Pall Corporation Site
Dye Tracer Test 26-Week Summary
June 16, 2011

The following provides an update of the Pall Corporation dye tracer test to date. The 26-week schedule for the test was completed with the analysis of samples collected on May 19, 2011.

Background Analysis

Charcoal receptors were installed in each well involved in the dye tracer study on September 30, 2010 and collected on October 18, 2010. These samples were analyzed to establish a background concentration in the groundwater at each location of the two dyes injected.

During the dye tracer test, the presence of dye at a given sample location (i.e. a positive trace) is confirmed after two consecutive lab detections that are each at least 10 times the background concentration. If the concentration of dye in a well was non-detect during the background testing, a positive trace is confirmed by two consecutive detections of at least 10 times the lab detection limit. Lab results less than the 10 times factor, are noted as "background". In some cases, a value is reported as "no peak identified", which is considered non-detect.

Interference analysis

During collection of the background samples, groundwater samples were also collected from MW-4PI and MW-12D for matrix interference testing. This test showed that the proposed dyes to be used (fluorescein and eosine) did not degrade over time in the groundwater and that there were no serious interference problems that would preclude the use of fluorescein and eosine (though eosine eluted from the site groundwater at about half the concentration as the distilled water elution).

Dye Injection

Dye was injected at the two locations, MW-4PD and MW-6PD, on November 16 and 17, 2010. Fifteen pounds of fluorescein was injected into MW-4PD followed by 325 gallons of clean water. Thirty-five pounds of eosine was injected into MW-6PD followed by 325 gallons of clean water. Refer to Figure.

Dye Tracer Analytical Results

The following discussion pertains to charcoal eluent analysis, unless otherwise specified.

Fluorescein has been confirmed at five monitoring wells with two or more consecutive detections, each above 10 times the background level (or detection limit if background was non-detect). The spatial and temporal patterns indicate that fluorescein migrated north-northwesterly with the groundwater gradient in the deep zone, and also entered the intermediate zone in close proximity to the injection location, where it migrated in a similar detection. A summary of the fluorescein detections, moving progressively downgradient (north-northwest) from the injection point is provided:

- The first of two consecutive fluorescein detections at MW-4PI was the sample collected on February 23, 2011; thus fluorescein migrated from the deep zone, where it was injected at MW-4PD, to the intermediate zone in approximately 3 months (the February 7, 2011 sample was non-detect for fluorescein). Fluorescein had moved past MW-4PI by March 16, 2011, as the charcoal receptor deployed between March 16 and April 8, 2011 was non-detect.

- Fluorescein appeared at MW-12PI and MW-12PD, about 100 feet north-northwest of the injection point, in the samples collected on February 23, 2011. Fluorescein still appeared in both of these wells in the last samples collected (May 19, 2011). The fluorescein concentration in the intermediate well was about equal to or greater than those in the deep well.

- Confirmed flourescein appeared on April 8, 2011 at MW-2AI and MW-2AD, approximately 300 north-northwest of the injection point. Fluorescein moved past these wells by April 27, 2011 since the receptors deployed between April 27 and May 19 was non-detect. The concentrations in the intermediate well were less than those in the deep well (about one-third to three-fourths less), consistent with dilution as the dye moved vertically.

- The relatively high fluorescein concentration at MW-4PI compared to MW-12PI and MW-2AI suggests directly upward migration in the immediate vicinity of MW-4PD, where the fluorescein was injected. This does not preclude upward migration in other areas as well.

The monitoring well locations along a line just north of the aforementioned wells exhibited fluorescein in the deep zone, MW-5PD, MW-10PD and MW-11PD, but not in the intermediate zone. These wells are aligned more northerly with the injection point. The absence of confirmed fluorescein along this alignment suggests it is slightly off the groundwater flow path and/or better separation between the zones in this area.

Moving progressively downgradient from the injection point along this alignment:

- Fluorescein was first confirmed at MW-11PD, about 150 feet from the injection point, in the sample collected on March 16, 2011 and had moved past the well by April 27, 2011.

- Fluorescein was first confirmed at MW-5PD, about 220 feet from the injection point, in the sample collected on February 23, and had moved past this well by April 27, 2011.

- Fluorescein was first confirmed at MW-10PD, about 220 feet from the injection point, in the sample collected on April 8, and had moved past this well by April 27, 2011.

Previously, a non-confirmed single “hit” of fluorescein was detected at downgradient well MW-2AI in the January 19, 2011 sample, followed by a low detection in February that was less than the 10-times background criteria. This did not constitute a positive dye trace, and CDM was surprised to see fluorescein so soon at MW-2AI, which is the furthest downgradient well from the injection point, because it suggested that the fluorescein was bypassing the other wells. It now appears that the earlier, unconfirmed “hits” should be not be considered true dye traces, and that fluorescein first arrived at MW-2AI in April 2011.

There have been no confirmed eosine traces during the 26-week test. While fluorescein travelled about 300 feet from MW-4 to MW-2 in about 3 months, eosine has not been traced to any well in 6 months. The closest deep zone monitoring locations to the eosine injection location MW-6PD are MW-13PD, about 220 feet north-northwest of the injection point (close to gradient); MW-1PD, about 330 feet west of the injection point; and MW-4PD, about 500 feet downgradient of the injection point;. The closest intermediate wells to the eosine injection location are MW-17I about 100 feet north-northwest of the injection location (close to gradient), MW-4PI, about 500 feet downgardient, and MW-18PI, about 80 feet west of the injection location.

Summary and Recommendations

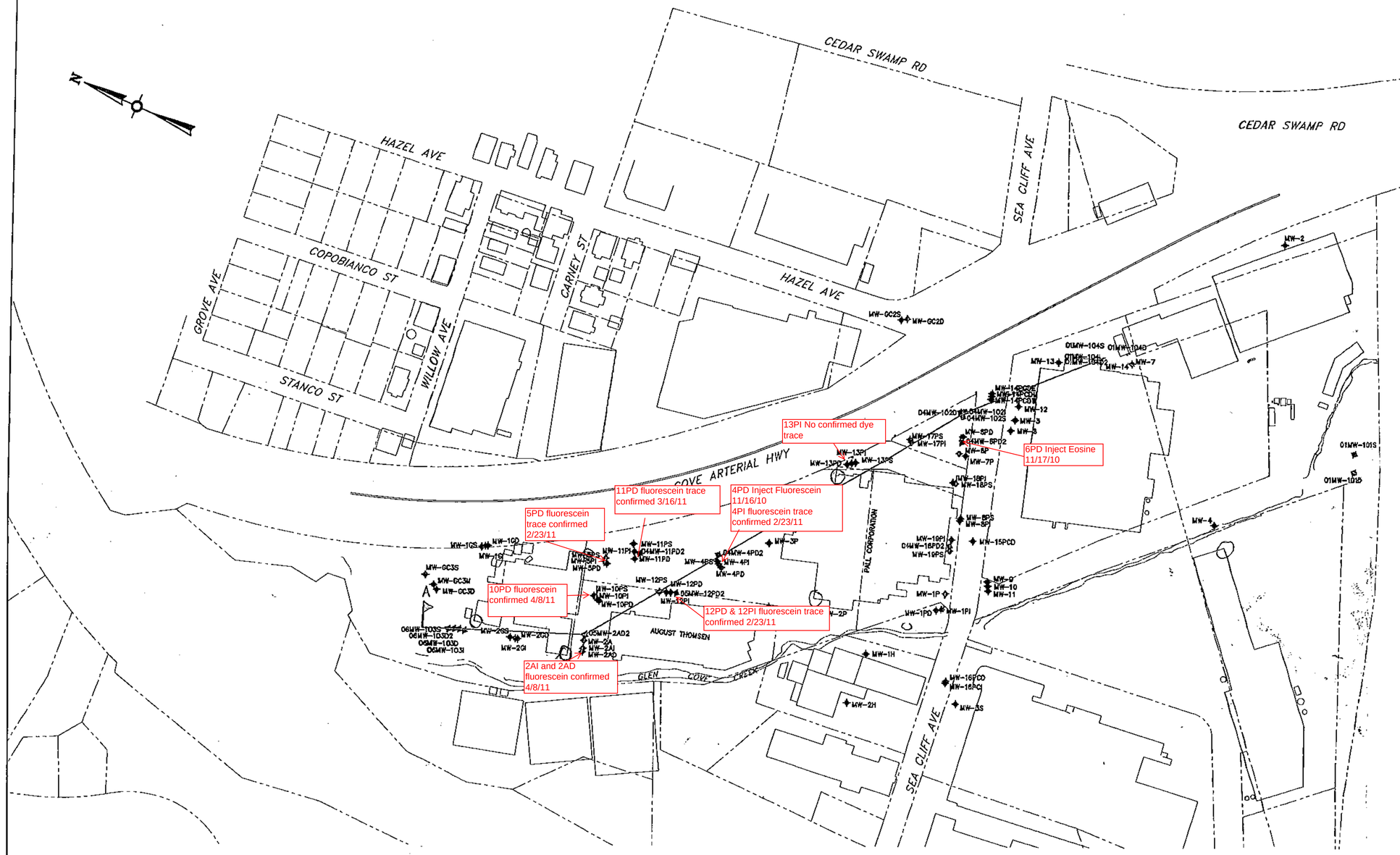
Fluorescein was traced downgradient of the injection points in both the deep and intermediate zones. Therefore, the data indicate that there is a component of contaminant migration from the deep groundwater zone to the intermediate zone, and remediation of the intermediate zone would be subject to recontamination. This connection between the deep and intermediate groundwater zones was also confirmed during the short-term aquifer testing.

Eosine has not yet been detected as of May 19, 2011. If eosine is migrating along a path such that it would miss the 13, 17 and 18 well clusters, then it is conceivable that it could still appear at the MW-4 cluster. Based upon the migration rate of fluorescein between MW-4 and MW-12, travel time is about 100 feet in three months (approximately 1 foot per day). The distance from MW-6 to MW-4 is about 500 feet; or about 15 months travel time.

CDM recommends the following:

- Collect three additional dye receptor samples from the following well clusters primarily for eosine; MW-4, MW-13, MW17, and MW-19 as well as MW-6PI. These samples would be collected on a monthly basis at the end of the following months, July 30, August 31 and September 30 and would further support the groundwater flow from deep to intermediate in the southern portion of the site with the trace of eosine. This information will also be useful in support of the remedial design efforts of OU1 and OU2.

- A coordinated effort on the remedial designs for both the intermediate (OU-1) and deep (OU-2) groundwater units. This coordinated effort would ensure that both OUs were remediated simultaneously without recontaminating the intermediate zone.



Property	Well Designation	PVC Elev	Ground Elev	Top Screen Elev	Total Depth of Well (ft)	Diam (inches)
Photocircuits New Wells	01MW-101S	59.84	60.33	10.83	50	2
	01MW-101D	59.54	60.09	-29.91	100	2
	01MW-104S	59.18	59.60	10.10	58.5	2
	01MW-104I	59.18	59.49	-10.01	80.15	2
	01MW-104D	59.08	59.34	-50.66	132.5	2
	01MW-104D2	59.21	59.49	-90.51	162.9	2
Old Wells	MW-2	60.96	61.07	51.07	24.6	2
	MW-3	56.84	57.48	47.48	NR 20'	4
	MW-4	56.04	56.55	48.55	23.7	2
	MW-5 Elev ???		56.55	-33.45	100.1	2
	MW-6				12.3	2
	MW-7	58.42	58.74	47.74	NR 20'	4
	MW-8	57.56	57.19	-97.81	NR 154.8	4
	MW-9	57.03	55.46	45.46	27.8	4
	MW-10	56.96	55.57	-59.43	132	4
	MW-11	57	55.78	-104.22	174	
	MW-12	58.76	58.16	8.16	50.3	4
	MW-13	58.8	59.59	19.59	50	4
	MW-14	58.8	59.16	24.16	43	4
Pass & Seymour	MW-3S	58.31	58.84	53.84	19.3	4
Sea Cliff Avenue	MW-14PCS	57.27	57.95	47.84	23.5	4
	MW-14PCI	57.38	57.77	20.77	55.9	2
	MW-14PCD	57.44	57.87	-27.13	92	2
	MW-15PCD	55.22	55.48	-34.52	85	2
	MW-18PCI	57.04	57.34	17.34	49.5	2
	MW-16PCD	57.04	57.24	-27.76	95.7	2
Full Site New Wells	04MW-102S	57.37	57.38	7.38	50	2
	04MW-102I	57.49	57.81	-31.19	100	2
	04MW-102D	57.56	57.90	-82.10	150	2
	04MW-4PD2	52.06	52.38	-92.62	155	2
	04MW-6PD2	56.42	56.71	-59.29	126	2
	04MW-11PD2	51.18	51.53	-93.47	152.6	2
	04MW-18PD2	55.11	55.39	-84.61	130	2
Old Wells	MW-1P	54.98	55.24	50.24	NR 1	4
	MW-1PI	55.04	55.25	15.25	48.4	2
	MW-1PD	54.79	55.05	-34.95	97.6	2
	MW-2P	53.43	53.78	49.78	14.2	4
	MW-3P	52.88	53.15	50.15	15.3	4
	MW-4PS	51.81	52.31	39.31	23.6	4
	MW-4PI	51.85	52.31	7.31	48.5	2
	MW-4PD	52.16	52.32	-38.68	101.4	2
	MW-5P	50.39	50.88	47.88	12.6	4
	MW-5PI	50.5	50.89	10.89	48.4	2
	MW-5PD	50.73	50.96	-39.04	98.38	2
	MW-6P	55.87	56.23	8.23	59.6	4
	MW-6PD	56.67	56.95	-33.05	100.2	2
	MW-7P	55.68	56.28	53.28	17.6	4
	MW-8PS	55.38	55.74	50.74	14.1	2
	MW-8PI	55.67	55.96	15.96	49.6	2
	MW-10PS	50.32	50.88	45.66	14.4	2
	MW-10PI	50.65	50.92	10.92	48.9	2
	MW-10PD	51.17	51.56	-38.42	99.2	2
	MW-11PS	50.78	51.35	46.35	14.2	2
	MW-11PI	50.72	51.38	11.38	50	2
	MW-11PD	51.51	51.45	-33.55	93.2	2
	MW-13-PS	54.43	54.73	49.73	14.7	2
	MW-13PI	54.3	54.61	14.61	50.2	2
	MW-13PD	54.33	54.55	-30.45	94.2	2
	MW-17PS	55.97	55.27	41.27	27.8	4
	MW-17PI	55.54	55.92	18.92	54.8	4
	MW-18PS	55.5	56.20	41.20	26.2	4
	MW-18PI	55.61	56.05	19.05	55.8	4
	MW-19PS	55.07	55.59	40.59	26.2	4
	MW-19PI	55.21	55.58	18.68	55.9	4
August Thomsen New Wells	05MW-2AD2	50.05	50.25	-94.75	155	2
	05MW-12PD2	51.66	51.89	-93.11	155	
Old Wells	MW-1A	52.75	53.39	50.39	12.5	4
	MW-2A	49.24	50.14	47.14	13.1	4
	MW-2AI	49.91	50.18	10.18	49.65	2
	MW-2AD	49.74	50.09	-29.91	104.5	2
	MW-12PS	51.06	51.50	46.50	14.5	2
	MW-12-PI	51.33	51.63	11.63	47.6	2
	MW-12PD	51.51	51.73	-33.27	100.2	2
Carney St Well Field New Wells	06MW-103S	51.97	49.11	-20.89	83.1	2
	06MW-103I	51.38	48.52	-61.48	122.0	2
	06MW-103D	51.34	48.59	-101.41	161.3	2
	06MW-10302	51.2	48.66	-153.34	214	2
Old Wells	MW-1GS	50.47	50.92	45.92	15	2
	MW-1GI	50.56	50.97	10.97	50.1	2
	MW-1GD	50.69	51.01	-33.99	94	2
	MW-2GD	47.93	48.22	-41.78	NR 87.71	2
	MW-2GI	47.93	48.21	8.21	NR 40	2
	MW-2GS	47.73	48.16	43.16	13.4	2
Public Supply Well Field Monitoring Wells	MW-GC2S	70.96	71.21	52.21	39	4
	MW-GC2D	70.63	70.48	-117.52	211	4
	GC-3S	52.99	53.22	49.22	23.5	4
	GC-3M	51.53	51.73	-42.27	114	4
	GC-3D	50.99	51.31	-128.69	203	4

LEGEND

MONITORING WELL

A A' GEOLOGIC CROSS SECTION

0 100 200
SCALE IN FEET

New Wells

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PHOTOCIRCUITS AND PALL CORP.

Glen Cove, New York
NYSDEC SITES 1-30-009 & 1-30-053B

SITE PLAN

EARTH TECH

AUGUST 2008 FIGURE NO. 2