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July 30, 2009

Mr. Michael Hinton
New York State Department of Environmental Conservation
Division of Water, Region 9
270 Michigan Avenue
Buffalo, New York 14203-7009

RE: Enhanced Bioremediation Pilot Test (Overburden) Results
Data Delivery, Former Carborundum Company (Hyde Park Facility)

Dear Mr. Hinton:

Parsons, on behalf of Atlantic Richfield Company, is submitting the results from the Hyde Park Facility overburden pilot test, conducted in accordance with the June 2008 work plan. A review of the testing program and results is provided below, followed by a summary of the path forward for the continuation of the pilot test. As stated in the work plan, a more comprehensive report will be provided upon completion of the bedrock pilot test.

Background and Objectives

The purpose of the overburden pilot test was to evaluate enhanced *in situ* bioremediation as a potential remediation tool for chlorinated volatile organic compounds (CVOCs) in groundwater. The pilot test was designed with the following primary objectives:

- Determine if enhanced *in situ* bioremediation is suitable to achieve the Site remediation goals for groundwater.
- Determine optimal parameters for potential additional application of enhanced *in situ* anaerobic bioremediation of chlorinated compounds of concern (COCs) at the Site.

The objectives were achieved by injecting a combination of soluble/slow-release organic substrate and a bioaugmentation culture into the subsurface using two injection wells completed in the overburden soils.

Pilot Test Implementation

The overburden pilot test was implemented in accordance with the work plan, with minor modifications. The following is a summary of the overburden pilot test program:

- Two injection wells (INJ-01 and INJ-02) and four performance monitoring wells (PMW-1 through PMW-4) were installed in the overburden pilot test area, near MW-7A (see Figure 1). In addition, one bedrock well (PMW-8) was installed to assist with evaluating potential responses in the bedrock during the overburden pilot test.

- An emulsified vegetable oil-based substrate was injected into the overburden groundwater, to stimulate anaerobic conditions and microbial populations capable of degrading the site COCs.

- The injected substrate mixture consisted of site groundwater and SRS^{TM} product at a ratio of 11:1. SRS^{TM} is a commercial emulsified vegetable oil product from Terra Systems, Inc. that consists of approximately 60% vegetable oil and 40% water, along with emulsifying additives. Five-hundred fifty-eight (558) gallons of the substrate mixture were injected into INJ-01, and 358 gallons were injected into INJ-02. The substrate injections were followed by a water push of 150 and 120 gallons of unamended groundwater into INJ-01 and INJ-02, respectively. The water push was conducted to clear the injection wells of substrate to avoid biofouling, and to further disperse the substrate into the overburden sediments.

- A higher than anticipated hydraulic conductivity was noticed during the injections. Borehole dilution tests (replacing well fluids with distilled water) were conducted at two monitoring wells adjacent to the injection wells to evaluate these zones.

- Approximately five weeks after the overburden injection, the groundwater near INJ-01 and INJ-02 was augmented with a microbial consortium including both *Dehalococcoides* and *Dehalobacter* species of bacteria (known to degrade CVOCs). The augmentation at each well consisted of 370 gallons of native groundwater water (sparged with nitrogen to remove oxygen from the water and the head space of the tank), 2 gallons of SRS^{TM} substrate to act as an oxygen scavenger, 15 pounds of sodium bicarbonate to buffer the pH, and 2 liters of the microbial culture at concentrations greater than 10^{10} cells/liter.

- The pilot test performance was monitored over the course of approximately 7 months with samples collected prior to the injection (baseline), and at 4, 13, 20, and 26 weeks after the injection.

Results

Hydrogeology

Results of the drilling and hydraulic testing indicate that there are two transmissive zones connecting the recently installed overburden wells. One zone is at approximately 15 to 17 feet below ground surface (bgs), where a sand lens was observed within the silt and clay (see boring logs in Attachment 1), and another zone exists along the interface between overburden and bedrock at approximately 25 to 28 feet bgs.

Observations during the injection indicated that there is a hydraulic connection between the overburden and the bedrock aquifers. Dilute concentrations of substrate were observed in MW-7B (screened in bedrock) during the injection. Furthermore, concentrations of total organic carbon (TOC) and acetic acid spiked in bedrock well MW-17B during the 4-week

performance monitoring event. A potential cause of this spike is the sodium lactate portion of the substrate (miscible in water) migrating with groundwater flow.

Geochemistry and Microbiology

Results indicated that the pilot test was effective at stimulating biodegradation of COCs in groundwater, and a complete pathway for degradation of chlorinated ethenes to ethene was observed in the overburden. The data also indicated that groundwater flow rates were higher than originally anticipated, and that the concentrations of TOC (i.e., substrate) decreased faster than expected. Supporting evidence for the effectiveness of the test is presented below and in the attached figures and tables. Results are grouped into the following discussions: (1) degradation of chlorinated ethenes, (2) geochemical indicator parameters, and (3) microbial populations and activity.

- Chlorinated Ethenes (Figure 2): Trichloroethene (TCE) has been reduced to isomers of dichloroethene (DCE) and vinyl chloride (VC) at all monitoring locations, although to varying degrees. Production of VC and ethene was greatest at downgradient wells MW-7A and PMW-8 (bedrock well), relative to the two injection wells and wells PMW-1 through PMW-3. A steady, but slow increase in VC and ethene through the 6.5-month monitoring event is a positive indication that dechlorination is proceeding. The data suggest that greater rates of dechlorination may be stimulated if levels of TOC greater than 30 to 40 milligrams per liter (mg/L) were to be sustained. At some locations, TOC was less than 20 mg/L by the 13-week sampling event.

- Geochemical Monitoring (Figure 3): Geochemical parameters indicated that biological activity was stimulated, and that conditions are within an acceptable range for biotransformation of COCs (e.g., a decrease in oxidation reduction potential and a stable pH above 6.0). However, TOC concentrations decreased more rapidly than expected, which indicates a limited reaction zone developed. Improved performance is anticipated if TOC were maintained at concentrations sufficient to overcome the flux of sulfate and COCs into the reaction zone.

- Microbial Populations (Figure 4): Sampling and analysis of dechlorinating bacteria and reductase enzymes indicates that the native microbial population was dominated by *Dehalobacter* (DHB), and that growth of DHB was stimulated by substrate addition. The addition of the bioaugmentation culture resulted in the growth of *Dehalococcoides* (DHC) while concentrations of DHB decreased dramatically. This suggests that DHC has a competitive advantage over DHB, which is beneficial to achieve complete dechlorination of DCE and VC to ethene. Increases in concentrations of ethene were greatest after bioaugmentation, suggesting that bioaugmentation had a positive impact on the overburden pilot test. Increases in concentrations of the reductase enzymes for VC (BVC and VCR R-Dase) were also

observed. Coupled with increases in ethene, this is a positive indication that dechlorination is proceeding to completion.

In summary, the pilot test concluded that enhanced *in situ* bioremediation is a viable option for treatment of chlorinated COCs in the overburden groundwater. The work plan design anticipated a lower flow regime, and therefore a relatively low concentration of vegetable oil was injected to prevent pore space "clogging." Due to zones of higher permeability (such as sand lenses), the substrate dispersed readily upon injection and was diluted by groundwater flow. Lower than desired TOC concentrations limited the effectiveness of biotransformation to some degree. Therefore, future substrate injections should consider the potential for higher rates of groundwater flow and compensate by applying higher concentrations of substrate.

Future Activities

Based on the overburden pilot test results, the following activities are planned:

- Proceed with the bedrock pilot test proposed in the June 2008 work plan. A buffering agent will be added during both the initial injection and the bioaugmentation injection to prevent pH from dropping below optimal levels (approximately 6). Use of a re-circulation system (withdrawing while injecting) will be evaluated to obtain better control of substrate distribution.

- Inject additional substrate in the overburden pilot test area to increase the concentrations of TOC in groundwater and to further stimulate the degradation processes activated by the first injection. The design of the injection will be enhanced to overcome the higher than anticipated groundwater flow rates. We are currently evaluating options that will affect the mobility of the substrate.

Schedule

The anticipated schedule for the future activities listed above is provided below.

Task	Schedule
NYSDEC Review of Overburden Pilot Test Report	August 14, 2009
Bedrock Well Drilling	August/September 2009
Baseline Groundwater Sampling Event	October 2009
Substrate Injections (Initial Bedrock and Second Overburden Injection)	October/November 2009
Performance Monitoring	4, 13, 20, and 26 weeks following injection

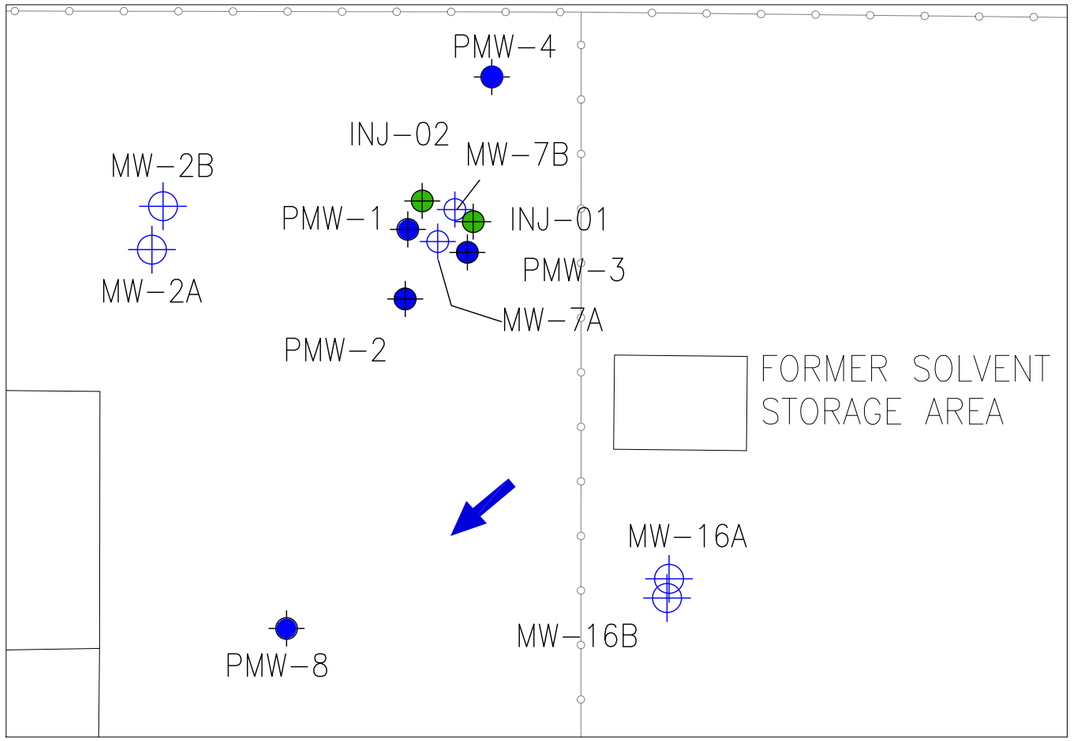
If changes to the approved June 2008 work plan are needed, we will notify you in writing prior to conducting the work. If you have any questions regarding this data report, please contact Bill Barber at (216) 271-8038.

Sincerely,

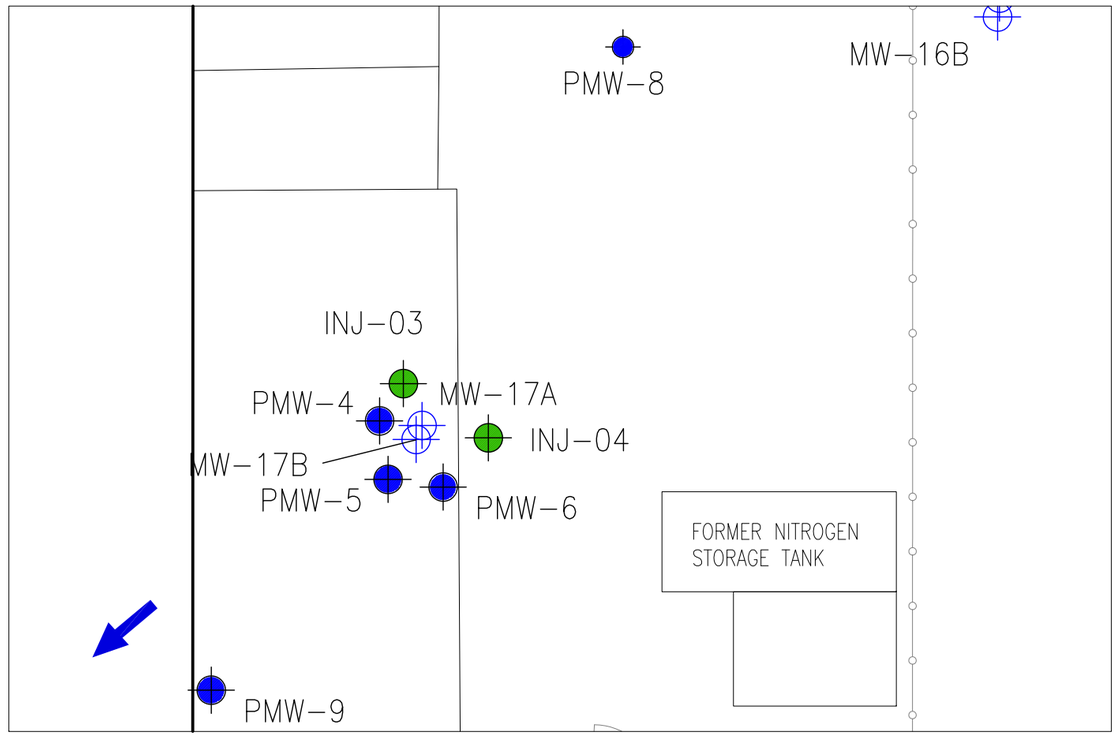
Mark S. Raybuck

Mark S. Raybuck
Project Manager

cc: M. Forcucci, NYSDOH
W. Barber, Atlantic Richfield Company



OVERBURDEN PILOT TEST AREA



BEDROCK PILOT TEST AREA

30 15 0 30 60

LEGEND:

MW-5A / MW-5B	MONITORING WELL LOCATION (A=OVERBURDEN, B=BEDROCK)
MH-1	MANHOLE / SANITARY SEWER SAMPLE LOCATION
INJ-01	INJECTION WELL LOCATION
PMW-6	PERFORMANCE MONITORING WELL LOCATION

APPROXIMATE GROUNDWATER FLOW DIRECTION

SOURCE: INTERA, 2006

FIGURE 1

FORMER CARBORUNDUM COMPANY
TOWN OF NIAGARA, NEW YORK

PILOT TEST WELL LOCATIONS

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FIGURE 2A - CONCENTRATIONS OF CHLOROETHENES AT INJECTION WELL INJ-02

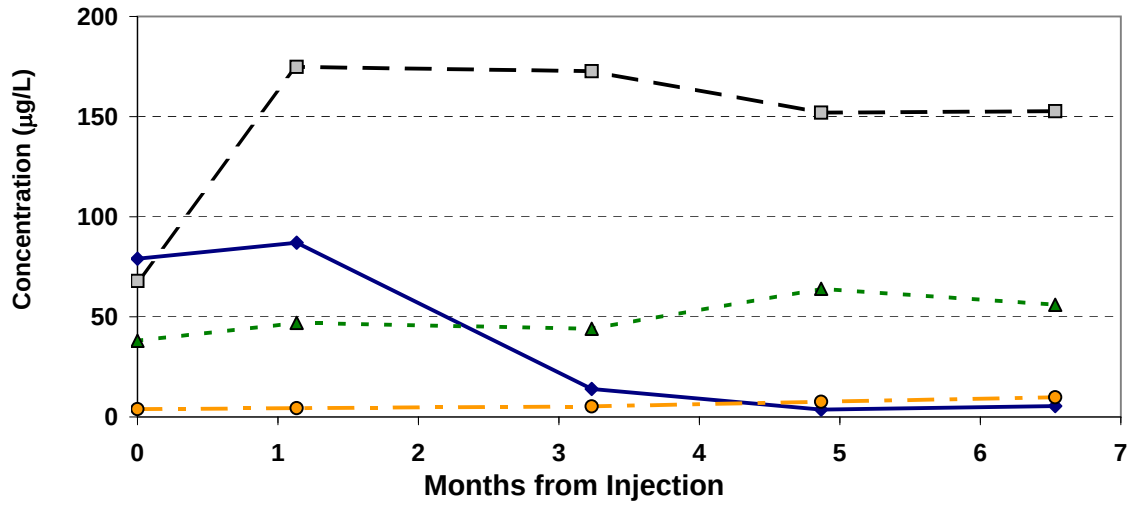
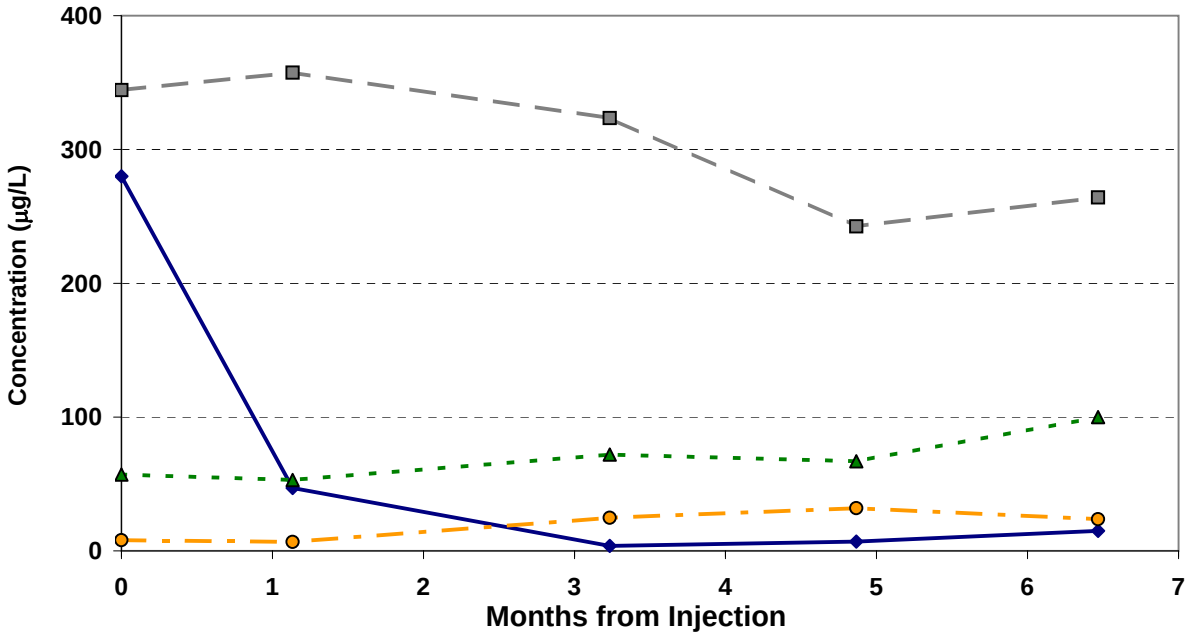


FIGURE 2B - CONCENTRATIONS OF CHLOROETHENES AT INJECTION AREA MONITORING WELL PMW-1



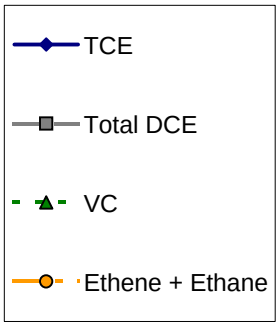


FIGURE 2 A AND B

FORMER CARBORUNDUM COMPANY
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

TRENDS OF CHLORINATED ETHENES - SELECTED WELLS

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FIGURE 2C - CONCENTRATIONS OF CHLOROETHENES AT INJECTION AREA MONITORING WELL MW-7A

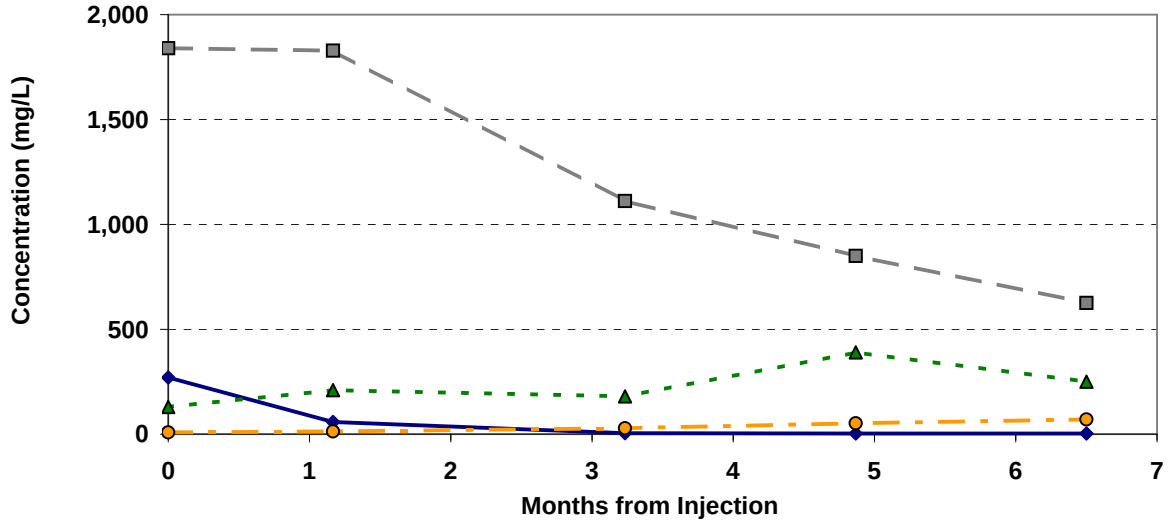
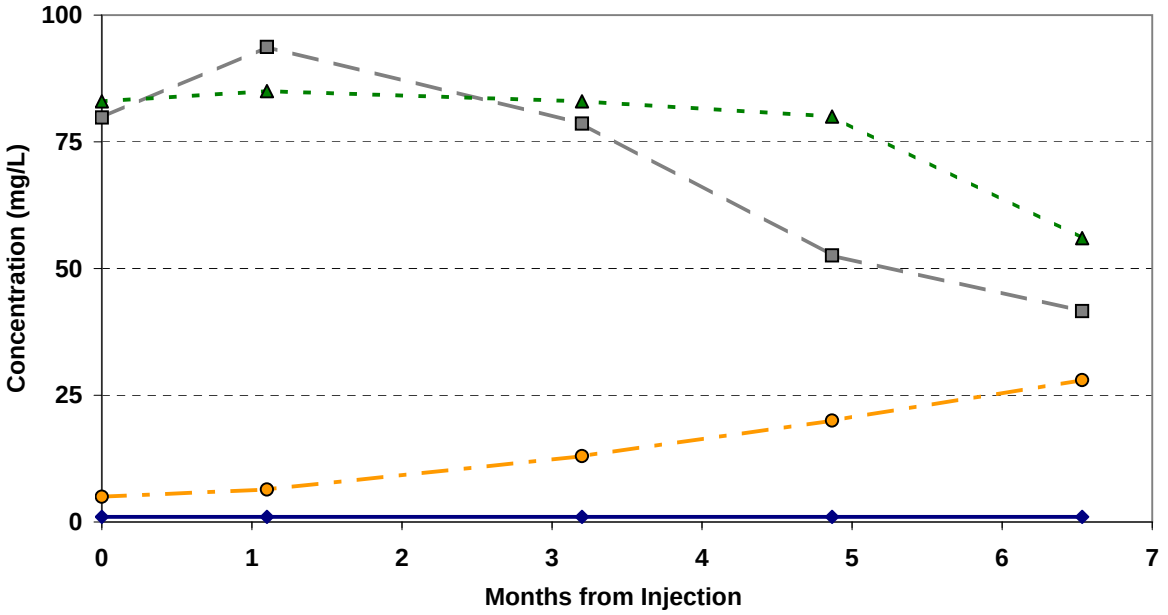


FIGURE 2D - CONCENTRATIONS OF CHLOROETHENES AT INJECTION AREA MONITORING WELL PMW-8



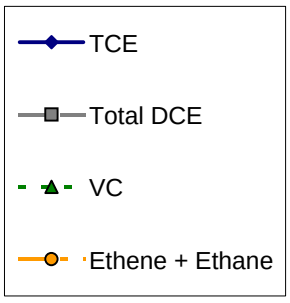


FIGURE 2 C AND D

FORMER CARBORUNDUM COMPANY
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

TRENDS OF CHLORINATED ETHENES - SELECTED WELLS

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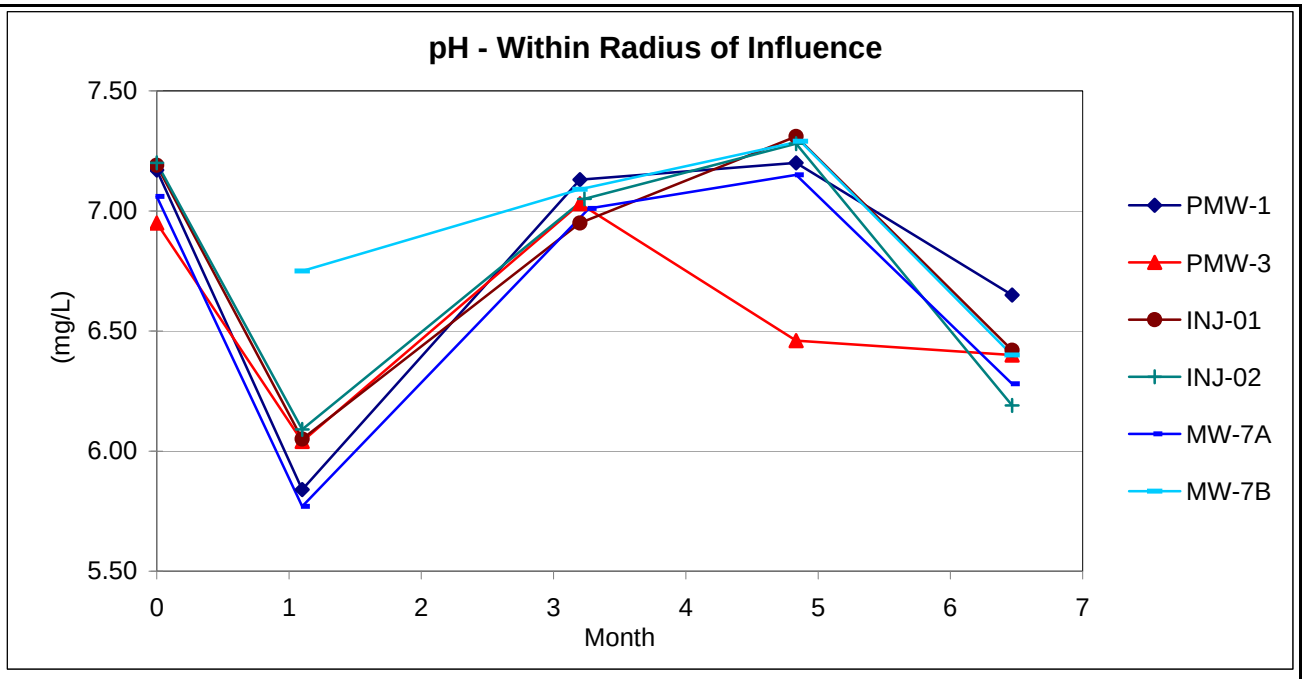

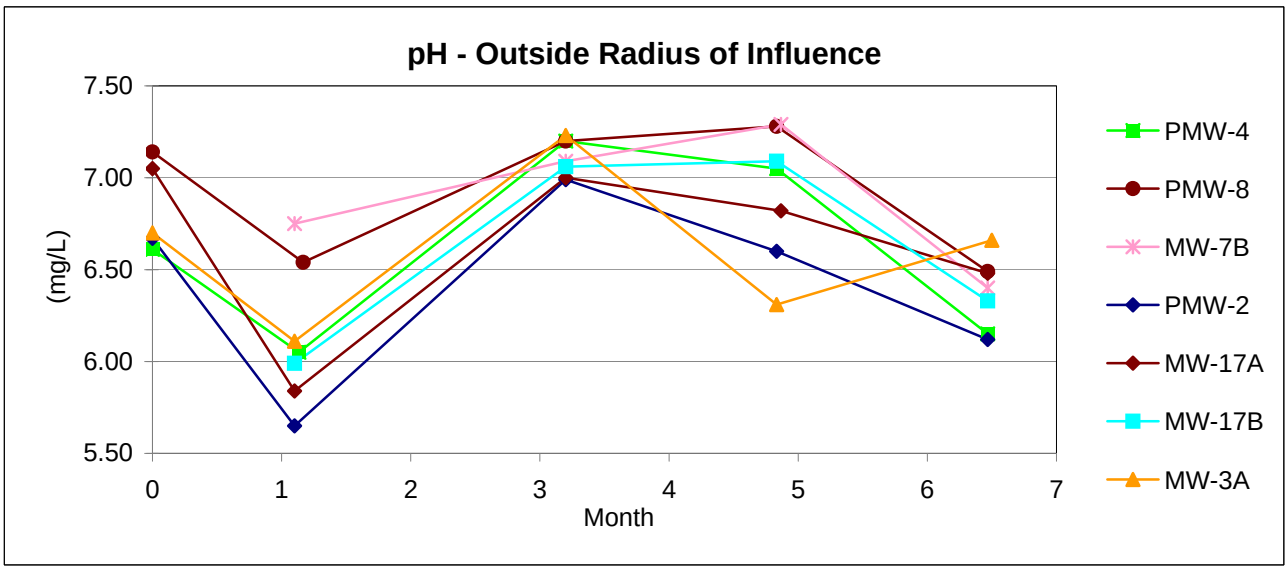

FIGURE 3A

FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

pH TRENDS

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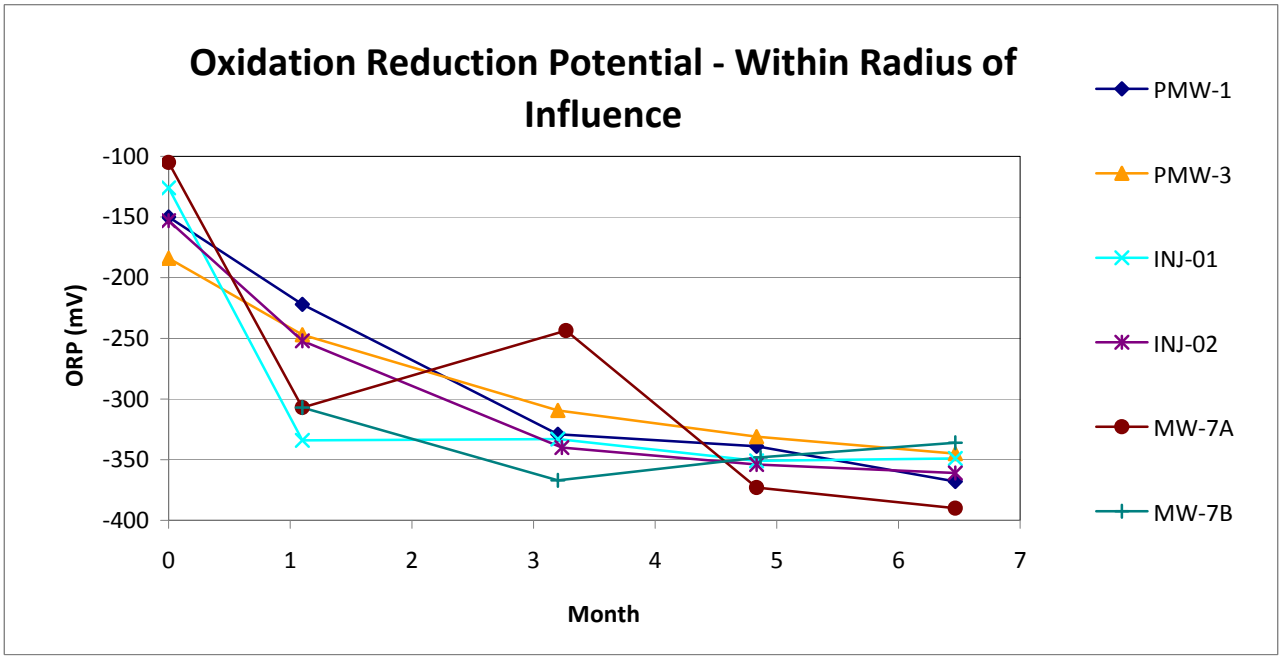

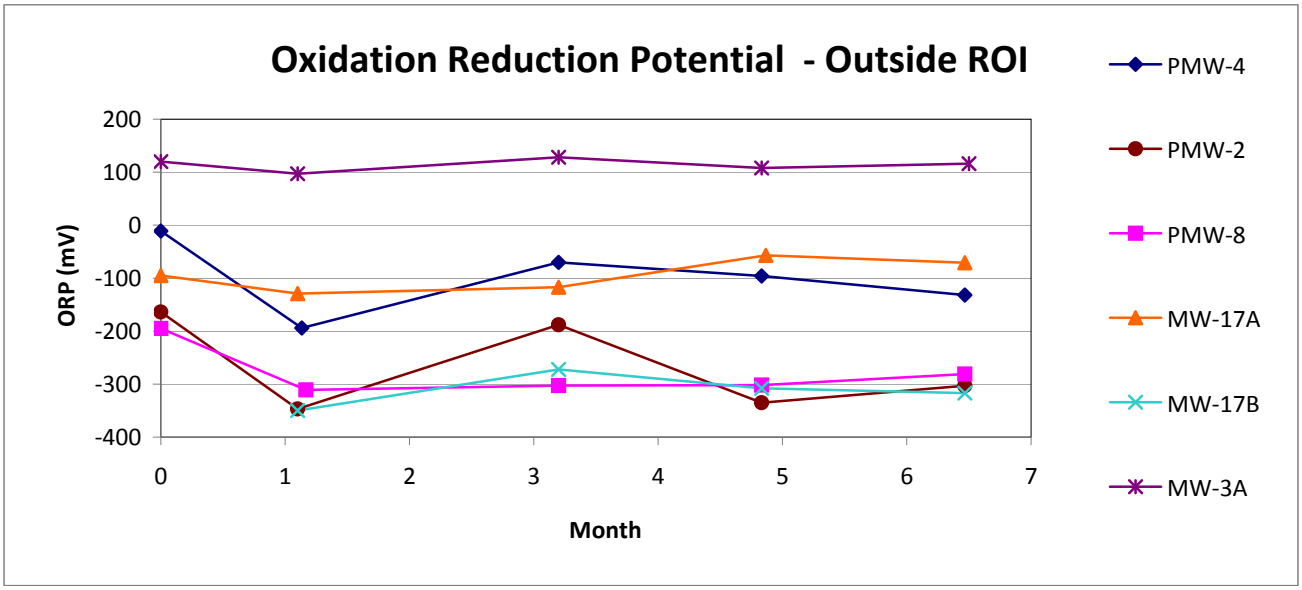

FIGURE 3B
FORMER CARBORUNDUM COMPANY ELECTRIC PRODUCTS DIVISION TOWN OF NIAGARA, NY OVERBURDEN PILOT TEST
OXIDATION-REDUCTION POTENTIAL TRENDS
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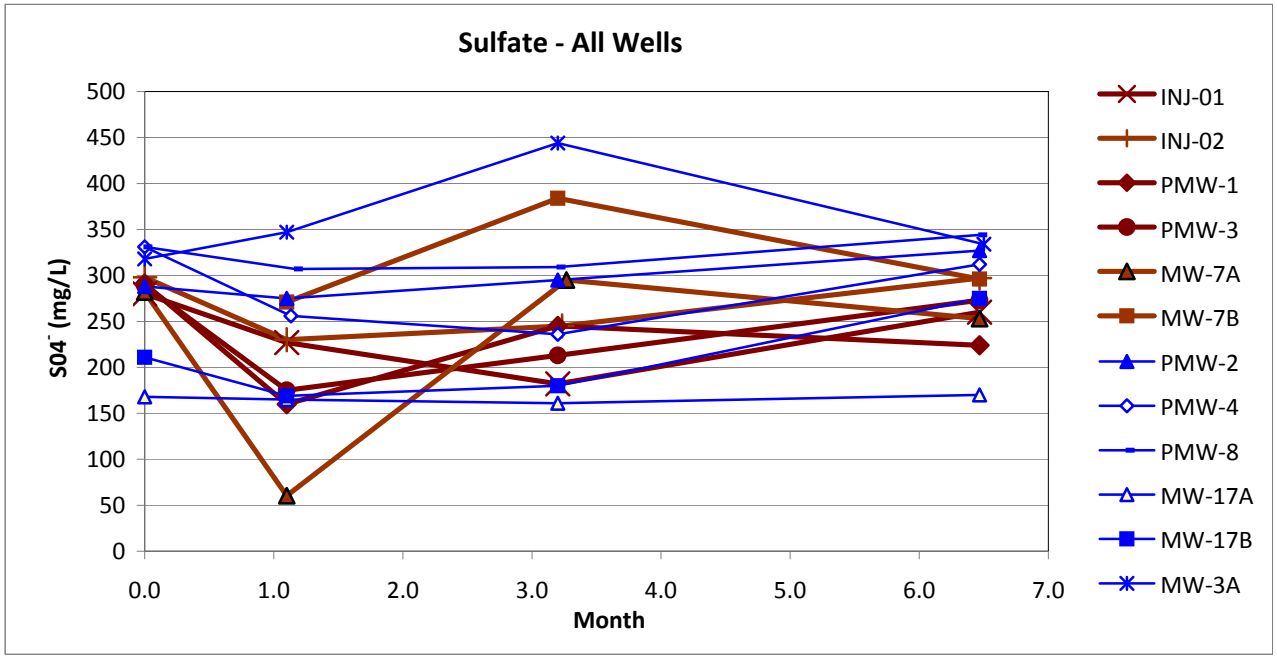

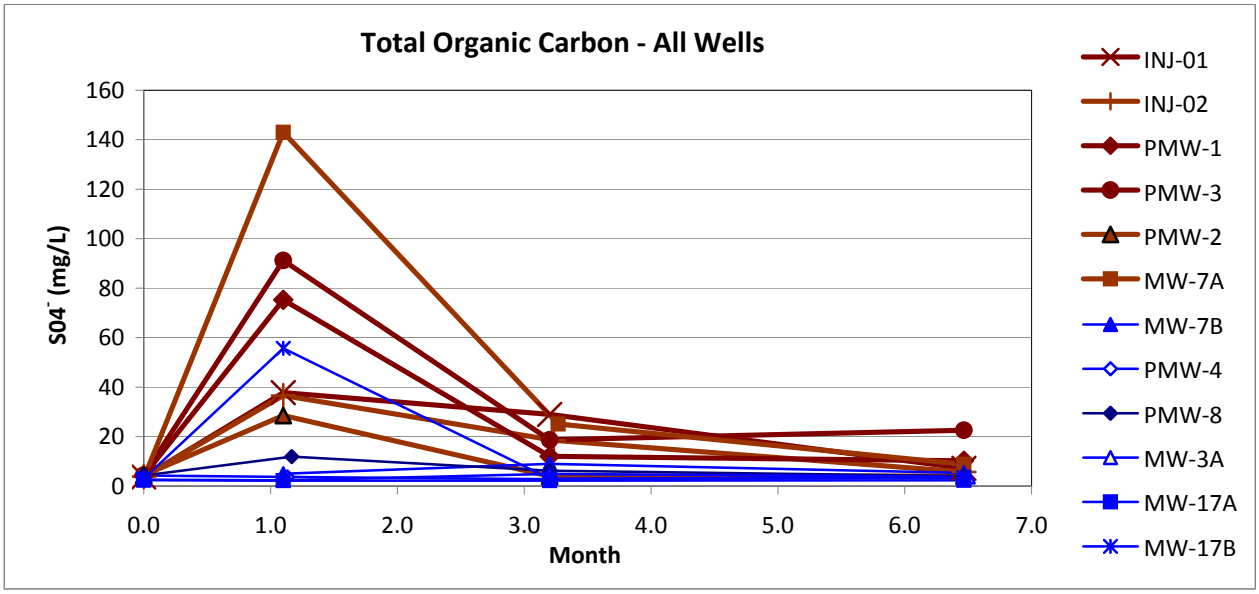

FIGURE 3C

FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

SULFATE AND TOTAL ORGANIC CARBON TRENDS

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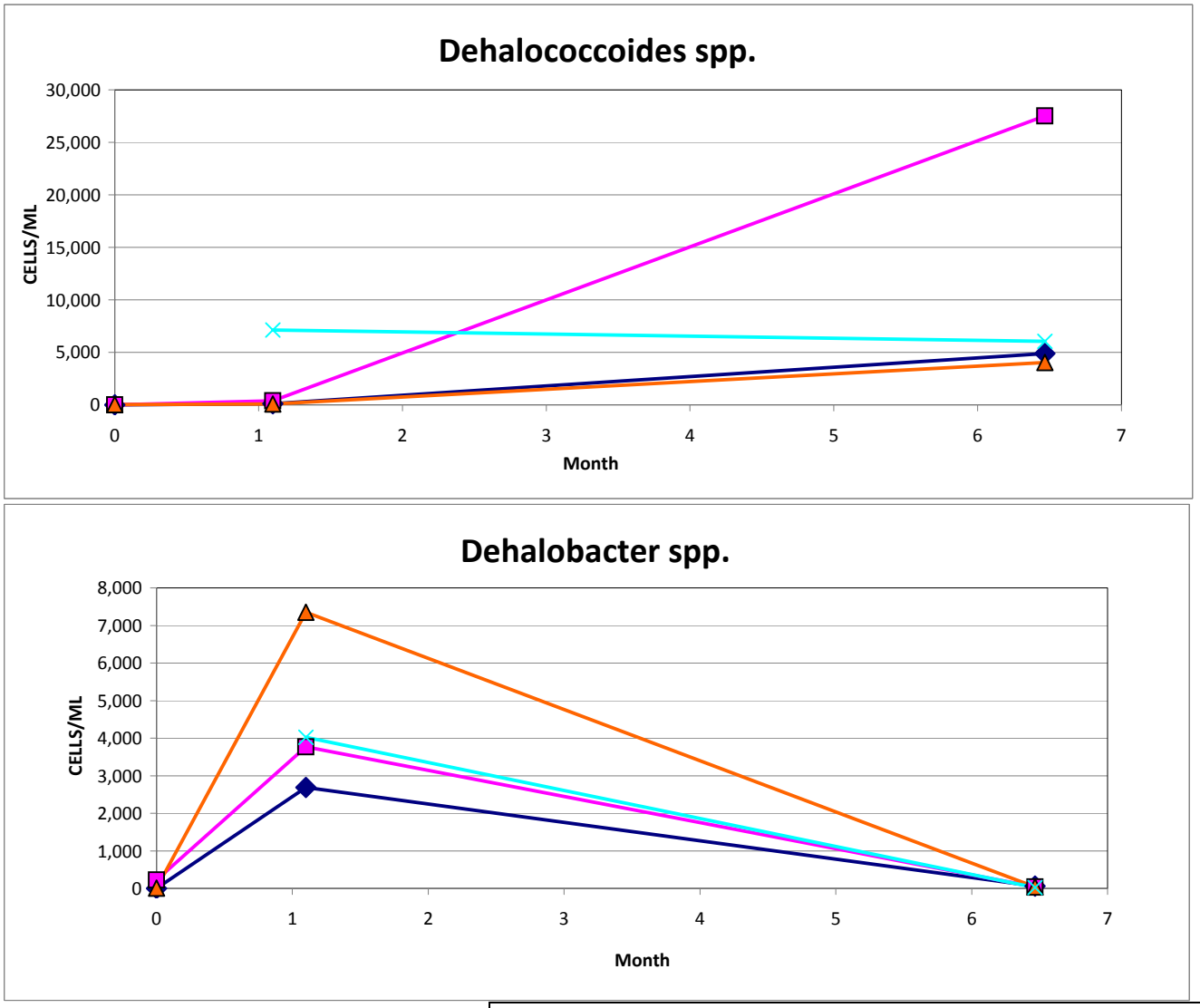

FIGURE 4A

FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

MICROBIAL POPULATIONS

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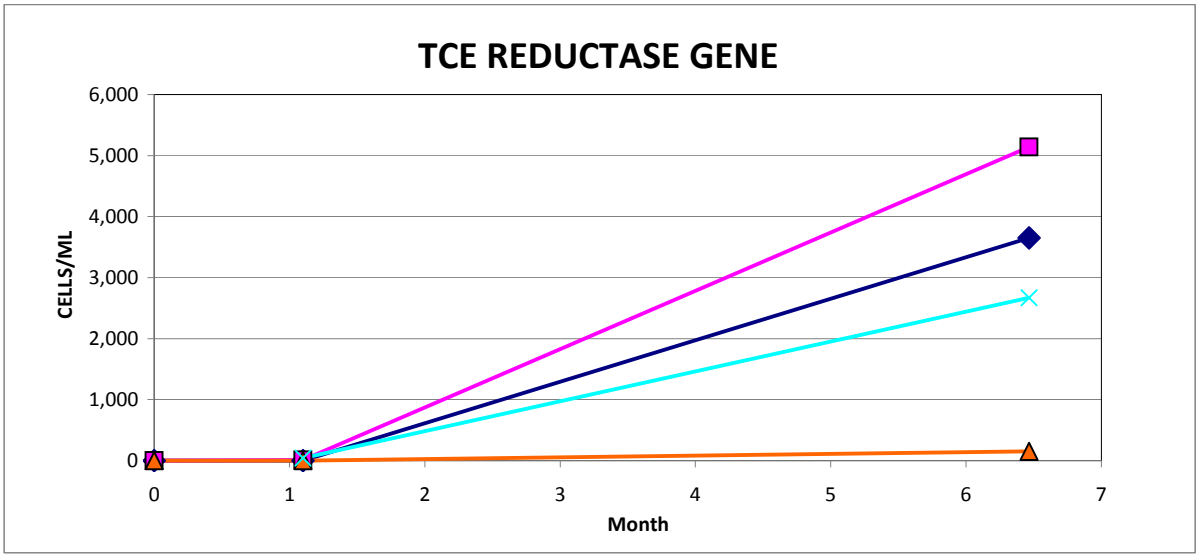

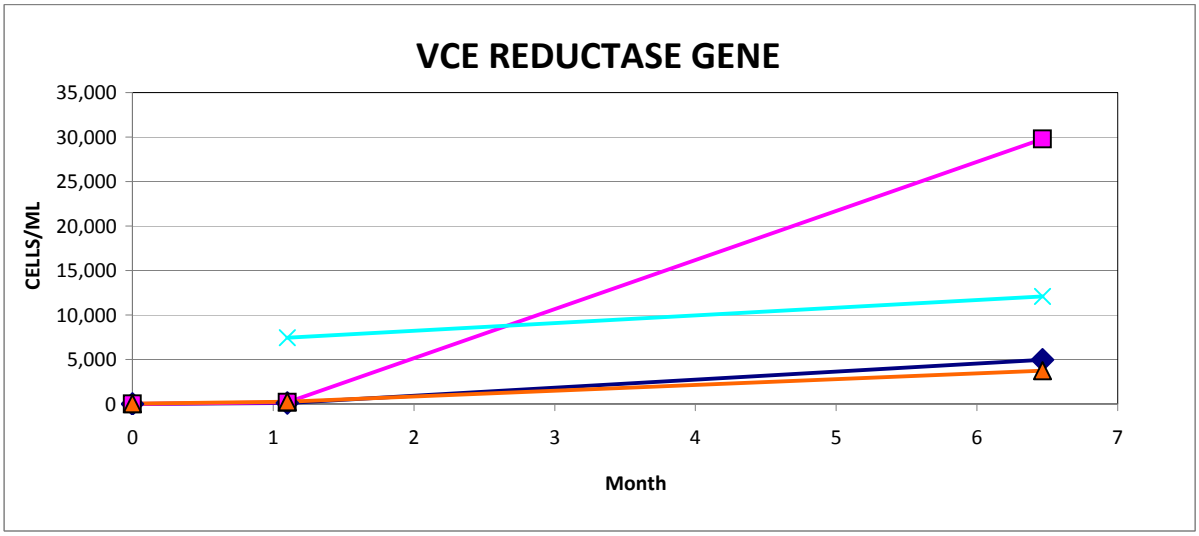

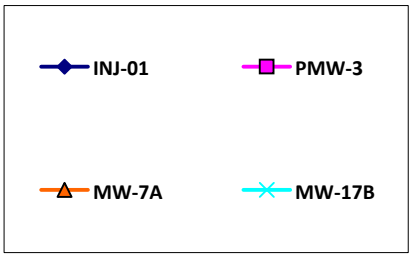

FIGURE 4B

FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

MICROBIAL POPULATIONS

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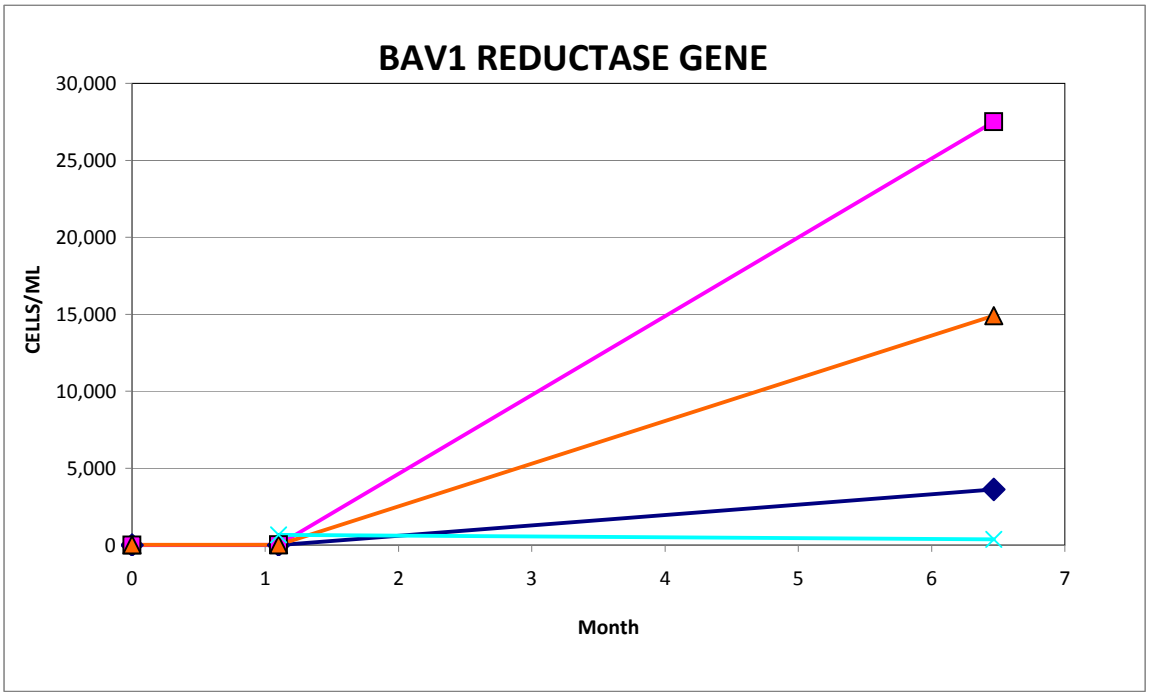

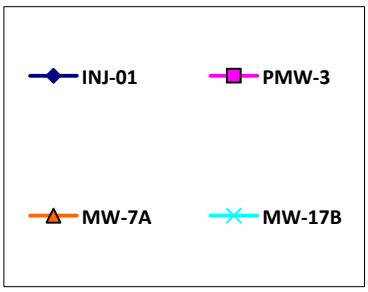

FIGURE 4C

FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY
OVERBURDEN PILOT TEST

MICROBIAL POPULATIONS

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TABLE 1
OVERBURDEN PILOT TEST
ANALYTICAL RESULTS OF COCS AND DEGRADATION PRODUCTS
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Months from Injection	PCE[a/] µg/l[c/]	TCE[a/] µg/l	cis-1,2-DCE µg/l	trans-DCE µg/l	1,1-DCE µg/l	Total DCE µg/l	VC[a/] µg/l	Ethene µg/l	Ethane µg/l	Ethene + Ethane µg/l	Methane µg/l	TCA µg/l	1,1,-DCA µg/l
PMW-1	11-Aug-08	0.0	*0.8 U*	280	330	1.4 J	13.0	344	57	4.3 J	3.7 J	8.0	98	1.8 J	74
	7-Oct-08	1.1	*0.8 U*	47	350	1.2 J	6.2	357	53	4.7 J	2 J	6.7	130 J	*0.8 U*	39
	9-Dec-08	3.2	*0.8 U*	3.7 J	320	1.2 J	2.3 J	324	72	16.0	8.7	24.7	160	*0.8 U*	26
	27-Jan-09	4.9	*0.8 U*	7	240	0.85 J	1.7 J	243	67	27.0	4.9 J	31.9	980	*0.8 U*	38
	16-Mar-09	6.5	*0.8 U*	15	260	1.3 J	2.9 J	264	100	22.0	1.7 J	23.7	1000	*0.8 U*	23
PMW-2	11-Aug-08	0.0	*4 U*	3600	2700	11 J	39.0	2750	38	5.2 J	2.4 J	7.6	150 J	5.7 J	180
	7-Oct-08	1.1	*3.2 U*	5600	3500	15 J	67.0	3582	53	6.5	1.6 J	8.1	130 J	14 J	260
	10-Dec-08	3.3	*16 U*	7400	5800	18 J	95 J	5913	63 J	4.8 J	*1 U*	5.8	47	21 J	430
	27-Jan-09	4.9	*4 U*	2500	3200	14 J	47.0	3261	150	15.0	*1 U*	16.0	140	7.8 J	200
	18-Mar-09	6.5	*8 U*	3400	4200	16 J	81.0	4297	120	12.0	*1 U*	13.0	110	11 J	320
PMW-3	13-Aug-08	0.0	*0.8 U*	270	460	4 J	2.5 J	467	39	3 J	2.9 J	5.9	120	*0.8 U*	10
	8-Oct-08	1.2	*1.6 U*	680	3600	19.0	10.0	3629	65	14.0	4.1 J	18.1	100 J	*1.6 U*	19
	8-Dec-08	3.2	*1.6 U*	11	1100	4.3 J	2.9 J	1107	66	9.7	1 J	10.7	160	*1.6 U*	8.6 J
	27-Jan-09	4.9	*4 U*	34	4300	20 J	9.3 J	4329	420	44.0	*1 U*	45.0	92	*4 U*	47
	17-Mar-09	6.5	*1.6 U*	13	900	7.5 J	2.1 J	910	310	91.0	1.1 J	92.1	320	*1.6 U*	13
PMW-4	13-Aug-08	0.0	*0.8 U*	8	*2.7 U*	*0.8 U*	*0.8 U*	4	*1 U*	*1 U*	4 J	5.0	12	*0.8 U*	*1 U*
	7-Oct-08	1.1	*0.8 U*	2.3 J	20	*0.8 U*	*0.8 U*	22	14	1.9 J	4.3 J	6.2	180 J	*0.8 U*	*1 U*
	10-Dec-08	3.3	*0.8 U*	10	15	*0.8 U*	*0.8 U*	17	11	*1 U*	1.7 J	2.7	87	*0.8 U*	*1 U*
	27-Jan-09	4.9	*0.8 U*	1.7 J	34	*0.8 U*	*0.8 U*	36	26	1.2 J	*1 U*	2.2	130	*0.8 U*	*1 U*
	18-Mar-09	6.5	*0.8 U*	1.3 J	40	*0.8 U*	*0.8 U*	42	26	*1 U*	*1 U*	2.0	93	*0.8 U*	*1 U*
PMW-8	12-Aug-08	0.0	*0.8 U*	*1 U*	78	0.99 J	*0.8 U*	80	83	4 J	*1 U*	5.0	140	*0.8 U*	*1 U*
(BEDROCK)	6-Oct-08	1.1	*0.8 U*	*1 U*	92	0.92 J	*0.8 U*	94	85	5.4	*1 U*	6.4	170 J	*0.8 U*	*1 U*
	8-Dec-08	3.2	*0.8 U*	*1 U*	77	*0.8 U*	*0.8 U*	79	83	12.0	*1 U*	13.0	180	*0.8 U*	*1 U*
	27-Jan-09	4.9	*0.8 U*	*1 U*	51	*0.8 U*	*0.8 U*	53	80	19.0	*1 U*	20.0	130	*0.8 U*	*1 U*
	18-Mar-09	6.5	*0.8 U*	*1 U*	40	*0.8 U*	*0.8 U*	42	56	27.0	*1 U*	28.0	140	*0.8 U*	*1 U*
INJ-01	13-Aug-08	0.0	*0.8 U*	85	470	1.9	6.8	479	47	2.5 J	2.1 J	4.6	140	1.2 J	37
	8-Oct-08	1.2	*0.8 U*	21	340	1.5 J	3.4 J	345	58	3.9 J	*1 U*	4.9	150 J	*0.8 U*	19
	9-Dec-08	3.2	*1.6 U*	5.6 J	1000	3.4 J	6.2 J	1010	110	11.0	*1 U*	12.0	190	*1.6 U*	45
	27-Jan-09	4.9	*0.8 U*	9	830	3.8 J	5.4	839	200	21.0	*1 U*	22.0	320	*0.8 U*	50
	17-Mar-09	6.5	*0.8 U*	6	550	3.1 J	3.6 J	557	170	25.0	*1 U*	26.0	710	*0.8 U*	33
INJ-02	12-Aug-08	0.0	*0.8 U*	79 J	66	*0.8 U*	1.1 J	68	38	2.4 J	1.5 J	3.9	120 J	*0.8 U*	5.4 J
	7-Oct-08	1.1	*0.8 U*	87	170	*0.8 U*	4 J	175	47	3.4 J	*1 U*	4.4	200 J	*0.8 U*	22
	9-Dec-08	3.2	*0.8 U*	14	170	0.81 J	1.9 J	173	44	4.3 J	*1 U*	5.3	160	*0.8 U*	9
	27-Jan-09	4.9	*0.8 U*	3.7 J	150	*0.8 U*	1.2 J	152	64	6.6	*1 U*	7.6	210	*0.8 U*	9
	18-Mar-09	6.5	*0.8 U*	5	150	0.82 J	1.9 J	153	56	8.8	*1 U*	9.8	260	*0.8 U*	10
MW-7A	12-Aug-08	0.0	*2 U*	270	1800	5.9 J	34.0	1840	130	7.2	*1 U*	8.2	21	4.1 J	280
	8-Oct-08	1.2	*0.8 U*	58	1800	3.5 J	25.0	1829	210	12.0	*1 U*	13.0	21 J	*0.8 U*	250
	9-Dec-08	3.2	*1.6 U*	4.3 J	1100	1.7 J	9.6 J	1111	180	27.0	*1 U*	28.0	24	*1.6 U*	150
	27-Jan-09	4.9	*0.8 U*	3.2 J	840	2.4 J	7.6	850	390	51.0	*1 U*	52.0	110	*0.8 U*	230
	17-Mar-09	6.5	*0.8 U*	2.9 J	620	1.5 J	3.6 J	625	250	69.0	*1 U*	70.0	210	*0.8 U*	140

TABLE 1
OVERBURDEN PILOT TEST
ANALYTICAL RESULTS OF COCS AND DEGRADATION PRODUCTS
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Months from Injection	PCE[a/] µg/l[c/]	TCE[a/] µg/l	cis-1,2-DCE µg/l	trans-DCE µg/l	1,1-DCE µg/l	Total DCE µg/l	VC[a/] µg/l	Ethene µg/l	Ethane µg/l	Ethene + Ethane µg/l	Methane µg/l	TCA µg/l	1,1,-DCA µg/l
MW-7B	12-Aug-08	0.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
(BEDROCK)	7-Oct-08	1.1	*0.8 UJ*	*1 UJ*	19 J	*0.8 UJ*	*0.8 UJ*	21	29 J	3.1 J	*1 U*	4.1	220 J	*0.8 UJ*	*1 UJ*
	9-Dec-08	3.2	*0.8 U*	*1 U*	21	*0.8 U*	*0.8 U*	23	33	4.1 J	*1 U*	5.1	250	*0.8 U*	*1 U*
	27-Jan-09	4.9	*0.8 U*	*1 U*	13	*0.8 U*	*0.8 U*	15	29	3.3 J	*1 U*	4.3	220	*0.8 U*	*1 U*
	17-Mar-09	6.5	*0.8 U*	*1 U*	20	*0.8 U*	*0.8 U*	22	30	2.1 J	*1 U*	3.1	150	*0.8 U*	*1 U*
MW-17A	12-Aug-08	0.0	*0.8 U*	40	190	2.5 J	11.0	204	24	1.5 J	*1 U*	2.5	120	*0.8 U*	21
	7-Oct-08	1.1	*0.8 U*	43	200	3.5 J	13.0	217	23	1.3 J	*1 U*	2.3	120 J	*0.8 U*	23
	10-Dec-08	3.3	*0.8 U*	39	210	2.2 J	12.0	224	27	1.1 J	*1 U*	2.1	65	*0.8 U*	25
	26-Jan-09	4.8	*0.8 U*	32	210	2.1 J	11.0	223	29	1.4 J	*1 U*	2.4	88	*0.8 U*	23
	16-Mar-09	6.5	*0.8 U*	29	210	2.5 J	12.0	225	28	1.4 J	*1 U*	2.4	78	*0.8 U*	20
MW-17B	12-Aug-08	0.0	#N/A	4.6 J	630	8.5	#N/A	639	82	4.0	0.53 J	4.5	160	#N/A	17
(BEDROCK)	8-Oct-08	1.2	*0.8 U*	3.3 J	600	5.9	4.4 J	610	120	6.6	*1 U*	7.6	170 J	*0.8 U*	22
	10-Dec-08	3.3	*0.8 U*	2.6 J	260	3.1 J	2.9 J	266	170	33.0	*1 U*	34.0	120	*0.8 U*	28
	26-Jan-09	4.8	*0.8 U*	2.1 J	280	4.2 J	3.1 J	287	210	61.0	*1 U*	62.0	130	*0.8 U*	24
	17-Mar-09	6.5	*0.8 U*	1.6 J	270	3.6 J	3.2 J	277	180	71.0	*1 U*	72.0	180	*0.8 U*	22
MW-3A	12-Aug-08	0.0	*0.8 U*	*1 U*	0.89 J	*0.8 U*	*0.8 U*	2	*1 U*	*1 U*	*1 U*	2.00	25.00	*0.8 U*	*1 U*
	6-Oct-08	1.1	*0.8 U*	1.9 J	11	*0.8 U*	*0.8 U*	13	*1 U*	*1 U*	*1 U*	2.00	19 J	*0.8 U*	*1 U*
	8-Dec-08	3.2	*0.8 U*	1.4 J	*0.8 U*	*0.8 U*	*0.8 U*	2	*1 U*	*1 U*	*1 U*	2.00	7.7 J	*0.8 U*	*1 U*
	26-Jan-09	4.8	*0.8 U*	*1 U*	1 J	*0.8 U*	*0.8 U*	3	*1 U*	*1 U*	*1 U*	2.00	7.3 J	*0.8 U*	*1 U*
	16-Mar-09	6.5	*0.8 U*	*1 U*	0.99 J	*0.8 U*	*0.8 U*	3	*1 U*	*1 U*	*1 U*	2.00	5 J	*0.8 U*	*1 U*

Notes:
ITALICIZED VALUES REPRESENT DETECTION LIMIT WHEN THE PARAMETER WAS NOT DETECTED
INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE-08
J = ESTIMATED VALUE
U = BELOW DETECTION LIMITS
UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW
#N/A = NOT SAMPLED
CONCENTRATIONS FOR BASELINE EVENT AT MW-17B WERE TAKEN FROM APRIL 2008 GROUNDWATER SAMPLING.

TABLE 2
OVERBURDEN PILOT TEST
ANALYTICAL RESULTS OF GEOCHEMICAL PARAMETERS
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Months from Injection	Total Organic Carbon mg/l	Arsenic mg/l	Manganese mg/l	Selenium mg/l	Chloride mg/l	Bromide mg/l	Sulfate mg/l	Acetic Acid mg/l	Butyric Acid mg/l	Lactic Acid mg/l	Propionic Acid mg/l	Pyruvic Acid mg/l	Total Volatile Fatty Acids mg/l
PMW-1	11-Aug-08	0	4.2	#N/A	#N/A	#N/A	115.0	*2 U*	291.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	75.3	#N/A	#N/A	#N/A	97.7 J	*2 U*	160.0	152.1	2.9	*1 U*	10.1	*4 U*	170.1
	8-Dec-08	3	12.0	#N/A	#N/A	#N/A	78.9	*2 U*	245.0	16.1	*1 UJ*	*1 U*	*1 U*	*4 U*	16.1
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	10.2	#N/A	#N/A	#N/A	88.7	*2 U*	224.0	49.9	7.9	*1 U*	*1 U*	*4 U*	64
PMW-2	11-Aug-08	0	4.4	#N/A	#N/A	#N/A	88.6	*2 U*	288.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	28.5	#N/A	#N/A	#N/A	91.8 J	*2 U*	275.0	64.2	*1 U*	*1 U*	*1 U*	*4 U*	64.2
	8-Dec-08	3	4.0	#N/A	#N/A	#N/A	45.5	*2 U*	295.0	1.6	*1 UJ*	*1 U*	*1 U*	*4 U*	1.6
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	4.1	#N/A	#N/A	#N/A	86.6	*2 U*	327.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
PMW-3	13-Aug-08	0	4.4	*0.0102 U*	0.1	*0.0107 U*	106.0	*2 U*	289.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	0
	6-Oct-08	1	91.2	*0.0102 U*	0.3	*0.0107 U*	92.3 J	*2 U*	175.0	290.6	7	*1 U*	17.3	*4 U*	314.9
	8-Dec-08	3	18.7	*0.01 U*	0.1	*0.0107 U*	92.6	*2 U*	213.0	22.1	*1 UJ*	*1 U*	*1 U*	*4 U*	22.1
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	22.6	*0.01 U*	0.1	*0.0107 U*	93.5	*2 U*	273.0	22.3	*1 U*	*1 U*	*1 U*	*4 U*	22.3
PMW-4	13-Aug-08	0	4.3	#N/A	#N/A	#N/A	110.0	*2 U*	331.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	7-Oct-08	1	3.7	#N/A	#N/A	#N/A	101 J	*2 U*	256.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	8-Dec-08	3	2.8	#N/A	#N/A	#N/A	94.8	*2 U*	236.0	*1 U*	*1 UJ*	*1 U*	*1 U*	*4 U*	*4 U*
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	3.4	#N/A	#N/A	#N/A	107.0	*2 U*	312.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
PMW-8	12-Aug-08	0	4.3	#N/A	#N/A	#N/A	110.0	*2 U*	331.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
(BEDROCK)	8-Oct-08	1	11.9	*0.0102 U*	0.1	*0.0107 U*	116 J	*2 U*	307.0	17.9	*1 U*	*1 U*	*1 U*	*4 U*	17.9
	8-Dec-08	3	6.2	*0.01 U*	0.1	*0.0107 U*	119.0	*2 U*	309.0	1.5	*1 UJ*	*1 U*	*1 U*	*4 U*	2
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	4.0	*0.01 U*	0.1	*0.0107 U*	139.0	*2 U*	344.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
INJ-01	13-Aug-08	0	3.7	#N/A	#N/A	#N/A	85.1	*2 U*	280.0	*1 U*	*1 U*	*1 U*	*1 U*	*1 U*	*1 U*
	6-Oct-08	1	37.8	*0.0102 U*	0.1	*0.0107 U*	115 J	*2 U*	227.0	101.4	*1 U*	*1 U*	*1 U*	*4 U*	101.4
	8-Dec-08	3	29.0	#N/A	#N/A	#N/A	59.8	*2 U*	182.0	40.8	*1 UJ*	*1 U*	*1 U*	*4 U*	41
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	7.2	#N/A	#N/A	#N/A	24.6	*2 U*	260.0	6.9	*1 U*	*1 U*	*1 U*	*4 U*	7
INJ-02	12-Aug-08	0	3.8	#N/A	#N/A	#N/A	124.0	*2 U*	298.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	36.6	#N/A	#N/A	#N/A	138 J	*2 U*	230.0	86.8	1.1	*1 U*	*1 U*	*4 U*	86.8
	9-Dec-08	3	18.5	#N/A	#N/A	#N/A	74.5	*2 U*	245.0	13.6	*1 UJ*	*1 U*	*1 U*	*4 U*	13.6
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	5.7	#N/A	#N/A	#N/A	116.0	*2 U*	297.0	4.6	*1 U*	*1 U*	*1 U*	*4 U*	0

TABLE 2
OVERBURDEN PILOT TEST
ANALYTICAL RESULTS OF GEOCHEMICAL PARAMETERS
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Months from Injection	Total Organic Carbon mg/l	Arsenic mg/l	Manganese mg/l	Selenium mg/l	Chloride mg/l	Bromide mg/l	Sulfate mg/l	Acetic Acid mg/l	Butyric Acid mg/l	Lactic Acid mg/l	Propionic Acid mg/l	Pyruvic Acid mg/l	Total Volatile Fatty Acids mg/l
MW-7A	12-Aug-08	0	3.2	*0.0102 U*	0.1	*0.0107 U*	22.3	*2 U*	282.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	143.0	*0.0102 U*	0.3	*0.0107 U*	21.3 J	*2 U*	60.4	329.1	23.7	*1 U*	6.4	*4 U*	359.2
	10-Dec-08	3	25.1	*0.01 U*	0.1	*0.0107 U*	24.1	*2 U*	295.0	48.4	*1 UJ*	*1 U*	*1 U*	*4 U*	48.4
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	8.8	*0.01 U*	0.0	*0.0107 U*	*0.2 U*	*2 U*	253.0	12.6	*1 U*	*1 U*	*1 U*	*4 U*	12.6
MW-7B	12-Aug-08	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
(BEDROCK)	6-Oct-08	1	5.0	*0.0102 U*	0.1	*0.0107 U*	164 J	*2 U*	271.0	1.2	*1 U*	*1 U*	*1 U*	*4 U*	1.2
	8-Dec-08	3	9.0	*0.01 U*	0.1	*0.0107 U*	153.0	*2 U*	384.0	2.2	*1 UJ*	*1 U*	*1 U*	*4 U*	2.2
	27-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	5.3	*0.01 U*	0.1	*0.0107 U*	179.0	*2 U*	296.0	1.1	*1 U*	*1 U*	*1 U*	*4 U*	1
MW-17A	12-Aug-08	0	2.4	#N/A	#N/A	#N/A	1250.0	*2 U*	168.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	2.2	#N/A	#N/A	#N/A	1270 J	*2 U*	165.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	8-Dec-08	3	2.2	#N/A	#N/A	#N/A	1070.0	*2 U*	161.0	*1 U*	*1 UJ*	*1 U*	*1 U*	*4 U*	*4 U*
	27-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	2.3	#N/A	#N/A	#N/A	1220.0	*2 U*	170.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
MW-17B	12-Aug-08	0	3.1	#N/A	#N/A	#N/A	475.0	#N/A	211.0	*1 U*	#N/A	#N/A	#N/A	#N/A	#N/A
(BEDROCK)	6-Oct-08	1	55.7	*0.0102 U*	0.1	*0.0107 U*	561 J	*2 U*	169.0	146.4	1.4	*1 U*	*1 U*	*4 U*	147.8
	8-Dec-08	3	3.0	*0.01 U*	0.1	*0.0107 U*	802.0	*2 U*	180.0	*1 U*	*1 UJ*	*1 U*	*1 U*	*4 U*	*4 U*
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	16-Mar-09	6	3.5	*0.01 U*	0.1	*0.0107 U*	631.0	*2 U*	275.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
MW-3A	12-Aug-08	0	2.6	#N/A	#N/A	#N/A	17.6	*2 U*	318.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	6-Oct-08	1	2.3	#N/A	#N/A	#N/A	19.4 J	*2 U*	347.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*
	8-Dec-08	3	4.9	#N/A	#N/A	#N/A	23.3	*2 U*	444.0	*1 U*	*1 UJ*	*1 U*	*1 U*	*4 U*	*4 U*
	26-Jan-09	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	17-Mar-09	7	3.7	#N/A	#N/A	#N/A	27.3	*2 U*	334.0	*1 U*	*1 U*	*1 U*	*1 U*	*4 U*	*4 U*

ITALICIZED VALUES REPRESENTS DETECTION LIMIT WHEN THE PARAMETER WAS NOT DETECTED

INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE-08

µg/L - MICROGRAMS PER LITER

mg/L - MILLIGRAMS PER LITER

J = ESTIMATED VALUE

U = BELOW DETECTION LIMITS

UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW

E - EXCEEDANCE

#NA - Well was not sampled for this parameter
For MW-17A and B annual sampling in Arpil 2008 were used for baseline

TABLE 3
OVERBURDEN PILOT TEST
RESULTS FOR FIELD LABORATORY ANALYTES
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Ferrous Iron mg/L	Manganese mg/L	Carbon Dioxide mg/L	Hydrogen Sulfide mg/L	Alkalinity (as $CaCO_3$)[a/] mg/L
PMW-1	11-Aug-08	3.0	<0.1	140	0.0	400
	6-Oct-08	<0.1	<0.1	838	2.0	296
	8-Dec-08	0.2	<0.1	948	2.0	200
	26-Jan-09	NM	NM	126	NM	20
	16-Mar-09	0.2	<0.1	420	2.1	1108
PMW-2	11-Aug-08	1.0	<0.1	232	0.3	360
	6-Oct-08	<0.1	<0.1	618	2.0	534
	8-Dec-08	2.8	<0.1	157	0.7	40
	26-Jan-09	NM	NM	152	NM	30
	16-Mar-09	1.0	<0.1	480	1.2	504
PMW-3	13-Aug-08	1.0	<0.1	169	0.1	340
	6-Oct-08	1.0	<0.1	292	2.0	358
	8-Dec-08	<0.1	<0.1	260	2.0	380
	26-Jan-09	NM	NM	136	NM	30
	16-Mar-09	0.2	<0.1	232	2.4	560
PMW-4	13-Aug-08	1.6	<0.1	172	0.0	460
	7-Oct-08	1.8	<0.1	362	0.0	262
	8-Dec-08	1.2	<0.1	60	0.0	60
	26-Jan-09	NM	NM	145	NM	20
	16-Mar-09	0.5	<0.1	86	0.2	326
PMW-8	12-Aug-08	0.9	<0.1	468	0.0	420
(BEDROCK)	8-Oct-08	0.1	<0.1	892	2.0	255
	8-Dec-08	<0.1	<0.1	813	2.0	350
	26-Jan-09	NM	NM	193	NM	15
	16-Mar-09	0.6	<0.1	502	1.1	352
INJ-01	13-Aug-08	11.3	<0.1	156	0.1	440
	6-Oct-08	<0.1	<0.1	168	2.0	354
	8-Dec-08	<0.1	<0.1	140	2.0	420
	26-Jan-09	NM	NM	299	NM	25
	16-Mar-09	0.0	<0.1	145	1.5	324
INJ-02	12-Aug-08	1.6	<0.1	178	0.1	360
	6-Oct-08	<0.1	<0.1	714	2.0	204
	9-Dec-08	<0.1	<0.1	1298	2.0	240
	26-Jan-09	NM	NM	192	NM	20
	16-Mar-09	0.2	<0.1	176	1.8	374
MW-7A	12-Aug-08	3.4	<0.1	167	0.0	460
	6-Oct-08	0.8	0	464	2.0	424
	10-Dec-08	0.2	<0.1	1005	2.0	400
	26-Jan-09	NM	NM	171	NM	20
	16-Mar-09	0.1	<0.1	266	1.5	308
MW-7B	12-Aug-08	NM	NM	NM	NM	NM
(BEDROCK)	6-Oct-08	<0.1	<0.1	652	0.7	280
	8-Dec-08	<0.1	<0.1	60	0.0	400
	27-Jan-09	NM	NM	162	NM	25
	16-Mar-09	<0.1	<0.1	200	1.1	360
MW-17A	12-Aug-08	4.1	<0.1	154	0.0	340
	6-Oct-08	1.3	<0.1	298	0.0	88
	8-Dec-08	3.8	<0.1	197	0.1	80
	27-Jan-09	NM	NM	43	NM	20
	16-Mar-09	0.6	<0.1	324	1.1	385
MW-17B	12-Aug-08	NM	NM	NM	NM	NM
(BEDROCK)	6-Oct-08	0.2	<0.1	422	1.0	304
	8-Dec-08	0.4	<0.1	455	2.0	360
	26-Jan-09	NM	NM	68	NM	15
	16-Mar-09	0.3	<0.1	224	0.2	274
MW-3A	12-Aug-08	0.8	<0.1	237	0.0	600
	6-Oct-08	<0.1	<0.1	602	0.0	367
	8-Dec-08	<0.1	<0.1	464	0.1	400
	26-Jan-09	NM	NM	44	NM	30
	17-Mar-09	<0.1	<0.1	360	1.1	400

NOTE: Italicized concentrations were non-detect, listed at the detection limit
#NA = Not Applicable, typically due to no sample being taken.
NM = not measured
[a/] $CaCO_3$ - calcium carbonate, refers to type of alkalinity test.

TABLE 4
OVERBURDEN PILOT TEST
RESULTS OF SELECTED LOW FLOW SAMPLING PARAMETERS
FORMER CARBORUNDUM COMPANY
ELECTRIC PRODUCTS DIVISION
TOWN OF NIAGARA, NY

Well ID	Date	Months from Injection	Specific Conductivity mS/cm	Oxidataion Reduction Potential mv	pH SU
PMW-1	11-Aug-08	0.0	1.41	-150	7.17
	6-Oct-08	1.1	1.79	-222	5.84
	8-Dec-08	3.2	0.73	-329	7.13
	26-Jan-09	4.8	1.58	-339	7.20
	16-Mar-09	6.5	0.94	-368	6.65
PMW-2	11-Aug-08	0.0	1.30	-164	6.67
	6-Oct-08	1.1	2.36	-347	5.65
	8-Dec-08	3.2	1.17	-188	6.99
	26-Jan-09	4.8	1.41	-335	6.60
	16-Mar-09	6.5	1.35	-303	6.12
PMW-3	13-Aug-08	0.0	1.35	-184	6.95
	6-Oct-08	1.1	2.36	-247	6.04
	8-Dec-08	3.2	0.74	-309	7.03
	26-Jan-09	4.8	1.30	-331	6.46
	16-Mar-09	6.5	0.93	-345	6.40
PMW-4	13-Aug-08	0.0	0.91	-11	6.61
	7-Oct-08	1.1	2.16	-194	6.05
	8-Dec-08	3.2	0.72	-70	7.20
	26-Jan-09	4.8	1.53	-96	7.05
	16-Mar-09	6.5	1.24	-132	6.15
PMW-8	12-Aug-08	0.0	1.46	-195	7.14
(BEDROCK)	8-Oct-08	1.2	1.72	-311	6.54
	8-Dec-08	3.2	1.17	-303	7.20
	26-Jan-09	4.8	1.60	-302	7.28
	16-Mar-09	6.5	1.60	-281	6.49
INJ-01	13-Aug-08	0.0	1.35	-126	7.19
	6-Oct-08	1.1	2.24	-334	6.05
	8-Dec-08	3.2	1.03	-333	6.95
	26-Jan-09	4.8	1.50	-351	7.31
	16-Mar-09	6.5	0.95	-349	6.42
INJ-02	12-Aug-08	0.0	1.40	-153	7.20
	6-Oct-08	1.1	1.86	-252	6.09
	9-Dec-08	3.2	1.12	-340	7.05
	26-Jan-09	4.8	1.58	-354	7.28
	16-Mar-09	6.5	1.27	-361	6.19
MW-7A	12-Aug-08	0.0	1.23	-105	7.06
	6-Oct-08	1.1	2.04	-307	5.77
	10-Dec-08	3.3	0.73	-244	7.01
	26-Jan-09	4.8	1.54	-373	7.15
	16-Mar-09	6.5	1.39	-390	6.28
MW-7B	12-Aug-08	#N/A	#NA	#NA	#N/A
(BEDROCK)	6-Oct-08	1.1	1.94	-307	6.75
	8-Dec-08	3.2	1.26	-367	7.09
	27-Jan-09	4.9	1.68	-348	7.29
	16-Mar-09	6.5	1.54	-336	6.40
MW-17A	12-Aug-08	0.0	4.67	-95	7.05
	6-Oct-08	1.1	7.46	-129	5.84
	8-Dec-08	3.2	3.48	-117	7.00
	27-Jan-09	4.9	4.38	-57	6.82
	16-Mar-09	6.5	3.89	-71	6.48
MW-17B	12-Aug-08	#N/A	#NA	#NA	#NA
(BEDROCK)	6-Oct-08	1.1	3.98	-350	5.99
	8-Dec-08	3.2	1.88	-272	7.06
	26-Jan-09	4.8	2.95	-308	7.09
	16-Mar-09	6.5	3.05	-317	6.33
MW-3A	12-Aug-08	0.0	1.41	120	6.70
	6-Oct-08	1.1	1.86	97	6.11
	8-Dec-08	3.2	1.29	128	7.23
	26-Jan-09	4.8	1.52	108	6.31
	17-Mar-09	6.5	1.75	116	6.66

NOTE: Italicized concentrations were non-detect, listed at the detection limit
#NA = Not Applicable, typically due to no sample being taken.
mS/cm - millisiemens / cm
mV - Millivolts
SU - Standard Units

Attachment 1

Boring Logs

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

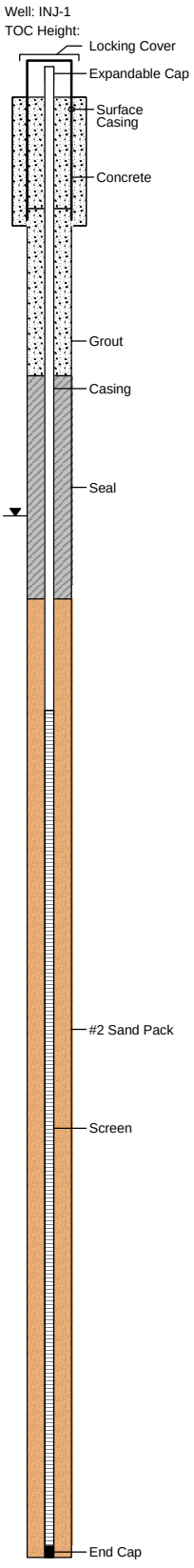
Date Started	: 7/9/2008
Date Completed	: 7/9/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

LOG OF BORING/WELL INJ-1

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 9.01 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0-2		Reddish brown SILT and CLAY, trace gravel. Wet at 2 feet.	ML		0.0	NA	NA
5-6		Reddish brown SILT, some clay, stiff, gray mottling, damp, no odor or stain.	ML		0.0	16	2-2-4-5
7-8		Reddish brown SILT, some clay, semi-stiff, slight plasticity, moist, no odor or stain.	ML		0.0	18	3-4-5-6
9-10		As above but moist and sticky.	ML		0.0	18	2-1-3-1
11-12		Reddish brown SILT, little-some clay, trace sand, mottled, wet soft, no stain or odor.	ML		0.0	17	WOH-WOH-2-1
13-14		Reddish brown SILT, little sand, trace gravel, wet, soft, no stain or odor.	ML		0.0	9	1-3-6-2
15-16		Upper 6 inches as above. Reddish brown fine to medium SAND, little silt, trace gravel and coarse sand, no odor or stain.	SM		0.0	13	2-4-4-8
17-18		Reddish brown SILT, little clay, little coarse sand and gravel, dense. Till. Damp-moist, no odor or stain.	ML		0.0	14	24-36-50/4"
19-20		Reddish brown SILT, trace clay, trace coarse sand and gravel, dense, damp. Till. no odor or stain.	ML		0.0	24	42-39-29-19
21-22		Reddish brown SILT as above. Upper 6 inches of sample dilatent SILT (auger fill?).	ML		0.0	8	7-24-27-18
23-24		Reddish brown SILT, little to some coarse gravel, trace coarse sand, dense, moist-damp. Till. No stain or odor.	ML		0.0	15	14-30-44-38
25-26		Till as above upper 2 inches. Rest of sample was dark gray dolomite gravel. Auger refusal at 26.25 feet.	Dolo		0.0	10	10-30-50/4"



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.02-inch slots
Length	: 15-feet
SAND PACK	
Material	: #2 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Bentonite Hole Plug
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

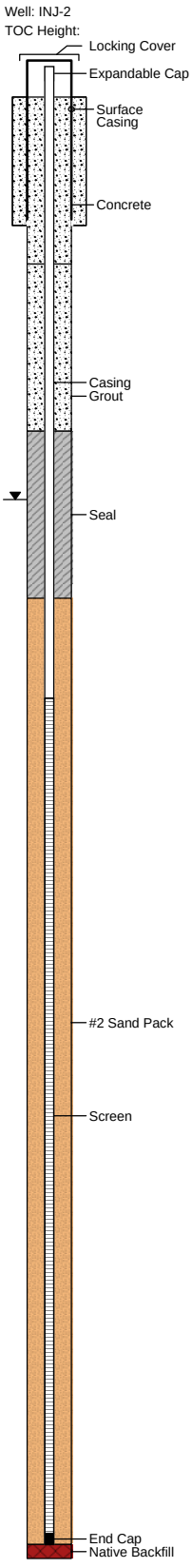
Date Started	: 7/7/2008
Date Completed	: 7/7/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

LOG OF BORING/WELL INJ-2

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 8.73 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0		Reddish brown SILT and CLAY, moist, no odor or stain.	ML		0.0	NA	NA
6		Auger from 5 feet to 20 feet. No sampling.				NA	A-A-A
8						NA	A-A-A-A
10						NA	A-A-A-A
12						NA	A-A-A-A
14						NA	A-A-A-A
16						NA	A-A-A-A
18						NA	A-A-A-A
19						NA	A-A
20		Reddish brown SILT, some clay, little gravel, little sand in lenses in bottom 6 inches of sample, wet, no stain or odor.	ML				
22		Auger to refusal at 26.5 feet. Dark gray dolomite at bottom of boring.			0.0	18	20-25-30-35
23						NA	A-A-A-A
25						NA	A-A-A-A
26						NA	A



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.02-inch slots
Length	: 15-feet
SAND PACK	
Material	: #2 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Bentonite Hole Plug
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

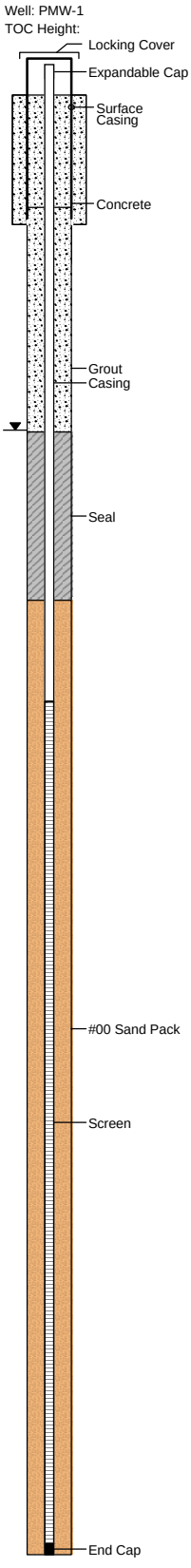
Date Started	: 7/7/2008
Date Completed	: 7/9/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

BORING/WELL PMW-1

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 8.47 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0–5		Reddish brown SILT and CLAY, trace gravel, water at 2.5 feet, no odor or stain.	ML		0.0	NA	NA
5–20		Auger from 5 feet to 20 feet. No sampling.				NA	A-A-A-A
6						NA	A-A-A-A
8						NA	A-A-A-A
10						NA	A-A-A-A
12						NA	A-A-A-A
14						NA	A-A-A-A
16						NA	A-A-A-A
18						NA	A-A-A-A
19						NA	A-A
20–22		Reddish brown SILT, some clay, trace coarse sand and gravel, dense, moist, no stain or odor.	ML		0.0	18	15-25-22-25
22		Auger to refusal at 26 feet. Dark gray dolomite at bottom of boring.					
23						NA	A-A-A-A
25						NA	A-A-A-A



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 15-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Bentonite Hole Plug
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

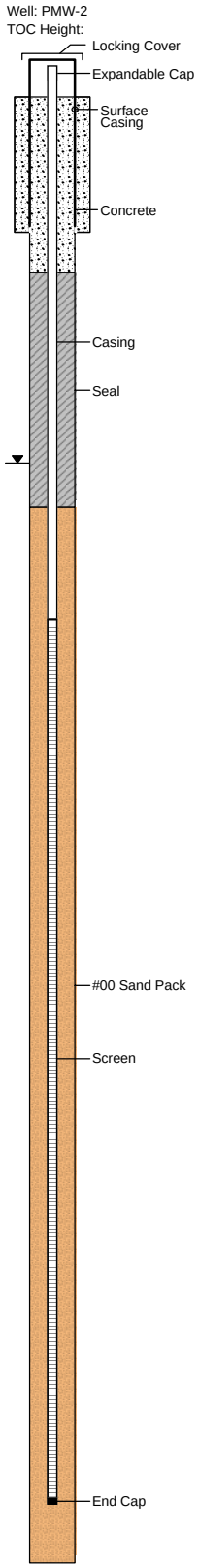
Date Started	: 7/7/2008
Date Completed	: 7/9/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

BORING/WELL PMW-2

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 8.74 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0–5		Reddish brown SILT and CLAY, trace gravel, moist-wet, no odor or stain.	ML		0.0	NA	NA
5–15		Auger from 5 feet to 15 feet. No sampling.				NA	A-A-A-A
8						NA	A-A-A-A
10						NA	A-A-A-A
12						NA	A-A-A-A
14						NA	A-A-A-A
15–16		Reddish brown SILT and fine-medium SAND, trace gravel, wet, no stain or odor.	ML		0.0	12	WOH-3-17-16
17–25		Auger to 25 feet. No sampling.				NA	A-A-A-A
18						NA	A-A-A-A
20						NA	A-A-A-A
22						NA	A-A-A-A
24						NA	A-A-A-A
25		Dark grey, SAND and GRAVEL, little silt, loose, wet, no odor, no stain.			0.0	NA	50/5"



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 15-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: None
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

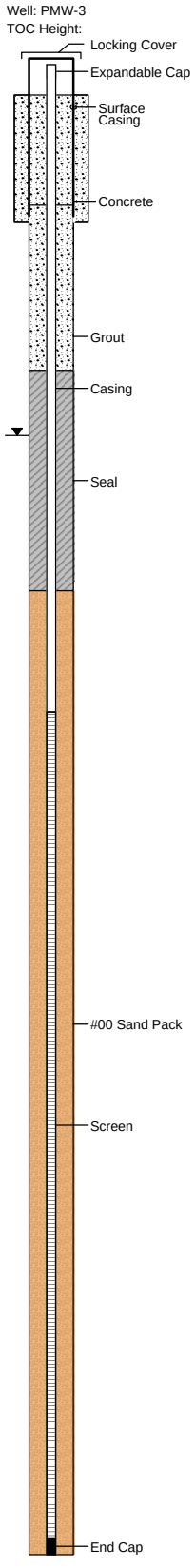
Date Started	: 7/9/2008
Date Completed	: 7/9/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

BORING/WELL PMW-3

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 8.68 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0–5		Reddish brown SILT and CLAY, trace brick, moist, no odor or stain.	ML		0.0	NA	NA
5–15		Auger from 5 feet to 15 feet. No sampling.				NA	A-A-A-A
						NA	A-A-A-A
						NA	A-A-A-A
						NA	A-A-A-A
						NA	A-A-A-A
15–16		Reddish fine-medium SAND, trave gravel, loose, wet (may be fall-in/wash from above? Reddish brown SILT, little fine sand, trace gravel.	ML		0.0	14	1-7-6-13
17–25		Augered from 17 to 25 feet. No sampling.				NA	A-A-A-A
						NA	A-A-A-A
						NA	A-A-A-A
						NA	A-A-A-A
25–26		Reddish brown SILT, some fine-medium sand. Dark gray dolomite gravel at bottom of boring. Auger refusal at 26.5 feet.	ML		0.0	NA	20-50/2"



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 15-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Bentonite Hole Plug
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

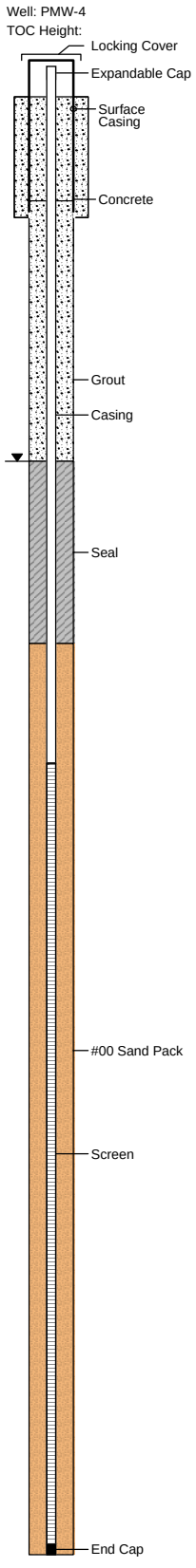
Date Started	: 7/1/2008
Date Completed	: 7/2/2008
Drilling Method	: 4 1/4" ID H.S.A.
Sampling Method	: Split-Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

BORING/WELL PMW-4

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 9.50 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0–2		Reddish brown SILT and CLAY, moist, no odor or stain. Hit solid obstruction at 4.5 feet in original location. Moved location about 3 feet to west.	ML		0.0	NA	NA
5–8		Reddish brown SILT, some clay, stiff, damp-moist, no odor or stain.	ML		0.0	18	6-7-10-10
					0.0	18	3-5-7-7
9–10		Reddish-brown Silt as above changing to sticky soft CLAY, little silt, moist-wet, no odor or stain, .	ML		0.0	14	1-2-1-2
11–12		Reddish brown CLAY, little silt, soft, sticky, some roll, wet, no odor or stain.	CL		0.0	16	1-2-1-1
13–14		As above. Silt content increased with depth to some. No odor or stain.	CL		0.0	20	WOH-1-1-1
15–16		Reddish brown SILT, some clay, fine-medium sand lenses up to 1 inch in lower sample with trace gravel, wet.	ML-CL		0.0	12	1-2-3-5
17–18		Reddish brown fine-medium SAND, little silt, trace clay and gravel. Compaction increased with depth. Reddish brown, SAND and SILT, little coarse sand and gravel, Till, slight odor.	SM		0.0	14	WOH-8-18-32
19–20		Dark gray dolomite gravel/cobble. Poor recovery.	GM		0.0	3	50/5"
21–22		Reddish brown SILT, some sand, little gravel, Till, moist, no odor or stain.	ML		0.0	5	10-42-50/3"
23–24		Reddish brown SILT, some sand, little coarse sand-gravel, dense, Till, moist, no odor or stain. Some loose silty sand, caved material from above on top of sample.	ML		0.0	14	20-13-15-30
25–26		Dense Till as above.	ML		0.0	12	10-32-50/5"
27–28		Dark gray dolomite gravel.	GM		0.0	0.5	50/5"



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 15-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Bentonite Hole Plug
WELL HEAD	
Protection	: Locking Pro-Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008

Date Started	: 7/1/2008
Date Completed	: 7/11/2008
Drilling Method	: 4 1/4" ID HSA/HQ Coring
Sampling Method	: Split-Spoon/Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Jason
Geologist	: Scott Dillman
Project Manager	: Mark Raybuck
Reviewed By	: Scott Dillman
Regulatory Agency	: NYSDEC

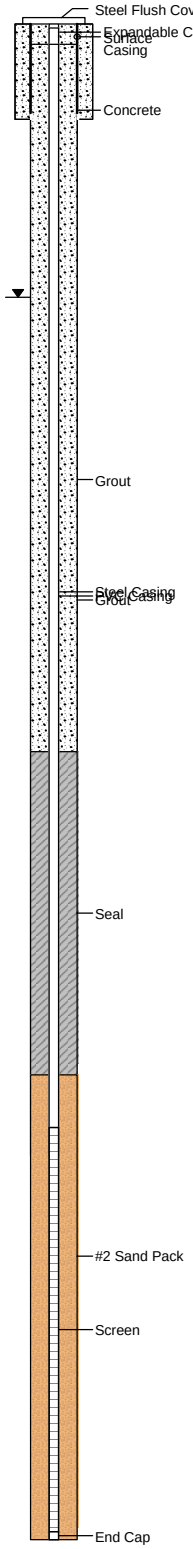
BORING/WELL PMW-8

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene

Water Levels
After Completion: 6.46 ft (TOC) 7/10/2008

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery Inches	Blow Count
0-2		Asphalt 0-6 inches. Reddish brown SILT, little clay, damp, moist at 4.5 feet, no odor or stain.	ML		0.0	NA	HAND
5-6		Reddish brown SILT, little-some clay, stiff, damp-moist, stiff, no odor or stain.	ML		0.0	18	3-4-3-5
7-8		Reddish-brown Silt, some clay, damp, moist at bottom, stiff, no odor or stain .	ML		0.0	18	3-4-6-7
9-10		Reddish brown CLAY, some silt, plastic, will roll, moist-wet, no odor or stain.	CL		0.0	14	3-1-1-3
11-12		As above grading to SILT, little-some clay, little fine-medium sand, trace coarse sand. Sand in lenses. Till. Wet, no odor or stain.	CL-SL		0.0	16	1-2-1-6
13-15		Reddish brown SILT, some fine-medium sand, trace coarse sand and gravel, trace clay, wet grading to moist, no odor or stain.	ML		0.0	20	3-4-5-10
15-16					0.0	12	10-12-18-19
17-18		Reddish brown SILT, little clay, little fine-medium sand, trace little-coarse sand and gravel, dense-compacted, Till damp.	ML		0.0	14	11-22-26-33
19-20		Reddish brown SAND and SILT, little gravel, trace clay, dense, moist, no odor or stain.	SM-ML		0.0	3	10-13-23-50/5"
21-22		Till as above.	ML		0.0	5	10-28-50/5"
23-24		Cobble in shoe. Poor recovery.	ML		0.0	14	14-39-50/5"
25-26		Reddish brown SILT and SAND, little coarse sand and gravel, trace cobble, dense, moist-wet, no odor or stain. Auger refusal at 26.5 feet.	ML		0.0	12	13-29-50/2"
27-28		Drill socket into bedrock with rollerbit from 26.5 to 28.5 feet.	Dolo		0.0	0.5	ROLLER
29-31		HQ Core. Drillers noted multiple fractures during drilling based on water loss and drilling properties. Gray-dark gray dolomite, healed fractures and vugs, gypsum crystals in vugs, some open vugs. Open fractures at 12-14 inches, 23-24 inches, and 33-35 inches and vugs 39-41 inches from top of core. Bottom 6 inches of core not recovered. RQD = 33%	Dolo		NA	41" of 60"	HQ Core
34-37		HQ core. Gray-dark gray dolomite. Upper 26 inches had scattered fractures and vugs. Next 32 inches had massive dolomite. One vug with gypsum crystal fill. Bottom 2 inches had bedding plane fractures. RQD = 53%. Boring terminated at 37.5 feet.	Dolo		NA	60" of 48"	HQ Core

Well: PMW-8
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
WELL SCREEN	
Material	: PVC Sch 40
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #2 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 28 ft.