



Technical Memorandum

Date: June 20, 2008
To: Robert Leitch, USACE North Atlantic Division New England District
From: Deirdre Dahlen, Battelle
Subject: Sawyer Street 2007 Semi-annual Groundwater Monitoring Results

This Technical Memorandum presents a summary of the groundwater monitoring activities conducted at the Sawyer Street Confined Disposal Facility (CDF) in New Bedford, Massachusetts during the 2007 semi-annual monitoring period. The 2007 monitoring study is a continuation of a multi-year groundwater sampling program to sample six groundwater wells located at the perimeter of the CDF. Results from the monitoring study are used to assess potential trends in concentrations of polychlorinated biphenyls (PCBs as Aroclor) and selected metals (cadmium, chromium, copper, and lead) and to evaluate the integrity of the CDF. Groundwater well development and results from monitoring conducted since 2001 are presented in ENSR (2006). Results from the 2007 semi-annual monitoring study are discussed in this Technical Memorandum.

Field Activity Summary

Sampling was conducted in the early summer and fall of 2007, on June 28-29, 2007 and October 15-16, 2007. During both events, *in-situ* water quality measurements (temperature, specific conductivity, dissolved oxygen [DO], pH, Oxidative Redox Potential [ORP], turbidity), groundwater levels, and samples of groundwater were collected at six wells located at the perimeter of the CDF (Figure 1), identified as MW-1, MW-3, MW-4A, MW-5, MW-6, and MW-7A. All field measurements and groundwater collection were conducted according to the Field Sampling Plan (FSP) developed for this investigation (Battelle, 2006). Field activities are summarized briefly below.

Groundwater sampling was performed according to the procedures for Low-Flow (Low-Stress) Purging and Sampling based on EPA Region I Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 2, July 30, 1996 (EPA, 1996). A Geotech GeoPump II Peristaltic Pump was used during the June 2007 sampling event and a bladder pump (equipped with dedicated Teflon bladders) was used during the October 2007 event. Dedicated sampling tubing was used to collect groundwater samples during both events to minimize the risk of sample contamination and cross contamination between wells. Upon arrival for sample collection, the water level was measured with a cleaned water level tape and the well volume was calculated. The water level tape was cleaned between wells following decontamination procedures described in the FSP (Battelle, 2006). The pump (peristaltic or bladder) was then affixed to the dedicated tubing which was placed into the well. The well depth was measured again before purging the well to account for any water displacement from the pump. Groundwater samples for PCB Aroclor and metals analysis were collected once the well was purged and all diagnostic parameters (i.e., pH, DO, specific conductivity, turbidity, temperature, and ORP) achieved a steady state. The flow rate was verified using a graduated cylinder and timepiece and then recorded on the field log sheets.

In addition to the field samples, field and laboratory quality control (QC) samples were collected to meet measurement quality objectives defined in the FSP. During each sampling event, one field duplicate sample and one equipment blank were collected; one matrix spike/matrix spike duplicate (MS/MSD) were also collected to provide 'extra' water for the preparation of laboratory-based QC samples.



Field measurements were recorded on detailed field logs sheets that are provided as an attachment to this Technical Memorandum (Appendix A). The integrity of the groundwater samples was maintained by using cleaned, dedicated sampling tubing for each well, by not introducing contaminants into the samples during collection, by collecting the samples in clean bottles provided by the analytical laboratories, by keeping the samples cold on ice during transport to the analytical laboratories, and by analyzing the samples within the required holding time.



Figure 1: Sawyer Street CDF Monitoring Well Locations and PCB Aroclor 1242 and 1248 Concentrations in Groundwater



***In-situ* Water Quality Summary**

Water quality parameters were measured during the initial pumping of groundwater from the wells before the actual groundwater sample collection. *In-situ* measurements were made using an YSI® multi-meter sonde and a flow-thru cell. The flow-thru cell was disconnected from the discharge line during the actual sample collection. The YSI® sonde was calibrated and used according to all manufacturer's specifications. Calibration records are documented on the field logs (Appendix A). Turbidity was measured using a LaMotte, 2020E turbidity meter. Once the diagnostic parameters had stabilized, sample collection was initiated. These data are summarized in Table 1.

Chemistry Water Quality Summary

The groundwater samples collected from the June and October 2007 sampling events were analyzed for PCB Aroclors and selected metals, including cadmium, chromium, copper, and lead. PCB Aroclor analysis was performed by Battelle, located in Duxbury, Massachusetts and metals analysis was performed by Battelle Marine Science Laboratory, located in Sequim, Washington. Sample results are summarized in Table 2 (PCB Aroclor) and Table 3 (metals), and are compared to the Massachusetts Contingency Plan (MCP), Method 1 category GW-3 criteria for groundwater that has a potential to discharge to a surface water body (http://www.mass.gov/dep/cleanup/laws/0974_2.htm).

Concentrations of PCB Aroclors were generally low or undetected in the groundwater samples. Aroclor 1242 was detected in 4 of the 6 wells (MW-1, MW-3, MW-4A, and MW-6) during the June 2007 event; Aroclor 1248 was detected in 3 of the 6 wells (MW-3, MW-4A, and MW-5) during the October 2007 event; and Aroclor 1260 was detected in 1 of the 6 wells (MW-7A) during the June 2007 event (Table 2). All PCB Aroclors were measured at levels below the MCP GW-3 criteria of 10 µg/L, which is consistent with earlier monitoring events conducted from 2004 to 2006 (ENSR, 2006). The June and October 2007 sampling results for Aroclor 1242 and 1248 are shown on Figure 1. Figure 1 shows that Aroclor 1242 detections are located in the western, northern, and eastern portions of the site, whereas Aroclor 1248 detections are observed in the eastern portion of the site only. The lone Aroclor 1260 detection was observed in MW-7A, which is located in the southern portion of the site where neither Aroclor 1242 nor Aroclor 1248 was detected.

Consistent with earlier monitoring events conducted since 2001 (ENSR, 2006), metals concentrations measured in the groundwater sampled in 2007 were below the MCP GW-3 criteria (Table 3). Cadmium was detected at low concentrations (0.018 to 0.718 µg/L) in groundwater collected at all 6 wells during the 2007 semi-annual monitoring, with the highest concentrations measured at well MW-7A. Chromium, copper, and lead were detected above the laboratory method detection limits in all the field samples. Due to the low-level background contamination (see Quality Control section), sample results for chromium, copper, and lead were "U" qualified during third party validation because the concentrations were below five times the concentrations in the equipment blanks.

Quality Control

Analytical data received third party validation and the data were qualified according to Region 1 Data Validation guidelines. Qualifiers reported on Tables 2 and 3 represent the final qualifier assigned by the data validator. Results from the field QC samples were also evaluated to assess data quality in terms of precision (field duplicate) and potential contamination (equipment blank) that may contribute to contaminant concentrations measured in the field samples, as follows.



Field Duplicates – PCB Aroclor and metals results were comparable between the original sample and the replicate sample collected at well MW-5 (June 2007 event) and at MW-4A (October 2007 event) (see Tables 2 and 3).

Equipment Blanks – PCB Aroclors were undetected in the equipment blanks, indicating that the sampling methods were free of PCB Aroclor contamination. Metals were detected in the equipment blanks (Table 3) at concentrations equal to or lower compared to earlier investigations (ENSR, 2006). Sample concentrations of cadmium were generally one order of magnitude higher compared to equipment blank concentrations, suggesting that the impact to data quality is minimal. Concentrations of chromium, copper, and lead in the groundwater samples were frequently less than five times the equipment blank concentrations, suggesting that sample concentrations for these metals may be biased high (sample values <5x equipment blank values are ‘U’ qualified on Table 3). While potential field contamination may have contributed to sample concentrations for chromium, copper, and lead, all metals concentrations in all of the groundwater samples are well below the MCP GW-3 criteria (Table 3).

Summary

Semi-annual monitoring was performed in 2007 at the Sawyer Street CDF as part of the ongoing groundwater monitoring program. Groundwater levels, water quality parameters, PCB Aroclor, and selected metals were monitored in all six wells at the facility. Analysis of groundwater samples indicates that although low-level detections of PCB Aroclor and metals were observed, concentrations are all below MCP GW-3 criteria. The groundwater data collected during the semi-annual monitoring suggest that the integrity of the CDF is currently maintained.

Literature Cited

Battelle, 2006. Groundwater Monitoring Final Field Sampling Plan-New Bedford, Massachusetts. Prepared by Battelle. June 2006.

ENSR, 2006. Final Sawyer Street Groundwater Report: New Bedford Harbor Superfund Site - New Bedford, Massachusetts. Prepared by ENSR Corporation. December 2006.

EPA, 1996. EPA Region I Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Rev. 2, July 30, 1996.

Massachusetts Department of Environmental Protection, 2008. MCP Method 1 Groundwater Standards. 310 CMR 40.0974(2). http://www.mass.gov/dep/cleanup/laws/0974_2.htm



Table 1: Summary of *In-situ* Groundwater Data Collected Immediately Prior to Sampling

Well ID	Date/ Time	Depth to Water (ft)	pH	Spec Cond. (µS/cm)	Temp (°C)	DO (mg/L)	Turbidity (NTU)	ORP (mV)	Purge Vol. (L)	Flow Rate (mL/min)	Color/ Odor	Draw-down* (ft)
June 2007 Sampling Event												
MW-1	6/28/2007 17:55	17.7	7.19	848	18.17	2.12	5.6	-93.4	6.3	96	Clear	1.2
MW-3	6/28/2007 13:50	16.8	7.35	4322	15.58	0.18	7	-205.1	6.4	158	H2S Odor	1.7
MW-4A	6/28/2007 10:21	12.96	7.55	4518	17.39	0.39	1.8	-285.8	2.6	50	H2S Odor	2.11
MW-5	6/28/2007 12:48	13.0	7.93	3370	16.59	0.23	1.2	-229.2	4.9	109	H2S Odor	2.81
MW-6	6/28/2007 15:46	14.95	7.54	517	15.8	0.52	2.4	-96.3	8.5	148	H2S Odor	1.55
MW-7A	6/29/2007 10:18	11.55	6.67	777	14.12	1.46	0.35	183.1	5.3	113	Clear	0.2
October 2007 Sampling Event												
MW-1	10/16/2007 10:11	18.7	6.63	1023	16.66	0.67	1.22	-192.5	4.6	76	H2S	2.3
MW-3	10/16/2007 13:33	15.6	6.86	8016	16:46	0.35	9.87	-313.3	4.1	76	Rusty brown, slight H2S	0.9
MW-4A	10/15/2007 12:43	15.1	6.73	5985	16.57	0.18	3.9	-409.8	3.6	62	H2S	2.7
MW-5	10/15/2007 15:12	12.9	7.2	4236	16.08	0.16	6.6	-418.9	4.1	76	H2S	2.0
MW-6	10/16/2007 11:36	13.7	7.18	478	16.16	0.61	5.14	-270.5	3.7	89	Reddish particles	0.9
MW-7A	10/16/2007 15:01	11.5	6.48	850	16.6	0.44	0	26	2.4	74	Clear	0.2

* Drawdown is the distance in feet the water level changed during the sampling process.



Table 2: PCB Aroclor Results from June and October 2007 Sampling Events

Well ID	Date	Result (µg/L)													
		Aroclor 1016	Final Qual	Aroclor 1221	Final Qual	Aroclor 1232	Final Qual	Aroclor 1242	Final Qual	Aroclor 1248	Final Qual	Aroclor 1254	Final Qual	Aroclor 1260	Final Qual
MCP GW-3 Criteria		10		10		10		10		10		10		10	
MW-1	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0880	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/16/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
MW-3	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0790	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/16/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0890	U ¹	0.0053	U ¹
MW-4A	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0610	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/15/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0690	U ¹	0.0053	U ¹
MW-5	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/15/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0970	U ¹	0.0053	U ¹
MW-6	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0081	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/16/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
MW-7A	6/29/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/16/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
Field QC															
MW-4A	10/15/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0690	U ¹	0.0053	U ¹
MW-4A REP	10/15/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0680	U ¹	0.0053	U ¹
MW-5	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
MW-5 REP	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
Equipment Blank	6/28/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹
	10/18/2007	0.0061	U ¹	0.0033	U ¹	0.0071	U ¹	0.0066	U ¹	0.0071	U ¹	0.0071	U ¹	0.0053	U ¹

Notes:

MCP: Massachusetts Contingency Plan, Method 1 MCP GW-3 standard from 310 CMR 40.0974(2).

NA = not available

¹ 'U' qualifier indicates chemical not detected at concentration above the laboratory reporting limit.



Table 3: Metals Results from June and October 2007 Sampling Events

Well ID	Date	Result (µg/L)							
		Cadmium	Final Qual	Chromium	Final Qual	Copper	Final Qual	Lead	Final Qual
MCP GW-3 Criteria		4		300		NA		10	
MW-1	6/28/2007	0.18		2.668	U ²	1.668	U ²	1.028	
	10/16/2007	0.269		5.16	U ²	2.66		1.11	
MW-3	6/28/2007	0.039		3.778	U ²	3.467	U ²	0.046	U ²
	10/16/2007	0.19		8.79	U ²	1.87		0.221	U ²
MW-4A	6/28/2007	0.055		4.96		4.633		0.413	
	10/15/2007	0.021		9.96		0.622	U ²	0.159	U ²
MW-5	6/28/2007	0.042		1.201	U ²	3.422	U ²	0.052	
	10/15/2007	0.028		7.73	U ²	0.653	U ²	0.123	U ²
MW-6	6/28/2007	0.079		2.505	U ²	1.752	U ²	0.292	
	10/16/2007	0.033		1.83	U ²	0.707	U ²	0.102	U ²
MW-7A	6/29/2007	0.537		1.155	U ²	3.996	U ²	0.076	
	10/16/2007	0.718		3.64	U ²	5.86		0.078	U ²
Field QC									
MW-4A	10/15/2007	0.021		9.96		0.622	U ²	0.159	U ²
MW-4A REP	10/15/2007	0.018		6.4	UJ ²	0.594	U ²	0.061	U ²
MW-5	6/28/2007	0.042		1.201	U ²	3.422	U ²	0.052	
MW-5 REP	6/28/2007	0.042		1.367	U ²	2.164	U ²	0.027	UJ ²
Equipment Blank	6/28/2007	0.0032		0.93		0.857		0.01	
	10/16/2007	0.001	U ¹	1.79		0.293		0.0761	
Method Detection Limit		0.001		0.08		0.004		0.001	

MCP: Massachusetts Contingency Plan, Method 1 MCP GW-3 standard from 310 CMR 40.0974(2).

NA = not available

¹ 'U' qualifier indicates chemical not detected at concentration above the laboratory reporting limit

² 'U' qualifier indicates chemical not detected at concentration above 5x equipment blank values

J = estimated value