U.S. Army Corps of Engineers
Omaha District

Special Study Report

Results of Elutriate Sampling Conducted Along the Yellowstone River at Intake Dam, Montana on April 29-30, 2009

Water Quality Unit
Water Control and Water Quality Section
Hydrologic Engineering Branch
Engineering Division
Omaha District
U.S. Army Corps of Engineers

June 2009

1 BACKGROUND INFORMATION

A project is being considered by the Omaha District of the U.S. Army Corps of Engineers (Corps) to modify the Intake Dam structure on the Yellowstone River near Glendive, Montana. The project would address pallid sturgeon recovery in the Yellowstone River system by working with the U.S. Bureau of Reclamation (USBR) to modify the USBR's Intake Dam irrigation diversion to allow for fish passage. Modifying Intake Dam is considered a top priority for increasing pallid sturgeon populations. Located approximately 72 miles upstream from the confluence of the Yellowstone River with the Missouri River, the dam currently is a barrier to spawning and migrating warm water fish on the Yellowstone River.

The Corps and USBR are currently evaluating design options to modify Intake Dam. A design is being pursued that will provide a way for fish to move past the diversion dam, is practical to construct, and assures continued supply of irrigation water to the Lower Yellowstone Irrigation District. An option being considered is to reconfigure the dam into a river-wide ramp that has a slight gradient that doesn't impede the passage of warm water fish. A screening system may also be included to prevent young fish from being swept into the irrigation canal as they move downstream.

Modification of the Intake Dam structure may result in the scouring of sediment currently upstream of the dam and its movement downstream. It is unknown whether the sediment that would be scoured contains any contamination that may be a concern. To address this unknown, sediment in the projected scour area upstream and in selected areas downstream of Intake Dam was sampled and analyzed for contamination. Sediment samples representative of the Intake Dam area were collected and elutriate analysis was conducted. Sampling and analysis of the sediment samples was conducted in accordance with the prepared Sampling and Analysis Plan (Attachment 1). Sediment and water samples for elutriate analysis were collected at Intake Dam on April 29 and 30, 2009. The remainder of this report presents the findings of the conducted sampling.

2 FIELD RESULTS

2.1 Location of Sampled Sites

The locations of the sites where sediment and water samples were collected at Intake Dam are shown in Figure 1. The latitude and longitude of the sampled sites determined with a "hand-held" GPS device are given below.

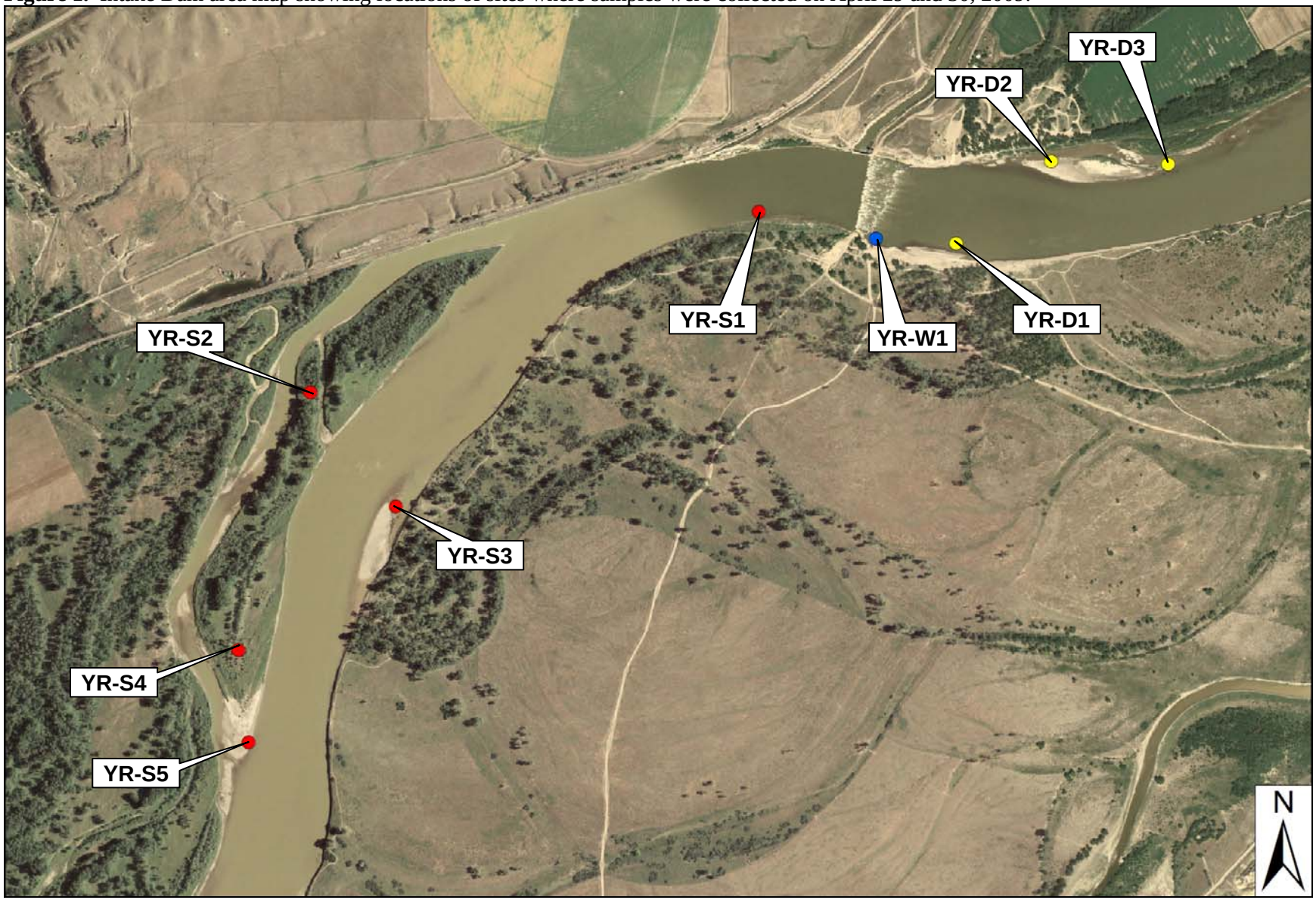
GPS MEASUREMENTS (NAD27 CONUS)

GPS Device Used for Determining Actual Locations: Garmin GPS Map 765

Sampled Locations:

YR-S1:	Latitude: N 47° 16' 47.2" W,	Longitude: 104° 31' 58.9" N
YR-S2:	Latitude: N 47° 16' 31.6" W,	Longitude: 104° 32' 57.9" N
YR-S3:	Latitude: N 47° 16' 21.5" W,	Longitude: 104° 32' 47.0" N
YR-S4:	Latitude: N 47° 16' 08.8" W,	Longitude: 104° 33' 07.3" N
YR-S5:	Latitude: N 47° 16' 00.8" W,	Longitude: 104° 33' 07.0" N
YR-D1:	Latitude: N 47° 16' 43.6" W,	Longitude: 104° 31' 33.8" N
YR-D2:	Latitude: N 47° 16' 51.2" W,	Longitude: 104° 31' 21.0" N
YR-D3:	Latitude: N 47° 16' 51.0" W,	Longitude: 104° 31' 05.9" N
YR-W1:	Latitude: N 47° 16' 44.3" W,	Longitude: 104° 31' 43.9" N

Figure 1. Intake Dam area map showing locations of sites where samples were collected on April 29 and 30, 2009.



2.2 Water Quality Field Measurements

In-situ water quality conditions that were measured near the surface of the Yellowstone River on April 30, 2009 (12:15 pm) at site YR-W1 are given below. The site was in an area of moderate current approximately 5 meters from the bank in 2 feet of water.

WATER QUALITY FIELD MEASUREMENTS						
Temp (°C)	**pH (S.U.)**	**Sp. Cond. (umhos/cm)**	**D.O. (mg/l)**	**D.O. (% Sat.)**	**Turbidity (NTU)**	**ORP (mV)**
8.0	8.3	625	10.7	95.0	913	352

2.3 Samples Collected

A description of the samples that were collected at sites YR-S1, YR-S2, YR-S3, YR-S4, YR-S5, YR-D1, YR-D2, YR-D3, and YR-W1 is given below. A split sediment sample was created at site YR-S3. All samples were delivered to Midwest Laboratories, Inc. (Omaha, Nebraska) on May 1, 2009. It is noted that core samples were not able to be collected at most sites due to the presence of "cobble" in the sediment, and the "cemented" nature of the substrate of the Yellowstone River in the area of Intake Dam. All cobbles (i.e., stones > 3 inches) were removed from the sediment sample collected for elutriate analysis; therefore, the "Particle Size Distribution Reports" are biased in this regard. Methods used to collect sediment samples from "cemented" substrates were modified in the field. Sediment samples were collected in "cemented" substrates by using a shovel to dig to a depth of approximately 1½ feet and collecting representative sediment from the bottom and sides of the excavated hole.

SAMPLES COLLECTED*				
Sample Type	**Sample ID**	**Sampled Depth**	**Collection Time**	**Sampling Method**
Sediment	YR-S1	2.0 ft	30-Apr-09 8:40	Composite Core/Grab
Sediment	YR-S2	4.0 ft	30-Apr-09 10:00	Composite Core
Sediment	YR-S3	1.5 ft	30-Apr-09 9:10	Composite Grab
Sediment	YR-S4	3.0 ft	30-Apr-09 10:30	Composite Core
Sediment	YR-S5	1.5 ft	30-Apr-09 11:00	Composite Grab
Sediment	YR-D1	1.5 ft	30-Apr-09 8:00	Composite Grab
Sediment	YR-D2	1.5 ft	29-Apr-09 11:00	Composite Grab
Sediment	YR-D3	1.5ft	29-Apr-09 12:00	Composite Grab
Water	YR-W1	Surface	30-Apr-09 12:15	Grab

* See following sampling notes for site-specific substrate description and sampling method.

2.4 Sampling Notes

The following sampling notes describe conditions at the individual sampling sites and methods utilized to collect the individual samples.

Site YR-S1

Water Depth: 1 foot
Substrate Type: Mixed cobble, gravel, and sand.
Sampling Method: Shoveled through "cemented" layer at the surface. Collected five 2-inch cores to a depth of 2 feet. Collected two shovel scoops to a depth of 1.5 feet. All collected sediment combined/mixed and a composite sample created.

Site YR-S2

Water Depth: 0 (Sample collected on "permanent" island)
Soil Type: Fine sand.
Sampling Method: Auger used to collect a 2-inch core to a depth of 4 feet. Collected sediment combined/mixed and a composite sample created.

Site YR-S3

Water Depth: 0.5 feet
Substrate Type: "Cemented" cobble-gravel-sand.
Sampling Method: Shovel used to dig a 1.5 foot deep hole. Sediment was collected from the sides and bottom of hole. Collected sediment combined/mixed and a composite sample created.

Site YR-S4

Water Depth: 0 (Sample collected on "permanent" island)
Soil Type: Fine to coarse sand.
Sampling Method: Auger used to collect a 2-inch core to a depth of 3 feet. A "rocky" layer encountered at 3 feet which could not be cored through. Collected sediment combined and a composite sample created.

Site YR-S5

Water Depth: 0.5 feet
Substrate Type: "Cemented" cobble-gravel-sand.
Sampling Method: Shovel used to dig a 1.5 foot deep hole. Sediment was collected from the sides and bottom of hole. Collected sediment combined/mixed and a composite sample created.

Site YR-D1

Water Depth: 1 foot
Substrate Type: "Cemented" cobble-gravel-sand.
Sampling Method: Shovel used to dig a 1.5 foot deep hole. Sediment was collected from the sides and bottom of hole. Collected sediment combined/mixed and a composite sample created.

Site YR-D2

Water Depth: 0.5 foot
Substrate Type: "Cemented" cobble-gravel-sand.
Sampling Method: Shovel used to dig a 1.5 foot deep hole. Sediment was collected from the sides and bottom of hole. Collected sediment combined/mixed and a composite sample created. Sample site was at the upstream point of an exposed "gravel/cobble" bar.

Site YR-D3

Water Depth: 0.5 foot
Substrate Type: Sand.
Sampling Method: Shovel used to dig a 1.5 foot deep hole. Sediment was collected from the sides and bottom of hole. Collected sediment combined/mixed and a composite sample created. Sample site was in a "depositional area" at the downstream point of an exposed "gravel/cobble" bar. Substrate contained layers of seemingly black decomposed material.

Site YR-W1

Water Depth: 2.0 feet
Substrate Type: NA.
Sampling Method: Plastic bucket used to collect water from river and was poured into 1-gallon, amber glass jugs.

3 ANALYTICAL RESULTS

The laboratory analytical results for the collected receiving water, sediment, and prepared elutriate samples are provided in Attachment 2 as follows:

ATTACHMENT 2.1 – Analytical Results of Receiving Water Collected at Site YR-W1.

ATTACHMENT 2.2 – Analytical Results of Sediment Sample Collected at Site YR-S1 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S1.

ATTACHMENT 2.3 – Analytical Results of Sediment Sample Collected at Site YR-S2 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S2.

ATTACHMENT 2.4 – Analytical Results of Sediment Sample Collected at Site YR-S3 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S3.

ATTACHMENT 2.5 – Analytical Results of Split Sediment Sample Collected at Site YR-S3 and Elutriate Sample Prepared from Split Sediment Sample Collected at Site YR-S3.

ATTACHMENT 2.6 – Analytical Results of Sediment Sample Collected at Site YR-S4 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S4.

ATTACHMENT 2.7 – Analytical Results of Sediment Sample Collected at Site YR-S5 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S5.

ATTACHMENT 2.8 – Analytical Results of Sediment Sample Collected at Site YR-D1 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D1.

ATTACHMENT 2.9 – Analytical Results of Sediment Sample Collected at Site YR-D2 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D2.

ATTACHMENT 2.10 – Analytical Results of Sediment Sample Collected at Site YR-D3 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D3.

4 SUMMARY OF ANALYTICAL RESULTS

4.1 Particle Size Distribution of Collected Sediment Samples

Table 1 summarizes the Particle Size analyses for the sediment samples collected at sites YR-S1, YR-S2, YR-S3, YR-S3(Split), YR-S4, YR-S5, YR-D1, YR-D2, and YR-D3.

Table 1. Particle Size Distribution of the Collected Sediment Samples.

Site	Site Location	Percent Gravel		Percent Sand			Percent Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
YR-S1	Submerged Substrate	5.9	44.9	4.8	4.9	38.5	0.6	0.4
YR-S2	Permanent Emergent Island	0.0	3.3	8.4	7.4	12.9	45.6	22.4
YR-S3	Submerged Substrate	19.3	44.4	8.4	8.1	18.3	1.2	0.3
YR-S3(Split)	Submerged Substrate	24.8	46.9	7.8	6.5	12.4	1.3	0.3
YR-S4	Permanent Emergent Island	12.1	22.6	2.7	13.0	39.9	7.1	2.6
YR-S5	Submerged Substrate	33.8	27.8	6.3	8.6	20.8	2.3	0.4
YR-D1	Submerged Substrate	36.8	17.6	2.3	2.0	40.0	0.9	0.4
YR-D2	Submerged Substrate	19.6	48.4	10.4	6.9	12.7	1.6	0.4
YR-D3	Submerged Substrate	0.0	0.0	0.0	0.3	45.7	46.3	7.7

Note: All cobbles (i.e., stones > 3 inches) were removed from the collected sediment samples in the field; therefore, the particle size distribution is biased in this regard.

4.2 Water Quality Characteristics of Collected Receiving Water and Prepared Elutriate Samples

No Organochlorine Pesticides, PCBs, or Organophosphate Pesticides were detected in the collected receiving water or in any of the prepared elutriate samples (Attachments 2.1 – 2.10).

Table 2 summarizes the general water quality characteristics of the collected receiving water and prepared elutriate samples. As discussed in the prepared Sampling and Analysis Plan (Attachment 1), the elutriate samples were not centrifuged or filtered as a last step in their preparation. This was done to allow the elutriate samples to be more comparable to selected Montana water quality standards (i.e., all metals except Aluminum) that are based on total recoverable methods. Since the dissolved phase of metals tends to be the most toxic to aquatic life, the total metal concentrations measured would be indicative of "worst-case" conditions assuming all the measured total metal concentration is dissolved. The turbidity levels for the prepared elutriate samples give an indication of the "total" material that was retained in the sample and analyzed. A review of Table 2 indicates that elutriate sample YR-D3 appears to be atypical. It has, relatively, a high total Kjeldahl nitrogen value (> 4 times the next highest value), and a very high total ammonia value (> 20 times the next highest value). The total ammonia level of 3.84 mg/l for the YR-D3 elutriate sample is about 1 mg/l below the acute and 2.8 mg/l above the chronic total ammonia criteria for a pH level of 8.3 and a water temperature of 20°C. The sediment sample collected at site YR-D3 seemingly included a localized area of organic matter high in nitrogen that was exposed to anaerobic conditions. Site YR-D3 was located downstream of Intake Dam. It is believed to be an isolated occurrence and not indicative of the sediments upstream from Intake Dam that are characterized by the elutriate samples collected upstream of Intake Dam.

Table 3 summarizes the metal concentrations that were analyzed in the receiving water and the prepared elutriate samples. Very high levels of total Iron, Manganese, and Aluminum were present in the Yellowstone River water sample, the collected sediment samples, and the prepared elutriate samples (Table 3 and Attachments 2.1 – 2.10). Measured total Iron concentrations were 4 to 11 times higher than the chronic criteria of 1,000 mg/l for the protection of warmwater aquatic life. Measured total Manganese concentrations ranged from about ½ to 5 times the secondary maximum contaminant level based on aesthetic properties. The measured total Aluminum concentrations were not directly comparable to Montana water quality standards that are based on dissolved Aluminum concentrations. The high levels of total Iron, Manganese, and Aluminum are believed to be a natural condition associated with the geology and soils of the region.

Detectable levels of total Arsenic, Lead, and Zinc were measured in all the prepared elutriate samples (Table 3). Arsenic and Zinc were also detected in the Yellowstone River receiving water (Table 3). Arsenic levels ranged from 3 to 11 ug/l for both the five samples upstream (i.e., YR-S1, YR-S2, YE-S3, YR-S4, and YR-S5) and three samples downstream (i.e., YR-D1, YR-D2, and YR-D3) of Intake Dam. The mean Arsenic concentrations for the five upstream and three downstream samples were, respectively 5.8 ug/l and 6.0 ug/l. The Arsenic concentration of 11 ug/l for elutriate samples YR-S1 and YR-D3 is just above the 10 ug/l human health criterion for surface waters, but well below the 150 ug/l chronic criteria for aquatic life protection. Lead levels ranged from 2 to 8 ug/l for both the five upstream and three downstream elutriate samples. The mean Lead concentrations for the five upstream and three downstream samples were, respectively 4.8 ug/l and 4.3 ug/l. The Lead concentration of 8 ug/l for elutriate samples YR-S4 and YR-D3 is just above the 7.8 ug/l hardness-calculated chronic criteria for aquatic life protection. Zinc levels ranged from 13 to 36 ug/l for the five upstream elutriate samples, and from 16 to 30 ug/l for the three downstream elutriate samples. The mean Zinc concentrations for the five upstream and three downstream elutriate samples were, respectively 26.4 ug/l and 20.7 ug/l. All the measured Zinc concentrations were well below the 218 ug/l hardness-calculated acute and chronic criteria for aquatic life protection. The detectable levels of Arsenic, Lead, and Zinc in the sediments are seemingly an ambient condition of the Yellowstone River in the area of the Intake Dam.

Table 2. General Water Quality Characteristics of Collected Receiving Water and Prepared Elutriate Samples.

Parameter	Detection Limit	Receiving Water	Elutriate Samples								
		YR-W1	YR-S1	SR-S2	YR-S3	YR-S3 (Split)	YR-S4	YR-S5	YR-D1	YR-D2	YR-D3
Alkalinity, Total (mg/l)	4	139	138	183	139	139	144	140	140	140	164
Ammonia Nitrogen, Total(mg/l)[(1)]	0.02	n.d.	0.17	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	3.84
Carbon, Total Organic (mg/l)	0.2	2.9	3.4	6.5	3.5	5.0	4.0	3.7	3.3	3.6	4.9
Carbonaceous Biochemical Oxygen Demand – CBOD (mg/l)	2	n.d.	n.d.	4	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	4
Chemical Oxygen Demand – COD (mg/l)	3	38	14	35	14	16	47	17	15	13	26
Kjeldahl Nitrogen, Total (mg/l)	0.2	n.d	1.1	1.2	0.7	n.d.	1.1	0.9	0.8	0.9	4.9
Nitrate-Nitrite Nitrogen (mg/l)	0.02	0.50	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.40	0.30
Oxidation Reduction Potential (mV)	-----	-13	-50	-48	-38	1	1	1	-41	-38	-64
pH (S.U.)[(2)]	0.1	8.3	8.1	7.9	8.1	8.1	8.0	8.1	8.1	8.1	7.4
Phosphorus, Total (mg/l)	0.02	0.36	0.13	0.23	0.13	0.24	0.35	0.21	0.15	0.10	0.22
Suspended Solids, Total (mg/l)	4	875	-----	-----	-----	-----	-----	-----	-----	-----	-----
Turbidity	1	86	149	219	148	82	418	268	131	117	292

(1) Montana's water quality criteria for total ammonia are pH and temperature dependent. Acute and chronic criteria (salmonid fish not present) for a pH of 8.3 and a temperature of 20°C are, respectively, 4.7 and 1.0 mg/l.

(2) Montana's water quality criteria for pH are ≥ 6.5 and ≤ 9.0.

Table 3. Metal Concentrations Determined for Collected Receiving Water and Prepared Elutriate Samples. Also given are Montana's water quality standard (WQS) criteria.

Parameter	Detection Limit	Receiving Water	Elutriate Samples									Montana WQS Criteria[1]
		YR-W1	YR-S1	YR-S2	YR-S3	YR-S3 (Split)	YR-S4	YR-S5	YR-D1	YR-D2	YR-D3	
Calcium, Total (mg/l)	1	49.2	49.9	65.9	49.1	48.8	63.6	51.2	55.1	49.4	44.5	-----
Magnesium, Total (mg/l)	1	19.5	19.1	28.9	19.3	19.2	19.4	19.1	17.2	18.0	21.4	-----
Hardness, Total (mg/l)	1	203	203	284	202	201	239	207	208	197	199	-----
Aluminum, Total (ug/l)	25	4,600	4,997	7,731	6,109	3,989	11,731	9,425	5,100	4,402	10,100	See Note 1
Antimony, Total (ug/l)	0.5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	5.6[5]
Arsenic, Total (ug/l)	1	6	11	3	4	3	6	5	4	3	11	340[2], 150[3], 10[4]
Beryllium, Total (ug/l)	2	2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	4[4]
Cadmium, Total (ug/l)	0.2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	4.4[2], 0.46[3], 5[4]
Chromium, Total (ug/l)	1	n.d.	n.d.	n.d.	n.d.	10	18	10	n.d.	n.d.	10	3,220[2], 154[3], 100[4]
Copper, Total (ug/l)	1	20	n.d.	11	n.d.	10	17	10	n.d.	n.d.	10	27[2], 17[3], 1,300[4]
Cyanide, Total (ug/)	8	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	22[2], 5.2[3], 140[4]
Iron, Total (ug/l)	7	4,300	3,395	5,949	4,961	2,872	11,731	7,763	4,540	3,268	6,900	1,000[3], 300[5]
Lead, Total (ug/l)	0.5	n.d.	3	5	3	2	8	5	3	2	8	201[2], 7.8[3], 15[4]
Manganese, Total (ug/l)	2	46	227	81	43	28	199	97	92	92	530	50[5]
Mercury, Total (ug/l)	0.02	n.d.	n.d.	n.d.	n.d.	n.d.	0.02	n.d.	n.d.	n.d.	n.d.	1.7[2], 0.91[3], 0.05[4]
Nickel, Total (ug/l)	10	n.d.	n.d.	n.d.	n.d.	n.d.	16	10	n.d.	n.d.	10	854[2], 95[3], 100[4]
Selenium, Total (ug/l)	1	n.d.	3	3	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	3	20[2], 5[3], 50[4]
Silver, Total (ug/l)	3	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	14[2], 100[4]
Thallium, Total (ug/l)	0.5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.24[4]
Zinc, Total (ug/l)	10	21	16	25	21	13	36	34	16	16	30	218[2,3], 2,000[4]

[1] Montana's water quality criteria for Cadmium, Chromium, Copper, Lead, Nickel, Silver, and Zinc are based or hardness. Criteria given are for a hardness of 203 mg/l.

[2] Acute criterion for protection of warmwater aquatic life.

[3] Chronic criterion for protection of warmwater aquatic life.

[4] Human health criterion for surface waters.

[5] Secondary maximum contaminant level based on aesthetic properties.

Note 1: Montana's water quality criteria for Aluminum are based on dissolved concentrations and not directly comparable to the measured total concentrations. The acute and chronic criteria for dissolved Aluminum are, respectively, 750 and 87 ug/l. Historic monitoring of total and dissolved Aluminum levels in the Missouri River at Williston, North Dakota indicates that ambient total Aluminum levels are much higher than dissolved levels (i.e., > 1,000 times).

ATTACHMENT 1.

SAMPLING AND ANALYSIS PLAN
For
2009 Elutriate Sampling – Yellowstone River Intake Dam Area

SAMPLING AND ANALYSIS PLAN

for

2009 Elutriate Sampling – Yellowstone River Intake Dam Area

Project Number: SPS-YELLOW-001

Prepared By:

Water Quality Unit
Water Control and Water Quality Section
Hydrologic Engineering Branch
U.S. Army Corps of Engineers – Omaha District

April 2009

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Dave Jensen — 22-Apr-2009
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1 PROJECT DESCRIPTION

1.1 BACKGROUND INFORMATION

A project is being considered by the Omaha District of the U.S. Army Corps of Engineers (Corps) to modify the Intake Dam structure on the Yellowstone River near Glendive, Montana. The project would address pallid sturgeon recovery in the Yellowstone River system by working with the U.S. Bureau of Reclamation (USBR) to modify the USBR's Intake Dam irrigation diversion to allow for fish passage. Modifying Intake Dam is considered a top priority for increasing pallid sturgeon populations. Located approximately 72 miles upstream from the confluence of the Yellowstone River with the Missouri River, the dam currently is a barrier to spawning and migrating warm water fish on the Yellowstone River.

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Modification of the Intake Dam structure may result in the scouring of soil and sediment currently upstream of the dam and its movement downstream. It is unknown whether the soil/sediment that would be scoured contains any contamination that may be a concern. To address this unknown, soil/sediment in the projected scour area upstream and in selected areas downstream of Intake Dam will be sampled and analyzed for contamination. Representative samples will be collected and elutriate analysis conducted in accordance with the "Inland Testing Manual" (EPA/USACE, 1998). The modification of Intake Dam may also result in the introduction of fill material into the Yellowstone River that falls under the purview of Section 404 of the Federal Clean Water Act. Evaluating contamination of the soil/sediment would potentially facilitate a Section 401 water quality certification review of a proposed project.

1.2 PROJECT LOCATION

Intake Dam is located on the Yellowstone River approximately 13 miles northeast of Glendive, Montana (Attachment 1).

2 PROJECT/TASK ORGANIZATION AND RESPONSIBILITIES

The USACE's Water Control and Water Quality Section will conduct the collection of the soil/sediment samples at the Intake Dam site. The collected samples will be delivered to the District's contracted laboratory (Midwest Laboratories) in Omaha, Nebraska for sediment and elutriate analysis.

Staff Responsibilities and Contacts for Sampling:
Sample Collection: Dave Jensen (995-2310), Bill Otto (995-2313), Jim Laney (995-3733
Sampling Coordination: Dave Jensen
Data Quality Review: Dave Jensen
Laboratory Analysis: Midwest Laboratories, Prem Arora (829-9878)

3 SITE-SPECIFIC WATER QUALITY CONCERNS

3.1 SECTION 303(D) LISTINGS

Designated Yellowstone River stream segment MT42M001_012 [Powder River to the Lower Yellowstone Diversion Dam (i.e., Intake Dam)] is not identified as impaired by the State on Montana. The potential "scour area" behind the Intake Dam is on this stream segment at the downstream boundary.

The designated Yellowstone River stream segment immediately downstream of Intake Dam (segment number MT42M001_011) is identified as an impaired waterbody on the State of Montana's Section 303(d) list. The stream segment is listed as partially supporting of Aquatic Life and Warm Water Fishery. The probable causes of impairment are listed as: 1) alteration in stream-side or littoral vegetative covers, 2) chromium, 3) copper, 4) fish-passage barrier, 5) lead, 6) total nitrogen, 7) pH, 8) total phosphorus, 9) sedimentation and siltation, and 10) total dissolved solids. Stream segment MT42M001_011 is 71.1 miles long and runs from the Intake Dam to the North Dakota border.

3.2 CONCERNS IDENTIFIED BY THE STATE OF MONTANA

The State of Montana has requested that elutriate testing of soil/sediment from identified "scour areas" include the following metals at the specified detection levels: copper (1 ug/l), lead (0.5 ug/l), arsenic (3 ug/l), and chromium (1 ug/l).

4 DATA QUALITY OBJECTIVES

The data collected through this monitoring project will be used to assess the potential contamination of soil/sediment in projected scour areas immediately upstream of Intake Dam and in selected downstream areas. Collected information may also be used to facilitate Section 401 water quality certification review of a potential project to modify Intake Dam for fish passage.

5 DATA COLLECTION APPROACH

5.1 DATA COLLECTION DESIGN

Soil/sediment samples will be collected at eight sites (YR-S1, YR-S2, YR-S3, YR-S4, YR-S5, YR-D1, YR-D2, and YR-D3) and Yellowstone River water at one site (YR-W1) at the proposed project area. The location of the nine sites within the project area is shown in Attachments 2 and 3. Preliminary latitude and longitude coordinates for the nine sites are given below. The "actual" location of the sampled sites will be determined with a GPS unit in the field when the samples are collected.

Site	Latitude	Longitude
YR-D1	47° 16' 43.4"	104° 31' 33.1"
YR-D2	47° 16' 49.1"	104° 31' 17.2"
YR-D3	47° 17' 03.9"	104° 30' 27.4"
YR-S1	47° 16' 46.3"	104° 31' 55.5"
YR-S2	47° 16' 32.8"	104° 32' 52.7"
YR-S3	47° 16' 18.6"	104° 32' 50.0"
YR-S4	47° 16' 08.7"	104° 33' 07.9"
YR-S5	47° 15' 42.1"	104° 33' 21.8"
YR-W1	47° 15' 46.9"	104° 33' 03.0"

5.2 MEASUREMENT AND SAMPLING METHODS

5.2.1 Receiving Water Sample

Water from the Yellowstone River will be collected at the Intake Dam site (i.e., receiving water) and will be used to prepare elutriate samples (see Section 1.1). The laboratory requires 4 gallons of receiving water for each 1 gallon of soil/sediment to be analyzed. In addition to the 4 gallons of water for each 1 gallon soil/sediment, an additional gallon of receiving water is required for "background" analysis. The receiving water will be collected at Site YR-W1 near the river bank.

At the time the receiving water is collected, the following field measurements will be taken: water temperature, dissolved oxygen, pH, conductivity, oxidation-reduction potential, and turbidity. The measurements will be obtained with a "HydroLab" equipped with a MS5 DataSonde and Surveyor data logger in accordance with the Water Quality Unit's SOP Number WQ-21201, Using a "Hydrolab DS4a and DS5" to Directly Measure Water Quality (USACE, 2008). Measurements will be taken by immersion of the DataSonde directly into the river, or a plastic bucket will be used to collect a near-surface water sample. The Hydrolab would then be immediately placed in the plastic bucket and the measurements taken. Measurements will be appropriately recorded on a field sheet (Attachment 4).

5.2.2 Soil/Sediment Samples for Elutriate Sample Preparation

Soil/sediment samples will be collected for elutriate analysis. The soil/sediment samples will be collected at Sites YR-S1, YR-S2, YR-S3, YR-S4, YR-S5, YR-D1, YR-D2, and YR-D3. The equipment, supplies, and procedures to be used to collect the soil/sediment samples are as follows.

5.2.2.1 Sampling Equipment and Supplies

5.2.2.1.1 Supplies and Miscellaneous Equipment

- 1 gallon wide mouth glass jars
- 1 gallon narrow mouth glass jugs
- Sample bottle labels
- ARF
- Field sheets
- GPS device
- 5 gallon buckets
- Shovel
- Tarp
- Hammer, screwdriver, trowel
- Scrub brush
- Cooler with Ice
- Waders and rain gear

5.2.2.1.2 Soil Sampling Equipment

- Gas powered auger and gasoline mix
- 2-inch stainless steel corer head
- Auger extensions

5.2.2.1.3 Sediment Sampling Equipment

- 2-inch stainless steel Ogeechee sand corer (36-inch and 48-inch)
- Extension handle and segments
- Hand corer head
- Ogeechee slide hammer
- Polyethylene liner tubes and caps, core catchers, nose pieces
- Core sample removal tool

5.2.2.2 Soil Collection Procedure – Composite Sample

- Select sample site and record general information (including Latitude/Longitude) on the field sheet.
- Remove any vegetation near the proposed boring site.
- Set out equipment near boring site. Using a tarp can help keep vegetation and other material away from the collection bucket.
- If the ground is frozen, use a pick or shovel to remove the top frozen soil.
- Attach the corer to the auger head and bore down and collect sample in approximately one-foot increments to a total depth of 4 feet if possible.
- After each coring suspend the corer over a clean 5-gallon collection bucket. Make sure the power head is away from the collection bucket and deposit the sample into the bucket.
- Heavy clays may require a trowel, screwdriver, hammer and/or wooden stake to remove the sample from the corer.
- When all cores from one site have been collected in the bucket, thoroughly mix the collected soil and transfer it to a wide mouth glass jar. Affix the sample label to the jar (easier if done prior to filling the jar with soil).
- Clean the coring device, tools and sample collection bucket between sample locations.
- Deliver the samples and an analytical request form to the laboratory analyzing the samples.

5.2.2.3 Sediment Collection Procedure – Composite Sample

- Select sample site and record general information (including Latitude/Longitude) on the field sheet.
- Stage collection equipment on a nearby bank or in a small boat anchored at sample site.
- Locate selected boring site with an appropriate marker (e.g., survey marker, pipe, etc.)
- Attach the appropriate head assembly and extensions to 4-foot Ogeechee corer.
- If possible, collect a 4-foot sediment core sample in one “increment” using the slide hammer if necessary. If the sediment core can’t be collected in one “increment” because of consolidation of the sediment, carefully remove the corer, process the sample, and reinsert the corer in the bore hole. Proceed until a sediment core is collected to a 4-foot depth. If a rock of other buried obstruction is encountered, abandon the boring and locate a new boring site.
- After each coring suspend the corer over a clean 5-gallon collection bucket and deposit the collected sample into the bucket. Use the core sample removal tool as necessary
- When all cores from one site have been collected in the bucket, thoroughly mix the collected sediment and transfer it to a wide mouth glass jar. Affix the sample label to the jar (easier if done prior to filling the jar with soil).
- Clean the coring device, tools and sample collection bucket between sample locations.
- Deliver the samples and an analytical request form to the laboratory analyzing the samples.

5.2.3 Elutriate Samples

Standard elutriate samples will be prepared in accordance with the "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual: Inland Testing Manual" (USEPA and USACE, 1998). The elutriate sample will be prepared by using water collected on site from the Yellowstone River. The sample will be prepared by sub-sampling approximately 1-liter of the collected soil/sediment sample from the well-mixed original sample. The soil/sediment material and unfiltered receiving water are then combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22 $\pm$ 2°C). This is best accomplished by volumetric displacement. After the correct ratio is achieved, the mixture is stirred vigorously for 30 minutes with a mechanical stirrer/shaker. After the 30 minute mixing period, the mixture is allowed to settle for at least one hour. The supernatant will then be siphoned off without disturbing the settled material. Since Montana's numeric water quality standards for aquatic life are based upon the analysis of metals samples following a "total recoverable" digestion procedure (MDEQ, 2004), the supernatant will not be centrifuged or filtered prior to analyses.

5.3 SAMPLE HANDLING, CUSTODY, AND TRANSPORT

The collected samples will be transported by Water Control and Water Quality Section personnel to Midwest Laboratories, Inc. in Omaha, Nebraska for analysis. An Analytical Request Form (ARF) will be completed and submitted with the samples delivered to the laboratory (Attachment 5).

5.4 PARAMETERS TO BE MEASURED AND ANALYZED

The parameters that will be measured or analyzed for the different types of samples are listed in Tables 1, 2, 3, and 4.

5.5 ANALYTICAL METHODS

Tables 2 through 4 list the methods that will be used by Midwest laboratories to analyze the samples for the required parameters.

A maximum laboratory turn-around time of 30 days is required. A turn-around time of 30 days or less is needed to ensure the USACE can stay on schedule regarding the planning of a possible project.

5.6 QUALITY CONTROL

Where applicable, field measurements and samples will be collected in accordance with SOPs developed by the USACE's Water Quality Unit.

6 DATA MANAGEMENT AND REPORTING

All water quality measurements and analyses will be verified, validated, and compiled. Once compiled, the results will be emailed to Tiffany Vanosdall (CENWO-PM-AP).

Table. 1. Field Parameters to be Measured.

Parameter	Method	Resolution Limit	Measurement Taken	
			Lat/Long	Receiving Water
Coring Location	GPS	25 feet	**X**	
Water Temperature (°C)	HydroLab	0.1		**X**
Dissolved Oxygen (mg/l and % sat.)	HydroLab	0.1		**X**
pH (S.U)	HydroLab	0.1		**X**
Conductivity (umhos/cm)	HydroLab	1		**X**
Oxidation-Reduction Potential	HydroLab	1		**X**
Turbidity (NTU)	HydroLab	0.1		**X**

Table. 2. Parameters to be Analyzed in Collected Soil/Sediment Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Particle Size	Sieve (Minimum Sieve #200)	0.001 mm	$60
Alkalinity, Total	SM2320B	4 mg/l	14
Oxidation Reduction Potential	SM2580B	1 mV*	30
pH	EPA 150.1	0.1 S.U.*	7
NUTRIENTS			
Ammonia, Total as N	EPA 350.1	0.02 mg/kg	18
Kjeldahl Nitrogen, Total as N	EPA 351.3	0.2 mg/kg	20
Nitrate/Nitrite, Total as N	EPA 353.2	0.02 mg/kg	12
Phosphorus, Total	SM4500PF	0.02 mg/kg	18
AGGREGATE ORGANIC CONSTITUENTS			
Chemical Oxygen Demand	ASTM D1252	3 mg/kg	17
Total Organic Carbon	EPA 415.1	0.4 mg/kg	25
METALS			
Metals Scan (Total)	EPA 6010B	See Table 5a	175
PESTICIDES AND PCBs			
Organochlorine Pesticide and PCB Scan	EPA 8081 and EPA 8082	See Table 6a	175
Organophosphate Pesticide Scan	EPA 8141	See Table 8a	150
Total Laboratory Cost for Analyzing a Soil/Sediment Sample			**$721**

* Resolution limit.

Table. 3. Parameters to be Analyzed in Prepared Elutriate Water Samples and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
SAMPLE PREPARATION			
Elutriate Sample Preparation	1:4 Soil/Sediment:Receiving Water	-----	$160
PHYSICAL AND AGGREGATE PROPERTIES			
Alkalinity, Total	SM2320B	4 mg/l	14
Oxidation Reduction Potential	SM2580B	1 mV*	30
pH	EPA 150.1	0.1 S.U.*	7
Turbidity	EPA 180.1	1 NTU	13
NUTRIENTS			
Ammonia, Total as N	EPA 350.1	0.02 mg/l	18
Kjeldahl Nitrogen, Total as N	EPA 351.3	0.2 mg/l	20
Nitrate/Nitrite, Total as N	EPA 353.2	0.02 mg/l	12
Phosphorus, Total	SM4500PF	0.02 mg/l	18
AGGREGATE ORGANIC CONSTITUENTS			
Carbonaceous Biochemical Oxygen Demand	SM5210B	2 mg/l	26
Chemical Oxygen Demand	ASTM D1252	3 mg/l	17
Total Organic Carbon	EPA 415.1	0.4 mg/l	25
METALS			
Metals Scan (Total)	EPA 6010B	See Table 5b	175
PESTICIDES AND PCBs			
Organochlorine Pesticide and PCB Scan	EPA 8081 and EPA 8082	See Table 6b	175
Organophosphate Pesticide Scan	EPA 8141	See Table 7b	150
Total Laboratory Cost for Analyzing an Elutriate Water Sample			**$860**

* Resolution limit.

Table. 4. Parameters to be Analyzed in Receiving Water Sample and Unit Costs.

Parameter	Method	Detection Limit	Analytical Cost
PHYSICAL AND AGGREGATE PROPERTIES			
Alkalinity, Total	SM2320B	4 mg/l	14
Oxidation Reduction Potential	SM2580B	1 mV*	30
pH	EPA 150.1	0.1 S.U.*	7
Total Suspended Solids	EPA 160.2	4 mg/l	10
Turbidity	EPA 180.1	1 NTU	13
NUTRIENTS			
Ammonia, Total as N	EPA 350.1	0.02 mg/l	18
Kjeldahl Nitrogen, Total as N	EPA 351.3	0.2 mg/l	20
Nitrate/Nitrite, Total as N	EPA 353.2	0.02 mg/l	12
Phosphorus, Total	SM4500PF	0.02 mg/l	18
AGGREGATE ORGANIC CONSTITUENTS			
Carbonaceous Biochemical Oxygen Demand	SM5210B	2 mg/l	26
Chemical Oxygen Demand	ASTM D1252	3 mg/l	17
Total Organic Carbon	EPA 415.1	0.4 mg/l	25
METALS			
Metals Scan (Total)	EPA 6010B	See Table 5b	175
PESTICIDES AND PCBs			
Organochlorine Pesticide and PCB Scan	EPA 8081 and EPA 8082	See Table 6b	175
Organophosphate Pesticide Scan	EPA 8141	See Table 7b	150
Total Laboratory Cost for Analyzing the Receiving Water Sample			**$710**

* Resolution limit.

Table 5a. Detection and Reporting Limits for individual metals included in the Metals Scan of soil/sediment samples.

Metal	Detection Limit (mg/kg)	Reporting Limit (mg/kg)	Metal	Detection Limit (mg/kg)	Reporting Limit (mg/kg)
Aluminum	13	50	Lead	13	50
Antimony	10	30	Magnesium	3	10
Arsenic	10	30	Manganese	1	5
Beryllium	0.25	5	Mercury	0.1	0.5
Cadmium	0.2	1	Nickel	1	5
Calcium	14	50	Selenium	10	30
Chromium	1	3	Silver	1	3
Copper	1	5	Thallium	10	30
Cyanide	1	5	Zinc	2	10
Iron	11	50			

Table 5b. Detection and Reporting Limits for individual metals included in the Metals Scan of elutriate and receiving water samples.

Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)	Metal	Detection Limit (µg/l)	Reporting Limit (µg/l)
Aluminum	25	75	Lead	0.5	2
Antimony	0.5	2	Magnesium	1,000	3,000
Arsenic	1	3	Manganese	2	10
Beryllium	2	5	Mercury	0.02	0.1
Cadmium	0.2	1	Nickel	10	30
Calcium	1,000	3,000	Selenium	1	3
Chromium	1	10	Silver	1	3
Copper	1	5	Thallium	0.5	2
Cyanide	8	20	Zinc	10	30
Iron	7	20			

Table 6a. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of soil/sediment samples.

Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)	Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)
DDE	0.8	9.9	Alpha-BHC (alpha-Lindane)	0.4	5.1
DDD	0.7	9.9	Beta-BHC (beta-Lindane)	1.0	5.1
DDT	1.0	9.9	Delta-BHC (delta-Lindane)	1.8	5.1
Methoxychlor	1.2	5.1	Gamma-BHC (gamma-Lindane)	0.6	5.1
Aldrin	0.7	5.1	Gamma-Chlordane	0.8	5.1
Dieldrin	0.7	9.9	PCB - Aroclor1016	10	50
Endosulfan 1	0.7	5.1	PCB - Aroclor1260	10	50
Endosulfan 2	0.8	9.9	PCB - Aroclor1221	10	50
Endosulfan Sulfate	1.0	9.9	PCB - Aroclor1248	10	50
Endrin	1.0	9.9	PCB - Aroclor1268	10	50
Endrin Aldehyde	1.0	9.9	PCB - Aroclor1232	10	50
Endrin Ketone	0.8	9.9	PCB - Aroclor1254	10	50
Heptachlor	0.6	5.1	PCB - Aroclor1242	10	50
Heptachlor Epoxide	0.8	5.1	PCB - Aroclor1262	10	50
Alpha-Chlordane	0.8	5.1			

Table 6b. Detection and Reporting Limits for individual parameters included in the Organochlorine Pesticide and PCB Scan of water samples.

Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)	Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)
DDE	0.005	0.1	Alpha-BHC (alpha-Lindane)	0.009	0.05
DDD	0.005	0.1	Beta-BHC (beta-Lindane)	0.009	0.05
DDT	0.004	0.1	Delta-BHC (delta-Lindane)	0.014	0.05
Methoxychlor	0.005	0.5	Gamma-BHC (gamma-Lindane)	0.035	0.05
Aldrin	0.008	0.5	Gamma-Chlordane	0.006	0.05
Dieldrin	0.004	0.1	PCB - Aroclor1016	0.2	1.0
Endosulfan 1	0.006	0.05	PCB - Aroclor1260	0.2	1.0
Endosulfan 2	0.003	0.1	PCB - Aroclor1221	0.2	2.0
Endosulfan Sulfate	0.010	0.1	PCB - Aroclor1248	0.3	1.0
Endrin	0.003	0.1	PCB - Aroclor1268	0.3	1.0
Endrin Aldehyde	0.011	0.1	PCB - Aroclor1232	0.2	1.0
Endrin Ketone	0.006	0.1	PCB - Aroclor1254	0.2	1.0
Heptachlor	0.009	0.05	PCB - Aroclor1242	0.2	1.0
Heptachlor Epoxide	0.007	0.05	PCB - Aroclor1262	0.2	1.0
Alpha-Chlordane	0.011	0.05			

Table 7a. Detection and Reporting Limits for individual parameters included in the Organophosphate Pesticide Scan of soil/sediment samples.

Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)	Parameter	Detection Limit (µg/kg)	Reporting Limit (µg/kg)
Azinphos Methyl	5	20	Malathion	4	20
Bolstar	5	20	Merphos	4	20
Chlorpyrifos	9	20	Mevinphos	7	20
Coumaphos	6	20	Ethyl Paration	8	20
Demetion o, s	5	20	Methyl Paration	4	20
Diazinon	7	20	Phorate	6	20
Dichlorvos	5	20	Ronnel	5	20
Dimethoate	8	20	Sulfotep	9	20
Disulfoton	3	20	Tepp	8	20
EPN	4	20	Tetrachlorovinphos	4	20
Ethoprop	8	20	Tokuthion	4	20
Fensulfothion	6	20	Trichlorinate	4	20
Fenthion	9	20			

Table 7b. Detection and Reporting Limits for individual parameters included in the Organophosphate Pesticide Scan of water samples.

Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)	Parameter	Detection Limit (µg/l)	Reporting Limit (µg/l)
Azinphos Methyl	0.02	0.2	Malathion	0.02	0.2
Bolstar	0.02	0.2	Merphos	0.07	0.2
Chlorpyrifos	0.08	0.2	Mevinphos	0.05	0.2
Coumaphos	0.07	0.2	Ethyl Paration	0.07	0.2
Demetion o, s	0.07	0.2	Methyl Paration	0.04	0.2
Diazinon	0.11	0.2	Phorate	0.07	0.2
Dichlorvos	0.08	0.2	Ronnel	0.04	0.2
Dimethoate	0.06	0.2	Sulfotep	0.10	0.2
Disulfoton	0.05	0.2	Tepp	0.06	0.2
EPN	0.05	0.2	Tetrachlorovinphos	0.03	0.2
Ethoprop	0.03	0.2	Tokuthion	0.02	0.2
Fensulfothion	0.06	0.2	Trichlorinate	0.06	0.2
Fenthion	0.10	0.2			

7 ESTIMATED COSTS FOR FIELD COLLECTION AND LABORATORY ANALYSIS OF ELUTRIATE SAMPLES

Field Collection:

Field Mobilization and Collection of Samples: 24 man hours @ $100 = $2,400

(Note: The elutriate sampling at Intake Dam will be included in a planned sampling trip to collect water quality samples at the Garrison and Fort Peck Projects. Travel and per diem costs will be covered under the planned sampling trip to Garrison and Fort Peck and not charged to the Intake Dam project.

Laboratory Analysis (Midwest Laboratories – Omaha, Nebraska):

Sample Type	Number of Samples*	Analytical Cost per Sample	Total Cost
Soil/Sediment	7	$721	$5,047
Elutriate	7	$860	$6,020
Soil/Sediment (no Pesticides)**	2	$396	$792
Elutriate (no Pesticides)**	2	$535	$1,070
Receiving Water	1	$710	$710
Total Estimated Laboratory Analytical Costs			**$13,639**

* A split sample will be prepared from one of the 5 collected upstream soil/sediment samples for QA/QC evaluation.

** No pesticide analyses will be done on samples collected at sites YR-D1 and YR-D2.

Total Estimated Sampling Costs:

Sample Collection	$2,400
Sample Analyses	$13,639
Total Estimated Costs	$16,039

8 REFERENCES

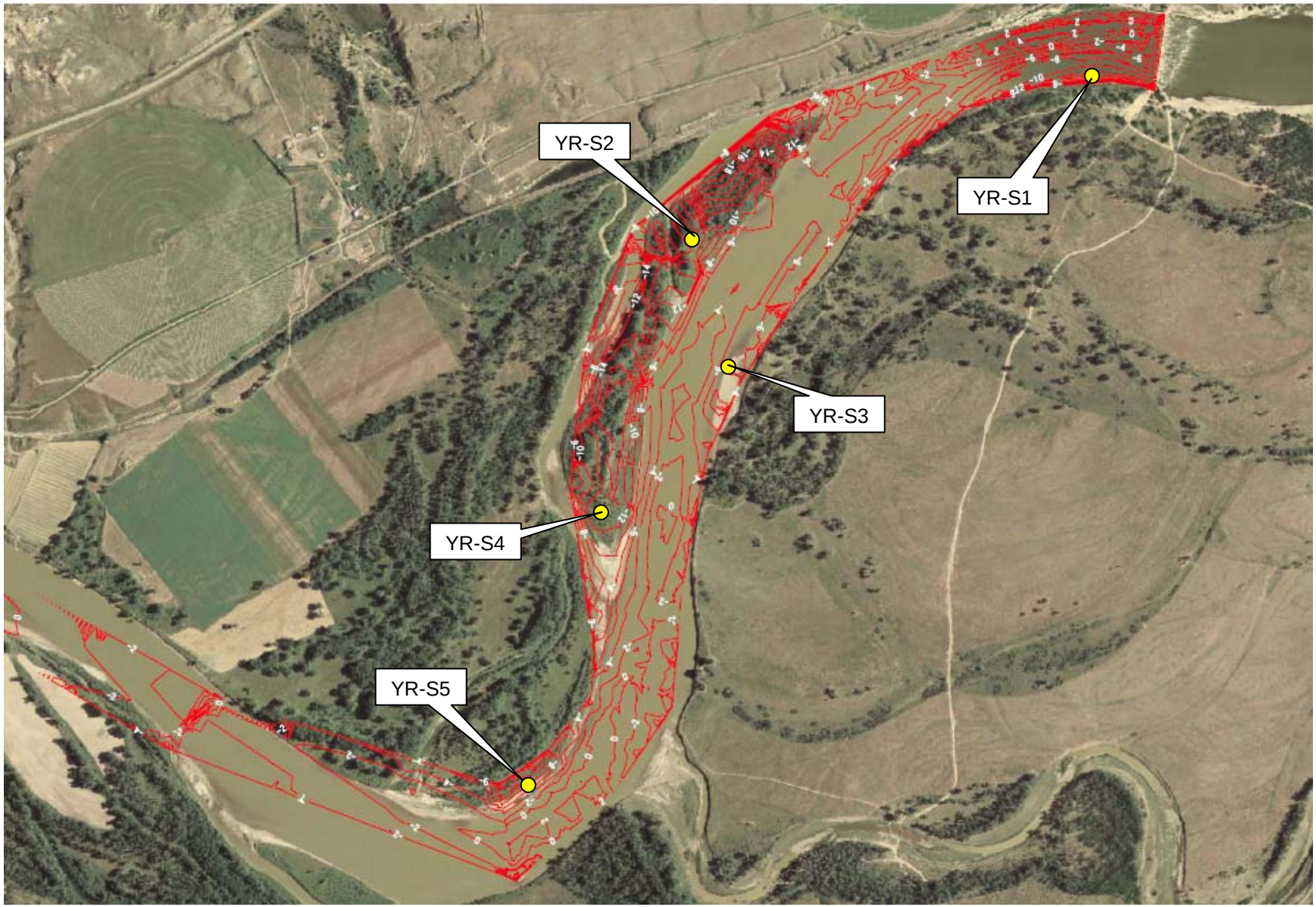
MDEQ. 2004. Circular WQB-7 Montana Numeric Water Quality Standards. Water Quality Standards Section, Planning, Prevention, and Assistance Division, Montana Depratment of Environmental Quality. Helena, Montana.

USEPA and USACE. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Test Manual: Inland Testing Manual. EPA-823-B-98-004, February 1998. U.S. Environmental Protection Agency, Office of Water. Department of Army, U.S. Army Corps of Engineers. Washington, D.C

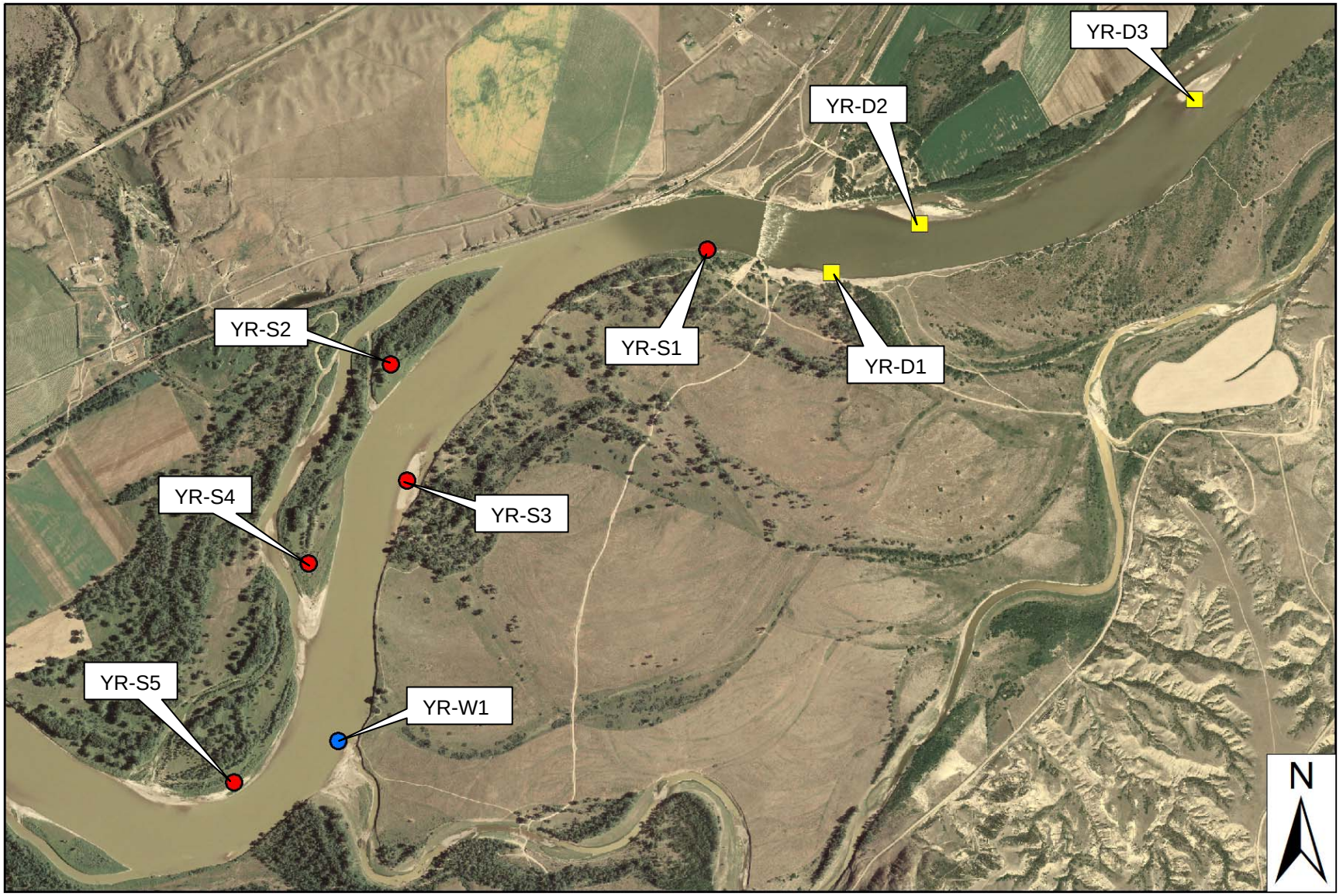
USACE. 2008. Using a “Hydrolab DS4a and DS5” to directly Measure Water Quality. October 2008. Water Quality Unit, Water Control and Water Quality Section, Hydrologic Engineering Branch, Engineering Division, Omaha District, U.S. Army Corps of Engineers. Omaha, Nebraska.

ATTACHMENT 1. Location of Intake Dam near Glendive, Montana.

ATTACHMENT 2. Location of sediment sampling sites within projected "scour" areas above Intake Dam.



ATTACHMENT 3. Location of sampling sites in the area of Intake Dam.



Attachment 4. Field Sheet for Intake Dam Elutriate Monitoring Project.
(U.S. Army Corps of Engineers – Omaha District – Water Quality Unit)

FIELD DATA SHEET

Project Name: Intake Dam Elutriate Monitoring **Project Number:** SPS-YELLOW-001

Trip Number: _____ **Date:** _____

Site Location: Intake Dam, RM72.4 of the Yellowstone River, Montana

Site Numbers: YR-S1, YR-S2, YR-S3, YR-S4, YR-S5, YR-D1, YR-D2**,** YR-D3, YR-W1

Collectors: _____

GPS MEASUREMENTS

GPS Device Used: _____

Site YR-W1: Latitude: _____ Longitude: _____

Site YR-S1: Latitude: _____ Longitude: _____

Site YR-S2: Latitude: _____ Longitude: _____

Site YR-S3: Latitude: _____ Longitude: _____

Site YR-S4: Latitude: _____ Longitude: _____

Site YR-S5: Latitude: _____ Longitude: _____

Site YR-D1: Latitude: _____ Longitude: _____

Site YR-D2: Latitude: _____ Longitude: _____

Site YR-D3: Latitude: Longitude:

WATER MEASUREMENTS

Water Quality Measurements:

Temp. (°C)	D.O. (mg/l)	D.O. (% Sat)	pH (S.U.)	Cond. (umho/cm)	ORP (mV)	Turbidity (NTUs)

SAMPLES COLLECTED

Sample Type	Sample ID	Sampled Depth	Collection Time	Sampling Method
Water	YR-W1	Surface		Grab
Soil/Sediment	YR-D1			Composite Core
Soil/Sediment	YR-D2			Composite Core
Soil/Sediment	YR-D3			Composite Core
Soil/Sediment	YR-S1			Composite Core
Soil/Sediment	YR-S2			Composite Core
Soil/Sediment	YR-S3			Composite Core
Soil/Sediment	YR-S4			Composite Core
Soil/Sediment	YR-S5			Composite Core
Soil/Sediment	YR-SPT			Split Sample

Split Sample Site: _____

Attachment 5. Analytical Request Form for Intake Dam Elutriate Monitoring Project.
(U.S. Army Corps of Engineers – Omaha District – Water Quality Unit)

ANALYTICAL REQUEST FORM

Project Name: Intake Dam Elutriate Monitoring **Project Number:** SPS-YELLOW-001

Trip Number: _____

Samples to be Analyzed:

Site Number	Sample Description	Sample Identification Number	Collection Date	Collection Time	Number of Sample Containers
YR-W1	Yellowstone River Receiving Water	YR-W1			37*
YR-D1	Soil/Sediment Sample	YR-D1			1
YR-D2	Soil/Sediment Sample	YR-D2			1
YR-D3	Soil/Sediment Sample	YR-D3			1
YR-S1	Soil/Sediment Sample	YR-S1			1
YR-S2	Soil/Sediment Sample	YR-S2			1
YR-S3	Soil/Sediment Sample	YR-S3			1
YR-S4	Soil/Sediment Sample	YR-S4			1
YR-S5	Soil/Sediment Sample	YR-S5			1
YR-SPT	Soil/Sediment Sample (Split Sample)	YR-SPT			1

* Assuming 1-gallon containers **Total Number of Sample Containers Delivered to Lab:** _____

Samples Collected By: _____

Samples Delivered By: _____

Samples Received By: _____ **Date/Time Received:** _____

REQUESTED LABORATORY ANALYSES			
Parameter*	**Soil/Sediment**	**Elutriate Water****	**Receiving Water**
PHYSICAL AND AGGREGATE PROPERTIES			
Particle Size	**X**		
Alkalinity, Total	**X**	**X**	**X**
Oxidation-Reduction Potential	**X**	**X**	**X**
pH	**X**	**X**	**X**
Total Suspended Solids			**X**
Turbidity		**X**	**X**
NUTRIENTS			
Ammonia, Total as N	**X**	**X**	**X**
Kjeldahl Nitrogen, Total as N	**X**	**X**	**X**
Nitrate/Nitrite, Total as N	**X**	**X**	**X**
Phosphorus, Total	**X**	**X**	**X**
AGGREGATE ORGANIC CONSTITUENTS			
Carbonaceous Biochemical Oxygen Demand		**X**	**X**
Chemical Oxygen Demand	**X**	**X**	**X**
Total Organic Carbon	**X**	**X**	**X**
METALS			
Metals Scan	**X**	**X**	**X**
PESTICIDES AND PCBs (No Pesticides/PCBs on YR-D1 and YR-D2)			
Organochlorine Pesticide and PCB Scan	**X**	**X**	**X**
Organophosphate Pesticide Scan	**X**	**X**	**X**

* See SAP for detection and reporting limits.
** Do not do a final centrifugation or filtration of the elutriate sample.

Comments:

ATTACHMENT 2.1.

Analytical Results of Receiving Water Collected at Site YR-W1.

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Report #: 09-146-2083

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:					1571399
Sample ID:					YR-W1
Parameter	Method	Method Detection Limit	Laboratory Reporting Limit	Units	Receiving Water
Alkalinity	SM 2320 B	4	10	mg/L	139
Aluminum	EPA 200.7	25	75	µg/L	4600
Ammonia as N, Total	EPA 350.2	0.02	0.1	mg/L	n.d.
Antimony	EPA 200.8	0.5	2	µg/L	n.d.
Arsenic	EPA 200.8	1	3	µg/L	6
Beryllium	EPA 200.7	2	5	µg/L	2J
Cadmium	EPA 200.8	0.2	1	µg/L	n.d.
Calcium	EPA 200.7	1	3	mg/L	49.2
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	2	5	mg/L	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	3	10	mg/L	38
Chromium, Total	EPA 200.7	1	10	µg/L	n.d.
Copper, Total	EPA 200.7	1	5	µg/L	20
Cyanide	SM 4500 CN-E	8	20	µg/L	n.d.
Iron, Total	EPA 200.7	7	20	µg/L	4300
Kjeldahl Nitrogen (Total or N	EPA 351.3	0.2	0.5	mg/L	n.d.
Lead, Total	EPA 200.7	0.5	2	µg/L	n.d.
Magnesium (Total)	EPA 200.7	1	3	mg/L	19.5
Manganese (Total)	EPA 200.7	2	10	µg/L	46
Mercury, Total	EPA 245.1	0.02	0.05	µg/L	n.d.
Nickel (Total)	EPA 200.7	10	30	µg/L	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.02	0.05	mg/L	0.5
Organochlorine Pesticides/PCBs	EPA 8081/8082	*	*	---	n.d.*
Organophosphate Pesticides	EPA 8141	*	*	---	n.d.*
Oxidation reduction potential	SM 2580B	---	---	mV	-13
Particle Size	Sieve	---	---	---	---
pH	SM 4500-H	0.1	0.2	---	8.28
Selenium (Total)	EPA 200.8	1	3	µg/L	n.d.
Silver (Total)	EPA 200.7	1	3	µg/L	n.d.
Thallium (Total)	EPA 200.7	0.5	2.0	µg/L	n.d.
Total Organic Carbon - TOC	EPA 415.1	0.2	1	mg/L	2.9
Total Phosphorus	SM 4500 P-F	0.02	0.05	mg/L	0.36
Total Suspended Solids	SM 2540D	4	10	mg/L	875
Turbidity	EPA 180.1	1	3	NTU	86
Zinc, Total	EPA 200.7	10	30	µg/L	21

--- Test not requested
J = Estimated concentration below laboratory reporting limit.
* See attached results
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2083

Reported to:
US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571399 **Sample** YR-W1 YELLOWSTONE RECEIVING WATER

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/11/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2083

Lab number: 1571399 **Sample ID** YR-W1 YELLOWSTONE RECEIVING WATER

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysi** 5/11/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

ATTACHMENT 2.2.

Analytical Results of Sediment Sample Collected at Site YR-S1 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S1.

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Report #: 09-146-2083
09-146-2087
09-141-2089

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571403	1571399	1571418
Sample ID:						YR-S1	YR-W1	Elutriate
Parameter	**Method**	**Method Detection Limit**		**Laboratory Reporting Limit**		**Units**	**Soil**	**Receiving Water**	**Elutriate Water**
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	138
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	3,140	4600	4,997
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	5.4	n.d.	0.17
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	11
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.23	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.36	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	3,928	49.2	49.87
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	14
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	5.9	n.d.	n.d.
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	3.5	20	n.d.
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	16,212	4300	3,395
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	45.8	n.d.	1.06
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	3
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1,509	19.5	19.14
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	258	46	227
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	6.4	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-42	-13	-50
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.1	8.28	8.13
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	3
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	900	2.9	3.4
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	242	0.36	0.13
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	149
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	16.6	21	16

n.d. = Not Detected
--- Test not requested
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2087

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571403 **Sample** YR-S1

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2087

Lab number: 1571403 **Sample ID** YR-S1

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2089

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571418 **Sample** YR-S1 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2089

Lab number: 1571418 **Sample ID** YR-S1 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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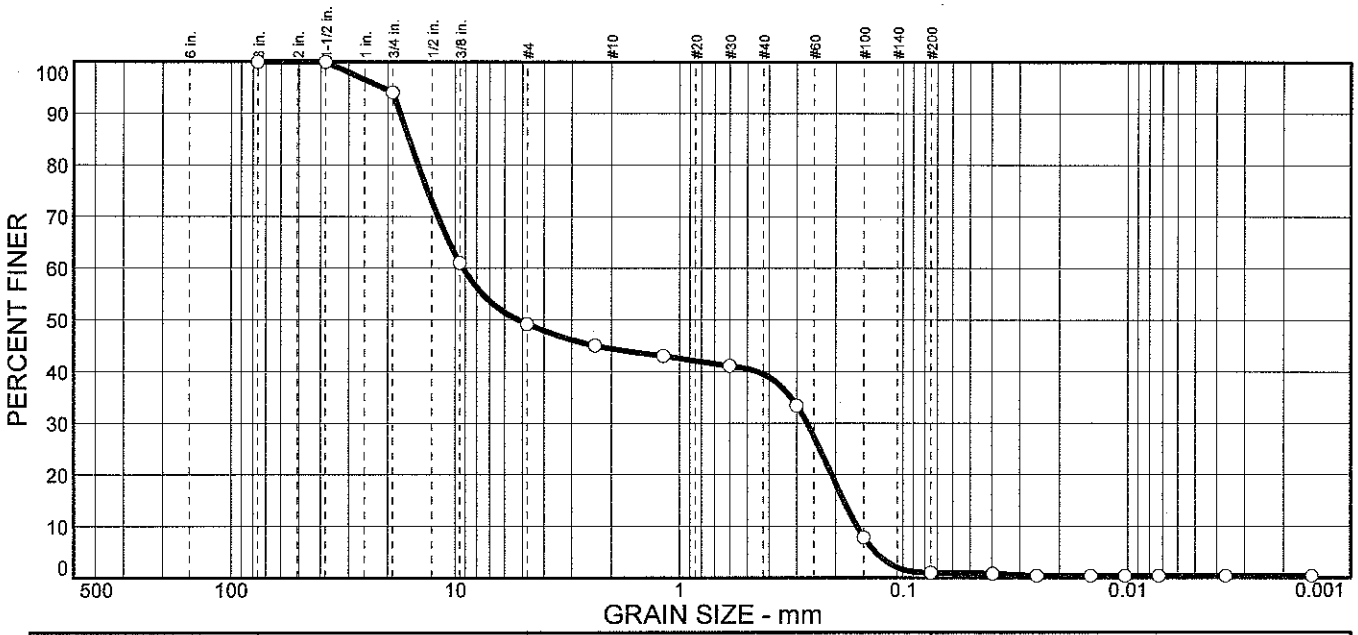
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2030
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571767 **Source of Sample:** **Date:** 04/30/2009
Location: YR-S1 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	5.9	44.9	4.8	4.9	38.5	0.6	0.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	94.1		
.375 in.	61.0		
#4	49.2		
#8	45.0		
#16	43.0		
#30	41.1		
#50	33.4		
#100	7.8		
#200	1.0		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 16.1 D_{60}= 9.23 D_{50}= 5.22
D_{30}= 0.270 D_{15}= 0.185 D_{10}= 0.161
C_u= 57.24 C_c= 0.05

Classification
USCS= AASHTO=

Remarks

Figure

mjs 5-19-09

ATTACHMENT 2.3.

Analytical Results of Sediment Sample Collected at Site YR-S2 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S2.

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Report #: 09-146-2083
09-146-2088
09-141-2090

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571404	1571399	1571419
Sample ID:						YR-S2	YR-W1	Elutriate
Parameter	**Method**	**Method Detection Limit**		**Laboratory Reporting Limit**		**Units**	**Soil**	**Receiving Water**	**Elutriate Water**
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	13,132	139	183
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	11,314	4600	7,731
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d	n.d.	n.d
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	3
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.59	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.41	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	14,268	49.2	65.92
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	4J
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	35
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	13.9	n.d.	n.d.
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	12.6	20	11
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	15,073	4300	5,949
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	444	n.d.	1.23
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	9.8	n.d.	5
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	6,306	19.5	28.92
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	244	46	81
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	13	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-45	-13	-48
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8	8.28	7.86
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	3
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	2070	2.9	6.5
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	312	0.36	0.23
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	219
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	39.7	21	25

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2088

Reported to:
US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571404 **Sample** YR-S2

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2088

Lab number: 1571404 **Sample ID** YR-S2

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2090

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571419 **Sample** YR-S2 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2090

Lab number: 1571419 **Sample ID** YR-S2 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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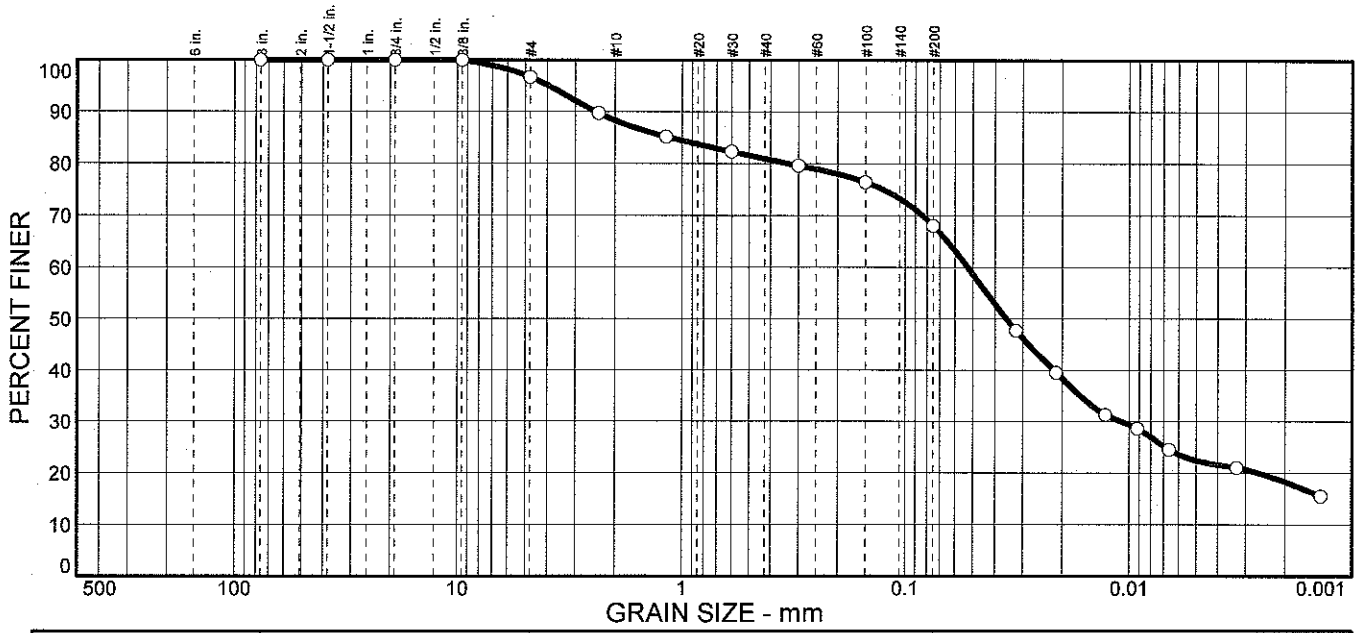
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-139-2014
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571768 **Source of Sample:** **Date:** 04/30/2009
Location: YR-S2 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.3	8.4	7.4	12.9	45.6	22.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	96.7		
#8	89.7		
#16	85.2		
#30	82.3		
#50	79.6		
#100	76.4		
#200	68.0		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 1.13 D_{60}= 0.0530 D_{50}= 0.0358
D_{30}= 0.0109 D_{15}= D_{10}=
C_u= C_c=

Classification
USCS= AASHTO=

Remarks

Figure

MS 5-19-09

ATTACHMENT 2.4.

Analytical Results of Sediment Sample Collected at Site YR-S3 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S3.

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Report #: 09-146-2083
09-146-2089
09-141-2091

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571405	1571399	1571420
Sample ID:						YR-S3	YR-W1	Elutriate
Parameter	**Method**	**Method Detection Limit**		**Laboratory Reporting Limit**		**Units**	**Soil**	**Receiving Water**	**Elutriate Water**
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	139
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	2,390	4600	6,109
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d	n.d.	n.d
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	4
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.21	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.32	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	2,991	49.2	49.1
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	14
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	7.2	n.d.	n.d.
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	3.2	20	n.d.
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	15,643	4300	4,961
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	112	n.d.	0.74
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	3
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1,418	19.5	19.3
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	223	46	43
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	6.4	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-44	-13	-38
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.3	8.28	8.12
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	2100	2.9	3.5
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	295	0.36	0.13
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	148
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	14	21	21

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
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REPORT OF ANALYSIS

Report Number: 09-146-2089

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
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1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571405 **Sample** YR-S3

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2089

Lab number: 1571405 **Sample ID** YR-S3

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2091

Reported to:
US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571420 **Sample** YR-S3 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2091

Lab number: 1571420 **Sample ID** YR-S3 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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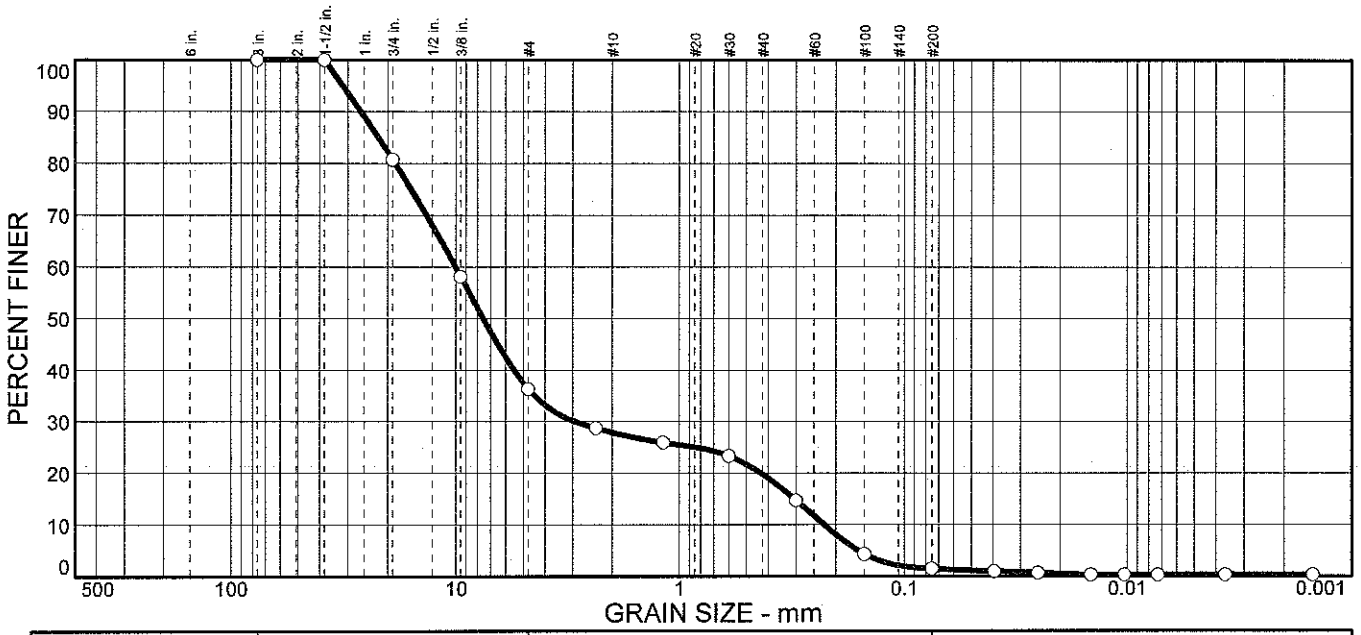
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2031
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571769 **Source of Sample:** **Date:** 04/30/2009
Location: YR-S3 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	19.3	44.4	8.4	8.1	18.3	1.2	0.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	80.7		
.375 in.	58.1		
#4	36.3		
#8	28.7		
#16	25.9		
#30	23.3		
#50	14.7		
#100	4.3		
#200	1.5		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 22.1 D_{60}= 10.1 D_{50}= 7.56
D_{30}= 2.95 D_{15}= 0.306 D_{10}= 0.226
C_u= 44.47 C_c= 3.82

Classification
USCS= AASHTO=

Remarks

Figure

MJS 5-19-09

ATTACHMENT 2.5.

Analytical Results of Split Sediment Sample Collected at Site YR-S3 and Elutriate Sample Prepared from Split Sediment Sample Collected at Site YR-S3.

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Report #: 09-146-2083
09-146-2092
09-141-2093

Split Sample of YR-S3

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571408	1571399	1571423
Sample ID:						YR-SPT	YR-W1	Elutriate
Parameter	**Method**	**Method Detection Limit**		**Laboratory Reporting Limit**		**Units**	**Soil**	**Receiving Water**	**Elutriate Water**
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	139
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	2,439	4600	3,989
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d	n.d.	n.d
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	3
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.23	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.25	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	3,256	49.2	48.8
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	16
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	4	n.d.	10
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	2.9	20	10
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	13,398	4300	2,872
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	147	n.d.	n.d.
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	2
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1,042	19.5	19.2
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	204	46	28
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	5.4	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	n.d.*	n.d.*	n.d.*
Organophosphate Pesticides	EPA 8141			*	*	---	n.d.*	n.d.*	n.d.*
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-30	-13	1
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.2	8.28	8.13
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	2,800	2.9	5
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	614	0.36	0.24
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	82
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	12.1	21	13

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2092

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571408 **Sample** YR-SPT

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2092

Lab number: 1571408 **Sample ID** YR-SPT

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2093

Reported to:
US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571423 **Sample** YR-SPT ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2093

Lab number: 1571423 **Sample ID** YR-SPT ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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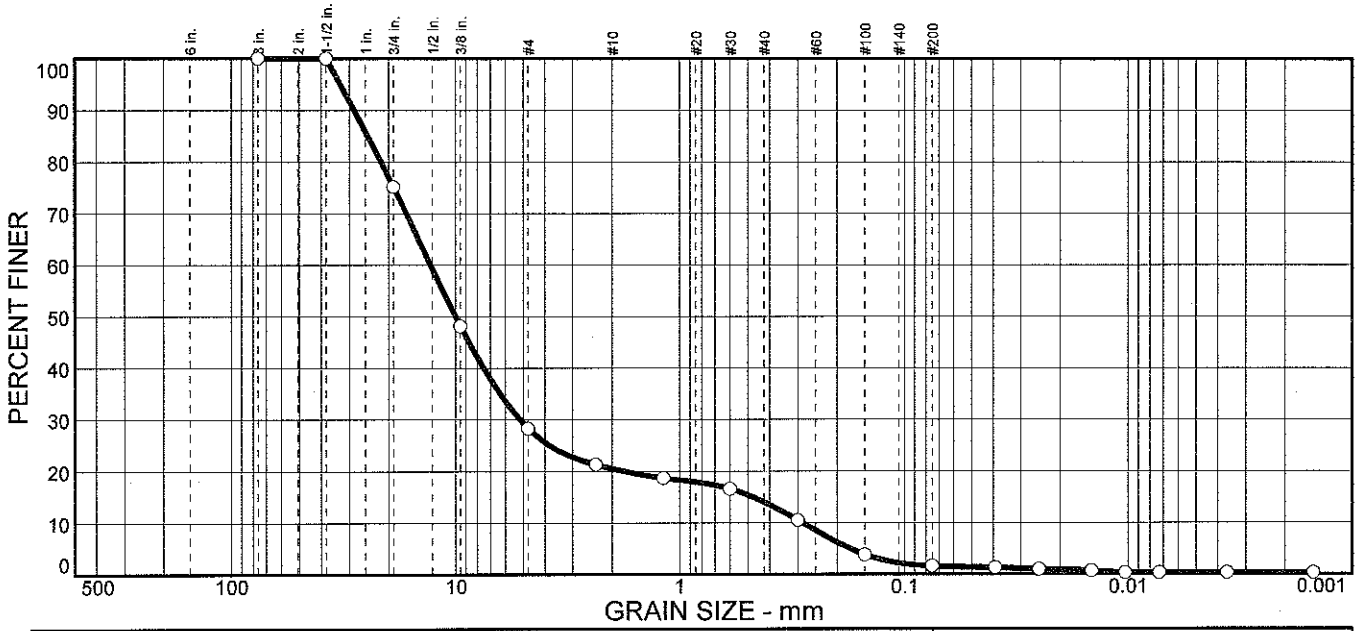
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2034
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571772 **Source of Sample:** **Date:** 04/30/2009
Location: YR-SPT (Split Sample of YR-53) **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	24.8	46.9	7.8	6.5	12.4	1.3	0.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	75.2		
.375 in.	48.1		
#4	28.3		
#8	21.3		
#16	18.7		
#30	16.6		
#50	10.5		
#100	3.8		
#200	1.6		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 24.8 D_{60}= 13.0 D_{50}= 10.0
D_{30}= 5.17 D_{15}= 0.476 D_{10}= 0.286
C_u= 45.31 C_c= 7.20

Classification
USCS= AASHTO=

Remarks

Figure

MS 5-18-09

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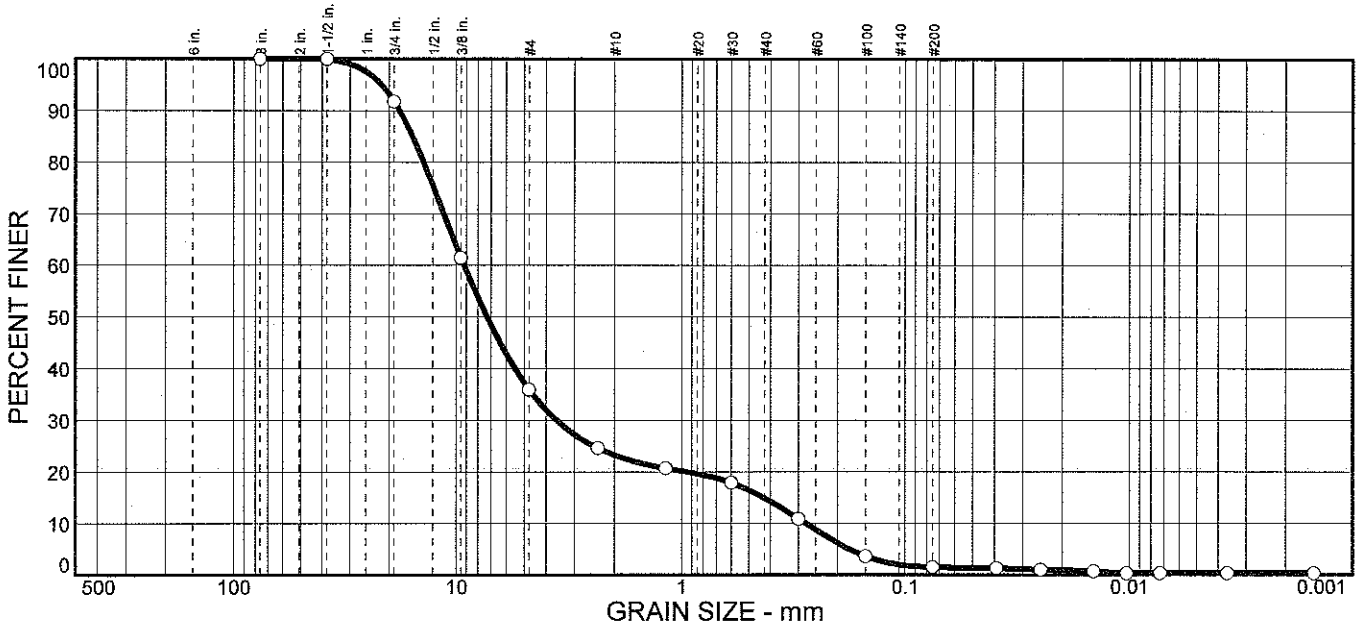
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2034
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571772 DUP **Source of Sample:** **Date:** 04/30/2009
Location: YR-SPT DUP (Lab Duplicate) **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	8.2	55.9	12.6	8.4	13.4	1.2	0.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	91.8		
.375 in.	61.4		
#4	35.9		
#8	24.6		
#16	20.7		
#30	17.9		
#50	10.9		
#100	3.6		
#200	1.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.7 D_{60}= 9.24 D_{50}= 7.31
D_{30}= 3.60 D_{15}= 0.430 D_{10}= 0.278
C_u= 33.19 C_c= 5.04

Classification

USCS= AASHTO=

Remarks

Figure

MS 5-19-09

ATTACHMENT 2.6.

Analytical Results of Sediment Sample Collected at Site YR-S4 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S4.

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Report #: 09-146-2083
09-146-2090
09-141-2092

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571406	1571399	1571421
Sample ID:						YR-S4	YR-W1	Elutriate
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Soil	Receiving Water	Elutriate Water
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	144
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	2,943	4600	11,731
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d	n.d.	n.d
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	6
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.27	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.33	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	5,521	49.2	63.6
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	47
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	8.1	n.d.	18
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	4.9	20	17
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	14,062	4300	11,731
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	175	n.d.	1.1
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	5.9	n.d.	8
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	2,194	19.5	19.4
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	246	46	199
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	0.02
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	8.9	n.d.	16
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-43	-13	1
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.3	8.28	8.04
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	6700	2.9	4
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	291	0.36	0.35
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	418
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	19.1	21	36

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2090

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571406 **Sample** YR-S4

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2090

Lab number: 1571406 **Sample ID** YR-S4

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2092

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571421 **Sample** YR-S4 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2092

Lab number: 1571421 **Sample ID** YR-S4 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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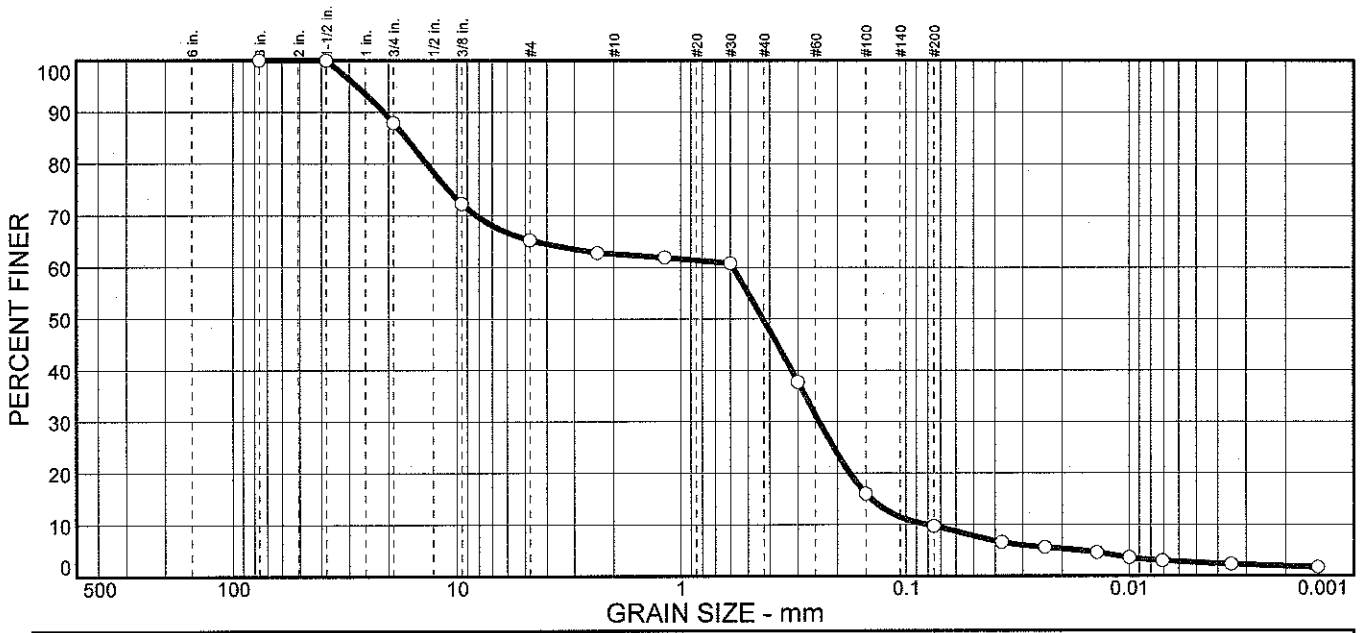
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2032
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571770 **Source of Sample:** **Date:** 04/30/2009
Location: YR-S4 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	12.1	22.6	2.7	13.0	39.9	7.1	2.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	87.9		
.375 in.	72.3		
#4	65.3		
#8	62.8		
#16	61.9		
#30	60.8		
#50	37.7		
#100	16.0		
#200	9.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.8 D_{60}= 0.585 D_{50}= 0.431
D_{30}= 0.242 D_{15}= 0.142 D_{10}= 0.0807
C_u= 7.26 C_c= 1.24

Classification

USCS= AASHTO=

Remarks

Figure

MJS 5-19-09

ATTACHMENT 2.7.

Analytical Results of Sediment Sample Collected at Site YR-S5 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-S5.

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Report #: 09-146-2083
09-146-2091
09-141-2093

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571407	1571399	1571422
Sample ID:						YR-S5	YR-W1	YR-S5
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Soil	Receiving Water	Elutriate Water
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	140
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	4,083	4600	9,425
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d	n.d.	n.d
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	5
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.28	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.34	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	4,555	49.2	51.9
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	17
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	3.9	n.d.	10
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	3.6	20	10
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	15,471	4300	7,763
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	322	n.d.	0.88
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	5
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1,243	19.5	19.1
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	269	46	97
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	6.7	n.d.	10
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.5
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-40	-13	1
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8	8.28	8.11
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	3,000	2.9	3.7
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	243	0.36	0.21
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	268
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	15.2	21	34

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2091

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/30/09

Lab number: 1571407 **Sample** YR-S5

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2091

Lab number: 1571407 **Sample ID** YR-S5

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2093

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571422 **Sample** YR-S5 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Dieldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2093

Lab number: 1571422 **Sample ID** YR-S5 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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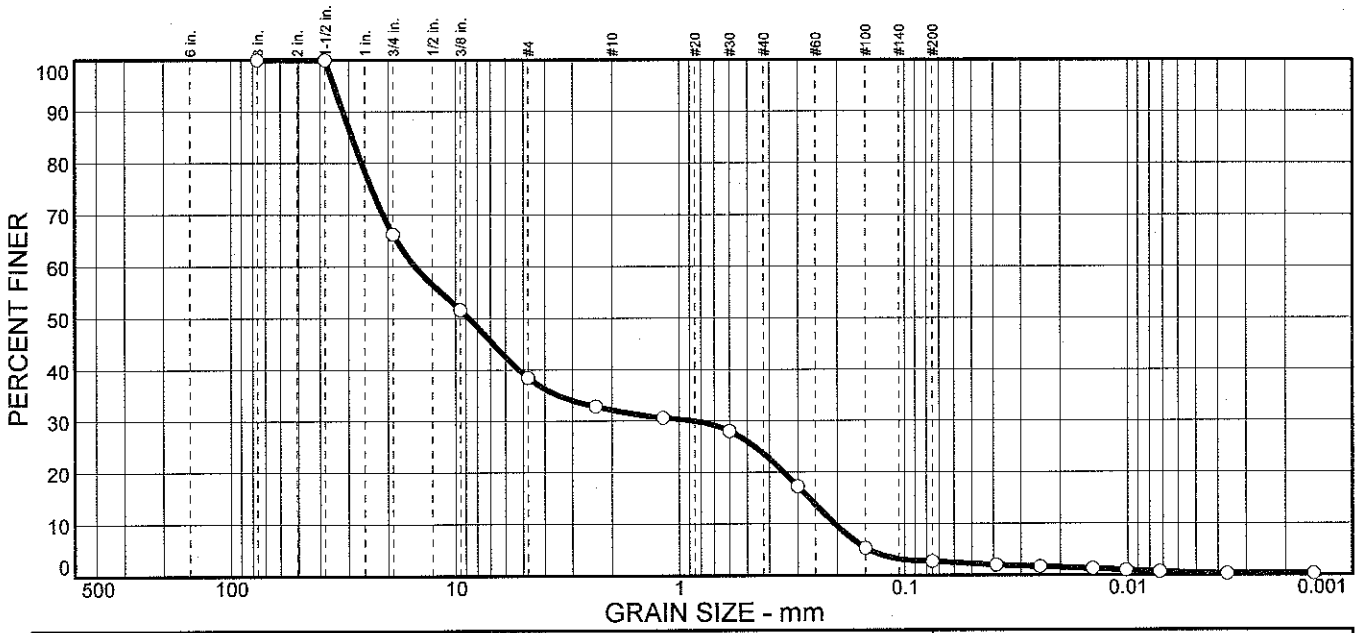
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2033
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571771 **Source of Sample:** **Date:** 04/30/2009
Location: YR-S5 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	33.8	27.8	6.3	8.6	20.8	2.3	0.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	66.2		
.375 in.	51.6		
#4	38.4		
#8	32.8		
#16	30.6		
#30	28.0		
#50	17.2		
#100	5.3		
#200	2.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 29.0 D_{60}= 15.2 D_{50}= 8.74
D_{30}= 0.869 D_{15}= 0.268 D_{10}= 0.207
C_u= 73.62 C_c= 0.24

Classification

USCS= AASHTO=

Remarks

Figure

MJS 5-19-09

ATTACHMENT 2.8.

Analytical Results of Sediment Sample Collected at Site YR-D1 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D1.

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Report #: 09-146-2083
09-146-2084
09-141-2086

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571400	1571399	1571415
Sample ID:						YR-D1	YR-W1	Elutriate
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Soil	Receiving Water	Elutriate Water
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	140
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	2748	4600	5100
Ammonia as N Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d.	n.d.	n.d.
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	4
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	n.d.	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.3	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	5011	49.2	55.1
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	15
Chromium Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	7.2	n.d.	n.d.
Copper Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	4	20	n.d.
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron Total	EPA 200.7	4	7	10	20	mg/kg µg/L	14282	4300	4540
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	91.4	n.d.	0.8
Lead Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	3
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1905	19.5	17.2
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	251	46	92
Mercury Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	8.5	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-21.7	-13	-41
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.1	8.28	8.09
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	5200	2.9	3.3
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	284	0.36	0.15
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	131
Zinc Total	EPA 200.7	1	10	5	30	mg/kg µg/L	20.2	21	16

n.d. = Non detect
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached results
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour Samples were not filtered.

Prem N. Arora Environmental Project Manager
Midwest Laboratories Inc.

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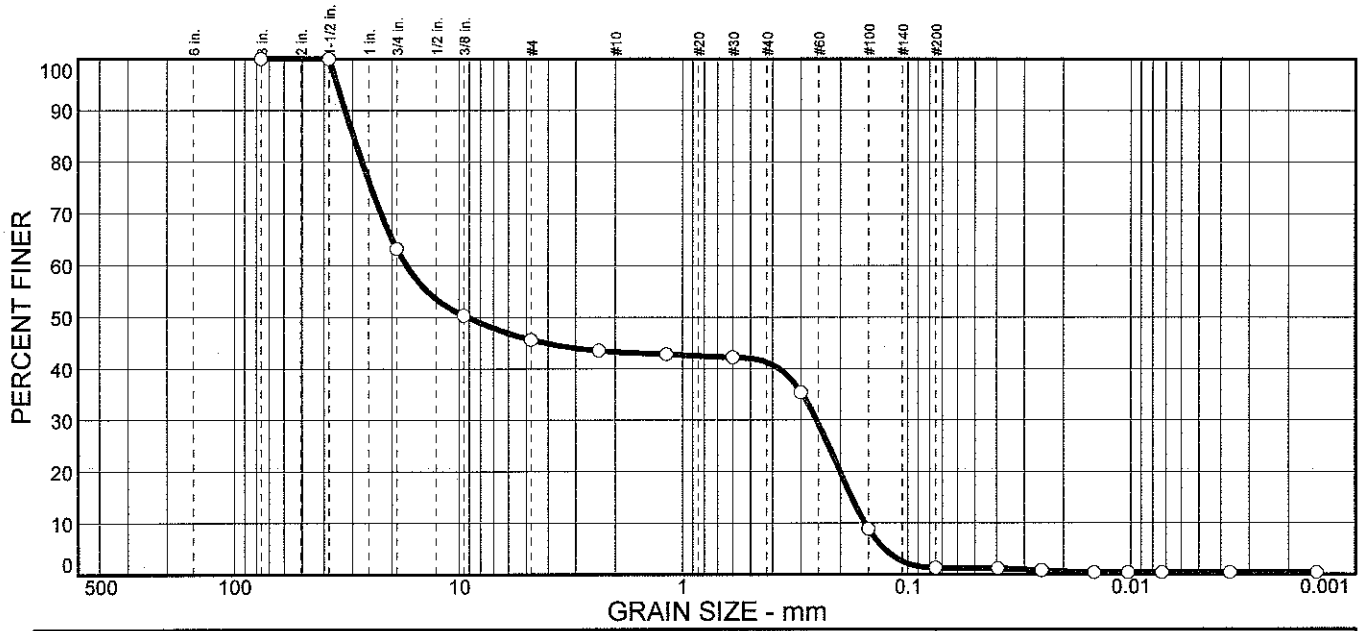
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2027
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571764 **Source of Sample:** **Date:** 04/30/2009
Location: YR-D1 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	36.8	17.6	2.3	2.0	40.0	0.9	0.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	63.2		
.375 in.	50.3		
#4	45.6		
#8	43.5		
#16	42.8		
#30	42.2		
#50	35.4		
#100	8.8		
#200	1.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 29.7 D_{60}= 17.3 D_{50}= 9.20
D_{30}= 0.256 D_{15}= 0.179 D_{10}= 0.156
C_u= 110.82 C_c= 0.02

Classification

USCS= AASHTO=

Remarks

Figure

MJS 5-11-09

ATTACHMENT 2.9.

Analytical Results of Sediment Sample Collected at Site YR-D2 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D2.

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Report #: 09-146-2083
09-146-2085
09-141-2087

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571401	1571399	1571416
Sample ID:						YR-D2	YR-W1	Elutriate
Parameter	**Method**	**Method Detection Limit**		**Laboratory Reporting Limit**		**Units**	**Soil**	**Receiving Water**	**Elutriate Water**
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	n.d.	139	140
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	2398	4600	4402
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	n.d.	n.d.	n.d.
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	23.1	6	3
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.38	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.82	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	3463	49.2	49.43
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	n.d.
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	13
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	5.6	n.d.	n.d.
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	7.1	20	n.d.
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	40,628	4300	3268
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	53.9	n.d.	0.87
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	6.9	n.d.	2J
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	1895	19.5	18
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	408	46	38
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	13.6	n.d.	n.d.
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.4
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-13.1	-13	-38
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	8.1	8.28	8.08
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	n.d.
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	3400	2.9	3.6
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	272	0.36	0.1
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	117
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	26.3	21	15

n.d. = Not Detected
--- Test not requested/Applicable
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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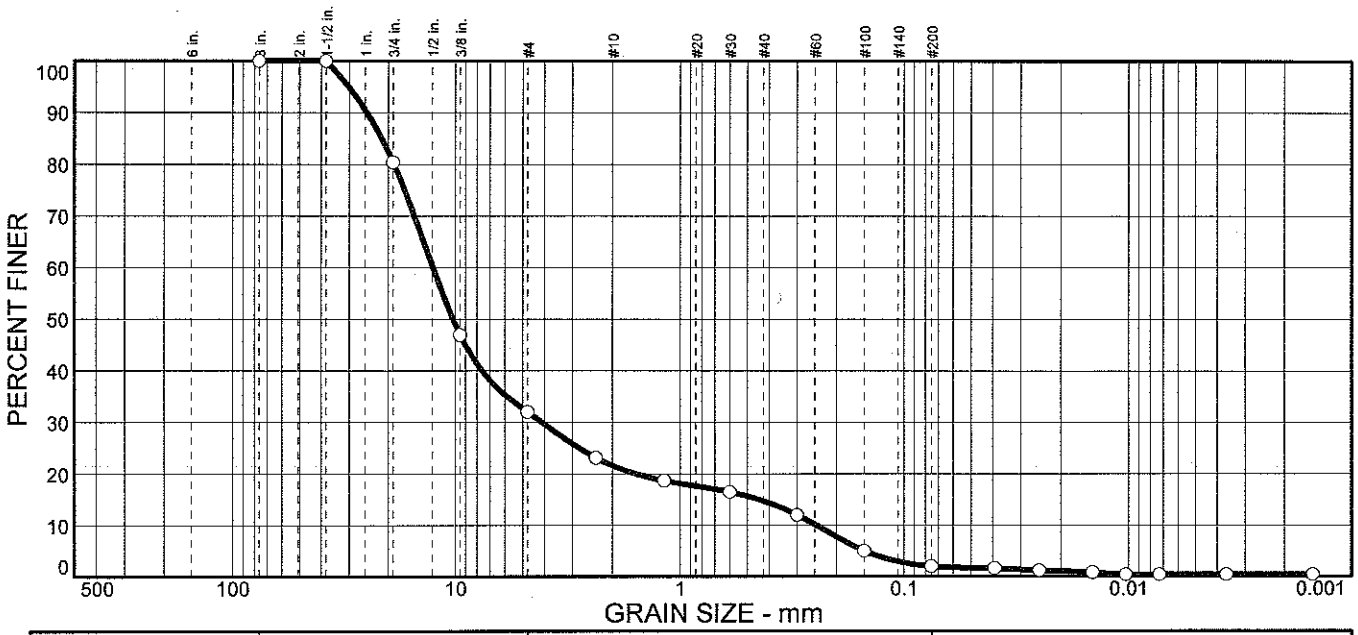
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2028
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571765 **Source of Sample:** **Date:** 04/29/2009
Location: YR-D2 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	19.6	48.4	10.4	6.9	12.7	1.6	0.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	80.4		
.375 in.	46.9		
#4	32.0		
#8	23.1		
#16	18.7		
#30	16.5		
#50	12.0		
#100	5.0		
#200	2.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.4 D_{60}= 12.6 D_{50}= 10.3
D_{30}= 4.10 D_{15}= 0.444 D_{10}= 0.246
C_u= 51.33 C_c= 5.41

Classification

USCS= AASHTO=

Remarks

Figure

M/S 5-19-09

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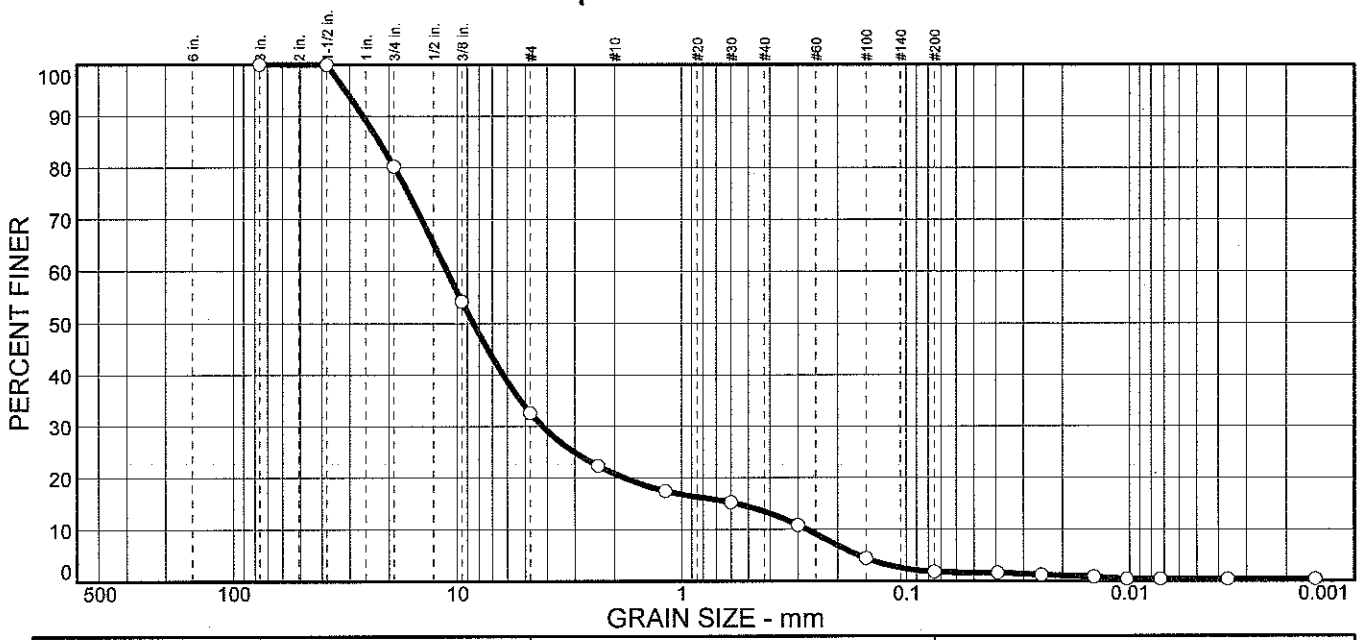
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2028
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571765 DUP **Source of Sample:** **Date:** 04/29/2009
Location: YR-D2 DUP (Lab Duplicate) **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	19.8	47.6	11.8	7.4	11.6	1.4	0.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	80.2		
.375 in.	54.2		
#4	32.6		
#8	22.3		
#16	17.4		
#30	15.2		
#50	10.8		
#100	4.4		
#200	1.8		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 22.1 D_{60}= 11.1 D_{50}= 8.49
D_{30}= 4.19 D_{15}= 0.571 D_{10}= 0.275
C_u= 40.34 C_c= 5.76

Classification
USCS= AASHTO=

Remarks

Figure

MJS 5-18-09

ATTACHMENT 2.10.

Analytical Results of Sediment Sample Collected at Site YR-D3 and Elutriate Sample Prepared from Sediment Sample Collected at Site YR-D3.

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Report #: 09-146-2083
09-146-2086
09-141-2088

USACE
DAVE JENSEN
106 SOUTH 15TH STREET
OMAHA NE 68102

Project Name: SPS-YELLOW-001
Project #: SPS-YELLOW-001
Trip Number: EDXDEJ042709

Lab Number:						1571402	1571399	1571417
Sample ID:						YR-D3	YR-W1	Elutriate
Parameter	Method	Method Detection Limit		Laboratory Reporting Limit		Units	Soil	Receiving Water	Elutriate Water
Alkalinity	SM 2320 B	-	4	-	10	mg/kg mg/L	3102	139	164
Aluminum	EPA 200.7	2	25	10	75	mg/kg µg/L	6322	4600	10,100
Ammonia as N, Total	EPA 350.2	0.2	0.02	1	0.1	mg/kg mg/L	20.6	n.d.	3.84
Antimony	EPA 200.8	1	0.5	5	2	mg/kg µg/L	n.d.	n.d.	n.d.
Arsenic	EPA 200.8	1	1	5	3	mg/kg µg/L	n.d.	6	11
Beryllium	EPA 200.7	0.1	2	0.5	5	mg/kg µg/L	0.38	2J	n.d.
Cadmium	EPA 200.8	0.5	0.2	2	1	mg/kg µg/L	0.36	n.d.	n.d.
Calcium	EPA 200.7	5	1	25	3	mg/kg mg/L	13,634	49.2	44.5
Carbonaceous Biochemical Oxygen Demand - CBOD	SM 5210.B	-	2	-	5	mg/L	---	n.d.	4J
Chemical Oxygen Demand-COD	ASTM 1252	-	3	-	10	mg/L	---	38	26
Chromium, Total	EPA 200.7	0.2	1	1	10	mg/kg µg/L	11.7	n.d.	10
Copper, Total	EPA 200.7	0.2	1	1.0	5	mg/kg µg/L	10.9	20	10
Cyanide	SM 4500 CN-E	0.5	8	3	20	mg/kg µg/L	n.d.	n.d.	n.d.
Iron, Total	EPA 200.7	4	7	10	20	mg/kg µg/L	11,968	4300	6900
Kjeldahl Nitrogen (Total or N	EPA 351.3	2	0.2	10	0.5	mg/kg mg/L	409	n.d.	4.85
Lead, Total	EPA 200.7	1	0.5	5	2	mg/kg µg/L	6.9	n.d.	8
Magnesium (Total)	EPA 200.7	2	1	10	3	mg/kg mg/L	5,456	19.5	21.4
Manganese (Total)	EPA 200.7	1	2	5	10	mg/kg µg/L	221	46	530
Mercury, Total	EPA 245.1	0.2	0.02	1	0.05	mg/kg µg/L	n.d.	n.d.	n.d.
Nickel (Total)	EPA 200.7	0.2	10	2	30	mg/kg µg/L	13	n.d.	10
Nitrate/Nitrite Nitrogen	EPA 353.2	0.2	0.02	1	0.05	mg/kg mg/L	n.d.	0.5	0.3
Organochlorine Pesticides/PCBs	EPA 8081/8082			*	*	---	*Page 2	n.d.*	*Page 4
Organophosphate Pesticides	EPA 8141			*	*	---	*Page 3	n.d.*	*Page 5
Oxidation reduction potential	SM 2580B	---	---	---	---	mV	-40	-13	-64
Particle Size	Sieve	---	---	---	---	---	See Attached	---	---
pH	SM 4500-H	0.1		0.2		---	7.4	8.28	7.35
Selenium (Total)	EPA 200.8	1	1	4	3	mg/kg µg/L	n.d.	n.d.	3
Silver (Total)	EPA 200.7	1	3	5	10	mg/kg µg/L	n.d.	n.d.	n.d.
Thallium (Total)	EPA 200.7	1	0.5	5.0	2	mg/kg µg/L	n.d.	n.d.	n.d.
Total Organic Carbon - TOC	EPA 415.1	2	0.2	10.0	1	mg/kg mg/L	8200	2.9	4.9
Total Phosphorus	SM 4500 P-F	0.2	0.02	1	0.05	mg/kg mg/L	316	0.36	0.22
Total Suspended Solids	SM 2540D	-	4	-	10	mg/L	---	875	---
Turbidity	EPA 180.1	-	1	-	3	NTU	---	86	292
Zinc, Total	EPA 200.7	1	10	5	30	mg/kg µg/L	33.7	21	30

n.d. = Not Detected
--- Test not requested
J = Estimated concentration below laboratory reporting limit.
* See attached report
Note: Receiving water and Elutriate Extract were analyzed for metal and organic analysis after settling time of one (1) hour. Samples were not filtered.

Prem N. Arora, Environmental Project Manager
Midwest Laboratories, Inc.

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REPORT OF ANALYSIS

Report Number: 09-146-2086

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09
Date Sampled: 04/29/09

Lab number: 1571402 **Sample** YR-D3

Method: EPA 8080/8082 **Units:** µg/Kg **Analyst:** awr **Date of Analysis:** 5/12/2009

Analysis	Level Found	Method Detection Limit (µg/L)	Analysis	Level Found	Method Detection Limit (µg/L)
4,4'-DDE	n.d.	9.9	Endosulfan I	n.d.	5.1
4,4'-DDD	n.d.	9.9	Endosulfan II	n.d.	9.9
4,4'-DDT	n.d.	9.9	Endosulfan sulfate	n.d.	9.9
4,4'-Methoxychlor	n.d.	51	Endrin	n.d.	9.9
Aldrin	n.d.	5.1	Endrin aldehyde	n.d.	9.9
Aroclor 1016	n.d.	50	Endrin ketone	n.d.	9.9
Aroclor 1221	n.d.	50	Heptachlor	n.d.	5.1
Aroclor 1232	n.d.	50	Heptachlor epoxide	n.d.	5.1
Aroclor 1242	n.d.	50	alpha-Chlordane	n.d.	5.1
Aroclor 1248	n.d.	50	alpha-BHC	n.d.	5.1
Aroclor 1254	n.d.	50	beta- BHC	n.d.	5.1
Aroclor 1260	n.d.	50	delta-BHC	n.d.	5.1
Aroclor 1262	n.d.	50	gama-BHC (Lindane)	n.d.	5.1
Aroclor 1268	n.d.	50	gama-(Chlordane)	n.d.	5.1
Dieldrin	n.d.	9.9			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2086

Lab number: 1571402 **Sample ID** YR-D3

Method: EPA 8141 **Units:** ppm **Analyst:** awr **Date of Analysi** 5/12/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.04	Merphos	n.d.	0.20
Bolstar	n.d.	0.02	Mevinphos	n.d.	0.2
Chlorpyrifos	n.d.	0.02	Monocrotophos	n.d.	0.04
Coumaphos	n.d.	0.02	Naled	n.d.	0.2
Demeton	n.d.	0.02	Ethyl Parathion	n.d.	0.02
Diazinon	n.d.	0.02	Methyl Parathion	n.d.	0.02
Dichlorvos	n.d.	0.02	Phorate	n.d.	0.02
Dimethoate	n.d.	0.2	Ronnel	n.d.	0.02
Disulfoton	n.d.	0.02	Sulfotep	n.d.	0.02
EPN	n.d.	0.02	Tetrachlorovinphos	n.d.	0.02
Ethoprop	n.d.	0.02	TEPP	n.d.	0.10
Fensulfothion	n.d.	0.2	Tokuthion	n.d.	0.02
Fenthion	n.d.	0.02	Trichloronate	n.d.	0.02
Malathion	n.d.	0.02			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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REPORT OF ANALYSIS

Report Number: 09-146-2088

Reported to: US ARMY CORPS OF ENGINEERS
DAVE JENSEN
CENWO-ED-HA
1616 CAPITOL AVE 5TH FLOOR
OMAHA NE 68102

For: (20061) US ARMY CORPS OF ENGINEERS
(402)995-2310

PO/Proj. #: SPS-YELLOW-001
INTAKE DAM ELUTRIATE
MONITORING EDXDEJ042709

Date Reported: 06/12/09
Date Received: 05/01/09

Lab number: 1571417 **Sample** YR-D3 ELUTRIATE

Method: EPA 8081A/8082 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/11/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
4,4'-DDE	n.d.	0.10	Endosulfan I	n.d.	0.05
4,4'-DDD	n.d.	0.10	Endosulfan II	n.d.	0.1
4,4'-DDT	n.d.	0.10	Endosulfan sulfate	n.d.	0.1
4,4'-Methoxychlor	n.d.	0.50	Endrin	n.d.	0.1
Aldrin	n.d.	0.50	Endrin aldehyde	n.d.	0.1
Aroclor 1016	n.d.	1.00	Endrin ketone	n.d.	0.1
Aroclor 1221	n.d.	2.00	Heptachlor	n.d.	0.05
Aroclor 1232	n.d.	1.00	Heptachlor epoxide	n.d.	0.05
Aroclor 1242	n.d.	1.00	alpha-Chlordane	n.d.	0.05
Aroclor 1248	n.d.	1.00	alpha-BHC	n.d.	0.05
Aroclor 1254	n.d.	1.00	beta- BHC	n.d.	0.05
Aroclor 1260	n.d.	1.00	delta-BHC	n.d.	0.05
Aroclor 1262	n.d.	1.00	gama-BHC (Lindane)	n.d.	0.05
Aroclor 1268	n.d.	1.00	gama-(Chlordane)	n.d.	0.05
Djeldrin	n.d.	0.10			

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REPORT OF ANALYSIS

For: (20061) US ARMY CORPS OF ENGINEERS
Report Number: 09-146-2088

Lab number: 1571417 **Sample ID** YR-D3 ELUTRIATE

Method: EPA 8141 **Units:** µg/L **Analyst:** awr **Date of Analysis:** 5/11/2009

Analysis	Level Found	Method Detection Limit	Analysis	Level Found	Method Detection Limit
Azinphos Methyl	n.d.	0.2	Merphos	n.d.	0.2
Bolstar	n.d.	0.2	Mevinphos	n.d.	1
Chlorpyrifos	n.d.	0.2	Monocrotophos	n.d.	1
Coumaphos	n.d.	0.4	Naled	n.d.	2
Demeton	n.d.	0.2	Ethyl Parathion	n.d.	0.2
Diazinon	n.d.	0.2	Methyl Parathion	n.d.	0.2
Dichlorvos	n.d.	0.2	Phorate	n.d.	0.2
Dimethoate	n.d.	1.0	Ronnel	n.d.	0.2
Disulfoton	n.d.	0.2	Sulfotep	n.d.	0.2
EPN	n.d.	0.2	Tetrachlorovinphos	n.d.	0.2
Ethoprop	n.d.	0.2	TEPP	n.d.	0.2
Fensulfothion	n.d.	1.0	Tokuthion	n.d.	0.2
Fenthion	n.d.	0.2	Trichloronate	n.d.	0.2
Malathion	n.d.	0.2			

Notes:
n.d. - Not Detected.
add'l report (DFT).

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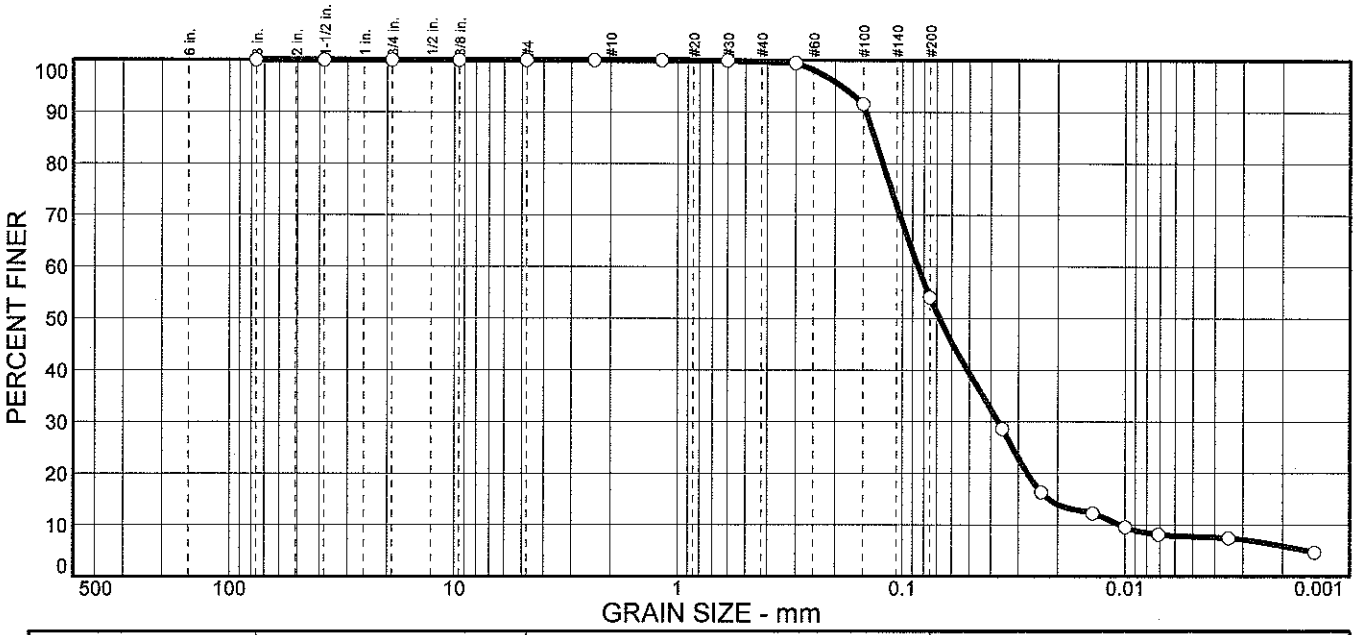
Particle Size Distribution Report

Project: SPS-YELLOW-001 INTAKE DAM ELUTRIATE MONITORING EDXDEJ042709 **Report No.:** 09-134-2029
Client: US ARMY CORPS OF ENGINEERS

Sample No: 1571766 **Source of Sample:** **Date:** 04/29/2009
Location: YR-D3 **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	45.7	46.3	7.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	100.0		
#16	100.0		
#30	99.9		
#50	99.5		
#100	91.6		
#200	54.0		

* (no specification provided)

Soil Description

Atterberg Limits
PL= LL= PI=

Coefficients
D_{85}= 0.134 D_{60}= 0.0852 D_{50}= 0.0682
D_{30}= 0.0371 D_{15}= 0.0220 D_{10}= 0.0106
C_u= 8.02 C_c= 1.52

Classification
USCS= AASHTO=

Remarks

Figure

MJS 5-19-09