February 12, 2020 Reference No. 11208041

Mr. Zachary Sasnow
Corrective Action Project Manager
U.S. EPA, Region 5
77 West Jackson Boulevard DW-8J
Chicago, Illinois
U.S.A. 60604 3590

Dear Mr. Sasnow:

Re: North Ditch – Updated Ecological Screening Assessment
EPA ID #MID 041 793 340
RACER Nodular Facility - Saginaw, Michigan

This letter presents the results of additional sampling of the sediments present in the North Ditch at Revitalizing Auto Communities Environmental Response Trust's (RACER's) Former Nodular Industrial Land (Site) in Saginaw, Michigan, as well as, an update to the original North Ditch ecological screening assessment (GHD 2019a). Additional sampling was completed on December 10, 2019 in accordance with the United States Environmental Protection Agency (U.S. EPA) approved "Work Plan to Complete Additional North Ditch Sediment Sampling" (Work Plan; GHD, 2019b). The primary intent of this additional sampling was to refine estimates of potential risks of polychlorinated biphenyls (PCBs) to semi-aquatic wildlife feeding on fish from the North Ditch. To that end, additional sampling was targeted to assessing current concentrations of Total Organic Carbon (TOC) and specifically Black Carbon (BC) in the sediments. BC can significantly reduce the bioavailability of PCBs and other hydrophobic organics. Moreover, the additional sampling would also assess current concentrations of PCBs in the biologically active zone of North Ditch sediments. At the request of USEPA, sediment samples were also analyzed for PAHs, which typically co-occur with BC.

In addition to reporting sampling results, this letter also provides an update to the North Ditch Ecological Screening Assessment (ESA) submitted to on March 14, 2019 by incorporating the results of the additional sampling completed in accordance with the Work Plan.

The following figures, tables and attachments were prepared in support of the Updated ESA:

Figure 1	North Ditch Sediment, Soil, and Surface Water Sample Locations
Table 1	Sediment in Biologically Active Zone (Top 3 Inches) – Analytical Results
Table 2	Sediment in Biologically Active Zone (Top 3 Inches) – Ecological Screening Results
Table 3	Sediments below Biologically Active Zone (3 to 6 Inches) – Analytical Results
Table 4	Sediments below Biologically Active Zone (3 to 6 Inches) – Summary Statistics
Attachment A	Analytical Results and Data Validation Reports

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1. Summary of Field Activities

In order to evaluate the composition of TOC in the North Ditch, and more specifically the BC component, ten sediment samples were collected from seven locations (SED-401-19, SED-402-19, SED-403-19 SED-404-19, SED-405-16, SED-406-19, and SED-407-19) in the North Ditch. The samples were submitted under chain of custody procedures to the laboratory for analysis. Sediment sample locations are presented on Figure 1. Sediment samples were generally evenly distributed along the centerline of the channel.

1.1 Sample Collection Procedure

The sediment samples were collected from below the water surface using an Ekman Dredge in accordance with the Work Plan. Sediment recovery from the Ekman Dredge ranged from 6 to 9 inches. The upper 3-inches of the sediment column or biologically active zone (BAZ) were sampled and submitted for laboratory analysis. Three additional sediment samples were collected from the 3-6-inch interval at sediment sample locations (SED-401-19, SED-403-19, and SED-405-16) and submitted for laboratory analysis.

2. Analytical Results Summary

Sediment samples were submitted to Eurofins TestAmerica and analyzed for Polycyclic Aromatic Hydrocarbons (PAHs), PCBs, TOC and BC in accordance with the Work Plan. A summary of analytical results for the BAZ samples are presented in Table 1 and the ecological screening for the BAZ samples is provided in Table 2. The below BAZ (i.e., 3-6 inch interval) analytical sample results are presented in Table 3 and the ecological screening for the samples below BAZ are provided in Table 4. The data validation memorandum is presented in Attachment A. Note that the deeper samples analyzed for PAHs were prepared and analyzed outside of the required holding times, due to a transcription error on the chain-of-custody. The associated results are presented with qualifiers, including rejected results. Since shallow samples from the same locations were analyzed within the required holding times for PAHs, the qualified and rejected results should have no effect on the evaluation.

In analyzing for BC in the deeper samples, the lab felt that there may have been issues with the homogeneity of the samples. Therefore, the BC analyses were done twice for each of the deeper samples, yielding two different results for each deeper sample location. Because neither result is more representative of the sediment sample, the two results were averaged to yield a representative BC concentration for those samples. The average results are presented in Tables 3 and 4.

A duplicate sample was taken at location SED-403-19 (0-3 inch), making a total of eight samples from the BAZ. In the following discussion, the duplicate will be considered just another sample in estimating average concentrations. This assumption had minor effects on the average of any parameter.

3. Updated Ecological Screening Assessment

3.1 Background

As part of Resource Conservation and Recovery Act (RCRA) corrective action, the North Ditch surface water, underlying sediments, and bank soils have been sampled for Nodular-specific chemicals: target analyte list (TAL) metals, PCBs, and others (e.g., nitrate, ammonia, and cyanide). The North Ditch sample results identified elevated concentrations of PCBs and organic carbon (GHD 2019a).

The North Ditch previously received flow from the Secondary Ponds, and the North Ditch had low detections of PCBs. Importantly, testing of the Secondary Pond sediments found very high contributions of BC (2.9 percent, GHD 2018), which presumably also occurs in the North Ditch.

Compared to typical organic carbon, BC binds much more aggressively (5 to 100 times more) to hydrophobic substances, like PCBs, greatly reducing their bioavailability and potential for bioaccumulation (e.g., see Cornelissen et al. 2005; Driscoll et al. 2009; USEPA 2012). The likely presence of significant amounts of BC in the North Ditch would significantly reduce PCB concentrations in forage fish compared to those estimated with typical biota-sediment accumulation factors (BSAF). The relative reduction in bioavailability associated with BC versus typical organic carbon is inversely related to the amount of TOC. That is, the more typical TOC there is, the less BC reduces bioavailability. The relationship between typical TOC, BC, and bioavailability is complex and can only be estimated with complex iterative calculations (USEPA 2012).

Hence, the ameliorative effects of BC and TOC binding, to PCB and PAHs, were evaluated consistent with the approach taken with the Secondary Pond data. More specifically, it was assumed that BC binds PCBs 10 times more aggressively than regular TOC. Bioavailability of PCBs will then be estimated with an effective TOC concentration that includes binding of both types of organic carbon.

3.2 Black Carbon Results Summary

Consistent with the results observed in the Secondary Pond, the average levels of BC in the 2019 North Ditch sediment samples was 1.5%/. This concentration of BC is elevated compared to a normal BC concentration of 0.3% for urban sediments (USEPA, 2012). TOC, which includes BC and amorphous organic carbon, averaged about 3.8% in BAZ sediments as presented in Table 1.

The bioavailability of PCBs (and PAHs) was then estimated with an effective TOC concentration that includes binding of both types of organic carbon. More specifically, as discussed in the Work Plan (GHD 2019b), the effective TOC concentration was estimated with the following equation, which assumes that BC has, on average, 10 times the binding capacity of regular OC:

$$Effective\ TOC = ([TOC] - [BC]) + 10 * [BC]$$

where [TOC] and [BC] are concentrations of TOC and BC, respectively.

Using the above equation, the effective TOC concentration for the BAZ sediments of the North Ditch averages 17.2%.

To assess whether BC levels were similar in deeper sediments (3-6 inches) as in the BAZ, the results of the deeper sediment samples were compared to the results of the sediments in the BAZ. In general, concentrations of all parameters, including BC, in the deeper samples were similar to those in the BAZ samples. See Table 1 vs. Table 3. Therefore, the results of these deeper samples were not evaluated further, and the focus of the letter will be the samples within the BAZ.

3.3 PAH Results Summary

PAHs were found at elevated but generally low concentrations within all 2019 samples. Total PAHs concentrations averaged 3.2 milligram per kilogram (mg/kg) across all the BAZ samples. However, because TOC averaged approximately 3.8%, the total PAHs averaged only about 0.9 mg/kg when expressed at equivalent 1% TOC concentration. Expressing PAH values at 1% carbon is important because many widely used Ecological Screening Values are totally or largely based on chemical concentrations expressed at 1% OC[1]. Moreover, aquatic sediments typically have around 1% to 2% TOC concentrations, so expressing organic concentrations on a 1% TOC basis controls for site-specific instances with sediments having very low or very high TOC concentrations. When the additional binding capacity of BC is included, the total PAH when normalized to 1% effective TOC averaged only 0.18 mg/kg. All of these values are well below the PEC (Probable Effects Concentration) value of 22.8 mg/kg, above which total PAHs might pose toxicity (MacDonald et al. 2000). Hence, irrespective of whether the PAH concentrations are expressed as bulk sediment concentrations, or normalized to TOC or effective TOC, PAH concentrations are well below levels of concern for benthic invertebrates. Thus, potential for PAH toxicity can be dismissed.

3.4 PCB Results Summary

Four PCB Aroclors were detected (Aroclors 1242, 1248, 1256, and 1260) in BAZ sediments. When the duplicate samples are treated as individual samples and values reported as non-detect are set to zero, the average Total PCB concentration is 0.368 mg/kg. This average concentration was dominated by Aroclor 1248, which made up approximately 66% of the total PCB concentration. Aroclor 1260 was the second most abundant Aroclor. Expressed at 1% TOC, without consideration of additional BC binding, effective PCB concentrations are only approximately 0.115 mg/kg. However, when the additional binding of BC is considered, the Total PCB concentration is approximately 0.023 mg/kg when expressed at 1% effective TOC. All of these values are below the PEC value for PCBs, which is widely used to screen for potential ecological effects.

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[1] For example, the PEC value for Total PAHs is geometric mean of the ER-M, SEL, and PEL-HA28 for Total PAHs (MacDonald et al. 2000). The first two of these are based on carbon-normalized concentration expressed at 1% TOC. Thus, the PEC is a function of TOC concentrations, even if that is not acknowledged in the source document.

3.5 Estimation of PCB Concentrations in Forage Fish and Potential Ecological Risks

Using the same methods as in the original North Ditch ESA (GHD 2019a)[2], these current data can be used to estimate PCB concentrations in benthically-coupled forage fish. Given the age of and uncertainties with historic data collected from the North Ditch, this updated assessment assumes that the 2019 data are the most representative of current conditions of sediment within the North Ditch. Previous results for PCBs and organic carbon are not be considered in this updated risk assessment.

As the North Ditch is colonized by fish, there will be exposure to fish-eating wildlife. These wildlife are represented in ecological risk assessments (ERAs) by mink and herons. Mink are more sensitive than birds to PCB toxicity; thus, the following will focus on risks to this most-sensitive species. Tracey and Hansen (1996) considered bioaccumulation of PCBs by benthos and benthically coupled fish. These authors found a median biota-sediment accumulation factor (BSAF) of 1.64 for those fish, normalized to fish lipid and TOC in the sediments.

This BSAF can then be used to estimate PCB concentrations in fish with available data on effective TOC concentrations in sediments and likely lipid concentrations in fish. When the enhanced binding capacity of BC is considered, the North Ditch sediments will sorb as strongly as sediments with an average of about 17% TOC. Small forage fish generally have approximately 3 to 5 % lipid (e.g., see Suns and Hitchin 1992). Therefore, the Site-specific PCB accumulation factor for benthically-coupled forage fish is 0.39, which is calculated by dividing the average forage fish lipids (4%) by the effective TOC (17%) and multiplying by the BSAF value (1.64).

When applied to the average PCB concentration in BAZ sediments (0.37 mg/kg, this accumulation factor produces an estimated average PCB concentration for bottom-feeding forage fish of about 0.14 mg/kg total PCBs. By comparison, the Region V No Observed Effect Concentration (NOEC) for PCBs in food for toxic effects on mink is 0.50 mg/kg (Chapman 2003). The Lowest Observed Effect Concentration (LOEC) was estimated as 0.60 mg/kg. Therefore, potential PCB exposures to most sensitive fish-eating wildlife, the mink, are well below potentially toxic exposures. That is, only about 30% of the NOEC and 25% of the LOEC.

Moreover, this negligible exposure estimated above includes three conservative assumptions that compound to significantly exaggerate likely risks to mink and to other less sensitive predators:

- First, the exposure assessment assumes that mink eat only fish from the North Ditch. In fact, mink typically eat about as much terrestrial prey as aquatic prey (USEPA 1993). Using a more realistic assumption about diet would reduce the exposure to PCBs by about half.
- Second, the North Ditch is less than 1 acre, but mink forage over tens to hundreds of acres (USEPA 1993, Halbrook and Petach 2018). Using realistic assumptions about a mink's limited use of the North Ditch would reduce exposures by one to two orders of magnitude.

[2] In general, the ecological screening followed usual guidance: e.g., USEPA 1997,1998, and USEPA Region 4 2018.

- Third, the assessment of exposure is based on estimated PCBs in benthivorous fish. These forage fish are most exposed to sediment-bound PCBs via their consumption of benthic invertebrates. However, many, potentially most of the forage fish in the Ditch will instead be feeding on the water-column food chain. In addition to the plankton-based water column food chain, the water column food chain of the Ditch will include the littoral food chain. The littoral food chain pertains to the microhabitat of the abundant physical structure (vegetation, branches) that occurs in the North Ditch. Because water column concentrations of PCBs are generally far below those in sediment pore water, potential for PCB bioaccumulation is much reduced for forage fish feeding on these two water column microhabitats.

These three observations further reduce risks to fish-eating wildlife below the already negligible level identified above.

4. Conclusions and Recommendations

The December 2019 sampling of the North Ditch indicates that current PCB concentrations in BAZ sediments are low, with an average total PCB Aroclor concentration of less than 0.4 mg/kg. In addition, the potential impact of these already low PCB concentrations is further reduced, by moderately high levels of TOC (approximately 4%). Potential impacts of PCBs are reduced even more significantly by moderately high levels of BC. Assuming that the BC has binding capacity 10 times that of regular organic carbon suggests that the sediments have an effective binding capacity of about 17% TOC.

Concentrations of PCBs in benthically-coupled forage fish were estimated to be about 0.14 mg/kg. This PCB concentration in fish is well below concentrations that cause harm to most sensitive wildlife, the mink. Moreover, this estimate exposure concentration includes several compounded safety factors that would reduce these negligible risks even further. Hence, the additional sampling data collected in 2019 show, clearly, that PCBs in the North Ditch pose no risk to mink. These new sample data eliminate the uncertainty about these risks identified in the original analysis (GHD 2019a).

Elevated but generally low concentrations of PAHs were also found in North Ditch sediments. For bulk sediment, total PAHs averaged about 3.2 mg/kg. However, as with the PCBs, potential effects of the already low PAH concentrations were ameliorated by the high binding capacity of the sediments. Thus, the PAH concentrations were assessed to be well below levels that could cause toxicity.

In summary, therefore, no further action is recommended for the North Ditch.

5. References

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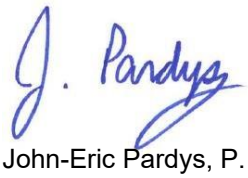
Should you have any questions, please do not hesitate to call.

Yours truly,

GHD



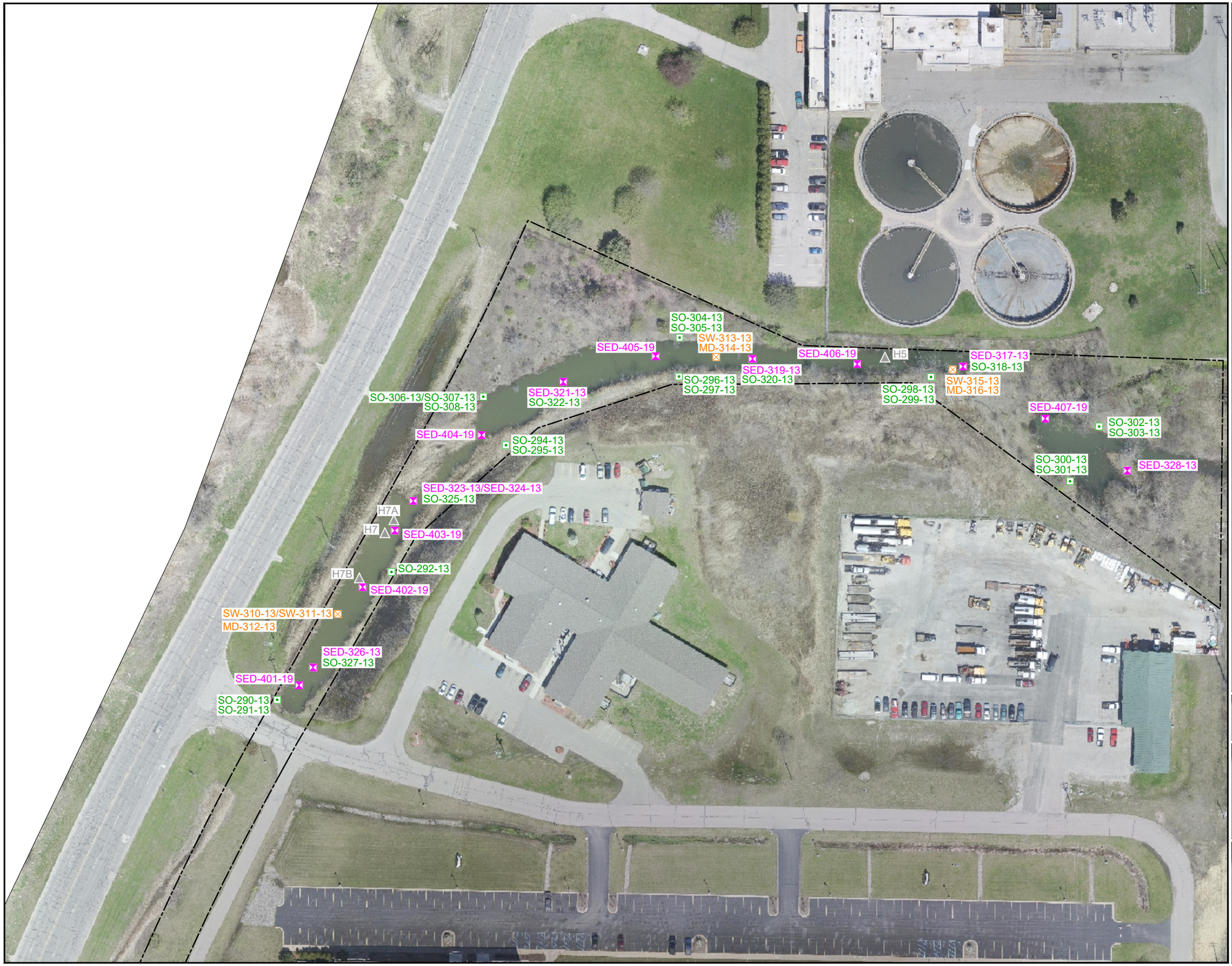
John-Eric Pardys, P. Eng.

Daniel Smith, Ph.D.

JEP/lj/2

Encl.

cc: Dave Favero, RACER
Michael Tomka, GHD



SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

REVITALIZING AUTO COMMUNITES ENVIRONMENTAL RESPONSE

SAGINAW, MICHIGAN

NORTH DITCH SEDIMENT SAMPLE LOCATIONS

GHD

Source Reference:
MICHIGAN STATE PLANE SOUTH, NAD 83 USING INTERNATIONAL FEET, NGVD 88
AERIAL: GHD UAV ORTHOIMAGERY - MAY 3, 2016.

Project Manager:	Reviewed By:	Date:	
JEP	GR	JULY 2019	
Scale: 1" = 50'	Project Nº: 58502-T02	Report Nº: SAGN004	Drawing Nº: figure 1

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Table 1

Sediment in Biologically Active Zone (Top 3 Inches) - Analytical Results
RACER Nodular Industrial Land
Saginaw, MI

Sample Location:		SED-401-19	SED-402-19	SED-404-19	SED-405-19	SED-406-19	SED-407-19	SED-403-19	SED-403-19
Sample ID:		S-58502-121019-SSH-5019	S-58502-121019-SSH-5219	S-58502-121019-SSH-5719	S-58502-121019-SSH-5819	S-58502-121019-SSH-6019	S-58502-121019-SSH-6119	S-58502-121019-SSH-5319	S-58502-121019-SSH-5419
Sample Date:		12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019
Sample Depth:		(0-3) IN	(0-3) IN	(0-3) IN	(0-3) IN	(0-3) IN	(0-3) IN	(0-3) IN	(0-3) IN (Duplicate)
Parameters	**Units**								
SVOAs									
Acenaphthene	mg/kg	0.013 J	0.016 J	0.0096 J	0.065 U	0.022 U	0.012 J	0.1 J	0.049
Acenaphthylene	mg/kg	0.035 U	0.016 J	0.019 U	0.065 U	0.022 U	0.011 J	0.041 J	0.016 J
Anthracene	mg/kg	0.036	0.042 J	0.014 J	0.035 J	0.0077 J	0.029	0.22	0.087
Benzo(a)anthracene	mg/kg	0.16	0.11	0.043	0.15	0.041	0.18	0.62	0.27
Benzo(a)pyrene	mg/kg	0.19	0.14	0.063	0.18	0.042	0.21	0.7	0.32
Benzo(b)fluoranthene	mg/kg	0.3	0.25	0.097	0.28	0.062	0.29	1.1	0.42
Benzo(g,h,i)perylene	mg/kg	0.18	0.14	0.056	0.14	0.025	0.15	0.44	0.26
Benzo(k)fluoranthene	mg/kg	0.08	0.056	0.029	0.07	0.021 J	0.12	0.29	0.13
Chrysene	mg/kg	0.23	0.17	0.067	0.2	0.057	0.25	0.86	0.37
Dibenz(a,h)anthracene	mg/kg	0.043	0.036 J	0.017 J	0.065 U	0.022 U	0.035	0.14	0.06
Fluoranthene	mg/kg	0.42	0.29	0.1	0.3	0.11	0.48	1.6	0.72
Fluorene	mg/kg	0.022 J	0.045 J	0.02	0.036 J	0.0056 J	0.015 J	0.24	0.094
Indeno(1,2,3-cd)pyrene	mg/kg	0.15	0.11	0.04	0.11	0.023	0.13	0.37	0.22
Naphthalene	mg/kg	0.074	0.19	0.065	0.24	0.011 J	0.059	0.79	0.29
Phenanthrene	mg/kg	0.22	0.23	0.1	0.23	0.055	0.27	1.3	0.51
Pyrene	mg/kg	0.35	0.24	0.093	0.23	0.083	0.4	1.4	0.61
Total PAH	mg/kh	2.49	2.08	0.82	2.30	0.58	2.64	10.21	4.43
Total PAH at 1% TOC	mg/kh	0.99	0.42	0.25	0.30	0.41	1.76	2.37	0.94
Total PAH at 1% Effective TOC	mg/kh	0.28	0.09	0.05	0.11	0.09	0.29	0.41	0.15
PCBs									
Aroclor-1242 (PCB-1242)	mg/kg	0.11 U	0.17 U	0.061 U	0.22 U	0.14	0.067 U	0.11 U	0.094 U
Aroclor-1248 (PCB-1248)	mg/kg	0.087 J	0.23	0.061 U	0.49	0.07 U	0.41	0.45	0.29
Aroclor-1254 (PCB-1254)	mg/kg	0.11 U	0.17 U	0.061 U	0.22 U	0.036 J	0.067 U	0.11 U	0.094 U
Aroclor-1260 (PCB-1260)	mg/kg	0.092 J	0.18	0.061 U	0.11 J	0.07 U	0.05 J	0.23	0.15
Total Aroclors ND = 0	mg/kg	0.18	0.41	0.00	0.60	0.18	0.46	0.68	0.44
Total Aroclors at 1% OC	mg/kg	0.07	0.08	0.00	0.08	0.13	0.31	0.16	0.09
Total Aroclors at 1% OC	mg/kg	0.02	0.02	0.00	0.03	0.03	0.05	0.03	0.02
Wet									
Black Carbon		0.72%	1.90%	1.50%	1.40%	0.59%	0.84%	2.30%	2.70%
Total Organic Carbon (TOC)		2.50%	4.90%	3.30%	7.60%	1.40%	1.50%	4.30%	4.70%
Effective TOC		8.98%	22.00%	16.80%	20.20%	6.71%	9.06%	25.00%	29.00%

Note:

J - Estimated Concentration
U - not detected

Table 2

Sediment in Biologically Active Zone (Top 3 Inches) - Ecological Screening Results
RACER Nodular Industrial Land
Saginaw, MI

Parameters	Units	PEC	# of Samples	Frequency of Detections	Max Detect	Mean Detect	Max SQ	Mean SQ
SVOAs								
Acenaphthene	mg/kg	See total PAH	8.00	75%	0.10	0.025	NA	NA
Acenaphthylene	mg/kg	See total PAH	8.00	50%	0.04	0.011	NA	NA
Anthracene	mg/kg	See total PAH	8.00	100%	0.22	0.059	NA	NA
Benzo(a)anthracene	mg/kg	See total PAH	8.00	100%	0.29	0.100	NA	NA
Benzo(a)pyrene	mg/kg	See total PAH	8.00	100%	0.86	0.276	NA	NA
Benzo(b)fluoranthene	mg/kg	See total PAH	8.00	75%	0.14	0.041	NA	NA
Benzo(g,h,i)perylene	mg/kg	See total PAH	8.00	100%	1.60	0.503	NA	NA
Benzo(k)fluoranthene	mg/kg	See total PAH	8.00	100%	0.24	0.060	NA	NA
Chrysene	mg/kg	See total PAH	8.00	100%	0.37	0.144	NA	NA
Dibenz(a,h)anthracene	mg/kg	See total PAH	8.00	100%	0.79	0.215	NA	NA
Fluoranthene	mg/kg	See total PAH	8.00	100%	0.62	0.197	NA	NA
Fluorene	mg/kg	See total PAH	8.00	100%	0.70	0.231	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	See total PAH	8.00	100%	1.30	0.364	NA	NA
Naphthalene	mg/kg	See total PAH	8.00	100%	1.10	0.350	NA	NA
Phenanthrene	mg/kg	See total PAH	8.00	100%	0.44	0.174	NA	NA
Pyrene	mg/kg	See total PAH	8.00	100%	1.40	0.426	NA	NA
Total PAH	mg/kh	22.80	8.00	100%	10.21	3.193	0.45	0.14
Total PAH at 1% TOC	mg/kh	22.80	8.00	100%	2.37	0.932	0.10	0.04
Total PAH at 1% Effective TOC	mg/kh	22.80	8.00	100%	0.41	0.184	0.02	0.01
PCBs								
Aroclor-1242 (PCB-1242)	mg/kg	See total PCBs	8.00	13%	0.14	0.018	NA	NA
Aroclor-1248 (PCB-1248)	mg/kg	See total PCBs	8.00	75%	0.49	0.245	NA	NA
Aroclor-1254 (PCB-1254)	mg/kg	See total PCBs	8.00	13%	0.04	0.005	NA	NA
Aroclor-1260 (PCB-1260)	mg/kg	See total PCBs	8.00	75%	0.23	0.102	NA	NA
Total Aroclors ND = 0	mg/kg	0.68	8.00	75%	0.68	0.368	1.01	0.54
Total Aroclors at 1% OC	mg/kg	0.68	8.00	75%	0.31	0.115	0.45	0.17
Total Aroclors at 1% OC	mg/kg	0.68	8.00	75%	0.05	0.023	0.08	0.03
Wet								
Black Carbon			8.00	100%	2.7%	1.5%		
Total Organic Carbon (TOC)			8.00	100%	7.6%	3.8%		
Effective TOC			8.00	100%	29.0%	17.2%		

Notes:

PEC = Probable Effects Concentration from MacDonald et al., 2000
SQ = Concentraion / PEC
NA = Not Applicable
Effective TOC = (TOC-BC) + 10 * BC

Table 3

Sediments Below Biologically Active Zone (3 to 6 Inches) - Analytical Results
RACER Nodular Industrial Land
Saginaw, MI

Sample Location:		**SED-401-19**	**SED-405-19**	**SED-403-19**	**SED-403-19**
Sample ID:		**S-58502-121019-SSH-5119**	**S-58502-121019-SSH-5919**	**S-58502-121019-SSH-5519**	**S-58502-121019-SSH-5619**
Sample Date:		**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**
Sample Depth:		**(3-6) IN**	**(3-6) IN**	**(3-6) IN**	**(3-6) IN (Duplicate)**
Parameters	**Units**				
SVOAs					
Acenaphthene	mg/kg	R	R	R	0.05 J-
Acenaphthylene	mg/kg	R	R	R	0.02 J-
Anthracene	mg/kg	R	R	R	0.11 J-
Benzo(a)anthracene	mg/kg	0.28 J-	0.28 J-	0.05 J-	0.31 J-
Benzo(a)pyrene	mg/kg	0.29 J-	0.32 J-	R	0.32 J-
Benzo(b)fluoranthene	mg/kg	0.47 J-	0.54 J-	R	0.49 J-
Benzo(g,h,i)perylene	mg/kg	0.23 J-	0.23 J-	R	0.22 J-
Benzo(k)fluoranthene	mg/kg	0.20 J-	R	R	0.18 J-
Chrysene	mg/kg	0.43 J-	0.32 J-	0.06 J-	0.45 J-
Dibenz(a,h)anthracene	mg/kg	R	R	R	R
Fluoranthene	mg/kg	0.83 J-	0.54 J-	0.19 J-	0.82 J-
Fluorene	mg/kg	R	R	0.04 J-	0.14 J-
Indeno(1,2,3-cd)pyrene	mg/kg	0.17 J-	0.19 J-	R	0.17 J-
Naphthalene	mg/kg	0.24 J-	0.55 J-	0.19 J-	0.33 J-
Phenanthrene	mg/kg	0.46 J-	0.45 J-	0.20 J-	0.70 J-
Pyrene	mg/kg	0.67 J-	0.47 J-	0.16 J-	0.74 J-
Total PAH ND = 0	mg/kh	4.27	3.90	0.89	3.53
Total PAH at 1% TOC	mg/kh	1.47	0.83	0.26	1.60
Total PAH at 1% Effective TOC	mg/kh	0.23	0.15	0.05	0.21
PCBs					
Aroclor-1242 (PCB-1242)	mg/kg	0.15 U	0.76	0.085 U	0.093 U
Aroclor-1248 (PCB-1248)	mg/kg	0.075 J	0.19 U	0.088	0.05 J
Aroclor-1254 (PCB-1254)	mg/kg	0.15 U	0.19 U	0.085 U	0.093 U
Aroclor-1260 (PCB-1260)	mg/kg	0.15 U	0.21	0.058 J	0.093 U
Total Aroclors ND = 0	mg/kg	0.08	0.97	0.15	0.05
Total Aroclors at 1% TOC	mg/kg	0.03	0.21	0.04	0.02
Total Aroclors at 1% Effective TOC	mg/kg	0.004	0.038	0.008	0.003
Wet					
Black Carbon		1.74%	2.35%	1.60%	1.60%
Total Organic Carbon (TOC)		2.90% J-	4.70% J-	3.40% J-	2.20% J-
Effective TOC		18.52%	25.85%	17.80%	16.60%

Notes:

J - estimated concentration
J- - estimated concentration with low bias
R - rejected result
U - not detected

Table 4

Sediments Below Biologically Active Zone (3 to 6 Inches) - Summary Statistics
RACER Nodular Industrial Land
Saginaw, MI

Parameters	Units	Number of Samples	Freq. of Detec	Max Detect	Mean Detect
SVOAs					
Acenaphthene	mg/kg	1.00	100%	0.05	0.050
Acenaphthylene	mg/kg	1.00	100%	0.02	0.018
Anthracene	mg/kg	1.00	100%	0.11	0.110
Benzo(a)anthracene	mg/kg	4.00	100%	0.31	0.230
Benzo(a)pyrene	mg/kg	3.00	100%	0.32	0.310
Benzo(b)fluoranthene	mg/kg	3.00	100%	0.54	0.500
Benzo(g,h,i)perylene	mg/kg	3.00	100%	0.23	0.227
Benzo(k)fluoranthene	mg/kg	2.00	100%	0.20	0.190
Chrysene	mg/kg	4.00	100%	0.45	0.316
Dibenz(a,h)anthracene	mg/kg	0.00			
Fluoranthene	mg/kg	4.00	100%	0.83	0.520
Fluorene	mg/kg	2.00	100%	0.14	0.091
Indeno(1,2,3-cd)pyrene	mg/kg	3.00	100%	0.19	0.177
Naphthalene	mg/kg	4.00	100%	0.55	0.328
Phenanthrene	mg/kg	4.00	100%	0.46	0.373
Pyrene	mg/kg	4.00	100%	0.74	0.510
Total PAH	mg/kh	4.00	100%	4.27	3.148
Total PAH at 1% TOC	mg/kh	4.00	100%	1.60	1.042
Total PAH at 1% Effective T	mg/kh	4.00	100%	0.23	0.161
PCBs					
Aroclor-1242 (PCB-1242)	mg/kg	4.00	25%	0.76	0.190
Aroclor-1248 (PCB-1248)	mg/kg	4.00	75%	0.09	0.053
Aroclor-1254 (PCB-1254)	mg/kg	4.00	0%	0.00	0.000
Aroclor-1260 (PCB-1260)	mg/kg	4.00	50%	0.21	0.067
Total Aroclors ND = 0	mg/kg	4.00	100%	0.97	0.310
Total Aroclors at 1% OC	mg/kg	4.00	100%	0.21	0.074
Total Aroclors at 1% OC	mg/kg	4.00	100%	0.04	0.013
Wet					
Black Carbon		4.00	100%	2.4%	1.8%
Total Organic Carbon (TOC)		4.00	100%	4.7%	3.3%
Effective TOC		4.00	100%	25.9%	19.7%

Note:
Effective TOC = (TOC-BC) + 10 * BC

Attachment A
Analytical Results and Reduced Validation Memorandum

Memorandum

February 7, 2020

To:	John Eric Pardys, GHD	Ref. No.:	058502A-A02-02Y19
From:	Ruth L. Mickle/sb/3	Tel:	612-524-6872
Cc:	Graeme Richardson, GHD		

Subject: **Analytical Results and Reduced Validation**
North Ditch Sediment Sampling
RACER Trust – Nodular Site
Saginaw, Michigan
December 2019

1. Introduction

This document details a reduced data validation of analytical results for samples collected in support of the North Ditch Sampling at the RACER-Nodular Site during December 2019. Samples were submitted to Eurofins TestAmerica (TestAmerica) located in North Canton, Ohio. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Standard GHD report deliverables were submitted by the laboratory. The final results and supporting quality assurance/quality control (QA/QC) data were assessed. Evaluation of the data was based on information obtained from the chain of custody form, finished report forms, method blank data, duplicate data, recovery data from surrogate spikes/laboratory control samples (LCS)/matrix spikes (MS) and field QA/QC samples.

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable guidance from the documents entitled:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review", USEPA 540-R-2017-01, January 2017

ii) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review", USEPA 540-R-2017-02, January 2017

Items i) and ii) will subsequently be referred to as the "Guidelines" in this Memorandum.

2. Sample Holding Time and Preservation

The sample holding time criteria for the analyses are summarized in Table 3. Sample chain of custody documents and analytical reports were used to determine sample holding times. Several samples were prepared and analyzed outside the required holding times. The associated sample results are presented with qualifiers, including rejected results, in Table 4.

All samples were properly preserved, delivered on ice, and stored by the laboratory at the required temperature (0-6°C).

3. Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures.

For this study, laboratory method blanks were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

The method blank results were non-detect or a detection was reported within acceptance criteria, indicating that laboratory contamination was not a factor for this investigation.

4. Surrogate Spike Recoveries - Organic Analyses

In accordance with the methods employed, all samples, blanks, and QC samples analyzed for organics are spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices.

All samples submitted for organic determinations were spiked with the appropriate number of surrogate compounds prior to sample extraction and/analysis.

Each individual surrogate compound is expected to meet the laboratory control limits with the exception of polycyclic aromatic hydrocarbon (PAH) analyses. According to the "Guidelines" for PAH analyses, up to one outlying surrogate in the base/neutral fraction is acceptable as long as the recovery is at least 10 percent.

Surrogate recoveries were assessed against laboratory control limits. Two samples submitted for PAH analyses yielded low biased surrogate recoveries. Since the associated data were qualified as estimated or rejected based on holding time criteria, no data qualification was required based on surrogate results. The remaining surrogate recoveries met the above criteria.

5. Laboratory Control Sample Analyses

LCS are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

For this study, LCS were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

The LCS contained all analytes of interest. LCS recoveries were assessed per the "Guidelines". All LCS recoveries were within the control limits demonstrating acceptable analytical accuracy.

6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

To evaluate the effects of sample matrices on the preparation process, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS/MSD samples. The RPD between the MS and MSD is used to assess analytical precision.

If the original sample concentration is significantly greater than the spike concentration, or, if sample is diluted five times or greater, the recovery is not assessed.

MS/MSD analyses were performed as specified in Table 1.

The MS/MSD samples were spiked with the analytes of interest, and the results were evaluated using the "Guidelines". Table 5 presents the outlying matrix spike results. The associated sample data were qualified estimated based on the high biased spike recoveries. The remaining percent recoveries and RPD values were within the control limits demonstrating acceptable analytical accuracy and precision.

7. Duplicate Sample Analyses – Inorganic Analyses

Analytical precision is evaluated based on the analysis of laboratory duplicate samples. The duplicate results were evaluated per the "Guidelines". Table 6 presents non-comparable lab duplicate results from total organic carbon (TOC) analysis. The associated sample results were qualified estimated, as noted in the table. The remaining duplicate analyses performed were acceptable, demonstrating acceptable analytical precision.

8. Field QA/QC Samples

The field QA/QC consisted of two field duplicate sample sets.

Field Duplicate Sample Analysis

To assess the analytical and sampling protocol precision, two field duplicate sample sets were collected and submitted "blind" to the laboratory, as specified in Table 1. The RPDs associated with these duplicate samples must be less than 100 percent for soil samples. If the reported concentration in either the investigative sample or its duplicate is less than five times the reporting limit (RL), the evaluation criteria is two times the RL value for soil samples.

There were several non-comparable field duplicate results from one duplicate set: S-58502-121019-SSH-5519 and S-58502-121019-SSH-5619. However, since the results were previously qualified based on holding time criteria, no qualification was required based on field duplicate results. The remaining field duplicate results were within acceptable agreement.

9. Analyte Reporting

The laboratory reported detected results down to the laboratory's method detection limit (MDL) for each analyte. Positive analyte detections less than the RL but greater than the MDL were qualified as estimated

(J) in Table 2 unless qualified otherwise in this memorandum. Non-detect results were presented as non-detect at the RL in Table 2.

10. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are acceptable with the specific qualifications and exceptions noted herein.

Table 1

Sample Collection and Analysis Summary
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Sample Identification	Location	Matrix	Initial Sample Depth (ft. bgs.)	Final Sample Depth (ft. bgs.)	Collection Date (mm/dd/yyyy)	Collection Time (hr:min)	Analysis/ Parameters: PCBs	PAHs	TOC and Black Carbon	Comments
TA SDG No.: 240-123651-1,-2 &-3										
S-58502-121019-SSH-5019	SED-401-19	sediment	0	3	12/10/2019	08:15	X	X	X	
S-58502-121019-SSH-5119	SED-401-19	sediment	3	6	12/10/2019	08:25	X	X	X	
S-58502-121019-SSH-5219	SED-402-19	sediment	0	3	12/10/2019	08:45	X	X	X	
S-58502-121019-SSH-5319	SED-403-19	sediment	0	3	12/10/2019	09:00	X	X	X	
S-58502-121019-SSH-5419	SED-403-19	sediment	0	3	12/10/2019	09:05	X	X	X	FD (-5319)
S-58502-121019-SSH-5519	SED-403-19	sediment	3	6	12/10/2019	09:20	X	X	X	
S-58502-121019-SSH-5619	SED-403-19	sediment	3	6	12/10/2019	09:20	X	X	X	FD (-5519), MS/MSD
S-58502-121019-SSH-5719	SED-404-19	sediment	0	3	12/10/2019	09:45	X	X	X	
S-58502-121019-SSH-5819	SED-405-19	sediment	0	3	12/10/2019	10:20	X	X	X	
S-58502-121019-SSH-5919	SED-405-19	sediment	3	6	12/10/2019	10:25	X	X	X	
S-58502-121019-SSH-6019	SED-406-19	sediment	0	3	12/10/2019	11:35	X	X	X	MS/MSD
S-58502-121019-SSH-6119	SED-407-19	sediment	0	3	12/10/2019	12:00	X	X	X	

Notes:

MS/MSD - Matrix Spike/Matrix Spike Duplicate
FD - Field Duplicate Sample of sample in parenthesis
ft bgs - Feet below ground surface
PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls
TOC - Total Organic Carbon

Table 2

Validated Analytical Results Summary
North Ditch Sediment Sampling
Racer Trust - Nodular Site
Saginaw, Michigan
December 2019

Location ID:		SED-401-19	SED-401-19	SED-402-19	SED-403-19	SED-403-19	SED-403-19
Sample Name:		S-58502-121019-SSH-5119	S-58502-121019-SSH-5019	S-58502-121019-SSH-5219	S-58502-121019-SSH-5519	S-58502-121019-SSH-5619	S-58502-121019-SSH-5319
Sample Date:		12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019
Depth:		3-6 IN	0-3 IN	0-3 IN	3-6 IN	3-6 IN Duplicate	0-3 IN
Parameters	Unit						
PAHs							
Acenaphthene	µg/kg	R	13 J	16 J	R	50 J-	100 J
Acenaphthylene	µg/kg	R	35 U	16 J	R	18 J-	41 J
Anthracene	µg/kg	R	36	42 J	R	110 J-	220
Benzo(a)anthracene	µg/kg	280 J-	160	110	48 J-	310 J-	620
Benzo(a)pyrene	µg/kg	290 J-	190	140	R	320 J-	700
Benzo(b)fluoranthene	µg/kg	470 J-	300	250	R	490 J-	1100
Benzo(g,h,i)perylene	µg/kg	230 J-	180	140	R	220 J-	440
Benzo(k)fluoranthene	µg/kg	200 J-	80	56	R	180 J-	290
Chrysene	µg/kg	430 J-	230	170	64 J-	450 J-	860
Dibenz(a,h)anthracene	µg/kg	R	43	36 J	R	R	140
Fluoranthene	µg/kg	830 J-	420	290	190 J-	820 J-	1600
Fluorene	µg/kg	R	22 J	45 J	41 J-	140 J-	240
Indeno(1,2,3-cd)pyrene	µg/kg	170 J-	150	110	R	170 J-	370
Naphthalene	µg/kg	240 J-	74	190	190 J-	330 J-	790
Phenanthrene	µg/kg	460 J-	220	230	200 J-	700 J-	1300
Pyrene	µg/kg	670 J-	350	240	160 J-	740 J-	1400
PCBs							
Aroclor-1016 (PCB-1016)	µg/kg	150 U	110 U	170 U	85 U	93 U	110 U
Aroclor-1221 (PCB-1221)	µg/kg	150 U	110 U	170 U	85 U	93 U	110 U
Aroclor-1232 (PCB-1232)	µg/kg	150 U	110 U	170 U	85 U	93 U	110 U
Aroclor-1242 (PCB-1242)	µg/kg	150 U	110 U	170 U	85 U	93 U	110 U
Aroclor-1248 (PCB-1248)	µg/kg	75 J	87 J	230	88	50 J	450
Aroclor-1254 (PCB-1254)	µg/kg	150 U	110 U	170 U	85 U	93 U	110 U
Aroclor-1260 (PCB-1260)	µg/kg	150 U	92 J	180	58 J	93 U	230

Table 2

Validated Analytical Results Summary
North Ditch Sediment Sampling
Racer Trust - Nodular Site
Saginaw, Michigan
December 2019

Location ID:		**SED-401-19**	**SED-401-19**	**SED-402-19**	**SED-403-19**	**SED-403-19**	**SED-403-19**
Sample Name:		**S-58502-121019-SSH-5119**	**S-58502-121019-SSH-5019**	**S-58502-121019-SSH-5219**	**S-58502-121019-SSH-5519**	**S-58502-121019-SSH-5619**	**S-58502-121019-SSH-5319**
Sample Date:		**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**
Depth:		**3-6 IN**	**0-3 IN**	**0-3 IN**	**3-6 IN**	**3-6 IN Duplicate**	**0-3 IN**
Parameters	Unit						
General Chemistry							
Soot carbon	mg/kg	8700 / 26000	7200	19000	14000 / 18000	11000 / 21000	23000
Total organic carbon (TOC)	mg/kg	29000 J-	25000 J	49000 J	34000 J-	22000 J-	43000 J

Table 2

Validated Analytical Results Summary
North Ditch Sediment Sampling
Racer Trust - Nodular Site
Saginaw, Michigan
December 2019

Location ID:		SED-403-19	SED-404-19	SED-405-19	SED-405-19	SED-406-19	SED-407-19
Sample Name:		S-58502-121019-SSH-5419	S-58502-121019-SSH-5719	S-58502-121019-SSH-5919	S-58502-121019-SSH-5819	S-58502-121019-SSH-6019	S-58502-121019-SSH-6119
Sample Date:		12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019	12/10/2019
Depth:		0-3 IN Duplicate	0-3 IN	3-6 IN	0-3 IN	0-3 IN	0-3 IN
Parameters	Unit						
PAHs							
Acenaphthene	µg/kg	49	9.6 J	R	65 U	22 U	12 J
Acenaphthylene	µg/kg	16 J	19 U	R	65 U	22 U	11 J
Anthracene	µg/kg	87	14 J	R	35 J	7.7 J	29
Benzo(a)anthracene	µg/kg	270	43	280 J-	150	41	180
Benzo(a)pyrene	µg/kg	320	63	320 J-	180	42	210
Benzo(b)fluoranthene	µg/kg	420	97	540 J-	280	62	290
Benzo(g,h,i)perylene	µg/kg	260	56	230 J-	140	25	150
Benzo(k)fluoranthene	µg/kg	130	29	R	70	21 J	120
Chrysene	µg/kg	370	67	320 J-	200	57	250
Dibenz(a,h)anthracene	µg/kg	60	17 J	R	65 U	22 U	35
Fluoranthene	µg/kg	720	100	540 J-	300	110	480
Fluorene	µg/kg	94	20	R	36 J	5.6 J	15 J
Indeno(1,2,3-cd)pyrene	µg/kg	220	40	190 J-	110	23	130
Naphthalene	µg/kg	290	65	550 J-	240	11 J	59
Phenanthrene	µg/kg	510	100	460 J-	230	55	270
Pyrene	µg/kg	610	93	470 J-	230	83	400
PCBs							
Aroclor-1016 (PCB-1016)	µg/kg	94 U	61 U	190 U	220 U	70 U	67 U
Aroclor-1221 (PCB-1221)	µg/kg	94 U	61 U	190 U	220 U	70 U	67 U
Aroclor-1232 (PCB-1232)	µg/kg	94 U	61 U	190 U	220 U	70 U	67 U
Aroclor-1242 (PCB-1242)	µg/kg	94 U	61 U	760	220 U	140	67 U
Aroclor-1248 (PCB-1248)	µg/kg	290	61 U	190 U	490	70 U	410
Aroclor-1254 (PCB-1254)	µg/kg	94 U	61 U	190 U	220 U	36 J	67 U
Aroclor-1260 (PCB-1260)	µg/kg	150	61 U	210	110 J	70 U	50 J

Table 2

Validated Analytical Results Summary
North Ditch Sediment Sampling
Racer Trust - Nodular Site
Saginaw, Michigan
December 2019

Location ID:		**SED-403-19**	**SED-404-19**	**SED-405-19**	**SED-405-19**	**SED-406-19**	**SED-407-19**
Sample Name:		**S-58502-121019-SSH-5419**	**S-58502-121019-SSH-5719**	**S-58502-121019-SSH-5919**	**S-58502-121019-SSH-5819**	**S-58502-121019-SSH-6019**	**S-58502-121019-SSH-6119**
Sample Date:		**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**	**12/10/2019**
Depth:		**0-3 IN**	**0-3 IN**	**3-6 IN**	**0-3 IN**	**0-3 IN**	**0-3 IN**
		Duplicate					
Parameters	Unit						
General Chemistry							
Soot carbon	mg/kg	27000	15000	32000 / 15000	14000	5900	8400
Total organic carbon (TOC)	mg/kg	47000 J	33000 J	47000 J-	76000 J	14000 J	15000 J

Note:

PAHs	- Polycyclic Aromatic Hydrocarbons
PCBs	- Polychlorinated Biphenyls
J	- Estimated concentration
J-	- Estimated concentration with a low bias
R	- Rejected Result

Table 3

Analytical Methods and Holding Time Criteria
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Method	Matrix	Holding Time	
			Collection to Extraction (Days)	Collection or Extraction to Analysis (Days)
PCBs	SW-846 8082	solid	One year to exraction	40
PAHs	SW-846 8270	solid	14	40
TOC	Lloyd Kahn Method	Solid	-	14
Soot/Black Carbon	Lloyd Kahn Method	Solid	-	None specified -- 14 days as an advisory holding time

Notes

SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions.
PAHs - Polycyclic Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyls
TOC - Total Organic Carbon

Table 4

Qualified Sample Results Due to Holding Time Exceedance
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Sample ID	Holding Time (days)	Holding Time Criteria (days)	Analyte	Qualified Sample Results	Units
PAHs	S-58502-121019-SSH-5119	29 days to prep	14 days to prep	Acenaphthene	R	ug/kg
				Acenaphthylene	R	ug/kg
				Anthracene	R	ug/kg
				Benzo(a)anthracene	280 J-	ug/kg
				Benzo(a)pyrene	290 J-	ug/kg
				Benzo(b)fluoranthene	470 J-	ug/kg
				Benzo(g,h,i)perylene	230 J-	ug/kg
				Benzo(k)fluoranthene	200 J-	ug/kg
				Chrysene	430 J-	ug/kg
				Dibenz(a,h)anthracene	R	ug/kg
				Fluoranthene	830 J-	ug/kg
				Fluorene	R	ug/kg
				Indeno(1,2,3-cd)pyrene	170 J-	ug/kg
				Naphthalene	240 J-	ug/kg
				Phenanthrene	460 J-	ug/kg
				Pyrene	670 J-	ug/kg
PAHs	S-58502-121019-SSH-5519	29 days to prep	14 days to prep	Acenaphthene	R	ug/Kg
				Acenaphthylene	R	ug/Kg
				Anthracene	R	ug/Kg
				Benzo(a)anthracene	48 J-	ug/Kg
				Benzo(a)pyrene	130 R	ug/Kg
				Benzo(b)fluoranthene	R	ug/Kg
				Benzo(g,h,i)perylene	R	ug/Kg
				Benzo(k)fluoranthene	R	ug/Kg
				Chrysene	64 J-	ug/Kg
				Dibenz(a,h)anthracene	R	ug/Kg
				Fluoranthene	190 J-	ug/Kg

Table 4

Qualified Sample Results Due to Holding Time Exceedance
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Sample ID	Holding Time (days)	Holding Time Criteria (days)	Analyte	Qualified Sample Results		Units
PAHs	S-58502-121019-SSH-5519	29 days to prep	14 days to prep	Fluorene	41	J-	ug/Kg
				Indeno(1,2,3-cd)pyrene		R	ug/Kg
				Naphthalene	190	J-	ug/Kg
				Phenanthrene	200	J-	ug/Kg
				Pyrene	160	J-	ug/Kg
PAHs	S-58502-121019-SSH-5619	29 days to prep	14 days to prep	Acenaphthene	50	J-	ug/Kg
				Acenaphthylene	18	J-	ug/Kg
				Anthracene	110	J-	ug/Kg
				Benzo(a)anthracene	310	J-	ug/Kg
				Benzo(a)pyrene	320	J-	ug/Kg
				Benzo(b)fluoranthene	490	J-	ug/Kg
				Benzo(g,h,i)perylene	220	J-	ug/Kg
				Benzo(k)fluoranthene	180	J-	ug/Kg
				Chrysene	450	J-	ug/Kg
				Dibenz(a,h)anthracene		R	ug/Kg
				Fluoranthene	820	J-	ug/Kg
				Fluorene	140	J-	ug/Kg
				Indeno(1,2,3-cd)pyrene	170	J-	ug/Kg
				Naphthalene	330	J-	ug/Kg
				Phenanthrene	700	J-	ug/Kg
				Pyrene	740	J-	ug/Kg
PAHs	S-58502-121019-SSH-5919	29 days to prep	14 days to prep	Acenaphthene		R	ug/kg
				Acenaphthylene		R	ug/kg
				Anthracene		R	ug/kg
				Benzo(a)anthracene	280	J-	ug/kg

Table 4

Qualified Sample Results Due to Holding Time Exceedance
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Sample ID	Holding Time (days)	Holding Time Criteria (days)	Analyte	Qualified Sample Results		Units
PAHs	S-58502-121019-SSH-5919	29 days to prep	14 days to prep	Benzo(a)pyrene	320	J-	ug/kg
				Benzo(b)fluoranthene	540	J-	ug/kg
				Benzo(g,h,i)perylene	230	J-	ug/kg
				Benzo(k)fluoranthene		R	ug/kg
				Chrysene	320	J-	ug/kg
				Dibenz(a,h)anthracene		R	ug/kg
				Fluoranthene	540	J-	ug/kg
				Fluorene		R	ug/kg
				Indeno(1,2,3-cd)pyrene	190	J-	ug/kg
				Naphthalene	550	J-	ug/kg
				Phenanthrene	460	J-	ug/kg
				Pyrene	470	J-	ug/kg
General Chemistry	S-58502-121019-SSH-5119	35 days	14 days	Total organic carbon (TOC)	29000	J-	mg/kg
	S-58502-121019-SSH-5519	35 days	14 days	Total organic carbon (TOC)	34000	J-	mg/kg
	S-58502-121019-SSH-5619	35 days	14 days	Total organic carbon (TOC)	22000	J-	mg/kg
	S-58502-121019-SSH-5919	35 days	14 days	Total organic carbon (TOC)	47000	J-	mg/kg

Notes:

PAHs - Polycyclic Aromatic Hydrocarbons
J- - Estimated concentration with a low bias
R - Rejected Result

Table 5

Qualified Sample Results Due to Outlying MS/MSD Results
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Sample ID	Analyte	MS % Recovery	MSD % Recovery	RPD (percent)	Control Limits % Recovery	Control Limits RPD	Qualified Result	Units
PAHs	S-58502-121019-SSH-5619	Fluoranthene	154	175	9	30-125	31	820 J	ug/Kg
		Phenanthrene	137	150	7	31-120	35	700 J	ug/Kg
		Pyrene	147	154	3	28-122	30	740 J	ug/Kg

Notes:

MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
PAHs - Polycyclic Aromatic Hydrocarbons
J - Estimated concentration

Table 6

Qualified Sample Data Due to Variability in Lab Duplicate Results
North Ditch Sediment Sampling
RACER Trust - Nodular Site
Saginaw, Michigan
December 2019

Parameter	Analyte	RPD	RPD limit	Sample ID	Qualified Result	Units
General Chemistry	Total organic carbon (TOC)	33	20	S-58502-121019-SSH-5019	25000 J	mg/kg
				S-58502-121019-SSH-5219	49000 J	mg/kg
				S-58502-121019-SSH-5319	43000 J	mg/kg
				S-58502-121019-SSH-5419	47000 J	mg/kg
				S-58502-121019-SSH-5719	33000 J	mg/kg
				S-58502-121019-SSH-5819	76000 J	mg/kg
				S-58502-121019-SSH-6019	14000 J	mg/kg
				S-58502-121019-SSH-6119	15000 J	mg/kg

Notes:

RPD - Relative Percent Difference
J - Estimated concentration