SAN ANTONIO
WATER SYSTEM

MITCHELL LAKE WETLANDS QUALITY TREATMENT INITIATIVE - PHASE I

SEDIMENT QUALITY IN POTENTIAL DREDGE SITES REPORT

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MITCHELL LAKE
SEDIMENT QUALITY IN POTENTIAL DREDGE SITES

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LIST OF ABBREVIATIONS

PLUMMER	Plummer Associates, Inc.
CFR	Code of Federal Regulations
COC	chemicals of concern
CY	cubic yards
EPA	U.S. Environmental Protection Agency
ft	feet
$^{GW}GW_{Ing}$	Ingestion of COCs in Class 1 or 2 groundwater
$^{GW}Soil_{Ing}$	Soil to groundwater leaching of COCs to Class 1 or 2 groundwater
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
PCB	Polychorinated biphenyl
PCL	protective concentration level
PP	priority pollutants
RCRA	Resource Conservation and Recovery Act
SATL	San Antonio Testing Laboratory
SAWS	San Antonio Water System
SPLP	Synthetic Precipitation Leaching Procedure
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TCLP	Toxicity Characterization Leaching Procedure
$^{Tot}Soil_{Comb}$	Combined ingestion, dermal contact, inhalation of volatiles and particulates, and ingestion of aboveground and below-ground vegetables with COCs in soil
TPH	total petroleum hydrocarbons
TRRP	Texas Risk Reduction Program
USACE	U.S. Army Corps of Engineers

1 Background

The San Antonio Water System (SAWS) is investigating the feasibility of modifications to Mitchell Lake that would route discharges from the lake through a downstream constructed wetland to improve the quality of the discharges. As part of this project, Plummer Associates, Inc., (Plummer) and Freese and Nichols, Inc., have been engaged to prepare preliminary recommendations for improvements to the existing dam on the southern bank of Mitchell Lake. The recommended improvements include construction of a new spillway and outlet works to control the lake level. The construction will involve dredging along the dam, particularly in front of the existing and proposed spillways, to remove approximately 3,800 cubic yards (CY) of sediment. The dredged material will need to be managed. Potential management options are land application (which could include beneficial use during construction of the wetland cells or application directly on land in the vicinity of Mitchell Lake), disposal at a designated composting facility, disposal at a non-hazardous waste landfill, or – depending on the quality of the sediment – disposal at a hazardous waste disposal site.

Samples of the sediment were collected in the general area where dredging is anticipated to occur. Analyses were performed to provide a preliminary determination of the quality of the sediment so that the potential range of available management options could be identified. This report summarizes the sampling event and the results of the analyses. Based on the analytical results, an assessment is provided of management options for the dredged sediment.

2 Sediment Management Options

This section includes a review of the potential options and regulatory concerns associated with the management and disposal of dredged sediment from Mitchell Lake.

2.1 DISPOSAL IN A HAZARDOUS WASTE LANDFILL

The dredged sediment would need to be disposed of in a hazardous waste landfill if it qualifies as hazardous waste. The material would be considered hazardous waste if it exhibits any of the following characteristics: 1) ignitability, 2) corrosivity, 3) reactivity, or 4) toxicity. These characteristics are defined and determined as follows:

- Ignitability – Wastes are considered ignitable if they have a flash point below 140°F, can cause fire, have ignitable compressed gases, or are oxidizers. Ignitability can be determined through a flash point test.
- Corrosivity – Wastes are considered corrosive if they have a pH of less than or equal to 2 or a pH greater than or equal to 12.5. Corrosivity can be determined through pH measurement.
- Reactivity – Wastes are considered reactive if they react with water, give off toxic gases, or detonate or explode when heated. There are no test methods for determining reactivity.
- Toxicity – Wastes are considered toxic if they are harmful when ingested or absorbed. Toxicity can be determined through a Toxicity Characteristic Leaching Procedure (TCLP) test. If concentrations of any of the 60 regulated TCLP constituents exceed regulatory limits, the waste is considered toxic.

2.2 DISPOSAL IN A NON-HAZARDOUS WASTE LANDFILL

The sediment could be disposed of in a non-hazardous waste landfill if it is not hazardous. Non-hazardous waste landfills sometimes differentiate between three classes of non-hazardous waste, referred to as Class 1, 2, or 3.

- Class 1 non-hazardous waste – This waste has the highest potential for causing adverse impacts to human health. If a material contains any concentrations that exceed the levels listed in Figure: 30 TAC §335.521(a)(1) of Chapter 335 in Title 30 of the Texas Administrative Code (30 TAC §335), or if it contains concentrations of total petroleum hydrocarbons (TPH) in excess of 1,500 mg/kg, the waste would be considered Class 1.

- Class 2 non-hazardous waste – This waste is intermediate in strength compared with Class 1 and Class 3. It contains concentrations of constituents below which are specified for a Class 1 waste but does not meet the qualifications for a Class 3 waste, which are described below.
- Class 3 non-hazardous waste – This is the most inert waste. Class 3 waste must not contain any concentrations of constituents above the levels listed in Figure: 30 TAC §335.521(a)(3).

Class 1 waste is generally the most expensive waste to dispose of, so there is an economic benefit to determining that it is a Class 2 or 3 waste. The nearest landfill to Mitchell Lake, Covel Gardens, has tipping fees for Class 1 waste that are approximately double that of Class 2 waste. They do not differentiate between Class 2 or 3 waste, however. As of October 2020, Covel Gardens reported their standard tipping fees are as follows: $28/ton for dry Class 2 waste, $40/ton for wet Class 2 waste, $54/ton for dry Class 1 waste, and $100/ton for wet Class 1 waste[1].

Many landfills (including Covel Gardens) will compare the results from a TCLP test to the levels listed in Figure: 30 TAC §335.521(a)(1) for determining whether a material is Class 1 or Class 2 waste.

2.3 USE AS COMPOST

There is not clear guidance for determining whether dredged sediment is suitable for composting. The two nearest composting facilities, Garden-Ville and New Earth, told Plummer that their standard protocol is to refuse dredged sediment. When asked if they would make an exception if sediment quality data were provided, representatives from both said upper management would need to approve it and that any sediment quality data that is available would need to be provided to them for review.

[1] Waste is considered wet if it does not pass a Paint Filter Test and is considered dry if it passes a Paint Filter Test.

2.4 USE IN LAND APPLICATION

There are no definitive requirements for determining whether dredged sediment is suitable for land application. There are some general, federal recommendations developed by the USEPA and US Army Corps of Engineers (USACE) for establishing recommended maximum concentrations of select heavy metals in material to be land applied, and more detailed recommendations provided by the TCEQ. Federal and state guidance for managing dredged sediment is outlined below.

2.4.1 Federal Guidance

The USEPA states *"there is currently no clear guidance specifically addressing suitability of dredged material for beneficial uses. Some states have set standards for contaminants in industrial waste materials and have included dredged material in that category. Other criteria may be applicable, such as… USEPA 503 Regulation for the application of biosolids, but the criteria for suitability will be determined by the State or local authority where the dredged material will be used*" (USEPA, May 2004). Similarly, the USACE states *"…guidance for sewage sludge can offer some guidance in examining dredged material for heavy metals"* (USACE, July 2015).

USACE and USEPA recommended maximum limits are shown in Table 1.

Table 1. USACE and USEPA Recommended Limits for Dredged Sediment

PARAMETER	USACE Recommended Limits[1]	USEPA Recommended Limits[2]
Arsenic, mg/kg	-	41
Boron, mg/kg	100	-
Cadmium, mg/kg	15, or 1% of zinc	39
Chromium, mg/kg	1,000	-
Copper, mg/kg	1,000	1,500
Lead, mg/kg	1,000	300
Mercury, mg/kg	10	17
Nickel, mg/kg	200	420
Selenium, mg/kg	-	100
Zinc, mg/kg	2,000	2,800

[1]Dredging and Dredged Material Management (July 31, 2015)

[2]40 CFR §503.13, Table 3

2.4.2 State Guidance

The Texas Commission on Environmental Quality (TCEQ) oversees the Texas Risk Reduction Program (TRRP), which establishes requirements for remediating properties affected by contamination. While TRRP is assumed not to be applicable to Mitchell Lake, its requirements can provide guidance on quality objectives. A comparison of concentrations of Chemicals of Concern (COC) in the dredged material to the protective concentration levels (PCLs) set forth for TRRP is a conservative approach in evaluating whether the material could be land-applied without causing potential adverse impacts. PCLs are effectively the concentration of a COC that can be allowed to be present within the source medium (dredged sediment in this case). The TCEQ provides guidance for screening material against applicable PCLs in their publication titled 'Determining Which Releases are Subject to TRPP." Note that this document relates specifically to "releases that occur under the jurisdiction of a TCEQ Remediation Division program," which is not applicable to Mitchell Lake.

The recommended approach in the guidance document for screening the source medium is as follows:

- Step 1. Compare COC concentrations with Texas-specific background concentrations. If they are below background concentrations, the material is considered uncontaminated.
- Step 2. If the COC concentrations are above background concentrations, compare the COC concentrations with both the $^{Tot}Soil_{Comb}$[2] and $^{GW}Soil_{Ing}$[3] PCLs for Class 1 residential groundwater based on a 0.5-acre source area. If COC concentrations are below the more restrictive of the two PCLs, the material is considered uncontaminated. (Note that for metals, $^{GW}Soil_{Ing}$ is generally the more restrictive PCL, while for organic compounds, $^{Tot}Soil_{Comb}$ is generally the more restrictive PCL.)
- Step 3. If the COC concentrations are above the more restrictive of the $^{Tot}Soil_{Comb}$ and $^{GW}Soil_{Ing}$ PCLs for Class 1 groundwater based on a 0.5-acre source area, but below the less restrictive PCL, utilize the SPLP test to compare the COC

[2] $^{Tot}Soil_{Comb}$ is the PCL for combined ingestion, dermal contact, inhalation of volatiles and particulates, and ingestion of aboveground and below-ground vegetables with COCs in soil.
[3] $^{GW}Soil_{Ing}$ is the PCL for soil to groundwater leaching of COCs to Class 1 or 2 groundwater.

concentrations with the ${}^{GW}GW_{Ing}$[4] PCL. This test measures the likelihood of the source to leach contaminants. If the COC concentrations are below the ${}^{GW}GW_{Ing}$ PCL, the material is considered uncontaminated.

4 ${}^{GW}GW_{Ing}$ is the PCL for ingestion of COCs in Class 1 or 2 groundwater.

3 Sampling Event

Plummer sampled four locations within the proposed dredge area[5] in Mitchell Lake on September 24, 2020. Sampling protocol was previously developed by Plummer and documented in the *Dredged Lake Sediment Sampling Plan*[6]. Sampling locations are shown in Figure 1. Station #1, located in front of the existing spillway, was the only location that was not submerged at the time of sampling.

The sediment samples collected were analyzed using the following types of analyses:

- Toxicity Characteristic Leaching Procedure (TCLP) leachate was analyzed for the regulated TCLP parameters: eight metals, 24 volatile and semi-volatile organic compounds, two herbicides, and six pesticides (reported in mg/L). The TCLP leachate was also analyzed for pH, flashpoint, reactive cyanide, and reactive sulfide.
- The sediment was analyzed to determine the total concentration (reported by dry weight in mg/kg) of the eight metals regulated by the Resource Conservation and Recovery Act (RCRA) (referred to as the RCRA 8 metals); select additional priority pollutant (PP) metals[7] (beryllium, boron, copper, nickel, thallium, and zinc); cyanide; polychlorinated biphenyls (PCBs); and TPH.
- Synthetic Precipitation Leaching Procedure (SPLP) leachate was analyzed for the RCRA 8 metals and the PP metals identified above (reported in mg/L).

Metals were the primary focus of the analyses because previous sediment testing within the lake found somewhat elevated concentrations of select metals at some locations in the lake. Previous testing for the presence of herbicides and pesticides found mostly non-detectable concentrations. PCBs were not previously analyzed.

Not all samples were analyzed for all parameters. A summary of the analyses conducted on samples from each station is shown in Table 2.

[5] The proposed dredge area corresponds to the area indicated in Freese and Nichol's preliminary engineering report (dated April 2020) that would need to be dredged to facilitate natural drainage from the deepest portion of the lake to the spillway.
[6] Draft study plan was submitted to SAWS on September 9, 2020 and verbally approved. A final copy of the plan was submitted to SAWS on October 5, 2020.
[7] Priority pollutant metals are those which are regulated by the USEPA and for which analytical test methods have been developed.

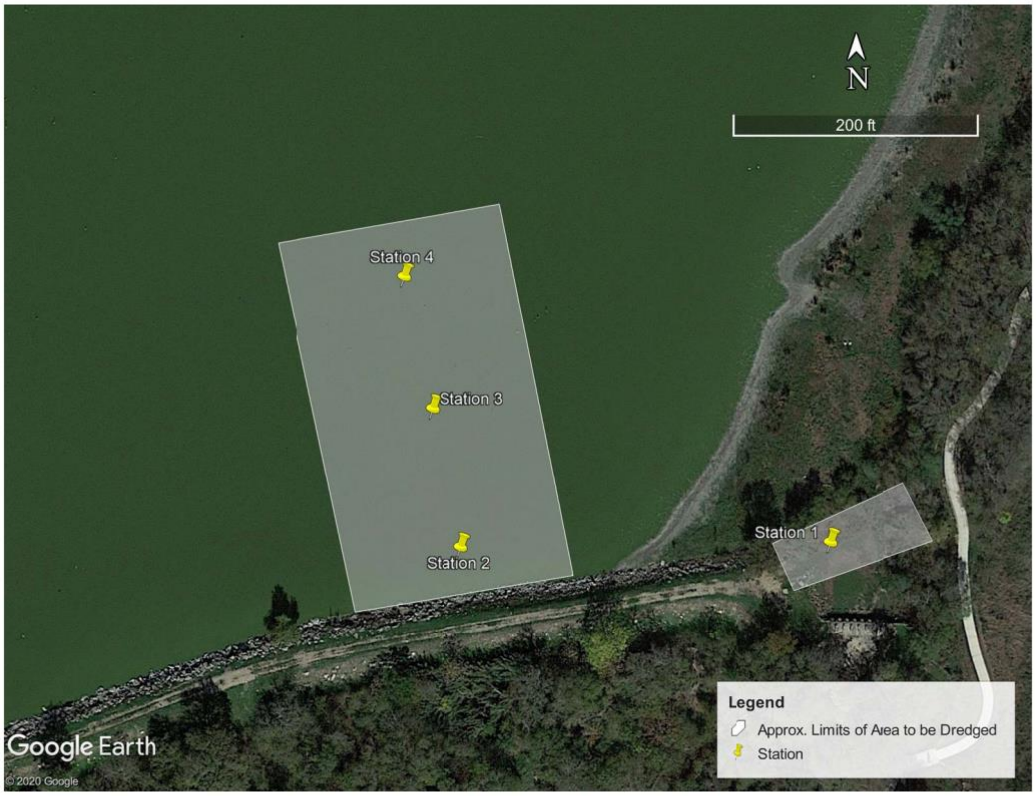

Figure 1. Map of Sampling Stations and Proposed Dredge Areas

Table 2. Sample Locations and Analyses Conducted

ANALYSES CONDUCTED	STA #1	STA #2	STA #3	STA #4
TCLP, TPH, cyanide, and sulfide (mg/L)			X	
Dry weight RCRA 8 and PP metals and PCBs (mg/kg)*	X	X	X	X
SPLP RCRA 8 and PP metals (mg/L)	X	X	X	X

* PCBs were not analyzed for Station #3

Samples were collected using a Wildco© hand corer, with an extension used for collecting submerged samples. The samples collected at Stations #1, #3, and #4 were a composite of three individual cores approximately 12-inches in depth. The samples collected at Station #2 were a composite of two individual cores approximately 30-inches in depth. Cores from each station were thoroughly mixed, transferred into sample bottles, placed on ice, and transported to San Antonio Testing Laboratory (SATL) for analysis.

Field conditions, with respect to water depth and physical characteristics of the sediment at each station, were recorded during sampling.

4 Sediment Sampling Results

This section includes the field and laboratory test results.

4.1 FIELD RESULTS

The sediments at the four stations had observably different physical characteristics. The characteristics observed were as follows:

- Station #1 – Sediment was exposed. The sediment was brown-to-gray in color, dry, and clayey. It was generally consistent in appearance across the vertical profile. See Figure 2 for a photograph of the sample.
- Station #2 – Sediment layer was submerged in approximately 30-inches of water. The sediment, across most of the vertical profile, was brown-to-gray in color, highly organic, and mucky. A more compacted clayey material was observed in the sediment below approximately 24-inches. Sediment at this station was non-weight bearing and could not be walked across safely. See Figure 3 for a photograph of the sample.
- Station #3 – Sediment layer was submerged in approximately 30-inches of water. The sediment was considerably more compacted than that at Station #2 and had a thinner organic layer over a more consolidated clayey underlayer. It was also brown-to-gray in color. See Figure 4 for a photograph of the sample.
- Station #4 – Sediment layer was submerged in approximately 30-inches of water. The material was notably more compacted than Stations #2 and #3, with a thin, but compacted, organic upper layer and a heavily compacted clayey underlayer. There was a notable difference in color between the upper layer and the underlayer. The upper layer was browner in color, and the underlayer was grayer. The underlayer was also more clayey. See Figure 5 for a photograph of the sample.

One possible explanation for the thick, highly organic material present at Station #2 is that decaying organic material such as algae and plant debris are deposited along the dam by wind and wave action. This would explain the relative lack of organic material further out into the lake and along the shoreline in the vicinity of the pilot wetland, as noted during Plummer's prior site visits to the wetland.

Figure 2. Station #1 Sample

Figure 3. Station #2 Sample

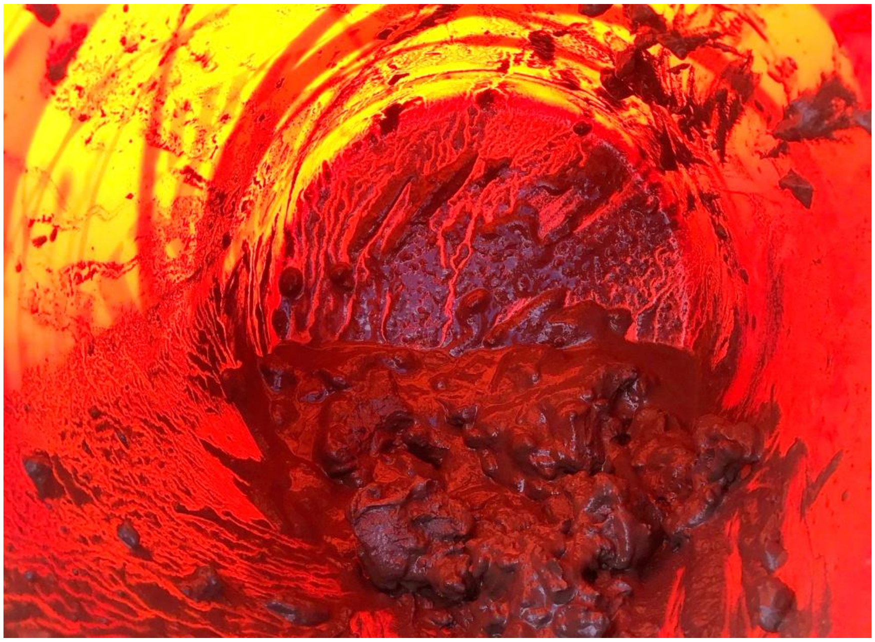

Figure 4. Station #3 Sample

Figure 5. Station #4 Sample

4.2 LABORATORY RESULTS

Results and conclusions from the laboratory analyses are listed below.

4.2.1 Results of Hazardous vs Non-Hazardous Waste Determination

The analyses of the sample from Station #3 show the material did not exhibit ignitability, corrosivity, reactivity, or toxicity. The results of the flashpoint, pH, and TCLP tests confirmed the material collected at Station #3 would be classified as non-hazardous. The analytical results and the flashpoint, pH, and TCLP regulatory limits are shown in Table 3.

4.2.2 Results of Non-Hazardous Waste Classification

The analyses of the sample from Station #3 for TCLP parameters, TPH, and reactive cyanide are well below the concentrations that trigger a Class 1 non-hazardous waste designation. Therefore, a landfill would be likely to classify dredged material from this location as a Class 2 non-hazardous waste[8]. The analytical results and the concentrations triggering a Class 1 designation are shown in Table 3.

[8] There are many more constituents listed in 30 TAC §335.521 (a)(1) than the 60 constituents regulated by TCLP. Covel Gardens landfill confirmed to Plummer in a phone call that they are primarily concerned about the TCLP constituents. Therefore, if the TCLP results confirm the material would be considered Class 2, they would be unlikely to request testing for any additional constituents.

Table 3. Results of TCLP Test, TCLP Regulatory Limits, and Class 1 Non-Hazardous Waste Regulatory Limits

PARAMETER	STATION #3 RESULTS	TCLP (40 CFR §261) TRIGGERS FOR HAZARDOUS WASTE DESIGNATION[1]	CLASS 1 TRIGGERS (§335.521)[2]
pH, su	7.68	<2 or >12.5	<2 or >12.5
Flashpoint, deg F	>200	<140	<150
Reactive Cyanide, mg/L	<10	-	20[3]
Reactive Sulfide, mg/L	<10	-	-
Total Petroleum Hydrocarbons			
C6-C12 hydrocarbons, mg/kg	<10		
>C12-C28 hydrocarbons, mg/kg	<50		
>C28-C35 hydrocarbons, mg/kg	<50		
Total C6-C35 hydrocarbons, mg/kg	<150	-	1,500[4]
Metals			
Arsenic, mg/L	0.033	5	1.8
Barium, mg/L	1.33	100	100
Cadmium, mg/L	<0.01	1	0.05
Chromium, mg/L	<0.01	5	5
Lead, mg/L	<0.01	5	1.5
Mercury, mg/L	<0.002	0.2	0.2
Selenium, mg/L	0.016	1	1
Silver, mg/L	<0.01	5	5
Volatile Organic Compounds			
Benzene, mg/L	<0.025	0.5	0.5
Carbon Tetrachloride, mg/L	<0.025	0.5	0.5
Chlorobenzene, mg/L	<0.025	100	70
Chloroform, mg/L	<0.025	6	6
1,1-Dichloroethene, mg/L	<0.025	0.7	0.6
1,2-Dichloroethane, mg/L	<0.013	0.5	0.5
1,4-Dichlorobenzene, mg/L	<0.025	7.5	7.5
Methyl Ethyl Ketone (2-Butanone), mg/L	<0.05	200	200
Tetrachloroethene, mg/L	<0.025	0.7	0.7
Trichloroethene, mg/L	<0.025	0.5	0.5
Vinyl chloride, mg/L	<0.025	0.2	0.2

PARAMETER	STATION #3 RESULTS	TCLP (40 CFR §261) TRIGGERS FOR HAZARDOUS WASTE DESIGNATION	CLASS 1 TRIGGERS (§335.521)
Semi-Volatile Organic Compounds			
2,4,5-Trichlorophenol, mg/L	<0.01	400	400
2,4,6-Trichlorophenol, mg/L	<0.01	2	2
2,4-Dinitrotoluene	<0.01	0.13	0.13
2-Methylphenol [o-Cresol], mg/L	<0.01	200	200
3/4-Methylphenol, mg/L	<0.01	200	200
Benzidine, mg/L	<0.01	-	0.002
Hexachlorobenzene, mg/L	<0.01	0.13	0.13
Hexachlorobutadiene, mg/L	<0.01	0.5	0.4
Hexachloroethane, mg/L	<0.01	3	3
Nitrobenzene, mg/L	<0.01	2	2
Pentachlorophenol, mg/L	<0.01	100	100
Pyridine, mg/L	<0.01	5	4
Chlorophenoxy Acid Herbicides			
2,4-D, mg/L	<0.02	10	10
2,4,5-TP (Silvex), mg/L	<0.025	1	1
Organochlorine Pesticides			
gamma-BHC (Lindane), mg/L	<0.25	0.4	0.3
Heptachlor, mg/L	<0.005	0.008	0.008
Heptachlor Epoxide, mg/L	<0.005	0.008	0.04
Endrin, mg/L	<0.005	0.02	0.02
Methoxychlor, mg/L	<0.25	10	10
Toxaphene, mg/L	<0.5	0.5	0.3
Chlordane	<0.025	0.03	0.03

[1]Hazardous waste regulatory limits as defined in 40 CFR §261
[2]Class 1 limits shown only for TCLP constituents
[3]30 TAC §335.505
[4]30 TAC §335.508

4.2.3 Results of Total Concentration and SPLP Leachate Analyses

The results of analyses for metals and PCBs were as follows:

- Total PCB concentrations are non-detectable at all three sampling locations (Stations #1, #2, and #4). The results and the regulatory levels are shown in Table 4.
- The total metals analyses (reported in mg/kg) show a clear and consistent trend of increasing concentrations the further into the lake the samples were collected. Station #1 (at the spillway) had the lowest metals concentrations, while Station #4 (furthest into the lake) had the highest. The trend within the lake indicates the more compacted, clayey material has considerably higher concentrations of metals than the organic material. The results are shown in Table 4.
- SPLP leachate metals analyses (reported in mg/L) show most concentrations are non-detectable. Low concentrations of certain metals were detected (arsenic, barium, boron, chromium, nickel, and zinc), with concentrations at Station #1 generally showing slightly higher concentrations. The results are shown in Table 5.
- In screening the material for suitability for land application based on USACE and USEPA guidance, all metals concentrations at all stations were below the maximum recommended concentrations listed in Table 1.
- In screening the material for suitability for land application based on the TCEQ's three recommended steps for determining contamination, the screening indicated the material should be suitable for land application. Results of the screening are as follows:
    - Step 1 – Screen against Texas-specific background concentrations. The dry weight concentrations of certain metals at some of the stations exceed Texas-specific background concentrations. Metals that are elevated above Texas-specific background concentrations at some or all stations are arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc. Based on these results, the screening proceeded to Step 2. (Results are shown in Table 4).

For reference, the dry weight concentrations were also compared against local background concentrations in soils from the Cook Trust property[9], which is one possible location for land application. The metals concentrations within the main body of the lake (Stations #2, 3, and 4) were generally elevated above concentrations in soil at the Cook Trust property. By contrast, metals concentrations at Station #1 were lower than those in soils at the Cook Trust property. The results are shown in Table 6.

- Step 2 – Compare dry weight concentrations of metals to ${}^{GW}Soil_{Ing}$ and ${}^{Tot}Soil_{Comb}$ PCLs. The dry weight concentrations of certain metals at some stations (arsenic, cadmium, lead, mercury, selenium, and silver) are in excess of the ${}^{GW}Soil_{Ing}$ PCLs, but all concentrations are less than the ${}^{Tot}Soil_{Comb}$ PCLs. Based on these results, the screening proceeded to Step 3. (Results are shown in Table 4.)
- Step 3 – Compare SPLP leachate concentrations to ${}^{GW}GW_{Ing}$ PCLs. The SPLP leachate concentrations of all metals at all stations were well below ${}^{GW}GW_{Ing}$ PCLs. Based on these results, the material would be considered uncontaminated. SPLP results are shown in Table 5.

[9] From the "Limited Subsurface Investigation Letter Report" dated March 27, 2017. Samples were collected from two locations within the proposed full-scale wetland: the Cell 1 footprint and the Cell 2 and 3 footprints.

Table 4. Comparison of Dry Weight Analyses and Texas-Specific Background Concentrations and Tier 1 Residential PCLs

PARAMETER	STA #1	STA #2	STA #3	STA #4	Texas-Specific Background Conc.	Tier 1 Res Soil PCL, $^{GW}Soil_{Ing}$, 0.5-Ac Source Area	Tier 1 Res Soil PCL, $^{Tot}Soil_{Comb}$, 0.5-ac, mg/kg
Metals & Cyanide							
Arsenic, mg/kg	1.5	4.63	**6.65**	**9.12**	5.9	5.0	24
Barium, mg/kg	30.6	149	175	251	300	440	8,100
Beryllium, mg/kg	<0.4	0.421	0.401	0.585	1.5	1.8	38
Boron, mg/kg	<0.1	<1	6.08	<1	30	-	16,000
Cadmium, mg/kg	<0.5	**1.84**	**3.34**	**4.61**	N/A	1.5	52
Chromium, mg/kg	6.19	146	240	323	30	2,400	33,000
Copper, mg/kg	4.52	66.3	96.4	139	15	1,000	1,300
Lead, mg/kg	6.87	**81.9**	**120**	**171**	15	3.0	500
Mercury, mg/kg	<0.04	1.66	**2.85**	**4.51**	0.04	2.1	8.3
Nickel, mg/kg	10.1	17.7	21.8	29.8	10	160	840
Selenium, mg/kg	<1	1.68	2.16	**3.44**	0.3	2.3	310
Silver, mg/kg	<0.35	**15.4**	**26.2**	**37.9**	N/A	0.48	97
Thallium, mg/kg	<1	<1	<0.25	<1	N/A	1.7	5.3
Zinc, mg/kg	19.3	284	467	654	30	2,400	9,900
Cyanide, mg/kg	<0.1	<0.1	<0.1	<0.1	N/A	40	45
Polychlorinated Biphenyls (PCBs)							
PCB 1016, mg/kg	<0.05	<0.05	-	<0.05	-	11	1.1
PCB 1221, mg/kg	<0.05	<0.05	-	<0.05			
PCB 1232, mg/kg	<0.05	<0.05	-	<0.05			
PCB 1242, mg/kg	<0.05	<0.05	-	<0.05			
PCB 1248, mg/kg	<0.05	<0.05	-	<0.05			
PCB 1254, mg/kg	<0.05	<0.05	-	<0.05			
PCB 1260, mg/kg	<0.05	<0.05	-	<0.05			

*Blue shaded cells indicate concentrations in excess of Texas-specific background concentrations. Red, bolded text indicate concentrations in excess of the higher of either $^{GW}Soil_{Ing}$ PCLs or background concentrations. No concentrations exceed Tier 1 $^{Tot}Soil_{Comb}$ PCLs.

Table 5. Comparison of SPLP Leachate Metals and Tier 1 Residential PCLs

METAL	STA #1	STA #2	STA #3	STA #4	Tier 1 Res Soil PCL, $^{GW}GW_{Ing}$, 0.5-ac
Arsenic, mg/L	<0.01	0.017	0.027	0.03	1
Barium, mg/L	0.226	0.341	0.378	0.502	200
Beryllium, mg/L	<0.004	<0.004	<0.004	<0.004	0.4
Boron, mg/L	2.53	0.511	0.389	0.355	490
Cadmium, mg/L	<0.005	<0.005	<0.005	<0.005	0.5
Chromium, mg/L	0.012	<0.01	<0.01	<0.01	10
Copper, mg/L	<0.02	<0.02	<0.02	<0.02	130
Lead, mg/L	<0.01	<0.01	<0.01	<0.01	1.5
Mercury, mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.2
Nickel, mg/L	0.023	<0.01	<0.01	<0.01	-
Selenium, mg/L	<0.01	<0.01	<0.01	<0.01	5
Silver, mg/L	<0.05	<0.05	<0.05	<0.05	12
Thallium, mg/L	<0.01	<0.01	<0.01	<0.01	0.2
Zinc, mg/L	0.076	0.079	0.046	0.051	730

Table 6. Range of Lake Sediment Results and Cook Trust Background Concentrations

PARAMETER	Lake Sediment Results	Cook Trust (Cell 1)	Cook Trust (Cell 2 & 3)
Arsenic, mg/kg	1.50 – 9.12	3.01	2.85
Barium, mg/kg	30.6 – 251	56.0	51.1
Cadmium, mg/kg	<0.5 – 4.61	ND	ND
Chromium, mg/kg	6.19 – 323	18.2	22.6
Lead, mg/kg	6.87 – 171	22.2	21.0
Mercury, mg/kg	<0.04 – 4.51	-	0.092
Selenium, mg/kg	<1 – 3.44	ND	ND
Silver, mg/kg	<0.35 – 37.9	ND	0.966

5 Conclusions

The results of the screening indicated the following:

- The material that was tested is non-hazardous.
- The material that was tested would most likely be classified as Class 2 non-hazardous waste if it were disposed at a landfill.
- The material that was tested exceeded some of the $^{GW}Soil_{Ing}$ PCLs for select metals but did not exceed any of the $^{Tot}Soil_{Comb}$ PCLs. Moreover, the material did not exceed $^{GW}GW_{Ing}$ PCLs. Based on these results and the TCEQ's recommended TRRP screening process, the material is not considered contaminated.
- The material that was tested did not exceed any USEPA or USACE maximum recommended concentrations for land application of dredged sediment.
- Potential management options, based on the results of the testing, are 1) disposal in a non-hazardous waste landfill as Class 2 waste, and 2) land application. Composting may be another option but the material would need to be explicitly approved by the composting facility after providing them with testing results.
- The nature of the sediment varies from highly organic muck to compacted clay. The physical characteristics of the material could impact land disposal options, as the organic muck would not be suitable for some beneficial uses (such as levee fill). The clayey material would be suitable for levee fill, however.
- The contractor should be required to conduct additional sampling and analysis prior to dredging to confirm the quality of the material to be dredged since quality can vary spatially.
- Coordination with TCEQ is recommended prior to dredging to discuss management of dredged materials if the material is to be land applied.

6 References

“Determining Which Releases are Subject to TRRP”, TCEQ, Revised November 19, 2010.

Dredging and Dredged Material Management, USACE, July 31, 2015.

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