

April 27, 2009

Shelly Puleo
United States Environmental Protection Agency
RGP-NOI Processing
Municipal Assistance Unit (CMU)
1 Congress Street, Suite 1100
Boston, MA 02114-2023

**RE: Remediation General Permit (RGP) Application
Temporary Groundwater Pump and Treat System
Village Street and Main Street, Medway, Massachusetts**

Dear Ms. Puleo:

Geosphere Environmental Management, Inc. (GEOSPHERE), operator, on behalf of the Town of Medway, Massachusetts, owner of the above referenced facility (the site), is pleased to present the accompanying documentation as application for the *Remedial General Permit* (RGP) at a Contaminated Construction Dewatering Site. This RGP application is in relation to a temporary groundwater pump and treat system to be installed on site and utilized for a maximum of seven (7) days. The expected dates of treatment are from May 4, 2009 through May 11, 2009.

The site is located at the intersection of Village Street and Main Street, Medway, Massachusetts. Contaminated groundwater is to be extracted from a sewer line trench, stored in a 20,000-gallon frac tank, where it will then be treated through a bag filter and 2,000 lb. carbon filtration system. The treated groundwater will be discharged onto the ground surface where it will run off into a siltation barrier and discharge into the nearby storm drain. The treated groundwater will eventually flow into the Charles River.

Additional information is contained in the attached Notice of Intent (NOI) and attached Figures. If you have any questions, please feel free to call GEOSPHERE at 603-773-0075 or 888-838-6571.

Sincerely,
GEOSPHERE ENVIRONMENTAL MANAGEMENT, INC.



David Niemeyer, P.G.
Director of Environmental Compliance

Attachments

cc: Mark Flaherty, Water and Sewer Superintendent, Town of Medway, Massachusetts

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

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

a) Name of facility/site: Sewer Line Installation		Facility SIC code(s):		Facility/site address: Village Street and Main Street, Medway, MA	
Location of facility/site: Longitude: <u>42 14N</u> latitude: <u>71.44W</u>		Street: Village Street and Main Street, Medway, MA			
b) Name of facility/site owner: Town of Medway, Water and Sewer Dept.		Town: Medway			
Email address of owner: Mark Flaherty, Water and Sewer Superintendent mflaherty@townofmedway.org		State: MA		Zip: 02053	
Telephone no. of facility/site owner: 508-533-3200		Zip: 02053		County: Norfolk	
Fax no. of facility/site owner:		Owner is (check one): 1. Federal _____ 2. State/Tribal <input checked="" type="checkbox"/> _____ 3. Private _____ 4. other, if so, describe: _____			
Address of owner (if different from site):					
Street: Medway Town Hall, 155 Village Street					
Town: Medway		State: MA		Zip: 02053	
County: Norfolk					
c) Legal name of operator: Geosphere Environmental Management, Inc.		Operator telephone no: 603-773-0075			
		Operator fax no.: 603-773-0077		Operator email: dniemeyer@geospherenh.com	
Operator contact name and title: David Niemeyer, Senior Project Hydrogeologist, Geosphere Environmental Management, Inc.					

Address of operator (if different from owner):		Street: 51 Portsmouth Ave	
Town: Exeter		State: NH	County: Rockingham
		Zip: 03833	

d) Check "yes" or "no" for the following:

1. Has a prior NPDES permit exclusion been granted for the discharge? Yes ___ No X, if "yes," number: _____

2. Has a prior NPDES application (Form 1 & 2C) ever been filed for the discharge? Yes ___ No X, if "yes," date and tracking #: _____

3. Is the discharge a "new discharge" as defined by 40 CFR 122.22? Yes X No ___

4. For sites in Massachusetts, is the discharge covered under the MA Contingency Plan (MCP) and exempt from state permitting? Yes ___ No X

e) Is site/facility subject to any State permitting or other action which is causing the generation of discharge? Yes ___ No X

If "yes," please list:

1. site identification # assigned by the state of NH or MA: _____

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 storm water general permit? Y ___ N X if Y, number: _____

2. phase I or II construction storm water general permit? Y ___ N X if Y, number: _____

3. individual NPDES permit? Y ___ N X, if Y, number: _____

4. any other water quality related permit? Y ___ N X, if Y, number: _____

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

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

A temporary treatment system, incorporating a storage tank and carbon filtration system will be installed on site to treat Benzene, Toluene, and TPH contaminated groundwater, in relation to a historical diesel spill. The groundwater will be extracted from a sewer line trench. The treated groundwater will be discharged onto the ground surface where it will run off into a siltation barrier and eventually discharge into a storm drain.

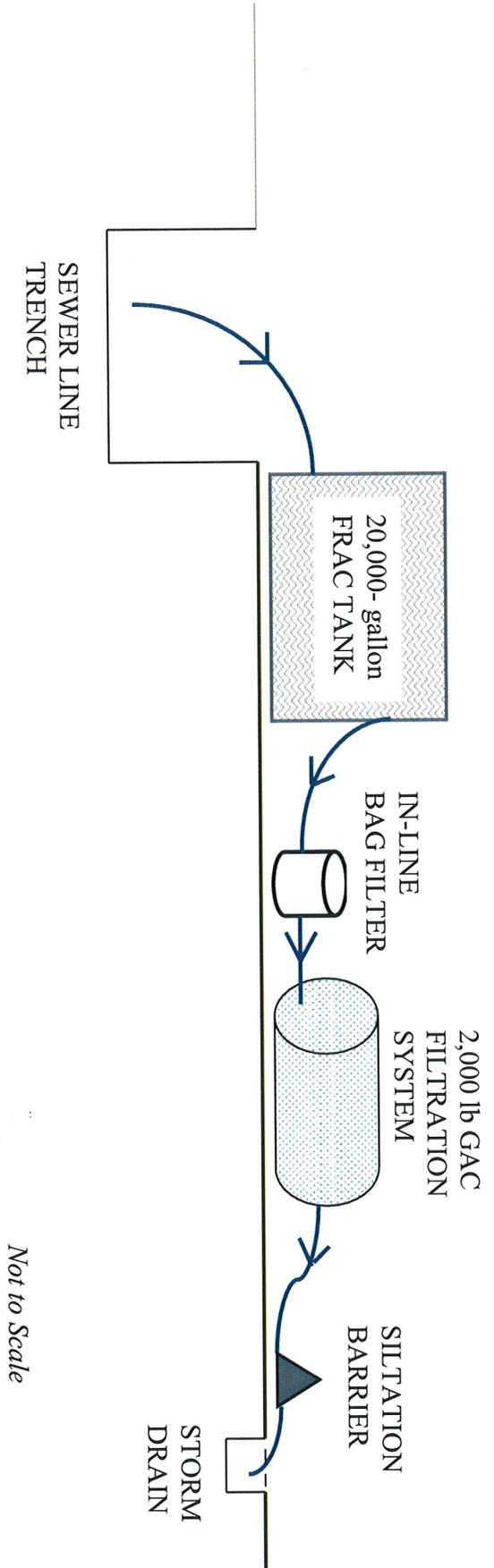
b) Provide the following information about each discharge:	1) Number of discharge points: 1	2) What is the maximum and average flow rate of discharge (in cubic feet per second, ft ³ /s)? Max. flow 0.1114 cfs Average flow 0.0668. Is maximum flow a design value? Y ___ N <input checked="" type="checkbox"/> X For average flow, include the units and appropriate notation if this value is a design value or estimate if not available.
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3) Latitude and longitude of each discharge within 100 feet: pt.1:long. 42.14E lat. 71.44N ; pt.2: long. _____ lat. _____ ; pt.3: long. _____ lat. _____ ; pt.4:long. _____ lat. _____ ; pt.5: long. _____ lat. _____ ; pt.6:long. _____ lat. _____ ; pt.7: long. _____ lat. _____ ; etc.

4) If hydrostatic testing, total volume of the discharge (gals): N/A	5) Is the discharge intermittent <input checked="" type="checkbox"/> or seasonal <input type="checkbox"/> ? Is discharge ongoing Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> ? Temporary system. 7 days maximum
c) Expected dates of discharge (mm/dd/yy): start <u>4/27/2009</u> end <u>5/4/2009</u>	
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).	

See Attached Figure 1 - Site Plan

Figure 2 – Temporary Groundwater Treatment System Schematic



3. Contaminant information. In order to complete this section, the applicant will need to take a minimum of one sample of the untreated water and have it analyzed for all of the parameters listed in Appendix III. Historical data, (i.e., data taken no more than 2 years prior to the effective date of the permit) may be used if obtained pursuant to: i. Massachusetts' regulations 310 CMR 40.0000, the Massachusetts Contingency Plan ("Chapter 21E"); ii. New Hampshire's Title 50 RSA 485-A: Water Pollution and Waste Disposal or Title 50 RSA 485-C: Groundwater Protection Act; or iii. an EPA permit exclusion letter issued pursuant to 40 CFR 122.3, provided the data was analyzed with test methods that meet the requirements of this permit. Otherwise, a new sample shall be taken and analyzed.

a) Based on the analysis of the sample(s) of the untreated influent, the applicant must check the box of the sub-categories that the potential discharge falls within.

Gasoline Only	VOC Only	Primarily Metals	Urban Fill Sites	Contaminated Sumps	Mixed Contaminants	Aquifer Testing
Fuel Oils (and X Other Oils) only	VOC with Other Contaminants	Petroleum with Other Contaminants	Listed Contaminated Sites	Contaminated Dredge Condensates	Hydrostatic Testing of Pipelines/Tanks	Well Development or Rehabilitation

b) Based on the analysis of the untreated influent, the applicant must indicate whether each listed chemical is **believed present** or **believed absent** in the potential discharge. Attach additional sheets as needed.

PARAMETER	Believe Absent	Believe Present	# of Samples (1 min-imum)	Type of Sample (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Avg. daily value	
							concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
1. Total Suspended Solids		X	1	grab	SM-2540D	2.0 mg/L	96 mg/L			
2. Total Residual Chlorine	X		1	grab	SM4500-CL G	0.1 mg/L	<0.1 mg/L			
3. Total Petroleum Hydrocarbons		X	2	grab	8015 /1664 SM4500 -CN,CE	588 ug/L (8015) 0.5 mg/L (1664)	671	335.5		
4. Cyanide		X	1	grab		0.01 mg/L	0.01 mg/L			
5. Benzene		X	2	grab	8260B	0.50 and 1.0	4.8	2.9		
6. Toluene		X	2	grab	8260B	0.75 and 1.0	1.5	1.25		
7. Ethylbenzene	X		2	grab	8260B	0.5 and 1.0	<1.0			
8. (m,p,o) Xylenes	X		2	grab	8260B	1.0	<1.0			
9. Total BTEX ⁴		X	2	grab	8260B	--	6.3	4.15		

⁴BTEX = Sum of Benzene, Toluene, Ethylbenzene, total Xylenes.

PARAMETER	Believe Absent	Believe Present	# of Samples (1 minimum)	Type of Sample (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Avg. daily value	
							concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
10. Ethylene Dibromide (1,2- Dibromo-methane)	X		1	grab	504.1	0.02	<0.02			
11. Methyl-tert-Butyl Ether (MTBE)	X		1	grab	8260B	2.0	<2.0			
12. tert-Butyl Alcohol (TBA)	X		1	grab	8260B	25.0	<25.0			
13. tert-Amyl Methyl Ether (TAME)	X		1	grab	8260B	5.0	<5.0			
14. Naphthalene	X		1	grab	8260B	1.0	<1.0			
15. Carbon Tetra-chloride	X		1	grab	8260B	1.0	<1.0			
16. 1,4 Dichlorobenzene	X		1	grab	8260B	1.0	<1.0			
17. 1,2 Dichlorobenzene	X		1	grab	8206B	1.0	<1.0			
18. 1,3 Dichlorobenzene	X		1	grab	8206B	1.0	<1.0			
19. 1,1 Dichloroethane	X		1	grab	8260B	1.0	<1.0			
20. 1,2 Dichloroethane	X		1	grab	8260B	1.0	<1.0			
21. 1,1 Dichloroethylene	X		1	grab	8260B	1.0	<1.0			
22. cis-1,2 Dichloro-ethylene	X		1	grab	8206B	1.0	<1.0			
23. Dichloromethane (Methylene Chloride)	X		1	grab	8260B	5.0	<5.0			
24. Tetrachloroethylene	X		1	grab	8260B	1.0	<1.0			

PARAMETER	Believe Absent	Believe Present	# of Samples (1 minimum)	Type of Sample (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method ug/L	Maximum daily value		Avg. daily Value	
							concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
25. 1,1,1 Trichloroethane	X		1	grab	8260B	1.0	<1.0			
26. 1,1,2 Trichloroethane	X		1	grab	8260B	1.0	<1.0			
27. Trichloroethylene	X		1	grab	8260B	1.0	<1.0			
28. Vinyl Chloride	X		1	grab	8260B	1.0	<1.0			
29. Acetone	X									
30. 1,4 Dioxane	X		1	grab	8260B	3.0	<3.0			
31. Total Phenols	X		1	grab	8270D	5.0	<5.0			
32. Pentachlorophenol	X		1	grab	8270D	5.0	<5.0			
33. Total Phthalates ⁵ (Phthalate esters)	X		1	grab	8270D	5.0	<5.0			
34. Bis (2-Ethylhexyl) Phthalate (Di-ethylhexyl) Phthalate]	X		1	grab	8270D	5.0	<5.0			
35. Total Group I Polycyclic Aromatic Hydrocarbons (PAH)	X		1	grab	8270D	--	--			
a. Benzo(a) Anthracene	X		1	grab	8270D	5.0	<5.0			
b. Benzo(a) Pyrene	X		1	grab	8270D	5.0	<5.0			
c. Benzo(b)Fluoranthene	X		1	grab	8270D	5.0	<5.0			
d. Benzo(k) Fluoranthene	X		1	grab	8270D	5.0	<5.0			
e. Chrysene	X		1	grab	8270D	5.0	<5.0			

⁵The sum of individual phthalate compounds.

PARAMETER	Believe Absent	Believe Present	# of Samples (1 minimum)	Type of Sample (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method ug/L	Maximum daily value		Average daily value	
							concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
f. Dibenzo(a,h)anthracene	X		1	grab	8270D	5.0	<5.0			
g. Indeno(1,2,3-cd)Pyrene	X		1	grab	8270D	5.0	<5.0			
36. Total Group II Polycyclic Aromatic Hydrocarbons (PAH)	X		1	grab	8270D	--	--			
h. Acenaphthene	X		1	grab	8270D	5.0	<5.0			
i. Acenaphthylene	X		1	grab	8270D	5.0	<5.0			
j. Anthracene	X		1	grab	8270D	5.0	<5.0			
k. Benzo(ghi) Perylene	X		1	grab	8270D	5.0	<5.0			
l. Fluoranthene	X		1	grab	8270D	5.0	<5.0			
m. Fluorene	X		1	grab	8270D	5.0	<5.0			
n. Naphthalene-	X		1	grab	8270D	5.0	<5.0			
o. Phenanthrene	X		1	grab	8270D	5.0	<5.0			
p. Pyrene	X		1	grab	8270D	5.0	<5.0			
37. Total Polychlorinated Biphenyls (PCBs)	X		1	grab	608	0.5	<0.5			
38. Antimony	X		1	grab	200.7	0.100 mg/L	<0.100 mg/L			
39. Arsenic	X		1	grab	200.7	0.050 mg/L	<0.050 mg/L			
40. Cadmium	X		1	grab	200.7	0.004 mg/L	<0.004 mg/L			
41. Chromium III	X		1	grab	200.7	0.005 mg/L	<0.005 mg/L			
42. Chromium VI	X		1	grab	SM3500-CRD	0.02 mg/L	<0.02 mg/L			

PARAMETER	Believe Absent	Believe Present	# of Samples (1 minimum)	Type of Sample (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method mg/L	Maximum daily value		Avg. daily value	
							concentration (µg/L)	mg/L	mass (kg)	concentration (ug/l)
43. Copper	X		1	grab	200.7	0.010	<0.010			
44. Lead	X		1	grab	200.7	0.040	<0.040			
45. Mercury	X		1	grab	245.1	0.0005	<0.0005			
46. Nickel	X		1	grab	200.7	0.010	<0.010			
47. Selenium	X		1	grab	200.7	0.050	<0.050			
48. Silver	X		1	grab	200.7	0.020	<0.020			
49. Zinc	X		1	grab	200.7	0.020	<0.020			
50. Iron		X	1	grab	200.7	0.100	0.588			
Other (describe):										

c) For discharges where **metals** are believed present, please fill out the following:

<p><i>Step 1:</i> Do any of the metals in the influent have a reasonable potential to exceed the effluent limits in Appendix III (i.e., the limits set at zero to five dilutions)? Y ___ N <u>X</u></p>	<p>If yes, which metals?</p>
<p><i>Step 2:</i> For any metals which have reasonable potential to 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? Metals: _____</p>	<p>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 "Yes," list which metals: _____</p>
<p>DF: _____</p>	

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:

Groundwater within the open sewer line trench will be extracted and stored in a 20,000 frac tank, where it will then be pumped through a bag filter prior to being pumped and treated through a 2,000 lb. carbon filtration system. A pumped rated at 50 gpm will be used to pump the contaminated groundwater through the temporary system.

b) Identify each applicable treatment unit (check all that apply):	Frac. tank	Air stripper	Oil/water separator	Equalization tanks	Bag filter	GAC filter
	X					X
	Chlorination	Dechlorination	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 30 gpm Maximum flow rate of treatment system 50 gpm Design flow rate of treatment system _____

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

NONE

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

a) Identify the discharge pathway:	Direct _____	Within facility _____	Storm drain <u>X</u>	River/brook _____	Wetlands _____	Other (describe): <u>X</u> Siltation Barrier
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b) Provide a narrative description of the discharge pathway, including the name(s) of the receiving waters:

Treated groundwater will be discharged directly onto the ground surface, where it will run off into a siltation barrier and discharge into the nearby storm drain that eventually discharges in the Charles River.

c) Attach a detailed map(s) indicating the site location and location of the outfall to the receiving water. See Figure 1. Site Plan

1. For multiple discharges, number the discharges sequentially.

2. For indirect discharges, 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 N/A (See Attachment A)cis
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? Yes No If yes, for which pollutant(s)?

Is there a TMDL? Yes No If yes, for which pollutant(s)?

6. Results of Consultation with Federal Services: Please provide the following information according to requirements of Part 1B.4 and Appendices II and VII.

a) Are any listed threatened or endangered species, or designated critical habitat, in proximity to the discharge? Yes No (See Notes in Section 7)
Has any consultation with the federal services been completed? YES No or is consultation underway? YES No
What were the results of the consultation with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service (check one):
a "no jeopardy" opinion? or written concurrence on a finding that the discharges are not likely to adversely affect any endangered species or critical habitat?

b) Are any historic properties listed or eligible for listing on the National Register of Historic Places located on the facility or site or in proximity to the discharge?
Yes No Have any state or tribal historic preservation officer been consulted in this determination (Massachusetts only)? Yes No

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.

In regards to Section 6, GEOSPHERE has reviewed Appendix VII Section I, and determined the Site meets the requirements of Criteria D. After an evaluation of available data, the effect of the Site's discharges and discharge related activities does not adversely affect any listed species or critical habitat.

See Attached Figure 1 -Site Plan, for the proposed temporary discharge location.

See Attachment A for for the Charles River (receiving waters) available Streamflow Statistics.

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: Sewer line replacement project, Town of Medway, Massachusetts

Operator signature:

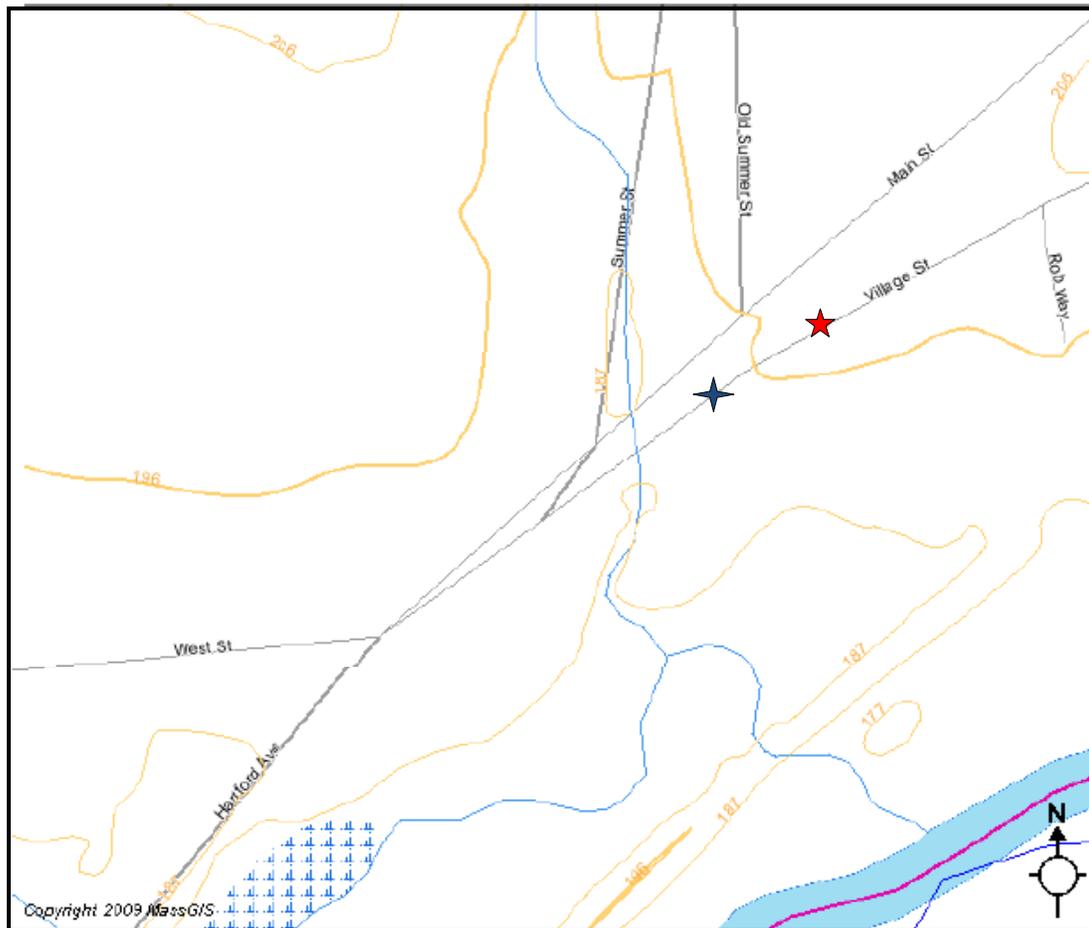


Title: Director of Environmental Compliance,
Geosphere Environmental Management, Inc.

Date: April 27, 2009

FIGURE 1 – SITE PLAN

Medway, Massachusetts



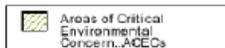
Source: MassGIS (www.mass.gov/mgis). Maps and photos are for planning purposes only.

WARNING: This map does not meet national map accuracy standards, and cannot be used for engineering purposes. Please consult conditions of use at <http://www.state.ma.us/mgis/>

★ Temporary Groundwater Treatment Location

★ Treated Groundwater Discharge Location

Areas of Critical Environmental Concern ACECs



Zone IIs



Contours 3m Lines



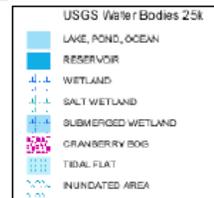
Contours 3m Labels Feet



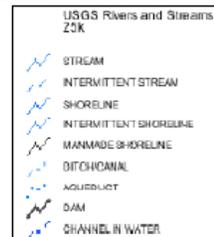
Census 2000 Roads



USGS Water Bodies 25k



USGS Rivers and Streams 25k



Aquifers by Yield Green Shades





StreamStats Data-Collection Station Report

USGS Station Number 01103280
Station Name CHARLES RIVER AT MEDWAY, MA

[Click here to link to available data on NWIS-Web for this site.](#)

Descriptive Information

Station Type	Gaging Station, continuous record
Regulated?	Undefined
Period of Record	
Remarks	
Latitude (degrees NAD83)	42.1398197
Longitude (degrees NAD83)	-71.389503
Hydrologic unit code	01090001
Local Basin	-
County	021-Norfolk
MCD	-
Directions to station	

Physical Characteristics

Characteristic Name	Value	Units	Citation Number
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Streamflow Statistics

Statistic Name	Value	Units	Citation Number
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Flow-Duration Statistics

1_Percent_Duration	693.07	cubic feet per second	41
10_Percent_Duration	277.6	cubic feet per second	41
20_Percent_Duration	180	cubic feet per second	41
25_Percent_Duration	149	cubic feet per second	41
30_Percent_Duration	122.8	cubic feet per second	41
40_Percent_Duration	87.9	cubic feet per second	41
5_Percent_Duration	381.05	cubic feet per second	41
50_Percent_Duration	64	cubic feet per second	41
60_Percent_Duration	48.1	cubic feet per second	41
70_Percent_Duration	36	cubic feet per second	41
75_Percent_Duration	28	cubic feet per second	41
80_Percent_Duration	20	cubic feet per second	41
90_Percent_Duration	13	cubic feet per second	41
95_Percent_Duration	9.295	cubic feet per second	41
99_Percent_Duration	4	cubic feet per second	41
General Flow Statistics			
Average_daily_streamflow	115.029	cubic feet per second	41
Maximum_daily_flow	1410	cubic feet per second	41
Minimum_daily_flow	2.1	cubic feet per second	41
Std_Dev_of_daily_flows	141.287	cubic feet per second	41
Base Flow Statistics			
Average_BFI_value	0.496	dimensionless	42
Number_of_years_to_compute_BFI	5	years	42
Std_dev_of_annual_BFI_values	0.023	dimensionless	42

Citations

Citation Number	Citation Name and URL
41	Wolock, D.M., 2003, Flow characteristics at U.S. Geological Survey streamgages in the conterminous United States: U.S. Geological Survey Open-File Report 03-146, digital data set, available on World Wide Web at URL http://water.usgs.gov/lookup/getspatial?qsitesdd
42	Wolock, D.M., 2003, Base-flow index grid for the conterminous United States: U.S. Geological Survey Open-File Report 03-263, digital data set, available on World Wide Web at URL http://water.usgs.gov/lookup/getspatial?bfi48grd



CERTIFICATE OF ANALYSIS

Geosphere Environmental Mgt.
Attn: Mr. David Niemeyer
51 Portsmouth Avenue
Exeter, NH 03833

Date Received: 4/22/2009
Date Reported: 4/24/2009
P.O. #:
Work Order #: 0904-06769

DESCRIPTION: PROJECT# 09208 MEDWAY RGP

Subject sample(s) has/have been analyzed by our Warwick, R.I. laboratory with the attached results.

Reference: All parameters were analyzed by 40 CFR, 136 / U.S. EPA approved methodologies and all NELAC requirements were met. The specific methodologies are listed in the methods column of the Certificate of Analysis.

Data qualifiers (if present) are explained in full at the end of a given sample's analytical results.

(~) Indicates NELAP certification for this analyte.

Certification #: RI-033, MA-RI015, CT-PH-0508, ME-RI015
NH-253700 A & B, USDA S-41844, NY-11726

If you have any questions regarding this work, or if we may be of further assistance, please contact our customer service department.

Approved by:

Sharon Baker
Data Reporting

enc: Chain of Custody

R.I. Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

Geosphere Environmental Mgt.
Date Received: 4/22/2009
Work Order #: 0904-06769

Approved by: 

Data Reporting

Sample # 001

SAMPLE DESCRIPTION: STA 43-GW

SAMPLE TYPE: GRAB

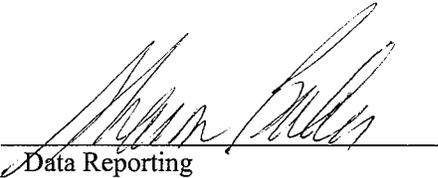
SAMPLE DATE/TIME: 4/22/2009 @ 10:00

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
Temperature upon receipt	11		degrees C	EPA 170.1	4/22/2009 10:35	SSS
Total Suspended Solids	96	2.0	mg/l	SM-2540D	4/23/2009 10:54	ALC
Total Residual Chlorine	<0.1	0.1	mg/l	SM 4500CL G	4/22/2009 21:30	CAA
Total Cyanide	0.01	0.01	mg/l	SM-4500CN-C E	4/23/2009 20:16	ML
Hexavalent Chromium	<0.02	0.02	mg/l	SM3500-CR D	4/22/2009 22:00	CAA
Trivalent Chromium	<0.02	0.02	mg/l	CALCULATION	4/24/2009 8:32	BMM
TPH	1.7	0.5	mg/l	EPA 1664	4/24/2009 7:20	TV
PCB						
Aroclor-1016	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1221	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1232	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1242	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1248	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1254	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Aroclor-1260	<0.5	0.5	ug/l	EPA 608	4/23/2009 12:34	RGM
Surrogate			RANGE		4/23/2009 12:34	RGM
Tetrachloro-m-xylene(TCMX)	110		30-150%	EPA 608	4/23/2009 12:34	RGM
Decachlorobiphenyl	91		30-150%	EPA 608	4/23/2009 12:34	RGM
Extraction date	Extracted			SW846 3510	4/23/2009 12:22	CEC
Semi-Volatile Organic Compounds						
Acenaphthene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Acenaphthylene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Anthracene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzidine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzo(a)anthracene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzo(b)fluoranthene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzo(k)fluoranthene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzo(g,h,i)perylene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Benzo(a)pyrene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Bis(2-chloroethyl)ether	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Bis(2-Chloroethoxy)methane	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Bis(2-Chloroisopropyl)Ether	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Bis(2-ethylhexyl)phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
4-Bromophenyl phenyl ether	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Butylbenzyl phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Chloronaphthalene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
4-Chlorophenyl phenyl ether	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Chrysene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Dibenzo(a,h)anthracene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Di-n-butyl phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC

R.I. Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

Geosphere Environmental Mgt.
Date Received: 4/22/2009
Work Order #: 0904-06769

Approved by: 

Data Reporting

Sample # 001

SAMPLE DESCRIPTION: STA 43-GW

SAMPLE TYPE: GRAB

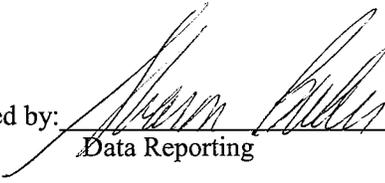
SAMPLE DATE/TIME: 4/22/2009 @ 10:00

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
1,2-Dichlorobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
1,3-Dichlorobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
1,4-Dichlorobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
3,3'-Dichlorobenzidine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Diethyl phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Dimethyl phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4-Dinitrotoluene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,6-Dinitrotoluene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Di-n-octyl phthalate	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
1,2-Diphenylhydrazine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Fluoranthene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Fluorene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Hexachlorobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Hexachlorobutadiene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Hexachlorocyclopentadiene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Hexachloroethane	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Indeno(1,2,3-cd)pyrene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Isophorone	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Naphthalene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Nitrobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
N-nitrosodimethylamine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
N-nitrosodiphenylamine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
N-nitrosodi-n-propylamine	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Phenanthrene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Pyrene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
1,2,4-Trichlorobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
4-Chloro-3-methylphenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Chlorophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4-Dichlorophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4-Dimethylphenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Methyl-4,6-dinitrophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4-Dinitrophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Nitrophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
4-Nitrophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Pentachlorophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Phenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4,5-Trichlorophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2,4,6-Trichlorophenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Methylnaphthalene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
2-Methylphenol	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
3 & 4-Methylphenols	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC

R.I. Analytical Laboratories, Inc.

CERTIFICATE OF ANALYSIS

Geosphere Environmental Mgt.
Date Received: 4/22/2009
Work Order #: 0904-06769

Approved by: 

Data Reporting

Sample # 001

SAMPLE DESCRIPTION: STA 43-GW

SAMPLE TYPE: GRAB

SAMPLE DATE/TIME: 4/22/2009 @ 10:00

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
Acetophenone	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Aniline	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Azobenzene	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
4-Chloroaniline	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Dibenzofuran	<5	5	ug/l	SW-846 8270D	4/23/2009 15:24	MLC
Surrogates			RANGE	SW-846 8270D	4/23/2009 15:24	MLC
Phenol-d5	21		15-110%	SW-846 8270D	4/23/2009 15:24	MLC
2-Fluorophenol	22		15-110%	SW-846 8270D	4/23/2009 15:24	MLC
2,4,6-Tribromophenol	59		15-110%	SW-846 8270D	4/23/2009 15:24	MLC
Nitrobenzene-d5	56		30-130%	SW-846 8270D	4/23/2009 15:24	MLC
2-Fluorobiphenyl	74		30-130%	SW-846 8270D	4/23/2009 15:24	MLC
P-Terphenyl-d14	54		30-130%	SW-846 8270D	4/23/2009 15:24	MLC
Total Metals						
Antimony	<0.100	0.100	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Arsenic	<0.050	0.050	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Cadmium	<0.004	0.004	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Chromium	<0.005	0.005	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Copper	<0.010	0.010	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Iron	0.588	0.100	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Lead	<0.040	0.040	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Mercury	<0.0005	0.0005	mg/l	EPA 245.1	4/24/2009 14:34	MAZ
Nickel	<0.010	0.010	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Selenium	<0.050	0.050	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Silver	<0.020	0.020	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Zinc	<0.020	0.020	mg/l	EPA 200.7	4/23/2009 20:04	VMY
Volatile Organic Compounds						
Benzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Bromobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Bromochloromethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Bromodichloromethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Bromoform	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Bromomethane	<7	7	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
n-Butylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Sec-butylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
tert-Butylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Carbon Tetrachloride	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Chlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Chloroethane	<5	5	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Chloroform	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Chloromethane	<5	5	ug/l	SW-846 8260B	4/23/2009 13:04	MMM

R.I. Analytical Laboratories, Inc.

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Geosphere Environmental Mgt.
Date Received: 4/22/2009
Work Order #: 0904-06769

Approved by: 

Data Reporting

Sample # 001

SAMPLE DESCRIPTION: STA 43-GW

SAMPLE TYPE: GRAB

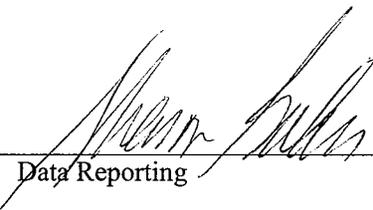
SAMPLE DATE/TIME: 4/22/2009 @ 10:00

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
2-Chlorotoluene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
4-Chlorotoluene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Dibromochloromethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2-Dibromo-3-Chloropropane	<2	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Dibromomethane	<2	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2-Dichlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,3-Dichlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,4-Dichlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Dichlorodifluoromethane	<5	5	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1-Dichloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2-Dichloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1-Dichloroethene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
cis-1,2-Dichloroethene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
trans-1,2-Dichloroethylene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2-Dichloropropane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,3-Dichloropropane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
2,2-Dichloropropane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1-Dichloropropene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,3-Dichloropropene (total)	<1	1	ug/l	SW-846 8260B	4/23/2009 16:37	MMM
Ethylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Hexachlorobutadiene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Isopropylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
p-Isopropyltoluene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Methylene Chloride	<5	5	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Naphthalene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
n-Propylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Styrene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1,1,2-Tetrachloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1,1,2,2-Tetrachloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Tetrachloroethene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Toluene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2,3-Trichlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2,4-Trichlorobenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1,1-Trichloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,1,2-Trichloroethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Trichloroethene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Trichlorofluoromethane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2,3-Trichloropropane	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,2,4-Trimethylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
1,3,5-Trimethylbenzene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Vinyl Chloride	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM

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CERTIFICATE OF ANALYSIS

Geosphere Environmental Mgt.
Date Received: 4/22/2009
Work Order #: 0904-06769

Approved by: 

Data Reporting

Sample # 001

SAMPLE DESCRIPTION: STA 43-GW

SAMPLE TYPE: GRAB

SAMPLE DATE/TIME: 4/22/2009 @ 10:00

PARAMETER	SAMPLE RESULTS	DET. LIMIT	UNITS	METHOD	DATE/TIME ANALYZED	ANALYST
o-Xylene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
m,p-Xylene	<1	1	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Methyl Tertiary Butyl Ether (MTBE)	<2	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Ethyl Tertiary Butyl Ether	<5	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Diisopropyl Ether (DIPE)	<5	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Tertiary Amyl Methyl Ether	<5	2	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Tertiary Butanol (TBA)	<25	25	ug/l	SW-846 8260B	4/23/2009 13:04	MMM
Surrogates			RANGE	SW-846 8260B	4/23/2009 13:04	MMM
Dibromofluoromethane	96		86-118%	SW-846 8260B	4/23/2009 13:04	MMM
Toluene-d8	96		88-110%	SW-846 8260B	4/23/2009 13:04	MMM
4-Bromofluorobenzene	93		86-115%	SW-846 8260B	4/23/2009 13:04	MMM
1,2 Dichloroethane-d4	95		80-120%	SW-846 8260B	4/23/2009 13:04	MMM
Volatile Organic Compounds						
1,4-Dioxane	<3	3	ug/l	SW-846 8260B	4/24/2009 16:13	MMM
Surrogates			RANGE	SW-846 8260B	4/24/2009 16:13	MMM
1,4- Dioxane-d8	87		70-130%	SW-846 8260B	4/24/2009 16:13	MMM
Organic Compounds						
1,2-Dibromoethane (EDB)	<0.02	0.02	ug/l	EPA 504.1	4/23/2009 18:18	RGM
1,2-Dibromo-3-chloropropane (DBCP)	<0.02	0.02	ug/l	EPA 504.1	4/23/2009 18:18	RGM

CHAIN OF CUSTODY RECORD

R.I. Analytical Laboratories, Inc.

41 Illinois Avenue
Warwick, RI 02888
Tel: 800-937-2580
Fax: 401-738-1970

131 Coolidge St, Bldg. 2
Hudson, MA 01749
Tel: 888-228-3334
Fax: 978-568-0078

Date Collected	Time Collected	Field Sample Identification	Grab or Composite	# of Containers & Type ¹	Preservation Code ²	Matrix Code ³	TSS (160.2)	TRC (330.5)	TPH (1664)	CN (335.2)	(5260) VOCs + organics, diskane, EDB, SVOCs (8270)	PCBs (608)	Trace Metals (See List)	Hex Chromium (Table 1)
4/22/09	10:00 AM	STA 43-6W	G	2 AG NP	GW							X		
				2 AG NP							X			
				2 AG S										
				1 P NP			X						X	
				1 P SH				X						
				1 P N									X	
				4 V H										

Client Information

Company Name: **GEOSPHERE** Project Name: **Medway RGP**

Address: **51 Portsmouth Ave** P.O. Number: **09208**

City / State / Zip: **Exeter, NH 03833** Report To: _____ Phone: _____

Telephone: **603-773-0075 x12** Fax: **603-773-0077** Sampled by: **Abigail Thompson**

Contact Person: **DAVID NIEMEYER** Quote No: **600081034** Email address: **dn.niemeyer@geosphere.com**

Relinquished By	Date	Time	Received By	Date	Time
<i>[Signature]</i>	4/22/09	10:55	<i>[Signature]</i>	4/22/09	10:55
<i>[Signature]</i>	4/22/09	16:30	<i>[Signature]</i>	4-22-09	16:30
<i>[Signature]</i>	4-22-09	17:45	<i>[Signature]</i>	4/22/09	17:45

Project Comments

Circle if applicable: GW-1, GW-2, GW-3, S-1, S-2, S-3 MCP Data Enhancement QC Package? Yes (No)

Metals: Antimony, Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Silver, Zinc, Iron

SVOCs: include Total Pesticides, Pentachlorophenol, Total Phthalates, Bis(2-Hydroxyethyl) Anthracene 100

Container Types: P=Poly, G=Glass, AG=Amber Glass, V=Vial, SI=Sterile
Matrix Codes: GW=Groundwater, SW=Surface Water, WW=Wastewater, DW=Drinking Water, S=Soil, SI=Sludge, A=Air, B=Bulk/Solid, O=

Preservation Codes: NP=None, N=HNO₃, H=HCl, S=H₂SO₄, SH=NaOH, SB=NaHSO₄, M=MeOH, T=Na₂S₂O₃, Z=ZnOAc, I=Ice