UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

DIVE REPORT – September 9, 2004

From: Bruce Duncan, Science Lead & Divemaster **Dates of dive:** **August 24-26, 2004**
August 20-Sept 1, 2004

Thru: Rob Pedersen, Unit Diving Officer & Divemaster

To: Keven McDermott, Dive Team Sponsor
Bill Riley, OEA Director

Project: Rhone Poulenc (RCRA site) Groundwater/Sediment Initial Assessment
Requested by: RCRA program
Start Date: 8/24/2004
Purpose: Scientific Investigation
Local Waterbody: Lower Duwamish Waterway, Slip 6
General Location: Approximate location N47 31.127 W122 18.309. See separate figure for overflight photo and Figure 2 below for plots of boat locations from GPS (Table 2)

Scientific Objectives (summary): Sediment core samples and seepage meter water samples were obtained from 13 and 3 stations respectively. Piezometer installations did not work due to the claylike sediment.

Summary: 25 dive events completed: 21 solo tethered dive events (=21 individual dives); 2 untethered paired dive events (=4 individual dives); and 2 combination tethered and untethered paired dive events (=4 individual dives) for a total of 29 total individual dives. Sediment samples were successfully collected at 13 subtidal stations; 3 piezometer installations were attempted by divers plus approximately 4 attempts were made from the boat, none were sampled successfully due to the claylike sediment; seepage meters were installed at 4 stations and sampled successfully from 3 stations. Tethered diving was successful; some adjustments need to be made to the backpacks.

Personnel:
Hydrogeologist: Rene Fuentes (RF)
Divers: Bruce Duncan (BD), Rob Pedersen (RP), Sean Sheldrake (SS), Tim Siwiec (TS), Chad Schulze (CS), Lisa Macchio (LM)
Boat Operators: Doc Thompson, Dave Terpening, Jed Januch
Other Field Support Personnel: Brandon Perkins (Technical Support Unit), Steve Potokar (Investigation and Engineering Unit), Margo Tufts (Office of Water)

Detailed Objectives: Aug 24-26, collect sediment samples from 13 stations. Place seepage meter with two datasondes, one recording bottom ambient parameters and the other recording ground water discharge through a flow-through cell – and leave for 6 days to look for different signatures in field parameters between ground water and bottom ambient water. Aug 30-Sep 1, collect ground water samples from 13 stations. Install piezometers (when piezometers failed on Aug 30, seepage meters [approx. 10.5 inches diam] were installed on Aug 31, see Figure 3).

Scientific Observations:
Station locations and sediment sampling: See Figures 1, 2, & Table 2, below. A transect line (a 100m line joined to a 200m line) with premarked sampling locations was placed in Slip 6 on Aug 24. The location of the East end was approximately N47 31.127 W122 18.309 and the West end approximately N47 31.173 W122 18.309. Sampling locations were marked at 0m, 35m, 70m, 100m, 135m, and 170m beginning from the E end. These marked locations were designated Subtidal (Sb) sampling stations: 0m=Sb3; 35m=Sb4; 70m=Sb5; 100m=Sb6;

135m=Sb7; 170m=Sb8. A large seepage meter was placed at Sb3. The meter was equipped with two datasondes to record ambient bottom water and discharging ground water field level parameters. Cores were collected from Sb3, Sb4, Sb5, and Sb6. On Aug 25, station Sb11 was located approximately midway between the dolphins marking the "offshore" set of pilings that run parallel to the river boundary of the site. Sb12 was located at the northern dolphin at this same location. Stations Sb1 and Sb2 were located adjacent to the NE corners of "finger piers" 1 and 5 (counting from E to W – and as indicated in the QASP). An additional station was placed approximately 20ft upchannel from Sb3 and designated Sb17 (at approximately [–]6m). Station Sb13 was located at a dolphin nearest to the NW corner of the site. Sediment cores were collected from stations Sb11, Sb12, Sb2, Sb1, Sb17, and Sb3. On Aug 26, stations Sb7 and Sb8 were sampled for sediment. Sediment was collected from 12 stations. Locations were adjusted slightly from the QASP based on the need to sample close to the SW and SE corners of the site and to have somewhat even spacing along the transect line.

Data was retrieved from the datasondes and matched using the depth and time data (one unit's clock was approximately 30 min ahead of the other) see Figure 4. Data were compared for conductivity, temperature, redox, and pH by looking at the raw plots and then plotting the differences between the two meters to look at trends over time. Differences occurred but were not huge. For example, conductivity plots indicated a decrease in ambient bottom water conductivity relative to ground water conductivity of about 1 to 2 mS/cm over the 6 day period (Figure 5). Ground water Redox declined through the 6 days, while surface water redox increased and leveled off (Figure 6). The two units were off by about 100 mV in the lab after retrieval. The pH readings differed in the lab by about 0.2 units after retrieval. After adjusting for this, ground water pH was generally higher than bottom ambient water with the difference reaching about 0.5 units then reducing to 0.2-0.3 units by the end of the 6 days (Figure 7).

<u>Ground water sampling</u>: Piezometers installed at stations Sb2, Sb3, and Sb17 on Aug 29 all failed to produce ground water samples. Pairs of seepage meters were installed at Sb8, Sb18, Sb17, and Sb7 (total of 8 meters) on Aug 30 and allowed to purge overnight. On Sep 1, collection bags were opened and later in the day, collected. During the waiting period, an intertidal station in Slip 6 was sampled using the MH minipiezometers.

Dive Details: see Summary Table (Table 1) below
Hazards: Minimal exposure to vessels; typical old pilings (creosote, splintered wood, metal protrusions).
Exposures: Water – unknown contaminants in site-related water discharging from outfalls – likely high dilution in the slip and waterway; Sediment – potential for PCBs, metals, PAHs.
Diver /Equipment Issues: 8/24: Computers need date and time reset; air leak from KM block at rotating knob (fixed on boat before dive – set screw needed careful tightening); RP Aga exhaust leak (all Agas cleaned as per protocols); Comm rope needs protective cap for surface end; tethered system needs hose protectors (installed by SS) 8/25: Empty tank set up for first dive (tank rotated out); bitter end of tethered belt is frayed and needs singeing; RP set up line and clip by the ladder for diver wt belts. 8/26: red goody bag lost on transect line (recovered on 9/1). 8/30: protective caps for tender comm unit need to be tied onto the unit. 8/31: Tethered backpack with snap harness needs replacing – webbing is too short for most divers. 9/1: need more disinfection wipes
First Aid Supplies Expended: none
Decontamination: Freshwater rinse.

Follow-up to Issues:
Each diver – reset date and time on computer
CS - reset date and time on the standby computer
Each diver – take care to put cap back on to standby tank
RP – singe end of tethered backpack belt, replace snap webbing with longer webbing and buckle
LM – contact OTS for protective caps for surface end of the two comm ropes
SS – order Allegro killer wipes (6" x 6.75") Part 5000 160; 800-622-3530

Table 1 - Dive Summaries:

Date/ Dive event	Div-ers	Max Depth (ft)	Start	End	Bottom Time (min)	Surf Int (after)	Comments	TP In	TP Out
Tuesday 8/24/2004 – Tethered diving									
08/24 #01	BD	21 ft	12:01	12:28	27 min	0:31	Place large seepage meter with 2 datasondes at Station 3.	2850	1000
08/24 #02	BD	22 ft	12:59	13:22	23 min	0:14	Sediment cores from Sb3	2700	1600
08/24 #03	BD	22 ft	13:36	13:52	16 min	>12:00	Sediment cores from Sb4	1600	700
08/24 #04	RP	22 ft	14:46	15:16	30 min	0:14	Sediment cores from Sb4 and Sb5	2600	850
08/24 #05	RP	21ft	15:30	15:46	16 min	>12:00	Sediment cores from Sb6	2800	1800
Wednesday 8/25/2004 – Tethered diving									
08/25 #06	TS	16 ft	11:01	11:24	23 min	0:25	Sediment cores from Sb11	2750	1200
08/25 #07	TS	13 ft	11:49	12:12	23 min	>12:00	Sediment cores from Sb12	2800	1600
08/25 #08	CS	19 ft	13:01	13:27	26 min	0:20	Sediment cores from Sb2	2650	1100
08/25 #09	CS	20 ft	13:47	14:07	20 min	>12:00	Sediment cores from Sb3	2800	1600
08/25 #10	BD	23 ft	14:42	15:12	30 min	>12:00	Set line to new station (Sb17) and collect sediment cores	2700	1000
08/25 #11	RP	12 ft	15:44	16:01	17 min	>12:00	Sediment cores from Sb13	2600	1800
Thursday 8/26/2004 – mix of regular and tethered									
08/26 #12	LM RP	12 ft	10:42	11:15	33 min	0:21	Sediment cores from Sb8	2600 2400	1200 1050
08/26 #13	LM RP	14 ft	11:36	11:57	21 min	>12:00	Sediment cores from Sb7	2600 2700	1600 1800
08/26 #14	TS BD	16 ft	13:50 13:42	14:00 14:05	10 min 23 min	0:43 0:38	Test piezometer installation at Sb2 Steel tank - tethered	2500 3200	1800 2000
08/26 #15	TS BD	20 ft	14:43	15:01	18 min	>12:00	Test piezometer installation Steel tank – tethered	1800 2000	750 1200
Monday 8/30/2004 – Tethered									
08/30 #16	BD	11 ft	11:07	11:31	24 min	0:39	Install piezometer at Sb3 Retrieve large seepage meter and datasondes	2600	1400
08/30 #17	BD	11 ft	12:10	12:23	13 min	>12:00	Install piezometer at Sb17	1400	1050
08/30 #18	LM	19 ft	15:35	15:58	23 min	>12:00	Recover piezometers and pipes at Sb3 and Sb17	3000	1600
Tuesday 8/31/2004 – Tethered									
08/31 #19	RP	11 ft	10:07	10:48	41 min	>12:00	Install seepage meters (#10,#6) at Sb8 and (#7, #4) at Sb18 (at 150m)	3100	1400
08/31 #20	TS	8 ft	11:58	12:09	11 min	0:23	Install seepage meters (#8,#5) at Sb7	2950	2000
08/31 #21	TS	11 ft	12:32	12:42	10 min	>12:00	Install seepage meters (#3,#2) at Sb17	2000	1150
Wednesday 9/1/2004 – Tethered									
09/01 #22	BD	13 ft	10:34	11:00	26 min	0:16	Install bags at seepage meters at Sb8, Sb18, Sb7	2600	1600
09/01	BD	15 ft	11:16	11:29	13 min	>12:00	Install bags at seepage meters at Sb17	1600	1000

#23									
09/01 #24	SS	12 ft	14:42	15:13	31 min	0:14	Steel tank. Retrieve bags from seepage meters at Sb8, Sb18, Sb7	2100	1000
09/01 #25	SS	17 ft	15:27	15:35	8 min	>12:00	Retrieve bags from seepage meter at Sb17	3000	2400

Table 2. Station locations – for the antenna on the boat – station location from the antenna is given in last column:

Waypt #	Date/Time	Description	Lat/Lon	Bearing & Dist to station
Tw	8/24/2004	W end of Transect	N47 31.127 W122 18.309	
Te	8/24/2004	E end of transect	N47 31.173 W122 18.139	
Tw	8/24/2004 11:09	W end of transect	N47 31.125 W122 18.311	
47	8/25/2004 10:42	Sb11	N47 31.146 W122 18.367	Station at antenna
48, 49	8/25/2004 11:43	Sb12	N47 31.200 W122 18.378	NNE – 10ft
50	8/25/2004 12:41	Sb2	N47 31.115 W122 18.251	Upchannel-15ft
51	8/25/2004 13:45	Sb1	N47 31.161 W122 18.133	350deg – 30ft
52	8/25/2004 14:40	Sb17	N47 31.168 W122 18.149	20 ft upchannel from Sb3 (not from antenna)
53	8/25/2004 15:34	Sb13	N47 31.272 W122 18.392	300deg – 50ft
54	8/26/2004 9:59	Sb8	N47 31.125 W122 18.264	280deg – 60ft
		Sb7		30deg – 90ft
55	8/26/2004 13:25	Piezometer test (Sb2)	N47 31.115 W122 18.251	
56	8/31/2004 10:08	Sb8	N47 31.137 W122 18.283	335deg – no dist est.
		Sb18		260deg – no dist est.
57	9/1/2004 10:28	Sb8	N47 31.137 W122 18.283	140deg – 30ft
		Sb18		80deg – 60ft
		Sb7		70deg – 90ft
58	9/1/2004 11:19	Sb3	N47 31.167 W122 18.150	0deg – 30ft
59	9/1/2004 12:40	Shore sample	N47 31.169 W122 18.187	

Figure 1. Planned locations of sampling stations

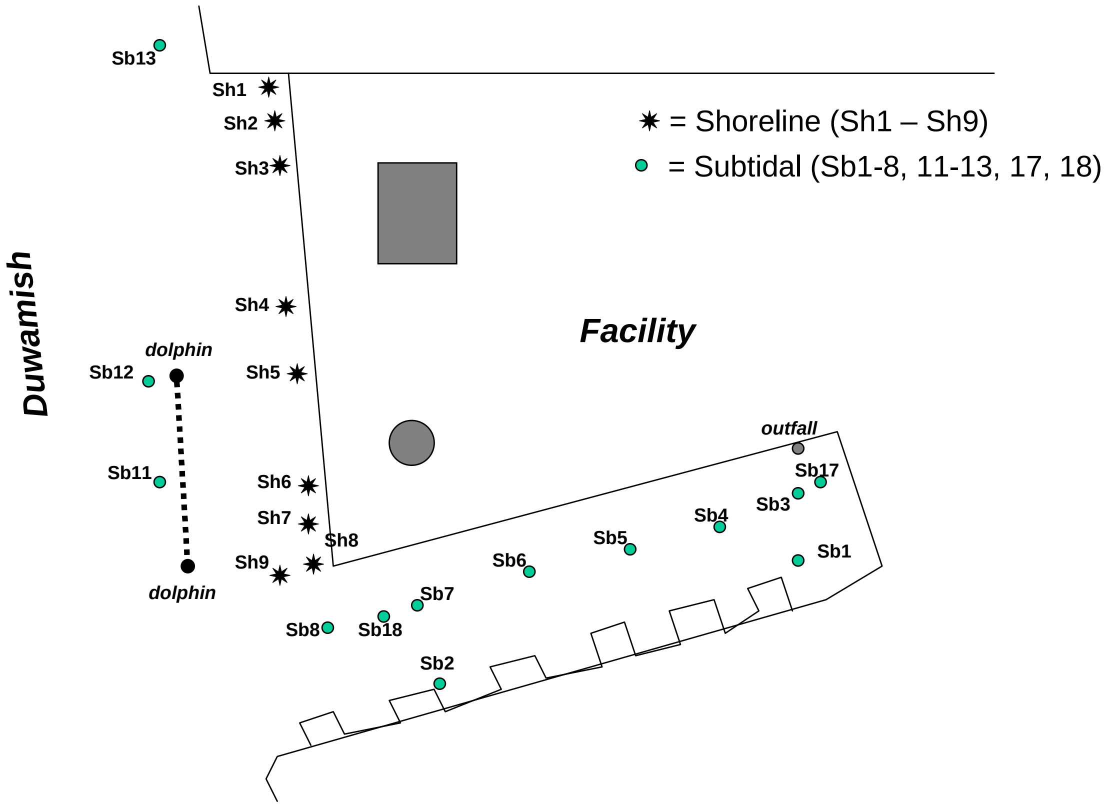


Figure 2. Location of Boat (00##) and associated station (Sb#)

Legend:

0053=Sb13	MOB=W end transect line	0057=Sb8, Sb18, Sb7	0059=shore sampling
0048=Sb12		0054=Sb8, Sb7	0058=Sb3
0047=Sb11		0055=Sb2	0051=Sb1

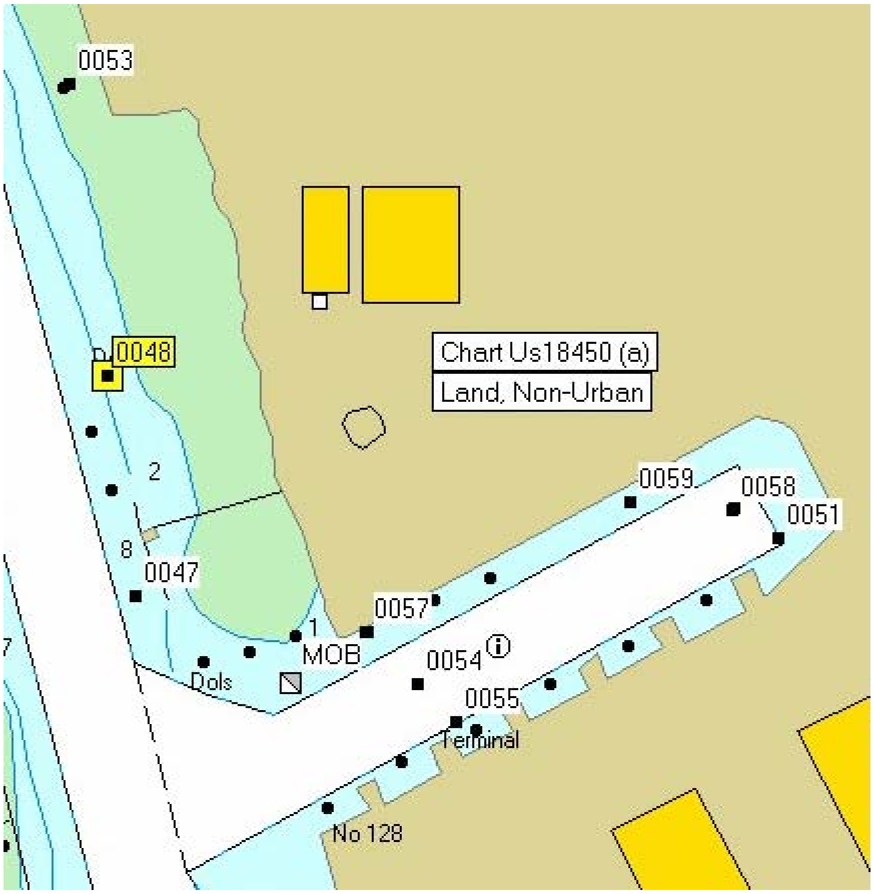


Figure 3. Seepage meter (~10.5 inches diameter) with clip for transect line and folded bag

Piezometer Installation SOP:

Goals:
1. Insert pipe until refusal
2. Insert the piezometer to the bottom of the pipe - if more than one length of pipe is needed join them underwater but make sure the piezometer is threaded past the joint (the piezometer tip will catch in the joint).
3. Remove the pipe and keep the piezometer tip where it is – push down on the piezometer as the pipe is pulled up; tamp the pipe up and down to pack sediment around the piezometer.
4. Connect and deliver tubing to boat

Equipment Needed Per Piezometer Station:
__ dedicated roll of 100' tubing – with coupling
__ 3 five foot pipes with 2 couplers (plus 4-5 spares and couplers overall for the project)
__ 1 piezometer with screen with coupling (plus 1=spare to take down and probably 4-5 spares overall)
__ 2 small goodybags (plus 1 spare overall for the project)
__ 2 bolts (plus 6 spares to take down and 15 spares overall for the project)
__ hammer
__ Comm gear for at least the installer

Installer:
1. small red goodybag with spare piezometer (~15ft with screened end; taped – with tabs) and 4 spare bolts for pipe
2. installation pipe with bolt taped (with tabs) to end. (Can use the other end to probe if necessary, just need to clear the pipe before pushing into sediment). Other end of pipe with coupling
3. hammer if necessary in spare piezometer bag

Sherpa:
1. goodybag with 50-100ft coil of taped (with tabs) tubing, 4 bolts, and piezometer coiled and taped (with tabs) on the outside held by the lanyard looped around the coil
2. 1or 2 pipes with couplings – piezometer can be prethreaded if necessary and carried with the pipes

Method:
1. Installer untapes the bolt, holds it in the bottom of pipe, places the pipe on substrate, and pushes the pipe in to refusal
2. Sherpa hands piezometer to Installer. If a second section of pipe is needed, Sherpa threads the piezometer through new section and Installer threads it into pipe already in the substrate (this takes care of the problem of the piezometer tip catching in the joint between the pipes).
3. Installer raises the second pipe and threads it onto the first section, then pushes the now 10ft pipe in to refusal (if 3rd section is needed you need to prethread through the two additional sections before leaving the surface)
4. Installer moves to top of pipe and removes pipe while pushing down on the piezometer to keep it in place. Installer tamps the pipe up and down during removal to pack sediment around the piezometer. When the pipe is almost completely out, Sherpa grasps the tubing firmly and holds the piezometer in place. Installer unthreads the free end of the piezometer from the pipe and lays the pipe down.
5. IF Two sections of pipe were used, Sherpa holds the piezometer while Installer unthreads the pipe. Sherpa pushes down on the piezometer as Installer removes the pipe, tamping the pipe up and down to pack sediment around the piezometer. Sherpa unthreads the free end of the piezometer tubing from the pipes.
6. Sherpa hands the 100ft coil to Installer who connects the coil while Sherpa retrieves the pipes.
7. Installer pays out the coils of the 100ft tubing slowly and they float up to surface. After Installer pays out the coils the rest of the bundle can be released depending on surface conditions and the ability of surface personnel to retrieve the tubing. Installer then takes one pipe from the Sherpa for ascent to surface.

Figure 4. Datasonde comparison of depth measurements. Used to calibrate data temporally

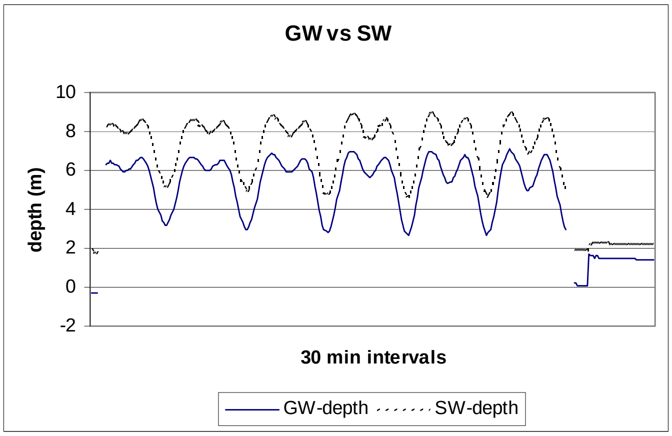
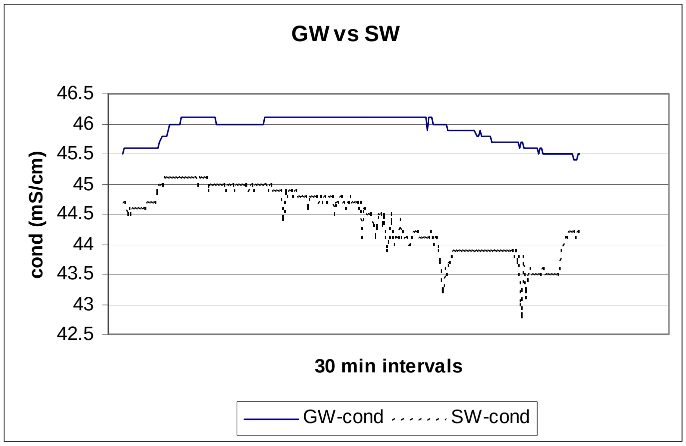


Figure 5. Datasonde comparison for conductivity. First plot of each meter indicating reading about 1 mS/cm different at start and finish. Ground water conductivity increased slightly, plateaued, then declined. Second plot of the difference in conductivity shows how bottom and GW diverged over time by about 1 to 2 mS/cm.



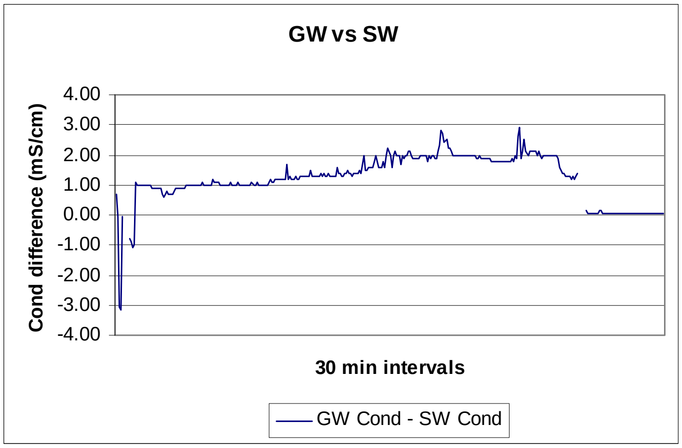


Figure 6. Datasonde comparison for Redox/ORP. Ground water Redox declined through the 6 days, while surface water redox increased and leveled off. The two units were off by about 100 mV in the lab after retrieval.

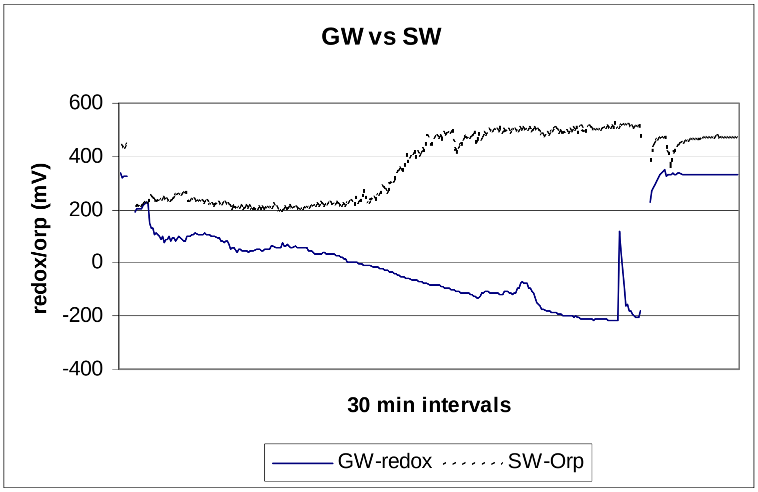


Figure 7. Datasonde comparison for pH. The pH readings differed in the lab by about 0.2 units after retrieval. After adjusting for this, ground water pH was generally higher than bottom ambient water with the difference reaching about 0.5 units then reducing to 0.2-0.3 units by the end of the 6 days.