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## MEMORANDUM

**To:** Don Vernon, TG Boise

**From:** Kelly Kincella, TG Kellogg  
Dan McCracken, TG Kellogg

**Date:** 6-19-08

**Subject:** EMF Flood Water Analysis

**Attachments:** Sample Location Map, Results from SVL Analytical

**Job Code:** 2005-3040

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The purpose of this memo is to summarize the results of water quality sampling of flood waters at East Mission Flats (EMF) and nearby areas in May of 2008. This sampling effort was not part of a regular surface water sampling program but was conducted opportunistically to establish a baseline for flood water equality levels before any contaminated soil was placed on site as part of Phase 1 operations. Samples were taken on two occasions. The first set of samples was taken on May 20, 2008 while water levels were rising at EMF. Water was observed flowing into EMF through culverts under I-90 and via rising water levels in the wetland west of EMF. This set of samples consisted of turbid flood water actively flowing into and inundating the site. A second set of samples was taken on May 28, 2008 when the river level had dropped and water levels at EMF were receding. These samples were of much clearer, stagnant water that was slowly draining from EMF back to the river and wetland.

The decision to sample on 05/20 and 05/28 was based on the level of flood waters observed on site at EMF. Based on our observations, the flood water level at EMF was it's highest on 05/22/08 which was three days after USGS recorded the rivers peak on 5/19. Sampling before and after peak level provided the widest range of test results for flood waters entering EMF and receding water flowing out of EMF.

On each occasion, samples were taken from four locations. Locations were chosen to represent metals concentrations for various hydraulic situations around EMF. These included the Coeur d'Alene River upstream of EMF, water flowing into EMF from the river and wetland, stagnant water in the planned repository footprint, and water flowing out of EMF to the river and wetland. The four sampling locations are displayed in Figure 1.0. Location #1 is at the eastern end of the site just south of the dump pad at the mouth of a culvert that feeds water in and out from an area south of the I-90. Location #2 is

located in the Phase 1 footprint approximately 40 feet west of the dump pad. Samples taken here represent metals concentrations in the stagnant water across the repository footprint. Location #3 was taken on the far west end of the site near Dredge road, and provided data for water that was backed up from wetlands northwest of EMF. Location #4 is on the west bank of the Coeur d'Alene River just upstream of the Canyon Road Bridge. This location is intended to provide metal levels in water upstream of EMF.

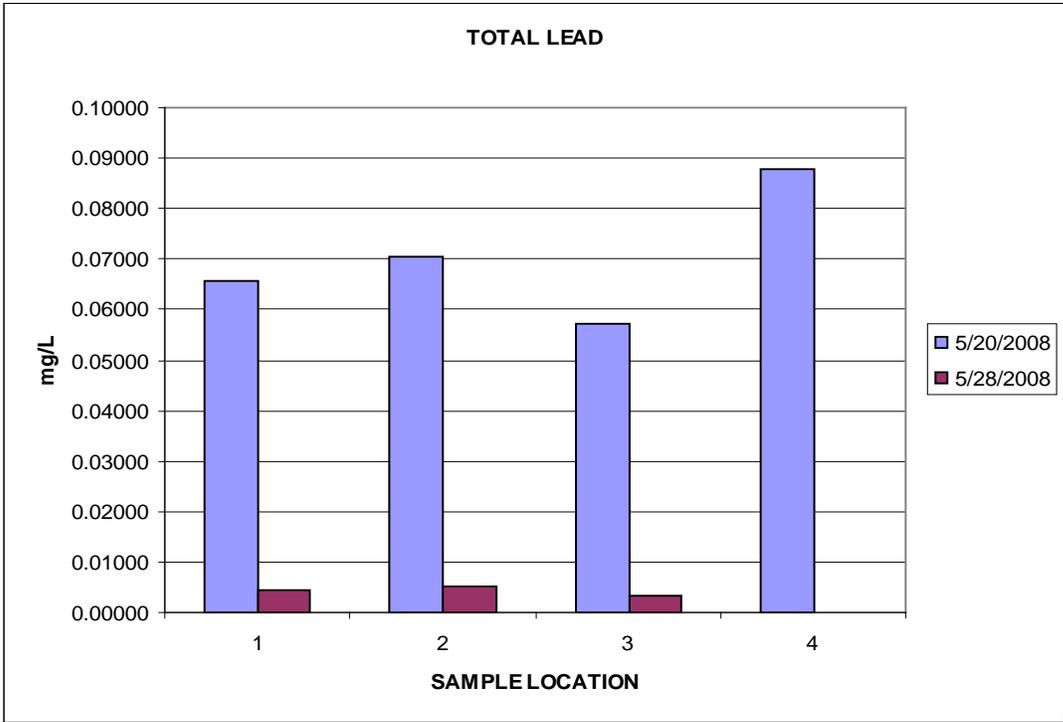
Samples were analyzed by SVL Analytical for levels of Lead, Zinc, and Arsenic. Results from these analyses are displayed in Table 1 Numerical Results. The table shows the levels of total recoverable and dissolved Arsenic, Lead, and Zinc in surface water samples taken at EMF on 5/20 and then on 5/28.

**Table 1 Numerical Results**

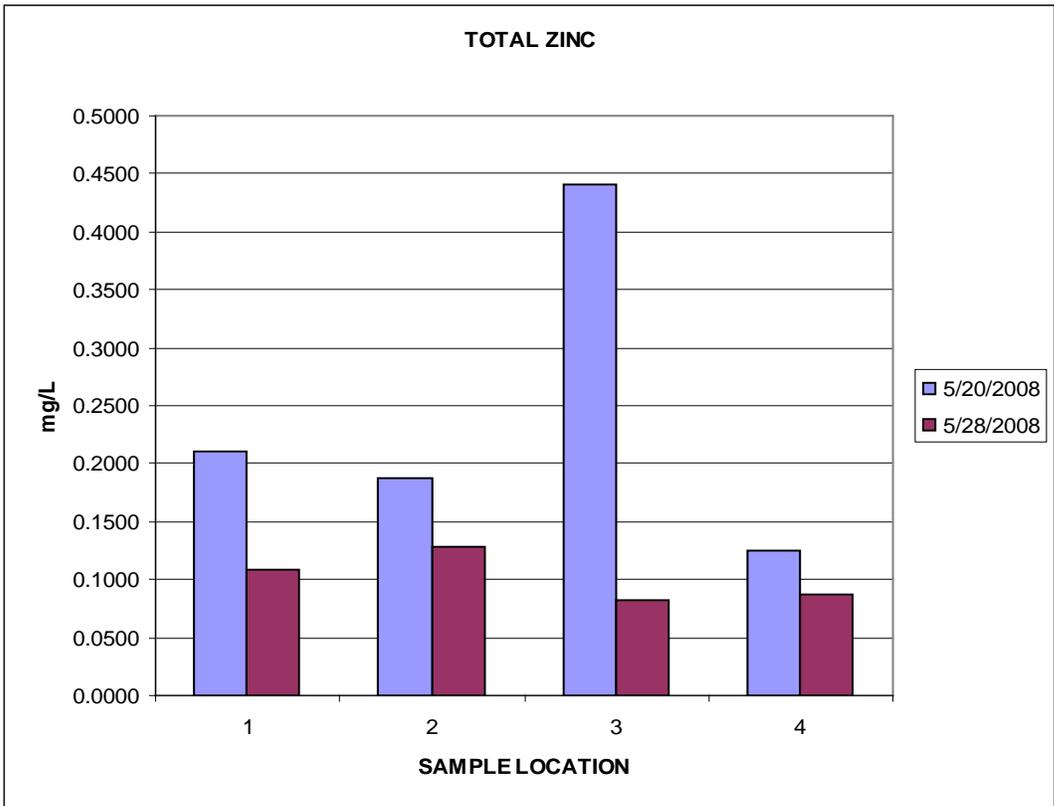
<b>EMF Water Sample Analysis</b>				
<b>Date</b>	<b>Sample ID</b>	<b>Levels Arsenic (mg/L)</b>	<b>Levels Lead (mg/L)</b>	<b>Levels Zinc (mg/L)</b>
5/20/2008	EMF 052008-01	<0.00300	0.06560	0.2100
5/20/2008	EMF 052008-01A	<0.00300	0.00305	0.1530
5/20/2008	EMF 052008-02	0.00376	0.07060	0.1880
5/20/2008	EMF 052008-02A	<0.00300	0.00326	0.1350
5/20/2008	EMF 052008-03	0.00542	0.05730	0.4400
5/20/2008	EMF 052008-03A	<0.00300	0.00490	0.2590
5/20/2008	EMF 052008-04	<0.00300	0.08790	0.1250
5/20/2008	EMF 052008-04A	<0.00300	<0.00300	0.0492
<b>Date</b>	<b>Sample ID</b>	<b>Levels Arsenic (mg/L)</b>	<b>Levels Lead (mg/L)</b>	<b>Levels Zinc (mg/L)</b>
5/28/2008	EMF 052008-01	<0.00300	0.00885	0.1080
5/28/2008	EMF 052008-01A	<0.00300	0.00449	0.1090
5/28/2008	EMF 052008-02	<0.00300	0.00911	0.1290
5/28/2008	EMF 052008-02A	<0.00300	0.00519	0.1260
5/28/2008	EMF 052008-03	0.00317	0.00535	0.0821
5/28/2008	EMF 052008-03A	<0.00300	0.00324	0.0802
5/28/2008	EMF 052008-04	<0.00300	0.02740	0.0874
5/28/2008	EMF 052008-04A	<0.00300	<0.00300	0.0658

**Note: Sample ID ending in 'A' indicates sample was filtered and tested for dissolved metals.**

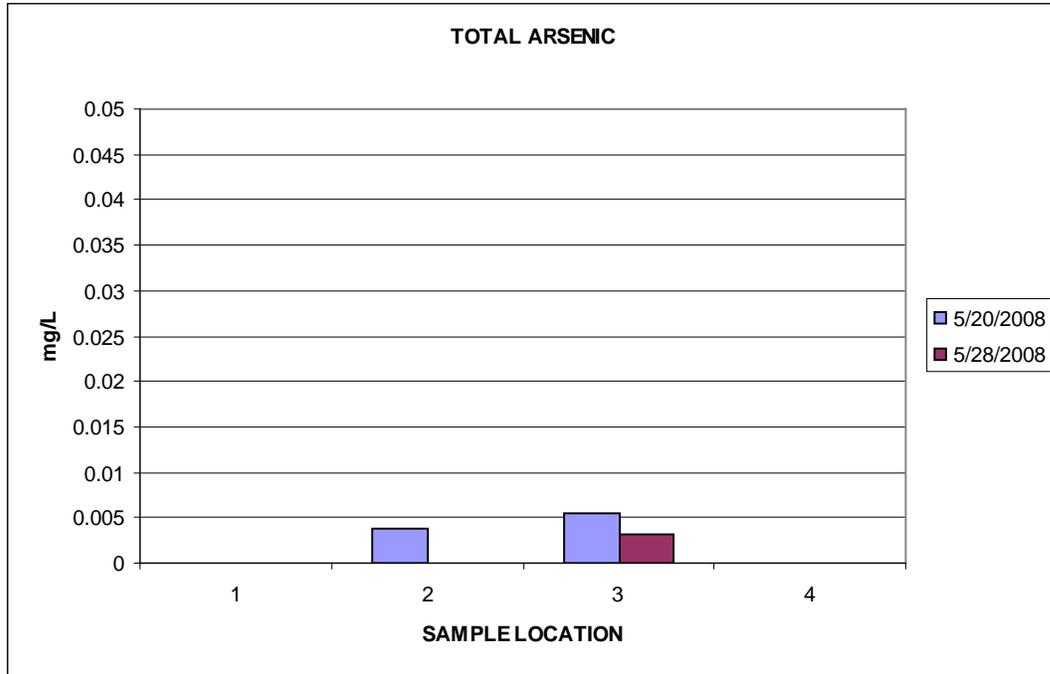
Figures 2, 3, and 4 graphically display the results for total recoverable metals at each sample location. Note that for locations 1, 2, and 3 the 5/20 samples generally represent rising waters flowing into EMF, and the 5/28 samples represent receding flood water flowing out of EMF. Figures 5, 6, and 7 graphically display the results for dissolved metals at each sampling location. Included in these graphs is a line to represent the Chronic Criteria for Aquatic life or the Criterion Continuous Concentration (CCC) for dissolved metals in surface water according to the Rules of the Department of Environmental Quality, IDAPA 58.01.02, "Water Quality Standards." Metal levels for the CCC are dependant on water hardness, and were calculated using the equation in Section 210.02.b of the Rules, and using a hardness of 80 mg/L as CaCO<sub>3</sub> (this is the average hardness for the Coeur d'Alene River as reported by IDEQ).



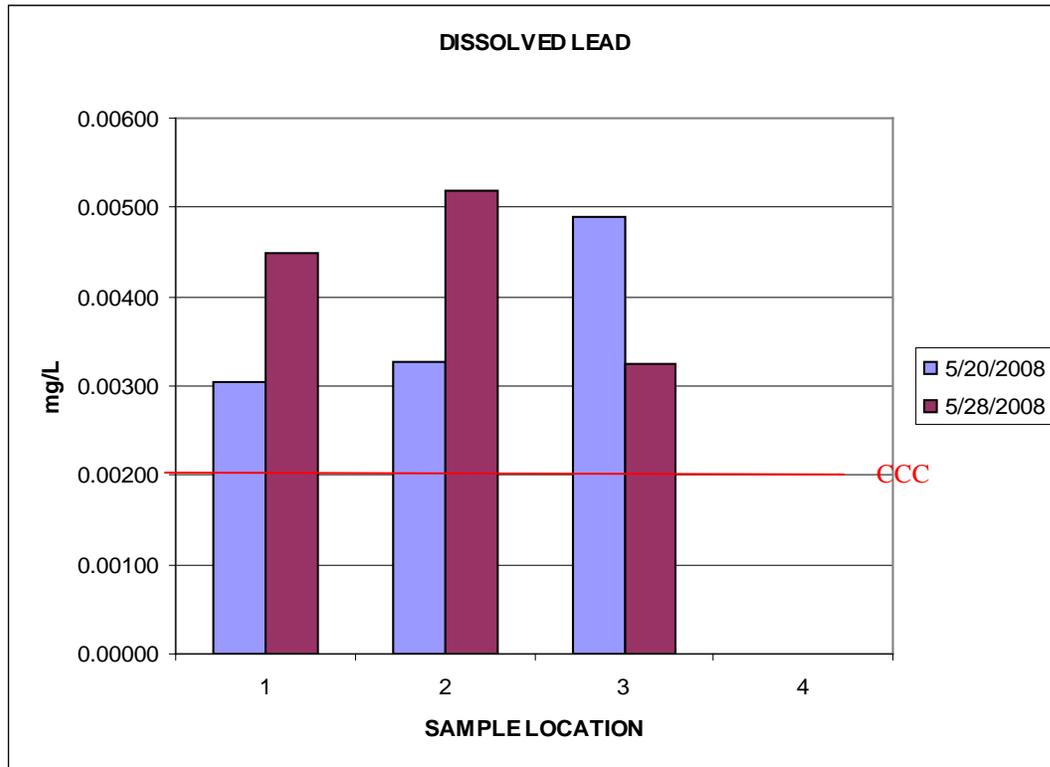
**Figure 2. Sample Results for Total Lead**



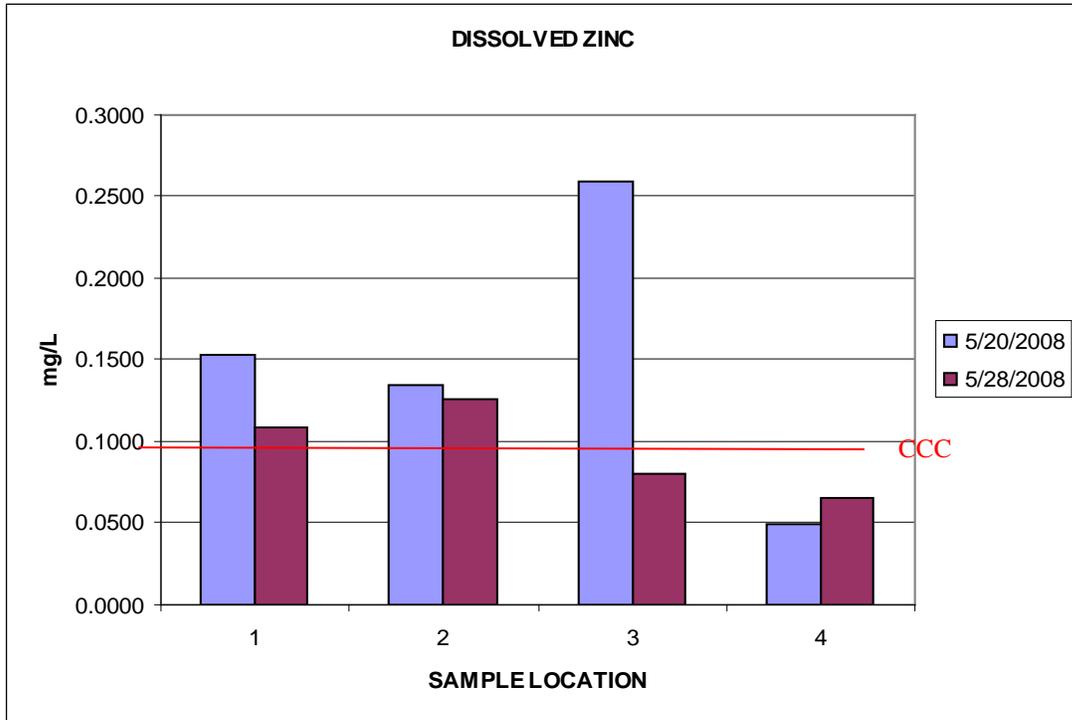
**Figure 3. Sample Results for Total Zinc**



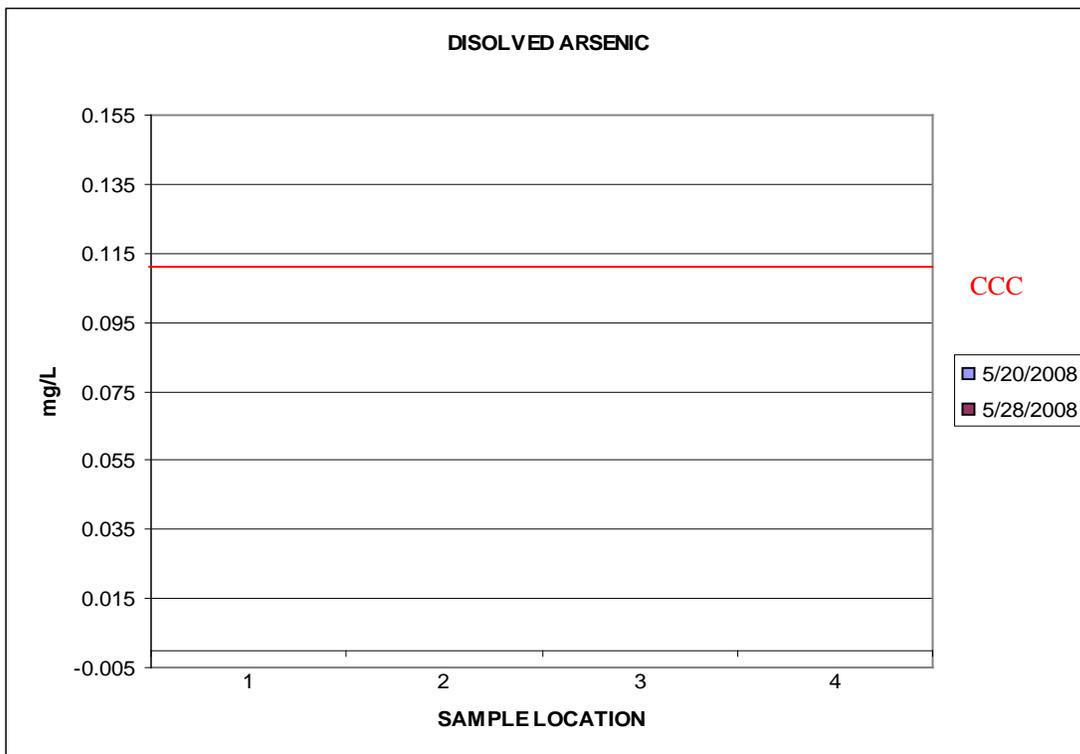
**Figure 4. Sample Results for Total Arsenic**



**Figure 5. Sample Results for Dissolved Lead**



**Figure 6. Sample Results for Dissolved Zinc**



**Figure 7. Sample Results for Dissolved Arsenic (All below detection limits)**

These results show a general decrease in total metals in the surface water at EMF during the flood event. This is likely a result of metals-laden sediment settling out of the water at EMF. Results for dissolved zinc show a slight decrease between rising and receding waters at EMF. The measured concentration at locations 1 and 2 exceeded the CCC as the flood waters receded. Dissolved lead was not detectable on either date for the Coeur d'Alene River upstream of EMF, but exceeded the CCC at each of the other locations on both dates. The measured lead concentrations increased for sites 1 and 2, and decreased at site 3. Dissolved Arsenic was below detection limits for all samples.

These results do provide some baseline information for flood water quality at East Mission Flats. These data might also be used for planning future sampling efforts. More data regarding dissolved lead and zinc concentrations would be of particular interest since each of those exceeded water quality standards during the flood event. It might also be advantageous to collect and compile more data on dissolved lead and zinc in the vicinity of EMF to identify the cause of the increase in concentrations observed during this sampling effort. This data would be useful in monitoring potential environmental impacts of future operations at East Mission Flats Repository.