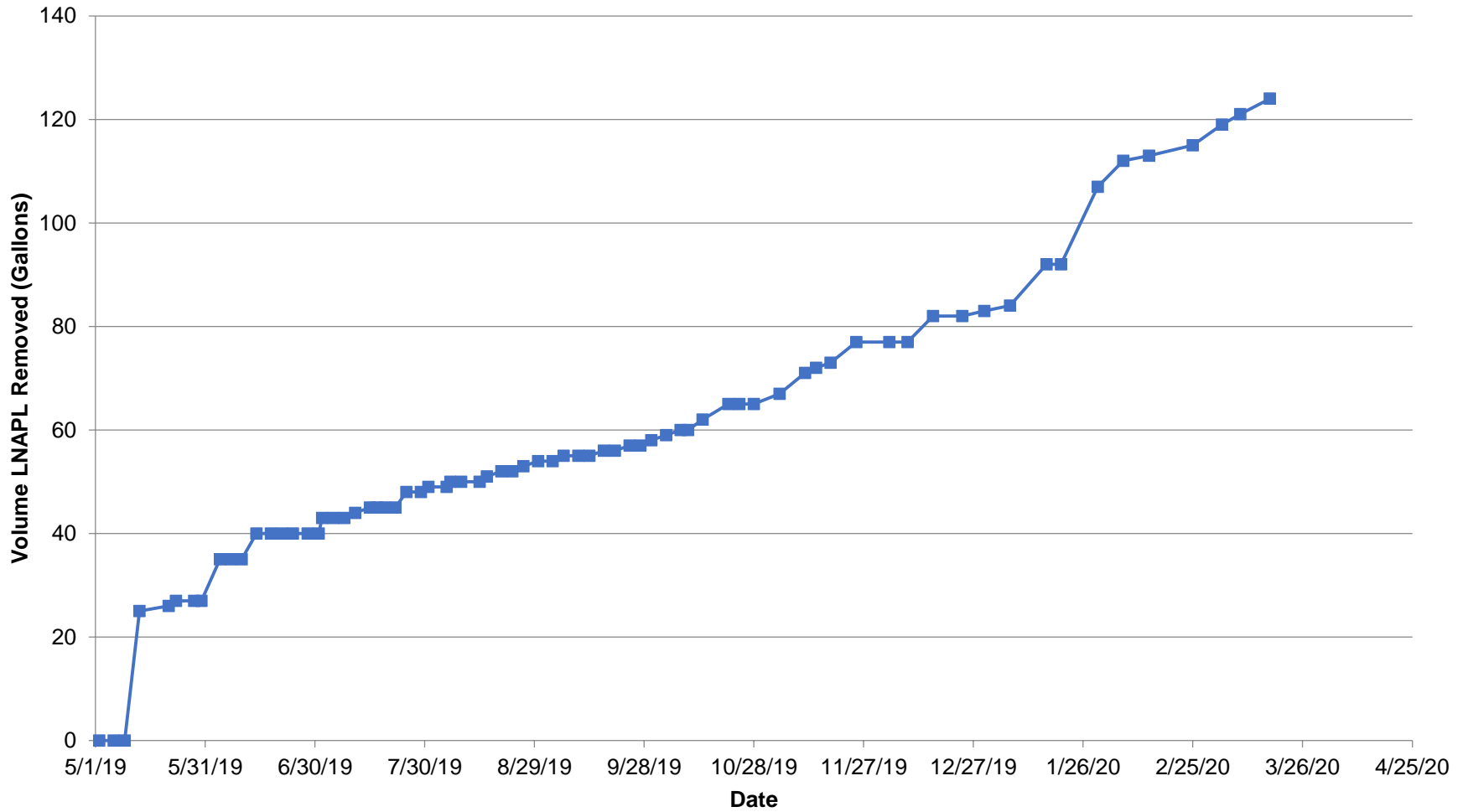
Light Non-Aqueous Phase Liquid Removed 2019-2020 RACER Pontiac North Campus Pontiac, Michigan



Note: LNAPL volume removed from well RW-08-14 from May 2019 through March 2020.

—■ LNAPL Removed (gallons)

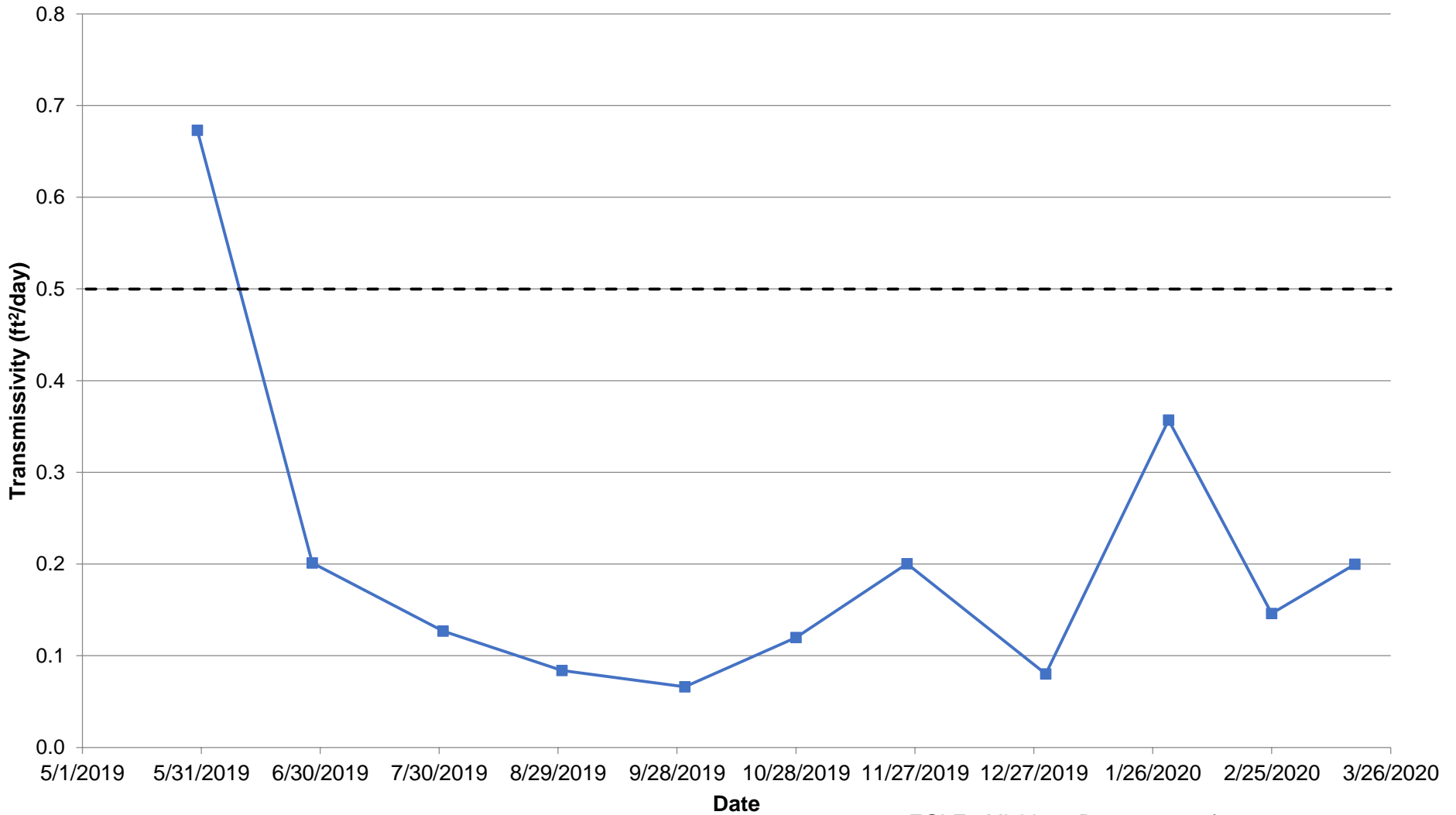
Cumulative Light Non-Aqueous Phase Liquid Removed 2019-2020 RACER Pontiac North Campus Pontiac, Michigan



Note: LNAPL volume removed from well RW-08-14 from May 2019 through March 2020.

—■— Cumulative LNAPL Removed (gallons)

RW-08-14 Recovery Data Transmissivity RACER Pontiac North Campus Pontiac, Michigan



—■— Transmissivity

- - - EGLE Recoverability Threshold

EGLE - Michigan Department of Environment, Great Lakes, and Energy

Note: Example calculation on last page.

$$T_n = Q_n \cdot \frac{\ln\left(\frac{R_{OI}}{r_w}\right)}{2 \cdot \pi \cdot s_n}$$

ASTM Equation 16

$$s_{n_unconfined} = b_n (1 - \rho_n)$$

ASTM Equation 17

Where,

- T_n = Transmissivity to LNAPL (ft²/d)
- Q_n = Measured LNAPL Recovery Rate (ft³/d)
- R_{oi} = Radius of Influence (ft)
- r_w = Well Radius (ft)
- s_n = LNAPL drawdown (ft)

For this evaluation, the value of the term ln(R_{oi}/r_w) was assumed to be approximately 4.6, as recommended by the ASTM standard (ASTM 2013). Monthly LNAPL recovery rates were calculated based on total LNAPL recovery volume each month per number of days during the recovery period.

Where,

- b_n = Change in LNAPL thickness (ft); (b_{n0} – b_{nt}), initial LNAPL thickness – LNAPL thickness at time t
 - ρ_n = LNAPL density (g/cc)
 - s_n = maximum LNAPL skimming drawdown (ft)
- LNAPL drawdown was calculated during each gauging event and the monthly geometric mean was used in the transmissivity calculation.

Reference:

- ASTM. 2013. Standard Guide for Estimation of LNAPL Transmissivity. ASTM Standard E2856 -13.
- ASTM International, West Conshohocken, Pennsylvania.

Example calculation for RW-08-14 transmissivity

Initial LNAPL Thickness (ft) 1.27
 ln(R/r_w)= 4.6
 LNAPL density 0.879

Date	Elapsed Time		DTW ft bTOC	DTP ft bTOC	LNAPL Thickness feet	Vol Removed gal	Cumulative Vol Removed gal	Q _n ft ³ /d	Q _n (monthly) ft ³ /d	s _n	Geomean	Monthly T _n ft ² /day
	Days	Minutes									s _n	
5/2/2019			10.15	8.88	1.27		0.00					
5/6/2019	4	5760	9.01	8.74	0.27		0.00	0.00		0.12		
5/9/2019	3	4320	8.70	8.10	0.60		0.00	0.00		0.08		
5/13/2019	4	5760	8.65	8.61	0.04	25	25.00	0.84		0.15		
5/21/2019	8	11520	8.88	8.81	0.07	1	26.00	0.02		0.15		
5/23/2019	2	2880	8.71	8.66	0.05	1	27.00	0.07		0.15		
5/28/2019	5	7200	9.10	8.45	0.65		27.00	0.00		0.08		
5/30/2019	2	2880	9.58	8.53	1.05		27.00	0.00	0.13	0.03	0.09	0.67

Abbreviations:

- bTOC - below top of casing
- d - day
- DTW = depth to water
- DTP - depth to product
- ft - feet
- gal - gallon
- LNAPL - light non-aqueous phase liquid
- Q_n - recovery rate
- s_n - maximum LNAPL skimming drawdown
- T_n - transmissivity