11 British American Boulevard
Latham, New York 12110
Tel: 518-782-4500
Fax: 518-782-5145

August 13, 2010

Mr. Jeffrey Dyber, P.E.
NYSDEC – Remediation Bureau A
625 Broadway
Albany, New York 12233-7015
Subject: Dye Tracer Test Scope and Schedule
Pall Corporation Site (Site No.: 1-30-53B)
30-36 Sea Cliff Avenue, Glen Cove, New York

Dear Mr. Dyber:

Camp Dresser & McKee (CDM) is pleased to present this scope of work to conduct a dye tracer test in groundwater at the Pall Corporation site (Pall site) located in Glen Cove, New York. The objective for this test is to further assess the potential for groundwater migration from the deep groundwater zone into the intermediate groundwater zone and possible recontamination of the intermediate zone from upgradient sources. CDM's assumptions for the tracer test design are summarized below followed by the proposed tracer test injection and monitoring program.

Tracer Test Design Assumptions

CDM's assumptions for the tracer test design are based on both direct data collected from the site by CDM and others, and CDM's professional judgment and experience with dye tracer tests.

Hydrogeology

The focus of the dye tracer test is the deep and intermediate groundwater zones. The intermediate zone occurs from approximately 35 feet to 60 feet belowground surface (bgs). The deep zone is encountered at approximately 80 feet; based upon previous work at the Pall site and vicinity, the stratigraphy is complex and the site-specific thickness of the deep zone is not fully documented. Regional literature indicates that the deep zone is as thick as 100 feet.

Geologic cross-sections of the Pall site prepared by Enviro-Sciences, Inc. in 2000, are included as Appendix A. Based upon these cross-sections, the subsurface consists of a complicated series of sand or sandy gravel layers and intervening lower permeability layers. Many of these lithologic layers, as depicted by Enviro-Sciences, are discontinuous and/or non-horizontal, and in some areas two units may not be separated by a low permeability layer, e.g. the shallow and intermediate zones appear to be directly connected at MW-10PD (Enviro-Sciences cross-section C-C'). The deep zone thickness depicted by Enviro-Sciences is generally at least twenty to thirty feet, with the base of the unit not encountered. In addition, some of

the wells are screened in clayey sand, and it is not clear how well connected the clayey sand is to the sandier strata of the deep zone. A cross-section by AECOM, also included in Appendix A, shows layers pinching out and/or non-horizontal, in similar fashion to the Enviro-Sciences cross-sections. The AECOM cross-section suggests that the deep zone can be as thin as 10 feet locally (MW-6PD), but the base of the unit at MW-19PD was apparently not encountered and the deep zone appears to be at least 30 feet thick at that location. For the purpose of thisdye tracer test, CDM believes that an effective aquifer thickness of 50 feet is within the range of credibility and is a conservative design assumption because of the likely presence of lower permeability layers within the deep zone.

Both the intermediate and deep zones consist of sand and sand with gravel, with intervening low permeability zones. The effective porosity of the sandy strata is assumed to be 20 percent. The hydraulic conductivities (K) of these zones are highly variable according to regional literature. The Dvirka &Bartilucci work plan (March 2006) reports the regional hydraulic conductivity ranges from 10 to 300 feet per day (ft/d). Site-specific measurements reported by Enviro-Sciences, Inc., in the Phase II Remedial Investigation Report (July 2000) ranged from 7 x 10^{-3} to 4 x 10^{-2} centimeters per second, or approximately 20 to 100 ft/d. The hydraulic gradient of the deep zone is calculated to be 0.008 between MW-4PI and MW-6PI, based on a head difference of 3.77 feet over 485 feet lateral distance. Assuming an effective porosity of 20% (based upon a typical range of 10%-30% for sand, e.g. Groundwater and Wells, Third Edition, ed. R. Sterrett, pub. Johnson Screens, 2007), and the measured hydraulic gradient of 0.008 in the deep zone, the estimated onsite groundwater flow velocity ranges from 0.8 to 4 ft/d using hydraulic conductivities of 20 ft/d and 100 ft/day in the equation below. This averages to approximately 2.5 ft/d.

$$\text{Velocity (ft/d)} = \frac{\text{Hydraulic Conductivity (ft/d) x Hydraulic Gradient (feet/foot)}}{\text{Effective Porosity (dimensionless)}}$$

This seems reasonable although higher and lower velocities should be expected. The intervening semi-confining layers consist of silty sand and clay. Figure 1 presents potentiometric surface maps for the intermediate and deep zones and a vertical gradient map that shows the difference between the deep and intermediate potentiometric surfaces. Consistent with historical mapping, the apparent groundwater flow across the site is to the west and the vertical gradient is upward from the deep zone into the intermediate zone. The magnitude of the upward vertical gradient is greatest near the August Thomson property, with head differences more than 2 feet. In the vicinity of MW-8PI and MW-18PI, extending in the upgradient direction,, the upward vertical gradient decreases to a head difference of approximately 0.5 feet. With the exception of the August Thomson property, the remaining off-site areas adjacent to the site have low magnitude vertical gradients.

Dye Tracer Test Plan

The proposed layout for the dye tracer test is shown on Figure 2 and the schedule is shown in Table 1. The technical approach is to inject dye into the deep zone and monitor for dye in the intermediate zone at potential migration locations in the downgradient direction. Several variables and factors must be considered to anticipate possible flow paths and migration times to the monitoring points. These variables and factors include the following:

- The dye will migrate primarily along the most hydraulically conductive flow paths, which can deviate from the direct down-gradient direction based on the potentiometric surface maps.
- Although dye migration will be initiated in the deep zone, where the dye can be detected in the intermediate zones is dependent on where the formation allows the dye to migrate upward into the intermediate zone where it will then assume an intermediate zone migration path.
- Significant dye dilution is expected to occur from the deep zone into the intermediate zone.

CDM proposes to inject dye at two deep zone monitoring wells (MW-6PD and MW-4PD). A different dye will be injected into each well so that the origination point of each downgradeint dye detection will be known, allowing better evaluation of flow paths. Twelve intermediate monitoring wells will be monitored for dye (MW-2AI, MW-3PI, MW-4PI, MW-6PI, MW-8PI, MW-10PI, MW-11PI, MW-12PI, MW-13PI, MW-17PI, MW-18PI, MW-19PI). In order to monitor the progress of the dye tracer test, an additional eight deep zone monitoring wells will be monitored as well (MW-2AD, MW-3PD, MW-4PD, MW-10PD, MW-11PD, MW-12PD, MW-13PD, and MW-15PCD).

Monitoring Procedures

Monitoring will be performed by collecting both receptor and aqueous grab samples. However, the aqueous grab samples will not be analyzed unless the receptor sample analysis is positive for dye. The receptors are supplied by the laboratory and consist of activated charcoal contained in a mesh bag. The sampling assembly consists of marble packs to provide weight, the receptor, and water sample vial. The assembly is attached to a cord that is lowered into the well (Figure 3). The receptor and water sample vial are lowered to a point approximately in the center of the screen and the cord secured. The assembly will be allowed to remain in the well for 3 weeks and retrieved during the next sampling event. A new receptor is then attached to the assembly and lowered back into the well. The samples are held in Ziploc bags and stored on ice until delivered to the laboratory. New disposable latex or nitrile gloves will be used between each individual well during sampling.

Dye Injection

Eosine will be injected into MW-6PD and Fluorescein will be injected into MW-4PD. Material Safety Data Sheets for these dyes are provided in Appendix B. USEPA Underground Injection Control (UIC) program information has been submitted to EPA on August 11 and a copy is provided in Appendix C. Both dyes come from the chemical family of Xanthene and are common to all fluorescent dyes. As shown on both MSDS sheets, there are no hazardous components to either dye under part 29 CFR 1910.1200 and both products are in compliance with Toxic Substance Control Act (TSCA) reporting requirements.

The most distant monitoring point for the Eosine tracer test is MW-4PI, approximately 500 feet from injection well MW-6PD. Based on an effective aquifer thickness in the deep zone of 50 feet and an assumed lateral dispersion width of 75 feet (there is insufficient data to calculate lateral dispersion and 75 feet is assumed based upon best professional judgment), approximately 35 pounds of dye will be required to develop a 1 milligram per liter (mg/L) concentration in the deep zone across this entire zone (see dye quantity calculation below) at MW-6PD. The actual dye concentration over most of the dye plume during the dye tracer test will certainly be higher in the deep zone by more than an order of magnitude. Because the dyes can be detected reliably at less than 0.001 mg/L, dye dilution upon entering the intermediate zone should not be a concern as compared to an equivalent dilution of contaminants from the deep zone into the intermediate zone.

DYE QUANTITY CALCULATION

Aquifer volume – 500 ft x 75 feet x 50 ft x 0.3 total porosity x 28.32 L/ft^3=15,930,000 L

Dye mass = 35 pounds x 453,592 mg/lb = 15,875,720 mg

Aquifer concentration = 15,875,720 mg/15,930,000L = 0.997 mg/L

Note: total porosity estimated at 30% based upon typical range of 25-40% (Groundwater and Wells, Third Edition, ed. R. Sterrett, pub. Johnson Screens, 2007)

The distance to the furthest monitoring well for the Fluorescein tracer test is approximately 300 feet. Performing a similar calculation, approximately 21 pounds of Fluorescein would be required to achieve an aquifer concentration of approximately 1 mg/L. However, comparatively less Fluorescein dye is required because of its higher fluorescent activity and lower detection limits. Therefore, only 15 pounds of Fluorescein will be required. Background fluorescence testing, as described under monitoring below, will be performed to ensure the selection of the best dyes prior to dye injection.

Prior to dye injection, CDM will inspect the site monitoring wells to determine which ones are leaking water through the well head to the ground surface due to artesian pressure. In order to prevent dye from surfacing via leaking well heads, CDM will modify well heads observed to be leaking to prevent leakage during the tracer test. Wells observed to be under artestian pressure will be modified using a Fernco coupling with a short, threaded PVC nipple to accommodate a threaded PVC cap. Teflon tape will be wrapped around the threads to provide a better seal. The field crew will also have sorbent materials that can be used to contain dye should a leak occur. An alternative, for no-traffic areas, may be to install a longer PVC extension, to raise the well head above the static water level.

The dyes will be injected into the screened intervals of the monitoring wells using a packer assemble. The packer assembly will seal off the upper portion of the well so that the dye does not migrate up into the water column and instead is forced into the screened interval formation. The total dye mass will be injected in a concentrated solution as a slug followed by a potable water flush. The target flush volume is approximately 300 gallons not to exceed a flow rate of 5 gallons per minute. An evaluation of the pressure response to dye injection at 5 gallons per minute is provided in Figure 4 (explanation of Figure 4 provided in Appendix D). In addition, the well head injection pressure will be kept at 10 pounds per square inch (psi) or below. In CDM's judgment, a maximum injection pressure of 10 psi will minimize the potential for artificially forcing the dye into the intermediate zone while ensuring it is entrained in the ambient aquifer flow regime. If this volume cannot be injected at or below 10 psi, the target flush volume will be reduced.

All down-hole equipment reused for dye injection will be cleaned between each location by initially spraying with standard commercial bleach such as Clorox followed by a potable water rinse. The bleach rinse will be performed over polyethylene sheeting with the rinse solution collected and placed into a sanitary sewer. A total volume of less than 5 gallons of bleach rinse solution is expected.

Dye Analyses

Dye analyses for both receptors and water samples will be performed at the Crawford Hydrology Lab at Western Kentucky University. The fluorimetric analyses will be performed using a spectrofluorophotometer under the laboratory's standard operating protocol.

Background Fluorescence Study

A background fluorescence study is required to ensure that the dyes planned for injection, or other interfering constituents that fluoresce at the dye's wavelengths, are not present in groundwater at the site. As shown in Table 1, the background study will include all monitoring wells and injection wells used in the dye tracer test. The background study will require activated charcoal dye receptors (receptors) be installed into the monitoring wells for a period of three weeks and laboratory-analyzed for both dyes. The data from this study will

also be used for comparisons to the tracer test data to determine the presence of dye above the background fluorescence levels.

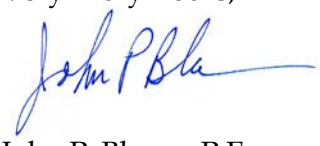
Dye Tracer Test Schedule

Following dye injection, a monitoring program will be initiated that is designed to conservatively accommodate a reasonable range of groundwater migration variables and factors, along with logistical and cost considerations. Dye monitoring will be initiated at each station assuming that the dye is migrating at an average rate of 2.5 ft/d. Dye monitoring will continue until the monitoring period exceeds three times the time required for migration at a rate of 2.5 ft/d or the well is positive for dye on three monitoring events.

The dye monitoring events occur at three week intervals and are assumed to last for approximately 27 weeks resulting in a total of 9 sample events plus the background event. Over the 27 week period, CDM anticipates a total of 100 receptor analyses and 41 water analyses. Based on data evaluation during the dye tracer test, this schedule could be curtailed. If additional monitoring beyond 27 weeks could be beneficial to the dye tracer test objectives, we will discuss with you in advance of week 27 so that we can prepare an amendment for additional sampling.

If you have any questions regarding this scope of work, please do not hesitate to give me a call.

Very Truly Yours,



John P. Blaum, P.E.
Senior Project Manager
Camp Dresser & McKee

cc: J. Thomas Duffey (CDM)
R. Chenenko (CDM)

Attachments:
Table 1 – Dye Tracer Test Schedule
Figure 1 – Groundwater Migration Patterns
Figure 2 – Dye Tracer Test Plan
Figure 3 – Dye Monitoring Kit
Figure 4 - Dye Injection Pressure Estimates
Appendix A – Site Cross Sections
Appendix B – Material Safety Data Sheets for Fluorescein and Eosine

Appendix C – USEPA Underground Injection Control Information
Appendix D – Dye Injection Pressure Estimates

Table 1

Dye Tracer Test Schedule

Pall Corporation Site

Glen Cove, New York

Well Code	Zone	Injection Point Distance		Dye Tracer Test Event in Weeks and Assumed Dyes Present																						
				Background	Dye Injection	Routine Dye Monitoring																				
		MW-14PD	MW-6PD	1	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50	53	56	59	62		
MW-4PI	Intermediate	~575 feet	~485 feet	0	NA									1	1	2	2	2	2	2	2	2	2	2		
MW-6PI	Intermediate	~115 feet	~30 feet	0	NA	1	1	2	2	2	2	2														
MW-8PI	Intermediate	~230 feet	~150 feet	0	NA		1	1	1	2	2	2	2	2	2	2	2	2								
MW-13PI	Intermediate	~275 feet	~200 feet	0	NA			1	1	1	2	2	2	2	2	2	2	2	2	2	2					
MW-14PI	Intermediate	~10 feet	NA	0	NA	1	1	1	1	1																
MW-17PI	Intermediate	~165 feet	~85 feet	0	NA	1	1	2	2	2	2	2	2	2												
MW-18PI	Intermediate	~170 feet	~80 feet	0	NA		1	1	2	2	2	2	2	2	2											
MW-19PI	Intermediate	~265 feet	~185 feet	0	NA			1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
MW-102S	Intermediate	~55 feet	NA	0	NA	1	1	1	1	1	1	1														
MW-102I	Deep	~50 feet	NA	0	NA	1	1	1	1	1	1	1														
MW-4PD	Deep	~575 feet	~485 feet	0	NA									1	1	2	2	2	2	2	2	2	2	2		
MW-13PD	Deep	~275 feet	~200 feet	0	NA			1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
MW-15PCD	Deep	~275 feet	~200 feet	0	NA			1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
MW-6PD	Deep	Eosine Injection		0	NA																					
MW-14PD	Deep	Fluorescein Injection		0	NA																					Totals
Duplicates				2	NA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	16	
Total Receptor Analyses				17	NA	6	8	12	12	12	11	11	8	10	9	8	8	8	7	7	7	6	6	4	173	
Assumed Water Analyses (dye-positive samples only)				0	NA	0	1	2	3	5	8	8	7	7	6	7	7	7	6	6	6	5	5	4	100	
PeakFit Data Analyses (dye-positive samples only)				17	NA	0	1	2	3	5	8	8	7	7	6	7	7	7	6	6	6	5	5	4	117	

NOTES:

NA - Not applicable

PeakFit data analysis is required to determine the dye concentrations when more than one dye is present.

Dye monitoring at any one well will be discontinued after three positive monitoring events.

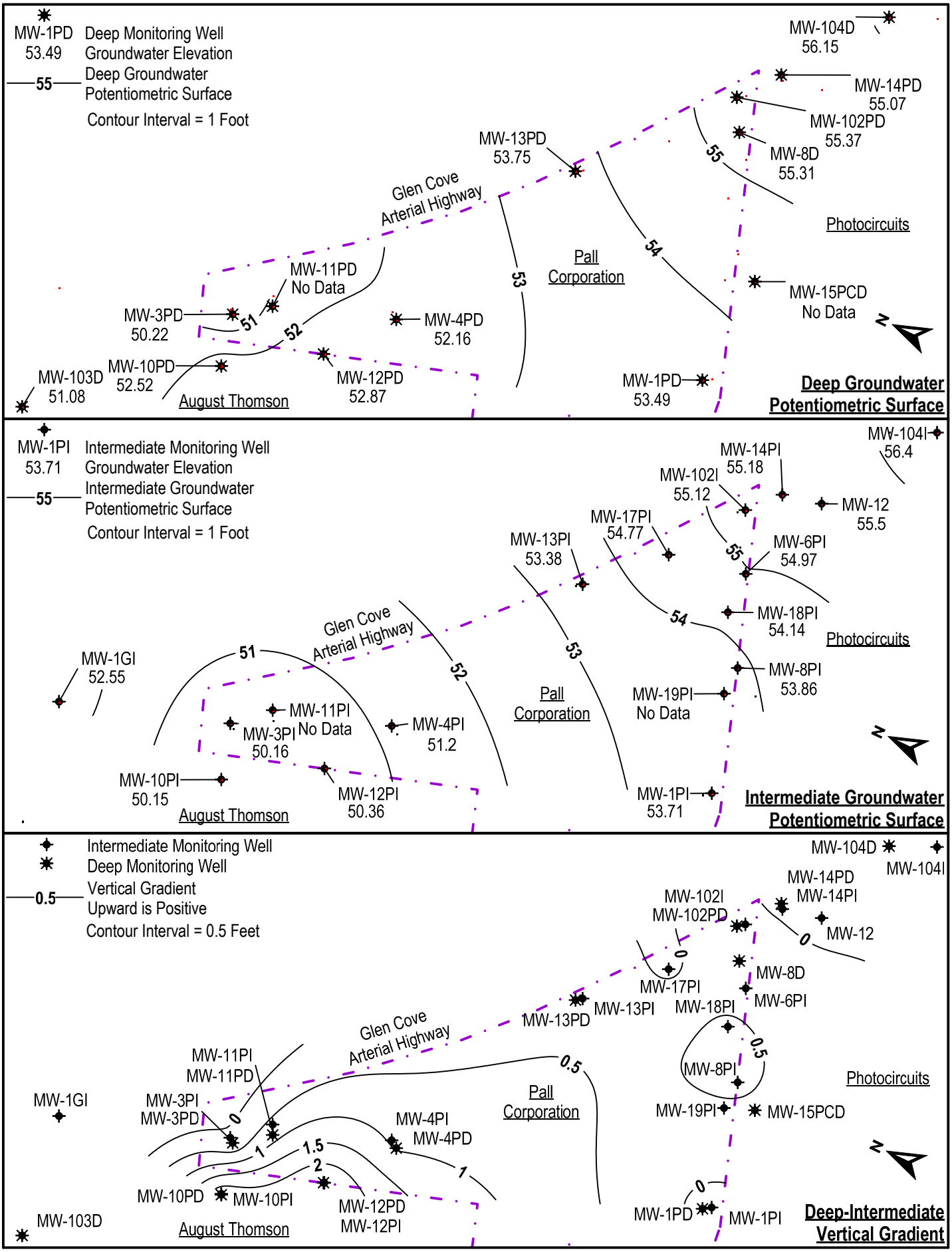


Figure 1: Groundwater Migration Patterns

Pall Corporation Site
Glen Cove, New York

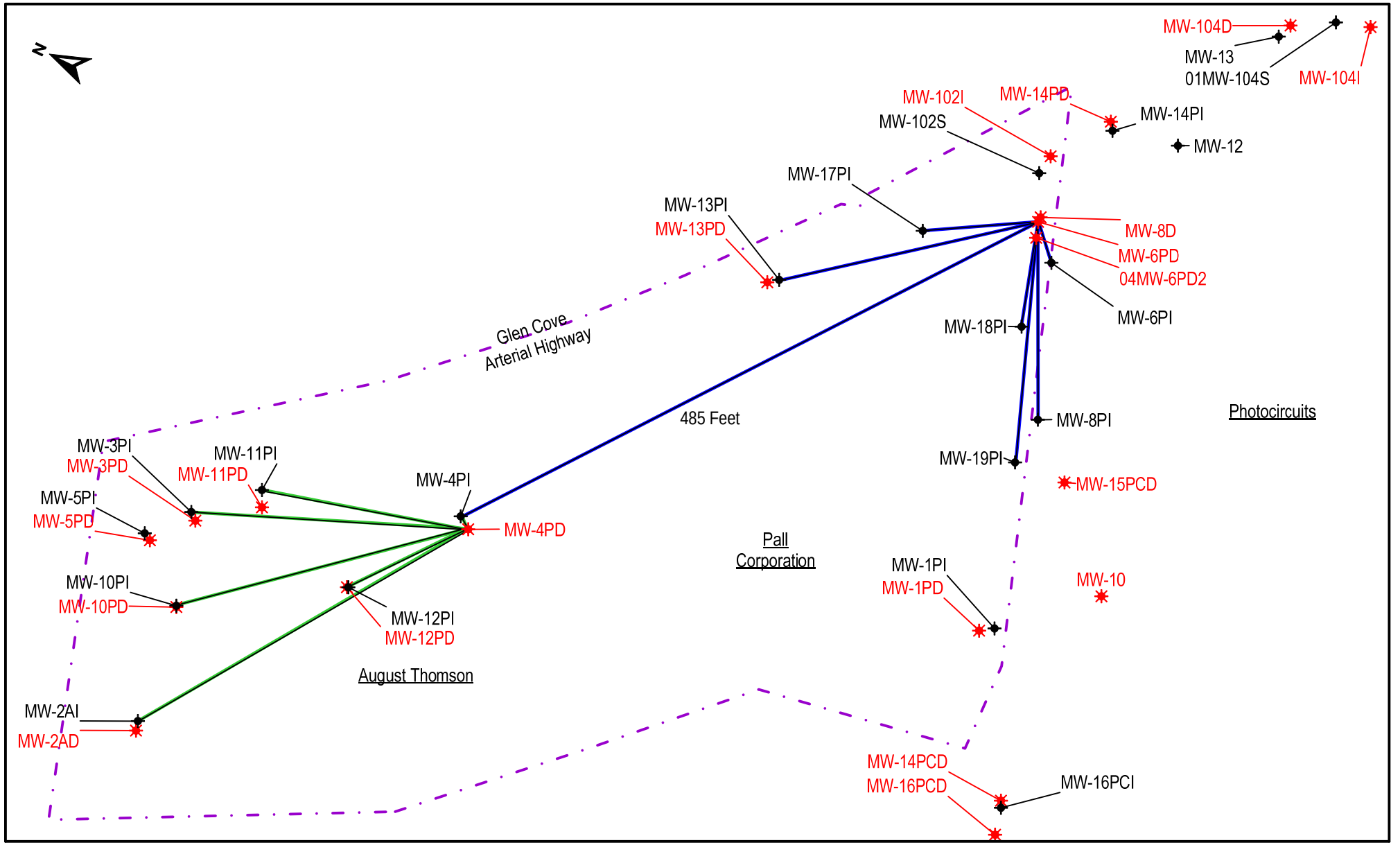
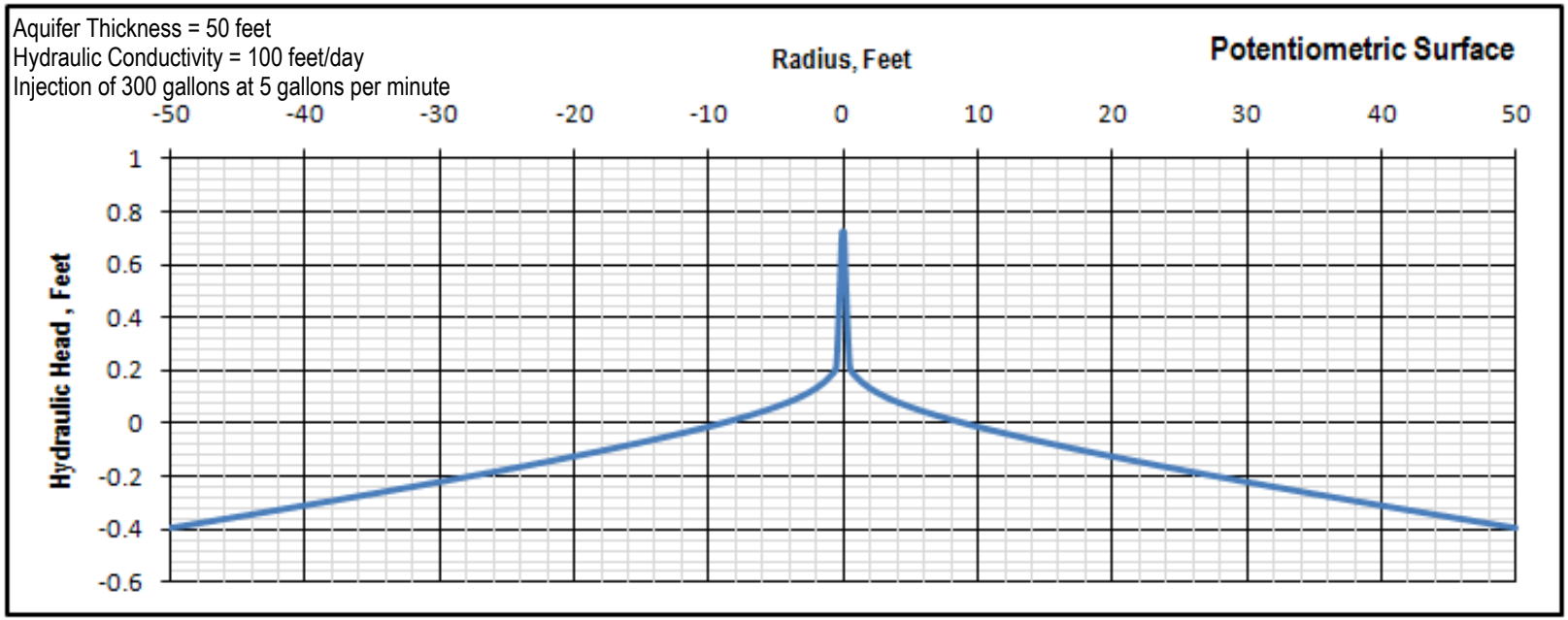


Figure 2
Dye Tracer Test Plan
Pall Corporation Site
Glen Cove, New York

CDM

Figure 3
Dye Monitoring Kit
Pall Corporation Site
Glen Cove, New York

CDM



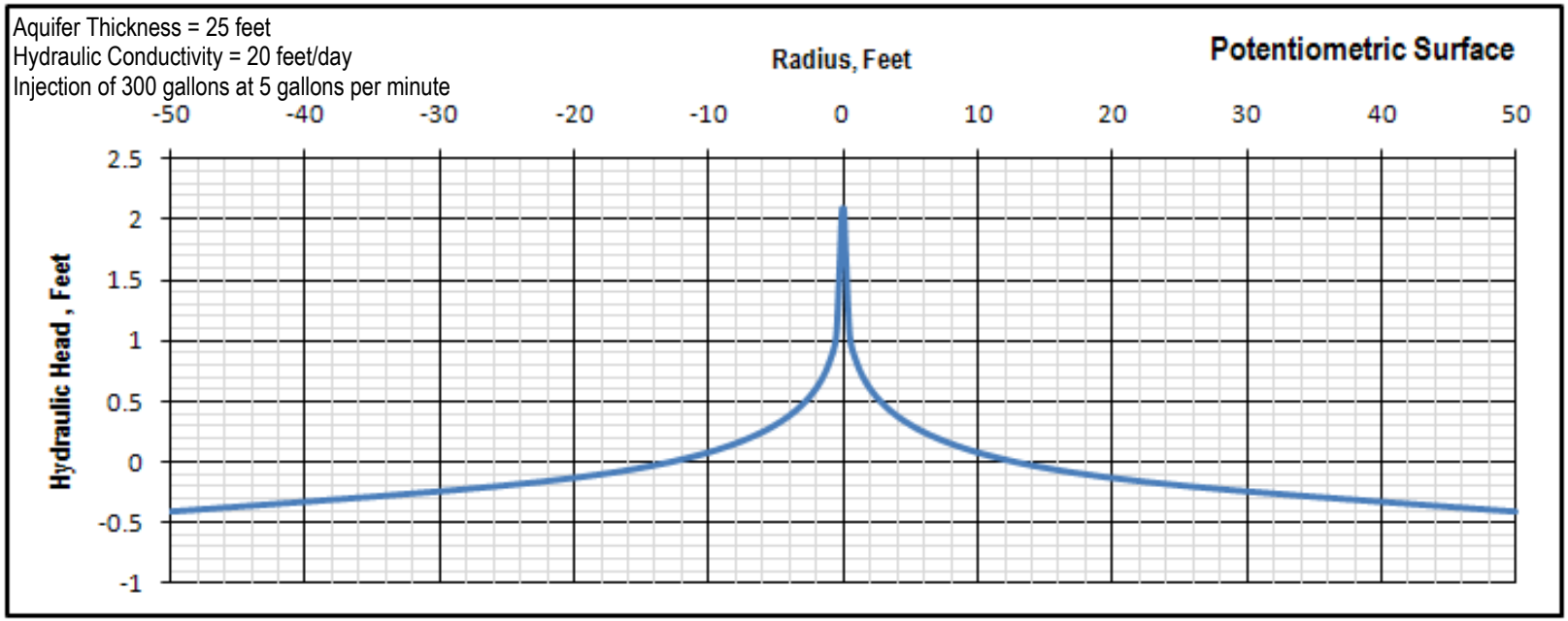
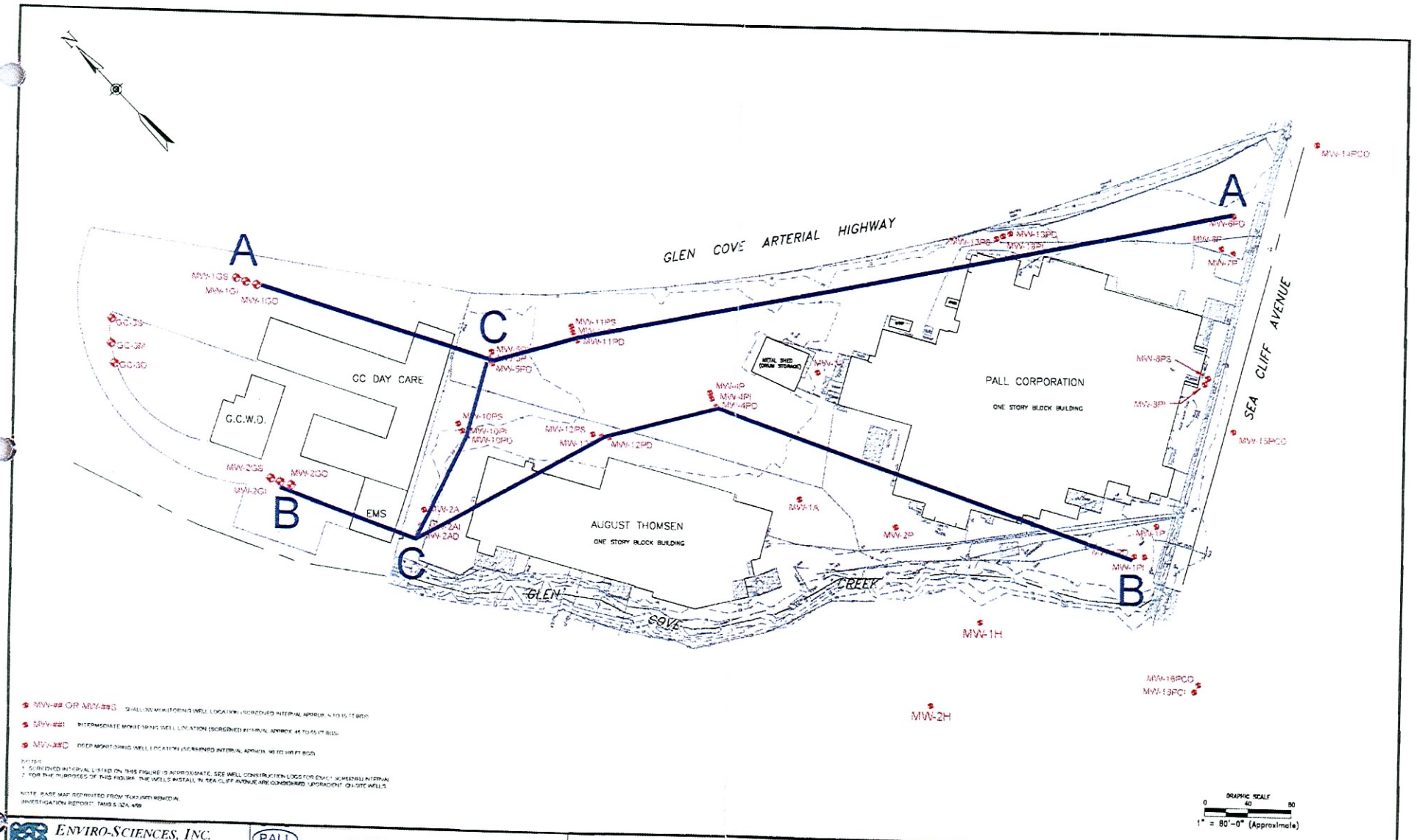


Figure 4
Dye Injection Pressure Estimates
Pall Corporation Site
Glen Cove, New York

CDM

Appendix A
Site Cross-Section



ENVIRO-SCIENCES, INC.
312 EAST MAIN STREET
PATCHOGUE, NEW YORK 11772
PHONE: 631-207-9005 FAX: 631-207-3614

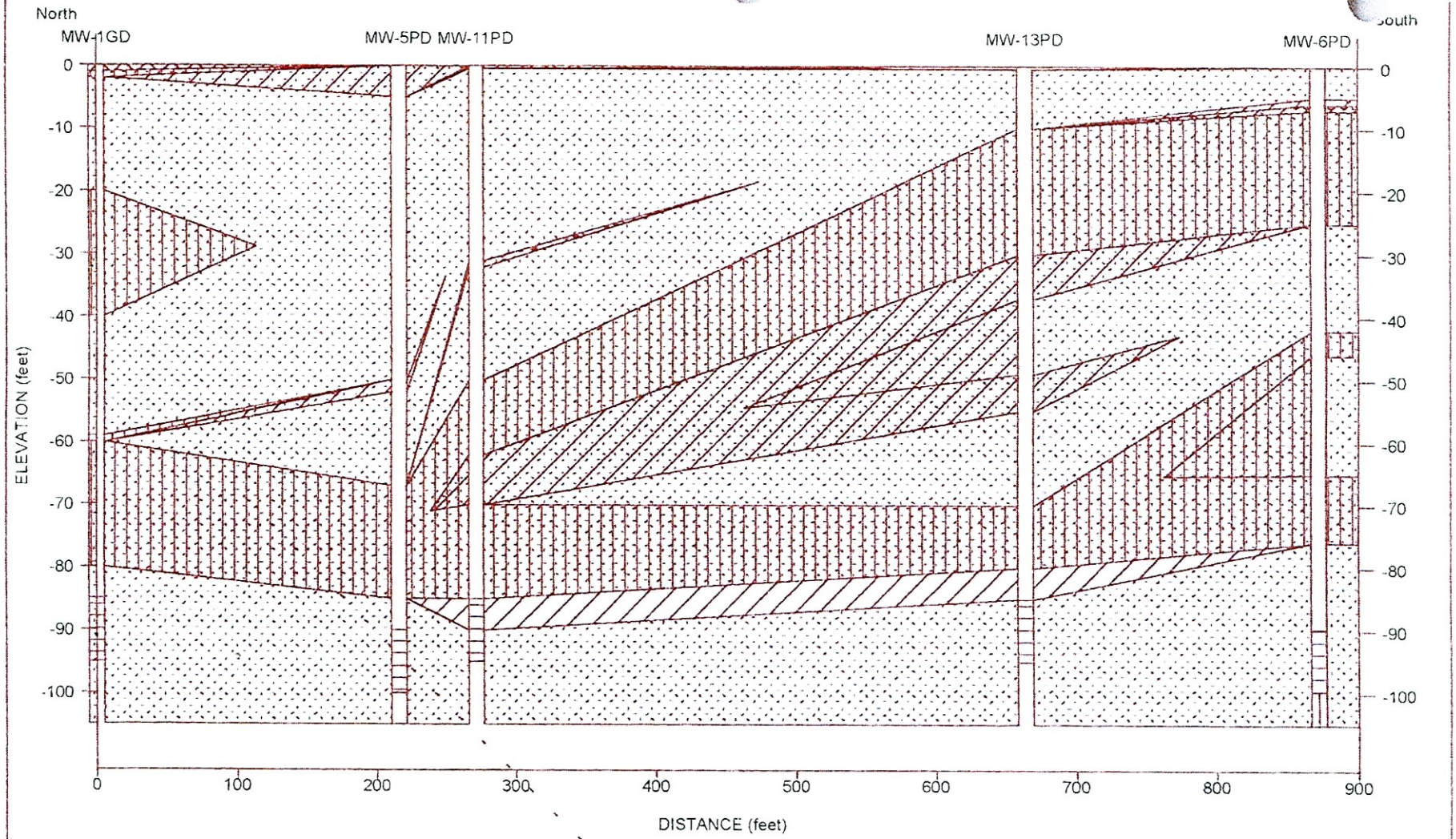
PALL

Pall Corporation
30 Sea Cliff Avenue
Glen Cove, New York 11542

Geologic Section Plan
(Sections A-A, B-B, and C-C)

DATE:	03/12/00	DRAWN:	DJS
REV. NO.	1	DESIGNED:	DJS
PROJECT NO.	MT&E-PALL-M371	FILE:	FIGURE2-1.DWG

FIGURE
2-1



Pall Corporation
30 Sea Cliff Avenue
Glen Cove, New York

FIGURE-2-2

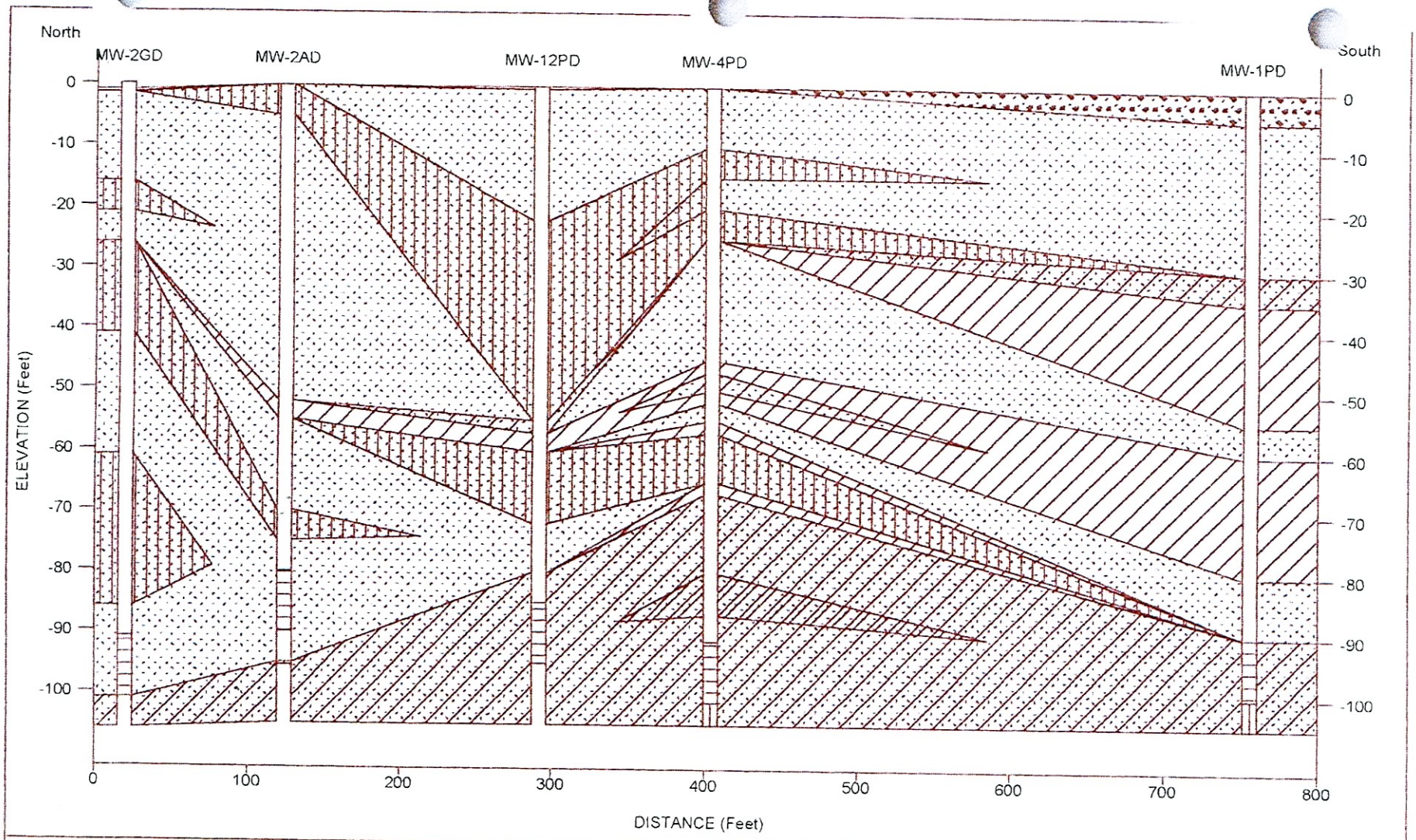
GEOLOGIC CROSS SECTION
Section North-South
Site Specific Cross-Section A-A'

LEGEND

- Silty sand
- Sand and gravely sand
- Quartz gravel
- Clayey sand
- Sand and clay
- Gravelly clay
- Sandy silt

ENVIRO-SCIENCES, INC.
312 East Main Street
Patchogue, New York 11772
(631) 207-9005, Fax (631) 207-3614

03-08-2000 c:\mtech5\sectiona.cro



Pall Corporation
30 Sea Cliff Avenue
Glen Cove, New York

FIGURE 2-3

GEOLOGIC CROSS SECTION

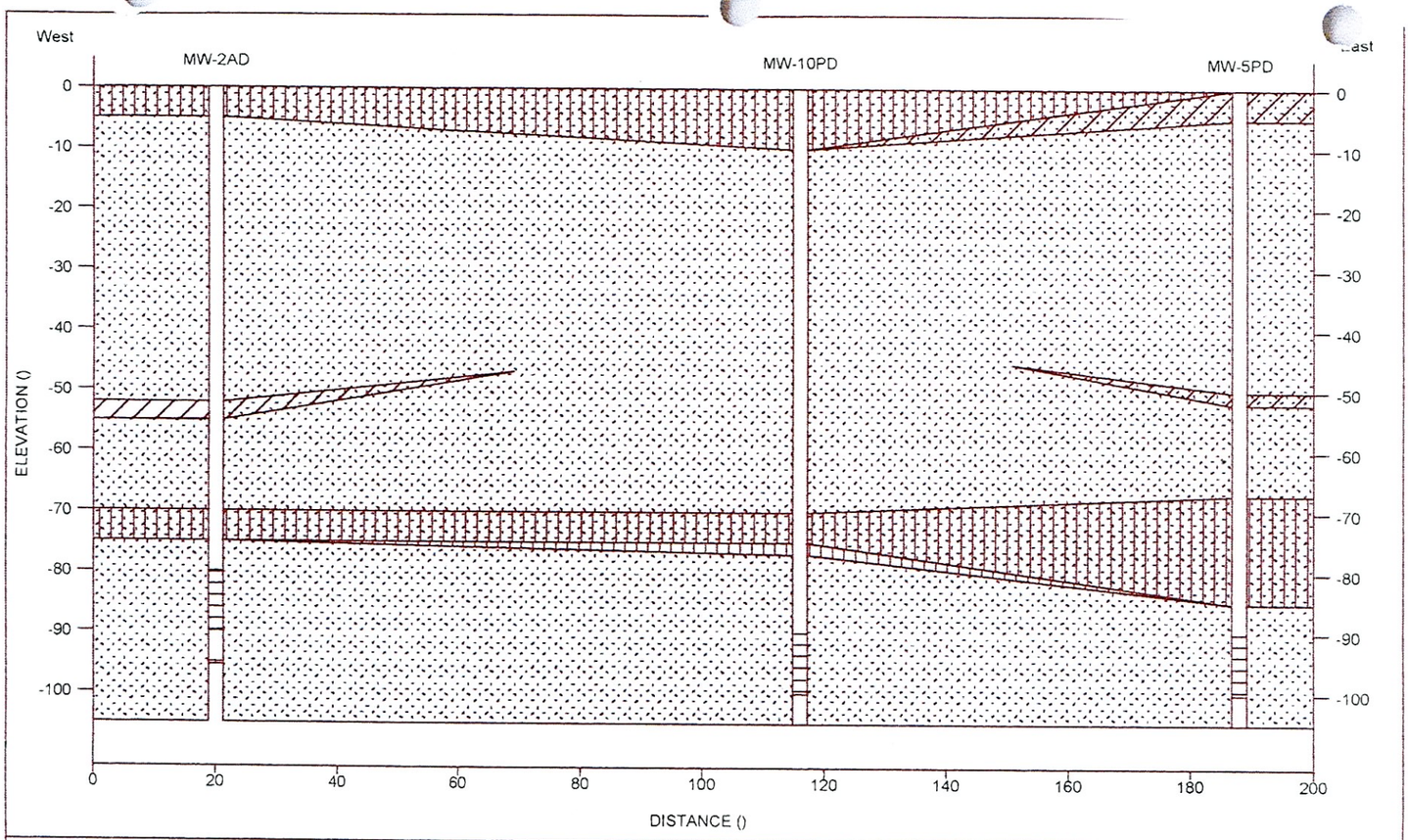
Section North-South
Site Specific Cross-Section B-B'

LEGEND

- Sand
- Sandy gravel
- Silty sand
- Clayey sand
- Clay

ENVIRO-SCIENCES, INC.
312 East Main Street
Patchogue, New York 11772
(631) 207-9005, Fax (631) 207-3614

03-08-2000 c:\mtech5\sectionb.cro



Pall Corporation
30 Sea Cliff Avenue
Glen Cove, New York

FIGURE 2-4

GEOLOGIC CROSS SECTION
Section West-East
Site Specific Cross-Section C-C'

LEGEND

- Sand/Gravelly Sand
- Silty sand
- Clay
- Sandy clay

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312 East Main Street
Patchogue, New York 11772
(631) 207-9005, Fax (631) 207-3614

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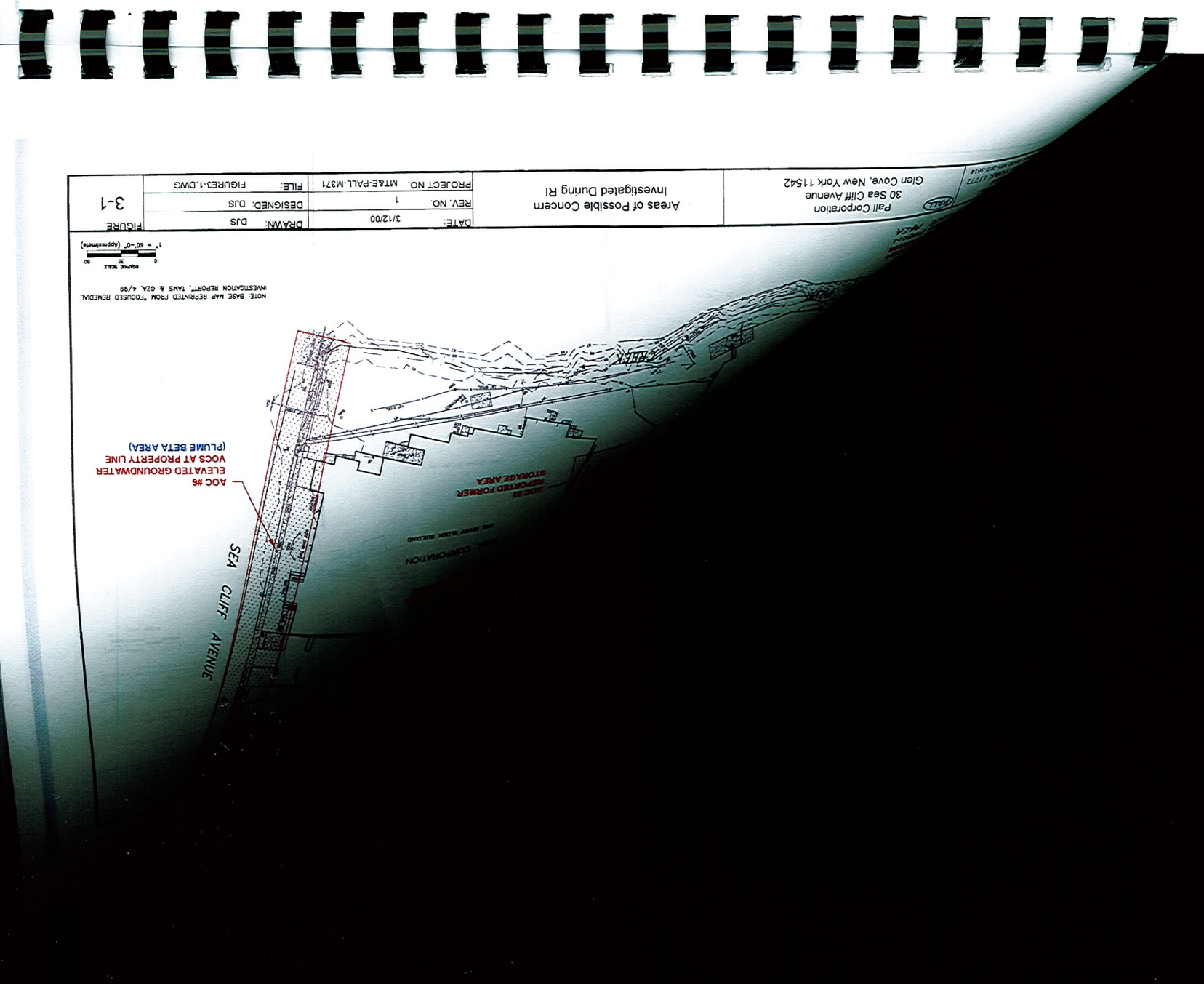

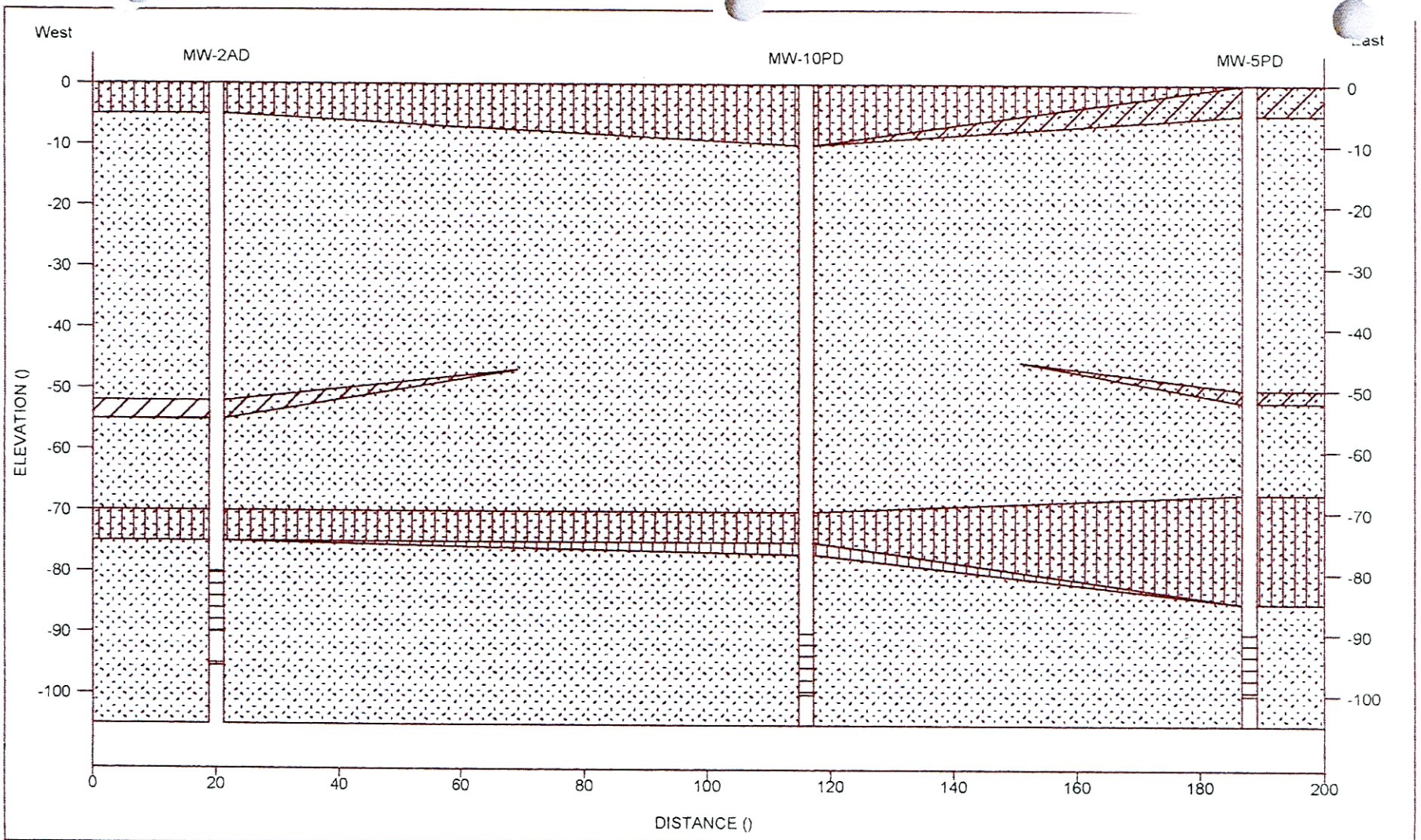

Pall Corporation
30 Sea Cliff Avenue
Glen Cove, New York

FIGURE 2-4

GEOLOGIC CROSS SECTION
Section West-East
Site Specific Cross-Section C-C'

LEGEND

- Sand/Gravelly Sand
- Silty sand
- Clay
- Sandy clay

ENVIRO-SCIENCES, INC.
312 East Main Street
Patchogue, New York 11772
(631) 207-9005, Fax (631) 207-3614

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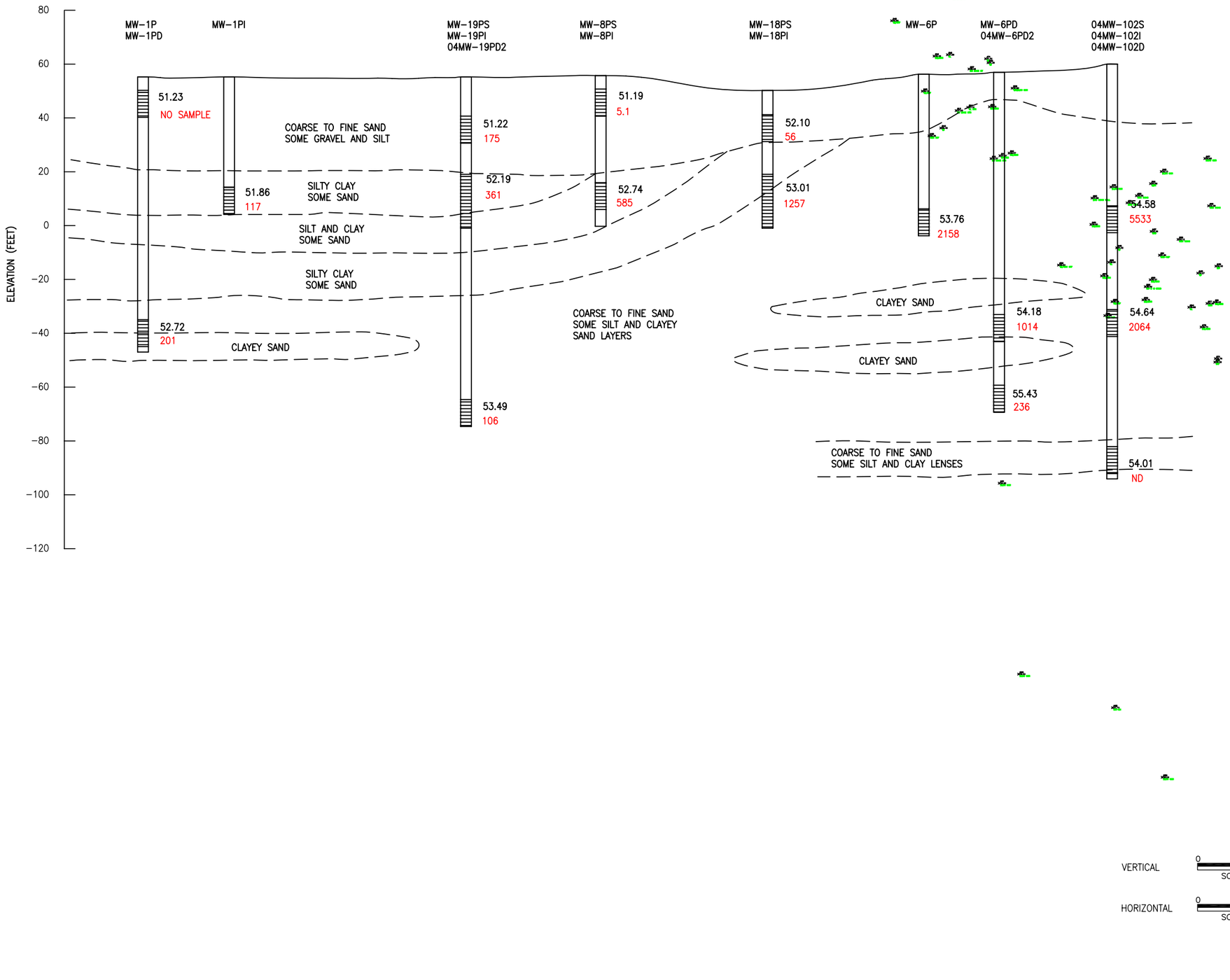


NOTE:

1. LOCATIONS OF GEOLOGIC CROSS SECTIONS ARE SHOWN ON FIGURE 3.
2. TOTAL CHLORINATED ALIPHATIC COMPOUNDS CONCENTRATION FROM ROUND 2 GROUNDWATER SAMPLING EVENT CONDUCTED IN OCTOBER 2008.

VERTICAL 0 20 40 SCALE IN FEET

HORIZONTAL 0 20 40 SCALE IN FEET

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PHOTOCIRCUITS AND PALL CORP.

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

GEOLOGIC CROSS SECTION C-C'

EARTH TECH | AECOM

AUGUST 2009 FIGURE NO. 6

Appendix B
Dye Material Safety Data Sheets

Xanthene

From Wikipedia, the free encyclopedia

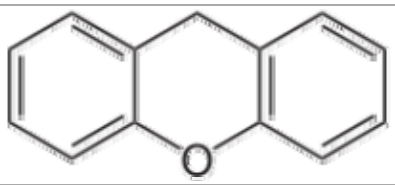
Xanthene (9*H*-xanthene, 10*H*-9-oxaanthracene) is a yellow organic heterocyclic compound. Its chemical formula is $C_{13}H_{10}O$. It is soluble in diethyl ether. Its melting point is 101-102 °C and its boiling point is 310-312 °C. Xanthene is used as a fungicide and it is also a useful intermediate in organic synthesis.

Derivatives of xanthene are commonly referred to collectively as xanthenes, and among other uses are the basis of a class of dyes which includes fluorescein, eosins, and rhodamines. Xanthene dyes tend to be fluorescent, yellow to pink to bluish red, brilliant dyes. Many xanthene dyes can be prepared by condensation of derivates of phthalic anhydride with derivates of resorcinol or 3-aminophenol.

See also

- Xanthone
- Xanthine
- Xanthydrol

Retrieved from "http://en.wikipedia.org/wiki/Xanthene"
Categories: Organic compound stubs | Fungicides | Xanthenes

Xanthene	
	
IUPAC name	
9H-Xanthene	
Other names	
Dibenzo[*a*,*e*]pyran 10*H*-9-oxaanthracene	
Identifiers	
CAS number	92-83-1 ✓
EC number	202-194-4
SMILES	`c1(Oc2ccccc2C3)c3cccc1`
Properties	
Molecular formula	$C_{13}H_{10}O$
Molar mass	182.22 g/mol
Appearance	Yellow solid
Melting point	101-102 °C
Boiling point	310-312 °C
Hazards	
R-phrases	R42 R43
S-phrases	S22 S36 S37 S45
✓ (what is this?) (verify) Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

MATERIAL SAFETY DATA SHEET

15189 Eosine OJ

EOSINE

SECTION I - IDENTIFICATION

MANUFACTURER/DISTRIBUTOR. CHEMCENTRAL/Dyes & Pigments Division
13395 Huron River Drive
Romulus, Michigan 48174
EMERGENCY PHONE NUMBER... (313) 941-4800
EFFECTIVE DATE..... 10/25/1996
REVISED DATE..... 10/25/1996
CHEMICAL NAME..... Acid Red 87 (Color Index name)
TRADE NAME..... 15189 Eosine OJ
CHEMICAL FAMILY..... Xanthene
CHEMICAL FORMULA..... 45380 (Color Index formula)

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	HAZARDOUS %	TLV (Units)	PROD. CAS #
None as per part 29 CFR 1910.1200. This product supplied is in compliance with TSCA Reporting Requirements, SARA Title III. Not Listed.			

SECTION III - PHYSICAL DATA

BOILING Point(F)..... N/A
FREEZING POINT (F)..... N/A
VOLATILITY/VOL(%)..... N/A
MELTING POINT..... N/A
VAPOR PRESSURE (mm Hg)... N/A
VAPOR DENSITY (Air=1).... N/A
SOLUBILITY IN H20..... Moderate
APPEARANCE/ODOR..... Red powder, no characteristic odor
SPECIFIC GRAVITY (H20=1). Approximately 1
EVAPORATION RATE..... N/A
PH..... N/A

SECTION IV FIRE & EXPLOSION HAZARD DATA

FLASH POINT..... N/A
LOWER FLAME LIMIT..... N/A
HIGHER FLAME LIMIT..... N/A
EXTINGUISH MEDIA..... Water fog, CO2, or Dry chemical.
FOR FIRE..... Fire fighters should be equipped with self contained breathing apparatus and turnout gear.

UNUSUAL FIRE HAZARD..... Adequate ventilation and clean up must be maintained to minimize dust accumulation. May form explosive dust/air mixture.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE.... Ingestion in rats, LD50=4,700 mg/kg

OVER EXPOSURE EFFECTS.... Contact with eyes may result in severe irritation. Contact with skin may result in irritation. Ingestior may result in gastric disturbances. Inhalation of dust may irritate respiratory tract.

FIRST AID PROCEDURES..... Flush eyes with flowing water at least 15 minutes. If irritation develops, consult a physician. Wash affected skin areas thoroughly with soap and water. If irritation develops, consult a physician. Remove and launder contaminated clothing before reuse. If swallowed, dilute with water and induce vomiting. Get immediate medical attention. If inhaled, move to fresh air. Aid in breathing, if necessary, and get medical attention.
NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAS CONVULSIONS.

SECTION VI - REACTIVITY DATA

CHEMICAL STABILITY..... Stable

CONDITIONS TO AVOID..... N/A

INCOMPATIBLE MATERIALS... Unknown

DECOMPOSITION PRODUCTS... Carbon monoxide, Carbon dioxide, and oxides of Nitroger

HAZARDOUS POLYMERIZATION. Does not occur

POLYMERIZATION AVOID..... N/A

SECTION VII - SPILL OR LEAK PROCEDURE

FOR SPILL ..... Spills should be contained and placed in suitable containers.

WASTE DISPOSAL METHOD.... Do not discharge into sewers or waterways. Dispose of in accordance with local regulations.

SECTION VIII - SPECIAL PROTECTION

RESPIRATORY PROTECTION... NIOSH/OSHA approved dust respirator as necessary.

VENTILATION..... Local exhaust to control dusts.

PROTECTIVE GLOVES..... To prevent skin contact.

EYE PROTECTION..... Goggles.

PROTECTIVE EQUIPMENT..... Eye wash fountains should be easily accessible.

HANDLING AND STORAGE..... Keep away from excessive heat and moisture. Keep containers closed.

SECTION IX - SPECIAL PRECAUTIONS

HAZARD CLASS..... N/A
DOT SHIPPING NAME..... Ink Material
NMFC Item #101720
REPORTABLE QUANTITY (RQ). N/A
UN NUMBER..... N/A
NA #..... N/A
DOT LABELS REQUIRED..... Mfg. Label Only
SPECIAL SHIPPING INSTRUCTIONS:
MANUFACTURER'S LABEL ONLY
PACKAGING SIZE..... Various

FOOT NOTES
This information is furnished without warranty, representation, or license of any kind, except that it is accurate to the best of CHEMCENTRAL Corporation's knowledge or obtained from sources believed by CHEMCENTRAL Corporation to be accurate. The CHEMCENTRAL Corporation does not assume any legal responsibility for use or reliance upon same. Customers are encouraged to conduct their own tests. Before using any product, read its label.

N/A = Not applicable

REFERENCES

Material Safety Data Sheet
(FLUORESCEIN)
15174 URANINE C

CHEMCENTRAL/Dyes & Pigments
13395 Huron River Drive
Romulus, MI 48174

REVISION DATE: 12-6-00
CHEMTREC: 800-424-9300
EMERGENCY: 734-941-4800

SECTION I - IDENTIFICATION

TRADE NAME: ..... 15174 URANINE C
CHEMICAL NAME: ..... Acid Yellow 73 CAS# 6417-85-2
CHEMICAL FAMILY: ..... Xanthene

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS INGREDIENT	PERCENT	CAS NUMBER	PEL
NONE as per 29CFR part 1910.1200 or Sara Title III			

HMIS HAZARD RATINGS (if applicable):
HEALTH: 1
FIRE 0
REACTIVITY 0

SECTION III - PHYSICAL DATA

APPEARANCE: ..... Orange powder, no characteristic odor.
BOILING POINT: ..... N/A
MELTING POINT: ..... N/A
FREEZING POINT: ..... N/A
VAPOR PRESSURE: ..... N/A
VAPOR DENSITY (AIR=1): ..... N/A
SPECIFIC GRAVITY: ..... Approximately 1
pH: ..... N/A
SOLUBILITY IN WATER: ..... Moderate
VOLATILITY: ..... N/A

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT: ..... N/A
EXTINGUISHING MEDIA: ..... Water fog, CO2, or Dry chemical.
FIRE FIGHT PROCEDURES: ... Fire fighters should be equipped with self contained breathing apparatus and turnout gear.
UNUSUAL FIRE HAZARD: ..... Adequate ventilation and clean up must be maintained to minimize dust accumulation. May form explosive dust/air mixture.

Material Safety Data Sheet
(FLUORESCEIN)
15174 URANINE C

SECTION V - REACTIVITY DATA

STABILITY: ..... Stable
CONDITIONS TO AVOID: ..... N/A
HAZARDOUS POLYMERIZATION: Does not occur
POLYMERIZATION TO AVOID: N/A
INCOMPATIBILITY: ..... Avoid contact with strong oxidizing agents
DECOMPOSITION: ..... Carbon monoxide,Carbon dioxide,and oxides of Nitrogen and Sulfur.

SECTION VI - HEALTH DATA

THRESHOLD LIMIT VALUE:.. Not Established
OVER EXPOSURE EFFECTS: Contact with eyes may result in severe irritation. Contact with skin may result in irritation. Ingestion may result in gastric disturbances. Inhalation of dust may irritate respiratory tract.

SECTION VII FIRST AID

FIRST AID PROCEDURES: Flush eyes with flowing water at least 15 minutes. If irritation develops, consult a physician. Wash affected skin areas thoroughly with soap and water. If irritation develops, consult a physician. Remove and launder contaminated clothing before reuse.

If swallowed, dilute with water and induce vomiting. Get immediate medical attention. If inhaled, move to fresh air. Aid in breathing, if necessary, and get medical attention.

NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAS CONVULSIONS.

SECTION VIII EMPLOYEE PROTECTION

RESPIRATORY PROTECTION: NIOSH/OSHA approved dust respirator as necessary.
PROTECTIVE GLOVES: ..... To prevent skin contact.
EYE PROTECTION: ..... Goggles.
ADDITIONAL MEASURES: ..... Eye wash fountains should be easily accessible.
HANDLING AND STORAGE: ... Keep away from excessive heat and moisture. Keep containers closed.
VENTILATION: ..... Local exhaust to control dusts.

SECTION IX - SPILL AND DISPOSAL DATA

SPILL: ..... Spills should be contained and placed in suitable containers.
WASTE DISPOSAL: ..... Do not discharge into sewers or waterways. Dispose of in accordance with local regulations.

Material Safety Data Sheet
(FLUORESCEIN)
15174 URANINE C

SECTION X - TRANSPORTATION DATA

PROPER SHIPPING NAME: ..... Ink Material NMFC Item #101720
HAZARD CLASS AND LABEL: MFR LABEL ONLY
UN NUMBER: ..... N/A
REPORTABLE QUANTITY: ..... N/A

SECTION XI - ADDTIONAL INFORMATION

FOOT NOTES: This information is furnished without warranty, representation, or license of any kind, except that it is accurate to the best of CHEMCENTRAL Corporation's knowledge or obtained from sources believed by CHEMCENTRAL Corporation to be accurate.

The CHEMCENTRAL Corporation does not assume any legal responsibility for use or reliance upon same. Customers are encouraged to conduct their own tests. Before using any product, read its label.

Appendix C
USEPA Underground Injection Control Program

Type or print all information. See reverse for instructions.

OMB No. 2040-0042 Approval Expires 4/30/07

INVENTORY OF INJECTION WELLS

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GROUND WATER AND DRINKING WATER

(This information is collected under the authority of the Safe Drinking Water Act)

1. DATE PREPARED (Year, Month, Day): Aug 10, 2010

2. FACILITY ID NUMBER: NYD 002054419

PAPERWORK REDUCTION ACT NOTICE

The public reporting burden for this collection of information is estimated at about 0.5 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch, 2136, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, and to the Office of Management and Budget, Paperwork Reduction Project, Washington, DC 20503.

3. TRANSACTION TYPE (Please mark one of the following)

- [ ] Deletion
- [X] First Time Entry
- [ ] Entry Change
- [ ] Replacement

4. FACILITY NAME AND LOCATION

A. NAME (last, first, and middle initial): Pall Corporation

B. STREET ADDRESS/ROUTE NUMBER: 30 Sea Cliff Avenue

F. CITY/TOWN: Glen Cove

G. STATE: NY

C. LATITUDE: DEG 40 | MIN 51 | SEC 08.00

D. LONGITUDE: DEG 73 | MIN 37 | SEC 20.62

H. ZIP CODE: 11542

E. TOWNSHIP/RANGE

TOWNSHIP	RANGE	SECT	1/4 SECT

I. NUMERIC COUNTY CODE:

J. INDIAN LAND (mark "x"): [ ] Yes [X] No

5. LEGAL CONTACT:

A. TYPE (mark "x"): [X] Owner [ ] Operator

B. NAME (last, first, and middle initial): ~~Farsad~~ Fotouhi, Farsad

C. PHONE (area code and number): 734-913-6130

D. ORGANIZATION: Pall Corporation

E. STREET/P.O. BOX: 600 South Wagner Road

F. CITY/TOWN: Ann Arbor

G. STATE: MI

H. ZIP CODE:

I. OWNERSHIP (mark "x"): [X] PRIVATE [ ] PUBLIC [ ] SPECIFY OTHER [ ] STATE [ ] FEDERAL

6. WELL INFORMATION:

A. CLASS AND TYPE	B. NUMBER OF WELLS COMM	B. NUMBER OF WELLS NON-COMM	C. TOTAL NUMBER OF WELLS	D. WELL OPERATION STATUS UC	AC	TA	PA	AN
V -		2	0 2		2			
			0					
			0					
			0					
			0					
			0					
			0					

COMMENTS (Optional): Existing Monitoring wells will be used to inject 2 dyes at two locations to determine groundwater horizontal and vertical flow direction

KEY:
DEG = Degree
MIN = Minute
SEC = Second
SECT = Section
1/4 SECT = Quarter Section
COMM = Commercial
NON-COMM = Non-Commercial
AC = Active
UC = Under Construction
TA = Temporarily Abandoned
PA = Permanently Abandoned and Approved by State
AN = Permanently Abandoned and not Approved by State

EPA Form 7520-16 (Rev. 8-01)

Attachment 2 - EPA Inventory of Injection Wells Form

Appendix D
Dye Injection Pressure Estimate

Appendix D

Pressure Analysis for Dye Injection – Figure 4

The general equation used to calculate the hydraulic heads in response to injection is shown below.

$$S = 11.46QW(u)/T$$

Where

$$U = 1.87r^2S/(Tt)$$

And

s	= Water level change in feet
Q	= Injection rate in gallons per minute (gpm)
W(u)	= Well function, dimensionless
T	= Aquifer transmissivity in gallons per day per foot (gpd/ft)
r	= Distance from pumping well in feet
S	= Aquifer storativity as a decimal
t	= Time after pumping started in days

Source: William C. Walton, Analytical Groundwater Modeling, Flow and Contaminant Migration, Lewis Publishers, 1989.

Notes:

T=KD where K is hydraulic conductivity and D is aquifer thickness.

The range of aquifer thicknesses and hydraulic conductivity was used on are noted on Figure 4.

Storativity was assumed to be 0.2, based on literature values for sand.

Transmissivity (T) is equal to hydraulic conductivity For the plots in Figure 4, storativity (i.e. effective porosity) is assumed to be 20%,