ATTACHMENT A

REMEDIATION GENERAL PERMIT

(Provided on CD)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
BOSTON, MA 02109-3912

CERTIFIED MAIL RETURN RECEIPT REQUESTED

APR 4 2011

Brian Guichard, Site Manager
Olin Corporation
51 Eames Street
Wilmington, MA 01887

Re: Authorization to discharge under the Remediation General Permit (RGP) – MAG910000. Olin Corporation site located at 51 Eames Street Wilmington, MA 01887 Middlesex County; Authorization # MAG910074 – Reissuance

Dear Mr. Guichard:

Based on the review of a Notice of Intent (NOI) dated December 3, 2010 and submitted on behalf of Olin Corporation of Tennessee by Steve Morrow for the site referenced above, the U.S. Environmental Protection Agency (EPA) hereby authorizes you, as the named Operator, to discharge in accordance with the provisions of the RGP at this site. Your authorization number is listed above.

The checklist enclosed with this RGP authorization indicates the pollutants which you are required to monitor. Also indicated on the checklist are the effluent limits, test methods and minimum levels (MLs) for each pollutant. Please note that the checklist does not represent the complete requirements of the RGP. Operators must comply with all of the applicable requirements of this permit, including influent and effluent monitoring, narrative water quality standards, record keeping, and reporting requirements, found in Parts I and II, and Appendices I – VIII of the RGP. See EPA's website for the complete RGP and other information at: http://www.epa.gov/region1/npdes/mass.html#dgp.

Please note that the checklist includes parameters categorized as follows:

1. **Parameters you have marked "Believed Present".**

   These include total phenols, total phthalates, bis (2- ethylhexyl) phthalate, chloride and iron. With the exception of the pollutants iron and chloride, the remaining three parameters are not in violation of the RGP limits. However, since these were detected in historic (influent and effluent) data, monitoring is required based on the reasonable potential for re-occurrence of these pollutants in the future at levels which may violate RGP permit limits.

2. **Parameters you reported as "Believed Absent": total suspended solids, phenols, total residual chlorine, arsenic, nickel and zinc.**

   With the exception of arsenic which was reported in influent as high as 13 ug/L in violation of the Appendix III limit, total suspended solids, total residual chlorine, phenols, nickel, and zinc were detected at levels below the RGP limits. All these parameters are required to be monitored based also on their historic presence, and a reasonable potential to exceed RGP criteria limits in the future.

Also, please note that the metals included on the list are dilution dependent pollutants and subject to limitations based on a dilution factor range (DFR). Due to the absence of dilution since this discharge is to an unnamed ditch, EPA determined that the DFR for these parameters is in the one to five (1-5) range (See Appendix IV of the RGP for Massachusetts facilities). Therefore, the limits for arsenic of 10 ug/L, nickel of 29 ug/L, zinc of 66.6 ug/L and iron of 1,000 ug/L are required to achieve permit compliance at your site.

Finally, please note the list of pollutants attached to this authorization is subject to a recertification if the operations at the site result in a discharge lasting longer than six months. A recertification can be submitted to EPA within six (6) to twelve (12) months of operations in accordance with the 2010 RGP requirements.

This general permit and authorization to discharge will expire on September 9, 2015. Since you have not reported a termination date, we interpret that to mean that the discharge will continue indefinitely or that the termination date is unknown. If for any reason the discharge terminates sooner than the expiration date, you are required to submit a Notice of Termination (NOT) to the attention of the contact person indicated below within 30 days of project completion.

Thank you in advance for your cooperation in this matter. Please contact Victor Alvarez at 617-918-1572 or Alvarez.Victor@epa.gov, if you have any questions.

Sincerely,

David M. Webster, Chief
Industrial Permits Branch

Enclosure

cc: Kathleen Keohane, MassDEP
Steve Morrow, Olin

	Parameter	Effluent Limit/Method#/ML (All Effluent Limits are shown as Daily Maximum Limit, unless denoted by a **, in that case it will be a Monthly Average Limit)
	11. Methyl-tert-Butyl Ether (MtBE)	70.0 ug/l/Me#8260C/ML 10ug/L
	12.tert-Butyl Alcohol (TBA) (TertiaryButanol)	Monitor Only(ug/L)/Me#8260C/ML 10ug/L
	13. tert-Amyl Methyl Ether (TAME)	Monitor Only(ug/L)/Me#8260C/ML 10ug/L
	14. Naphthalene [5]	20 ug/L /Me#8260C/ML 2ug/L
	15. Carbon Tetrachloride	4.4 ug/L /Me#8260C/ ML 5ug/L
	16. 1,2 Dichlorobenzene (o-DCB)	600 ug/L /Me#8260C/ ML 5ug/L
	17. 1,3 Dichlorobenzene (m-DCB)	320 ug/L /Me#8260C/ ML 5ug/L
	18. 1,4 Dichlorobenzene (p-DCB)	5.0 ug/L /Me#8260C/ ML 5ug/L
	18a. Total dichlorobenzene	763 ug/L - NH only /Me#8260C/ ML 5ug/L
	19. 1,1 Dichloroethane (DCA)	70 ug/L /Me#8260C/ ML 5ug/L
	20. 1,2 Dichloroethane (DCA)	5.0 ug/L /Me#8260C/ ML 5ug/L
	21. 1,1 Dichloroethene (DCE)	3.2 ug/L/Me#8260C/ ML 5ug/L
	22. cis-1,2 Dichloroethene (DCE)	70 ug/L/Me#8260C/ ML 5ug/L
	23. Methylene Chloride	4.6 ug/L/Me#8260C/ ML 5ug/L
	24. Tetrachloroethene (PCE)	5.0 ug/L/Me#8260C/ ML 5ug/L
	25. 1,1,1 Trichloro-ethane (TCA)	200 ug/L/Me#8260C/ ML 5ug/L
	26. 1,1,2 Trichloro-ethane (TCA)	5.0 ug/L /Me#8260C/ ML 5ug/L
	27. Trichloroethene (TCE)	5.0 ug/L /Me#8260C/ ML 5ug/L
	28. Vinyl Chloride (Chloroethene)	2.0 ug/L /Me#8260C/ ML 5ug/L
	29. Acetone	Monitor Only(ug/L)/Me#8260C/ML 50ug/L
	30. 1,4 Dioxane	Monitor Only /Me#1624C/ML 50ug/L
√	31. Total Phenols	300 ug/L Me#420.1&420.2/ML 2 ug/L/ Me# 420.4 /ML 50ug/L
	32. Pentachlorophenol (PCP)	1.0 ug/L /Me#8270D/ML 5ug/L,Me#604 &625/ML 10ug/L
√	33. Total Phthalates (Phthalate esters) [6]	3.0 ug/L ** /Me#8270D/ML 5ug/L, Me#606/ML 10ug/L& Me#625/ML 5ug/L
√	34. Bis (2-Ethylhexyl) Phthalate [Di- (ethylhexyl) Phthalate]	6.0 ug/L /Me#8270D/ML 5ug/L,Me#606/ML 10ug/L & Me#625/ML 5ug/L
	35. Total Group I Polycyclic Aromatic Hydrocarbons (PAH)	10.0 ug/L
	a. Benzo(a) Anthracene [7]	0.0038 ug/L /Me#8270D/ ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L
	b. Benzo(a) Pyrene [7]	0.0038 ug/L /Me#8270D/ ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L

2010 Remediation General Permit
Summary of Monitoring Parameters[1]

NPDES Authorization Number:	**MAG91074 - Reissuance**
Date Authorization Issued:	March, 2011
Facility/Site Name:	Olin Corporation
Facility/Site Address:	Olin Corporation site located at 51 Eames Street Wilmington, MA 01887 Middlesex County
	Owners email:SCMorrow@olin.com
Legal Name of Operator:	Olin Corporation
Operators name, title, and address:	Brian Guichard, Site Manager Address, same as the owner.
Estimated Date of Completion:	Unknown
Category and Sub-Category:	Class II. Subcategory B. and C. VOC Sites with Additional Contamination and Primarily Heavy Metals Sites, Respectively.
Receiving Water:	Unnamed ditch to Halls Brook holding area.

Monitoring & Limits are applicable if checked. All samples are to be collected as grab samples

	Parameter	**Effluent Limit/Method#/ML** (All Effluent Limits are shown as Daily Maximum Limit, unless denoted by a **, in that case it will be a Monthly Average Limit)
✓	1. Total Suspended Solids (TSS)	30 milligrams/liter (mg/L) **, 50 mg/L for hydrostatic testing **, Me#60.2/ML5ug/L
✓	2. Total Residual Chlorine (TRC) [1]	Freshwater = 11 ug/L ** Saltwater = 7.5 ug/L **/ Me#330.5/ML 20ug/L
	3. Total Petroleum Hydrocarbons (TPH)	5.0 mg/L/ Me# 1664A/ML 5.0mg/L
	4. Cyanide (CN) [2, 3]	Freshwater = 5.2 ug/l ** Saltwater = 1.0 ug/L **/ Me#335.4/ML 5ug/L
	5. Benzene (B)	5ug/L /50.0 ug/L for hydrostatic testing only/ Me#8260C/ML 2 ug/L
	6. Toluene (T)	(limited as ug/L total BTEX)/ Me#8260C/ ML 2ug/L
	7. Ethylbenzene (E)	(limited as ug/L total BTEX) Me#8260C/ ML 2ug/L
	8. (m,p,o) Xylenes (X)	(limited as ug/L total BTEX) Me#8260C/ ML 2ug/L
	9. Total Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) [4]	100 ug/L/ Me#8260C/ ML 2ug/L
	10. Ethylene Dibromide (EDB) (1,2- Dibromoethane)	0.05 ug/l/ Me#8260C/ ML 10ug/L

	Parameter	Effluent Limit/Method#/ML (All Effluent Limits are shown as Daily Maximum Limit, unless denoted by a **, in that case it will be a Monthly Average Limit)
	c. Benzo(b)Fluoranthene [7]	0.0038 ug/L /Me#8270D/ ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L
	d. Benzo(k)Fluoranthene [7]	0.0038 ug/L /Me#8270D/ ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L
	e. Chrysene [7]	0.0038 ug/L /Me#8270D/ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L
	f. Dibenzo(a,h)anthracene [7]	0.0038 ug/L /Me#8270D/ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML 5ug/L
	g. Indeno(1,2,3-cd) Pyrene [7]	0.0038 ug/L /Me#8270D/ML 5ug/L, Me#610/ML 5ug/L& Me#625/ML5ug/L
	36. Total Group II Polycyclic Aromatic Hydrocarbons (PAH)	100 ug/L
	h. Acenaphthene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	i. Acenaphthylene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	j. Anthracene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	k. Benzo(ghi) Perylene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	l. Fluoranthene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	m. Fluorene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	n. Naphthalene [5]	20 ug/l / Me#8270/ML 5ug/L, Me#610/ML 5ug/L & Me#625/ML 5ug/L
	o. Phenanthrene	X/Me#8270D/ML 5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	p. Pyrene	X/Me#8270D/ML5ug/L,Me#610/ML 5ug/L & Me#625/ML 5ug/L
	37. Total Polychlorinated Biphenyls (PCBs) [8, 9]	0.000064 ug/L/Me# 608/ ML 0.5 ug/L
√	38. Chloride	Monitor only/Me# 300.0/ ML 0.1ug/L

	Metal parameter	Total Recoverable Metal Limit @ H [10]= 50 mg/l CaCO3 for discharges in Massachusetts (ug/l) [11/12]		Minimum level=ML	
		Freshwater			
	39. Antimony	5.6/ML 10			
√	40. Arsenic **	10/ML20			
	41. Cadmium **	0.2/ML10			
	42. Chromium III (trivalent) **	48.8/ML15			

	Metal parameter	Total Recoverable Metal Limit @ H [10]= 50 mg/l CaCO3 for discharges in Massachusetts (ug/l) [11/12]		Minimum level=ML	
		Freshwater			
	43. Chromium VI (hexavalent) **	11.4/ML10			
	44. Copper **	5.2/ML15			
	45. Lead **	1.3/ML20			
	46. Mercury **	0.9/ML0.2			
√	47. Nickel **	29/ML20			
	48. Selenium **	5/ML20			
	49. Silver	1.2/ML10			
√	50. Zinc **	66.6/ML15			
√	51. Iron	1,000/ML 20			

	Other Parameters	Limit
√	52. Instantaneous Flow	Site specific in CFS
√	53. Total Flow	Site specific in CFS
√	54. pH Range for Class A & Class B Waters in MA	6.5-8.3; 1/Month/Grab[13]
	55. pH Range for Class SA & Class SB Waters in MA	6.5-8.3; 1/Month/Grab[13]
	56. pH Range for Class B Waters in NH	6.5-8; 1/Month/Grab[13]
	57. Daily maximum temperature - Warm water fisheries	83°F; 1/Month/Grab[14]
	58. Daily maximum temperature - Cold water fisheries	68°F; 1/Month/Grab[14]
	59. Maximum Change in Temperature in MA - Any Class A water body	1.5°F; 1/Month/Grab[14]
	60. Maximum Change in Temperature in MA - Any Class B water body- Warm Water	5°F; 1/Month/Grab[14]
	61. Maximum Change in Temperature in MA – Any Class B water body - Cold water and Lakes/Ponds	3°F; 1/Month/Grab[14]
	62. Maximum Change in Temperature in MA – Any Class SA water body - Coastal	1.5°F; 1/Month/Grab[14]
	63. Maximum Change in Temperature in MA – Any Class SB water body - July to September	1.5°F; 1/Month/Grab[14]
	64. Maximum Change in Temperature in MA –Any Class SB water body - October to June	4°F; 1/Month/Grab[14]

Footnotes:

[1] Although the maximum values for TRC are 11ug/l and 7.5 ug/l for freshwater, and saltwater respectively, the compliance limits are equal to the minimum level (ML) of the test method used as listed in Appendix VI (i.e., Method 330.5, 20 ug/l).
[2] Limits for cyanide are based on EPA's water quality criteria expressed as micrograms per liter. There is currently no EPA approved test method for free cyanide. Therefore, total cyanide must be reported.

[3] Although the maximum values for cyanide are 5.2 ug/l and 1.0 ug/l for freshwater and saltwater, respectively, the compliance limits are equal to the minimum level (ML) of the Method 335.4 as listed in Appendix VI (i.e., 10 ug/l).
[4] BTEX = sum of Benzene, Toluene, Ethylbenzene, and total Xylenes.
[5] Naphthalene can be reported as both a purgeable (VOC) and extractable (SVOC) organic compound. If both VOC and SVOC are analyzed, the highest value must be used unless the QC criteria for one of the analyses is not met. In such cases, the value from the analysis meeting the QC criteria must be used.
[6] The sum of individual phthalate compounds(not including the #34, Bis (2-Ethylhexyl) Phthalate . The compliance limits are equal to the minimum level (ML) of the test method used as listed in Appendix VI.
Total values calculated for reporting on NOIs and discharge monitoring reports shall be calculated by adding the measured concentration of each constituent. If the measurement of a constituent is less than the ML, the permittee shall use a value of zero for that constituent. For each test, the permittee shall also attach the raw data for each constituent to the discharge monitoring report, including the minimum level and minimum detection level for the analysis.
[7] Although the maximum value for the individual PAH compounds is 0.0038 ug/l, the compliance limits are equal to the minimum level (ML) of the test method used as listed in Appendix VI.
[8] In the November 2002 WQC, EPA has revised the definition of Total PCBs for aquatic life as total PCBs is the sum of all homologue, all isomer, all congener, or all "Oroclor analyses."Total values calculated for reporting on NOIs and discharge monitoring reports shall be calculated by adding the measured concentration of each constituent. If the measure of a constituent is less than the ML, the permittee shall use a value of zero for that constituent. For each test, the permittee shall also attach the raw data for each constituent to the discharge monitoring report, including the minimum level and minimum detection level for the analysis.
[9]Although the maximum value for total PCBs is 0.000064 ug/l, the compliance limit is equal to the minimum level (ML) of the test method used as listed in Appendix VI (i.e., 0.5 ug/l for Method 608 or 0.00005 ug/l when Method 1668a is approved).
[10] Hardness. Cadmium, Chromium III, Copper, Lead, Nickel, Silver, and Zinc are Hardness Dependent.
[11] For a Dilution Factor (DF) from 1 to 5, metals limits are calculated using DF times the base limit for the metal. See Appendix IV. For example, iron limits are calculated using DF x 1,000ug/L (the iron base limit). Therefore DF is 1.5, the iron limit will be 1,500 ug/L; DF 2, then iron limit =1,000 x 2 =2,000 ug/L., etc. not to exceed the DF=5.
[12] Minimum Level (ML) is the lowest level at which the analytical system gives a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence. The ML is calculated by multiplying the laboratory-determined method detection limit by 3.18 (see 40 CFR Part 136, Appendix B).
[13] pH sampling for compliance with permit limits may be performed using field methods as provided for in EPA test Method 150.1.
[14] Temperature sampling per Method 170.1

Olin
3855 NORTH OCOEE STREET, SUITE 200, CLEVELAND, TN. 37312
(423) 336-4000 FAX (423) 336-4166

December 3, 2010

U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code OEP06-44
Boston, MA 02109-3912
ATT: Remediation General Permit NOI Processing

Re: Re-Application for Coverage under the 2010 Remediation General Permit
Olin Corporation
MAG910074

To Whom It May Concern:

Please find enclosed the Notice of Intent (NOI) to re-apply for coverage for the Final 2010 Remediation General Permit.

Sincerely,

Steve Morrow
Principal Environmental Specialist

B. Suggested Form for Notice of Intent (NOI) for the Remediation General Permit

1. General facility/site information. Please provide the following information about the site:

a) Name of **facility/site**: Olin Corporation		**Facility/site** mailing address:			
Location of **facility/site**: longitude: -71.153732 latitude: 42.528698	Facility SIC code(s): 9999	Street: 51 Eames Street			
b) Name of **facility/site owner:**		Town: Wilmington			
Email address of facility/site owner: SGMorrow@olin.com / Olin Corporation		State: MA	Zip: 01887	County: Middlesex	
Telephone no. of facility/site **owner**: 423-336-4511					
Fax no. of facility/site **owner**: 423-336-4166		**Owner** is (check one): 1. Federal ○ 2. State/Tribal ○ 3. Private ⊙ 4. Other ○ if so, describe:			
Address of **owner** (if different from site):					
Street: 3855 North Ocoee Street, Suite 200					
Town: Cleveland	State: TN	Zip: 37312	County: Bradley		
c) Legal name of **operator**:	**Operator** telephone no: 978-658-6121				
	Operator fax no.: 978-658-6121	**Operator** email: BEGuichard@olin.com			
Operator contact name and title: Brian Guichard, Site Manager					
Address of **operator** (if different from owner):	Street: 51 Eames Street				
Town: Wilmington	State: MA	Zip: 01887	County: Middlesex		

d) Check Y for "yes" or N for "no" for the following:
1. Has a prior NPDES permit exclusion been granted for the discharge? Y ○ N ⊙, if Y, number:
2. Has a prior NPDES application (Form 1 & 2C) ever been filed for the discharge?
Y ⊙ N ○, if Y, date and tracking #: 2/11/2000 MA0005304
3. Is the discharge a "new discharge" as defined by 40 CFR 122.2? Y ○ N ⊙
4. For sites in Massachusetts, is the discharge covered under the Massachusetts Contingency Plan (MCP) and exempt from state permitting? Y ○ N ⊙

e) Is site/facility subject to any State permitting, license, or other action which is causing the generation of discharge? Y ⊙ N ○
If Y, please list:
1. site identification # assigned by the state of NH or MA: RTN-3-0471
2. permit or license # assigned:
3. state agency contact information: name, location, and telephone number:

f) Is the site/facility covered by any other EPA permit, including:
1. Multi-Sector General Permit? Y ○ N ⊙, if Y, number:
2. Final Dewatering General Permit? Y ○ N ⊙, if Y, number:
3. EPA Construction General Permit? Y ○ N ⊙, if Y, number:
4. Individual NPDES permit? Y ○ N ⊙, if Y, number:
5. any other water quality related individual or general permit? Y ○ N ⊙, if Y, number: MAG910074

g) Is the site/facility located within or does it discharge to an Area of Critical Environmental Concern (ACEC)? Y ○ N ⊙

h) Based on the facility/site information and any historical sampling data, identify the sub-category into which the potential discharge falls.

Activity Category	**Activity Sub-Category**
I - Petroleum Related Site Remediation	A. Gasoline Only Sites ☐ B. Fuel Oils and Other Oil Sites (including Residential Non-Business Remediation Discharges) ☐ C. Petroleum Sites with Additional Contamination ☐
II - Non Petroleum Site Remediation	A. Volatile Organic Compound (VOC) Only Sites ☐ B. VOC Sites with Additional Contamination ☒ C. Primarily Heavy Metal Sites ☒
III - Contaminated Construction Dewatering	A. General Urban Fill Sites ☐ B. Known Contaminated Sites ☐

IV - Miscellaneous Related Discharges	A. Aquifer Pump Testing to Evaluate Formerly Contaminated Sites ☐ B. Well Development/Rehabilitation at Contaminated/Formerly Contaminated Sites ☐ C. Hydrostatic Testing of Pipelines and Tanks ☐ D. Long-Term Remediation of Contaminated Sumps and Dikes ☐ E. Short-term Contaminated Dredging Drain Back Waters (if not covered by 401/404 permit) ☐

2. Discharge information. Please provide information about the discharge, (attaching additional sheets as necessary) including:

a) Describe the discharge activities for which the owner/applicant is seeking coverage:

Pump and treat system to contain LNAPL migration

b) Provide the following information about each discharge:

1) Number of discharge points: 1

2) What is the **maximum** and **average flow rate** of discharge (in cubic feet per second, ft^3/s)?
Max. flow 0.22 Is maximum flow a **design value**? Y ○ N ⊙
Average flow (include units) 0.19 Is average flow a design value or estimate? ESTIMATE

3) Latitude and longitude of each discharge within 100 feet:

pt.1: lat	42.527244	long	-71.155097	pt.2: lat.		long.	;
pt.3: lat		long		pt.4: lat.		long.	;
pt.5: lat		long		pt.6: lat.		long.	;
pt.7: lat		long		pt.8: lat.		long.	; etc.

4) If hydrostatic testing, total volume of the discharge (gals):

5) Is the discharge intermittent ⊙ or seasonal ○ ?
Is discharge ongoing? Y ⊙ N ○

c) Expected dates of discharge (mm/dd/yy): start end

d) Please attach a line drawing or flow schematic showing water flow through the facility including:
1. sources of intake water, 2. contributing flow from the operation, 3. treatment units, and 4. discharge points and receiving waters(s). Unnamed ditch, East ditch, New Boston Street drainway, Halls Brook Holding area

3. Contaminant information.

a) Based on the sub-category selected (see Appendix III), indicate whether each listed chemical is **believed present** or **believed absent** in the potential discharge. Attach additional sheets as needed.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
1. Total Suspended Solids (TSS)		☒	☐	1	grab	SM 2540	D 2.0			0	0
2. Total Residual Chlorine (TRC)		☒	☐	9	grab	SM 4500	CLF 0.020			0	0
3. Total Petroleum Hydrocarbons (TPH)		☒	☐	9	grab	1664A	4.7			0	0
4. Cyanide (CN)	57125	☒	☐	1	grab	620400	IACN 0.010			0	0
5. Benzene (B)	71432	☒	☐	9	grab	82600B	1.0			0	0
6. Toluene (T)	108883	☒	☐	9	grab	82600B	1.0			0	0
7. Ethylbenzene (E)	100414	☒	☐	9	grab	82600B	1.0			0	0
8. (m,p,o) Xylenes (X)	108883; 106423; 95476; 1330207	☒	☐	9	grab	82600B	1.0			0	0
9. Total BTEX [2]	n/a	☒	☐	9	grab	82600B	1.0			0	0
10. Ethylene Dibromide (EDB) (1,2-Dibromoethane) [3]	106934	☒	☐	1	grab	8011	0.02			0	0
11. Methyl-tert-Butyl Ether (MtBE)	1634044	☒	☐	1	grab	8260 B	1.0			0	0
12. tert-Butyl Alcohol (TBA) (Tertiary-Butanol)	75650	☒	☐	1	grab	8260 B	50			0	0

* Numbering system is provided to allow cross-referencing to Effluent Limits and Monitoring Requirements by Sub-Category included in Appendix III, as well as the Test Methods and Minimum Levels associated with each parameter provided in Appendix VI.

[2] BTEX = Sum of Benzene, Toluene, Ethylbenzene, total Xylenes.

[3] EDB is a groundwater contaminant at fuel spill and pesticide application sites in New England.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
13. tert-Amyl Methyl Ether (TAME)	9940508	☒	☐	1	grab	8260 B	1.0			0	0
14. Naphthalene	91203	☒	☐	9	grab	8270 C	0.91			0	0
15. Carbon Tetrachloride	56235	☒	☐	1	grab	8260 B	1.0			0	0
16. 1,2 Dichlorobenzene (o-DCB)	95501	☒	☐	1	grab	8260 B	1.0			0	0
17. 1,3 Dichlorobenzene (m-DCB)	541731	☒	☐	1	grab	8260 B	1.0			0	0
18. 1,4 Dichlorobenzene (p-DCB)	106467	☒	☐	1	grab	8260 B	1.0			0	0
18a. Total dichlorobenzene		☒	☐								
19. 1,1 Dichloroethane (DCA)	75343	☒	☐	1	grab	8260 B	1.0			0	0
20. 1,2 Dichloroethane (DCA)	107062	☒	☐	1	grab	8260 B	1.0			0	0
21. 1,1 Dichloroethene (DCE)	75354	☒	☐	9	grab	8260 B	1.0			0	0
22. cis-1,2 Dichloroethene (DCE)	156592	☒	☐	9	grab	8260 B	1.0			0	0
23. Methylene Chloride	75092	☒	☐	1	grab	8260 B	2.0			0	0
24. Tetrachloroethene (PCE)	127184	☒	☐	1	grab	8260 B	1.0			0	0
25. 1,1,1 Trichloro-ethane (TCA)	71556	☒	☐	9	grab	8260 B	1.0			0	0
26. 1,1,2 Trichloro-ethane (TCA)	79005	☒	☐	1	grab	8260 B	1.0			0	0
27. Trichloroethene (TCE)	79016	☒	☐	9	grab	8260 B	1.0			0	0

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
28. Vinyl Chloride (Chloroethene)	75014	☒	☐	1	grab	8260 B	0.5			0	0
29. Acetone	67641	☒	☐	9	grab	8260 B	50			0	0
30. 1,4 Dioxane	123911	☒	☐	1	grab	8260 B	50			0	0
31. Total Phenols	108952	☐	☒	9	grab	L210-001A	0.01			0	0.066
32. Pentachlorophenol (PCP)	87865	☒	☐	9	grab	8270 C	0.91			0	0
33. Total Phthalates (Phthalate esters) [4]		☐	☒	9	grab	8270 C					0.048
34. Bis (2-Ethylhexyl) Phthalate [Di-(ethylhexyl) Phthalate]	117817	☐	☒	9	grab	8270 C	1.8				0.022
35. Total Group I Polycyclic Aromatic Hydrocarbons (PAH)		☒	☐	9	grab	8270 C				0	0
a. Benzo(a) Anthracene	56553	☒	☐	9	grab	8270 C	0.27			0	0
b. Benzo(a) Pyrene	50328	☒	☐	9	grab	8270 C	0.18			0	0
c. Benzo(b)Fluoranthene	205992	☒	☐	9	grab	8270 C	0.27			0	0
d. Benzo(k)Fluoranthene	207089	☒	☐	9	grab	8270 C	0.27			0	0
e. Chrysene	21801	☒	☐	9	grab	8270 C	0.91			0	0
f. Dibenzo(a,h)anthracene	53703	☒	☐	9	grab	8270 C	0.45			0	0
g. Indeno(1,2,3-cd) Pyrene	193395	☒	☐	9	grab	8270 C	0.45			0	0
36. Total Group II Polycyclic Aromatic Hydrocarbons (PAH)		☒	☐	9	grab	8270 C				0	0

[4] The sum of individual phthalate compounds.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
h. Acenaphthene	83329	☒	☐	9	grab	8270 C	0.91			0	0
i. Acenaphthylene	208968	☒	☐	9	grab	8270 C	0.27			0	0
j. Anthracene	120127	☒	☐	9	grab	8270 C	0.91			0	0
k. Benzo(ghi) Perylene	191242	☒	☐	9	grab	8270 C	0.45			0	0
l. Fluoranthene	206440	☒	☐	9	grab	8270 C	0.91			0	0
m. Fluorene	86737	☒	☐	9	grab	8270 C	0.91			0	0
n. Naphthalene	91203	☒	☐	9	grab	8270 C	0.91			0	0
o. Phenanthrene	85018	☒	☐	9	grab	8270 C	0.18			0	0
p. Pyrene	129000	☒	☐	9	grab	8270 C	4.5			0	0
37. Total Polychlorinated Biphenyls (PCBs)	85687; 84742; 117840; 84662; 131113; 117817.	☒	☐	1	grab	608	0.91			0	0
38. Chloride	16887006	☐	☒	1	grab	300.0	10			320,000	235
39. Antimony	7440360	☒	☐	1	grab	200.7	6.0			0	0
40. Arsenic	7440382	☒	☐	1	grab	200.7	10			0	0
41. Cadmium	7440439	☒	☐		grab	200.7	1.0			0	0
42. Chromium III (trivalent)	16065831	☒	☐	1	grab	200.7	5.0			0	0
43. Chromium VI (hexavalent)	18540299	☒	☐	1	grab	7196 A	5.0			0	0
44. Copper	7440508	☒	☐	1	grab	200.7	1.0			0	0
45. Lead	7439921	☒	☐	1	grab	200.7	5.0			0	0
46. Mercury	7439976	☒	☐	1	grab	245.1	0.20			0	0
47. Nickel	7440020	☒	☐	1	grab	200.7	10			0	0
48. Selenium	7782492	☒	☐	1	grab	200.7	10			0	0
49. Silver	7440224	☒	☐	1	grab	200.7	5.0			0	0
50. Zinc	7440666	☒	☐	1	grab	200.7	50			0	0
51. Iron	7439896	☐	☒	9	grab	200.7	100				811.85
Other (describe):		☐	☐		grab						

Other

Paarameter	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type	Analytical Method Used	Minimum Level of Test Method	Maximum Daily Value		Average Concnetration	
								Concentration	Mass	Concentration	Mass
								(µg/l)	(kg)	(µg/l)	(kg)
Ammonia	8013-59-0	X		9	Grab	L107-06-1B	0.1 mg/l			0	
2,4,4-Trimethyl-1-Pentene	107-39-1	X		9	Grab	8260B	1 µg/l			0	
2,4,4-Trimethyl-2-Pentene	107-40-4	X		9	Grab	8260B	1 µg/l			0	
N-Nitrosodimethylamine	62-75-9		X	1	Grab	8270LL	1.9 ng/l			0.096	0.000066

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
		☐	☐								
		☐	☐								

b) For discharges where **metals** are believed present, please fill out the following (attach results of any calculations):

Step 1: Do any of the metals in the influent exceed the effluent limits in Appendix III (i.e., the limits set at zero dilution)? Y ⊙ N ○	If yes, which metals? ARSENIC, IRON
Step 2: For any metals which exceed the **Appendix III** limits, calculate the **dilution factor (DF)** using the formula in Part I.A.3.c (step 2) of the NOI instructions or as determined by the State prior to the submission of this NOI. What is the dilution factor for applicable metals? Metal: ARSENIC DF: 0 Metal: IRON DF: 0 Metal: DF: Metal: DF: Etc.	Look up the limit calculated at the corresponding dilution factor in **Appendix IV.** Do any of the metals in the **influent** have the potential to exceed the corresponding **effluent** limits in Appendix IV (i.e., is the influent concentration above the limit set at the calculated dilution factor)? Y ⊙ N ○ If Y, list which metals: ARSENIC, IRON

4. Treatment system information. Please describe the treatment system using separate sheets as necessary, including:

a) A description of the treatment system, including a schematic of the proposed or existing treatment system:

See attached sketch and process description.

b) Identify each applicable treatment unit (check all that apply):	Frac. tank ☐	Air stripper ☐	Oil/water separator ☐	Equalization tanks ☒	Bag filter ☒	GAC filter ☒
	Chlorination ☒	De-chlorination ☒	Other (please describe):			

c) Proposed **average** and **maximum flow rates** (gallons per minute) for the discharge and the **design flow rate**(s) (gallons per minute) of the treatment system:
Average flow rate of discharge 15.86 gpm Maximum flow rate of treatment system 25 gpm
Design flow rate of treatment system 25 gpm

d) A description of chemical additives being used or planned to be used (attach MSDS sheets):

CALCIUM HYPOCHLORITE, SODIUM HYDROXIDE, HYDROCHLORIC ACID, SODIUM SULFITE

5. Receiving surface water(s). Please provide information about the receiving water(s), using separate sheets as necessary:

a) Identify the discharge pathway:	Direct to receiving water ☐	Within facility (sewer) ☐	Storm drain ☐	Wetlands ☒	Other (describe): DRAINAGE DITCH

b) Provide a narrative description of the discharge pathway, including the name(s) of the receiving waters:
Unnamed ditch, East ditch, New Boston Street drainway, Halls Brook Holding area

c) Attach a detailed map(s) indicating the site location and location of the outfall to the receiving water:
1. For multiple discharges, number the discharges sequentially.
2. For indirect dischargers, indicate the location of the discharge to the indirect conveyance and the discharge to surface water
The map should also include the location and distance to the nearest sanitary sewer as well as the locus of nearby sensitive receptors (based on USGS topographical mapping), such as surface waters, drinking water supplies, and wetland areas.

d) Provide the state water quality classification of the receiving water CLASS B

e) Provide the reported or calculated seven day-ten year low flow (7Q10) of the receiving water 0 cfs
Please attach any calculation sheets used to support stream flow and dilution calculations.

f) Is the receiving water a listed 303(d) water quality impaired or limited water? Y ○ N ⊙ If yes, for which pollutant(s)?

Is there a final TMDL? Y ○ N ⊙ If yes, for which pollutant(s)?

6. ESA and NHPA Eligibility.

Please provide the following information according to requirements of Permit Parts I.A.4 and I.A.5 Appendices II and VII.

a) Using the instructions in Appendix VII and information on Appendix II, under which criterion listed in Part I.C are you eligible for coverage under this general permit?

A ⊙ B ○ C ○ D ○ E ○ F ○

b) If you selected Criterion D or F, has consultation with the federal services been completed? Y ○ N ○ Underway ○

c) If consultation with U.S. Fish and Wildlife Service and/or NOAA Fisheries Service was completed, was a written concurrence finding that the discharge is "not likely to adversely affect" listed species or critical habitat received? Y ⊙ N ○

d) Attach documentation of ESA eligibility as described in the NOI instructions and required by Appendix VII, Part I.C, Step 4.

e) Using the instructions in Appendix VII, under which criterion listed in Part II.C are you eligible for coverage under this general permit?

1 ⊙ 2 ○ 3 ○

f) If Criterion 3 was selected, attach all written correspondence with the State or Tribal historic preservation officers, including any terms and conditions that outline measures the applicant must follow to mitigate or prevent adverse effects due to activities regulated by the RGP.

7. Supplemental information.

Please provide any supplemental information. Attach any analytical data used to support the application. Attach any certification(s) required by the general permit.

8. Signature Requirements: The Notice of Intent must be signed by the operator in accordance with the signatory requirements of 40 CFR Section 122.22, including the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Facility/Site Name:	OLIN CORPORATION
Operator signature:	Curtis M Richards
Printed Name &Title:	CURTIS M. RICHARDS, CORPORATE VICE PRESIDENT - ENVIRONMENT, HEALTH & SAFETY
Date:	12/2/10

Prepared/Date: BJR 09/28/10
Checked/Date: PHT 09/28/10

Olin Corporation

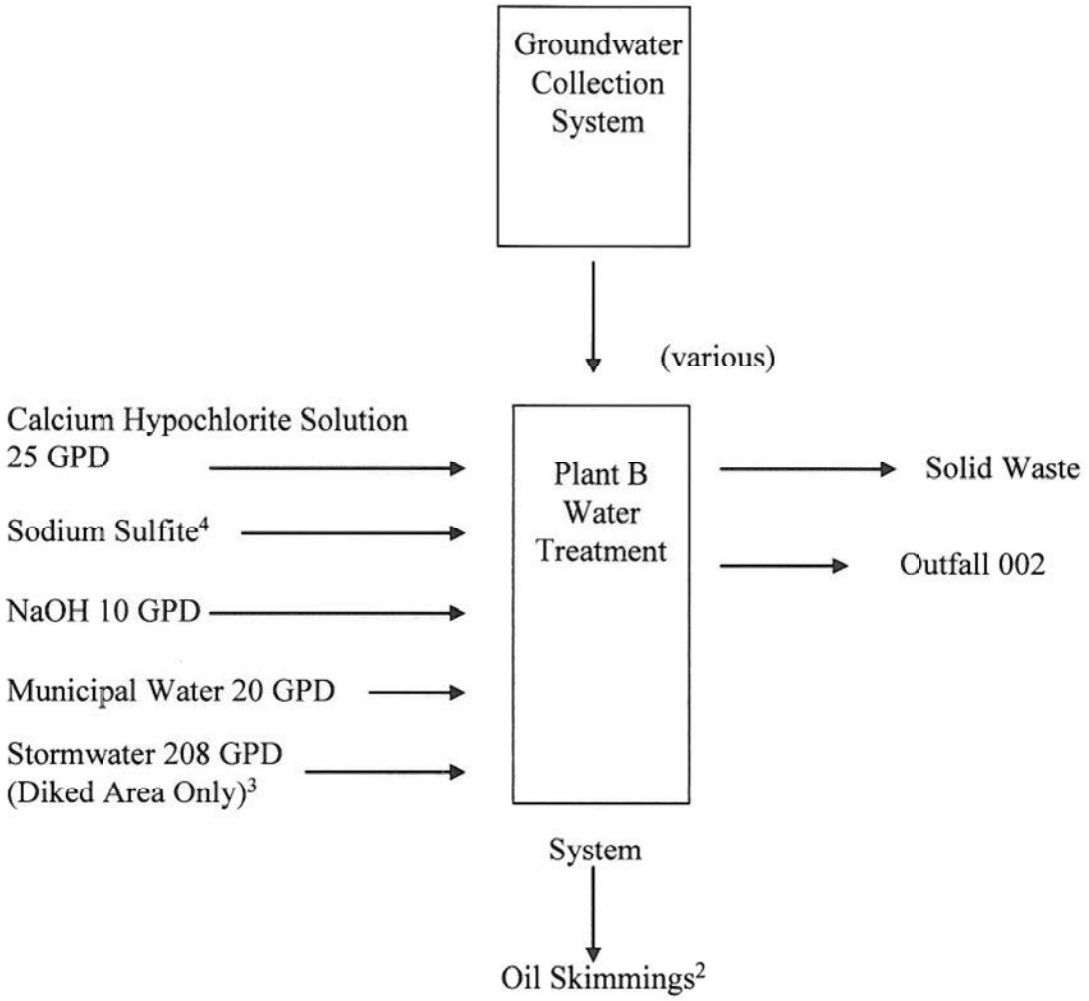
MACTEC

Figure 1
Site Location

Document: P:\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_8X11_P_NaturalHeritageRequest.mxd PDF: P:\OLIN\Wilmington\GIS\Figures\Plant B and RGP Discharge Location.pdf 09/28/2010 3:58 PM bjroden

Attachment II

Wilmington Wastewater Flow
MA6910074



Notes:

1. Various Flow Rate
2. Solid Waste consist of 1) 1-Drum of Filter Bags/year
   2) 6-2000# carbon beds/year carbon shipping back to Calgon Corporation for regeneration
   3) < 1-55 Gallon Drum of Recovered Oil
3. Stormwater Basis: 33' x 51' Pad with 49.5" Rainfall/year
   Discharge approximately 250 days/year
4. Only added if Total Residual Chlorine is >0.02mg/l

Mr. Steven Morrow
Olin Corporation
3855 North Ocoee Street
Suite 200
Cleveland, TN 37312-4441

Job Number: 360-30715-1

Client Sample ID: **OC-Eff102010**
Lab Sample ID: **360-30715-1**

EFFLUENT

Date Sampled: 10/20/2010 1025
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier	Unit	MDL	RL	Dilution
Method: 8260B		Date Analyzed:		10/27/2010 0518	
Prep Method: 5030B		Date Prepared:		10/27/2010 0518	
Benzene	ND	ug/L	0.20	1.0	1.0
Toluene	ND	ug/L	0.40	1.0	1.0
Ethylbenzene	ND	ug/L	0.20	1.0	1.0
o-Xylene	ND	ug/L	0.40	1.0	1.0
m-Xylene & p-Xylene	ND	ug/L	0.40	2.0	1.0
Methyl tert-butyl ether	ND	ug/L	0.20	1.0	1.0
Butyl alcohol, tert-	ND	ug/L	3.8	50	1.0
Tert-amyl methyl ether	ND	ug/L	0.60	5.0	1.0
Carbon tetrachloride	ND	ug/L	0.40	1.0	1.0
1,1,1-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1,2-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1-Dichloroethane	ND	ug/L	0.20	1.0	1.0
1,1-Dichloroethene	ND	ug/L	0.40	1.0	1.0
1,2-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,2-Dichloroethane	ND	ug/L	0.40	1.0	1.0
1,3-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,4-Dioxane	ND	ug/L	10	50	1.0
1,4-Dichlorobenzene	ND	ug/L	0.20	1.0	1.0
Acetone	ND	ug/L	16	50	1.0
cis-1,2-Dichloroethene	ND	ug/L	0.20	1.0	1.0
Methylene Chloride	ND	ug/L	0.20	2.0	1.0
Tetrachloroethene	ND	ug/L	0.20	1.0	1.0
Trichloroethene	ND	ug/L	0.40	1.0	1.0
Vinyl chloride	ND	ug/L	0.40	0.50	1.0
2,4,4-Trimethyl-1-pentene	ND	ug/L	0.60	1.0	1.0
2,4,4-Trimethyl-2-pentene	ND	ug/L	0.60	1.0	1.0
Surrogate				Acceptance Limits	
4-Bromofluorobenzene	96	%		70 - 130	
Dibromofluoromethane	100	%		70 - 130	
Toluene-d8 (Surr)	102	%		70 - 130	
Method: 8270C LL		Date Analyzed:		11/10/2010 1952	
Prep Method: 3510C		Date Prepared:		10/25/2010 1620	
2,4,5-Trichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4,6-Trichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dinitrophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dimethylphenol	ND	ug/L	0.45	4.5	1.0
2-Chlorophenol	ND	ug/L	0.45	4.5	1.0

Mr. Steven Morrow
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Job Number: 360-30715-1

Client Sample ID: **OC-Eff102010**
Lab Sample ID: **360-30715-1**

Date Sampled: 10/20/2010 1025
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	MDL	RL	Dilution
2-Methylphenol	ND		ug/L	0.45	4.5	1.0
2-Nitrophenol	ND		ug/L	0.45	4.5	1.0
3 & 4 Methylphenol	ND		ug/L	0.45	4.5	1.0
4,6-Dinitro-2-methylphenol	ND		ug/L	0.45	4.5	1.0
4-Chloro-3-methylphenol	ND		ug/L	0.45	4.5	1.0
4-Nitrophenol	ND		ug/L	0.45	4.5	1.0
Acenaphthene	ND		ug/L	0.045	0.91	1.0
Acenaphthylene	ND		ug/L	0.045	0.27	1.0
Anthracene	ND		ug/L	0.064	0.91	1.0
Benzo[a]anthracene	ND		ug/L	0.15	0.27	1.0
Benzo[a]pyrene	ND		ug/L	0.094	0.18	1.0
Benzo[b]fluoranthene	ND		ug/L	0.13	0.27	1.0
Benzo[g,h,i]perylene	ND		ug/L	0.085	0.45	1.0
Benzo[k]fluoranthene	ND		ug/L	0.15	0.27	1.0
Bis(2-ethylhexyl) phthalate	0.45	J B	ug/L	0.45	1.8	1.0
Butyl benzyl phthalate	ND		ug/L	0.45	4.5	1.0
Chrysene	ND		ug/L	0.15	0.91	1.0
Di-n-butyl phthalate	0.57	J B	ug/L	0.55	4.5	1.0
Di-n-octyl phthalate	ND		ug/L	0.66	4.5	1.0
Dibenz(a,h)anthracene	ND		ug/L	0.058	0.45	1.0
Diethyl phthalate	ND		ug/L	0.45	4.5	1.0
Dimethyl phthalate	ND		ug/L	0.45	4.5	1.0
Fluoranthene	ND		ug/L	0.18	0.91	1.0
Fluorene	ND		ug/L	0.045	0.91	1.0
Indeno[1,2,3-cd]pyrene	ND		ug/L	0.072	0.45	1.0
Naphthalene	ND		ug/L	0.045	0.91	1.0
Pentachlorophenol	ND		ug/L	0.45	0.91	1.0
Phenanthrene	ND		ug/L	0.077	0.18	1.0
Phenol	ND		ug/L	0.45	4.5	1.0
Pyrene	ND		ug/L	0.17	4.5	1.0
N-Nitrosodimethylamine	ND		ug/L	0.45	4.5	1.0

Surrogate			Acceptance Limits
2,4,6-Tribromophenol	62	%	15 - 110
2-Fluorobiphenyl	59	%	30 - 130
2-Fluorophenol	28	%	15 - 110
Phenol-d5	17	%	15 - 110
Terphenyl-d14	75	%	30 - 130
Nitrobenzene-d5	68	%	30 - 130

Method: **608**
Prep Method: **CWA_Prep**

Date Analyzed: 10/26/2010 1722
Date Prepared: 10/22/2010 1558

Mr. Steven Morrow
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3855 North Ocoee Street
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Cleveland, TN 37312-4441

Job Number: 360-30715-1

Client Sample ID: **OC-Eff102010**
Lab Sample ID: **360-30715-1**

Date Sampled: 10/20/2010 1025
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	MDL	RL	Dilution
PCB-1016	ND	*	ug/L	0.25	0.91	1.0
PCB-1221	ND		ug/L	0.40	0.91	1.0
PCB-1232	ND		ug/L	0.31	0.91	1.0
PCB-1242	ND		ug/L	0.16	0.91	1.0
PCB-1248	ND		ug/L	0.35	0.91	1.0
PCB-1254	ND		ug/L	0.31	0.91	1.0
PCB-1260	ND	*	ug/L	0.23	0.91	1.0
Surrogate					Acceptance Limits	
Tetrachloro-m-xylene	83		%		30 - 150	
DCB Decachlorobiphenyl	113		%		30 - 150	
Surrogate					Acceptance Limits	
Tetrachloro-m-xylene	87		%		30 - 150	
DCB Decachlorobiphenyl	109		%		30 - 150	
Method: 8011			Date Analyzed:		11/01/2010 1746	
Prep Method: 8011			Date Prepared:		11/01/2010 1000	
Ethylene Dibromide	ND		ug/L	0.013	0.020	1.0
Surrogate					Acceptance Limits	
1,1,1,2-Tetrachloroethane	109		%		70 - 130	
Surrogate					Acceptance Limits	
1,1,1,2-Tetrachloroethane	105		%		70 - 130	
Method: 200.7 Rev 4.4			Date Analyzed:		10/27/2010 1241	
Prep Method: 200.7			Date Prepared:		10/26/2010 0752	
Silver	ND		ug/L	1.4	5.0	1.0
Arsenic	ND		ug/L	2.8	10	1.0
Cadmium	ND		ug/L	0.13	1.0	1.0
Chromium	ND		ug/L	0.65	5.0	1.0
Copper	ND		ug/L	2.3	10	1.0
Iron	ND		ug/L	14	100	1.0
Nickel	ND		ug/L	1.2	10	1.0
Lead	ND		ug/L	1.4	5.0	1.0
Antimony	ND		ug/L	1.5	6.0	1.0
Selenium	ND		ug/L	4.0	10	1.0
Zinc	ND		ug/L	6.6	50	1.0
Method: 245.1			Date Analyzed:		10/26/2010 1547	
Prep Method: 245.1			Date Prepared:		10/26/2010 0819	
Mercury	ND		ug/L	0.060	0.20	1.0

Mr. Steven Morrow
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Job Number: 360-30715-1

Client Sample ID: **OC-Eff102010**
Lab Sample ID: **360-30715-1**

Date Sampled: 10/20/2010 1025
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	RL	RL	Dilution
Method: 1664A			Date Analyzed:	10/27/2010 1606		
Prep Method: 1664A			Date Prepared:	10/27/2010 1119		
SGT-HEM	ND		mg/L	4.7	4.7	1.0
Method: 300.0			Date Analyzed:	10/30/2010 0928		
Chloride	320		mg/L	10	10	10
Method: 7196A			Date Analyzed:	10/21/2010 0821		
Cr (VI)	ND		mg/L	0.0050	0.0050	1.0
Method: 7196A			Date Analyzed:	11/03/2010 1131		
Chromium, trivalent	ND		mg/L	0.0050	0.0050	1.0
Method: L204001A CN			Date Analyzed:	10/26/2010 1509		
Prep Method: Distill/CN			Date Prepared:	10/26/2010 1035		
Cyanide, Total	ND		mg/L	0.010	0.010	1.0
Method: L210-001A			Date Analyzed:	11/05/2010 1556		
Prep Method: Distill/Phenol			Date Prepared:	11/05/2010 1359		
Phenols, Total	ND		mg/L	0.010	0.010	1.0
Method: SM 2540D			Date Analyzed:	10/26/2010 1023		
Total Suspended Solids	ND		mg/L	2.0	2.0	1.0
Method: SM 4500 Cl F			Date Analyzed:	10/21/2010 0918		
Chlorine	ND	HF	mg/L	0.020	0.020	1.0

Mr. Steven Morrow
Olin Corporation
3855 North Ocoee Street
Suite 200
Cleveland, TN 37312-4441

Job Number: 360-30715-1

Client Sample ID: **OC-Inf102010** INFLUENT
Lab Sample ID: **360-30715-2**

Date Sampled: 10/20/2010 0945
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier	Unit	MDL	RL	Dilution
Method: 8260B		Date Analyzed:		10/27/2010 0540	
Prep Method: 5030B		Date Prepared:		10/27/2010 0540	
Benzene	ND	ug/L	0.20	1.0	1.0
Toluene	ND	ug/L	0.40	1.0	1.0
Ethylbenzene	ND	ug/L	0.20	1.0	1.0
o-Xylene	ND	ug/L	0.40	1.0	1.0
m-Xylene & p-Xylene	ND	ug/L	0.40	2.0	1.0
Methyl tert-butyl ether	ND	ug/L	0.20	1.0	1.0
Butyl alcohol, tert-	ND	ug/L	3.8	50	1.0
Tert-amyl methyl ether	ND	ug/L	0.60	5.0	1.0
Carbon tetrachloride	ND	ug/L	0.40	1.0	1.0
1,1,1-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1,2-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1-Dichloroethane	ND	ug/L	0.20	1.0	1.0
1,1-Dichloroethene	ND	ug/L	0.40	1.0	1.0
1,2-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,2-Dichloroethane	ND	ug/L	0.40	1.0	1.0
1,3-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,4-Dioxane	ND	ug/L	10	50	1.0
1,4-Dichlorobenzene	ND	ug/L	0.20	1.0	1.0
Acetone	ND	ug/L	16	50	1.0
cis-1,2-Dichloroethene	ND	ug/L	0.20	1.0	1.0
Methylene Chloride	ND	ug/L	0.20	2.0	1.0
Tetrachloroethene	ND	ug/L	0.20	1.0	1.0
Trichloroethene	ND	ug/L	0.40	1.0	1.0
Vinyl chloride	ND	ug/L	0.40	0.50	1.0
2,4,4-Trimethyl-1-pentene	120	ug/L	0.60	1.0	1.0
2,4,4-Trimethyl-2-pentene	21	ug/L	0.60	1.0	1.0

Surrogate			Acceptance Limits
4-Bromofluorobenzene	99	%	70 - 130
Dibromofluoromethane	98	%	70 - 130
Toluene-d8 (Surr)	98	%	70 - 130

Method: 8270C LL		Date Analyzed:		11/10/2010 2024	
Prep Method: 3510C		Date Prepared:		10/25/2010 1620	
2,4,5-Trichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4,6-Trichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dichlorophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dinitrophenol	ND	ug/L	0.45	4.5	1.0
2,4-Dimethylphenol	ND	ug/L	0.45	4.5	1.0
2-Chlorophenol	ND	ug/L	0.45	4.5	1.0

Mr. Steven Morrow
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Job Number: 360-30715-1

Client Sample ID: **OC-Inf102010**
Lab Sample ID: **360-30715-2**

Date Sampled: 10/20/2010 0945
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	MDL	RL	Dilution
2-Methylphenol	ND		ug/L	0.45	4.5	1.0
2-Nitrophenol	ND		ug/L	0.45	4.5	1.0
3 & 4 Methylphenol	ND		ug/L	0.45	4.5	1.0
4,6-Dinitro-2-methylphenol	ND		ug/L	0.45	4.5	1.0
4-Chloro-3-methylphenol	ND		ug/L	0.45	4.5	1.0
4-Nitrophenol	ND		ug/L	0.45	4.5	1.0
Acenaphthene	ND		ug/L	0.045	0.91	1.0
Acenaphthylene	ND		ug/L	0.045	0.27	1.0
Anthracene	ND		ug/L	0.064	0.91	1.0
Benzo[a]anthracene	ND		ug/L	0.15	0.27	1.0
Benzo[a]pyrene	ND		ug/L	0.094	0.18	1.0
Benzo[b]fluoranthene	ND		ug/L	0.13	0.27	1.0
Benzo[g,h,i]perylene	ND		ug/L	0.085	0.45	1.0
Benzo[k]fluoranthene	ND		ug/L	0.15	0.27	1.0
Bis(2-ethylhexyl) phthalate	9.3	B	ug/L	0.45	1.8	1.0
Butyl benzyl phthalate	ND		ug/L	0.45	4.5	1.0
Chrysene	ND		ug/L	0.15	0.91	1.0
Di-n-butyl phthalate	0.60	J B	ug/L	0.55	4.5	1.0
Di-n-octyl phthalate	ND		ug/L	0.66	4.5	1.0
Dibenz(a,h)anthracene	ND		ug/L	0.058	0.45	1.0
Diethyl phthalate	ND		ug/L	0.45	4.5	1.0
Dimethyl phthalate	ND		ug/L	0.45	4.5	1.0
Fluoranthene	ND		ug/L	0.18	0.91	1.0
Fluorene	ND		ug/L	0.045	0.91	1.0
Indeno[1,2,3-cd]pyrene	ND		ug/L	0.072	0.45	1.0
Naphthalene	ND		ug/L	0.045	0.91	1.0
Pentachlorophenol	ND		ug/L	0.45	0.91	1.0
Phenanthrene	ND		ug/L	0.077	0.18	1.0
Phenol	0.97	J *	ug/L	0.45	4.5	1.0
Pyrene	ND		ug/L	0.17	4.5	1.0
N-Nitrosodimethylamine	ND		ug/L	0.45	4.5	1.0

Surrogate			Acceptance Limits
2,4,6-Tribromophenol	60	%	15 - 110
2-Fluorobiphenyl	53	%	30 - 130
2-Fluorophenol	25	%	15 - 110
Phenol-d5	15	%	15 - 110
Terphenyl-d14	58	%	30 - 130
Nitrobenzene-d5	63	%	30 - 130

Method: **608**
Prep Method: **CWA_Prep**

Date Analyzed: 10/26/2010 1747
Date Prepared: 10/22/2010 1558

Mr. Steven Morrow
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Cleveland, TN 37312-4441

Job Number: 360-30715-1

Client Sample ID: **OC-Inf102010**
Lab Sample ID: **360-30715-2**

Date Sampled: 10/20/2010 0945
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	MDL	RL	Dilution
PCB-1016	ND	*	ug/L	0.25	0.91	1.0
PCB-1221	ND		ug/L	0.40	0.91	1.0
PCB-1232	ND		ug/L	0.31	0.91	1.0
PCB-1242	ND		ug/L	0.16	0.91	1.0
PCB-1248	ND		ug/L	0.35	0.91	1.0
PCB-1254	ND		ug/L	0.31	0.91	1.0
PCB-1260	ND	*	ug/L	0.23	0.91	1.0
Surrogate					Acceptance Limits	
Tetrachloro-m-xylene	54		%		30 - 150	
DCB Decachlorobiphenyl	66		%		30 - 150	
Surrogate					Acceptance Limits	
Tetrachloro-m-xylene	59		%		30 - 150	
DCB Decachlorobiphenyl	68		%		30 - 150	
Method: 8011			Date Analyzed:		11/01/2010 1808	
Prep Method: 8011			Date Prepared:		11/01/2010 1000	
Ethylene Dibromide	ND		ug/L	0.013	0.020	1.0
Surrogate					Acceptance Limits	
1,1,1,2-Tetrachloroethane	124		%		70 - 130	
Surrogate					Acceptance Limits	
1,1,1,2-Tetrachloroethane	96		%		70 - 130	
Method: 200.7 Rev 4.4			Date Analyzed:		10/27/2010 1244	
Prep Method: 200.7			Date Prepared:		10/26/2010 0752	
Silver	ND		ug/L	1.4	5.0	1.0
Arsenic	13		ug/L	2.8	10	1.0
Cadmium	ND		ug/L	0.13	1.0	1.0
Chromium	0.89	J B	ug/L	0.65	5.0	1.0
Copper	ND		ug/L	2.3	10	1.0
Iron	9400		ug/L	14	100	1.0
Nickel	2.8	J	ug/L	1.2	10	1.0
Lead	ND		ug/L	1.4	5.0	1.0
Antimony	ND		ug/L	1.5	6.0	1.0
Selenium	ND		ug/L	4.0	10	1.0
Zinc	7.4	J	ug/L	6.6	50	1.0
Method: 245.1			Date Analyzed:		10/26/2010 1548	
Prep Method: 245.1			Date Prepared:		10/26/2010 0819	
Mercury	ND		ug/L	0.060	0.20	1.0

Mr. Steven Morrow
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Job Number: 360-30715-1

Client Sample ID: **OC-Inf102010**
Lab Sample ID: **360-30715-2**

Date Sampled: 10/20/2010 0945
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier		Unit	RL	RL	Dilution
Method: 1664A			Date Analyzed:	10/27/2010 1610		
Prep Method: 1664A			Date Prepared:	10/27/2010 1131		
SGT-HEM	ND		mg/L	4.7	4.7	1.0
Method: 300.0			Date Analyzed:	10/30/2010 0958		
Chloride	300		mg/L	10	10	10
Method: 7196A			Date Analyzed:	10/21/2010 0821		
Cr (VI)	ND		mg/L	0.0050	0.0050	1.0
Method: 7196A			Date Analyzed:	11/03/2010 1131		
Chromium, trivalent	ND		mg/L	0.0050	0.0050	1.0
Method: L204001A CN			Date Analyzed:	10/26/2010 1510		
Prep Method: Distill/CN			Date Prepared:	10/26/2010 1035		
Cyanide, Total	ND		mg/L	0.010	0.010	1.0
Method: L210-001A			Date Analyzed:	11/05/2010 1559		
Prep Method: Distill/Phenol			Date Prepared:	11/05/2010 1359		
Phenols, Total	ND		mg/L	0.010	0.010	1.0
Method: SM 2540D			Date Analyzed:	10/26/2010 1023		
Total Suspended Solids	9.0		mg/L	5.0	5.0	1.0
Method: SM 4500 Cl F			Date Analyzed:	10/21/2010 0918		
Chlorine	ND	HF	mg/L	0.020	0.020	1.0

Mr. Steven Morrow
Olin Corporation
3855 North Ocoee Street
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Cleveland, TN 37312-4441

Job Number: 360-30715-1

Client Sample ID: **OC-Trip Blank**
Lab Sample ID: **360-30715-3**

Date Sampled: 10/20/2010 0945
Date Received: 10/20/2010 1745
Client Matrix: Water

Analyte	Result/Qualifier	Unit	MDL	RL	Dilution
Method: 8260B		Date Analyzed:		10/27/2010 0456	
Prep Method: 5030B		Date Prepared:		10/27/2010 0456	
Benzene	ND	ug/L	0.20	1.0	1.0
Toluene	ND	ug/L	0.40	1.0	1.0
Ethylbenzene	ND	ug/L	0.20	1.0	1.0
o-Xylene	ND	ug/L	0.40	1.0	1.0
m-Xylene & p-Xylene	ND	ug/L	0.40	2.0	1.0
Methyl tert-butyl ether	ND	ug/L	0.20	1.0	1.0
Butyl alcohol, tert-	ND	ug/L	3.8	50	1.0
Tert-amyl methyl ether	ND	ug/L	0.60	5.0	1.0
Carbon tetrachloride	ND	ug/L	0.40	1.0	1.0
1,1,1-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1,2-Trichloroethane	ND	ug/L	0.40	1.0	1.0
1,1-Dichloroethane	ND	ug/L	0.20	1.0	1.0
1,1-Dichloroethene	ND	ug/L	0.40	1.0	1.0
1,2-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,2-Dichloroethane	ND	ug/L	0.40	1.0	1.0
1,3-Dichlorobenzene	ND	ug/L	0.40	1.0	1.0
1,4-Dioxane	ND	ug/L	10	50	1.0
1,4-Dichlorobenzene	ND	ug/L	0.20	1.0	1.0
Acetone	ND	ug/L	16	50	1.0
cis-1,2-Dichloroethene	ND	ug/L	0.20	1.0	1.0
Methylene Chloride	ND	ug/L	0.20	2.0	1.0
Tetrachloroethene	ND	ug/L	0.20	1.0	1.0
Trichloroethene	ND	ug/L	0.40	1.0	1.0
Vinyl chloride	ND	ug/L	0.40	0.50	1.0
2,4,4-Trimethyl-1-pentene	ND	ug/L	0.60	1.0	1.0
2,4,4-Trimethyl-2-pentene	ND	ug/L	0.60	1.0	1.0

Surrogate			Acceptance Limits
4-Bromofluorobenzene	99	%	70 - 130
Dibromofluoromethane	100	%	70 - 130
Toluene-d8 (Surr)	100	%	70 - 130

DATA REPORTING QUALIFIERS

Client: Olin Corporation

Job Number: 360-30715-1

Lab Section	Qualifier	Description
GC/MS VOA		
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
GC/MS Semi VOA		
	B	Compound was found in the blank and sample.
	*	LCS or LCSD exceeds the control limits
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
GC Semi VOA		
	*	RPD of the LCS and LCSD exceeds the control limits
Metals		
	B	Compound was found in the blank and sample.
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
General Chemistry		
	HF	Field parameter with a holding time of 15 minutes

ATTACHMENT B

DEED RESTRICTION
(Provided on CD)

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Recorded: 10/09/2012 03:51 PM

NOTICE AND DECLARATION OF RESTRICTIVE COVENANT

THIS DECLARATION is made as of the 5TH day of October, 2012 by OLIN CORPORATION, a Virginia corporation ("Declarant").

RECITALS

A. The Declarant owns fee simple title to the real estate and improvements referred to as 51 Eames Street, Wilmington, Middlesex County, Massachusetts, being legally described on Exhibit A attached hereto and incorporated herein by reference (the "Property").

B. The Property is at present listed on the National Priority List and certain hazardous substances are present in soil and groundwater at the Property.

C. The Declarant has completed certain remedial actions in two areas described as Area A and Area B in the map attached as Exhibit B hereto.

D. As of the date hereof, Declarant is investigating and evaluating the environmental conditions of the Property.

E. Declarant desires to impose upon and subject the Property to this Declaration, which shall become effective upon the recording of this Declaration in the land records of Middlesex County.

NOTICE AND DECLARATION

NOW, THEREFORE, the Declarant hereby declares that the Property and any portion thereof is and shall be held, transferred, sold, conveyed, used and occupied subject to the perpetual restrictive covenants hereinafter set forth, which restrictive covenants shall run with the Property and be binding upon all parties having any right, title or interest in the Property or any part thereof, their successors and assigns, and shall inure to the benefit of each owner thereof, and which are for the purpose of protecting the value and desirability of the Property.

1. Restricted Uses. Notwithstanding any laws, rules, regulations, ordinances or orders of any governmental or quasi-governmental entity, including, without limitation, local municipal and zoning ordinances, the Property, or any portion thereof, shall not be used for any residential, school, child day care center, playground or public recreation area purposes. The Property shall be used solely for commercial or industrial purposes.

2. Restriction on Groundwater Use. No groundwater shall be extracted from beneath the Property for any purpose, except to monitor the groundwater, or as part of an action to address groundwater conditions.

3. Excavation Restriction. No excavation of any kind shall occur in Areas A and B, except such excavation that is necessary to maintain the contours of the existing cap on Area A and shaping and grading as required to install a cap on Area B. Excavation in other areas of the Property shall be permissible only: 1) consistent with that certain Environmental and Open Space Restriction, dated October 31, 2006, and recorded in Book 20680, Page 234 of the land records of Middlesex County, Massachusetts, where applicable; and 2) in conformance with an appropriate soil management plan to address construction worker safety and soil management.

4. Runs with the Land. The perpetual restrictive covenants created in this Declaration are appurtenant to the Property and are (i) made for the direct benefit of the Property; (ii) shall run with the land; (iii) may be enforced as either equitable servitudes or real covenants; and (iv) shall bind and inure to the benefit of every person or entity having any property interest in the Property or any portion thereof.

5. Severability. If any portion of this Declaration shall to any extent be invalid or unenforceable, the remaining provisions of this Declaration shall not be affected thereby, and each provision of this Declaration shall be valid and enforceable to the fullest extent permitted by law.

6. Successors and Assigns Bound. This Declaration shall be perpetual and shall be binding upon and shall inure to the benefit of Declarant, any subsidiary of Declarant, division, parent or wholly owned corporation or affiliate now or hereafter existing, and their respective successors and assigns with respect to the Property and the tenants, subtenants, licensees,

vendees, concessionaires and successors and assigns of any of them with any fee, leasehold, license or other interest in the Property.

7. Governing Law. This Declaration shall be governed by and construed in accordance with the laws of the State of Massachusetts.

IN WITNESS WHEREOF, the said Olin Corporation has caused these presents to be signed, acknowledged and delivered in its name and behalf as a sealed instrument by Curtis M. Richards, its Corporate Vice President for Environment, Health & Safety, this ____ day of _____, 2012.

OLIN CORPORATION

By: Curtis M Richards

Name: Curtis M . Richards

Title: Corporate Vice President
Environment, Health & Safety

State of Tennessee ss.
County of Bradley

Personally appeared the above-named Curtis M. Richards, Corporate Vice President for Environment, Health & Safety and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of said corporation, before me.

Angela J. Goodner
Notary Public
My commission expires: June 30, 2014

ANGELA J. GOODNER
STATE OF TENNESSEE NOTARY PUBLIC
BRADLEY COUNTY

EXHIBIT A

LEGAL DESCRIPTION

Parcel A

A certain parcel of land situated in Wilmington, County of Middlesex, Massachusetts situated on the southerly side of Eames Street being comprised of several parcels of registered and unregistered hand as shown on a plan entitled "Plan of Land in Wilmington, Mass.," dated July 9, 1980 by Dana F. Perkins & Assoc., Inc. and recorded, being further bounded and described as follows:

Beginning at the most northerly point of the parcel herein described at a point on the southerly sideline of Eames Street and the westerly sideline of the land now or formerly of the Boston & Main Railroad as shown on said plan; thence running

Along the easterly sideline of the land now or formerly of the Boston & Maine Railroad by the following six (6) courses, S 37° 51' 09" E 285.43 feet by the remains of a stone wall, S 81° 51' 09" E 26.99 feet, S 37° 51' 09" E 389.00 feet, S 33° 49' 53" E 843.72 feet, 31.55 feet on a curve to the right having a radius of 5958.75 feet, and S 15° 51' 29" W 95.69 feet to a point at the land now or formerly of New England Resins & Pigments Corp.; thence

Along the land nor or formerly of said New England Resins & Pigments Corp., S 10° 09' 31" E 832.50 feet to a point on the line between the City of Woburn and the Town of Wilmington; thence

By the town line along said land now or formerly of New England Resins & Pigments Corp., owners unknown and the City of Woburn, S 60° 32' 25" W 1048.38 feet to a point on the easterly sideline of other land now or formerly of the Boston & Main Railroad as shown on said plan;

Northerly along the easterly sideline of said land now or formerly of the Boston & Maine Railroad by the following two (2) courses, 510.21 feet on a curve line to the left having .a radius

of 1951.10 feet, and N 14° 48' 27" W 1938.47 feet to a point on the southerly sideline of Eames Street; thence

Along the southerly sideline of Eames Street by the following three (3) courses N, 58° 11' 02" E 317.36 feet, 112.20 and N 43° 14' 02" E 103.11 feet to a point on the westerly sideline of said land now or formerly of the Boston & Maine Railroad and the point of beginning.

The above described parcel of land contains 49.2 acres, more or less and includes within it the following described parcel of registered land:

PARCEL B

That certain parcel of registered land situated in Wilmington, in the County of Middlesex and the Commonwealth of Massachusetts, bounded and described as follows:

Northwesterly by Eames Street, four hundred forty-three and 74/100 (443.74) feet;

Northeasterly two hundred eighty-five and 43/100 (285.43) feet;

Northerly twenty-six and 99/100 (26.99) feet, and

Northeasterly ten hundred thirteen and 4/100 (1,013.04) feet, by land now or formerly of the Boston and Main Railroad;

Easterly by lands now or formerly of Consolidated Chemical Industries and of Merrimac Chemical Co., nine hundred seventeen and 21/100 (917.21) feet;

Southeasterly by Phelps Street, five hundred twenty-two and 43/100 (522.43) feet;

Southwesterly by Wilmington Avenue, two hundred forty-five (245) feet;

Southeasterly by the end of said Wilmington Avenue, by land now or formerly of Ann Russo and by the end of Linwood Avenue, two hundred twenty (220) feet;

Northeasterly by said Linwood. Avenue, seventy (70) feet;

Northwesterly by a. line crossing Linwood Avenue and by said Anna Russo land, one hundred ten (110) feet;

Southwesterly thirty-five (35) feet, and

Northwesterly seventy (70) feet, by said Anna Russo land;

Northeasterly by said Wilmington Avenue, thirty-five (35) feet;

Southeasterly seventy (70) feet

Northeasterly one hundred five (105) feet, and

Northwesterly seventy (70) feet by other land now or formerly of Anna Russo;

Northeasterly by said Wilmington Avenue, seventy (70) feet;

Southeasterly by said Phelps Street, three hundred twenty (320) feet, and

Southwesterly by Longwood Avenue, nineteen hundred sixty-nine and 81/100 (1,969.81) feet.

All of said boundaries are determined by the Land Court to be located as shown on plan 27579-A, which is filed with Certificate of Title 11786, the same being compiled from a plan drawn by Emmons & Fleming, Surveyors, dated April 17, 1957, and additional data on file in the Land Registration Office, all as modified and approved by the Court, and said land is shown as Lot one (1) and two (2) on said plan.

So much of said Lot 2 as is included within the limits of said Phelps Street, Linwood Avenue and Longwood Avenue is subject to the rights of all persons lawfully entitled thereto in and over the same.

So much of the land hereby reentered as is located within the limits of said Wilmington Avenue is subject to the rights of all persons lawfully entitled thereto in and over the same.

So much of said Lot 2 as is included within the limits of the ditches, shown on said plan, is subject to such rights as may exist at the time of original decree.

For title of the grantor to said registered land see Middlesex County Northern District Land Court Transfer Certificate of Title No. 24003; for title to said unregistered land see deed of Stepan Chemical Company dated September 12, 1980 and recorded with Middlesex North District Registry of Deeds in Book 2438 at page 105.

PARCELC

That certain land in Wilmington, Middlesex County, Massachusetts, being shown as Lots "A", "B", "C", "D" and "E" on a plan entitled, "Plan of Land in Wilmington, Mass., Scale 1"=6',March 31, 1981, Dana F. Perkins and Assoc., Inc., Civil Engineers and Surveyors, Reading-Lowell, Mass." to be recorded herewith, and bounded and described according to said plan as follows:

LOT A

SOUTHERLY: by land now or formerly of Olin Corporation 45.42 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of Anna Russo 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 105.00 feet. containing 4,731 square feet of land according to said plan

LOT B

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 910.00 feet;

NORTHERLY: by land now or formerly of Harry L. Marshall 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 910.00 feet.

Containing 40,950 square feet of land according to said plan.

LOT C

SOUTHERLY: by land now or formerly of Harry L. Marshall 45.00 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

WESTERLY: by land now or formerly of Boston and Maine Railroad 105.00 feet.

Containing 4,725 square feet of land according to said plan.

LOT D

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 35.00 feet;

NORTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 35.00 feet.

Containing 1,575 square feet of land according to said plan.

LOT E

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of National Polychemicals, Inc. 45.00 feet;

WESTERLY: by land of Boston and Maine Railroad 105.00 feet.

Containing 4,725 square feet of land according to said plan.

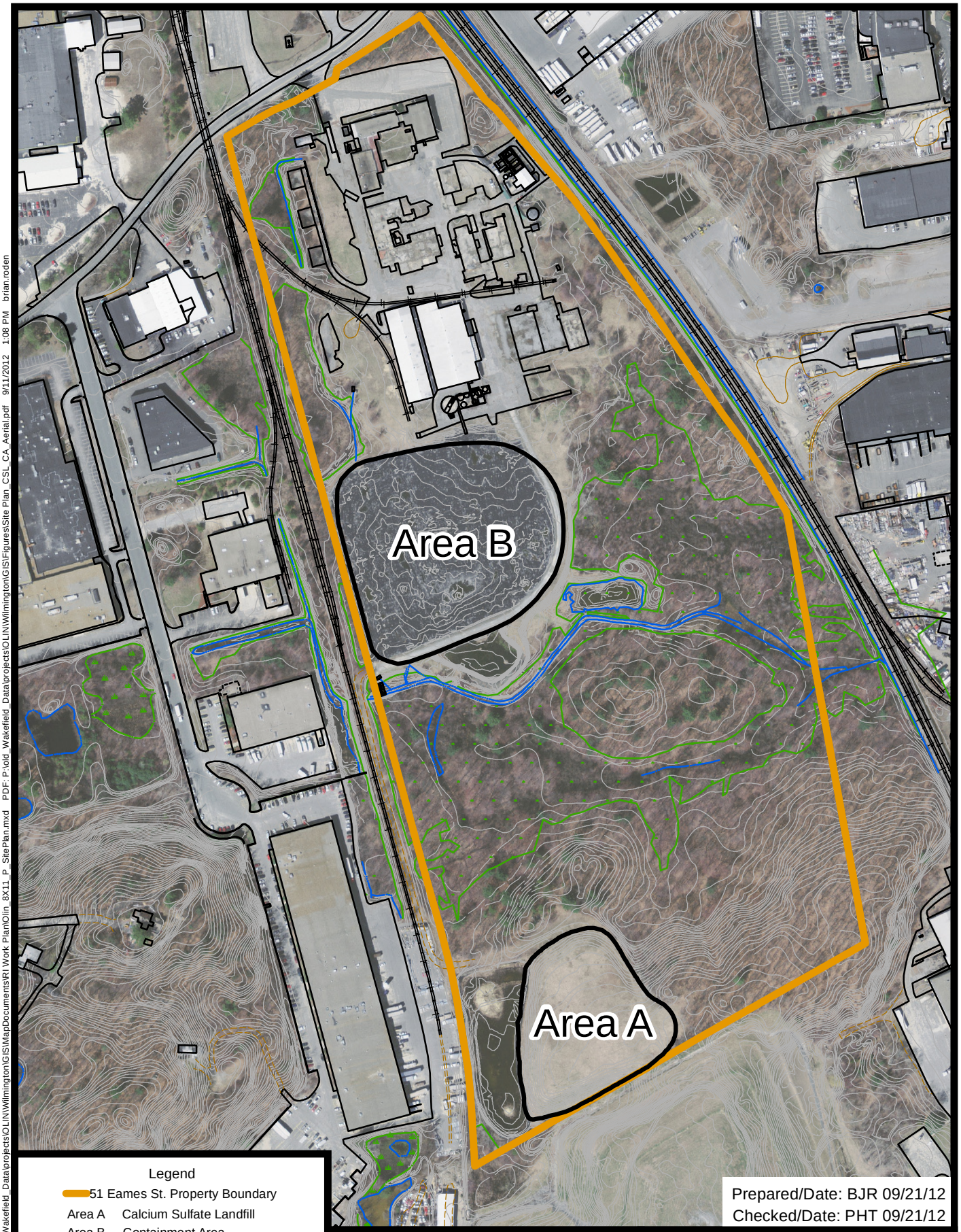
Together with all the right, title and interest of the Grantor in and to the lot labeled."21" and "Harry L. Marshall" on said plan, being the lot located between the aforesaid Lot B and Lot C.

Together also with all right, title and interest of the Grantor in and to Longwood Avenue as show on said plan.

For title reference see Deed of Nicholas Triantos and Louis G. Manolis a/k/a Louis Manolis dated April 2, 1981 and recorded with Middlesex North District Registry of Deeds in Book 2471 at page 680

EXHIBIT B

MAP OF SOIL RESTRICTION AREAS



Legend

51 Eames St. Property Boundary

Area A Calcium Sulfate Landfill

Area B Containment Area

N

0 150 300 Feet

Prepared/Date: BJR 09/21/12

Checked/Date: PHT 09/21/12

amec

Site Plan
51 Eames Street
Wilmington, MA

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_8X11_P_SitePlan.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\Figures\Site Plan_CSL_CA_Aerial.pdf 9/11/2012 1:08 PM brian.roden

Olin
190 Carondelet Plaza
Suite 1530
Clayton, MO 63105-3443

SPECIFIC AUTHORIZATION

TO

Curt M. Richards

Vice President, Environment, Health & Safety

Pursuant to the authority granted me, I hereby delegate to Curt M. Richards, Vice President, Environment, Health & Safety, the authority to execute and file in the name of, and on behalf of Olin Corporation, documents related to regulatory activities at Environmental Remediation Group (ERG) sites where the signature of an Officer of the Corporation is not needed.

Grantee is authorized to redelegate any part of the authority herein granted.

George H. Pain
Vice President, General Counsel & Secretary

Dated: 1/28/05

Distribution:

Grantor
Grantee
Corporate Secretary (Original)
Controller
Vice President, Auditing

Middlesex North Registry of Deeds - 20/20 Perfect Vision i2 Document Detail Report

Current datetime: 7/24/2013 9:24:21 AM

Doc#	Document Type	Town	Book/Page	File Date	Consideration
62370	RESTRICTIONS		20680/234	11/07/2006	

Property-Street Address and/or Description

51 EAMES ST

Grantors

OLIN CORP, WILMINGTON TOWN CONSERVATION, WILMINGTON TOWN SELECTMEN

Grantees

References-Book/Pg	Description	Recorded Year
26507/220	NOT	2012

Registered Land Certificate(s)-Cert# Book/Pg

2006 00062370
Bk: 20680 Pg: 234 Page: 1 of 25 27
Recorded: 11/07/2006 12:20 PM

ENVIRONMENTAL AND OPEN SPACE RESTRICTIO
TO
THE TOWN OF WILMINGTON

THIS ENVIRONMENTAL AND OPEN SPACE RESTRICTION is made as of this 31st day of October, 2006, by **Olin Corporation** ("Olin"), a Virginia corporation, with a principal place of business in Clayton, Missouri:

WITNESSETH:

WHEREAS, Olin is the owner of those certain parcels of land located in Wilmington, Middlesex County, Massachusetts, with the buildings and improvements thereon, known and numbered as 51 Eames Street, which land is more particularly bounded and described in Exhibit A attached hereto and made a part hereof (the "Property");

WHEREAS, the Property is part of a larger disposal site, known as the Olin Site (the "Site") as the result of past releases of oil and/or hazardous materials (the "Contamination"), which are present in soil, sediment and groundwater at the Site;

WHEREAS, Olin has agreed, in connection with certain remedial work performed on the Property pursuant to the Massachusetts Contingency Plan, 310 CMR 40.0000 ("MCP"), Massachusetts General Laws, Chapter 21E ("Chapter 21E") and Massachusetts Department of Environmental Protection ("MassDEP") approvals and as a condition of the 401 Water Quality Certification issued by MassDEP dated July 27, 2000 (the "401 Certification"), which 401 Certification was incorporated by reference in an Order of Conditions issued by the Wilmington Conservation Commission, dated July 25, 2000 (the "Order of Conditions"), that the portion of the Property, comprised of approximately 20± acres of land, the perimeter of which is described in Exhibit B attached hereto, located south of the stream known as the South Ditch, and being shown as the "Area Subject to Environmental and Open Space Restriction" on a plan entitled, "ALTA/ACSM Perimeter Survey, Eames Street, Wilmington, MA", dated July 10, 2006, prepared by Dana F. Perkins, inc., which plan is attached as Exhibit B and recorded herewith (the "Restricted Area"), shall be preserved in its predominately natural, undeveloped condition, subject to rights herein reserved to perform and/or maintain response actions required by MassDEP and/or United States Environmental Protection Agency (the "EPA") at the Site; and

WHEREAS, this Environmental and Open Space Restriction has been voluntarily negotiated by and between Olin, MassDEP, and the Town of Wilmington, acting by and through its Conservation Commission, and such parties agree that this Environmental and Open Space Restriction is in full settlement and satisfaction of the requirements for the imposition of a land use restriction as provided in the 401 Certification and the Order of Conditions.

Please Return to: Foley Hoag LL
ATTN: Maureen A. - 11th FL.
155 Seaport Boulevard
BOSTON, MA 02210

I. GRANTOR CLAUSE:

NOW, THEREFORE, Olin ("Grantor", which expression includes its successors and assigns) grants with QUITCLAIM COVENANTS to the **Town of Wilmington, a municipal**

Restricted Area Address: 51 Eames Street, Wilmington, Middlesex County, Massachusetts

corporation acting by and through its Conservation Commission, with an address at the Town Building, 121 Glen Road, Wilmington, MA 01887 ("Grantee", which expression includes its successors and permitted assigns), in perpetuity, pursuant to Massachusetts General Laws, Chapter 184, Section 26, and exclusively for the purpose described herein, the following described Environmental and Open Space Restriction (hereinafter referred to as the "Restriction") in, on, over, through and under the Restricted Area, and Grantee hereby accepts and holds this Restriction pursuant to Massachusetts General Laws, Chapter 40, Section 8C.

As this Restriction is a restriction "held by any governmental body" under Massachusetts General Laws, Chapter 184, Section 26(c), it is intended to conform thereto and shall run in perpetuity.

II. PURPOSE:

The purpose of this Restriction is the preservation of the Restricted Area in a predominately natural, undeveloped condition, subject to the reserved rights, as provided herein. The qualities of the Restricted Area preserved by this Restriction will benefit the public, including the limitation on development in such Restricted Area, which will provide relief from the density of industrial, commercial and other uses in the vicinity of the Property.

III. RESERVED RIGHTS, PERMITTED ACTS AND USES, AND PROHIBITED ACTS AND USES:

A. Background.

1. As provided above, the Property is part of the Site, a larger disposal site, as the result of past releases of the Contamination. The Site was listed by MassDEP as a confirmed disposal site pursuant to Chapter 21E and classified as a Tier IA Site (MADEP/RTN: 3-0471), pursuant to the MCP. In April 2006, the Site was listed by the EPA as a federal Superfund Site on the National Priorities List pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §9601 et. seq. ("CERCLA"). As of the date of this Restriction, the EPA has primary jurisdiction over response actions conducted at the Site.

2. Olin has performed certain investigations and response actions on the Property and has continued to perform such investigations and response actions on the Property and the Site in accordance with Chapter 21E and/or CERCLA, and other applicable laws, as required by MassDEP and/or EPA, or other cognizant governmental entity.

3. The retention of the following Reserved Rights in this Restriction will facilitate and permit the investigation and remediation of the Contamination at the Site as required by MassDEP and EPA and in accordance with Chapter 21E, CERCLA and other applicable environmental laws, while at the same time limiting industrial, commercial or other development in the Restricted Area.

B. Reserved Rights and Permitted Acts.

1. Notwithstanding anything herein to the contrary, Grantor expressly reserves to itself and its successors and assigns the right to conduct, or permit in, on, over, through and under the Restricted Area, any and all acts as may be required for the performance and/or maintenance of temporary or permanent response actions for the Site, including without limitation, the investigation and/or remediation of soils, sediments and groundwater, the construction or placement of temporary or permanent structures, such as treatment facilities, treatment wetlands, roads, conduits, pipes, monitoring wells, fences or other structures associated with investigation and/or remediation of the Site, and any other activities as may be required by MassDEP and/or EPA in order to implement the investigation and/or remediation of the Site in accordance with applicable law. Grantee hereby agrees that this Restriction is subject to the foregoing Reserved Rights. Grantee further agrees that it shall not interfere with any and all acts by the Grantor, MassDEP and/or EPA as may be required by MassDEP and/or EPA for the performance and/or maintenance of temporary or permanent response actions for the Site. Grantee agrees that it shall not, by virtue of its status as "Grantee", object to the investigation and/or remediation activities required by MassDEP and/or EPA within the Restricted Area or to Grantor's exercise of any of its reserved rights and permitted acts and uses in this Paragraph B.1.

2. Notwithstanding any provisions of Paragraph C of this Section III below, Grantor reserves to itself and its successors and assigns the right to conduct or permit the following activities in, on, over, under and through the Restricted Area, provided that such activities will not be undertaken except upon a determination by MassDEP and/or EPA that such activities shall present no significant risk of harm to health, safety, public welfare or the environment and shall not interfere with the performance of required response actions as have been or may be performed or maintained on the Restricted Area:

   a. Any activities associated with prudent maintenance of the Restricted Area in its predominately natural, undeveloped condition, including, without limitation, selective pruning and clearing, in accordance with generally accepted forestry management practices, to control or prevent fire or disease or to preserve the present condition of the Restricted Area;

   b. Erection of signs with respect to hunting, trespass and any limitations relating to public access;

   c. The maintenance of piles of limbs, brush, leaves and similar biodegradable material originating from the Restricted Area,

provided such piles do not interfere with the purpose of this Restriction;

d. The placing of fences that do not interfere with the purpose of this Restriction; and

e. Measures designed to restore native biotic communities, to control or remove invasive or exotic species, or to maintain or enhance the predominately natural, undeveloped condition of the Restricted Area.

3. All other acts and uses not explicitly prohibited by Paragraph C below are permitted, subject to Section IV (Notice and Approval) below.

C. Prohibited Acts and Uses.

The following acts and uses are prohibited in the Restricted Area, except as otherwise permitted in Paragraph B of this Section III above:

1. Construction or placement of any building, tennis court, landing strip, mobile home, swimming pool, fences, asphalt or concrete pavement, sign, billboard or other advertising display, antenna, utility pole, tower, conduit, line or other temporary or permanent structure or facility in, on, under, through or above the Restricted Area, unless such construction or placement is required in connection with response actions pursuant to Paragraph B.1 of Section III;

2. Mining, excavation, dredging or removing from the Restricted Area any soil, loam, peat, gravel, sand, rock or other mineral resource or natural deposit except as necessary for proper soil conservation and then only in a manner which does not impair the purposes of the restrictions recited herein;

3. Placing, filling, storing or dumping on the Restricted Area of any soil, refuse, trash, vehicle bodies or parts, rubbish, debris, junk, waste or other substance or material whatsoever or installation of underground storage tanks;

4. Cutting, removing or otherwise destroying trees, shrubs, grasses or other vegetation;

5. Any activities detrimental to wildlife habitat, drainage, flood control, water conservation, water quality, erosion control or soil conservation;

6. Engaging in agricultural activity or using the Restricted Area for cultivation of fruits, vegetables or other plants destined for human consumption;

7. Using the groundwater or surface water in the Restricted Area for a private water supply or any other potable or non-potable purpose without prior written approvals from MassDEP, EPA or other cognizant government entity in accordance with the MCP or other applicable laws and the conditions of this Restriction; and

8. Hunting or trapping.

IV. NOTICE AND APPROVAL:

A. Notice of Intention to Undertake Certain Actions.

Grantor agrees to notify Grantee before exercising any right which is permitted under Paragraph B.3 in Section III, but which is not otherwise permitted under Paragraphs B.1-2 in Section III. The purpose of said notification is to afford Grantee an adequate opportunity to monitor the activities in question and to ensure that they are designed and carried out in a manner that is consistent with the purpose of this Restriction. Notices shall be in writing and delivered by hand, or mailed postage prepaid by registered or certified mail return receipt requested, or delivered by a recognized overnight delivery service, not less than forty (40) days prior to the date Grantor intends to undertake the activity in question. Notices shall be effective upon such personal delivery, or if mailed or sent by delivery service upon the date shown on the return receipt. Notices shall describe the nature, scope, design, location, timetable, and any other material aspect of the proposed activity in sufficient detail to permit Grantee to make an informed judgment as to its consistency with the purpose of this Restriction.

B. Grantee's Approval.

Grantee shall grant or deny its approval within thirty (30) days from the effective date of Grantor's notice described in Section IV, Paragraph A above. Approval or denial by Grantee shall be in writing and delivered by hand, or mailed postage prepaid by registered or certified mail return receipt requested, or delivered by a recognized overnight delivery service. Failure of Grantee to respond within said period shall be deemed to constitute approval by Grantee of the request as submitted, so long as the request sets forth the provisions of this paragraph relating to deemed approval after the passage of time. Grantee's approval may be denied only upon a reasonable determination by Grantee that the action as proposed would be inconsistent with the purpose of this Restriction and/or would be inconsistent with those rights reserved under Section III hereof; such determination(s) together with the reasons therefor shall be set forth in the denial notice.

C. Limitation on Grantee's Notice and Approval Rights.

As provided in Paragraph A of this Section IV, Grantee shall have the right to notice of and the right to approve of Grantor's exercise of any right which is permitted under Paragraph B, 3 in Section III, but is not otherwise permitted

under Paragraphs B, 1-2 in Section III. However, nothing in this Section IV shall be construed to require notice to Grantee and/or Grantee's approval of any investigation and/or remediation activities at the Site required by and/or approved by MassDEP and/or EPA or of any reserved rights and permitted acts and uses under Paragraphs B, 1-2 in Section III above.

V. LEGAL REMEDIES OF GRANTEE:

A. Legal and Injunctive Relief.

The rights hereby granted shall include the right to enforce this Restriction by appropriate legal proceedings and to obtain injunctive and other equitable relief against any violations, including, without limitation, relief requiring restoration of the Restricted Area to its condition prior to the time of the injury complained of (it being agreed that Grantee may have no adequate remedy at law), and shall be in addition to, and not in limitation of, any other rights and remedies available to Grantee; provided, however, that Grantee's right to enforce this Restriction shall not apply to required response actions conducted by Grantor or as may be required by MassDEP and/or EPA. Grantor's exercise of any and all of the reserved rights and permitted acts and uses under Paragraph B, 1-2 in Section III above shall not constitute "injury" to the Restricted Area, the Property or the Site.

B. Reimbursement of Costs of Enforcement.

In the event that either party shall be required to engage counsel to enforce its rights hereunder the prevailing party in any action shall be entitled to its reasonable attorneys' fees.

C. Grantee's Disclaimer of Liability.

By its acceptance of this Restriction, Grantee does not undertake any liability or obligation relating to the condition of the Restricted Area, including with respect to compliance with Chapter 21E, CERCLA, or other environmental laws and regulations.

D. Grantor's Rights.

Notwithstanding anything to the contrary provided herein, Grantor shall not have any obligation to maintain the Restricted Area but shall have the right to do so if it so elects.

E. Natural Causes; Emergencies; Response Actions.

Nothing contained in this Restriction shall be construed to entitle Grantee to bring any action against Grantor for any injury to or change in the condition of the Restricted Area resulting (a) from natural causes beyond Grantor's control including, but not limited to fire, floods, storms, earth movement or from any prudent action taken by Grantor under emergency conditions to prevent, abate or

mitigate significant injury to the Restricted Area, and (b) from the exercise of any and all reserved rights and permitted acts and uses under Paragraph B, 1-2 in Section III above.

F. Severability Clause.

If any provision of this Restriction shall to any extent be held invalid, the remainder shall not be affected.

G. Non-Waiver.

Any election by Grantee as to the manner and timing of its right to enforce this Restriction or otherwise exercise its rights hereunder shall not be deemed or construed to be a waiver of such rights.

VI. ACCESS:

The Restriction hereby granted does not grant to Grantee, to the general public, or to any other person any right to enter upon the Restricted Area, except as provided below:

A. There is granted to Grantee and its representatives the right to enter the Restricted Area by foot, with an escort provided by Olin, at reasonable times after reasonable notice to Olin and in a reasonable manner for the purpose of inspecting the same to determine compliance herewith. Grantee shall be permitted to exercise its right pursuant to this Paragraph A no more than two times per calendar year, except that Grantee may request additional inspections from Olin due to emergency circumstances, and Olin's consent to such inspections shall not be unreasonably withheld. Within five (5) business days after Olin's receipt of Grantee's request for a non-emergency inspection, Olin shall provide an escort and a route of access for Grantee's inspection. Grantee may be restricted from all or portions of the Property and/or the Restricted Area as required in connection with investigation and/or remediation activities as required by MassDEP and/or EPA. At such time that Grantee performs such an inspection, Olin shall provide Grantee with a route of access, by foot only, to the Restricted Area, in order that Grantee perform such inspection and for no other purpose. Grantee shall have no right to designate or to change the route of access to the Restricted Area, as designated by Olin in connection with such inspections.

Olin shall retain its rights and obligations provided in this Paragraph A (including but not limited to the right to provide an escort and to designate the route of such access to Grantee hereunder) so long as Olin exists as a duly organized corporation in the United States. However, that in the event that Olin ceases to have existence as such a corporation, the then holder(s) of title to the Property and/or the Restricted Area shall succeed to such rights and obligations of Olin provided in this Paragraph A, and in such event, Grantee thereafter shall deliver its request for such inspections to the then holder(s) of record of the Property and/or Restricted Area.

B. There is granted to MassDEP a right of access to enter the Restricted Area for the purpose of performance, or causing or overseeing others to perform and maintain response actions, including without limitation, investigation and remediation activities related to the Site pursuant to Chapter 21E, the MCP and CERCLA. Notwithstanding anything herein to the contrary, Grantor shall also have the right to provide access to enter the Restricted Area to any person or entity for the purpose of performing and maintaining, or causing or overseeing others to perform and maintain, the actions permitted pursuant to Section III, Paragraph B of this Restriction.

VII. EXTINGUISHMENT:

A. Grantee's Receipt of Restricted Area.

Grantor and Grantee agree that the conveyance of this Restriction gives rise for purposes of this paragraph to a real property right, immediately vested in Grantee, with a fair market value that is at least equal to the proportionate value that this Restriction, determined at the time of the grant, bears to the value of the unrestricted Restricted Area at that time. Notwithstanding the forgoing, Grantee shall not claim any rights or privileges, by virtue of its status as "Grantee", with respect to the investigation and/or remediation activities required by MassDEP and/or EPA within the Restricted Area, nor shall Grantee claim any rights or privileges, by virtue of its status as "Grantee", with respect to the portions of the Property or the Site not within the Restricted Area, except for the access rights provided in Section VI, Paragraph A in so far as such rights may affect the Property.

B. Value of Grantee's Restricted Area Right.

Such proportionate value of Grantee's property right shall remain constant.

C. Right of Grantee to Recover Proportional Value at Disposition.

If any occurrence ever gives rise to extinguishment or other release of the Restriction under applicable law, then Grantee, on a subsequent sale, exchange or involuntary conversion of the Restricted Area, shall be entitled to a portion of the proceeds equal to such proportionate value, subject, however, to any applicable law which expressly provides for a different disposition of proceeds.

D. Grantor/Grantee Cooperation Regarding Public Action.

Whenever all or any part of the Restricted Area or any interest therein is taken by public authority under power of eminent domain or other act of public authority, then Grantor and Grantee shall cooperate in recovering the full value of all direct and consequential damages resulting from such action.

E. Allocation of Expenses upon Disposition.

All related expenses incurred by Grantor and Grantee shall first be paid out of any recovered proceeds, and the remaining proceeds shall be distributed between Grantor and Grantee in shares equal to such proportionate value.

F. Continuing Trust of Grantee's Share of Proceeds of Restriction Disposition.

Grantee shall use its share of the proceeds in a manner consistent with the purpose of this Restriction.

VIII. ASSIGNABILITY; AMENDMENT:

A. Assignability - Running of the Burden.

The burdens of this Restriction shall run with the Restricted Area in perpetuity, and shall be enforceable against Grantor and its successors and assigns holding any interest in the Restricted Area.

B. Assignability - Running of the Benefit.

The benefits of this Restriction shall be in gross and shall not be assignable by Grantee, except in the following instances and from time to time:

1. The Grantee may assign this Restriction, in whole or in part, to the MassDEP, the EPA or other state or federal agency as may be required by the MassDEP or the EPA, provided the agency to be assigned the Restriction gives its prior written approval of the assignment;

2. As a condition of any assignment, Grantee requires that the purpose of this Restriction continue to be carried out;

3. The assignee, at the time of any assignment, qualifies under Section 170(h) of the Internal Revenue Code of 1986, as amended, and applicable regulations thereunder, and under Section 32 of Chapter 184 of the Massachusetts General Laws as an eligible donee to receive this Restriction directly;

4. If the assignee is a commission, authority or other instrumentality of the Grantee, or a charitable corporation or trust, then assignee, at the time of assignment, shall obtain any approvals as may be required by and comply with any requirements of Sections 31-33 of Chapter 184 of the Massachusetts General Laws; and

5. In the event of any assignment to an entity other than MassDEP or EPA, the Grantee shall deliver prior written notice to MassDEP and EPA of such assignment.

C. Amendment and Subordination.

Grantor and Grantee agree that this Restriction may be amended as required by MassDEP and/or EPA to facilitate the investigation, remediation and maintenance activities or other response actions at the Site; provided that such amendment is not inconsistent with the purpose of this Restriction (including the limitation on development in the Restricted Area). Grantor and Grantee, for themselves and any person holding rights and interests under them pursuant to this Restriction, hereby assent to and this Restriction shall be subject to such institutional controls, including without limitation a grant of environmental restriction, an activity and use limitation or other land use restriction as may be required by MassDEP and/or EPA on the Restricted Area, in connection with the investigation, remediation and long term operation and maintenance of response actions at the Site ("Institutional Controls"); provided, however, that such subordination of this Restriction to such Institutional Controls shall not create any new rights or obligations of Grantor or Grantee pursuant to this Restriction. Grantor and Grantee further agree that each party shall not interfere with and shall fully cooperate with MassDEP and/or EPA in connection with any such amendment to or subordination of this Restriction as may be required by MassDEP and/or EPA. Grantor and Grantee may amend this Restriction after completion of the remediation, provided that such amendment is consistent with the purpose of and the rights reserved under this Restriction, and such amendment is approved by MassDEP and/or EPA.

IX. SUBSEQUENT TRANSFERS:

Grantor agrees to incorporate a reference to this Restriction in any deed or other legal instrument by which it divests itself of any interest in all or a portion of the Restricted Area or the Property, including, without limitation, a leasehold interest. In the event of the transfer of title to the Property and/or the Restricted Area, or any portion thereof, by Grantor, or its successors and assigns, to another person or entity, Olin shall retain (i) its reserved rights to perform and/or maintain required response actions in the Restricted Area, as provided in Section III, Paragraph B.1 of this Restriction, (ii) a right of access to the Restricted Area, and (iii) its rights pursuant to Section VI, Paragraph A. Grantor further agrees to give written notice to Grantee of the transfer of any such interest at least ten (10) days prior to the date of such transfer. Failure of Grantor to do so shall not impair the validity of this Restriction or limit its enforceability in any way.

X. EFFECTIVE DATE:

This Restriction shall be effective when Grantor and Grantee have executed it, and it has been recorded and registered.

XI. RECORDATION:

Within (30) days of its date of execution of this Restriction, Grantor shall record this instrument with the Middlesex North Registry of Deeds and shall file for registration of this instrument with the Land Registration of the Middlesex North Registry District, and Grantor shall submit a certified registry copy of the same to the appropriate headquarters and regional office of MassDEP and EPA and to Grantee within fourteen (14) days of its date or recordation and/or

registration. This instrument is exempt from documentary stamp excise taxes pursuant to Section 1 of Chapter 64D of the Massachusetts General Laws.

XII. TERMINATION OF RIGHTS AND OBLIGATIONS:

Notwithstanding anything to the contrary contained herein, the rights and obligations under this Restriction of any party holding any interest in the Restricted Area terminate upon, and to the extent of, such party's transfer of its interest, except that liability for acts or omissions occurring prior to transfer, and liability for the transfer itself if the transfer is in violation of this Restriction, shall survive the transfer; provided, however, that Grantor shall retain its reserved rights to perform and/or maintain required response actions in the Restricted Area, as provided in Section III, Paragraph B.1 of this Restriction, in the event of the transfer of title to the Property and/or the Restricted Area by Grantor, or its successors and assigns, to another person or entity.

XIII. MISCELLANEOUS:

A. Controlling Law.

The laws of The Commonwealth of Massachusetts shall govern the interpretation and performance of this Restriction.

B. Liberal Construction.

Any general rule of construction to the contrary notwithstanding, this Restriction shall be liberally construed in favor of the grant to affect the purpose of this Restriction, the public policies and purposes of Massachusetts General Laws, Chapter 184, Sections 26 and 31-33 and the policies and purposes of Chapter 21E. If any provision in this instrument is found to be ambiguous, then an interpretation consistent with the purpose of this Restriction and the Reserved Rights under this Restriction that would render the provision valid shall be favored over any interpretation that would render it invalid.

C. Entire Agreement.

This instrument sets forth the entire agreement of the parties with respect to the Restriction and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Restriction, all of which are merged herein.

D. Pre-existing Rights of the Public.

This Restriction shall not be construed as representing the existence or non-existence of any pre-existing rights of the public, if any, in and to the Restricted Area, and any such pre-existing rights of the public, if any, are not affected by the granting of this Restriction.

E. Captions.

The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

F. Compliance with Applicable Law.

The exercise of any right reserved under this Restriction by Grantor or its successors and assigns shall be in compliance with the then-current Zoning By-Law of the Town of Wilmington, the state Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40, as amended) and all other applicable federal, state, and local laws.

G. Notices.

Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by recognized overnight courier or by first class certified mail, postage prepaid, return receipt requested, addressed as follows:

To Grantor:	Olin Corporation 1186 Lower River Road Charleston, TN 37310 Attn: Mr. Curtis M. Richards
With a copy to:	Foley Hoag LLP Seaport World Trade Center West 155 Seaport Boulevard Boston, MA 02210 Attn: Laurie Burt, Esq.
To Grantee:	The Town of Wilmington Conservation Commission 121 Glen Road Wilmington, MA 01887 Attn: _____
With a copy to:	Town of Wilmington Board of Selectmen 121 Glen Road Wilmington, MA 01887 Attn: _____
And	Deutsch Williams et al., P.C. 99 Summer Street Boston, MA 02110 Attn: Paul R. DeRensis, Esq.

To MassDEP: Massachusetts Department of Environmental Protection
Northeast Regional Office
206A Lowell Street
Wilmington, MA 01887

To EPA: United States Environmental Protection Agency
Region I New England
One Congress Street, Suite 1100
Boston, MA 02114-2023
Attn: Wesley Kelman, Esq.

or to such other addresses as the parties may give the other, from time to time, by written notice.

H. Rights under Law.

Except as provided herein, this Restriction is not intended to expand or limit the rights that the Town of Wilmington otherwise has under applicable federal, state, and local laws.

I. Status of Prior Declaration.

The Grantor had previously declared and imposed upon the Property a restrictive covenant, entitled "Declaration of Restrictive Covenant", for the benefit of the Grantor and its successors in interest to the Property and any portion thereof which includes the Restricted Area (the "Declaration"), which Declaration was recorded with the Middlesex North Registry of Deeds in Book 17927, Page 162 and filed as Document No. 227718 in the Middlesex North Registry District of the Land Court. Simultaneously with the recording of this Restriction, Grantor will record and register a Release of the Declaration.

[The remainder of this page is left intentionally blank]

Executed under seal this 31st day of October, 2006.

WITNESSES:

Print Name: Karen L. Crocker

Print Name: GARLAND B. WILLIAMS

OLIN CORPORATION

By: Curtis M Richards

Print Name: CURTIS M RICHARDS

Its: VP- EH+S

Duly Authorized

STATE OF Massachusetts)
COUNTY OF Suffolk)

On this 27th day of September, 2006, before me, the undersigned, a notary public of the State of Massachusetts, duly commissioned and sworn, personally appeared Curtis M. Richards, personally known to me, as VP-EH+S of **OLIN CORPORATION**, signer and sealer of the foregoing instrument, and acknowledged the execution of the foregoing instrument to be his free act and deed as such VP- EH+S, and the free act and deed of Olin Corporation.

[SEAL]

Print Name:

Notary Public/State of Massachusetts

My Commission Expires: May 15, 2009

SHERYL A. HOWARD
Notary Public
Commonwealth of Massachusetts
My Commission Expires
May 15, 2009

Doc 00240947

MIDDLESEX NORTH LAND COURT

REGISTRY DISTRICT

RECEIVED FOR REGISTRATION

On: Nov 07,2006 at 12:02P

Document Fee 75.00 Rec Total $375.00

NOTED ON: CERT 33908 BK 00172 PG 215

I HEREBY ATTEST AND CERTIFY ON 11-07-06
THAT THE FOREGOING DOCUMENT IS A FULL TRUE AND
CORRECT COPY OF THE ORIGINAL ON FILE IN MY OFFICE
AND IN MY LEGAL CUSTODY

RICHARD P HOWE JR
ASST. RECORDER
LAND COURT

BY Richard P Howe Jr

ACCEPTANCE OF GRANT BY THE TOWN OF WILMINGTON:

We, the undersigned, being a majority of the Conservation Commission of the Town of Wilmington, Massachusetts, hereby certify that at a meeting duly held on October 4, 2006, the Conservation Commission voted to approve the foregoing Environmental and Open Space Restriction pursuant to Massachusetts General Laws, Chapter 40, Section 8C and in full satisfaction of the Order of Conditions issued to Olin Corporation by the Wilmington Conservation Commission, dated July 25, 2000.

Judith A Waterhouse

Vincent Licciardi

Beverly A. Shea

Tom Siracusa

COMMONWEALTH OF MASSACHUSETTS,
Middlesex County

On this 4th day of October, 2006, before me, the undersigned Notary Public, personally appeared the above-named Conservation Commission members proved to me by satisfactory evidence of identification, being [(check whichever applies): ☐ driver's license or other state or federal governmental document bearing a photographic image, ☐ oath or affirmation of a credible witness known to me who knows the above signatory, or ☒ my own personal knowledge of the identity of the signatory,] to be the person whose name is signed above, and acknowledged the foregoing to be signed by him/her voluntarily for its stated purpose.

CHERYL ANN LICCIARDI
Notary Public
Commonwealth of Massachusetts
My Commission Expires Jul 30, 2010

Cheryl Ann Licciardi
Print Name: Cheryl Ann Licciardi
Notary Public
My Commission Expires: July 30, 2010

Doc 00240947

MIDDLESEX NORTH LAND COURT

REGISTRY DISTRICT

RECEIVED FOR REGISTRATION

On: Nov 07,2006 at 12:02P

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I HEREBY ATTEST AND CERTIFY ON 11-07-06
THAT THE FOREGOING DOCUMENT IS A TRUE AND
CORRECT COPY OF THE ORIGINAL ON FILE IN MY OFFICE
AND IN MY LEGAL CUSTODY

RICHARD P. HOME JR
ASST REGISTRAR
LAND COURT

BY: Richard P. Home Jr

APPROVAL OF SELECTMEN

We, the undersigned, being a majority of the Board of Selectmen of the Town of Wilmington, Massachusetts, hereby certify that at a meeting duly held on October 10 ____, 2006, the Selectmen voted to approve acquisition by the Town of Wilmington Conservation Commission of the foregoing Environmental and Open Space Restriction pursuant to Massachusetts General Laws, Chapter 40, Section 8C.

BOARD OF SELECTMEN

COMMONWEALTH OF MASSACHUSETTS,
Middlesex County

On this 10 day of October, 2006, before me, the undersigned Notary Public, personally appeared the above-named Raymond N. Lepore, Michael J. Newhouse, Charles R. Fiore, Jr, & Suzanne M. Sullivan, proved to me by satisfactory evidence of identification, being [(check whichever applies): □ driver's license or other state or federal governmental document bearing a photographic image, ☒ oath or affirmation of a credible witness known to me who knows the above signatory, or □ my own personal knowledge of the identity of the signatory,] to be the person whose name is signed above, and acknowledged the foregoing to be signed by him/her voluntarily for its stated purpose.

Print Name: Beverly J. Dalton
Notary Public
My Commission Expires: September 26, 2008

EXHIBIT A

PARCEL A

A certain parcel of land situated in Wilmington, County of Middlesex, Massachusetts situated on the southerly side of Eames Street being comprised of several parcels of registered and unregistered land as shown on a plan entitled "Plan of Land in Wilmington, Mass.," dated July 9, 1980 by Dana F. Perkins & Assoc., Inc., being further bounded and described as follows:

Beginning at the most northerly point of the parcel herein described at a point on the southerly sideline of Eames Street and the westerly sideline of the land now or formerly of the Boston & Main Railroad as shown on said plan; thence running

Along the easterly sideline of the land now or formerly of the Boston & Maine Railroad by the following six (6) courses, S 37° 51' 09" E 285.43 feet by the remains of a stone wall, S 81° 51' 09" E 26.99 feet, S 37° 51' 09" E 389.00 feet, S 33° 49' 53" E 843.72 feet, 31.55 feet on a curve to the right having a radius of 5958.75 feet, and S 15° 51' 29" W 95.69 feet to a point at the land now or formerly of New England Resins & Pigments Corp.; thence

Along the land now or formerly of said New England Resins & Pigments Corp., S 10° 09' 31" E 832.50 feet to a point on the line between the City of Woburn and the Town of Wilmington; thence

By the town line along said land now or formerly of New England Resins & Pigments Corp., owners unknown and the City of Woburn, S 60° 32' 25" W 1048.38 feet to a point on the easterly sideline of other land now or formerly of the Boston & Main Railroad as shown on said plan;

Northerly along the easterly sideline of said land now or formerly of the Boston & Maine Railroad by the following two (2) courses, 510.21 feet on a curve line to the left having a radius of 1951.10 feet, and N 14° 48' 27" W 1938.47 feet to a point on the southerly sideline of Eames Street; thence

Along the southerly sideline of Eames Street by the following three (3) courses N, 58° 11' 02" E 317.36 feet, 112.20 and N 43° 14' 02" E 103.11 feet to a point on the westerly sideline of said land now or formerly of the Boston & Maine Railroad and the point of beginning.

The above described parcel of land contains 49.2 acres, more or less and includes within it the following described parcel of registered land:

PARCEL B

That certain parcel of registered land situated in Wilmington, in the County of Middlesex and the Commonwealth of Massachusetts, bounded and described as follows

Northwesterly: by Eames Street, four hundred forty-three and 74/100 (443.74) feet;

Northeasterly: two hundred eighty-five and 43/100 (285.43) feet;

Northerly: twenty-six and 99/100 (26.99) feet, and

Northeasterly: ten hundred thirteen and 4/100 (1,013.04) feet, by land now or formerly of the Boston and Main Railroad;

Easterly: by lands now or formerly of Consolidated Chemical Industries and of Merrimac Chemical Co., nine hundred seventeen and 21/100 (917.21) feet;

Southeasterly: by Phelps Street, five hundred twenty-two and 43/100 (522.43) feet;

Southwesterly: by Wilmington Avenue, two hundred forty-five (245) feet;

Southeasterly: by the end of said Wilmington Avenue, by land now or formerly of Ann Russo and by the end of Linwood Avenue, two hundred twenty (220) feet;

Northeasterly: by said Linwood Avenue, seventy (70) feet;

Northwesterly: by a line crossing Linwood Avenue and by said Anna Russo land, one hundred ten (110) feet;

Southwesterly: thirty-five (35) feet, and

Northwesterly: seventy (70) feet, by said Anna Russo land;

Northeasterly: by said Wilmington Avenue, thirty-five (35) feet;

Southeasterly: seventy (70) feet

Northeasterly: one hundred five (105) feet, and

Northwesterly: seventy (70) feet by other land now or formerly of Anna Russo;

Northeasterly: by said Wilmington Avenue, seventy (70) feet;

Southeasterly: by said Phelps Street, three hundred twenty (320) feet, and

Southwesterly: by Longwood Avenue, nineteen hundred sixty-nine and 81/100 (1,969.81) feet.

All of said boundaries are determined by the Land Court to be located as shown on plan 27579-A, which is filed with Certificate of Title 11786, the same being compiled from a plan drawn by Emmons & Fleming, Surveyors, dated April 17, 1957, and additional data on file in the Land Registration Office, all as modified and approved by the Court, and said land is shown as

Lot one (1) and two (2) on said plan.

So much of said Lot 2 as is included within the limits of said Phelps Street, Linwood Avenue and Longwood Avenue is subject to the rights of all persons lawfully entitled thereto in and over the same.

So much of the land hereby registered as is located within the limits of said Wilmington Avenue is subject to the rights of all persons lawfully entitled thereto in and over the same.

So much of said Lot 2 as is included within the limits of the ditches, shown on said plan, is subject to such rights as may exist at the time of original decree.

For title of the grantor to said registered land see Middlesex County Northern District Land Court Transfer Certificate of Title No. 24003; for title to said unregistered land see deed of Stepan Chemical Company dated September 12, 1980 and recorded with Middlesex North District Registry of Deeds in Book 2438 at page 105.

PARCEL C

That certain land in Wilmington, Middlesex County, Massachusetts, being shown as Lots "A", "B", "C", "D" and "E" on a plan entitled, "Plan of Land in Wilmington, Mass., Scale 1"=60', March 31, 1981, Dana F. Perkins and Assoc., Inc., Civil Engineers and Surveyors, Reading-Lowell, Mass.", and bounded and described according to said plan as follows:

LOT A

SOUTHERLY: by land now or formerly of Olin Corporation 45.42 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of Anna Russo 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 105.00 feet.

containing 4,731 square feet of land according to said plan.

LOT B

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 910.00 feet;

NORTHERLY: by land now or formerly of Harry L. Marshall 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 910.00 feet, containing 40,950 square feet of land according to said plan.

LOT C

SOUTHERLY: by land now or formerly of Harry L. Marshall 45.00 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

WESTERLY: by land now or formerly of Boston and Maine Railroad 105.00 feet.

Containing 4,725 square feet of land according to said plan.

LOT D

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 35.00 feet;

NORTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

WESTERLY: by land now or formerly of Boston and Main Railroad 35.00 feet.

Containing 1,575 square feet of land according to said plan.

LOT E

SOUTHERLY: by land now or formerly of Olin Corporation 45.00 feet;

EASTERLY: by Longwood Avenue 105.00 feet;

NORTHERLY: by land now or formerly of National Polychemicals, Inc. 45.00 feet;

WESTERLY: by land of Boston and Maine Railroad 105.00 feet.

Containing 4,725 square feet of land according to said plan.

Together with all the right, title and interest of the Grantor in and to the lot labeled "21" and "Harry L. Marshall" on said plan, being the lot located between the aforesaid Lot B and Lot C.

Together also with all right, title and interest of the Grantor in and to Longwood Avenue as shown on said plan.

For title reference see Deed of Nicholas Triantos and Louis G. Manolis a/k/a Louis Manolis dated April 2, 1981 and recorded with Middlesex North District Registry of Deeds in Book 2471 at page 680.

Said Property being the same as that conveyed to Olin Corporation by quitclaim deeds (a) from Stepan Chemical Company, dated September 12, 1980 and recorded with the Middlesex North District Registry of Deeds on September 15, 1980 in Book 2438 at Page 105; (b) Middlesex County Northern District Land Court Transfer Certificate of Title No. 24003, dated September 15, 1980, evidencing the transfer of the registered land to Olin Corporation; and (c) from Nicholas Triantos and Louis G. Manolis a/k/a/ Louis Manolis, dated April 2, 1981 and recorded with Middlesex North District Registry of Deeds on April 3, 1981 in Book 2471 at page 680. For Grantor's title, see also (i) Quitclaim Deed from Olin Corporation to Olin Chemicals and Chlor Alkali, Inc., dated August 7, 1998 ,which deed was recorded with the Middlesex North District Registry of Deeds on October 6, 1998 in Book 9608, Page 34 and filed with the Middlesex North Registry District of the Land Court as Document 178754, and (ii) the Certificate of Merger merging Olin Chemicals and Chlor Alkali, Inc. into Olin Corporation, recorded with the Middlesex North District Registry of Deeds on February 16, 1999 in Book 9943, Page 58 and filed with the Middlesex North Registry District of the Land Court as Documents 181625 and 181626.

The Restriction is granted subject to all restrictions, agreements, encumbrances and other matters of record, as of the date hereof.

EXHIBIT B

PERIMETER OF THE PORTION OF THE OLIN PROPERTY SUBJECT TO ENVIRONMENTAL AND OPEN SPACE RESTRICTION

A certain parcel of land, situated in the Town of Wilmington, Middlesex County, Massachusetts, being shown as "Area Subject to Environmental and Open Space Restriction" on a plan prepared by Dana F. Perkins, inc., Consulting Engineers & Land Surveyors, Tewksbury, MA, entitled "ALTA/ACSM, Perimeter Survey, Eames Street, Wilmington, MA", dated July 10, 2006, attached hereto. Said Parcel being further bounded and described as follows:

Beginning at a point at the south east corner of said parcel at land now or formerly of the City of Woburn;

thence by land of said City of Woburn S60°32'25"W a distance of 1048.88' to a point at land now or formerly of the Boston & Maine Railroad(B&M);

thence by land of said B&M in two courses as follows:
by a curved line to the left having a length of 510.21' and a radius of 1951.10' to a point,
N14°48'27"W a distance of 64.67' to a point at land now or formerly of the Town of Wilmington;

thence by land of said Town of Wilmington in three courses as follows:
N75°11'33"E a distance of 45.00' to a point;
N14°48'27"W a distance of 105.00' to a point;
S75°11'33"W a distance of 45.00' to a point at land of said B&M;

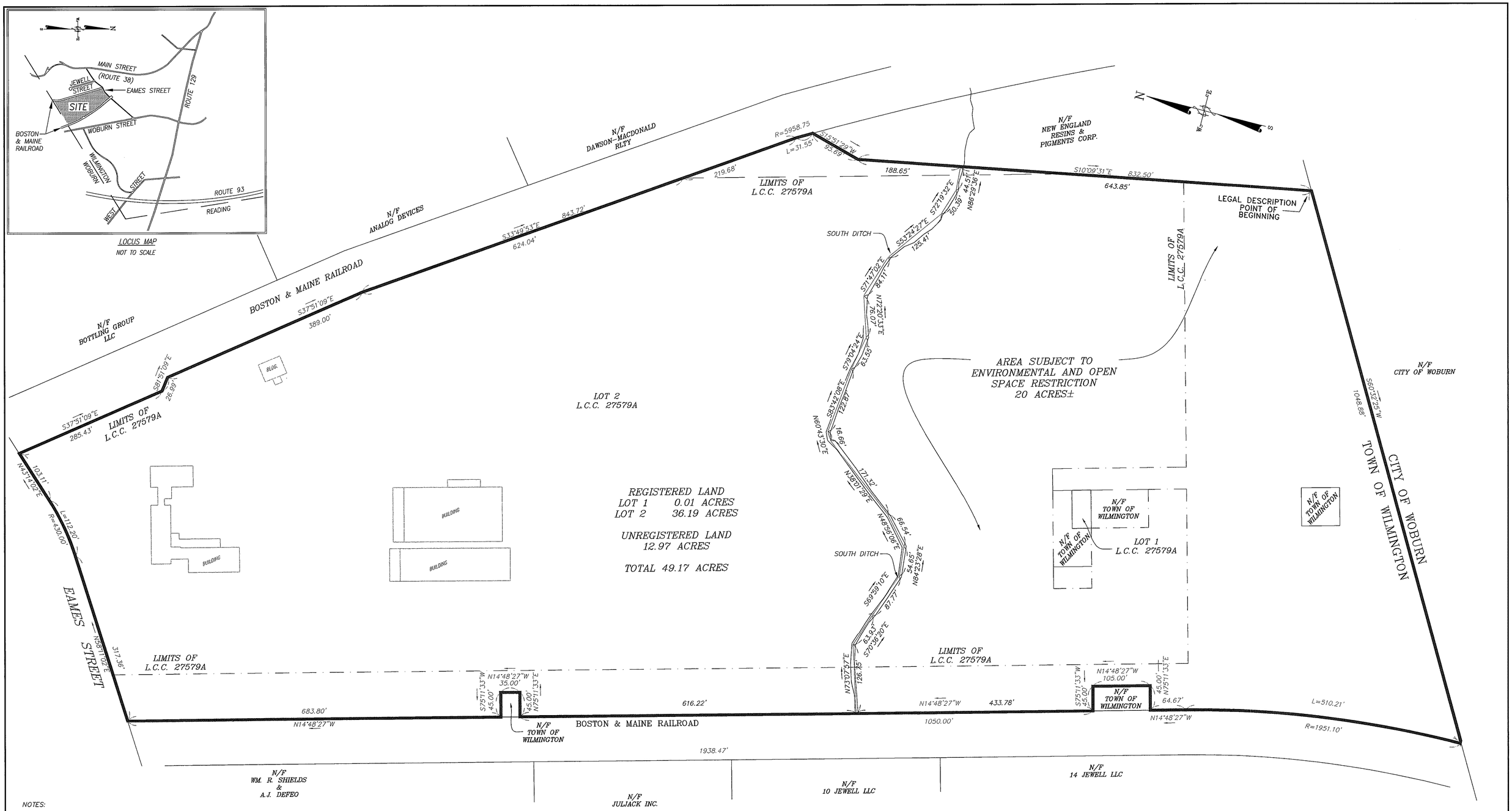
thence by land of said B&M N14°48'27"W a distance of 433.78' to a point within the South Ditch;

thence within said South Ditch in fourteen courses as follows:
N73°07'57"E a distance of 126.75' to a point;
S70°36'20"E a distance of 63.93' to a point;
S69°59'10"E a distance of 87.77' to a point;
N84°23'28"E a distance of 54.65' to a point;
N48°56'06"E a distance of 66.54' to a point;
N38°01'29"E a distance of 171.32' to a point;
N60°43'30"E a distance of 16.66' to a point;
S83°42'08"E a distance of 122.87' to a point;
S79°04'24"E a distance of 63.55' to a point;
N72°20'33"E a distance of 76.07' to a point;
S71°47'02"E a distance of 84.11' to a point;
S53°24'27"E a distance of 125.41' to a point;
S72°19'32"E a distance of 50.39' to a point;
N86°29'36"E a distance of 44.51' to a point at land now or formerly of New England Resins & Pigments Corp.;

thence by land of said New England Resins & Pigments Corp.
S10°09'31"E a distance of 643.85' to a point and the point of beginning.

Said parcel described above containing 20 acres more or less.

Said parcel being a portion of the Property conveyed to Olin Corporation by (a) quitclaim deed from Stepan Chemical Company, dated September 12, 1980 and recorded with the Middlesex North District Registry of Deeds on September 15, 1980 in Book 2438 at Page 105; (b) Middlesex County Northern District Land Court Transfer Certificate of Title No. 24003, dated September 15, 1980, evidencing the transfer of the registered land to Olin Corporation; and (c) quitclaim deed from Nicholas Triantos and Louis G. Manolis a/k/a/ Louis Manolis, dated April 2, 1981 and recorded with Middlesex North District Registry of Deeds on April 3, 1981 in Book 2471 at Page 680.



NOTES:

1. PROPERTY LINES SHOWN HEREON ARE THE RESULTS OF ON-THE-GROUND SURVEYS AND COMPILATION OF AVAILABLE DEEDS AND PLANS OF RECORD.

REFERENCE IS MADE TO THE FOLLOWING:
(i) QUITCLAIM DEED FROM STEPAN CHEMICAL COMPANY TO OLIN CORPORATION, DATED SEPTEMBER 12, 1980 AND RECORDED WITH MIDDLESEX NORTH REGISTRY OF DEEDS ON SEPTEMBER 15, 1980 IN BOOK 2438 AT PAGE 105; AND (ii) DEED OF NICHOLAS TRIANTOS AND LOUIS G. MANOLIS a/k/a LOUIS MANOLIS TO OLIN CORPORATION, DATED APRIL 2, 1981 AND RECORDED WITH MIDDLESEX NORTH REGISTRY OF DEEDS ON APRIL 3, 1981 IN BOOK 2471 AT PAGE 680.

880 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.

I Hereby Certify to:

Olin Corporation
Massachusetts Department of Environmental Protection ("MassDEP")
United States Environmental Protection Agency
Town of Wilmington, acting by and through its Conservation Commission

This is to certify that this map or plat and the survey on which it is based were made in accordance with the "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys," jointly established and adopted by ALTA and NSPS in 2005. Pursuant to the Accuracy Standards as adopted by ALTA and NSPS and in effect on the date of this certification, undersigned further certifies that in my professional opinion, as a land surveyor registered in the State of Massachusetts, the Relative Positional Accuracy of this survey does not exceed that which is specified therein.

COMMONWEALTH OF MASSACHUSETTS
GREGORY R. CORCORAN
38034
PROFESSIONAL LAND SURVEYOR

ALTA/ACSM
PERIMETER SURVEY
EAMES STREET
WILMINGTON, MA

SCALE: 1"=80' | DATE: JULY 10, 2006 * | JOB NO. 50272PL06 | SHEET 1 OF 1

DANA F. PERKINS, inc.
Consulting Engineers & Land Surveyors
1049 EAST STREET
TEWKSBURY, MASSACHUSETTS 01876

PREPARED FOR:
OLIN CORPORATION
51 EAMES STREET
WILMINGTON, MA 01887

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MIDDLESEX NORTH LAND COURT

REGISTRY DISTRICT

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AND IN MY LEGAL CUSTODY

RICHA[illegible]
ASST. RECORDER
LAND COURT

BY: Richa[illegible] P Howe Jr.

END OF DOCUMENT

Richa[illegible] P Howe Jr.

Please Return to:
ATTN: Maureen A. - 11th FL.
Foley Hoag LLP
155 Seaport Blvd.
Boston, MA 02210

ATTACHMENT C

CALCIUM SULFATE LANDFILL

(Provided on CD)

December 24, 2013

Mr. David C. Adams
MassDEP Northeast Region
205B Lowell Street
Wilmington, Massachusetts 01887

Subject: Calcium Sulfate Landfill Biennial Report
Olin Corporation
51 Eames Street, Wilmington MA

Dear Mr. Adams:

On behalf of Olin Corporation (Olin), please find enclosed one hard copy and one electronic copy of the Biennial Post Closure Monitoring Report for the Calcium Sulfate Landfill located at Olin's 51 Eames Street property in Wilmington, Massachusetts.

If you have any questions please do not hesitate to contact James Cashwell, Olin Corporation, at 423-336-4012.

Sincerely,
AMEC Environment & Infrastructure

Peter Thompson
Project Manager

Mark A. Peters, PE
Project Principal

Correspondence:
AMEC Environment & Infrastructure, Inc.
511 Congress Street, Ste. 200
Portland, Maine 04101 USA
Tel 207-775-5401 | Fax 207-772-4762

CALCIUM SULFATE LANDFILL BIENNIAL REPORT

OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

Prepared for:

Olin Corporation
3855 North Ocoee Street; Suite 200
Cleveland, TN 37312

Prepared by:

AMEC Environment & Infrastructure, Inc.
511 Congress Street, Suite 200
Portland, Maine 04101

Project No. 6107130016.01.15

December 23, 2013

CALCIUM SULFATE LANDFILL BIENNIAL REPORT

OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

Prepared for:

Olin Corporation
3855 North Ocoee Street; Suite 200
Cleveland, TN 37312

Prepared by:

AMEC Environment & Infrastructure, Inc.
511 Congress Street, Suite 200
Portland, Maine 04101

Project No. 6107130016.01.15

December 23, 2013

Peter Thompson
Project Manager

Mark A. Peters, PE
Project Principal

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ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Environment & Infrastructure, Inc.
CSL	Calcium Sulfate Landfill
MassDEP	Massachusetts Department of Environmental Protection
MCLs	Maximum Contaminant Levels (Federal)
MMCL	Massachusetts Maximum Contaminant Levels
Olin	Olin Corporation
ORSG	Office of Research and Standard Guidelines
PCMP	Post Closure Monitoring Plan
SMCLs	Secondary Maximum Contaminate Levels
TDS	total dissolved solids
the Site	51 Eames Street in Wilmington, Massachusetts
QA/QC	Quality Assurance and Quality Control

1.0 INTRODUCTION

This Biennial Report for the Calcium Sulfate Landfill (CSL) is being submitted on behalf of Olin Corporation by AMEC Environment & Infrastructure, Inc (AMEC) in accordance with the Post Closure Monitoring Plan (PCMP) (MACTEC, 2006) which was approved by the Massachusetts Department of Environmental Protection (MADEP) in January 2009 and amended in 2011. The request to amend the PCMP was submitted by Olin in 2010 (Olin, 2010) and approved by MassDEP in March 2011. In their March 2011 letter, the MassDEP also suggested that the original PCMP be revised and simplified to address only the current approved monitoring program (as amended). The PCMP has been revised as suggested for Olin's internal use. The PCMP provides information on the construction, closure, geologic and hydrologic conditions of the CSL that will not be repeated in this report.

The CSL is located upon a portion of land owned by Olin Corporation (Olin) located at 51 Eames Street in Wilmington, Massachusetts (the Site). Figure 1 shows the site location. The post closure monitoring will continue until 2018 which completes a 30 year post closure period of monitoring from the time the facility was formally closed in 1988.

This Biennial Report presents:

1. Closure monitoring requirements;
2. Annual inspection reports which present the inspection of the landfill, including annual inspection of the cap, monitoring wells, access roads, and maintenance activities and corrective measures undertaken based on inspection findings;
3. Biannual groundwater analytical results and evaluation of trends;
4. A summary of hydrologic conditions including water level measurements and groundwater flow; and
5. Summary and recommendations.

2.0 CLOSURE MONITORING REQUIREMENTS

Inspection, monitoring and maintenance activities for the CSL include:

- annual inspections of the cover system, access roads, fences, gates and groundwater monitoring well network (see Table 1);
- semiannual groundwater monitoring which is to be completed in the spring and fall to coincide with periods of high and low groundwater level; and
- biennial monitoring reports.

Table1 presents the schedule for inspection, maintenance and monitoring activities under the current PCMP. Figure 2 shows a site plan of the CSL including the locations of monitoring wells. Details of the monitoring well network including elevations, depths, and screened intervals are presented in Table 2.

3.0 ANNUAL INSPECTION OF CSL

Inspection, monitoring, and maintenance activities for the CSL were performed in accordance with the PCMP. Following the baseline monitoring period, which ended in 2010, annual inspections of the cover, access roads, monitoring well network, and fences and gates have been completed in April prior to the spring semiannual groundwater monitoring event. Landfill Inspection reports are included in Appendix A.

3.1 Findings of Annual Inspections

The annual spring inspections completed at the CSL in 2011 and 2012 indicate that the landfill cap and associated landfill components (monitoring wells, access road, fencing and gate) are in good condition. Several fallen trees and branches required removal from the access road. The cap was well vegetated, showed no evidence of erosion, settlement or ponding of water. Several areas of poor or sparse ground cover were noted in 2011, but did not require maintenance at that time.

The April 2012 inspection did not note any areas of poor or sparse ground cover and the monitoring network and landfill cap and associated landfill components continued to be in good condition. Several tire ruts were noted in the soil outside the entry gate but did not warrant repair.

3.2 Corrective Actions

No corrective actions other than the removal of fallen trees and braches from the access road were undertaken during this reporting period (January 2011 to January 2013).

4.0 GROUNDWATER MONITORING

Groundwater monitoring was completed semiannually in the spring (May) and fall (November) during in accordance with the PCMP. Analytical results from the quarterly baseline monitoring were presented in the previous monitoring report (Olin, 2010). Analytical results from groundwater monitoring events completed subsequent to the baseline monitoring (March 2010 to November 2012) are presented in Table 3. Chain of custody forms and field data records for the monitoring events are presented in Appendix B. Quality assurance and quality control (QA/QC) information relating to groundwater monitoring is discussed in data validation reports presented in Appendix C. This discussion includes results of field duplicate and matrix spike/ matrix spike duplicate samples that are collected for sample QA/QC in addition results of laboratory quality control samples. The groundwater analytical results are discussed in the following section.

4.1 Analytical Results

The CSL analytical parameters include calcium, sulfate, aluminum, chromium, iron, manganese, nickel, sodium, chloride, alkalinity (total, bicarbonate, and carbonate), and total dissolved solids. State and federal maximum contaminant levels (MMCLs/MCLs) exist for chromium. The MCL for chromium was not exceeded in any groundwater samples, therefore analytical data are only presented in tables. Secondary MCLs (SMCLs) exist for sulfate, aluminum, iron, manganese, chloride, and total dissolved solids (TDS). The concentrations of these parameters have historically been in excess of these SMCLs, but these limits are not enforced as drinking water standards. Sodium concentrations have historically been in excess of the corresponding Massachusetts's Office of Research and Standards Guidelines (ORSGs). The ORSG for sodium is an advisory-only guideline for those on a sodium-restricted diet. The ORSG for sodium of 20 mg/L is equivalent to the federal labeling of sodium in bottled water of 5 mg or less per 8 oz serving. Nickel did not exceed the corresponding ORSG. There are no groundwater standards or guidelines for calcium and alkalinity.

The most recent groundwater data is consistent with historical data for groundwater at the CSL and indicates the groundwater system is stable. The CSL contains gypsum (calcium sulfate) and the primary dissolved constituents in groundwater of interest are therefore calcium and sulfate. The monitoring well network monitors groundwater on the southern side of the CSL adjacent to the Woburn Sanitary Landfill (SL-3), along its eastern downgradient side (SL-5, SL-6) along a northern perimeter with locally elevated bedrock (SL-7, SL-8) and along its western side (SL-1D and SL-2) which may receive some component of groundwater flow from the CSL.

Prior studies by Olin as discussed in the PCMP (Geomega, 1999) indicate that groundwater sampled at SL-3, located adjacent to the Woburn Sanitary Landfill, shows some impact by the Woburn Sanitary Landfill and as a result has elevated bicarbonate alkalinity, iron and manganese compared to concentrations for these parameters at other wells.

All other parameters at the various CSL monitoring wells remain consistent with historic ranges.

It has not been possible to collected representative groundwater samples for chemical analysis from SL-7 or SL-8 since 2009. Both monitoring wells are typically dry except during periods of high groundwater. It is believed that the wells act as sumps which fill with water during larger precipitation events so that subsequent water levels may not be representative of actual surrounding groundwater elevations. It is recommended that these wells remain in the program and be sampled when water levels permit, but that water elevations from the wells be interpreted accordingly

4.2 Trend Analysis

Time series plots of calcium, sulfate, aluminum, chloride, chromium, iron, manganese, sodium, and nickel, are presented in Appendix D. The plots indicate the concentrations of calcium sulfate and other analytes are stable and within historical ranges. The concentrations of calcium and sulfate are highest in SL-6, SL-5, and to a lesser degree SL-3 and are consistent with their position on the downgradient sides of the CSL.

4.3 Summary of Hydrologic Conditions

The water level data collected from the monitoring well network at the CSL during semiannual sampling events shows groundwater levels are highest in the late winter and spring (December to May) and are lowest in the late summer and early fall. Table 4 presents groundwater level measurements collected at the CSL. Interpreted overburden groundwater contours at the CSL for water levels collected in the spring (May) and fall (November) of 2011 and 2012 are shown in Figures 3 through 6.

Due to the presence of a topographic high to the east and the Woburn Sanitary landfill to the south, groundwater flow at the CSL flows generally to the northeast from a localized divide that runs through the southern portion of the CSL from the southeast to northwest. The primary flow component is toward SL-5 and SL-6, with smaller component of flow toward SL-3 on the southern side of that localized divide. This is consistent with the groundwater monitoring data that indicate the highest calcium and sulfate concentrations in groundwater are from SL-5 and SL-6. The area of shallow bedrock in the vicinity of SL-7 and SL-8 at the northern edge of the CSL may create the appearance of a localized groundwater high, but the thin overburden deposits located there are only variably saturated which is why these monitoring wells are frequently dry when sampled. The groundwater mound apparent in some monitoring periods in this area may have limited lateral influence. The very low calcium and sulfate concentrations in SL-2 and SL-1D and apparent salt impact support the interpreted flow direction from west to east in this portion of the site. Therefore local groundwater flow at the CSL is primarily to the northeast and east and with a smaller component to the southwest.

5.0 SUMMARY

The annual inspection reports indicate the landfill cap, the landfill monitoring wells, and other landfill components (gate and fence) are currently in good condition. No corrective actions are currently required or planned.

Analytical data from for the most recent monitoring periods is consistent with historical data and show no State (MMCLs) or Federal (MCLs) water quality standards were exceeded. The secondary (SMCLs) guidance values for aluminum, iron, manganese, sulfate, and TDS were each exceeded in three or more monitoring wells and the ORSG standard for sodium was exceeded in two monitoring wells. This data does not indicate any risk above the USEPA excess lifetime cancer range ($1x10^{-4}$).

6.0 REFERENCES

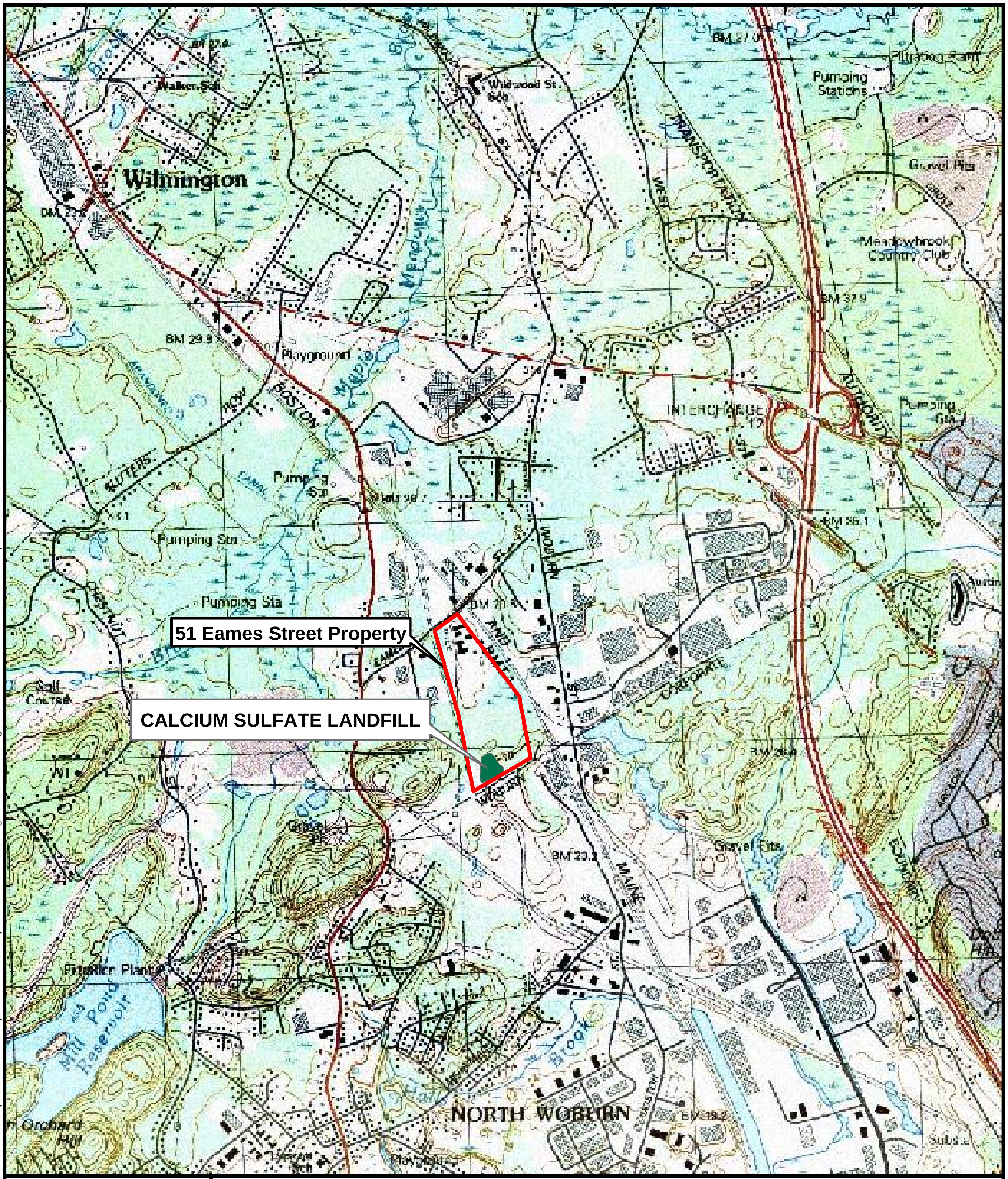
Geomega, 1999. Olin Wilmington Technical Series, IV. Geochemical Discrimination Between Groundwater Emanating from the Calcium Sulfate and Woburn Sanitary Landfills. Prepared for Olin Corporation, Wilmington, MA Facility, February 10, 1999.

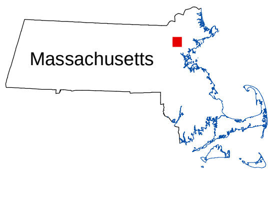
MACTEC, 2009. Draft Calcium Sulfate Landfill Post Closure Monitoring Plan, prepared for Olin Corporation by MACTEC Engineering & Consulting, Inc. December, 2009.

MADEP, 2011. Letter from David C. Adams and John A. Carrigan, MADEP, to Steve Morrow, Olin Corporation, regarding Wilmington – Solid Waste/COR, Olin Gypsum Landfill, Approval of Modification of Post Closure Monitoring Plan, Transmittal Number X236418, March 3, 2011.

Olin, 2010. Letter from Steve Morrow, Olin Corporation, to David C. Adams, Department of Environmental Quality Engineering, Re: Calcium Sulfate Landfill Data Review. December 8, 2010

FIGURES





Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs at http://www.mass.gov/mgis

0 1,000 2,000
Feet

Figure 1
Site Location
Calcium Sulfate Landfill
Biennial Report
51 Eames Street
Wilmington, Massachusetts

Prepared/Date: BRP 05/07/13 | Checked/Date: JKR 05/07/13

amec

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\MapDocuments\SiteMap.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\Figures\Calcium Sulfate Landfill\Site Location.pdf 05/07/2013 3:54 PM brian.peters

Legend

A CSL Groundwater Monitoring Well

Fence

Approximate CSL Boundary

Wilmington / Woburn Town Line

amec

AMEC Environment & Infrastructure
107 Audubon Road Suite 301
Wakefield, MA 01880

0 50 100 200 Feet

Figure 2
Calcium Sulfate Landfill
Site Plan

Biennial Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared by BJR | Checked by JR

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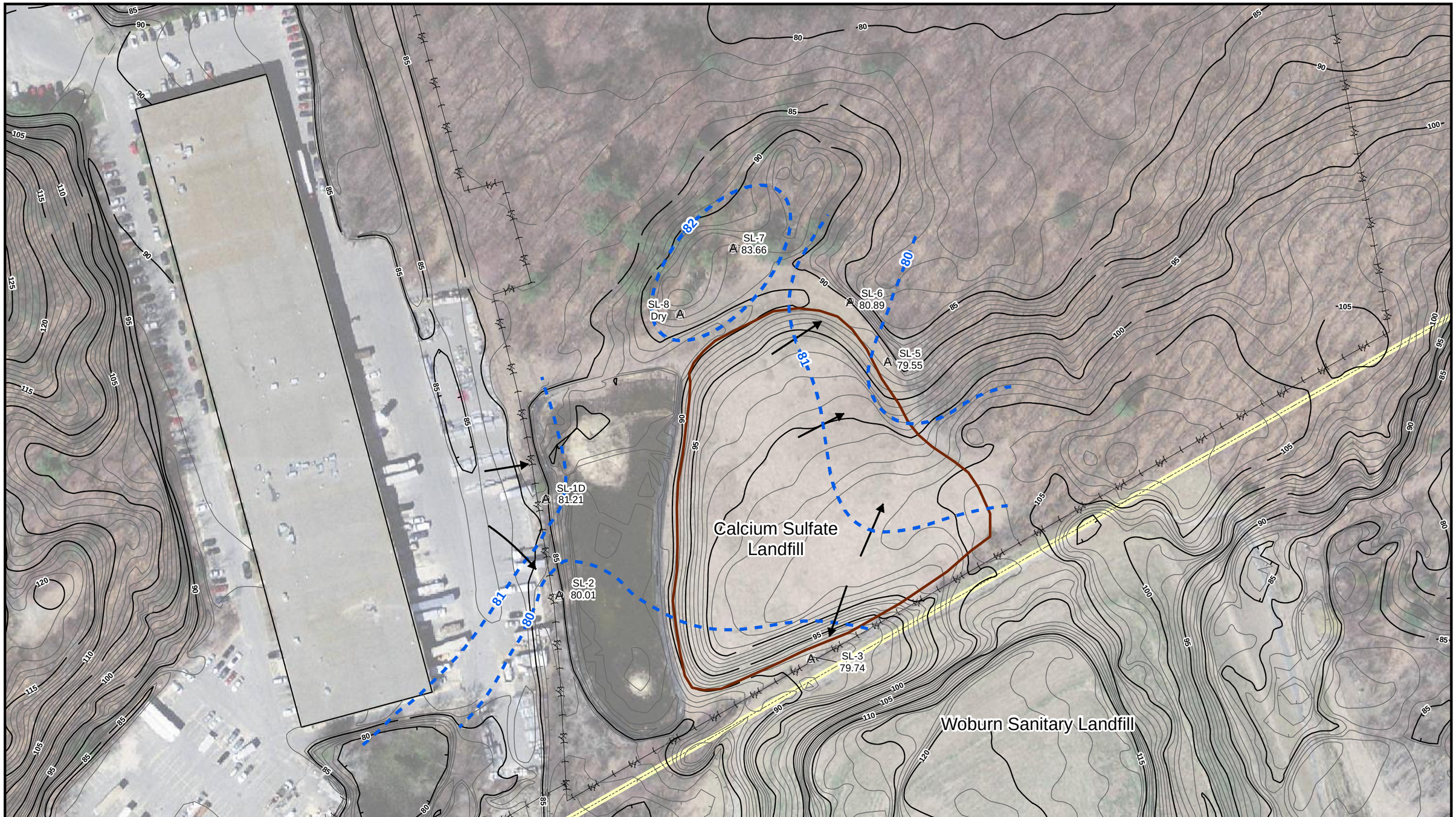

Legend

- A CSL Groundwater Monitoring Well
- Inferred Groundwater Contour (ft)
- Interpreted Direction of Groundwater Flow
- 1 Foot Contour
- 5 Foot Contour
- Fence
- Approximate CSL Boundary
- Wilmington / Woburn Town Line

AMEC Environment & Infrastructure
107 Audubon Road Suite 301
Wakefield, MA 01880

0 50 100 200 Feet

Figure 3
Calcium Sulfate Landfill
Shallow Groundwater Contours - May 2011

Biennial Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared by BRP | Checked by PHT

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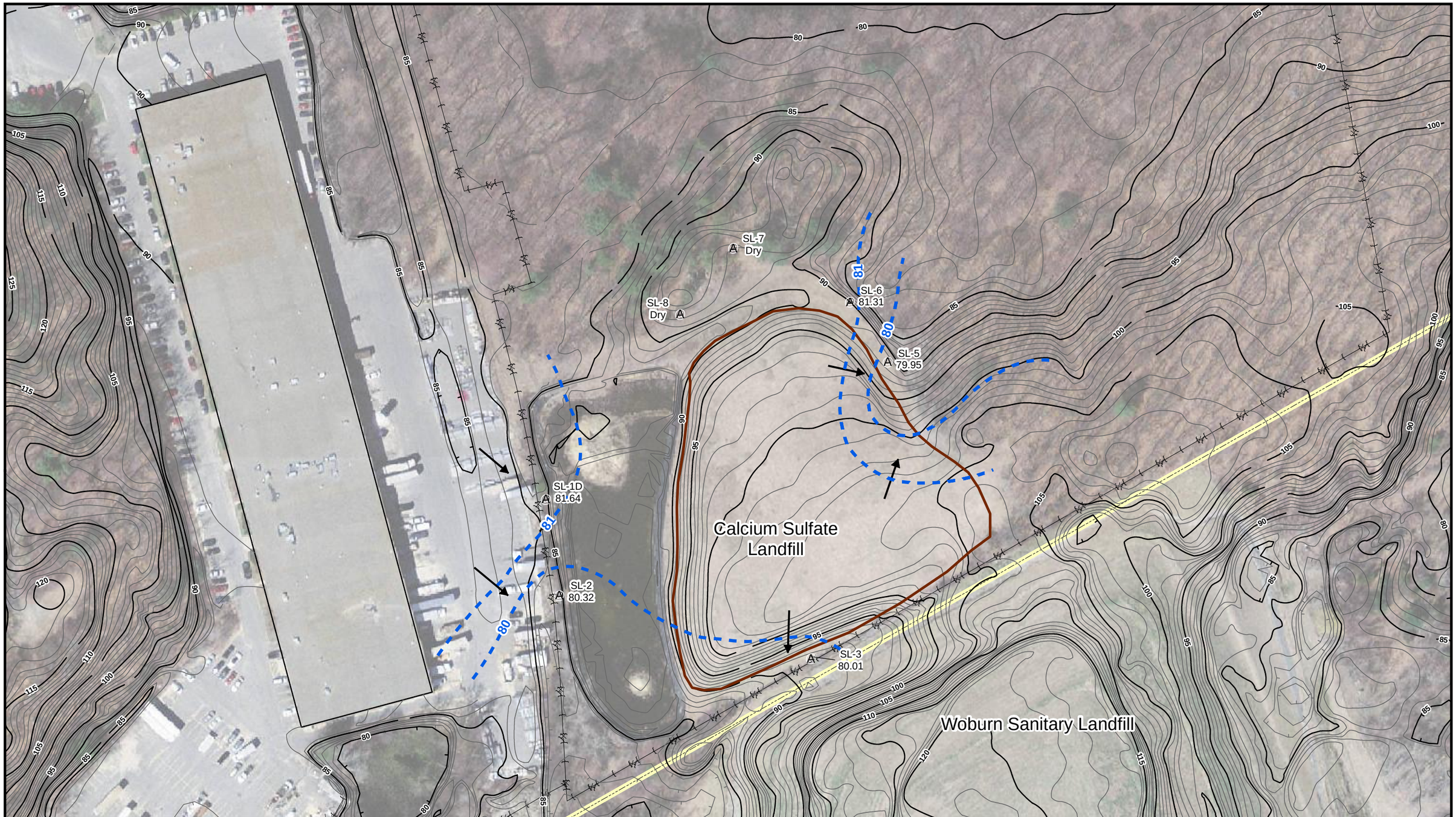

Legend

- A CSL Groundwater Monitoring Well
- Inferred Groundwater Contour (ft)
- Interpreted Direction of Groundwater Flow
- 1 Foot Contour
- 5 Foot Contour
- Fence
- Approximate CSL Boundary
- Wilmington / Woburn Town Line

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0 50 100 200 Feet

Figure 4
Calcium Sulfate Landfill
Shallow Groundwater Contours - Nov 2011

Biennial Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared by BRP | Checked by PHT

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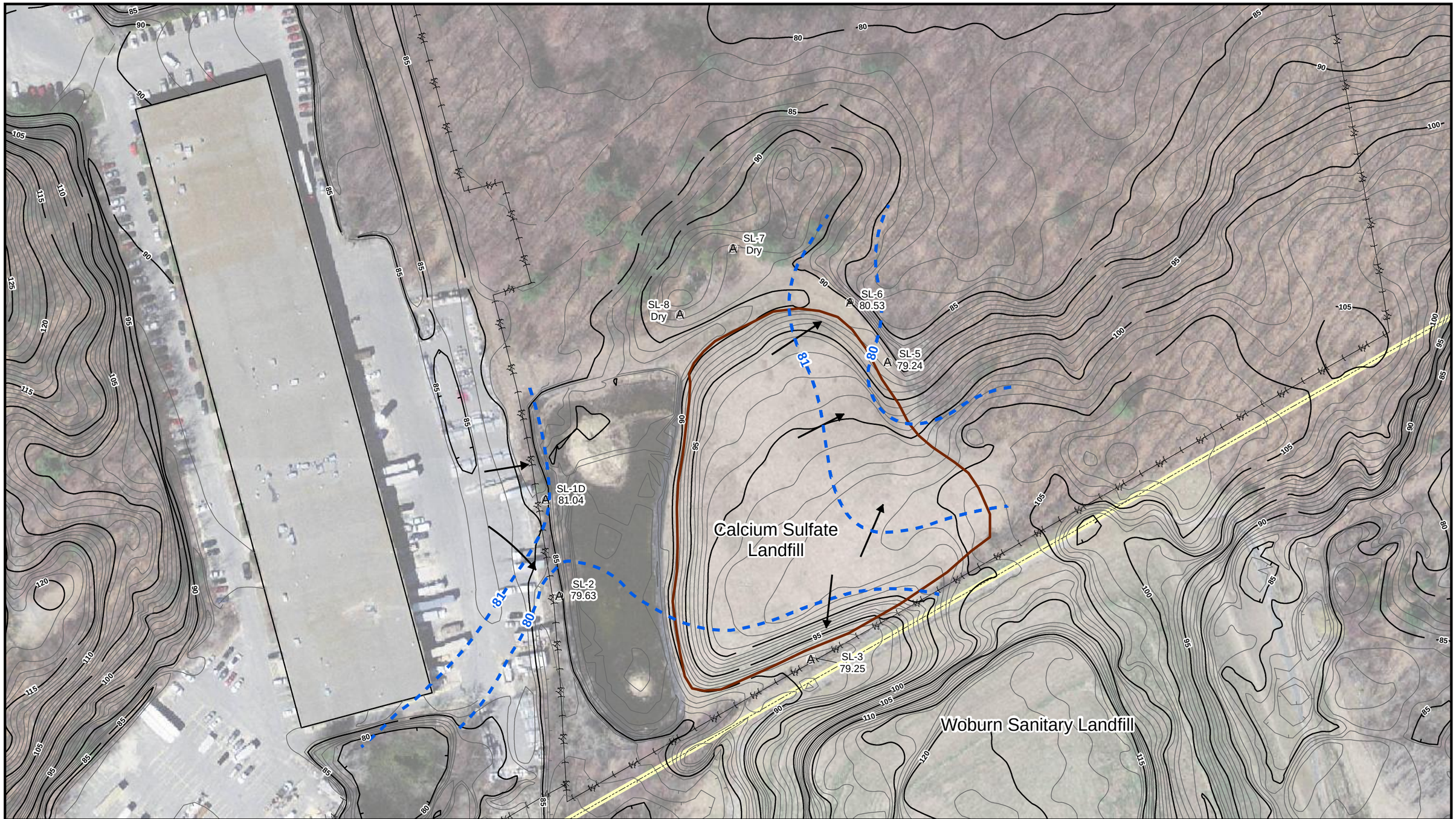

Legend

- A CSL Groundwater Monitoring Well
- Inferred Groundwater Contour (ft)
- Interpreted Direction of Groundwater Flow
- 1 Foot Contour
- 5 Foot Contour
- Fence
- Approximate CSL Boundary
- Wilmington / Woburn Town Line

amec

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107 Audubon Road Suite 301
Wakefield, MA 01880

0 50 100 200 Feet

Figure 5
Calcium Sulfate Landfill
Shallow Groundwater Contours - May 2012

Biennial Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared by BRP	Checked by PHT

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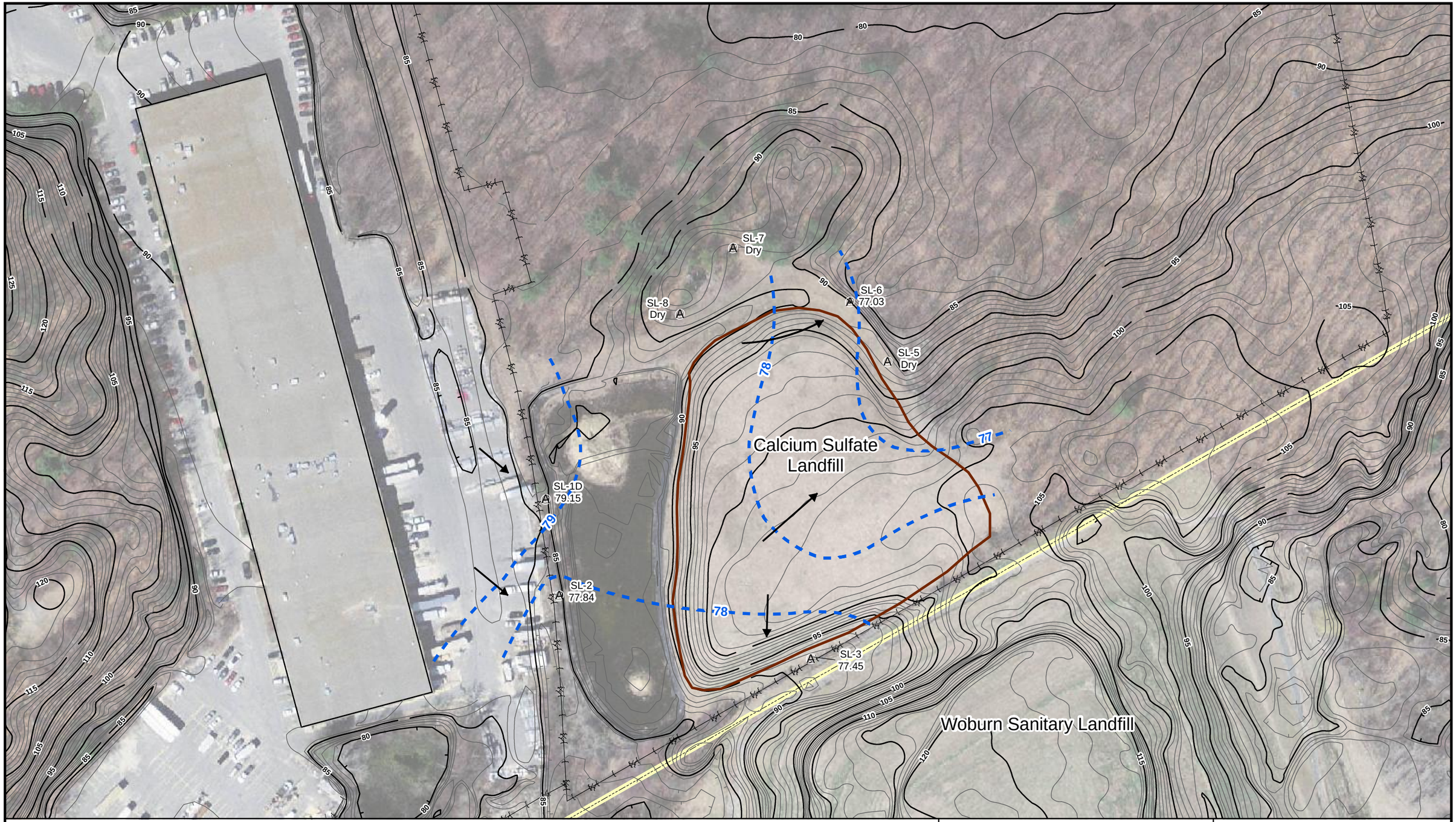

Legend

- A CSL Groundwater Monitoring Well
- Inferred Groundwater Contour (ft)
- Interpreted Direction of Groundwater Flow
- 1 Foot Contour
- 5 Foot Contour
- Fence
- Approximate CSL Boundary
- Wilmington / Woburn Town Line

AMEC Environment & Infrastructure
107 Audubon Road Suite 301
Wakefield, MA 01880

0 50 100 200 Feet

Figure 6
Calcium Sulfate Landfill
Shallow Groundwater Contours - Nov 2012

Biennial Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared by BRP | Checked by PHT

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TABLES

Table 1
Post Closure Monitoring Schedule
(Inspection and Groundwater Monitoring)

Calcium Sulfate Landfill Biennial Report - May 2013
Olin Chemical Superfund Site - Wilmington, MA

Component	Action	Required Frequency
LANDFILL		
Landfill Cover System	Inspection	Annually in spring (April - June)
Landfill Cover System	Mowing	Annually in summer or as needed
Site Drainage System	Inspection	Annually in spring (April - June)
Site Security (Fences, gates)	Inspection	Annually in spring (April - June)
Access Road	Inspection	Annually in spring (April - June)
Ground Water Monitoring System	Inspection	Annually in spring (April - June)
Ground Water Monitoring Program		
7 monitoring locations	Low flow sampling	Semi-annually in spring and fall
		(May and November)

Current Post Closure Monitoring Plan was enacted in 2011 and is to continue through 2018, pending approval by MassDEP.

Prepared by:JKR 5/6/2013
Checked by:PHT 12/16/2013

Table 2
Monitoring Well Details

Calcium Sulfate Landfill Biennial Report - May 2013
Olin Chemical Superfund Site - Wilmington, MA

Monitoring Well	Date Installed	Northing	Easting	Top of Casing Elevation	Ground (elevation)	Boring Depth (ft bgs)	Boring Depth (elevation)	Well Depth (ft bgs)	Top of Screen (elevation)	Bottom of Screen (elevation)	Bedrock (elevation)
SL-1D	11/12/1987	555264.40	693229.80	86.36	84.1	14.5	69.6	14.5	79.7	69.7	71.6
SL-2	11/13/1987	555159.10	693244.40	85.74	83.5	15	68.5	15	78.5	68.5	70.5
SL-3	11/20/1987	555090.10	693519.40	92.64	90.2	21	69.2	21	79.5	69.5	71.2
SL-5	11/17/1987	555414.30	693603.20	94.42	92.8	15.5	77.3	15	87.6	77.6	79.8
SL-6	11/18/1987	555479.80	693562.10	92.68	90.1	21	69.1	21	79.1	69.1	71.1
SL-7*	11/19/1987	555538.60	693434.40	95.25	93.3	10	83.1	10	88.3	83.3	86.3
SL-8*	11/19/1987	555466.50	693376.40	92.4	90.9	6	84.9	6	89.9	84.9	87.9

* = these wells have historically contained little or no groundwater due to shallow depth of bedrock
All wells are active
Elevation in feet msl

Prepared by: TDL 03/14/2011
Checked by: JKR 5/8/2013

Table 3
Summary of Analytical Data Groundwater - September 2010 to November 2012

Calcium Sulfate Landfill Biennial Report
Olin Chemical Superfund Site - Wilmington, MA

Parameter	Range of Detected Concentrations			Average of All Samples	Regulatory Criteria or Guidance Value (mg/L)	OC-SL-1D-092910 9/29/2010	OC-SL-1D 5/11/2011	OC-SL1D 11/15/2011	OC-SL-1D 5/21/2012	OC-SL-1D 11/15/2012
Metals, Total (mg/L)										
Aluminum	0.015	-	0.66	0.094	0.05	0.15	0.082 J	0.067 J	0.044 J	0.11 J
Calcium	18	-	600	252	-	28	30	27	23	18
Chromium	0.00097	-	0.0025	0.0026	0.1	0.005 U	0.005 U	0.005 U	0.005 U	0.0025 J
Iron	0.073	-	31	9.7	0.3	0.18	0.099 J	0.21	0.1 U	0.15
Manganese	0.0035	-	4.6	1.5	0.05	0.016	0.013	0.013	0.011 U	0.045
Nickel	0.0014	-	0.0046	0.0042	0.1	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Sodium	1.5	-	27	12.5	20	22	23	27	23	25
Metals, Filtered (mg/L)										
Aluminum	0.018	-	0.018	0.042	0.05	0.018				
Calcium	28	-	480	267	-	28				
Chromium				0.0025	0.1	0.005 U				
Iron	29	-	30	14.8	0.3	0.1 U				
Manganese	0.011	-	4.1	2.8	0.05	0.011				
Nickel	0.0015	-	0.0022	0.0027	0.1	0.01 U				
Sodium	12	-	23	16.5	20	23				
Inorganics (mg/L)										
Alkalinity, Total	15	-	230	138	-					35
Bicarbonate Alkalinity, as CaCO3	13	-	270	139.5	-	33	28	27	28	
Carbonate Alkalinity, as CaCO3				0.50	-	1 U	1 U	1 U	1 U	
Chloride	1.3	-	48	11	250	35	34	48	45	31
Sulfate	25	-	1300	485	250	44	47	31	27 J	25
Total Dissolved Solids (TDS)	75	-	1900	862	500	160	180	170	180	
Field Parameters										
Temperature (ºC)						16.4	14.0	16.9	14.2	14.3
Specific Conductance (mS/cm)						0.303	0.315	0.335	0.323	0.296
pH						5.5	5.7	5.7	5.7	6.0
Dissolved Oxygen (mg/L)						1.8	1.9	0.6	1.4	0.7

Notes:
mg/L = milligram per liter
U = not detected, value is the detection limit
J = value is estimated
Shaded values = Exceed criteria
Regulatory Criteria from "Standards and Guidance for Contaminants in Massachusetts Drinking Waters" , MADEP 2013.
Massachusetts Maximum Contaminant Levels (MCL): Chromium (Total)
Massachusetts Drinking Waters Guidelines (ORSG): Nickel, Sodiium
Secondary MCLs: Aluminum, Iron, Manganese, Chloride, Sulfate, TDS

Table 3
Summary of Analytical Data Groundwater - September 2010 to November 2012

Calcium Sulfate Landfill Biennial Report
Olin Chemical Superfund Site - Wilmington, MA

Parameter	Range of Detected Concentrations			Average of All Samples	Regulatory Criteria or Guidance Value (mg/L)	OC-SL-2 5/11/2011	OC-SL2 11/15/2011	OC-SL-2 5/21/2012	OC-SL-2 11/15/2012
Metals, Total (mg/L)									
Aluminum	0.015	-	0.66	0.094	0.05	0.66	0.054 J	0.061 J	0.18 J
Calcium	18	-	600	252	-	19	21	74	25
Chromium	0.00097	-	0.0025	0.0026	0.1	0.00097 J	0.005 U	0.0015 J	0.005 U
Iron	0.073	-	31	9.7	0.3	3.8	0.31	0.13 U	0.57
Manganese	0.0035	-	4.6	1.5	0.05	0.007	0.0035 J	0.023 U	0.098
Nickel	0.0014	-	0.0046	0.0042	0.1	0.01 U	0.01 U	0.0014 J	0.01 U
Sodium	1.5	-	27	12.5	20	1.5 J	1.9 J	2.5	21
Metals, Filtered (mg/L)									
Aluminum	0.018	-	0.018	0.042	0.05				
Calcium	28	-	480	267	-				
Chromium				0.0025	0.1				
Iron	29	-	30	14.8	0.3				
Manganese	0.011	-	4.1	2.8	0.05				
Nickel	0.0015	-	0.0022	0.0027	0.1				
Sodium	12	-	23	16.5	20				
Inorganics (mg/L)									
Alkalinity, Total	15	-	230	138	-				15
Bicarbonate Alkalinity, as CaCO3	13	-	270	139.5	-	13	26	22	
Carbonate Alkalinity, as CaCO3				0.50	-	1 U	1 U	1 U	
Chloride	1.3	-	48	11	250	1.3	1.5	3.3	35
Sulfate	25	-	1300	485	250	34	27	150 J	51
Total Dissolved Solids (TDS)	75	-	1900	862	500	99	75	270	
Field Parameters									
Temperature (ºC)						14.0	16.4	13.0	14.6
Specific Conductance (mS/cm)						0.136	0.143	0.460	0.340
pH						4.9	5.5	5.4	5.3
Dissolved Oxygen (mg/L)						5.4	1.7	1.2	2.3

Notes:
mg/L = milligram per liter
U = not detected, value is the detection limit
J = value is estimated
Shaded values = Exceed criteria
Regulatory Criteria from "Standards and Guidance for Contaminants in Massachusetts Drinking Waters" , MADEP 2013.
Massachusetts Maximum Contaminant Levels (MCL): Chromium (Total)
Massachusetts Drinking Waters Guidelines (ORSG): Nickel, Sodiium
Secondary MCLs: Aluminum, Iron, Manganese, Chloride, Sulfate, TDS

Table 3
Summary of Analytical Data Groundwater - September 2010 to November 2012

Calcium Sulfate Landfill Biennial Report
Olin Chemical Superfund Site - Wilmington, MA

Parameter	Range of Detected Concentrations			Average of All Samples	Regulatory Criteria or Guidance Value (mg/L)	OC-SL-3-092810 9/28/2010	OC-SL-3DUP-092810 9/28/2010	OC-SL-3 5/10/2011	OC-SL-3 DUP 5/10/2011	OC-SL3 11/14/2011	OC-SL3 DUP 11/14/2011
Metals, Total (mg/L)											
Aluminum	0.015	-	0.66	0.094	0.05	0.11	0.14	0.024 J	0.017 J	0.1 U	0.1 U
Calcium	18	-	600	252	-	340	330	180	200	210	210
Chromium	0.00097	-	0.0025	0.0026	0.1	0.005 U	0.0011 J	0.005 U	0.005 U	0.005 U	0.005 U
Iron	0.073	-	31	9.7	0.3	30	31	21	22	27	26
Manganese	0.0035	-	4.6	1.5	0.05	4.6	4.6	2.2	2.4	2.5	2.5
Nickel	0.0014	-	0.0046	0.0042	0.1	0.01 U	0.002 J	0.0038 J	0.0045 J	0.01 U	0.01 U
Sodium	1.5	-	27	12.5	20	13	13	7.3	8.2	8.7	8.8
Metals, Filtered (mg/L)											
Aluminum	0.018	-	0.018	0.042	0.05	0.1 U	0.1 U				
Calcium	28	-	480	267	-	280	280				
Chromium				0.0025	0.1	0.005 U	0.005 U				
Iron	29	-	30	14.8	0.3	29	30				
Manganese	0.011	-	4.1	2.8	0.05	4.1	4				
Nickel	0.0015	-	0.0022	0.0027	0.1	0.0022 J	0.0022 J				
Sodium	12	-	23	16.5	20	12	12				
Inorganics (mg/L)											
Alkalinity, Total	15	-	230	138	-						
Bicarbonate Alkalinity, as CaCO3	13	-	270	139.5	-	250	230	240	220	260	250
Carbonate Alkalinity, as CaCO3				0.50	-	1 U	1 U	1 U	1 U	1 U	1 U
Chloride	1.3	-	48	11	250	4.8	4.6	3.9	3.5	3.8	3.4
Sulfate	25	-	1300	485	250	650	720	230 J	160 J	170	130
Total Dissolved Solids (TDS)	75	-	1900	862	500	1100	1100	610	470	530	440
Field Parameters											
Temperature (ºC)						16.1		14.7		18.1	
Specific Conductance (mS/cm)						1.37		0.851		0.795	
pH						5.9		5.7		5.9	
Dissolved Oxygen (mg/L)						<0.01		<0.01		<0.01	

Notes:
mg/L = milligram per liter
U = not detected, value is the detection limit
J = value is estimated
Shaded values = Exceed criteria
Regulatory Criteria from "Standards and Guidance for Contaminants in Massachusetts Drinking Waters" , MADEP 2013.
Massachusetts Maximum Contaminant Levels (MCL): Chromium (Total)
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Table 3
Summary of Analytical Data Groundwater - September 2010 to November 2012

Calcium Sulfate Landfill Biennial Report
Olin Chemical Superfund Site - Wilmington, MA

Parameter	Range of Detected Concentrations			Average of All Samples	Regulatory Criteria or Guidance Value (mg/L)	OC-SL-3 5/21/2012	OC-SL-3 DUP 5/21/2012	OC-SL-3 11/15/2012	OC-SL-3 DUP 11/15/2012
Metals, Total (mg/L)									
Aluminum	0.015	-	0.66	0.094	0.05	0.1 U	0.015 J	0.2 U	0.2 U
Calcium	18	-	600	252	-	240	270	280	280
Chromium	0.00097	-	0.0025	0.0026	0.1	0.005 U	0.005 U	0.0012 J	0.0018 J
Iron	0.073	-	31	9.7	0.3	25	28	22	23
Manganese	0.0035	-	4.6	1.5	0.05	2.6	2.9	3.5	3.5
Nickel	0.0014	-	0.0046	0.0042	0.1	0.0027 J	0.0026 J	0.0039 J	0.0035 J
Sodium	1.5	-	27	12.5	20	8.3	9.1	9.9	10
Metals, Filtered (mg/L)									
Aluminum	0.018	-	0.018	0.042	0.05				
Calcium	28	-	480	267	-				
Chromium				0.0025	0.1				
Iron	29	-	30	14.8	0.3				
Manganese	0.011	-	4.1	2.8	0.05				
Nickel	0.0015	-	0.0022	0.0027	0.1				
Sodium	12	-	23	16.5	20				
Inorganics (mg/L)									
Alkalinity, Total	15	-	230	138	-			230	220
Bicarbonate Alkalinity, as CaCO3	13	-	270	139.5	-	270	270		
Carbonate Alkalinity, as CaCO3				0.50	-	1 U	1 U		
Chloride	1.3	-	48	11	250	5.7	5.9	4.9	4.8
Sulfate	25	-	1300	485	250	340 J	440 J	550 J	560 J
Total Dissolved Solids (TDS)	75	-	1900	862	500	810	880		
Field Parameters									
Temperature (ºC)						15.1		15.4	
Specific Conductance (mS/cm)						1.31		1.69	
pH						5.8		6.1	
Dissolved Oxygen (mg/L)						0.4		<0.01	

Notes:
mg/L = milligram per liter
U = not detected, value is the detection limit
J = value is estimated
Shaded values = Exceed criteria
Regulatory Criteria from "Standards and Guidance for Contaminants in Massachusetts Drinking Waters" , MADEP 2013.
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Secondary MCLs: Aluminum, Iron, Manganese, Chloride, Sulfate, TDS

Table 3
Summary of Analytical Data Groundwater - September 2010 to November 2012

Calcium Sulfate Landfill Biennial Report
Olin Chemical Superfund Site - Wilmington, MA

Parameter	Range of Detected Concentrations			Average of All Samples	Regulatory Criteria or Guidance Value (mg/L)	OC-SL-5 5/10/2011	OC-SL5 11/14/2011	OC-SL-5 5/21/2012	OC-SL-6-092810 9/28/2010	OC-SL-6 5/10/2011	OC-SL6 11/14/2011	OC-SL-6 5/21/2012	OC-SL-6 11/15/2012
Metals, Total (mg/L)													
Aluminum	0.015	-	0.66	0.094	0.05	0.2 U	0.029 J	0.2 U	0.069 J	0.035 J	0.019 J	0.019 J	0.1 J
Calcium	18	-	600	252	-	600	580	510	530	470	400	470	430
Chromium	0.00097	-	0.0025	0.0026	0.1	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U	0.005 U	0.0019 J
Iron	0.073	-	31	9.7	0.3	0.2 U	0.13 J	0.1 U	0.16 J	0.073 J	1.1	0.2 U	0.28
Manganese	0.0035	-	4.6	1.5	0.05	0.26	0.28	0.23	3	1.3	0.68	0.69	3.7
Nickel	0.0014	-	0.0046	0.0042	0.1	0.0026 J	0.0036 J	0.0046 J	0.02 U	0.0024 J	0.01 U	0.0014 J	0.01 U
Sodium	1.5	-	27	12.5	20	10	16	10	17	13	7	6.5	16
Metals, Filtered (mg/L)													
Aluminum	0.018	-	0.018	0.042	0.05				0.1 U				
Calcium	28	-	480	267	-				480				
Chromium				0.0025	0.1				0.005 U				
Iron	29	-	30	14.8	0.3				0.1 U				
Manganese	0.011	-	4.1	2.8	0.05				3.1				
Nickel	0.0015	-	0.0022	0.0027	0.1				0.0015 J				
Sodium	12	-	23	16.5	20				19				
Inorganics (mg/L)													
Alkalinity, Total	15	-	230	138	-								190
Bicarbonate Alkalinity, as CaCO3	13	-	270	139.5	-	92	110	120	220	100	150	110	
Carbonate Alkalinity, as CaCO3				0.50	-	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
Chloride	1.3	-	48	11	250	2.4	2.6	3.2	2.3	1.5	1.5	1.3	3
Sulfate	25	-	1300	485	250	1200 J	1100	1200 J	1300	1100 J	700	1100 J	1000
Total Dissolved Solids (TDS)	75	-	1900	862	500	1800	1700	1900	1900	1800	1200	1600	
Field Parameters													
Temperature (ºC)						13.4	16.1	12.9	17.3	15.4	16.8	13.7	14.2
Specific Conductance (mS/cm)						2.47	2.38	2.57	2.47	2.29	1.73	2.28	2.48
pH						6.1	6.0	5.9	5.8	5.6	5.8	5.7	6.3
Dissolved Oxygen (mg/L)						2.6	<0.01	2.0	<0.01	<0.01	<0.01	0.9	<0.01

Notes:
mg/L = milligram per liter
U = not detected, value is the detection limit
J = value is estimated
Shaded values = Exceed criteria
Regulatory Criteria from "Standards and Guidance for Contaminants in Massachusetts Drinking Waters" , MADEP 2013.
Massachusetts Maximum Contaminant Levels (MCL): Chromium (Total)
Massachusetts Drinking Waters Guidelines (ORSG): Nickel, Sodiium
Secondary MCLs: Aluminum, Iron, Manganese, Chloride, Sulfate, TDS

Prepared/Date: BJR 5/2/13
Checked/Date: JKR 5/9/13

Table 4
Summary of Groundwater Elevations

Calcium Sulfate Landfill Biennial Report - December 2013
Olin Chemical Superfund Site - Wilmington, MA

Monitoring Well			Groundwater Elevation										
Location	Northing	Easting	9/30/91	8/14/92	9/3/92	1/7/93	4/21/93	10/8/95	5/1/96	12/17/96	4/7/98	4/22/98	4/29/98
SL-1D	555264.4	693230	80.40	79.01	78.98	82.06	83.07	78.40		83.22	81.51	81.49	-
SL-2	555159.1	693244	78.88	-	77.93	80.84	83.87	76.47	82.76	83.24	80.57	80.29	-
SL-3	555090.1	693519	78.14	-	77.61	80.53	83.87	75.79	82.93	83.17	80.58	79.99	80.16
SL-5	555414.3	693603	78.05	-	-	81.42	81.86	-	80.43	82.18	81.30	-	80.75
SL-6	555479.8	693562	78.06	76.68	76.93	81.73	81.97	75.20	81.70	82.44	81.51	80.92	-
SL-7	555538.6	693434	84.02	-	-	84.07	84.04	84.06	83.70	-	83.92	83.33	-
SL-8	555466.5	693376	-	-	-	87.73	86.38	86.81	86.86	-	86.18	87.31	-

Monitoring Well			Groundwater Elevation							
Location	Northing	Easting	5/2/01	10/31/01	3/2/10	9/28/10	5/10/11	11/14/11	5/21/12	11/15/12
SL-1D	555264.4	693230	-	-	82.83	77.40	81.21	81.64	81.04	79.15
SL-2	555159.1	693244	80.04	78.20	81.54	DRY	80.01	80.32	79.63	77.84
SL-3	555090.1	693519	79.83	78.01	81.12	76.01	79.74	80.01	79.25	77.45
SL-5	555414.3	693603	80.41	78.66	82.87	DRY	79.55	79.95	79.24	DRY
SL-6	555479.8	693562	80.71	78.86	82.72	75.22	80.89	81.31	80.53	77.03
SL-7	555538.6	693434	83.39	81.56	84.42	DRY	83.66	DRY	DRY	DRY
SL-8	555466.5	693376	-	86.17	88.33	DRY	DRY	DRY	DRY	DRY

Prepared by: TDL 03/14/2011
Checked by: JKR 5/8/2013

APPENDIX A
LANDFILL INSPECTION REPORTS

LANDFILL INSPECTION SHEET

Facility Name: Calcium Sulfate Landfill

Location: 51 Eames Street, Wilmington, Massachusetts

Date of Inspection: 9 / 22 /20 10

Monitoring Well Condition

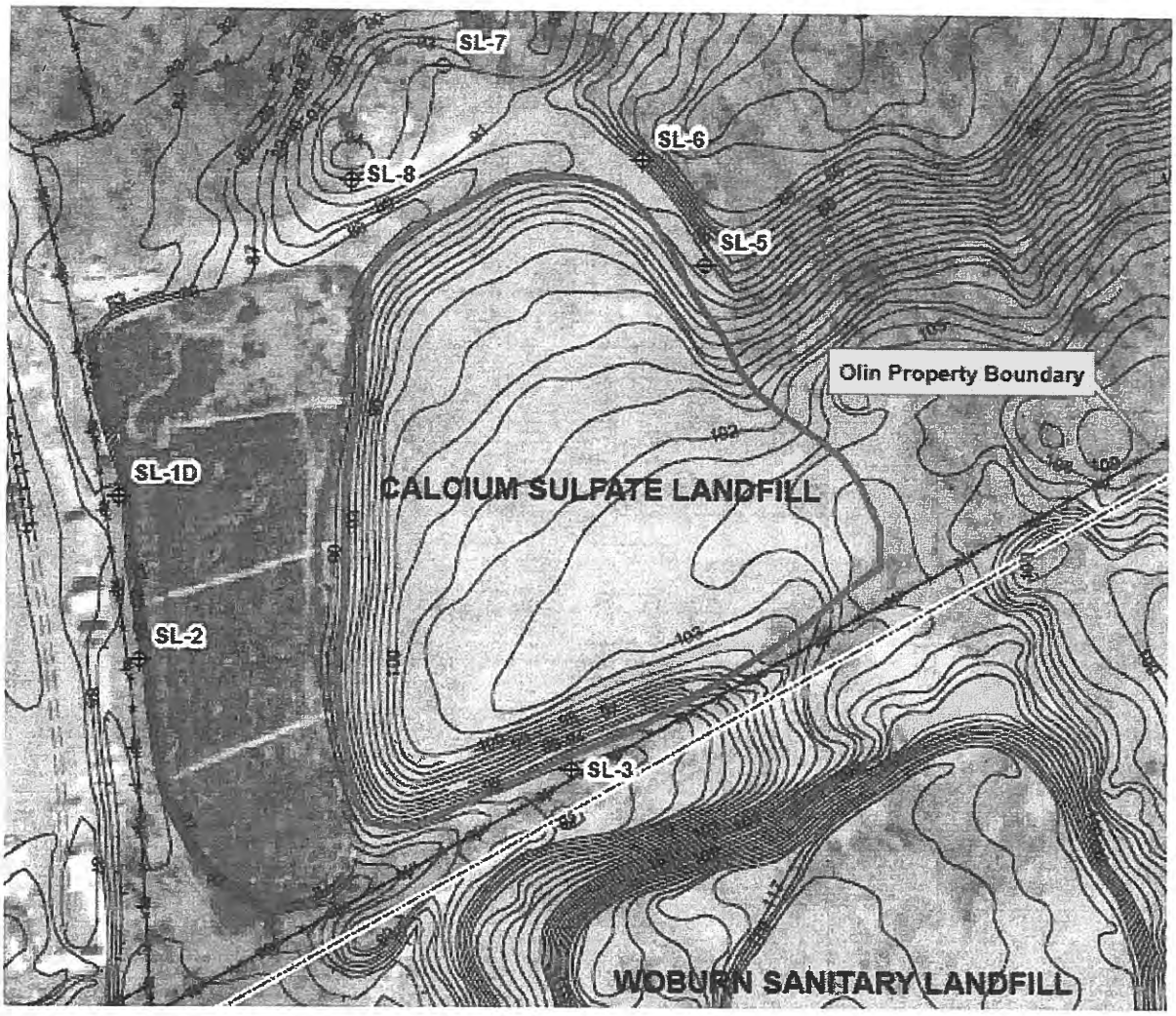
Well ID	Locked	Labeled	Comments
SL-08	x Yes ___ No	x Yes ___ No	
SL-07	x Yes ___ No	x Yes ___ No	
SL-06	x Yes ___ No	x Yes ___ No	
SL-05	x Yes ___ No	x Yes ___ No	Replace rusted lock
SL-03	x Yes ___ No	x Yes ___ No	
SL-02	x Yes ___ No	x Yes ___ No	
SL-01D	x Yes ___ No	x Yes ___ No	

Landfill Component	Condition	Comments
Access Road	Soil Erosion: ___ Yes x No	
Gate	Hinges Locked: x Yes ___ No	
Fence	Holes: ___ Yes x No Other:	
Vegetative Cover	Soil Erosion: ___ Yes x No Veg Distress: ___ Yes x No Animal Burrows: ___ Yes x No	
Drainage Swales	Soil Erosion: ___ Yes x No Veg Distress: ___ Yes x No	
Settlement	Depressions: ___ Yes x No Ponding of Water: ___ Yes ___ No	

Inspector Name (Printed): Brian Guichard

Inspector Signature: _____ Date: 9/22/10

Use map below to locate areas of Erosion (E), Animal Borrow (AB), Vegetative Distress (VD), Holes in Fence (FH), and provide additional comments and descriptions



Additional Notes

All area locks, gates, and fenceline found to be intact and secure.

Area vegetation healthy with no signs of distress.

There were some ruts in the roadway by the entry gate from access through gate for spring sampling when area was muddy.

LANDFILL INSPECTION SHEET

Facility Name: Calcium Sulfate Landfill

Location: 51 Eames Street, Wilmington, Massachusetts

Date of Inspection: 4 / 12 /2011

Monitoring Well Condition

Well ID	Locked	Labeled	Comments
SL-08	x Yes ___ No	x Yes ___ No	
SL-07	x Yes ___ No	x Yes ___ No	
SL-06	x Yes ___ No	x Yes ___ No	
SL-05	x Yes ___ No	x Yes ___ No	
SL-03	x Yes ___ No	x Yes ___ No	
SL-02	x Yes ___ No	x Yes ___ No	
SL-01D	x Yes ___ No	x Yes ___ No	

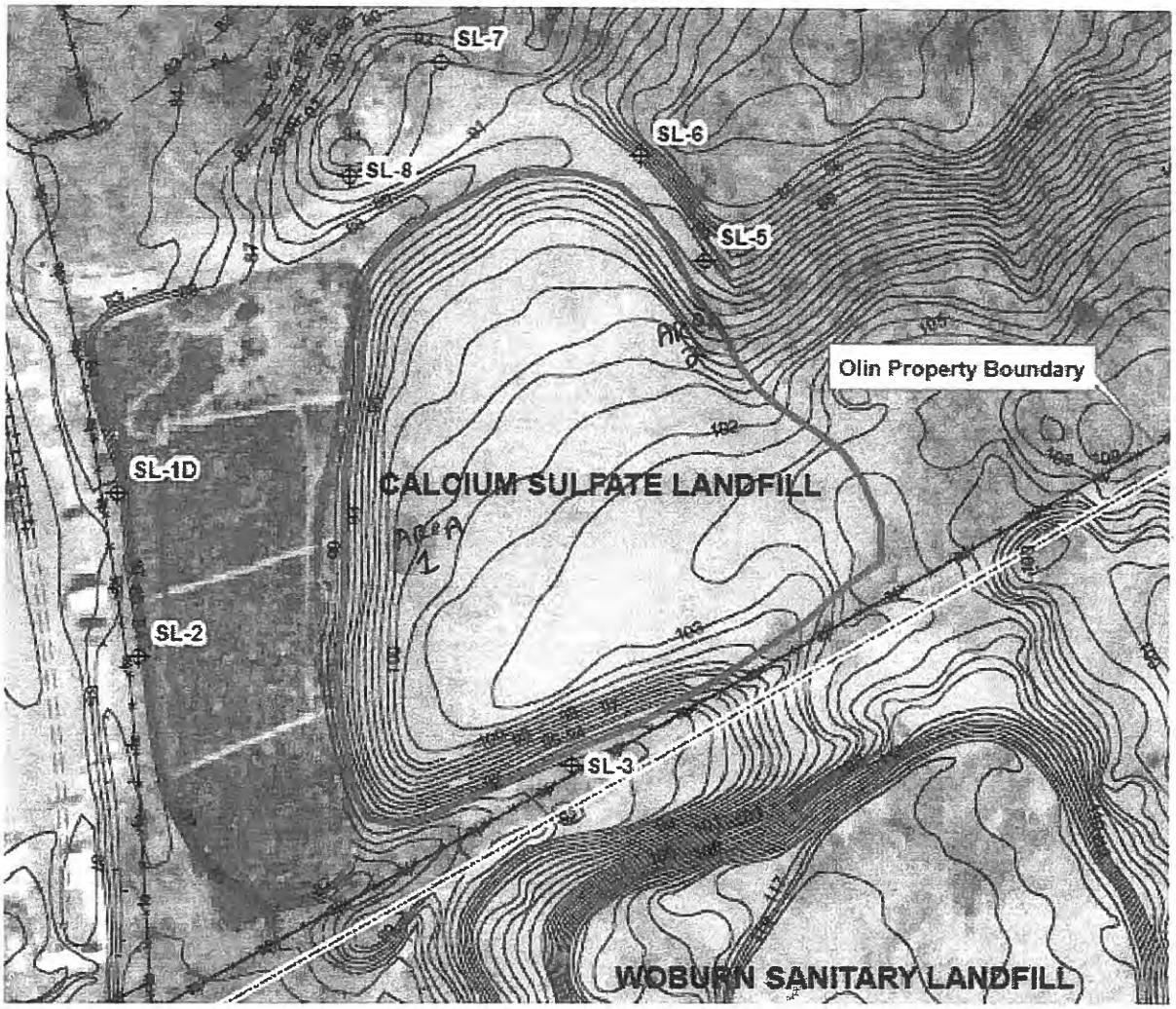
Landfill Component	Condition	Comments
Access Road	Soil Erosion: ___ Yes x No	Roadway in good condition removed some fallen trees and branches
Gate	Hinges Locked: x Yes ___ No	Entry gate secure and functioning properly
Fence	Holes: x Yes ___ No Other:	No holes, breaks, or damage noticed
Vegetative Cover	Soil Erosion: ___ Yes x No Veg Distress: x Yes ___ No Animal Burrows: ___ Yes ___ No	There were two areas of poor ground cover noticed both minor and may recover during the growing season.
Drainage Swales	Soil Erosion: ___ Yes ___ No Veg Distress: ___ Yes ___ No	
Settlement	Depressions: ___ Yes x No Ponding of Water: ___ Yes x No	

Inspector Name (Printed): Brian Guichard

Inspector Signature: [signature]

Date: 4-12-11

Use map below to locate areas of Erosion (E), Animal Borrow (AB), Vegetative Distress (VD), Holes in Fence (FH), and provide additional comments and descriptions



Additional Notes

There were two areas of minor vegetative distress noted above that still had adequate vegetative cover to prevent erosion and may fill in as the current growing season progresses.

LANDFILL INSPECTION SHEET

Facility Name: Calcium Sulfate Landfill

Location: 51 Eames Street, Wilmington, Massachusetts

Date of Inspection: _____4__/___12___/2012___

Monitoring Well Condition

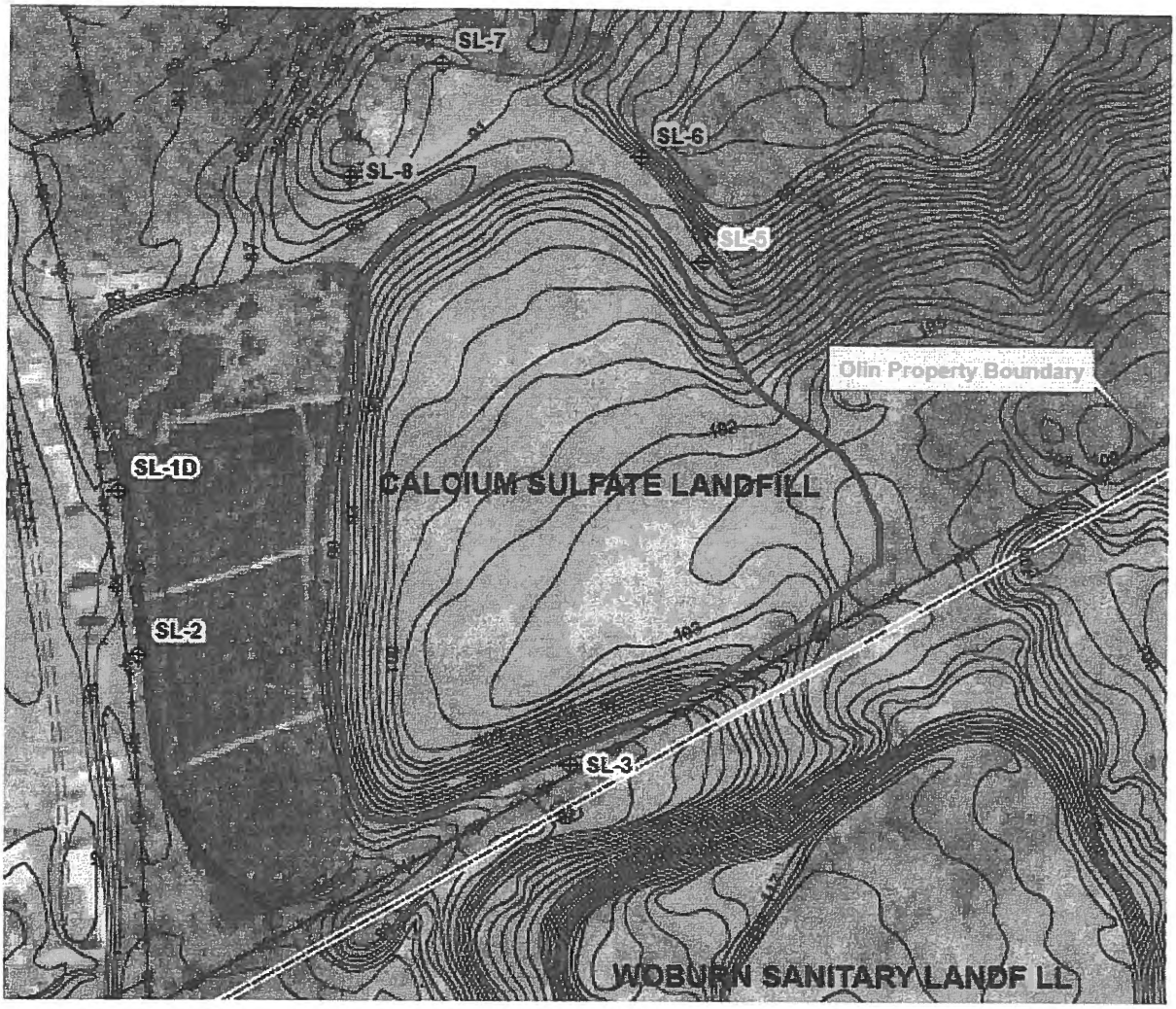
Well ID	Locked	Labeled	Comments
SL-08	__x__Yes ____No	__x__Yes ____No	
SL-07	__x__Yes ____No	__x__Yes ____No	
SL-06	__x__Yes ____No	__x__Yes ____No	
SL-05	_x___Yes ____No	__x__Yes ____No	
SL-03	__x__Yes ____No	__x__Yes ____No	
SL-02	__x__Yes ____No	__x__Yes ____No	
SL-01D	__x__Yes ____No	__x__Yes ____No	

Landfill Component	Condition	Comments
Access Road	Soil Erosion: ___Yes _x_No	
Gate	Hinges Locked: __x_Yes ___No	
Fence	Holes: ___Yes _x__No Other:	
Vegetative Cover	Soil Erosion: ___Yes __x_No Veg Distress: ___Yes __x_No Animal Burrows: ___Yes __x_No	
Drainage Swales	Soil Erosion: ___Yes _x__No Veg Distress: ___Yes __x_No	
Settlement	Depressions: ___Yes __x_No Ponding of Water: ___Yes __x_No	

Inspector Name (Printed): ___Brian Guichard_____

Inspector Signature: _____ Date: _____

Use map below to locate areas of Erosion (E), Animal Borrow (AB), Vegetative Distress (VD), Holes in Fence (FH), and provide additional comments and descriptions



Additional Notes

Ruts in Soft Soil near entry Gate

APPENDIX B
CHAIN OF CUSTODIES AND FIELD DATA RECORDS

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 3-2-10

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE: 10:30

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

		STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
~~YSI~~ MODEL NO. u 22	pH	4.0	units	pH 4.0	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity	0.444	uS/cm	Sp. Conductivity 0.45	uS/cm	+/- 10% of standard
	Redox		mV	Redox 345	mV	see note 1
	DO		%*	DO 12.7	%*	+/- 10% of standard
	Thermometer Temperature		deg. C	Temperature 12.1	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE Hach		0.1	NTU	0.1	NTU	within 0.3 NTU
MODEL NO. 2100Q		20.0	NTU	20.3	NTU	+/- 10% of standard
UNIT ID NO.			NTU		NTU	
		---	NTU	---	NTU	

PM CALIBRATION INFORMATION

		STANDARD VALUE		METER VALUE		CRITERIA **
YSI MODEL NO.	pH		units	pH	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity		uS/cm	Sp. Conductivity	uS/cm	+/- 10% of standard
	Redox		mV	Redox	mV	see note 1
	DO		%*	DO	%*	+/- 10% of standard
	Thermometer Temperature		deg. C	Temperature	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE			NTU		NTU	within 0.3 NTU
MODEL NO.			NTU		NTU	+/- 10% of standard
UNIT ID NO.			NTU		NTU	
		---	NTU	---	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other		

Calibration Fluids/ Standard Source:

Lot Numbers pH

mV

Sp. Cond.

Turb.

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 3-3-10

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE:

8:10

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

	STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
~~YSI~~ MODEL NO. U-22	pH	units	pH 4.0	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity	uS/cm	Sp. Conductivity 0.45	uS/cm	+/- 10% of standard
	Redox	mV	Redox 343	mV	see note 1
	DO	%*	DO 12.7	%*	+/- 10% of standard
	Thermometer Temperature	deg. C	Temperature 9.8	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE HACH	0.1	NTU	0.1	NTU	within 0.3 NTU
MODEL NO. 2100P	20.0	NTU	20.0	NTU	+/- 10% of standard
UNIT ID NO.		NTU		NTU	
	—	NTU	—	NTU	

PM CALIBRATION INFORMATION

	STANDARD VALUE		METER VALUE		CRITERIA **
YSI MODEL NO.	pH	units	pH	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity	uS/cm	Sp. Conductivity	uS/cm	+/- 10% of standard
	Redox	mV	Redox	mV	see note 1
	DO	%*	DO	%*	+/- 10% of standard
	Thermometer Temperature	deg. C	Temperature	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE		NTU		NTU	within 0.3 NTU
MODEL NO.		NTU		NTU	+/- 10% of standard
UNIT ID NO.		NTU		NTU	
	—	NTU	—	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other		

Calibration Fluids/ Standard Source:

Lot Numbers pH

mV

Sp. Cond.

Turb.

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

MACTEC ENGINEERING AND CONSULTING, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: CALCIUM SULFATE LANDFILL, WILMINGTON, MA
WELL ID: SL 1D
ROUND NO.:
SAMPLE ID:
SITE TYPE:
DATE: 3-3-10
TIME START: 12:05 END: 12:50
JOB NUMBER:
BOTTLE TIME:

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT.

PROTECTIVE CASING / WELL DIFFERENCE: FT.

INITIAL DEPTH TO WATER: 3.53 FT.

WELL DEPTH (TOR): 16.32 FT.

PID AMBIENT AIR: PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: FT.

SCREEN LENGTH: See Survey FT.

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: FT.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: SEC.

DISCHARGE TIMER SETTING: SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%)	TURBIDITY (NTU) (10%) (0-2)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
12:10	12.61	210	5.2	10	5.03	12.7	2.7	340		
12:15	12.62	210	5.2	11	5.30	12.9	4.7	349		
12:20	12.62	210	5.2	11	5.25	12.7	2.9	360		
12:25	12.62	210	5.1	13	5.25	12.2	1.8	367		
12:30	12.62	210	5.2	13	5.25	12.0	1.9	368		
12:35	12.62	210	5.2	13	5.25	12.2	1.6	369		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [X] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [X] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [X] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	
[X] Alkalinity	2320B	4 DEG. C	250 mL Poly	[X]	
[X] TDS	2540C	4 DEG. C	125 mL Poly	[X]	
[X] Sulfate	300.0/375.2	4 DEG. C	125 mL Poly	[X]	
[X] Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	
[X] Dissolved Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	DISS. 6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	Field Filtered
[X] Chloride	300.0	4 DEG. C	125 mL Poly	[X]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: [ ] NO

NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE:

LOCATION SKETCH

Created by:

Checked by:

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: CALCIUM SULFATE LANDFILL, WILMINGTON, MA
SAMPLE ID:
TIME START: 10:45 END: 11:30
WELL ID: 5L2
SITE TYPE:
JOB NUMBER:
ROUND NO.:
DATE: 3-3-10
BOTTLE TIME: 11:15

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

PROTECTIVE CASING STICKUP (FROM GROUND): FT.

PROTECTIVE CASING / WELL DIFFERENCE: FT.

INITIAL DEPTH TO WATER: 4.20 FT.

WELL DEPTH (TOR): 9.17 FT.

PID AMBIENT AIR: PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: 4.27 FT.

SCREEN LENGTH: See Survey FT.

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: FT.
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: 1.5 GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: SEC.

DISCHARGE TIMER SETTING: SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%)	TURBIDITY (NTU) (10%) (0-2)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
10:45	4.28	290								
10:50	4.27	275	2.9	19	6.73	12.8	8.3	253		
10:55	4.27	275	2.9	19	6.31	12.7	5.4	278		
11:00	4.27	275	3.0	19	6.08	12.6	2.2	292		
11:05	4.27	275	3.0	19	5.96	12.5	1.1	301		
11:10	4.27	275	3.0	19	5.93	12.4	0.4	304		
11:15	4.27	275	3.0	19	5.92	12.3	0.4	307		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [X] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [X] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [X] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	
[X] Alkalinity	2320B	4 DEG. C	250 mL Poly	[X]	
[X] TDS	2540C	4 DEG. C	125 mL Poly	[X]	
[X] Sulfate	300.0/375.2	4 DEG. C	125 mL Poly	[X]	
[X] Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	
[X] Dissolved Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	DISS. 6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	Field Filtered
[X] Chloride	300.0	4 DEG. C	125 mL Poly	[X]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: [ ] NO

NUMBER OF GALLONS GENERATED:

NOTES

1 EA X 1 L no preserve
1 EA X 500 mL w/nitric
1 EA X 500 mL w/nitric filtered

SIGNATURE:

LOCATION SKETCH

Created by:
Checked by:

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT	CALCIUM SULFATE LANDFILL, WILMINGTON, MA	WELL ID	SL-3	ROUND NO.	
SAMPLE ID		SITE TYPE		DATE	3-3-10
TIME	START 835 END 10:05	JOB NUMBER		BOTTLE TIME	

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

PROTECTIVE CASING STICKUP (FROM GROUND): FT.

PROTECTIVE CASING / WELL DIFFERENCE: FT.

INITIAL DEPTH TO WATER: 11.52 FT.

WELL DEPTH (TOR): 23.47 FT.

PID AMBIENT AIR: PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: FT.

SCREEN LENGTH: See Survey FT.

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: FT.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: SEC.

DISCHARGE TIMER SETTING: SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%)	TURBIDITY (NTU) (10%) (0-2)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
8:40	11.57	180	9.0	0.16	5.55	1.9	7.5	56		
8:45	11.57	180	9.2	0.16	5.71	1.1	6.8	39		
8:50	11.57	180	9.2	0.16	5.71	1.0	8.1	40		
8:55	11.57	180	9.2	0.16	5.70	1.0	7.4	41		
9:00	11.57	180	9.3	0.16	5.71	0.9	7.4	43		
9:05	11.57	180	9.3	0.16	5.71	0.9	6.9	43		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [X] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [X] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [X] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	
[X] Alkalinity	2320B	4 DEG. C	250 mL Poly	[X]	
[X] TDS	2540C	4 DEG. C	125 mL Poly	[X]	
[X] Sulfate	300.0/375.2	4 DEG. C	125 mL Poly	[X]	
[X] Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	
[X] Dissolved Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	DISS. 6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	Field Filtered
[X] Chloride	300.0	4 DEG. C	125 mL Poly	[X]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED [ ] NO

NUMBER OF GALLONS GENERATED

NOTES: 1 eA x 500 mL + MS, MSD Dup w/nitric
1 eA x 500 mL + MS, MSD, Dup w/nitric filtered
1 eA x 1L + MS MSD, Dup

SIGNATURE:

LOCATION SKETCH

Created by:

Checked by:

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: CALCIUM SULFATE LANDFILL, WILMINGTON, MA
SAMPLE ID:
TIME START: 12:30 END: 1:20
WELL ID: SL5
SITE TYPE:
JOB NUMBER:
ROUND NO.:
DATE: 3-2-10
BOTTLE TIME:

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT.

PROTECTIVE CASING / WELL DIFFERENCE: FT.

INITIAL DEPTH TO WATER: 11.55 FT.

WELL DEPTH (TOR): 17.0 FT.

PID AMBIENT AIR: PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: 11.64 FT.

SCREEN LENGTH: See Survey FT.

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: FT.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: SEC.

DISCHARGE TIMER SETTING: SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%)	TURBIDITY (NTU) (10%) (0-2)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
12:40	11.68	240	8.4	0.32	6.06	9.0	0.9	294		
12:45	11.64	220	8.4	0.33	6.03	2.2	0.6	289		
12:50	11.64	220	8.4	0.33	6.02	6.6	0.3	287		
12:55	11.64	220	8.4	0.34	6.02	3.2	0.3	284		
1:00	11.64	220	8.3	0.34	6.03	3.0	0.3	283		
1:05	11.64	220	8.3	0.34	6.03	2.9	0.3	281		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [X] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [X] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [X] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	
[X] Alkalinity	2320B	4 DEG. C	250 mL Poly	[X]	
[X] TDS	2540C	4 DEG. C	125 mL Poly	[X]	
[X] Sulfate	300.0/375.2	4 DEG. C	125 mL Poly	[X]	
[X] Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	
[X] Dissolved Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	DISS. 6010B	HNO3 / 4 DEG. C	500 mL Poly	[X]	Field Filtered
[X] Chloride	300.0	4 DEG. C	125 mL Poly	[X]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: [ ] NO

NUMBER OF GALLONS GENERATED: _____

NOTES

1 EA x 1L unpre.
1 EA x 500 mL w/ nitric
1 EA x 500 mL w/ nitric filtered

SIGNATURE:

LOCATION SKETCH

Created by:
Checked by:

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: CALCIUM SULFATE LANDFILL, WILMINGTON, MA
SAMPLE ID:
TIME START 10:50 END 11:45
WELL ID: SL 6
SITE TYPE:
JOB NUMBER:
ROUND NO.:
DATE: 3-2-10
BOTTLE TIME:

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT.

PROTECTIVE CASING / WELL DIFFERENCE: FT.

INITIAL DEPTH TO WATER: 9.96 FT.

WELL DEPTH (TOR): 22.61 FT.

PID AMBIENT AIR: PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: 10.2 FT.

SCREEN LENGTH: See Survey FT.

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: FT.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: SEC.

DISCHARGE TIMER SETTING: SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%)	TURBIDITY (NTU) (10%) (0-2)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
11:00	10.16	130	9.2	0.33	5.93	1.8	10.6	281		
11:05	10.16	150	9.1	0.33	5.85	1.1	9.8	278		
11:10	10.2	170	9.2	0.32	5.85	0.9	7.6	275		
11:15	10.2	170	9.2	0.32	5.89	0.8	3.9	271		
11:20	10.2	170	9.2	0.32	5.91	0.8	2.6	269		
11:25	10.2	170	9.2	0.32	5.94	0.7	2.0	268		
11:30	10.2	170	9.2	0.32	5.94	0.7	1.4	262		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [X] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [X] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [X] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	
[X] Alkalinity	2320B	4 DEG. C	250 mL Poly	X	
[X] TDS	2540C	4 DEG. C	125 mL Poly	X	
[X] Sulfate	300.0/375.2	4 DEG. C	125 mL Poly	X	
[X] Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	6010B	HNO3 / 4 DEG. C	500 mL Poly	X	
[X] Dissolved Metals (Ca, Na, Al, Mn, Fe, Cr, Ni)	DISS. 6010B	HNO3 / 4 DEG. C	500 mL Poly	X	Field Filtered
[X] Chloride	300.0	4 DEG. C	125 mL Poly	X	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	
[ ]				[ ]	

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED [ ] NO

NUMBER OF GALLONS GENERATED _____

NOTES

1 x 1 L unpre
1 x 500 mL w/nitric
1 x 500 mL w/nitric filtered

SIGNATURE:

LOCATION SKETCH

Created by:
Checked by:

MACTEC

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL 7
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 3-2-10
TIME: START 1:25 END 1:30
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 10.83 FT
WELL DEPTH (TOR): 12.05 FT
PROTECTIVE CASING STICKUP (FROM GROUND): FT
PROTECTIVE CASING / WELL DIFFERENCE: FT
FINAL DEPTH TO WATER: FT
PID AMBIENT AIR: PPM
WELL DIAMETER: IN
SCREEN LENGTH: FT
PID WELL MOUTH: PPM
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:
PRESSURE TO PUMP: PSI
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING:
DISCHARGE TIMER SETTING:

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP

SAMPLE I.D. NUMBER: SL 8

ROUND NO.:

EXPLORATION ID:

SITE TYPE:

DATE: 3-2-10

TIME: START 1:35 END 1:40

JOB NUMBER:

FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 4.07 FT

WELL DEPTH (TOR): 6.0 FT

PROTECTIVE CASING STICKUP (FROM GROUND): FT

PROTECTIVE CASING / WELL DIFFERENCE: FT

FINAL DEPTH TO WATER: FT

PID AMBIENT AIR: PPM

WELL DIAMETER: IN

SCREEN LENGTH: FT

PID WELL MOUTH: PPM

DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING:

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO

NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

MACTEC

revised 3/8/2010

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Chain of Custody Form

005741

•53 Southampton Road
Westfield, MA 01085
(P) 413-572-4000
(F) 413-572-3707
Westfield

•148 Rangeway Road
N. Billerica, MA 01862
(P) 978-667-1400
(F) 978-667-7871
Boston - Service Center

Client: Olin Corp
Address: 51 Fames St
Wilmington MA 01887
Phone: 9786586121 Fax: 9786586121

Client Project #: Calcium Sulfate landfill
Site ID & State:
Reports Sent To: Brian Guichard
Email: bsguichard@olin.com Email Rpt: ☐

Job# | Quote# | PO#

Shaded areas for office use
Invoice same as Report to? ☐
If Invoice contact or address different, note in *Comments*

Requested Turnaround Time (PLEASE SPECIFY)
STANDARD _____ RUSH _____ *(Lab Approval Required)*

Regulatory Programs/Presumptive Certainty/QC Forms
MADEP MCP ☐ GW1/S1 ☐ PWS DEP Forms ☐
CTDEP RCP ☐ CT RSR ☐ EDD Required ☐
QA Rpt: No QC ☐ Std QC Rpt ☐ CLP ☐

500-series for drinking water
600-series for waste water, NPDES
6000-series for groundwater, soil, waste
8000-series for groundwater, soil, waste
Use comments section to further define.

Comments *(Special Instructions)*

Please print legibly. If the analytical requests are not clearly defined on the chain-of-custody, the turnaround time will begin after all questions have been satisfactorily answered.

Sample Type Codes: WW-Wastewater, DW-Drinking Water, SW-Surface Water, GW-Groundwater, LW Lab Water, A-Air, S-Solids, "Z"- Other (please specify)

Sample I.D.	Sample Type	Sampler's Initials	Date Time Collected	Grab	Comp.	# Containers	Plastic(P) or Glass(G)	Preservative: NaHSO4/MeOH	HNO3 to pH <2	H2SO4 to pH <2	HCl to pH <2	NaOH to pH >12	Na2S2O3	None / 4° C	524 / 624 / 8260	525 / 625 / 8270	PCB / Pest / Herbicide	EPH / VPH	DRO / GRO / ETPH	Metals (Please Specify)	Mercury	General Chemistry	Bacteriological	Toxicity			Chlorides	Sulfate
SL3-030310	GW	BG	03-03-10 9:10	X		3	P		2					1													✓	✓
SL3MS-030310	GW	BG	3-3-10 9:10	X		3	P		2					1													✓	✓
SL3MSD-030310	GW	BG	3-3-10 9:10	X		3	P		2					1													✓	✓
SL3DUP-030310	GW	BG	3-3-10 9:10	X		3	P		2					1													✓	✓
SL5-030210	GW	BG	3-2-10 1:05	X		3	P		2					1													✓	✓
SL6-030210	GW	BG	3-2-10 1:05	X		3	P		2					1													✓	✓
SL2-030310	GW	BG	3-3-10 11:30	X		3	P		2					1													✓	✓
SL1D-030310	GW	BG	3-3-10 12:35	X		3	P		2					1													✓	✓

Comments:
Please Analyze All for: Alkalinity, TDS, Total metal, Diss. metal

Total metals = CA, NA, AL, MN, FE, CR, NI

Dissolved metals = CA, NA, AL, MN, FE, CR, NI

Sampled by (print): BRIAN GUICHARD 3-3-10 Signature:

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
	3-3-10	1:40		3-3-10	1:40
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

Cooler ? Y / N
MADEP Requirement Samples Iced? Y / N
Temp @ receipt: _____ ºC
Preservation / pH checked? Y / N
By:_____ Date:_____

WESTFIELD

Page_____ of _____

White = Lab file Yellow = Report copy Pink = Customer copy

WI-QA-010-REV 4A

TAL 8245.360 (0402)

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 9/28/10

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE:

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

Horiba

~~YSI MODEL~~ NO. U-22

UNIT ID NO.

	STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
pH	4.00	units	4.02	units	+/- 10% of standard
Sp. Conductivity		uS/cm	4.49	uS/cm	+/- 10% of standard
Redox		mV	301	mV	see note 1
DO		%*	8.26	%*	+/- 10% of standard
Thermometer Temperature		deg. C	22.65	deg. C	+/- 2.0 deg. C

TURBIDITY METER TYPE Hach

MODEL NO. 2100?

UNIT ID NO.

0.0	NTU	0.0	NTU	within 0.3 NTU
10.0	NTU	10.0	NTU	+/- 10% of standard
	NTU		NTU	
—	NTU	—	NTU	

PM CALIBRATION INFORMATION

YSI MODEL NO.

UNIT ID NO.

	STANDARD VALUE		METER VALUE		CRITERIA **
pH		units	4.01	units	+/- 10% of standard
Sp. Conductivity		uS/cm	4.50	uS/cm	+/- 10% of standard
Redox		mV	267	mV	see note 1
DO		%*	6.22	%*	+/- 10% of standard
Thermometer Temperature		deg. C	26.89	deg. C	+/- 2.0 deg. C

TURBIDITY METER TYPE

MODEL NO.

UNIT ID NO.

	NTU		NTU	within 0.3 NTU
	NTU		NTU	+/- 10% of standard
	NTU		NTU	
—	NTU	—	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other	Pine Environmental Auto cal Sol	

Calibration Fluids/ Standard Source:

Lot Numbers pH

mV

Sp. Cond.

Turb.

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 9/29/10

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE:

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

Horiba
~~YSI MODEL~~ NO. U-22
UNIT ID NO.

	STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
pH	4.0	units	4.02	units	+/- 10% of standard
Sp. Conductivity		uS/cm	4.49	uS/cm	+/- 10% of standard
Redox		mV	301	mV	see note 1
DO		%*	8.26	%*	+/- 10% of standard
Thermometer Temperature		deg. C	22.65	deg. C	+/- 2.0 deg. C

TURBIDITY METER TYPE: Hach
MODEL NO. 2100P
UNIT ID NO.

	0.0	NTU	0.0	NTU	within 0.3 NTU
	10.0	NTU	10.0	NTU	+/- 10% of standard
		NTU		NTU	
	—	NTU	—	NTU	

PM CALIBRATION INFORMATION

Horiba
~~YSI MODEL~~ NO. U-22
UNIT ID NO.

	STANDARD VALUE		METER VALUE		CRITERIA **
pH		units	3.98	units	+/- 10% of standard
Sp. Conductivity		uS/cm	4.49	uS/cm	+/- 10% of standard
Redox		mV	345	mV	see note 1
DO		%*	6.98	%*	+/- 10% of standard
Thermometer Temperature		deg. C	25.48	deg. C	+/- 2.0 deg. C

TURBIDITY METER TYPE: Hach
MODEL NO. 2100P
UNIT ID NO.

	0.0	NTU	0.1	NTU	within 0.3 NTU
	10.0	NTU	10.0	NTU	+/- 10% of standard
		NTU		NTU	
	—	NTU	—	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other	pine environmental autocal soil	

Calibration Fluids/ Standard Source:
Lot Numbers pH
mV
Sp. Cond.
Turb.

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC
Checkedy by: BJR

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-1D
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9-29-10
TIME: START 9:45 END 10:35
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 8.96 FT
FINAL DEPTH TO WATER: 9.02 FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.5 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 16.32 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
9:50	9.02	210	16.44	0.324	5.35	3.17	7.8	301		
9:55	9.02	210	16.59	0.317	5.38	2.86	6.3	300		
10:00	9.02	210	16.44	0.318	5.43	2.26	9.1	299		
10:05	9.02	210	16.41	0.310	5.46	1.99	10.6	299		
10:10	9.02	210	16.41	0.307	5.48	1.83	8.2	300		
10:15	9.02	210	16.41	0.303	5.49	1.79	7.9	300		
10:20	9.02	210	16.40	0.303	5.50	1.78	7.8	301		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER Silicon dedicated

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-2
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/29/10
TIME: START 9:30 END 9:35
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 9.17 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-3
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/28/10
TIME START: 11:25 END: 1:00
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 16.63 FT
FINAL DEPTH TO WATER: 16.76 FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.5 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 23.59 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:20	16.76	170	16.65	1.29	5.90	0.71	11.1	-32		
11:25	16.76	170	16.28	1.28	5.90	>0.01	7.4	-35		
11:30	16.76	170	16.27	1.29	5.90	>0.01	6.6	-37		
11:35	16.76	170	16.11	1.31	5.91	>0.01	6.1	-38		
11:40	16.76	170	15.93	1.35	5.90	>0.01	5.6	-39		
11:45	16.76	170	16.10	1.37	5.91	>0.01	5.5	-39		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER Silicon dedicated

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

LOCATION SKETCH

NOTES: Grab MS, MSD, and Dup Samples

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-5
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/28/10
TIME: START 11:00 END 11:05
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 1 FT
WELL DEPTH (TOR): 17.05 FT
PROTECTIVE CASING STICKUP (FROM GROUND): FT
PROTECTIVE CASING / WELL DIFFERENCE: FT
FINAL DEPTH TO WATER: FT
SCREEN LENGTH: FT
PID AMBIENT AIR: PPM
WELL DIAMETER: IN
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
PID WELL MOUTH: PPM
WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:
PRESSURE TO PUMP: PSI
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING:
DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:00	well	Dry								

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO
NUMBER OF GALLONS GENERATED: _____

NOTES: no Samples

SIGNATURE: [signature]

LOCATION SKETCH

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-6
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/28/10
TIME: START 10:05 END 10:50
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 17.46 FT
WELL DEPTH (TOR): 23.05 FT
PROTECTIVE CASING STICKUP (FROM GROUND): FT
PROTECTIVE CASING / WELL DIFFERENCE: FT
FINAL DEPTH TO WATER: 17.99 FT
PID AMBIENT AIR: PPM
WELL DIAMETER: IN
SCREEN LENGTH: FT
PID WELL MOUTH: PPM
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:
PRESSURE TO PUMP: PSI
TOTAL VOL. PURGED: 1 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING:
DISCHARGE TIMER SETTING:

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:05	17.95	120	17.77	2.51	5.75	0.97	2.4	287		
10:15	17.97	120	17.77	2.50	5.76	0.28	3.4	279		
10:20	17.97	120	17.47	2.49	5.78	>0.01	2.3	267		
10:25	17.98	120	17.32	2.48	5.79	>0.01	2.1	258		
10:30	17.98	120	17.39	2.47	5.81	>0.01	1.5	252		
10:35	17.99	120	17.29	2.47	5.82	>0.01	1.3	249		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER Silicon dedicated

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-7
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/29/10
TIME: START 10:50 END 10:55
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 12.05 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:50	DRY									

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

LOCATION SKETCH

NOTES: no Sample

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-8
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 9/29/10
TIME: START 11:05 END 11:10
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 60 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:05	Dry									

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO
NUMBER OF GALLONS GENERATED: _____

LOCATION SKETCH

NOTES

no Sample

SIGNATURE: _____

MACTEC

revised 3/8/2010

TestAmerica Laboratories, Inc.
Chain of Custody Form

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

•53 Southampton Road
Westfield, MA 01085
(P) 413-572-4000
(F) 413-572-3707

Client: Olin Chemical/MACTEC
Address: 51 Eames Street
Wilmington, MA 01887
Phone: Fax:

Project #:
Project Manager:
Work ID: Calcium Sulfate Landfill
Contact: David Chapman/Brian Guichard

Job# | Quote# | PO#

Shaded areas for office use

Analysis Requested
Check analysis and specify method and analytes in comments section.
For example:
500-series for drinking water
600-series for waste water
8000-series for haz/solid waste
Use comments section to further define.

Comments
(Special Instructions)
MCP case narrative
6010 metals-Al/Ca/Cr/Fe/Mn/Na/Ni

Requested Turn Around Time
10 Business Day (Std) XX
15 Business Day
Other
Rush TAT Requested:
24 hrs 72 hrs
48 hrs 5 Day

Regulatory Classification / Special Report Format
NPDES Drinking Water DEP Form(s)
RCRA MCP GW1/S1 MWRA Smart Rpt
Other MCP QA/QC Rpt XX

Sample Type Codes
WW-Wastewater DW-Drinking water SW-Surfacewater
LW-Labwater GW-Groundwater A-Air
S-Solid / Soil SL-Sludge O-Oil Z-Other

Sample ID	Sample Type	Sampler's Initials	Date Time Collected	Grab	Comp.	# Containers	Plastic(P) or Glass(G)	Preservative: NaHSO4/MeOH	HNO3 to pH <2	H2SO4 to pH <2	HCl to pH <2	NaOH to pH >12	NAOH/ZNAC	None / 4° C	Bi/carbonate Alkalinity	Chloride, Sulfate	TDS	6010 total	6010 Dissolved	Other	Other	Other	Other	Other	Other	Other	Other
SL-6-092810	GW	BG	9/28/10 10:35	X		3	P		2					1	X	X	X	X	X								
SL-3-092810	GW	BG	9/28/10 11:45	X		3	P		2					1		XX	X	X	X								
SL-3MS-092810	GW	BG	9/28/10 11:45	X		3	P		2					1	X	X	X	X	X								
SL-3MSD-092810	GW	BG	9/28/10 11:45	X		3	P		2					1	X	X	X	X	X								
SL-3DUP-092810	GW	BG	9/28/10 11:45	X		3	P		2					1	X	X	X	X	X								
SL-1D-092910	GW	BG	9/29/10 10:20	X		3	P		2					1	X	X	X	X	X								

Sampled by (print): BRIAN GUICHARD
Signature:

Relinquished by: Date: 9/29/10 Time: 1330
Received by: Date: 9-29-10 Time: 1330

Relinquished by: Date: Time:
Received by: Date: Time:

Method of shipment:

TestAmerica-Westfield

Cooler ? Y / N Samples Iced? Y / N
Temp @ receipt: _____ °C
Preservation/pH checked
By: _____ Date: _____

Page_____ of _____

STL-8245 (1000)

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 5-10-11

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE:

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

Horiba ~~YSI~~ MODEL NO. U-22

UNIT ID NO.

	STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
pH	4.0	units	3.99	units	4.02 +/- 10% of standard
Sp. Conductivity	4.49	uS/cm	4.59	uS/cm	4.49 +/- 10% of standard
Redox		mV	245	mV	see note 1
DO		%*	8.80	%*	8.88 +/- 10% of standard
Thermometer Temperature		deg. C	17.83	deg. C	16.02 +/- 2.0 deg. C

TURBIDITY METER TYPE Hach

MODEL NO. 2100P

UNIT ID NO.

0.2	NTU	0.19	NTU	0.2	within 0.3 NTU
20.0	NTU	20.4	NTU	19.9	+/- 10% of standard
	NTU		NTU		
---	NTU	---	NTU		

PM CALIBRATION INFORMATION

YSI MODEL NO.

UNIT ID NO.

	STANDARD VALUE		METER VALUE		CRITERIA **
pH		units		units	+/- 10% of standard
Sp. Conductivity		uS/cm		uS/cm	+/- 10% of standard
Redox		mV		mV	see note 1
DO		%*		%*	+/- 10% of standard
Thermometer Temperature		deg. C		deg. C	+/- 2.0 deg. C

TURBIDITY METER TYPE

MODEL NO.

UNIT ID NO.

	NTU		NTU	within 0.3 NTU
	NTU		NTU	+/- 10% of standard
	NTU		NTU	
---	NTU	---	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other		

Calibration Fluids/ Standard Source:

Lot Numbers pH

mV

Sp. Cond.

Turb.

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 5-11-11

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE:

EQUIPMENT CALIBRATION

		AM CALIBRATION INFORMATION						ACCEPTANCE CRITERIA **
		STANDARD VALUE		METER VALUE				
~~YSI~~ Horiba MODEL NO.	U-22	pH	4.0 units	pH	4.0 units	4.03		+/- 10% of standard
UNIT ID NO.		Sp. Conductivity	4.49 uS/cm	Sp. Conductivity	4.53 uS/cm	4.73		+/- 10% of standard
		Redox	mV	Redox	247 mV	253		see note 1
		DO	%*	DO	8.06 %*	8.29		+/- 10% of standard
		Thermometer Temperature	deg. C	Temperature	17.53 deg. C	16.42		+/- 2.0 deg. C
TURBIDITY METER TYPE	Hach		0.2 NTU		0.23 NTU	0.27		within 0.3 NTU
MODEL NO.	2100P		20.0 NTU		20.7 NTU	19.2		+/- 10% of standard
UNIT ID NO.			NTU		NTU			
			— NTU		— NTU			

PM CALIBRATION INFORMATION

		STANDARD VALUE		METER VALUE		CRITERIA **
YSI MODEL NO.		pH	units	pH	units	+/- 10% of standard
UNIT ID NO.		Sp. Conductivity	uS/cm	Sp. Conductivity	uS/cm	+/- 10% of standard
		Redox	mV	Redox	mV	see note 1
		DO	%*	DO	%*	+/- 10% of standard
		Thermometer Temperature	deg. C	Temperature	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE			NTU		NTU	within 0.3 NTU
MODEL NO.			NTU		NTU	+/- 10% of standard
UNIT ID NO.			NTU		NTU	
			— NTU		— NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other		

Calibration Fluids/ Standard Source:

Lot Numbers pH:

mV:

Sp. Cond.:

Turb.:

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL 1D
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-11-11
TIME: START 10:45 END 11:40
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

INITIAL DEPTH TO WATER: 5.15 FT
FINAL DEPTH TO WATER: 5.20 FT
DRAWDOWN VOLUME: 0.008 GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.46 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 16.4 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: <0.01

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:50	5.19	120	16.69	0.288	5.84	6.67	13.3	171		
10:55	5.20	160	14.80	0.309	5.68	3.06	6.25	191		
11:00	5.20	160	14.49	0.311	5.67	2.48	5.01	196		
11:05	5.20	160	14.43	0.311	5.69	2.36	3.21	197		
11:10	5.20	160	14.25	0.313	5.69	2.13	2.26	199		
11:15	5.20	160	14.12	0.314	5.68	1.99	2.04	202		
11:20	5.20	160	14.09	0.314	5.67	1.95	1.24	203		
11:25	5.20	160	14.04	0.315	5.67	1.94	1.21	204		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [x] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER n/A

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [x] OTHER n/A

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1.5

LOCATION SKETCH

NOTES

SIGNATURE:

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
EXPLORATION ID:
TIME: START 9:40 END 10:25
SAMPLE I.D. NUMBER: SL-~~1~~2
SITE TYPE:
JOB NUMBER:
ROUND NO.:
DATE: 5-11-11
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

INITIAL DEPTH TO WATER: 5.73 FT
FINAL DEPTH TO WATER: 5.73 FT
DRAWDOWN VOLUME: <0.01 GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.8 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 9.55 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: <0.01

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
9:45	5.73	270	15.73	0.152	5.53	5.59	33.1	201		
9:50	5.73	270	15.01	0.146	5.26	5.44	29.4	223		
9:55	5.73	270	14.51	0.140	5.00	5.32	16.9	246		
10:00	5.73	270	14.22	0.137	4.88	5.35	5.86	254		
10:05	5.73	270	14.02	0.135	4.85	5.32	2.44	260		
10:10	5.73	270	14.03	0.136	4.85	5.35	2.29	262		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [x] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER n/a

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [x] OTHER n/a

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1.8

NOTES

SIGNATURE:

LOCATION SKETCH

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-3
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-10-11
TIME: START 10:20 END 11:25
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

INITIAL DEPTH TO WATER: 12.90 FT
FINAL DEPTH TO WATER: 12.90 FT
DRAWDOWN VOLUME: <0.01 GAL
(Initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.4 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 23.6 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: <0.01

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:25	12.91	210	18.29	0.892	5.97	3.17	18.1	-31		
10:30	12.91	210	15.51	0.812	5.82	<0.01	6.92	-48		
10:35	12.91	210	15.09	0.826	5.78	<0.01	7.93	-54		
10:40	12.91	210	14.93	0.837	5.75	<0.01	7.14	-62		
10:45	12.90	210	14.79	0.850	5.74	<0.01	5.74	-65		
10:50	12.90	210	14.72	0.851	5.73	<0.01	4.92	-65		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER n/a

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [x] OTHER n/a

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1.4

NOTES: Also collect ms/msD/ dup

SIGNATURE:

LOCATION SKETCH

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-5
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-10-11
TIME: START 9:05 END 10:00
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [x] TOP OF PROTECTIVE CASING
- [ ] OTHER

INITIAL DEPTH TO WATER: 14.87 FT
FINAL DEPTH TO WATER: 14.99 FT
DRAWDOWN VOLUME: 0.02 GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 2.3 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 17.1 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: <0.01

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
9:10	14.98	195	17.13	2.41	5.93	4.08	1.34	207		
9:15	14.99	195	14.50	2.45	5.95	5.44	0.55	197		
9:20	14.99	195	14.28	2.45	5.97	5.27	0.37	195		
9:25	14.99	195	14.03	2.45	5.99	5.07	0.41	195		
9:30	14.99	195	13.83	2.45	6.02	4.78	0.13	194		
9:35	14.99	195	13.70	2.46	6.03	3.59	0.28	194		
9:40	14.99	195	13.56	2.46	6.04	2.78	0.21	194		
9:45	14.99	195	13.48	2.47	6.05	2.68	0.17	194		
9:50	14.99	195	13.43	2.47	6.05	2.64	0.15	194		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [x] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER n/a

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [x] OTHER n/a

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 2.3

LOCATION SKETCH

NOTES

SIGNATURE:

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-6
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-10-11
TIME: START 8:20 END 8:55
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 11.79 FT
FINAL DEPTH TO WATER: 12.01 FT
DRAWDOWN VOLUME: 0.04 GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: 1.0 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 23.1 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: 0.04

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
8:25	12.02	150	18.04	2.19	5.72	0.80	0.94	211		
8:30	12.02	150	16.25	2.24	5.68	<0.01	0.42	206		
8:35	12.01	150	15.64	2.28	5.65	<0.01	0.40	205		
8:40	12.01	150	15.43	2.28	5.63	<0.01	0.39	206		
8:45	12.01	150	15.39	2.29	5.62	<0.01	0.42	206		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [x] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [x] OTHER n/a

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER n/a

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: 5t-7
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-11-11
TIME: START n/a END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 11.59 FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 12.1 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
Well Not Sampled										

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 3/8/2010

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-8
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-11-11
TIME: START N/A END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: N/A FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): 3 FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
no sample taken										

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]
[ ] Other_____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED YES NO
NUMBER OF GALLONS GENERATED _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

MACTEC

revised 3/8/2010

TestAmerica Westfield
Westfield Executive Park 53 Southampton Road
Westfield, MA 01085
Phone (413) 572-4000 Fax (413) 572-3707

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Guichard	Lab PM: Mason, Becky C	Carrier Tracking No(s):	COC No:
Client Contact: James Cashwell	Phone: 9786586121	E-Mail: becky.mason@testamericainc.com		Page:
Company: Olin Corporation				Job #:
Address: 51 Eames street	Due Date Requested:			
City: Wilington	TAT Requested (days):			
State, Zip: MA, 01887				
Phone:	PO #: REWI0013			
Email:	WO #:			
Project Name: Calcium Sulfate Landfill	Project #:			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Bl/carbonate Alkalinity/Chloride/Sulfate	6010 total metals-Al/Ca/Cr/Fe/Mn/Na/Ni	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D		
OC- SL-6	5-10-11	8:45	G	W	n	n	✓	✓	2	This job is MCP
OC- SL-5	5-10-11	9:50	G	W	n	n	✓	✓	2	
OC- SL-3	5-10-11	10:50	G	W	n	y	✓	✓	8	includes MS, MSD + Dup
OC- SL-2	5-11-11	10:10	G	W	n	n	✓	✓	2	
OC- SL-1D	5-11-11	10:25	G	W	n	n	✓	✓		
OC-										
OC-										
OC-										
OC-										
OC-										
OC-										

SL-3 Also has MS, MSD, and Dup

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 5-11-11	Company Olin	Received by:	Date/Time: 5-11-11 1300	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: _____ TASK NO: _____ DATE: 1-14-4
PROJECT NUMBER: _____ MACTEC CREW: _____
PROJECT LOCATION: _____ SAMPLER NAME: Brian Gerchard
WEATHER CONDITIONS (AM): _____ SAMPLER SIGNATURE: [signature]
WEATHER CONDITIONS (PM): _____ CHECKED BY: _____ DATE: _____

MULTI-PARAMETER WATER QUALITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

	Units	AM CALIBRATION Start Time: Standard Value	Meter Value	End Time: *Acceptance Criteria (AM)	PM CALIBRATION CHECK Start Time: Standard Value	Meter Value	End Time: *Acceptance Criteria (PM)
pH (4)	SU	4.0	4.03	+/- 0.1 pH Units			
pH (7)	SU	7.0		+/- 0.1 pH Units	7.0		+/- 0.3 pH Units
pH (10)	SU	10.0		+/- 0.1 pH Units			
Redox	+/- mV	240	278	+/- 10 mV	240		+/- 10 mV
Conductivity	uS/cm	1413	4.39	+/- 3% of standard	1413		+/- 5% of standard
DO (saturated)	%	100		+/- 2% of standard			
DO (saturated)	mg/L[1] (see Chart 1)		7.64	+/- 0.2 mg/L	<0.1		+/- 0.5 mg/L of standard
DO (<0.1)	mg/L	<0.1		< 0.5 mg/L			
Temperature	°C		18.01				
Baro. Press.	mmHg						

TURBIDITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

	Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
Standard	NTU	<0.1	0.2	<0.1		+/- 0.3 NTU of stan.
Standard	NTU	20	2.1	20		+/- 5% of standard
Standard	NTU	100		100		+/- 5% of standard
Standard	NTU	800		800		+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Background	ppmv	<0.1		<0.1		within 5 ppmv of BG
Span Gas	ppmv	100		100		+/- 10% of standard

O_2-LEL 4 GAS METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Methane	%	50		50		+/- 10% of standard
O_2	%	20.9		20.9		+/- 10% of standard
H_2S	ppmv	25		25		+/- 10% of standard
CO	ppmv	50		50		+/- 10% of standard

OTHER METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

See Notes Below for Additional Information

☐ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: Portland FOS
Lot#/Date Produced: _____
Trip Blank Source: Lab
Sample Preservatives Source: Lab
Disposable Filter Type: 0.45µm cellulose
Calibration Fluids / Standard Source:
- DO Calibration Fluid (<0.1 mg/L) Portland FOS
- Other _____
- Other _____
- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)		
pH (7)		
pH (10)		
ORP		
Conductivity		
<0.1 Turb. Stan.		
20 Turb. Stan.		
100 Turb. Stan.		
800 Turb. Stan.		
PID Span Gas		
O_2-LEL Span Gas		
DO		

NOTES:

MACTEC

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.
** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME:
PROJECT NUMBER:
PROJECT LOCATION:
WEATHER CONDITIONS (AM):
WEATHER CONDITIONS (PM):

TASK NO: DATE: 1-15-11
MACTEC CREW:
SAMPLER NAME: BRyan Guichard
SAMPLER SIGNATURE:
CHECKED BY: DATE:

MULTI-PARAMETER WATER QUALITY METER

METER TYPE
MODEL NO.
UNIT ID NO.

	Units	AM CALIBRATION Standard Value (Start Time:)	AM Meter Value (End Time:)	*Acceptance Criteria (AM)	PM CALIBRATION CHECK Standard Value (Start Time:)	PM Meter Value (End Time:)	*Acceptance Criteria (PM)
pH (4)	SU	4.0	4.01	+/- 0.1 pH Units			
pH (7)	SU	7.0		+/- 0.1 pH Units	7.0	3.96	+/- 0.3 pH Units
pH (10)	SU	10.0		+/- 0.1 pH Units			
Redox	+/- mV	240	271	+/- 10 mV	240	294	+/- 10 mV
Conductivity	uS/cm	1413	4.48	+/- 3% of standard	1413	4.78	+/- 5% of standard
DO (saturated)	%	100		+/- 2% of standard			
DO (saturated)	mg/L[1] (see Chart 1)			+/- 0.2 mg/L			
DO (<0.1)	mg/L	<0.1	7.85	< 0.5 mg/L	<0.1		+/- 0.5 mg/L of standard
Temperature	°C		21-39			8.29	
Baro. Press.	mmHg					18.70	

TURBIDITY METER

METER TYPE
MODEL NO.
UNIT ID NO.

	Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
Standard	NTU	<0.1	0.2	<0.1	0.2	+/- 0.3 NTU of stan.
Standard	NTU	20	19.7	20	19.8	+/- 5% of standard
Standard	NTU	100		100		+/- 5% of standard
Standard	NTU	800		800		+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE
MODEL NO.
UNIT ID NO.

Background	ppmv	<0.1		<0.1		within 5 ppmv of BG
Span Gas	ppmv	100		100		+/- 10% of standard

O_2-LEL 4 GAS METER

METER TYPE
MODEL NO.
UNIT ID NO.

Methane	%	50		50		+/- 10% of standard
O_2	%	20.9		20.9		+/- 10% of standard
H_2S	ppmv	25		25		+/- 10% of standard
CO	ppmv	50		50		+/- 10% of standard

OTHER METER

METER TYPE
MODEL NO.
UNIT ID NO.

See Notes Below for Additional Information

☐ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: Portland FOS
Lot#/Date Produced:
Trip Blank Source: Lab
Sample Preservatives Source: Lab
Disposable Filter Type: 0.45µm cellulose
Calibration Fluids / Standard Source:
- DO Calibration Fluid (<0.1 mg/L) Portland FOS
- Other
- Other
- Other

	Cal. Standard Lot Number	Exp. Date
pH (4)		
pH (7)		
pH (10)		
ORP		
Conductivity		
<0.1 Turb. Stan.		
20 Turb. Stan.		
100 Turb. Stan.		
800 Turb. Stan.		
PID Span Gas		
O_2-LEL Span Gas		
DO		

NOTES:

MACTEC

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.
** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC SL1D
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-11
TIME: START 8:20 END 9:10
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 4.72 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 4.87 FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: 0.024 GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: 1.32 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
8:25	4.87	170	19.82	0.307	5.80	2.07	5.58	205		
8:30	4.87	170	17.48	0.331	5.72	0.89	4.54	207		
8:35	4.87	170	17.17	0.334	5.69	0.73	4.09	211		
8:40	4.87	170	17.03	0.335	5.66	0.63	2.91	215		
8:45	4.87	170	16.84	0.336	5.68	0.61	2.06	217		
8:50	4.87	170	16.86	0.335	5.67	0.62	1.47	218		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: 1.32

LOCATION SKETCH

NOTES

SIGNATURE: _____

MACTEC

revised 11/14/2011

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC-SL 2
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-11
TIME: START 7:30 END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PROTECTIVE CASING / WELL DIFFERENCE: FT

INITIAL DEPTH TO WATER: 5.42 FT
WELL DEPTH (TOR): FT
PID AMBIENT AIR: PPM
WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 5.72 FT
SCREEN LENGTH: FT
PID WELL MOUTH: PPM

DRAWDOWN VOLUME: 0.048 GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:
PRESSURE TO PUMP: PSI

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

TOTAL VOL. PURGED: 2.36 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING:
DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
7:35	5.72	260	19.86	0.143	5.57	2.67	13.8	247		
7:40	5.72	260	17.74	0.144	5.63	2.33	22.1	241		
7:45	5.72	260	17.08	0.144	5.59	1.98	15.8	244		
7:50	5.72	260	16.80	0.144	5.58	1.98	6.20	244		
7:55	5.72	260	16.53	0.142	5.49	1.81	3.31	245		
8:00	5.72	260	16.44	0.142	5.51	1.76	2.66	241		
8:05	5.72	260	16.38	0.143	5.53	1.72	1.67	239		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 2.36

LOCATION SKETCH

NOTES: note: top of Riser partially broken

SIGNATURE: _____

MACTEC

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC-SL2
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-14-11
TIME: START 11:05 END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 5.4 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: _____ FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: _____ GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: _____ GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:10			19.86	0.139	5.78	2.97	39.9	115		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO

NUMBER OF GALLONS GENERATED: _____

LOCATION SKETCH

NOTES

PUMP FAILURE

SIGNATURE: _____

MACTEC

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC-SL3
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-14-11
TIME: START 9:35 END 11:00
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT
PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 12.63 FT
WELL DEPTH (TOR): _____ FT
PID AMBIENT AIR: _____ PPM
WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 12.83 FT
SCREEN LENGTH: _____ FT
PID WELL MOUTH: _____ PPM

DRAWDOWN VOLUME: 0.032 GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____
PRESSURE TO PUMP: _____ PSI

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

TOTAL VOL. PURGED: 0.91 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING: _____
DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
9:40	12.79	140	19.88	0.784	5.96	1.71	2.58	-69		
9:45	12.82	140	18.43	0.803	5.87	>0.01	2.67	-77		
9:50	12.82	140	18.24	0.791	5.89	>0.01	2.07	-84		
9:55	12.82	140	18.10	0.794	5.88	>0.01	1.77	-86		
10:00	12.83	140	18.10	0.795	5.86	>0.01	1.56	-83		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 0.91

NOTES: Also Grab MS, MSD + Dup Samples

SIGNATURE: _____

LOCATION SKETCH

MACTEC

revised 11/14/2011

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC-SL5
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-14-11
TIME: START 8:45 END 9:25
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT

PROTECTIVE CASING / WELL DIFFERENCE: FT

INITIAL DEPTH TO WATER: 14.47 FT

WELL DEPTH (TOR): FT

PID AMBIENT AIR: PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: FT

SCREEN LENGTH: FT

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING:

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
8:50	14.57	190	19.01	2.19	6.01	0.01	1.29	181		
8:55	14.57	190	16.81	2.40	6.00	>0.01	0.79	180		
9:00	14.57	190	16.37	2.41	6.02	>0.01	0.94	183		
9:05	14.57	190	16.23	2.38	6.02	>0.01	0.50	186		
9:10	14.57	190	16.12	2.38	6.03	>0.01	0.49	187		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [x] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO

NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

MACTEC

revised 11/14/2011

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: OC SL6
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-14-11
TIME: START 8:00 END 8:45
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 11.57 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 12.56 FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: 0.19 GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: 0.9 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
8:05	12.6	110	20.66	1.86	5.74	>0.01	5.22	215		
8:10	12.57	110	17.46	1.96	5.75	>0.01	2.72	201		
8:15	12.57	110	17.12	1.87	5.75	>0.01	1.68	196		
8:20	12.57	110	16.93	1.77	5.77	>0.01	1.41	194		
8:25	12.56	110	16.81	1.75	5.77	>0.01	1.09	194		
8:30	12.56	110	16.78	1.73	5.77	>0.01	0.85	195		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER Reduced

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]
[ ] Other				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: 0.9

LOCATION SKETCH

NOTES

SIGNATURE:

MACTEC

revised 11/14/2011

TestAmerica Westfield
Westfield Executive Park 53 Southampton Road
Westfield, MA 01085
Phone (413) 572-4000 Fax (413) 572-3707

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Guichard	Lab PM: Mason, Becky C	Carrier Tracking No(s):	COC No:
Client Contact: James Cashwell	Phone: 9786586121	E-Mail: becky.mason@testamericainc.com		Page: 1 of 1
Company: Olin Corporation				Job #:
Address: 51 Eames street	Due Date Requested:			
City: Wilington	TAT Requested (days):			
State, Zip: MA, 01887				
Phone:	PO #: REWI0013			
Email:	WO #:			
Project Name: Calcium Sulfate Landfill	Project #:			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Bi/carbonate Alkalinity/Chloride/Sulfate/TDS	6010 total metals-Al/Ca/Cr/Fe/Mn/Na/Ni	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	P		
OC- SL6	11-14-11	8:30	G	W	n	n	x	x	2	This job is MCP
OC- SL5	11-14-11	9:10	G	W	n	n	x	x	2	
OC- SL3	11-14-11	10:00	G	W	n	y	x	x	8	
OC- SL2	11-15-11	8:05	G	W	n	n	x	x	2	
OC- SL1D	11-15-11	8:50	G	W	n	n	x	x	2	
OC-										
OC-										
OC-										
OC-										
OC-										
OC-										

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Brian Guichard	11-15-11 1245	OLIN	[signature]	11-15-11 1245	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

MACTEC ENGINEERING AND CONSULTING

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT: Olin Chemical Superfund Site

DATE: 5-21-12

CREW ID OR TASK ID: Calcium Sulfate Landfill

JOB NUMBER:

SAMPLER SIGNATURE: [signature]

EQUIPMENT CALIBRATION

AM CALIBRATION INFORMATION

		STANDARD VALUE		METER VALUE		ACCEPTANCE CRITERIA **
YSI MODEL NO.	pH	3.97	units	pH	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity	4.92	uS/cm	Sp. Conductivity	uS/cm	+/- 10% of standard
	Redox	213	mV	Redox	mV	see note 1
	DO	7.01	%*	DO	%*	+/- 10% of standard
	Thermometer Temperature	24.55	deg. C	Temperature	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE			NTU		NTU	within 0.3 NTU
MODEL NO.			NTU		NTU	+/- 10% of standard
UNIT ID NO.			NTU		NTU	
		---	NTU	---	NTU	

PM CALIBRATION INFORMATION

		STANDARD VALUE		METER VALUE		CRITERIA **
YSI MODEL NO.	pH		units	pH	units	+/- 10% of standard
UNIT ID NO.	Sp. Conductivity		uS/cm	Sp. Conductivity	uS/cm	+/- 10% of standard
	Redox		mV	Redox	mV	see note 1
	DO		%*	DO	%*	+/- 10% of standard
	Thermometer Temperature		deg. C	Temperature	deg. C	+/- 2.0 deg. C
TURBIDITY METER TYPE			NTU		NTU	within 0.3 NTU
MODEL NO.			NTU		NTU	+/- 10% of standard
UNIT ID NO.			NTU		NTU	
		---	NTU	---	NTU	

MATERIALS RECORD

		Lot Number
Deionized Water Source:		
Trip Blank Water Source:		
Sample Preservatives Source:		
Disposable Filter Type:		
Other		

Calibration Fluids/ Standard Source: Pine Env

Lot Numbers pH: C148273

mV: "

Sp. Cond.: "

Turb.: "

NOTES: Ambient air used as source for D.O. calibration.

* = Indicate in notes section what was used as the DO standard (i.e., based on saturation at room temperature)

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified parameter was not calibrated to the acceptance criteria.

1 = meter must read within specified range of the Zobell solution (usually 231 +/- 10 mv @ 25 deg C).

2 = specify acceptance criteria in the Notes section

Created by: DLC

Checkedy by: BJR

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL 1 D
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-21-12
TIME: START 11:40 END 12:15
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 5.32 FT
FINAL DEPTH TO WATER: 5.32 FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
TOTAL VOL. PURGED: 1.2 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:45	5.32	180	17.87	0.307	5.82	4.58	2.37	128		
11:50	5.32	180	14.44	0.325	5.75	6.10	2.52	142		
11:55	5.32	180	14.31	0.324	5.73	6.17	1.76	150		
12:00	5.32	180	14.08	0.324	5.71	6.18	1.71	156		
12:05	5.32	180	14.18	0.323	5.74	6.19	1.40	157		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER dedicated

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: 1.2

NOTES

SIGNATURE: _____

LOCATION SKETCH

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-2
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-21-12
TIME: START 10:45 END 11:35
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT
PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 6.11 FT
WELL DEPTH (TOR): _____ FT
PID AMBIENT AIR: _____ PPM
WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 6.21 FT
SCREEN LENGTH: _____ FT
PID WELL MOUTH: _____ PPM

DRAWDOWN VOLUME: _____ GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____
PRESSURE TO PUMP: _____ PSI

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

TOTAL VOL. PURGED: 2.9 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING: _____
DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:50	6.21	280	24.71	0.363	6.00	2.61	31.6	88		
10:55	6.21	280	14.30	0.476	5.57	3.25	22.6	129		
11:00	6.22	280	13.40	0.483	5.51	3.33	11.9	137		
11:05	6.22	280	13.06	0.477	5.47	3.12	3.41	132		
11:10	6.21	280	13.05	0.475	5.46	3.00	2.10	121		
11:15	6.21	280	12.98	0.463	5.45	2.80	0.96	115		
11:20	6.21	280	12.91	0.461	5.45	2.78	1.24	109		
11:25	6.21	280	12.95	0.460	5.44	2.77	1.17	108		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER dedicated

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 2.9

NOTES

SIGNATURE: _____

LOCATION SKETCH

revised 5/21/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-3
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-21-12
TIME: START 9:20 END 10:35
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: 13.39 FT
FINAL DEPTH TO WATER: 13.44 FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
TOTAL VOL. PURGED: 1.5 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: 2 IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
9:25	13.44	160	22.10	0.910	5.85	2.05	6.57	-89		
9:30	13.44	160	15.37	1.21	5.80	4.67	6.35	-88		
9:35	13.44	160	15.22	1.25	5.79	0.80	10.1	-88		
9:40	13.44	160	15.24	1.27	5.80	0.44	7.8	-91		
9:45	13.44	160	15.19	1.30	5.79	0.46	4.9	-92		
9:50	13.44	160	15.22	1.30	5.79	0.43	4.4	-93		
9:55	13.44	160	15.12	1.31	5.80	0.44	3.5	-93		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER dedicated

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1.5

LOCATION SKETCH

NOTES

SIGNATURE: _____

revised 5/21/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-5
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-21-12
TIME: START 8:35 END 9:15
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [x] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PROTECTIVE CASING / WELL DIFFERENCE: FT

INITIAL DEPTH TO WATER: 15.08 FT
WELL DEPTH (TOR): FT
PID AMBIENT AIR: PPM
WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 15.29 FT
SCREEN LENGTH: FT
PID WELL MOUTH: PPM

DRAWDOWN VOLUME: GAL
(Initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:
PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: 1.1 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)
REFILL TIMER SETTING:
DISCHARGE TIMER SETTING:

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
8:40	15.28	170	17.73	2.34	5.90	2.50	2.02	154		
8:45	15.29	170	13.70	2.52	5.86	2.04	1.69	158		
8:50	15.29	170	13.11	2.53	5.86	2.05	1.13	159		
8:55	15.29	170	12.91	2.56	5.87	2.09	0.77	158		
9:00	15.29	170	12.89	2.57	5.88	1.97	0.79	158		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER Dedicated

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO
NUMBER OF GALLONS GENERATED: 1.1

NOTES

SIGNATURE: _____

LOCATION SKETCH

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL6
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 5-21-12
TIME: START 7:40 END 8:35
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 12.15 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: 12.40 FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: _____ GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: 1.1 GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
7:45	12.37	110	13.78	1.68	5.71	0.97	2.02	158		
7:50	12.38	110	14.92	2.22	5.66	2.29	1.79	152		
7:55	12.38	110	14.06	2.25	5.65	2.32	1.54	147		
8:00	12.38	110	14.29	2.24	5.66	0.73	1.37	140		
8:05	12.39	110	13.78	2.27	5.65	0.74	0.79	133		
8:10	12.39	110	13.86	2.27	5.66	0.83	0.49	125		
8:15	12.39	110	13.71	2.29	5.66	0.87	0.63	119		
8:20	12.40	110	13.69	2.28	5.65	0.90	0.50	117		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [x] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [x] OTHER Ded. coiled

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER ~~dedicated~~

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: 1.1

LOCATION SKETCH

NOTES

SIGNATURE: _____

revised 5/21/2012

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA
SAMPLE ID:
TIME: START 12:25 END
WELL ID: SL-7
SITE TYPE: Superfund
JOB NUMBER:
ROUND NO.:
DATE: 5-21-12
BOTTLE TIME:

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:
INITIAL DEPTH TO WATER: FT.
FINAL DEPTH TO WATER: FT.
DRAWDOWN VOLUME: GAL.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER

WELL DEPTH (TOR): FT.
SCREEN LENGTH: FT.
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): --- FT.
PID AMBIENT AIR: N/A PPM
PID WELL MOUTH: N/A PPM
PRESSURE TO PUMP: N/A PSI
REFILL TIMER SETTING: N/A SEC.

PROTECTIVE CASING / WELL DIFFERENCE: N/A FT.
WELL DIAMETER: 2 IN.

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING: N/A SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1	DISS. O2 (mg/L) (10%)(>0.5)	TURBIDITY (NTU) (10%) (> 5)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH (ft.)	COMMENTS
	Dry									

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] VOCs: Trimethylpentenes	8260 B	HCL / 4 DEG. C	3 X 40 mL	[ ] VOCs
[ ] SVOCs: NDPA and BEHP	8270 C	4 DEG. C	2 X 1 L AG	[ ] SVOCs
[ ] VPH	MA VPH	HCL / 4 DEG. C	3 X 40 mL	[ ] VPH
[ ] Dissolved Fe	DIS. 6010B	HNO3 / 4 DEG. C	1 X 500 mL	[ ] Dis. Fe
[ ] pH	SM 4500 H+B	4 DEG. C	1 X 500 mL	[ ] pH
[ ] Ammonia-Nitrogen	10-107-06-1	H2SO4 / 4 DEG. C	1 X 250 mL	[ ] Ammonia-Nitrogen
[ ] Chloride	300.0	4 DEG. C	1 X 500 mL	[ ] Chloride
[ ] Sulfate	300.0	4 DEG. C	1 X 500 mL	[ ] Sulfate
[ ] Specific Conductivity	SM 2510B	4 DEG. C	1 X 500 mL	[ ] Specific Conductivity
[ ] Dissolved Al, Cr	DIS. 6010B	HNO3 / 4 DEG. C	1 X 500 mL	[ ] Dis. Al, Cr

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO
NUMBER OF GALLONS GENERATED:

NOTES

SIGNATURE:

LOCATION SKETCH

Sampled by:
Prepared by:
Checked by:

amec

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA
SAMPLE ID:
TIME: START END

WELL ID: GL-8
SITE TYPE: Superfund
JOB NUMBER:

ROUND NO.:
DATE: 5-21-12
BOTTLE TIME:

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID:

MEASUREMENT POINT
- [X] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): --- FT.

PROTECTIVE CASING / WELL DIFFERENCE: N/A FT.

INITIAL DEPTH TO WATER: FT.

WELL DEPTH (TOR): FT.

PID AMBIENT AIR: N/A PPM

WELL DIAMETER: IN.

FINAL DEPTH TO WATER: FT.

SCREEN LENGTH: FT.

PID WELL MOUTH: N/A PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: GAL.
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: N/A PSI

TOTAL VOL. PURGED: GAL.
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER SETTING: N/A SEC.

DISCHARGE TIMER SETTING: N/A SEC.

PURGE DATA

TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (uS/cm) (3%)	pH (units) (+/- 0.1	DISS. O2 (mg/L) (10%)(>0.5)	TURBIDITY (NTU) (10%) (> 5)	ORP/Eh (mV) (+/- 10 mV)	SAMPLE DEPTH (ft.)	COMMENTS
	Dry									

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] LDPE (Dedicated)

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] SILICON (Dedicated)

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] VOCs: Trimethylpentenes	8260 B	HCL / 4 DEG. C	3 X 40 mL	[ ] VOCs
[ ] SVOCs: NDPA and BEHP	8270 C	4 DEG. C	2 X 1 L AG	[ ] SVOCs
[ ] VPH	MA VPH	HCL / 4 DEG. C	3 X 40 mL	[ ] VPH
[ ] Dissolved Fe	DIS. 6010B	HNO3 / 4 DEG. C	1 X 500 mL	[ ] Dis. Fe
[ ] pH	SM 4500 H+B	4 DEG. C	1 X 500 mL	[ ] pH
[ ] Ammonia-Nitrogen	10-107-06-1	H2SO4 / 4 DEG. C	1 X 250 mL	[ ] Ammonia-Nitrogen
[ ] Chloride	300.0	4 DEG. C	1 X 500 mL	[ ] Chloride
[ ] Sulfate	300.0	4 DEG. C	1 X 500 mL	[ ] Sulfate
[ ] Specific Conductivity	SM 2510B	4 DEG. C	1 X 500 mL	[ ] Specific Conductivity
[ ] Dissolved Al, Cr	DIS. 6010B	HNO3 / 4 DEG. C	1 X 500 mL	[ ] Dis. Al, Cr

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES / NO

NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE:

LOCATION SKETCH

Sampled by:

Prepared by:

Checked by:

amec

P:\OLIN\Wilmington\2011 Quarterly Sampling\Blank Forms\
GW.xls, Blank

Field Instrument Calibration Record

Project: Olin

Task ID: Calcium sulfate

Date: 7-15-12

Sampler Signature: [signature]

Job Number: _____

Equipment Calibration Information

		Standard Value		Meter Value AM		Meter Value PM		Acceptance Criteria*
Horiba ~~YSI~~		pH	____ units	pH	3.97 units	pH	4.00 units	+/- 10% of standard
Model No.	U22	Cond.	____ mS/cm	Cond.	4.64 umho/cm	Cond.	4.54 umho/cm	+/- 10% of standard
Unit ID	Olin	Redox	____ Mv	Redox	215 Mv	Redox	242 Mv	See note 1
		DO	____ mg/l	DO	6.96 mg/l	DO	6.53 mg/l	+/- 10% of standard
		Temp.	____ deg. C	Temp.	18.41 deg. C	Temp.	15.52 deg. C	+/- 2.0 deg. C

Turbidity Meter	Hach	Standard Value	Meter Value AM	Meter Value PM	Criteria
Model No.	2100P	____ NTU	0.0 NTU	____ NTU	within 0.3 NTU
Unit ID	Olin	____ NTU	200 NTU	____ NTU	+/- 10% of standard
		____ NTU	____ NTU	____ NTU	
		____ NTU	____ NTU	____ NTU	

Materials Record		Lot Number
Deionized Water Source		
Trip Blank Water Source		
Sample Preservatives Source		
Disposable Filter Type		
Horiba Calibration Std. Source		
Other		

Calibration Fluids

Standard Source: _____

Lot Numbers

pH _____

Mv _____

Cond. _____

Turb. _____

Notes:

* = If the meter reading is not within accetance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the specified Parameter was not calibrated to the acceptance criteria.

1 = Meter must read within specified range of the Zobel solution (usually 231 +/- 10 mv)

Ambient air used as source for D. O. Calibration

Comments:

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-1D
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-12
TIME: START 2:30 END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT

PROTECTIVE CASING / WELL DIFFERENCE: FT

INITIAL DEPTH TO WATER: 7.21 FT

WELL DEPTH (TOR): FT

PID AMBIENT AIR: PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: FT

SCREEN LENGTH: FT

PID WELL MOUTH: PPM

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING:

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
2:35	7.21	180	27.18	0.206	5.73	>0.01	5.5	94		
2:40	7.21	180	14.99	0.300	5.96	>0.01	2.8	112		
2:45	7.21	180	14.71	0.303	5.97	0.54	2.3	115		
2:50	7.21	180	14.43	0.304	5.99	0.67	3.1	113		
2:55	7.21	180	14.43	0.297	6.00	0.69	2.9	115		
3:00	7.21	180	14.29	0.296	6.00	0.70	2.7	116		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

revised 11/13/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-2
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-12
TIME: START 1:30 END 2:25
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 7.90 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: _____ FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: _____ GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: _____ GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
1:35	7.92	200	24.11	0.282	6.05	1.33	20.9	109		
1:40	7.92	200	16.30	0.334	5.59	1.95	22.7	138		
1:45	7.92	200	15.30	0.339	5.46	2.96	14.0	144		
1:50	7.92	200	14.91	0.335	5.41	3.20	8.2	127		
1:55	7.92	200	14.76	0.340	5.36	2.85	4.1	100		
2:00	7.92	200	14.71	0.342	5.35	2.47	4.5	91		
2:05	7.92	200	14.65	0.338	5.32	2.25	3.0	88		
2:10	7.92	200	14.60	0.339	5.31	2.26	2.4	89		
2:15	7.92	200	14.60	0.340	5.30	2.25	2.3	88		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[x] TDS	2540C	4 DEG. C	125 ml Poly	[x] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES NO

NUMBER OF GALLONS GENERATED: _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

revised 11/13/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-3
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-12
TIME: START 11:25 END
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): FT

PROTECTIVE CASING / WELL DIFFERENCE: FT

INITIAL DEPTH TO WATER: 15.19 FT

WELL DEPTH (TOR): FT

PID AMBIENT AIR: PPM

WELL DIAMETER: IN

FINAL DEPTH TO WATER: FT

SCREEN LENGTH: FT

PID WELL MOUTH: PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PRESSURE TO PUMP: PSI

TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING:

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
11:30	15.19	170	16.92	1.17	6.22	0.32	7.2	-81		
11:35	15.19	170	16.28	1.61	6.09	>0.01	7.5	-85		
11:40	15.19	170	15.67	1.65	6.06	>0.01	3.3	-85		
11:45	15.19	170	15.42	1.69	6.09	>0.01	3.3	-89		
11:50	15.19	170	15.39	1.69	6.09	>0.01	2.5	-90		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: (YES) NO

NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

Collect MS, MSD, + Dup

revised 11/13/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-5
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-12
TIME: START 11:15 END 11:17
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [ ] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

INITIAL DEPTH TO WATER: DRY FT
FINAL DEPTH TO WATER: FT
DRAWDOWN VOLUME: GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})
TOTAL VOL. PURGED: GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

WELL DEPTH (TOR): FT
SCREEN LENGTH: FT
RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED:

PROTECTIVE CASING STICKUP (FROM GROUND): FT
PID AMBIENT AIR: PPM
PID WELL MOUTH: PPM
PRESSURE TO PUMP: PSI
REFILL TIMER SETTING:

PROTECTIVE CASING / WELL DIFFERENCE: FT
WELL DIAMETER: IN

WELL INTEGRITY:	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DISCHARGE TIMER SETTING:

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (ms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS

DRY

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[ ] Alkalinity	2320B	4 DEG. C	250 ml Poly	[ ] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[ ] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[ ] Sulfate
[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[ ] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____
[ ] Other_____	_____	_____	_____	[ ] _____

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES (NO)
NUMBER OF GALLONS GENERATED: _____

NOTES

SIGNATURE: _____

LOCATION SKETCH

revised 11/13/2012

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

PROJECT: Olin Corporation, Calcium Sulfate Landfill PCMP
SAMPLE I.D. NUMBER: SL-6
ROUND NO.:
EXPLORATION ID:
SITE TYPE:
DATE: 11-15-12
TIME: START 10:30 END 11:10
JOB NUMBER:
FILE TYPE:

WATER LEVEL / PUMP SETTINGS

MEASUREMENT POINT
- [x] TOP OF WELL RISER
- [ ] TOP OF PROTECTIVE CASING
- [ ] OTHER _____

PROTECTIVE CASING STICKUP (FROM GROUND): _____ FT

PROTECTIVE CASING / WELL DIFFERENCE: _____ FT

INITIAL DEPTH TO WATER: 15.65 FT

WELL DEPTH (TOR): _____ FT

PID AMBIENT AIR: _____ PPM

WELL DIAMETER: 2 IN

FINAL DEPTH TO WATER: _____ FT

SCREEN LENGTH: _____ FT

PID WELL MOUTH: _____ PPM

WELL INTEGRITY:

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

DRAWDOWN VOLUME: _____ GAL
(initial - final x 0.16 {2-inch} or x 0.65 {4-inch})

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: _____

PRESSURE TO PUMP: _____ PSI

TOTAL VOL. PURGED: _____ GAL
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter)

REFILL TIMER SETTING: _____

DISCHARGE TIMER SETTING: _____

PURGE DATA

TIME	DEPTH TO WATER (ft)	PURGE RATE (ml/m)	TEMP. (deg. c)	SPECIFIC CONDUCTANCE (µms/cm)	pH (units)	DISS. O2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
10:35	15.98	100	21.42	1.75	5.75	>0.01	6.3	115		
10:40	16.00	100	16.91	2.28	6.19	>0.01	4.9	88		
10:45	16.02	100	16.22	2.33	6.23	>0.01	4.6	73		
10:50	16.04	100	14.41	2.45	6.24	>0.01	4.4	68		
10:55	16.06	100	14.38	2.47	6.26	>0.01	3.3	67		
11:00	16.06	100	14.16	2.48	6.27	>0.01	2.5	67		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- [ ] QED BLADDER
- [ ] SIMCO BLADDER
- [ ] GEOPUMP

TYPE OF TUBING
- [ ] TEFLON OR TEFLON LINED
- [ ] HIGH DENSITY POLYETHYLENE
- [ ] OTHER _____

TYPE OF PUMP MATERIAL
- [ ] POLYVINYL CHLORIDE
- [ ] STAINLESS STEEL
- [ ] OTHER _____

TYPE OF BLADDER MATERIAL
- [ ] TEFLON
- [ ] OTHER _____

ANALYTICAL PARAMETERS

To Be Collected

	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] Alkalinity	2320B	4 DEG. C	250 ml Poly	[x] Alkalinity
[ ] TDS	2540C	4 DEG. C	125 ml Poly	[ ] TDS
[x] Sulfate	300.0/375.2	4 DEG. C	125 ml Poly	[x] Sulfate
[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)	6010B	HNO3 to pH <2	500 ml Poly	[x] Metals (Ca, Al, Mn,Fe, Cr, Ni)
[ ] Other _____				[ ]
[ ] Other _____				[ ]
[ ] Other _____				[ ]

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES (circled) NO

NUMBER OF GALLONS GENERATED: _____

LOCATION SKETCH

NOTES

SIGNATURE: _____

revised 11/13/2012

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Guichard	Lab PM: Mason, Becky C	Carrier Tracking No(s):	COC No: 360-16663-3909.1
Client Contact: Mr. Brian Guichard	Phone: 9786586121	E-Mail: becky.mason@testamericainc.com		Page: Page 1 of 1
Company: Olin Corporation				Job #:
Address: 51 Eames street	Due Date Requested:			
City: Wilmington	TAT Requested (days):			
State, Zip: MA, 01887				
Phone: 9786586121	PO #: REWI0018			
Email: beguichard@olin.com	WO #:			
Project Name: Olin Chemical Superfund Site	Project #: 36001816			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B - (MOD) Custom Pick List	2320B, 300.0_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	N		
SL-6	11-15-12	11:00	G	Water			X	X	2	SL 3 contains
SL-3	↓	11:50	G	Water			X	X	8	MS, MSD + Dup
SL-2		2:15	G	Water			X	X	2	
SL-1D		3:00	G	Water			X	X	2	
				Water						
				Water						
				Water						
				Water						
				Water						

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	11-16-12 1325	Olin		11/16/12 1325	TAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

APPENDIX C
DATA VALIDATION REPORTS

(Provided on CD-ROM)

FILE COPY

Deliverable Review Form

1 ***Project Information:***

Project Name: Olin Chemical Superfund Site

Project Number: 6107-10-0016 Project Manager: Peter Thompson

Document Name: Data Validation Report - September 2010 Calcium Sulfate Landfill Groundwater

Document Revision Number: _____ Revision Date: _____

Prepared By: _____

2 ***Technical Review:*** This document has been independently reviewed for technical adequacy, validity, feasibility, continuity, and conformance to client requirements and accepted professional standards. Technical review of this document has been performed by:

Subject Area(s): Initial Data Validation

Printed Name: Wolfgang Calderbio

Signature: [signature] Date: 11/12/10

Subject Area(s): Senior Data Validation

Printed Name: Chris Ricardi

Signature: [signature] Date: 11/12/10

Subject Area(s): QC Review

Printed Name: Kelly Chatterton

Signature: [signature] Date: 12/13/10

3 ***Tables/Figures/Appendices (including calculations) Review:*** Independently reviewed for technical adequacy, continuity, and conformance to regulatory requirements and accepted professional standards (use back of form if more room is needed). Reviews performed by:

List of reviewed Tables/Figures/Appendices: Table 1 - Sample Summary

Created by: KJC 10/25/10 Checked by: [initials] Date: 11/15/10

List of reviewed Tables/Figures/Appendices: Table 2 - Final Results Summary

Created by: KJC 11/12/10 Checked by: [initials] Date: 11/15/10

List of reviewed Tables/Figures/Appendices: Table 3 - Validation Qualification Action Summary

Created by: KJC 11/12/10 Checked by: [initials] Date: 11/15/10

List of reviewed Tables/Figures/Appendices: _____

Created by: _____ Checked by: _____ Date: _____

4 ***Certifying Project Manager:*** I certify that this document has been reviewed and edited prior to release and is in conformance with the company's standards for technical and document quality:

Print Name: Peter Thompson

Signature: _____ Date: _____

5 ***Certifying Project Principal:*** I certify that this document has been reviewed and edited prior to release and is in conformance with the company's standards for technical and document quality:

Print Name: Michael Murphy

Signature: [signature] Date: 1/6/11

6 *Policy ES-4* ***Contract Requirements: Contract = Contract, Subcontract, Work Order, Change Order, or PO***

- [ ] NA
- [ ] This is a Standard Contract
- [ ] This is a Non-Standard Contract * and was checked & stamped by an OCA or MACTEC Attorney

* Client-generated contracts and/or any mods to PWAS/other standard company contracts shall be reviewed by an OCA. See Policies LD-6, LD-7 and LD-30 for more information.

All Contracts - Client must sign two copies of the contract first, then return them to MACTEC for our signature on both copies. MACTEC returns one signed contract to Client, and stamps one File Copy for MACTEC's project files.)

Back of form to be completed by Annette\Project Assistant.

Deliverable Review Form (Continued)

Sections 7-9 to be Completed by Annette\Project Assistant

7 ***Copy Editing:*** This document has been checked to ensure correct spelling, grammar, and word usage; completeness (no missing text, figures, tables); accuracy (index, page numbers, internal references); continuity of style; and conformance to specified format and style requirements (whether MACTEC format or client requested format). Copy editing of this document was performed by:

Print Name: Annette Savastano

Signature: Annette Savastano Date: 12/14/10

8 ***Policy ES-4 Requirements (Proposals, Reports & Other Client Deliverables):*** **Check all that apply below.**

	MACTEC's copy is a "duplicate original" of the client's original and is stamped "File Copy"
	This is a Draft - Transmittal signed by Principal is attached to Client's & MACTEC's File Copy
X	This is a Final - Project Manager & Principal wet signatures on Client's & MACTEC's File Copy
X	And all Tables/Figures/Appendices have wet initials for Reviewed By/Checked By per QA Policy
	This is a PDF electronic delivery sent via email. A printout of the deliverable that was sent to client and a copy of the transmittal email sent to the client is attached to the printout and stamped File Copy
	If Absentee Signature was used - Approval from absentee is attached to File Copy (see policy update below). Absentee Signature Policy Update - The authorized employee should sign their own name and the phrase "for _____ with permission." Documentation of permission to sign must be included with File Copy.

9 ***Timeliness Database:*** [X] NA

Original Deliverable Due Date: _____ Actual Delivery Date: _____

Variance Explanation (if applicable): _____

10 ***Use this space for any additional notes/comments/signatures:***

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P.O. Box 7050
Portland, Maine 04112-7050
Telephone: 207/775-5401
Fax: 207/772-4762
Home Page: www.mactec.com

To: Steve Morrow
From: Chris Ricardi
Date: December 13, 2010
Subject: Calcium Sulfate Landfill Post Closure Monitoring Program 3Q10-September 2010

DATA VALIDATION REPORT
SEPTEMBER 2010 CALCIUM SULFATE LANDFILL GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS
TestAmerica Laboratories Data Set 360-30381-1

1.0 INTRODUCTION

Groundwater samples were collected from the Olin Chemical Superfund Site on September 28 and September 29, 2010. Samples were analyzed by TestAmerica Laboratories in Westfield, Massachusetts. Data were reported in sample delivery group (SDG) 360-30381-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following USEPA SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- dissolved and total metals (aluminum, calcium, chromium, iron, manganese, nickel, and sodium) by USEPA Method 6010B
- general chemistry analyses for carbonate and bicarbonate alkalinity by SM19 SM 2320B, chloride and sulfate by USEPA Method 300, and total dissolved solids by SM19 SM 2540C

The Draft Post Closure Plan (MACTEC, 2006) and the MassDEP Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2004] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington annual and quarterly groundwater monitoring tasks. Final sample results are presented on data summaries in Table 2. Validation reason codes were associated with final results that have been qualified. Table 3 presents analytical results that were qualified and the associated reason codes.

2.0 METALS

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Matrix Spike Analysis
* Field Duplicate Results
* Laboratory Control Sample
* Detection Limits
  Total and Dissolved Metal Concentration Review

***** = indicates that criteria were met for this parameter

MACTEC

3.0 GENERAL CHEMISTRY – Carbonate and Bicarbonate Alkalinity, Chloride, Sulfate, and Total Dissolved Solids

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Matrix Spike Analysis
* Laboratory Duplicate Analysis
* Laboratory Control Sample
* Detection Limits

* = indicates that criteria were met for this parameter

Except for the validation actions noted above, the results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi

12/13/10

Chris Ricardi, NRCC-EAC
Senior Chemist

Date

MJ Murphy

1/6/11

Michael Murphy
Project Principal

Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, D.C. 20005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Draft Calcium Sulfate Landfill Post Closure Monitoring Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; December, 2006.

Massachusetts Department of Environmental Protection (MassDEP), 2004. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; May 2004.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

U.S. Environmental Protection Agency (USEPA), 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 -December 1996.

Table 1
Sample Summary - 360-30381
Data Validation Report
September 2010 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

				SW6010	SW6010	SM2320B	E300	SM2540C
Lab Sample ID	**Location**	**Sample ID**	**Sample Date**	**Total Metals**	**Dissolved Metals**	**Alkalinity**	**Chloride, Sulfate**	**Total Dissolved Solids**
360-30381-4	SL-1D	OC-SL-1D-092910	9/29/2010	7	7	2	2	1
360-30381-2	SL-3	OC-SL-3-092810	9/28/2010	7	7	2	2	1
360-30381-3	SL-3	OC-SL-3DUP-092810	9/28/2010	7	7	2	2	1
360-30381-1	SL-6	OC-SL-6-092810	9/28/2010	7	7	2	2	1

Notes:
Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 10/25/10
Checked by / Date: WDC 1/25/10

Table 2
Final Results Summary - 360-30381
Data Validation Report
September 2010 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SL-1D		SL-3		SL-3		SL-6	
			COC Sample	OC-SL-1D-092910		OC-SL-3-092810		OC-SL-3DUP-092810		OC-SL-6-092810	
			Date Sampled	09/29/10		09/28/10		09/28/10		09/28/10	
			Sample Type	FS		FS		FD		FS	
			Report Number	360-30381-1		360-30381-1		360-30381-1		360-30381-1	
Fract	**Analysis Method**	**Parameter Name**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	ug/l	150		110		140		69	J
T	SW6010	Calcium	ug/l	28000		340000		330000		530000	
T	SW6010	Chromium	ug/l	5	U	5	U	1.1	J	10	U
T	SW6010	Iron	ug/l	180		30000		31000		160	J
T	SW6010	Manganese	ug/l	16		4600		4600		3000	
T	SW6010	Nickel	ug/l	10	U	10	U	2	J	20	U
T	SW6010	Sodium	ug/l	22000		13000		13000		17000	
F	SW6010	Aluminum	ug/l	18	J	100	U	100	U	100	U
F	SW6010	Calcium	ug/l	28000		280000		280000		480000	
F	SW6010	Chromium	ug/l	5	U	5	U	5	U	5	U
F	SW6010	Iron	ug/l	100	U	29000		30000		100	U
F	SW6010	Manganese	ug/l	11		4100		4000		3100	
F	SW6010	Nickel	ug/l	10	U	2.2	J	2.2	J	1.5	J
F	SW6010	Sodium	ug/l	23000		12000		12000		19000	
N	A2320	Bicarbonate Alkalinity, as CaCO3	mg/l	33		250		230		220	
N	A2320	Carbonate Alkalinity, as CaCO3	mg/l	1	U	1	U	1	U	1	U
N	E300	Chloride	mg/l	35		4.8		4.6		2.3	
N	E300	Sulfate	mg/l	44		650		720		1300	
F	A2540C	Total Dissolved Solids	mg/l	160		1100		1100		1900	

Notes:
N = normal
T = total (unfiltered)
F = filtered
FS = field sample
FD = field duplicate
U = not detected, value is the detection limit
J = value is estimated
ug/l = microgram per liter
mg/l = milligram per liter

Prepared by / Date: KJC 11/12/10
Checked by / Date: WDC 11/15/10

Table 3
Validation Qualification Action Summary
Data Validation Report
September 2010 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
				NONE						

J - Value is estimated
U - Not detected, value is the detection limit
BL - QC Blank Qualifier
MS-L - MS and/or MSD recovery low
TD - Dissolved concentration exceeds total
ug/L - microgram per liter

Prepared by / Date: KJC 11/12/10
Checked by / Date: WDC 11/15/10

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date [signature] 11/10/10
Sr. Review/Date Chris Ricardi 11/11/10
Lab Report # 360-30381-1
Project # 61071000016.12

Total and Dissolved aluminum, calcium, chromium, iron, manganese, sodium, nickel.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): Yes [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? Yes [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] No [✓] N/A [ ] Comments: cooler temperature at receipt -0.4°C. samples received same day as shipped.

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* Yes [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? Yes [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable) NA

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	MADEP % Rec
Water	80-120
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs ~~collected?~~ analyzed? List project samples that were spiked. @ 4/10/10

Yes [✓] No [ ] N/A [ ] Comments: Sample OC-SC-3-092810 was analyzed for MS/MSD (total and dissolved).

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [✓] **No** [ ] N/A [ ] Comments:

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

%R Calcium (-39, 74, 25, 30), iron (48), and manganese (62, 70, 74) were less than QC limit. Unspiked sample result is greater than 4x the spike concentration. No further action required.

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result, D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

***NOTE**: MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments:

OC-SL-3-092810 and
OC-SL-3DUP-092810.

Fraction	Lab ID	Sample ID	Analyte	Orig	Qual	Dup	Qual	RPD
D	360-30381-2	OC-SL-3-092810	Aluminum	100	U	100	U	0
T	360-30381-2	OC-SL-3-092810	Aluminum	110		140		24
T	360-30381-2	OC-SL-3-092810	Calcium	340000		280000		19
D	360-30381-2	OC-SL-3-092810	Calcium	280000		330000		16
D	360-30381-2	OC-SL-3-092810	Chromium	5	U	5	U	0
T	360-30381-2	OC-SL-3-092810	Chromium	5	U	1.1	J	---
T	360-30381-2	OC-SL-3-092810	Iron	30000		30000		0
D	360-30381-2	OC-SL-3-092810	Iron	29000		31000		7
T	360-30381-2	OC-SL-3-092810	Manganese	4600		4600		0
D	360-30381-2	OC-SL-3-092810	Manganese	4100		4000		2
D	360-30381-2	OC-SL-3-092810	Nickel	2.2	J	2	J	10
T	360-30381-2	OC-SL-3-092810	Nickel	10	U	2.2	J	---
T	360-30381-2	OC-SL-3-092810	Sodium	13000		13000		0
D	360-30381-2	OC-SL-3-092810	Sodium	12000		12000		0

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [✓] **No** [ ] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [ ] No [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2001. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Massachusetts Quality Assurance and Quality Control (QA/QC) Requirements." BWSC-CAM, Interim Final Draft, Revision No. 2, 5 October 2001.

MADEP, 2001. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for Sampling, Data Evaluation and Reporting Activities," BWSC-CAM, Section VII, Public Comment Draft, Revision No. 0, 21 December 2001.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date [signature] 11/10/10
Sr. Review/Date Chris Ricardi 11/11/10
Lab Report # 360-30381-1
Project # 6107/00016.12

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes [✓] No [ ] N/A [ ] Comments: Cooler temp logged at -0.4°C.

☒ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

Samples received same day as shipped.

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [✓] No [ ] N/A [ ] Comments: See above.

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Field ID and Lab ID
- [✓] Date and time collected
- [✓] Analyst Initials
- [✓] Dilution Factor
- [NA] % moisture or solids
- [✓] Reporting limits
- [NA] *Clean-up method*
- [✓] Analysis method
- [✓] Preparation method
- [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
- [✓] Matrix
- [✓] Target analytes and concentrations
- [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Method blank results
- [✓] LCS recoveries
- [✓] MS/MSD recoveries and RPDs
- [✓] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

✓ 28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days Sulfide, TDS, TSS = 7 days pH = analyze immediately Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments:

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity** ☐ = 1 mg/L	Bicarbonate Alkalinity** ☑ = 1 mg/L	Carbonate Alkalinity** ☑ = 1 mg/L
Nitrate Nitrogen as N* ☐ = .05 mg/L	Nitrite Nitrogen as N* ☐ = .01 mg/L	Chloride* ☐ = 1 mg/L	Hardness * ☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☑ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 **<u>Method Blanks</u>** **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☑ = 80-120%	Carbonate Alkalinity** ☑ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☑ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☐ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N**☐ = 80-120%	Nitrite Nitrogen as N** ☐= 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [✓] No [ ] N/A [ ] Comments: Sample OC-SC-3-092810 was analyzed for SO4 and chloride as MS/D.

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes [✓] No [ ] N/A [ ] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [✓] No [ ] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125% pH* = NA	TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits? Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: $RPD = \frac{S - D}{(S + D)/2} \times 100\%$ Where S = MS result, D = MSD result

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☑ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

***NOTE**: MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [✓] No [ ] N/A [ ] Comments: Samples OC-SL-3-092810 and OC-SL-3D-092810.

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

Analyte	Orig (mg/L)	Dup (mg/L)	RPD
Bicarb. Alk.	250	230	8.3
Carb. Alk.	1U	1U	—
TDS	1100	1100	0
Chloride	4.8	4.6	4.3
Sulfate	650	720	10

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [ ] No [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

Massachusetts Department of Environmental Protection (MADEP), 2004. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; May 2004.

FILE COPY

Deliverable Review Form

1 ***Project Information:***

Project Name: Olin Chemical Superfund Site

Project Number: 6107-11-0016 Project Manager: Peter Thompson

Document Name: Data Validation Report - May 2011 Calcium Sulfate Landfill Groundwater

Document Revision Number: _____ Revision Date: _____

Prepared By: _____

2 ***Technical Review:*** This document has been independently reviewed for technical adequacy, validity, feasibility, continuity, and conformance to client requirements and accepted professional standards. Technical review of this document has been performed by:

Subject Area(s): Initial Data Validation

Printed Name: Wolfgang Calicchio

Signature: [signature] Date: 7/6/11

Subject Area(s): Senior Data Validation

Printed Name: Chris Ricardi

Signature: [signature] Date: 7/6/11

Subject Area(s): QC Review

Printed Name: Kelly Chatterton

Signature: [signature] Date: 7/13/11

3 ***Tables/Figures/Appendices (including calculations) Review:*** Independently reviewed for technical adequacy, continuity, and conformance to regulatory requirements and accepted professional standards (use back of form if more room is needed). Reviews performed by:

List of reviewed Tables/Figures/Appendices: Table 1 - Sample Summary

Created by: hic KJC 05/20/11 Checked by: [signature] Date: 7/6/11

List of reviewed Tables/Figures/Appendices: Table 2 - Final Results Summary

Created by: hic KJC 06/13/11 Checked by: [signature] Date: 7/6/11

List of reviewed Tables/Figures/Appendices: Table 3 - Validation Qualification Action Summary

Created by: hic KJC 06/13/11 Checked by: [signature] Date: 7/6/11

List of reviewed Tables/Figures/Appendices:

Created by: _____ Checked by: _____ Date: _____

4 ***Certifying Project Manager:*** I certify that this document has been reviewed and edited prior to release and is in conformance with the company's standards for technical and document quality:

Print Name: Peter Thompson

Signature: _____ Date: _____

5 ***Certifying Project Principal:*** I certify that this document has been reviewed and edited prior to release and is in conformance with the company's standards for technical and document quality:

Print Name: Michael Murphy

Signature: [signature] Date: 7/27/11

6 *Policy ES-4* ***Contract Requirements: Contract = Contract, Subcontract, Work Order, Change Order, or PO***

- [ ] NA
- [ ] This is a Standard Contract
- [ ] This is a Non-Standard Contract * and was checked & stamped by an OCA or MACTEC Attorney

* Client-generated contracts and/or any mods to PWAS/other standard company contracts shall be reviewed by an OCA. See Policies LD-6, LD-7 and LD-30 for more information.

All Contracts - Client must sign two copies of the contract first, then return them to MACTEC for our signature on both copies. MACTEC returns one signed contract to Client, and stamps one File Copy for MACTEC's project files.)

Back of form to be completed by Annette\Project Assistant.

Deliverable Review Form (Continued)

Sections 7-9 to be Completed by Annette\Project Assistant

7 ***Copy Editing:*** This document has been checked to ensure correct spelling, grammar, and word usage; completeness (no missing text, figures, tables); accuracy (index, page numbers, internal references); continuity of style; and conformance to specified format and style requirements (whether MACTEC format or client requested format). Copy editing of this document was performed by:

Print Name: Annette Savastano

Signature: Annette Savastano Date: 7/24/11

8 ***Policy ES-4 Requirements (Proposals, Reports & Other Client Deliverables):*** **Check all that apply below.**

	MACTEC's copy is a "duplicate original" of the client's original and is stamped "File Copy"
	This is a Draft - Transmittal signed by Principal is attached to Client's & MACTEC's File Copy
X	This is a Final - Project Manager & Principal wet signatures on Client's & MACTEC's File Copy
X	And all Tables/Figures/Appendices have wet initials for Reviewed By/Checked By per QA Policy
	This is a PDF electronic delivery sent via email. A printout of the deliverable that was sent to client and a copy of the transmittal email sent to the client is attached to the printout and stamped File Copy
	If Absentee Signature was used - Approval from absentee is attached to File Copy (see policy update below). Absentee Signature Policy Update - The authorized employee should sign their own name and the phrase "for _____ with permission." Documentation of permission to sign must be included with File Copy.

9 ***Timeliness Database:*** [X] NA

Original Deliverable Due Date: _____ Actual Delivery Date: _____

Variance Explanation (if applicable): _____

10 ***Use this space for any additional notes/comments/signatures:***

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Fax: 207/772-4762
Home Page: www.mactec.com

To: James Cashwell
From: Chris Ricardi
Date: July 26, 2011
Subject: Calcium Sulfate Landfill Semi-Annual – May 2011

DATA VALIDATION REPORT
MAY 2011 CALCIUM SULFATE LANDFILL GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS
TestAmerica Laboratories Data Set 360-33756-1

1.0 INTRODUCTION

Groundwater samples were collected from the Olin Chemical Superfund Site on May 10 and May 11, 2011. Samples were analyzed by TestAmerica Laboratories in Westfield, Massachusetts. Data were reported in sample delivery group (SDG) 360-33756-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following USEPA SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- total metals (aluminum, calcium, chromium, iron, manganese, nickel, and sodium) by USEPA Method 6010B
- general chemistry analyses for carbonate and bicarbonate alkalinity by SM19 SM 2320B, chloride and sulfate by USEPA Method 300, and total dissolved solids by SM19 SM 2540C

The Draft Post Closure Plan (MACTEC, 2006) and the MassDEP Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2004] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington groundwater monitoring tasks. Final sample results are presented on data summaries in Table 2. Validation reason codes were associated with final results that have been qualified. Table 3 presents analytical results that were qualified and the associated reason codes.

2.0 METALS

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Matrix Spike Analysis
* Field Duplicate Results
* Laboratory Control Sample
  Detection Limits

***** = indicates that criteria were met for this parameter

Detection Limits

Sample OC-SL-5 required a two-fold dilution due to target analyte concentrations. Reporting limits for analytes that were not detected are elevated.

3.0 GENERAL CHEMISTRY – Carbonate and Bicarbonate Alkalinity, Chloride, Sulfate, and Total Dissolved Solids

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
  Matrix Spike Analysis
* Laboratory Duplicate Analysis
  Field Duplicate Analysis
* Laboratory Control Sample
* Detection Limits

***** = indicates that criteria were met for this parameter

Matrix Spike Analysis

Sample OC-SL-6 was selected by the laboratory for MS/MSD analysis. The MS and MSD percent recoveries for sulfate (155 and 62), and the MS/MSD relative percent difference (RPD) for sulfate (86) were outside of the quality control (QC) limits. Review of the MS/MSD data indicates that sample sulfate results greater than 1000 mg/L may present a matrix interference. Based on professional judgment, samples OC-SL-5 and OC-SL-6 with high concentration sulfate results (>1000 mg/L) were qualified estimated (J).

Field Duplicate Analysis

Sample OC-SL-3 was submitted with a field duplicate sample OC-SL-3 DUP. The RPD for sulfate (36) exceeded the QC limit of 30. The results for sulfate in samples OC-SL-3 and OC-SL-3 DUP were qualified estimated (J).

Except for the validation actions noted above, the results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi

7/26/11

Chris Ricardi, NRCC-EAC
Senior Chemist

Date

MJ Murphy

7/27/11

Michael Murphy
Project Principal

Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW., Washington, D.C. 20005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Draft Calcium Sulfate Landfill Post Closure Monitoring Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; December, 2006.

Massachusetts Department of Environmental Protection (MassDEP), 2004. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; May 2004.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

USEPA, 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 -December 1996.

Table 1
Sample Summary
Data Validation Report
May 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

				SW6010	SM2320B	E300	SM2540C
Lab Sample ID	**Location**	**Sample ID**	**Sample Date**	**Total Metals**	**Alkalinity**	**Chloride, Sulfate**	**Total Dissolved Solids**
360-33756-1	SL-1D	OC-SL-1D	5/11/2011	7	2	2	1
360-33756-2	SL-2	OC-SL-2	5/11/2011	7	2	2	1
360-33756-3	SL-3	OC-SL-3	5/10/2011	7	2	2	1
360-33756-4	SL-3	OC-SL-3 DUP	5/10/2011	7	2	2	1
360-33756-5	SL-5	OC-SL-5	5/10/2011	7	2	2	1
360-33756-6	SL-6	OC-SL-6	5/10/2011	7	2	2	1

Notes:
Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 05/20/11
Checked by / Date: WDC 06/16/11

Table 2
Final Results Summary
Data Validation Report
May 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SL-1D		SL-2		SL-3		SL-3		SL-5		SL-6	
			COC Sample	OC-SL-1D		OC-SL-2		OC-SL-3		OC-SL-3 DUP		OC-SL-5		OC-SL-6	
			Date Sampled	05/11/11		05/11/11		05/10/11		05/10/11		05/10/11		05/10/11	
			Sample Type	FS		FS		FS		FD		FS		FS	
			Report Number	360-33756-1		360-33756-1		360-33756-1		360-33756-1		360-33756-1		360-33756-1	
Fract	**Analysis Method**	**Parameter Name**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	ug/l	82	J	660		24	J	17	J	200	U	35	J
T	SW6010	Calcium	ug/l	30000		19000		180000		200000		600000		470000	
T	SW6010	Chromium	ug/l	5	U	0.97	J	5	U	5	U	10	U	5	U
T	SW6010	Iron	ug/l	99	J	3800		21000		22000		200	U	73	J
T	SW6010	Manganese	ug/l	13		7	J	2200		2400		260		1300	
T	SW6010	Nickel	ug/l	10	U	10	U	3.8	J	4.5	J	2.6	J	2.4	J
T	SW6010	Sodium	ug/l	23000		1500	J	7300		8200		10000		13000	
N	A2320	Bicarbonate Alkalinity, as CaCO3	mg/l	28		13		240		220		92		100	
N	A2320	Carbonate Alkalinity, as CaCO3	mg/l	1	U	1	U	1	U	1	U	1	U	1	U
N	E300	Chloride	mg/l	34		1.3		3.9		3.5		2.4		1.5	
N	E300	Sulfate	mg/l	47		34		230	J	160	J	1200	J	1100	J
F	A2540C	Total Dissolved Solids	mg/l	180		99		610		470		1800		1800	

Notes:
N = normal
T = total (unfiltered)
F = filtered
FS = field sample
FD = field duplicate
U = not detected, value is the detection limit
J = value is estimated
ug/l = microgram per liter
mg/l = milligram per liter

Prepared by / Date: KJC 06/13/11
Checked by / Date: WDC 06/16/11

Table 3
Validation Qualification Action Summary
Data Validation Report
May 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
360-33756-1	360-33756-1	E300	OC-SL-6	Sulfate	1100		1100	J	MS-H, MS-RPD	mg/l
360-33756-1	360-33756-2	E300	OC-SL-5	Sulfate	1200		1200	J	MS-H, MS-RPD	mg/l
360-33756-1	360-33756-3	E300	OC-SL-3	Sulfate	230		230	J	FD	mg/l
360-33756-1	360-33756-6	E300	OC-SL-3 DUP	Sulfate	160		160	J	FD	mg/l

Units:

ug/L = microgram per liter

Validation Qualifier:

J = value is estimated

Validation Reason Codes:

FD = Field Duplicate limit exceeded.

MS-H = MS and/or MSD recovery high

MS-RPD = MS/MSD RPD limit exceeded

Prepared by / Date: KJC 06/13/11

Checked by / Date: WDC 06/16/11

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date [signature] 6/7/11
Sr. Review/Date Chris Ricciardi 7/2/11
Lab Report # 360-33756-1
Project # 6107110016.12

aluminum, calcium, chromium, iron, manganese, nickel, sodium - total only

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes** [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [✓] **No** [ ] N/A [ ] Comments: Sample OC-SL-5 required dilution due to high target analytes (two fold). Reporting limits have been adjusted.

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [✓] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

6/7/11

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

Calcium (3173 ug/L) was reported in the method blank. Action level established at 5x blank conc. All calcium results > AL, no action required.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [✓] No [ ] N/A [ ] Comments: Sample OC-SL-3 was submitted for MS analysis.

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [✓] **No** [ ] N/A [ ] Comments:

MS %R calcium (131) greater than QC limit. Unspiked result was greater than four times the spike concentration. No action required.

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [✓] **No** [ ] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result, D = MSD sample result

RPD for calcium (21) exceeded limit of 20. Unspiked > 4x spiking conc.; no action required.

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

***NOTE**: MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments:

Sample OC-SL-3 and OC-SL-3 DUP.

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments: See attached.

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No** [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

Olin Calcium Sulfate Landfill
May 2011
Duplicate RPD

Sample ID	Analyte	Orig Concen (mg/L)	Q	Dup Conc. (mg/L)	Q	RPD
OC-SL-3	Aluminum	24	J	17	J	34
OC-SL-3	Calcium	180000		200000		11
OC-SL-3	Chromium	5	U	5	U	---
OC-SL-3	Iron	21000		22000		4.7
OC-SL-3	Manganese	2200		2400		8.7
OC-SL-3	Nickel	3.8	J	4.5	J	17
OC-SL-3	Sodium	7300		8200		12

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [ ] No [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2001. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Massachusetts Quality Assurance and Quality Control (QA/QC) Requirements." BWSC-CAM, Interim Final Draft, Revision No. 2, 5 October 2001.

MADEP, 2001. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for Sampling, Data Evaluation and Reporting Activities," BWSC-CAM, Section VII, Public Comment Draft, Revision No. 0, 21 December 2001.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date [signature] 6/7/11
Sr. Review/Date Chris Ricciardi 7/2/11
Lab Report # 360-33756-1
Project # 61071100016.12

bicarbonate + carbonate alkalinity, chloride, sulfate, TDS

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Check items received. **Yes** [✓] No [ ] N/A [ ] Comments:

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory (IDs must be cross-referenced)*

Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

✓ Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

✓ Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

✓ Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [✓] No [ ] N/A [ ] Comments:

Case narrative states that the following samples were received with more than a half inch of headspace: OC-SL-6 for the alkalinity analysis.
OC-SL-1D
OC-SL-3 DUP.

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Field ID and Lab ID
- [✓] Date and time collected
- [✓] Analyst Initials
- [✓] Dilution Factor
- [✓] % moisture or solids
- [✓] Reporting limits
- [✓] *Clean-up method*
- [✓] Analysis method
- [✓] Preparation method
- [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
- [✓] Matrix
- [✓] Target analytes and concentrations
- [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Method blank results
- [✓] LCS recoveries
- [✓] MS/MSD recoveries and RPDs
- [✓] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days Sulfide, TDS, TSS = 7 days pH = analyze immediately Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments:

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity**☐ = 1 mg/L	Bicarbonate Alkalinity** ☑ = 1 mg/L	Carbonate Alkalinity** ☑ = 1 mg/L
Nitrate Nitrogen as N* ☐ = .05 mg/L	Nitrite Nitrogen as N* ☐ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness *☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☑ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 **Method Blanks** **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☐ = 80-120%	Carbonate Alkalinity** ☐ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☑ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☐ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N**☐ = 80-120%	Nitrite Nitrogen as N** ☐= 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [✓] No [ ] N/A [ ] Comments: Sample OC-SL-3 was submitted for MS/MSD analysis. Lab analyze OC-SL-6 as MS/MSD.

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes [✓] No [ ] N/A [ ] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [✓] No [ ] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes [✓] No [ ] N/A [ ] Comments:

OC-SL-6 Sulfate MS/MSD %R (155, 62) outside of QC limits. ~~Unspiked~~ 6/7/14 Other spike sulfate data (samples < 1000 mg/L) were within limits. Professional judgment estimated (J) high results in samples OC-SL-6 and OC-SL-5.

NOTE: $\%R_{SA} = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☒ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result, D = MSD result

Yes [✓] **No** [ ] N/A [ ] Comments:

Sample OC-SL-6 sulfate MS/MSD RPD (8%) greater than QC limit. Sulfate in samples OC-SL-6 and OC-SL-5 qualified as above.

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☑ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [✓] No [ ] N/A [ ] Comments: OC-SL-3 and OC-SL-3 Dup.

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☐ *MADEP Option 1(1 per 20)* ☑ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [ ] No [✓] N/A [ ] Comments: See attached.

Sulfate RPD (36) exceeded QC limit of 30. Results for sulfate in duplicate pair OC-SL-3 and OC-SL-3DUP were qualified estimated (~~U~~J).

6/7/11

Olin Calcium Sulfate Landfill
May 2011
Duplicate RPD

Sample ID	Analyte	Orig Concen (mg/L)	Q	Dup Conc. (mg/L)	Q	RPD
OC-SL-3	Bicarbonate Alkalinity, as CaCO3	240		220		8.7
OC-SL-3	Carbonate Alkalinity, as CaCO3	1	U	1	U	---
OC-SL-3	Chloride	3.9		3.5		11
OC-SL-3	Sulfate	230		160		36
OC-SL-3	Total Dissolved Solids	610		470		26

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

Massachusetts Department of Environmental Protection (MADEP), 2004. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; May 2004.

Job ID: 360-33756-1

Laboratory: TestAmerica Westfield

Narrative

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 05/11/2011; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.2 C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2 C of the required temperature or method specified range. For samples with a specified temperature of 4 C, samples with a temperature ranging from just above freezing temperature of water to 6 C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

TOTAL METALS (ICP)
Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 05/13/2011 and analyzed on 05/13/2011 and 05/16/2011.

Calcium failed the recovery criteria high for the MS of sample OC-SL-3 (360-33756-3) in batch 360-73623. The associated LCS and LCSD recovered within control limits. Refer to the QC report for details.

Manganese exceeded the control criteria for the serial dilution of sample OC-SL-3 (360-33756-3).

Calcium was detected in method blank MB 360-73582/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate, and has been flagged "J". If the associated sample reported a result above the MDL and/or RL, the result has been "B" flagged. Refer to the QC report for details.

Sample OC-SL-5 (360-33756-2)[2X] required dilution prior to analysis due to high target concentration. The reporting limits have been adjusted accordingly.

At the request of the client, an abbreviated/modified MCP analyte list was reported for this job.

No other difficulties were encountered during the metals analyses.

All other quality control parameters were within the acceptance limits.

ANIONS
Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for anions in accordance with EPA Method 300.0. The samples were analyzed on 05/13/2011 and 05/14/2011.

Sulfate failed the recovery criteria high for the MS of sample OC-SL-6 (360-33756-1) in batch 360-73731. Sulfate failed the recovery criteria low for the MSD of sample OC-SL-6MSD (360-33756-1) in batch 360-73731. Chloride and Sulfate exceeded the rpd limit. The associated LCS recovered within control limits. Refer to the QC report for details.

Samples OC-SL-6 (360-33756-1)[20X], OC-SL-5 (360-33756-2)[20X], OC-SL-3 (360-33756-3)[10X] and OC-SL-3 DUP (360-33756-6)[10X]

Job ID: 360-33756-1 (Continued)

Laboratory: TestAmerica Westfield (Continued)

required dilution prior to analysis due to high target concentration. The reporting limits have been adjusted accordingly.

No other difficulties were encountered during the anions analyses.

All other quality control parameters were within the acceptance limits.

ALKALINITY

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for alkalinity in accordance with SM20 2320B. The samples were analyzed on 05/12/2011.

The following samples were received with noticeable (more than one-half inch) headspace in the sample container: OC-SL-6 (360-33756-1), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6). The alkalinity method requires that samples be collected and submitted with zero-headspace.

No difficulties were encountered during the alkalinity analyses.

All quality control parameters were within the acceptance limits.

TOTAL DISSOLVED SOLIDS

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for total dissolved solids in accordance with SM20 2540C. The samples were analyzed on 05/12/2011.

No difficulties were encountered during the TDS analyses.

All quality control parameters were within the acceptance limits.

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 360-73582/1-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: MB 360-73582/1-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	12	ug/L		05/13/11 10:14	05/13/11 17:23	1
Calcium	317	J	400	50	ug/L		05/13/11 10:14	05/13/11 17:23	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 17:23	1
Iron	ND		100	14	ug/L		05/13/11 10:14	05/13/11 17:23	1
Manganese	ND		10	3.0	ug/L		05/13/11 10:14	05/13/11 17:23	1
Sodium	ND		2000	280	ug/L		05/13/11 10:14	05/13/11 17:23	1
Nickel	ND		10	1.2	ug/L		05/13/11 10:14	05/13/11 17:23	1

Lab Sample ID: LCS 360-73582/2-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: LCS 360-73582/2-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Aluminum	5000	4670		ug/L		93	80 - 120
Calcium	20000	19100		ug/L		95	80 - 120
Chromium	1000	946		ug/L		95	80 - 120
Iron	5000	4740		ug/L		95	80 - 120
Manganese	1000	941		ug/L		94	80 - 120
Sodium	20000	18400		ug/L		92	80 - 120
Nickel	1000	934		ug/L		93	80 - 120

Lab Sample ID: LCSD 360-73582/3-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: LCSD 360-73582/3-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Aluminum	5000	4900		ug/L		98	80 - 120	5	20
Calcium	20000	20100		ug/L		101	80 - 120	6 ~~5~~	20
Chromium	1000	993		ug/L		99	80 - 120	4 ~~5~~	20
Iron	5000	4980		ug/L		100	80 - 120	5	20
Manganese	1000	987		ug/L		99	80 - 120	5	20
Sodium	20000	19300		ug/L		96	80 - 120	4 ~~5~~	20
Nickel	1000	979		ug/L		98	80 - 120	5	20

6/7/11

Lab Sample ID: 360-33756-3 MS
Matrix: Water
Analysis Batch: 73623

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Aluminum	24	J	5000	4700		ug/L		93	75 - 125
Calcium	180000	B	20000	204000	4	ug/L		131	75 - 125
Chromium	ND		1000	923		ug/L		92	75 - 125
Iron	21000		5000	26600	4	ug/L		120	75 - 125
Manganese	2200		1000	3080		ug/L		92	75 - 125
Sodium	7300		20000	26600		ug/L		97	75 - 125
Nickel	3.8	J	1000	903		ug/L		90	75 - 125

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 360-33756-3 MSD
Matrix: Water
Analysis Batch: 73623

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Aluminum	24	J	5000	4590		ug/L		91	75 - 125	2	20
Calcium	180000	B	20000	199000	4	ug/L		106	75 - 125	21	20
Chromium	ND		1000	901		ug/L		90	75 - 125	2	20
Iron	21000		5000	26000	4	ug/L		109	75 - 125	9.6	20
Manganese	2200		1000	3010		ug/L		85	75 - 125	7.9	20
Sodium	7300		20000	26000		ug/L		94	75 - 125	3	20
Nickel	3.8	J	1000	885		ug/L		88	75 - 125	2	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-73655/3
Matrix: Water
Analysis Batch: 73655

Client Sample ID: MB 360-73655/3
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/13/11 12:26	1
Chloride	ND		1.0	1.0	mg/L			05/13/11 12:26	1

Lab Sample ID: LCS 360-73655/4
Matrix: Water
Analysis Batch: 73655

Client Sample ID: LCS 360-73655/4
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	83.1		mg/L		104	85 - 115
Chloride	40.0	42.4		mg/L		106	85 - 115

Lab Sample ID: MB 360-73723/5
Matrix: Water
Analysis Batch: 73723

Client Sample ID: MB 360-73723/5
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/13/11 18:59	1
Chloride	ND		1.0	1.0	mg/L			05/13/11 18:59	1

Lab Sample ID: LCS 360-73723/6
Matrix: Water
Analysis Batch: 73723

Client Sample ID: LCS 360-73723/6
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	82.6		mg/L		103	85 - 115
Chloride	40.0	42.2		mg/L		106	85 - 115

Lab Sample ID: 360-33756-3 MS
Matrix: Water
Analysis Batch: 73723

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	230		200	456		mg/L		112	75 - 125
Chloride	ND		100	106		mg/L		106	75 - 125

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 360-33756-3 MSD
Matrix: Water
Analysis Batch: 73723

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Sulfate	230		200	456		mg/L		112	75 - 125	0	20
Chloride	ND		100	106		mg/L		106	75 - 125	0	20

Lab Sample ID: MB 360-73731/3
Matrix: Water
Analysis Batch: 73731

Client Sample ID: MB 360-73731/3
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/14/11 09:41	1
Chloride	ND		1.0	1.0	mg/L			05/14/11 09:41	1

Lab Sample ID: LCS 360-73731/4
Matrix: Water
Analysis Batch: 73731

Client Sample ID: LCS 360-73731/4
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	80.3		mg/L		100	85 - 115
Chloride	40.0	40.9		mg/L		102	85 - 115

Lab Sample ID: 360-33756-1 MS
Matrix: Water
Analysis Batch: 73731

Client Sample ID: OC-SL-6
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	1100		400	1750	F	mg/L		155	75 - 125
Chloride	ND		200	227		mg/L		113	75 - 125

Lab Sample ID: 360-33756-1 MSD
Matrix: Water
Analysis Batch: 73731

Client Sample ID: OC-SL-6
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Sulfate	1100		400	1370	F	mg/L		62	75 - 125	~~24~~	20
Chloride	ND		200	178	F	mg/L		89	75 - 125	24	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 360-73558/3
Matrix: Water
Analysis Batch: 73558

Client Sample ID: MB 360-73558/3
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Bicarbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:20	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:20	1

Lab Sample ID: 360-33756-3 DU
Matrix: Water
Analysis Batch: 73558

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Bicarbonate Alkalinity as CaCO3	240		240		mg/L		0.4	20

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Method: SM 2320B - Alkalinity (Continued)

Lab Sample ID: 360-33756-3 DU
Matrix: Water
Analysis Batch: 73558

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Carbonate Alkalinity as CaCO3	ND		ND		mg/L		NC	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 360-73527/1
Matrix: Water
Analysis Batch: 73527

Client Sample ID: MB 360-73527/1
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/12/11 14:36	1

Lab Sample ID: LCS 360-73527/2
Matrix: Water
Analysis Batch: 73527

Client Sample ID: LCS 360-73527/2
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Total Dissolved Solids	200	195		mg/L		98	85 - 115

Lab Sample ID: 360-33756-3 DU
Matrix: Water
Analysis Batch: 73527

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	610		632		mg/L		3	20

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Westfield
Westfield Executive Park
53 Southampton Road
Westfield, MA 01085
Tel: (413)572-4000

CHECKED FOR COMPLETENESS OF PARAMETERS ORDERED BY:

6/7/11

TestAmerica Job ID: 360-33756-1
Client Project/Site: Olin Chemical Calcium Sulfate Landfill

For:
Olin Corporation
PO BOX 248
Charleston, Tennessee 37310-0248

Attn: Mr. James Cashwell

Authorized for release by:
05/18/2011 01:22:59 PM
Joe Chimi
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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

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Job ID: 360-33756-1

Laboratory: TestAmerica Westfield

Narrative

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

The samples were received on 05/11/2011; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.2 C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2 C of the required temperature or method specified range. For samples with a specified temperature of 4 C, samples with a temperature ranging from just above freezing temperature of water to 6 C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

TOTAL METALS (ICP)

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 05/13/2011 and analyzed on 05/13/2011 and 05/16/2011.

Calcium failed the recovery criteria high for the MS of sample OC-SL-3 (360-33756-3) in batch 360-73623. The associated LCS and LCSD recovered within control limits. Refer to the QC report for details.

Manganese exceeded the control criteria for the serial dilution of sample OC-SL-3 (360-33756-3).

Calcium was detected in method blank MB 360-73582/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate, and has been flagged “J”. If the associated sample reported a result above the MDL and/or RL, the result has been “B” flagged. Refer to the QC report for details.

Sample OC-SL-5 (360-33756-2)[2X] required dilution prior to analysis due to high target concentration. The reporting limits have been adjusted accordingly.

At the request of the client, an abbreviated/modified MCP analyte list was reported for this job.

No other difficulties were encountered during the metals analyses.

All other quality control parameters were within the acceptance limits.

ANIONS

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for anions in accordance with EPA Method 300.0. The samples were analyzed on 05/13/2011 and 05/14/2011.

Sulfate failed the recovery criteria high for the MS of sample OC-SL-6 (360-33756-1) in batch 360-73731. Sulfate failed the recovery criteria low for the MSD of sample OC-SL-6MSD (360-33756-1) in batch 360-73731. Chloride and Sulfate exceeded the rpd limit. The associated LCS recovered within control limits. Refer to the QC report for details.

Samples OC-SL-6 (360-33756-1)[20X], OC-SL-5 (360-33756-2)[20X], OC-SL-3 (360-33756-3)[10X] and OC-SL-3 DUP (360-33756-6)[10X]

Job ID: 360-33756-1 (Continued)

Laboratory: TestAmerica Westfield (Continued)

required dilution prior to analysis due to high target concentration. The reporting limits have been adjusted accordingly.

No other difficulties were encountered during the anions analyses.

All other quality control parameters were within the acceptance limits.

ALKALINITY

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for alkalinity in accordance with SM20 2320B. The samples were analyzed on 05/12/2011.

The following samples were received with noticeable (more than one-half inch) headspace in the sample container: OC-SL-6 (360-33756-1), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6). The alkalinity method requires that samples be collected and submitted with zero-headspace.

No difficulties were encountered during the alkalinity analyses.

All quality control parameters were within the acceptance limits.

TOTAL DISSOLVED SOLIDS

Samples OC-SL-6 (360-33756-1), OC-SL-5 (360-33756-2), OC-SL-3 (360-33756-3), OC-SL-2 (360-33756-4), OC-SL-1D (360-33756-5) and OC-SL-3 DUP (360-33756-6) were analyzed for total dissolved solids in accordance with SM20 2540C. The samples were analyzed on 05/12/2011.

No difficulties were encountered during the TDS analyses.

All quality control parameters were within the acceptance limits.

MassDEP Analytical Protocol Certification Form

Laboratory Name: **TestAmerica Westfield** Project #: **360-33756-1**

Project Location: **Calcium Sulfate Landfill** RTN:

This form provides certifications for the following data set: list Laboratory Sample ID Number(s):

360-33756-(1-6)

Matrices: [X] Groundwater/Surface Water [ ] Soil/Sediment [ ] Drinking Water [ ] Air [ ] Other:

CAM Protocols (check all that apply below):

8260 VOC CAM II A [ ]	7470/7471 Hg CAM III B [ ]	Mass DEP VPH CAM IV A [ ]	8081 Pesticides CAM V B [ ]	7196 Hex Cr CAM VI B [ ]	Mass DEP APH CAM IX A [ ]
8270 SVOC CAM II B [ ]	7010 Metals CAM III C [ ]	Mass DEP EPH CAM IV B [ ]	8151 Herbicides CAM V C [ ]	8330 Explosives CAM VIII A [ ]	TO-15 VOC CAM IX B [ ]
6010 Metals CAM III A [X]	6020 Metals CAM III D [ ]	8082 PCB CAM V A [ ]	9014 Total Cyanide/PAC CAM VI A [ ]	332.0 Perchlorate CAM VIII B [ ]	

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding time.	[X] Yes [ ] No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	[X] Yes [ ] No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	[X] Yes [ ] No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	[X] Yes [ ] No
E	a. VPH, EPH and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	[ ] Yes [ ] No [ ] Yes [ ] No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	[X] Yes [ ] No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	[X] Yes [ ] No[1]

Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WCS-07-350***

H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	[ ] Yes [X] No
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s) ?	[ ] Yes [X] No

[1] All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature: Position: Laboratory Director

Printed Name: Steven C. Hartmann Date: 5/18/11 11:20

This form has been electronically signed and approved

Detection Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Client Sample ID: OC-SL-6 — Lab Sample ID: 360-33756-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	35	J	100	12	ug/L	1		6010B	Total/NA
Calcium	470000	B	400	50	ug/L	1		6010B	Total/NA
Iron	73	J	100	14	ug/L	1		6010B	Total/NA
Manganese	1300		10	3.0	ug/L	1		6010B	Total/NA
Sodium	13000		2000	280	ug/L	1		6010B	Total/NA
Nickel	2.4	J	10	1.2	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1100		40	40	mg/L	20		300.0	Total/NA
Chloride	1.5		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	100		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	1800		100	100	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL-5 — Lab Sample ID: 360-33756-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	600000	B	800	100	ug/L	2		6010B	Total/NA
Manganese	260		20	6.1	ug/L	2		6010B	Total/NA
Sodium	10000		4000	550	ug/L	2		6010B	Total/NA
Nickel	2.6	J	20	2.5	ug/L	2		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1200		40	40	mg/L	20		300.0	Total/NA
Chloride	2.4		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	92		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	1800		100	100	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL-3 — Lab Sample ID: 360-33756-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	24	J	100	12	ug/L	1		6010B	Total/NA
Calcium	180000	B	400	50	ug/L	1		6010B	Total/NA
Iron	21000		100	14	ug/L	1		6010B	Total/NA
Manganese	2200		10	3.0	ug/L	1		6010B	Total/NA
Sodium	7300		2000	280	ug/L	1		6010B	Total/NA
Nickel	3.8	J	10	1.2	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	230		20	20	mg/L	10		300.0	Total/NA
Chloride	3.9		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	240		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	610		40	40	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL-2 — Lab Sample ID: 360-33756-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	660		100	12	ug/L	1		6010B	Total/NA
Calcium	19000	B	400	50	ug/L	1		6010B	Total/NA
Chromium	0.97	J	5.0	0.65	ug/L	1		6010B	Total/NA
Iron	3800		100	14	ug/L	1		6010B	Total/NA
Manganese	7.0	J	10	3.0	ug/L	1		6010B	Total/NA
Sodium	1500	J	2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	34		2.0	2.0	mg/L	1		300.0	Total/NA
Chloride	1.3		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	13		1.0	1.0	mg/L	1		SM 2320B	Total/NA

Client Sample ID: OC-SL-2 (Continued) — Lab Sample ID: 360-33756-4

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Total Dissolved Solids	99		10	10	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL-1D — Lab Sample ID: 360-33756-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	82	J	100	12	ug/L	1		6010B	Total/NA
Calcium	30000	B	400	50	ug/L	1		6010B	Total/NA
Iron	99	J	100	14	ug/L	1		6010B	Total/NA
Manganese	13		10	3.0	ug/L	1		6010B	Total/NA
Sodium	23000		2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	47		2.0	2.0	mg/L	1		300.0	Total/NA
Chloride	34		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	28		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	180		20	20	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL-3 DUP — Lab Sample ID: 360-33756-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	17	J	100	12	ug/L	1		6010B	Total/NA
Calcium	200000	B	400	50	ug/L	1		6010B	Total/NA
Iron	22000		100	14	ug/L	1		6010B	Total/NA
Manganese	2400		10	3.0	ug/L	1		6010B	Total/NA
Sodium	8200		2000	280	ug/L	1		6010B	Total/NA
Nickel	4.5	J	10	1.2	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	160		20	20	mg/L	10		300.0	Total/NA
Chloride	3.5		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	220		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	470		40	40	mg/L	1		SM 2540C	Total/NA

Method Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL WFD
300.0	Anions, Ion Chromatography	MCAWW	TAL WFD
SM 2320B	Alkalinity	SM	TAL WFD
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL WFD

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater",

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL WFD = TestAmerica Westfield, Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085, TEL (413)572-4000

Sample Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
360-33756-1	OC-SL-6	Water	05/10/11 08:45	05/11/11 16:45
360-33756-2	OC-SL-5	Water	05/10/11 09:50	05/11/11 16:45
360-33756-3	OC-SL-3	Water	05/10/11 10:50	05/11/11 16:45
360-33756-4	OC-SL-2	Water	05/11/11 10:10	05/11/11 16:45
360-33756-5	OC-SL-1D	Water	05/11/11 11:25	05/11/11 16:45
360-33756-6	OC-SL-3 DUP	Water	05/10/11 10:50	05/11/11 16:45

Method: 6010B - Metals (ICP)

Client Sample ID: OC-SL-6 — **Lab Sample ID: 360-33756-1**
Date Collected: 05/10/11 08:45 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	35	J	100	12	ug/L		05/13/11 10:14	05/13/11 17:52	1
Calcium	470000	B	400	50	ug/L		05/13/11 10:14	05/13/11 17:52	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 17:52	1
Iron	73	J	100	14	ug/L		05/13/11 10:14	05/13/11 17:52	1
Manganese	1300		10	3.0	ug/L		05/13/11 10:14	05/13/11 17:52	1
Sodium	13000		2000	280	ug/L		05/13/11 10:14	05/13/11 17:52	1
Nickel	2.4	J	10	1.2	ug/L		05/13/11 10:14	05/13/11 17:52	1

Client Sample ID: OC-SL-5 — **Lab Sample ID: 360-33756-2**
Date Collected: 05/10/11 09:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		200	25	ug/L		05/13/11 10:14	05/16/11 10:52	2
Calcium	600000	B	800	100	ug/L		05/13/11 10:14	05/16/11 10:52	2
Chromium	ND		10	1.3	ug/L		05/13/11 10:14	05/16/11 10:52	2
Iron	ND		200	28	ug/L		05/13/11 10:14	05/16/11 10:52	2
Manganese	260		20	6.1	ug/L		05/13/11 10:14	05/16/11 10:52	2
Sodium	10000		4000	550	ug/L		05/13/11 10:14	05/16/11 10:52	2
Nickel	2.6	J	20	2.5	ug/L		05/13/11 10:14	05/16/11 10:52	2

Client Sample ID: OC-SL-3 — **Lab Sample ID: 360-33756-3**
Date Collected: 05/10/11 10:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	24	J	100	12	ug/L		05/13/11 10:14	05/13/11 17:38	1
Calcium	180000	B	400	50	ug/L		05/13/11 10:14	05/13/11 17:38	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 17:38	1
Iron	21000		100	14	ug/L		05/13/11 10:14	05/13/11 17:38	1
Manganese	2200		10	3.0	ug/L		05/13/11 10:14	05/13/11 17:38	1
Sodium	7300		2000	280	ug/L		05/13/11 10:14	05/13/11 17:38	1
Nickel	3.8	J	10	1.2	ug/L		05/13/11 10:14	05/13/11 17:38	1

Client Sample ID: OC-SL-2 — **Lab Sample ID: 360-33756-4**
Date Collected: 05/11/11 10:10 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	660		100	12	ug/L		05/13/11 10:14	05/13/11 17:58	1
Calcium	19000	B	400	50	ug/L		05/13/11 10:14	05/13/11 17:58	1
Chromium	0.97	J	5.0	0.65	ug/L		05/13/11 10:14	05/13/11 17:58	1
Iron	3800		100	14	ug/L		05/13/11 10:14	05/13/11 17:58	1
Manganese	7.0	J	10	3.0	ug/L		05/13/11 10:14	05/13/11 17:58	1
Sodium	1500	J	2000	280	ug/L		05/13/11 10:14	05/13/11 17:58	1
Nickel	ND		10	1.2	ug/L		05/13/11 10:14	05/13/11 17:58	1

Client Sample ID: OC-SL-1D — **Lab Sample ID: 360-33756-5**
Date Collected: 05/11/11 11:25 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	82	J	100	12	ug/L		05/13/11 10:14	05/13/11 18:07	1
Calcium	30000	B	400	50	ug/L		05/13/11 10:14	05/13/11 18:07	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 18:07	1

Method: 6010B - Metals (ICP) (Continued)

Client Sample ID: OC-SL-1D — **Lab Sample ID: 360-33756-5**
Date Collected: 05/11/11 11:25 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	99	J	100	14	ug/L		05/13/11 10:14	05/13/11 18:07	1
Manganese	13		10	3.0	ug/L		05/13/11 10:14	05/13/11 18:07	1
Sodium	23000		2000	280	ug/L		05/13/11 10:14	05/13/11 18:07	1
Nickel	ND		10	1.2	ug/L		05/13/11 10:14	05/13/11 18:07	1

Client Sample ID: OC-SL-3 DUP — **Lab Sample ID: 360-33756-6**
Date Collected: 05/10/11 10:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	17	J	100	12	ug/L		05/13/11 10:14	05/13/11 18:10	1
Calcium	200000	B	400	50	ug/L		05/13/11 10:14	05/13/11 18:10	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 18:10	1
Iron	22000		100	14	ug/L		05/13/11 10:14	05/13/11 18:10	1
Manganese	2400		10	3.0	ug/L		05/13/11 10:14	05/13/11 18:10	1
Sodium	8200		2000	280	ug/L		05/13/11 10:14	05/13/11 18:10	1
Nickel	4.5	J	10	1.2	ug/L		05/13/11 10:14	05/13/11 18:10	1

General Chemistry

Client Sample ID: OC-SL-6 — **Lab Sample ID: 360-33756-1**
Date Collected: 05/10/11 08:45 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	1100		40	40	mg/L			05/14/11 10:11	20
Chloride	1.5		1.0	1.0	mg/L			05/13/11 17:28	1
Bicarbonate Alkalinity as CaCO3	100		1.0	1.0	mg/L			05/12/11 11:50	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:50	1
Total Dissolved Solids	1800		100	100	mg/L			05/12/11 14:36	1

Client Sample ID: OC-SL-5 — **Lab Sample ID: 360-33756-2**
Date Collected: 05/10/11 09:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	1200		40	40	mg/L			05/14/11 10:57	20
Chloride	2.4		1.0	1.0	mg/L			05/13/11 17:58	1
Bicarbonate Alkalinity as CaCO3	92		1.0	1.0	mg/L			05/12/11 11:56	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:56	1
Total Dissolved Solids	1800		100	100	mg/L			05/12/11 14:36	1

Client Sample ID: OC-SL-3 — **Lab Sample ID: 360-33756-3**
Date Collected: 05/10/11 10:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	230		20	20	mg/L			05/13/11 19:44	10
Chloride	3.9		1.0	1.0	mg/L			05/13/11 19:29	1
Bicarbonate Alkalinity as CaCO3	240		1.0	1.0	mg/L			05/12/11 11:37	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:37	1
Total Dissolved Solids	610		40	40	mg/L			05/12/11 14:36	1

Client Sample ID: OC-SL-2 — **Lab Sample ID: 360-33756-4**
Date Collected: 05/11/11 10:10 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	34		2.0	2.0	mg/L			05/13/11 20:29	1
Chloride	1.3		1.0	1.0	mg/L			05/13/11 20:29	1
Bicarbonate Alkalinity as CaCO3	13		1.0	1.0	mg/L			05/12/11 12:02	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 12:02	1
Total Dissolved Solids	99		10	10	mg/L			05/12/11 14:36	1

Client Sample ID: OC-SL-1D — **Lab Sample ID: 360-33756-5**
Date Collected: 05/11/11 11:25 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	47		2.0	2.0	mg/L			05/13/11 20:59	1
Chloride	34		1.0	1.0	mg/L			05/13/11 20:59	1
Bicarbonate Alkalinity as CaCO3	28		1.0	1.0	mg/L			05/12/11 12:07	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 12:07	1
Total Dissolved Solids	180		20	20	mg/L			05/12/11 14:38	1

Client Sample ID: OC-SL-3 DUP — **Lab Sample ID: 360-33756-6**
Date Collected: 05/10/11 10:50 — **Matrix: Water**
Date Received: 05/11/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	160		20	20	mg/L			05/13/11 21:45	10

General Chemistry (Continued)

Client Sample ID: OC-SL-3 DUP
Date Collected: 05/10/11 10:50
Date Received: 05/11/11 16:45

Lab Sample ID: 360-33756-6
Matrix: Water

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.5**		1.0	1.0	mg/L			05/13/11 21:30	1
Bicarbonate Alkalinity as CaCO3	**220**		1.0	1.0	mg/L			05/12/11 12:14	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 12:14	1
Total Dissolved Solids	**470**		40	40	mg/L			05/12/11 14:38	1

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is 4 times greater than the matrix spike concentration; therefore, control limits are not applicable.
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F	MS or MSD exceeds the control limits
F	RPD of the MS and MSD exceeds the control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis.
EPA	United States Environmental Protection Agency
ND	Not Detected above the reporting level.
MDL	Method Detection Limit
RL	Reporting Limit
RE, RE1 (etc.)	Indicates a Re-extraction or Reanalysis of the sample.
%R	Percent Recovery
RPD	Relative Percent Difference, a measure of the relative difference between two points.

QC Association Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Metals

Prep Batch: 73582

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73582/1-A	MB 360-73582/1-A	Total/NA	Water	3010A	
LCS 360-73582/2-A	LCS 360-73582/2-A	Total/NA	Water	3010A	
LCSD 360-73582/3-A	LCSD 360-73582/3-A	Total/NA	Water	3010A	
360-33756-3	OC-SL-3	Total/NA	Water	3010A	
360-33756-3 MS	OC-SL-3	Total/NA	Water	3010A	
360-33756-3 MSD	OC-SL-3	Total/NA	Water	3010A	
360-33756-1	OC-SL-6	Total/NA	Water	3010A	
360-33756-2	OC-SL-5	Total/NA	Water	3010A	
360-33756-4	OC-SL-2	Total/NA	Water	3010A	
360-33756-5	OC-SL-1D	Total/NA	Water	3010A	
360-33756-6	OC-SL-3 DUP	Total/NA	Water	3010A	

Analysis Batch: 73623

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73582/1-A	MB 360-73582/1-A	Total/NA	Water	6010B	73582
LCS 360-73582/2-A	LCS 360-73582/2-A	Total/NA	Water	6010B	73582
LCSD 360-73582/3-A	LCSD 360-73582/3-A	Total/NA	Water	6010B	73582
360-33756-3	OC-SL-3	Total/NA	Water	6010B	73582
360-33756-3 MS	OC-SL-3	Total/NA	Water	6010B	73582
360-33756-3 MSD	OC-SL-3	Total/NA	Water	6010B	73582
360-33756-1	OC-SL-6	Total/NA	Water	6010B	73582
360-33756-4	OC-SL-2	Total/NA	Water	6010B	73582
360-33756-5	OC-SL-1D	Total/NA	Water	6010B	73582
360-33756-6	OC-SL-3 DUP	Total/NA	Water	6010B	73582

Analysis Batch: 73642

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-33756-2	OC-SL-5	Total/NA	Water	6010B	73582

General Chemistry

Analysis Batch: 73527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73527/1	MB 360-73527/1	Total/NA	Water	SM 2540C	
LCS 360-73527/2	LCS 360-73527/2	Total/NA	Water	SM 2540C	
360-33756-3	OC-SL-3	Total/NA	Water	SM 2540C	
360-33756-3 DU	OC-SL-3	Total/NA	Water	SM 2540C	
360-33756-1	OC-SL-6	Total/NA	Water	SM 2540C	
360-33756-2	OC-SL-5	Total/NA	Water	SM 2540C	
360-33756-4	OC-SL-2	Total/NA	Water	SM 2540C	
360-33756-5	OC-SL-1D	Total/NA	Water	SM 2540C	
360-33756-6	OC-SL-3 DUP	Total/NA	Water	SM 2540C	

Analysis Batch: 73558

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73558/3	MB 360-73558/3	Total/NA	Water	SM 2320B	
LCS 360-73558/4	LCS 360-73558/4	Total/NA	Water	SM 2320B	
360-33756-3	OC-SL-3	Total/NA	Water	SM 2320B	
360-33756-3 DU	OC-SL-3	Total/NA	Water	SM 2320B	
360-33756-1	OC-SL-6	Total/NA	Water	SM 2320B	
360-33756-2	OC-SL-5	Total/NA	Water	SM 2320B	
360-33756-4	OC-SL-2	Total/NA	Water	SM 2320B	

General Chemistry (Continued)

Analysis Batch: 73558 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-33756-5	OC-SL-1D	Total/NA	Water	SM 2320B	
360-33756-6	OC-SL-3 DUP	Total/NA	Water	SM 2320B	

Analysis Batch: 73655

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73655/3	MB 360-73655/3	Total/NA	Water	300.0	
LCS 360-73655/4	LCS 360-73655/4	Total/NA	Water	300.0	
360-33756-1	OC-SL-6	Total/NA	Water	300.0	
360-33756-2	OC-SL-5	Total/NA	Water	300.0	

Analysis Batch: 73723

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73723/5	MB 360-73723/5	Total/NA	Water	300.0	
LCS 360-73723/6	LCS 360-73723/6	Total/NA	Water	300.0	
360-33756-3	OC-SL-3	Total/NA	Water	300.0	
360-33756-3	OC-SL-3	Total/NA	Water	300.0	
360-33756-3 MS	OC-SL-3	Total/NA	Water	300.0	
360-33756-3 MSD	OC-SL-3	Total/NA	Water	300.0	
360-33756-4	OC-SL-2	Total/NA	Water	300.0	
360-33756-5	OC-SL-1D	Total/NA	Water	300.0	
360-33756-6	OC-SL-3 DUP	Total/NA	Water	300.0	
360-33756-6	OC-SL-3 DUP	Total/NA	Water	300.0	

Analysis Batch: 73731

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-73731/3	MB 360-73731/3	Total/NA	Water	300.0	
LCS 360-73731/4	LCS 360-73731/4	Total/NA	Water	300.0	
360-33756-1	OC-SL-6	Total/NA	Water	300.0	
360-33756-1 MS	OC-SL-6	Total/NA	Water	300.0	
360-33756-1 MSD	OC-SL-6	Total/NA	Water	300.0	
360-33756-2	OC-SL-5	Total/NA	Water	300.0	

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 360-73582/1-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: MB 360-73582/1-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	12	ug/L		05/13/11 10:14	05/13/11 17:23	1
Calcium	317	J	400	50	ug/L		05/13/11 10:14	05/13/11 17:23	1
Chromium	ND		5.0	0.65	ug/L		05/13/11 10:14	05/13/11 17:23	1
Iron	ND		100	14	ug/L		05/13/11 10:14	05/13/11 17:23	1
Manganese	ND		10	3.0	ug/L		05/13/11 10:14	05/13/11 17:23	1
Sodium	ND		2000	280	ug/L		05/13/11 10:14	05/13/11 17:23	1
Nickel	ND		10	1.2	ug/L		05/13/11 10:14	05/13/11 17:23	1

Lab Sample ID: LCS 360-73582/2-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: LCS 360-73582/2-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Aluminum	5000	4670		ug/L		93	80 - 120
Calcium	20000	19100		ug/L		95	80 - 120
Chromium	1000	946		ug/L		95	80 - 120
Iron	5000	4740		ug/L		95	80 - 120
Manganese	1000	941		ug/L		94	80 - 120
Sodium	20000	18400		ug/L		92	80 - 120
Nickel	1000	934		ug/L		93	80 - 120

Lab Sample ID: LCSD 360-73582/3-A
Matrix: Water
Analysis Batch: 73623

Client Sample ID: LCSD 360-73582/3-A
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Aluminum	5000	4900		ug/L		98	80 - 120	5	20
Calcium	20000	20100		ug/L		101	80 - 120	5	20
Chromium	1000	993		ug/L		99	80 - 120	5	20
Iron	5000	4980		ug/L		100	80 - 120	5	20
Manganese	1000	987		ug/L		99	80 - 120	5	20
Sodium	20000	19300		ug/L		96	80 - 120	5	20
Nickel	1000	979		ug/L		98	80 - 120	5	20

Lab Sample ID: 360-33756-3 MS
Matrix: Water
Analysis Batch: 73623

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 73582

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Aluminum	24	J	5000	4700		ug/L		93	75 - 125
Calcium	180000	B	20000	204000	4	ug/L		131	75 - 125
Chromium	ND		1000	923		ug/L		92	75 - 125
Iron	21000		5000	26600	4	ug/L		120	75 - 125
Manganese	2200		1000	3080		ug/L		92	75 - 125
Sodium	7300		20000	26600		ug/L		97	75 - 125
Nickel	3.8	J	1000	903		ug/L		90	75 - 125

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 360-33756-3 MSD — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73623 — **Prep Batch: 73582**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Aluminum	24	J	5000	4590		ug/L		91	75 - 125	2	20
Calcium	180000	B	20000	199000	4	ug/L		106	75 - 125	2	20
Chromium	ND		1000	901		ug/L		90	75 - 125	2	20
Iron	21000		5000	26000	4	ug/L		109	75 - 125	2	20
Manganese	2200		1000	3010		ug/L		85	75 - 125	2	20
Sodium	7300		20000	26000		ug/L		94	75 - 125	2	20
Nickel	3.8	J	1000	885		ug/L		88	75 - 125	2	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-73655/3 — **Client Sample ID: MB 360-73655/3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73655

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/13/11 12:26	1
Chloride	ND		1.0	1.0	mg/L			05/13/11 12:26	1

Lab Sample ID: LCS 360-73655/4 — **Client Sample ID: LCS 360-73655/4**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73655

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	83.1		mg/L		104	85 - 115
Chloride	40.0	42.4		mg/L		106	85 - 115

Lab Sample ID: MB 360-73723/5 — **Client Sample ID: MB 360-73723/5**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73723

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/13/11 18:59	1
Chloride	ND		1.0	1.0	mg/L			05/13/11 18:59	1

Lab Sample ID: LCS 360-73723/6 — **Client Sample ID: LCS 360-73723/6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73723

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	82.6		mg/L		103	85 - 115
Chloride	40.0	42.2		mg/L		106	85 - 115

Lab Sample ID: 360-33756-3 MS — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73723

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	230		200	456		mg/L		112	75 - 125
Chloride	ND		100	106		mg/L		106	75 - 125

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 360-33756-3 MSD — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73723

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Sulfate	230		200	456		mg/L		112	75 - 125	0	20
Chloride	ND		100	106		mg/L		106	75 - 125	0	20

Lab Sample ID: MB 360-73731/3 — **Client Sample ID: MB 360-73731/3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73731

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/14/11 09:41	1
Chloride	ND		1.0	1.0	mg/L			05/14/11 09:41	1

Lab Sample ID: LCS 360-73731/4 — **Client Sample ID: LCS 360-73731/4**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73731

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	80.0	80.3		mg/L		100	85 - 115
Chloride	40.0	40.9		mg/L		102	85 - 115

Lab Sample ID: 360-33756-1 MS — **Client Sample ID: OC-SL-6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73731

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	% Rec	% Rec. Limits
Sulfate	1100		400	1750	F	mg/L		155	75 - 125
Chloride	ND		200	227		mg/L		113	75 - 125

Lab Sample ID: 360-33756-1 MSD — **Client Sample ID: OC-SL-6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73731

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	% Rec	% Rec. Limits	RPD	RPD Limit
Sulfate	1100		400	1370	F	mg/L		62	75 - 125	24	20
Chloride	ND		200	178	F	mg/L		89	75 - 125	24	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 360-73558/3 — **Client Sample ID: MB 360-73558/3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73558

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Bicarbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:20	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/12/11 11:20	1

Lab Sample ID: 360-33756-3 DU — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73558

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Bicarbonate Alkalinity as CaCO3	240		240		mg/L		0.4	20

Method: SM 2320B - Alkalinity (Continued)

Lab Sample ID: 360-33756-3 DU — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73558

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Carbonate Alkalinity as CaCO3	ND			ND		mg/L				NC	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 360-73527/1 — **Client Sample ID: MB 360-73527/1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73527

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/12/11 14:36	1

Lab Sample ID: LCS 360-73527/2 — **Client Sample ID: LCS 360-73527/2**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73527

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec. Limits		
Total Dissolved Solids			200	195		mg/L		98	85 - 115		

Lab Sample ID: 360-33756-3 DU — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 73527

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	610			632		mg/L				3	20

DILUTION LOGS

TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 5/14/11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution				Comments
									Sample Aliquot 2	Units	Final Volume 2	Units	
AMB	5/14/11	300.0	33756A1		500	uL	10	mL					SO4 over-range
			A2										

entries completed by day [new page each day]

0029

TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 5-13-11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution				Comments
									Sample Aliquot 2	Units	Final Volume 2	Units	
RLE	5-13-11	300.0	33756 A1		1	mL	10	mL					
			A2		1	mL	10	mL					
			A3		1		10						
			A3 MS		1		10						
			A3 MSD		1		10						
			A4		1		10						
			A5		1		10						
			A6		1		10						

entries completed by day [new page each day]

001g

TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 5-16-11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution: Sample Aliquot 2	Units	Final Volume 2	Units	Comments
[illegible]	5-16-11	6010	33756-2	2X	5	mL	10	mL					dil for Ca
					[illegible] 5-16-11								

[illegible] 5-16-11

entries completed by day [new page each day]

BL-QA-025

002h

Lab Chronicle

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Client Sample ID: OC-SL-6
Lab Sample ID: 360-33756-1
Date Collected: 05/10/11 08:45
Matrix: Water
Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		1	73623	05/13/11 17:52	EMN	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:36	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 11:50	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73655	05/13/11 17:28	RWE	TAL WFD
Total/NA	Analysis	300.0		20	73731	05/14/11 10:11	RWE	TAL WFD

Client Sample ID: OC-SL-5
Lab Sample ID: 360-33756-2
Date Collected: 05/10/11 09:50
Matrix: Water
Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		2	73642	05/16/11 10:52	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:36	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 11:56	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73655	05/13/11 17:58	RWE	TAL WFD
Total/NA	Analysis	300.0		20	73731	05/14/11 10:57	RWE	TAL WFD

Client Sample ID: OC-SL-3
Lab Sample ID: 360-33756-3
Date Collected: 05/10/11 10:50
Matrix: Water
Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		1	73623	05/13/11 17:38	EMN	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:36	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 11:37	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73723	05/13/11 19:29	RWE	TAL WFD
Total/NA	Analysis	300.0		10	73723	05/13/11 19:44	RWE	TAL WFD

Client Sample ID: OC-SL-2
Lab Sample ID: 360-33756-4
Date Collected: 05/11/11 10:10
Matrix: Water
Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		1	73623	05/13/11 17:58	EMN	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:36	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 12:02	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73723	05/13/11 20:29	RWE	TAL WFD

Lab Chronicle

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Client Sample ID: OC-SL-1D

Lab Sample ID: 360-33756-5

Date Collected: 05/11/11 11:25

Matrix: Water

Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		1	73623	05/13/11 18:07	EMN	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:38	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 12:07	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73723	05/13/11 20:59	RWE	TAL WFD

Client Sample ID: OC-SL-3 DUP

Lab Sample ID: 360-33756-6

Date Collected: 05/10/11 10:50

Matrix: Water

Date Received: 05/11/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			73582	05/13/11 10:14	EMN	TAL WFD
Total/NA	Analysis	6010B		1	73623	05/13/11 18:10	EMN	TAL WFD
Total/NA	Analysis	SM 2540C		1	73527	05/12/11 14:38	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	73558	05/12/11 12:14	AMS	TAL WFD
Total/NA	Analysis	300.0		1	73723	05/13/11 21:30	RWE	TAL WFD
Total/NA	Analysis	300.0		10	73723	05/13/11 21:45	RWE	TAL WFD

Laboratory References:

TAL WFD = TestAmerica Westfield, Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085, TEL (413)572-4000

Certification Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-33756-1

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Westfield	Connecticut	State Program	1	PH-0494
TestAmerica Westfield	Florida	NELAC	4	E87912
TestAmerica Westfield	Maine	State Program	1	MA00014
TestAmerica Westfield	Massachusetts	State Program	1	M-MA014
TestAmerica Westfield	New Hampshire	NELAC	1	2539
TestAmerica Westfield	New Jersey	NELAC	2	MA008
TestAmerica Westfield	New York	NELAC	2	10843
TestAmerica Westfield	North Carolina	North Carolina DENR	4	647
TestAmerica Westfield	Rhode Island	State Program	1	LAO00057
TestAmerica Westfield	Vermont	State Program	1	VT-10843

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

State Accreditation Matrix

Method Name	Description	State where Primary Accreditation is Carried				
		New Hampshire (NELAC) prim.	Mass	Conn	Florida (NELAC)	North Carolina
821-R-02-012	Toxicity, Acute (48-Hour)(list upon request)	NP			NP	
SM 4500 Cl F	Chlorine, Residual		NP			
SM 9215E	Heterotrophic Plate Count (SimPlate)		P			
SM 9222D	Coliforms, Fecal (Membrane Filter)		P/NP			
SM 9223	Coliforms, Total, and E.Coli (Colilert-P/A)		P			
SM 9224	Coliforms, Total, and E.Coli (Enumeration)		P			
1103.1	E.coli		ambient/ source			
Enterolert	Enterococcus					
200.8 Rev 5.4	Metals (ICP/MS) (list upon request)	NP/P	NP/P	NP/P		
200.7 Rev 4.4	Metals (ICP)(list upon request)	NP/P	NP/P	NP/P		
6010B	Metals (ICP)(list upon request)	NP/SW		NP/SW		
245.1	Mercury (CVAA)	NP/P	NP	NP/P		
7470A	Mercury (CVAA)	NP		NP		
7471A	Mercury (CVAA)	SW		SW		
SM 2340B	Total Hardness (as CaCO3) by calculation	NP/P	NP	NP/P		
3005A	Preparation, Total Recoverable or Dissolved Metals	NP/P		NP/P		
3010A	Preparation, Total Metals	NP/P		NP/P		
3020A	Preparation, Total Metals	NP/P/SW		NP/P/SW		
3050B	Preparation, Metals	SW		SW		
504.1	EDB, DBCP and 1,2,3-TCP (GC)	P	P	P		
608	Organochlorine Pest/PCBs (list upon request)	NP	NP	NP		
625	Semivolatile Org Comp (GC/MS)(list upon request)	NP		NP		
3546	Microwave Extraction	SW				
3510C	Liquid-Liquid Extraction (Separatory Funnel)	NP		NP		
3540C	Soxhlet Extraction	SW				
3550B	Ultrasonic Extraction	SW		SW		
600/4-81-045	Polychlorinated Biphenyls (PCBs) (GC)		NP	NP		
8081A	Organochlorine Pesticides (GC)(list upon request)	NP/SW		NP/SW		
8082	PCBs by Gas Chromatography(list upon request)	NP/SW		NP/SW		
8270C	Semivolatile Comp.(GC/MS)(list upon request)	NP/SW		NP/SW		
CT ETPH	Conn - Ext. Total petroleum Hydrocarbons (GC)			NP/SW		
MA-EPH	Mass - Extractable Petroleum Hydrocarbons (GC)			NP/SW		NP/SW
524.2	Volatile Org Comp (GC/MS)(list upon request)	P	P	P		
524.2	Trihalomethane compounds	P	P	P		
624	Volatile Org Comp (GC/MS)(list upon request)	NP	NP	NP		
5035	Closed System Purge and Trap	SW		SW		
5030B	Purge and Trap	NP		NP		
8260B	Volatile Org Comp. (GC/MS)(list upon request)	NP/SW		NP/SW		
MAVPH	Mass - Volatile Petroleum Hydrocarbons (GC)			NP/SW		NP/SW
180.1	Turbidity, Nephelometric	P	P	P		
300	Anions, Ion Chromatography	NP/P	NP/P	NP/P		
410.4	COD	NP	NP	NP		
1010	Ignitability, Pensky-Martens Closed-Cup Method	SW		SW		
10-107-06-2	Nitrogen, Total Kjeldahl	NP	NP	NP		
7196A	Chromium, Hexavalent	NP/SW		NP/SW		
9012A	Cyanide, Total and/or Amenable	NP/SW		NP/SW		
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	NP		NP		
9040B	pH	NP		NP		
9045C	pH	SW		SW		
L107041C	Nitrogen, Nitrate	NP	P	NP/P		
L107-06-1B	Nitrogen Ammonia	NP	NP	NP/P		
L204001A CN	Cyanide, Total	P	NP/P	NP/P		
L210-001A	Phenolics, Total Recoverable	NP	NP	NP		
SM 2320B	Alkalinity	NP/P	NP/P	NP/P		
SM 2510B	Conductivity, Specific Conductance	NP/P	NP/P	NP/P		
SM 2540C	Solids, Total Dissolved (TDS)	NP/P	NP/P	NP/P		
SM 2540D	Solids, Total Suspended (TSS)	NP	NP	NP		
SM 3500 CR D	Chromium, Hexavalent	NP		NP		
SM 4500 H+ B	pH	NP/P	NP/P	NP/P		
SM 4500 NO2 B	Nitrogen, Nitrite	NP	P	NP/P		
SM 4500 P E	Phosphorus, Orthophosphate	NP/P	NP	NP/P		
SM 4500 P E	Phosphorus, Total	NP	NP	NP		
SM 4500 S2 D	Sulfide, Total	NP		NP		
SM 5210B	BOD, 5-Day	NP	NP	NP		
SM 5310B	Organic Carbon, Total (TOC)	NP/P	NP	NP/P		

Not all organic compounds are accreditied under NELAC
For methods with multiple compounds all compounds may not meet NELAC criteria, listing should be obtained from the laboratory
The lab carries additional accreditations with several states. This is the laboratories typcial listing but is subject to change based on the laboratories current certification standing.

Login Sample Receipt Checklist

Client: Olin Corporation

Job Number: 360-33756-1

Login Number: 33756

List Number: 1

Creator: Ard, Vanessa L

List Source: TestAmerica Westfield

Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	N/A	
The cooler's custody seal, if present, is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

TestAmerica Westfield
Westfield Executive Park 53 Southampton Road
Westfield, MA 01085
Phone (413) 572-4000 Fax (413) 572-3707

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Guichard	Lab PM: Mason, Becky C	Carrier Tracking No(s):	COC No:
Client Contact: James Cashwell	Phone: 9786586121	E-Mail: becky.mason@testamericainc.com		Page:
Company: Olin Corporation				Job #: 360-33756
Address: 51 Eames street	Due Date Requested:			
City: Wilington	TAT Requested (days):			
State, Zip: MA, 01887				
Phone:	PO #: REWI0013			
Email:	WO #:			
Project Name: Calcium Sulfate Landfill	Project #:			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

SL-3 Also has MS, MSD, And Dup

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Bi/carbonate Alkalinity/Chloride/Sulfate (TDS)	6010 total metals-Al/Ca/Cr/Fe/Mn/Na/Ni (Rec 5/12/11)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D		
OC- SL-6	5-10-11	8:45	G	W	n	n	✓	✓	2	This job is MCP
OC- SL-5	5-10-11	9:50	G	W	n	n	✓	✓	2	
OC- SL-3	5-10-11	10:50	G	W	n	y	✓	✓	8	includes MS, MSD + Dup
OC- SL-2	5-11-11	10:10	G	W	n	n	✓	✓	2	
OC- SL-1D	5-11-11	11:25	G	W	n	n	✓	✓		
OC-										
OC-										
OC-										
OC-										
OC-										
OC-										

VA

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	5-11-11 1300	Olin	[signature]	5-11-11 1300	
[signature]	5-11-11 1645		[signature]	5-11-11 1645	

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 1.2/1.6

05/18/2011

To: James Cashwell
From: Chris Ricardi
Date: February 7, 2012
Subject: Calcium Sulfate Landfill Semi-Annual Monitoring–November 2011

DATA VALIDATION REPORT
NOVEMBER 2011 CALCIUM SULFATE LANDFILL GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS
TestAmerica Laboratories Data Set 360-37644-1

1.0 INTRODUCTION

Groundwater samples were collected from the Olin Chemical Superfund Site on November 14 and November 15, 2011. Samples were analyzed by TestAmerica Laboratories in Westfield, Massachusetts. Data were reported in sample delivery group (SDG) 360-37644-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following U.S. Environmental Protection Agency (USEPA) SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- total metals (aluminum, calcium, chromium, iron, manganese, nickel, and sodium) by USEPA Method 6010B
- general chemistry analyses for carbonate and bicarbonate alkalinity by SM19 SM 2320B, chloride and sulfate by USEPA Method 300, and total dissolved solids by SM19 SM 2540C

The Draft Post Closure Plan (MACTEC, 2006) and the Massachusetts Department of Environmental Protection (MassDEP) Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington groundwater monitoring tasks. Final sample results are presented on data summaries in Table 2. Table 3 presents a summary of validation actions for results that were qualified during validaition. Validation reason codes are associated with final results that have been qualified.

Field duplicate sample OC-SL3 DUP was not listed on the chain of custody shipped with the sample group. The duplicate was included in the shipment, analyzed, and reported by the laboratory.

2.0 METALS

Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
  Blanks
* Matrix Spike Analysis
* Field Duplicate Results
* Laboratory Control Sample
  Detection Limits

***** **=** indicates that criteria were met for this parameter

2.1 Validation Observations and Actions

Blanks

Chromium (0.659 J µg/L) was reported in the method blank associated with all samples. An action level was established at five times the reported chromium blank concentration. Sample detections of chromium were less than the action level, less than the reporting limit, and were qualified not detected (U) at the reporting limit.

Detection Limits

Sample OC-SL-5 required a two-fold dilution due to target analyte concentrations. Reporting limits for analytes that were not detected are elevated.

3.0 GENERAL CHEMISTRY – Carbonate and Bicarbonate Alkalinity, Chloride, Sulfate, and Total Dissolved Solids

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Matrix Spike Analysis
* Laboratory Duplicate Analysis
* Field Duplicate Analysis
* Laboratory Control Sample
* Detection Limits

***** **=** indicates that criteria were met for this parameter

The results are interpreted to be usable as reported by TestAmerica.

Except for the validation actions noted above, the results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi

2/7/2012

Chris Ricardi, NRCC-EAC
Senior Chemist

Date

M J Murphy

2/10/12

Michael Murphy
Project Principal

Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, D.C. 20005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Draft Calcium Sulfate Landfill Post Closure Monitoring Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; December, 2006.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

USEPA, 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 -December 1996.

Table 1
Sample Summary
Data Validation Report
November 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab Sample ID	Location	Sample ID	Sample Date	SW6010 Total Metals	SM2320B Alkalinity	E300 Chloride, Sulfate	SM2540C Total Dissolved Solids
360-37644-1	SL-6	OC-SL6	11/14/2011	7	2	2	1
360-37644-2	SL-5	OC-SL5	11/14/2011	7	2	2	1
360-37644-3	SL-3	OC-SL3	11/14/2011	7	2	2	1
360-37644-4	SL-2	OC-SL2	11/15/2011	7	2	2	1
360-37644-5	SL-1D	OC-SL1D	11/15/2011	7	2	2	1
360-37644-6	SL-3	OC-SL3 DUP	11/14/2011	7	2	2	1

Notes:
Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 12/05/11
Checked by / Date: WDC 12/15/11

Table 2
Final Results Summary
Data Validation Report
November 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SL-1D		SL-2		SL-3		SL-3		SL-5		SL-6	
			COC Sample	OC-SL1D		OC-SL2		OC-SL3		OC-SL3 DUP		OC-SL5		OC-SL6	
			Date Sampled	11/15/11		11/15/11		11/14/11		11/14/11		11/14/11		11/14/11	
			Sample Type	FS		FS		FS		FD		FS		FS	
			Report Number	360-37644-1		360-37644-1		360-37644-1		360-37644-1		360-37644-1		360-37644-1	
Fract	**Analysis Method**	**Parameter Name**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	ug/l	67	J	54	J	100	U	100	U	29	J	19	J
T	SW6010	Calcium	ug/l	27000		21000		210000		210000		580000		400000	
T	SW6010	Chromium	ug/l	5	U	5	U	5	U	5	U	10	U	5	U
T	SW6010	Iron	ug/l	210		310		27000		26000		130	J	1100	
T	SW6010	Manganese	ug/l	13		3.5	J	2500		2500		280		680	
T	SW6010	Nickel	ug/l	10	U	10	U	10	U	10	U	3.6	J	10	U
T	SW6010	Sodium	ug/l	27000		1900	J	8700		8800		16000		7000	
N	A2320	Bicarbonate Alkalinity, as CaCO3	mg/l	27		26		260		250		110		150	
N	A2320	Carbonate Alkalinity, as CaCO3	mg/l	1	U	1	U	1	U	1	U	1	U	1	U
N	E300	Chloride	mg/l	48		1.5		3.8		3.4		2.6		1.5	
N	E300	Sulfate	mg/l	31		27		170		130		1100		700	
F	A2540C	Total Dissolved Solids	mg/l	170		75		530		440		1700		1200	

Notes:
N = normal
T = total (unfiltered)
F = filtered
FS = field sample
FD = field duplicate
U = not detected, value is the detection limit
J = value is estimated
ug/l = microgram per liter
mg/l = milligram per liter

Prepared by / Date: KJC 12/16/11
Checked by / Date: WDC 12/16/11

Table 3
Validation Qualification Action Summary
Data Validation Report
November 2011 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
360-37644-1	360-37644-1	SW6010	OC-SL6	Chromium	1.1	J B	5	U	BL1	ug/l
360-37644-1	360-37644-3	SW6010	OC-SL3	Chromium	0.71	J B	5	U	BL1	ug/l
360-37644-1	360-37644-5	SW6010	OC-SL1D	Chromium	0.66	J B	5	U	BL1	ug/l
360-37644-1	360-37644-6	SW6010	OC-SL3 DUP	Chromium	0.77	J B	5	U	BL1	ug/l

Units:

ug/L = microgram per liter

Validation Reason Codes:

BL1 = Method Blank Qualifier

Prepared by / Date: KJC 12/16/11

Checked by / Date: WDC 12/16/11

Validation Qualifier:

U = not detected, value is the detection limit

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date [signature] 12/16/11
Sr. Review/Date Chris Ricardi 1/25/12
Lab Report # 360-37644-1
Project # 6107110016.12

total aluminum, calcium, chromium, iron, manganese, nickel, sodium

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: *If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

ACTION: *If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

FILE COPY

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Westfield
Westfield Executive Park
53 Southampton Road
Westfield, MA 01085
Tel: (413)572-4000

TestAmerica Job ID: 360-37644-1
Client Project/Site: Olin Chemical Calcium Sulfate Landfill

For:
Olin Corporation
PO BOX 248
Charleston, Tennessee 37310-0248

Attn: Mr. James Cashwell

CHECKED FOR COMPLETENESS OF PARAMETERS ORDERED BY:

Authorized for release by:
12/5/2011 11:30:55 AM
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Designee for

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LINKS

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Job ID: 360-37644-1

Laboratory: TestAmerica Westfield

Narrative

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

The samples were received on 11/15/2011; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 1.7 C.

Note: All samples that require thermal preservation are considered acceptable if the arrival temperature is within the method's specified temperature range or for general analysis, ranging from 6°C to just above the freezing temperature of water. Samples that are hand delivered, immediately following collection, may not meet these criteria; however, they will be considered acceptable according to NELAC and State standards, if there is evidence that the chilling process has begun, such as stored and transported to the laboratory on ice.

TOTAL METALS (ICP)

Samples OC-SL6 (360-37644-1), OC-SL5 (360-37644-2), OC-SL3 (360-37644-3), OC-SL2 (360-37644-4), OC-SL1D (360-37644-5) and OC-SL3 DUP (360-37644-6) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 11/16/2011 and analyzed on 11/16/2011 and 11/17/2011.

At the request of the client, an abbreviated/modified MCP analyte list was reported for this job.

Chromium was detected in method blank MB 360-83440/1-A at a level that was above the method detection limit but below the reporting limit. The value should be considered an estimate, and has been flagged “J”. If the associated sample reported a result above the MDL and/or RL, the result has been “B” flagged. Refer to the QC report for details.

Iron failed the recovery criteria high for the MS of sample OC-SL3MS (360-37644-3) in batch 360-83501.

Calcium and Iron failed the recovery criteria low for the MSD of sample OC-SL3MSD (360-37644-3) in batch 360-83501. The presence of the '4' qualifier in the report indicates analytes where the concentration in the unspiked sample exceeded four times the spiking amount.

Refer to the QC report for details.

Sample OC-SL5 (360-37644-2)[2X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No other difficulties were encountered during the metals analyses.

All other quality control parameters were within the acceptance limits.

ALKALINITY

Samples OC-SL6 (360-37644-1), OC-SL5 (360-37644-2), OC-SL3 (360-37644-3), OC-SL2 (360-37644-4), OC-SL1D (360-37644-5) and OC-SL3 DUP (360-37644-6) were analyzed for alkalinity in accordance with SM20 2320B. The samples were analyzed on 11/16/2011.

The following samples were received with noticeable (more than one-half inch) headspace in the sample container: OC-SL1D (360-37644-5), OC-SL3 (360-37644-3), OC-SL3 DUP (360-37644-6), OC-SL6 (360-37644-1). The alkalinity method requires that samples be collected and submitted with zero-headspace.

No difficulties were encountered during the alkalinity analyses.

All quality control parameters were within the acceptance limits.

Job ID: 360-37644-1 (Continued)

Laboratory: TestAmerica Westfield (Continued)

TOTAL DISSOLVED SOLIDS

Samples OC-SL6 (360-37644-1), OC-SL5 (360-37644-2), OC-SL3 (360-37644-3), OC-SL2 (360-37644-4), OC-SL1D (360-37644-5) and OC-SL3 DUP (360-37644-6) were analyzed for total dissolved solids in accordance with SM20 2540C. The samples were analyzed on 11/17/2011.

No difficulties were encountered during the TDS analyses.

All quality control parameters were within the acceptance limits.

ANIONS (28 DAY HOLD TIME)

Samples OC-SL6 (360-37644-1), OC-SL5 (360-37644-2), OC-SL3 (360-37644-3), OC-SL2 (360-37644-4), OC-SL1D (360-37644-5) and OC-SL3 DUP (360-37644-6) were analyzed for anions (28 day hold time) in accordance with EPA Method 300.0. The samples were analyzed on 11/30/2011, 12/01/2011 and 12/03/2011.

Samples OC-SL6 (360-37644-1)[20X], OC-SL5 (360-37644-2)[20X], OC-SL3 (360-37644-3)[10X] and OC-SL3 DUP (360-37644-6)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No difficulties were encountered during the anions analyses.

All quality control parameters were within the acceptance limits.

MassDEP Analytical Protocol Certification Form

Laboratory Name: **TestAmerica Westfield** Project #: **360-37644-1**

Project Location: **Calcium Sulfate Landfill** RTN:

This form provides certifications for the following data set: list Laboratory Sample ID Number(s):

360-37644-1 [1-6]

Matrices: [X] Groundwater/Surface Water [ ] Soil/Sediment [ ] Drinking Water [ ] Air [ ] Other:

CAM Protocols (check all that apply below):

8260 VOC CAM II A [ ]	7470/7471 Hg CAM III B [ ]	Mass DEP VPH CAM IV A [ ]	8081 Pesticides CAM V B [ ]	7196 Hex Cr CAM VI B [ ]	Mass DEP APH CAM IX A [ ]
8270 SVOC CAM II B [ ]	7010 Metals CAM III C [ ]	Mass DEP EPH CAM IV B [ ]	8151 Herbicides CAM V C [ ]	8330 Explosives CAM VIII A [ ]	TO-15 VOC CAM IX B [ ]
6010 Metals CAM III A [X]	6020 Metals CAM III D [ ]	8082 PCB CAM V A [ ]	9014 Total Cyanide/PAC CAM VI A [ ]	332.0 Perchlorate CAM VIII B [ ]	

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding time.	[X] Yes [ ] No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	[X] Yes [ ] No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	[X] Yes [ ] No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	[X] Yes [ ] No
E	a. VPH, EPH and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	[ ] Yes [ ] No [ ] Yes [ ] No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	[X] Yes [ ] No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	[X] Yes [ ] No[1]

***Data User Note:* Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WCS-07-350**

H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	[ ] Yes [X] No
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s) ?	[ ] Yes [X] No

[1] All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature: Christine Lucinda Reynolds Position: Quality Assurance Manager

Printed Name: Christine Reynolds Date: 12/5/11 10:16

This form has been electronically signed and approved

Detection Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Client Sample ID: OC-SL6 — Lab Sample ID: 360-37644-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	19	J	100	13	ug/L	1		6010B	Total/NA
Calcium	400000		400	50	ug/L	1		6010B	Total/NA
Chromium	1.1	J B	5.0	0.65	ug/L	1		6010B	Total/NA
Iron	1100		100	14	ug/L	1		6010B	Total/NA
Manganese	680		10	3.0	ug/L	1		6010B	Total/NA
Sodium	7000		2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	700		40	40	mg/L	20		300.0	Total/NA
Chloride	1.5		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	150		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	1200		200	200	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL5 — Lab Sample ID: 360-37644-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	29	J	200	25	ug/L	2		6010B	Total/NA
Calcium	580000		800	100	ug/L	2		6010B	Total/NA
Iron	130	J	200	28	ug/L	2		6010B	Total/NA
Manganese	280		20	6.1	ug/L	2		6010B	Total/NA
Sodium	16000		4000	550	ug/L	2		6010B	Total/NA
Nickel	3.6	J	20	2.5	ug/L	2		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	1100		40	40	mg/L	20		300.0	Total/NA
Chloride	2.6		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	110		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	1700		200	200	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL3 — Lab Sample ID: 360-37644-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	210000		400	50	ug/L	1		6010B	Total/NA
Chromium	0.71	J B	5.0	0.65	ug/L	1		6010B	Total/NA
Iron	27000		100	14	ug/L	1		6010B	Total/NA
Manganese	2500		10	3.0	ug/L	1		6010B	Total/NA
Sodium	8700		2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	170		20	20	mg/L	10		300.0	Total/NA
Chloride	3.8		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	260		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	530		40	40	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL2 — Lab Sample ID: 360-37644-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	54	J	100	13	ug/L	1		6010B	Total/NA
Calcium	21000		400	50	ug/L	1		6010B	Total/NA
Iron	310		100	14	ug/L	1		6010B	Total/NA
Manganese	3.5	J	10	3.0	ug/L	1		6010B	Total/NA
Sodium	1900	J	2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	27		2.0	2.0	mg/L	1		300.0	Total/NA
Chloride	1.5		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	26		1.0	1.0	mg/L	1		SM 2320B	Total/NA

Detection Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Client Sample ID: OC-SL2 (Continued) — Lab Sample ID: 360-37644-4

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Total Dissolved Solids	75		10	10	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL1D — Lab Sample ID: 360-37644-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	67	J	100	13	ug/L	1		6010B	Total/NA
Calcium	27000		400	50	ug/L	1		6010B	Total/NA
Chromium	0.66	J B	5.0	0.65	ug/L	1		6010B	Total/NA
Iron	210		100	14	ug/L	1		6010B	Total/NA
Manganese	13		10	3.0	ug/L	1		6010B	Total/NA
Sodium	27000		2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	31		2.0	2.0	mg/L	1		300.0	Total/NA
Chloride	48		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	27		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	170		20	20	mg/L	1		SM 2540C	Total/NA

Client Sample ID: OC-SL3 DUP — Lab Sample ID: 360-37644-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	210000		400	50	ug/L	1		6010B	Total/NA
Chromium	0.77	J B	5.0	0.65	ug/L	1		6010B	Total/NA
Iron	26000		100	14	ug/L	1		6010B	Total/NA
Manganese	2500		10	3.0	ug/L	1		6010B	Total/NA
Sodium	8800		2000	280	ug/L	1		6010B	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
Sulfate	130		20	20	mg/L	10		300.0	Total/NA
Chloride	3.4		1.0	1.0	mg/L	1		300.0	Total/NA
Bicarbonate Alkalinity as CaCO3	250		1.0	1.0	mg/L	1		SM 2320B	Total/NA
Total Dissolved Solids	440		40	40	mg/L	1		SM 2540C	Total/NA

Method Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL WFD
300.0	Anions, Ion Chromatography	MCAWW	TAL WFD
SM 2320B	Alkalinity	SM	TAL WFD
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL WFD

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater",

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL WFD = TestAmerica Westfield, Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085, TEL (413)572-4000

Sample Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
360-37644-1	OC-SL6	Water	11/14/11 08:30	11/15/11 16:45
360-37644-2	OC-SL5	Water	11/14/11 09:10	11/15/11 16:45
360-37644-3	OC-SL3	Water	11/14/11 10:00	11/15/11 16:45
360-37644-4	OC-SL2	Water	11/15/11 08:05	11/15/11 16:45
360-37644-5	OC-SL1D	Water	11/15/11 08:50	11/15/11 16:45
360-37644-6	OC-SL3 DUP	Water	11/14/11 10:00	11/15/11 16:45

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Client Sample ID: OC-SL6
Date Collected: 11/14/11 08:30
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-1
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	19	J	100	13	ug/L		11/16/11 09:46	11/16/11 18:10	1
Calcium	400000		400	50	ug/L		11/16/11 09:46	11/16/11 18:10	1
Chromium	1.1	J B	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:10	1
Iron	1100		100	14	ug/L		11/16/11 09:46	11/16/11 18:10	1
Manganese	680		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:10	1
Sodium	7000		2000	280	ug/L		11/16/11 09:46	11/16/11 18:10	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:10	1

Client Sample ID: OC-SL5
Date Collected: 11/14/11 09:10
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-2
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	29	J	200	25	ug/L		11/16/11 09:46	11/17/11 14:24	2
Calcium	580000		800	100	ug/L		11/16/11 09:46	11/17/11 14:24	2
Chromium	ND		10	1.3	ug/L		11/16/11 09:46	11/17/11 14:24	2
Iron	130	J	200	28	ug/L		11/16/11 09:46	11/17/11 14:24	2
Manganese	280		20	6.1	ug/L		11/16/11 09:46	11/17/11 14:24	2
Sodium	16000		4000	550	ug/L		11/16/11 09:46	11/17/11 14:24	2
Nickel	3.6	J	20	2.5	ug/L		11/16/11 09:46	11/17/11 14:24	2

Client Sample ID: OC-SL3
Date Collected: 11/14/11 10:00
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-3
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 17:46	1
Calcium	210000		400	50	ug/L		11/16/11 09:46	11/16/11 17:46	1
Chromium	0.71	J B	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 17:46	1
Iron	27000		100	14	ug/L		11/16/11 09:46	11/16/11 17:46	1
Manganese	2500		10	3.0	ug/L		11/16/11 09:46	11/16/11 17:46	1
Sodium	8700		2000	280	ug/L		11/16/11 09:46	11/16/11 17:46	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 17:46	1

Client Sample ID: OC-SL2
Date Collected: 11/15/11 08:05
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-4
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	54	J	100	13	ug/L		11/16/11 09:46	11/16/11 18:16	1
Calcium	21000		400	50	ug/L		11/16/11 09:46	11/16/11 18:16	1
Chromium	ND		5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:16	1
Iron	310		100	14	ug/L		11/16/11 09:46	11/16/11 18:16	1
Manganese	3.5	J	10	3.0	ug/L		11/16/11 09:46	11/16/11 18:16	1
Sodium	1900	J	2000	280	ug/L		11/16/11 09:46	11/16/11 18:16	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:16	1

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Client Sample ID: OC-SL1D
Date Collected: 11/15/11 08:50
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-5
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**67**	**J**	100	13	ug/L		11/16/11 09:46	11/16/11 18:19	1
Calcium	**27000**		400	50	ug/L		11/16/11 09:46	11/16/11 18:19	1
Chromium	**0.66**	**J B**	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:19	1
Iron	**210**		100	14	ug/L		11/16/11 09:46	11/16/11 18:19	1
Manganese	**13**		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:19	1
Sodium	**27000**		2000	280	ug/L		11/16/11 09:46	11/16/11 18:19	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:19	1

Client Sample ID: OC-SL3 DUP
Date Collected: 11/14/11 10:00
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-6
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 18:13	1
Calcium	**210000**		400	50	ug/L		11/16/11 09:46	11/16/11 18:13	1
Chromium	**0.77**	**J B**	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:13	1
Iron	**26000**		100	14	ug/L		11/16/11 09:46	11/16/11 18:13	1
Manganese	**2500**		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:13	1
Sodium	**8800**		2000	280	ug/L		11/16/11 09:46	11/16/11 18:13	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:13	1

General Chemistry

Client Sample ID: OC-SL6 — **Lab Sample ID: 360-37644-1**
Date Collected: 11/14/11 08:30 — **Matrix: Water**
Date Received: 11/15/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	700		40	40	mg/L			12/01/11 18:41	20
Chloride	1.5		1.0	1.0	mg/L			11/30/11 16:54	1
Bicarbonate Alkalinity as CaCO3	150		1.0	1.0	mg/L			11/16/11 10:58	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 10:58	1
Total Dissolved Solids	1200		200	200	mg/L			11/17/11 08:56	1

Client Sample ID: OC-SL5 — **Lab Sample ID: 360-37644-2**
Date Collected: 11/14/11 09:10 — **Matrix: Water**
Date Received: 11/15/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	1100		40	40	mg/L			12/01/11 18:57	20
Chloride	2.6		1.0	1.0	mg/L			11/30/11 17:10	1
Bicarbonate Alkalinity as CaCO3	110		1.0	1.0	mg/L			11/16/11 11:04	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 11:04	1
Total Dissolved Solids	1700		200	200	mg/L			11/17/11 08:56	1

Client Sample ID: OC-SL3 — **Lab Sample ID: 360-37644-3**
Date Collected: 11/14/11 10:00 — **Matrix: Water**
Date Received: 11/15/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	170		20	20	mg/L			11/30/11 16:06	10
Chloride	3.8		1.0	1.0	mg/L			11/30/11 15:50	1
Bicarbonate Alkalinity as CaCO3	260		1.0	1.0	mg/L			11/16/11 10:44	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 10:44	1
Total Dissolved Solids	530		40	40	mg/L			11/17/11 08:56	1

Client Sample ID: OC-SL2 — **Lab Sample ID: 360-37644-4**
Date Collected: 11/15/11 08:05 — **Matrix: Water**
Date Received: 11/15/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	27		2.0	2.0	mg/L			11/30/11 17:43	1
Chloride	1.5		1.0	1.0	mg/L			11/30/11 17:43	1
Bicarbonate Alkalinity as CaCO3	26		1.0	1.0	mg/L			11/16/11 11:16	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 11:16	1
Total Dissolved Solids	75		10	10	mg/L			11/17/11 08:56	1

Client Sample ID: OC-SL1D — **Lab Sample ID: 360-37644-5**
Date Collected: 11/15/11 08:50 — **Matrix: Water**
Date Received: 11/15/11 16:45

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	31		2.0	2.0	mg/L			11/30/11 17:59	1
Chloride	48		1.0	1.0	mg/L			11/30/11 17:59	1
Bicarbonate Alkalinity as CaCO3	27		1.0	1.0	mg/L			11/16/11 11:21	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 11:21	1
Total Dissolved Solids	170		20	20	mg/L			11/17/11 08:56	1

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

General Chemistry

Client Sample ID: OC-SL3 DUP
Date Collected: 11/14/11 10:00
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-6
Matrix: Water

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**130**		20	20	mg/L			12/03/11 11:37	10
Chloride	**3.4**		1.0	1.0	mg/L			11/30/11 18:15	1
Bicarbonate Alkalinity as CaCO3	**250**		1.0	1.0	mg/L			11/16/11 11:28	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 11:28	1
Total Dissolved Solids	**440**		40	40	mg/L			11/17/11 08:56	1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
B	Compound was found in the blank and sample.
4	MS, MSD: The analyte present in the original sample is 4 times greater than the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Metals

Prep Batch: 83440

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	3010A	
360-37644-2	OC-SL5	Total/NA	Water	3010A	
360-37644-3	OC-SL3	Total/NA	Water	3010A	
360-37644-3 MS	OC-SL3	Total/NA	Water	3010A	
360-37644-3 MSD	OC-SL3	Total/NA	Water	3010A	
360-37644-4	OC-SL2	Total/NA	Water	3010A	
360-37644-5	OC-SL1D	Total/NA	Water	3010A	
360-37644-6	OC-SL3 DUP	Total/NA	Water	3010A	
LCS 360-83440/2-A	Lab Control Sample	Total/NA	Water	3010A	
LCSD 360-83440/3-A	Lab Control Sample Dup	Total/NA	Water	3010A	
MB 360-83440/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 83501

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	6010B	83440
360-37644-3	OC-SL3	Total/NA	Water	6010B	83440
360-37644-3 MS	OC-SL3	Total/NA	Water	6010B	83440
360-37644-3 MSD	OC-SL3	Total/NA	Water	6010B	83440
360-37644-4	OC-SL2	Total/NA	Water	6010B	83440
360-37644-5	OC-SL1D	Total/NA	Water	6010B	83440
360-37644-6	OC-SL3 DUP	Total/NA	Water	6010B	83440
LCS 360-83440/2-A	Lab Control Sample	Total/NA	Water	6010B	83440
LCSD 360-83440/3-A	Lab Control Sample Dup	Total/NA	Water	6010B	83440
MB 360-83440/1-A	Method Blank	Total/NA	Water	6010B	83440

Analysis Batch: 83564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-2	OC-SL5	Total/NA	Water	6010B	83440

General Chemistry

Analysis Batch: 83506

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	SM 2540C	
360-37644-2	OC-SL5	Total/NA	Water	SM 2540C	
360-37644-3	OC-SL3	Total/NA	Water	SM 2540C	
360-37644-3 DU	OC-SL3	Total/NA	Water	SM 2540C	
360-37644-4	OC-SL2	Total/NA	Water	SM 2540C	
360-37644-5	OC-SL1D	Total/NA	Water	SM 2540C	
360-37644-6	OC-SL3 DUP	Total/NA	Water	SM 2540C	
LCS 360-83506/2	Lab Control Sample	Total/NA	Water	SM 2540C	
MB 360-83506/1	Method Blank	Total/NA	Water	SM 2540C	

Analysis Batch: 83551

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	SM 2320B	
360-37644-2	OC-SL5	Total/NA	Water	SM 2320B	
360-37644-3	OC-SL3	Total/NA	Water	SM 2320B	
360-37644-3 DU	OC-SL3	Total/NA	Water	SM 2320B	
360-37644-4	OC-SL2	Total/NA	Water	SM 2320B	
360-37644-5	OC-SL1D	Total/NA	Water	SM 2320B	
360-37644-6	OC-SL3 DUP	Total/NA	Water	SM 2320B	

General Chemistry (Continued)

Analysis Batch: 83551 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 360-83551/3	Method Blank	Total/NA	Water	SM 2320B	

Analysis Batch: 84161

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	300.0	
360-37644-2	OC-SL5	Total/NA	Water	300.0	
360-37644-3	OC-SL3	Total/NA	Water	300.0	
360-37644-3	OC-SL3	Total/NA	Water	300.0	
360-37644-3 MS	OC-SL3	Total/NA	Water	300.0	
360-37644-3 MSD	OC-SL3	Total/NA	Water	300.0	
360-37644-4	OC-SL2	Total/NA	Water	300.0	
360-37644-5	OC-SL1D	Total/NA	Water	300.0	
360-37644-6	OC-SL3 DUP	Total/NA	Water	300.0	
LCS 360-84161/6	Lab Control Sample	Total/NA	Water	300.0	
MB 360-84161/5	Method Blank	Total/NA	Water	300.0	

Analysis Batch: 84209

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-1	OC-SL6	Total/NA	Water	300.0	
360-37644-2	OC-SL5	Total/NA	Water	300.0	
LCS 360-84209/6	Lab Control Sample	Total/NA	Water	300.0	
MB 360-84209/5	Method Blank	Total/NA	Water	300.0	

Analysis Batch: 84269

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
360-37644-6	OC-SL3 DUP	Total/NA	Water	300.0	
LCS 360-84269/4	Lab Control Sample	Total/NA	Water	300.0	
MB 360-84269/3	Method Blank	Total/NA	Water	300.0	

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 360-83440/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 17:38	1
Calcium	ND		400	50	ug/L		11/16/11 09:46	11/16/11 17:38	1
Chromium	0.659	J	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 17:38	1
Iron	ND		100	14	ug/L		11/16/11 09:46	11/16/11 17:38	1
Manganese	ND		10	3.0	ug/L		11/16/11 09:46	11/16/11 17:38	1
Sodium	ND		2000	280	ug/L		11/16/11 09:46	11/16/11 17:38	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 17:38	1

Lab Sample ID: LCS 360-83440/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	5000	5250		ug/L		105	80 - 120
Calcium	20000	21100		ug/L		106	80 - 120
Chromium	1000	1060		ug/L		106	80 - 120
Iron	5000	5480		ug/L		110	80 - 120
Manganese	1000	1060		ug/L		106	80 - 120
Sodium	20000	20300		ug/L		101	80 - 120
Nickel	1000	1050		ug/L		105	80 - 120

Lab Sample ID: LCSD 360-83440/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	5000	5400		ug/L		108	80 - 120	3	20
Calcium	20000	21700		ug/L		108	80 - 120	2	20
Chromium	1000	1080		ug/L		108	80 - 120	2	20
Iron	5000	5480		ug/L		110	80 - 120	0	20
Manganese	1000	1090		ug/L		109	80 - 120	2	20
Sodium	20000	20700		ug/L		104	80 - 120	2	20
Nickel	1000	1080		ug/L		108	80 - 120	3	20

Lab Sample ID: 360-37644-3 MS — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	ND		5000	5230		ug/L		105	75 - 125
Calcium	210000		20000	230000	4	ug/L		101	75 - 125
Chromium	0.71	J B	1000	1040		ug/L		104	75 - 125
Iron	27000		5000	33800	4	ug/L		141	75 - 125
Manganese	2500		1000	3480		ug/L		101	75 - 125
Sodium	8700		20000	28900		ug/L		101	75 - 125
Nickel	ND		1000	1030		ug/L		103	75 - 125

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 360-37644-3 MSD — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	ND		5000	5210		ug/L		104	75 - 125	0	20
Calcium	210000		20000	215000	4	ug/L		25	75 - 125	7	20
Chromium	0.71	J B	1000	1040		ug/L		104	75 - 125	0	20
Iron	27000		5000	30500	4	ug/L		74	75 - 125	10	20
Manganese	2500		1000	3270		ug/L		80	75 - 125	6	20
Sodium	8700		20000	28200		ug/L		98	75 - 125	2	20
Nickel	ND		1000	1020		ug/L		102	75 - 125	1	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-84161/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			11/30/11 15:18	1
Chloride	ND		1.0	1.0	mg/L			11/30/11 15:18	1

Lab Sample ID: LCS 360-84161/6 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	79.2		mg/L		99	85 - 115
Chloride	40.0	42.0		mg/L		105	85 - 115

Lab Sample ID: 360-37644-3 MS — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	170		200	375		mg/L		104	75 - 125
Chloride	ND		100	106		mg/L		106	75 - 125

Lab Sample ID: 360-37644-3 MSD — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	170		200	375		mg/L		104	75 - 125	0	20
Chloride	ND		100	106		mg/L		106	75 - 125	0	20

Lab Sample ID: MB 360-84209/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84209

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			12/01/11 16:00	1
Chloride	ND		1.0	1.0	mg/L			12/01/11 16:00	1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 360-84209/6 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84209

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	78.5		mg/L		98	85 - 115
Chloride	40.0	41.4		mg/L		103	85 - 115

Lab Sample ID: MB 360-84269/3 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84269

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			12/03/11 11:05	1
Chloride	ND		1.0	1.0	mg/L			12/03/11 11:05	1

Lab Sample ID: LCS 360-84269/4 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84269

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	76.5		mg/L		96	85 - 115
Chloride	40.0	39.4		mg/L		98	85 - 115

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 360-83551/3 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83551

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Bicarbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 09:06	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			11/16/11 09:06	1

Lab Sample ID: 360-37644-3 DU — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83551

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Bicarbonate Alkalinity as CaCO3	260		265		mg/L		0.6	20
Carbonate Alkalinity as CaCO3	ND		ND		mg/L		NC	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 360-83506/1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83506

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			11/17/11 08:56	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 360-83506/2
Matrix: Water
Analysis Batch: 83506

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			200	190		mg/L		95	85 - 115		

Lab Sample ID: 360-37644-3 DU
Matrix: Water
Analysis Batch: 83506

Client Sample ID: OC-SL3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	530			528		mg/L				0.8	20

TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 11/30/11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution: Sample Aliquot 2	Units	Final Volume 2	Units	Comments
AMB	11/30	300.0	37552C7	50	200	µL	10	mL					
			37644B3	10	1	mL	10	mL					
			MS										
			MSD										

entries completed by day [new page each day]

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TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 12/1/11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution: Sample Aliquot 2	Serial Dilution: Units	Serial Dilution: Final Volume 2	Serial Dilution: Units	Comments
AMS	12/1/11	300.0	37526A7 B	10x	1	mL	10	mL					
			12/1/11 AS	20x	500	mL							
			37644B1	20x									
			B2										

entries completed by day [new page each day]

TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 12/2/11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution				Comments
									Sample Aliquot 2	Units	Final Volume 2	Units	
BMB	12/2/11	300.0	3764486	10	1	mL	10	mL					

entries completed by day [new page each day]

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TestAmerica Westfield

Analytical Dilution Preparation Log

Date: 12/2/11

Analyst Initials	Date	Method	LIMs Sample ID	Rpt'd Dil.	Sample Aliquot 1	Units	Final Volume 1	Units	Serial Dilution				Comments
									Sample Aliquot 2	Units	Final Volume 2	Units	
BMB	12/2/11	300.0	37644B6	10	1	mL	10	mL					

entries completed by day [new page each day]

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Lab Chronicle

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Client Sample ID: OC-SL6

Lab Sample ID: 360-37644-1
Date Collected: 11/14/11 08:30
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		1	83501	11/16/11 18:10	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 10:58	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 16:54	AMS	TAL WFD
Total/NA	Analysis	300.0		20	84209	12/01/11 18:41	AMS	TAL WFD

Client Sample ID: OC-SL5

Lab Sample ID: 360-37644-2
Date Collected: 11/14/11 09:10
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		2	83564	11/17/11 14:24	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 11:04	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 17:10	AMS	TAL WFD
Total/NA	Analysis	300.0		20	84209	12/01/11 18:57	AMS	TAL WFD

Client Sample ID: OC-SL3

Lab Sample ID: 360-37644-3
Date Collected: 11/14/11 10:00
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		1	83501	11/16/11 17:46	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 10:44	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 15:50	AMS	TAL WFD
Total/NA	Analysis	300.0		10	84161	11/30/11 16:06	AMS	TAL WFD

Client Sample ID: OC-SL2

Lab Sample ID: 360-37644-4
Date Collected: 11/15/11 08:05
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		1	83501	11/16/11 18:16	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 11:16	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 17:43	AMS	TAL WFD

Lab Chronicle

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Client Sample ID: OC-SL1D

Lab Sample ID: 360-37644-5

Date Collected: 11/15/11 08:50
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		1	83501	11/16/11 18:19	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 11:21	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 17:59	AMS	TAL WFD

Client Sample ID: OC-SL3 DUP

Lab Sample ID: 360-37644-6

Date Collected: 11/14/11 10:00
Matrix: Water
Date Received: 11/15/11 16:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			83440	11/16/11 09:46	OG	TAL WFD
Total/NA	Analysis	6010B		1	83501	11/16/11 18:13	TJS	TAL WFD
Total/NA	Analysis	SM 2540C		1	83506	11/17/11 08:56	EMN	TAL WFD
Total/NA	Analysis	SM 2320B		1	83551	11/16/11 11:28	EMN	TAL WFD
Total/NA	Analysis	300.0		1	84161	11/30/11 18:15	AMS	TAL WFD
Total/NA	Analysis	300.0		10	84269	12/03/11 11:37	AMS	TAL WFD

Laboratory References:

TAL WFD = TestAmerica Westfield, Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085, TEL (413)572-4000

Certification Summary

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Westfield	Connecticut	State Program	1	PH-0494
TestAmerica Westfield	Maine	State Program	1	MA00014
TestAmerica Westfield	Massachusetts	State Program	1	M-MA014
TestAmerica Westfield	New Hampshire	NELAC	1	2539
TestAmerica Westfield	New York	NELAC	2	10843
TestAmerica Westfield	Rhode Island	State Program	1	LAO00057
TestAmerica Westfield	Vermont	State Program	1	VT-10843

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

State Accreditation Matrix

Method Name	Description	State where **Primary** Accreditation is Carried		
		New Hampshire (NELAC)	Mass	Conn
821-R-02-012	Toxicity, Acute (48-Hour)(list upon request)	NP		
SM 4500 Cl F	Chlorine, Residual		NP	
SM 9215E	Heterotrophic Plate Count (SimPlate)		P	
SM 9222D	Coliforms, Fecal (Membrane Filter)		P/NP	
SM 9223	Coliforms, Total, and E.Coli (Colilert-P/A)		P	
SM 9224	Coliforms, Total, and E.Coli (Enumeration)		P	
1103.1	E.coli		ambient/ source	
Enterolert	Enterococcus			
200.8 Rev 5.4	Metals (ICP/MS) (list upon request)	NP/P	NP/P	
200.7 Rev 4.4	Metals (ICP)(list upon request)	NP/P	NP/P	
6010B/C	Metals (ICP)(list upon request)	NP/SW		
245.1	Mercury (CVAA)	NP/P	NP	
7470A	Mercury (CVAA)	NP		
7471A	Mercury (CVAA)	SW		
SM 2340B	Total Hardness (as CaCO3) by calculation	NP/P	NP	
3005A	Preparation, Total Recoverable or Dissolved Metals	NP/P		
3010A	Preparation, Total Metals	NP/P		
3020A	Preparation, Total Metals	NP/P/SW		
3050B	Preparation, Metals	SW		
504.1	EDB, DBCP and 1,2,3-TCP (GC)	P	P	
608	Organochlorine Pest/PCBs (list upon request)	NP	NP	
625	Semivolatile Org Comp (GC/MS)(list upon request)	NP	NP	
3546	Microwave Extraction	SW		
3510C	Liquid-Liquid Extraction (Separatory Funnel)	NP		
3550B	Ultrasonic Extraction	SW		
8081AB	Organochlorine Pesticides (GC)(list upon request)	NP/SW		
8082/A	PCBs by Gas Chromatography(list upon request)	NP/SW		
8270C/D	Semivolatile Comp.(GC/MS)(list upon request)	NP/SW		
CT ETPH	Conn - Ext. Total petroleum Hydrocarbons (GC)	NP/SW		NP/SW
MA-EPH	Mass - Extractable Petroleum Hydrocarbons (GC)	NP/SW		
524.2	Volatile Org Comp (GC/MS)(list upon request)	P	P	
524.2	Trihalomethane compounds	P	P	
624	Volatile Org Comp (GC/MS)(list upon request)	NP	NP	
5035	Closed System Purge and Trap	SW		
5030B	Purge and Trap	NP		
8260B/C	Volatile Org Comp. (GC/MS)(list upon request)	NP/SW		
MAVPH	Mass - Volatile Petroleum Hydrocarbons (GC)			
180.1	Turbidity, Nephelometric	P	P	
300	Anions, Ion Chromatography	NP/P	NP/P	
410.4	COD	NP	NP	
1010	Ignitability, Pensky-Martens Closed-Cup Method	SW		
10-107-06-2	Nitrogen, Total Kjeldahl	NP	NP	
7196A	Chromium, Hexavalent	NP/SW		
9012A	Cyanide, Total and/or Amenable	NP/SW		
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	NP		
9045C	pH	SW		
L107041C	Nitrogen, Nitrate	NP	P	
L107-06-1B	Nitrogen Ammonia	NP	NP	
L204001A CN	Cyanide, Total	P	NP/P	
L210-001A	Phenolics, Total Recoverable	NP	NP	
SM 2320B	Alkalinity	NP/P	NP/P	
SM 2510B	Conductivity, Specific Conductance	NP/P	NP/P	
SM 2540C	Solids, Total Dissolved (TDS)	NP/P	NP/P	
SM 2540D	Solids, Total Suspended (TSS)	NP	NP	
SM 3500 CR D	Chromium, Hexavalent	NP		
SM 4500 H+ B	pH	NP/P	NP/P	
SM 4500 NO2 B	Nitrogen, Nitrite	NP	P	
SM 4500 P E	Phosphorus, Orthophosphate	NP/P	NP	
SM 4500 P E	Phosphorus, Total	NP	NP	
SM 4500 S2 D	Sulfide, Total	NP		
SM 5210B	BOD, 5-Day	NP	NP	
SM 5310B	Organic Carbon, Total (TOC)	NP/P	NP	

Not all organic compounds are accreditied under NELAC
For methods with multiple compounds all compounds may not meet NELAC criteria, listing should be obtained from the laboratory
The lab carries additional accreditations with several states. This is the laboratories typcial listing but is subject to change based on the laboratories current certification standing.

Login Sample Receipt Checklist

Client: Olin Corporation

Job Number: 360-37644-1

Login Number: 37644
List Number: 1
Creator: Ard, Vanessa L

List Source: TestAmerica Westfield

Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	N/A	
The cooler's custody seal, if present, is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	False	Recieved Dup sample not listed on COC
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	False	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica Westfield
Westfield Executive Park 53 Southampton Road
Westfield, MA 01085
Phone (413) 572-4000 Fax (413) 572-3707

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Guichard	Lab PM: Mason, Becky C	Carrier Tracking No(s):	COC No:
Client Contact: James Cashwell	Phone: 9786586121	E-Mail: becky.mason@testamericainc.com		Page: 1 of 1
Company: Olin Corporation				Job #:
Address: 51 Eames street	Due Date Requested:			
City: Wilington	TAT Requested (days):			
State, Zip: MA, 01887				
Phone:	PO #: REWI0013			
Email:	WO #:			
Project Name: Calcium Sulfate Landfill	Project #:			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2SO3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - ph 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No) And Dup	Bi/carbonate Alkalinity/Chloride/Sulfate/TDS	6010 total metals-Al/Ca/Cr/Fe/Mn/Na/Ni	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D		
OC- SL6	11-14-11	8:30	G	W	n	n	X	X	2	This job is MCP
OC- SL5	11-14-11	9:10	G	W	n	n	X	X	2	
OC- SL3	11-14-11	10:00	G	W	n	y	X	X	8	
OC- SL2	11-15-11	8:05	G	W	n	n	X	X	2	
OC- SL1D	11-15-11	8:50	G	W	n	n	X	X	2	
OC-										
OC-										
OC-										
OC-										
OC-										
OC-										

JB 11/15/11

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by: | Date: | Time: | Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Brian Guichard	11-15-11 1245	Olin	Jerry Dah	11-15-11 1245	
Jerry Dah	11-15-11 16:45		James Beese	11/15/11 16:45	CA

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 1.7°C w/ ice

12/5/2011

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): Yes [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? Yes [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [✓] **No** [ ] N/A [ ] Comments: Field duplicate OC-SL3 DUP not on COC.

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* Yes [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? Yes [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☑ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil.

Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used?

Yes [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP

Yes [✓] No [ ] N/A [ ] Comments:
Sample OC-SL5 was analyzed at a 2x dilution. The chromium RL was adjusted accordingly.

NOTE: *Verify that the reported metals match the target list specified on the COC.*

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

Chromium (0.659 J ug/L). AL 5x = 3.295 ug/L.
Sample detections of chromium were less than the AL, less than the RL and were qualified not detected (U).

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Client Sample ID: OC-SL6
Date Collected: 11/14/11 08:30
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-1
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	19	J	100	13	ug/L		11/16/11 09:46	11/16/11 18:10	1
Calcium	400000		400	50	ug/L		11/16/11 09:46	11/16/11 18:10	1
Chromium	1.1	J-B ~~U~~	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:10	1
Iron	1100		100	14	ug/L		11/16/11 09:46	11/16/11 18:10	1
Manganese	680		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:10	1
Sodium	7000		2000	280	ug/L		11/16/11 09:46	11/16/11 18:10	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:10	1

Client Sample ID: OC-SL5
Date Collected: 11/14/11 09:10
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-2
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	29	J	200	25	ug/L		11/16/11 09:46	11/17/11 14:24	2
Calcium	580000		800	100	ug/L		11/16/11 09:46	11/17/11 14:24	2
Chromium	ND		10	1.3	ug/L		11/16/11 09:46	11/17/11 14:24	2
Iron	130	J	200	28	ug/L		11/16/11 09:46	11/17/11 14:24	2
Manganese	280		20	6.1	ug/L		11/16/11 09:46	11/17/11 14:24	2
Sodium	16000		4000	550	ug/L		11/16/11 09:46	11/17/11 14:24	2
Nickel	3.6	J	20	2.5	ug/L		11/16/11 09:46	11/17/11 14:24	2

Client Sample ID: OC-SL3
Date Collected: 11/14/11 10:00
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-3
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 17:46	1
Calcium	210000		400	50	ug/L		11/16/11 09:46	11/16/11 17:46	1
Chromium	0.71	J-B ~~U~~	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 17:46	1
Iron	27000		100	14	ug/L		11/16/11 09:46	11/16/11 17:46	1
Manganese	2500		10	3.0	ug/L		11/16/11 09:46	11/16/11 17:46	1
Sodium	8700		2000	280	ug/L		11/16/11 09:46	11/16/11 17:46	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 17:46	1

Client Sample ID: OC-SL2
Date Collected: 11/15/11 08:05
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-4
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	54	J	100	13	ug/L		11/16/11 09:46	11/16/11 18:16	1
Calcium	21000		400	50	ug/L		11/16/11 09:46	11/16/11 18:16	1
Chromium	ND		5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:16	1
Iron	310		100	14	ug/L		11/16/11 09:46	11/16/11 18:16	1
Manganese	3.5	J	10	3.0	ug/L		11/16/11 09:46	11/16/11 18:16	1
Sodium	1900	J	2000	280	ug/L		11/16/11 09:46	11/16/11 18:16	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:16	1

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Client Sample ID: OC-SL1D
Date Collected: 11/15/11 08:50
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-5
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**67**	J	100	13	ug/L		11/16/11 09:46	11/16/11 18:19	1
Calcium	**27000**		400	50	ug/L		11/16/11 09:46	11/16/11 18:19	1
Chromium	**0.66**	J-B~ U	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:19	1
Iron	**210**		100	14	ug/L		11/16/11 09:46	11/16/11 18:19	1
Manganese	**13**		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:19	1
Sodium	**27000**		2000	280	ug/L		11/16/11 09:46	11/16/11 18:19	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:19	1

Client Sample ID: OC-SL3 DUP
Date Collected: 11/14/11 10:00
Date Received: 11/15/11 16:45

Lab Sample ID: 360-37644-6
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 18:13	1
Calcium	**210000**		400	50	ug/L		11/16/11 09:46	11/16/11 18:13	1
Chromium	**0.77**	J-B~ U	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 18:13	1
Iron	**26000**		100	14	ug/L		11/16/11 09:46	11/16/11 18:13	1
Manganese	**2500**		10	3.0	ug/L		11/16/11 09:46	11/16/11 18:13	1
Sodium	**8800**		2000	280	ug/L		11/16/11 09:46	11/16/11 18:13	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 18:13	1

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	*MADEP % Rec*
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs ~~collected~~ analyzed? List project samples that were spiked. — Yes [✓] No [ ] N/A [ ] Comments: OC-SL3

12/16/11

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? — Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? — Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? — Yes [✓] **No** [ ] N/A [ ] Comments:

Sample Type	*MADEP % Rec*	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

MS and/or MSD percent recovery of iron (141 and 74) and calcium (25) and the RPD for calcium (120) and iron (62) were outside QC limits. Unspiked calcium and iron conc. > 4x spike, no action.

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Landfill

TestAmerica Job ID: 360-37644-1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 360-83440/1-A
Matrix: Water
Analysis Batch: 83501

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 83440

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		11/16/11 09:46	11/16/11 17:38	1
Calcium	ND		400	50	ug/L		11/16/11 09:46	11/16/11 17:38	1
Chromium	0.659	J	5.0	0.65	ug/L		11/16/11 09:46	11/16/11 17:38	1
Iron	ND		100	14	ug/L		11/16/11 09:46	11/16/11 17:38	1
Manganese	ND		10	3.0	ug/L		11/16/11 09:46	11/16/11 17:38	1
Sodium	ND		2000	280	ug/L		11/16/11 09:46	11/16/11 17:38	1
Nickel	ND		10	1.3	ug/L		11/16/11 09:46	11/16/11 17:38	1

Lab Sample ID: LCS 360-83440/2-A
Matrix: Water
Analysis Batch: 83501

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 83440

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	5000	5250		ug/L		105	80 - 120
Calcium	20000	21100		ug/L		106	80 - 120
Chromium	1000	1060		ug/L		106	80 - 120
Iron	5000	5480		ug/L		110	80 - 120
Manganese	1000	1060		ug/L		106	80 - 120
Sodium	20000	20300		ug/L		101	80 - 120
Nickel	1000	1050		ug/L		105	80 - 120

Lab Sample ID: LCSD 360-83440/3-A
Matrix: Water
Analysis Batch: 83501

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 83440

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	5000	5400		ug/L		108	80 - 120	3	20
Calcium	20000	21700		ug/L		108	80 - 120	2	20
Chromium	1000	1080		ug/L		108	80 - 120	2	20
Iron	5000	5480		ug/L		110	80 - 120	0	20
Manganese	1000	1090		ug/L		109	80 - 120	2	20
Sodium	20000	20700		ug/L		104	80 - 120	2	20
Nickel	1000	1080		ug/L		108	80 - 120	3	20

Lab Sample ID: 360-37644-3 MS
Matrix: Water
Analysis Batch: 83501

Client Sample ID: OC-SL3
Prep Type: Total/NA
Prep Batch: 83440

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	ND		5000	5230		ug/L		105	75 - 125
Calcium	210000		20000	230000	4	ug/L		101	75 - 125
Chromium	0.71	J B	1000	1040		ug/L		104	75 - 125
Iron	27000		5000	33800	4	ug/L		141	75 - 125
Manganese	2500		1000	3480		ug/L		101	75 - 125
Sodium	8700		20000	28900		ug/L		101	75 - 125
Nickel	ND		1000	1030		ug/L		103	75 - 125

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 360-37644-3 MSD — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 83501 — **Prep Batch: 83440**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	ND		5000	5210		ug/L		104	75 - 125	0	20
Calcium	210000		20000	215000	4	ug/L		25	75 - 125	12	20
Chromium	0.71	J B	1000	1040		ug/L		104	75 - 125	0	20
Iron	27000		5000	30500	4	ug/L		74	75 - 125	10	20
Manganese	2500		1000	3270		ug/L		80	75 - 125	6	20
Sodium	8700		20000	28200		ug/L		98	75 - 125	2	20
Nickel	ND		1000	1020		ug/L		102	75 - 125	1	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-84161/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			11/30/11 15:18	1
Chloride	ND		1.0	1.0	mg/L			11/30/11 15:18	1

Lab Sample ID: LCS 360-84161/6 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	79.2		mg/L		99	85 - 115
Chloride	40.0	42.0		mg/L		105	85 - 115

Lab Sample ID: 360-37644-3 MS — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	170		200	375		mg/L		104	75 - 125
Chloride	ND		100	106		mg/L		106	75 - 125

Lab Sample ID: 360-37644-3 MSD — **Client Sample ID: OC-SL3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84161

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	170		200	375		mg/L		104	75 - 125	0	20
Chloride	ND		100	106		mg/L		106	75 - 125	0	20

Lab Sample ID: MB 360-84209/5 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 84209

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			12/01/11 16:00	1
Chloride	ND		1.0	1.0	mg/L			12/01/11 16:00	1

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [✓] **No** [ ] N/A [ ] Comments:

Calcium (121), Iron (62).
Unspiked >4x spike, no qualification.

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments: OC-SL3

9.2 Were field duplicates collected per the required frequency? Yes [✓] No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. Yes [✓] No [ ] N/A [ ] Comments: See attached.

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] No [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

VALIDATION REPORT
360-37644-1 METALS
FIELD DUPLICATE RPD ASSESSMENT
NOVEMBER 2011
OLIN CALCIUM SULFATE LANDFILL

Sample ID	Analyte	Orig	Q	DUP	Q	RPD
OC-SL3	Aluminum	100	U	100	U	0
OC-SL3	Calcium	210000		210000		0
OC-SL3	Chromium	0.71	U	0.77	U	8.1
OC-SL3	Iron	27000		26000		3.8
OC-SL3	Manganese	2500		2500		0
OC-SL3	Nickel	10	U	10	U	0
OC-SL3	Sodium	8700		8800		1.1

10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes [✓] No [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date [illegible] 12/15/11
Sr. Review/Date Cling Ricardo 1/25/11
Lab Report # 360-37644-1
Project # 61071100016.12

Bicarbonate alkalinity, carbonate alkalinity, chloride, sulfate, TDS

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Yes [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement *Yes [✓] No [ ] N/A [ ] Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

ACTION: *If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: *Yes [✓] No [ ] N/A [ ] Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

ACTION: *If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? Yes [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

✓ Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

✓ Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [✓] No [ ] N/A [ ] Comments:

Field duplicate sample OC-SL3 DUP not included on COC.
Alkalinity samples OC-SL10, OC-SL3, OC-SL3 DUP, and OC-SL6 were received with noticeable head space in the sample container. ~~Alkalinity method requires~~ no headspace. CN 1/25/12

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Field ID and Lab ID
- [✓] Date and time collected
- [✓] Analyst Initials
- [✓] Dilution Factor
- [✓] % moisture or solids
- [✓] Reporting limits
- [✓] *Clean-up method*
- [✓] Analysis method
- [✓] Preparation method
- [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
- [✓] Matrix
- [✓] Target analytes and concentrations
- [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Method blank results
- [✓] LCS recoveries
- [✓] MS/MSD recoveries and RPDs
- [✓] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

- ✓ 28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate
- ✓ Alkalinity = 14 days
- Sulfide, TDS, TSS = 7 days
- pH = analyze immediately
- Nitrate nitrogen as N = 48 hrs
- Nitrite nitrogen as N = 48 hrs
- Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ QAPP/IRSWP ☐ Lab? Yes [✓] No [ ] N/A [ ] Comments:

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity**☐ = 1 mg/L	Bicarbonate Alkalinity** ☑ = 1 mg/L	Carbonate Alkalinity** ☑ = 1 mg/L
Nitrate Nitrogen as N* ☐ = .05 mg/L	Nitrite Nitrogen as N* ☐ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness *☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☑ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks Yes [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☑ = 80-120%	Carbonate Alkalinity** ☑ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☑ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☐ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N**☐ = 80-120%	Nitrite Nitrogen as N** ☐= 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [✓] No [ ] N/A [ ] Comments: OC-SL2 chloride and sulfate MS/MSD.

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes [✓] No [ ] N/A [ ] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [✓] No [ ] N/A [ ] Comments:

Yes [ ] No [✓] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits *(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)*

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result, D = MSD result

Yes [ ] **No** [✓] N/A [ ] Comments:

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☑ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. Yes [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] No [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] No [ ] N/A [ ] Comments: OC-SL3

9.2 Were field duplicates collected per the required frequency? Yes [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☑ *MADEP Option 1(1 per 20)* ☑ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. Yes [✓] No [ ] N/A [ ] Comments:

Analyte	Orig	DUP	RPD
Bicarb Alk	260	250	3.9
Carb Alk	1U	1U	0
TDS	530	440	19
chloride	3.8	3.4	11
sulfate	170	130	27

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [ ] **No** [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

To: James Cashwell
From: Chris Ricardi
Date: October 9, 2012
Subject: Calcium Sulfate Landfill Semi-Annual Monitoring – May 2012

DATA VALIDATION REPORT
MAY 2012 CALCIUM SULFATE LANDFILL GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

TestAmerica Laboratories Data Set 360-40726-1

1.0 INTRODUCTION

Groundwater samples were collected from the Olin Chemical Superfund Site on May 21, 2012. Samples were analyzed by TestAmerica Laboratories in Westfield, Massachusetts. Data were reported in sample delivery group (SDG) 360-40726-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following U.S. Environmental Protection Agency (USEPA) SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- Total metals (aluminum, calcium, chromium, iron, manganese, nickel, and sodium) by USEPA Method 6010B
- General chemistry analyses for carbonate and bicarbonate alkalinity by SM19 SM 2320B, chloride and sulfate by USEPA Method 300, and total dissolved solids by SM19 SM 2540C

The Draft Post Closure Plan (MACTEC, 2006) and the Massachusetts Department of Environmental Protection (MassDEP) Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington groundwater monitoring tasks. Final sample results are presented in data summaries on Table 2. Table 3 presents a summary of validation actions for results that were qualified during validaition. Validation reason codes are associated with final results that have been qualified.

2.0 METALS

The data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
  Blanks
* Matrix Spike Analysis
* Field Duplicate Results

AMEC Environment & Infrastructure, Inc.
107 Audubon Road, Suite 301 • Wakefield, MA 01880 USA
Tel: 781.245.6606 • Fax: 781.246.5060

* Laboratory Control Sample
  Detection limits

* indicates that criteria were met for this parameter

2.1 Validation Observations and Actions

Method Blanks

Calcium (84.1 µg/L), iron (35.7 µg/L) and manganese (7.42 µg/L) were detected in the method blank. A blank validation action limit was established at five times the blank concentration. Iron was detected below the reporting limit and action limit in samples OC-SL-1D, OC-SL-5, and OC-SL-6 and the results were qualified not detected (U) at the reporting limit. In sample OC-SL-2, iron was detected above the reporting limit and below the action limit and the sample was qualified U at the reported concentration. Manganese was detected above the reporting limit and below the action limit in samples OC-SL-1D and OC-SL-2. Manganese results were qualified U at the reported concentrations. Calcium was not detected below the action limit.

Detection Limits

Sample OC-SL-2 required a two-fold dilution due to target analyte concentrations. Reporting limits for analytes that were not detected are elevated.

3.0 GENERAL CHEMISTRY – Carbonate and Bicarbonate Alkalinity, Chloride, Sulfate, and Total Dissolved Solids

The data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
* Blanks
  Matrix Spike Analysis
* Laboratory Duplicate Analysis
* Field Duplicate Analysis
* Laboratory Control Sample
* Detection limits

* indicates that criteria were met for this parameter

3.1 Validation Observations and Actions

Matrix Spike Analysis

Sample OC-SL-3 was submitted for MS/MSD analysis. The MS percent recovery for sulfate (126) was greater than the upper QC control limit of 125. Detections of sulfate in the associated samples were qualified estimated (J).

Except for the validation actions noted above, the results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi

10/09/2012

Chris Ricardi, NRCC-EAC
Senior Chemist

Date

M J Murphy

10/19/12

Michael Murphy
Project Principal

Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, D.C. 20005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Draft Calcium Sulfate Landfill Post Closure Monitoring Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; December, 2006.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

USEPA, 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 - December 1996.

Table 1
Sample Summary
Data Validation Report
May 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab Sample ID	Location	Sample ID	Sample Date	SW6010 Total Metals	SM2320B Alkalinity	E300 Chloride, Sulfate	SM2540C Total Dissolved Solids
360-40726-1	SL-6	OC-SL-6	5/21/2012	7	2	2	1
360-40726-2	SL-5	OC-SL-5	5/21/2012	7	2	2	1
360-40726-3	SL-3	OC-SL-3	5/21/2012	7	2	2	1
360-40726-4	SL-3	OC-SL-3 DUP	5/21/2012	7	2	2	1
360-40726-5	SL-2	OC-SL-2	5/21/2012	7	2	2	1
360-40726-6	SL-1D	OC-SL-1D	5/21/2012	7	2	2	1

Notes:
Number listed under method indicates number of target analytes reported

Prepared by / Date: KJC 06/15/12
Checked by / Date: MJW 08/27/12

Table 2
Final Results Summary
Data Validation Report
May 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SL-1D		SL-2		SL-3		SL-3		SL-5		SL-6	
			COC Sample	OC-SL-1D		OC-SL-2		OC-SL-3		OC-SL-3 DUP		OC-SL-5		OC-SL-6	
			Date Sampled	05/21/12		05/21/12		05/21/12		05/21/12		05/21/12		05/21/12	
			Sample Type	FS		FS		FS		FD		FS		FS	
			Report Number	360-40726-1		360-40726-1		360-40726-1		360-40726-1		360-40726-1		360-40726-1	
Fract	**Analysis Method**	**Parameter Name**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	ug/l	44	J	61	J	100	U	15	J	200	U	19	J
T	SW6010	Calcium	ug/l	23000		74000		240000		270000		510000		470000	
T	SW6010	Chromium	ug/l	5	U	1.5	J	5	U	5	U	10	U	5	U
T	SW6010	Iron	ug/l	100	U	130	U	25000		28000		100	U	200	U
T	SW6010	Manganese	ug/l	11	U	23	U	2600		2900		230		690	
T	SW6010	Nickel	ug/l	10	U	1.4	J	2.7	J	2.6	J	4.6	J	1.4	J
T	SW6010	Sodium	ug/l	23000		2500		8300		9100		10000		6500	
N	A2320	Bicarbonate Alkalinity, as CaCO3	mg/l	28		22		270		270		120		110	
N	A2320	Carbonate Alkalinity, as CaCO3	mg/l	1	U	1	U	1	U	1	U	1	U	1	U
N	E300	Chloride	mg/l	45		3.3		5.7		5.9		3.2		1.3	
N	E300	Sulfate	mg/l	27	J	150	J	340	J	440	J	1200	J	1100	J
F	A2540C	Total Dissolved Solids	mg/l	180		270		810		880		1900		1600	

Notes:
N = normal
T = total (unfiltered)
F = filtered
FS = field sample
FD = field duplicate
U = not detected, value is the detection limit
J = value is estimated
ug/l = microgram per liter
mg/l = milligram per liter

Prepared by / Date: KJC 08/30/12
Checked by / Date: MJW 08/31/12

Table 3
Validation Qualification Action Summary
Data Validation Report
May 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
360-40726-1	360-40726-6	SW6010	OC-SL-1D	Iron	82	J B	100	U	BL1	ug/l
360-40726-1	360-40726-5	SW6010	OC-SL-2	Iron	130	B	130	U	BL1	ug/l
360-40726-1	360-40726-2	SW6010	OC-SL-5	Iron	61	J B	100	U	BL1	ug/l
360-40726-1	360-40726-1	SW6010	OC-SL-6	Iron	71	J B	200	U	BL1	ug/l
360-40726-1	360-40726-6	SW6010	OC-SL-1D	Manganese	11	B	11	U	BL1	ug/l
360-40726-1	360-40726-5	SW6010	OC-SL-2	Manganese	23	B	23	U	BL1	ug/l
360-40726-1	360-40726-6	E300	OC-SL-1D	Sulfate	27		27	J	MS-H	mg/l
360-40726-1	360-40726-5	E300	OC-SL-2	Sulfate	150		150	J	MS-H	mg/l
360-40726-1	360-40726-3	E300	OC-SL-3	Sulfate	340		340	J	MS-H	mg/l
360-40726-1	360-40726-4	E300	OC-SL-3 DUP	Sulfate	440		440	J	MS-H	mg/l
360-40726-1	360-40726-2	E300	OC-SL-5	Sulfate	1200		1200	J	MS-H	mg/l
360-40726-1	360-40726-1	E300	OC-SL-6	Sulfate	1100		1100	J	MS-H	mg/l

Units:
ug/l = microgram per liter
mg/l = milligram per liter

Validation Reason Codes:
BL1 = Method Blank Qualifier
MS-H = MS and/or MSD recovery high

Prepared by / Date: KJC 08/30/12
Checked by / Date: MJW 08/31/12

Validation Qualifier:
U = not detected, value is the detection limit
J = value is estimated

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Washburn 8/27/12
Sr. Review/Date Chris Ricardi 9/13/12
Lab Report # 360-40726-1
Project # 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*

Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes** [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* N/A ☑ % moisture or solids ☑ *Reporting limits*
N/A ☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☑ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☐ QAPP ☐ Lab ☐ MADEP **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

Diluted sample
OC-SL-2 2x

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

Ca - 84.1✓ Fe - 35.7 U Mn - 7.42 U Subset of samples < AL qual U

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 360-91277/1-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 91277

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		05/29/12 10:03	05/29/12 16:51	1
Calcium	84.1	J	400	63	ug/L		05/29/12 10:03	05/29/12 16:51	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 16:51	1
Iron	35.7	J	100	21	ug/L		05/29/12 10:03	05/29/12 16:51	1
Manganese	7.42	J	10	3.9	ug/L		05/29/12 10:03	05/29/12 16:51	1
Sodium	ND		2000	780	ug/L		05/29/12 10:03	05/29/12 16:51	1
Nickel	ND		10	1.4	ug/L		05/29/12 10:03	05/29/12 16:51	1

Lab Sample ID: LCS 360-91277/2-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	5000	5670		ug/L		113	80 - 120
Calcium	20000	22200		ug/L		111	80 - 120
Chromium	1000	1120		ug/L		112	80 - 120
Iron	5000	5630		ug/L		113	80 - 120
Manganese	1000	1130		ug/L		113	80 - 120
Sodium	20000	21300		ug/L		106	80 - 120
Nickel	1000	1140		ug/L		114	80 - 120

Lab Sample ID: LCSD 360-91277/3-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	5000	5660		ug/L		113	80 - 120	0	20
Calcium	20000	22200		ug/L		111	80 - 120	0	20
Chromium	1000	1120		ug/L		112	80 - 120	0	20
Iron	5000	5640		ug/L		113	80 - 120	0	20
Manganese	1000	1130		ug/L		113	80 - 120	0	20
Sodium	20000	21300		ug/L		107	80 - 120	0	20
Nickel	1000	1140		ug/L		114	80 - 120	0	20

Lab Sample ID: 360-40726-3 MS
Matrix: Water
Analysis Batch: 91319

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	ND		5000	4950		ug/L		99	75 - 125
Calcium	240000	B	20000	275000	4	ug/L		153	75 - 125
Chromium	ND		1000	959		ug/L		96	75 - 125
Iron	25000	B	5000	31400	4	ug/L		124	75 - 125
Manganese	2600	B	1000	3640		ug/L		105	75 - 125
Sodium	8300		20000	27600		ug/L		96	75 - 125
Nickel	2.7	J	1000	963		ug/L		96	75 - 125

MJW 8/27/12

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits? Yes [✓] **No** [ ] N/A [ ] Comments:

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

	Ca	Iron
MS	153	–
MSD	136	130

greater the 4x the spike amount. no action required

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 360-91277/1-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 91277

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		05/29/12 10:03	05/29/12 16:51	1
Calcium	84.1	J	400	63	ug/L		05/29/12 10:03	05/29/12 16:51	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 16:51	1
Iron	35.7	J	100	21	ug/L		05/29/12 10:03	05/29/12 16:51	1
Manganese	7.42	J	10	3.9	ug/L		05/29/12 10:03	05/29/12 16:51	1
Sodium	ND		2000	780	ug/L		05/29/12 10:03	05/29/12 16:51	1
Nickel	ND		10	1.4	ug/L		05/29/12 10:03	05/29/12 16:51	1

Lab Sample ID: LCS 360-91277/2-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	5000	5670		ug/L		113	80 - 120
Calcium	20000	22200		ug/L		111	80 - 120
Chromium	1000	1120		ug/L		112	80 - 120
Iron	5000	5630		ug/L		113	80 - 120
Manganese	1000	1130		ug/L		113	80 - 120
Sodium	20000	21300		ug/L		106	80 - 120
Nickel	1000	1140		ug/L		114	80 - 120

Lab Sample ID: LCSD 360-91277/3-A
Matrix: Water
Analysis Batch: 91319

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	5000	5660		ug/L		113	80 - 120	0	20
Calcium	20000	22200		ug/L		111	80 - 120	0	20
Chromium	1000	1120		ug/L		112	80 - 120	0	20
Iron	5000	5640		ug/L		113	80 - 120	0	20
Manganese	1000	1130		ug/L		113	80 - 120	0	20
Sodium	20000	21300		ug/L		107	80 - 120	0	20
Nickel	1000	1140		ug/L		114	80 - 120	0	20

Lab Sample ID: 360-40726-3 MS
Matrix: Water
Analysis Batch: 91319

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	ND		5000	4950		ug/L		99	75 - 125
Calcium	240000	B	20000	275000	4	ug/L		153	75 - 125
Chromium	ND		1000	959		ug/L		96	75 - 125
Iron	25000	B	5000	31400	4	ug/L		124	75 - 125
Manganese	2600	B	1000	3640		ug/L		105	75 - 125
Sodium	8300		20000	27600		ug/L		96	75 - 125
Nickel	2.7	J	1000	963		ug/L		96	75 - 125

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Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91319

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	ND		5000	4980		ug/L		100	75 - 125	1	20
Calcium	240000	B	20000	271000	4	ug/L		136	75 - 125	1	20
Chromium	ND		1000	965		ug/L		97	75 - 125	1	20
Iron	25000	B	5000	31700	4	ug/L		130	75 - 125	1	20
Manganese	2600	B	1000	3600		ug/L		100	75 - 125	1	20
Sodium	8300		20000	27600		ug/L		97	75 - 125	0	20
Nickel	2.7	J	1000	970		ug/L		97	75 - 125	1	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-91297/3
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/25/12 10:47	1
Chloride	ND		1.0	1.0	mg/L			05/25/12 10:47	1

Lab Sample ID: LCS 360-91297/4
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	83.7		mg/L		105	85 - 115
Chloride	40.0	41.3		mg/L		103	85 - 115

Lab Sample ID: 360-40726-3 MS
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	340		200	597	F	mg/L		126	75 - 125
Chloride	ND		100	121		mg/L		121	75 - 125

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	340		200	569		mg/L		112	75 - 125	5	20
Chloride	ND		100	113		mg/L		113	75 - 125	6	20

Lab Sample ID: MB 360-91352/3
Matrix: Water
Analysis Batch: 91352

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/29/12 14:44	1
Chloride	ND		1.0	1.0	mg/L			05/29/12 14:44	1

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NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result, D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No** [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database. See Blanks

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91319

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	ND		5000	4980		ug/L		100	75 - 125	1	20
Calcium	240000	B	20000	271000	4	ug/L		136	75 - 125	1	20
Chromium	ND		1000	965		ug/L		97	75 - 125	1	20
Iron	25000	B	5000	31700	4	ug/L		130	75 - 125	1	20
Manganese	2600	B	1000	3600		ug/L		100	75 - 125	1	20
Sodium	8300		20000	27600		ug/L		97	75 - 125	0	20
Nickel	2.7	J	1000	970		ug/L		97	75 - 125	1	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-91297/3
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/25/12 10:47	1
Chloride	ND		1.0	1.0	mg/L			05/25/12 10:47	1

Lab Sample ID: LCS 360-91297/4
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	83.7		mg/L		105	85 - 115
Chloride	40.0	41.3		mg/L		103	85 - 115

Lab Sample ID: 360-40726-3 MS
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	340		200	597	F	mg/L		126	75 - 125
Chloride	ND		100	121		mg/L		121	75 - 125

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	340		200	569		mg/L		112	75 - 125	5	20
Chloride	ND		100	113		mg/L		113	75 - 125	6	20

Lab Sample ID: MB 360-91352/3
Matrix: Water
Analysis Batch: 91352

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/29/12 14:44	1
Chloride	ND		1.0	1.0	mg/L			05/29/12 14:44	1

MJW 8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-1D

Date Collected: 05/21/12 12:05
Date Received: 05/23/12 17:00

Lab Sample ID: 360-40726-6
Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**44**	J	100	13	ug/L		05/29/12 10:03	05/29/12 17:33	1
Calcium	**23000**	~~B~~	400	63	ug/L		05/29/12 10:03	05/29/12 17:33	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 17:33	1
Iron	100 ~~82~~	~~J B~~ U	100	21	ug/L		05/29/12 10:03	05/29/12 17:33	1
Manganese	**11**	~~B~~ U	10	3.9	ug/L		05/29/12 10:03	05/29/12 17:33	1
Sodium	**23000**		2000	780	ug/L		05/29/12 10:03	05/29/12 17:33	1
Nickel	ND		10	1.4	ug/L		05/29/12 10:03	05/29/12 17:33	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**27**	J	2.0	2.0	mg/L			05/25/12 15:03	1
Chloride	**45**		1.0	1.0	mg/L			05/25/12 15:03	1
Bicarbonate Alkalinity as CaCO3	**28**		1.0	1.0	mg/L			05/24/12 14:03	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 14:03	1
Total Dissolved Solids	**180**		10	10	mg/L			05/24/12 12:44	1

MW 8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-2

Date Collected: 05/21/12 11:25
Date Received: 05/23/12 17:00

Lab Sample ID: 360-40726-5
Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	61	J	100	13	ug/L		05/29/12 10:03	05/29/12 17:30	1
Calcium	74000	~~B~~	400	63	ug/L		05/29/12 10:03	05/29/12 17:30	1
Chromium	1.5	J	5.0	0.66	ug/L		05/29/12 10:03	05/29/12 17:30	1
Iron	130	~~B~~ U	100	21	ug/L		05/29/12 10:03	05/29/12 17:30	1
Manganese	23	~~B~~ U	10	3.9	ug/L		05/29/12 10:03	05/29/12 17:30	1
Sodium	2500		2000	780	ug/L		05/29/12 10:03	05/29/12 17:30	1
Nickel	1.4	J	10	1.4	ug/L		05/29/12 10:03	05/29/12 17:30	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	150	J	20	20	mg/L			05/29/12 17:01	10
Chloride	3.3		1.0	1.0	mg/L			05/25/12 14:46	1
Bicarbonate Alkalinity as CaCO3	22		1.0	1.0	mg/L			05/24/12 13:58	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 13:58	1
Total Dissolved Solids	270		20	20	mg/L			05/24/12 12:44	1

MJW
8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-3

Date Collected: 05/21/12 09:55
Date Received: 05/23/12 17:00

Lab Sample ID: 360-40726-3
Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		100	13	ug/L		05/29/12 10:03	05/29/12 17:00	1
Calcium	**240000**	~~B~~	400	63	ug/L		05/29/12 10:03	05/29/12 17:00	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 17:00	1
Iron	**25000**	~~B~~	100	21	ug/L		05/29/12 10:03	05/29/12 17:00	1
Manganese	**2600**	~~B~~	10	3.9	ug/L		05/29/12 10:03	05/29/12 17:00	1
Sodium	**8300**		2000	780	ug/L		05/29/12 10:03	05/29/12 17:00	1
Nickel	**2.7**	J	10	1.4	ug/L		05/29/12 10:03	05/29/12 17:00	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**340**	J	20	20	mg/L			05/25/12 11:38	10
Chloride	**5.7**		1.0	1.0	mg/L			05/25/12 11:21	1
Bicarbonate Alkalinity as CaCO3	**270**		1.0	1.0	mg/L			05/24/12 13:10	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 13:10	1
Total Dissolved Solids	**810**		40	40	mg/L			05/24/12 12:44	1

MJV
8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-3 DUP

Lab Sample ID: 360-40726-4

Date Collected: 05/21/12 09:55
Date Received: 05/23/12 17:00

Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**15**	**J**	100	13	ug/L		05/29/12 10:03	05/29/12 17:27	1
Calcium	**270000**	~~**B**~~	400	63	ug/L		05/29/12 10:03	05/29/12 17:27	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 17:27	1
Iron	**28000**	~~**B**~~	100	21	ug/L		05/29/12 10:03	05/29/12 17:27	1
Manganese	**2900**	~~**B**~~	10	3.9	ug/L		05/29/12 10:03	05/29/12 17:27	1
Sodium	**9100**		2000	780	ug/L		05/29/12 10:03	05/29/12 17:27	1
Nickel	**2.6**	**J**	10	1.4	ug/L		05/29/12 10:03	05/29/12 17:27	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**440**	J	20	20	mg/L			05/25/12 13:55	10
Chloride	**5.9**		1.0	1.0	mg/L			05/25/12 13:38	1
Bicarbonate Alkalinity as CaCO3	**270**		1.0	1.0	mg/L			05/24/12 13:53	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 13:53	1
Total Dissolved Solids	**880**		100	100	mg/L			05/24/12 12:44	1

MJW
8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-5

Date Collected: 05/21/12 09:00
Date Received: 05/23/12 17:00

Lab Sample ID: 360-40726-2

Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		200	26	ug/L		05/29/12 10:03	05/31/12 11:53	2
Calcium	**510000**	~~B~~	800	130	ug/L		05/29/12 10:03	05/31/12 11:53	2
Chromium	ND		10	1.3	ug/L		05/29/12 10:03	05/31/12 11:53	2
Iron	200 ~~61~~	~~J B~~ U	200	41	ug/L		05/29/12 10:03	05/31/12 11:53	2
Manganese	**230**	~~B~~	20	7.9	ug/L		05/29/12 10:03	05/31/12 11:53	2
Sodium	**10000**		4000	1600	ug/L		05/29/12 10:03	05/31/12 11:53	2
Nickel	**4.6**	J	20	2.9	ug/L		05/29/12 10:03	05/31/12 11:53	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**1200**	J	40	40	mg/L			05/25/12 13:21	20
Chloride	**3.2**		1.0	1.0	mg/L			05/25/12 13:03	1
Bicarbonate Alkalinity as CaCO3	**120**		1.0	1.0	mg/L			05/24/12 13:03	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 13:03	1
Total Dissolved Solids	**1900**		200	200	mg/L			05/24/12 12:44	1

MJW
8/27/12

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Calcium Sulfate Cap

TestAmerica Job ID: 360-40726-1

Client Sample ID: OC-SL-6

Date Collected: 05/21/12 08:20
Date Received: 05/23/12 17:00

Lab Sample ID: 360-40726-1
Matrix: Water

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**19**	J	100	13	ug/L		05/29/12 10:03	05/29/12 17:21	1
Calcium	**470000**	~~B~~	400	63	ug/L		05/29/12 10:03	05/29/12 17:21	1
Chromium	ND		5.0	0.66	ug/L		05/29/12 10:03	05/29/12 17:21	1
Iron	100 ~~71~~ ~~J B~~ U		100	21	ug/L		05/29/12 10:03	05/29/12 17:21	1
Manganese	**690**	~~B~~	10	3.9	ug/L		05/29/12 10:03	05/29/12 17:21	1
Sodium	**6500**		2000	780	ug/L		05/29/12 10:03	05/29/12 17:21	1
Nickel	**1.4**	J	10	1.4	ug/L		05/29/12 10:03	05/29/12 17:21	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	**1100**	J	40	40	mg/L			05/25/12 12:46	20
Chloride	**1.3**		1.0	1.0	mg/L			05/25/12 12:29	1
Bicarbonate Alkalinity as CaCO3	**110**		1.0	1.0	mg/L			05/24/12 12:57	1
Carbonate Alkalinity as CaCO3	ND		1.0	1.0	mg/L			05/24/12 12:57	1
Total Dissolved Solids	**1600**		200	200	mg/L			05/24/12 12:44	1

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field_sample_id	qc_code	param_name	final_result	AVE	DIFF	RPD
OC-SL-3	FS	Bicarbonate Alkalinity, as CaCO3	270	270	0	0%
OC-SL-3 DUP	FD	Bicarbonate Alkalinity, as CaCO3	270			
OC-SL-3	FS	Chloride	5.7	5.8	0.2	3%
OC-SL-3 DUP	FD	Chloride	5.9			
OC-SL-3	**FS**	**Sulfate**	**340**	390	100	26%
OC-SL-3 DUP	**FD**	**Sulfate**	**440**			
OC-SL-3	FS	Total Dissolved Solids	810	845	70	8%
OC-SL-3 DUP	FD	Total Dissolved Solids	880			
OC-SL-3	FS	Calcium	240000	255000	30000	12%
OC-SL-3 DUP	FD	Calcium	270000			
OC-SL-3	FS	Iron	25000	26500	3000	11%
OC-SL-3 DUP	FD	Iron	28000			
OC-SL-3	FS	Manganese	2600	2750	300	11%
OC-SL-3 DUP	FD	Manganese	2900			
OC-SL-3	FS	Nickel	2.7	2.65	0.1	4%
OC-SL-3 DUP	FD	Nickel	2.6			
OC-SL-3	FS	Sodium	8300	8700	800	9%
OC-SL-3 DUP	FD	Sodium	9100			

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OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date Mike Washburn 8/27/12
Sr. Review/Date Chris Ricciuti 9/13/12
Lab Report # 360-40726-1
Project # 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] No [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

[✓] Field ID and Lab ID [✓] Date and time collected [✓] Analyst Initials [✓] Dilution Factor [✓] % moisture or solids [✓] Reporting limits
[✓] *Clean-up method* [✓] Analysis method [✓] Preparation method [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
[✓] Matrix [✓] Target analytes and concentrations [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

[✓] Method blank results [✓] LCS recoveries [✓] MS/MSD recoveries and RPDs [✓] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 <u>Holding Times</u> Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days Sulfide, TDS, TSS = 7 days pH = analyze immediately Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments: Lab used 10mg/L for TSS

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity** ☑ = 1 mg/L	Bicarbonate Alkalinity** ☐ = 1 mg/L	Carbonate Alkalinity** ☐ = 1 mg/L
Nitrate Nitrogen as N* ☐ = .05 mg/L	Nitrite Nitrogen as N* ☐ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness *☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☐ = 10 mg/L	TSS* ☑ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 **<u>Method Blanks</u>** **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS not analyzed for Alkalinities

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☑ = 80-120%	Carbonate Alkalinity** ☑ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☐ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☐ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N**☐ = 80-120%	Nitrite Nitrogen as N** ☐= 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [✓] No [ ] N/A [ ] Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes [✓] No [ ] N/A [ ] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [✓] No [ ] N/A [ ] Comments:

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Yes [✓] **No** [✓] N/A [ ] Comments:

J positive

Sulfate MS - 126

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91319

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 91277

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aluminum	ND		5000	4980		ug/L		100	75 - 125	1	20
Calcium	240000	B	20000	271000	4	ug/L		136	75 - 125	1	20
Chromium	ND		1000	965		ug/L		97	75 - 125	1	20
Iron	25000	B	5000	31700	4	ug/L		130	75 - 125	1	20
Manganese	2600	B	1000	3600		ug/L		100	75 - 125	1	20
Sodium	8300		20000	27600		ug/L		97	75 - 125	0	20
Nickel	2.7	J	1000	970		ug/L		97	75 - 125	1	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 360-91297/3
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/25/12 10:47	1
Chloride	ND		1.0	1.0	mg/L			05/25/12 10:47	1

Lab Sample ID: LCS 360-91297/4
Matrix: Water
Analysis Batch: 91297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	80.0	83.7		mg/L		105	85 - 115
Chloride	40.0	41.3		mg/L		103	85 - 115

Lab Sample ID: 360-40726-3 MS
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	340		200	597	F	mg/L		126	75 - 125
Chloride	ND		100	121		mg/L		121	75 - 125

Lab Sample ID: 360-40726-3 MSD
Matrix: Water
Analysis Batch: 91297

Client Sample ID: OC-SL-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	340		200	569		mg/L		112	75 - 125	5	20
Chloride	ND		100	113		mg/L		113	75 - 125	6	20

Lab Sample ID: MB 360-91352/3
Matrix: Water
Analysis Batch: 91352

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	ND		2.0	2.0	mg/L			05/29/12 14:44	1
Chloride	ND		1.0	1.0	mg/L			05/29/12 14:44	1

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6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result, D = MSD result

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [✓] No [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☑ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [__] **No** [✓] N/A [__] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

To: James Cashwell
From: Chris Ricardi
Date: February 12, 2013
Subject: Calcium Sulfate Landfill Semi-Annual Monitoring – November 2012

DATA VALIDATION REPORT
NOVEMBER 2012 CALCIUM SULFATE LANDFILL GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS
TestAmerica Laboratories Data Set 480-28727-1

1.0 INTRODUCTION

Groundwater samples were collected from the Olin Chemical Superfund Site on November 15, 2012. Samples were analyzed by TestAmerica Laboratories in Buffalo, New York. Data were reported in sample delivery group (SDG) 480-28727-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following U.S. Environmental Protection Agency (USEPA) SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- total metals (aluminum, calcium, chromium, iron, manganese, nickel, and sodium) by USEPA Method 6010B
- general chemistry analyses for total alkalinity by SM19 SM 2320B and chloride and sulfate by USEPA Method 300

The Draft Post Closure Plan (MACTEC, 2006) and the Massachusetts Department of Environmental Protection (MassDEP) Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington groundwater monitoring tasks. Final sample results are presented on data summaries in Table 2. Table 3 presents a summary of validation actions for results that were qualified during validaition. Validation reason codes are associated with final results that have been qualified.

2.0 METALS

The data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Matrix Spike Analysis
* Field Duplicate Results

AMEC Environment & Infrastructure, Inc.
2 Robbins Road
Westford, MA 01886
Tel +(978) 692-9090
Fax +(978) 692-6633

* Laboratory Control Sample
  Detection limits

* = indicates that criteria were met for this parameter

2.1 Validation Observations and Actions

Detection Limits

The lab used a reporting limit of 200 µg/L for aluminium. A quantitation limit of 100 µg/L is identified in the Quality Assurance Project Plan (QAPP) [MACTEC, 2009].

The lab used a reporting limit of 500 µg/L for calcium. A quantitation limit of 400 µg/L is identified in the QAPP. Calcium was detected at concentrations greater than the quantitation limit in all samples.

3.0 GENERAL CHEMISTRY – Carbonate and Bicarbonate Alkalinity, Chloride, Sulfate, and Total Dissolved Solids

The data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
* Blanks
  Matrix Spike Analysis
* Laboratory Duplicate Analysis
* Field Duplicate Analysis
* Laboratory Control Sample
* Detection limits

* = indicates that criteria were met for this parameter

3.1 Validation Observations and Actions

Matrix Spike Analysis

Sample OC-SL-3 was submitted for MS/MSD analysis. The MS percent recovery for sulfate (137) was greater than the upper QC control limit of 125. Detections of sulfate in OC-SL-3 and OC-SL-3 DUP were qualified estimated (J).

Except for the validation actions noted above, the results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi, NRCC-EAC
Senior Chemist

5/16/13
Date

Michael Murphy
Project Principal

5/16/13
Date

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, D.C. 20005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Draft Calcium Sulfate Landfill Post Closure Monitoring Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; December, 2006.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2009. "Final Remedial Investigation/Feasibility Study Project Operations Plan"; Volume III-B Quality Assurance Project Plan; Olin Chemical Superfund Site; 51 Eames Street; Wilmington, MA; August 14, 2009.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

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Table 1
Sample Summary
Data Validation Report
November 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab Sample ID	Location	Sample ID	Sample Date	SW6010 Total Metals	SM2320B Total Alkalinity	E300 Chloride, Sulfate
480-28727-1	SL-6	OC-SL-6	11/15/2012	7	1	2
480-28727-2	SL-3	OC-SL-3	11/15/2012	7	1	2
480-28727-3	SL-2	OC-SL-2	11/15/2012	7	1	2
480-28727-4	SL-1D	OC-SL-1D	11/15/2012	7	1	2
480-28727-5	SL-3	OC-SL-3 DUP	11/15/2012	7	1	2

Notes:
Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 12/07/12
Checked by / Date: MJW 12/17/12

Table 2
Final Results Summary
Data Validation Report
November 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SL-1D		SL-2		SL-3		SL-3		SL-6	
			COC Sample	OC-SL-1D		OC-SL-2		OC-SL-3		OC-SL-3 DUP		OC-SL-6	
			Date Sampled	11/15/12		11/15/12		11/15/12		11/15/12		11/15/12	
			Sample Type	FS		FS		FS		FD		FS	
			Report Number	480-28727-1		480-28727-1		480-28727-1		480-28727-1		480-28727-1	
Fract	**Analysis Method**	**Parameter Name**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	mg/l	0.11	J	0.18	J	0.2	U	0.2	U	0.1	J
T	SW6010	Calcium	mg/l	18		25		280		280		430	
T	SW6010	Chromium	mg/l	0.0025	J	0.005	U	0.0012	J	0.0018	J	0.0019	J
T	SW6010	Iron	mg/l	0.15		0.57		22		23		0.28	
T	SW6010	Manganese	mg/l	0.045		0.098		3.5		3.5		3.7	
T	SW6010	Nickel	mg/l	0.01	U	0.01	U	0.0039	J	0.0035	J	0.01	U
T	SW6010	Sodium	mg/l	25		21		9.9		10		16	
N	A2320	Alkalinity, Total	mg/l	35		15		230		220		190	
N	E300	Chloride	mg/l	31		35		4.9		4.8		3	
N	E300	Sulfate	mg/l	25		51		550	J	560	J	1000	

Notes:
N = normal
T = total (unfiltered)
FS = field sample
FD = field duplicate
U = not detected, value is the detection limit
J = value is estimated
mg/l = milligram per liter

Prepared by / Date: KJC 12/17/12
Checked by / Date: MJW 12/17/12

Table 3
Validation Qualification Action Summary
Data Validation Report
November 2012 Calcium Sulfate Landfill Sampling
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
480-28727-1	480-28727-2	E300	OC-SL-3	Sulfate	550		550	J	MS-H	mg/l
480-28727-1	480-28727-5	E300	OC-SL-3 DUP	Sulfate	560		560	J	MS-H	mg/l

Units:
mg/l = milligram per liter

Validation Reason Codes:
MS-H = MS and/or MSD recovery high

Prepared by / Date: KJC 12/17/12
Checked by / Date: MJW 12/17/12

Validation Qualifier:
J = value is estimated

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Washburn 12/13/12
Sr. Review/Date Chris Ricardi 2/12/13
Lab Report # 480-28727-1
Project # 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes** [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* NA ☐ % moisture or solids ☑ *Reporting limits*
NA ☐ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

Al used 200 vice 100
Ca used 500 vice 200

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SL-3

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

	MS	MSD
Ca	156	158

=> sample results > 4X spike amount. No action required.

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Wilmington MA Superfund S

TestAmerica Job ID: 480-28727-1

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-92758/1-A
Matrix: Water
Analysis Batch: 93426

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 92758

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		0.0050	0.0010	mg/L		11/27/12 07:30	11/29/12 14:59	1
Sodium	ND		1.0	0.32	mg/L		11/27/12 07:30	11/29/12 14:59	1
Calcium	ND		0.50	0.10	mg/L		11/27/12 07:30	11/29/12 14:59	1
Iron	ND		0.050	0.019	mg/L		11/27/12 07:30	11/29/12 14:59	1
Nickel	ND		0.010	0.0013	mg/L		11/27/12 07:30	11/29/12 14:59	1
Aluminum	ND		0.20	0.060	mg/L		11/27/12 07:30	11/29/12 14:59	1
Manganese	ND		0.0030	0.00040	mg/L		11/27/12 07:30	11/29/12 14:59	1

Lab Sample ID: LCS 480-92758/2-A
Matrix: Water
Analysis Batch: 93426

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 92758

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	0.200	0.214		mg/L		107	80 - 120
Sodium	10.0	10.6		mg/L		106	80 - 120
Calcium	10.0	10.7		mg/L		107	80 - 120
Iron	10.0	10.6		mg/L		106	80 - 120
Nickel	0.200	0.211		mg/L		106	80 - 120
Aluminum	10.0	10.5		mg/L		105	80 - 120
Manganese	0.200	0.215		mg/L		108	80 - 120

Lab Sample ID: LCSD 480-92758/3-A
Matrix: Water
Analysis Batch: 93426

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 92758

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	0.200	0.216		mg/L		108	80 - 120	1	20
Sodium	10.0	10.7		mg/L		107	80 - 120	1	20
Calcium	10.0	10.8		mg/L		108	80 - 120	0	20
Iron	10.0	10.6		mg/L		106	80 - 120	0	20
Nickel	0.200	0.213		mg/L		106	80 - 120	1	20
Aluminum	10.0	10.6		mg/L		106	80 - 120	1	20
Manganese	0.200	0.215		mg/L		108	80 - 120	0	20

Lab Sample ID: 480-28727-2 MS
Matrix: Water
Analysis Batch: 93426

Client Sample ID: OC-SL-3
Prep Type: Total/NA
Prep Batch: 92758

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	0.0012	J	0.200	0.219		mg/L		109	75 - 125
Sodium	9.9		10.0	21.0		mg/L		110	75 - 125
Calcium	280		10.0	296	4	mg/L		156	75 - 125
Iron	22		10.0	33.4		mg/L		110	75 - 125
Nickel	0.0039	J	0.200	0.222		mg/L		109	75 - 125
Aluminum	ND		10.0	10.7		mg/L		107	75 - 125
Manganese	3.5		0.200	3.77	4	mg/L		115	75 - 125

MJW
12/13/12

QC Sample Results

Client: Olin Corporation
Project/Site: Olin Chemical Wilmington MA Superfund S

TestAmerica Job ID: 480-28727-1

Method: 6010 - Metals (ICP) (Continued)

Lab Sample ID: 480-28727-2 MSD — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 93426 — **Prep Batch: 92758**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	0.0012	J	0.200	0.217		mg/L		108	75 - 125	1	20
Sodium	9.9		10.0	21.2		mg/L		112	75 - 125	1	20
Calcium	280		10.0	296	4	mg/L		158	75 - 125	0	20
Iron	22		10.0	33.8		mg/L		113	75 - 125	1	20
Nickel	0.0039	J	0.200	0.222		mg/L		109	75 - 125	0	20
Aluminum	ND		10.0	10.8		mg/L		107	75 - 125	1	20
Manganese	3.5		0.200	3.76	4	mg/L		109	75 - 125	0	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 480-91789/124 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 91789

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.50	0.28	mg/L			11/20/12 12:12	1
Sulfate	ND		2.0	0.35	mg/L			11/20/12 12:12	1

Lab Sample ID: LCS 480-91789/123 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 91789

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	20.0	21.0		mg/L		105	90 - 110
Sulfate	20.0	21.5		mg/L		107	90 - 110

Lab Sample ID: 480-28727-1 MS — **Client Sample ID: OC-SL-6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 91789

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.0		125	140		mg/L		110	90 - 110

Lab Sample ID: 480-28727-2 MS — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 91789

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	4.9		25.0	32.1		mg/L		109	90 - 110

Lab Sample ID: 480-28727-2 MSD — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 91789

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	4.9		25.0	32.9	F	mg/L		112	90 - 110	3	20

MJW 12/13/12

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result, D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No** [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

Field Duplicates

lab_sample_id	field_sample_id	qc_code	param_name	final_result	average	difference	RPD
480-28727-2	OC-SL-3	FS	Calcium	280	280	0	0%
480-28727-5	OC-SL-3 DUP	FD	Calcium	280			
480-28727-2	OC-SL-3	FS	Chromium	0.0012	0.0015	0.0006	40%
480-28727-5	OC-SL-3 DUP	FD	Chromium	0.0018			
480-28727-2	OC-SL-3	FS	Iron	22	22.5	1	4%
480-28727-5	OC-SL-3 DUP	FD	Iron	23			
480-28727-2	OC-SL-3	FS	Manganese	3.5	3.5	0	0%
480-28727-5	OC-SL-3 DUP	FD	Manganese	3.5			
480-28727-2	OC-SL-3	FS	Nickel	0.0039	0.0037	0.0004	11%
480-28727-5	OC-SL-3 DUP	FD	Nickel	0.0035			
480-28727-2	OC-SL-3	FS	Sodium	9.9	9.95	0.1	1%
480-28727-5	OC-SL-3 DUP	FD	Sodium	10			

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10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [ ] **No** [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

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MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date Mike Washburn 12/13/12
Sr. Review/Date Chris Ricardi 2/12/13
Lab Report # 480-28727-1
Project # 61071200016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Check items received. **Yes** [✓] No [ ] N/A [ ] Comments:

[✓] *Name of Laboratory* [✓] *Address* [✓] *Project ID* [✓] *Phone #* [✓] *Sample identification – Field and Laboratory*

Client Information: [✓] *Name* [✓] *Address* [✓] *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

[✓] *Narrative serves as an exception report for the project and method QA/QC performance.* [✓] *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?*

Yes [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ Date and time collected ☑ Analyst Initials ☑ Dilution Factor N/A ☐ % moisture or solids ☑ Reporting limits
N/A ☐ *Clean-up method* ☑ Analysis method ☑ Preparation method ☑ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☐ MS/MSD recoveries and RPDs N/A ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days Sulfide, TDS, TSS = 7 days pH = analyze immediately Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments:

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses,*

therefore all criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity** ☑ = 1 mg/L	Bicarbonate Alkalinity** ☐ = 1 mg/L	Carbonate Alkalinity** ☐ = 1 mg/L
Nitrate Nitrogen as N* ☐ = .05 mg/L	Nitrite Nitrogen as N* ☐ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness *☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☐ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 **Method Blanks** **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS Limits:

Alkalinity** ☑ = 80-120%	Bicarbonate Alkalinity** ☐ = 80-120%	Carbonate Alkalinity** ☐ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☐ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☐ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N**☐ = 80-120%	Nitrite Nitrogen as N** ☐= 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SL-3
OC-SL-6 (MS only)

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [✓] No [ ] N/A [ ] Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data.

Yes [✓] No [ ] N/A [ ] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [✓] No [ ] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes [✓] **No** [ ] N/A [ ] Comments:

Sulfate MS 137

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result
D = MSD result

Yes [ ] **No** [✓] N/A [ ] Comments:

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [ ] No [ ] N/A [✓] Comments:

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 480-92476/52 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92476

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		0.50	0.28	mg/L			11/24/12 00:38	1
Sulfate	ND		2.0	0.35	mg/L			11/24/12 00:38	1

Lab Sample ID: LCS 480-92476/51 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92476

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	20.0	20.7		mg/L		104	90 - 110
Sulfate	20.0	21.2		mg/L		106	90 - 110

Lab Sample ID: 480-28727-2 MS — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92476

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	550		250	895	F	mg/L		137	90 - 110

Lab Sample ID: 480-28727-2 MSD — **Client Sample ID: OC-SL-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92476

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	550		250	824		mg/L		108	90 - 110	8	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 480-92786/30 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92786

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity, Total	ND		5.0	0.79	mg/L			11/26/12 04:44	1

Lab Sample ID: MB 480-92786/54 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92786

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity, Total	ND		5.0	0.79	mg/L			11/26/12 07:09	1

Lab Sample ID: LCS 480-92786/31 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 92786

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity, Total	100	100		mg/L		100	90 - 110

MW
12/13/12

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [✓] No [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☑ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [ ] No [✓] N/A [ ] Comments:

Field Duplicate

lab_sample_id	field_sample_id	qc_code	param_name	final_result	average	difference	RPD
480-28727-2	OC-SL-3	FS	Alkalinity, Total	230	225	10	4%
480-28727-5	OC-SL-3 DUP	FD	Alkalinity, Total	220			
480-28727-2	OC-SL-3	FS	Chloride	4.9	4.85	0.1	2%
480-28727-5	OC-SL-3 DUP	FD	Chloride	4.8			
480-28727-2	**OC-SL-3**	**FS**	**Sulfate**	**550**	555	10	2%
480-28727-5	**OC-SL-3 DUP**	**FD**	**Sulfate**	**560**			

MJW 12/13/12

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

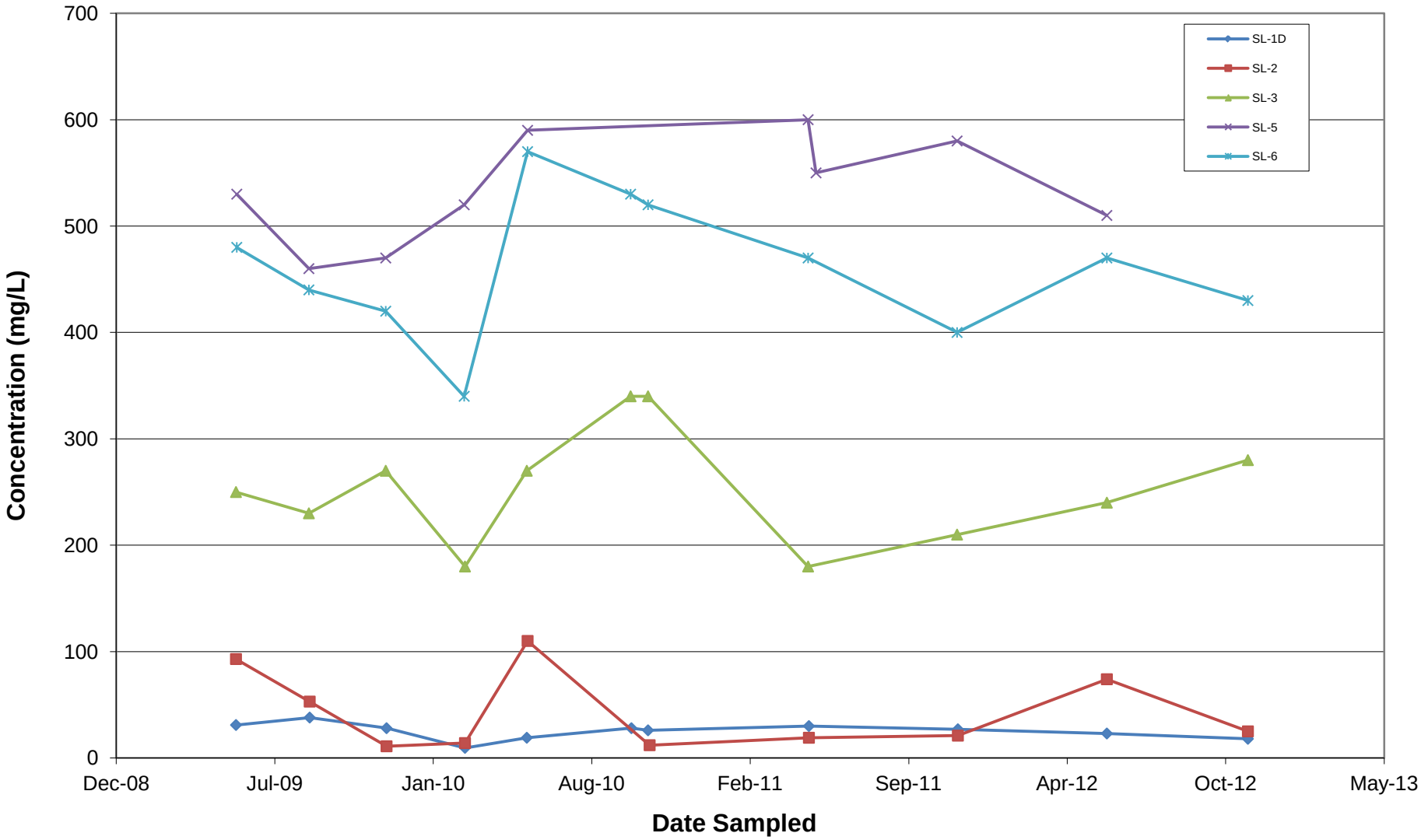
REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

APPENDIX D
DATA TREND PLOTS



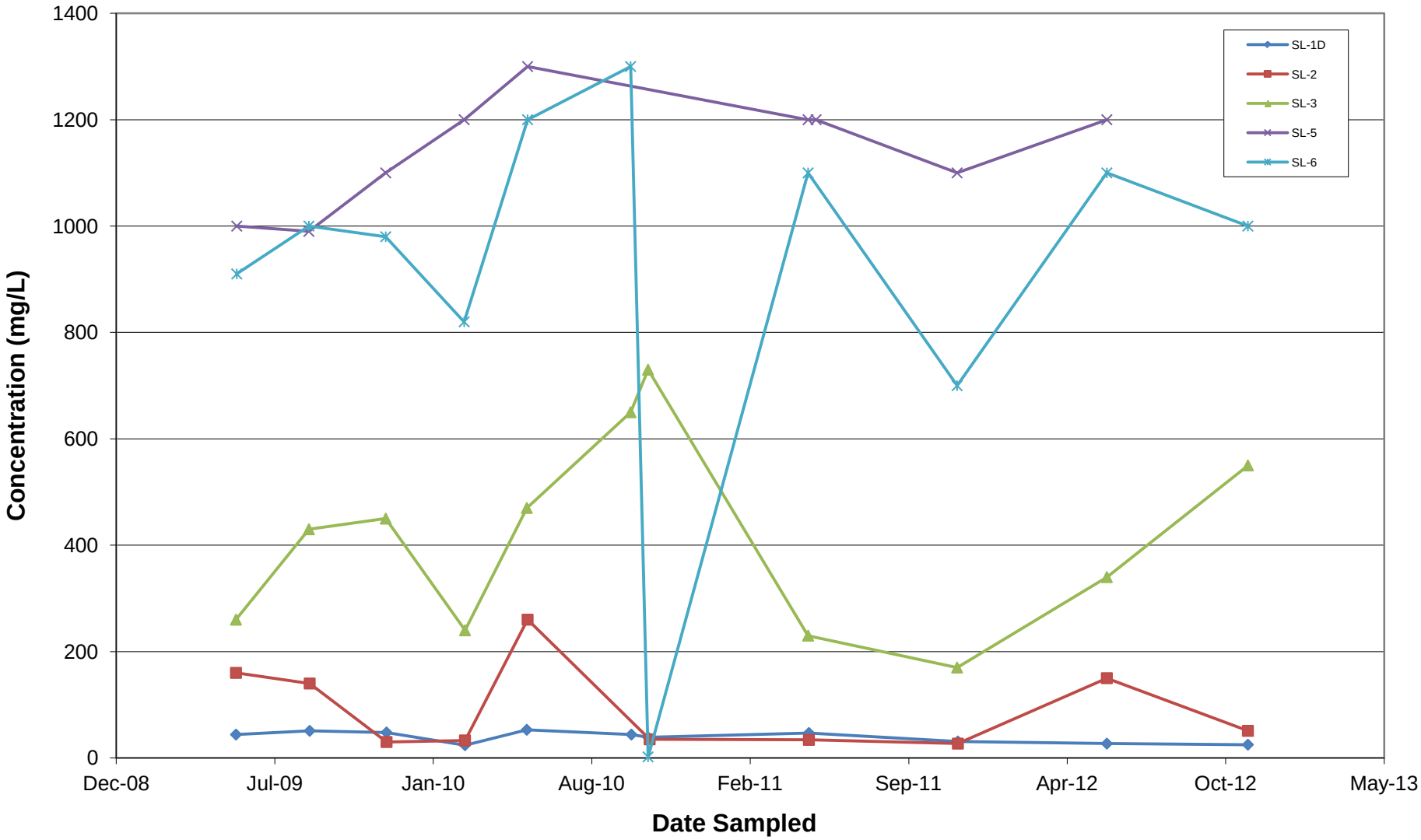
Olin Chemical Superfund Site
Wilmington, Massachusetts

Calcium in Calcium Sulfate Landfill Groundwater

Figure C-1

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Calcium CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



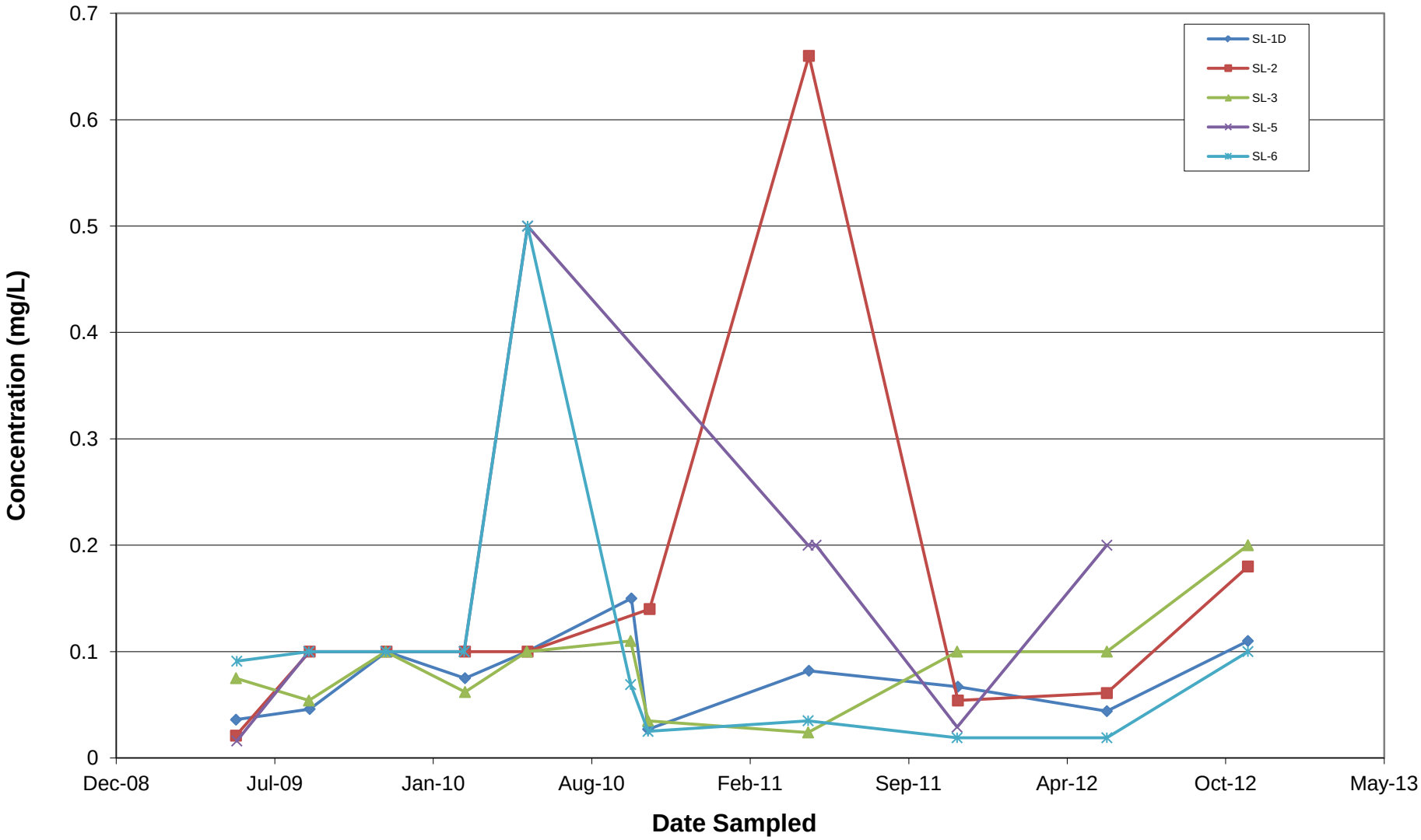
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sulfate in Calcium Sulfate Landfill Groundwater

Figure C-2

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Sulfate CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



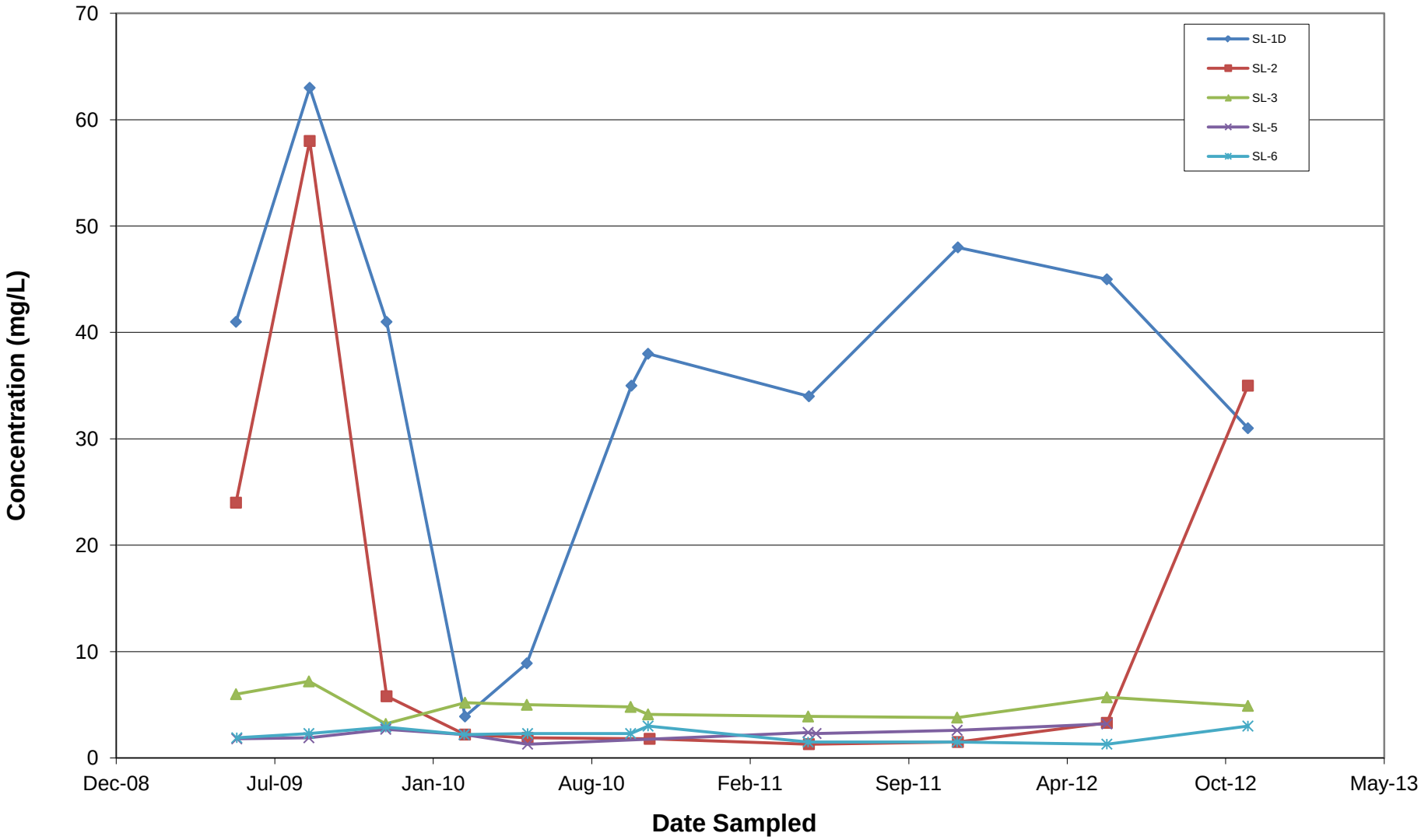
Olin Chemical Superfund Site
Wilmington, Massachusetts

Aluminum in Calcium Sulfate Landfill Groundwater

Figure C-3

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Aluminum CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



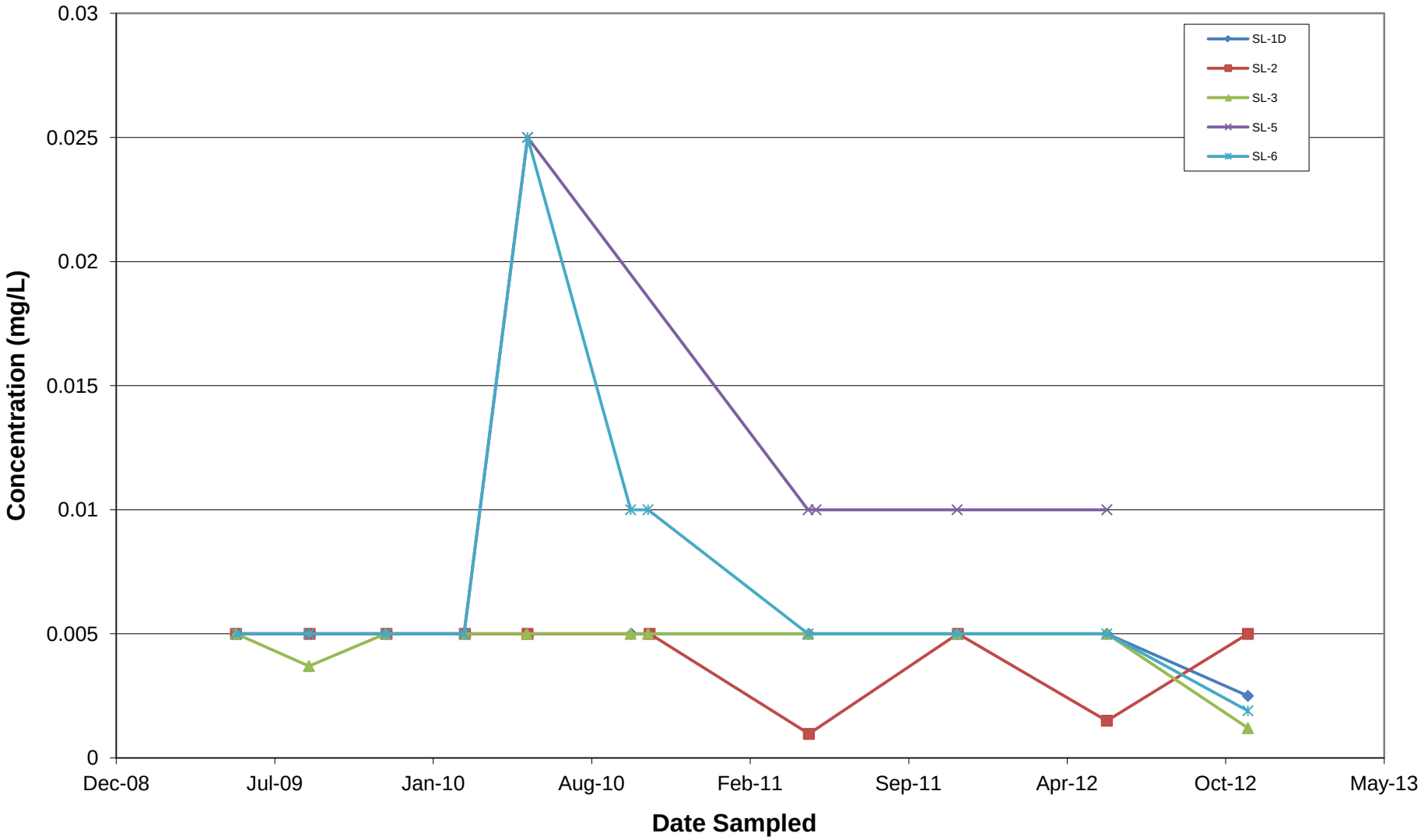
Olin Chemical Superfund Site
Wilmington, Massachusetts

Chloride in Calcium Sulfate Landfill Groundwater

Figure C-4

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Chloride CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



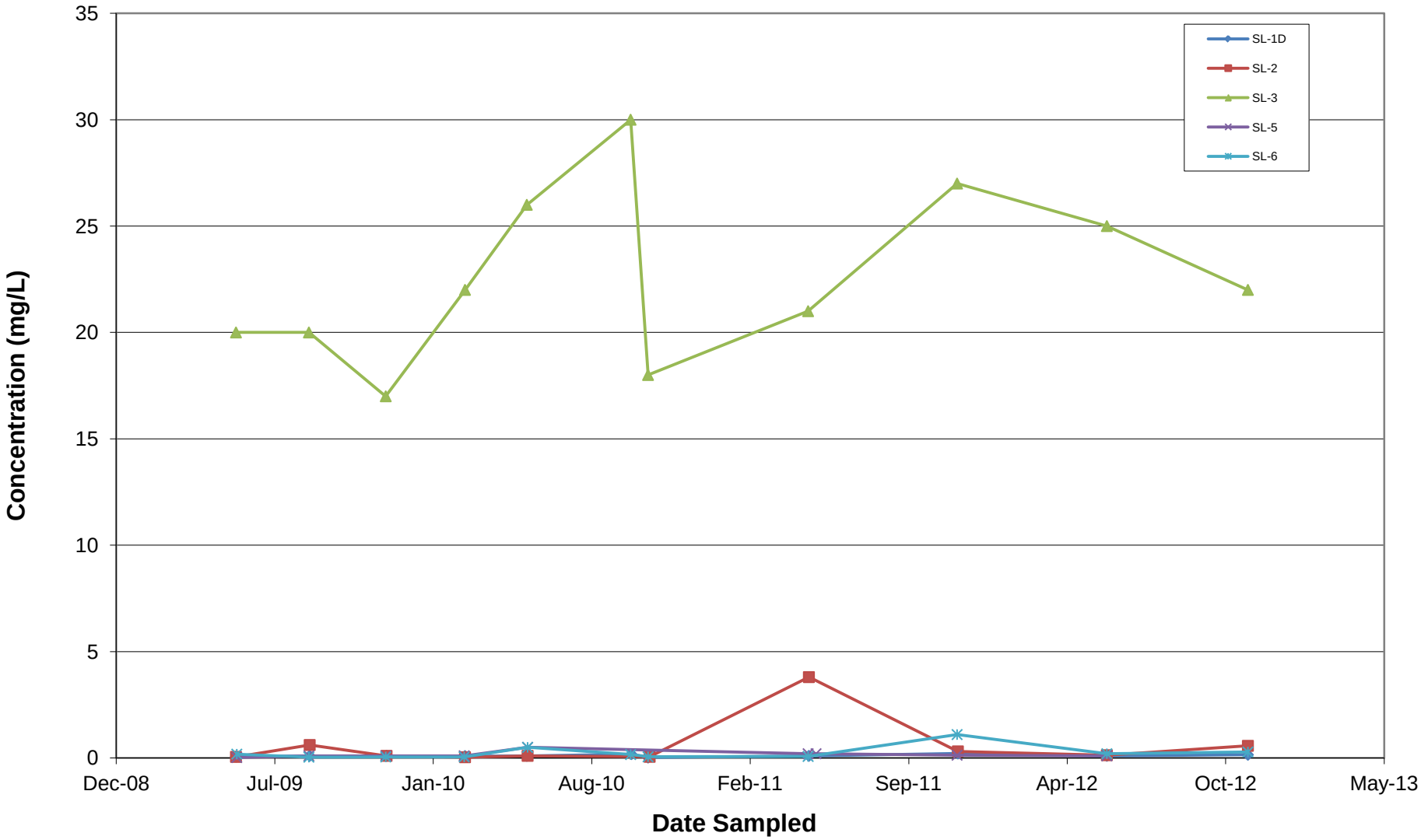
Olin Chemical Superfund Site
Wilmington, Massachusetts

Chromium in Calcium Sulfate Landfill Groundwater

Figure C-5

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Chromium CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



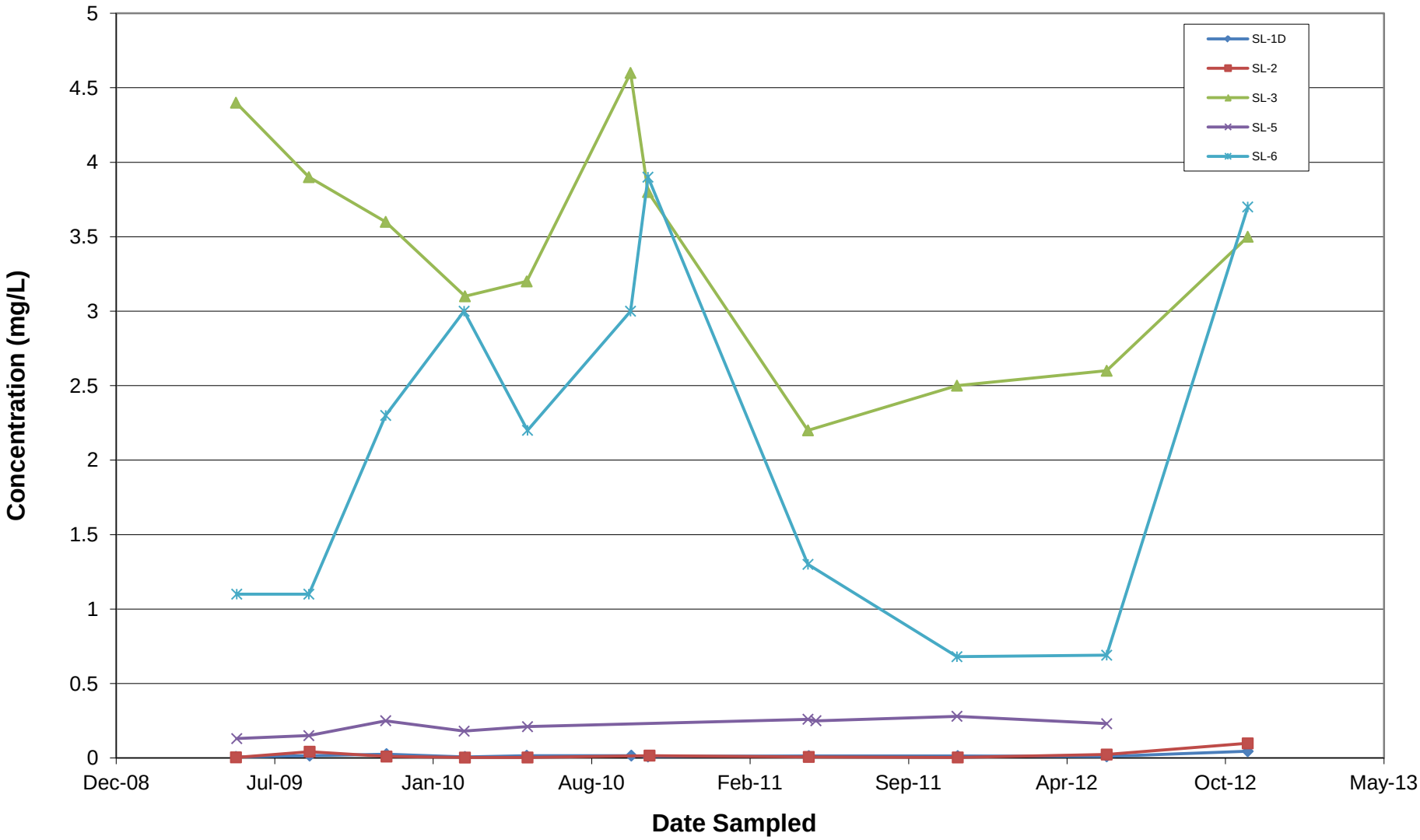
Olin Chemical Superfund Site
Wilmington, Massachusetts

Iron in Calcium Sulfate Landfill Groundwater

Figure C-6

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Iron CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



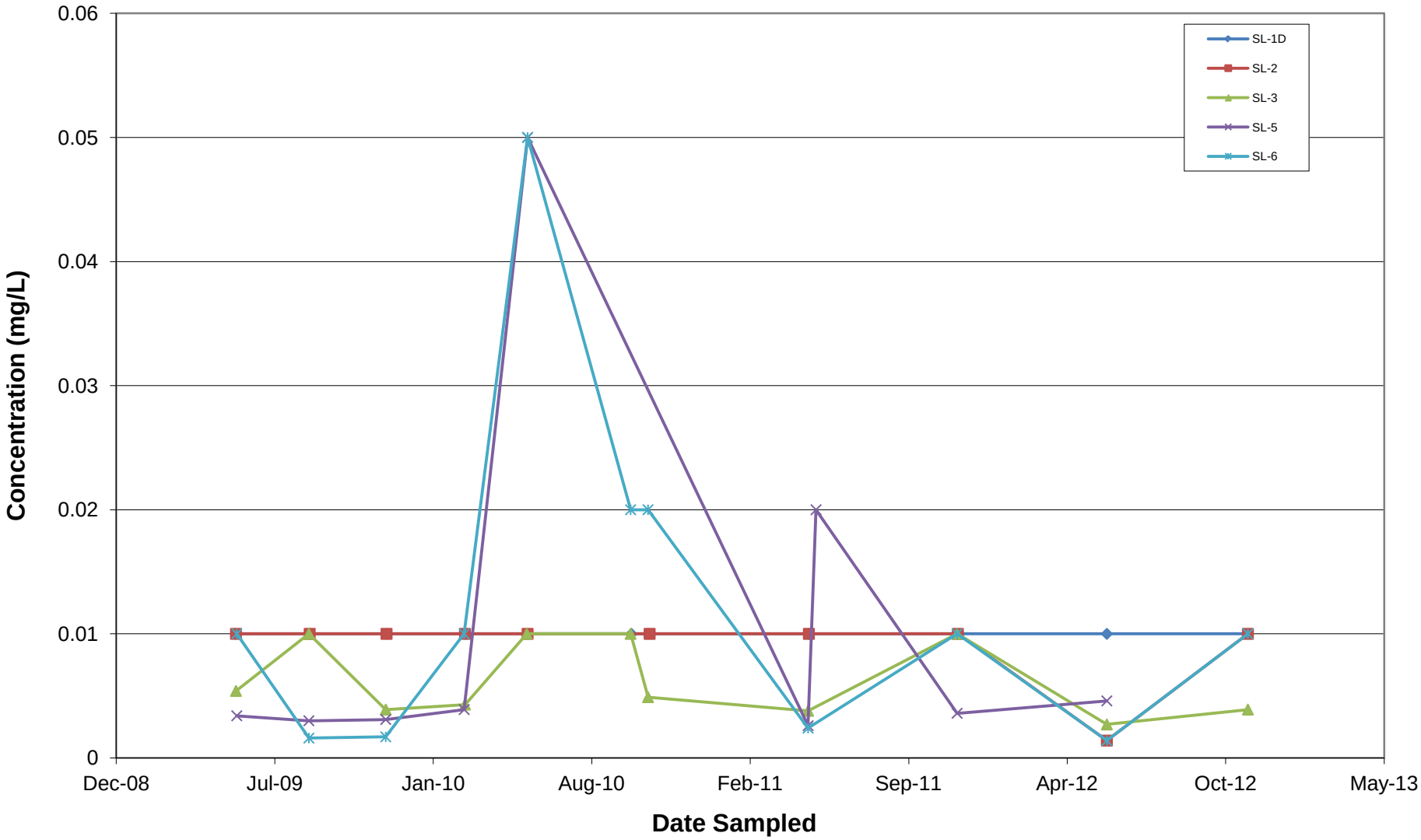
Olin Chemical Superfund Site
Wilmington, Massachusetts

Manganese in Calcium Sulfate Landfill Groundwater

Figure C-7

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Manganese CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



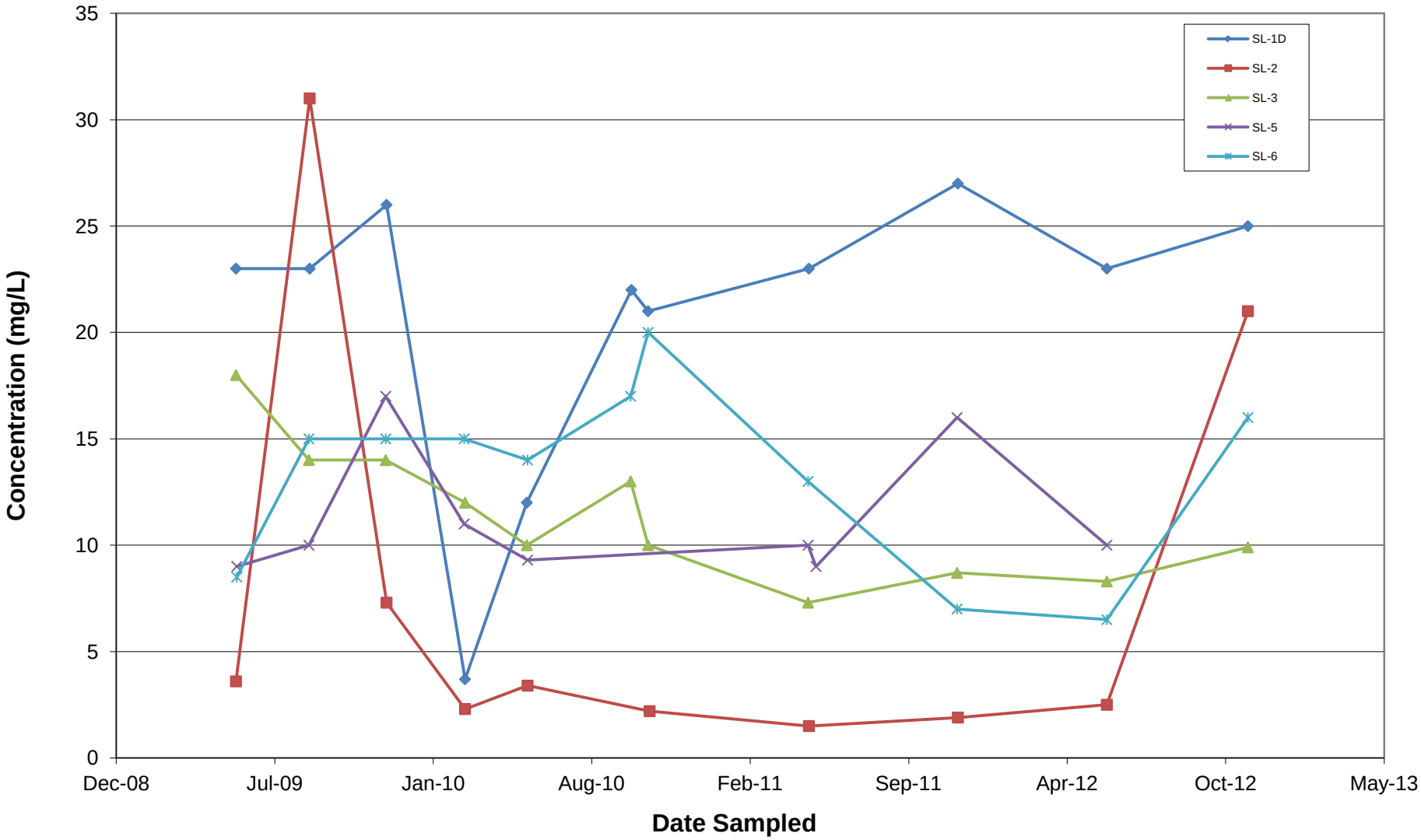
Olin Chemical Superfund Site
Wilmington, Massachusetts

Nickel in Calcium Sulfate Landfill Groundwater

Figure C-8

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Nickel CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012



Olin Chemical Superfund Site
Wilmington, Massachusetts

Sodium in Calcium Sulfate Landfill Groundwater

Figure C-9

P:\Projects\olinwilm\Olin Wilmington CSS 2013\4.0_Deliverables\4.1_Reports\CSL Biennial Report\Appendices\
CSL-GW-Trends to Nov 2012.xls, Sodium CSL

Prepared by: RRD 11/5/2012
Checked by: EYM 11/29/2012

ATTACHMENT D

NORTH POND DATA MEMORANDUM

(Provided on CD)

Memo

To: Mr. James Cashwell (Olin)

From: Brian Roden
Peter Thompson
Michael Murphy

Date: December 10, 2013 (revised April 10, 2014)

Subject: North Pond Investigation
Olin Chemical Superfund Site
Wilmington, Massachusetts

INTRODUCTION

This memorandum has been prepared to summarize the results of the North Pond investigation. The investigation was completed in accordance with the USEPA-approved work plan and the Statement of Work. The results do not indicate the presence of impacts associated with the Olin Chemicals Superfund Site (OCSS). We have identified "historic" sediments that have been present during the long history of North Pond. We have also identified "new" sediments that were emplaced during significant re-work of the North Pond in the 1980s. The historic sediments are not impacted. The new sediments could not have been impacted by the OCSS due to the lack of a current surface water connection and lack of a groundwater migratory connection as described below. Even so, we have agreed to use the data contained herein to perform human health and ecological quantitative risk assessments. The data do not indicate risk above USEPA's acceptable excess lifetime cancer risk range to human health or the environment. Based on this conclusion, we do not recommend carrying the North Pond any further in the Remedial Investigation or Feasibility Study. This memorandum and associated results will be provided as Attachment D in the OU1/OU2 Remedial Investigation (RI) report. The specific procedures, results, and conclusions of the risk assessments are contained in Appendices M and N in the RI report.

Olin maintains the position that the North Pond was not impacted by the OCSS and the results of this investigation support this conclusion. However, the scope of work associated with the North Pond investigation was intended to evaluate the question of potential OCSS impact. The scope of work included the following:

1. Videographic study to assess potential current hydraulic connection between the OCSS and North Pond;

2. Topographic evaluation of the general area to determine whether or not there is a topographic gradient that would support surface flow from the OCSS to North Pond;

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3. Identification of "historic" sediments that were left in place following past dredging/excavation for the purposes of industrial development;

4. Sampling of "historic" and "new" sediments as well as surface water to assess the potential presence of OCSS constituents of interest.

The videographic study was completed and is described below. It indicates that there is no current hydraulic connection between the OCSS and the North Pond. USEPA agreed that the topographic study was not necessary due to known current conditions. The investigation of historic and new sediments and surface water was completed; the results are provided herein.

The North Pond is located southeast of the Olin facility on the border of Wilmington and Woburn just south of Presidential Way (Figure 1). The area surrounding North Pond was largely undeveloped except for a large industrial complex located on its southwestern shore at the time of the 1955 aerial photograph provided by USEPA (Attachment A),.

The North Pond area was developed by other business entities to accommodate various commercial and industrial facilities between 1960 and 1980. In the 1980s, the North Pond area was significantly reworked by non-Olin entities, sediments were excavated and the area filled to construct Presidential Way and to develop areas around the edge of North Pond and Presidential Way per a Superseding Order of Conditions issued by the Massachusetts Department of Environmental Quality in July 1984. The order indicated that 6,000 cubic yards of sediment would be dredged and that 60,000 square feet of the North Pond and wetlands would be filled to construct Presidential Way. The order indicated that dredged sediment would not be used as fill in the pond and also called for dredging of the southern portion of the North Pond. The Massachusetts Department of Environmental Quality Engineering (now MassDEP) issued a Certificate of Compliance on November 6, 1986 to Dundee Park Properties with respect to the July 24, 1984 Superseding Order of Conditions. The Certificate of Compliance stated "the work regulated by the above referenced Order of Conditions has been satisfactorily completed." This indicates that the current surficial sediments in North Pond cannot be impacted by historical disposal practices at the OCSS.

The North Pond has been investigated at various times during the years. Historical (pre-1980) sediments were identified in 2003-2004. This was necessary to evaluate potential impacts to historical North Pond sediments from the OCSS during operation of the plant. Surface soil, subsurface soil, and sediment samples were collected during the 2003/2004 investigation to assess conditions at that time. The data collected did not indicate impacts from the OCSS, but the samples were not analyzed for the extensive list of compounds prescribed by the Remedial Investigation (RI) work plan. The historical sediments were sampled again during the 2013 RI investigation as described below. The North Pond area and various boring locations are shown on Figure 1. The analytical results associated with the soil samples collected during 2003/2004 are provided in Table 1, while those of the sediment samples are provided in Table 2.

A camera study was completed in 2010, with oversight by USEPA, to assess the potential connection between North Pond and the OCSS through an existing culvert. On October 21, 2010, Clean Harbors utilized a mobile camera (crawler – cyclops camera system mounted on

wheels positioned four-inches off the ground) to investigate the culvert outlet located under Woburn Street in an easterly direction (under Woburn Street) and westerly direction (under 887 Woburn Street). The mobile camera was only able to survey 3.7 feet in an easterly direction and 6.2 feet in a westerly direction due obstructions of heavy debris (80% of the culvert was filled with sediment) in both directions. The camera study location is identified on Figure 1 by the label indicating the "Exiting Opening" where the culvert is visible. Camera study photographs are included in Attachment B. The owner of Whitney Barrel indicated anecdotally that the culvert Olin surveyed was fabricated and installed by Whitney Barrel to help drain the parking lot.

Based on numerous inspections, including the camera survey, and reports by USEPA both USEPA and Olin concur there is no evidence of an existing surface water connection between South Ditch and North Pond. The culvert which was the subject of the camera inspection is in poor condition and no active flow was observed. Further, there is no visual evidence of an existing culvert opening to convey flow under the active MBTA rail road tracks. The current condition (which appears to have existed since 1955), is that flow from the South Ditch enters the East Ditch on the west side of the railroad tracks and flows southward towards the New Boston Drainage Way in Woburn.

The remainder of this memorandum describes 1) the scope of work completed during 2013, 2) the results of the current study, 3) a comparison of the data from the North Pond and South Ditch, 4) conceptual site model information to aid in evaluating the results in context, and 5) the final conclusions.

SCOPE OF WORK and RESULTS

Soil Borings

In March 2013, AMEC advanced six soil borings within the historic bounds of North Pond (Figure 1). Each soil boring was logged and inspected to identify an organic layer that may represent historical North Pond sediments. An organic layer was present at each soil boring location and a soil sample was collected from that organic layer. Soil samples were analyzed for volatile organic compounds (VOCs), SVOCs, N-Nitrosodimethylamine (NDMA), metals including hexavalent chromium, and inorganics. Soil boring logs are provided in Attachment C.

As shown in Table 3, eight VOCs, six SVOCs, 22 metals, and four inorganics were detected in the 2013 soil borings. The VOCs detected in soil (historic sediments) samples are not chemicals of interest and are not attributable to the OCSS. The SVOCs detected in soils are all PAHs and were detected at low frequency and are commonly detected in sediments in urban/suburban water bodies. As expected, several naturally-occurring metals and inorganics were also detected in soil samples. In particular, the concentrations of chromium are orders of magnitude lower than those reported in sediments at the OCSS. The concentrations and types of constituents detected do not indicate impact of the historic North Pond sediment from the OCSS.

Surface Water and Sediment

At the time the soil borings were completed in March 2013, North Pond was frozen and inaccessible. In June 2013, AMEC collected four surface water and sediment samples by boat from the current North Pond at locations shown in Figure 1. Surface water and sediment samples were analyzed for VOCs, SVOCs, NDMA, metals including hexavalent chromium, and inorganics. These samples were collected to determine if there is evidence of impact to current sediments from the OCSS. The current sediments of North Pond were established in 1980 and later, well after any facility discharges to the ditch system at the Olin property. Surface water and sediment logs are provided in Attachment C.

Surface water results are shown in Table 4. One VOC (acetone likely a laboratory artifact), 16 SVOCs, 14 metals, and five inorganics were detected in at least one of the 2013 surface water samples. The SVOCs detected include polycyclic aromatic hydrocarbons (PAHs) and several phthalates, including bis(2-ethylhexyl)phthalate (BEHP). The low levels of BEHP and Di-n-butylphthalate detected in surface water samples from North Pond are consistent with the low level detections of BEHP and Di-n-butylphthalate in the duplicate surface water sample (SW/SD-600) collected from the surface water that flows into North Pond from the area of the former Ritter Trucking and other industrial facilities located to the north. Di-n-octylphthalate and BEHP were released to sediment and surface water from the Ritter Trucking Site as reported by USEPA in their 1998 Final Site Inspection and Prioritization Report.

Chromium, ammonia and sulfate were among the constituents detected in surface water in North Pond but they were also detected at concentrations consistent with those found in the sample collected from surface water flowing into the pond from the area of the former Ritter Trucking facility and other industrial properties to the north. NDMA, BEHP, chromium, and ammonia were not detected in shallow groundwater samples collected adjacent and upgradient to North Pond (the most recent OU3 sampling events in monitoring well GW-74S). This demonstrates that there is not a completed migration pathway for these OCSS chemicals of interest between shallow groundwater and surface water of the pond. NDMA was not detected in surface water samples from North Pond. The North Pond surface water data for these chemicals of interest demonstrate no impact to North Pond from the OCSS and are consistent with analytical data associated with surface water entering North Pond from industrialized areas to the north.

Sediment results are shown in Table 5. Four VOCs, 14 SVOCs, 24 metals, and four inorganics were detected one or more times in the 2013 sediment samples. Most of the SVOC detections were PAHs, consistent with the industrialized setting of the area and storm water runoff from the industrialized area. Both 2,4,4-Trimethyl-1-pentene (TM1P) and BEHP were detected in one of five samples at low estimated concentrations at different locations whereas chromium, hexavalent chromium, and ammonia, as well as almost other metals were detected in all samples at low concentrations. The ammonia concentration increases with increasing organic content of the sediment indicating the presence of ammonia is related to organic matter in the sediment (and likely related to biological activity). As indicated previously in the discussion of surface water, BEHP was clearly released to North Pond via to the drainage to the north (from Ritter Trucking) and the one detection of BEHP in current sediment was at SW/SD-602 within

the portion of North Pond where the outfall of that drainage feature enters North Pond. The source of the one low-level detection of TM1P is unknown, although it appears to be present only recently. The fact that it was only detected once, in one media (current sediment), at a low estimated concentration, indicates that it is not present as a result of impacts from the OCSS.

COMPARISON OF SOUTH DITCH AND NORTH POND DATA

The North Pond investigation has not identified any historical or current physical connection between the OCSS and North Pond. The final component of this assessment compares the analytical data for constituents detected in surface water and sediment samples at the OCSS (South Ditch and East Ditch) to the analytical data for constituents detected in North Pond historical sediment samples and current surface water and sediment samples. The analytical data indicate there are no historical or current complete migration pathways between the OCSS and North Pond.

Table 6 presents a comparison of the list of detected parameters, the frequency of detection, and the range of detected concentrations of OCSS chemicals of interest for sediment samples from the lower South Ditch, East Ditch, and the North Pond (historical and current-day samples). Also attached is a complete summary of historical sediment data for the South Ditch and East Ditch (from the 1997 Comprehensive Site Investigation Report) (Attachment D). Table 7 presents a similar comparison for surface water.

As shown in Table 6, many of the analytes that were detected in the lower South Ditch and East Ditch sediment samples are not detected or are not detected frequently in historic North Pond sediment samples (soil borings) or current North Pond sediment samples. For example, BEHP was detected in all 24 sediment samples in the South Ditch and all but one of the sediment samples in the East Ditch. However BEHP was detected in only one of twelve historic sediment samples and three of seven current sediment samples in North Pond. In addition, the BEHP concentration detected in the one North Pond historic sediment sample was substantially lower than BEHP concentrations from the South Ditch and East Ditch. BEHP was also released to North Pond from Ritter Trucking and low level BEHP detections cannot be attributed or considered as evidence of a former connection to the OCSS and North Pond. Also N-nitrosodiphenylamine (NDPA), which has been detected frequently in both South Ditch and East Ditch sediment samples, was not detected in either North Pond current or historic sediment samples.

As shown in Table 7, several other chemicals of interest (NDMA, NDPA, TM1P, and TM2P) which have been detected in South Ditch and East Ditch surface water samples were not detected in North Pond surface water. Other parameters detected in North Pond surface water are either naturally occurring (metals) or common anthropogenic compounds (e.g, PAHs).

A well-documented release of BEHP and other chemicals occurred in the immediate vicinity of North Pond at the former Ritter Trucking facility and affected a surface water drainage feature that flows into North Pond. Therefore, the presence of BEHP, PAHs, and metals/inorganics in sediment samples from North Pond, by itself, is not sufficient to conclude that a connection

between South Ditch and North Pond existed, especially if the concentrations detected in North Pond are low.

In addition to the existing chemistry data, a remote-controlled camera investigation of a culvert located between the Whitney Barrel property and North Pond did not confirm a current surface water connection between the East Ditch and North Pond. In addition, results of groundwater sampling in the immediate vicinity of North Pond do not support the presence of a current groundwater pathway between the OCSS and North Pond.

CONCEPTUAL SITE MODEL

The major components of the North Pond conceptual site model (CSM) are summarized below to provide context in interpreting North Pond data. Historic sediments from North Pond are discussed separately from current surface water and sediment. Based on the Superseding Order of Conditions issued by the Massachusetts Department of Environmental Quality in 1984, it appears that: 1) the historic sediments from the pond were excavated in the 1980s, 2) the pond was almost completely re-worked during the construction of Presidential Way and the development of additional commercial/industrial buildings on fill placed into the pond (approximately 73% of the pond has been filled), and 3) physical modifications to the pond to enhance its flood storage capacity.

Potential Contaminant Sources

There are several potential and documented sources of impacts to North Pond including storm water flow from the general industrial area around North Pond and operations at businesses with known environmental releases (Ritter Trucking and Whitney Barrel). The USEPA Final Site Inspection Prioritization Report (FSIPR) for Ritter Trucking was completed in 1998. This report identifies numerous inputs to North Pond including roof drains from a property located at 2 Industrial Way, storm sewers located along Woburn Street, and run off from the Ritter Trucking Property that included soil stockpiles from two known spills. Stockpiled soils were contaminated with VOCs (acetone, BTEX compounds, 1,2-dichloroethane), SVOCs (BEHP, pyrene, anthracene, naphthalene), and metals (arsenic, cadmium, lead and mercury). Spill number 1 was a phthalate ester from a tanker truck which flowed over the ground surface and down an embankment onto the southern industrial property adjoining Ritter Trucking. Spill number 2 was fuel related. The FSIPR also identified floor drains impacted with chlorinated VOCs and fuel compounds. Groundwater was also documented as having been impacted by chlorinated VOCs and fuel compounds.

This assessment evaluates the analytical data for North Pond to identify impacts and to evaluate the sources of any impacts.

Migration Pathways

There is no known (past or present) migration pathway of constituents from the OCSS to North Pond. Migration pathways from sources close to North Pond include groundwater, a direct surface water pathway from industrial properties to the north, including Ritter Trucking, and

general industrial run off from Woburn Street and Presidential Way that is directed to a storm sewer system that discharges directly to North Pond and overland flow (run-off) to North Pond from adjacent non-OCSS commercial and industrial properties. The migration pathways from the OCSS that Olin was requested to consider include potential for an historical surface water pathway that would have had to been present prior to 1972 before the facility was connected to the MDC sewer system and ceased discharging process water on-Site, a current surface water pathway, and a current groundwater pathway. As stated above, none of these potential pathways have been verified and the existing chemistry data supports this finding.

Evaluation of Potential OCSS Pre 1972 Surface Water Migration Pathways

During the period of facility operation from 1953 until approximately 1972, liquid waste disposal practices resulted in discharge to the on-Property ditch system including South Ditch from overflow of various structures receiving liquid wastes. The majority of these impacts on-Property have been remediated, greatly reducing the potential for migration of contaminated sediment off-site. Impacted groundwater discharges to South Ditch surface water. South Ditch surface water then flows into the East Ditch and then flows southward from East Ditch to the New Boston Drainage Way.

We have no conclusive evidence that surface flow has ever differed from the conceptual description offered above. USEPA has provided an aerial photo from 1955 that they believe indicates otherwise. However, the referenced photo does not conclusively indicate actual flow of surface water under the MBTA rail line to the North Pond nor does it conclusively indicate that surface water ever flowed from the OCSS to the North Pond. We have attempted to locate a culvert under the MBTA rail line to help assess USEPA's statements, but no culvert has been found. Therefore, we are left to conclude what all evidence points to today – North Pond was/is not impacted by flow of surface water from the OCSS.

Evaluation of Potential OCSS Post 1972 Surface Water Migration Pathways

There is no evidence of a current connection between the South Ditch or East Ditch and the North Pond. Data from USEPA in their 1980 Preliminary Site Assessment Report for Whitney Barrel and Son's further suggests that flow from an identified culvert in East Ditch was from Whitney Barrel to East Ditch, not toward North Pond. Visual inspections conducted on several occasions have not identified any culvert or opening beneath the rail line that separates the East Ditch and the Whitney Barrel property at 888 Woburn Street. The October 2010, culvert investigation on Woburn Street concluded that there does not appear to be a current surface water hydraulic connection between the South Ditch, East Ditch, the "culvert outlet," and North Pond.

Groundwater Migration Pathways

Groundwater pathways to surface water include shallow groundwater from the areas with higher topographic relief than North Pond which include areas to the north and east. Groundwater data from recent OU3 investigations included sampling results for monitoring well GW-74S that is located immediately adjacent to North Pond on the north side. Recent groundwater analytical

results for chemicals of interest (TMPs, BEHP, NDMA, NDPhA, chromium, sulfate and ammonia) are provided in a series of figures for wells located between South Ditch and North Pond in Attachment E. This includes shallow and deep overburden groundwater data for GW-50S, GW-50D, GW-74S, GW-74D, GW-80S, GW-80D and GW-403D (shallow groundwater) and bedrock groundwater data for GW-80BR. As indicated in these figures, the wells are aligned along an approximate straight line, from South Ditch toward North Pond. Therefore groundwater elevation data is not spatially distributed in a way that would allow determining whether groundwater flow is directly to North Pond or slightly to the south as might be expected due to the elevated topography to the north and north east of North Pond. The discussion of groundwater migration pathways therefore relies mainly on the groundwater chemical data.

BEHP was only detected once in two of the eight wells referenced above. BEHP was detected once at a concentration of 0.61J μg/L at well GW-80S and once at a low estimated concentration of 0.5J μg/L at well GW-74D. Well GW-80S is adjacent to Whitney Barrel. Of note, BEHP was not detected in any of the other shallow or deep overburden wells which indicates that BEHP did not migrate from the OCSS to the location of well GW-80S. This pattern of BEHP detection is more consistent with either known releases from Ritter Trucking or potential releases from the Whitney Barrel facility (especially given the nature of the Whitney Barrel business).

TM-2-P was not detected in shallow, deep or bedrock groundwater in the wells discussed. TM-1-P was only detected (1.2 µg/L) in GW-50D, indicating there is no groundwater pathway for TMPs from the OCSS to North Pond.

Sulfate was not detected in shallow groundwater at GW-50S, GW-403, or GW-74S but was detected at low estimated concentrations at GW-80S. Sulfate was detected at a higher concentration (1,100 and 1,800 mg/L) at GW-50D but relatively low concentrations (3.4 and 14 mg/L) at GW-80D and slightly higher concentrations at GW-74D (18 and 22 mg/L). Sulfate was not detected at GW-80BR. Sulfate is ubiquitous in the environment.

Ammonia was detected at higher concentrations in deeper groundwater at GW-50D compared to GW-50S. Ammonia was detected in shallow groundwater at GW-80S at similar low concentrations. Ammonia was detected at low concentrations in bedrock groundwater. Ammonia was not detected at GW-74S or GW-74D. Ammonia is ubiquitous in the environment.

Chromium was not detected in either shallow or deep overburden groundwater at GW-50 S/D or GW-403. Chromium was detected at GW-80S/D and GW-80BR with the higher concentrations occurring in shallow groundwater. Chromium was not detected in GW-74S or GW-74D. The detection of higher concentrations of chromium in shallow groundwater at GW-80S, (which is located immediately adjacent to a railroad spur and Whiney Barrel) is likely related to activities at one of these locations.

NDPA was not detected in shallow, deep or bedrock groundwater for the wells discussed. NDMA was detected in groundwater at all wells except GW-403, GW-74S and GW-74S. Concentrations of NDMA are highest in deeper groundwater with the highest concentrations upgradient at GW-50D.

Overall the patterns of groundwater concentrations of COIs, in particular TMPs, BEHP and chromium (which are present in North Pond sediment) do not indicate a groundwater pathway from the OCSS to North Pond. With the exception of BEHP which has other documented sources, the only COI detected at GW-74S and GW-74D was sulfate, which also has other sources in the environment.

SUMMARY OF RESULTS

Comparison of chemical data collected from South Ditch and East Ditch and the North Pond do not support either an historical or current connection between OCSS and North Pond. This is also supported by the CSM which indicates no conclusive evidence of a historical connection from the South Ditch or East Ditch to North Pond. Additionally, there is no current connection from the South Ditch or East Ditch to North Pond. Therefore, there is no indication of an impact to North Pond from the OCSS.

Two different soil boring programs have been conducted in the area of historic North Pond in an attempt to located historic sediments. The organic layer from soil borings, presumed to represent historical sediment, has been sampled and analytical results of soil sampling indicate there is no impact from the OCSS to these subsurface organic soils.

Current surface water and sediments from North Pond have also been sampled and analyzed. As indicated in the CSM the potential for a current migration pathway between the OCSS and current North Pond surface water and sediments via groundwater discharge to the pond was considered. However, the analytical data for groundwater samples collected immediately adjacent to North Pond indicate that for OCSS chemicals of interest, there is no current complete migration pathway between groundwater and the surface water or sediment of North Pond.

CONCLUSIONS AND RECOMMENDATIONS

The chemical data collected for North Pond indicate no impact to North Pond attributable to the OCSS. There is no conclusive evidence of a physical historic surface water connection and there is no current surface water connection between the South Ditch or East Ditch and North Pond. The data indicate historical North Pond sediment (accessed in soil borings) and current surface water and sediment in North Pond are not impacted by the OCSS. Based on these data and lack of a current connection through surface water or groundwater, no further investigation or evaluation of the North Pond area is warranted. In fact, the very limited impacts at North Pond are most likely associated with older documented releases from adjacent industrial properties and anthropogenic sources including run-off from roadways, paved surfaces, and adjacent facilities. Given the relatively recent age of sediment in North Pond, any impacts to those sediments cannot be attributed to historical disposal practices at the OCSS.

The investigation was completed in accordance with the USEPA-approved work plan and the Statement of Work. The results do not indicate the presence of impacts associated with the OCSS. Based on this conclusion, we recommend that this memorandum be provided as Attachment D in the OU1/OU2 RI report and the results summarized. Although the results

support that the North Pond is clearly not part of the OCSS, Olin has agreed to conduct quantitative risk assessments which are included in the RI Report. The risk assessments concluded that risk to populations and communities of ecological receptors exposed to North Pond surface water and sediment are unlikely and potential cancer and noncancer risks to trespassers for exposures to surface water and sediment of North Pond are below the CERCLA acceptable cancer risk range and the hazard index threshold of 1, respectively. The specifics of the human health and ecological risk assessments for North Pond are included in Appendices M and N of the RI Report.

TABLES

Table 1
Summary of Detected Parameters - 2003-2004 North Pond Soil Borings
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	NPSB1 NPSB1-Fill1 11/20/2003 0-2 ft	NPSB1 NPSB1-SED1 11/20/2003 6-7.5 ft	NPSB1 NPSB1-SOIL1 11/20/2003 9-11 ft	NPSB2 NPSB2-Fill1 11/20/2003 2-3 ft	NPSB3 NPSB3-Fill1 11/20/2003 2-4 ft
Volatile Organics (mg/kg)									
Toluene	1 / 7	0.0017 : 0.11	0.0042 - 0.0042	0.0094		0.003 U	0.003 U		
Semivolatile Organics (mg/kg)									
Bis(2-Ethylhexyl)phthalate	1 / 5	0.4 : 2.4	0.73 - 0.73	0.84		2.2 U			
Pesticides (mg/kg)									
4,4'-DDT	2 / 5	0.011 : 0.013	0.027 - 0.047	0.018		0.013 U			
Metals (mg/kg)									
Arsenic	8 / 8		1.22 - 60	11.7	60	4.72		7.97	3.29
Chromium	8 / 8		15.5 - 53.8	33	18.8	17.5		50.6	53.8
Chromium, Trivalent	5 / 5		15.5 - 53.8	31	18.8	17.6		50.6	53.8
Lead	8 / 8		2.76 - 18.4	9.5	5.82	5.18		18.4	6.24
Mercury	1 / 8	0.049 : 0.13	0.052 - 0.052	0.040	0.049 U	0.06 U		0.052	0.05 U
Thallium	2 / 8	0.628 : 1.7	0.944 - 3.48	0.99	1.19 U	0.696 U		0.944	3.48
Inorganics (mg/kg)									
Chloride	7 / 7		6.4 - 70.8	30		70.8	15.2		
Nitrogen, as Ammonia	7 / 7		4.5 - 55.8	27		55.8	4.5		
Percent Solids **(%)**	10 / 10		69.5 - 92.8	84	92.8	76.2	80.9	88.2	92
pH **(pH units)**	4 / 4		6.5 - 7.37	6.7		6.5	6.57		
Sulfate	7 / 7		5.6 - 96	30		15.5	25.5		

1 - Average uses half the reporting limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected, value is reporting limit
J - Estimated

Table 1
Summary of Detected Parameters - 2003-2004 North Pond Soil Borings
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	NPSB3 NPSB3-SED1 11/20/2003 9.4-10.4 ft	NPSB3 NPSB3-SOIL1 11/20/2003 10.4-12 ft	NPSB4 NPSB4-Fill 9/8/2004 0-2 ft	NPSB4 NPSB4-Sed 9/8/2004 5-7 ft	NPSB4 NPSB4-Soil 9/8/2004 10-11.5 ft
Volatile Organics (mg/kg)					
Toluene	0.003 U	0.003 U	0.0042	0.0017 U	0.11 U
Semivolatile Organics (mg/kg)					
Bis(2-Ethylhexyl)phthalate	0.4 U		0.73 J	2.4 U	1.9 U
Pesticides (mg/kg)					
4,4'-DDT	0.012 U		0.011 U	0.047	0.027
Metals (mg/kg)					
Arsenic	1.22		5.1	7.5	3.7
Chromium	15.5		50	32	29
Chromium, Trivalent	15.5				
Lead	2.76		12	17	8.2
Mercury	0.052 U		0.1 U	0.13 U	0.1 U
Thallium	0.628 U		1.5 U	1.7 U	1.2 U
Inorganics (mg/kg)					
Chloride	39.1	60.8	6.4	6.4	8.1
Nitrogen, as Ammonia	13	5.9	43	43	21
Percent Solids **(%)**	83.2	82.8	84.3	69.5	86.2
pH **(pH units)**	7.37	6.53			
Sulfate	6.3	5.6	12	96	50

1 - Average uses half the reporting limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected, value is reporting limit
J - Estimated

Prepared/Date: BJR 9/13/13
Checked/Date: KJC 10/15/13

Table 2
Summary of Detected Parameters - 2003 North Pond Sediment Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	NPSED1 NPSED1-SED1 11/20/2003 0-1 ft	NPSED1 NPSED1-SED1 DUP 11/20/2003 0-1 ft
Volatile Organics (mg/kg)						
Acetone	2 / 2		0.96 - 1.6	1.3	0.96 N	1.6 N
Semivolatile Organics (mg/kg)						
Bis(2-Ethylhexyl)phthalate	2 / 2		4.2 - 5.2	4.7	5.2	4.2
Fluoranthene	2 / 2		1.9 - 2.9	2.4	2.9 J	1.9 J
Pyrene	2 / 2		2.5 - 3.3	2.9	3.3 J	2.5 J
Metals (mg/kg)						
Antimony	2 / 2		2.68 - 2.81	2.7	2.81 J	2.68 J
Arsenic	2 / 2		13.4 - 14.7	14.1	14.7	13.4
Chromium	2 / 2		1320 - 1580	1450	1320	1580
Chromium, Hexavalent	2 / 2		57.8 - 127	92	57.8 J	127 J
Chromium, Trivalent	2 / 2		1260 - 1450	1355	1260 J	1450 J
Lead	2 / 2		91.6 - 97.1	94	97.1	91.6
Mercury	2 / 2		0.282 - 0.369	0.33	0.369	0.282
Thallium	1 / 2	1.14 : 1.14	1.56 - 1.56	1.1	1.56 J	1.14 UJ
Inorganics (mg/kg)						
Chloride	2 / 2		182 - 223	203	182	223
Nitrogen, as Ammonia	2 / 2		233 - 245	239	245	233
Percent Solids **(%)**	2 / 2		42.2 - 44.4	43	42.2	44.4
pH **(pH units)**	2 / 2		6.13 - 6.26	6.2	6.26	6.13
Sulfate	2 / 2		33.8 - 35.3	35	35.3	33.8

1 - Average uses half the reporting limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected,
value is reporting limit
J - Estimated
N - Presumptively present

Prepared/Date: BJR 9/13/13
Checked/Date: KJC 10/15/13

Table 3
Summary of Detected Parameters - 2013 North Pond Soil Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	SB-600 OC-SB-600-6.0/8.0-XXX 3/6/2013 6-8 ft	SB-601 OC-SB-601-6.0/8.0-XXX 3/6/2013 6-8 ft	SB-602 OC-SB-602-7.0/9.0-XXX 3/7/2013 7-9 ft	SB-603 OC-SB-603-7.0/9.0-XXX 3/7/2013 7-9 ft
Volatile Organics (mg/kg)								
2-Butanone	4 / 7	0.023 : 0.028	0.027 - 0.11	0.039	0.061 J	0.039 J	0.11	0.028 U
Acetone	7 / 7		0.023 - 0.51	0.17	0.24 J	0.18 J	0.51 J	0.075 J
Benzene	1 / 7	0.0023 : 0.0072	0.0096 - 0.0096	0.0030	0.004 U	0.0035 U	0.0072 U	0.0028 UJ
Carbon disulfide	1 / 7	0.0023 : 0.0072	0.0038 - 0.0038	0.0021	0.004 U	0.0035 U	0.0072 U	0.0028 UJ
Ethyl benzene	1 / 7	0.0023 : 0.0072	0.0011 - 0.0011	0.0017	0.004 U	0.0035 U	0.0072 U	0.0028 UJ
Methyl Tertbutyl Ether	1 / 7	0.0023 : 0.0072	0.0013 - 0.0013	0.0017	0.0013 J	0.0035 U	0.0072 U	0.0028 UJ
Toluene	1 / 7	0.0023 : 0.0072	0.0071 - 0.0071	0.0026	0.004 U	0.0035 U	0.0072 U	0.0028 UJ
Xylenes (m&p)	1 / 7	0.0046 : 0.014	0.0014 - 0.0014	0.0033	0.0079 U	0.007 U	0.014 U	0.0056 UJ
Semivolatile Organics (mg/kg)								
Benzo(a)pyrene	1 / 7	0.043 : 0.86	0.23 - 0.23	0.27	0.23 J	0.42 U	0.64 U	0.043 U
Benzoic Acid	2 / 7	2.3 : 4.3	0.14 - 1	1.3	2.4 UJ	1 J	3.2 UJ	0.14 J
Fluoranthene	1 / 7	0.043 : 0.86	0.45 - 0.45	0.27	0.48 U	0.42 U	0.64 U	0.043 U
Pentachlorophenol	2 / 7	0.45 : 0.86	0.017 - 0.15	0.26	0.48 U	0.15 J	0.64 U	0.017 J
Phenanthrene	1 / 7	0.043 : 0.86	0.28 - 0.28	0.25	0.48 U	0.42 U	0.64 U	0.043 UJ
Pyrene	1 / 7	0.043 : 0.86	0.4 - 0.4	0.26	0.48 U	0.42 U	0.64 U	0.043 UJ
Metals (mg/kg)								
Aluminum	7 / 7		3400 - 11000	6900	5700 J	11000 J	11000 J	5700 J
Arsenic	7 / 7		0.86 - 9.6	3.9	3.1	9.6	3.1	0.86 J
Barium	7 / 7		7.5 - 65	31	31	61	65	7.5
Beryllium	6 / 7	0.23 : 0.23	0.046 - 2.1	0.55	0.9	0.24	2.1	0.13 J
Cadmium	6 / 7	0.24 : 0.24	0.051 - 0.26	0.13	0.15 J	0.26	0.17 J	0.24 U
Calcium	7 / 7		530 - 5800	2433	2700	4000	5800	530
Chromium	7 / 7		6.4 - 80	32	20	37	65	6.4
Chromium, Hexavalent	4 / 7	0.25 : 0.39	0.3 - 1.2	0.44	0.3 J	0.25 UJ	0.39 UJ	0.26 UJ
Cobalt	7 / 7		0.72 - 9.2	3.1	2.2	9.2	1.8	0.72
Copper	7 / 7		1.8 - 28	8.5	3.9	28	4.7	1.8
Iron	7 / 7		2100 - 14000	5857	3000 J	14000 J	3800 J	2100 J
Lead	7 / 7		2.1 - 16	7.9	12	16	11	2.1
Magnesium	7 / 7		660 - 4800	1803	660	4800	1400	760
Manganese	7 / 7		28 - 320	131	130 J	320 J	180 J	28 J
Mercury	4 / 7	0.12 : 0.13	0.014 - 0.1	0.058	0.041 J	0.059 J	0.1 J	0.014 J
Nickel	7 / 7		2.6 - 12	6.4	2.6	12	7.6	3.3
Potassium	7 / 7		300 - 2000	813	340	2000	540	300
Selenium	6 / 7	0.7 : 0.7	0.63 - 3.7	1.2	1.3	0.87	3.7	0.63
Sodium	6 / 7	210 : 210	140 - 370	222	180 J	330	370	140 J
Tin	7 / 7		0.59 - 2.8	1.3	1.5 J	2.8	1.4 J	0.59 J
Vanadium	7 / 7		4.7 - 33	11.8	5.4	33	7.6	4.7
Zinc	7 / 7		4.7 - 43	16.8	6.8	43	13	4.7

Table 3
Summary of Detected Parameters - 2013 North Pond Soil Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	SB-600 OC-SB-600-6.0/8.0-XXX 3/6/2013 6-8 ft	SB-601 OC-SB-601-6.0/8.0-XXX 3/6/2013 6-8 ft	SB-602 OC-SB-602-7.0/9.0-XXX 3/7/2013 7-9 ft	SB-603 OC-SB-603-7.0/9.0-XXX 3/7/2013 7-9 ft
Inorganics (mg/kg)								
CARBON	7 / 7		56 - 610	218	66 J	56 J	91 J	610 J
Chloride	7 / 7		40 - 990	208	120	990	150	50
Nitrate as N	7 / 7		0.56 - 3	1.3	2.2	0.56 J	3	1.1 J
Nitrogen, as Ammonia	6 / 7	4.9 : 4.9	4.2 - 47	14.9	20	16	47	4.2
Percent Moisture **(%)**	7 / 7		22 - 49	28	30	22	49	23
Percent Solids **(%)**	7 / 7		51 - 78	72	70	78	51	77
pH **(pH units)**	7 / 7		5.91 - 7.18	6.6	5.91	6.08	6.7	5.94
Sulfate	6 / 7	28 : 28	22 - 200	88	120	200	180	28 U

1 - Average uses half the reporting
limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected,
value is reporting limit
J - Estimated

Table 3
Summary of Detected Parameters - 2013 North Pond Soil Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	SB-604 DUP-5 3/7/2013 9-11 ft	SB-604 OC-SB-604- 9.0/11-XXX 3/7/2013 9-11 ft	SB-605 OC-SB-605- 7.0/9.0-XXX 3/8/2013 7-9 ft
Volatile Organics (mg/kg)			
2-Butanone	0.024 U	0.023 U	0.027 J
Acetone	0.025 J	0.023 J	0.16 J
Benzene	0.0024 U	0.0023 U	0.0096
Carbon disulfide	0.0024 U	0.0023 U	0.0038
Ethyl benzene	0.0024 U	0.0023 U	0.0011 J
Methyl Tertbutyl Ether	0.0024 U	0.0023 U	0.0028 U
Toluene	0.0024 U	0.0023 U	0.0071
Xylenes (m&p)	0.0048 U	0.0046 U	0.0014 J
Semivolatile Organics (mg/kg)			
Benzo(a)pyrene	0.86 U	0.86 U	0.45 U
Benzoic Acid	4.3 UJ	4.3 UJ	2.3 UJ
Fluoranthene	0.86 U	0.45 J	0.45 U
Pentachlorophenol	0.86 U	0.86 U	0.45 U
Phenanthrene	0.86 U	0.28 J	0.45 U
Pyrene	0.86 U	0.4 J	0.45 U
Metals (mg/kg)			
Aluminum	3400 J	3900 J	7600 J
Arsenic	1.5	1.9	7.5
Barium	14	15	21
Beryllium	0.23 U	0.046 J	0.31
Cadmium	0.053 J	0.051 J	0.11 J
Calcium	1000	1300	1700
Chromium	8	8.9	80
Chromium, Hexavalent	0.7 J	0.41 J	1.2 J
Cobalt	1.8	2.1	4
Copper	4.7	6.6	10
Iron	4200 J	4700 J	9200 J
Lead	2.7	4.2	7.6
Magnesium	1400	1400	2200
Manganese	62 J	57 J	140 J
Mercury	0.13 U	0.12 U	0.13 U
Nickel	4.4	5.2	10
Potassium	790	720	1000
Selenium	0.74	0.7 U	0.77
Sodium	190	240	210 U
Tin	0.64 J	0.88 J	1.5 J
Vanadium	7.7	9.3	15
Zinc	11	12	27

Table 3
Summary of Detected Parameters - 2013 North Pond Soil Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	SB-604 DUP-5 3/7/2013 9-11 ft	SB-604 OC-SB-604- 9.0/11-XXX 3/7/2013 9-11 ft	SB-605 OC-SB-605- 7.0/9.0-XXX 3/8/2013 7-9 ft
Inorganics (mg/kg)			
CARBON	250 J	330 J	120 J
Chloride	40	59	46
Nitrate as N	0.8 J	0.6 J	0.66 J
Nitrogen, as Ammonia	6.2	4.9 U	8.2
Percent Moisture **(%)**	24	22	26
Percent Solids **(%)**	76	78	74
pH **(pH units)**	7.18	7.17	6.92
Sulfate	22 J	23 J	55

1 - Average uses half the reporting limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected, value is reporting limit
J - Estimated

Prepared/Date: BJR 9/13/13
Checked/Date: KJC 10/15/13

Table 4
Summary of Detected Parameters - 2013 North Pond Surface Water Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	SW/SD-600 OC-DUP 6/20/2013	SW/SD-600 OC-SW-600-XXX 6/20/2013	SW/SD-601 OC-SW-601-XXX 6/20/2013	SW/SD-602 OC-SW-602-XXX 6/20/2013	SW/SD-603 OC-SW-603-XXX 6/20/2013
Volatile Organics (mg/L)									
Acetone	2 / 5	0.05 : 0.05	0.0035 - 0.004	0.017	0.05 U	0.05 U	0.05 U	0.0035 J	0.004 J
Semivolatile Organics (mg/L)									
Acenaphthene	3 / 5	0.00095 : 0.00096	0.000038 - 0.00005	0.00022	0.00095 U	0.00096 U	0.00005 J	0.000038 J	0.000047 J
Anthracene	1 / 5	0.00095 : 0.00096	0.000036 - 0.000036	0.00039	0.00095 U	0.00096 U	0.00095 U	0.00095 U	0.000036 J
Benzo(a)anthracene	2 / 5	0.00028 : 0.00029	0.000076 - 0.00012	0.00012	0.00028 U	0.00029 U	0.00028 U	0.000076 J	0.00012 J
Benzo(a)pyrene	2 / 5	0.00019 : 0.00019	0.00013 - 0.00017	0.00012	0.00019 U	0.00019 U	0.00019 U	0.00013 J	0.00017 J
Benzo(b)fluoranthene	2 / 5	0.00028 : 0.00029	0.00021 - 0.00027	0.00018	0.00028 U	0.00029 U	0.00028 U	0.00021 J	0.00027 J
Benzo(k)fluoranthene	2 / 5	0.00028 : 0.00029	0.000076 - 0.00015	0.00013	0.00028 U	0.00029 U	0.00028 U	0.000076 J	0.00015 J
Bis(2-Ethylhexyl)phthalate	4 / 5	0.0019 : 0.0019	0.00041 - 0.0026	0.0010	0.00041 J	0.0019 UJ	0.00046 J	0.0026	0.00063 J
Butylbenzylphthalate	1 / 5	0.0047 : 0.0052	0.00072 - 0.00072	0.0021	0.0047 U	0.0048 U	0.0047 U	0.00072 J	0.0052 U
Caprolactam	1 / 5	0.0047 : 0.0052	0.00033 - 0.00033	0.0020	0.0047 UJ	0.0048 UJ	0.0047 UJ	0.00033 J	0.0052 UJ
Chrysene	2 / 5	0.00095 : 0.00096	0.0002 - 0.00029	0.00038	0.00095 U	0.00096 U	0.00095 U	0.0002 J	0.00029 J
Diethylphthalate	2 / 5	0.0047 : 0.0052	0.000097 - 0.00013	0.0015	0.0047 U	0.0048 U	0.00013 J	0.000097 J	0.0052 U
Di-n-butylphthalate	3 / 5	0.0047 : 0.0048	0.00036 - 0.00046	0.0012	0.00046 J	0.0048 U	0.0047 U	0.00036 J	0.00043 J
Di-n-octylphthalate	1 / 5	0.0047 : 0.0052	0.0023 - 0.0023	0.0024	0.0047 UJ	0.0048 UJ	0.0047 UJ	0.0023 J	0.0052 UJ
Fluoranthene	2 / 5	0.00095 : 0.00096	0.00051 - 0.00063	0.00051	0.00095 U	0.00096 U	0.00095 U	0.00051 J	0.00063 J
Fluorene	1 / 5	0.00095 : 0.00096	0.000079 - 0.000079	0.00040	0.00095 U	0.00096 U	0.00095 U	0.00095 U	0.000079 J
Pyrene	3 / 5	0.0047 : 0.0048	0.000094 - 0.00039	0.0011	0.0047 U	0.0048 U	0.000094 J	0.00039 J	0.00037 J
Metals, Total (mg/L)									
Aluminum	3 / 5	0.2 : 0.2	0.11 - 0.22	0.14	0.2 U	0.2 U	0.11 J	0.22	0.18 J
Barium	5 / 5		0.026 - 0.041	0.035	0.041	0.041	0.027	0.026	0.041
Calcium	5 / 5		23 - 57	40	56	57	23	23	40
Chromium	4 / 5	0.005 : 0.005	0.001 - 0.0043	0.0025	0.005 U	0.001 J	0.0023 J	0.0024 J	0.0043 J
Copper	5 / 5		0.0018 - 0.0039	0.0027	0.002	0.0018	0.0035	0.0039	0.0023
Iron	5 / 5		0.54 - 2.9	1.6	0.6	0.54	1.9	2.1	2.9
Lead	5 / 5		0.00019 - 0.0013	0.00079	0.00025 J	0.00019 J	0.0011	0.0013	0.0011
Magnesium	5 / 5		3 - 7.9	5.4	7.9	7.9	3	3.1	5.2
Manganese	5 / 5		0.32 - 0.49	0.39	0.41	0.41	0.34	0.32	0.49
Nickel	3 / 5	0.01 : 0.01	0.0014 - 0.0025	0.0031	0.01 U	0.01 U	0.0014 J	0.0025 J	0.0015 J
Potassium	5 / 5		2 - 5	3.5	5	5	2.1	2	3.6
Silver	1 / 5	0.001 : 0.001	0.000022 - 0.000022	0.00040	0.001 U	0.001 U	0.000022 J	0.001 U	0.001 U
Sodium	5 / 5		74 - 180	124	180	180	74	78	110
Zinc	5 / 5		0.01 - 0.021	0.016	0.01 J	0.011 J	0.021 J	0.021 J	0.016 J
Inorganics (mg/L)									
Bromide	3 / 5	0.2 : 0.2	0.27 - 0.68	0.35	0.68	0.62	0.2 U	0.2 U	0.27
Chloride	5 / 5		120 - 330	216	330	310	120	120	200
Nitrate as N	4 / 5	0.05 : 0.05	0.082 - 0.24	0.13	0.23	0.24	0.085	0.082	0.05 U
Nitrogen, as Ammonia	4 / 5	0.02 : 0.02	0.093 - 0.11	0.082	0.11	0.093	0.097	0.1	0.02 U
Sulfate	5 / 5		4.2 - 15	9.7	15	15	4.3	4.2	10
Total Suspended Solids	1 / 5	4 : 4	6 - 6	2.8	4 U	4 U	4 U	4 U	6
Total Dissolved Solids	5 / 5		320 - 900	602	900	890	340	320	560

1 - Average uses half the reporting limit for non-detects.
mg/L - milligrams per liter
U - Not detected,
value is reporting limit
J - Estimated

Prepared/Date: BJR 9/13/13
Checked/Date: KJC 10/15/13

Table 5
Summary of Detected Parameters - 2013 North Pond Sediment Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	SW/SD-600 OC-DUP 6/20/2013 0-0.5 ft	SW/SD-600 OC-SD-600-0.0/0.5-XXX 6/20/2013 0-0.5 ft	SW/SD-601 OC-SD-601-0.0/0.5-XXX 6/20/2013 0-0.5 ft	SW/SD-602 OC-SD-602-0.0/0.5-XXX 6/20/2013 0-05 ft	SW/SD-603 OC-SD-603-0.0/0.5-XXX 6/20/2013 0-0.5 ft
Volatile Organics (mg/kg)									
2,4,4-Trimethyl-1-pentene	1 / 5	0.0057 : 0.011	0.002 - 0.002	0.0036	0.0057 UJ	0.0059 UJ	0.0095 U	0.011 U	0.002 J
2-Butanone	3 / 5	0.029 : 0.029	0.025 - 0.084	0.039	0.029 UJ	0.029 UJ	0.025 J	0.084 J	0.059 J
Acetone	3 / 5	0.29 : 0.29	0.12 - 0.33	0.20	0.29 U	0.29 U	0.12 J	0.33 J	0.24 J
Carbon disulfide	1 / 5	0.0029 : 0.006	0.0073 - 0.0073	0.0032	0.0029 UJ	0.0029 UJ	0.0073	0.0054 U	0.006 U
Semivolatile Organics (mg/kg)									
Anthracene	1 / 5	0.29 : 1.1	0.19 - 0.19	0.32	0.41 U	0.19 J	0.97 U	1.1 U	0.29 U
Benzo(a)anthracene	3 / 5	0.29 : 0.97	0.51 - 0.81	0.50	0.51	0.81	0.97 U	0.54 J	0.29 U
Benzo(a)pyrene	4 / 5	0.29 : 0.29	0.29 - 0.84	0.49	0.56	0.84	0.29 J	0.62 J	0.29 U
Benzo(b)fluoranthene	4 / 5	0.29 : 0.29	0.55 - 1.2	0.76	0.78	1.2	0.55 J	1.1	0.29 U
Benzo(ghi)perylene	2 / 5	0.29 : 1.1	0.42 - 0.47	0.41	0.42	0.47	0.97 U	1.1 U	0.29 U
Benzo(k)fluoranthene	2 / 5	0.29 : 1.1	0.29 - 0.39	0.37	0.29 J	0.39	0.97 U	1.1 U	0.29 U
Bis(2-Ethylhexyl)phthalate	1 / 5	1 : 4.8	3.7 - 3.7	1.7	2.1 U	1 U	4.8 U	3.7 J	1.4 U
Carbazole	1 / 5	0.29 : 1.1	0.16 - 0.16	0.31	0.41 U	0.16 J	0.97 U	1.1 U	0.29 U
Chrysene	4 / 5	0.29 : 0.29	0.47 - 1.1	0.68	0.7	1	0.47 J	1.1	0.29 U
Fluoranthene	5 / 5		0.18 - 2.2	1.4	1.4	2.1	1.1	2.2	0.18 J
Fluorene	1 / 5	0.29 : 1.1	0.078 - 0.078	0.29	0.41 U	0.078 J	0.97 U	1.1 U	0.29 U
Indeno(1,2,3-cd)pyrene	2 / 5	0.29 : 1.1	0.31 - 0.4	0.38	0.31 J	0.4	0.97 U	1.1 U	0.29 U
Phenanthrene	4 / 5	0.97 : 0.97	0.09 - 1.1	0.57	0.51 J	1.1 J	0.97 U	0.65 J	0.09 J
Pyrene	5 / 5		0.18 - 2	1.3	1.5	2	0.96 J	2	0.18 J
Metals (mg/kg)									
Aluminum	5 / 5		3100 - 8400	5860	3100 J	8400 J	6800 J	6600 J	4400 J
Arsenic	4 / 5	7.9 : 7.9	4.1 - 13	7.6	4.1	6	13	11	7.9 U
Barium	5 / 5		28 - 62	39	32 J	62 J	28 J	41 J	32 J
Beryllium	5 / 5		0.17 - 0.53	0.42	0.17	0.37	0.53	0.51	0.5
Cadmium	5 / 5		0.14 - 2.2	1.2	0.14 J	0.25 J	2.2	2.1	1.1
Calcium	5 / 5		890 - 4000	2518	890 J	2600 J	2400 J	2700 J	4000 J
Chromium	5 / 5		6.4 - 780	223	6.4 J	20 J	170 J	140 J	780 J
Chromium, Hexavalent	5 / 5		0.24 - 0.9	0.53	0.33	0.24	0.9	0.29 J	0.87
Cobalt	5 / 5		2.8 - 9	5.9	2.8	9	7.6	6	4.3
Copper	5 / 5		9.1 - 68	39	9.1 J	14 J	61 J	68 J	41 J
Iron	5 / 5		8700 - 23000	14140	8700 J	23000 J	16000 J	14000 J	9000 J
Lead	5 / 5		15 - 110	58	15 J	31 J	80 J	110 J	53 J
Magnesium	5 / 5		1100 - 5300	2600	1500 J	5300 J	2600 J	2500 J	1100 J
Manganese	5 / 5		120 - 1500	586	1000	1500	150	160	120
Mercury	4 / 5	0.12 : 0.12	0.013 - 0.17	0.095	0.013 J	0.12 U	0.11 J	0.12 J	0.17
Nickel	5 / 5		5.7 - 17	12.1	5.7 J	17 J	14 J	15 J	8.7 J
Potassium	5 / 5		360 - 2400	1072	630 J	2400 J	870 J	1100 J	360 J
Selenium	5 / 5		0.44 - 0.92	0.72	0.44	0.48	0.92	0.86	0.91
Silver	2 / 5	0.38 : 0.87	0.34 - 0.39	0.35	0.38 U	0.87 U	0.34 J	0.39 J	0.79 U
Sodium	5 / 5		90 - 240	170	90 J	140	240	230	150 J
Thallium	2 / 5	1.3 : 1.6	0.39 - 0.82	0.68	0.39 J	0.82 J	1.3 U	1.5 U	1.6 U
Tin	5 / 5		0.41 - 11	4.8	0.41 J	0.7 J	6.4	5.3	11
Vanadium	5 / 5		9.1 - 26	20	9.1 J	26 J	25 J	25 J	17 J
Zinc	5 / 5		65 - 360	243	65 J	110 J	360 J	360 J	320 J

Table 5
Summary of Detected Parameters - 2013 North Pond Sediment Data
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	SW/SD-600 OC-DUP 6/20/2013 0-0.5 ft	SW/SD-600 OC-SD-600-0.0/0.5-XXX 6/20/2013 0-0.5 ft	SW/SD-601 OC-SD-601-0.0/0.5-XXX 6/20/2013 0-0.5 ft	SW/SD-602 OC-SD-602-0.0/0.5-XXX 6/20/2013 0-05 ft	SW/SD-603 OC-SD-603-0.0/0.5-XXX 6/20/2013 0-0.5 ft
Inorganics (mg/kg)									
Chloride	5 / 5		51 - 320	158	51	60	320	260	99
Nitrate as N	2 / 5	1 : 1	1.2 - 2	0.94	2	1.2	1 U	1 U	1 U
Nitrogen, as Ammonia	5 / 5		3.1 - 23	10.5	4 J	3.1 J	3.2 J	19	23
Percent Moisture **(%)**	5 / 5		17 - 43	31	19	17	32	42	43
Percent Solids **(%)**	5 / 5		57 - 83	69	81	83	68	58	57
pH **(pH units)**	5 / 5		6.5 - 6.9	6.7	6.91	6.5	6.48	6.88	6.61
Sulfate	3 / 5	21 : 26	200 - 270	149	21 U	26 U	200	270	250
Total Organic Carbon	5 / 5		1700 - 80000	37060	1700	3600	49000	51000	80000

1 - Average uses half the reporting limit for non-detects.
mg/kg - milligrams per kilogram
U - Not detected,
value is reporting limit
J - Estimated

Prepared/Date: BJR 9/13/13
Checked/Date: KJC 10/15/13

Table 6
Comparison of South Ditch and East Ditch Sediment to Historic and Current North Pond Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lower South Ditch Sediment (1)				East Ditch Sediment (2)				Historic North Pond Sediment (Soil Borings) (3)				Current North Pond Sediment (4)			
Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples
Volatile Organics (mg/kg)																
2,4,4-Trimethyl-1-pentene	8 / 21	0.0075 : 0.71	0.0096 - **2.8**	0.31	8 / 14	0.004 : 0.05	0.004 - 0.11	0.022	0 / 14	0.0017 : 0.11		NA	1 / 7	0.005 : 0.011	0.002 - 0.002	0.0033
2,4,4-Trimethyl-2-pentene	5 / 21	0.0075 : 0.71	0.0035 - **1**	0.18	5 / 14	0.004 : 0.05	0.003 - 0.061	0.014	0 / 14	0.0017 : 0.11		NA	0 / 7	0.005 : 0.012		NA
Semivolatile Organics (mg/kg)																
Bis(2-Ethylhexyl)phthalate	24 / 24		11 - **24827**	3042	13 / 14	1.3 : 1.3	0.23 - 440	90	1 / 12	0.21 : 4.3	0.73 - 0.73	1.1	3 / 7	1 : 4.8	3.7 - 5.2	2.5
Butylbenzylphthalate	2 / 24	0.29 : 1100	0.13 - **0.57**	117	2 / 14	0.2 : 2	0.066 - 0.38	0.33	0 / 12	0.043 : 2.4		NA	0 / 7	0.2 : 3.9		NA
Di-n-butylphthalate	3 / 24	0.29 : 1100	0.22 - **0.43**	117	3 / 14	0.2 : 2	0.075 - 0.23	0.26	0 / 12	0.21 : 4.3		NA	0 / 7	1 : 5.6		NA
Di-n-octylphthalate	3 / 24	0.31 : 1100	0.15 - 0.85	117	6 / 14	0.2 : 2	0.054 - **1.4**	0.34	0 / 12	0.043 : 2.4		NA	0 / 7	0.2 : 3.9		NA
N-Nitrosodiphenylamine	7 / 24	2.2 : 1100	0.065 - **4.3**	117	9 / 14	0.28 : 2	0.06 - 1.5	0.39	0 / 12	0.0058 : 7.7		NA	0 / 7	0.2 : 3.9		NA
Phenol	2 / 24	0.29 : 1100	0.076 - **0.13**	117	1 / 14	0.2 : 2	0.069 - 0.069	0.33	0 / 12	0.043 : 2.4		NA	0 / 7	0.2 : 3.9		NA
Metals (mg/kg)																
Calcium	9 / 9		820 - 1900	1116	14 / 14		650 - **7900**	1766	7 / 7		530 - 5800	2433	5 / 5		890 - 4000	2518
Chromium	24 / 24		140 - **10000**	3068	14 / 14		7.8 - 920	161	15 / 15		6.4 - 80	32.8	7 / 7		6.4 - 1580	574
Sodium	6 / 9	280 : 510	95 - 220	158	11 / 14	130 : 394	36 - 340	143	6 / 7	210 : 210	140 - **370**	222	5 / 5		90 - 240	170
Inorganics (mg/kg)																
Chloride	6 / 6		53 - 140	108	3 / 11	40 : 40	71 - 690	93	14 / 14		6.4 - **990**	119	7 / 7		51 - 320	171
Nitrogen, as Ammonia	9 / 9		54 - **290**	160	12 / 14	8 : 8	12 - 238	71	13 / 14	4.9 : 4.9	4.2 - 55.8	20.7	7 / 7		3.1 - 245	76
Sulfate	6 / 6		340 - 830	550	10 / 11	160 : 160	110 - **3900**	960	13 / 14	28 : 28	5.6 - 200	58.9	5 / 7	21 : 26	33.8 - 270	116

1. South Ditch sediment data collected from locations: BS030, BS031, BS032, ISCO2, SD-1, SDC-1 to SDC-8 and SW-6 between August 1992 and February 2011.
2. East Ditch sediment data collected from locations: EDSD/SW2 (EDBS6), EDSD/SW3 (EDBS8), SW-1 to SW-5 between August 1992 to December 2010.
3. North Pond historic sediments (soil borings) shown in Tables 1 and 4.
4. North Pond sediment data shown in Tables 3 and 5.

Prepared/Date: BJR 10/9/13
Checked/Date: KJC 10/15/13

Bold and shaded cells are the maximum concentration in the four data sets.
mg/kg - milligrams per kilogram
NA - Not applicable

Table 7
Comparison of South Ditch and East Ditch Surface Water to North Pond Surface Water
Olin Chemical Superfund Site
Wilmington, Massachusetts

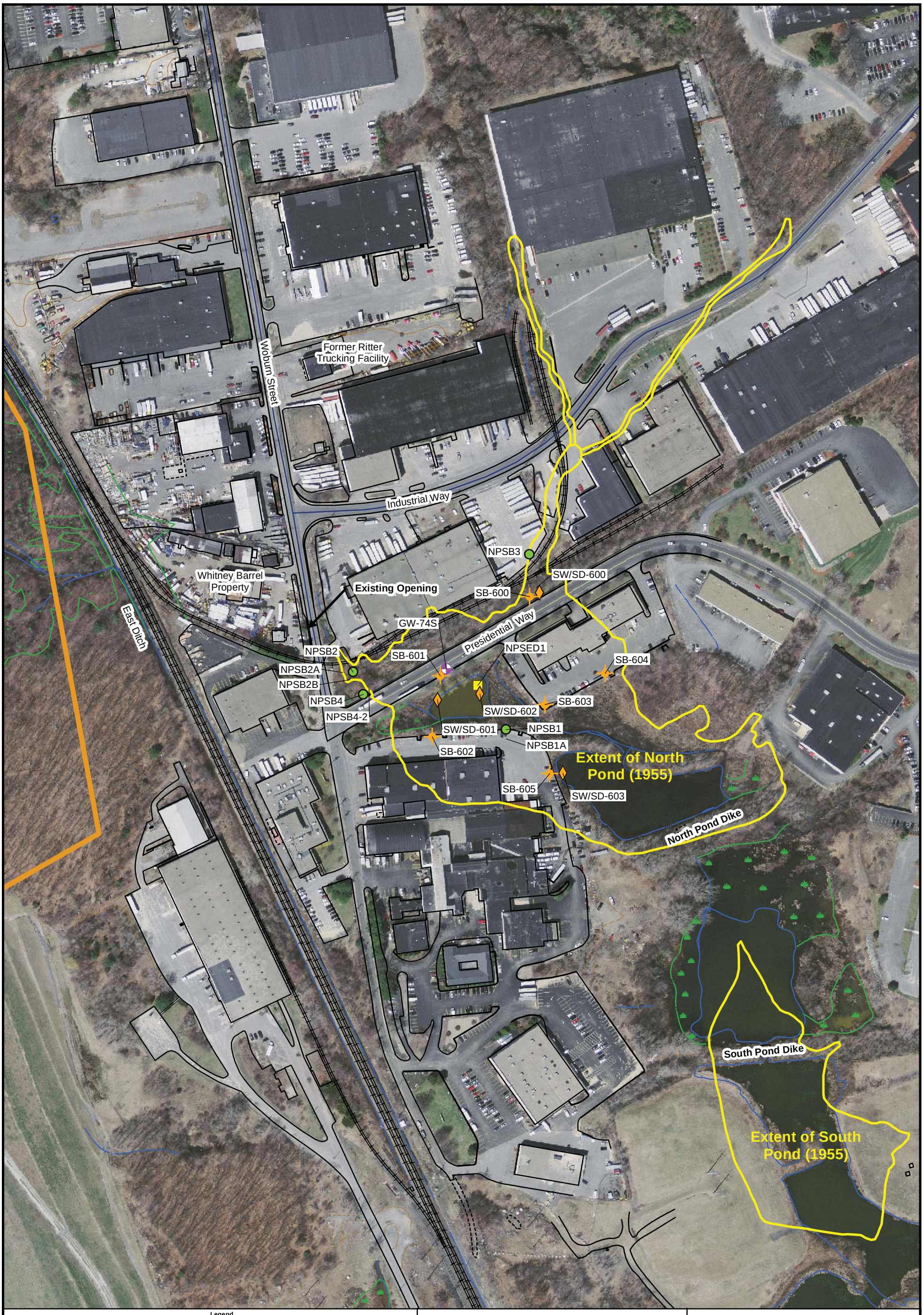
	South Ditch Surface Water (1)				East Ditch Surface Water (2)				North Pond Surface Water (3)			
Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene	9 / 12	0.001 : 0.001	0.0014 - **0.01**	0.0033	2 / 10	0.001 : 0.001	0.0039 - 0.0044	0.0012	0 / 5	0.001 : 0.001		NA
2,4,4-Trimethyl-2-pentene	5 / 12	0.001 : 0.001	0.00044 - **0.002**	0.00069	1 / 10	0.001 : 0.001	0.00057 - 0.00057	0.00051	0 / 5	0.001 : 0.001		NA
Semivolatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate	2 / 11	0.0018 : 0.0089	0.0018 - **0.0061**	0.0024	2 / 10	0.0018 : 0.0021	0.0012 - 0.0015	0.0010	4 / 5	0.0019 : 0.0019	0.00041 - 0.0026	0.0010
Butylbenzylphthalate	0 / 12	0.00096 : 0.005		NA	0 / 10	0.0045 : 0.0053		NA	1 / 5	0.0047 : 0.0052	0.00072 - **0.00072**	0.0021
Diethylphthalate	0 / 12	0.00096 : 0.0051		NA	0 / 10	0.0045 : 0.0062		NA	2 / 5	0.0047 : 0.0052	0.000097 - **0.00013**	0.0015
Di-n-butylphthalate	0 / 12	0.0045 : 0.005		NA	0 / 10	0.0045 : 0.0053		NA	3 / 5	0.0047 : 0.0048	0.00036 - **0.00046**	0.0012
Di-n-octylphthalate	0 / 12	0.00096 : 0.005		NA	0 / 10	0.0045 : 0.0053		NA	1 / 5	0.0047 : 0.0052	0.0023 - **0.0023**	0.0024
N-Nitrosodimethylamine	12 / 12		0.000023 - **0.0003**	0.00012	4 / 10	0.0000019 : 0.00002	0.0000033 - 0.000012	0.0000045	0 / 5	0.0000019 : 0.0000021		NA
N-Nitrosodi-n-propylamine	2 / 12	0.0000019 : 0.000021	0.0000049 - **0.0000093**	0.0000035	1 / 10	0.0000019 : 0.00002	0.0000033 - 0.0000033	0.0000021	0 / 5	0.0000019 : 0.0000021		NA
N-Nitrosodiphenylamine	2 / 12	0.00096 : 0.005	0.00047 - **0.00064**	0.0017	0 / 10	0.0045 : 0.0053		NA	0 / 5	0.0047 : 0.0052		NA
Metals, Total (mg/L)												
Calcium	12 / 12		23 - **81**	53	10 / 10		11 - 46	34	5 / 5		23 - 57	39.8
Chromium	66 / 66		0.0096 - **2.4**	0.39	10 / 18	0.005 : 0.005	0.00068 - 0.065	0.0062	4 / 5	0.005 : 0.005	0.001 - 0.0043	0.0025
Sodium	66 / 66		52 - **240**	116	18 / 18		17 - 190	81	5 / 5		74 - 180	124
Inorganics (mg/L)												
Chloride	66 / 66		64 - 300	148	18 / 18		26 - **360**	166	5 / 5		120 - 330	216
Nitrogen, as Ammonia	66 / 66		14 - **140**	55	15 / 18	0.1 : 0.1	0.11 - 10	3.1	4 / 5	0.02 : 0.02	0.093 - 0.11	0.082
Sulfate	66 / 66		68 - **990**	339	18 / 18		14 - 99	38	5 / 5		4.2 - 15	9.7

1. South Ditch surface water data collected from locations: ISCO1, ISCO2, PZ-16RR, PZ-17RR, PZ-18R, SD-1, SD-17 between November 2010 and December 2012.
2. East Ditch surface water data collected from locations:EDSD/SW0, EDSD/SW1 (EDBS5), EDSD/SW2 (EDBS6), EDSD/SW5 (EDBS11), EDSD/SW7, ISCO3 between December 2010 and November 2012.
3. North Pond surface water data shown in Table 2.

Bold and shaded cells are the maximum concentration in the three data sets.
mg/L - milligram per liter
NA - Not applicable

Prepared/Date: BJR 10/9/13
Checked/Date: KJC 10/15/13

FIGURES



Legend

- Surface Water and Sediment Location
- Existing Monitoring Well
- Soil Boring Location
- Historical Soil Boring Location
- Historical Sediment Sample Location
- Approximate Extent of North and South Ponds from 1955
- 51 Eames St. Property Boundary
- Railroad
- Paved Road
- Unpaved Road
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 110 220 440 Feet

Figure 1
North Pond Sample Locations with Current Aerial Photo

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 3/11/14 | Checked/Date: CTM 3/11/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_11X17_P.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\North Pond\Figure 1 - North Pond Sample Locations.pdf

ATTACHMENT A

4-5-55
4556-64
51 Eames St
© 2001 COL-EAST NORTH ADAMS, MA.
1-800-FLY-TOPO

April 5, 1955

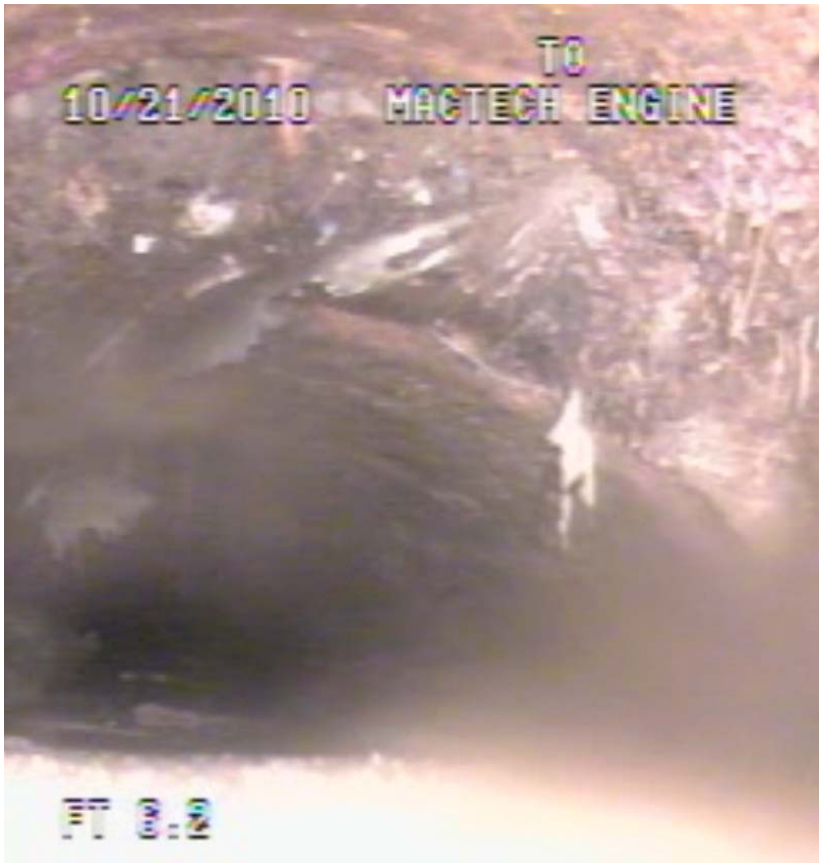
April 19, 1976

ATTACHMENT B

Photo 1: Track-Mounted Camera

Photo 2: Still Shot in an Easterly Direction

Photo 3: Still Shot in a Westerly Direction



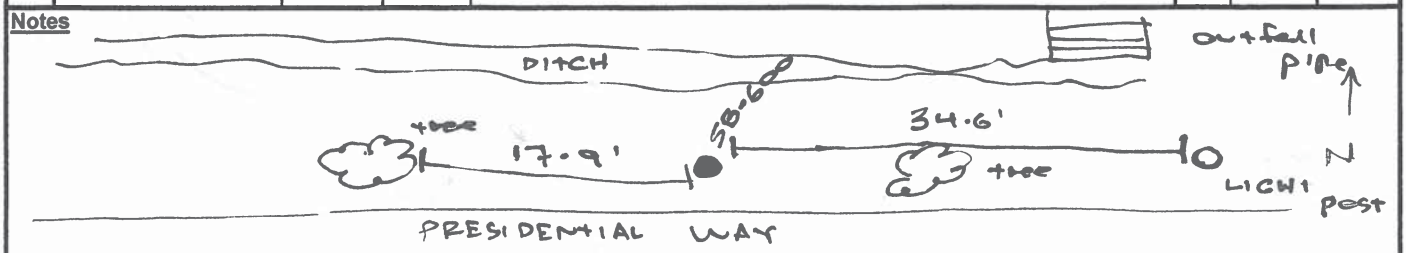
ATTACHMENT C

amec	Project: Olin, Wilmington Location: ~~Olin~~, Wilmington, MA Client: Olin	Boring: SB-600 File No.:

Contractor: CDS/ Boart	Drilling Method: Pre-vac / Sonic	**Definitions:** S = Split Spoon Sample U = Thin Wall Tube Sample R = Rock Core Sample V = Insitu Vane Shear Test q_p = Unconfined Compressive Strength (psf) woh = weight of 140 lb. hammer wor = weight of rods wc = Water Content, percent oc = Organic Content, percent
Operator: J. Graglia	Bore Hole ID/OD: 6"	
Logged By: DLC	Auger ID/OD: 6" casing / 4.75" core barrel	
Checked By: MAM 4-5-13	Sampler: DLC	
Date Start/Finish: 3-6-13 / "	Hammer Wt./ Fall: /	
Boring Location: SB-600	Water Level[3]: ~~OL~~ ≈ 9'	
Ref. Elevation[1]: presidential way		

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	PID ~~Elevation~~
0 1 5	Pre-vac	/	13:00	0-5: Brown fine SAND, some silt, some cobbles from 4-5, loose, dry (FILL)	FILL	N	<0.1 ~~<0.1~~
5 ↓		5.0/ 3.9	13:50	0-0.6: Brown fine SAND, some silt, dry. 0.6-1.1: Tan med-coarse SAND and GRAVEL, some cobbles dry	SP SM	xxx @ 14:30	<0.1 <0.1
10				1.1-2.1: Dark brown fine SAND and organic SILT, some wood frags, damp 2.1-3.9: Brown, poorly graded med SAND, wet	OL SP		<0.1 1.3
15		5.0/ 3.9	14:40	0-3.9: Brown, med SAND, poorly graded, transitions to tan @ 2.6	SP		<0.1
20		5.0/ 4.1	14:45	0-2.0: Same as 0-3.9 above 2.0-3.0: Brown-red brown coarse SAND and GRAVEL, wet 3.0-4.1: Same as above, but gray	SP SM		1.4
				End of boring: 20' BGS			

Notes



Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-600

amec

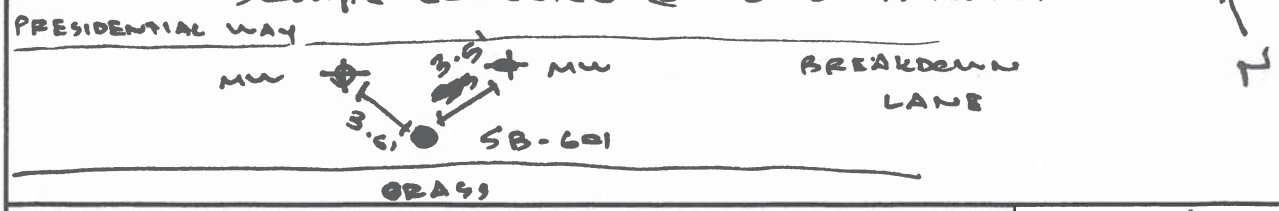
Project: Olin, Wilmington		Boring: SB-601
Location: ~~SB-601~~ (Wilmington, MA)		File No.:
Client: Olin		

Contractor: CDS / Boart Longyear	Drilling Method: Pre-vac / Sonic	**Definitions:**
Operator: J. Graglia	Bore Hole ID/OD: 6"	S = Split Spoon Sample
Logged By: DLC	Auger ID/OD: 6" casing 4 3/4" core barrel	U = Thin Wall Tube Sample
Checked By: 4-8-13 MAM	Sampler: DLC	R = Rock Core Sample
Date Start/Finish: 3-6-13 / "	Hammer Wt./ Fall: /	V = Insitu Vane Shear Test
Boring Location: Presidential Way	Water Level[3]: ≈ 8'	q_p = Unconfined Compressive Strength (psf)
Ref. Elevation[1]: /		woh = weight of 140 lb. hammer
		wor = weight of rods
		wc = Water Content, percent
		oc = Organic Content, percent

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	PID ~~Elevation~~
0				0-0.9: Asphalt and large rock frags / cobbles			
1	Pre-vac			0.9-1.5: Brown fine SAND, some silt, moist, (FILL)	FILL	N	<0.1
5		/	11:20	1.5-5.0: Gray, rock frags / cobbles loose, 6" max in diameter (4 layers of asphalt)	(FILL)		
5		5.0/ 4.1	12:05	0.0-1.0: Brown SAND and SILT, some gravel / cobbles, moist	(SM)	0.0-5.0 6.0-8.0 @ 12:30	19.5 5.2
				1.0-1.3: Same as above, but more cobbles / rock frags, dry	SM		0.5
				1.3-2.4: Dark brown organic SILT, some wood / plant frags, damp	OL		0.5
10				2.4-2.8: Brown med SAND, damp	SP		0.2
				2.8-4.1: Gray rock frags and SAND wet.	SM		
		5.0/ 1.9	12:15	0-1.9: Gray med-coarse SAND and GRAVEL, some cobbles wet	SM		5.3 0.6
15							
		5.0/ 3.8	12:25	0-3.8: Gray, SAND and cobbles, some rock frags, COBBLES wet	SM		2.3
20							
				End of boring = 20' BGS			

Notes

Sample collected @ 6-8' interval



Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-601

amec

Project: Olin, Wilmington Location: Wilmington, MA Client: Olin		Boring: SB-602 File No.:

Contractor: Boart, CDS	Drilling Method: Sonic
Operator: J. Graglia	Bore Hole ID/OD: 6"
Logged By: DLC	Auger ID/OD: 6" casing 4.75 core barrel
Checked By: MAM	Sampler: DLC
Date Start/Finish: 3-6-13 / 3-7-13	Hammer Wt./ Fall: /
Boring Location: SB-602	Water Level[3]: ≈ 8'
Ref. Elevation[1]: /	

Definitions:
S = Split Spoon Sample
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
q_p = Unconfined Compressive Strength (psf)
woh = weight of 140 lb. hammer
wor = weight of rods
wc = Water Content, percent
oc = Organic Content, percent

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	PID Elevation
0	Pre-vac	/	13:50	0-1.2: Brown, med-coarse poorly graded SAND and GRAVEL, some cobbles, damp, loose (FILL)	FILL	N	1.9
5							
↓	/	5.0/ 3.6	~~5.0/ 3.6~~ 13:55	0-0.9: Same as above 0.9-2.1: Dark brown ORGANIC SILT, some peat, wood/plant fragments, wet	OL SP	01:10 @ 7.0/9.0-7.0 OC-SB-602	0.6
10	/			2.1-3.6: Gray, fine-med poorly graded SAND, uniform, wet			
15		5.0/ 2.8	14:15	0-1.5: Same as 2.1-3.6 above 1.5-2.8: Gray to tan poorly graded med SAND, some rock frags, wet	~~SM~~ SP	N	1.2
20		5.0/ 2.9	14:20	0-0.4: Same as 1.5-2.8 above 0.4-0.6: Same as above, but red 0.6-2.9: Same as above, but grey.			1.1
				End of boring: 20' BGS			

Notes

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-602

amec

Project: olin, wilmington
Location: wilmington, MA
Client: olin

Boring: SB-603
File No.:

Contractor: Boart Longyear	Drilling Method: Sonic
Operator: J. Braglia	Bore Hole ID/OD: 6" casing 4.75" core barrel
Logged By: DLC	Auger ID/OD: " "
Checked By: MPM	Sampler: DLC
Date Start/Finish: 5-6-13 / 5-7-13	Hammer Wt./ Fall: /
Boring Location: SB-603	Water Level[3]: ≈ 8'
Ref. Elevation[1]: /	

Definitions:
S = Split Spoon Sample
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
q_p = Unconfined Compressive Strength (psf)
woh = weight of 140 lb. hammer
wor = weight of rods
wc = Water Content, percent
oc = Organic Content, percent

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	PID Elevation[1]
0				0-5: Brown, poorly graded med SAND and GRAVEL. Some cobbles, loose (FILL)	FILL	N	1.6
1							
	Pre-vac	/	11:15				
5							
		5.0/ 3.9	11:50	0-1.9: Brown-gray poorly graded med SAND and GRAVEL, some cobbles, loose, damp 1.9-2.3: Brown-red brown med SAND and ORGANICS, some plant matter wet	SM	Y: 12:10 @ 0.0-1.9 - 1.9-2.3 - 0.0	2.1
				2.3-3.9: Same as above, but no organics			
10							
		5.0/ 3.8	11:55	0-3.8: Brown poorly graded med SAND, uniform, wet		N	1.5
15							
		5.0/ 4.0	12:00	0-2.6: Brown, poorly graded, med-coarse SAND, wet, loose 2.6-4.0: Same as above, but gravel, some cobbles and gravel		N	1.5
20				End of boring: 20' BGS			

Notes

MS and MSD collected from 7.9' interval

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-603

amec

Project:	olin, wilmington
Location:	wilmington, MA
Client:	olin
Boring:	SB-604
File No.:	

Contractor:	Boart LCDS	Drilling Method:	sonic
Operator:	J. Graglia	Bore Hole ID/OD:	6"
Logged By:	DLC	Auger ID/OD:	6" casing 4.75" core barrel
Checked By:	MM	Sampler:	DLC
Date Start/Finish:	~~3-4~~ 3-6/3-7 2013	Hammer Wt./ Fall:	/
Boring Location:	604	Water Level[3]:	± 10
Ref. Elevation[1]:			

Definitions:
S = Split Spoon Sample
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
q_p = Unconfined Compressive Strength (psf)
wob = weight of 140 lb. hammer
wor = weight of rods
wc = Water Content, percent
oc = Organic Content, percent

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	Elevation
0	Pre. var	/	9:40	0-5: Brown, med-fine poorly graded SAND and GRAVEL, some cobbles wet	FILL	N	4.0
5		5.0/0.4	9:50	0-0.4: Same as above, but darker. Large cobble at 0.3-0.4.	FILL	N	27.0
10		5.0/4.5	9:55	0-1.9: Brown, ~~med~~ poorly graded med SAND. Loose, damp 1.9-2.1: Gray boulder 2.1-4.5: Brown poorly graded med. coarse SAND, some gravel, wet	SP	Y: 0-1.9 11/8-20 2.1-4.5 09-05-30	6.3
15		5.0/4.1	10:00	0-3.1: Same as above, 3.1-4.1: Same as above, but dry.	SP		1.7
20				End of boring: 20' BGS			

Notes

DUP-5 collected at location ~~(9-11)~~ (9-11' interval)

No distinct organic layer observed. Collected sample at 9-11' in dark brown-brown sand layer

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-604

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Project:	Olin, Wilmington
Location:	Wilmington, MA
Client:	Olin
Boring:	SB-605
File No.:	

Contractor:	Boart Longyear / CDS
Operator:	J. Graglia
Logged By:	DLC
Checked By:	MAM
Date Start/Finish:	3-6-13 / 3-8-13
Boring Location:	SB-605
Ref. Elevation[1]:	/
Drilling Method:	Sonic
Bore Hole ID/OD:	6"
Auger ID/OD:	6" casing 4.75" core barrel
Sampler:	DLC
Hammer Wt./ Fall:	/
Water Level[3]:	≈ 8'

Definitions:
S = Split Spoon Sample
U = Thin Wall Tube Sample
R = Rock Core Sample
V = Insitu Vane Shear Test
q_p = Unconfined Compressive Strength (psf)
woh = weight of 140 lb. hammer
wor = weight of rods
wc = Water Content, percent
oc = Organic Content, percent

Depth	Sample No.	Recovery	Time	Sample Description and Classification	Unified Classification	Analytical Collected (Y/N)	PID Elevation
0	Pre-voc	/	8:30	Brown, poorly graded, med-coarse SAND and gravel, some large rock frags/ cobbles	FILL	N	225
5		5.0 / 4.8	8:40	0-0.4: Gray, white rock flour, boulder, dry, loose 0.4-2.6: Dark brown fine organic silt, saturated 2.6-3.9: Same as above, but some fine SAND	OL	Y (0.0-0.4) (0.4-1.0) (1.0-2.0)	12.2
10		/		3.9-4.8: Brown-gray poorly graded med-coarse SAND and GRAVEL, wet	SM	Y (3.9-4.8)	4
15		5.0 / 4.6	8:50	0-0.9: Same as 3.9-4.8 above 0.9-4.6: Brown, poorly graded med SAND and GRAVEL, some fines wet	SM	N	1.9
20		5.0 / 4.1	9:05	0-4.1: Same as above (0.9-4.6 above) but lighter brown End of boring: 20' BGS	SM	N	2.1

Notes

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

Boring: SB-605

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - SURFACE WATER/ SEDIMENT SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA | JOB NUMBER: 6107-13-0016 | DATE: 6-20-13

FIELD SAMPLE ID (SW): OC-SW-600-[illegible] | SW BOTTLE TIME: 14:05

FIELD SAMPLE ID (SED): OC-SD-600-[illegible] | SED BOTTLE TIME: 14:15

QC SAMPLES COLLECTED: DUP, MS, MSD | ACTIVITY TIME: START 14:05 END 14:30

SURFACE WATER DATA

WATER DEPTH AT LOCATION	0.3 FT	SPEC. COND	1238 uS/cm
DEPTH OF SAMPLE FROM SURFACE	0.1 FT	D.O.	8.24 mg/L
TEMPERATURE	16.71 DEG C	SALINITY	/ %
TURBIDITY	6.22 NTU	ORP	-23.4 mV
pH	6.84 UNITS		

EQUIPMENT USED:
- [ ] BEAKER
- [x] DIRECT DIP
- [ ] PERISTALTIC PUMP
- [ ] FILTER (0.45 micron)
- [ ] LDPE Tubing & Silicon

TYPE OF SURFACE WATER:
- [ ] STREAM/ RIVER
- [x] LAKE/ POND
- [ ] SEEP
- [ ] MARSH
- [ ] OTHER _____

DECON FLUIDS USED:
- [ ] DI WATER
- [x] LIQUINOX
- [x] OTHER Distilled

SEDIMENT DATA

DEPTH OF SEDIMENT: 0.0-0.5

TYPE OF SAMPLE:
- [ ] DISCRETE
- [x] COMPOSITE

SAMPLE OBSERVATIONS
- ODOR: /
- COLOR: brown/ red brown
- DESCRIPTION: Brown - red brown SAND, some gravel

TYPE OF SEDIMENT:
- [ ] ORGANIC
- [x] SAND
- [x] GRAVEL
- [ ] CLAY
- [ ] OTHER _____

EQUIPMENT FOR COLLECTION:
- [ ] HAND AUGER
- [x] S.S. SPOON
- [x] S.S. BOWL
- [ ] DREDGE
- [ ] OTHER _____

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] POTABLE WATER
- [x] LIQUINOX
- [x] OTHER Distilled

ANALYTICAL PARAMETERS

SURFACE WATER	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260	HCl / 4 DEG. C	3 X 40 mL	[x]
[x] SVOCs	8270C	4 DEG. C	2 X 1 L	[x]
[x] NDMA/ NDPA	MOD 521	4 DEG. C	2 X 1 L	[x]
[x] TAL Metals/ Hardness	6010B/7470A	HNO3 / 4 DEG. C	1 X 500 mL	[x]
[x] Hex Cr	3060A/7196A	4 DEG. C no headspace	1 X 250 mL	[x]
[ ] Opex/ Kempore	7199	4 DEG. C	2 X 40 mL	[ ]
[ ] Diphenylamine	3620B	4 DEG. C	w/ SVOCs	[ ]
[ ] Nonylphenol	ws-ms-1000	H2SO4/ 4 DEG. C	2 X 1L	[ ]
[ ] VPH	MADEP 98-1	HCl / 4 DEG. C	3 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	HCl / 4 DEG. C	2 X 1L	[ ]
[ ] Hydrazine	MOD 8315	Acetate Buffer/ 4 DEG. C	2 X 40 mL	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	2 X 250 mL	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	2 X 250 mL	[ ]
[ ] DMF	mod 8033	4 DEG. C	2 X 40 mL	[ ]
[x] Ammonia	lachat	H2SO4/ 4 DEG. C	1 X 250 mL	[x]
[x] Anions/ TSS	EPA 300	4 DEG. C	1 X 500 mL	[x]
[x] TOC	SM 5310	HCl / 4 DEG. C	1 X 125 mL	[x]

ANALYTICAL PARAMETERS

SEDIMENT	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260B/5035A	4 DEG. C DI/MeOH	2-low & 1-med	[x]
[x] SVOCs/ Diphenylamine	8270C low level	4 DEG. C	1 X 8 oz.	[x]
[x] NDMA/ NDPA	8270 low level	4 DEG. C	1 X 8 oz.	[x]
[x] TAL Metals	6010B/7471A	4 DEG. C	1 X 4 oz.	[x]
[x] Hex Cr	3060A/7199	4 DEG. C	1 X 4 oz.	[x]
[ ] VPH	MADEP 98-1	MeOH / 4 DEG. C	1 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	4 DEG. C	1 X 8 oz.	[ ]
[ ] Hydrazine	MOD 8315	4 DEG. C	1 X 4 oz.	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	1 X 4 oz.	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	1 X 8 oz.	[ ]
[ ] DMF	mod 8033	4 DEG. C	1 X 4 oz.	[ ]
[x] Ammonia/Anions/TOC	Lachat/ EPA 300/ LK	4 DEG. C	1 X 8 oz.	[x]
[ ]				[ ]

NOTES

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SIGNATURE: [signature] ND

Checked By:

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - SURFACE WATER/ SEDIMENT SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA | JOB NUMBER: 6107-13-0016 | DATE: 6-20-13

FIELD SAMPLE ID (SW): OC-SW-601-KTP | SW BOTTLE TIME: 13:30

FIELD SAMPLE ID (SED): OC-SD-601-0.0/0.5-KTP | SED BOTTLE TIME: 13:45

QC SAMPLES COLLECTED: | ACTIVITY TIME: START 13:20 END 13:55

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 5.0 FT | SPEC. COND: 556 uS/cm

DEPTH OF SAMPLE FROM SURFACE: 1.0 FT | D.O.: 7.85 mg/L

TEMPERATURE: 20.15 DEG C | SALINITY: / %

TURBIDITY: 6.25 NTU | ORP: -12.9 mV

pH: 6.58 UNITS

EQUIPMENT USED:
- [ ] BEAKER
- [x] DIRECT DIP
- [ ] PERISTALTIC PUMP
- [ ] FILTER (0.45 micron)
- [ ] LDPE Tubing & Silicon

TYPE OF SURFACE WATER:
- [ ] STREAM/ RIVER
- [x] LAKE/ POND
- [ ] SEEP
- [ ] MARSH
- [ ] OTHER

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] LIQUINOX
- [x] OTHER Distilled

SEDIMENT DATA

DEPTH OF SEDIMENT: 0-0.5

TYPE OF SAMPLE:
- [ ] DISCRETE
- [x] COMPOSITE

SAMPLE OBSERVATIONS

ODOR: /

COLOR: brown

TYPE OF SEDIMENT:
- [x] ORGANIC
- [ ] SAND
- [ ] GRAVEL
- [ ] CLAY
- [ ] OTHER

EQUIPMENT FOR COLLECTION:
- [x] HAND AUGER
- [x] S.S. SPOON
- [x] S.S. BOWL
- [ ] DREDGE
- [ ] OTHER

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] POTABLE WATER
- [x] LIQUINOX
- [x] OTHER Distilled

DESCRIPTION: Brown. dark brown SILT and SAND. some organics saturated

ANALYTICAL PARAMETERS

SURFACE WATER	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260	HCl / 4 DEG. C	3 X 40 mL	[x]
[x] SVOCs	8270C	4 DEG. C	2 X 1 L	[x]
[x] NDMA/ NDPA	MOD 521	4 DEG. C	2 X 1 L	[x]
[x] TAL Metals/ Hardness	6010B/7470A	HNO3 / 4 DEG. C	1 X 500 mL	[x]
[x] Hex Cr	3060A/7196A	4 DEG. C no headspace	1 X 250 mL	[x]
[ ] Opex/ Kempore	7199	4 DEG. C	2 X 40 mL	[ ]
[ ] Diphenylamine	3620B	4 DEG. C	w/ SVOCs	[ ]
[ ] Nonylphenol	ws-ms-1000	H2SO4/ 4 DEG. C	2 X 1L	[ ]
[ ] VPH	MADEP 98-1	HCl / 4 DEG. C	3 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	HCl / 4 DEG. C	2 X 1L	[ ]
[ ] Hydrazine	MOD 8315	Acetate Buffer/ 4 DEG. C	2 X 40 mL	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	2 X 250 mL	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	2 X 250 mL	[ ]
[ ] DMF	mod 8033	4 DEG. C	2 X 40 mL	[ ]
[x] Ammonia	lachat	H2SO4/ 4 DEG. C	1 X 250 mL	[x]
[x] Anions/ TSS	EPA 300	4 DEG. C	1 X 500 mL	[x]
[x] TOC	SM 5310	HCl / 4 DEG. C	1 X 125 mL	[x]

ANALYTICAL PARAMETERS

SEDIMENT	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260B/5035A	4 DEG. C DI/MeOH	2-low & 1-med	[x]
[x] SVOCs/ Diphenylamine	8270C low level	4 DEG. C	1 X 8 oz.	[x]
[x] NDMA/ NDPA	8270 low level	4 DEG. C	1 X 8 oz.	[x]
[x] TAL Metals	6010B/7471A	4 DEG. C	1 X 4 oz.	[x]
[x] Hex Cr	3060A/7199	4 DEG. C	1 X 4 oz.	[x]
[ ] VPH	MADEP 98-1	MeOH / 4 DEG. C	1 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	4 DEG. C	1 X 8 oz.	[ ]
[ ] Hydrazine	MOD 8315	4 DEG. C	1 X 4 oz.	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	1 X 4 oz.	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	1 X 8 oz.	[ ]
[ ] DMF	mod 8033	4 DEG. C	1 X 4 oz.	[ ]
[x] Ammonia/Anions/TOC	Lachat/ EPA 300/ LK	4 DEG. C	1 X 8 oz.	[x]
[ ]				[ ]

NOTES

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SIGNATURE: [signature]

Checked By: MD

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - SURFACE WATER/ SEDIMENT SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA

JOB NUMBER: 6107-13-0016

DATE: 6-20-13

FIELD SAMPLE ID (SW): OC-SW-602-0.4-TAP — SW BOTTLE TIME: 12:45

FIELD SAMPLE ID (SED): OC-SD-602-0.0-0.5-TAP — SED BOTTLE TIME: 13:00

QC SAMPLES COLLECTED:

ACTIVITY TIME: START 12:40 END 13:05

SURFACE WATER DATA

WATER DEPTH AT LOCATION: ~~2.5~~ 2.5 FT

DEPTH OF SAMPLE FROM SURFACE: 0.4 FT

TEMPERATURE: 20.38 DEG C

TURBIDITY: 8.24 NTU

pH: 6.78 UNITS

SPEC. COND: 502 uS/cm

D.O.: 12.80 14.30 mg/L

SALINITY: / %

ORP: -5.4 mV

EQUIPMENT USED:
- [ ] BEAKER
- [x] DIRECT DIP
- [ ] PERISTALTIC PUMP
- [ ] FILTER (0.45 micron)
- [ ] LDPE Tubing & Silicon

TYPE OF SURFACE WATER:
- [ ] STREAM/ RIVER
- [x] LAKE/ POND
- [ ] SEEP
- [ ] MARSH
- [ ] OTHER

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] LIQUINOX
- [x] OTHER Distilled

SEDIMENT DATA

DEPTH OF SEDIMENT: 0.0-0.5

TYPE OF SAMPLE:
- [ ] DISCRETE
- [x] COMPOSITE

SAMPLE OBSERVATIONS

ODOR: N/A

COLOR: brown / dark brown

TYPE OF SEDIMENT:
- [x] ORGANIC
- [x] SAND
- [ ] GRAVEL
- [ ] CLAY
- [ ] OTHER

EQUIPMENT FOR COLLECTION:
- [x] HAND AUGER
- [x] S.S. SPOON
- [x] S.S. BOWL
- [ ] DREDGE
- [ ] OTHER

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] POTABLE WATER
- [x] LIQUINOX
- [x] OTHER Distilled

DESCRIPTION: Brown - dark brown SAND, some silt/ organics

ANALYTICAL PARAMETERS

SURFACE WATER		METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x]	VOCs	8260	HCl / 4 DEG. C	3 X 40 mL	[x]
[x]	SVOCs	8270C	4 DEG. C	2 X 1 L	[x]
[x]	NDMA/ NDPA	MOD 521	4 DEG. C	2 X 1 L	[x]
[x]	TAL Metals/ Hardness	6010B/7470A	HNO3 / 4 DEG. C	1 X 500 mL	[x]
[x]	Hex Cr	3060A/7196A 7199	4 DEG. C no headspace	1 X 250 mL	[x]
[ ]	Opex/ Kempore	7199	4 DEG. C	2 X 40 mL	[ ]
[ ]	Diphenylamine	3620B	4 DEG. C	w/ SVOCs	[ ]
[ ]	Nonylphenol	ws-ms-1000	H2SO4/ 4 DEG. C	2 X 1L	[ ]
[ ]	VPH	MADEP 98-1	HCl / 4 DEG. C	3 X 40 mL	[ ]
[ ]	EPH	MADEP 98-1	HCl / 4 DEG. C	2 X 1L	[ ]
[ ]	Hydrazine	MOD 8315	Acetate Buffer/ 4 DEG. C	2 X 40 mL	[ ]
[ ]	Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	2 X 250 mL	[ ]
[ ]	Phthalic Anhydride	mod 8000	4 DEG. C	2 X 250 mL	[ ]
[ ]	DMF	mod 8033	4 DEG. C	2 X 40 mL	[ ]
[x]	Ammonia	lachat	H2SO4/ 4 DEG. C	1 X 250 mL	[x]
[x]	Anions/ TSS	EPA 300	4 DEG. C	1 X 500 mL	[x]
[x]	TOC	SM 5310	HCl / 4 DEG. C	1 X 125 mL	[x]

ANALYTICAL PARAMETERS

SEDIMENT		METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x]	VOCs	8260B/5035A	4 DEG. C DI/MeOH	2-low & 1-med	[x]
[x]	SVOCs/ Diphenylamine	8270C low level	4 DEG. C	1 X 8 oz.	[x]
[x]	NDMA/ NDPA	8270 low level	4 DEG. C	1 X 8 oz.	[x]
[x]	TAL Metals	6010B/7471A	4 DEG. C	1 X 4 oz.	[x]
[x]	Hex Cr	3060A/7199	4 DEG. C	1 X 4 oz.	[x]
[ ]	VPH	MADEP 98-1	MeOH / 4 DEG. C	1 X 40 mL	[ ]
[ ]	EPH	MADEP 98-1	4 DEG. C	1 X 8 oz.	[ ]
[ ]	Hydrazine	MOD 8315	4 DEG. C	1 X 4 oz.	[ ]
[ ]	Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	1 X 4 oz.	[ ]
[ ]	Phthalic Anhydride	mod 8000	4 DEG. C	1 X 8 oz.	[ ]
[ ]	DMF	mod 8033	4 DEG. C	1 X 4 oz.	[ ]
[x]	Ammonia/Anions/TOC	Lachat/ EPA 300/ LK	4 DEG. C	1 X 8 oz.	[x]
[ ]					[ ]

NOTES

amec

SIGNATURE:

Checked By:

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

FIELD DATA RECORD - SURFACE WATER/ SEDIMENT SAMPLING

PROJECT: OLIN CHEMICAL SUPERFUND SITE, WILMINGTON, MA | JOB NUMBER: 6107-13-0016 | DATE: ~~6-30-13~~ 6.20.13

FIELD SAMPLE ID (SW): ~~OC-SW-603-7~~ | SW BOTTLE TIME: ~~12:00~~ 12:10

FIELD SAMPLE ID (SED): 603 | SED BOTTLE TIME: ~~12:10~~ ~~12:00~~

QC SAMPLES COLLECTED: | ACTIVITY TIME: START 11:50 END 12:10

SURFACE WATER DATA

WATER DEPTH AT LOCATION	1.0 FT	SPEC. COND	844 uS/cm
DEPTH OF SAMPLE FROM SURFACE	0.3 FT	D.O.	10.72 mg/L
TEMPERATURE	21.50 DEG C	SALINITY	/ %
TURBIDITY	7.64 NTU	ORP	-114.6 mV
pH	6.56 UNITS		

EQUIPMENT USED:
- [ ] BEAKER
- [x] DIRECT DIP
- [ ] PERISTALTIC PUMP
- [ ] FILTER (0.45 micron)
- [ ] LDPE Tubing & Silicon

TYPE OF SURFACE WATER:
- [ ] STREAM/ RIVER
- [x] LAKE/ POND
- [ ] SEEP
- [ ] MARSH
- [ ] OTHER

DECON FLUIDS USED:
- [x] DI WATER
- [x] LIQUINOX
- [ ] OTHER

SEDIMENT DATA

DEPTH OF SEDIMENT: 0.0-0.5'

TYPE OF SAMPLE:
- [ ] DISCRETE
- [x] COMPOSITE

SAMPLE OBSERVATIONS:
ODOR: N/A
COLOR: dark brown

TYPE OF SEDIMENT:
- [x] ORGANIC
- [x] SAND
- [ ] GRAVEL
- [ ] CLAY
- [x] OTHER silt

EQUIPMENT FOR COLLECTION:
- [x] HAND AUGER
- [x] S.S. SPOON
- [x] S.S. BOWL
- [ ] DREDGE
- [ ] OTHER

DECON FLUIDS USED:
- [ ] DI WATER
- [ ] POTABLE WATER
- [x] LIQUINOX
- [x] OTHER Distilled

DESCRIPTION: Dark brown SAND and SILT, some organics

ANALYTICAL PARAMETERS

SURFACE WATER	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260	HCl / 4 DEG. C	3 X 40 mL	[x]
[x] SVOCs	8270C	4 DEG. C	2 X 1 L	[x]
[x] NDMA/ NDPA	MOD 521	4 DEG. C	2 X 1 L	[x]
[x] TAL Metals/ Hardness	6010B/7470A	HNO3 / 4 DEG. C	1 X 500 mL	[x]
[x] Hex Cr	3060A/7196A 17199	4 DEG. C no headspace	1 X 250 mL	[x]
[ ] Opex/ Kempore	7199	4 DEG. C	2 X 40 mL	[ ]
[ ] Diphenylamine	3620B	4 DEG. C	w/ SVOCs	[ ]
[ ] Nonylphenol	ws-ms-1000	H2SO4/ 4 DEG. C	2 X 1L	[ ]
[ ] VPH	MADEP 98-1	HCl / 4 DEG. C	3 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	HCl / 4 DEG. C	2 X 1L	[ ]
[ ] Hydrazine	MOD 8315	Acetate Buffer/ 4 DEG. C	2 X 40 mL	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	2 X 250 mL	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	2 X 250 mL	[ ]
[ ] DMF	mod 8033	4 DEG. C	2 X 40 mL	[ ]
[x] Ammonia	lachat	H2SO4/ 4 DEG. C	1 X 250 mL	[x]
[x] Anions/ TSS TDS	EPA 300	4 DEG. C	1 X 500 mL	[x]
[x] TOC	SM 5310	HCl / 4 DEG. C	1 X 125 mL	[x]

ANALYTICAL PARAMETERS

SEDIMENT	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
[x] VOCs	8260B/5035A	4 DEG. C DI/MeOH	2-low & 1-med	[x]
[x] SVOCs/ Diphenylamine	8270C low level	4 DEG. C	1 X 8 oz.	[x]
[x] NDMA/ NDPA	8270 low level	4 DEG. C	1 X 8 oz.	[x]
[x] TAL Metals	6010B/7471A	4 DEG. C	1 X 4 oz.	[x]
[x] Hex Cr	3060A/7199	4 DEG. C	1 X 4 oz.	[x]
[x] VPH	MADEP 98-1	MeOH / 4 DEG. C	1 X 40 mL	[ ]
[ ] EPH	MADEP 98-1	4 DEG. C	1 X 8 oz.	[ ]
[ ] Hydrazine	MOD 8315	4 DEG. C	1 X 4 oz.	[ ]
[ ] Acetaldehyde/Formaldehyde	sw-846/8315A	4 DEG. C	1 X 4 oz.	[ ]
[ ] Phthalic Anhydride	mod 8000	4 DEG. C	1 X 8 oz.	[ ]
[ ] DMF	mod 8033	4 DEG. C	1 X 4 oz.	[ ]
[x] Ammonia/Anions/TOC	Lachat/ EPA 300/ LK	4 DEG. C	1 X 8 oz.	[x]
[ ]				[ ]

NOTES

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SIGNATURE: [signature]

Checked By:

ATTACHMENT D

TABLE 59
SEDIMENT EXPOSURE POINT CONCENTRATIONS - EAST DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
VOCs (mg/Kg)							
1,1,1-Trichloroethane	0.007 :	0.04	1 / 18	47	47	2.6181	2.6181
1,1,2,2-Tetrachloroethane	0.002 :	0.04	2 / 17	0.004	0.016	0.0073	0.0073
1,1-Dichloroethane	0.007 :	0.04	6 / 18	0.003	0.019	0.0083	0.0083
1,2-Dichloroethene(total)	0.007 :	0.03	6 / 18	0.007	0.12	0.0153	0.0153
1,2-Dichloropropane	0.007 :	0.03	1 / 17	0.04	0.04	0.0086	0.0086
2,4,4-Trimethyl-1-pentene	0.02 :	0.05	14 / 18	0.004	0.2	0.0541	0.0541
2,4,4-Trimethyl-2-Pentene	0.01 :	0.05	11 / 18	0.002	1.1	0.0804	0.0804
2-Butanone (MEK)	0.02 :	0.08	2 / 17	0.091	0.28	0.0371	0.0371
Acetone	0.03 :	0.41	8 / 18	0.12	1.4	0.2288	0.2288
Benzene	0.007 :	0.04	4 / 18	0.003	0.018	0.0087	0.0087
Chlorobenzene	0.007 :	0.04	5 / 18	0.002	0.014	0.0073	0.0073
Ethylbenzene	0.007 :	0.04	1 / 17	0.005	0.005	0.0075	0.005
Methylene Chloride	0.01 :	0.08	3 / 17	0.004	0.008	0.0122	0.008
Styrene	0.007 :	0.04	1 / 17	0.005	0.005	0.0071	0.005
Tetrachloroethene (PCE)	0.007 :	0.04	2 / 17	0.007	0.01	0.0075	0.0075
Toluene	0.007 :	0.04	6 / 18	0.002	0.012	0.0069	0.0069
Trichloroethene (TCE)	0.007 :	0.03	12 / 18	0.002	0.15	0.0199	0.0199
Vinyl Chloride	0.01 :	0.08	3 / 18	0.002	0.012	0.0129	0.012
Xylenes, Total	0.007 :	0.04	3 / 17	0.003	0.02	0.0079	0.0079
SVOCs (mg/Kg)							
4-Bromophenyl-phenylether	0.4 :	3	1 / 17	0.23	0.23	0.5018	0.23
4-Chlorophenyl-phenylether	0.4 :	3	2 / 17	0.074	0.22	0.4938	0.22
Anthracene	0.5 :	3	10 / 17	0.033	0.52	0.3312	0.3312
Benzo(a)Anthracene	0.5 :	1	13 / 17	0.055	1.7	0.5473	0.5473
Benzo(a)Pyrene	0.5 :	1	13 / 17	0.059	2	0.5701	0.5701
Benzo(b)Fluoranthene	0.5 :	0.7	14 / 17	0.075	4.4	1.0074	1.0074

TABLE 59
SEDIMENT EXPOSURE POINT CONCENTRATIONS - EAST DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Benzo(g,h,i)Perylene	0.5 :	3	11 / 17	0.056	2.1	0.5962	0.5962
Benzo(k)Fluoranthene	0.4 :	1	10 / 16	0.053	1.4	0.4046	0.4046
Benzoic Acid	2 :	10	4 / 17	0.45	3.4	1.9047	1.9047
Butylbenzylphthalate	0.4 :	3	5 / 16	0.066	0.49	0.4541	0.4541
Chrysene	0.5 :	1	14 / 17	0.093	3.4	0.9084	0.9084
Di-n-butylphthalate	0.4 :	5.8	8 / 18	0.075	0.5	0.5281	0.5
Di-n-octylphthalate	0.5 :	2	10 / 18	0.054	10	0.9952	0.9952
Dibenzo(a,h)Anthracene	0.4 :	3	2 / 17	0.41	0.43	0.4347	0.43
Dibenzofuran	0.4 :	3	2 / 17	0.11	0.22	0.4871	0.22
Fluoranthene	0.5 :	1	15 / 17	0.077	4.5	1.3545	1.3545
Fluorene	0.4 :	2	4 / 17	0.12	0.4	0.4247	0.4
Indeno (1,2,3-cd)Pyrene	0.5 :	1.3	12 / 17	0.069	2.7	0.5697	0.5697
N-Nitrosodiphenylamine	0.7 :	2	15 / 18	0.093	4.3	1.0529	1.0529
Naphthalene	0.4 :	3	2 / 18	0.053	53	3.4113	3.4113
Phenanthrene	0.5 :	3	12 / 17	0.06	1.9	0.7095	0.7095
Phenol	0.4 :	2	6 / 18	0.069	0.36	0.3438	0.3438
Pyrene	0.5 :	1	16 / 18	0.077	3.5	0.9787	0.9787
bis(2-EthylHexyl)phthalate	0 :	0	17 / 17	0.23	9300	756.6347	756.635
Pesticides/PCBs (mg/Kg)							
4,4'-DDD	0.004 :	2	1 / 18	0.007	0.007	0.0957	0.007
4,4'-DDT	0.006 :	2	2 / 18	0.0044	0.026	0.0965	0.026
Alpha-Chlordane	0.02 :	9	4 / 17	0.045	1.6	0.4851	0.4851
Delta-BHC	0.002 :	0.9	1 / 18	0.058	0.058	0.0487	0.0487
Endosulfan I	0.002 :	0.9	2 / 18	0.028	0.09	0.0504	0.0504
Endosulfan Sulfate	0.004 :	2	2 / 18	0.088	0.17	0.1056	0.1056
Endrin	0.004 :	2	2 / 18	0.0082	0.61	0.1157	0.1157
Endrin Aldehyde	0.006 :	0.5	5 / 18	0.02	6.5	0.4189	0.4189

TABLE 59
SEDIMENT EXPOSURE POINT CONCENTRATIONS - EAST DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Endrin Ketone	0.004 :	2	2 / 18	0.011	0.4	0.1059	0.1059
Gamma-Chlordane	0.02 :	9	5 / 18	0.03	1.6	0.4623	0.4623
Metals (mg/Kg)							0
Aluminum	0 :	0	18 / 18	7.3	60000	10639.81	10639.8
Antimony	20 :	92	5 / 18	0.05	43	17.6299	17.6299
Arsenic	0 :	0	17 / 17	0.0053	440	104.2066	104.207
Barium	0 :	0	18 / 18	0.0097	250	52.7234	52.7234
Cadmium	0.001 :	1	9 / 17	1.1	14	2.4706	2.4706
Calcium	0 :	0	18 / 18	1	9900	2080.683	2080.68
Chromium	0 :	0	18 / 18	2.1	3000	622.8944	622.894
Cobalt	0 :	0	18 / 18	0.0044	39	10.0505	10.0505
Copper	0 :	0	17 / 17	0.02	280	75.3681	75.3681
Iron	0 :	0	18 / 18	6.8	140000	39739.79	39739.8
Lead	10 :	35	13 / 18	0.012	790	111.3073	111.307
Manganese	0 :	0	18 / 18	0.069	1900	360.9528	360.953
Mercury	0.0001 :	0.28	9 / 18	0.0001	1.3	0.3008	0.3008
Nickel	0 :	0	18 / 18	0.01	54	13.5962	13.5962
Potassium	0 :	0	18 / 18	0.34	1700	647.8189	647.819
Sodium	0 :	0	18 / 18	0.18	560	152.8	152.8
Vanadium	0 :	0	18 / 18	0.009	93	24.0622	24.0622
Zinc	0 :	0	18 / 18	0.026	1100	207.7258	207.726
Inorganics (mg/Kg)							
Chloride	40 :	40	11 / 18	0.064	240	58.5663	58.5663
Nitrate as N	1 :	1	2 / 3	0.0014	0.0015	0.1676	0.0015
Nitrogen, Ammonia	8 :	8	15 / 17	0.16	410	100.2447	100.245
Sulfate as SO4	0 :	0	18 / 18	110	18000	2103.889	2103.89

TABLE 59
SEDIMENT EXPOSURE POINT CONCENTRATIONS - EAST DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	

Notes:
1 Selection of OHM of Concern for this medium is presented in Table 7.
2 Samples included in Site Data set are presented in Attachment 1.
Duplicate samples were averaged with their original samples prior to calculation of summary statistics.
The arithmetic mean represents the arithmetic average of all sample results, with one-half the SQL used as the value for non-detects.
3 The EPC is the arithmetic mean concentration unless the arithmetic mean concentration exceeds the maximum detected concentration (MADEP, 1995). For these OHM, the maximum detected concentration is used as the EPC.
EPC = Exposure Point Concentration
OHM = Oil or Hazardous Material
SQL = Sample Quantitation Limit
MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

TABLE 60
SEDIMENT EXPOSURE POINT CONCENTRATIONS - ON-SITE DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
VOCs (mg/Kg)							
1,1,2,2-Tetrachloroethane	0.005 :	1	2 / 24	0.002	0.003	0.026	0.003
1,1-Dichloroethane	0.005 :	1	4 / 24	0.003	0.034	0.0269	0.0269
2,4,4-Trimethyl-1-pentene	0.01 :	0.02	18 / 24	0.002	28	2.7831	2.7831
2,4,4-Trimethyl-2-Pentene	0.01 :	0.02	16 / 24	0.002	9.4	0.8529	0.8529
2-Butanone (MEK)	0.015 :	3	6 / 24	0.012	0.074	0.085	0.074
2-Hexanone	0.015 :	3	2 / 24	0.02	0.036	0.0791	0.036
Acetone	0.02 :	3	9 / 24	0.007	1.7	0.1836	0.1836
Benzene	0.005 :	1	1 / 24	0.015	0.015	0.0266	0.015
Carbon Disulfide	0.01 :	2	3 / 24	0.003	0.005	0.0513	0.005
Chlorobenzene	0.005 :	1	1 / 24	0.007	0.007	0.0263	0.007
Ethylbenzene	0.005 :	0.046	6 / 24	0.003	0.71	0.0396	0.0396
Methylene Chloride	0.01 :	2	7 / 24	0.004	0.024	0.0521	0.024
Styrene	0.005 :	1	2 / 24	0.004	0.007	0.0263	0.007
Tetrachloroethene (PCE)	0.005 :	1	2 / 24	0.007	0.032	0.0266	0.0266
Toluene	0.005 :	1	8 / 24	0.002	1.1	0.0719	0.0719
Xylenes, Total	0.005 :	1	6 / 24	0.002	0.25	0.0366	0.0366
SVOCs (mg/Kg)							
1,2,4-Trichlorobenzene	0.4 :	1200	5 / 29	0.083	1.4	49.6234	1.4
1,2-Dichlorobenzene	0.4 :	1200	1 / 29	1.6	1.6	49.6902	1.6
2-Methylnaphthalene	0.4 :	1200	1 / 29	1.4	1.4	49.6833	1.4
4-Bromophenyl-phenylether	0.4 :	1200	5 / 29	0.47	3.4	49.9371	3.4
4-Chlorophenyl-phenylether	0.4 :	1200	4 / 29	0.23	2.3	49.7895	2.3
Benzo(a)Anthracene	0.4 :	1200	2 / 29	0.095	2.1	49.7848	2.1
Benzo(a)Pyrene	0.4 :	1200	1 / 29	0.1	0.1	49.7988	0.1
Benzo(b)Fluoranthene	0.4 :	1200	5 / 29	0.064	0.87	49.7192	0.87
Benzo(g,h,i)Perylene	0.4 :	1200	1 / 29	0.083	0.083	49.7982	0.083

TABLE 60
SEDIMENT EXPOSURE POINT CONCENTRATIONS - ON-SITE DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Benzoic Acid	2 :	5800	4 / 28	0.11	2	248.4971	2
Butylbenzylphthalate	0.4 :	1200	12 / 29	0.33	160	57.6357	57.6357
Chrysene	0.4 :	1200	3 / 29	0.1	1.3	49.7881	1.3
Di-n-butylphthalate	0.4 :	1200	13 / 29	0.016	2100	154.8332	154.833
Di-n-octylphthalate	0.4 :	1200	12 / 29	0.091	24	50.7106	24
Dibenzofuran	0.4 :	1200	2 / 29	1.6	5.9	49.8074	5.9
Dimethylphthalate	0.4 :	1200	3 / 29	0.12	0.53	49.7602	0.53
Fluoranthene	0.4 :	1200	10 / 29	0.065	4.1	49.6732	4.1
Fluorene	0.4 :	1200	2 / 29	0.092	4	49.7675	4
Indeno (1,2,3-cd)Pyrene	0.4 :	1200	3 / 29	0.091	13	50.2433	13
N-Nitrosodiphenylamine	0.4 :	550	16 / 29	0.24	6200	422.6209	422.621
Naphthalene	0.4 :	1200	1 / 29	2.2	2.2	49.7109	2.2
Phenanthrene	0.4 :	1200	12 / 29	0.054	34	51.2749	34
Phenol	0.4 :	1100	7 / 29	0.075	56	31.0897	31.0897
Pyrene	0.4 :	1200	11 / 29	0.07	9.1	49.8667	9.1
bis(2-EthylHexyl)phthalate	0.8 :	37	26 / 29	0.082	150000	11092.86	11092.9
Pesticides/PCBs (mg/Kg)							
4,4'-DDT	0.004 :	0.6	3 / 29	0.018	1.2	0.0958	0.0958
Aldrin	0.002 :	0.3	4 / 29	0.046	0.45	0.0469	0.0469
Alpha-Chlordane	0.0022 :	3	1 / 29	0.025	0.025	0.238	0.025
Beta-BHC	0.002 :	0.3	1 / 28	0.46	0.46	0.0438	0.0438
Endosulfan I	0.002 :	0.3	3 / 29	0.0032	0.41	0.0409	0.0409
Endosulfan Sulfate	0.004 :	0.6	3 / 29	0.047	0.12	0.0693	0.0693
Endrin	0.004 :	0.6	1 / 29	0.035	0.035	0.0593	0.035
Endrin Aldehyde	0.004 :	0.6	6 / 29	0.055	2.5	0.1578	0.1578
Endrin Ketone	0.004 :	0.6	1 / 29	0.065	0.065	0.0641	0.0641
Heptachlor	0.002 :	0.3	3 / 29	0.0006	0.54	0.0441	0.0441

TABLE 60
SEDIMENT EXPOSURE POINT CONCENTRATIONS - ON-SITE DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Heptachlor Epoxide	0.002 :	0.3	2 / 29	0.0046	0.006	0.0319	0.006
Methoxychlor	0.02 :	3	1 / 29	0.29	0.29	0.3228	0.29
Metals (mg/Kg)							
Aluminum	0 :	0	29 / 29	570	66700	7444.483	7444.48
Antimony	20 :	31	14 / 29	1.1	69	20.7966	20.7966
Arsenic	0.5 :	0.5	28 / 29	1.1	26.4	4.7845	4.7845
Barium	0 :	0	29 / 29	4.6	74	19.131	19.131
Beryllium	0.3 :	2.4	4 / 29	0.22	10.4	1.0353	1.0353
Cadmium	0.21 :	1.6	3 / 29	0.4	2.7	0.6029	0.6029
Calcium	0 :	0	29 / 29	160	7570	1191.655	1191.66
Chromium	0 :	0	29 / 29	5.4	13800	1382.772	1382.77
Cobalt	1.5 :	2.4	20 / 29	1.5	38.4	5.3172	5.3172
Copper	2.5 :	2.5	26 / 29	2.2	97.7	13.5328	13.5328
Iron	0 :	0	29 / 29	330	67500	7623.104	7623.1
Lead	10 :	12	13 / 28	2.3	59.7	13.6179	13.6179
Manganese	0 :	0	29 / 29	3.7	95	41.4862	41.4862
Mercury	0.086 :	0.26	13 / 29	0.11	1.2	0.2198	0.2198
Nickel	4 :	6.3	18 / 29	4.3	110	10.6535	10.6535
Potassium	0 :	0	29 / 29	130	960	306.6552	306.655
Selenium	0.5 :	2.9	1 / 29	0.78	0.78	0.3928	0.3928
Silver	0.83 :	2.9	2 / 29	2.7	5.8	1.0288	1.0288
Sodium	0 :	0	29 / 29	28	500	184.1379	184.138
Vanadium	2.5 :	2.5	27 / 29	3.6	50.3	12.8931	12.8931
Zinc	2.5 :	2.5	28 / 29	3.9	372	43.5535	43.5535

TABLE 60
SEDIMENT EXPOSURE POINT CONCENTRATIONS - ON-SITE DITCH
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	
Inorganics (mg/Kg)							
Chloride	40 : 40		16 / 23	44	240	75	75
Nitrate as N	0 : 0		2 / 2	2.8	3.7	3.25	3.25
Nitrite as N	1 : 1		1 / 2	2.2	2.2	1.35	1.35
Nitrogen, Ammonia	8 : 8		27 / 28	18	410	117	117
Sulfate as SO4	40 : 40		22 / 23	80	3200	553.3044	553.304

Notes:

1 Selection of OHM of Concern for this medium is presented in Table 7.

2 Samples included in Site Data set are presented in Attachment 1.
Duplicate samples were averaged with their original samples prior to calculation of summary statistics.
The arithmetic mean represents the arithmetic average of all sample results, with one-half the SQL used as the value for non-detects.

3 The EPC is the arithmetic mean concentration unless the arithmetic mean concentration exceeds the maximum detected concentration (MADEP, 1995). For these OHM, the maximum detected concentration is used as the EPC.

EPC = Exposure Point Concentration

OHM = Oil or Hazardous Material

SQL = Sample Quantitation Limit

MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

TABLE 61
SEDIMENT EXPOSURE POINT CONCENTRATIONS - WEST DITCH OFF-SITE
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
VOCs (mg/Kg)							
1,1,1-Trichloroethane	0.007 :	0.02	4 / 9	0.006	0.0185	0.0074	0.0074
1,1-Dichloroethane	0.007 :	0.02	2 / 8	0.003	0.004	0.0048	0.004
2,4,4-Trimethyl-1-pentene	0.01 :	0.01	8 / 9	0.006	6.5	0.9176	0.9176
2,4,4-Trimethyl-2-Pentene	0.01 :	0.01	8 / 9	0.003	1.8	0.2589	0.2589
Acetone	0.015 :	0.092	4 / 9	0.009	0.093	0.0301	0.0301
Bromoform	0.007 :	0.01	5 / 8	0.003	0.102	0.0265	0.0265
Carbon Tetrachloride	0.007 :	0.01	2 / 8	0.005	0.011	0.0052	0.0052
Chloroform	0.007 :	0.01	5 / 8	0.003	0.009	0.0048	0.0048
Dibromochloromethane	0.007 :	0.02	3 / 8	0.004	0.026	0.0094	0.0094
Methylene Chloride	0.01 :	0.05	1 / 9	0.01	0.01	0.0097	0.0097
Tetrachloroethene (PCE)	0.007 :	0.02	2 / 8	0.003	0.004	0.0047	0.004
Toluene	0.007 :	0.02	3 / 8	0.009	0.012	0.0066	0.0066
Trichloroethene (TCE)	0.007 :	0.02	3 / 8	0.002	0.003	0.0042	0.003
Xylenes, Total	0.007 :	0.02	1 / 8	0.006	0.006	0.005	0.005
SVOCs (mg/Kg)							
1,2,4-Trichlorobenzene	0.4 :	0.9	2 / 9	0.076	0.21	0.2484	0.21
4-Bromophenyl-phenylether	0.4 :	0.9	6 / 9	0.15	0.65	0.3878	0.3878
4-Chlorophenyl-phenylether	0.4 :	1	2 / 9	0.058	0.1	0.2866	0.1
Benzo(a)Anthracene	0.4 :	0.9	4 / 9	0.11	0.49	0.2933	0.2933
Benzo(a)Pyrene	0.4 :	0.9	4 / 9	0.14	0.6	0.3317	0.3317
Benzo(b)Fluoranthene	0.4 :	0.9	5 / 9	0.052	1.2	0.4868	0.4868
Benzo(g,h,i)Perylene	0.4 :	0.9	3 / 9	0.28	0.45	0.3111	0.3111
Benzo(k)Fluoranthene	0.4 :	0.9	2 / 9	0.077	0.29	0.2726	0.2726
Benzoic Acid	2 :	7	1 / 9	0.17	0.17	1.565	0.17
Chrysene	0.4 :	0.9	4 / 9	0.2	0.73	0.3806	0.3806
Di-n-butylphthalate	0.4 :	1	1 / 9	0.086	0.086	0.2929	0.086

TABLE 61
SEDIMENT EXPOSURE POINT CONCENTRATIONS - WEST DITCH OFF-SITE
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Dibenzo(a,h)Anthracene	0.4 :	1	1 / 9	0.12	0.12	0.2911	0.12
Fluoranthene	0.4 :	0.4	6 / 9	0.083	1.7	0.7063	0.7063
Indeno (1,2,3-cd)Pyrene	0.4 :	0.9	6 / 9	0.14	0.56	0.3161	0.3161
N-Nitrosodiphenylamine	0.4 :	0.9	4 / 9	0.18	0.91	0.3983	0.3983
Phenanthrene	0.4 :	0.9	6 / 9	0.13	0.57	0.2989	0.2989
Pyrene	0.4 :	0.4	7 / 9	0.167	1.1	0.4541	0.4541
bis(2-EthylHexyl)phthalate	0.4 :	0.9	7 / 9	0.325	2.92	1.2322	1.2322
Pesticides/PCBs (mg/Kg)							
4,4'-DDD	0.004 :	0.07	1 / 9	0.19	0.19	0.0296	0.0296
Alpha-BHC	0.002 :	0.08	1 / 8	0.0052	0.0052	0.0105	0.0052
Beta-BHC	0.002 :	0.04	4 / 8	0.0031	0.21	0.032	0.032
Delta-BHC	0.002 :	0.04	5 / 8	0.0054	0.12	0.0263	0.0263
Endosulfan I	0.002 :	0.04	2 / 8	0.0032	0.15	0.0241	0.0241
Endosulfan Sulfate	0.004 :	0.07	2 / 9	0.074	0.24	0.0406	0.0406
Endrin Aldehyde	0.004 :	0.2	3 / 9	0.012	0.012	0.0211	0.012
Heptachlor Epoxide	0.002 :	0.04	2 / 8	0.033	0.16	0.0275	0.0275
Metals (mg/Kg)							
Aluminum	0 :	0	9 / 9	3100	150000	27766.67	27766.7
Antimony	20 :	20	5 / 8	99	250	83	83
Arsenic	23 :	23	8 / 9	1.7	11	6.1833	6.1833
Barium	0 :	0	9 / 9	3.6	24	11.8333	11.8333
Beryllium	1.5 :	3.5	1 / 8	1.9	1.9	1.0438	1.0438
Cadmium	1 :	2.4	1 / 8	2.1	2.1	0.8	0.8
Calcium	0 :	0	9 / 9	360	1200	631.1111	631.111
Chromium	0 :	0	9 / 9	140	8900	2744.444	2744.44
Cobalt	1.5 :	1.5	8 / 9	1.5	6.6	3.6111	3.6111
Copper	0 :	0	8 / 8	4.1	120	34.8781	34.8781

TABLE 61
SEDIMENT EXPOSURE POINT CONCENTRATIONS - WEST DITCH OFF-SITE
CURRENT LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	
Iron	0 : 0		9 / 9	3200	83000	18305.56	18305.6
Lead	10 : 10		4 / 8	10	100	21.875	21.875
Manganese	0 : 0		9 / 9	27	97	52	52
Mercury	0.1 : 0.2		2 / 9	0.21	0.96	0.1814	0.1814
Nickel	4 : 4		7 / 9	5.3	14	6.6861	6.6861
Potassium	0 : 0		9 / 9	330	1200	621.1111	621.111
Sodium	0 : 0		9 / 9	32	1600	511.5556	511.556
Vanadium	0 : 0		9 / 9	4.1	31	13.9889	13.9889
Zinc	0 : 0		9 / 9	8.1	60	20.3167	20.3167
Inorganics (mg/Kg)							
Chloride	40 : 40		8 / 9	60	1400	375.5	375.5
Nitrate as N	0 : 0		2 / 2	2.6	3.15	2.875	2.875
Nitrogen, Ammonia	8 : 8		6 / 8	75	1000	225.375	225.375
Sulfate as SO4	0 : 0		9 / 9	100	6000	1326.111	1326.11

Notes:

1 Selection of OHM of Concern for this medium is presented in Table 7.

2 Samples included in Site Data set are presented in Attachment 1.
Duplicate samples were averaged with their original samples prior to calculation of summary statistics.
The arithmetic mean represents the arithmetic average of all sample results, with one-half the SQL used as the value for non-detects.

3 The EPC is the arithmetic mean concentration unless the arithmetic mean concentration exceeds the maximum detected concentration (MADEP, 1995). For these OHM, the maximum detected concentration is used as the EPC.

EPC = Exposure Point Concentration
OHM = Oil or Hazardous Material
SQL = Sample Quantitation Limit
MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

TABLE 62
SEDIMENT EXPOSURE POINT CONCENTRATIONS - HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	
VOCs (mg/Kg)							
1,1,1-Trichloroethane	0.007 :	1	5 / 35	0.006	47	1.3638	1.3638
1,1,2,2-Tetrachloroethane	0.002 :	1	3 / 33	0.002	0.004	0.0212	0.004
1,1-Dichloroethane	0.007 :	1	11 / 34	0.003	0.034	0.0215	0.0215
1,2-Dichloroethene(total)	0.007 :	1	6 / 34	0.007	0.12	0.0252	0.0252
1,2-Dichloropropane	0.007 :	1	1 / 33	0.04	0.04	0.022	0.022
2,4,4-Trimethyl-1-pentene	0.02 :	0.05	32 / 35	0.009	28	2.1672	2.1672
2,4,4-Trimethyl-2-Pentene	0.01 :	0.05	31 / 35	0.002	9.4	0.6886	0.6886
2-Butanone (MEK)	0.02 :	3	7 / 33	0.012	0.28	0.0755	0.0755
2-Hexanone	0.02 :	3	2 / 33	0.02	0.036	0.0643	0.036
Acetone	0.02 :	3	16 / 35	0.009	1.7	0.1963	0.1963
Benzene	0.007 :	1	5 / 34	0.003	0.018	0.022	0.018
Bromoform	0.007 :	1	5 / 33	0.003	0.102	0.0266	0.0266
Carbon Disulfide	0.01 :	10	3 / 34	0.003	0.005	0.1882	0.005
Carbon Tetrachloride	0.007 :	1	2 / 33	0.005	0.011	0.0215	0.011
Chlorobenzene	0.007 :	1	6 / 34	0.002	0.014	0.021	0.014
Chloroform	0.007 :	1	5 / 33	0.003	0.009	0.0214	0.009
Dibromochloromethane	0.007 :	1	3 / 33	0.004	0.026	0.0225	0.0225
Ethylbenzene	0.007 :	0.046	7 / 33	0.003	0.71	0.0312	0.0312
Methylene Chloride	0.01 :	2	7 / 34	0.004	0.022	0.0408	0.022
Styrene	0.007 :	1	3 / 33	0.004	0.007	0.0213	0.007
Tetrachloroethene (PCE)	0.007 :	1	6 / 33	0.003	0.032	0.0218	0.0218
Toluene	0.007 :	1	12 / 34	0.002	1.1	0.0538	0.0538
Trichloroethene (TCE)	0.007 :	1	13 / 34	0.002	0.15	0.0275	0.0275
Vinyl Chloride	0.01 :	2	3 / 34	0.002	0.012	0.0416	0.012
Xylenes, Total	0.007 :	1	9 / 33	0.002	0.25	0.0293	0.0293
SVOCs (mg/Kg)							
1,2,4-Trichlorobenzene	0.4 :	1200	7 / 41	0.076	1.4	44.9835	1.4
1,2-Dichlorobenzene	0.4 :	1200	1 / 41	1.6	1.6	45.0433	1.6

TABLE 62
SEDIMENT EXPOSURE POINT CONCENTRATIONS - HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
2-Methylnaphthalene	0.4 :	1200	1 / 41	1.4	1.4	45.0372	1.4
4-Bromophenyl-phenylether	0.4 :	1200	11 / 41	0.15	3.4	45.236	3.4
4-Chlorophenyl-phenylether	0.4 :	1200	6 / 41	0.058	2.3	45.1094	2.3
Anthracene	0.4 :	1200	6 / 41	0.028	0.17	45.0826	0.17
Benzo(a)Anthracene	0.4 :	1200	13 / 41	0.055	2.1	45.0803	2.1
Benzo(a)Pyrene	0.4 :	1200	12 / 41	0.059	0.65	45.0972	0.65
Benzo(b)Fluoranthene	0.4 :	1200	17 / 41	0.052	1.2	45.1128	1.2
Benzo(g,h,i)Perylene	0.4 :	1200	9 / 41	0.059	0.58	45.1011	0.58
Benzo(k)Fluoranthene	0.4 :	1200	7 / 40	0.077	0.41	46.1837	0.41
Benzoic Acid	2 :	5800	7 / 40	0.11	3.4	223.2714	3.4
Butylbenzylphthalate	0.4 :	1200	17 / 40	0.066	160	51.8965	51.8965
Chrysene	0.4 :	1200	15 / 41	0.093	1.3	45.1462	1.3
Di-n-butylphthalate	0.4 :	1200	19 / 42	0.016	2100	116.6124	116.612
Di-n-octylphthalate	0.4 :	1200	19 / 42	0.054	24	44.8898	24
Dibenzo(a,h)Anthracene	0.4 :	1200	1 / 41	0.12	0.12	45.1231	0.12
Dibenzofuran	0.4 :	1200	2 / 41	1.6	5.9	45.125	5.9
Dimethylphthalate	0.4 :	1200	3 / 41	0.12	0.53	45.0916	0.53
Fluoranthene	0.4 :	1200	24 / 41	0.065	4.1	45.1958	4.1
Fluorene	0.4 :	1200	4 / 41	0.092	4	45.0668	4
Indeno (1,2,3-cd)Pyrene	0.4 :	1200	16 / 41	0.069	13	45.3985	13
N-Nitrosodiphenylamine	0.4 :	550	30 / 42	0.12	6200	298.6483	298.648
Naphthalene	0.4 :	1200	1 / 41	2.2	2.2	45.0567	2.2
Phenanthrene	0.4 :	1200	24 / 41	0.054	34	46.1476	34
Phenol	0.4 :	1100	13 / 42	0.069	56	31.0714	31.0714
Pyrene	0.4 :	1200	26 / 42	0.076	9.1	44.1587	9.1
bis(2-EthylHexyl)phthalate	0.9 :	37	39 / 41	0.26	150000	8303.369	8303.37
Pesticides/PCBs (mg/Kg)							
4,4'-DDD	0.004 :	0.6	2 / 42	0.007	0.19	0.0653	0.0653
4,4'-DDT	0.004 :	0.6	4 / 42	0.0044	1.2	0.086	0.086

TABLE 62
SEDIMENT EXPOSURE POINT CONCENTRATIONS - HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Aldrin	0.002 :	0.3	4 / 41	0.046	0.45	0.0439	0.0439
Alpha-BHC	0.002 :	0.3	1 / 41	0.0052	0.0052	0.0332	0.0052
Alpha-Chlordane	0.0022 :	3	5 / 41	0.025	1.6	0.2669	0.2669
Beta-BHC	0.002 :	0.3	5 / 41	0.0031	0.46	0.045	0.045
Delta-BHC	0.002 :	0.3	6 / 41	0.0054	0.12	0.0371	0.0371
Endosulfan I	0.002 :	0.3	6 / 41	0.0032	0.41	0.0438	0.0438
Endosulfan Sulfate	0.004 :	0.6	7 / 42	0.047	0.24	0.0765	0.0765
Endrin	0.004 :	0.6	3 / 42	0.0082	0.61	0.0694	0.0694
Endrin Aldehyde	0.004 :	0.6	12 / 42	0.012	2.5	0.1321	0.1321
Endrin Ketone	0.004 :	0.6	3 / 42	0.011	0.4	0.0685	0.0685
Gamma-Chlordane	0.0022 :	3	5 / 41	0.0036	1.6	0.2691	0.2691
Heptachlor	0.002 :	0.3	3 / 41	0.0006	0.54	0.042	0.042
Heptachlor Epoxide	0.002 :	0.3	3 / 41	0.0046	0.16	0.0366	0.0366
Methoxychlor	0.02 :	3	1 / 41	0.29	0.29	0.3361	0.29
Metals (mg/Kg)							
Aluminum	0 :	0	42 / 42	7.3	150000	13582.06	13582.1
Antimony	0.96 :	92	25 / 41	0.05	250	33.5297	33.5297
Arsenic	23 :	23	40 / 41	0.0053	440	35.7893	35.7893
Barium	0 :	0	42 / 42	0.0097	250	31.6862	31.6862
Beryllium	0.0015 :	6.9	7 / 40	0.22	10.4	1.0864	1.0864
Cadmium	0.001 :	2.4	10 / 40	0.4	14	1.2081	1.2081
Calcium	0 :	0	42 / 42	1	9900	1482.674	1482.67
Chromium	0 :	0	42 / 42	2.1	13800	1826.56	1826.56
Cobalt	1.5 :	1.5	39 / 42	0.0044	39	6.8764	6.8764
Copper	2.5 :	2.5	39 / 40	0.02	280	36.0358	36.0358
Iron	0 :	0	42 / 42	6.8	130000	18142.53	18142.5
Lead	10 :	10	26 / 41	0.012	790	56.8788	56.8788
Manganese	0 :	0	42 / 42	0.069	1900	130.5822	130.582
Mercury	0.0001 :	0.28	23 / 42	0.0001	1.3	0.2891	0.2891

TABLE 62
SEDIMENT EXPOSURE POINT CONCENTRATIONS - HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	
Nickel	4 : 4		38 / 42	0.01	110	12.5906	12.5906
Potassium	0 : 0		42 / 42	0.34	1600	429.6605	429.661
Silver	0.0015 : 6.9		1 / 40	2.7	2.7	0.9364	0.9364
Sodium	0 : 0		42 / 42	0.18	1600	276.5571	276.557
Vanadium	2.5 : 2.5		41 / 42	0.009	93	16.2636	16.2636
Zinc	0 : 0		42 / 42	0.026	1100	109.7075	109.708
Inorganics (mg/Kg)							
Chloride	40 : 40		31 / 34	0.064	1400	166.6087	166.609
Nitrate as N	1 : 1		6 / 7	0.0014	3.7	1.8218	1.8218
Nitrite as N	0.001 : 1		1 / 6	2.2	2.2	0.7001	0.7001
Nitrogen, Ammonia	8 : 8		37 / 39	0.16	1000	174.099	174.099
Sulfate as SO4	0 : 0		34 / 34	96	18000	1597.677	1597.68

Notes:
1 Selection of OHM of Concern for this medium is presented in Table 7.
2 Samples included in Site Data set are presented in Attachment 1.
Duplicate samples were averaged with their original samples prior to calculation of summary statistics.
The arithmetic mean represents the arithmetic average of all sample results, with one-half the SQL used as the value for non-detects.
3 The EPC is the arithmetic mean concentration unless the arithmetic mean concentration exceeds the maximum detected concentration (MADEP, 1995). For these OHM, the maximum detected concentration is used as the EPC.
EPC = Exposure Point Concentration
OHM = Oil or Hazardous Material
SQL = Sample Quantitation Limit
MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

TABLE 63
SEDIMENT EXPOSURE POINT CONCENTRATIONS - NON-HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
VOCs (mg/Kg)							
1,1,2,2-Tetrachloroethane	0.005 :	0.03	1 / 17	0.016	0.016	0.0054	0.0054
1,1-Dichloroethane	0.005 :	0.03	1 / 17	0.019	0.019	0.0061	0.0061
2,4,4-Trimethyl-1-pentene	0.01 :	0.05	8 / 17	0.002	0.028	0.0106	0.0106
2,4,4-Trimethyl-2-Pentene	0.01 :	0.05	4 / 17	0.002	0.012	0.0088	0.0088
2-Butanone (MEK)	0.015 :	0.08	1 / 16	0.091	0.091	0.019	0.019
Acetone	0.015 :	0.41	6 / 17	0.007	0.58	0.1149	0.1149
Methylene Chloride	0.01 :	0.05	5 / 17	0.005	0.024	0.0099	0.0099
Toluene	0.005 :	0.03	5 / 17	0.002	0.006	0.0045	0.0045
Trichloroethene (TCE)	0.005 :	0.03	2 / 17	0.002	0.007	0.0053	0.0053
Xylenes, Total	0.005 :	0.03	1 / 17	0.004	0.004	0.0052	0.004
SVOCs (mg/Kg)							
2-Methylnaphthalene	0.4 :	2	1 / 17	0.067	0.067	0.3422	0.067
4-Bromophenyl-phenylether	0.4 :	2	1 / 17	0.23	0.23	0.3488	0.23
4-Chlorophenyl-phenylether	0.4 :	2	2 / 17	0.074	0.22	0.3408	0.22
Anthracene	0.4 :	0.8	6 / 17	0.055	0.52	0.2732	0.2732
Benzo(a)Anthracene	0.4 :	0.8	8 / 17	0.095	1.7	0.4825	0.4825
Benzo(a)Pyrene	0.4 :	0.8	8 / 17	0.078	2	0.5122	0.5122
Benzo(b)Fluoranthene	0.4 :	0.8	9 / 17	0.069	4.4	0.8876	0.8876
Benzo(g,h,i)Perylene	0.4 :	0.8	8 / 17	0.056	2.1	0.4929	0.4929
Benzo(k)Fluoranthene	0.4 :	0.8	7 / 17	0.053	1.4	0.3949	0.3949
Benzoic Acid	2 :	8	3 / 17	0.085	2.5	1.4479	1.4479
Chrysene	0.4 :	0.8	8 / 17	0.14	3.4	0.7577	0.7577
Di-n-butylphthalate	0.4 :	2	3 / 17	0.086	0.23	0.2939	0.23
Di-n-octylphthalate	0.4 :	2	3 / 17	0.17	1.4	0.3712	0.3712
Dibenzo(a,h)Anthracene	0.4 :	0.8	3 / 17	0.12	0.43	0.2771	0.2771
Dibenzofuran	0.4 :	2	3 / 17	0.098	0.22	0.3281	0.22

TABLE 63
SEDIMENT EXPOSURE POINT CONCENTRATIONS - NON-HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2] Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	EPC [3]
Fluoranthene	0.4 :	0.8	9 / 17	0.079	4.5	1.1294	1.1294
Fluorene	0.4 :	2	3 / 17	0.2	0.3	0.3441	0.3
Indeno (1,2,3-cd)Pyrene	0.4 :	1.3	7 / 17	0.076	2.7	0.5181	0.5181
N-Nitrosodiphenylamine	0.4 :	2	7 / 17	0.06	0.82	0.3284	0.3284
Naphthalene	0.4 :	2	3 / 18	0.053	53	3.2598	3.2598
Phenanthrene	0.4 :	0.8	8 / 17	0.062	1.9	0.6342	0.6342
Pyrene	0.4 :	0.8	10 / 17	0.07	3.5	0.8725	0.8725
bis(2-EthylHexyl)phthalate	0.4 :	2.7	13 / 17	0.082	440	37.0555	37.0555
Pesticides/PCBs (mg/Kg)							
4,4'-DDT	0.004 :	2	1 / 17	0.018	0.018	0.0682	0.018
Endosulfan I	0.002 :	0.9	1 / 17	0.0081	0.0081	0.0313	0.0081
Endrin Aldehyde	0.004 :	0.05	2 / 17	0.23	6.5	0.4023	0.4023
Gamma-Chlordane	0.02 :	9	1 / 17	0.03	0.03	0.305	0.03
Heptachlor Epoxide	0.002 :	0.04	1 / 16	0.006	0.006	0.005	0.005
Metals (mg/Kg)							
Aluminum	0 :	0	17 / 17	570	19000	5839.412	5839.41
Arsenic	0.5 :	0.5	16 / 17	1.6	190	30.6265	30.6265
Barium	0 :	0	17 / 17	3.6	45	18.4647	18.4647
Cadmium	1 :	1.6	3 / 17	1.8	5	1.0765	1.0765
Calcium	0 :	0	17 / 17	160	3000	1005.882	1005.88
Chromium	0 :	0	17 / 17	5.4	320	56.5882	56.5882
Cobalt	1.5 :	2.4	10 / 17	1.5	27	4.9765	4.9765
Copper	2.5 :	2.5	15 / 17	3.6	190	31.6059	31.6059
Iron	0 :	0	17 / 17	330	140000	21166.47	21166.5
Lead	10 :	35	7 / 16	15	60	16.0313	16.0313
Manganese	0 :	0	17 / 17	3.7	1500	165.3824	165.382
Mercury	0.1 :	0.26	2 / 17	0.34	0.39	0.0956	0.0956

TABLE 63
SEDIMENT EXPOSURE POINT CONCENTRATIONS - NON-HOT SPOT
FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	Site Data/Concentration [2]						EPC [3]
	Minimum SQL	Maximum SQL	Frequency of Detection	Minimum	Maximum	Arithmetic Mean	
Nickel	4 : 6.3		8 / 17	5.3	18	5.8029	5.8029
Potassium	0 : 0		17 / 17	140	1700	518.2353	518.235
Selenium	0.5 : 5.9		1 / 17	0.78	0.78	0.6994	0.6994
Silver	1.5 : 5.3		1 / 17	5.8	5.8	1.3	1.3
Sodium	0 : 0		17 / 17	28	250	91.3529	91.3529
Vanadium	2.5 : 2.5		16 / 17	3.6	73	16.0088	16.0088
Zinc	2.5 : 2.5		16 / 17	3.9	170	40.4382	40.4382
Inorganics (mg/Kg)							
Chloride	40 : 40		4 / 17	46	98	30.2353	30.2353
Nitrogen, Ammonia	8 : 8		14 / 17	12	130	38.5882	38.5882
Sulfate as SO4	40 : 40		16 / 17	80	3900	665.2941	665.294

Notes:

1 Selection of OHM of Concern for this medium is presented in Table 7.

2 Samples included in Site Data set are presented in Attachment 1.
Duplicate samples were averaged with their original samples prior to calculation of summary statistics.
The arithmetic mean represents the arithmetic average of all sample results, with one-half the SQL used as the value for non-detects.

3 The EPC is the arithmetic mean concentration unless the arithmetic mean concentration exceeds the maximum detected concentration (MADEP, 1995). For these OHM, the maximum detected concentration is used as the EPC.

EPC = Exposure Point Concentration

OHM = Oil or Hazardous Material

SQL = Sample Quantitation Limit

MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

TABLE 64
SUMMARY SEDIMENT EXPOSURE POINT CONCENTRATIONS - FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	EPCs for Exposure Points [2]		Area-Weighted EPCs for Exposure Points [3]		EPC Total Site [5]
	Non-hot spot	Hot spot	Non-hot spot	Hot spot	
	Fraction of Site Area [4]:		0.26	0.74	
VOCs (mg/Kg)					
1,1,1-Trichloroethane	0	1.3638	0	1.009212	1.01
1,1,2,2-Tetrachloroethane	0.0054	0.004	0.001404	0.00296	0.0044
1,1-Dichloroethane	0.0061	0.0215	0.001586	0.01591	0.017
1,2-Dichloroethene(total)	0	0.0252	0	0.018648	0.019
1,2-Dichloropropane	0	0.022	0	0.01628	0.016
2,4,4-Trimethyl-1-pentene	0.0106	2.1672	0.002756	1.603728	1.61
2,4,4-Trimethyl-2-Pentene	0.0088	0.6886	0.002288	0.509564	0.51
2-Butanone (MEK)	0.019	0.0755	0.00494	0.05587	0.061
2-Hexanone	0	0.036	0	0.02664	0.027
Acetone	0.1149	0.1963	0.029874	0.145262	0.18
Benzene	0	0.018	0	0.01332	0.013
Bromodichloromethane	0	0.0065	0	0.00481	0.0048
Bromoform	0	0.0266	0	0.019684	0.020
Carbon Disulfide	0	0.005	0	0.0037	0.0037
Carbon Tetrachloride	0	0.011	0	0.00814	0.0081
Chlorobenzene	0	0.014	0	0.01036	0.010
Chloroform	0	0.009	0	0.00666	0.0067
Dibromochloromethane	0	0.0225	0	0.01665	0.017
Ethylbenzene	0	0.0312	0	0.023088	0.023
Methylene Chloride	0.0099	0.022	0.002574	0.01628	0.019
Styrene	0	0.007	0	0.00518	0.0052
Tetrachloroethene (PCE)	0	0.0218	0	0.016132	0.016
Toluene	0.0045	0.0538	0.00117	0.039812	0.041
Trichloroethene (TCE)	0.0053	0.0275	0.001378	0.02035	0.022
Vinyl Chloride	0	0.012	0	0.00888	0.0089
Xylenes, Total	0.004	0.0293	0.00104	0.021682	0.023
SVOCs (mg/Kg)					
1,2,4-Trichlorobenzene	0	1.4	0	1.036	1.04
1,2-Dichlorobenzene	0	1.6	0	1.184	1.18
2-Methylnaphthalene	0.067	1.4	0.01742	1.036	1.05
4-Bromophenyl-phenylether	0.23	3.4	0.0598	2.516	2.58
4-Chlorophenyl-phenylether	0.22	2.3	0.0572	1.702	1.76
Anthracene	0.2732	0.17	0.071032	0.1258	0.20
Benzo(a)Anthracene	0.4825	2.1	0.12545	1.554	1.68
Benzo(a)Pyrene	0.5122	0.65	0.133172	0.481	0.61
Benzo(b)Fluoranthene	0.8876	1.2	0.230776	0.888	1.12
Benzo(g,h,i)Perylene	0.4929	0.58	0.128154	0.4292	0.56
Benzo(k)Fluoranthene	0.3949	0.41	0.102674	0.3034	0.41
Benzoic Acid	1.4479	3.4	0.376454	2.516	2.89
Butylbenzylphthalate	0	51.8965	0	38.40341	38.4

TABLE 64
SUMMARY SEDIMENT EXPOSURE POINT CONCENTRATIONS - FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	EPCs for Exposure Points [2]		Area-Weighted EPCs for Exposure Points [3]		EPC Total Site [5]
	Non-hot spot	Hot spot	Non-hot spot	Hot spot	
	Fraction of Site Area [4]:		0.26	0.74	
Chrysene	0.7577	1.3	0.197002	0.962	1.16
Di-n-butylphthalate	0.23	116.6124	0.0598	86.293176	86.4
Di-n-octylphthalate	0.3712	24	0.096512	17.76	17.9
Dibenzo(a,h)Anthracene	0.2771	0.12	0.072046	0.0888	0.16
Dibenzofuran	0.22	5.9	0.0572	4.366	4.42
Dimethylphthalate	0	0.53	0	0.3922	0.39
Fluoranthene	1.1294	4.1	0.293644	3.034	3.33
Fluorene	0.3	4	0.078	2.96	3.04
Indeno (1,2,3-cd)Pyrene	0.5181	13	0.134706	9.62	9.75
N-Nitrosodiphenylamine	0.3284	298.6483	0.085384	220.99974	221
Naphthalene	3.2598	2.2	0.847548	1.628	2.48
Phenanthrene	0.6342	34	0.164892	25.16	25.3
Phenol	0	31.0714	0	22.992836	23.0
Pyrene	0.8725	9.1	0.22685	6.734	6.96
bis(2-EthylHexyl)phthalate	37.0555	8303.3685	9.63443	6144.4927	6154
Pesticides/PCBs (mg/Kg)					
4,4'-DDD	0	0.0653	0	0.048322	0.048
4,4'-DDT	0.018	0.086	0.00468	0.06364	0.068
Aldrin	0	0.0439	0	0.032486	0.032
Alpha-BHC	0	0.0052	0	0.003848	0.0038
Alpha-Chlordane	0	0.2669	0	0.197506	0.20
Beta-BHC	0	0.045	0	0.0333	0.033
Delta-BHC	0	0.0371	0	0.027454	0.027
Endosulfan I	0.0081	0.0438	0.002106	0.032412	0.035
Endosulfan Sulfate	0	0.0765	0	0.05661	0.057
Endrin	0	0.0694	0	0.051356	0.051
Endrin Aldehyde	0.4023	0.1321	0.104598	0.097754	0.20
Endrin Ketone	0	0.0685	0	0.05069	0.051
Gamma-Chlordane	0.03	0.2691	0.0078	0.199134	0.21
Heptachlor	0	0.042	0	0.03108	0.031
Heptachlor Epoxide	0.005	0.0366	0.0013	0.027084	0.028
Methoxychlor	0	0.29	0	0.2146	0.21
Metals (mg/Kg)					
Aluminum	5839.4118	13582.062	1518.24707	10050.726	11569
Antimony	0	33.5297	0	24.811978	24.8
Arsenic	30.6265	35.7893	7.96289	26.484082	34.4
Barium	18.4647	31.6862	4.800822	23.447788	28.2
Beryllium	0	1.0864	0	0.803936	0.80
Cadmium	1.0765	1.2081	0.27989	0.893994	1.17
Calcium	1005.8824	1482.6738	261.529424	1097.1786	1359
Chromium	56.5882	1826.5595	14.712932	1351.654	1366

TABLE 64
SUMMARY SEDIMENT EXPOSURE POINT CONCENTRATIONS - FUTURE LAND USE

Olin Corporation
Wilmington, MA Facility

OHM of Concern [1]	EPCs for Exposure Points [2]		Area-Weighted EPCs for Exposure Points [3]		EPC Total Site [5]
	Non-hot spot	Hot spot	Non-hot spot	Hot spot	
	Fraction of Site Area [4]:		0.26	0.74	
Cobalt	4.9765	6.8764	1.29389	5.088536	6.38
Copper	31.6059	36.0358	8.217534	26.666492	34.9
Iron	21166.4706	18142.531	5503.28236	13425.473	18929
Lead	16.0313	56.8788	4.168138	42.090312	46.3
Manganese	165.3824	130.5822	42.999424	96.630828	140
Mercury	0.0956	0.2891	0.024856	0.213934	0.24
Nickel	5.8029	12.5906	1.508754	9.317044	10.8
Potassium	518.2353	429.6605	134.741178	317.94877	453
Selenium	0.6994	0	0.181844	0	0.18
Silver	1.3	0.9364	0.338	0.692936	1.03
Sodium	91.3529	276.5571	23.751754	204.65225	228
Vanadium	16.0088	16.2636	4.162288	12.035064	16.2
Zinc	40.4382	109.7075	10.513932	81.18355	91.7
Inorganics (mg/Kg)					
Chloride	30.2353	166.6087	7.861178	123.29044	131
Nitrate as N		1.8218	0	1.348132	1.35
Nitrite as N		0.7001	0	0.518074	0.52
Nitrogen, Ammonia	38.5882	174.099	10.032932	128.83326	139
Sulfate as SO4	665.2941	1597.6765	172.976466	1182.2806	1355

Notes:

1 Selection of OHM of Concern for this medium are presented in Table 7.

2 EPCs for each exposure point are presented in the sediment exposure point concentration tables for future land use.

3 EPCs calculated by multiplying the EPC for the exposure point by the fractional site area of that exposure point.

4 Fractional site area represents the area of the exposure point divided by the area of the entire ditch (see sediment exposure point figure).

5 The final area-weighted EPC is the sum of the area-weighted EPCs for each exposure point.

"0" indicates that OHM was not detected in samples collected at exposure point. "Blank" indicates that OHM was not analyzed for or data were rejected.

EPC = Exposure Point Concentration

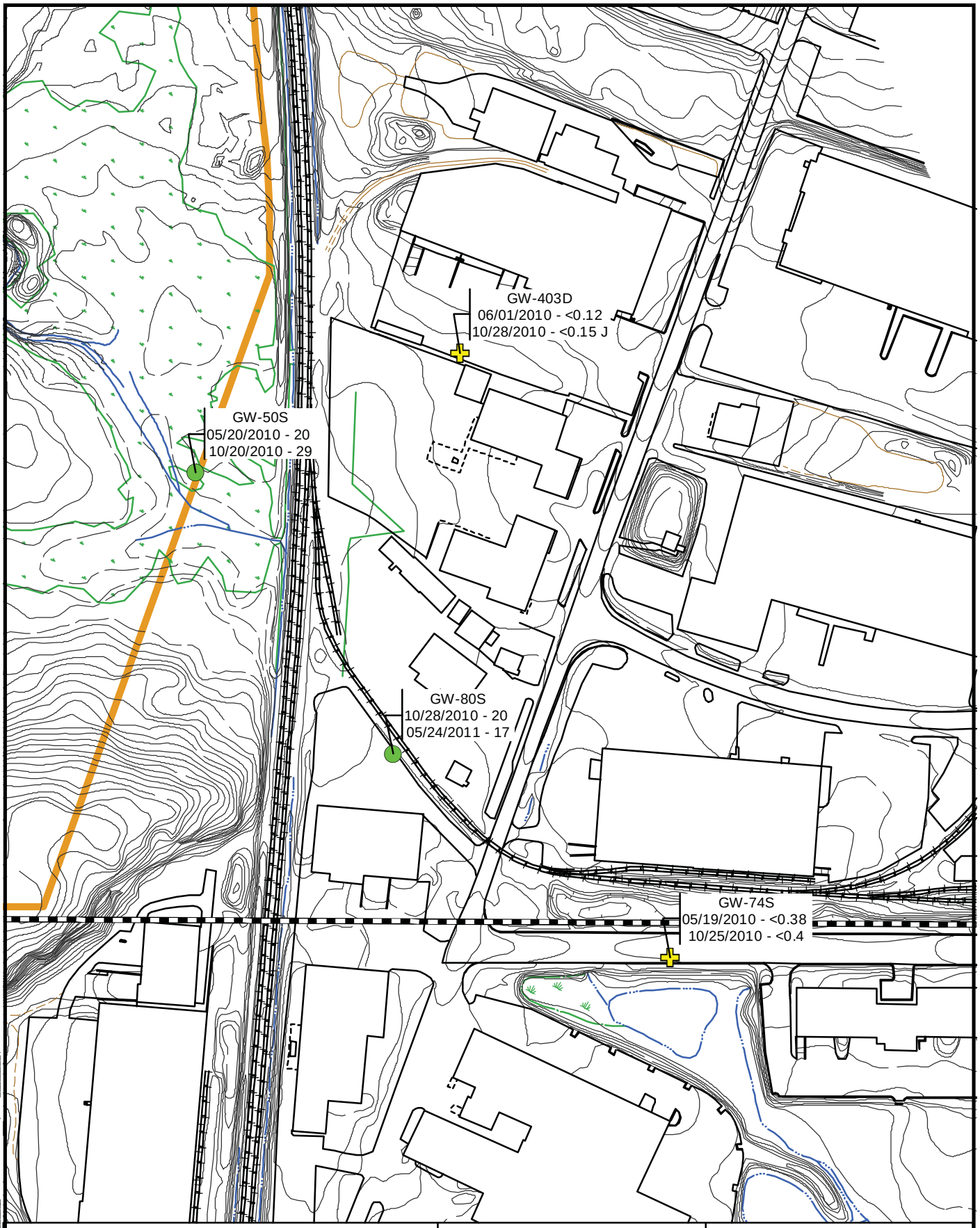
OHM = Oil or Hazardous Material

MADEP (1995): Guidance for Disposal Site Risk Characterization - In Support of the Massachusetts Contingency Plan (WSC/ORS-95-141, July).

Non-hot spot is the portion of the on- and off-site ditch that is not a hot spot (EP35)

Hot spot is the portion of the on- and off-site ditch that is a hot spot (EP34)

ATTACHMENT E



Legend

Nitrogen, as Ammonia: Units in mg/L

Detect

J - Estimated

Non-Detect

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Ammonia
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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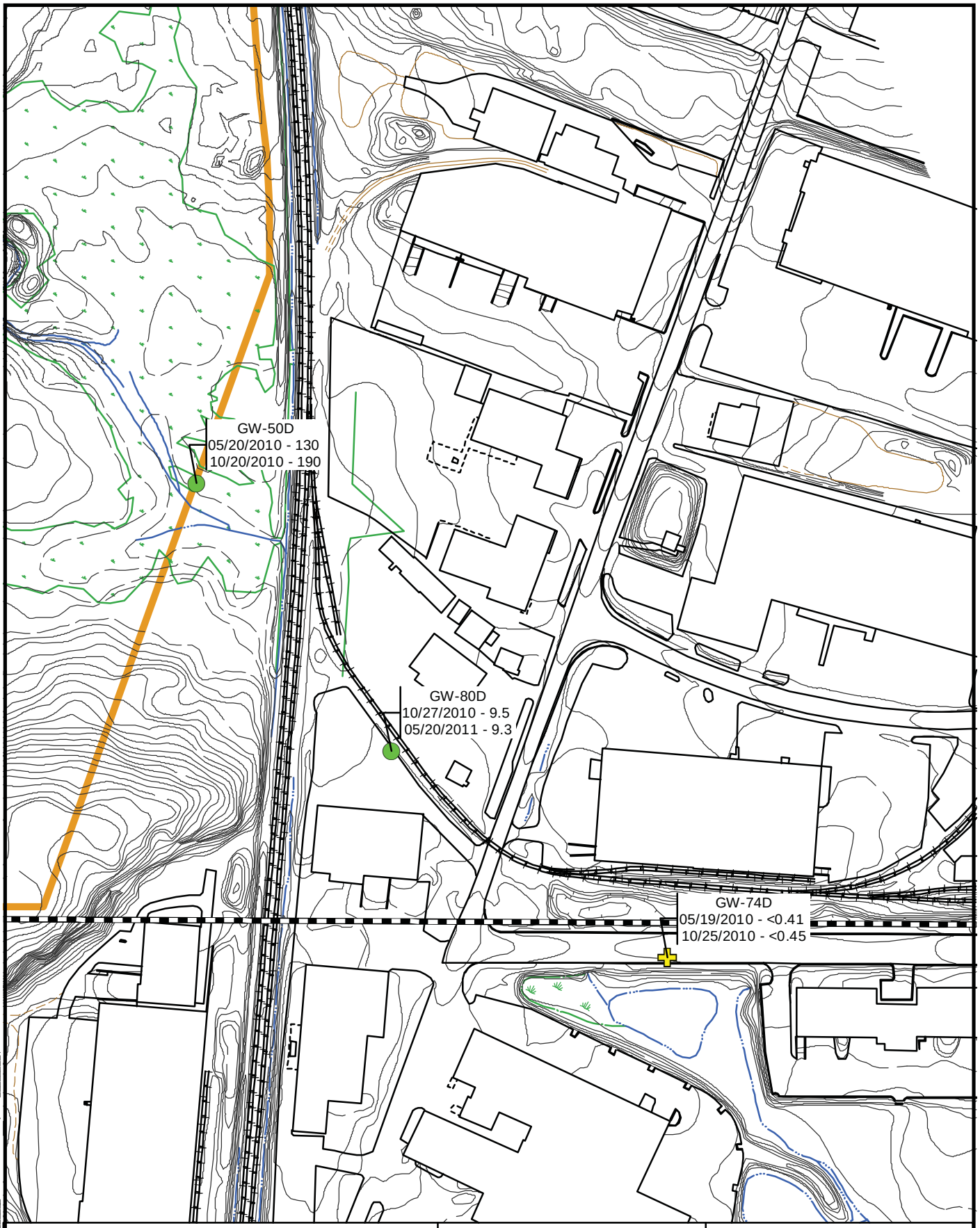

Legend

Nitrogen, as Ammonia

Units in mg/L

J - Estimated

Detect

Non-Detect

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Ammonia
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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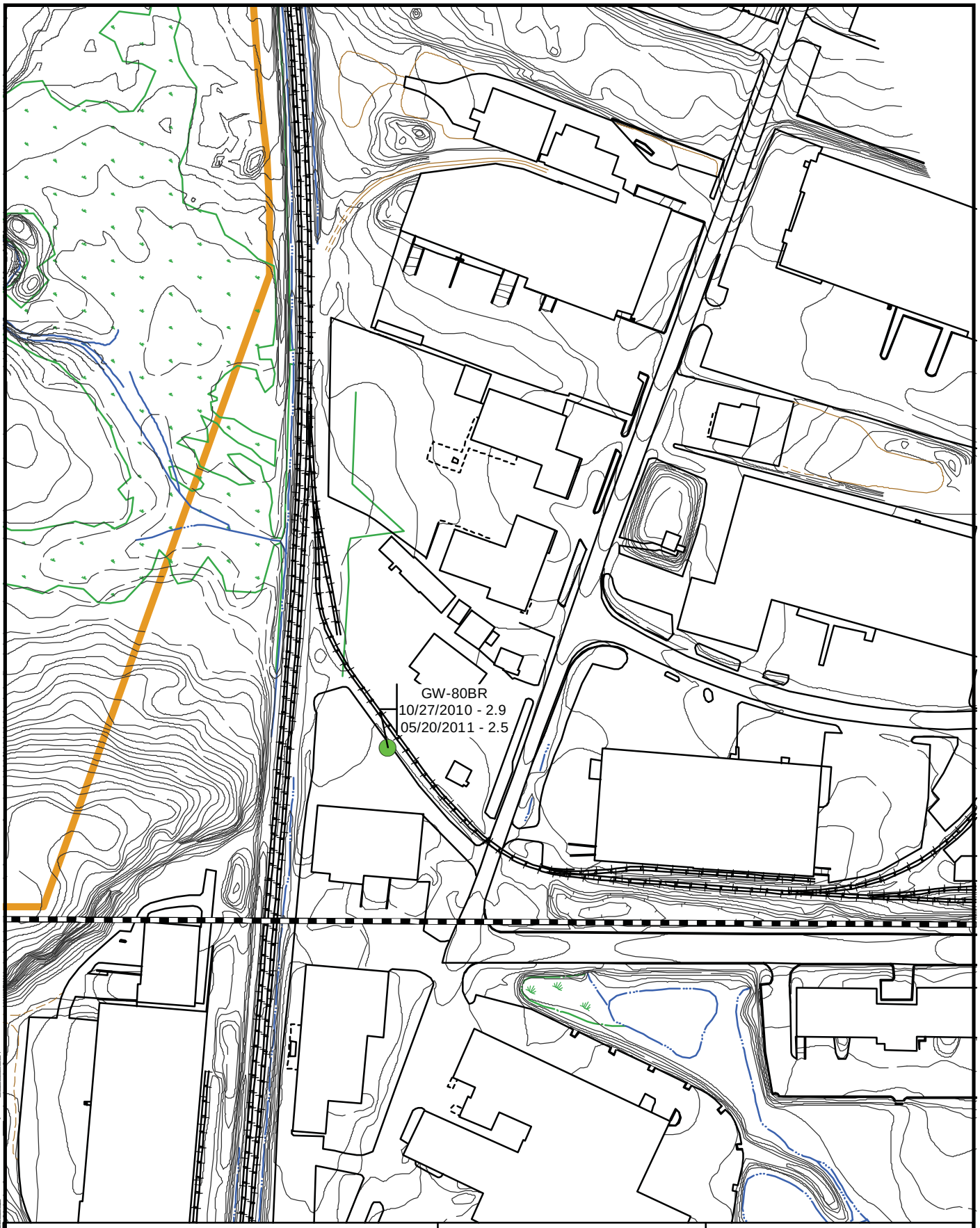

Legend

Nitrogen, as Ammonia

Units in mg/L

J - Estimated

Detect

Non-Detect

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Ammonia
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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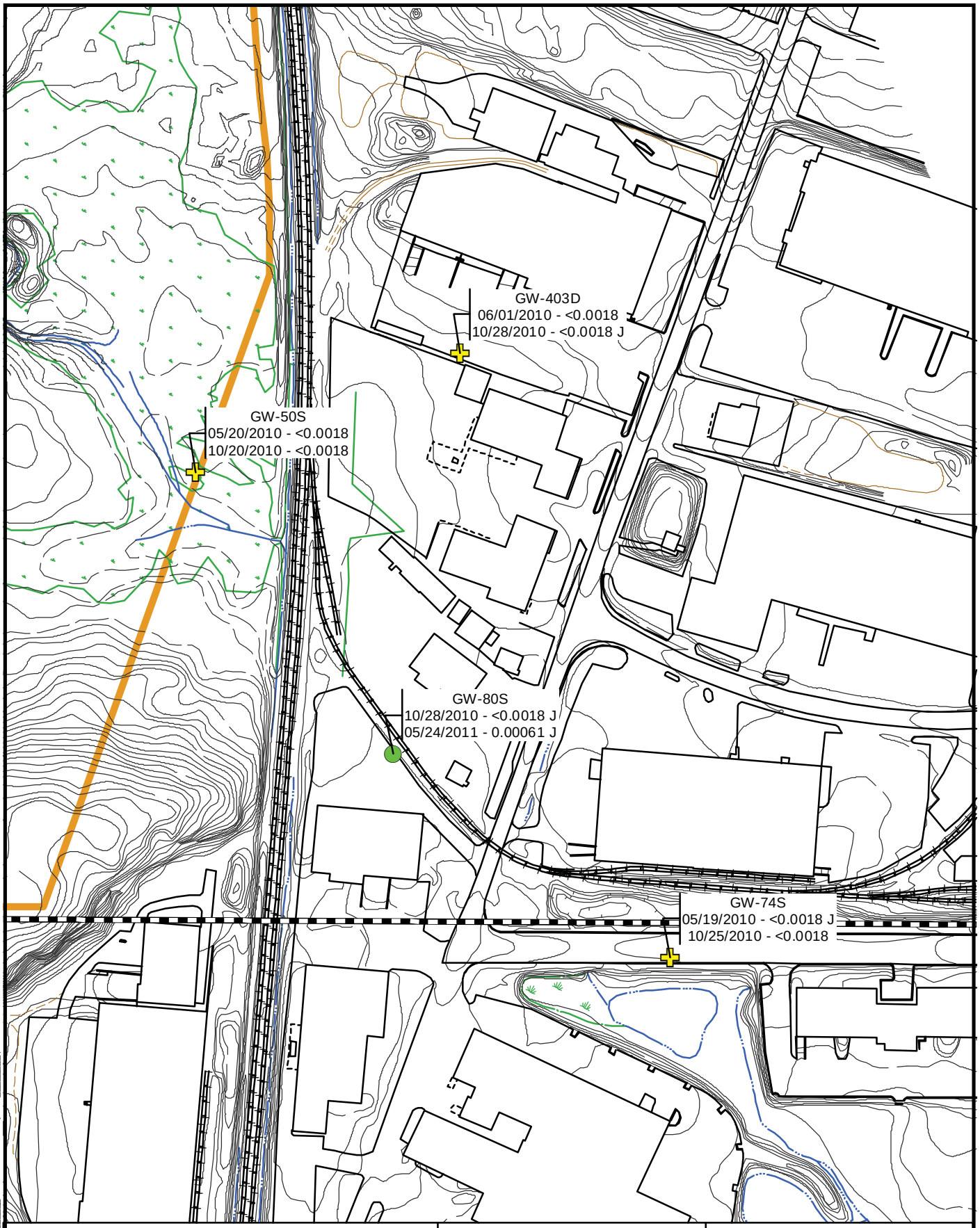

Legend

Bis(2)Ethylhexylphthalate

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Bis(2)Ethylhexylphthalate
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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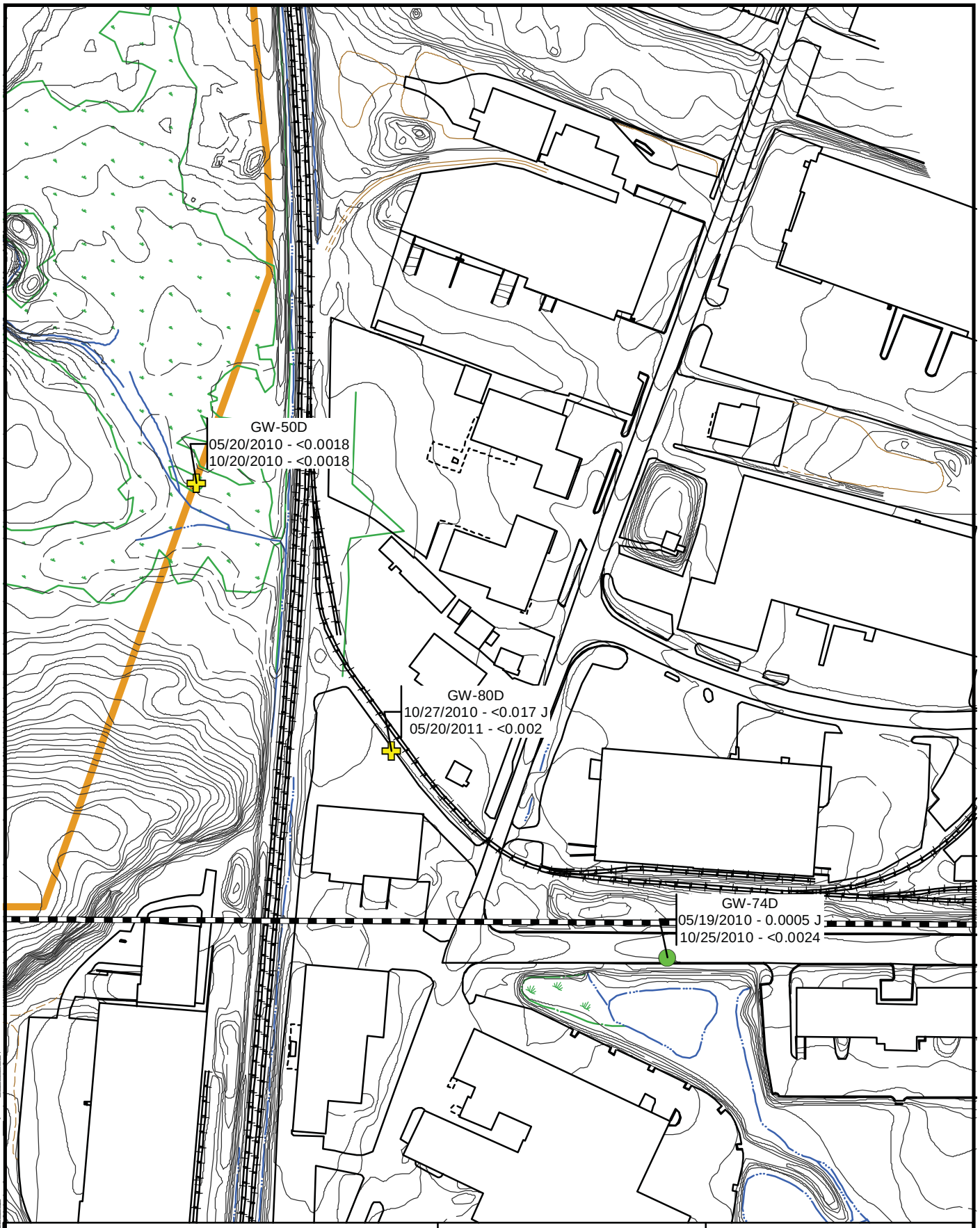

Legend

Bis(2)Ethylhexylphthalate

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

0 50 100 200 Feet

Bis(2)Ethylhexylphthalate
Deep Overburden Groundwater

Olin Chemical Superfund Site
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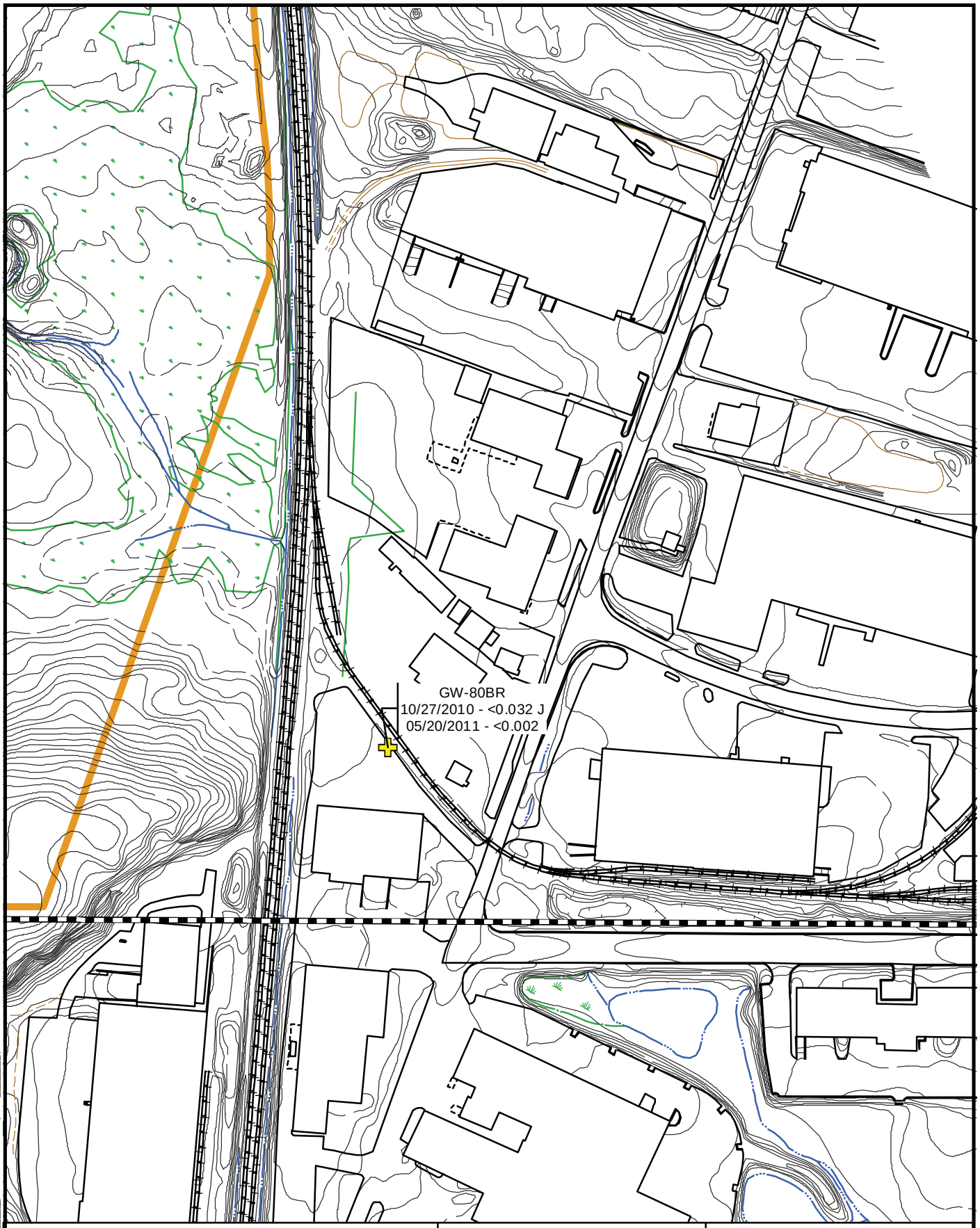

Legend

Bis(2)Ethylhexylphthalate

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Bis(2)Ethylhexylphthalate
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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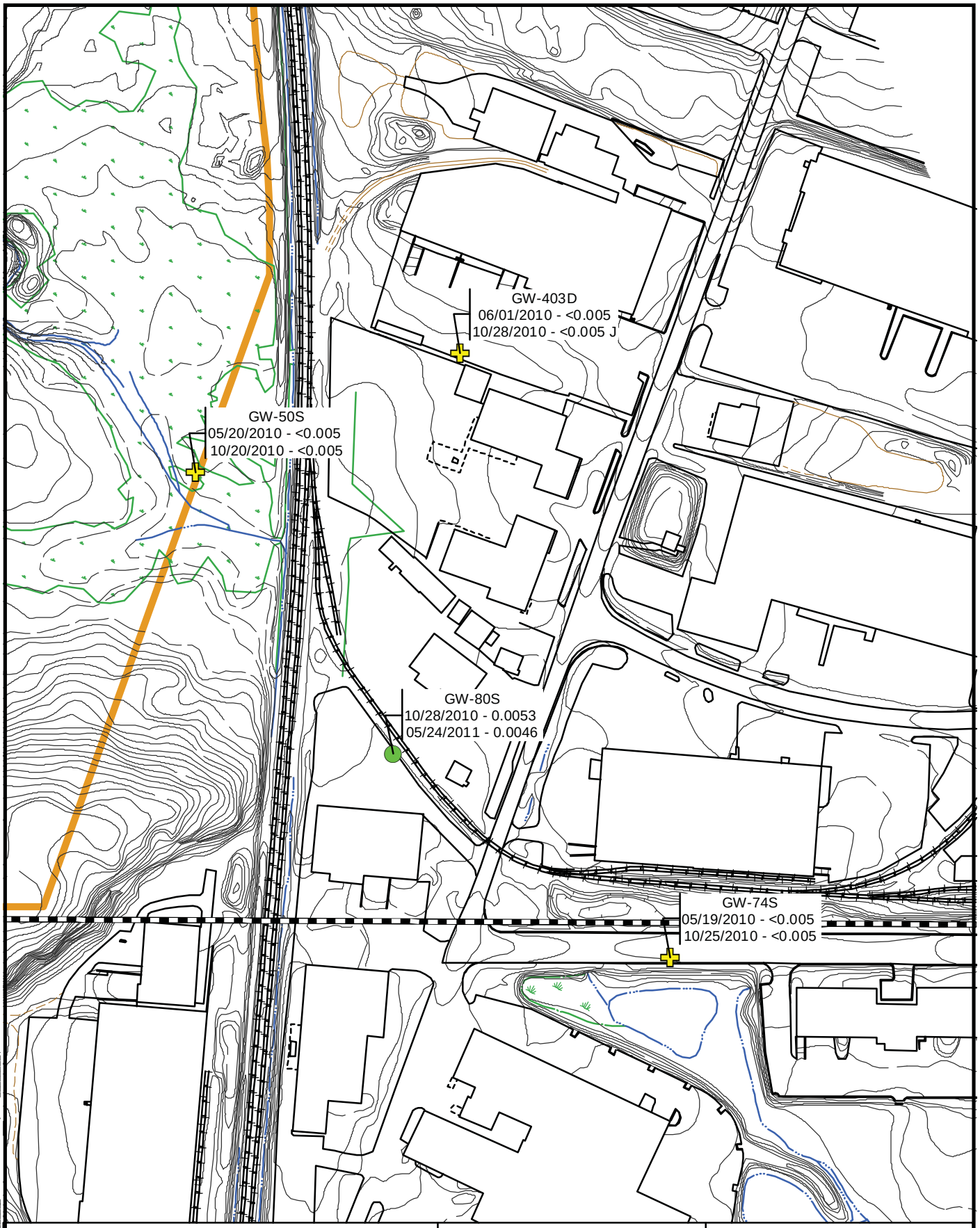

Legend

Chromium

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Chromium
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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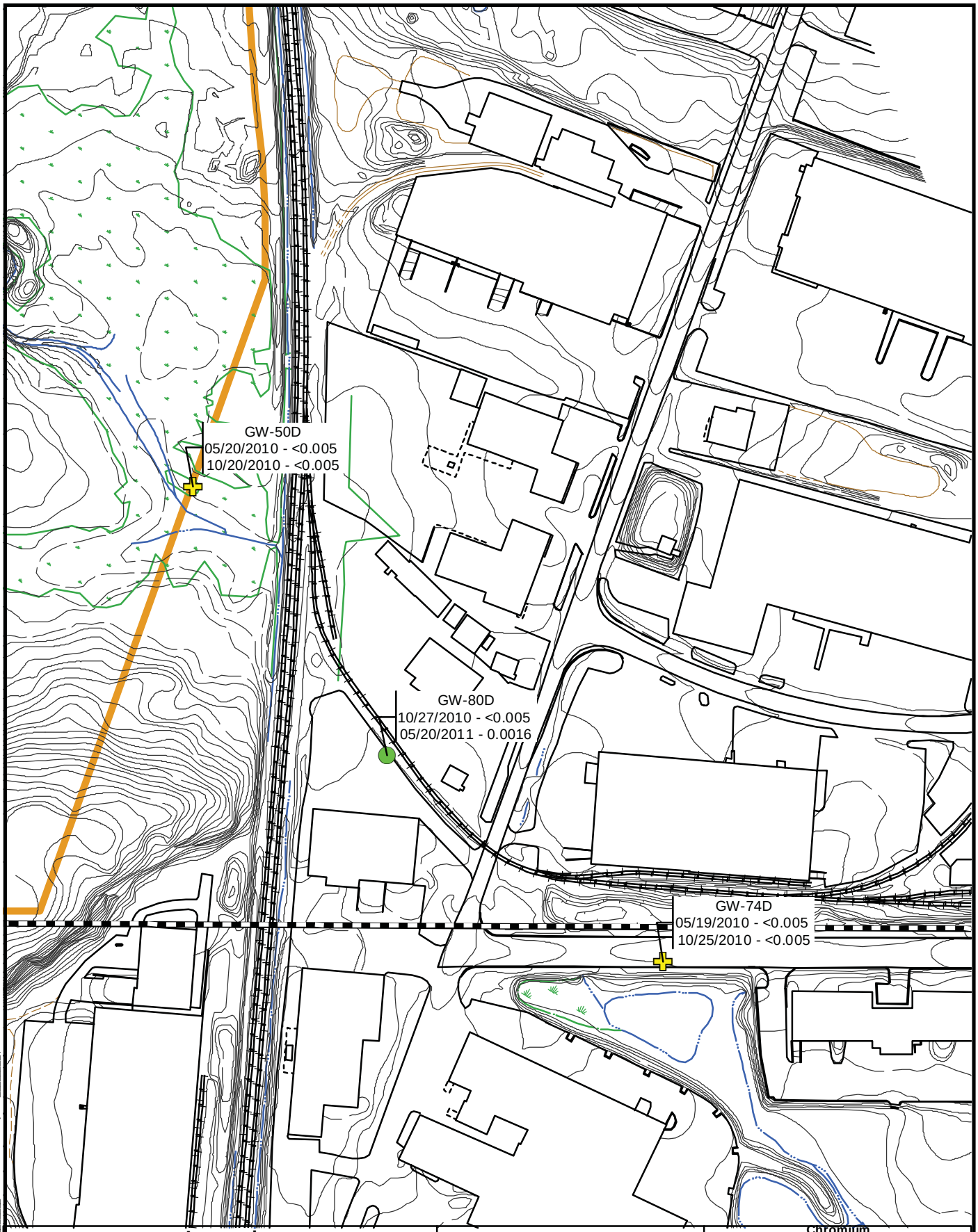

Legend

Chromium

Units in mg/L

J - Estimated

Detect

Non-Detect

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Chromium
Deep Overburden Groundwater

North Pond Memorandum
Olin Chemical Superfund Site
Wilmington, Massachusetts

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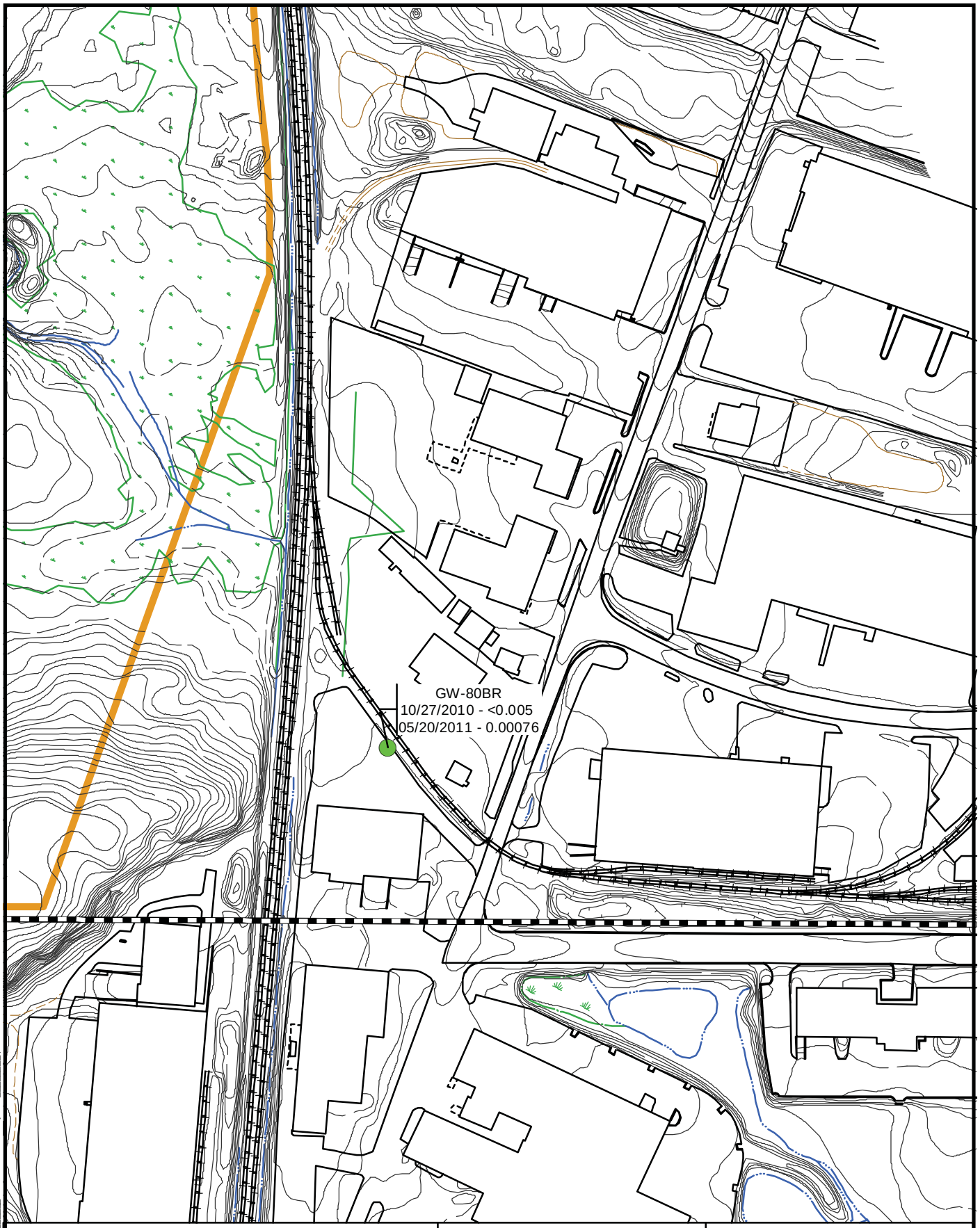

Legend

Chromium

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Chromium
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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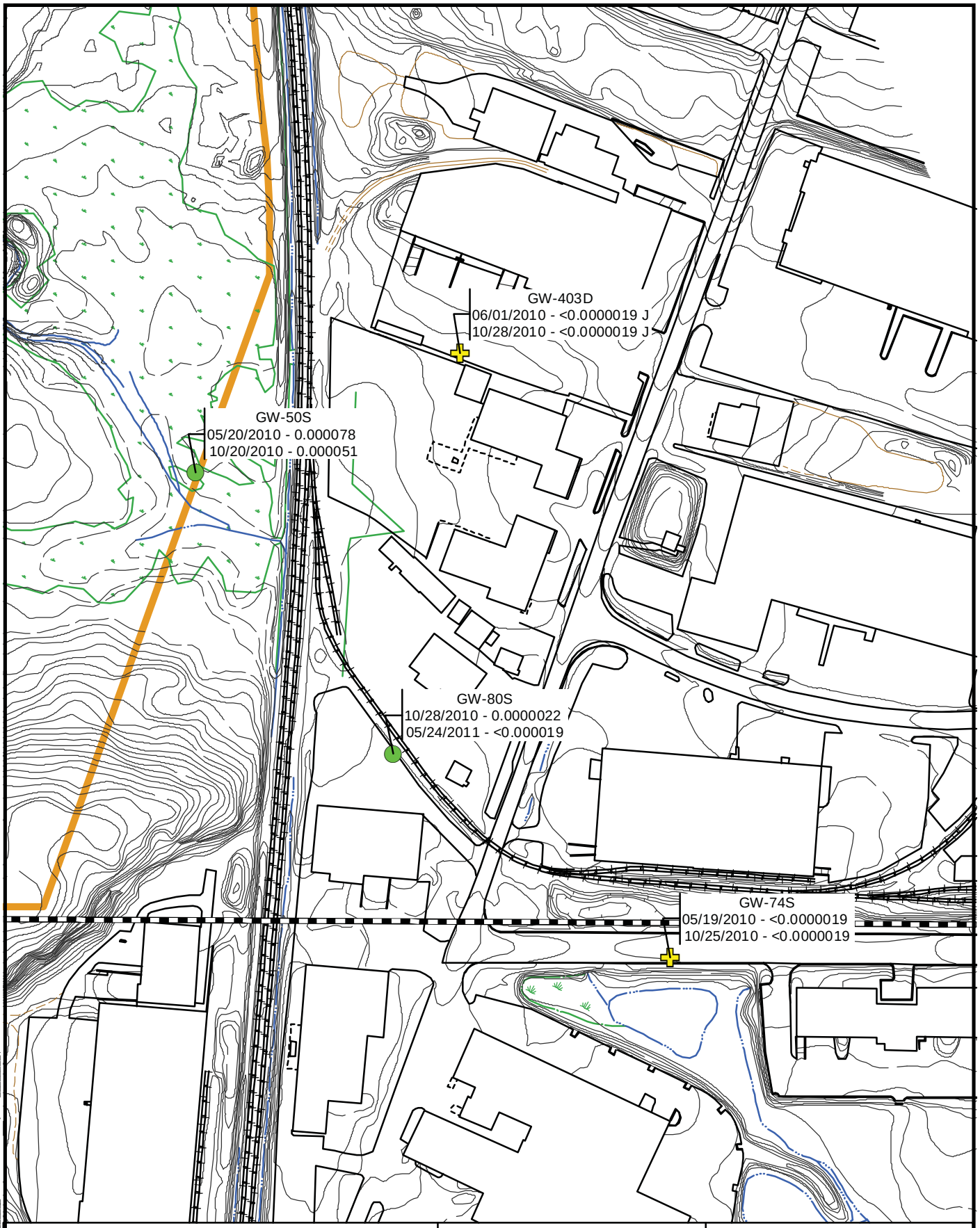

Legend

N-Nitrosodimethylamine

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

N-Nitrosodimethylamine
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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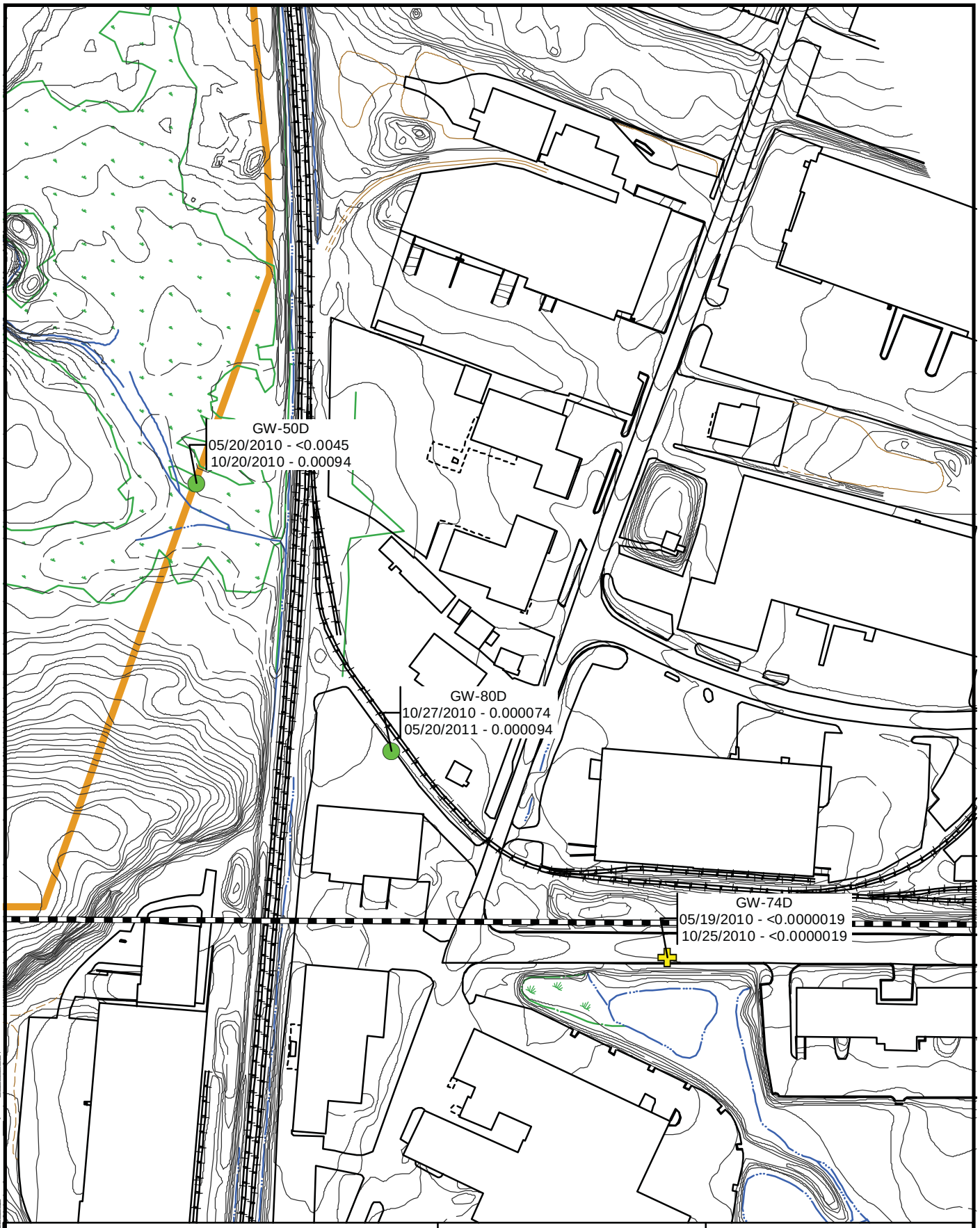

Legend

N-Nitrosodimethylamine

Detect

Non-Detect

Units in mg/L

J - Estimated

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

N-Nitrosodimethylamine
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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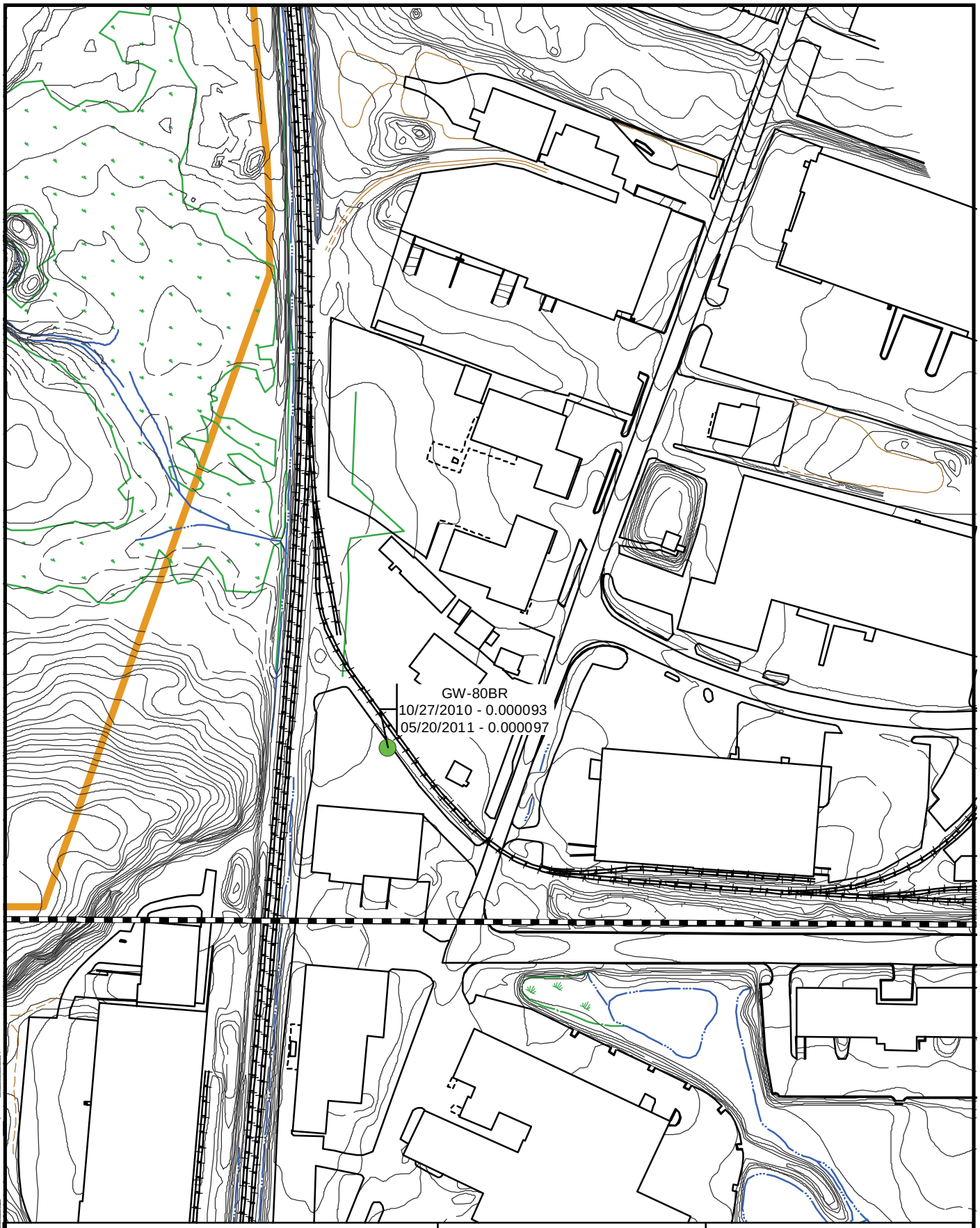

Legend

N-Nitrosodimethylamine

Units in mg/L

J - Estimated

Detect

Non-Detect

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

0 50 100 200 Feet

N-Nitrosodimethylamine
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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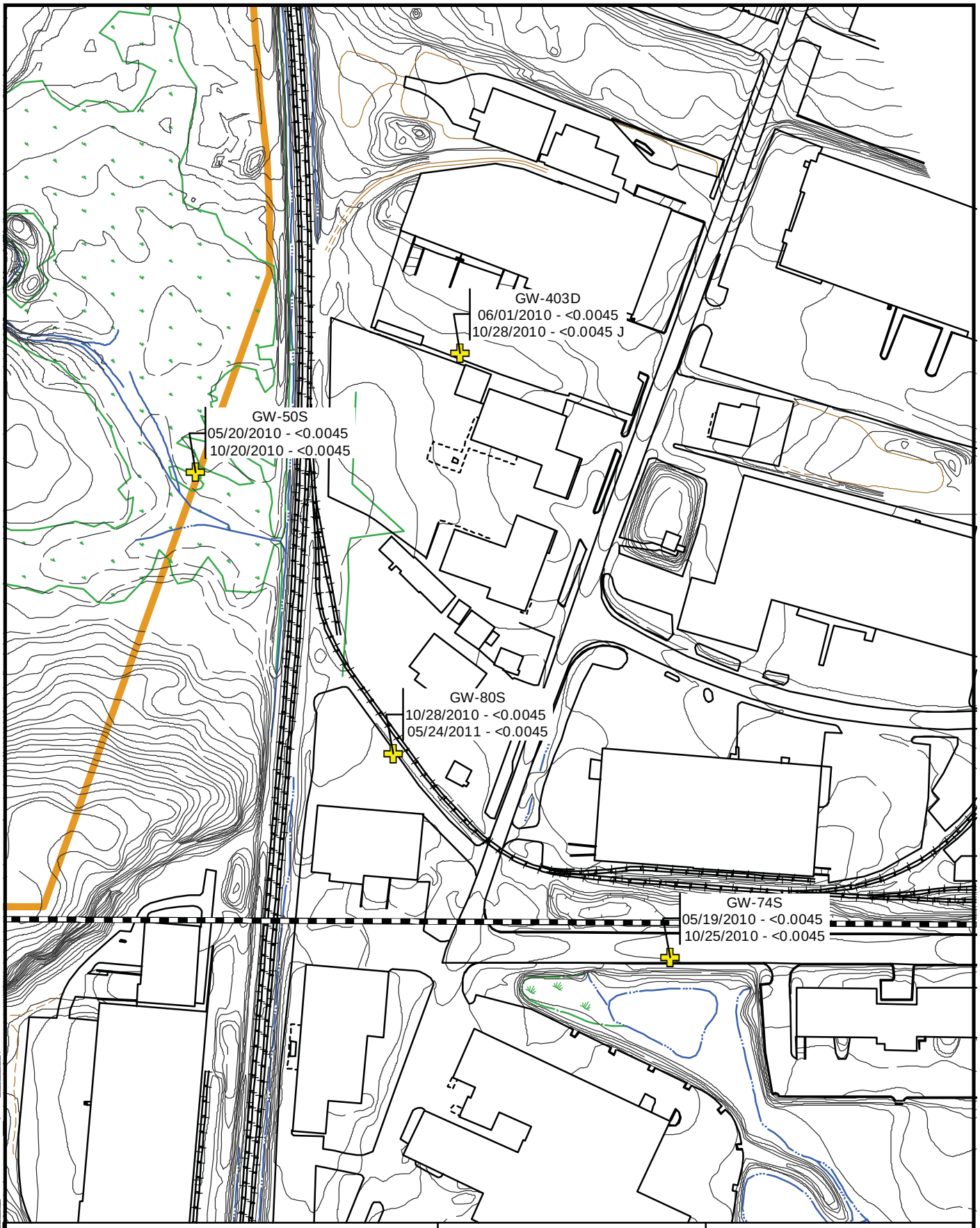

Legend

N-Nitrosodiphenylamine
- Detect
- Non-Detect

Units in mg/L
J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

0 50 100 200 Feet

N-Nitrosodiphenylamine
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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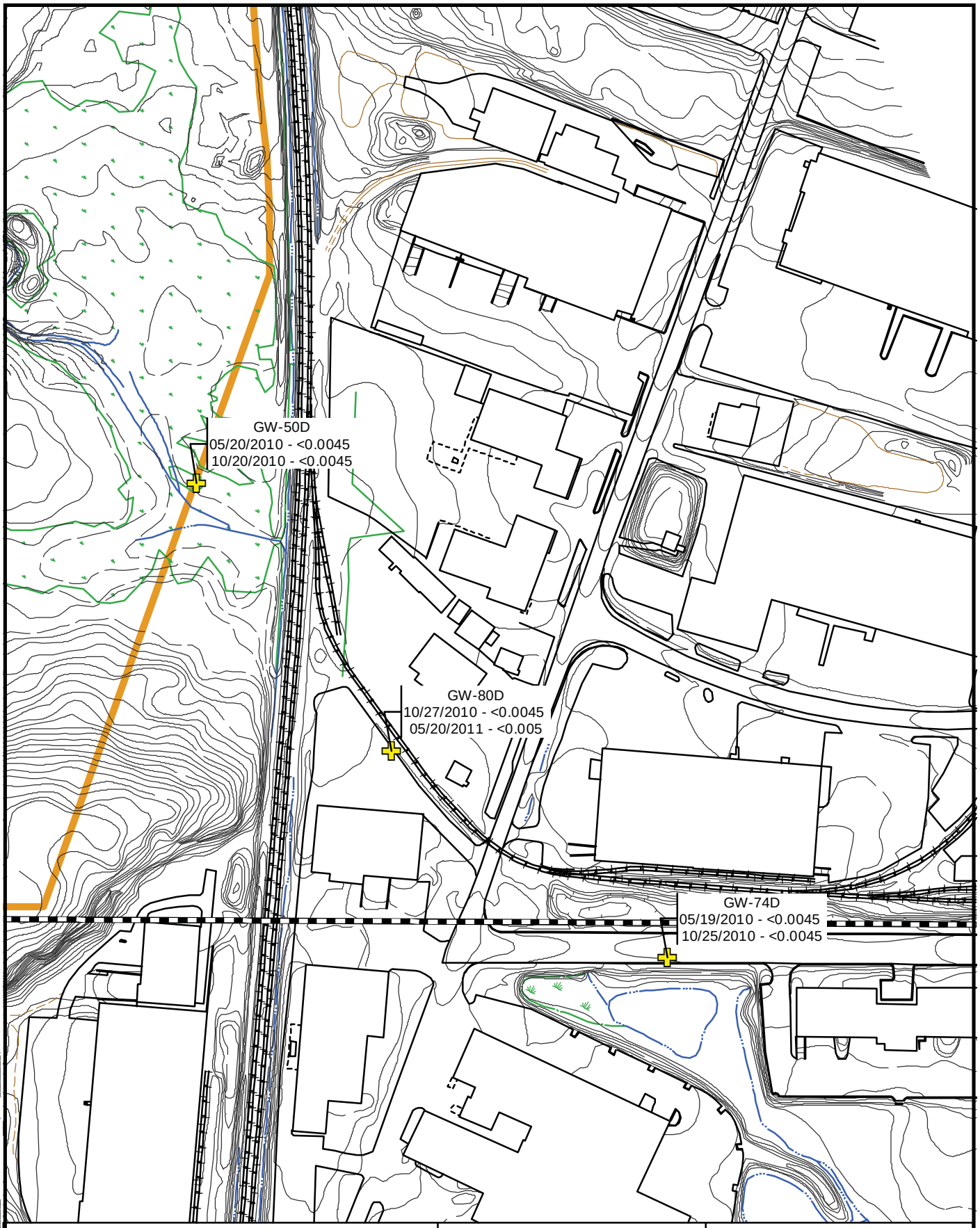

Legend

N-Nitrosodiphenylamine

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

N-Nitrosodiphenylamine
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

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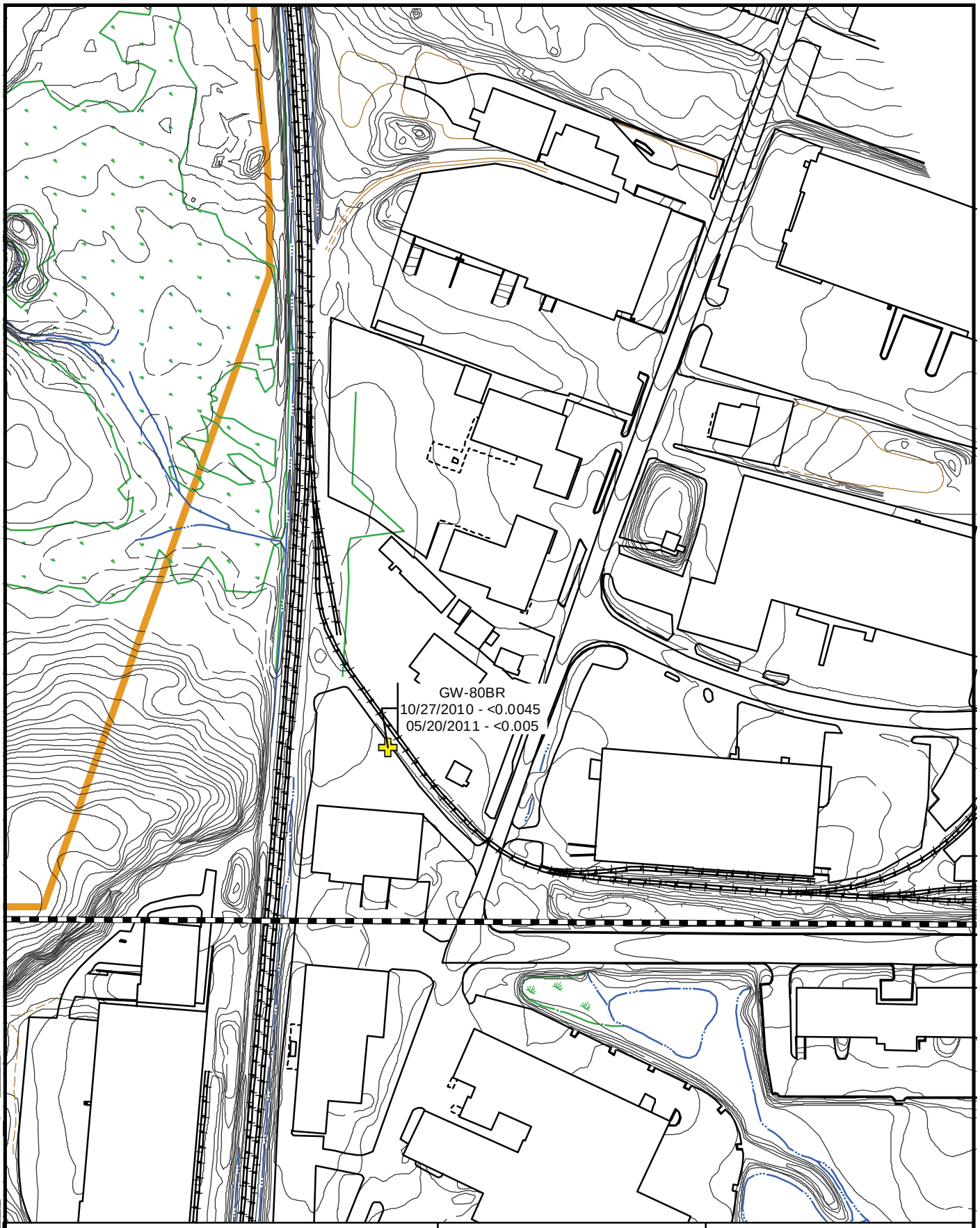

Legend

N-Nitrosodiphenylamine

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

N-Nitrosodiphenylamine
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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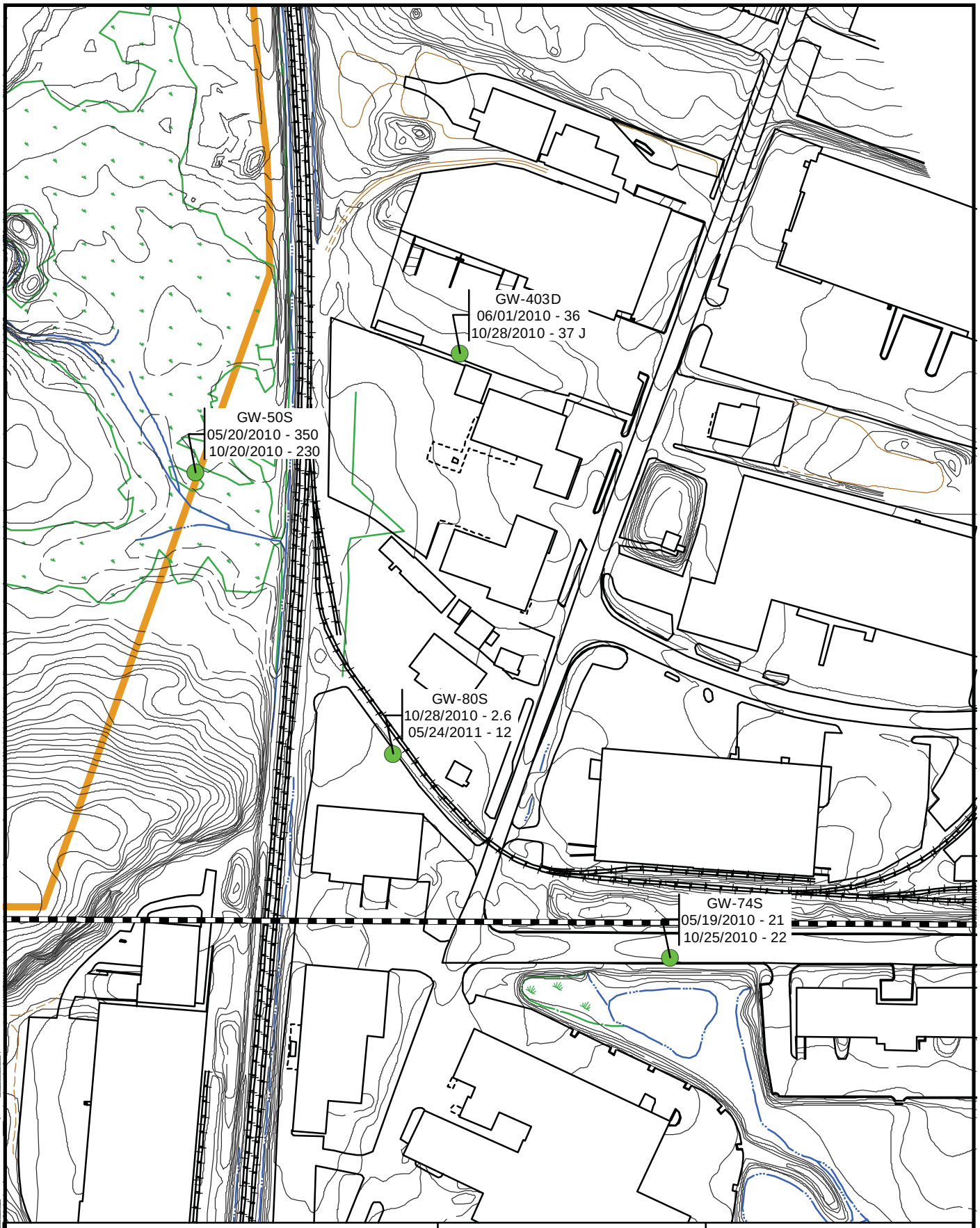

Legend

Sulfate — Units in mg/L

Detect — J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Sulfate
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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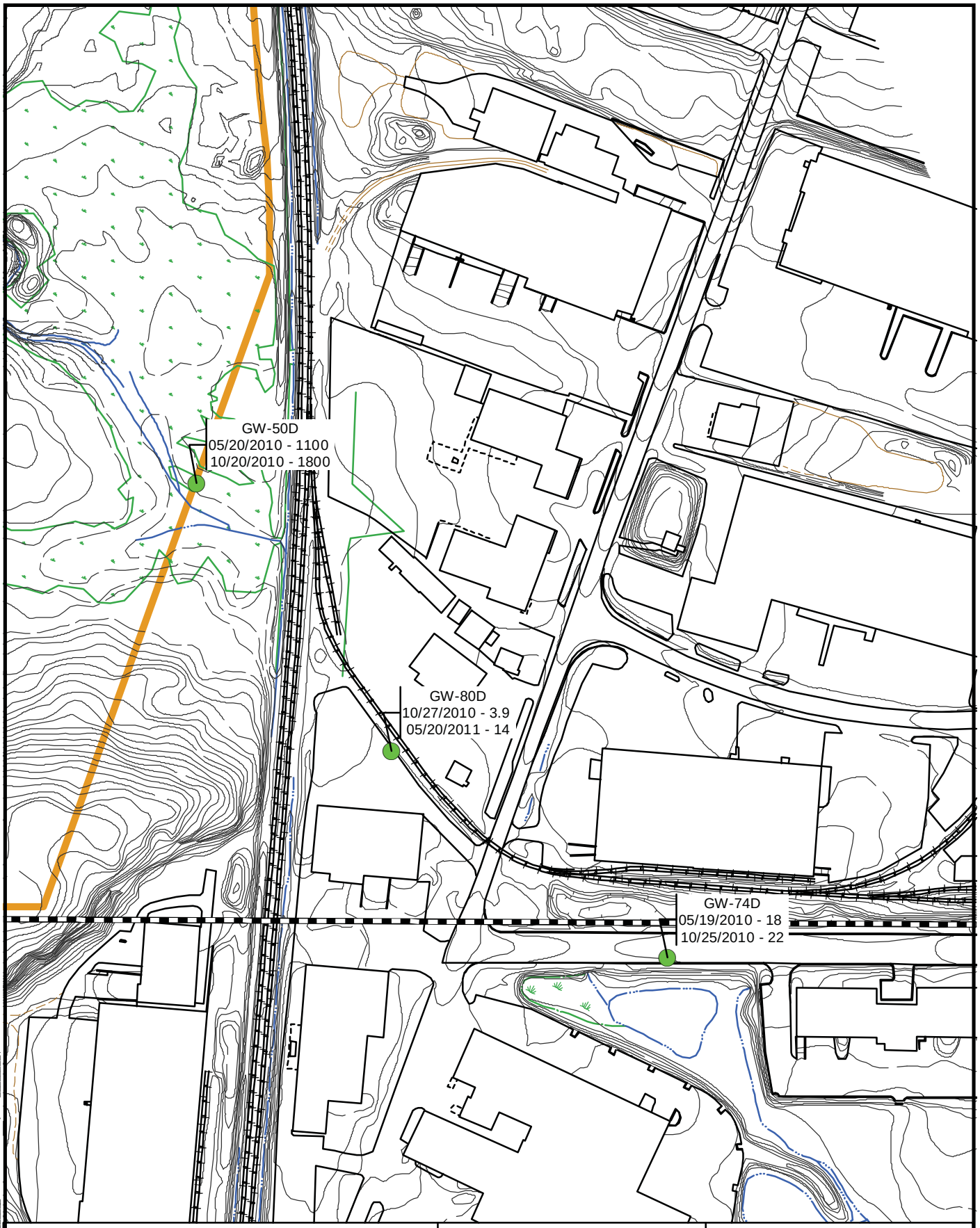


Legend

Sulfate

Detect

Non-Detect

Units in mg/L

J - Estimated

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

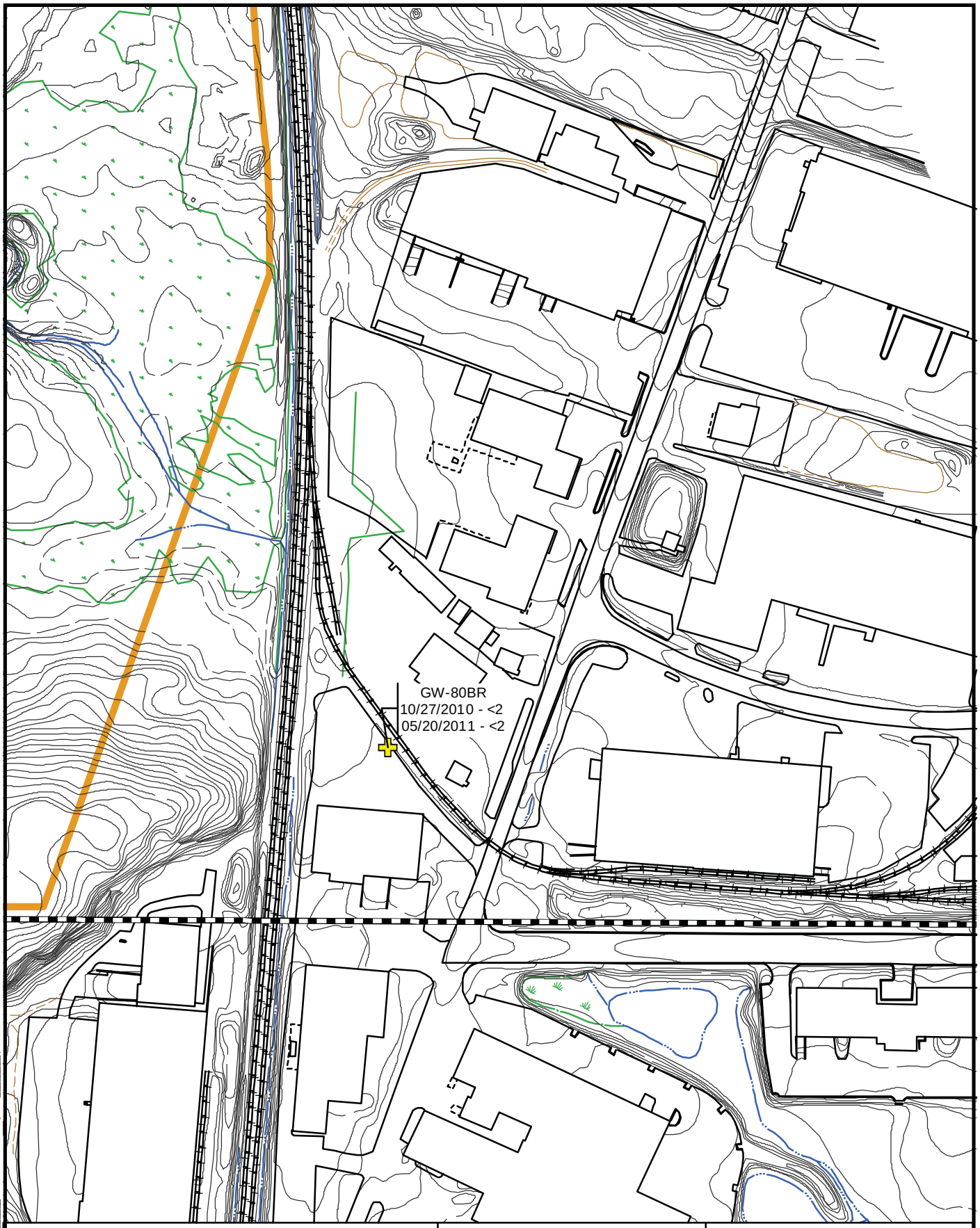
0 50 100 200 Feet

Sulfate
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

Document: P:\Projects_____.mxd PDF: P:\Projects_____.pdf 01/01/2005 12:01 PM FMLastName



Legend

Sulfate

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

Sulfate
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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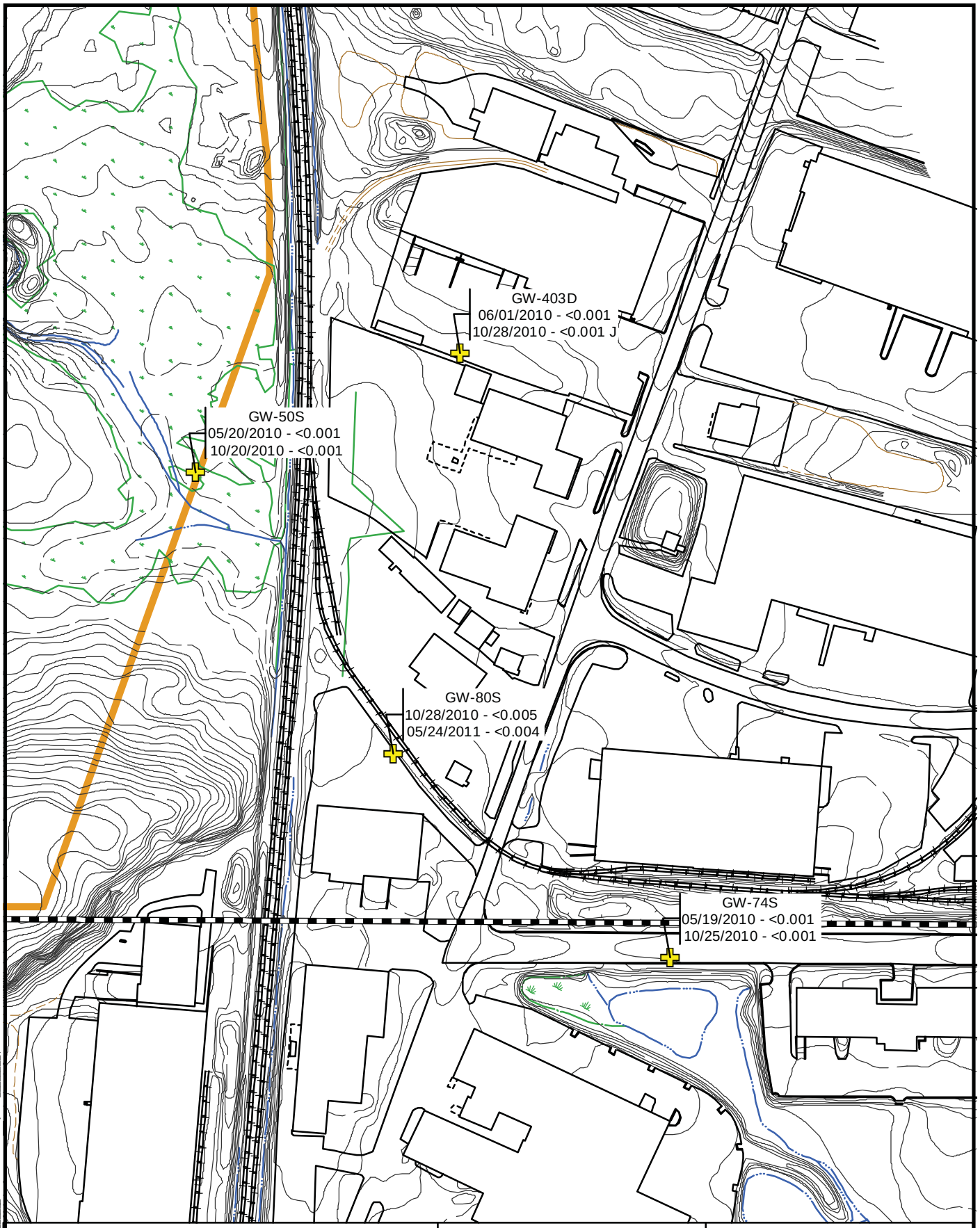

Legend

2,4,4-Trimethyl-1-pentene

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

2,4,4-Trimethyl-1-pentene
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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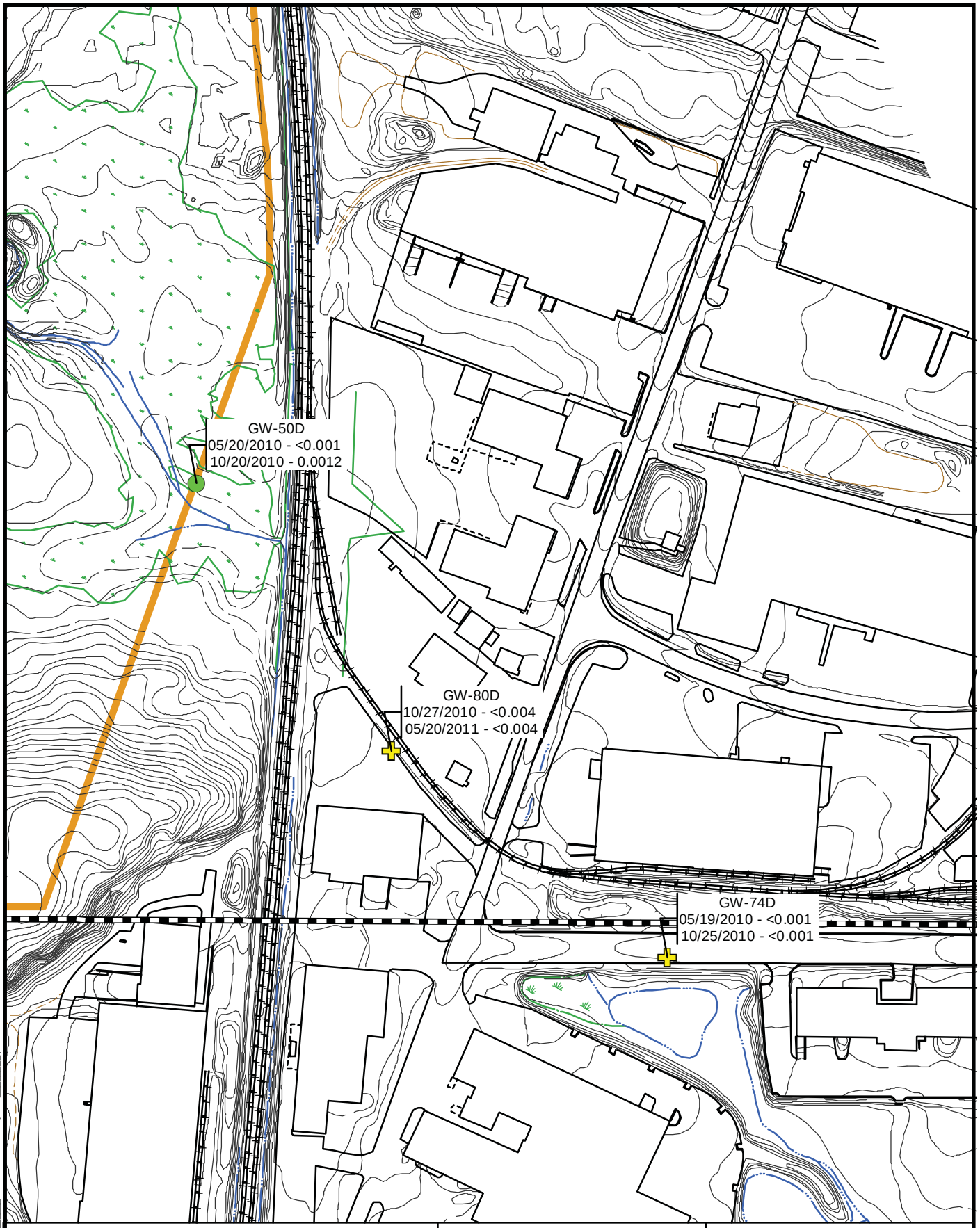


Legend

2,4,4-Trimethyl-1-pentene

Detect

Non-Detect

Units in mg/L

J - Estimated

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

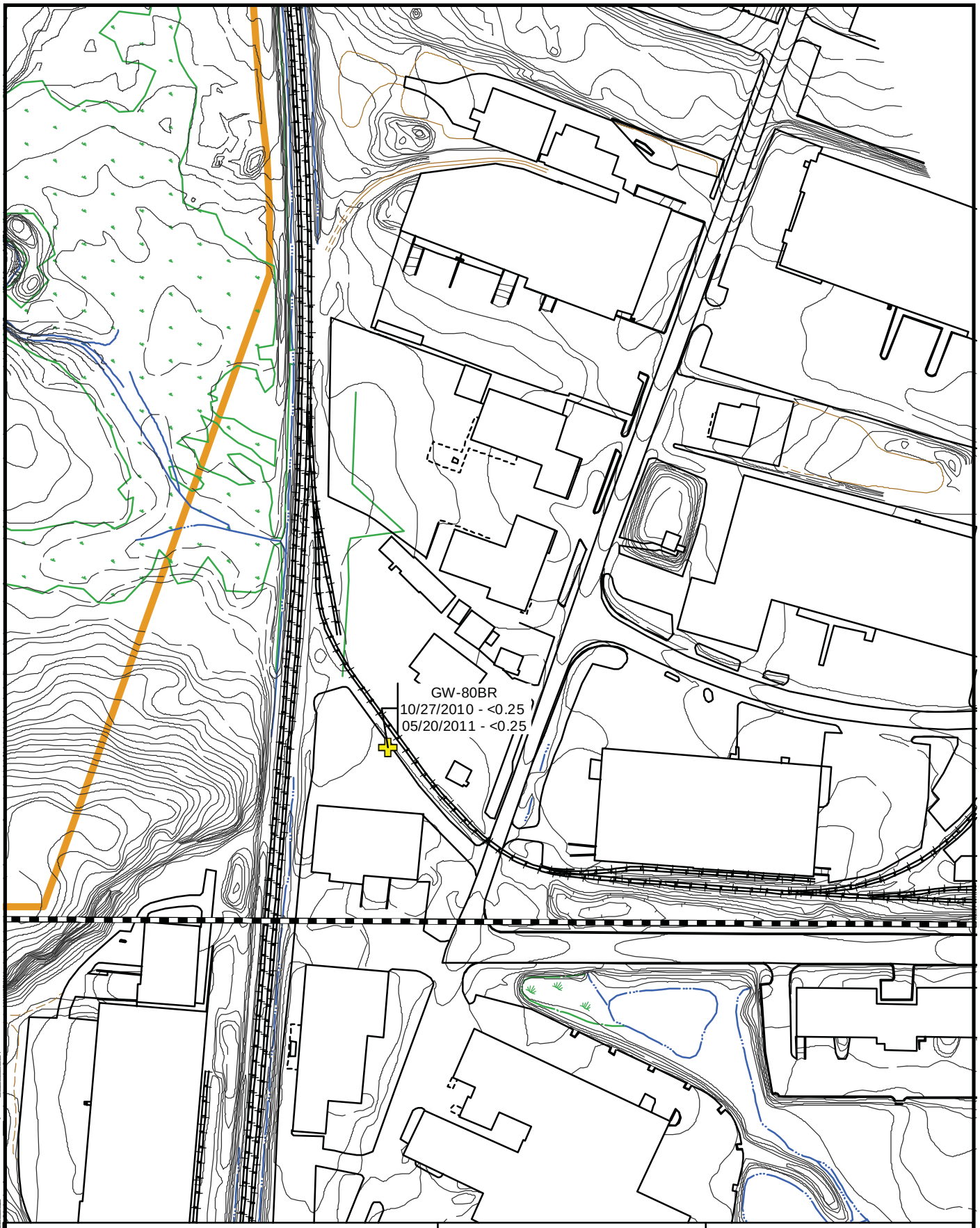
0 50 100 200 Feet

2,4,4-Trimethyl-1-pentene
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

Document: P:\Projects_____.mxd PDF: P:\Projects_____.pdf 01/01/2005 12:01 PM FMLastName



Legend

2,4,4-Trimethyl-1-pentene

Detect

Non-Detect

Units in mg/L

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

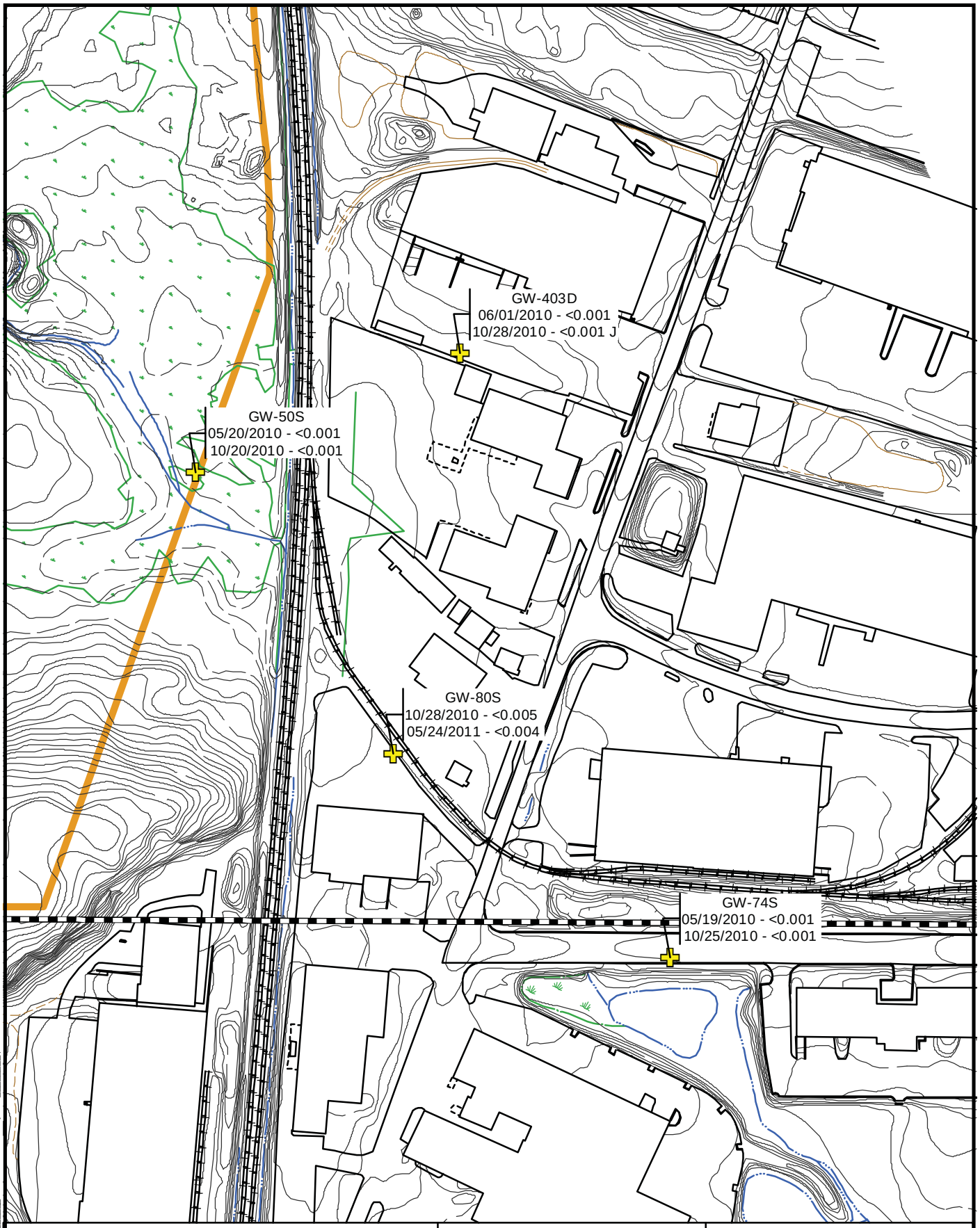
0 50 100 200 Feet

2,4,4-Trimethyl-1-pentene
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

Document: P:\Projects_____.mxd PDF: P:\Projects_____.pdf 01/01/2005 12:01 PM FMLastName



Legend

2,4,4-Trimethyl-2-pentene: Units in mg/L

Detect

Non-Detect

J - Estimated

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

2,4,4-Trimethyl-2-pentene
Shallow Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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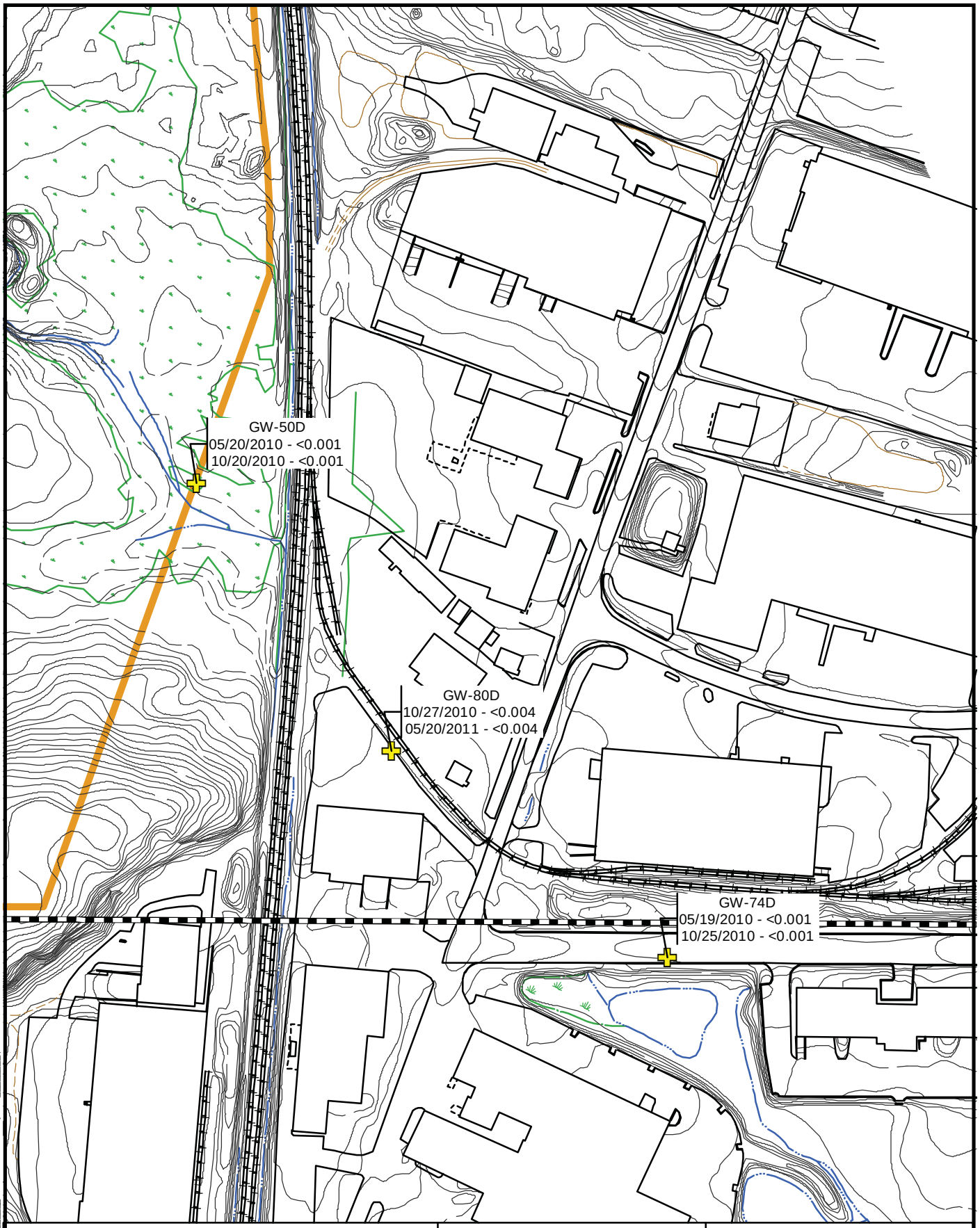

Legend

2,4,4-Trimethyl-2-pentene:

Detect

Non-Detect

Units in mg/L

J - Estimated

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

2,4,4-Trimethyl-2-pentene
Deep Overburden Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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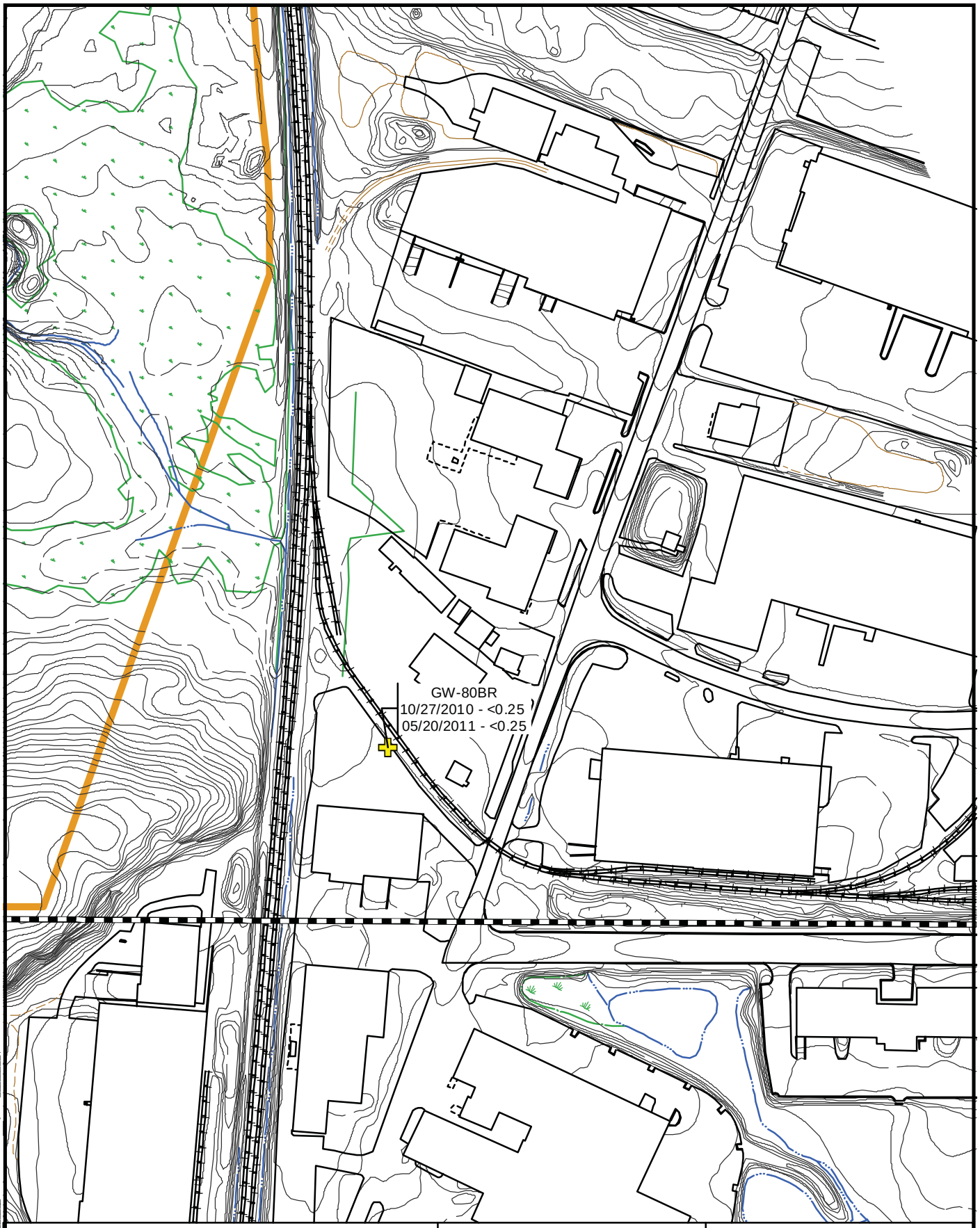

Legend

2,4,4-Trimethyl-2-pentene: Units in mg/L

Detect

Non-Detect

J - Estimated

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 50 100 200 Feet

2,4,4-Trimethyl-2-pentene
Bedrock Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date:BRP 04/04/14 | Checked\Date: PHT 04/04/14

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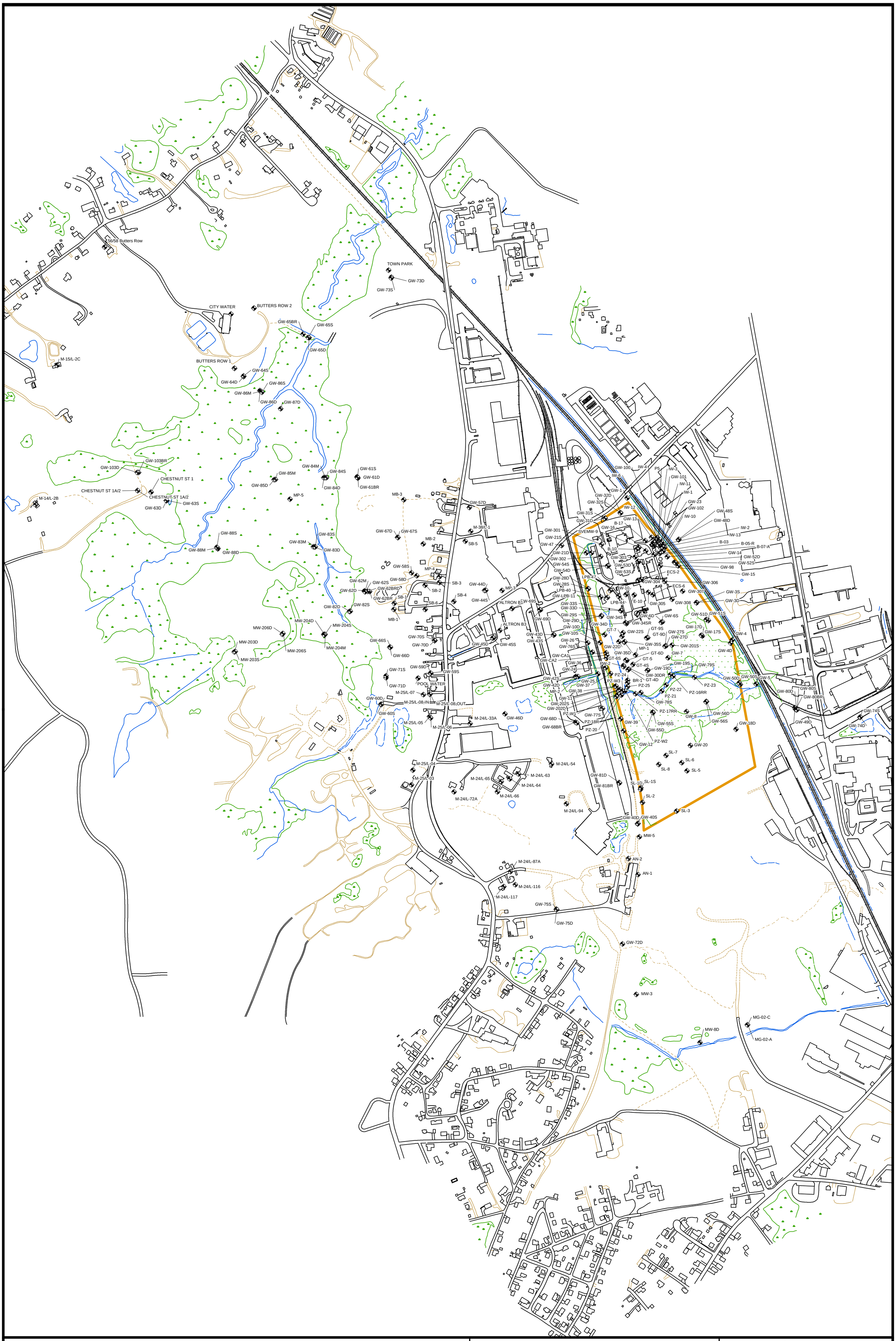
ATTACHMENT E

GROUNDWATER SUMMARY TABLE AND FIGURES

(Provided on CD)



Legend

GW Location	Structure
Trail	Water
Paved Road	Wetland Symbol
Unpaved Road	Wetland Boundary
Railroad	Site Boundary

MACTEC

MACTEC Engineering and Consulting
107 Audubon Road Suite 301
Wakefield, MA 01880

N

0 175 350 700 Feet

Groundwater Locations

51 Eames Street Site
Wilmington, Massachusetts

PROJ NO	6300060010	Prepared by BJR
DWG NO		Checked by XXX

Document: P:\W5-CHEM\OLIN\Wilmington\GIS\MapDocuments\Olin_Locations.mxd PDF: P:\W5-CHEM\OLIN\Wilmington\GIS\Figures\AllGroundwaterLocations.pdf 10/23/2006 9:43 AM bjroden

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	Frequency of Detection			Range of Non Detects			Range of Detected Concentrations			Average of All Samples	GW-10DR OC-GW-10D-DUP 2/29/2012	GW-10DR OC-GW-10DR-XXX 2/23/2011	GW-10DR OC-GW-10DR-XXX 5/18/2011	GW-10DR OC-GW-10D-XXX 2/29/2012
Volatile Organics (mg/L)														
1,1-Dichloroethane	4	/	20	0.001	:	0.004	0.0006	-	0.0016	0.000773		0.004 U	0.004 U	
1,1-Dichloroethene	2	/	20	0.001	:	0.004	0.00034	-	0.00048	0.000641		0.004 U	0.004 U	
1,2,4-Trichlorobenzene	2	/	20	0.001	:	0.004	0.00029	-	0.0003	0.00063		0.004 U	0.004 U	
1,2,4-Trimethylbenzene	2	/	20	0.001	:	0.004	0.00021	-	0.00035	0.000628		0.004 U	0.004 U	
1,2-Dichloroethane	8	/	20	0.001	:	0.004	0.00051	-	0.0019	0.000884		0.004 U	0.004 U	
1,3-Dichlorobenzene	3	/	20	0.001	:	0.004	0.00061	-	0.0024	0.000791		0.004 U	0.004 U	
2,4,4-Trimethyl-1-pentene	13	/	20	0.001	:	0.001	0.0035	-	0.19	0.0531		0.07	0.13 J	
2,4,4-Trimethyl-2-pentene	12	/	20	0.001	:	0.001	0.00065	-	0.11	0.015715		0.021	0.04	
Acetone	1	/	20	0.05	:	0.2	0.023	-	0.023	0.0324		0.2 UJ	0.2 U	
Benzene	2	/	20	0.001	:	0.004	0.00038	-	0.0004	0.000639		0.004 U	0.004 U	
Bromochloromethane	4	/	20	0.001	:	0.004	0.0002	-	0.00038	0.000609		0.004 U	0.004 U	
Bromodichloromethane	5	/	20	0.0005	:	0.002	0.00041	-	0.0018	0.000641		0.002 U	0.002 U	
Bromoform	6	/	20	0.001	:	0.004	0.00078	-	0.0084	0.001734		0.004 U	0.004 U	
Carbon disulfide	9	/	20	0.01	:	0.01	0.0003	-	0.0063	0.004097		0.0048 J	0.0063 J	
Chlorodibromomethane	6	/	20	0.0005	:	0.002	0.00024	-	0.0044	0.000785		0.002 U	0.002 U	
Chloroform	3	/	20	0.001	:	0.004	0.0014	-	0.0019	0.000933		0.004 U	0.004 U	
Chloromethane	2	/	20	0.002	:	0.008	0.00089	-	0.00099	0.001294		0.008 U	0.008 U	
Dibromomethane	5	/	20	0.001	:	0.004	0.0012	-	0.0041	0.00116		0.004 U	0.004 U	
Ethyl benzene	1	/	20	0.001	:	0.004	0.00022	-	0.00022	0.000636		0.004 U	0.004 U	
Methyl Tertbutyl Ether	2	/	20	0.001	:	0.004	0.00025	-	0.00034	0.00063		0.004 U	0.004 U	
Naphthalene	1	/	20	0.005	:	0.02	0.00035	-	0.00035	0.003143		0.02 U	0.02 U	
Toluene	5	/	20	0.001	:	0.004	0.00045	-	0.00068	0.000667		0.004 U	0.004 U	
Trichloroethene	2	/	20	0.001	:	0.004	0.00031	-	0.0005	0.000641		0.004 U	0.004 U	
Xylene, o	1	/	20	0.001	:	0.004	0.00025	-	0.00025	0.000638		0.004 U	0.004 U	
Semivolatile Organics (mg/L)														
2,6-Dinitrotoluene	3	/	20	0.0045	:	0.005	0.00047	-	0.00063	0.002022		0.0045 U	0.0045 U	
2-Nitrophenol	5	/	20	0.0045	:	0.0047	0.0028	-	0.0055	0.002688		0.0045 U	0.0045 U	
4-Bromophenyl phenyl ether	6	/	20	0.0045	:	0.0047	0.00058	-	0.0021	0.001958		0.0045 U	0.0045 U	
4-Nitrophenol	5	/	20	0.0045	:	0.0047	0.0016	-	0.0023	0.002193		0.0045 UJ	0.0045 U	
Azobenzene	2	/	20	0.0045	:	0.005	0.00053	-	0.00057	0.002103		0.0045 U	0.0045 U	
Benzaldehyde	1	/	20	0.0045	:	0.005	0.00067	-	0.00067	0.002189		0.0045 U	0.0045 U	
Benzo(ghi)perylene	1	/	20	0.00045	:	0.0005	0.000098	-	0.000098	0.000221		0.000098 J	0.00045 U	
Benzoic Acid	1	/	12	0.0045	:	0.0045	0.0038	-	0.0038	0.002379		0.0038 J	0.0045 UJ	
Biphenyl	5	/	20	0.0045	:	0.005	0.0005	-	0.0018	0.002016		0.0018 J	0.0018 J	
Bis(2-Ethylhexyl)phthalate	2	/	20	0.0018	:	0.0019	0.00077	-	0.0017	0.000939		0.0017 J	0.0018 U	
Dibenz(a,h)anthracene	2	/	20	0.00045	:	0.0005	0.000066	-	0.0001	0.000213		0.0001 J	0.00045 U	
Diethylphthalate	3	/	20	0.0045	:	0.0047	0.0019	-	0.0025	0.002263		0.0024 J	0.0045 U	
Diphenyl ether	18	/	20	0.0045	:	0.0045	0.00063	-	0.012	0.004102		0.011	0.012	

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	Frequency of Detection			Range of Non Detects			Range of Detected Concentrations			Average of All Samples	GW-10DR OC-GW-10D-DUP 2/29/2012	GW-10DR OC-GW-10DR-XXX 2/23/2011	GW-10DR OC-GW-10DR-XXX 5/18/2011	GW-10DR OC-GW-10D-XXX 2/29/2012
Diphenylamine	9	/	15	0.0045	:	0.0045	0.00049	-	0.004	0.001764		0.00064 J	0.004 J	
Diphenylmethanone	12	/	20	0.0045	:	0.0045	0.0005	-	0.0037	0.001835		0.0045 U	0.0045 U	
N-Nitrosodimethylamine	19	/	21	1.9E-06	:	4.8E-06	0.000026	-	0.0046	0.0007		0.0046 J	0.00087 J	
N-Nitrosodi-n-butylamine	2	/	3	1.9E-06	:	1.9E-06	2.7E-06	-	4.9E-06	2.85E-06	0.0000027 J			0.0000049 J
N-Nitrosodi-n-propylamine	2	/	23	5.4E-07	:	0.0001	9.4E-07	-	1.2E-06	7.23E-06	0.00000054 U	0.00000094 J	0.000019 U	0.00000077 U
N-Nitrosodiphenylamine	15	/	19	0.0045	:	0.0047	0.00065	-	0.026	0.004658		0.026	0.017	
N-Nitrosomethylethylamine	2	/	3	1.9E-06	:	1.9E-06	4.9E-07	-	5E-07	6.47E-07	0.00000049 J			0.0000005 J
Metals, Total (mg/L)														
Aluminum	15	/	20	0.1	:	0.1	0.015	-	11	3.06195		2.4	1.5	
Arsenic	9	/	20	0.001	:	0.1	0.0017	-	0.0057	0.00566		0.0024	0.0033	
Barium	16	/	20	0.01	:	0.01	0.0065	-	0.095	0.024795		0.032	0.022	
Beryllium	8	/	20	0.001	:	0.001	0.00024	-	0.0028	0.000847		0.001 U	0.001 U	
Cadmium	1	/	20	0.001	:	0.001	0.0013	-	0.0013	0.00054		0.001 U	0.001 U	
Calcium	20	/	20				1.7	-	230	80.025		2.3	2.3	
Chromium	14	/	20	0.005	:	0.0079	0.0025	-	1	0.242443		0.19	0.15	
Chromium, Hexavalent	2	/	16	0.001	:	0.001	0.00046	-	0.00062	0.000505		0.00062 J	0.001 UJ	
Cobalt	14	/	20	0.01	:	0.01	0.0019	-	0.087	0.02867		0.01 U	0.01 U	
Copper	2	/	20	0.01	:	0.019	0.0033	-	0.01	0.005665		0.0033 J	0.01 U	
Iron	19	/	20	0.31	:	0.31	0.045	-	67	13.32875		3.2	3.2	
Lead	1	/	20	0.005	:	0.005	0.0037	-	0.0037	0.00256		0.005 UJ	0.005 U	
Magnesium	20	/	20				0.12	-	31	12.4865		0.96	1.1	
Manganese	20	/	20				0.014	-	3.3	1.35435		0.065	0.078	
Mercury	4	/	20	0.0002	:	0.0003	0.00012	-	0.0003	0.000125		0.00012 J	0.0002 U	
Nickel	16	/	20	0.01	:	0.01	0.0018	-	0.096	0.02666		0.0032 J	0.0018 J	
Potassium	15	/	20	4	:	4	1.3	-	18	3.94		4 U	4 U	
Silver	4	/	20	0.005	:	0.006	0.0027	-	0.018	0.004335		0.0027 J	0.005 U	
Sodium	20	/	20				2.3	-	460	158.715		56	49	
Thallium	3	/	20	0.0001	:	0.001	0.00015	-	0.00043	0.00041		0.001 U	0.0001 U	
Tin	1	/	20	0.05	:	0.05	0.37	-	0.37	0.04225		0.05 U	0.05 U	
Vanadium	6	/	20	0.01	:	0.01	0.002	-	0.0096	0.00492		0.0096 J	0.0066 J	
Zinc	9	/	20	0.05	:	0.05	0.025	-	0.14	0.04945		0.05 U	0.05 U	
Metals, Dissolved (mg/L)														
Aluminum	1	/	3	0.1	:	0.1	1.9	-	1.9	0.666667				
Arsenic	1	/	1				0.0039	-	0.0039	0.0039				
Barium	1	/	1				0.0086	-	0.0086	0.0086				
Beryllium	1	/	1				0.00049	-	0.00049	0.00049				
Calcium	1	/	1				80	-	80	80				
Chromium	3	/	3				0.0021	-	0.37	0.124733				
Cobalt	1	/	1				0.051	-	0.051	0.051				

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Summary of Compounds Detected in On-Site Groundwater
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Wilmington, Massachusetts

param_name	Frequency of Detection			Range of Non Detects			Range of Detected Concentrations			Average of All Samples	GW-10DR OC-GW-10D-DUP 2/29/2012	GW-10DR OC-GW-10DR-XXX 2/23/2011	GW-10DR OC-GW-10DR-XXX 5/18/2011	GW-10DR OC-GW-10D-XXX 2/29/2012
Iron	1	/	1				20	-	20	20				
Magnesium	1	/	1				23	-	23	23				
Manganese	1	/	1				1.9	-	1.9	1.9				
Mercury	1	/	1				0.00006	-	0.00006	0.00006				
Nickel	1	/	1				0.056	-	0.056	0.056				
Potassium	1	/	1				1.9	-	1.9	1.9				
Silver	1	/	1				0.0042	-	0.0042	0.0042				
Sodium	1	/	1				190	-	190	190				
Zinc	1	/	1				0.065	-	0.065	0.065				
Inorganics (mg/L)														
Bromide	17	/	20	0.1	:	0.1	0.1	-	1.6	0.49		0.1	0.1 U	
Chloride	22	/	22				3.5	-	440	141.25		35	23	
LAB SPECIFIC CONDUCTANCE **(mS/cm)**	2	/	2				1.3	-	1.3	1.3				
Nitrate as N	6	/	20	0.05	:	0.05	0.092	-	16	0.9526		0.05 U	0.05 U	
Nitrogen, as Ammonia	22	/	22				0.19	-	520	126.7995		42	39	
Perchlorate	3	/	16	0.001	:	0.1	0.0047	-	0.0055	0.007		0.01 U	0.001 U	
Sulfate	22	/	22				19	-	3100	936.8182		130	100	
Site Specific Compounds (mg/L)														
Hydrazine	7	/	16	0.0002	:	0.0002	0.000072	-	0.00019	0.000105		0.000087 J	0.00014	
UDMH	1	/	16	0.0005	:	0.0005	0.00069	-	0.00069	0.000278		0.0005 U	0.0005 U	
Formaldehyde	3	/	16	0.03	:	0.03	0.0077	-	0.017	0.014419		0.017 J	0.011 J	
Dimethylformamide	1	/	16	0.02	:	0.02	0.019	-	0.019	0.010563		0.02 U	0.02 U	
4,4'-Isopropylidenediphenol	5	/	16	0.00094	:	0.00097	0.00049	-	0.00054	0.000486		0.00097 U	0.00096 U	
4-Nonylphenol (Tech.)	13	/	16	0.0048	:	0.0048	0.0032	-	0.038	0.013919		0.0048 U	0.0065	
OPEX	1	/	16	0.1	:	0.1	0.034	-	0.034	0.049		0.1 U	0.1 UJ	

mg/L = milligram per liter
U = not detected, value is the reporting limit
J = value is estimated
R = value is rejected

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-10S OC-GW-10S-XXX 10/18/2010	GW-10S OC-GW-10S-XXX 2/29/2012	GW-10S OC-GW-10S-XXX 5/14/2010	GW-202D OC-GW-202D-XXX 10/19/2010	GW-202D OC-GW-202D-XXX 5/14/2010	GW-202S OC-GW-202S-XXX 10/19/2010	GW-202S OC-GW-202S-XXX 5/14/2010	GW-408D OC-GW-408D-DUP 5/19/2011	GW-408D OC-GW-408D-DUP 5/25/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
1,1-Dichloroethene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
1,2,4-Trichlorobenzene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00029 J	
1,2,4-Trimethylbenzene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
1,2-Dichloroethane	0.001 U		0.001 U	0.0011	0.0013	0.001 U	0.001 U	0.00078 J	
1,3-Dichlorobenzene	0.001 U		0.001 U	0.00061 J	0.0024	0.001 U	0.0013	0.001 U	
2,4,4-Trimethyl-1-pentene	0.026		0.001 U	0.0045	0.001 U	0.06	0.06	0.15 J	
2,4,4-Trimethyl-2-pentene	0.0046		0.001 U	0.00094 J	0.001 U	0.011	0.0021	0.035 J	
Acetone	0.05 U		0.05 UJ	0.05 U	0.05 UJ	0.05 U	0.05 UJ	0.05 U	
Benzene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Bromochloromethane	0.001 U		0.001 U	0.00038 J	0.001 U	0.001 U	0.001 U	0.0003 J	
Bromodichloromethane	0.001 UJ		0.001 U	0.00096 J	0.0018	0.001 UJ	0.001 U	0.00083	
Bromoform	0.001 U		0.001 U	0.0041	0.0084	0.001 U	0.00078 J	0.0046	
Carbon disulfide	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.00033 J	
Chlorodibromomethane	0.0005 U		0.0005 U	0.0044	0.003	0.0005 U	0.00024 J	0.0012	
Chloroform	0.001 U		0.001 U	0.0025 U	0.0036 U	0.001 U	0.001 U	0.0018	
Chloromethane	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.00099 J	
Dibromomethane	0.001 U		0.001 U	0.0029	0.0041	0.001 U	0.001 U	0.0022	
Ethyl benzene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Methyl Tertbutyl Ether	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Naphthalene	0.005 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	
Toluene	0.001 U		0.001 U	0.00045 J	0.00068 J	0.001 U	0.001 U	0.00061 J	
Trichloroethene	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Xylene, o	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	
2-Nitrophenol	0.0045 U		0.0045 U	0.0029 J	0.0055	0.0045 U	0.0045 U	0.0042 J	
4-Bromophenyl phenyl ether	0.0045 U		0.0045 U	0.0045 U	0.0021 J	0.0045 U	0.0045 U	0.0014 J	
4-Nitrophenol	0.0045 UJ		0.0045 UJ	0.0019 J	0.0018 J	0.0045 UJ	0.0045 UJ	0.0023 J	
Azobenzene	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.00053 J	
Benzaldehyde	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	
Benzo(ghi)perylene	0.00045 U		0.00045 U	0.00045 U	0.00045 U	0.00045 U	0.00045 UJ	0.00045 U	
Benzoic Acid	0.0045 UJ		R	0.0045 UJ	R	0.0045 UJ	R	0.0045 UJ	
Biphenyl	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	
Bis(2-Ethylhexyl)phthalate	0.0018 U		0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	
Dibenz(a,h)anthracene	0.00045 U		0.00045 U	0.00045 U	0.00045 UJ	0.00045 U	0.00045 U	0.00045 U	
Diethylphthalate	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	0.0045 U	
Diphenyl ether	0.00063 J		0.0045 U	0.0021 J	0.004 J	0.0014 J	0.0045 U	0.0038 J	

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-10S OC-GW-10S-XXX 10/18/2010	GW-10S OC-GW-10S-XXX 2/29/2012	GW-10S OC-GW-10S-XXX 5/14/2010	GW-202D OC-GW-202D-XXX 10/19/2010	GW-202D OC-GW-202D-XXX 5/14/2010	GW-202S OC-GW-202S-XXX 10/19/2010	GW-202S OC-GW-202S-XXX 5/14/2010	GW-408D OC-GW-408D-DUP 5/19/2011	GW-408D OC-GW-408D-DUP 5/25/2011
Diphenylamine	0.0045 U		0.0045 U	0.0045 U	0.00049 J	0.0045 U	0.0023 J	0.00097 J	
Diphenylmethanone	0.0045 U		0.0045 U	0.0024 J	0.0037 J	0.0045 U	0.0045 U	0.0012 J	
N-Nitrosodimethylamine	0.000031	0.0000048 UJ	0.0000019 U	0.00069	0.00089	0.00014	0.0002	0.00065 J	
N-Nitrosodi-n-butylamine		0.0000019 U							
N-Nitrosodi-n-propylamine	0.0000019 U	0.0000019 U	0.0000095 U	0.000019 U	0.000047 U	0.0000019 U	0.000019 U	0.000019 U	
N-Nitrosodiphenylamine	0.0045 U		0.0045 U	0.0007 J	0.00065 J	0.0033 J	0.0023 J	0.0027 J	
N-Nitrosomethylethylamine		0.0000019 U							
Metals, Total (mg/L)									
Aluminum	1.5		2.1	9.8	11	0.021 J	0.1 U	7.9	
Arsenic	0.001 U		0.001 U	0.02 U	0.1 U	0.001 U	0.001 U	0.0035	
Barium	0.074		0.018	0.0065 J	0.0072 J	0.024	0.026	0.01 U	
Beryllium	0.00024 J		0.001 U	0.0022	0.0021	0.001 U	0.001 U	0.001	
Cadmium	0.001 U		0.001 U	0.001 U	0.0013 J	0.001 U	0.001 U	0.001 U	
Calcium	8.2		1.7	110	110	72	97	87	
Chromium	0.011		0.005 U	0.82	0.89	0.0058	0.005 U	1	
Chromium, Hexavalent	0.001 U		0.001 UJ	0.001 U	0.00046 J	0.001 U	0.001 UJ	0.001 U	
Cobalt	0.0063 J		0.0022 J	0.069	0.077	0.01 U	0.01 U	0.049	
Copper	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.019 U	
Iron	0.54		0.097 J	12	14	0.058 J	0.045 J	15	
Lead	0.005 U		0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	
Magnesium	0.55		0.12 J	31	28	8.5	9.5	23	
Manganese	0.15		0.014	2.4	2.6	0.67	0.82	1.7	
Mercury	0.0002 U		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	
Nickel	0.009 J		0.0025 J	0.093	0.096 J	0.0073 J	0.01 U	0.062	
Potassium	4 U		4 U	2.7 J	2.7 J	2.1 J	4 U	1.7 J	
Silver	0.005 UJ		0.005 U	0.013	0.018	0.005 UJ	0.005 U	0.006 U	
Sodium	13		2.3	280	280	79	86	190	
Thallium	0.001 U		0.001 U	0.00041 J	0.00043 J	0.001 U	0.001 U	0.00016 UJ	
Tin	0.05 U		0.05 UJ	0.05 U	0.37	0.05 U	0.05 UJ	0.05 U	
Vanadium	0.01 U		0.01 U	0.01 UJ	0.01 U	0.0036 J	0.0034 J	0.01 U	
Zinc	0.085		0.056	0.13	0.14	0.05 U	0.05 U	0.083	
Metals, Dissolved (mg/L)									
Aluminum									
Arsenic									
Barium									
Beryllium									
Calcium									
Chromium									
Cobalt									

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-10S OC-GW-10S-XXX 10/18/2010	GW-10S OC-GW-10S-XXX 2/29/2012	GW-10S OC-GW-10S-XXX 5/14/2010	GW-202D OC-GW-202D-XXX 10/19/2010	GW-202D OC-GW-202D-XXX 5/14/2010	GW-202S OC-GW-202S-XXX 10/19/2010	GW-202S OC-GW-202S-XXX 5/14/2010	GW-408D OC-GW-408D-DUP 5/19/2011	GW-408D OC-GW-408D-DUP 5/25/2011
Iron									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Silver									
Sodium									
Zinc									
Inorganics (mg/L)									
Bromide	0.1 U		0.1 U	0.77	0.68	0.31	0.37	0.61	
Chloride	10		3.5	240	250	75	61	180	
LAB SPECIFIC CONDUCTANCE **(mS/cm)**									
Nitrate as N	0.25		0.28	0.05 U	0.092	0.05 U	0.05 U	0.05 U	
Nitrogen, as Ammonia	2.4 J		0.19	190 J	230	63 J	67	150	
Perchlorate	0.001 U		0.001 U	0.0055 J	0.1 U	0.01 U	0.01 U	0.0053 J	
Sulfate	71 J		19	2000 J	2000	430 J	580	1000	
Site Specific Compounds (mg/L)									
Hydrazine	0.0002 U		0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 UJ		0.00011
UDMH	0.0005 U		0.0005 UJ	0.0005 U	0.00069 J	0.0005 U	0.0005 UJ		0.0005 U
Formaldehyde	0.03 U		0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.0077 J	
Dimethylformamide	0.02 UJ		0.02 U	0.02 U	0.019 J	0.02 U	0.02 U	0.02 U	
4,4'-Isopropylidenediphenol	0.00095 U		0.00095 U	0.00094 U	0.00051 J	0.00095 U	0.00049 J	0.00096 U	
4-Nonylphenol (Tech.)	0.0048 U		0.0048 U	0.027	0.026 J	0.029	0.038	0.012	
OPEX	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	

mg/L = milligram per liter
U = not detected, value is the reporting limit
J = value is estimated
R = value is rejected

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-408D OC-GW-408D-XXX 2/24/2011	GW-408D OC-GW-408D-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 5/25/2011	GW-408S OC-GW-408S-XXX 2/23/2011	GW-408S OC-GW-408S-XXX 5/19/2011	GW-55D OC-GW-55D-XXX 10/14/2010	GW-55D OC-GW-55D-XXX 5/18/2010	GW-55S OC-GW-55S-XXX 10/14/2010	GW-55S OC-GW-55S-XXX 5/18/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane	0.001 U	0.001 U		0.001 U	0.001 U	0.0016	0.0014	0.00086 J	0.001 U
1,1-Dichloroethene	0.001 U	0.001 U		0.001 U	0.001 U	0.00048 J	0.00034 J	0.001 U	0.001 U
1,2,4-Trichlorobenzene	0.001 U	0.0003 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2,4-Trimethylbenzene	0.001 U	0.001 U		0.001 U	0.001 U	0.00021 J	0.00035 J	0.001 U	0.001 U
1,2-Dichloroethane	0.00051 J	0.00078 J		0.001 U	0.001 U	0.0019	0.0017	0.0006 J	0.001 U
1,3-Dichlorobenzene	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
2,4,4-Trimethyl-1-pentene	0.081	0.14 J		0.14	0.19 J	0.0035	0.001 U	0.0035	0.001 U
2,4,4-Trimethyl-2-pentene	0.012	0.033 J		0.04	0.11	0.00065 J	0.001 U	0.001 U	0.001 U
Acetone	0.023 J	0.05 U		0.05 UJ	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 UJ
Benzene	0.001 U	0.001 U		0.001 U	0.001 U	0.0004 J	0.00038 J	0.001 U	0.001 U
Bromochloromethane	0.0002 J	0.0003 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Bromodichloromethane	0.00041 J	0.00081		0.0005 U	0.0005 U	0.001 UJ	0.001 U	0.001 UJ	0.001 U
Bromoform	0.0021	0.0047		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Carbon disulfide	0.01 U	0.0003 J		0.01 U	0.01 U	0.0063 J	0.0015 J	0.0018 J	0.01 U
Chlorodibromomethane	0.00065	0.0012		0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Chloroform	0.0014	0.0019		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloromethane	0.002 U	0.00089 J		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Dibromomethane	0.0012	0.0023		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Ethyl benzene	0.001 U	0.001 U		0.001 U	0.001 U	0.00022 J	0.001 U	0.001 U	0.001 U
Methyl Tertbutyl Ether	0.001 U	0.001 U		0.001 U	0.001 U	0.00034 J	0.00025 J	0.001 U	0.001 U
Naphthalene	0.005 U	0.005 U		0.005 U	0.005 U	0.00035 J	0.005 U	0.005 U	0.005 U
Toluene	0.00049 J	0.00061 J		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Trichloroethene	0.001 U	0.001 U		0.001 U	0.001 U	0.0005 J	0.00031 J	0.001 U	0.001 U
Xylene, o	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.00025 J	0.001 U	0.001 U
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene	0.005 U	0.00047 J		0.00063 J	0.00063 J	0.0045 U	0.0047 U	0.0045 U	0.0047 U
2-Nitrophenol	0.0028 J	0.0044 J		0.0045 U	0.0045 U	0.0045 U	0.0047 U	0.0045 U	0.0047 U
4-Bromophenyl phenyl ether	0.0012 J	0.0016 J		0.0045 U	0.0045 U	0.00067 J	0.00058 J	0.0045 U	0.0047 U
4-Nitrophenol	0.0016 J	0.0023 J		0.0045 UJ	0.0045 U	0.0045 U	0.0047 UJ	0.0045 U	0.0047 UJ
Azobenzene	0.005 U	0.00057 J		0.0045 U	0.0045 U	0.0045 U	0.0047 U	0.0045 U	0.0047 U
Benzaldehyde	0.005 U	0.0045 U		0.0045 U	0.0045 U	0.0045 U	0.00067 J	0.0045 U	0.0047 U
Benzo(ghi)perylene	0.0005 U	0.00045 U		0.00045 U	0.00045 U	0.00045 U	0.00047 UJ	0.00045 U	0.00047 UJ
Benzoic Acid	R	0.0045 UJ		R	0.0045 UJ	0.0045 UJ	R	0.0045 UJ	R
Biphenyl	0.005 U	0.0045 U		0.0045 U	0.0045 U	0.00092 J	0.0012 J	0.0005 J	0.0047 U
Bis(2-Ethylhexyl)phthalate	0.00077 J	0.0018 U		0.0018 U	0.0018 U	0.0018 U	0.0019 UJ	0.0018 U	0.0019 UJ
Dibenz(a,h)anthracene	0.0005 U	0.00045 U		0.000066 J	0.00045 U	0.00045 U	0.00047 UJ	0.00045 U	0.00047 UJ
Diethylphthalate	0.0019 J	0.0045 U		0.0025 J	0.0045 U	0.0045 U	0.0047 U	0.0045 U	0.0047 U
Diphenyl ether	0.0036 J	0.0041 J		0.0024 J	0.0028 J	0.0064	0.0081	0.0039 J	0.0019 J

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-408D OC-GW-408D-XXX 2/24/2011	GW-408D OC-GW-408D-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 5/25/2011	GW-408S OC-GW-408S-XXX 2/23/2011	GW-408S OC-GW-408S-XXX 5/19/2011	GW-55D OC-GW-55D-XXX 10/14/2010	GW-55D OC-GW-55D-XXX 5/18/2010	GW-55S OC-GW-55S-XXX 10/14/2010	GW-55S OC-GW-55S-XXX 5/18/2010
Diphenylamine		0.001 J		0.0012 J	0.0018 J				
Diphenylmethanone	0.0011 J	0.0013 J		0.0045 U	0.0045 U	0.0028 J	0.0016 J	0.0022 J	0.00057 J
N-Nitrosodimethylamine	0.00095 J	0.00065 J		0.000088	0.00014	0.0017	0.0017	0.00044	0.00022
N-Nitrosodi-n-butylamine									
N-Nitrosodi-n-propylamine	0.0000019 U	0.0000095 U		0.0000019 U	0.0000019 U	0.0000019 U	0.0001 U	0.0000012 J	0.00002 U
N-Nitrosodiphenylamine		0.0028 J		0.0046	0.0044 J	0.00084 J	0.0047 U	0.00091 J	0.0047 U
N-Nitrosomethylethylamine									
Metals, Total (mg/L)									
Aluminum	5.2	7.8		0.016 J	0.1 U	0.1 U	0.1 U	11	0.72
Arsenic	0.0044 J	0.0036		0.0021	0.0017 J	0.0052 U	0.01 U	0.01 U	0.01 U
Barium	0.01	0.01 U		0.01 U	0.01 U	0.011	0.01	0.095	0.0072 J
Beryllium	0.00074 J	0.001		0.001 U	0.001 U	0.001 U	0.001 U	0.0028	0.00085 J
Cadmium	0.001 U	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Calcium	76	87		45	51	160	210	42	41
Chromium	0.71	1		0.0025 J	0.0025 J	0.0072	0.0079 U	0.005 U	0.005 U
Chromium, Hexavalent	0.001 U	0.001 U		0.001 U	0.001 U				
Cobalt	0.048	0.049		0.002 J	0.0019 J	0.087	0.059	0.04	0.038
Copper	0.01	0.019 U		0.01 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U
Iron	23	15		0.28	0.31 U	55	67	8.5	6.7
Lead	0.005 UJ	0.005 U		0.005 U	0.005 U	0.005 UJ	0.005 U	0.0037 J	0.005 U
Magnesium	21	23		4.6	5.3	23	23	4.7	6
Manganese	1.8	1.7		0.43	0.46	2.8	3.3	1.2	1.5
Mercury	0.0002 U	0.0002 U		0.00016 J	0.0002 U	0.0003	0.0002 U	0.0002 U	0.0002 U
Nickel	0.053	0.061		0.0073 J	0.0082 J	0.0089 J	0.017 J	0.045	0.038
Potassium	2.3 J	1.6 J		1.9 J	1.3 J	18	13	4.3	1.7 J
Silver	0.012	0.006 U		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Sodium	180	190		48	51	460	420	140	120
Thallium	0.001 U	0.00016 UJ		0.001 U	0.00015	0.001 U	0.001 U	0.001 U	0.001 U
Tin	0.05 U	0.05 U		0.05 U	0.05 U	0.05 U	0.05 UJ	0.05 U	0.05 UJ
Vanadium	0.01 UJ	0.01 U		0.01 U	0.01 U	0.01 U	0.002 J	0.01 U	0.01 U
Zinc	0.062	0.084		0.05 U	0.05 U	0.05 U	0.05 U	0.049 J	0.025 J
Metals, Dissolved (mg/L)									
Aluminum	1.9								
Arsenic	0.0039 J								
Barium	0.0086 J								
Beryllium	0.00049 J								
Calcium	80								
Chromium	0.37								
Cobalt	0.051								

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-408D OC-GW-408D-XXX 2/24/2011	GW-408D OC-GW-408D-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 5/25/2011	GW-408S OC-GW-408S-XXX 2/23/2011	GW-408S OC-GW-408S-XXX 5/19/2011	GW-55D OC-GW-55D-XXX 10/14/2010	GW-55D OC-GW-55D-XXX 5/18/2010	GW-55S OC-GW-55S-XXX 10/14/2010	GW-55S OC-GW-55S-XXX 5/18/2010
Iron	20								
Magnesium	23								
Manganese	1.9								
Mercury	0.00006 J								
Nickel	0.056								
Potassium	1.9 J								
Silver	0.0042 J								
Sodium	190								
Zinc	0.065								
Inorganics (mg/L)									
Bromide	0.57	0.59		0.18	0.2	1.6	1.3	0.56	0.41
Chloride	180	180		46	41	400 J	440	110 J	150
LAB SPECIFIC CONDUCTANCE **(mS/cm)**									
Nitrate as N	0.05 U	0.05 U		0.05 U	0.05 U	0.98 J	0.05 U	16 J	1.1
Nitrogen, as Ammonia	120	140		39	33	340	520	180	150
Perchlorate	0.01 U	0.0047 J		0.01 U	0.01 U				
Sulfate	980	1000		220	270	2800 J	3100	1200 J	870
Site Specific Compounds (mg/L)									
Hydrazine	0.00019		0.00011	0.000077 J	0.000072 J				
UDMH	0.0005 U		0.0005 U	0.0005 U	0.0005 U				
Formaldehyde	0.03 U	0.03 U		0.03 U	0.03 U				
Dimethylformamide	0.02 U	0.02 U		0.02 U	0.02 U				
4,4'-Isopropylidenediphenol	0.00095 U	0.00096 U		0.00094 U	0.00096 U				
4-Nonylphenol (Tech.)	0.0099	0.012		0.021	0.021				
OPEX	0.1 U	0.1 UJ		0.034 J	0.1 UJ				

mg/L = milligram per liter
U = not detected, value is the reporting limit
J = value is estimated
R = value is rejected

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-78S OC-GW-78S 11/17/2010	GW-78S OC-GW-78S 6/10/2010	GW-79S OC-GW-79S-DUP 10/14/2010	GW-79S OC-GW-79S-XXX 10/14/2010	GW-79S OC-GW-79S-XXX 5/17/2010
Volatile Organics (mg/L)					
1,1-Dichloroethane			0.001 U	0.001 U	0.0006 J
1,1-Dichloroethene			0.001 U	0.001 U	0.001 U
1,2,4-Trichlorobenzene			0.001 U	0.001 U	0.001 U
1,2,4-Trimethylbenzene			0.001 U	0.001 U	0.001 U
1,2-Dichloroethane			0.001 U	0.001 U	0.001 U
1,3-Dichlorobenzene			0.001 U	0.001 U	0.001 U
2,4,4-Trimethyl-1-pentene			0.001 U	0.001 U	0.001 U
2,4,4-Trimethyl-2-pentene			0.001 U	0.001 U	0.001 U
Acetone			0.05 U	0.05 U	0.05 UJ
Benzene			0.001 U	0.001 U	0.001 U
Bromochloromethane			0.001 U	0.001 U	0.001 U
Bromodichloromethane			0.001 UJ	0.001 UJ	0.001 U
Bromoform			0.001 U	0.001 U	0.001 U
Carbon disulfide			0.0027 J	0.0029 J	0.01 U
Chlorodibromomethane			0.0005 U	0.0005 U	0.0005 U
Chloroform			0.001 U	0.001 U	0.001 U
Chloromethane			0.002 U	0.002 U	0.002 U
Dibromomethane			0.001 U	0.001 U	0.001 U
Ethyl benzene			0.001 U	0.001 U	0.001 U
Methyl Tertbutyl Ether			0.001 U	0.001 U	0.001 U
Naphthalene			0.005 U	0.005 U	0.005 U
Toluene			0.001 U	0.001 U	0.001 U
Trichloroethene			0.001 U	0.001 U	0.001 U
Xylene, o			0.001 U	0.001 U	0.001 U
Semivolatile Organics (mg/L)					
2,6-Dinitrotoluene			0.0045 U	0.0045 U	0.0045 U
2-Nitrophenol			0.0045 U	0.0045 U	0.0045 U
4-Bromophenyl phenyl ether			0.0045 U	0.0045 U	0.0045 U
4-Nitrophenol			0.0045 UJ	0.0045 UJ	0.0045 UJ
Azobenzene			0.0045 U	0.0045 U	0.0045 U
Benzaldehyde			0.0045 U	0.0045 U	0.0045 U
Benzo(ghi)perylene			0.00045 U	0.00045 U	0.00045 UJ
Benzoic Acid			0.0045 UJ	0.0045 UJ	R
Biphenyl			0.0045 U	0.0045 U	0.0045 U
Bis(2-Ethylhexyl)phthalate			0.0018 U	0.0018 U	0.0018 UJ
Dibenz(a,h)anthracene			0.00045 U	0.00045 U	0.00045 UJ
Diethylphthalate			0.0045 U	0.0045 U	0.0045 U
Diphenyl ether			0.0028 J	0.0026 J	0.004 J

Table 1
Summary of Compounds Detected in On-Site Groundwater
Olin Wilmington Superfund Site
Wilmington, Massachusetts

param_name	GW-78S OC-GW-78S 11/17/2010	GW-78S OC-GW-78S 6/10/2010	GW-79S OC-GW-79S-DUP 10/14/2010	GW-79S OC-GW-79S-XXX 10/14/2010	GW-79S OC-GW-79S-XXX 5/17/2010
Diphenylamine			0.00056 J	0.0045 U	0.0045 UJ
Diphenylmethanone			0.00054 J	0.0005 J	0.00079 J
N-Nitrosodimethylamine			0.000032	0.000026	0.00067
N-Nitrosodi-n-butylamine					
N-Nitrosodi-n-propylamine			0.0000019 U	0.0000019 U	0.000048 U
N-Nitrosodiphenylamine			0.0056 J	0.0058 J	0.0017 J
N-Nitrosomethylethylamine					
Metals, Total (mg/L)					
Aluminum			0.015 J	0.017 J	0.1 U
Arsenic			0.0044 J	0.0057 J	0.005 U
Barium			0.06	0.061	0.012
Beryllium			0.001 U	0.001 U	0.001 U
Cadmium			0.001 U	0.001 U	0.001 U
Calcium			82	86	230
Chromium			0.021	0.021	0.0078 U
Chromium, Hexavalent			0.001 UJ	0.001 UJ	0.001 U
Cobalt			0.01 U	0.01 U	0.015
Copper			0.01 U	0.011 U	0.01 U
Iron			3.8	4	35
Lead			0.005 UJ	0.005 UJ	0.005 U
Magnesium			9.5	9.9	17
Manganese			1.5	1.5	2.4
Mercury			0.00027	0.0003 U	0.0002 U
Nickel			0.01 U	0.01 U	0.01 U
Potassium			4.3 J	5.2 J	6
Silver			0.005 U	0.005 U	0.005 U
Sodium			160	170	200
Thallium			0.001 U	0.001 U	0.001 U
Tin			0.05 U	0.05 U	0.05 UJ
Vanadium			0.01 U	0.01 U	0.0032 J
Zinc			0.05 U	0.05 U	0.05 U
Metals, Dissolved (mg/L)					
Aluminum	0.1 U	0.1 U			
Arsenic					
Barium					
Beryllium					
Calcium					
Chromium	0.0021 J	0.0021 J			
Cobalt					

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param_name	GW-78S OC-GW-78S 11/17/2010	GW-78S OC-GW-78S 6/10/2010	GW-79S OC-GW-79S-DUP 10/14/2010	GW-79S OC-GW-79S-XXX 10/14/2010	GW-79S OC-GW-79S-XXX 5/17/2010
Iron					
Magnesium					
Manganese					
Mercury					
Nickel					
Potassium					
Silver					
Sodium					
Zinc					
Inorganics (mg/L)					
Bromide			0.35	0.36	0.69
Chloride	19	24	220 J	230 J	190
LAB SPECIFIC CONDUCTANCE **(mS/cm)**	1.3	1.3			
Nitrate as N			0.05 UJ	0.05 UJ	0.05 U
Nitrogen, as Ammonia	51	53	100	100	180
Perchlorate			0.01 U	0.01 U	0.01 U
Sulfate	580	530	710 J	720 J	1300
Site Specific Compounds (mg/L)					
Hydrazine			0.0002 U	0.0002 U	0.0002 UJ
UDMH			0.0005 U	0.0005 U	0.0005 UJ
Formaldehyde			0.03 UJ	0.03 U	0.03 U
Dimethylformamide			0.02 U	0.02 U	0.02 U
4,4'-Isopropylidenediphenol			0.00054 J	0.00049 J	0.0005 J
4-Nonylphenol (Tech.)			0.0038 J	0.0032 J	0.0061 J
OPEX			0.1 UJ	0.1 UJ	0.1 U

mg/L = milligram per liter
U = not detected, value is the reporting limit
J = value is estimated
R = value is rejected

Prepared by / Date: KJC 02/28/14
Checked by / Date: CTM 02/28/14