REVISED REMEDIATION GENERAL PERMIT NOTICE OF INTENT

APRIL 2018

2018 Water Main Improvements
Wayland, Massachusetts

TATA & HOWARD

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Letter of Transmittal

LIST OF APPENDICES

Section 1

TATA & HOWARD

II. Suggested Format for the Remediation General Permit Notice of Intent (NOI)

A. General site information:

<table>
<tr><td rowspan="2">1. Name of site:
Wayland 2018 Water Main Improvements</td><td colspan="3">Site address:
Street: Boston Post Road, Wayland, MA (Discharge at 326 Boston Post Road)</td></tr>
<tr><td>City: Wayland</td><td>State: MA</td><td>Zip: 01778</td></tr>
<tr><td rowspan="4">2. Site owner
Town of Wayland

Owner is (check one): ☐ Federal ☐ State/Tribal ☐ Private
■ Other; if so, specify: Town/Municipal</td><td colspan="3">Contact Person: Thomas Holder</td></tr>
<tr><td colspan="2">Telephone: 508-358-3678</td><td>Email: tholder@wayland.ma.us</td></tr>
<tr><td colspan="3">Mailing address:
Street: 66 River Road</td></tr>
<tr><td>City: Wayland</td><td>State: MA</td><td>Zip: 01778</td></tr>
<tr><td rowspan="4">3. Site operator, if different than owner</td><td colspan="3">Contact Person:</td></tr>
<tr><td colspan="2">Telephone:</td><td>Email:</td></tr>
<tr><td colspan="3">Mailing address:
Street:</td></tr>
<tr><td>City:</td><td>State:</td><td>Zip:</td></tr>
<tr><td>4. NPDES permit number assigned by EPA:
N/A

NPDES permit is (check all that apply: ■ RGP ☐ DGP ☐ CGP
☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:</td><td colspan="3">5. Other regulatory program(s) that apply to the site (check all that apply):
■ MA Chapter 21e; list RTN(s):
3-3325, 3-22753, 3-30287
☐ NH Groundwater Management Permit or Groundwater Release Detection Permit:
☐ CERCLA
☐ UIC Program
☐ POTW Pretreatment
☐ CWA Section 404</td></tr>
</table>

B. Receiving water information:

1. Name of receiving water(s):	Waterbody identification of receiving water(s):	Classification of receiving water(s):
Pine Brook	MA82A-14	B

Receiving water is (check any that apply): ☐ Outstanding Resource Water ☐ Ocean Sanctuary ☐ territorial sea ☐ Wild and Scenic River

2. Has the operator attached a location map in accordance with the instructions in B, above? (check one): ■ Yes ☐ No

Are sensitive receptors present near the site? (check one): ☐ Yes ■ No
If yes, specify:

3. Indicate if the receiving water(s) is listed in the State's Integrated List of Waters (i.e., CWA Section 303(d)). Include which designated uses are impaired, and any pollutants indicated. Also, indicate if a final TMDL is available for any of the indicated pollutants. For more information, contact the appropriate State as noted in Part 4.6 of the RGP. Pine Brook is not listed in the State's Integrated List of Waters.

4. Indicate the seven day-ten-year low flow (7Q10) of the receiving water determined in accordance with the instructions in Appendix V for sites located in Massachusetts and Appendix VI for sites located in New Hampshire.	0 Per MassDEP
5. Indicate the requested dilution factor for the calculation of water quality-based effluent limitations (WQBELs) determined in accordance with the instructions in Appendix V for sites in Massachusetts and Appendix VI for sites in New Hampshire.	1.0 Per MassDEP

6. Has the operator received confirmation from the appropriate State for the 7Q10and dilution factor indicated? (check one): ■ Yes ☐ No
If yes, indicate date confirmation received: 3/6/2018

7. Has the operator attached a summary of receiving water sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ■ Yes ☐ No

C. Source water information:

1. Source water(s) is (check any that apply):

■ Contaminated groundwater Has the operator attached a summary of influent sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ■ Yes ☐ No	☐ Contaminated surface water Has the operator attached a summary of influent sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ☐ Yes ☐ No	☐ The receiving water ☐ A surface water other than the receiving water; if so, indicate waterbody:	☐ Potable water; if so, indicate municipality or origin: ☐ Other; if so, specify:

2. Source water contaminants: Halogenated VOCs, TPHs, MTBE, 2-Methylnaphthalene	
a. For source waters that are contaminated groundwater or contaminated surface water, indicate are any contaminants present that are not included in the RGP? (check one): ☐ Yes ■ No If yes, indicate the contaminant(s) and the maximum concentration present in accordance with the instructions in Appendix VIII.	b. For a source water that is a surface water other than the receiving water, potable water or other, indicate any contaminants present at the maximum concentration in accordance with the instructions in Appendix VIII? (check one): ☐ Yes ☐ No
3. Has the source water been previously chlorinated or otherwise contains residual chlorine? (check one): ☐ Yes ■ No	

D. Discharge information

1.The discharge(s) is a(n) (check any that apply): ☐ Existing discharge ■ New discharge ☐ New source	
Outfall(s): Treated groundwater will be discharged directly to Pine Brook on the south side of Boston Post Road (Route 20) in Wayland, MA through a hose and diffusing device.	Outfall location(s): (Latitude, Longitude) 42.363072, 71.365524
Discharges enter the receiving water(s) via (check any that apply): ■ Direct discharge to the receiving water ☐ Indirect discharge, if so, specify: ☐ A private storm sewer system ☐ A municipal storm sewer system If the discharge enters the receiving water via a private or municipal storm sewer system: Has notification been provided to the owner of this system? (check one): ☐ Yes ☐ No Has the operator has received permission from the owner to use such system for discharges? (check one): ☐ Yes ☐ No, if so, explain, with an estimated timeframe for obtaining permission: Has the operator attached a summary of any additional requirements the owner of this system has specified? (check one): ☐ Yes ☐ No	
Provide the expected start and end dates of discharge(s) (month/year): August 2018-October 2018 Indicate if the discharge is expected to occur over a duration of: ■ less than 12 months ☐ 12 months or more ☐ is an emergency discharge	
Has the operator attached a site plan in accordance with the instructions in D, above? (check one): ■ Yes ☐ No	

<table>
<tr><td>2. Activity Category: (check all that apply)</td><td colspan="2">3. Contamination Type Category: (check all that apply)</td></tr>
<tr><td rowspan="4">☐ I – Petroleum-Related Site Remediation
☐ II – Non-Petroleum-Related Site Remediation
■ III – Contaminated Site Dewatering
☐ IV – Dewatering of Pipelines and Tanks
☐ V – Aquifer Pump Testing
☐ VI – Well Development/Rehabilitation
☐ VII – Collection Structure Dewatering/Remediation
☐ VIII – Dredge-Related Dewatering</td><td colspan="2">a. If Activity Category I or II: (check all that apply)

☐ A. Inorganics
☐ B. Non-Halogenated Volatile Organic Compounds
☐ C. Halogenated Volatile Organic Compounds
☐ D. Non-Halogenated Semi-Volatile Organic Compounds
☐ E. Halogenated Semi-Volatile Organic Compounds
☐ F. Fuels Parameters</td></tr>
<tr><td colspan="2">b. If Activity Category III, IV, V, VI, VII or VIII: (check either G or H)</td></tr>
<tr><td>■ G. Sites with Known Contamination</td><td>☐ H. Sites with Unknown Contamination</td></tr>
<tr><td>c. If Category III-G, IV-G, V-G, VI-G, VII-G or VIII-G: (check all that apply)

■ A. Inorganics
■ B. Non-Halogenated Volatile Organic Compounds
■ C. Halogenated Volatile Organic Compounds
■ D. Non-Halogenated Semi-Volatile Organic Compounds
☐ E. Halogenated Semi-Volatile Organic Compounds
■ F. Fuels Parameters</td><td>d. If Category III-H, IV-H, V-H, VI-H, VII-H or VIII-H Contamination Type Categories A through F apply</td></tr>
</table>

4. Influent and Effluent Characteristics

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
A. Inorganics									
Ammonia		✔	3	350.1	0.10 mg/L	2.18 mg/L	0.883 mg/L	Report mg/L	---
Chloride		✔	3	300.0	50000	338000	238000	Report µg/l	---
Total Residual Chlorine	✔		3	4500Cl D	0.02 mg/L	ND	0	0.2 mg/L	0.011 mg/L
Total Suspended Solids		✔	3	2540D	5 mg/L	801 mg/L	275 mg/L	30 mg/L	---
Antimony	✔		3	200.7	10	ND	0	206 µg/L	640
Arsenic		✔	3	3113B	1.0	13.4	7.23	104 µg/L	10
Cadmium		✔	3	3113B	0.05	0.15	0.05	10.2 µg/L	0.5272
Chromium III	✔		3	200.7	10	ND	0	323 µg/L	180.1
Chromium VI	✔		3	200.7	10	ND	0	323 µg/L	11.4
Copper		✔	3	200.7	2.0	7.6	2.53	242 µg/L	20.1
Iron		✔	3	3500Cr	20.0	39100	14694	5,000 µg/L	1000
Lead		✔	3	3113B	0.5	0.8	0.26	160 µg/L	10.01
Mercury	✔		3	245.1	0.2	ND	0	0.739 µg/L	0.91
Nickel	✔		3	200.7	10	ND	0	1,450 µg/L	111.7
Selenium	✔		3	3113B	2	ND	0	235.8 µg/L	5
Silver		✔	3	200.7	1	1.9	0.63	35.1 µg/L	17.8
Zinc		✔	3	200.7	10	401	146.23	420 µg/L	256.9
Cyanide	✔		3	4500CN	0.005 mg/L	ND	0	178 mg/L	5.2
B. Non-Halogenated VOCs									
Total BTEX		✔	2	524.2	Varies	2177.8	1094.7	100 µg/L	---
Benzene		✔	2	524.2	0.5	14	7	5.0 µg/L	---
1,4 Dioxane	✔		2	8270D	0.25	ND	0	200 µg/L	---
Acetone	✔		2	524.2	0.005 mg/L	ND	0	7.97 mg/L	---
Phenol	✔		2	420.1	100	ND	0	1,080 µg/L	300

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
C. Halogenated VOCs									
Carbon Tetrachloride	✔		3	524.2	0.3	ND	0	4.4 µg/L	1.6
1,2 Dichlorobenzene	✔		3	524.2	0.5	ND	0	600 µg/L	---
1,3 Dichlorobenzene	✔		3	524.2	0.5	ND	0	320 µg/L	---
1,4 Dichlorobenzene	✔		3	524.2	0.5	ND	0	5.0 µg/L	---
Total dichlorobenzene	✔		3	524.2	0.5	ND	0	763 µg/L in NH	---
1,1 Dichloroethane	✔		3	524.2	0.5	ND	0	70 µg/L	---
1,2 Dichloroethane	✔		3	524.2	0.5	ND	0	5.0 µg/L	---
1,1 Dichloroethylene	✔		3	524.2	0.5	ND	0	3.2 µg/L	---
Ethylene Dibromide	✔		1	504.1	0.015	ND	0	0.05 µg/L	---
Methylene Chloride	✔		3	524.2	0.5	ND	0	4.6 µg/L	---
1,1,1 Trichloroethane	✔		3	524.2	0.5	ND	0	200 µg/L	---
1,1,2 Trichloroethane	✔		3	524.2	0.5	ND	0	5.0 µg/L	---
Trichloroethylene		✔	3	8260B	0.5	41.8	14.5	5.0 µg/L	---
Tetrachloroethylene		✔	3	8260B	0.5	276	110	5.0 µg/L	3.3
cis-1,2 Dichloroethylene		✔	3	8260B	0.5	142	48	70 µg/L	---
Vinyl Chloride		✔	3	8260B	0.2	39.5	13.1	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates		✔	2	625 SIM	Varies	5.8	2.9	190 µg/L	
Diethylhexyl phthalate	✔		2	625 SIM	2.06	ND	0	101 µg/L	2.2
Total Group I PAHs		✔	2	625 SIM	Varies	6.28	3.14	1.0 µg/L	---
Benzo(a)anthracene	✔		2	625 SIM	0.06	ND	0	As Total PAHs	0.0038
Benzo(a)pyrene	✔		2	625 SIM	0.06	ND	0		0.0038
Benzo(b)fluoranthene	✔		2	625 SIM	0.06	ND	0		0.0038
Benzo(k)fluoranthene	✔		2	625 SIM	0.06	ND	0		0.0038
Chrysene	✔		2	625 SIM	0.06	ND	0		0.0038
Dibenzo(a,h)anthracene	✔		2	625 SIM	0.06	ND	0		0.0038
Indeno(1,2,3-cd)pyrene	✔		2	625 SIM	0.06	ND	0		0.0038

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
Total Group II PAHs		✔	2	625 SIM	Varies	120	60	100 µg/L	---
Naphthalene		✔	2	625 SIM	2.5	120	60	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs								0.000064 µg/L	---
Pentachlorophenol								1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons	✔		2	1664A	5 mg/L	ND	0	5.0 mg/L	---
Ethanol	✔		1	D3695	10 mg/L	ND	0	Report mg/L	---
Methyl-tert-Butyl Ether		✔	2	524.2	0.5	4.4	2.5	70 µg/L	20
tert-Butyl Alcohol	✔		2	524.2	25	ND	0	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether	✔		1	524.2	1	ND	0	90 µg/L in MA 140 µg/L in NH	---
Other (i.e., pH, temperature, hardness, salinity, LC_{50}, additional pollutants present); if so, specify:									
pH		✔	3	EC500		7.33 pH units	7.32		
Temperature		✔	3	EC500		55.2 °F	52.3		
Hardness		✔	3	200.7	165	246000	213000		
2-Methylnaphthalene		✔	4	EPH8270	4.7	20.8	5.2		
trans-1,2-dichloroethylene		✔	3	8260B	1	4	1.33		

E. Treatment system information

1. Indicate the type(s) of treatment that will be applied to effluent prior to discharge: (check all that apply)

☐ Adsorption/Absorption ☐ Advanced Oxidation Processes ☐ Air Stripping ■ Granulated Activated Carbon ("GAC")/Liquid Phase Carbon Adsorption
☐ Ion Exchange ☐ Precipitation/Coagulation/Flocculation ■ Separation/Filtration ☐ Other; if so, specify:

2. Provide a written description of all treatment system(s) or processes that will be applied to the effluent prior to discharge.
18,000 gallon weir style frac tank, bag filters, and granulated activated carbon pressure filters in series.

Identify each major treatment component (check any that apply):
■ Fractionation tanks☐ Equalization tank ☐ Oil/water separator ☐ Mechanical filter ■ Media filter
☐ Chemical feed tank ☐ Air stripping unit ■ Bag filter ☐ Other; if so, specify:

Indicate if either of the following will occur (check any that apply):
☐ Chlorination ☐ De-chlorination

3. Provide the **design flow capacity** in gallons per minute (gpm) of the most limiting component. Indicate the most limiting component: GAC/Bag Filters Is use of a flow meter feasible? (check one): ■ Yes ☐ No, if so, provide justification:	100GPM
Provide the proposed maximum effluent flow in gpm.	100 GPM
Provide the average effluent flow in gpm.	25 GPM
If Activity Category IV applies, indicate the estimated total volume of water that will be discharged:	

4. Has the operator attached a schematic of flow in accordance with the instructions in E, above? (check one): ■ Yes ☐ No

F. Chemical and additive information

1. Indicate the type(s) of chemical or additive that will be applied to effluent prior to discharge or that may otherwise be present in the discharge(s): (check all that apply)

☐ Algaecides/biocides ☐ Antifoams ☐ Coagulants ☐ Corrosion/scale inhibitors ☐ Disinfectants ☐ Flocculants ☐ Neutralizing agents ☐ Oxidants ☐ Oxygen ☐ scavengers ☐ pH conditioners ☐ Bioremedial agents, including microbes ☐ Chlorine or chemicals containing chlorine ☐ Other; if so, specify:

2. Provide the following information for each chemical/additive, using attachments, if necessary:

N/A

a. Product name, chemical formula, and manufacturer of the chemical/additive;
b. Purpose or use of the chemical/additive or remedial agent;
c. Material Safety Data Sheet (MSDS) and Chemical Abstracts Service (CAS) Registry number for each chemical/additive;
d. The frequency (hourly, daily, etc.), duration (hours, days), quantity (maximum and average), and method of application for the chemical/additive;
e. Any material compatibility risks for storage and/or use including the control measures used to minimize such risks; and
f. If available, the vendor's reported aquatic toxicity (NOAEL and/or LC50 in percent for aquatic organism(s)).

3. Has the operator attached an explanation which demonstrates that the addition of such chemicals/additives may be authorized under this general permit in accordance with the instructions in F, above? (check one): ☐ Yes ☐ No; if no, has the operator attached data that demonstrates each of the 126 priority pollutants in CWA Section 307(a) and 40 CFR Part 423.15(j)(1) are non-detect in discharges with the addition of the proposed chemical/additive? (check one): ☐ Yes ☐ No

G. Endangered Species Act eligibility determination

1. Indicate under which criterion the discharge(s) is eligible for coverage under this general permit:

☐ **FWS Criterion A**: No endangered or threatened species or critical habitat are in proximity to the discharges or related activities or come in contact with the "action area".

■ **FWS Criterion B**: Formal or informal consultation with the FWS under section 7 of the ESA resulted in either a no jeopardy opinion (formal consultation) or a written concurrence by FWS on a finding that the discharges and related activities are "not likely to adversely affect" listed species or critical habitat (informal consultation). Has the operator completed consultation with FWS? (check one): ■ Yes ☐ No; if no, is consultation underway? (check one): ☐ Yes ☐ No

☐ **FWS Criterion C**: Using the best scientific and commercial data available, the effect of the discharges and related activities on listed species and critical habitat have been evaluated. Based on those evaluations, a determination is made by EPA, or by the operator and affirmed by EPA, that the discharges and related activities will have "no effect" on any federally threatened or endangered listed species or designated critical habitat under the jurisdiction of the FWS. This determination was made by: (check one) ☐ the operator ☐ EPA ☐ Other; if so, specify:

☐ **NMFS Criterion**: A determination made by EPA is affirmed by the operator that the discharges and related activities will have "no effect" or are "not likely to adversely affect" any federally threatened or endangered listed species or critical habitat under the jurisdiction of NMFS and will not result in any take of listed species. Has the operator previously completed consultation with NMFS? (check one): ☐ Yes ☐ No

2. Has the operator attached supporting documentation of ESA eligibility in accordance with the instructions in Appendix I, and G, above? (check one): ☐ Yes ☐ No

Does the supporting documentation include any written concurrence or finding provided by the Services? (check one): ☐ Yes ☐ No; if yes, attach.

H. National Historic Preservation Act eligibility determination

1. Indicate under which criterion the discharge(s) is eligible for coverage under this general permit:

■ **Criterion A**: No historic properties are present. The discharges and discharge-related activities (e.g., BMPs) do not have the potential to cause effects on historic properties.

☐ **Criterion B**: Historic properties are present. Discharges and discharge related activities do not have the potential to cause effects on historic properties.

☐ **Criterion C**: Historic properties are present. The discharges and discharge-related activities have the potential to have an effect or will have an adverse effect on historic properties.

2. Has the operator attached supporting documentation of NHPA eligibility in accordance with the instructions in H, above? (check one): ■ Yes ☐ No

Does the supporting documentation include any written agreement with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (TPHO), or other tribal representative that outlines measures the operator will carry out to mitigate or prevent any adverse effects on historic properties? (check one): ☐ Yes ■ No

I. Supplemental information

Describe any supplemental information being provided with the NOI. Include attachments if required or otherwise necessary.

Locus Map, Dewatering Flow Schematic, Soil Boring Locations, Soil Boring Logs, Water Quality Results from Soil Borings and Existing Monitoring Wells, NHESP Determination and U.S. Fish and Wildlife Service Correspondence, and MHC Determination.

Has the operator attached data, including any laboratory case narrative and chain of custody used to support the application? (check one): ■ Yes ☐ No

Has the operator attached the certification requirement for the Best Management Practices Plan (BMPP)? (check one): ■ Yes ☐ No

J. Certification requirement

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 gathered and evaluated 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, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

BMPP certification statement: BMPP meeting the requirements of this Remediation General Permit will be developed and implemented upon initiation of discharge.	
Notification provided to the appropriate State, including a copy of this NOI, if required.	Check one: Yes ■ No ☐
Notification provided to the municipality in which the discharge is located, including a copy of this NOI, if requested.	Check one: Yes ■ No ☐
Notification provided to the owner of a private or municipal storm sewer system, if such system is used for site discharges, including a copy of this NOI, if requested.	Check one: Yes ☐ No ☐ NA ■
Permission obtained from the owner of a private or municipal storm sewer system, if such system is used for site discharges. If yes, attach additional conditions. If no, attach explanation and timeframe for obtaining permission.	Check one: Yes ☐ No ☐ NA ■
Notification provided to the owner/operator of the area associated with activities covered by an additional discharge permit(s). Additional discharge permit is (check one): ☐ RGP ☐ DGP ☐ CGP ☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:	Check one: Yes ☐ No ☐ NA ■
Signature: Tom Holder	Date: 4-10-18
Print Name and Title: Thomas Holder, Director of Public Works	

Section 2

TATA & HOWARD

Narrative

2.1 General

The proposed work consists of furnishing and installing approximately 2,400 linear feet of 12-inch ductile iron water main in Boston Post Road (Route 20) from Cochituate Road to #397 Boston Post Road (MassDOT Sta. 108+75 to Sta. 85+00) and approximately 340 linear feet of 12-inch water main on Pelham Island Road from Boston Post Road (Route 20) to Old Sudbury Road (Route 27), with associated service connections, valves, fittings, hydrants, and appurtenances. As part of the new water main construction, the work includes directional drilling below an existing 30-inch culvert with approximately 150 linear feet of new 14-inch diameter high density polyethylene (HDPE) water main, which has a similar inner diameter to that of a 12-inch ductile iron water main. The project is intended to improve hydraulics and asset management of this critical main. A locus map is attached in Figure No. 1 in Appendix A.

Soil borings were completed along the proposed project route on December 4, 2017, December 5, 2017, and December 14, 2017. The soil boring locations are attached in Appendix B. The boring logs are attached in Appendix C. Water quality samples were taken at temporary test wells (TWs) installed in Soil Boring Nos. 3, 4, 5, 6, and 7. The groundwater at Soil Boring Nos. 4, 5, 6, and 7 had exceedances of RCGW-1 Reportable Concentrations in some parameters. Soil Boring Nos. 4 and 7 exceeded the RCGW-1 Reportable Concentrations of petroleum hydrocarbons. Soil Boring Nos. 5 and 6 exceeded the RCGW-1 Reportable Concentrations and GW-2 Standards of volatile organic compounds (VOCs). Summaries of these water quality results and copies of the laboratory reports are included in Appendix D.

The requested activity category is III-G: Contaminated Site Dewatering with Known Contamination. The proposed discharge will originate from the water main trench dewatering between Soil Boring No. 3 and approximately 50 feet to the east of Soil Boring No. 7 (MassDOT Sta. 101+20 to MassDOT Sta. 90+60). The distance between these two limits is approximately 1,100 linear feet. The average depth to groundwater measured during soil borings within these limits was approximately 4.3 feet below grade. The new water main installation is required to have a minimum of 5 feet of cover over the top of the pipe, and dewatering is expected for the entire stretch of 1,100 linear feet. The groundwater from the trench will be pumped to an 18,000 gallon capacity weir style frac tank for sediment removal. The discharge from the frac tank will be pumped through bag filters operating in parallel for additional particulate removal followed by two granular activated carbon (GAC) pressure filters operating in series for known petroleum and VOC contaminant removal. Treated water will be discharged directly to Pine Brook through a discharge pipe and water diffusing device intended to prevent erosion and scour in Pine Brook. A dewatering treatment system schematic is attached in Figure No. 2 in Appendix A.

2.2 Area Description

The proposed discharge location on Boston Post Road (Route 20) is an intermittent stream that is part of Pine Brook. A Massachusetts Endangered Species Act (MESA) Information Request Form was filed to request site-specific information. A Natural Heritage and Endangered Species

Program (NHESP) determination was received on September 18, 2017. Based on NHESP's review, it was determined that the project does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat. The NHESP Determination and U.S. Fish and Wildlife Service correspondence is attached in Appendix E.

A Massachusetts Historical Commission (MHC) Project Notification Form (PNF) was filed to determine if any historical or archeological significant features may be present and may potentially be affected by the proposed project. A determination was received on April 9, 2018 and is attached in Appendix F. Based on MHC's review, it was determined that the project is unlikely to affect significant historic or archaeological resources.

2.3 Work Description

The Contractor will excavate the trench for the new water main to a typical depth of approximately 6 feet to maintain 5 feet of cover above the proposed 12-inch diameter ductile iron water main. The elevation of the existing roadway will not change, and the impervious area will not increase following construction. The project location will be returned to an equal condition at the end of construction. Based on the depth to groundwater observed during soil boring, dewatering will be required so the contractor can excavate to the proper subgrade to install the new water main. Excavated material will either be reused on site as fill, if suitable, or removed from the site as excess material.

To minimize the dewatering effort, the water main construction will be scheduled in late summer and early fall when groundwater levels are typically at their lowest. For the groundwater dewatered from the trench between Soil Boring Nos. 3 and approximately 50 feet to the east of Soil Boring No. 7, a treatment system will be required for the removal of known petroleum and VOC contaminants. The frac tank and treatment trailer will be located on the shoulder of the road or staged on a lot adjacent to the discharge point. The proposed discharge pipe will be installed through the 100-foot buffer zone of Pine Brook and discharged directly through a water diffusing device to Pine Brook (see attached locus map in Figure No. 1 in Appendix A). Significant care will be taken to minimize the potential impacts to the wetlands and keep contaminated groundwater and sediment from reaching Pine Brook. Erosion control measures including erosion control socks and silt fence will be installed at the edge of the road when water main construction occurs within the buffer zone.

2.4 Stormwater Management

Mitigating measures will be used during water main construction and trench dewatering. These mitigating measures include the installation, inspection, and maintenance of silt socks and siltation fence to remove sediment from stormwater runoff at the edge of the existing roadway. The proposed construction will not alter the current roadway layout and will not create new, permanent discharges to Pine Brook or increase the flow of stormwater runoff from the existing site.

2.5 Dewatering

Work in the existing roadway will require dewatering for the Contractor to install the new water main. The average depth to groundwater in the project area is approximately 4.3 feet. Continuous dewatering will be required until the water main is installed and the trench is backfilled. On site treatment will be required for the stretch of work between Soil Boring Nos. 3 and approximately 50 feet to the east of Soil Boring No. 7 since the groundwater has known petroleum and VOC contaminants. The groundwater in the trench will be pumped to an 18,000 gallon capacity weir style frac tank for sediment removal. The discharge from frac tank will be pumped through bag filters operating in parallel for additional particulate removal followed by two granular activated carbon (GAC) pressure filters operating in series for known petroleum and VOC contaminant removal. Treated water will be discharged directly to Pine Brook through a discharge pipe and water diffusing device intended to prevent erosion and scour in Pine Brook.

2.6 Testing Parameters

The National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) requires water quality testing prior to permit approval and during site dewatering activities. The water quality samples for the purpose of this permit application were taken from temporary test wells that were installed in December 2017 when soil borings were drilled and existing privately-owned monitoring wells on February 26, 2018, February 28, 2018, and March 21, 2018. Summaries of these water quality results and copies of the laboratory reports are included in Appendix D. Water quality based effluent limitations (WQBELs) were calculated using the EPA's suggested electronic format. The WQBEL calculation spreadsheet is included in Appendix G. The influent and effluent monitoring will occur monthly during the time of treatment and dewatering. In accordance with the NPDES RGP, the influent sample for Activity Category III-G requires testing of inorganics, non-halogenated volatile organic compounds, halogenated volatile organic compounds, semi-volatile organic compounds, and fuel parameters. The effluent water sample will test for the known contaminants and will meet the effluent limitations as described in the NPDES RGP.

The operator will also follow treatment system requirements as outlined in the NPDES RGP. During the first week of treatment system start up, the influent and effluent will be sampled two times. One sample of the influent and one sample of the effluent will be collected on the first day of discharge and again on one additional non-consecutive day within the first week of discharge. The samples will be analyzed in accordance with the required 5-day turnaround time and reviewed within 48 hours of receipt of the analysis results. If the treatment is achieving the effluent limitations, sample of the influent and effluent will be continued once a week for three additional weeks and one per month after these three weeks. During the final week of discharge the operator will sample the influent and effluent two times. One sample of the influent and one sample of the effluent will be collected on the last day of discharge and again on one additional non-consecutive day within the final week of discharge. These influent and effluent samples taken will meet the sampling requirements of a short-term discharge lasting more than 7 calendar days but not more

than 12 months. All required record keeping and reporting will be completed in accordance with the NPDES RGP.

Appendix A

TATA & HOWARD

TATA & HOWARD

Date: April 2018 Scale: 1' = 500'

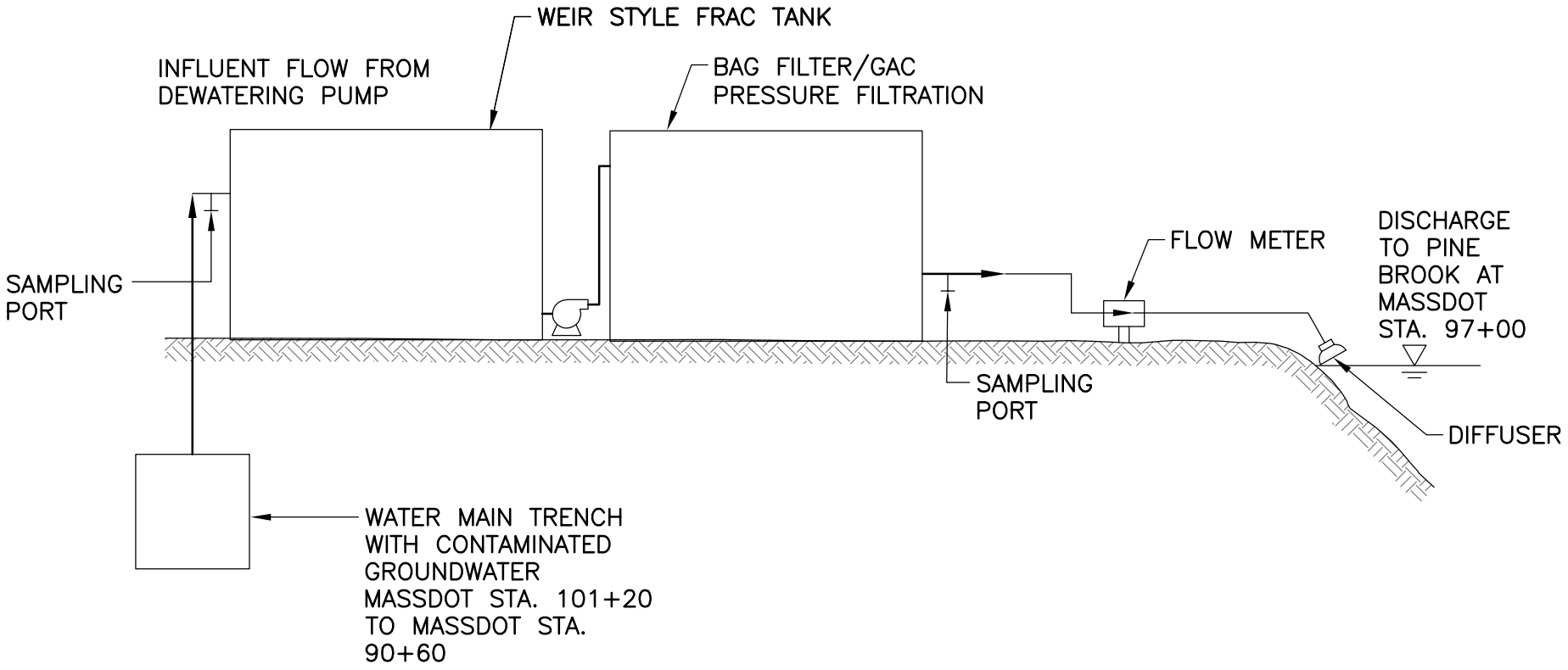
Locus Map

2018 Water Main Improvements
Boston Post Road

Wayland, Massachusetts

Figure No.

1



TATA & HOWARD

APRIL 2018 SCALE: NONE

DEWATERING TREATMENT SYSTEM SCHEMATIC
BETWEEN MASSDOT STA. 101+20 TO MASSDOT STA. 90+60
BOSTON POST ROAD (ROUTE 20)

WAYLAND, MA

Figure No.

2

Appendix B

TATA & HOWARD

TOWN OF WAYLAND

2018 WATER MAIN IMPROVEMENTS (ROUTE 20)

DWSRF ID NO. 4407

CONTRACT NO. 18-2009

DPW DIRECTOR

THOMAS HOLDER

DPW ADMINISTRATOR

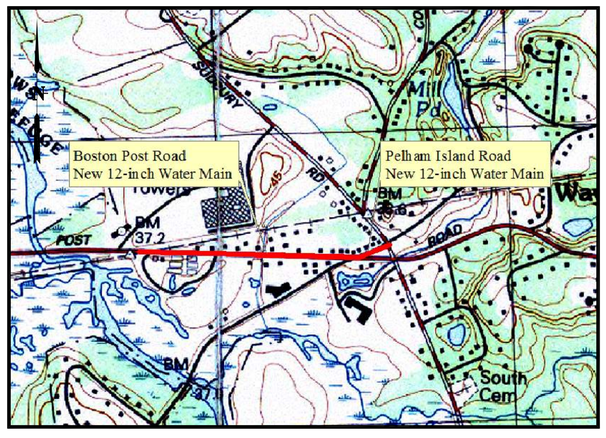
DANIEL CABRAL

WATER DIVISION SUPERINTENDENT

DON MILLETTE

TOWN ENGINEER

PAUL BRINKMAN, P.E.



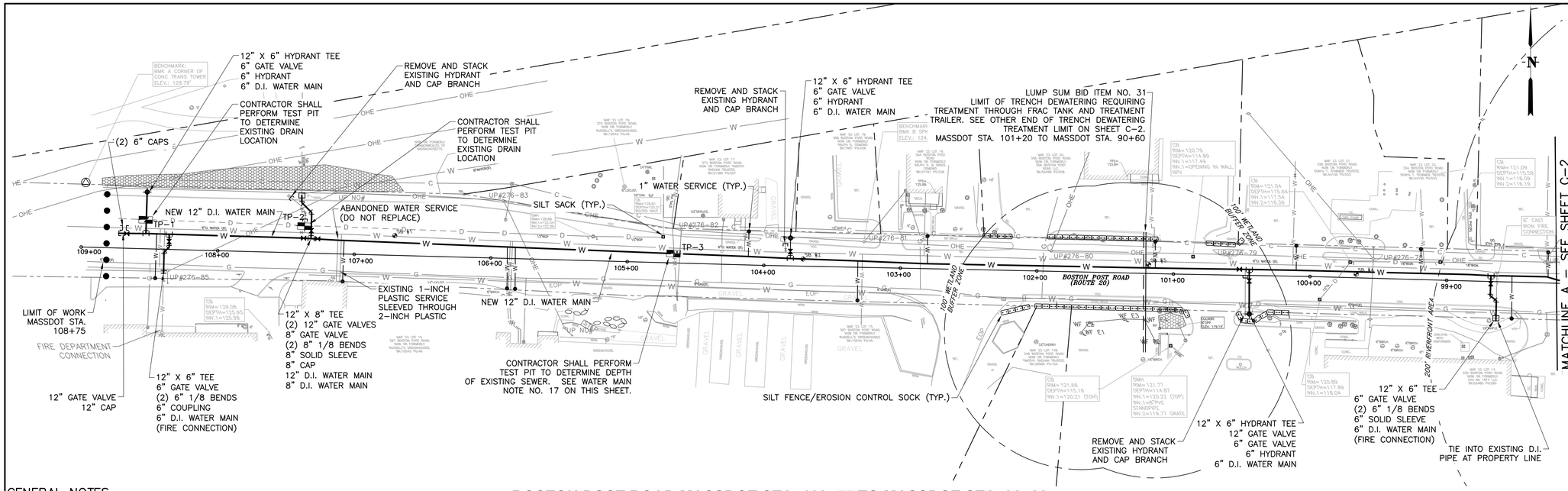
LOCATION PLAN
NO SCALE

SHEET INDEX

TATA & HOWARD

RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD, INC. • CONSULTING ENGINEERS • MARLBOROUGH, MA



BOSTON POST ROAD MASSDOT STA. 108+75 TO MASSDOT STA. 98+20

0 40' 80'

SCALE: 1" = 40'

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWN OF WAYLAND. ALL EXCAVATION AND RESTORATION SHALL MEET TOWN SPECIFICATIONS. A TOWN STREET OPENING PERMIT AND TRENCH OPENING PERMIT WILL BE REQUIRED FOR ALL STREETS WITHIN THE PROJECT AREA PRIOR TO ANY CONSTRUCTION.
2. THE ENGINEER MAY DIRECT THE CONTRACTOR TO VARY THE PROPOSED WORK DURING CONSTRUCTION TO MEET EXISTING CONDITIONS.
3. AREAS WITHIN THE 100-FOOT BUFFER ZONE OF A BORDERING VEGETATED WETLAND AND WITHIN THE 200-FOOT RIVERFRONT AREA ARE SUBJECT TO AN ORDER OF CONDITIONS ISSUED BY THE WAYLAND CONSERVATION COMMISSION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING AND COMPLYING WITH ALL REQUIREMENTS OF THE ORDER OF CONDITIONS.
4. STATIONING ALONG THE LENGTH OF THE WATER MAIN IS INTENDED FOR GENERAL REFERENCE AND IS BASED UPON MASSACHUSETTS DEPARTMENT OF TRANSPORTATION – HIGHWAY DIVISION STATIONING FOR BOSTON POST ROAD (ROUTE 20). WHERE PRECISE GROUND LOCATION IS REQUIRED, REFER TO ACTUAL FIELD MEASUREMENTS FOR ACTUAL DISTANCES FROM EXISTING GROUND FEATURES.
5. THE WORK ON BOSTON POST ROAD (ROUTE 20) OCCURS WITHIN THE MASSDOT STATE HIGHWAY LAYOUT (SHLO). ALL WORK WITHIN THE SHLO SHALL MEET THE REQUIREMENTS OF THE MASSDOT AND SHALL BE SUBJECT TO THE CONDITIONS OF THE MASSDOT PERMIT INCLUDED IN THE SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH THE CONDITIONS IN THE MASSDOT PERMIT AND FOR OBTAINING ANY ADDITIONAL PERMITS REQUIRED BY THE MASSDOT FOR CONSTRUCTING THE WATER MAIN.
6. THE CONTRACTOR SHALL FOLLOW THE MASSDOT APPROVED TRAFFIC MANAGEMENT PLAN AS REQUIRED IN THE CONTRACT DOCUMENTS.
7. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT A NPDES REMEDIATION GENERAL PERMIT (RGP) HAS BEEN OBTAINED FOR THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING AND COMPLYING WITH ALL REQUIREMENTS OF THE PERMIT INCLUSIVE OF ALL SAMPLING PRE- AND POST-TREATMENT.
8. THE CONTRACTOR SHALL ESTABLISH A STAGING AREA OUTSIDE OF A 100-FOOT BUFFER ZONE, FOR THE STORAGE OF EQUIPMENT AND STOCKPILING OF MATERIALS, UNLESS OTHERWISE NOTED. NO STORAGE OF GASOLINE, OIL OR OTHER FUEL OR HAZARDOUS MATERIALS IS PERMITTED WITHIN THE 100-FOOT BUFFER ZONE. STAGING AREA LOCATIONS SHALL BE COORDINATED WITH AND APPROVED BY THE OWNER.
9. STOCKPILES SHALL BE LOCATED AS NEEDED, WITHIN THE LIMIT OF WORK, IN AREAS OF MINIMAL IMPACT. NO STOCKPILING SHALL OCCUR ON THE GRASSY AREA OF THE INTERSECTION OF BOSTON POST ROAD AND COCHITUATE ROAD.
10. THE CONTRACTOR AT HIS EXPENSE SHALL BRACE UTILITY POLES IF REQUIRED, AND REPAIR ANY DAMAGE TO EXISTING SIDEWALKS, CURBS, PAVING, SHRUBS, TREES, STONE WALLS, LAWNS, ETC. ALL EXCAVATED MATERIALS SHALL BE RETURNED TO EQUAL OR BETTER THAN PRIOR CONDITION BY THE CONTRACTOR.
11. ALL EXISTING ASPHALT PAVEMENT SHALL BE SAW-CUT PRIOR TO EXCAVATION IN ORDER TO PROVIDE UNIFORM ASPHALT REPLACEMENT. ALL WATER MAIN TRENCHES IN EXISTING PAVED ROADS SHALL BE RESURFACED WITH TRENCH PAVEMENT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF PAVEMENT MARKINGS, TRAFFIC SIGN LOOPS, STRIPING, ARROWS, CROSSWALKS, ETC.
13. TWO (2) PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL BE FURNISHED BY THE OWNER, TO BE PUT UP AND MAINTAINED AT ALL TIMES AS TO ADVISE LOCAL TRAFFIC OF DELAYS AND CONSTRUCTION SCHEDULES.
14. ALL WORK UNDER THIS CONTRACT SHALL OCCUR AT NIGHT BETWEEN THE HOURS OF 7:00 PM AND 5:00 AM SUNDAY NIGHT THRU FRIDAY MORNING. TRAFFIC CONTROL DEVICES, VEHICLES, AND EQUIPMENT SHALL BE REMOVED FROM THE CONSTRUCTION ZONE. NO WORK SHALL BE DONE UNDER THE TERMS OF THIS CONTRACT ON SATURDAYS OR HOLIDAYS.

EROSION & SEDIMENT CONTROL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE AND REPAIR OF ALL EROSION CONTROL DEVICES ON-SITE. ALL EROSION CONTROL DEVICES SHALL BE REGULARLY INSPECTED. ANY SEDIMENTS REMOVED FROM THE CONTROL DEVICES SHALL BE DISPOSED OF ON THE UPLAND SIDE OF THE EROSION CONTROL LINE. THE CONTRACTOR SHALL PLACE ADDITIONAL EROSION CONTROL, REGARDLESS OF IT BEING SHOWN ON THE CONTRACT DRAWINGS, AS NECESSARY TO PREVENT SOIL EROSION THROUGHOUT THE PROJECT DURATION. NO WORK SHALL OCCUR BEYOND THE EROSION CONTROL OR THE LIMIT OF WORK LINES.
2. EROSION CONTROL SHALL BE INSTALLED AROUND EACH ACCESS PIT FOR DIRECTIONAL DRILLING.
3. IN THE STAGING AREA, THE CONTRACTOR SHALL HAVE A STOCKPILE OF MATERIALS REQUIRED TO CONTROL EROSION ON-SITE TO BE USED TO SUPPLEMENT OR REPAIR EROSION CONTROL DEVICES. THESE MATERIALS SHALL INCLUDE, BUT ARE NOT LIMITED TO, EROSION CONTROL SOCKS, HAY BALES, SILT FENCE, AND CRUSHED STONE.
4. AT NO TIME SHALL SILT-LADEN WATER BE ALLOWED TO ENTER SENSITIVE AREAS (WETLANDS, OFF-SITE AREA, AND DRAINAGE SYSTEMS). ANY RUNOFF FROM DISTURBED SURFACES SHALL BE DIRECTED THROUGH EROSION CONTROL BARRIERS PRIOR TO ENTERING ANY SENSITIVE AREAS.
5. NO MATERIALS SHALL BE DISPOSED OF INTO ANY WETLANDS OR EXISTING DRAINAGE SYSTEMS. SILT SACKS SHALL BE USED IN ALL CATCH BASINS WITHIN PROJECT LIMITS TO MINIMIZE SILT DEPOSITS INTO DRAINAGE SYSTEM. ALL WORK ASSOCIATED WITH FURNISHING AND INSTALLING, AND REMOVAL OF SILT SACKS SHALL BE PAID FOR IN THE COST PER LINEAR FOOT OF WATER MAIN.
6. REFUELING OF EQUIPMENT WILL BE REQUIRED TO BE COMPLETED OUTSIDE THE LIMITS OF THE RESOURCE AREAS AND THEIR ASSOCIATED BUFFER ZONES.
7. IF INTENSE RAINFALL IS ANTICIPATED, THE INSTALLATION OF SUPPLEMENTAL EROSION CONTROL DEVICES SHALL BE UTILIZED.

SURVEY NOTES

1. BASE PLANS AND PROPERTY LINE DETERMINATIONS WERE PREPARED BY WSP USA CORP., (155 MAIN DUNSTABLE ROAD, NASHUA, NH 03060) USING AN ON-GROUND SURVEY AND AERIAL PHOTOGRAPHY. GROUND SURVEY CONDUCTED BETWEEN 8/14/17 AND 8/28/2017).
2. DELINEATION OF BORDERING VEGETATED WETLANDS, AND EDGE OF BANK MEAN ANNUAL HIGH WATER WERE DETERMINED BY ECOTEC, INC. (102 GROVE STREET, WORCESTER, MA 01605-2629. 8/16/17).
3. THE LOCATION OF THE EXISTING UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE AND ARE INTENDED ONLY TO ADVISE THE CONTRACTOR OF THEIR PRESENCE. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING THE ACTUAL LOCATIONS OF ALL EXISTING UTILITIES, INCLUDING SERVICES. CALL "DIG SAFE" (1-888-344-7233) FOR FIELD LOCATIONS OF ALL EXISTING UTILITIES. IN ADDITION, THE CONTRACTOR SHALL CONTACT THE TOWN OF WAYLAND FOR WATER AND SEWER LINE LOCATIONS.
4. AS APPROPRIATE, CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES, INCLUDING HAND DIGGING, TO MAINTAIN THE INTEGRITY OF THE EXISTING UTILITIES.
5. LOCATION OF EXISTING DRAINAGE IS APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR IN THE FIELD. CONTRACTOR SHALL VERIFY INVERTS OF ALL DRAINAGE STRUCTURES PRIOR TO CONSTRUCTION. THE DRAINAGE SYSTEM ALONG THE PROJECT ROUTE (ROUTE 20) IS UNDER MASSDOT JURISDICTION.
6. BENCH MARKS HAVE BEEN ESTABLISHED BY THE SURVEYOR PRIOR TO THE START OF CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ALL BENCHMARKS THROUGHOUT CONSTRUCTION. ANY COST TO RE-ESTABLISH THESE ITEMS WILL BE AT NO COST TO THE OWNER.
7. HORIZONTAL DATUM REFERENCED THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD83 AND THE VERTICAL DATUM REFERENCED THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAVD88.

WATER MAIN NOTES

1. THE CONTRACTOR SHALL MAKE EVERY EFFORT NOT TO DISTURB THE EXISTING WATER SYSTEM. NO ADDITIONAL PAYMENT SHALL BE MADE FOR DAMAGE CREATED FOR THE CONVENIENCE OF THE CONTRACTOR.
2. UNLESS OTHERWISE NOTED OR APPROVED BY THE ENGINEER, THE NEW WATER MAIN SHALL PASS UNDER EXISTING UTILITIES. THE CONTRACTOR SHALL MAINTAIN A MINIMUM CLEARANCE BETWEEN THE NEW WATER MAIN AND OTHER EXISTING UTILITIES OF AT LEAST 18-INCHES, WITH THE EXCEPTION OF THE TWO DIRECTIONALLY DRILLED CULVERT CROSSINGS WHICH SHALL MAINTAIN A MINIMUM OF 5 FEET.
3. ALL WATER MAINS ARE TO BE LAID WITH A MINIMUM OF 5'-0" COVER, UNLESS OTHERWISE NOTED.
4. ALL PIPES, PIPE FITTINGS, PLUMBING FITTINGS AND FIXTURES, INCLUDING CORPORATIONS AND CURB STOPS MUST MEET THE REQUIREMENTS OF THE 2011 REDUCTION OF LEAD IN DRINKING WATER ACT AND AMENDMENTS TO SDWA SECTION 1417 FOR POTABLE WATER USE.
5. ALL BENDS, TEE, CAPS AND HYDRANTS SHALL BE BACKED WITH CONCRETE THRUST BLOCKS AS INDICATED ON THE CONTRACT DRAWINGS. ALL BENDS, TEE, CAPS, VALVES AND MISCELLANEOUS FITTINGS SHALL BE RESTRAINED AS SPECIFIED.
6. ALL VALVES ON ABANDONED WATER MAINS SHALL BE CLOSED, THE TOP SECTION OF THE GATE BOX REMOVED, AND THE REMAINING PORTION OF THE GATE BOX FILLED WITH SAND AND TOPPED AS SPECIFIED.
7. CONTRACTOR SHALL USE A WATER TIGHT PLUG DURING THE WATER MAIN INSTALLATION. PLUG SHALL REMAIN IN PLACE AT ALL TIMES.
8. UNLESS OTHERWISE NOTED, ALL WATER SERVICES ARE 1" AND SHALL EACH CONSIST OF A CORPORATION, COPPER TUBING, CURB STOP, AND BOX AS REQUIRED BY THE CONTRACT DOCUMENTS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE SIZE OF EXISTING WATER SERVICES AND INSTALL ANY NECESSARY TRANSITION FITTINGS.
9. ALL EXISTING WATER SERVICES ARE TO BE ABANDONED UNLESS OTHERWISE NOTED BY THE ENGINEER. NEW SERVICES ARE TO BE INSTALLED AS SPECIFIED AND IN ACCORDANCE WITH THE CONTRACT DRAWINGS. UNLESS OTHERWISE APPROVED BY THE ENGINEER, ALL ABANDONED SERVICES ARE TO BE SHUT OFF AT THE CORPORATION AT THE TIME OF THE NEW TIE OVER.
10. THE HOUSE SERVICE CONNECTIONS SHALL BE COMPLETED AFTER THE NEW WATER MAIN HAS BEEN PRESSURE TESTED, CHLORINATED AND APPROVED.
11. CONTRACTOR TO COORDINATE SHUTDOWN AND TIE-IN PROCEDURES AT ALL INTERSECTIONS WITH THE TOWN OF WAYLAND WATER DEPARTMENT.
12. THE CONTRACTOR SHALL NOT CONNECT TO THE EXISTING WATER MAIN UNTIL THE NEW MAIN HAS BEEN PRESSURE TESTED AND CHLORINATED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
13. THE CONTRACTOR SHALL PROVIDE ADDITIONAL TAPS IF REQUIRED FOR CHLORINATING AND HYDROSTATIC TESTING AT HIS EXPENSE. TAPS SHALL BE REMOVED AND THE WATER MAIN PLUGGED AFTER TESTING IS COMPLETE.
14. EXISTING HYDRANTS SHALL BE BAGGED ONCE EXISTING MAINS AND HYDRANTS HAVE BEEN TAKEN OUT OF SERVICE.
15. REMOVE EXISTING HYDRANTS AND EXISTING BRANCHES WHEN NEW WATER MAINS ARE IN SERVICE. DELIVER REMOVED HYDRANTS TO TOWN OF WAYLAND STOCK YARD UNLESS SPECIFIED OTHERWISE ON THE CONTRACT DRAWINGS.
16. NO HYDRANT SHALL BE BACKFILLED UNTIL CONTRACTOR IS DIRECTED TO DO SO BY THE WATER DIVISION.
17. A TEST PIT SHALL BE EXCAVATED AT ALL SEWER CROSSINGS TO DETERMINE THE DEPTH OF THE SEWER MAIN. BASED ON LIMITED RECORDS OF SEWER FORCE MAIN PIPING ELEVATIONS, CONTRACTOR SHALL BID SEWER CROSSING ITEMS PLANNING TO INSTALL WATER MAIN BELOW SEWER PIPING IN ACCORDANCE WITH THE SEWER CROSSING DETAIL ON SHEET C-4.
18. POLYETHYLENE ENCASEMENT SHALL BE PROVIDED FOR ENTIRE LENGTH OF NEW DUCTILE IRON WATER MAINS, VALVES, FITTINGS, AND HYDRANT BARRELS UP TO 12-INCHES BELOW FINISHED GRADE. HYDRANT DRAINS SHALL NOT BE ENCASED.

GEOTECHNICAL NOTES

1. BORINGS WERE DRILLED FOR PURPOSES OF DESIGN AND INDICATE SUBSURFACE CONDITIONS AT BORING LOCATION ONLY. SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN IN THE LOGS.
2. BORING LOCATIONS ARE SHOWN ON THE PLANS AND BORING LOGS ARE IN THE GEOTECHNICAL DATA BOUND IN APPENDIX A OF THESE SPECIFICATIONS.
3. FOR EARTH EXCAVATION, BACKFILL, FILL AND GRADING, SEE SPECIFICATION 02222, EARTHWORK FOR WATER DISTRIBUTION SYSTEMS.
4. CONTRACTOR IS REQUIRED TO SUBMIT COMPACTION REPORTS AS SPECIFIED IN SPECIFICATION SECTION 02222. THE CONTRACTOR SHALL BE STRICTLY HELD TO COMPACTION STANDARDS AS REFERENCED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR BACKFILLING, COMPACTING, AND STABILIZING ALL WORK DAILY.
5. CONTRACTOR SHALL SUBMIT A DEWATERING PLAN WITH DETAILS AND DRAWINGS IN ACCORDANCE WITH SPECIFICATION 02140.
6. FOR TEMPORARY EXCAVATION SUPPORT SYSTEM SEE SPECIFICATION 02160.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
W	WATER MAIN	W
W	WATER SERVICE	W
	GATE VALVE	
	REDUCER	
	SOLID SLEEVE	
H	TRANSITION COUPLING	H
	PIPE FITTINGS	
	CAP	H
	THRUST BLOCK	
	FIRE HYDRANT	
	CURB STOP	
W	WATER MANHOLE	
	CATCH BASIN	
	SILT SACK	
SD	STORM DRAIN	
D	DRAIN LINE	
D	DRAIN LINE (LOCATION NOT CONFIRMED)	
	CLEANOUT	
	RIP RAP	
	DRAINAGE PIPE W/ FLARED END	
UGE	ELEC. UNDERGROUND	
E	ELEC. MANHOLE	
OHE	ELEC. OH. WIRE	
	COMM. MANHOLE	
	COMMUNICATIONS BOX	
C	COMMUNICATIONS LINE	

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	TREE	
	SHRUB	
	ROCK	
	WETLANDS FLAG	
	WETLANDS	
	WETLAND BUFFER	
	RIVERFRONT BUFFER	
	DITCH / SWALE	
	LIMITS OF CONSTRUCTION	
	LIMITS OF CONTAMINATED GROUNDWATER TO BE DEWATERED	
	LIMITS OF DIRECTIONAL DRILLING	
	SILT FENCE/EROSION CONTROL SOCK	
100	5' CONTOUR	100
100	1' CONTOUR	102
100 ×	SPOT ELEVATION	100 ×
	BORING	
× 0+00	STATIONING	
106+00	MASSDOT STATIONING	
	FENCE - CHAIN LINK	
	FENCE - WIRE	
	STONE WALL	
	GUARD RAIL	
	BOLLARD	
	FLAG POLE	
	SIGN POST	
	PROPERTY LINE	
	BITUMINOUS CONCRETE	
	GRAVEL AREA	
	CONCRETE	
G	GAS LINE	
NG		
G	GAS VALVE	
	GAS METER	
	MONITORING WELL	
E	ELECTRIC METER	
AC	AIR CONDITIONER	
S	SEWER MANHOLE	
FM	SEWER FORCE MAIN	
	SEWER SERVICE	
	BENCHMARK	
	CULVERT PIPE	
	TEST PIT	TP-X
	GUY WIRE	
	LIGHT	
	UTILITY POLE	

ABBREVIATIONS

APPROX.	APPROXIMATE
BC.	BITUMINOUS CURB
BM	BENCHMARK
BIT.	BITUMINOUS
CB	CATCH BASIN
CC	CONCRETE CURB
CI	CAST IRON
CO	CLEAN OUT
CONC.	CONCRETE
DI	DUCTILE IRON
DIA.	DIAMETER
DMH	DRAIN MANHOLE
DWGS	DRAWINGS
ELEV.	ELEVATION
FFE	FINISHED FLOOR ELEVATION
FM	FORCE MAIN
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HTP	HANDICAPPED TRACTION PAD
HYD	HYDRANT
ICV	IRRIGATION CONTROL VALVE
INV.	INVERT
LR	LONG RADIUS
MAX.	MAXIMUM
MIN.	MINIMUM
MJ	MECHANICAL JOINT
PE	POLYETHYLENE
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
RD	RESIDUALS/DRAIN
(R)	RECORDED INFORMATION
RCP	REINFORCED CONCRETE PIPE
S	SEWER MANHOLE
TYP.	TYPICAL
VERT.	VERTICAL
VGC	VERTICAL GRANITE CURB
WF	WETLANDS FLAG
WRW	WOOD RETAINING WALL
BRW	BRICK RETAINING WALL
CRW	CONCRETE RETAINING WALL
SRW	STONE RETAINING WALL
SB	STONE BOUND
IRF	IRON ROD FOUND
IPF	IRON PIPE FOUND
FDC	FIRE DEPARTMENT CONNECTION

TOWN OF WAYLAND
MASSACHUSETTS
2018 WATER MAIN IMPROVEMENTS
(ROUTE 20)

GENERAL NOTES &
BOSTON POST ROAD MASSDOT
STA.108+75 TO STA. 98+20

RGP NOI SUBMITTAL NOT FOR CONSTRUCTION

TATA & HOWARD

T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

C-1

Drawn By: MTG
Designed By: MTG/MEC
Checked By: PSD
Approved By: PPN
Description
Date
Rev.

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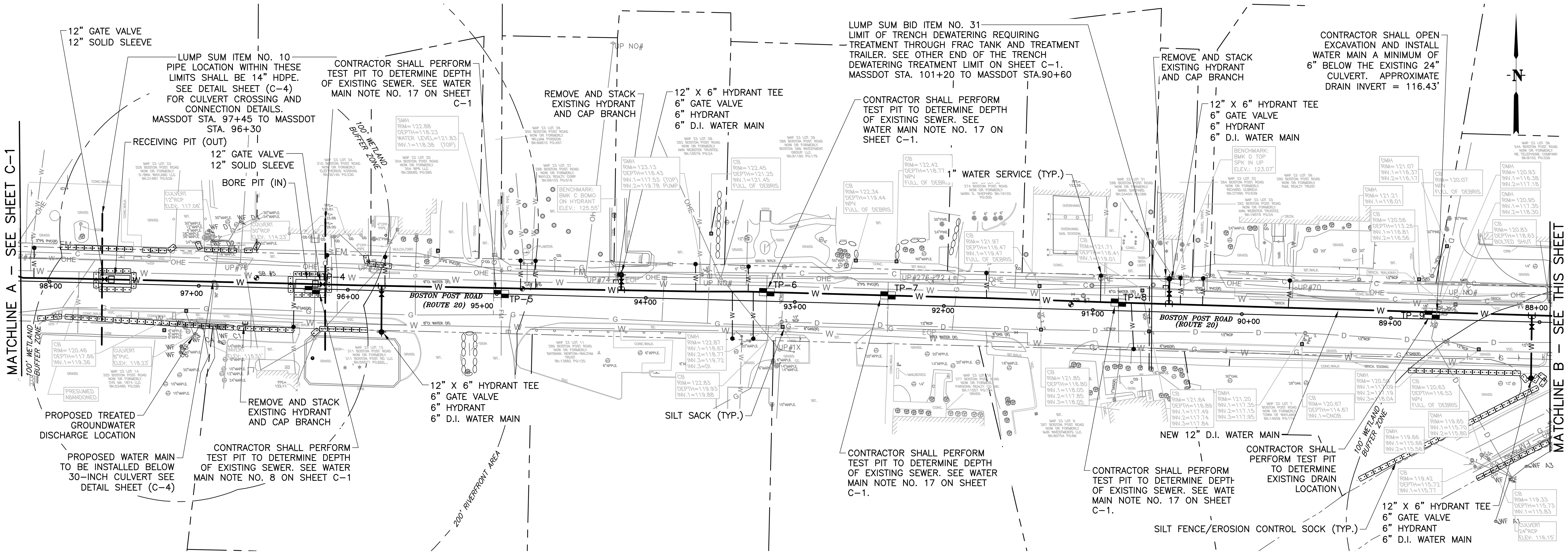
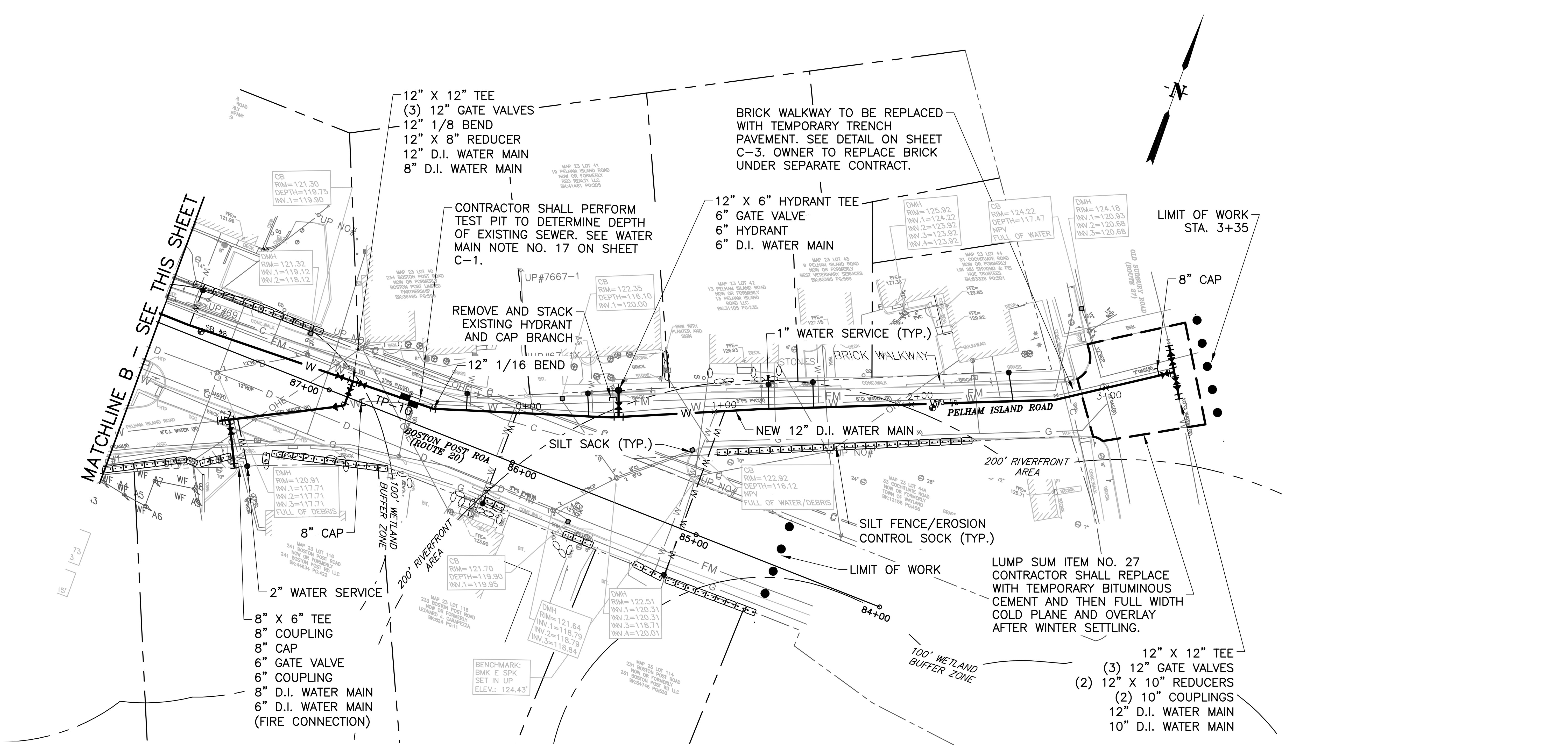


BOSTON POST ROAD MASSDOT STA. 98+20 TO MASSDOT STA. 87+93

0 40' 80'
SCALE: 1" = 40'



BOSTON POST ROAD MASSDOT STA. 87+93 TO STA. 85+00 & PELHAM ISLAND ROAD STA. 0+00 TO STA. 3+35

0 40' 80'
SCALE: 1" = 40'

TOWN OF WAYLAND
MASSACHUSETTS

2018 WATER MAIN IMPROVEMENTS (ROUTE 20)

Drawn By: MTG | Designed By: MTG/MEC | Checked By: PSO | Approved By: RPN

BOSTON POST RD. MASSDOT STA. 98+20 TO STA. 85+00 & PELHAM ISLAND RD. STA. 0+00 TO STA. 3+35

Rev.	Date	Description

RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD

T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

C-2

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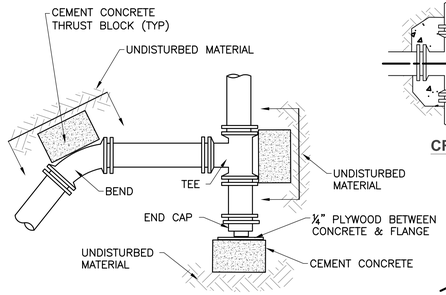
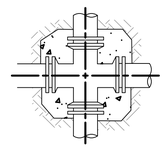
MINIMUM BEARING FACE AREA (SQ. FT.)				
PIPE SIZE (IN)	1/4 BEND (90°)	1/8 BEND (45°)	1/16 BEND (22°)	PLUG/ TEE
6"	6.0	3.0	2.5	4.5
8"	9.0	5.0	2.5	6.5
12"	13.3	6.7	3.7	9.6
16"	24.0	11.8	3.7	17.0
20"	26.2	14.2	7.2	18.5
24"	35.0	16.0	10.0	25.0
36"	85.0	46.0	23.4	60.7

NOTES:

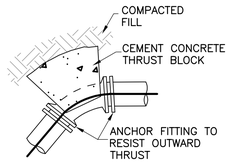
1. CONCRETE SHALL BE 3,000 PSI MINIMUM AT 28 DAYS.
2. THRUST BLOCKS SHALL BE PLACED AGAINST UNDISTURBED MATERIAL WHENEVER POSSIBLE.
3. ALL FITTINGS SHALL BE SUPPORTED IN CONCRETE.
4. FOR FIRE HYDRANT THRUSTING SEE HYDRANT DETAIL.
5. SEE VERTICAL BEND DETAIL FOR RESTRAINED PIPE REQUIREMENTS FOR VERTICAL BENDS.
6. POURED CONCRETE NOT TO COME WITHIN 6" OF MECHANICAL JOINTS.
7. BEARING FACE AREA CALCULATED ASSUMING 250 PSI AND 1.5 TON/S.F. ALLOWABLE SOIL BEARING CAPACITY.



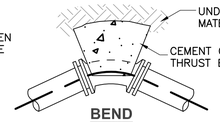
PLAN



CROSS



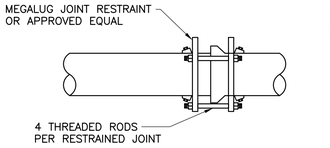
VERTICAL BEND

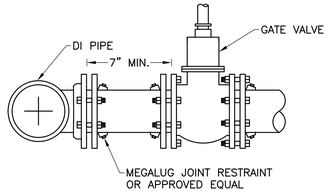


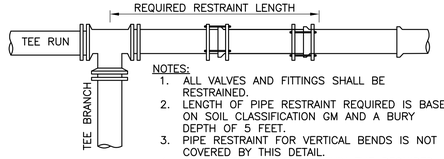
BEND

CONCRETE BACKING

SCALE: NONE







NOTES:

1. ALL VALVES AND FITTINGS SHALL BE RESTRAINED.
2. LENGTH OF PIPE RESTRAINT REQUIRED IS BASED ON SOIL CLASSIFICATION GM AND A BURY DEPTH OF 5 FEET.
3. PIPE RESTRAINT FOR VERTICAL BENDS IS NOT COVERED BY THIS DETAIL.
4. ALL JOINTS THAT FALL WITHIN THE REQUIRED RESTRAINT LENGTH SHALL BE MECHANICALLY RESTRAINED.
5. FIELD-LOK GASKETS AND MEGALUG JOINT RESTRAINTS SHALL BE PROVIDED AT JOINTS WITHIN 10' OF SEWER CROSSINGS.

MINIMUM LENGTH OF PIPE TO BE RESTRAINED (IN FEET)					
PIPE SIZE (IN)	1/4 BEND (90°)	1/8 BEND (45°)	1/16 BEND (22°)	PLUG/ CAP	TEE* (18')
6"	12	5	3	21	29
8"	16	7	4	28	34
12"	22	10	5	40	48
16"	29	12	6	51	57
20"	37	16	8	87	78
24"	43	18	9	102	93
36"	59	25	12	144	136

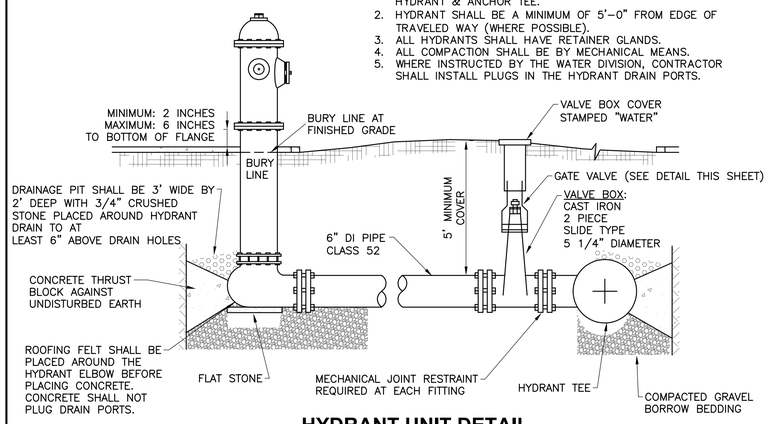
*The value in parenthesis for the Tee (18') indicates the required restraint length for each side of the Tee Run.
The values in the column for the Tee are the required restraint lengths for the Tee Branch.

MECHANICAL JOINT RESTRAINT

SCALE: NONE

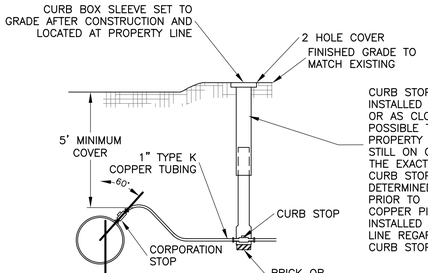
NOTES:

1. THRUST BLOCKS BACKED AGAINST UNDISTURBED SOIL AT HYDRANT & ANCHOR TEE.
2. HYDRANT SHALL BE A MINIMUM OF 5'-0" FROM EDGE OF TRAVELED WAY (WHERE POSSIBLE).
3. ALL HYDRANTS SHALL HAVE RETAINER GLANDS.
4. ALL COMPACTION SHALL BE BY MECHANICAL MEANS.
5. WHERE INSTRUCTED BY THE WATER DIVISION, CONTRACTOR SHALL INSTALL PLUGS IN THE HYDRANT DRAIN PORTS.



HYDRANT UNIT DETAIL

SCALE : NONE



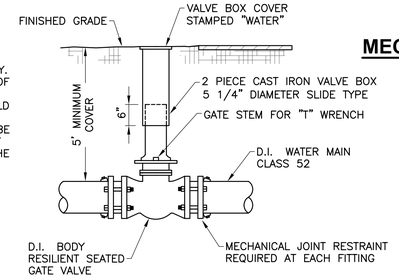
CURB STOPS SHALL BE INSTALLED ADJACENT TO OR AS CLOSE AS POSSIBLE TO THE PROPERTY LINE WHILE STILL ON CITY PROPERTY. THE EXACT LOCATIONS OF CURB STOPS SHALL BE DETERMINED IN THE FIELD PRIOR TO INSTALLATION. COPPER PIPING SHALL BE INSTALLED TO PROPERTY LINE REGARDLESS OF THE CURB STOP LOCATIONS.

NOTES:

1. SERVICES 1-INCH AND GREATER IN D.I. AND C.I. MAINS WITH A DIAMETER OF 12-INCHES OR GREATER SHALL BE DIRECT TAP.
2. IF CONTRACTOR CHOOSES TO INSTALL SERVICES UNDER PAVEMENT, TRENCHLESS METHOD SHALL BE APPROVED PRIOR TO CONSTRUCTION.

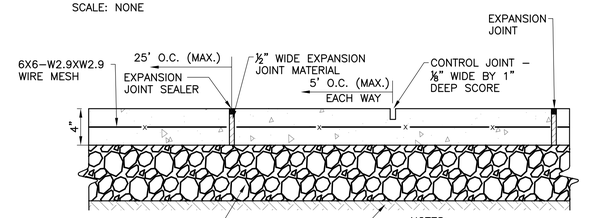
SERVICE CONNECTION (COPPER)

SCALE: NONE



GATE VALVE

SCALE: NONE

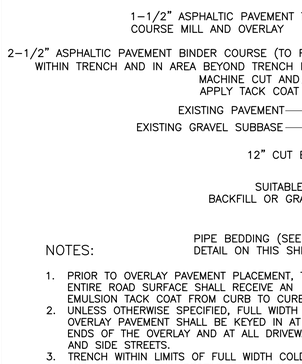


NOTES:

1. CONCRETE SHALL BE 6" THICK AT DRIVEWAY CROSSINGS

CONCRETE SIDEWALK SECTION

SCALE: NONE

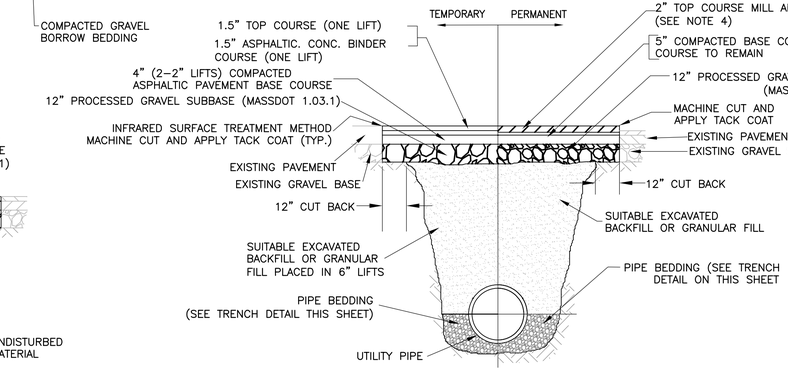


NOTES:

1. PRIOR TO OVERLAY PAVEMENT PLACEMENT, THE ENTIRE ROAD SURFACE SHALL RECEIVE AN EMULSION TACK COAT FROM CURB TO CURB.
2. UNLESS OTHERWISE SPECIFIED, FULL WIDTH OVERLAY PAVEMENT SHALL BE KEYED IN AT THE ENDS OF THE OVERLAY AND AT ALL DRIVEWAYS AND SIDE STREETS.
3. TRENCH WITHIN LIMITS OF FULL WIDTH COLDPLANE AND OVERLAY SHALL RECEIVE 4" ASPHALTIC BINDER COURSE TEMPORARY TRENCH PAVEMENT.

FULL WIDTH COLD PLANE AND OVERLAY (STA. 2+88 to STA. 3+45)

SCALE: NONE

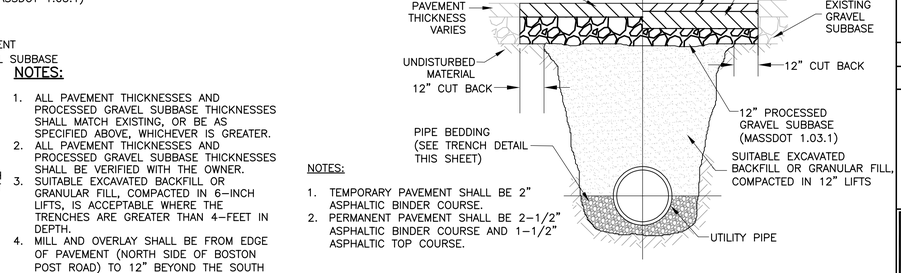


NOTES:

1. ALL PAVEMENT THICKNESSES AND PROCESSED GRAVEL SUBBASE THICKNESSES SHALL MATCH EXISTING, OR BE AS SPECIFIED ABOVE, WHICHEVER IS GREATER.
2. ALL PAVEMENT THICKNESSES AND PROCESSED GRAVEL SUBBASE THICKNESSES SHALL BE VERIFIED WITH THE OWNER.
3. SUITABLE EXCAVATED BACKFILL OR GRANULAR FILL, COMPACTED IN 6-INCH LIFTS, IS ACCEPTABLE WHERE THE TRENCHES ARE GREATER THAN 4-FEET IN DEPTH.
4. MILL AND OVERLAY SHALL BE FROM EDGE OF PAVEMENT (NORTH SIDE OF BOSTON POST ROAD) TO 12" BEYOND THE SOUTH SIDE OF THE TRENCH.
5. FOR HYDRANT AND SERVICE TRENCH PAVEMENT REQUIREMENTS, SEE SPECIFICATION SECTION 02513, ASPHALTIC PAVEMENT

MASSDOT PAVEMENT DETAIL (MASSDOT STA. 85+00 TO STA. 108+75)

SCALE: NONE

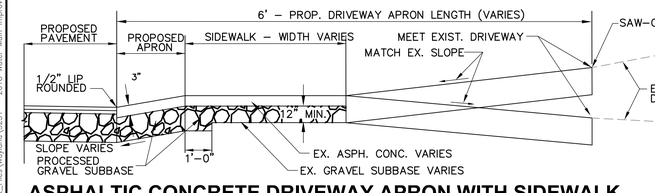


NOTES:

1. TEMPORARY PAVEMENT SHALL BE 2" ASPHALTIC BINDER COURSE.
2. PERMANENT PAVEMENT SHALL BE 2-1/2" ASPHALTIC BINDER COURSE AND 1-1/2" ASPHALTIC TOP COURSE.

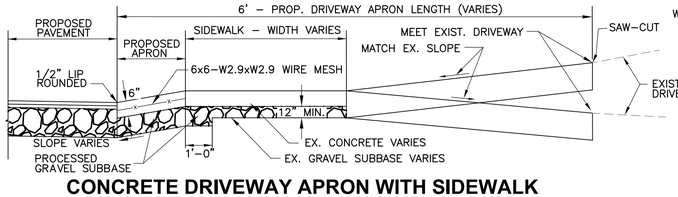
TRENCH PAVEMENT (STA. 0+00 TO STA. 2+88)

SCALE: NONE



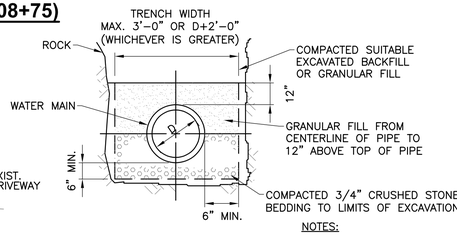
ASPHALTIC CONCRETE DRIVEWAY APRON WITH SIDEWALK

SCALE: NONE



CONCRETE DRIVEWAY APRON WITH SIDEWALK

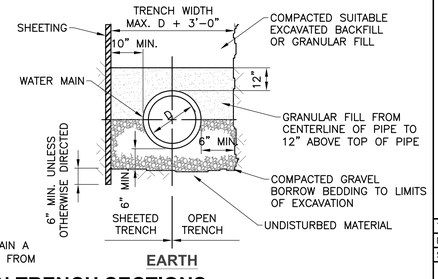
SCALE : NONE



ROCK

NOTES:

1. CONTRACTOR SHALL MAINTAIN A MINIMUM COVER OF 5'-0" FROM THE TOP OF PIPE.



EARTH

TYPICAL WATER MAIN TRENCH SECTIONS

SCALE: NONE

TOWN OF WAYLAND
MASSACHUSETTS

2018 WATER MAIN IMPROVEMENTS (ROUTE 20)

WATER MAIN DETAILS I

Approved By: RPN
Checked By: PSD
Designed By: MTG/MEC
Drawn By: MTG

Rev.	Date	Description

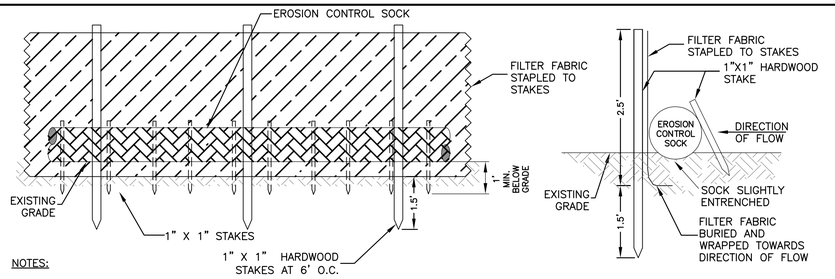
RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD

T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

C-3

P:\Project_Files\Wayland\5231 - 2018 Water Main Improvements\Drawings\Civil\40 Scale\EXPORT5231.IPR Design Drawings_40 Scale.dwg 4/19/2018 5:40 PM MCOUGHLIN

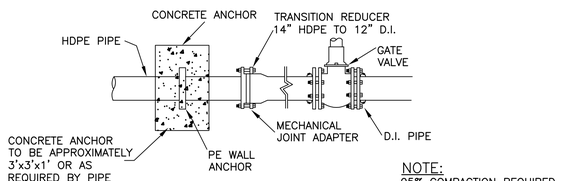


NOTES:

1. FINAL INSTALLATION TECHNIQUES SHALL BE AS RECOMMENDED BY THE MANUFACTURER AND AS DIRECTED BY THE ENGINEER.
2. EROSION CONTROL SOCK SHALL BE 8-INCHES IN DIAMETER AND FILLED WITH BIODEGRADABLE MATERIAL.

SILT FENCE/EROSION CONTROL SOCK

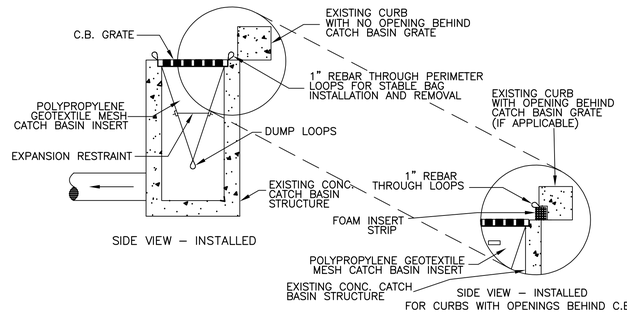
SCALE: NONE



NOTE:
95% COMPACTION REQUIRED BENEATH CONCRETE ANCHORS.

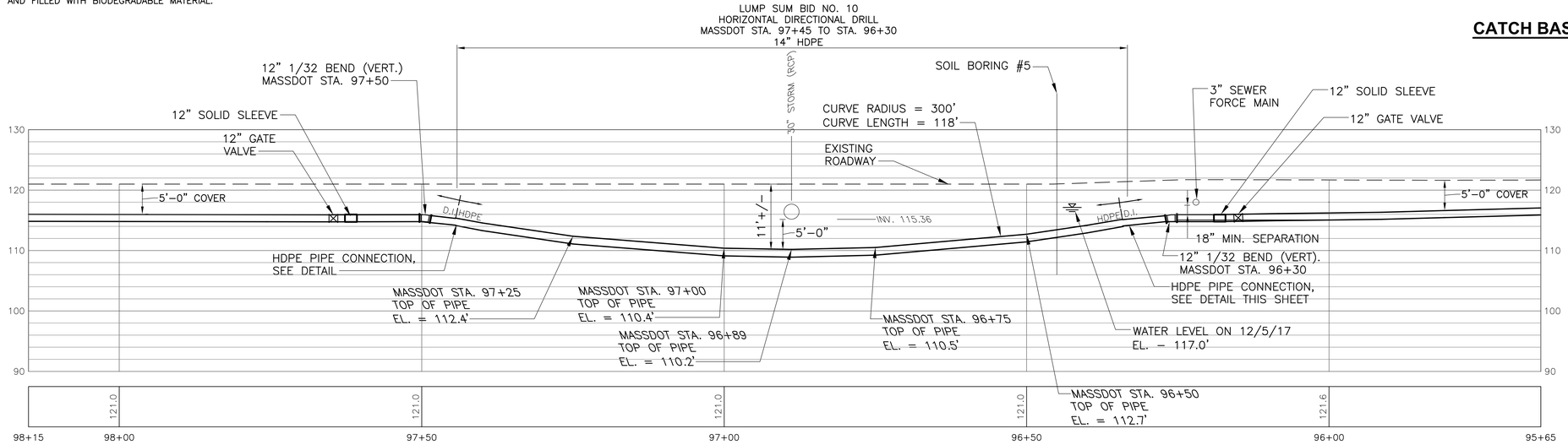
HDPE PIPE CONNECTION

SCALE: NONE



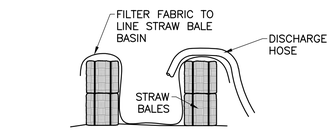
CATCH BASIN SILT FILTERING SYSTEM

SCALE: NONE

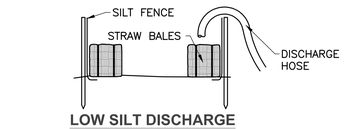


DIRECTIONAL DRILLING - CULVERT CROSSING MASSDOT STA. 97+45 TO STA. 96+30

SCALE: HORIZONTAL 1"=10'-0"
VERTICAL 1"=10'-0"



HIGH SILT DISCHARGE



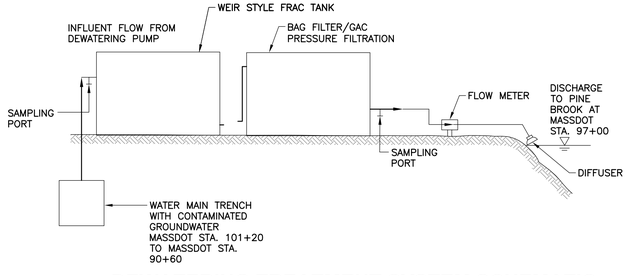
LOW SILT DISCHARGE

NOTES:

1. STRAW BALES SHALL BE STACKED 1 OR 2 ROWS HIGH AS REQUIRED TO MITIGATE THE FLOW.
2. THE BASIN SHALL BE SIZED TO FILTER THE FLOW BEING DISCHARGED TO THE BASIN.
3. SEDIMENTATION BASINS SHALL NOT BE USED FOR WATER DISCHARGED FROM TRENCH DEWATERING BETWEEN MASSDOT STA. 101+20 TO MASSDOT STA. 90+60. WATER REMOVED FROM THE TRENCH IN THIS AREA SHALL BE PUMPED, TREATED, AND DISCHARGED IN ACCORDANCE WITH THE TREATMENT SYSTEM SCHEMATIC ON THIS SHEET AND AS SPECIFIED IN SECTION 02140, SITE DRAINAGE AND DEWATERING.

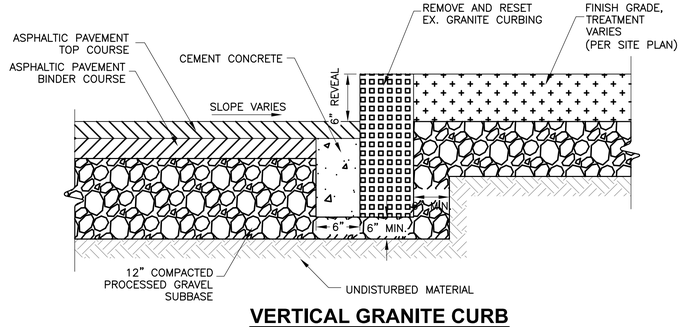
SEDIMENTATION DISCHARGE CONTROL BASIN

SCALE: NONE



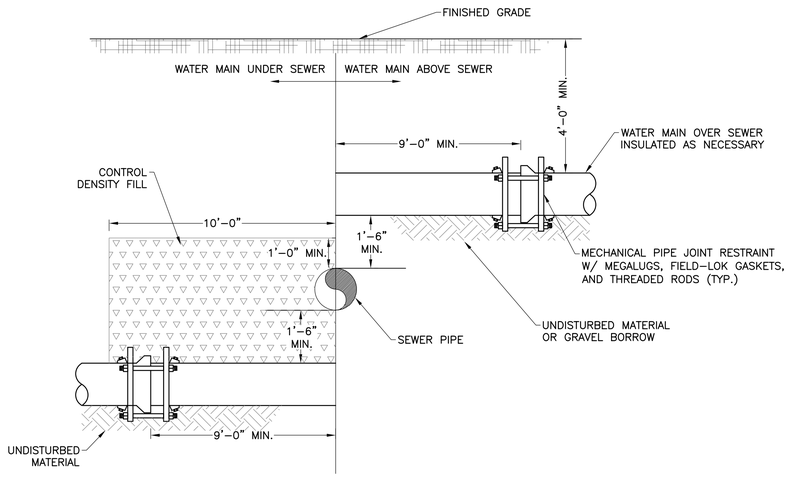
DEWATERING TREATMENT SYSTEM SCHEMATIC

SCALE: NONE



VERTICAL GRANITE CURB

SCALE: NONE



NOTES:

1. WATER MAINS AND SERVICES SHALL BE KEPT REMOTE FROM SEWER PIPING AND STRUCTURES. WHEREVER FEASIBLE, WATER MAINS SHOULD BE LAID AT A MINIMUM HORIZONTAL DISTANCE OF 10 FEET FROM SEWER PIPING. IF LOCAL CONDITIONS PREVENT THIS, THE WATER MAIN SHOULD BE INSTALLED SO THAT THE INVERT OF THE WATER MAIN IS 18 INCHES ABOVE THE CROWN OF THE SEWER PIPING.
2. WHENEVER WATER MAINS MUST CROSS SEWER PIPING, THE INVERT OF THE WATER MAIN SHALL BE INSTALLED SO THAT IT IS 18 INCHES ABOVE THE CROWN OF THE SEWER PIPING UNLESS THE TOP OF THE WATER MAIN WILL BE SET AT A DEPTH BELOW GRADE OF LESS THAN 4'-0". IN ADDITION, THE WATER MAIN SHALL BE CONSTRUCTED WITH ONE FULL LENGTH OF PIPE CENTERED ABOUT THE SEWER CROSSING. THE WATER MAIN SHALL HAVE MECHANICAL JOINT RESTRAINTS FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE SEWER CROSSING.
3. IF WATER MAIN HAS TO BE INSTALLED BELOW SEWER PIPING, THE CROWN OF THE WATER MAIN SHALL BE INSTALLED SO THAT IT IS 18 INCHES BELOW THE INVERT OF THE SEWER PIPING. THE WATER MAIN SHALL BE CONSTRUCTED WITH ONE FULL LENGTH OF PIPE CENTERED ABOUT THE SEWER CROSSING. THE WATER MAIN SHALL HAVE MECHANICAL JOINT RESTRAINTS FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE SEWER CROSSING. BOTH THE WATER MAIN AND SEWER PIPING SHALL BE ENCASED IN CONTROL DENSITY FILL FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE SEWER CROSSING.

SEWER CROSSING

SCALE: NONE

TOWN OF WAYLAND
MASSACHUSETTS

2018 WATER MAIN IMPROVEMENTS
(ROUTE 20)

WATER MAIN DETAILS II

Approved By: PPN
Checked By: PSD
Designed By: MTG/MEC
Drawn By: MTG

Rev.	Date	Description

RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD

T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

C-4

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS.
2. ALL SIGN LEGENDS, BORDERS AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, AND REFLECTORIZED PLASTIC DRUMS WITH LIGHTING DEVICES MOUNTED ON THEM, MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES."
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT AND SIMILAR OPERATIONS.
7. THE FIRST THREE PLASTIC DRUMS OF A TAPER MAY BE MOUNTED WITH TYPE A LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3m) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

LEGEND:

- REFLECTORIZED PLASTIC DRUM
- P/F POLICE/FLAGGER DETAIL
- TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- FLASHING ARROW PANEL
- WORK ZONE
- DIRECTION OF TRAFFIC
- IMPACT ATTENUATOR
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK VEHICLE
- MOVEABLE IMPACT ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN

THE IDEAL CAPACITY OF A MAJOR HIGHWAY IS GENERALLY CONSIDERED TO BE 1900 PASSENGER CARS PER HOUR PER LANE (PCPHPL). IN WORK ZONES ON A MULTI-LANE DIVIDED HIGHWAY, THE FOLLOWING VOLUME GUIDELINES HAVE BEEN SUGGESTED:

MEASURED AVERAGE WORK ZONE CAPACITIES

Number of Lanes		Number of Studies	Average Capacity	
NORMAL (existing)	OPEN (to traffic)		VPH	VPHPL
3	1	7	1,170	1,170
2	1	8	1,340	1,340
5	2	8	2,740	1,370
4	2	4	2,960	1,480
3	2	9	2,980	1,490
4	3	4	4,560	1,520

Source: Dudek, C., Notes on Work Zone Capacity and Level of Service. Texas Transportation Institute, Texas A&M University, College Station, Texas (1984)

BY OBTAINING HOURLY TRAFFIC COUNTS FOR A PARTICULAR ROADWAY (WITH A MINIMUM OF A 48-HOUR AUTOMATIC TRAFFIC RECORDER (ATR) COUNT), THIS WILL HELP TO DETERMINE AT WHAT TIMES OF THE DAY OR NIGHT A CERTAIN NUMBER OF LANES MAY BE CLOSED.

MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-1 GENERAL GUIDELINES

SUGGESTED WORK ZONE WARNING SIGN SPACING

Road Type	Distance Between Signs**		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350 (100)	350 (100)	350 (100)
MOST OTHER ROADWAYS*	500 (150)	500 (150)	500 (150)
FREEWAYS AND EXPRESSWAYS*	1,000 (300)	1,500 (450)	2,640 (800)

* SPEED CATEGORY TO BE DETERMINED BY HIGHWAY AGENCY

** DISTANCES ARE SHOWN IN FEET (METERS). THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TMP SETUPS. IT IS THE ONE WHICH MAY OFTEN HAVE THE "STANDARD RED OR RED-ORANGE FLAGS (16 in. X 16 in.)" MOUNTED ON IT. THESE ADVANCE WARNING SIGNS ARE LOCATED AT THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT BUT ARE USED IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS AS DESCRIBED ABOVE.

R2-10a AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 2003 MUTCD

STOPPING SIGHT DISTANCE AS A FUNCTION OF SPEED

SPEED* (km/h)	DISTANCE (m)
30	35
40	50
50	65
60	85
70	105
80	130
90	160
100	185
110	220
120	250

SPEED* (mph)	DISTANCE (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

*POSTED SPEED, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

THESE VALUES MAY BE USED TO DETERMINE THE LENGTH OF LONGITUDINAL BUFFER SPACES.

THE DISTANCES IN THE ABOVE CHART REPRESENT THE MINIMAL VALUES FOR BUFFER SPACING.

Source: Table 6C-2 2003 MUTCD

MASSHIGHWAY | Notes for Traffic Management | FIGURE Gen-2 NOTES ON WORK ZONE DISTANCES

CONVENTIONAL ROADWAY- A STREET OR HIGHWAY OTHER THAN A LOW-VOLUME ROAD, EXPRESSWAY, OR FREEWAY.

EXPRESSWAY- A DIVIDED HIGHWAY WITH PARTIAL CONTROL OF ACCESS.

FREEWAY- A DIVIDED HIGHWAY WITH FULL CONTROL OF ACCESS.

LOW-VOLUME ROAD- A FACILITY LYING OUTSIDE OF BUILT-UP AREAS OF CITIES, TOWNS, AND COMMUNITIES, AND IT SHALL HAVE A TRAFFIC VOLUME OF LESS THAN 400 AADT. IT SHALL NOT BE A FREEWAY, EXPRESSWAY, INTERCHANGE RAMP, FREEWAY SERVICE ROAD, OR A ROAD ON A DESIGNATED STATE HIGHWAY SYSTEM.

Source: 2003 MUTCD

TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES

Type of Taper	Taper Length (L)*
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE-LANE, TWO-WAY TRAFFIC TAPER	100 FT (30 m) MAXIMUM
DOWNSTREAM TAPER	100 FT (30 m) PER LANE

Source: Table 6C-3 2003 MUTCD

FORMULAS FOR DETERMINING TAPER LENGTHS

Speed Limit (S)	Taper Length (L) Feet
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

Speed Limit (S)	Taper Length (L) Meters
60 KM/H OR LESS	$L = \frac{WS^2}{155}$
70 KM/H OR MORE	$L = \frac{WS}{1.6}$

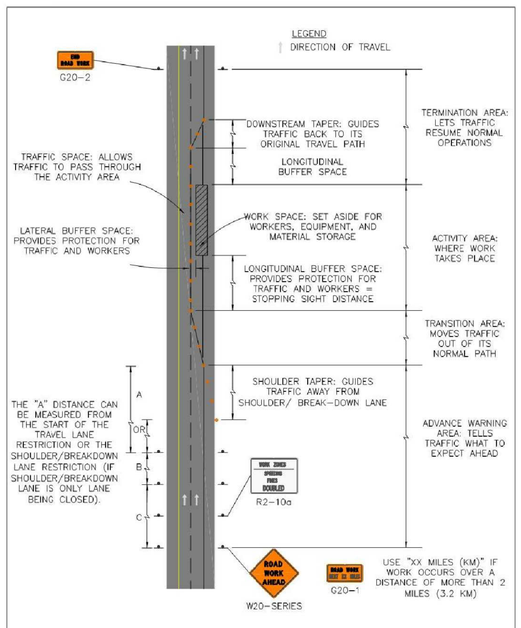
WHERE: L = TAPER LENGTH IN FEET (METERS)

W = WIDTH OF OFFSET IN FEET (METERS)

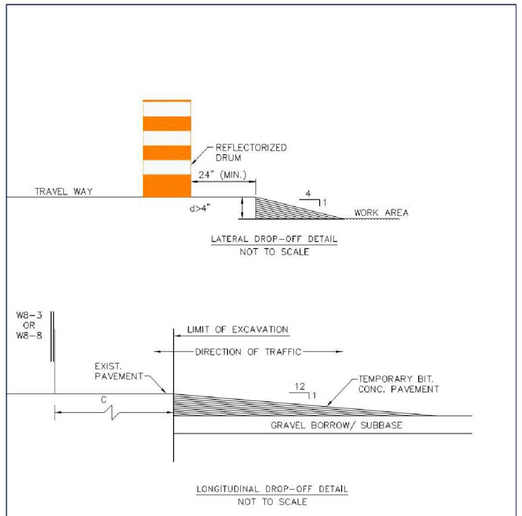
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICAPATED OPERATING SPEED IN MPH (KM/H)

Source: Table 6C-4 2003 MUTCD

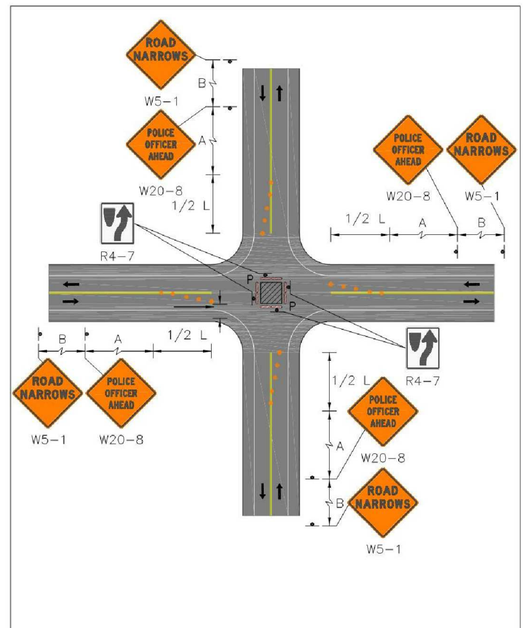
MASSHIGHWAY | Notes for Traffic Management | FIGURE Gen-3 NOTES ON WORK ZONE DISTANCES



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-4 COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL (TTC) ZONE NOT TO SCALE



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Gen-6 LATERAL AND LONGITUDINAL DROP-OFF DETAILS NOT TO SCALE



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | FIGURE Int-1 SINGLE LANE APPROACH CENTER CLOSURE NOT TO SCALE

TOWN OF WAYLAND
MASSACHUSETTS

2018 WATER MAIN IMPROVEMENTS
(ROUTE 20)

TRAFFIC MANAGEMENT PLAN
SHEET 1

Rev.	Date	Description

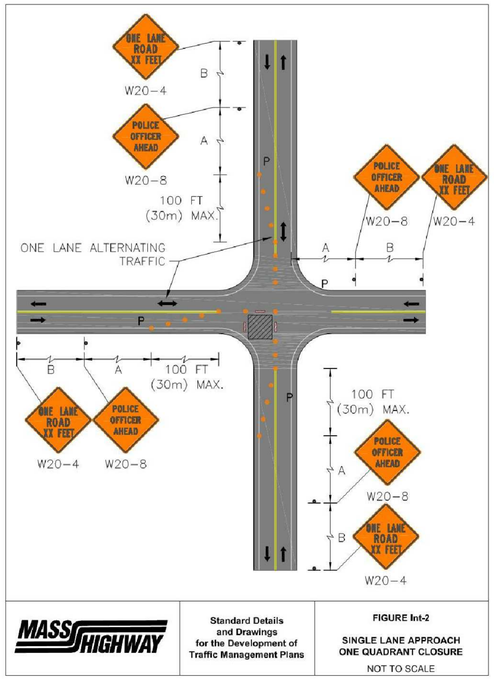
RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD

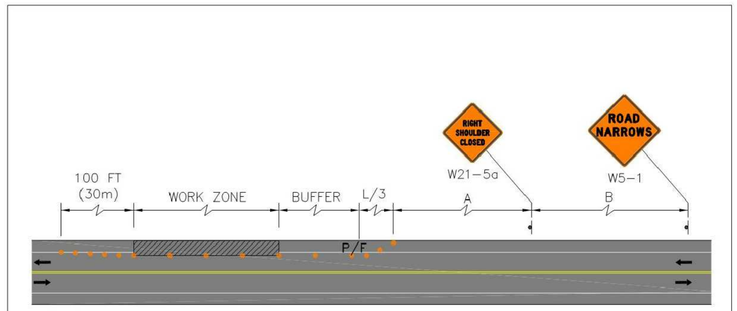
T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

TR-1

Designed By: MTG/MEC | Drawn By: MTG | Checked By: PSD | Approved By: PPN

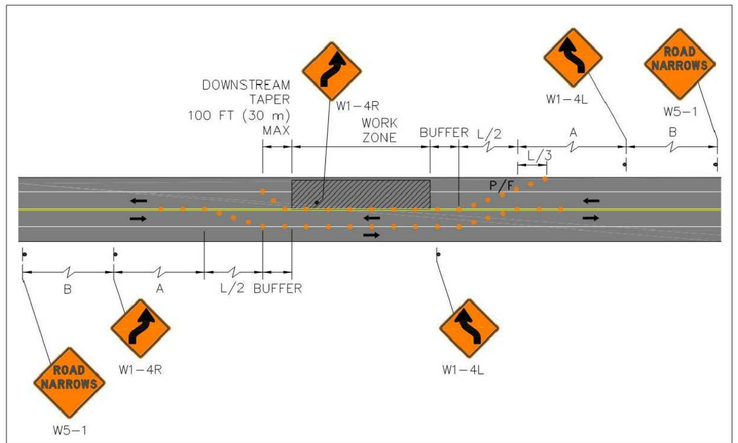


MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE Int-2** — **SINGLE LANE APPROACH ONE QUADRANT CLOSURE** — NOT TO SCALE

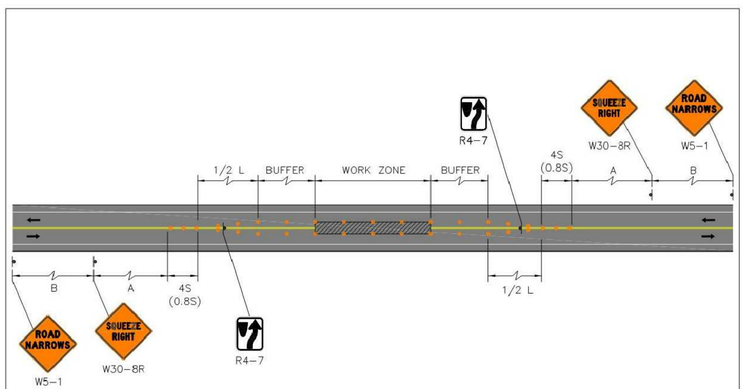


DRUM SPACING DEPENDENT ON SPEED

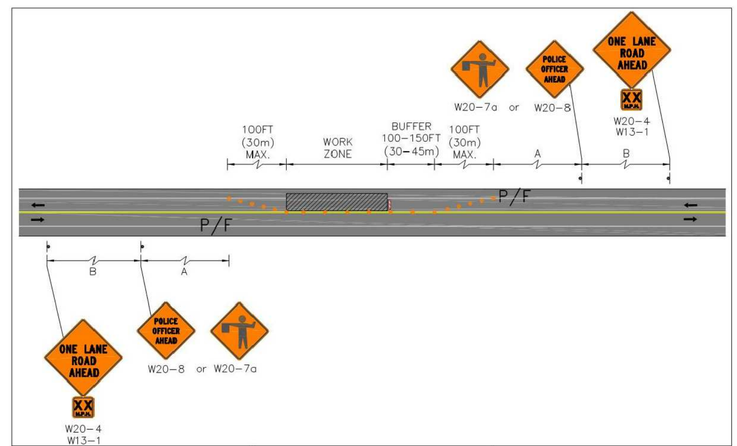
MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-1** — **TWO LANE ROAD SHOULDER CLOSED** — NOT TO SCALE



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-2** — **TWO LANE ROAD SHOULDER AND TRAVEL LANE CLOSED** — NOT TO SCALE



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-3** — **TWO LANE ROAD CENTER OF ROAD CLOSURE** — NOT TO SCALE



MASSHIGHWAY | Standard Details and Drawings for the Development of Traffic Management Plans | **FIGURE TLR-5** — **TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC WITH POLICE DETAIL** — NOT TO SCALE

TOWN OF WAYLAND
MASSACHUSETTS

2018 WATER MAIN IMPROVEMENTS
(ROUTE 20)

TRAFFIC MANAGEMENT PLAN
SHEET 2

Drawn By: MTG | Designed By: MTG/MEC | Checked By: PSD | Approved By: RPN

Description | Date | Rev.

RGP NOI SUBMITTAL
NOT FOR CONSTRUCTION

TATA & HOWARD

T&H NO.: 5231
DATE: APRIL 2018
SCALE: AS NOTED

TR-2

Appendix C

TATA & HOWARD

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-1 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/5/2017 **Date End:** 12/05/2017 **Location:** See Plan

Augers: HSA	**Sampler:**	140lbs	**Sampler:**
Size: 2.25”	S/S	Fall:30”	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/5/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						12”	ASPHALT
-	S-1	1’ -2’	12”	8”	10-10		Dry, medium dense, brown FINE TO MEDIUM SAND.
-	S-2	2’ – 4’	24”	18”	8-7-13-13		Dry, medium dense, brown FINE SAND AND SILT, some medium sand.
2’6”							
-	S-3	4’ – 6’	24”	10”	5-5-7-7		Dry, medium dense, light brown FINE TO MEDIUM SAND.
5’0”							
-	S-4	6’ – 8’	24”	12”	7-7-9-11		Dry, medium dense, light brown FINE TO MEDIUM SAND.
7’6”						8’	
-							Bottom of Exploration = 8’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-2 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/04/2017 **Date End:** 12/04/2017 **Location:** See Plan

Augers: HSA Size: 2.25" **Sampler:** S/S 140lbs Fall:30" **Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/4/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6"	S/C	SAMPLE DESCRIPTION
-						24"	ASPHALT
-							
-							
-	S-1	2' – 4'	24"	16"	13-7-4-3		Dry, medium dense, FINE TO MEDIUM SAND, little gravel.
2'6"							
-							
-							
-	S-2	4' – 6'	24"	16"	1-1-2-3		Dry, very loose, brown FINE TO MEDIUM SAND, trace gravel.
-							
5'0"							
-							
-	S-3	6' – 8'	24"	16"	4-8-10-7		Moist, medium dense, light brown FINE TO MEDIUM SAND, trace gravel.
-							
-							
7'6"						8'	
-							Bottom of Exploration = 8'
-							
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Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-3 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/14/2017 **Date End:** 12/14/2017 **Location:** See Plan

Augers: HSA	**Sampler:**	140lbs	**Sampler:**
Size: 2.25”	S/S	Fall:30”	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/14/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						12”	ASPHALT
-	S-1	1’ – 2’	12”	6”	41-32		Dry, very dense, brown FINE TO MEDIUM SAND, some gravel, no odor. PID/0.
-	S-2	2’ – 4’	24”	6”	17-18-6-3		Dry, medium dense, brown FINE TO MEDIUM SAND, some gravel, no odor PID/0.
2’6”							
-	S-3	4’ – 6’	24”	18”	2-8-18-20		Wet, medium dens, brown FINE TO MEDIUM SAND, no odor PID/0.
5’0”							
-	S-4	6’ – 8’	24”	16”	15-13-16-15		Wet, medium dense, brown MEDIUM TO COARSE SAND, no odor PID/0.
7’6”						8’	
-							Bottom of Exploration = 8’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig Set temporary well at 8’ 3’ Screen, 2’ Riser 2 sand.

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610	New England Boring Contractors P.O. Box 165 Derry, NH 03038	Fax: (603) 437-0034

Boring # B-4 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/5/2017 **Date End:** 12/05/2017 **Location:** See Plan

Augers: HSA Size: 2.25”	**Sampler:** S/S	140lbs Fall:30”	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/5/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						12”	ASPHALT
-	S-1	1’- 2’	12”	8”	29-26		Dry, very dense, gray, FINE TO MEDIUM SAND, some coarse gravel, no odor. PID/0
-	S-2	2’ – 4’	24”	14”	24-11-7-6		Dry, medium dense, brown FINE TO MEDIUM SAND, trace coarse sand, trace gravel, trace clay. PID/0
2’6”							
-	S-3	4’ – 6’	24”	20”	1-1-4-12		Moist, loose, dark brown FINE SAND AND SILT, little medium sand.
5’0”							
-	S-4	6’ – 8’	24”	18”	16-22-18-21		Dry, dense, brown FINE TO MEDIUM SAND, little coarse sand, little silt. (petro odor) PID/5.0
7’6”						8’	
-							Bottom of Exploration = 8’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig Set temporary well at 8.5. 3.5 Screen, 2.5 Riser 2.5 sand.

S/#: Sample	**PEN:** Penetration	**REC:** Recovery	**S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-5 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/5/2017 **Date End:** 12/05/2017 **Location:** See Plan

Augers: HSA Size: 2.25”	**Sampler:** S/S	140lbs Fall:30”	**Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/5/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						12”	ASPHALT
-	S-1	1’- 2’	12”	5”	18-20		Dry, dense, gray FINE TO MEDIUM SAND, some gravel, no odor. PID/0
-	S-2	2’ – 4’	24”	16”	13-6-3-3		Dry, loose, brown FINE TO MEDIUM SAND, trace gravel, no odor. PID/0
2’6”							
-	S-3	4’ – 6’	24”	22”	WOH/12”-3-5		Wet, medium dense, brown FINE TO MEDIUMS SAND, no odor. PID/2.9
5’0”							
-	S-4	6’ – 8’	24”	24”	6-12-12-12		Wet, medium dense, brown FINE TO MEDIM SAND, no odor. PID/0.8
7’6”							
-	S-5	8’ – 10’	24”	20”	13-12-13-12		Wet, medium dense, brown FINE TO MEDIUM SAND, no odor. PID/0.6
-						10’	
-							Bottom of Exploration = 10’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig Set temporary well at 9’8” 5’4” Screen, 4” Riser 3’ sand.

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-6 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/5/2017 **Date End:** 12/05/2017 **Location:** See Plan

Augers: HSA Size: 2.25" **Sampler:** S/S 140lbs Fall:30" **Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/5/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6"	S/C	SAMPLE DESCRIPTION
-						12"	ASPHALT
-	S-1	1'- 2'	12"	6"	23-23		Dry, dense, gray FINE TO MEDIUM SAND, some gravel.
-	S-2	2' – 4'	24"	18"	11-9-9-12		Dry, medium dense, brown FINE TO MEDIUM SAND, trace gravel,
2'6"							
-	S-3	4' – 5'	24"	16"	8-14-15-16		Wet, medium dense brown FINE TO MEDIUM SAND, trace gravel.
-	S-3A	5' – 5'4"					Wet, medium dense, brown-rust MEDIUM TO COARSE SAND, some gravel.
5'0"							
-	S-4	6' – 8'	24"	24"	3-14-14-14		Wet, medium dense, brown MEDIUM TO COARSE SAND, little gravel. (Had some blow in at 8')
7'6"						8'	
-							Bottom of Exploration = 8'

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig Set temporary well at 8' 3' Screen, 2' Riser 2 sand.

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-7 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/14/2017 **Date End:** 12/14/2017 **Location:** See Plan

Augers: HSA	**Sampler:**	140lbs	**Sampler:**
Size: 2.25”	S/S	Fall:30”	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/14/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						12”	ASPHALT
-	S-1	1’ – 2’	12”	7”	35-15		Dry, dense, brown FINE TO MEDIUM SAND, trace gravel.. no odor PID/0
-	S-2	2’ – 4’	24”	6”	11-2-2-9		Dry, loose, brown FINE TO MEDIUM SAND, some gravel, little coarse sand, no odor PID/0,
2’6”							
-	S-3	4’ – 6’	24”	18”	3-7-12-11		Wet, medium dense, brown FINE TO MEDIUM SAND, no odor PID/0
5’0”							
-	S-4	6’ – 8’	24”	24”	6-11-14-16		Wet, medium dense, brown FINE TO MEDIUM SAND, little coarse sand, no odor PID/0
7’6”						8’	
-							Bottom of Exploration = 8’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig Set temporary well at 8’ 3’ Screen, 2’ Riser 2 sand.

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-8 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/5/2017 **Date End:** 12/05/2017 **Location:** See Plan

Augers: HSA	**Sampler:**	140lbs	**Sampler:**
Size: 2.25”	S/S	Fall:30”	1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/5/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6”	S/C	SAMPLE DESCRIPTION
-						13”	ASPHALT
-	S-1	1’- 2’	12”	4”	7-7		Dry, medium dense, brown to dark brown FINE TO MEDIUM SAND, some gravel.
-	S-2	2’ – 4’	24”	15”	5-3-2-6		Dry, very loose, brown FINE TO MEDIUM SAND, little gravel.
2’6”							
-	S-3	4’ – 6’	24”	18”	7-11-12-10		Wet, medium dense, brown FINE TO MEDIUM SAND, some coarse sand, little gravel.
5’0”							
-	S-4	6’ – 8’	24”	14”	7-9-9-9		Wet, medium dense brown SILT AND FINE SAND.
7’6”						8’	
-							Bottom of Exploration = 8’

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

(603) 437-1610 **New England Boring Contractors** **Fax: (603) 437-0034**
P.O. Box 165
Derry, NH 03038

Boring # B-9 **Project**: Tata & Howard, Inc. Test Borings 5231 **Project #** 149591

Project Address: **City:** Wayland **State:** MA **Zip:**

Date Start: 12/04/2017 **Date End:** 12/04/2017 **Location:** See Plan

Augers: HSA Size: 2.25" **Sampler:** S/S 140lbs Fall:30" **Sampler:** 1-3/8 in. I.D. 30 in.

G R O U N D W A T E R O B S E R V A T I O N

Date: 12/4/17	**Depth:**	**Casing:**	**Stabilization Period**

DP	S./#	DEPTH	PEN	REC	BLOWS/6"	S/C	SAMPLE DESCRIPTION
-						6"	ASPHALT
-	S-1	6" – 2'	18'	10"	11-11-7		Dry, medium dense, brown FINE TO MEDIUM SAND, little gravel.
-	S-2	2' – 4'	24"	16"	6-8-11-11		Dry, medium dense, light brown FINE SAND, some medium sand.
2'6"							
-	S-3	4' – 6'	24"	14"	5-5-5-5		Dry, loose, light brown FINE SAND, some medium sand.
5'0"							
-	S-4	6' – 8'	24"	12"	5-7-6-5		Wet, loose, light brown SILT AND FINE SAND.
7'6"						8'	
-							Bottom of Exploration = 8'

Drillers. Michael Matarrozzo **Helper:** Matthew Soucy **Inspector:** Derek McClellen

Remarks: Truck mounted Steel rig

S/#: Sample **PEN:** Penetration **REC:** Recovery **S/C:** Strata Change

Appendix D

TATA & HOWARD

Table 2
Summary of Groundwater Analytical Results
2018 Water Main Improvements
Wayland, Massachusetts

Sample Location *Sample Date* *Depth to Water (feet)* **PARAMETER - Method (units)**	**TW-3** **12/14/17** **6.20**	**TW-4** **12/5/17** **4.75**	**TW-5** **12/5/17** **5.3**	**TW-6** **12/5/17** **4.65**	**TW-7** **12/14/17** **5.10**	**RCGW-1 Reportable Concentrations**	**Method 1 GW-2 Standards**	**Effluent Limitation TBEL Concentrations**
EPHs - MassDEP 04-1.1 (µg/L)			NT	NT				
C_9-C_{18} Aliphatics	<93	<93			<93	700	5,000	NA
C_{19}-C_{36} Aliphatics	<93	<93			<93	14,000	NA	NA
C_{11}-C_{22} Aromatics	<93.5	**228**			108	200	50,000	NA
Target PAH Analytes			NT	NT				
Diesel Analytes (µg/L)								
2-Methylnaphthalene	<4.7	<4.7			**20.8**	10	2,000	NA
Acenaphthene	<4.7	<4.7			<4.7	20	NA	NS
Naphthalene	<9.3	<9.3			67.5	140	700	20
Phenanthrene	<4.7	<4.7			<4.7	40	NA	NS
VPHs - MassDEP 04-1.1 (µg/L)			NT	NT				
C_5-C_8 Aliphatics	<150	**358**			<150	300	3,000	NA
C_9-C_{12} Aliphatics	<150	274			<150	700	5,000	NA
C_9-C_{10} Aromatics	<100	**579**			167	200	4,000	NA
Target VOC Analytes (µg/L)			NT	NT				
Benzene	<1.5	**28.3**			2.4	5	1,000	5
Toluene	<5.0	<5.0			6.5	1,000	50,000	NS
Ethylbenzene	<5.0	<5.0			9.5	700	20,000	NS
Naphthalene	<5.0	13.3			93.6	140	700	20
m- & p- Xylenes	<10.0	<10.0			<10.0	3,000	3,000	NS
o-Xylene	<5.0	<5.0			9.0	3,000	3,000	NS
MTBE	<1.5	<1.5			1.9	70	50,000	70
VOCs - EPA 8260B (µg/L)	NT	NT	Others ND	Others ND	NT			
cis-1,2-Dichloroethene			**142**	2.4		20	20	70
trans-1,2-Dichloroethene			4	<1.0		80	80	NS
Naphthalene			<1.0	16.6		140	700	20
Tetrachloroethylene			**276**	**53.7**		5	50	5
Trichloroethylene			**41.8**	1.9		5	5	5
Vinyl Chloride			**39.5**	<1.0		2	2	2
Total VOCs			503.30	74.60		NA	NA	NA

Notes:
1. µg/L = Micrograms per liter.
2. ND = Not detected above method reporting limit; NT = Not tested; NA = Not Applicable; NS = Not Specified.
3. EPHs = Extractable petroleum hydrocarbons; PAH = Polycyclic aromatic hydrocarbons; VPHs = Volatile petroleum hydrocarbons; VOCs = Volatile organic compounds.
4. Values preceded by "<" indicate that the result is non detect and the method reporting limit is shown.
5. Results in bold indicate that the applicable RCGW-1 Reportable Concentration is exceeded. Underlined data also indicate that the Method 1 GW-2 Standards are exceeded.
6. TW refers to the groundwater sample collected from the temporary well installed when the soil borings at the corresponding identification number were conducted.

Table 3
Summary of Additional Groundwater Analytical Results for NPDES Permit Application
Boston Post Road
Wayland, Massachusetts

Sample Location *Sample Date* *Depth to Water (feet)* **PARAMETER - Method (units)**	**298 BPR (AMB-117)** **2/26/2018** **3.79**	**268 BPR (SB4)** **2/28/2018** **2.08**	**338 BPR (MW-3)** **3/21/2018** **1.85**	**Pine Brook** **2/26/2018** **NA**	**RCGW-1 Reportable Concentrations**	**Effluent Limitation TBEL Concentrations**
Semi-Voliatile Organic Compouns EPA-625 (SIM) (µg/L)	NT	ALL ND	Others ND	NT		
Di-n-butylphthalate		<2.34	5.80		NS	NS
Fluorene		<0.19	0.48		30	NS
Total Group I PAHs		ND	**6.28**		NS	1
Naphthalene		<0.19	**120**		140	20
Total Group II PAHs		ND	**120**		NS	100
Semi-Voliatile Organic Compouns EPA-8270D (SIM) (µg/L)						
1,4-Dioxane	NT	<0.250	<0.250	NT	0.30	200
Total Petroleum Hydrocarbons EPA 1664A (mg/L)	NT	<5	<5	NT	0.2	5
VOCs - EPA 524.2 (µg/L)						
Halogenated VOCs	All ND	NT	NT	NT		
Acetone	NT	<5.0	<5.0	NT	6,300	7,970
Benzene	NT	<0.5	**14.0**	NT	5	5
Ethylbenzene	NT	2.0	365	NT	700	NS
Methyl tert-Butyl Ether (MTBE)	NT	4.4	0.5	NT	70	70
Tertiary-amyl methyl ether (TAME)	NT	NT	<1.0	NT	NS	90
Tertiary-butyl Alcohol	NT	<25.0	<25.0	NT	NS	120
Toluene	NT	<0.5	22.8	NT	1,000	NS
Xylene Total	NT	5.2	1,776	NT	3,000	NS
Phenols - EPA 420.1	NT	<100	<100	NT	NS	1,080
Total BTEX	NT	11.60	**2,177.80**	NT	NS	100
1,2-Dibromoethane (EDB) - EPA 504.1 (µg/L)	<0.015	NT	NT	NT	0.02	0.05
Ethanol - ASTM D3695 (mg/L)	NT	NT	<10	NT	1	Report (mg/L)
Total Metals - EPA 3005A/200.7 (µg/L)						
Antimony	<5.0	<10.0	<1.5	<5.0	6	206
Arsenic	0.6	7.7	13.4	0.7	10	104
Cadmium	<0.05	0.15	<0.08	0.07	4	10.2
Chromium (total)	<2.0	<4.0	<2.0	<2.0	100	NS
Chromium III	<10.0	<10.0	<10.0	NT	100	323
Chromium VI EPA 3500CR B-2009	<10.0	<10.0	<10.0	<10.0	100	323
Copper	7.6	<4.0	<2.0	2.4	10,000	242
Iron	662	4,320	**39,100**	693	NS	5,000
Lead	0.8	<1.0	<1.5	1.0	10	160
Mercury	<0.200	<0.200	<0.200	<0.200	2	0.739
Nickel	<5.0	<10.0	<5.0	<5.0	100	1,450
Selenium	<1.0	<2.0	<3.0	<1.0	50	235.8
Silver	<0.5	<1.0	1.9	<0.5	7	35.1
Zinc	14.3	401	23.4	33.4	900	420
Hardness	237,000	246,000	156,000	43,100	NS	NS
Classic Chemistry						
Ammonia as N - EPA 350.1 (mg/L)	0.11	0.36	2.18	<0.10	NS	Report (mg/L)
Chloride - EPA 300.0 (mg/L)	138	338	237	NT	NS	Report (µg/L)
Total Cyanide (LL) - EPA 4500CN CE (µg/L)	<5.0	<5.0	<5.0	NT	30	178,000
Total Residual Chlorine - EPA 4500CI D (µg/L)	<20	<20	<20	NT	NS	200
Total Suspemded Solids - EPA 2540D (mg/L)	**801**	<5	23	NT	NS	30

Notes:
1. RCGW-1 = Massachusetts Department of Environmental Protection Reportable Concentration category for groundwater. The Reportable Concentration standards were revised effective April 25, 2014.
2. µg/L = Micrograms per liter; mg/L = Milligrams per liter
3. TBEL = Technology based effluent limit; ND = Not detected above method reporting limit; NS = Not specified; NT = Not tested
4. VOCs = Volatile organic compounds
5. Results in bold indicate that the TBEL is exceeded.
6. Values preceded by "<" indicate that the result is non detect and the method reporting limit is shown.
7. Pine Brook was sampled and testing as the receiving water for the dewatering treatment system discharge point.
8. Per the Remediation General Permit Notice of Intent Application Form, Ammonia should be reported in mg/L , Chloride should be reported in µg/L, and Ethanol should be reported in mg/L.

CERTIFICATE OF ANALYSIS

Derek McClellan
Tata and Howard
67 Forest Street
Marlborough, MA 01752

This lab report includes the analytical results for TW-3 and TW-7, as indicated in Table 2.

RE: Wayland Water Main Improvements (5231)
ESS Laboratory Work Order Number: 1712360

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 3:18 pm, Dec 26, 2017

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

SAMPLE RECEIPT

The following samples were received on December 15, 2017 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for EPH were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1712360-01	TW-3	Ground Water	EPH8270, MADEP-EPH, MADEP-VPH
1712360-02	TW-7	Ground Water	EPH8270, MADEP-EPH, MADEP-VPH

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1712360-01 through 1712360-02**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV B	( ) 8081 Pesticides CAM V C	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX 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 times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) 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?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	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)?	Yes (X) 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 protocols(s)?	Yes (X) No ( )*
	***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 WSC-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 ( ) No (X)*

****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, accurate and complete.

Signature: Laurel Stoddard Date: December 26, 2017

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-3
Date Sampled: 12/14/17 12:00
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1712360
ESS Laboratory Sample ID: 1712360-01
Sample Matrix: Ground Water
Units: ug/L

Prepared: 12/18/17 15:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	ZLC	12/20/17 10:38	C7L0348	CL71802
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	ZLC	12/20/17 10:38	C7L0348	CL71802
C11-C22 Unadjusted Aromatics1	ND (93.5)		EPH8270		1	ZLC	12/22/17 19:12	C7L0356	CL71802
C11-C22 Aromatics1,2	ND (93.5)		EPH8270			ZLC	12/22/17 19:12		[CALC]
2-Methylnaphthalene	ND (4.7)		EPH8270		1	ZLC	12/22/17 19:12	C7L0356	CL71802
Acenaphthene	ND (4.7)		EPH8270		1	ZLC	12/22/17 19:12	C7L0356	CL71802
Naphthalene	ND (9.3)		EPH8270		1	ZLC	12/22/17 19:12	C7L0356	CL71802
Phenanthrene	ND (4.7)		EPH8270		1	ZLC	12/22/17 19:12	C7L0356	CL71802
Preservative:	**pH <= 2**		MADEP-EPH			ZLC			CL71802

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*44 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*110 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*105 %*		*40-140*
Surrogate: O-Terphenyl	*96 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-3
Date Sampled: 12/14/17 12:00
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712360
ESS Laboratory Sample ID: 1712360-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (100)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
C5-C8 Aliphatics1,2	ND (150)		MADEP-VPH		1	12/19/17 22:02		[CALC]
C9-C12 Aliphatics2,3	ND (150)		MADEP-VPH		1	12/19/17 22:02		[CALC]
Benzene	ND (1.5)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Ethylbenzene	ND (5.0)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Methyl tert-Butyl Ether	ND (1.5)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Naphthalene	ND (5.0)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Toluene	ND (5.0)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Xylene O	ND (5.0)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Xylene P,M	ND (10.0)		MADEP-VPH		1	12/19/17 22:02	C7L0306	CL72021
Preservative:	**pH <= 2**		MADEP-VPH					CL72021

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*110 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*107 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-7
Date Sampled: 12/14/17 10:25
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1712360
ESS Laboratory Sample ID: 1712360-02
Sample Matrix: Ground Water
Units: ug/L

Prepared: 12/18/17 15:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	12/19/17 15:35	C7L0256	CL71802
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	SMR	12/19/17 15:35	C7L0256	CL71802
C11-C22 Unadjusted Aromatics1	**196** (93.5)		EPH8270		1	ZLC	12/22/17 19:48	C7L0356	CL71802
C11-C22 Aromatics1,2	**108** (93.5)		EPH8270			ZLC	12/22/17 19:48		[CALC]
2-Methylnaphthalene	**20.8** (4.7)		EPH8270		1	ZLC	12/22/17 19:48	C7L0356	CL71802
Acenaphthene	ND (4.7)		EPH8270		1	ZLC	12/22/17 19:48	C7L0356	CL71802
Naphthalene	**67.5** (9.3)		EPH8270		1	ZLC	12/22/17 19:48	C7L0356	CL71802
Phenanthrene	ND (4.7)		EPH8270		1	ZLC	12/22/17 19:48	C7L0356	CL71802
Preservative:	**pH <= 2**		MADEP-EPH			ZLC			CL71802

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*53 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*104 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*95 %*		*40-140*
Surrogate: O-Terphenyl	*95 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-7
Date Sampled: 12/14/17 10:25
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712360
ESS Laboratory Sample ID: 1712360-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**167** (100)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
C5-C8 Aliphatics1,2	ND (150)		MADEP-VPH		1	12/19/17 1:14		[CALC]
C9-C12 Aliphatics2,3	ND (150)		MADEP-VPH		1	12/19/17 1:14		[CALC]
Benzene	**2.4** (1.5)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Ethylbenzene	**9.5** (5.0)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Methyl tert-Butyl Ether	**1.9** (1.5)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Naphthalene	**93.6** (5.0)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Toluene	**6.5** (5.0)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Xylene O	**9.0** (5.0)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Xylene P,M	ND (10.0)		MADEP-VPH		1	12/19/17 1:14	C7L0271	CL71837
Preservative:	**pH <= 2**		MADEP-VPH					CL71837

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*115 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*107 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71802 - 3510C										
Blank										
C19-C36 Aliphatics1	ND	100	ug/L							
C9-C18 Aliphatics1	ND	100	ug/L							
Decane (C10)	ND	5	ug/L							
Docosane (C22)	ND	5	ug/L							
Dodecane (C12)	ND	5	ug/L							
Eicosane (C20)	ND	5	ug/L							
Hexacosane (C26)	ND	5	ug/L							
Hexadecane (C16)	ND	5	ug/L							
Hexatriacontane (C36)	ND	5	ug/L							
Nonadecane (C19)	ND	5	ug/L							
Nonane (C9)	ND	5	ug/L							
Octacosane (C28)	ND	5	ug/L							
Octadecane (C18)	ND	5	ug/L							
Tetracosane (C24)	ND	5	ug/L							
Tetradecane (C14)	ND	5	ug/L							
Triacontane (C30)	ND	5	ug/L							
Surrogate: 1-Chlorooctadecane	*36.3*		ug/L	*50.00*		*73*	*40-140*			
Blank										
2-Methylnaphthalene	ND	5.0	ug/L							
Acenaphthene	ND	5.0	ug/L							
Acenaphthylene	ND	5.0	ug/L							
Anthracene	ND	5.0	ug/L							
Benzo(a)anthracene	ND	5.0	ug/L							
Benzo(a)pyrene	ND	10.0	ug/L							
Benzo(b)fluoranthene	ND	5.0	ug/L							
Benzo(g,h,i)perylene	ND	10.0	ug/L							
Benzo(k)fluoranthene	ND	10.0	ug/L							
C11-C22 Aromatics1,2	ND	100	ug/L							
C11-C22 Unadjusted Aromatics1	ND	100	ug/L							
Chrysene	ND	10.0	ug/L							
Dibenzo(a,h)Anthracene	ND	5.0	ug/L							
Fluoranthene	ND	10.0	ug/L							
Fluorene	ND	5.0	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	5.0	ug/L							
Naphthalene	ND	10.0	ug/L							
Phenanthrene	ND	5.0	ug/L							
Pyrene	ND	5.0	ug/L							
Surrogate: 2-Bromonaphthalene	*50.8*		ug/L	*50.00*		*102*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*51.6*		ug/L	*50.00*		*103*	*40-140*			
Surrogate: O-Terphenyl	*48.5*		ug/L	*50.00*		*97*	*40-140*			
LCS										
C19-C36 Aliphatics1	359	100	ug/L	400.0		90	40-140			
C9-C18 Aliphatics1	216	100	ug/L	300.0		72	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71802 - 3510C										
Decane (C10)	29	5	ug/L	50.00		57	40-140			
Docosane (C22)	42	5	ug/L	50.00		84	40-140			
Dodecane (C12)	29	5	ug/L	50.00		59	40-140			
Eicosane (C20)	42	5	ug/L	50.00		84	40-140			
Hexacosane (C26)	42	5	ug/L	50.00		84	40-140			
Hexadecane (C16)	41	5	ug/L	50.00		82	40-140			
Hexatriacontane (C36)	44	5	ug/L	50.00		89	40-140			
Nonadecane (C19)	43	5	ug/L	50.00		85	40-140			
Nonane (C9)	23	5	ug/L	50.00		45	30-140			
Octacosane (C28)	42	5	ug/L	50.00		84	40-140			
Octadecane (C18)	40	5	ug/L	50.00		81	40-140			
Tetracosane (C24)	42	5	ug/L	50.00		84	40-140			
Tetradecane (C14)	38	5	ug/L	50.00		76	40-140			
Triacontane (C30)	42	5	ug/L	50.00		85	40-140			
Surrogate: 1-Chlorooctadecane	*36.0*		ug/L	*50.00*		*72*	*40-140*			
LCS										
2-Methylnaphthalene	34.4	5.0	ug/L	50.00		69	40-140			
Acenaphthene	39.0	5.0	ug/L	50.00		78	40-140			
Acenaphthylene	39.2	5.0	ug/L	50.00		78	40-140			
Anthracene	42.8	5.0	ug/L	50.00		86	40-140			
Benzo(a)anthracene	44.2	5.0	ug/L	50.00		88	40-140			
Benzo(a)pyrene	42.2	10.0	ug/L	50.00		84	40-140			
Benzo(b)fluoranthene	44.1	5.0	ug/L	50.00		88	40-140			
Benzo(g,h,i)perylene	42.0	10.0	ug/L	50.00		84	40-140			
Benzo(k)fluoranthene	42.7	10.0	ug/L	50.00		85	40-140			
C11-C22 Aromatics1,2	561	100	ug/L							
C11-C22 Unadjusted Aromatics1	713	100	ug/L	850.0		84	40-140			
Chrysene	43.0	10.0	ug/L	50.00		86	40-140			
Dibenzo(a,h)Anthracene	43.0	5.0	ug/L	50.00		86	40-140			
Fluoranthene	42.4	10.0	ug/L	50.00		85	40-140			
Fluorene	40.7	5.0	ug/L	50.00		81	40-140			
Indeno(1,2,3-cd)Pyrene	43.5	5.0	ug/L	50.00		87	40-140			
Naphthalene	35.8	10.0	ug/L	50.00		72	40-140			
Phenanthrene	42.7	5.0	ug/L	50.00		85	40-140			
Pyrene	43.7	5.0	ug/L	50.00		87	40-140			
Surrogate: 2-Bromonaphthalene	*46.2*		ug/L	*50.00*		*92*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*48.4*		ug/L	*50.00*		*97*	*40-140*			
Surrogate: O-Terphenyl	*45.0*		ug/L	*50.00*		*90*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	349	100	ug/L	400.0		87	40-140	3	25	
C9-C18 Aliphatics1	207	100	ug/L	300.0		69	40-140	4	25	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71802 - 3510C										
Decane (C10)	27	5	ug/L	50.00		53	40-140	7	25	
Docosane (C22)	41	5	ug/L	50.00		82	40-140	2	25	
Dodecane (C12)	27	5	ug/L	50.00		55	40-140	7	25	
Eicosane (C20)	41	5	ug/L	50.00		82	40-140	2	25	
Hexacosane (C26)	41	5	ug/L	50.00		82	40-140	2	25	
Hexadecane (C16)	40	5	ug/L	50.00		80	40-140	2	25	
Hexatriacontane (C36)	43	5	ug/L	50.00		86	40-140	4	25	
Nonadecane (C19)	41	5	ug/L	50.00		83	40-140	2	25	
Nonane (C9)	21	5	ug/L	50.00		43	30-140	6	25	
Octacosane (C28)	41	5	ug/L	50.00		82	40-140	3	25	
Octadecane (C18)	39	5	ug/L	50.00		79	40-140	2	25	
Tetracosane (C24)	41	5	ug/L	50.00		82	40-140	2	25	
Tetradecane (C14)	37	5	ug/L	50.00		74	40-140	3	25	
Triacontane (C30)	41	5	ug/L	50.00		82	40-140	3	25	
Surrogate: 1-Chlorooctadecane	*34.7*		ug/L	*50.00*		*69*	*40-140*			
LCS Dup										
2-Methylnaphthalene	35.1	5.0	ug/L	50.00		70	40-140	2	20	
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Acenaphthene	39.6	5.0	ug/L	50.00		79	40-140	2	20	
Acenaphthylene	40.0	5.0	ug/L	50.00		80	40-140	2	20	
Anthracene	42.6	5.0	ug/L	50.00		85	40-140	0.3	20	
Benzo(a)anthracene	44.5	5.0	ug/L	50.00		89	40-140	0.6	20	
Benzo(a)pyrene	41.8	10.0	ug/L	50.00		84	40-140	0.9	20	
Benzo(b)fluoranthene	43.7	5.0	ug/L	50.00		87	40-140	0.8	20	
Benzo(g,h,i)perylene	42.2	10.0	ug/L	50.00		84	40-140	0.4	20	
Benzo(k)fluoranthene	43.5	10.0	ug/L	50.00		87	40-140	2	20	
C11-C22 Aromatics1,2	538	100	ug/L							
C11-C22 Unadjusted Aromatics1	692	100	ug/L	850.0		81	40-140	3	25	
Chrysene	42.7	10.0	ug/L	50.00		85	40-140	0.7	20	
Dibenzo(a,h)Anthracene	42.6	5.0	ug/L	50.00		85	40-140	0.8	20	
Fluoranthene	43.1	10.0	ug/L	50.00		86	40-140	2	20	
Fluorene	41.8	5.0	ug/L	50.00		84	40-140	3	20	
Indeno(1,2,3-cd)Pyrene	45.2	5.0	ug/L	50.00		90	40-140	4	20	
Naphthalene	36.2	10.0	ug/L	50.00		72	40-140	1	20	
Naphthalene Breakthrough	0.0		%				0-5		200	
Phenanthrene	43.1	5.0	ug/L	50.00		86	40-140	1	20	
Pyrene	44.0	5.0	ug/L	50.00		88	40-140	0.8	20	
Surrogate: 2-Bromonaphthalene	*46.8*		ug/L	*50.00*		*94*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*50.6*		ug/L	*50.00*		*101*	*40-140*			
Surrogate: O-Terphenyl	*44.6*		ug/L	*50.00*		*89*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL71837 - 5030B										
Blank										
1,2,4-Trimethylbenzene	ND	5.0	ug/L							
2,2,4-Trimethylpentane	ND	5.0	ug/L							
2-Methylpentane	ND	5.0	ug/L							
Benzene	ND	1.5	ug/L							
C5-C8 Aliphatics1,2	ND	150	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Aliphatics2,3	ND	150	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
n-Butylcyclohexane	ND	5.0	ug/L							
n-Decane	ND	5.0	ug/L							
Nonane (C9)	ND	5.0	ug/L							
Pentane	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*55.4*		ug/L	*50.00*		*111*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*55.7*		ug/L	*50.00*		*111*	*70-130*			
LCS										
1,2,4-Trimethylbenzene	94.7		ug/L	100.0		95	70-130			
2,2,4-Trimethylpentane	146		ug/L	150.0		97	70-130			
2-Methylpentane	154		ug/L	150.0		103	70-130			
Benzene	48.5		ug/L	50.00		97	70-130			
C5-C8 Aliphatics1,2	77.4		ug/L							
C5-C8 Unadjusted Aliphatics	412		ug/L	400.0		103	70-130			
C9-C10 Aromatics	92.0		ug/L	100.0		92	70-130			
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	249		ug/L	300.0		83	70-130			
Ethylbenzene	49.4		ug/L	50.00		99	70-130			
Methyl tert-Butyl Ether	145		ug/L	150.0		97	70-130			
Naphthalene	103		ug/L	100.0		103	70-130			
n-Butylcyclohexane	82.2		ug/L	100.0		82	70-130			
n-Decane	94.3		ug/L	100.0		94	70-130			
Nonane (C9)	81.2		ug/L	100.0		81	30-130			
Pentane	111		ug/L	100.0		111	70-130			
Toluene	141		ug/L	150.0		94	70-130			
Xylene O	95.3		ug/L	100.0		95	70-130			
Xylene P,M	190		ug/L	200.0		95	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*57.9*		ug/L	*50.00*		*116*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*57.4*		ug/L	*50.00*		*115*	*70-130*			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL71837 - 5030B										
LCS Dup										
1,2,4-Trimethylbenzene	95.4		ug/L	100.0		95	70-130	0.7	25	
2,2,4-Trimethylpentane	145		ug/L	150.0		97	70-130	0.5	25	
2-Methylpentane	150		ug/L	150.0		100	70-130	3	25	
Benzene	49.0		ug/L	50.00		98	70-130	1	25	
C5-C8 Aliphatics1,2	66.1		ug/L							
C5-C8 Unadjusted Aliphatics	403		ug/L	400.0		101	70-130	2	25	
C9-C10 Aromatics	92.7		ug/L	100.0		93	70-130	0.7	25	
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	246		ug/L	300.0		82	70-130	0.9	25	
Ethylbenzene	50.5		ug/L	50.00		101	70-130	2	25	
Methyl tert-Butyl Ether	145		ug/L	150.0		97	70-130	0.1	25	
Naphthalene	102		ug/L	100.0		102	70-130	0.7	25	
n-Butylcyclohexane	80.4		ug/L	100.0		80	70-130	2	25	
n-Decane	95.1		ug/L	100.0		95	70-130	0.9	25	
Nonane (C9)	79.1		ug/L	100.0		79	30-130	3	25	
Pentane	108		ug/L	100.0		108	70-130	3	25	
Toluene	143		ug/L	150.0		95	70-130	1	25	
Xylene O	97.2		ug/L	100.0		97	70-130	2	25	
Xylene P,M	194		ug/L	200.0		97	70-130	2	25	
Surrogate: 2,5-Dibromotoluene - FID	*54.7*		ug/L	*50.00*		*109*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*54.2*		ug/L	*50.00*		*108*	*70-130*			
Batch CL72021 - 5030B										
Blank										
1,2,4-Trimethylbenzene	ND	5.0	ug/L							
2,2,4-Trimethylpentane	ND	5.0	ug/L							
2-Methylpentane	ND	5.0	ug/L							
Benzene	ND	1.5	ug/L							
C5-C8 Aliphatics1,2	ND	150	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Aliphatics2,3	ND	150	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
n-Butylcyclohexane	ND	5.0	ug/L							
n-Decane	ND	5.0	ug/L							
Nonane (C9)	ND	5.0	ug/L							
Pentane	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL72021 - 5030B										
Surrogate: 2,5-Dibromotoluene - FID	*46.9*		ug/L	*50.00*		*94*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*45.8*		ug/L	*50.00*		*92*	*70-130*			
LCS										
1,2,4-Trimethylbenzene	88.9		ug/L	100.0		89	70-130			
2,2,4-Trimethylpentane	173		ug/L	150.0		115	70-130			
2-Methylpentane	179		ug/L	150.0		119	70-130			
Benzene	46.3		ug/L	50.00		93	70-130			
C5-C8 Aliphatics1,2	160		ug/L							
C5-C8 Unadjusted Aliphatics	479		ug/L	400.0		120	70-130			
C9-C10 Aromatics	86.4		ug/L	100.0		86	70-130			
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	243		ug/L	300.0		81	70-130			
Ethylbenzene	46.9		ug/L	50.00		94	70-130			
Methyl tert-Butyl Ether	138		ug/L	150.0		92	70-130			
Naphthalene	89.8		ug/L	100.0		90	70-130			
n-Butylcyclohexane	83.0		ug/L	100.0		83	70-130			
n-Decane	88.9		ug/L	100.0		89	70-130			
Nonane (C9)	83.2		ug/L	100.0		83	30-130			
Pentane	126		ug/L	100.0		126	70-130			
Toluene	134		ug/L	150.0		89	70-130			
Xylene O	89.1		ug/L	100.0		89	70-130			
Xylene P,M	180		ug/L	200.0		90	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*51.4*		ug/L	*50.00*		*103*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*50.3*		ug/L	*50.00*		*101*	*70-130*			
LCS Dup										
1,2,4-Trimethylbenzene	88.3		ug/L	100.0		88	70-130	0.6	25	
2,2,4-Trimethylpentane	168		ug/L	150.0		112	70-130	3	25	
2-Methylpentane	177		ug/L	150.0		118	70-130	1	25	
Benzene	46.8		ug/L	50.00		94	70-130	1	25	
C5-C8 Aliphatics1,2	155		ug/L							
C5-C8 Unadjusted Aliphatics	472		ug/L	400.0		118	70-130	1	25	
C9-C10 Aromatics	85.9		ug/L	100.0		86	70-130	0.6	25	
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	255		ug/L	300.0		85	70-130	5	25	
Ethylbenzene	47.2		ug/L	50.00		94	70-130	0.6	25	
Methyl tert-Butyl Ether	136		ug/L	150.0		91	70-130	1	25	
Naphthalene	97.1		ug/L	100.0		97	70-130	8	25	
n-Butylcyclohexane	85.7		ug/L	100.0		86	70-130	3	25	
n-Decane	94.3		ug/L	100.0		94	70-130	6	25	
Nonane (C9)	85.0		ug/L	100.0		85	30-130	2	25	
Pentane	126		ug/L	100.0		126	70-130	0.3	25	
Toluene	134		ug/L	150.0		89	70-130	0.1	25	
Xylene O	89.7		ug/L	100.0		90	70-130	0.6	25	
Xylene P,M	181		ug/L	200.0		90	70-130	0.3	25	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL72021 - 5030B										
Surrogate: 2,5-Dibromotoluene - FID	*46.9*		ug/L	*50.00*		*94*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*45.8*		ug/L	*50.00*		*92*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712360

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements

ESS Laboratory Work Order: 1712360

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1712360
Date Received: 12/15/2017
Project Due Date: 12/22/2017
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	191122	Yes	NA	Yes	1L Amber - HCl	HCl	
01	191123	Yes	NA	Yes	1L Amber - HCl	HCl	
01	191127	Yes	No	Yes	VOA Vial - HCl	HCl	
01	191128	Yes	No	Yes	VOA Vial - HCl	HCl	
01	191129	Yes	No	Yes	VOA Vial - HCl	HCl	
02	191120	Yes	NA	Yes	1L Amber - HCl	HCl	
02	191121	Yes	NA	Yes	1L Amber - HCl	HCl	
02	191124	Yes	No	Yes	VOA Vial - HCl	HCl	
02	191125	Yes	No	Yes	VOA Vial - HCl	HCl	
02	191126	Yes	No	Yes	VOA Vial - HCl	HCl	

2nd Review
Are barcode labels on correct containers? (Yes) / No

Completed By: Date & Time: ~~12/14~~ 12/15/17 2030
Reviewed By: Date & Time: 12/15/17 2050
Delivered By: 12/15/17 2050

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1712360

Turn Time: 5-Day Rush
Regulatory State: MA
Is this project for any of the following?: ○CT RCP ○MA MCP ○RGP
Reporting Limits: RCGW-1
Electonic Deliverables: ☐Limit Checker ☐Standard Excel ☐Other (Please Specify →)

Company Name	Project #	Project Name
Tetra Tech	5231	Wayland Water Main Improvements

Contact Person	Address
Derek McClellan	67 Forest St, Marlborough, MA 01752

City	State	Zip Code	PO #

Telephone Number	FAX Number	Email Address
508-303-9400		dmcclellan@tetratech.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Analysis: EPHs + 4 diesel PAHs	Analysis: VPHs + targets
1	12/14/17	12:00	Grab	GW	TW-3	X	X
2	12/14/17	10:25	Grab	GW	TW-7	X	X

Container Type:	AC-Air Cassette	AG-Amber Glass	B-BOD Bottle	C-Cubitainer	G - Glass	O-Other	P-Poly	S-Sterile	V-Vial	AG	V
Container Volume:	1-100 mL	2-2.5 gal	3-250 mL	4-300 mL	5-500 mL	6-1L	7-VOA	8-2 oz	9-4 oz	10-8 oz	11-Other*	6	7
Preservation Code:	1-Non Preserved	2-HCl	3-H2SO4	4-HNO3	5-NaOH	6-Methanol	7-Na2S2O3	8-ZnAce, NaOH	9-NH4Cl	10-DI H2O	11-Other*	2	2
										Number of Containers per Sample:		2	3

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 0.2 °C

Sampled by: DSM

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
Derek McClellan 12/14/17 2:00	T+H Cold Storage 12/14/17 2:00	Derek McClellan 12/15/17	12/15/17 9:30
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
12/15/17 18:45	12/15/17 2009		

CERTIFICATE OF ANALYSIS

Derek McClellan
Tata and Howard
67 Forest Street
Marlborough, MA 01752

This lab report includes the analytical results for TW-4, TW-5 and TW-6, as indicated in Table 2.

RE: Wayland Water Main Improvements (5231)
ESS Laboratory Work Order Number: 1712118

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 3:20 pm, Dec 13, 2017

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

SAMPLE RECEIPT

The following samples were received on December 06, 2017 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for EPH were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1712118-01	TW-4	Ground Water	EPH8270, MADEP-EPH, MADEP-VPH
1712118-02	TW-5	Ground Water	8260B
1712118-03	TW-6	Ground Water	8260B

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements

ESS Laboratory Work Order: 1712118

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements

ESS Laboratory Work Order: 1712118

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1712118-01 through 1712118-03**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV B	( ) 8081 Pesticides CAM V C	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX 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 times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) 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?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	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)?	Yes (X) 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 protocols(s)?	Yes (X) No ( )*
	***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 WSC-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 ( ) No (X)*

****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, accurate and complete.

Signature: Laurel Stoddard

Date: December 13, 2017

Printed Name: Laurel Stoddard

Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-4
Date Sampled: 12/05/17 13:50
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-01
Sample Matrix: Ground Water
Units: ug/L

Prepared: 12/11/17 14:58

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	ZLC	12/11/17 14:58	C7L0146	CL71110
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	ZLC	12/11/17 14:58	C7L0146	CL71110
C11-C22 Unadjusted Aromatics1	**228** (93.5)		EPH8270		1	ZLC	12/11/17 20:49	C7L0144	CL71110
C11-C22 Aromatics1,2	**228** (93.5)		EPH8270			ZLC	12/11/17 20:49		[CALC]
2-Methylnaphthalene	ND (4.7)		EPH8270		1	ZLC	12/11/17 20:49	C7L0144	CL71110
Acenaphthene	ND (4.7)		EPH8270		1	ZLC	12/11/17 20:49	C7L0144	CL71110
Naphthalene	ND (9.3)		EPH8270		1	ZLC	12/11/17 20:49	C7L0144	CL71110
Phenanthrene	ND (4.7)		EPH8270		1	ZLC	12/11/17 20:49	C7L0144	CL71110
Preservative:	**pH <= 2**		MADEP-EPH			ZLC			CL71110

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*59 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*113 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*108 %*		*40-140*
Surrogate: O-Terphenyl	*74 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-4
Date Sampled: 12/05/17 13:50
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**579** (100)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
C5-C8 Aliphatics1,2	**358** (150)		MADEP-VPH		1	12/07/17 19:11		[CALC]
C9-C12 Aliphatics2,3	**274** (150)		MADEP-VPH		1	12/07/17 19:11		[CALC]
Benzene	**28.3** (1.5)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Ethylbenzene	ND (5.0)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Methyl tert-Butyl Ether	ND (1.5)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Naphthalene	**13.3** (5.0)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Toluene	ND (5.0)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Xylene O	ND (5.0)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Xylene P,M	ND (10.0)		MADEP-VPH		1	12/07/17 19:11	C7L0108	CL70735
Preservative:	**pH <= 2**		MADEP-VPH					CL70735

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*99 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*101 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-5
Date Sampled: 12/05/17 12:25
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1,1-Trichloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1,2-Trichloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1-Dichloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1-Dichloroethene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,1-Dichloropropene	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2,3-Trichloropropane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2,4-Trimethylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2-Dibromoethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2-Dichloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,2-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,3,5-Trimethylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,3-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,3-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,4-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
1,4-Dioxane - Screen	ND (500)		8260B		1	12/07/17 16:18	C7L0100	CL70725
2,2-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
2-Butanone	ND (10.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
2-Chlorotoluene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
2-Hexanone	ND (10.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
4-Chlorotoluene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
4-Isopropyltoluene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Acetone	ND (10.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Benzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Bromobenzene	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Bromochloromethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-5
Date Sampled: 12/05/17 12:25
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Bromoform	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Bromomethane	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Carbon Disulfide	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Carbon Tetrachloride	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Chlorobenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Chloroethane	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Chloroform	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Chloromethane	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
cis-1,2-Dichloroethene	**142** (10.0)		8260B		10	12/08/17 14:09	C7L0100	CL70725
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Dibromochloromethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Dibromomethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Dichlorodifluoromethane	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Diethyl Ether	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Di-isopropyl ether	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Ethylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Hexachlorobutadiene	ND (0.6)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Hexachloroethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Isopropylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Methylene Chloride	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Naphthalene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
n-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
n-Propylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
sec-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Styrene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
tert-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Tetrachloroethene	**276** (10.0)		8260B		10	12/08/17 14:09	C7L0100	CL70725
Tetrahydrofuran	ND (5.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-5
Date Sampled: 12/05/17 12:25
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
trans-1,2-Dichloroethene	**4.0** (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Trichloroethene	**41.8** (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Trichlorofluoromethane	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Vinyl Chloride	**39.5** (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Xylene O	ND (1.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Xylene P,M	ND (2.0)		8260B		1	12/07/17 16:18	C7L0100	CL70725
Xylenes (Total)	ND (2.0)		8260B		1	12/07/17 16:18		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*94 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*101 %*		*70-130*
Surrogate: Dibromofluoromethane	*99 %*		*70-130*
Surrogate: Toluene-d8	*104 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-6
Date Sampled: 12/05/17 11:10
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1,1-Trichloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1,2-Trichloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1-Dichloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1-Dichloroethene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,1-Dichloropropene	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2,3-Trichloropropane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2,4-Trimethylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2-Dibromoethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2-Dichloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,2-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,3,5-Trimethylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,3-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,3-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,4-Dichlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
1,4-Dioxane - Screen	ND (500)		8260B		1	12/07/17 16:44	C7L0100	CL70725
2,2-Dichloropropane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
2-Butanone	ND (10.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
2-Chlorotoluene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
2-Hexanone	ND (10.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
4-Chlorotoluene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
4-Isopropyltoluene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Acetone	ND (10.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Benzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Bromobenzene	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Bromochloromethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-6
Date Sampled: 12/05/17 11:10
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Bromoform	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Bromomethane	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Carbon Disulfide	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Carbon Tetrachloride	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Chlorobenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Chloroethane	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Chloroform	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Chloromethane	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
cis-1,2-Dichloroethene	**2.4** (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Dibromochloromethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Dibromomethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Dichlorodifluoromethane	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Diethyl Ether	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Di-isopropyl ether	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Ethylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Hexachlorobutadiene	ND (0.6)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Hexachloroethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Isopropylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Methylene Chloride	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Naphthalene	**16.6** (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
n-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
n-Propylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
sec-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Styrene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
tert-Butylbenzene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Tetrachloroethene	**53.7** (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Tetrahydrofuran	ND (5.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements
Client Sample ID: TW-6
Date Sampled: 12/05/17 11:10
Percent Solids: N/A
Initial Volume: 5
Final Volume: 5
Extraction Method: 5030B

ESS Laboratory Work Order: 1712118
ESS Laboratory Sample ID: 1712118-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Trichloroethene	**1.9** (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Trichlorofluoromethane	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Vinyl Chloride	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Xylene O	ND (1.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Xylene P,M	ND (2.0)		8260B		1	12/07/17 16:44	C7L0100	CL70725
Xylenes (Total)	ND (2.0)		8260B		1	12/07/17 16:44		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*92 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*100 %*		*70-130*
Surrogate: Dibromofluoromethane	*100 %*		*70-130*
Surrogate: Toluene-d8	*106 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
Blank										
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L							
1,1,1-Trichloroethane	ND	1.0	ug/L							
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	1.0	ug/L							
1,1-Dichloroethane	ND	1.0	ug/L							
1,1-Dichloroethene	ND	1.0	ug/L							
1,1-Dichloropropene	ND	2.0	ug/L							
1,2,3-Trichlorobenzene	ND	1.0	ug/L							
1,2,3-Trichloropropane	ND	1.0	ug/L							
1,2,4-Trichlorobenzene	ND	1.0	ug/L							
1,2,4-Trimethylbenzene	ND	1.0	ug/L							
1,2-Dibromo-3-Chloropropane	ND	5.0	ug/L							
1,2-Dibromoethane	ND	1.0	ug/L							
1,2-Dichlorobenzene	ND	1.0	ug/L							
1,2-Dichloroethane	ND	1.0	ug/L							
1,2-Dichloropropane	ND	1.0	ug/L							
1,3,5-Trimethylbenzene	ND	1.0	ug/L							
1,3-Dichlorobenzene	ND	1.0	ug/L							
1,3-Dichloropropane	ND	1.0	ug/L							
1,4-Dichlorobenzene	ND	1.0	ug/L							
1,4-Dioxane - Screen	ND	500	ug/L							
2,2-Dichloropropane	ND	1.0	ug/L							
2-Butanone	ND	10.0	ug/L							
2-Chlorotoluene	ND	1.0	ug/L							
2-Hexanone	ND	10.0	ug/L							
4-Chlorotoluene	ND	1.0	ug/L							
4-Isopropyltoluene	ND	1.0	ug/L							
4-Methyl-2-Pentanone	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.0	ug/L							
Bromobenzene	ND	2.0	ug/L							
Bromochloromethane	ND	1.0	ug/L							
Bromodichloromethane	ND	0.6	ug/L							
Bromoform	ND	1.0	ug/L							
Bromomethane	ND	2.0	ug/L							
Carbon Disulfide	ND	1.0	ug/L							
Carbon Tetrachloride	ND	1.0	ug/L							
Chlorobenzene	ND	1.0	ug/L							
Chloroethane	ND	2.0	ug/L							
Chloroform	ND	1.0	ug/L							
Chloromethane	ND	2.0	ug/L							
cis-1,2-Dichloroethene	ND	1.0	ug/L							
cis-1,3-Dichloropropene	ND	0.4	ug/L							
Dibromochloromethane	ND	1.0	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
Dibromomethane	ND	1.0	ug/L							
Dichlorodifluoromethane	ND	2.0	ug/L							
Diethyl Ether	ND	1.0	ug/L							
Di-isopropyl ether	ND	1.0	ug/L							
Ethyl tertiary-butyl ether	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Hexachlorobutadiene	ND	0.6	ug/L							
Hexachloroethane	ND	1.0	ug/L							
Isopropylbenzene	ND	1.0	ug/L							
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Methylene Chloride	ND	2.0	ug/L							
Naphthalene	ND	1.0	ug/L							
n-Butylbenzene	ND	1.0	ug/L							
n-Propylbenzene	ND	1.0	ug/L							
sec-Butylbenzene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
tert-Butylbenzene	ND	1.0	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tetrachloroethene	ND	1.0	ug/L							
Tetrahydrofuran	ND	5.0	ug/L							
Toluene	ND	1.0	ug/L							
trans-1,2-Dichloroethene	ND	1.0	ug/L							
trans-1,3-Dichloropropene	ND	0.4	ug/L							
Trichloroethene	ND	1.0	ug/L							
Trichlorofluoromethane	ND	1.0	ug/L							
Vinyl Chloride	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Xylenes (Total)	ND	2.0	ug/L							
Surrogate: 1,2-Dichloroethane-d4	*22.4*		ug/L	*25.00*		*89*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.3*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*24.3*		ug/L	*25.00*		*97*	*70-130*			
Surrogate: Toluene-d8	*26.8*		ug/L	*25.00*		*107*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	10.0		ug/L	10.00		100	70-130			
1,1,1-Trichloroethane	9.9		ug/L	10.00		99	70-130			
1,1,2,2-Tetrachloroethane	10.0		ug/L	10.00		100	70-130			
1,1,2-Trichloroethane	9.5		ug/L	10.00		95	70-130			
1,1-Dichloroethane	9.6		ug/L	10.00		96	70-130			
1,1-Dichloroethene	10.4		ug/L	10.00		104	70-130			
1,1-Dichloropropene	10.6		ug/L	10.00		106	70-130			
1,2,3-Trichlorobenzene	10.4		ug/L	10.00		104	70-130			
1,2,3-Trichloropropane	9.5		ug/L	10.00		95	70-130			
1,2,4-Trichlorobenzene	10.9		ug/L	10.00		109	70-130			
1,2,4-Trimethylbenzene	10.1		ug/L	10.00		101	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
1,2-Dibromo-3-Chloropropane	10.5		ug/L	10.00		105	70-130			
1,2-Dibromoethane	10.0		ug/L	10.00		100	70-130			
1,2-Dichlorobenzene	10.5		ug/L	10.00		105	70-130			
1,2-Dichloroethane	10.2		ug/L	10.00		102	70-130			
1,2-Dichloropropane	9.8		ug/L	10.00		98	70-130			
1,3,5-Trimethylbenzene	9.9		ug/L	10.00		99	70-130			
1,3-Dichlorobenzene	9.8		ug/L	10.00		98	70-130			
1,3-Dichloropropane	11.3		ug/L	10.00		113	70-130			
1,4-Dichlorobenzene	10.5		ug/L	10.00		105	70-130			
1,4-Dioxane - Screen	216		ug/L	200.0		108	0-332			
2,2-Dichloropropane	9.4		ug/L	10.00		94	70-130			
2-Butanone	49.8		ug/L	50.00		100	70-130			
2-Chlorotoluene	10.0		ug/L	10.00		100	70-130			
2-Hexanone	49.2		ug/L	50.00		98	70-130			
4-Chlorotoluene	10.1		ug/L	10.00		101	70-130			
4-Isopropyltoluene	10.2		ug/L	10.00		102	70-130			
4-Methyl-2-Pentanone	49.6		ug/L	50.00		99	70-130			
Acetone	54.4		ug/L	50.00		109	70-130			
Benzene	10.1		ug/L	10.00		101	70-130			
Bromobenzene	10.0		ug/L	10.00		100	70-130			
Bromochloromethane	10.2		ug/L	10.00		102	70-130			
Bromodichloromethane	10.0		ug/L	10.00		100	70-130			
Bromoform	9.1		ug/L	10.00		91	70-130			
Bromomethane	11.2		ug/L	10.00		112	70-130			
Carbon Disulfide	10.5		ug/L	10.00		105	70-130			
Carbon Tetrachloride	10.3		ug/L	10.00		103	70-130			
Chlorobenzene	10.4		ug/L	10.00		104	70-130			
Chloroethane	10.1		ug/L	10.00		101	70-130			
Chloroform	9.7		ug/L	10.00		97	70-130			
Chloromethane	10.2		ug/L	10.00		102	70-130			
cis-1,2-Dichloroethene	9.7		ug/L	10.00		97	70-130			
cis-1,3-Dichloropropene	10.4		ug/L	10.00		104	70-130			
Dibromochloromethane	10.6		ug/L	10.00		106	70-130			
Dibromomethane	9.4		ug/L	10.00		94	70-130			
Dichlorodifluoromethane	10.4		ug/L	10.00		104	70-130			
Diethyl Ether	9.9		ug/L	10.00		99	70-130			
Di-isopropyl ether	9.9		ug/L	10.00		99	70-130			
Ethyl tertiary-butyl ether	10.0		ug/L	10.00		100	70-130			
Ethylbenzene	10.2		ug/L	10.00		102	70-130			
Hexachlorobutadiene	11.4		ug/L	10.00		114	70-130			
Hexachloroethane	9.6		ug/L	10.00		96	70-130			
Isopropylbenzene	9.7		ug/L	10.00		97	70-130			
Methyl tert-Butyl Ether	10.1		ug/L	10.00		101	70-130			
Methylene Chloride	9.7		ug/L	10.00		97	70-130			
Naphthalene	10.3		ug/L	10.00		103	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
n-Butylbenzene	10.3		ug/L	10.00		103	70-130			
n-Propylbenzene	10.3		ug/L	10.00		103	70-130			
sec-Butylbenzene	10.4		ug/L	10.00		104	70-130			
Styrene	10.2		ug/L	10.00		102	70-130			
tert-Butylbenzene	10.0		ug/L	10.00		100	70-130			
Tertiary-amyl methyl ether	9.2		ug/L	10.00		92	70-130			
Tetrachloroethene	8.6		ug/L	10.00		86	70-130			
Tetrahydrofuran	10.6		ug/L	10.00		106	70-130			
Toluene	10.4		ug/L	10.00		104	70-130			
trans-1,2-Dichloroethene	10.0		ug/L	10.00		100	70-130			
trans-1,3-Dichloropropene	10.1		ug/L	10.00		101	70-130			
Trichloroethene	10.2		ug/L	10.00		102	70-130			
Trichlorofluoromethane	10.2		ug/L	10.00		102	70-130			
Vinyl Chloride	10.7		ug/L	10.00		107	70-130			
Xylene O	10.4		ug/L	10.00		104	70-130			
Xylene P,M	20.4		ug/L	20.00		102	70-130			
Xylenes (Total)	30.7		ug/L							
Surrogate: 1,2-Dichloroethane-d4	*25.0*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.8*		ug/L	*25.00*		*103*	*70-130*			
Surrogate: Dibromofluoromethane	*27.4*		ug/L	*25.00*		*110*	*70-130*			
Surrogate: Toluene-d8	*27.6*		ug/L	*25.00*		*110*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	9.5		ug/L	10.00		95	70-130	5	20	
1,1,1-Trichloroethane	9.6		ug/L	10.00		96	70-130	2	20	
1,1,2,2-Tetrachloroethane	9.5		ug/L	10.00		95	70-130	5	20	
1,1,2-Trichloroethane	9.4		ug/L	10.00		94	70-130	1	20	
1,1-Dichloroethane	9.6		ug/L	10.00		96	70-130	0.7	20	
1,1-Dichloroethene	10.2		ug/L	10.00		102	70-130	2	20	
1,1-Dichloropropene	10.1		ug/L	10.00		101	70-130	6	20	
1,2,3-Trichlorobenzene	9.9		ug/L	10.00		99	70-130	4	20	
1,2,3-Trichloropropane	9.5		ug/L	10.00		95	70-130	0.2	20	
1,2,4-Trichlorobenzene	10.3		ug/L	10.00		103	70-130	6	20	
1,2,4-Trimethylbenzene	9.7		ug/L	10.00		97	70-130	5	20	
1,2-Dibromo-3-Chloropropane	9.5		ug/L	10.00		95	70-130	10	20	
1,2-Dibromoethane	9.6		ug/L	10.00		96	70-130	4	20	
1,2-Dichlorobenzene	9.9		ug/L	10.00		99	70-130	6	20	
1,2-Dichloroethane	9.8		ug/L	10.00		98	70-130	3	20	
1,2-Dichloropropane	9.3		ug/L	10.00		93	70-130	5	20	
1,3,5-Trimethylbenzene	9.3		ug/L	10.00		93	70-130	7	20	
1,3-Dichlorobenzene	9.8		ug/L	10.00		98	70-130	0.2	20	
1,3-Dichloropropane	10.3		ug/L	10.00		103	70-130	9	20	
1,4-Dichlorobenzene	10.1		ug/L	10.00		101	70-130	4	20	
1,4-Dioxane - Screen	209		ug/L	200.0		105	0-332	3	200	
2,2-Dichloropropane	9.1		ug/L	10.00		91	70-130	3	20	
2-Butanone	47.9		ug/L	50.00		96	70-130	4	20	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
2-Chlorotoluene	9.7		ug/L	10.00		97	70-130	3	20	
2-Hexanone	47.4		ug/L	50.00		95	70-130	4	20	
4-Chlorotoluene	9.8		ug/L	10.00		98	70-130	3	20	
4-Isopropyltoluene	10.0		ug/L	10.00		100	70-130	2	20	
4-Methyl-2-Pentanone	47.3		ug/L	50.00		95	70-130	5	20	
Acetone	49.1		ug/L	50.00		98	70-130	10	20	
Benzene	9.9		ug/L	10.00		99	70-130	2	20	
Bromobenzene	9.9		ug/L	10.00		99	70-130	1	20	
Bromochloromethane	9.5		ug/L	10.00		95	70-130	6	20	
Bromodichloromethane	9.7		ug/L	10.00		97	70-130	2	20	
Bromoform	8.5		ug/L	10.00		85	70-130	6	20	
Bromomethane	11.7		ug/L	10.00		117	70-130	4	20	
Carbon Disulfide	10.1		ug/L	10.00		101	70-130	4	20	
Carbon Tetrachloride	9.8		ug/L	10.00		98	70-130	5	20	
Chlorobenzene	9.8		ug/L	10.00		98	70-130	5	20	
Chloroethane	10.7		ug/L	10.00		107	70-130	5	20	
Chloroform	9.3		ug/L	10.00		93	70-130	4	20	
Chloromethane	9.9		ug/L	10.00		99	70-130	4	20	
cis-1,2-Dichloroethene	9.2		ug/L	10.00		92	70-130	5	20	
cis-1,3-Dichloropropene	10.0		ug/L	10.00		100	70-130	3	20	
Dibromochloromethane	9.9		ug/L	10.00		99	70-130	7	20	
Dibromomethane	9.2		ug/L	10.00		92	70-130	1	20	
Dichlorodifluoromethane	10.4		ug/L	10.00		104	70-130	0.2	20	
Diethyl Ether	9.8		ug/L	10.00		98	70-130	1	20	
Di-isopropyl ether	9.7		ug/L	10.00		97	70-130	2	20	
Ethyl tertiary-butyl ether	9.3		ug/L	10.00		93	70-130	7	20	
Ethylbenzene	9.8		ug/L	10.00		98	70-130	4	20	
Hexachlorobutadiene	10.9		ug/L	10.00		109	70-130	4	20	
Hexachloroethane	9.0		ug/L	10.00		90	70-130	6	20	
Isopropylbenzene	9.6		ug/L	10.00		96	70-130	1	20	
Methyl tert-Butyl Ether	9.7		ug/L	10.00		97	70-130	4	20	
Methylene Chloride	9.3		ug/L	10.00		93	70-130	4	20	
Naphthalene	9.5		ug/L	10.00		95	70-130	8	20	
n-Butylbenzene	9.3		ug/L	10.00		93	70-130	10	20	
n-Propylbenzene	9.8		ug/L	10.00		98	70-130	5	20	
sec-Butylbenzene	10.0		ug/L	10.00		100	70-130	5	20	
Styrene	9.8		ug/L	10.00		98	70-130	4	20	
tert-Butylbenzene	9.8		ug/L	10.00		98	70-130	2	20	
Tertiary-amyl methyl ether	9.5		ug/L	10.00		95	70-130	3	20	
Tetrachloroethene	8.1		ug/L	10.00		81	70-130	6	20	
Tetrahydrofuran	10.2		ug/L	10.00		102	70-130	4	20	
Toluene	9.9		ug/L	10.00		99	70-130	5	20	
trans-1,2-Dichloroethene	9.7		ug/L	10.00		97	70-130	3	20	
trans-1,3-Dichloropropene	9.9		ug/L	10.00		99	70-130	2	20	
Trichloroethene	9.7		ug/L	10.00		97	70-130	5	20	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch CL70725 - 5030B										
Trichlorofluoromethane	9.7		ug/L	10.00		97	70-130	5	20	
Vinyl Chloride	10.2		ug/L	10.00		102	70-130	4	20	
Xylene O	9.8		ug/L	10.00		98	70-130	5	20	
Xylene P,M	19.6		ug/L	20.00		98	70-130	4	20	
Xylenes (Total)	29.4		ug/L							
Surrogate: 1,2-Dichloroethane-d4	*25.1*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.2*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*26.9*		ug/L	*25.00*		*108*	*70-130*			
Surrogate: Toluene-d8	*27.5*		ug/L	*25.00*		*110*	*70-130*			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71110 - 3510C										
Blank										
C19-C36 Aliphatics1	ND	100	ug/L							
C9-C18 Aliphatics1	ND	100	ug/L							
Decane (C10)	ND	5	ug/L							
Docosane (C22)	ND	5	ug/L							
Dodecane (C12)	ND	5	ug/L							
Eicosane (C20)	ND	5	ug/L							
Hexacosane (C26)	ND	5	ug/L							
Hexadecane (C16)	ND	5	ug/L							
Hexatriacontane (C36)	ND	5	ug/L							
Nonadecane (C19)	ND	5	ug/L							
Nonane (C9)	ND	5	ug/L							
Octacosane (C28)	ND	5	ug/L							
Octadecane (C18)	ND	5	ug/L							
Tetracosane (C24)	ND	5	ug/L							
Tetradecane (C14)	ND	5	ug/L							
Triacontane (C30)	ND	5	ug/L							
Surrogate: 1-Chlorooctadecane	*41.4*		ug/L	*50.00*		*83*	*40-140*			
Blank										
2-Methylnaphthalene	ND	5.0	ug/L							
Acenaphthene	ND	5.0	ug/L							
Acenaphthylene	ND	5.0	ug/L							
Anthracene	ND	5.0	ug/L							
Benzo(a)anthracene	ND	5.0	ug/L							
Benzo(a)pyrene	ND	10.0	ug/L							
Benzo(b)fluoranthene	ND	5.0	ug/L							
Benzo(g,h,i)perylene	ND	10.0	ug/L							
Benzo(k)fluoranthene	ND	10.0	ug/L							
C11-C22 Aromatics1,2	ND	100	ug/L							
C11-C22 Unadjusted Aromatics1	ND	100	ug/L							
Chrysene	ND	10.0	ug/L							
Dibenzo(a,h)Anthracene	ND	5.0	ug/L							

CERTIFICATE OF ANALYSIS

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71110 - 3510C										
Fluoranthene	ND	10.0	ug/L							
Fluorene	ND	5.0	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	5.0	ug/L							
Naphthalene	ND	10.0	ug/L							
Phenanthrene	ND	5.0	ug/L							
Pyrene	ND	5.0	ug/L							
Surrogate: 2-Bromonaphthalene	*53.6*		ug/L	*50.00*		*107*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*51.7*		ug/L	*50.00*		*103*	*40-140*			
Surrogate: O-Terphenyl	*39.8*		ug/L	*50.00*		*80*	*40-140*			
LCS										
C19-C36 Aliphatics1	364	100	ug/L	400.0		91	40-140			
C9-C18 Aliphatics1	214	100	ug/L	300.0		71	40-140			
Decane (C10)	29	5	ug/L	50.00		59	40-140			
Docosane (C22)	45	5	ug/L	50.00		90	40-140			
Dodecane (C12)	34	5	ug/L	50.00		69	40-140			
Eicosane (C20)	45	5	ug/L	50.00		89	40-140			
Hexacosane (C26)	46	5	ug/L	50.00		91	40-140			
Hexadecane (C16)	41	5	ug/L	50.00		82	40-140			
Hexatriacontane (C36)	45	5	ug/L	50.00		90	40-140			
Nonadecane (C19)	45	5	ug/L	50.00		90	40-140			
Nonane (C9)	23	5	ug/L	50.00		47	30-140			
Octacosane (C28)	46	5	ug/L	50.00		93	40-140			
Octadecane (C18)	42	5	ug/L	50.00		84	40-140			
Tetracosane (C24)	46	5	ug/L	50.00		91	40-140			
Tetradecane (C14)	38	5	ug/L	50.00		76	40-140			
Triacontane (C30)	48	5	ug/L	50.00		95	40-140			
Surrogate: 1-Chlorooctadecane	*41.1*		ug/L	*50.00*		*82*	*40-140*			
LCS										
2-Methylnaphthalene	34.6	5.0	ug/L	50.00		69	40-140			
Acenaphthene	37.2	5.0	ug/L	50.00		74	40-140			
Acenaphthylene	38.6	5.0	ug/L	50.00		77	40-140			
Anthracene	41.0	5.0	ug/L	50.00		82	40-140			
Benzo(a)anthracene	40.2	5.0	ug/L	50.00		80	40-140			
Benzo(a)pyrene	40.0	10.0	ug/L	50.00		80	40-140			
Benzo(b)fluoranthene	41.4	5.0	ug/L	50.00		83	40-140			
Benzo(g,h,i)perylene	40.3	10.0	ug/L	50.00		81	40-140			
Benzo(k)fluoranthene	39.8	10.0	ug/L	50.00		80	40-140			
C11-C22 Aromatics1,2	604	100	ug/L							
C11-C22 Unadjusted Aromatics1	753	100	ug/L	850.0		89	40-140			
Chrysene	39.6	10.0	ug/L	50.00		79	40-140			
Dibenzo(a,h)Anthracene	41.0	5.0	ug/L	50.00		82	40-140			
Fluoranthene	41.1	10.0	ug/L	50.00		82	40-140			
Fluorene	38.9	5.0	ug/L	50.00		78	40-140			
Indeno(1,2,3-cd)Pyrene	42.5	5.0	ug/L	50.00		85	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71110 - 3510C										
Naphthalene	38.0	10.0	ug/L	50.00		76	40-140			
Phenanthrene	39.6	5.0	ug/L	50.00		79	40-140			
Pyrene	39.7	5.0	ug/L	50.00		79	40-140			
Surrogate: 2-Bromonaphthalene	*54.6*		ug/L	*50.00*		*109*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*55.9*		ug/L	*50.00*		*112*	*40-140*			
Surrogate: O-Terphenyl	*43.0*		ug/L	*50.00*		*86*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	368	100	ug/L	400.0		92	40-140	0.9	25	
C9-C18 Aliphatics1	222	100	ug/L	300.0		74	40-140	4	25	
Decane (C10)	30	5	ug/L	50.00		60	40-140	2	25	
Docosane (C22)	46	5	ug/L	50.00		92	40-140	2	25	
Dodecane (C12)	35	5	ug/L	50.00		70	40-140	2	25	
Eicosane (C20)	46	5	ug/L	50.00		91	40-140	2	25	
Hexacosane (C26)	47	5	ug/L	50.00		93	40-140	2	25	
Hexadecane (C16)	44	5	ug/L	50.00		88	40-140	6	25	
Hexatriacontane (C36)	46	5	ug/L	50.00		91	40-140	1	25	
Nonadecane (C19)	46	5	ug/L	50.00		92	40-140	3	25	
Nonane (C9)	24	5	ug/L	50.00		48	30-140	3	25	
Octacosane (C28)	47	5	ug/L	50.00		95	40-140	2	25	
Octadecane (C18)	44	5	ug/L	50.00		88	40-140	4	25	
Tetracosane (C24)	46	5	ug/L	50.00		93	40-140	2	25	
Tetradecane (C14)	40	5	ug/L	50.00		80	40-140	5	25	
Triacontane (C30)	49	5	ug/L	50.00		97	40-140	2	25	
Surrogate: 1-Chlorooctadecane	*39.2*		ug/L	*50.00*		*78*	*40-140*			
LCS Dup										
2-Methylnaphthalene	35.0	5.0	ug/L	50.00		70	40-140	1	20	
Acenaphthene	38.8	5.0	ug/L	50.00		78	40-140	4	20	
Acenaphthylene	39.9	5.0	ug/L	50.00		80	40-140	3	20	
Anthracene	42.0	5.0	ug/L	50.00		84	40-140	2	20	
Benzo(a)anthracene	40.8	5.0	ug/L	50.00		82	40-140	1	20	
Benzo(a)pyrene	40.3	10.0	ug/L	50.00		81	40-140	0.8	20	
Benzo(b)fluoranthene	41.3	5.0	ug/L	50.00		83	40-140	0.2	20	
Benzo(g,h,i)perylene	39.9	10.0	ug/L	50.00		80	40-140	1	20	
Benzo(k)fluoranthene	40.1	10.0	ug/L	50.00		80	40-140	0.8	20	
C11-C22 Aromatics1,2	598	100	ug/L							
C11-C22 Unadjusted Aromatics1	752	100	ug/L	850.0		88	40-140	0.1	25	
Chrysene	39.4	10.0	ug/L	50.00		79	40-140	0.6	20	
Dibenzo(a,h)Anthracene	40.5	5.0	ug/L	50.00		81	40-140	1	20	
Fluoranthene	41.7	10.0	ug/L	50.00		83	40-140	1	20	
Fluorene	40.0	5.0	ug/L	50.00		80	40-140	3	20	
Indeno(1,2,3-cd)Pyrene	41.3	5.0	ug/L	50.00		83	40-140	3	20	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CL71110 - 3510C										
Naphthalene	39.0	10.0	ug/L	50.00		78	40-140	2	20	
Phenanthrene	40.9	5.0	ug/L	50.00		82	40-140	3	20	
Pyrene	39.6	5.0	ug/L	50.00		79	40-140	0.4	20	
Surrogate: 2-Bromonaphthalene	*54.5*		ug/L	*50.00*		*109*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*52.8*		ug/L	*50.00*		*106*	*40-140*			
Surrogate: O-Terphenyl	*42.3*		ug/L	*50.00*		*85*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL70735 - 5030B										
Blank										
1,2,4-Trimethylbenzene	ND	5.0	ug/L							
2,2,4-Trimethylpentane	ND	5.0	ug/L							
2-Methylpentane	ND	5.0	ug/L							
Benzene	ND	1.5	ug/L							
C5-C8 Aliphatics1,2	ND	150	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Aliphatics2,3	ND	150	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
n-Butylcyclohexane	ND	5.0	ug/L							
n-Decane	ND	5.0	ug/L							
Nonane (C9)	ND	5.0	ug/L							
Pentane	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*46.3*		ug/L	*50.00*		*93*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*45.4*		ug/L	*50.00*		*91*	*70-130*			
LCS										
1,2,4-Trimethylbenzene	91.4		ug/L	100.0		91	70-130			
2,2,4-Trimethylpentane	167		ug/L	150.0		112	70-130			
2-Methylpentane	173		ug/L	150.0		116	70-130			
Benzene	46.9		ug/L	50.00		94	70-130			
C5-C8 Aliphatics1,2	143		ug/L							
C5-C8 Unadjusted Aliphatics	466		ug/L	400.0		116	70-130			
C9-C10 Aromatics	88.8		ug/L	100.0		89	70-130			
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	270		ug/L	300.0		90	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch CL70735 - 5030B										
Ethylbenzene	47.7		ug/L	50.00		95	70-130			
Methyl tert-Butyl Ether	139		ug/L	150.0		93	70-130			
Naphthalene	99.6		ug/L	100.0		100	70-130			
n-Butylcyclohexane	89.0		ug/L	100.0		89	70-130			
n-Decane	98.8		ug/L	100.0		99	70-130			
Nonane (C9)	89.9		ug/L	100.0		90	30-130			
Pentane	124		ug/L	100.0		124	70-130			
Toluene	137		ug/L	150.0		91	70-130			
Xylene O	91.2		ug/L	100.0		91	70-130			
Xylene P,M	184		ug/L	200.0		92	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*43.0*		ug/L	*50.00*		*86*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*42.4*		ug/L	*50.00*		*85*	*70-130*			
LCS Dup										
1,2,4-Trimethylbenzene	89.6		ug/L	100.0		90	70-130	2	25	
2,2,4-Trimethylpentane	168		ug/L	150.0		112	70-130	0.4	25	
2-Methylpentane	178		ug/L	150.0		119	70-130	2	25	
Benzene	47.6		ug/L	50.00		95	70-130	1	25	
C5-C8 Aliphatics1,2	156		ug/L							
C5-C8 Unadjusted Aliphatics	475		ug/L	400.0		119	70-130	2	25	
C9-C10 Aromatics	87.1		ug/L	100.0		87	70-130	2	25	
C9-C12 Aliphatics2,3	ND		ug/L							
C9-C12 Unadjusted Aliphatics	263		ug/L	300.0		88	70-130	3	25	
Ethylbenzene	47.6		ug/L	50.00		95	70-130	0.07	25	
Methyl tert-Butyl Ether	136		ug/L	150.0		91	70-130	2	25	
Naphthalene	98.4		ug/L	100.0		98	70-130	1	25	
n-Butylcyclohexane	87.9		ug/L	100.0		88	70-130	1	25	
n-Decane	96.7		ug/L	100.0		97	70-130	2	25	
Nonane (C9)	87.0		ug/L	100.0		87	30-130	3	25	
Pentane	128		ug/L	100.0		128	70-130	3	25	
Toluene	136		ug/L	150.0		90	70-130	0.7	25	
Xylene O	90.6		ug/L	100.0		91	70-130	0.6	25	
Xylene P,M	183		ug/L	200.0		92	70-130	0.3	25	
Surrogate: 2,5-Dibromotoluene - FID	*40.0*		ug/L	*50.00*		*80*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*39.3*		ug/L	*50.00*		*79*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements ESS Laboratory Work Order: 1712118

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements

ESS Laboratory Work Order: 1712118

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1712119
Date Received: 12/6/2017
Project Due Date: 12/13/2017
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.8 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	188253	Yes	NA	Yes	1L Amber - HCl	HCl	
01	188254	Yes	NA	Yes	1L Amber - HCl	HCl	
01	188261	Yes	No	Yes	VOA Vial - HCl	HCl	
01	188262	Yes	No	Yes	VOA Vial - HCl	HCl	
01	188263	Yes	No	Yes	VOA Vial - HCl	HCl	
02	188258	Yes	No	Yes	VOA Vial - HCl	HCl	
02	188259	Yes	No	Yes	VOA Vial - HCl	HCl	
02	188260	Yes	No	Yes	VOA Vial - HCl	HCl	
03	188255	Yes	No	Yes	VOA Vial - HCl	HCl	
03	188256	Yes	No	Yes	VOA Vial - HCl	HCl	
03	188257	Yes	No	Yes	VOA Vial - HCl	HCl	

2nd Review
Are barcode labels on correct containers? (Yes) / No

Completed By: Date & Time: 12/6/17 1654
Reviewed By: Date & Time: 12/6/17 1716
Delivered By: 12/6/17 1716

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
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www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1712118

Turn Time (5-Day) Rush
Regulatory State MA
Is this project for any of the following?: ○CT RCP ○MA MCP ○RGP
Reporting Limits RCGW-1 + RCS-1
Electonic Deliverables ☐Limit Checker ☐Standard Excel ☐Other (Please Specify →)

Company Name	Project #	Project Name
Tata + Howard	5231	Wayland Water Main Improvements

Contact Person	Address
Derek McClellan	67 Forest St.

City	State	Zip Code	PO #
Marlborough	MA	01752	

Telephone Number	FAX Number	Email Address
508-303-9400		dmcclellan@tataandhoward.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Analysis: EPH + 4 diesel PAH	VPHs + targets	VOCs 8260
1	12/5/17	150	Grab	GW	TW-4	X	X	
2	12/5/17	1225	Grab	GW	TW-5			X
3	12/5/17	1110	Grab	GW	TW-6			X
	12/5/17	120	Grab	Soil	B-4 (6-8')	X	X	

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer G - Glass O-Other P-Poly S-Sterile V-Vial — AG/J V ✓
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 6/7 7 7
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2/6 2/6 2
Number of Containers per Sample: 3/1 3 3

Laboratory Use Only
Cooler Present: Yes
Seals Intact: NA
Cooler Temperature: °C ice temp: 1.6

Sampled by: DSM

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
Derek McClellan 12/5/17 4115	T+H Cold Storage 12/5/17 415	Derek McClellan 12/6/17	12/6/17 10:42
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
12/6/17 16:18	12/6/17 1:35		

CERTIFICATE OF ANALYSIS

Derek McClellan
Tata and Howard
67 Forest Street
Marlborough, MA 01752

This lab report includes the analytical results for 298 BPR (AMB-117) and Pine Brook, as indicated in Table 3.

RE: Wayland Water Main Improvements - RGP (5517)
ESS Laboratory Work Order Number: 1802550

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 11:16 am, Mar 08, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1802550

SAMPLE RECEIPT

The following samples were received on February 27, 2018 for the analyses specified on the enclosed Chain of Custody Record.

The samples and analyses listed below were analyzed in accordance with the 2017 Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES).

ESS Laboratory is unable to achieve the required detection limit of 0.4 mg/L for Ethanol for the RGP permit. We have also been unable to procure a subcontract laboatory that is able to achieve this limit. The data for Ethanol has been reported using our current method reporting limit.

Lab Number	Sample Name	Matrix	Analysis
1802550-01	AMB-117	Ground Water	200.7, 245.1, 2540D, 300.0, 3113B, 350.1, 3500Cr B-2009, 4500 CN CE, 4500Cl D, 504.1, 524.2
1802550-02	Pine Brook	Surface Water	200.7, 245.1, 3113B, 350.1, 3500Cr B-2009

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

PROJECT NARRATIVE

Classical Chemistry
1802550-01 **The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: AMB-117
Date Sampled: 02/26/18 11:15
Percent Solids: N/A

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-01
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Arsenic	**0.6** (0.5)		3113B		1	KJK	03/02/18 7:06	100	10	CB82731
Cadmium	ND (0.05)		3113B		2	KJK	03/01/18 21:35	100	10	CB82731
Chromium	ND (2.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Chromium III	ND (10.0)		200.7		1	EEM	02/28/18 18:44	1	1	[CALC]
Copper	**7.6** (2.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Hardness	**237000** (499)		200.7		10	KJK	02/28/18 19:19	1	1	[CALC]
Iron	**662** (10.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Lead	**0.8** (0.5)		3113B		1	KJK	02/28/18 23:38	100	10	CB82731
Mercury	ND (0.200)		245.1		1	MJV	02/28/18 14:19	20	40	CB82738
Nickel	ND (5.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Selenium	ND (1.0)		3113B		1	KJK	03/01/18 4:57	100	10	CB82731
Silver	ND (0.5)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731
Zinc	**14.3** (5.0)		200.7		1	KJK	02/28/18 18:44	100	10	CB82731

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: AMB-117
Date Sampled: 02/26/18 11:15
Percent Solids: N/A
Initial Volume: 25
Final Volume: 25
Extraction Method: 524.2

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1-Trichloroethane	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,1,2-Trichloroethane	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,1-Dichloroethane	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,1-Dichloroethene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,2-Dichlorobenzene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,2-Dichloroethane	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,3-Dichlorobenzene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
1,4-Dichlorobenzene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
Carbon Tetrachloride	ND (0.3)		524.2		1	02/27/18 15:36	C8B0359	CB82719
cis-1,2-Dichloroethene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
Methylene Chloride	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
Tetrachloroethene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
Trichloroethene	ND (0.5)		524.2		1	02/27/18 15:36	C8B0359	CB82719
Vinyl Chloride	ND (0.2)		524.2		1	02/27/18 15:36	C8B0359	CB82719

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*109 %*		*80-120*
Surrogate: 4-Bromofluorobenzene	*109 %*		*80-120*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: AMB-117
Date Sampled: 02/26/18 11:15
Percent Solids: N/A

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-01
Sample Matrix: Ground Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	**0.11** (0.10)		350.1		1	JLK	02/28/18 18:42	mg/L	CB82803
Chloride	**138** (50.0)		300.0		100	EEM	02/28/18 13:21	mg/L	CB82814
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	EEM	02/27/18 10:40	ug/L	CB82713
Total Cyanide (LL)	ND (5.00)		4500 CN CE		1	EEM	02/27/18 11:35	ug/L	CB82715
Total Residual Chlorine	ND (20.0)		4500Cl D		1	EEM	02/27/18 10:50	ug/L	CB82712
Total Suspended Solids	**801** (5)		2540D		1	EEM	03/01/18 14:15	mg/L	CC80113

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: AMB-117
Date Sampled: 02/26/18 11:15
Percent Solids: N/A
Initial Volume: 35
Final Volume: 2
Extraction Method: 504/8011

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: SMR
Prepared: 3/6/18 15:05

504.1 1,2-Dibromoethane / 1,2-Dibromo-3-chloropropane

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,2-Dibromoethane	ND (0.015)		504.1		1	03/06/18 18:37		CC80613

	%Recovery	Qualifier	Limits
Surrogate: Pentachloroethane	*96 %*		*30-150*
Surrogate: Pentachloroethane [2C]	*129 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: Pine Brook
Date Sampled: 02/26/18 12:15
Percent Solids: N/A

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-02
Sample Matrix: Surface Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Arsenic	**0.7** (0.5)		3113B		1	KJK	03/02/18 7:18	100	10	CB82731
Cadmium	**0.07** (0.05)		3113B		2	KJK	03/01/18 21:41	100	10	CB82731
Chromium	ND (2.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Copper	**2.4** (2.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Hardness	**43100** (82.4)		200.7		1	KJK	02/28/18 18:50	1	1	[CALC]
Iron	**693** (10.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Lead	**1.0** (0.5)		3113B		1	KJK	02/28/18 23:43	100	10	CB82731
Mercury	ND (0.200)		245.1		1	MJV	02/28/18 14:21	20	40	CB82738
Nickel	ND (5.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Selenium	ND (1.0)		3113B		1	KJK	03/01/18 5:25	100	10	CB82731
Silver	ND (0.5)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731
Zinc	**33.4** (5.0)		200.7		1	KJK	02/28/18 18:50	100	10	CB82731

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: Pine Brook
Date Sampled: 02/26/18 12:15
Percent Solids: N/A

ESS Laboratory Work Order: 1802550
ESS Laboratory Sample ID: 1802550-02
Sample Matrix: Surface Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	ND (0.10)		350.1		1	JLK	02/28/18 18:43	mg/L	CB82803
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	EEM	02/27/18 10:40	ug/L	CB82713

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CB82713 - [CALC]										
Blank										
Chromium III	ND	10.0	ug/L							
LCS										
Chromium III	ND		ug/L							
LCS Dup										
Chromium III	ND		ug/L							
Batch CB82731 - 3005A/200.7										
Blank										
Antimony	ND	5.0	ug/L							
Arsenic	ND	0.5	ug/L							
Cadmium	ND	0.02	ug/L							
Chromium	ND	2.0	ug/L							
Chromium III	ND	2.00	ug/L							
Copper	ND	2.0	ug/L							
Hardness	ND	82.4	ug/L							
Iron	ND	10.0	ug/L							
Lead	ND	0.5	ug/L							
Nickel	ND	5.0	ug/L							
Selenium	ND	1.0	ug/L							
Silver	ND	0.5	ug/L							
Zinc	ND	5.0	ug/L							
LCS										
Antimony	43.7	5.0	ug/L	50.00		87	85-115			
Arsenic	46.5	12.5	ug/L	50.00		93	85-115			
Cadmium	24.7	12.5	ug/L	25.00		99	85-115			
Chromium	45.8	2.0	ug/L	50.00		92	85-115			
Chromium III	45.8	2.00	ug/L							
Copper	48.3	2.0	ug/L	50.00		97	85-115			
Hardness	2980	82.4	ug/L							
Iron	230	10.0	ug/L	250.0		92	85-115			
Lead	51.2	12.5	ug/L	50.00		102	85-115			
Nickel	47.3	5.0	ug/L	50.00		95	85-115			
Selenium	114	25.0	ug/L	100.0		114	85-115			
Silver	23.7	0.5	ug/L	25.00		95	85-115			
Zinc	45.7	5.0	ug/L	50.00		91	85-115			
LCS Dup										
Arsenic	48.4	12.5	ug/L	50.00		97	85-115	4	20	
Cadmium	26.1	12.5	ug/L	25.00		104	85-115	5	20	
Chromium III	50.7	2.00	ug/L							
Hardness	3160	82.4	ug/L							
Lead	52.0	12.5	ug/L	50.00		104	85-115	2	20	
Selenium	112	25.0	ug/L	100.0		112	85-115	1	20	
Batch CB82738 - 245.1/7470A										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CB82738 - 245.1/7470A										
Blank										
Mercury	ND	0.200	ug/L							
LCS										
Mercury	5.71	0.200	ug/L	6.000		95	85-115			
LCS Dup										
Mercury	5.69	0.200	ug/L	6.000		95	85-115	0.3	20	
524.2 Volatile Organic Compounds										
Batch CB82719 - 524.2										
Blank										
1,1,1-Trichloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	0.5	ug/L							
1,1-Dichloroethane	ND	0.5	ug/L							
1,1-Dichloroethene	ND	0.5	ug/L							
1,2-Dichlorobenzene	ND	0.5	ug/L							
1,2-Dichloroethane	ND	0.5	ug/L							
1,3-Dichlorobenzene	ND	0.5	ug/L							
1,4-Dichlorobenzene	ND	0.5	ug/L							
Carbon Tetrachloride	ND	0.3	ug/L							
cis-1,2-Dichloroethene	ND	0.5	ug/L							
Methylene Chloride	ND	0.5	ug/L							
Tetrachloroethene	ND	0.5	ug/L							
Trichloroethene	ND	0.5	ug/L							
Vinyl Chloride	ND	0.2	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*5.48*		ug/L	*5.000*		*110*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.35*		ug/L	*5.000*		*107*	*80-120*			
LCS										
1,1,1-Trichloroethane	10.4		ug/L	10.00		104	70-130			
1,1,2-Trichloroethane	10.2		ug/L	10.00		102	70-130			
1,1-Dichloroethane	10.1		ug/L	10.00		101	70-130			
1,1-Dichloroethene	10.3		ug/L	10.00		103	70-130			
1,2-Dichlorobenzene	10.8		ug/L	10.00		108	70-130			
1,2-Dichloroethane	10.1		ug/L	10.00		101	70-130			
1,3-Dichlorobenzene	10.3		ug/L	10.00		103	70-130			
1,4-Dichlorobenzene	10.9		ug/L	10.00		109	70-130			
Carbon Tetrachloride	10.2		ug/L	10.00		102	70-130			
cis-1,2-Dichloroethene	9.9		ug/L	10.00		99	70-130			
Methylene Chloride	11.8		ug/L	10.00		118	70-130			
Tetrachloroethene	10.0		ug/L	10.00		100	70-130			
Trichloroethene	10.0		ug/L	10.00		100	70-130			
Vinyl Chloride	10.1		ug/L	10.00		101	70-130			
Surrogate: 1,2-Dichlorobenzene-d4	*5.37*		ug/L	*5.000*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.15*		ug/L	*5.000*		*103*	*80-120*			
LCS Dup										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
524.2 Volatile Organic Compounds										
Batch CB82719 - 524.2										
1,1,1-Trichloroethane	10.9		ug/L	10.00		109	70-130	5	20	
1,1,2-Trichloroethane	10.2		ug/L	10.00		102	70-130	0.5	20	
1,1-Dichloroethane	10.3		ug/L	10.00		103	70-130	2	20	
1,1-Dichloroethene	10.7		ug/L	10.00		107	70-130	4	20	
1,2-Dichlorobenzene	10.8		ug/L	10.00		108	70-130	0	20	
1,2-Dichloroethane	10.0		ug/L	10.00		100	70-130	0.9	20	
1,3-Dichlorobenzene	10.4		ug/L	10.00		104	70-130	0.8	20	
1,4-Dichlorobenzene	10.6		ug/L	10.00		106	70-130	3	20	
Carbon Tetrachloride	10.4		ug/L	10.00		104	70-130	2	20	
cis-1,2-Dichloroethene	10.1		ug/L	10.00		101	70-130	2	20	
Methylene Chloride	12.0		ug/L	10.00		120	70-130	2	20	
Tetrachloroethene	10.3		ug/L	10.00		103	70-130	2	20	
Trichloroethene	10.3		ug/L	10.00		103	70-130	3	20	
Vinyl Chloride	10.4		ug/L	10.00		104	70-130	4	20	
Surrogate: 1,2-Dichlorobenzene-d4	*5.31*		ug/L	*5.000*		*106*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.99*		ug/L	*5.000*		*100*	*80-120*			
Classical Chemistry										
Batch CB82712 - General Preparation										
Blank										
Total Residual Chlorine	ND	20.0	ug/L							
LCS										
Total Residual Chlorine	1.78		mg/L	1.800		99	85-115			
Batch CB82713 - General Preparation										
Blank										
Hexavalent Chromium	ND	10.0	ug/L							
LCS										
Hexavalent Chromium	0.499		mg/L	0.4998		100	90-110			
LCS Dup										
Hexavalent Chromium	0.498		mg/L	0.4998		100	90-110	0.3	20	
Batch CB82715 - TCN Prep										
Blank										
Total Cyanide (LL)	ND	5.00	ug/L							
LCS										
Total Cyanide (LL)	20.4	5.00	ug/L	20.06		102	90-110			
LCS										
Total Cyanide (LL)	150	5.00	ug/L	150.4		99	90-110			
LCS Dup										
Total Cyanide (LL)	150	5.00	ug/L	150.4		100	90-110	0.5	20	
Batch CB82803 - NH4 Prep										
Blank										
Ammonia as N	ND	0.10	mg/L							

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CB82803 - NH4 Prep										
LCS										
Ammonia as N	0.11	0.10	mg/L	0.09994		111	80-120			
LCS										
Ammonia as N	1.03	0.10	mg/L	0.9994		103	80-120			
Batch CB82814 - General Preparation										
Blank										
Chloride	ND	0.5	mg/L							
LCS										
Chloride	2.5		mg/L	2.500		98	90-110			
Batch CC80113 - General Preparation										
Blank										
Total Suspended Solids	ND	5	mg/L							
LCS										
Total Suspended Solids	34		mg/L	34.10		100	80-120			
504.1 1,2-Dibromoethane / 1,2-Dibromo-3-chloropropane										
Batch CC80613 - 504/8011										
Blank										
1,2-Dibromoethane	ND	0.015	ug/L							
1,2-Dibromoethane [2C]	ND	0.015	ug/L							
Surrogate: Pentachloroethane	*0.157*		ug/L	*0.2000*		*78*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.162*		ug/L	*0.2000*		*81*	*30-150*			
LCS										
1,2-Dibromoethane	0.074	0.015	ug/L	0.08000		93	70-130			
1,2-Dibromoethane [2C]	0.076	0.015	ug/L	0.08000		95	70-130			
Surrogate: Pentachloroethane	*0.0846*		ug/L	*0.08000*		*106*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.0847*		ug/L	*0.08000*		*106*	*30-150*			
LCS										
1,2-Dibromoethane	0.192	0.015	ug/L	0.2000		96	70-130			
1,2-Dibromoethane [2C]	0.209	0.015	ug/L	0.2000		104	70-130			
Surrogate: Pentachloroethane	*0.216*		ug/L	*0.2000*		*108*	*30-150*			
Surrogate: Pentachloroethane [2C]	*0.223*		ug/L	*0.2000*		*111*	*30-150*			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802550

Notes and Definitions

U	Analyte included in the analysis, but not detected
HT	The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1802550

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1802550
Date Received: 2/27/2018
Project Due Date: 3/6/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / (NA)

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	204762	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	
01	204763	Yes	NA	Yes	250 mL Poly - NaOH	NaOH	pH 12
01	204764	Yes	NA	Yes	250 mL Poly - Unpres	NP	
01	204765	Yes	NA	Yes	500 mL Poly - H2SO4	H2SO4	
01	204766	Yes	No	Yes	VOA Vial - HCl	HCl	
01	204767	Yes	No	Yes	VOA Vial - HCl	HCl	
01	204768	Yes	No	Yes	VOA Vial - HCl	HCl	
01	204776	Yes	NA	Yes	1L Poly - Unpres	NP	
01	204777	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
02	204769	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	
02	204770	Yes	NA	Yes	500 mL Poly - H2SO4	H2SO4	
02	204778	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
02	204779	Yes	NA	Yes	250 mL Poly - Unpres	NP	

2nd Review
Are barcode labels on correct containers? (Yes) / No

Completed By: Date & Time: 2/27/18 10:00
Reviewed By: M. Nid Date & Time: 2/27/18 1033
Delivered By: M. Nid 2/27/18 1034

changes made 3/6/18 - ML

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1802550

Turn Time: X Standard Rush _____ Approved By: _____

Reporting Limits - NPDES RGP MLs

State where samples were collected: (MA) NH

Discharge into: Fresh Water ☒ Salt Water ☐

Is this project for: **RGP**

Electonic Deliverable Yes ____ No ____
Format: Excel ___ Access ___ PDF ___ Other ___

Project Manager: Derek McClellan
Company: Tata + Howard
Address: 67 Forest St
Marlborough, MA 01752

Project #: 5517
Project Name: Wayland 2018 Water Main Improvements
PO #

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals Total	RGP Metals Dissolved	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	TRC 4500-CL D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 3500	Phenol 420.1	RGP VOC Long List 524	1,4-Dioxane 8270-SIM	EDB 504.1	RGP SVOC Log List 625-SIM	PCB 608	Comment #
1	2/26/18	1115	G	GW	AMB-117	9 ~~22~~	X		X		X	X		X	X	X	X	X		X		x			1,2
2	2/26/18	1215	G	SW	Pine Brook	4	X		X							X		X							

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA	4	4	4	1	1	5	3	1	1	3	-	1	3	2	1	2	1	1							
Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter	P	P	P	V	P	P	AG	P	P	P	-	P	AG	V	AG	V	AG	AG							

Cooler Present ✓ Yes ____ No
Seals Intact ___ Yes ___ No NA: ✓
Cooler Temperature: 3.2 ic

Sampled by : DSM

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/3113B and Hg by 245.1, ~~Chromium III~~
2) Parameters in **BOLD** have Short hold-time **PERMIT ATTACHED**
*** TSS, TRC and Cl taken from the same container**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Derek McClellan	2/26/18 1556	ESS Hopkinton Dropoff	ESS Hopkinton 2/27/18	0912	M. Mick 2/27/18 0912
M. Mick	2/27/18 1014	2/27/18 10:15			

Please E-mail all changes to Chain of Custody in writin

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ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1802550

Turn Time: X Standard Rush _____ Approved By: _____

Reporting Limits - NPDES RGP MLs

State where samples were collected: (MA) NH

Discharge into: Fresh Water ☒ Salt Water ☐

Is this project for: **RGP**

Electonic Deliverable Yes ____ No ____
Format: Excel ___ Access ___ PDF ___ Other ___

Project Manager: Derek McClellan
Company: Tata + Howard
Address: 67 Forest St
Marlborough, MA 01752

Project #: 5517
Project Name: Wayland 2018 Water Main Improvements
PO #

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals Total	RGP Metals Dissolved	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	TRC 4500-CL D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 3500	Phenol 420.1	RGP VOC Long List 524	1,4-Dioxane 8270-SIM	EDB 504.1	RGP SVOC Log List 625-SIM	PCB 608	Comment #
1	2/26/18	1115	G	GW	AMB-117	9 ~~22~~	X		X		X	X		X	X	X	X	X		X					1,2
2	2/26/18	1215	G	SW	Pine Brook	4	X		X							X		X							

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA	4	4	4	1	1	5	3	1	1	3	-	1	3	2	1	2	1	1							
Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter	P	P	P	V	P	P	AG	P	P	P	-	P	AG	V	AG	V	AG	AG							

Cooler Present ✓ Yes ____ No
Seals Intact ___ Yes ___ No NA: ✓
Cooler Temperature: 3.2 ic

Sampled by: DSM

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/3113B and Hg by 245.1, ~~Chromium III~~
2) Parameters in **BOLD** have Short hold-time **PERMIT ATTACHED**
*** TSS, TRC and Cl taken from the same container**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Derek McClellan	2/26/18 1556	ESS Hopkinton Dropoff 2/26/18 515	ESS Hopkinton 2/27/18	0912	M. Mick 2/27/18 0912
M. Mick	2/27/18 1014	2/27/18 10:15			

Please E-mail all changes to Chain of Custody in writin

Page 1 of 1

CERTIFICATE OF ANALYSIS

This lab report includes the analytical results for 268 BPR (SB-4), as indicated in Table 3.

Derek McClellan
Tata and Howard
67 Forest Street
Marlborough, MA 01752

RE: Wayland Water Main Improvements - RGP (5517)
ESS Laboratory Work Order Number: 1802608

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:03 pm, Mar 23, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1802608

SAMPLE RECEIPT

The following samples were received on February 28, 2018 for the analyses specified on the enclosed Chain of Custody Record.

The samples and analyses listed below were analyzed in accordance with the 2017 Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES).

ESS Laboratory is unable to achieve the required detection limit of 0.4 mg/L for Ethanol for the RGP permit. We have also been unable to procure a subcontract laboatory that is able to achieve this limit. The data for Ethanol has been reported using our current method reporting limit.

Revision 1 March 23, 2018: This report has been revised to include 2-methylnaphthalene results per client request.

Lab Number	Sample Name	Matrix	Analysis
1802608-01	268 BPR SB4	Ground Water	1664A, 200.7, 245.1, 2540D, 300.0, 3113B, 350.1, 3500Cr B-2009, 420.1, 4500 CN CE, 4500Cl D, 524.2, 625 SIM, 8270D SIM

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

PROJECT NARRATIVE

524.2 Volatile Organic Compounds

C8C0015-CCV1 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
Tertiary-butyl Alcohol (38% @ 30%)

CC80125-BS1 **Blank Spike recovery is above upper control limit (B+).**
Tertiary-butyl Alcohol (162% @ 70-130%)

CC80125-BSD1 **Blank Spike recovery is above upper control limit (B+).**
Tertiary-butyl Alcohol (162% @ 70-130%)

Classical Chemistry

1802608-01 **The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.**
Total Residual Chlorine

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1802608

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (10.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Arsenic	**7.7** (1.0)		3113B		1	KJK	03/02/18 21:15	50	10	CC80143
Cadmium	**0.15** (0.05)		3113B		1	KJK	03/02/18 16:43	50	10	CC80143
Chromium	ND (4.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Chromium III	ND (10.0)		200.7		1	JLK	03/02/18 3:18	1	1	[CALC]
Copper	ND (4.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Hardness	**246000** (165)		200.7		1	KJK	03/02/18 3:18	1	1	[CALC]
Iron	**4320** (20.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Lead	ND (1.0)		3113B		1	KJK	03/02/18 18:59	50	10	CC80143
Mercury	ND (0.200)		245.1		1	MJV	03/02/18 10:42	20	40	CC80144
Nickel	ND (10.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Selenium	ND (2.0)		3113B		1	KJK	03/03/18 0:50	50	10	CC80143
Silver	ND (1.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143
Zinc	**401** (10.0)		200.7		1	KJK	03/02/18 3:18	50	10	CC80143

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A
Initial Volume: 25
Final Volume: 25
Extraction Method: 524.2

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Acetone	ND (5.0)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Benzene	ND (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Ethylbenzene	**2.0** (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Methyl tert-Butyl Ether	**4.4** (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Tertiary-butyl Alcohol	ND (25.0)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Toluene	ND (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Xylene O	**1.2** (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125
Xylene P,M	**4.0** (0.5)		524.2		1	03/01/18 12:53	C8C0015	CC80125

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*112 %*		*80-120*
Surrogate: 4-Bromofluorobenzene	*112 %*		*80-120*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 0.25
Extraction Method: 3510C

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 3/1/18 11:15

625(SIM) Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Acenaphthene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Acenaphthylene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Anthracene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Benzo(a)anthracene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Benzo(a)pyrene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Benzo(b)fluoranthene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Benzo(g,h,i)perylene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Benzo(k)fluoranthene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
bis(2-Ethylhexyl)phthalate	ND (2.06)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Butylbenzylphthalate	ND (2.34)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Chrysene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Dibenzo(a,h)Anthracene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Diethylphthalate	ND (2.34)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Dimethylphthalate	ND (2.34)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Di-n-butylphthalate	ND (2.34)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Di-n-octylphthalate	ND (2.34)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Fluoranthene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Fluorene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Indeno(1,2,3-cd)Pyrene	ND (0.05)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Naphthalene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Phenanthrene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808
Pyrene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*52 %*		*30-130*
Surrogate: 2,4,6-Tribromophenol	*84 %*		*15-110*
Surrogate: 2-Fluorobiphenyl	*59 %*		*30-130*
Surrogate: Nitrobenzene-d5	*69 %*		*30-130*
Surrogate: p-Terphenyl-d14	*73 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: ADMIN
Prepared: 3/6/18 19:00

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	03/07/18 0:30	C8C0089	CC80653

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	50 %		15-115

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 0.25
Extraction Method: 3510C

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 3/1/18 11:15

625(SIM) Polynuclear Aromatic Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
2-Methylnaphthalene	ND (0.19)		625 SIM		1	03/03/18 15:44	C8C0044	CB82808

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*52 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*59 %*		*30-130*
Surrogate: Nitrobenzene-d5	*69 %*		*30-130*
Surrogate: p-Terphenyl-d14	*73 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: 268 BPR SB4
Date Sampled: 02/28/18 10:30
Percent Solids: N/A

ESS Laboratory Work Order: 1802608
ESS Laboratory Sample ID: 1802608-01
Sample Matrix: Ground Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	**0.36** (0.10)		350.1		1	JLK	03/05/18 17:21	mg/L	CC80507
Chloride	**338** (50.0)		300.0		100	EEM	03/05/18 17:30	mg/L	CC80524
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	JLK	02/28/18 22:24	ug/L	CB82832
Phenols	ND (100)		420.1		1	JLK	03/02/18 20:01	ug/L	CC80228
Total Cyanide (LL)	ND (5.00)		4500 CN CE		1	EEM	03/02/18 11:00	ug/L	CC80211
Total Petroleum Hydrocarbon	ND (5)		1664A		1	LAB	03/06/18 13:36	mg/L	CC80510
Total Residual Chlorine	**HT** ND (20.0)		4500Cl D		1	JLK	02/28/18 20:10	ug/L	CB82836
Total Suspended Solids	ND (5)		2540D		1	EEM	03/01/18 14:15	mg/L	CC80113

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CB82832 - [CALC]										
Blank										
Chromium III	ND	10.0	ug/L							
LCS										
Chromium III	ND		ug/L							
LCS Dup										
Chromium III	ND		ug/L							
Batch CC80143 - 3005A/200.7										
Blank										
Antimony	ND	10.0	ug/L							
Arsenic	ND	1.0	ug/L							
Cadmium	ND	0.05	ug/L							
Chromium	ND	4.0	ug/L							
Chromium III	ND	4.00	ug/L							
Copper	ND	4.0	ug/L							
Hardness	ND	165	ug/L							
Iron	ND	20.0	ug/L							
Lead	ND	1.0	ug/L							
Nickel	ND	10.0	ug/L							
Selenium	ND	2.0	ug/L							
Silver	ND	1.0	ug/L							
Zinc	ND	10.0	ug/L							
LCS										
Antimony	85.7	10.0	ug/L	100.0		86	85-115			
Arsenic	90.6	25.0	ug/L	100.0		91	85-115			
Cadmium	48.6	25.0	ug/L	50.00		97	85-115			
Chromium	94.2	4.0	ug/L	100.0		94	85-115			
Chromium III	94.2	4.00	ug/L							
Copper	93.2	4.0	ug/L	100.0		93	85-115			
Hardness	6170	165	ug/L							
Iron	464	20.0	ug/L	500.0		93	85-115			
Lead	92.8	25.0	ug/L	100.0		93	85-115			
Nickel	94.9	10.0	ug/L	100.0		95	85-115			
Selenium	192	50.0	ug/L	200.0		96	85-115			
Silver	47.1	1.0	ug/L	50.00		94	85-115			
Zinc	92.8	10.0	ug/L	100.0		93	85-115			
LCS Dup										
Arsenic	90.2	25.0	ug/L	100.0		90	85-115	0.5	20	
Cadmium	47.3	25.0	ug/L	50.00		95	85-115	3	20	
Chromium III	94.2	4.00	ug/L							
Hardness	6190	165	ug/L							
Lead	92.6	25.0	ug/L	100.0		93	85-115	0.1	20	
Selenium	191	50.0	ug/L	200.0		96	85-115	0.3	20	
Batch CC80144 - 245.1/7470A										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC80144 - 245.1/7470A										
Blank										
Mercury	ND	0.200	ug/L							
LCS										
Mercury	5.86	0.200	ug/L	6.000		98	85-115			
LCS Dup										
Mercury	5.91	0.200	ug/L	6.000		98	85-115	0.7	20	
524.2 Volatile Organic Compounds										
Batch CC80125 - 524.2										
Blank										
Acetone	ND	5.0	ug/L							
Benzene	ND	0.5	ug/L							
Ethylbenzene	ND	0.5	ug/L							
Methyl tert-Butyl Ether	ND	0.5	ug/L							
Tertiary-butyl Alcohol	ND	25.0	ug/L							
Toluene	ND	0.5	ug/L							
Xylene O	ND	0.5	ug/L							
Xylene P,M	ND	0.5	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*5.61*		ug/L	*5.000*		*112*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.39*		ug/L	*5.000*		*108*	*80-120*			
LCS										
Acetone	55.9		ug/L	50.00		112	70-130			
Benzene	10.3		ug/L	10.00		103	70-130			
Ethylbenzene	10.4		ug/L	10.00		104	70-130			
Methyl tert-Butyl Ether	11.0		ug/L	10.00		110	70-130			
Tertiary-butyl Alcohol	81.1		ug/L	50.00		162	70-130			B+
Toluene	10.3		ug/L	10.00		103	70-130			
Xylene O	10.6		ug/L	10.00		106	70-130			
Xylene P,M	20.6		ug/L	20.00		103	70-130			
Surrogate: 1,2-Dichlorobenzene-d4	*5.53*		ug/L	*5.000*		*111*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.23*		ug/L	*5.000*		*105*	*80-120*			
LCS Dup										
Acetone	56.0		ug/L	50.00		112	70-130	0.09	20	
Benzene	10.3		ug/L	10.00		103	70-130	0.6	20	
Ethylbenzene	10.3		ug/L	10.00		103	70-130	0.8	20	
Methyl tert-Butyl Ether	10.9		ug/L	10.00		109	70-130	0.8	20	
Tertiary-butyl Alcohol	81.0		ug/L	50.00		162	70-130	0.07	25	B+
Toluene	10.2		ug/L	10.00		102	70-130	0.5	20	
Xylene O	10.5		ug/L	10.00		105	70-130	0.9	20	
Xylene P,M	20.6		ug/L	20.00		103	70-130	0	20	
Surrogate: 1,2-Dichlorobenzene-d4	*5.46*		ug/L	*5.000*		*109*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.17*		ug/L	*5.000*		*103*	*80-120*			
625(SIM) Semi-Volatile Organic Compounds										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CB82808 - 3510C										
Blank										
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.05	ug/L							
Benzo(a)pyrene	ND	0.05	ug/L							
Benzo(b)fluoranthene	ND	0.05	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.05	ug/L							
bis(2-Ethylhexyl)phthalate	ND	2.20	ug/L							
Butylbenzylphthalate	ND	2.50	ug/L							
Chrysene	ND	0.05	ug/L							
Dibenzo(a,h)Anthracene	ND	0.05	ug/L							
Diethylphthalate	ND	2.50	ug/L							
Dimethylphthalate	ND	2.50	ug/L							
Di-n-butylphthalate	ND	2.50	ug/L							
Di-n-octylphthalate	ND	2.50	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.05	ug/L							
Naphthalene	ND	0.20	ug/L							
Phenanthrene	ND	0.20	ug/L							
Pyrene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*1.76*		ug/L	*2.500*		*70*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*2.58*		ug/L	*3.750*		*69*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.82*		ug/L	*2.500*		*73*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.26*		ug/L	*2.500*		*90*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.20*		ug/L	*2.500*		*88*	*30-130*			
LCS										
Acenaphthene	2.46	0.20	ug/L	4.000		61	40-140			
Acenaphthylene	2.72	0.20	ug/L	4.000		68	40-140			
Anthracene	2.58	0.20	ug/L	4.000		64	40-140			
Benzo(a)anthracene	2.76	0.05	ug/L	4.000		69	40-140			
Benzo(a)pyrene	2.88	0.05	ug/L	4.000		72	40-140			
Benzo(b)fluoranthene	3.06	0.05	ug/L	4.000		76	40-140			
Benzo(g,h,i)perylene	3.51	0.20	ug/L	4.000		88	40-140			
Benzo(k)fluoranthene	2.55	0.05	ug/L	4.000		64	40-140			
bis(2-Ethylhexyl)phthalate	3.34	2.50	ug/L	4.000		84	40-140			
Butylbenzylphthalate	3.60	2.50	ug/L	4.000		90	40-140			
Chrysene	2.76	0.05	ug/L	4.000		69	40-140			
Dibenzo(a,h)Anthracene	3.14	0.05	ug/L	4.000		78	40-140			
Diethylphthalate	2.86	2.50	ug/L	4.000		72	40-140			
Dimethylphthalate	2.85	2.50	ug/L	4.000		71	40-140			
Di-n-butylphthalate	3.35	2.50	ug/L	4.000		84	40-140			
Di-n-octylphthalate	3.36	2.50	ug/L	4.000		84	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CB82808 - 3510C										
Fluoranthene	3.01	0.20	ug/L	4.000		75	40-140			
Fluorene	2.75	0.20	ug/L	4.000		69	40-140			
Indeno(1,2,3-cd)Pyrene	3.48	0.05	ug/L	4.000		87	40-140			
Naphthalene	2.20	0.20	ug/L	4.000		55	40-140			
Phenanthrene	2.69	0.20	ug/L	4.000		67	40-140			
Pyrene	2.99	0.20	ug/L	4.000		75	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.22*		ug/L	*2.500*		*49*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*2.81*		ug/L	*3.750*		*75*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.44*		ug/L	*2.500*		*57*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.80*		ug/L	*2.500*		*72*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.98*		ug/L	*2.500*		*79*	*30-130*			
LCS Dup										
Acenaphthene	2.61	0.20	ug/L	4.000		65	40-140	6	20	
Acenaphthylene	2.87	0.20	ug/L	4.000		72	40-140	5	20	
Anthracene	2.69	0.20	ug/L	4.000		67	40-140	4	20	
Benzo(a)anthracene	2.78	0.05	ug/L	4.000		70	40-140	0.7	20	
Benzo(a)pyrene	3.04	0.05	ug/L	4.000		76	40-140	5	20	
Benzo(b)fluoranthene	3.06	0.05	ug/L	4.000		76	40-140	0.06	20	
Benzo(g,h,i)perylene	3.68	0.20	ug/L	4.000		92	40-140	5	20	
Benzo(k)fluoranthene	2.87	0.05	ug/L	4.000		72	40-140	12	20	
bis(2-Ethylhexyl)phthalate	3.46	2.50	ug/L	4.000		87	40-140	4	20	
Butylbenzylphthalate	3.73	2.50	ug/L	4.000		93	40-140	4	20	
Chrysene	2.84	0.05	ug/L	4.000		71	40-140	3	20	
Dibenzo(a,h)Anthracene	3.26	0.05	ug/L	4.000		81	40-140	4	20	
Diethylphthalate	3.02	2.50	ug/L	4.000		75	40-140	5	20	
Dimethylphthalate	2.96	2.50	ug/L	4.000		74	40-140	4	20	
Di-n-butylphthalate	3.55	2.50	ug/L	4.000		89	40-140	6	20	
Di-n-octylphthalate	3.60	2.50	ug/L	4.000		90	40-140	7	20	
Fluoranthene	3.18	0.20	ug/L	4.000		79	40-140	5	20	
Fluorene	2.86	0.20	ug/L	4.000		71	40-140	4	20	
Indeno(1,2,3-cd)Pyrene	3.58	0.05	ug/L	4.000		90	40-140	3	20	
Naphthalene	2.37	0.20	ug/L	4.000		59	40-140	7	20	
Phenanthrene	2.81	0.20	ug/L	4.000		70	40-140	4	20	
Pyrene	3.09	0.20	ug/L	4.000		77	40-140	3	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.45*		ug/L	*2.500*		*58*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.55*		ug/L	*3.750*		*95*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.61*		ug/L	*2.500*		*65*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.98*		ug/L	*2.500*		*79*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.13*		ug/L	*2.500*		*85*	*30-130*			
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CC80653 - 3535A										
Blank										
1,4-Dioxane	ND	0.250	ug/L							
Surrogate: 1,4-Dioxane-d8	*ND*		ug/L	*5.000*		*40*	*15-115*			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CC80653 - 3535A										
LCS										
1,4-Dioxane	10.8	0.250	ug/L	10.00		108	40-140			
Surrogate: 1,4-Dioxane-d8	*2.63*		ug/L	*5.000*		*53*	*15-115*			
LCS Dup										
1,4-Dioxane	10.1	0.250	ug/L	10.00		101	40-140	7	20	
Surrogate: 1,4-Dioxane-d8	*2.76*		ug/L	*5.000*		*55*	*15-115*			
625(SIM) Polynuclear Aromatic Hydrocarbons										
Batch CB82808 - 3510C										
Blank										
2-Methylnaphthalene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*1.76*		ug/L	*2.500*		*70*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.82*		ug/L	*2.500*		*73*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.26*		ug/L	*2.500*		*90*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.20*		ug/L	*2.500*		*88*	*30-130*			
LCS										
2-Methylnaphthalene	2.27	0.20	ug/L	4.000		57	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.22*		ug/L	*2.500*		*49*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.44*		ug/L	*2.500*		*57*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.80*		ug/L	*2.500*		*72*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.98*		ug/L	*2.500*		*79*	*30-130*			
LCS Dup										
2-Methylnaphthalene	2.43	0.20	ug/L	4.000		61	40-140	7	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.45*		ug/L	*2.500*		*58*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.61*		ug/L	*2.500*		*65*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.98*		ug/L	*2.500*		*79*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.13*		ug/L	*2.500*		*85*	*30-130*			
Classical Chemistry										
Batch CB82832 - General Preparation										
Blank										
Hexavalent Chromium	ND	10.0	ug/L							
LCS										
Hexavalent Chromium	0.494		mg/L	0.4998		99	90-110			
LCS Dup										
Hexavalent Chromium	0.493		mg/L	0.4998		99	90-110	0.2	20	
Batch CB82836 - General Preparation										
Blank										
Total Residual Chlorine	ND	20.0	ug/L							
LCS										
Total Residual Chlorine	1.80		mg/L	1.800		100	85-115			
Batch CC80113 - General Preparation										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CC80113 - General Preparation										
Blank										
Total Suspended Solids	ND	5	mg/L							
LCS										
Total Suspended Solids	34		mg/L	34.10		100	80-120			
Batch CC80211 - TCN Prep										
Blank										
Total Cyanide (LL)	ND	5.00	ug/L							
LCS										
Total Cyanide (LL)	20.2	5.00	ug/L	20.06		101	90-110			
LCS										
Total Cyanide (LL)	149	5.00	ug/L	150.4		99	90-110			
LCS Dup										
Total Cyanide (LL)	149	5.00	ug/L	150.4		99	90-110	0.4	20	
Batch CC80228 - General Preparation										
Blank										
Phenols	ND	100	ug/L							
LCS										
Phenols	104	100	ug/L	100.0		104	80-120			
LCS										
Phenols	1040	100	ug/L	1000		104	80-120			
Batch CC80507 - NH4 Prep										
Blank										
Ammonia as N	ND	0.10	mg/L							
LCS										
Ammonia as N	0.09	0.10	mg/L	0.09994		87	80-120			
LCS										
Ammonia as N	1.02	0.10	mg/L	0.9994		102	80-120			
Batch CC80510 - General Preparation										
Blank										
Total Petroleum Hydrocarbon	ND	5	mg/L							
LCS										
Total Petroleum Hydrocarbon	14	5	mg/L	19.38		73	66-114			
Batch CC80524 - General Preparation										
Blank										
Chloride	ND	0.5	mg/L							
LCS										
Chloride	2.4		mg/L	2.500		97	90-110			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1802608

Notes and Definitions

U	Analyte included in the analysis, but not detected
HT	The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1802608

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1802608
Date Received: 2/28/2018
Project Due Date: 3/7/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? NA
   Temp: 2.6 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	205480	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205481	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205482	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205483	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205484	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205485	Yes	No	Yes	VOA Vial - HCl	HCl	
01	205486	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	205487	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	205490	Yes	NA	Yes	1L Amber - Unpres	NP	
01	205491	Yes	NA	Yes	1L Amber - Unpres	NP	
01	205492	Yes	NA	Yes	1L Amber - Unpres	NP	
01	205493	Yes	NA	Yes	1L Amber - Unpres	NP	
01	205494	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
01	205495	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	
01	205496	Yes	NA	Yes	250 mL Poly - NaOH	NaOH	**pH>12 2/28/18 1900** DL
01	205497	Yes	NA	Yes	500 mL Poly - H2SO4	H2SO4	
01	205498	Yes	NA	Yes	250 mL Poly - Unpres	NP	
01	205499	Yes	NA	Yes	1L Poly - Unpres	NP	

2nd Review
Are barcode labels on correct containers? Yes / No

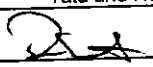
Completed

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

ESS Project ID: 1802608

Date Received: 2/28/2018

By:  Date & Time: 2/28/18 1605

Reviewed By: _____ Date & Time: _____

Delivered By: _____

changes made 3/6/18 - ML

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1802608

Turn Time: X Standard Rush _____ Approved By: _____

Reporting Limits - DPDES MGP MCLs

State where samples were collected: (MA) NH

Discharge into: Fresh Water [X] Salt Water [ ]

Is this project for: **RGP**

Electonic Deliverable Yes ___ No ___
Format: Excel ___ Access ___ PDF ___ Other ___

Project Manager: Derek McClellan
Company: Tata & Howard
Address: 67 Forest St.
Marlborough, MA

Project # 5517
Project Name: Wayland 2018 Water Main Improvements
PO #

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals Total	RGP Metals Dissolved	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	TRC 4500-CL D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 3500	Phenol 420.1	RGP VOC Long list 524 (VOA - Headspace free)	1,4-Dioxane 8270-SIM	EDB 504 (VOA - Headspace free)	RGP SVOC Long List 625-SIM	PCB 608	Comment #
1	2-25-18	10:30	G	GW	268 BPR SB4	22	X		X		X	X	X	X	X	X		X	X	X	X	X	X	X	1,2,3,4
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	4	1	1	5	3	1	1	3	-	1	3	2	1	2	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	P	V	P	P	AG	P	P	P	-	P	AG	V	AG	V	AG	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present X Yes ___ No
Seals Intact ___ Yes ___ No NA: X
Cooler Temperature: Ice temp 2.6

Sampled by: JDD CHH

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/3113B and Hg by 245.1 ML must be ≤120 ug/L
2) Parameters in **BOLD** have Short hold-time
PERMIT ATTACHED
3) Non Halogenated VOC + SVOC list + MTBE + Tert-Butyl Alcohol
4) Tert-Butyl Alcohol
* **TSS, TRC and Cl taken from the same container**

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	2/25/18 1:56			2/26/18 15:07	2/28/18 1858
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writin

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ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1802608

Turn Time: X Standard Rush _____ Approved By: _____

Reporting Limits - DPDES MGP MCLs

State where samples were collected: (MA) NH

Discharge into: Fresh Water [X] Salt Water [ ]

Is this project for: **RGP**

Electonic Deliverable Yes ___ No ___
Format: Excel ___ Access ___ PDF ___ Other ___

Project Manager: Derek McClellan
Company: Tata & Howard
Address: 67 Forest St. Marlborough, MA

Project # 5517
Project Name: Wayland 2018 Water Main Improvements
PO #

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals Total	RGP Metals Dissolved	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	TRC 4500-CL D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 3500	Phenol 420.1	RGP VOC Long list 524 (VOA - Halogenated)	1,4-Dioxane 8270-SIM	EDB 504.1 (VOA - Halogenated)	RGP SVOC Long List 625-SIM	PCB 608	Comment #
1	2-25-18	10:30	G	GW	268 BPR SB4	22	X		X		X	X	X	X	X	X		X	X	X	X	X	X	X	1,2,3,4
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	4	1	1	5	3	1	1	3	-	1	3	2	1	2	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	P	V	P	P	AG	P	P	P	-	P	AG	V	AG	V	AG	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present X Yes ___ No
Seals Intact ___ Yes ___ No NA: X
Cooler Temperature: Ice temp 2.6

Sampled by: JDD CHH

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/3113B and Hg by 245.1
2) Parameters in **BOLD** have Short hold-time
* **TSS, TRC and Cl taken from the same container**
PERMIT ATTACHED
3) Non Halogenated VOC + SVOC list + MTBE + Tert-Butyl Alcohol
4) Tert-Butyl Alcohol ML must be ≤ 20 ug/L

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	2/25/18 1:56			2/26/18 15:07	2/28/18 1858
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writin

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CERTIFICATE OF ANALYSIS

This lab report includes the analytical results for 338 BPR (MW-3), as indicated in Table 3.

Derek McClellan
Tata and Howard
67 Forest Street
Marlborough, MA 01752

RE: Wayland Water Main Improvements - RGP (5517)
ESS Laboratory Work Order Number: 1803430

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:48 pm, Mar 28, 2018

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1803430

SAMPLE RECEIPT

The following samples were received on March 21, 2018 for the analyses specified on the enclosed Chain of Custody Record.

The samples and analyses listed below were analyzed in accordance with the 2017 Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES).

ESS Laboratory is unable to achieve the required detection limit of 0.4 mg/L for Ethanol for the RGP permit. We have also been unable to procure a subcontract laboatory that is able to achieve this limit. The data for Ethanol has been reported using our current method reporting limit.

Lab Number	Sample Name	Matrix	Analysis
1803430-01	MW-3	Ground Water	1664A, 200.7, 245.1, 2540D, 300.0, 3113B, 350.1, 3500Cr B-2009, 420.1, 4500 CN CE, 4500Cl D, 524.2, 625 SIM, 8270D SIM, ASTM D3695

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

PROJECT NARRATIVE

524.2 Volatile Organic Compounds

1803430-01 **Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).**
1,2-Dichlorobenzene-d4 (211% @ 80-120%)

625(SIM) Semi-Volatile Organic Compounds

C8C0364-CCV2 **Calibration required quadratic regression (Q).**
Pentachlorophenol (122% @ 80-120%)

C8C0364-CCV2 **Continuing Calibration %Diff/Drift is above control limit (CD+).**
Pentachlorophenol (22% @ 20%)

Classical Chemistry

1803430-01 **The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

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Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (1.5)		3113B		3	KJK	03/22/18 22:42	100	10	CC82106
Arsenic	**13.4** (1.5)		3113B		3	KJK	03/22/18 17:15	100	10	CC82106
Cadmium	ND (0.08)		3113B		3	KJK	03/23/18 14:27	100	10	CC82106
Chromium	ND (2.0)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106
Chromium III	ND (10.0)		200.7		1	EEM	03/22/18 11:53	1	1	[CALC]
Copper	ND (2.0)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106
Hardness	**156000** (499)		200.7		10	KJK	03/22/18 14:42	1	1	[CALC]
Iron	**39100** (10.0)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106
Lead	ND (1.5)		3113B		3	KJK	03/22/18 19:05	100	10	CC82106
Mercury	ND (0.200)		245.1		1	MJV	03/22/18 12:07	20	40	CC82108
Nickel	ND (5.0)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106
Selenium	ND (3.0)		3113B		3	KJK	03/22/18 20:49	100	10	CC82106
Silver	**1.9** (0.5)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106
Zinc	**23.4** (5.0)		200.7		1	KJK	03/22/18 11:53	100	10	CC82106

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A
Initial Volume: 25
Final Volume: 25
Extraction Method: 524.2

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: DMC

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Acetone	ND (5.0)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Benzene	**14.0** (0.5)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Ethylbenzene	**365** (25.0)		524.2		50	03/22/18 16:35	C8C0327	CC82302
Methyl tert-Butyl Ether	**0.5** (0.5)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Tertiary-amyl methyl ether	ND (1.0)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Tertiary-butyl Alcohol	ND (25.0)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Toluene	**22.8** (0.5)		524.2		1	03/22/18 14:17	C8C0327	CC82302
Xylene O	**126** (25.0)		524.2		50	03/22/18 16:35	C8C0327	CC82302
Xylene P,M	**1650** (25.0)		524.2		50	03/22/18 16:35	C8C0327	CC82302

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*211 %*	*SM*	*80-120*
Surrogate: 4-Bromofluorobenzene	*110 %*		*80-120*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A
Initial Volume: 800
Final Volume: 0.25
Extraction Method: 3510C

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: IBM
Prepared: 3/26/18 11:37

625(SIM) Semi-Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Acenaphthene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Acenaphthylene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Anthracene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Benzo(a)anthracene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Benzo(a)pyrene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Benzo(b)fluoranthene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Benzo(g,h,i)perylene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Benzo(k)fluoranthene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
bis(2-Ethylhexyl)phthalate	ND (1.88)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Butylbenzylphthalate	ND (3.12)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Chrysene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Dibenzo(a,h)Anthracene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Diethylphthalate	ND (3.12)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Dimethylphthalate	ND (3.12)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Di-n-butylphthalate	**5.80** (3.12)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Di-n-octylphthalate	ND (3.12)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Fluoranthene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Fluorene	**0.48** (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Indeno(1,2,3-cd)Pyrene	ND (0.06)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Naphthalene	**120** (2.50)		625 SIM		10	03/27/18 12:09	C8C0364	CC82610
Pentachlorophenol	ND (0.62)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Phenanthrene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610
Pyrene	ND (0.25)		625 SIM		1	03/27/18 0:33	C8C0364	CC82610

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*65 %*		*30-130*
Surrogate: 2,4,6-Tribromophenol	*84 %*		*15-110*
Surrogate: 2-Fluorobiphenyl	*59 %*		*30-130*
Surrogate: Nitrobenzene-d5	*95 %*		*30-130*
Surrogate: p-Terphenyl-d14	*81 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A
Initial Volume: 500
Final Volume: 0.5
Extraction Method: 3535A

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: VSC
Prepared: 3/22/18 15:40

8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,4-Dioxane	ND (0.250)		8270D SIM		1	03/22/18 20:48	C8C0321	CC82246

	%Recovery	Qualifier	Limits
Surrogate: 1,4-Dioxane-d8	*30 %*		*15-115*

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Ammonia as N	**2.18** (0.10)		350.1		1	EEM	03/27/18 14:59	mg/L	CC82612
Chloride	**237** (50.0)		300.0		100	EEM	03/21/18 14:50	mg/L	CC82102
Hexavalent Chromium	ND (10.0)		3500Cr B-2009		1	EEM	03/21/18 14:10	ug/L	CC82138
Phenols	ND (100)		420.1		1	JLK	03/26/18 17:56	ug/L	CC82643
Total Cyanide (LL)	ND (5.00)		4500 CN CE		1	EEM	03/26/18 11:40	ug/L	CC82616
Total Petroleum Hydrocarbon	ND (5)		1664A		1	LAB	03/26/18 13:55	mg/L	CC82206
Total Residual Chlorine	ND (20.0)		4500Cl D		1	EEM	03/21/18 14:40	ug/L	CC82137
Total Suspended Solids	**23** (5)		2540D		1	JLK	03/23/18 20:16	mg/L	CC82334

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP
Client Sample ID: MW-3
Date Sampled: 03/21/18 09:45
Percent Solids: N/A
Initial Volume: 1
Final Volume: 1
Extraction Method: No Prep

ESS Laboratory Work Order: 1803430
ESS Laboratory Sample ID: 1803430-01
Sample Matrix: Ground Water
Units: mg/L
Analyst: ZLC
Prepared: 3/27/18 10:00

Alcohol Scan by GC/FID

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Ethanol	ND (10)		ASTM D3695		1	ZLC	03/27/18 12:01		CC82702

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CC82106 - 3005A/200.7										
Blank										
Antimony	ND	0.5	ug/L							
Arsenic	ND	0.5	ug/L							
Cadmium	ND	0.02	ug/L							
Chromium	ND	2.0	ug/L							
Chromium III	ND	2.00	ug/L							
Copper	ND	2.0	ug/L							
Hardness	ND	82.4	ug/L							
Iron	ND	10.0	ug/L							
Lead	ND	0.5	ug/L							
Nickel	ND	5.0	ug/L							
Selenium	ND	1.0	ug/L							
Silver	ND	0.5	ug/L							
Zinc	ND	5.0	ug/L							
LCS										
Antimony	49.1	12.5	ug/L	50.00		98	85-115			
Arsenic	50.0	12.5	ug/L	50.00		100	85-115			
Cadmium	23.9	12.5	ug/L	25.00		96	85-115			
Chromium	48.3	2.0	ug/L	50.00		97	85-115			
Chromium III	48.3	2.00	ug/L							
Copper	53.9	2.0	ug/L	50.00		108	85-115			
Hardness	3070	82.4	ug/L							
Iron	227	10.0	ug/L	250.0		91	85-115			
Lead	48.5	12.5	ug/L	50.00		97	85-115			
Nickel	46.0	5.0	ug/L	50.00		92	85-115			
Selenium	99.0	25.0	ug/L	100.0		99	85-115			
Silver	22.5	0.5	ug/L	25.00		90	85-115			
Zinc	47.9	5.0	ug/L	50.00		96	85-115			
LCS Dup										
Chromium III	47.2	2.00	ug/L							
Hardness	3140	82.4	ug/L							
Selenium	100	25.0	ug/L	100.0		100	85-115	1	20	
Batch CC82108 - 245.1/7470A										
Blank										
Mercury	ND	0.200	ug/L							
LCS										
Mercury	5.90	0.200	ug/L	6.000		98	85-115			
LCS Dup										
Mercury	5.98	0.200	ug/L	6.000		100	85-115	1	20	
Batch CC82138 - [CALC]										
Blank										
Chromium III	ND	10.0	ug/L							
LCS										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC82138 - [CALC]										
Chromium III	ND		ug/L							
LCS Dup										
Chromium III	ND		ug/L							
524.2 Volatile Organic Compounds										
Batch CC82302 - 524.2										
Blank										
Acetone	ND	5.0	ug/L							
Benzene	ND	0.5	ug/L							
Ethylbenzene	ND	0.5	ug/L							
Methyl tert-Butyl Ether	ND	0.5	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tertiary-butyl Alcohol	ND	25.0	ug/L							
Toluene	ND	0.5	ug/L							
Xylene O	ND	0.5	ug/L							
Xylene P,M	ND	0.5	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*4.76*		ug/L	*5.000*		*95*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.83*		ug/L	*5.000*		*97*	*80-120*			
LCS										
Acetone	51.7		ug/L	50.00		103	70-130			
Benzene	10.6		ug/L	10.00		106	70-130			
Ethylbenzene	10.3		ug/L	10.00		103	70-130			
Methyl tert-Butyl Ether	10.9		ug/L	10.00		109	70-130			
Tertiary-amyl methyl ether	10.5		ug/L	10.00		105	70-130			
Tertiary-butyl Alcohol	58.1		ug/L	50.00		116	70-130			
Toluene	10.4		ug/L	10.00		104	70-130			
Xylene O	10.3		ug/L	10.00		103	70-130			
Xylene P,M	20.1		ug/L	20.00		101	70-130			
Surrogate: 1,2-Dichlorobenzene-d4	*4.67*		ug/L	*5.000*		*93*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.62*		ug/L	*5.000*		*92*	*80-120*			
LCS Dup										
Acetone	51.8		ug/L	50.00		104	70-130	0.2	20	
Benzene	10.6		ug/L	10.00		106	70-130	0	20	
Ethylbenzene	10.4		ug/L	10.00		104	70-130	0.7	20	
Methyl tert-Butyl Ether	10.8		ug/L	10.00		108	70-130	0.8	20	
Tertiary-amyl methyl ether	10.7		ug/L	10.00		107	70-130	2	20	
Tertiary-butyl Alcohol	61.9		ug/L	50.00		124	70-130	6	25	
Toluene	10.4		ug/L	10.00		104	70-130	0.5	20	
Xylene O	10.6		ug/L	10.00		106	70-130	2	20	
Xylene P,M	20.3		ug/L	20.00		102	70-130	0.9	20	
Surrogate: 1,2-Dichlorobenzene-d4	*4.67*		ug/L	*5.000*		*93*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.67*		ug/L	*5.000*		*93*	*80-120*			
625(SIM) Semi-Volatile Organic Compounds										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CC82610 - 3510C										
Blank										
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.05	ug/L							
Benzo(a)pyrene	ND	0.05	ug/L							
Benzo(b)fluoranthene	ND	0.05	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.05	ug/L							
bis(2-Ethylhexyl)phthalate	ND	1.50	ug/L							
Butylbenzylphthalate	ND	2.50	ug/L							
Chrysene	ND	0.05	ug/L							
Dibenzo(a,h)Anthracene	ND	0.05	ug/L							
Diethylphthalate	ND	2.50	ug/L							
Dimethylphthalate	ND	2.50	ug/L							
Di-n-butylphthalate	ND	2.50	ug/L							
Di-n-octylphthalate	ND	2.50	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.05	ug/L							
Naphthalene	ND	0.20	ug/L							
Pentachlorophenol	ND	0.50	ug/L							
Phenanthrene	ND	0.20	ug/L							
Pyrene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*1.47*		ug/L	*2.500*		*59*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*2.74*		ug/L	*3.750*		*73*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.56*		ug/L	*2.500*		*62*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.90*		ug/L	*2.500*		*76*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.94*		ug/L	*2.500*		*78*	*30-130*			
LCS										
Acenaphthene	2.44	0.20	ug/L	4.000		61	40-140			
Acenaphthylene	2.67	0.20	ug/L	4.000		67	40-140			
Anthracene	2.60	0.20	ug/L	4.000		65	40-140			
Benzo(a)anthracene	2.58	0.05	ug/L	4.000		64	40-140			
Benzo(a)pyrene	2.82	0.05	ug/L	4.000		71	40-140			
Benzo(b)fluoranthene	2.88	0.05	ug/L	4.000		72	40-140			
Benzo(g,h,i)perylene	3.48	0.20	ug/L	4.000		87	40-140			
Benzo(k)fluoranthene	2.58	0.05	ug/L	4.000		65	40-140			
bis(2-Ethylhexyl)phthalate	2.96	1.50	ug/L	4.000		74	40-140			
Butylbenzylphthalate	3.25	2.50	ug/L	4.000		81	40-140			
Chrysene	2.62	0.05	ug/L	4.000		65	40-140			
Dibenzo(a,h)Anthracene	3.07	0.05	ug/L	4.000		77	40-140			
Diethylphthalate	2.82	2.50	ug/L	4.000		70	40-140			
Dimethylphthalate	2.75	2.50	ug/L	4.000		69	40-140			
Di-n-butylphthalate	3.21	2.50	ug/L	4.000		80	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
625(SIM) Semi-Volatile Organic Compounds										
Batch CC82610 - 3510C										
Di-n-octylphthalate	3.10	2.50	ug/L	4.000		77	40-140			
Fluoranthene	2.98	0.20	ug/L	4.000		75	40-140			
Fluorene	2.75	0.20	ug/L	4.000		69	40-140			
Indeno(1,2,3-cd)Pyrene	3.47	0.05	ug/L	4.000		87	40-140			
Naphthalene	2.34	0.20	ug/L	4.000		58	40-140			
Pentachlorophenol	3.14	0.50	ug/L	4.000		79	30-130			
Phenanthrene	2.68	0.20	ug/L	4.000		67	40-140			
Pyrene	2.80	0.20	ug/L	4.000		70	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.43*		ug/L	*2.500*		*57*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*2.77*		ug/L	*3.750*		*74*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.64*		ug/L	*2.500*		*65*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.00*		ug/L	*2.500*		*80*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.16*		ug/L	*2.500*		*86*	*30-130*			
LCS Dup										
Acenaphthene	2.60	0.20	ug/L	4.000		65	40-140	6	20	
Acenaphthylene	2.87	0.20	ug/L	4.000		72	40-140	7	20	
Anthracene	2.88	0.20	ug/L	4.000		72	40-140	10	20	
Benzo(a)anthracene	2.90	0.05	ug/L	4.000		72	40-140	12	20	
Benzo(a)pyrene	3.21	0.05	ug/L	4.000		80	40-140	13	20	
Benzo(b)fluoranthene	3.37	0.05	ug/L	4.000		84	40-140	16	20	
Benzo(g,h,i)perylene	3.90	0.20	ug/L	4.000		98	40-140	11	20	
Benzo(k)fluoranthene	2.79	0.05	ug/L	4.000		70	40-140	8	20	
bis(2-Ethylhexyl)phthalate	3.48	1.50	ug/L	4.000		87	40-140	16	20	
Butylbenzylphthalate	3.87	2.50	ug/L	4.000		97	40-140	17	20	
Chrysene	2.97	0.05	ug/L	4.000		74	40-140	13	20	
Dibenzo(a,h)Anthracene	3.49	0.05	ug/L	4.000		87	40-140	13	20	
Diethylphthalate	3.12	2.50	ug/L	4.000		78	40-140	10	20	
Dimethylphthalate	3.09	2.50	ug/L	4.000		77	40-140	12	20	
Di-n-butylphthalate	3.68	2.50	ug/L	4.000		92	40-140	13	20	
Di-n-octylphthalate	3.60	2.50	ug/L	4.000		90	40-140	15	20	
Fluoranthene	3.31	0.20	ug/L	4.000		83	40-140	10	20	
Fluorene	2.98	0.20	ug/L	4.000		75	40-140	8	20	
Indeno(1,2,3-cd)Pyrene	3.89	0.05	ug/L	4.000		97	40-140	11	20	
Naphthalene	2.27	0.20	ug/L	4.000		57	40-140	3	20	
Pentachlorophenol	3.47	0.50	ug/L	4.000		87	30-130	10	20	
Phenanthrene	3.01	0.20	ug/L	4.000		75	40-140	11	20	
Pyrene	3.18	0.20	ug/L	4.000		79	40-140	13	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.20*		ug/L	*2.500*		*48*	*30-130*			
Surrogate: 2,4,6-Tribromophenol	*3.70*		ug/L	*3.750*		*99*	*15-110*			
Surrogate: 2-Fluorobiphenyl	*1.62*		ug/L	*2.500*		*65*	*30-130*			
Surrogate: Nitrobenzene-d5	*2.19*		ug/L	*2.500*		*87*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.33*		ug/L	*2.500*		*93*	*30-130*			
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CC82246 - 3535A										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Semi-Volatile Organic Compounds w/ Isotope Dilution										
Batch CC82246 - 3535A										
Blank										
1,4-Dioxane	ND	0.250	ug/L							
Surrogate: 1,4-Dioxane-d8	*ND*		ug/L	*5.000*		*34*	*15-115*			
LCS										
1,4-Dioxane	10.3	0.250	ug/L	10.00		103	40-140			
Surrogate: 1,4-Dioxane-d8	*2.82*		ug/L	*5.000*		*56*	*15-115*			
LCS Dup										
1,4-Dioxane	10.5	0.250	ug/L	10.00		105	40-140	2	20	
Surrogate: 1,4-Dioxane-d8	*2.98*		ug/L	*5.000*		*60*	*15-115*			
Classical Chemistry										
Batch CC82102 - General Preparation										
Blank										
Chloride	ND	0.5	mg/L							
LCS										
Chloride	2.4		mg/L	2.500		98	90-110			
Batch CC82137 - General Preparation										
Blank										
Total Residual Chlorine	ND	20.0	ug/L							
LCS										
Total Residual Chlorine	1.80		mg/L	1.800		100	85-115			
Batch CC82138 - General Preparation										
Blank										
Hexavalent Chromium	ND	10.0	ug/L							
LCS										
Hexavalent Chromium	0.499		mg/L	0.4998		100	90-110			
LCS Dup										
Hexavalent Chromium	0.502		mg/L	0.4998		100	90-110	0.5	20	
Batch CC82206 - General Preparation										
Blank										
Total Petroleum Hydrocarbon	ND	5	mg/L							
LCS										
Total Petroleum Hydrocarbon	16	5	mg/L	19.38		82	66-114			
Batch CC82334 - General Preparation										
Blank										
Total Suspended Solids	ND	5	mg/L							
LCS										
Total Suspended Solids	30		mg/L	34.10		88	80-120			
Batch CC82612 - NH4 Prep										
Blank										

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CC82612 - NH4 Prep										
Ammonia as N	ND	0.10	mg/L							
LCS										
Ammonia as N	0.11	0.10	mg/L	0.09994		110	80-120			
LCS										
Ammonia as N	1.04	0.10	mg/L	0.9994		104	80-120			
Batch CC82616 - TCN Prep										
Blank										
Total Cyanide (LL)	ND	5.00	ug/L							
LCS										
Total Cyanide (LL)	20.0	5.00	ug/L	20.06		100	90-110			
LCS										
Total Cyanide (LL)	146	5.00	ug/L	150.4		97	90-110			
LCS Dup										
Total Cyanide (LL)	147	5.00	ug/L	150.4		97	90-110	0.4	20	
Batch CC82643 - General Preparation										
Blank										
Phenols	ND	100	ug/L							
LCS										
Phenols	104	100	ug/L	100.0		104	80-120			
LCS										
Phenols	1050	100	ug/L	1000		105	80-120			
Alcohol Scan by GC/FID										
Batch CC82702 - No Prep										
Blank										
Ethanol	ND	10	mg/L							
LCS										
Ethanol	1360	10	mg/L	1007		135	60-140			
LCS Dup										
Ethanol	1160	10	mg/L	1007		115	60-140	16	30	

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP ESS Laboratory Work Order: 1803430

Notes and Definitions

U	Analyte included in the analysis, but not detected
SM	Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).
Q	Calibration required quadratic regression (Q).
HT	The maximum holding time listed in 40 CFR Part 136 Table II for pH, Dissolved Oxygen, Sulfite and Residual Chlorine is fifteen minutes.
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: Tata and Howard
Client Project ID: Wayland Water Main Improvements - RGP

ESS Laboratory Work Order: 1803430

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1803430
Date Received: 3/21/2018
Project Due Date: 3/28/2018
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 4.8 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:
Rec'd clear vials for Ethanol analysis CA 3/21/18

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	209939	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209940	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209941	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209942	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209943	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209944	Yes	No	Yes	VOA Vial - HCl	HCl	
01	209945	Yes	NA	Yes	VOA Vial - Unpres	NP	
01	209946	Yes	NA	Yes	VOA Vial - Unpres	NP	
01	209947	Yes	NA	Yes	VOA Vial - Unpres	NP	
01	209948	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	209949	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	209950	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	209951	Yes	NA	Yes	1L Amber - H2SO4	H2SO4	
01	209952	Yes	NA	Yes	1L Amber - Unpres	NP	
01	209953	Yes	NA	Yes	1L Amber - Unpres	NP	
01	209954	Yes	NA	Yes	1L Poly - Unpres	NP	
01	209955	Yes	NA	Yes	Other Poly - Unpres	NP	
01	209956	Yes	NA	Yes	250 mL Poly - H2SO4	H2SO4	
01	209957	Yes	NA	Yes	250 mL Poly - H2SO4	H2SO4	
01	209958	Yes	NA	Yes	500 mL Poly - HNO3	HNO3	
01	209959	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
01	209960	Yes	NA	Yes	250 mL Poly - NaOH	NaOH	**pH > 12 3/21/18 1221** EL

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tata and Howard - ML/ML

ESS Project ID: 1803430
Date Received: 3/21/2018

2nd Review
Are barcode labels on correct containers? (Yes) No

Completed By: _____ Date & Time: 3/21/18 1311
Reviewed By: _____ Date & Time: 3/21/18 1339
Delivered By: _____ 3/21/18 1339

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 1803430

Turn Time: X Standard Rush_____ Approved By: _____

Reporting Limits - NPDES MCP MLS

State where samples were collected: (MA) NH

Discharge into: Fresh Water ☑ Salt Water ☐

Is this project for: **RGP**

Electonic Deliverable Yes____ No____

Format: Excel___ Access___ PDF___ Other_____

Project Manager: _____

Company: Tata & Howard

Address: 67 Forest St. Marlborough, MA

Project #: 5517

Project Name: Wayland 2018 Water Main Improvements

PO #

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	RGP Metals Total	RGP Metals Dissolved	Hardness (Calculation)	Ethanol ASTM D3695	Chloride 300.0*	Total Cyanide 4500 LL	TPH 1664	TSS 2540D*	TRC 4500-CL D*	Ammonia 350.1	Tri Cr (Calc. MUST run T. Cr)	Hex Cr 3500	Phenol 420.1	RGP VOC Long List 524 (VOA)	1,4-Dioxane 8270-SIM	EDB 504.1	RGP SVOC Log List 625-SIM	PCB 608	Comment #
1	3/21/18	9:45	G	G	MW-3	22	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		1,2
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							4	4	4	1	1	5	3	1	1	3	-	1	3	2	1	2	1	1	
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							P	P	P	V	P	P	AG	P	P	P	-	P	AG	V	AG	V	AG	AG	

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present X Yes ____No

Seals Intact ___ Yes ___No NA: X

Cooler Temperature: 4.8 Ice

Sampled by :

Comments: 1) RGP Metals include Sb, As, Cd, Cu, Fe, Pb, Ni, Se, Ag and Zn by 200.7/3113B and Hg by 245.1

2) Parameters in **BOLD** have Short hold-time **PERMIT ATTACHED**

*** TSS, TRC and Cl taken from the same container** X Five Parameters - MTBE TBA Tame

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
		3/21/18 1100	3/21/18 1203		3/21/18 1204
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writir

Page ____ of ____

Appendix E

TATA & HOWARD

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

Jack Buckley, *Director*

September 18, 2017

Molly Coughlin
Tata & Howard, Inc
67 Forest Street
Marlborough MA 01752

RE: Project Location: Boston Post Road
Project Description: 2018 Water Main Improvement Project
NHESP Tracking No.: 17-37121

Dear Commissioners & Applicant:

Thank you for submitting information regarding your project to the Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division").

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat** as indicated in the *Massachusetts Natural Heritage Atlas* (14th Edition). Therefore, the project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the site plans may require a filing with the Division.

Please note that this determination addresses only the matter of **rare** wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project. If you have any questions regarding this letter please contact Rebecca Gendreau, Endangered Species Review Assistant, at (508) 389-6357.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

IPaC Record Locator: 996-11256180 February 20, 2018

Subject: Consistency letter for the 'Wayland Water Main Improvements' project (TAILS 05E1NE00-2018-R-0762) under the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated to verify that the **Wayland Water Main Improvements** (Proposed Action) may rely on the concurrence provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action is within the scope and adheres to the criteria of the PBO, including the adoption of applicable avoidance and minimization measures, and may affect, but is not likely to adversely affect the endangered Indiana bat (*Myotis sodalis*) and/or the threatened Northern long-eared bat (*Myotis septentrionalis*). Consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) is required.

This "may affect - not likely to adversely affect" determination becomes effective when the lead Federal action agency or designated non-federal representative uses it to ask the Service to rely on the PBO to satisfy the agency's consultation requirements for this project.

Please provide this consistency letter to the lead Federal action agency or its designated non-federal representative with a request for its review, and as the agency deems appropriate, to submit for concurrence verification through the IPaC system. The lead Federal action agency or designated non-federal representative should log into IPaC using their agency email account and click "Search by record locator". They will need to enter the record locator **996-11256180**.

For Proposed Actions that include bridge/structure removal, replacement, and/or maintenance activities: If your initial bridge/structure assessments failed to detect Indiana bats, but you later detect bats during construction, please submit the Post Assessment Discovery of Bats at Bridge/Structure Form (User Guide Appendix E) to this Service Office. In these instances, potential incidental take of Indiana bats may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency for the Proposed Action accordingly.

Project Description

The following project name and description was collected in IPaC as part of the endangered species review process.

Name

Wayland Water Main Improvements

Description

Between 234 and 376 Boston Post Rd, Wayland, MA. Dewatering during water main replacement in areas of known contamination from approximately July to November 2018.

Determination Key Result

Based on your answers provided, this project(s) may affect, but is not likely to adversely affect the endangered Indiana bat and/or the threatened Northern long-eared bat. Therefore, consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required. However, also based on your answers provided, this project may rely on the concurrence provided in the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat.

Qualification Interview

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the Northern long-eared bat[1]?

   [1] See Northern long-eared bat species profile

   Automatically answered
   Yes

3. Which Federal Agency is the lead for the action?
   A) Federal Highway Administration (FHWA)

4. Are *all* project activities limited to non-construction[1] activities only? (examples of non-construction activities include: bridge/abandoned structure assessments, surveys, planning and technical studies, property inspections, and property sales)

   [1] Construction refers to activities involving ground disturbance, percussive noise, and/or lighting.

   No

5. Does the project include *any* activities that are **greater than** 300 feet from existing road/rail surfaces[1]?

   [1] Road surface is defined as the actively used [e.g. motorized vehicles] driving surface and shoulders [may be pavement, gravel, etc.] and rail surface is defined as the edge of the actively used rail ballast.

   No

6. Does the project include *any* activities **within** 0.5 miles of an Indiana bat and/or NLEB hibernaculum[1]?

   [1] For the purpose of this consultation, a hibernaculum is a site, most often a cave or mine, where bats hibernate during the winter (see suitable habitat), but could also include bridges and structures if bats are found to be hibernating there during the winter.

   No

7. Is the project located **within** a karst area?

   No

8. Is there *any* suitable[1] summer habitat for Indiana Bat or NLEB **within** the project action area[2]? (includes any trees suitable for maternity, roosting, foraging, or travelling habitat)

   [1] See the Service's summer survey guidance for our current definitions of suitable habitat.

   [2] The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR Section 402.02). Further clarification is provided by the national consultation FAQs.

   No

9. Does the project include maintenance of the surrounding landscape at existing facilities (e.g., rest areas, stormwater detention basins)?

   No

10. Does the project include wetland or stream protection activities associated with compensatory wetland mitigation?

    Yes

11. Does the project include slash pile burning?

    No

12. Does the project include *any* bridge removal, replacement, and/or maintenance activities (e.g., any bridge repair, retrofit, maintenance, and/or rehabilitation work)?

    No

13. Does the project include the removal, replacement, and/or maintenance of *any* structure other than a bridge? (e.g., rest areas, offices, sheds, outbuildings, barns, parking garages, etc.)

    No

14. Will the project involve the use of **temporary** lighting *during* the active season?
    Yes

15. Is there *any* suitable habitat **within** 1,000 feet of the location(s) where **temporary** lighting will be used?
    Yes

16. Will the project install new or replace existing **permanent** lighting?
    No

17. Are *all* project activities that are **not associated with** habitat removal, tree removal/trimming, bridge or structure removal, replacement, and/or maintenance, lighting, or use of percussives, limited to actions that DO NOT cause any stressors to the bat species, including as described in the BA/BO (i.e. activities that do not involve ground disturbance, percussive noise, temporary or permanent lighting, tree removal/trimming, nor bridge/structure activities)?

    Examples: lining roadways, unlighted signage , rail road crossing signals, signal lighting, and minor road repair such as asphalt fill of potholes, etc.

    No

18. Will the project raise the road profile **above the tree canopy**?
    No

19. Is the location of this project consistent with a No Effect determination in this key?
    Automatically answered
    Yes, because the project action area is outside of suitable Indiana bat and/or NLEB summer habitat

20. **General AMM 1**
    Will the project ensure *all* operators, employees, and contractors working in areas of known or presumed bat habitat are aware of *all* FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable Avoidance and Minimization Measures?

    Yes

21. **Lighting AMM 1**
    Will *all* **temporary** lighting be directed away from suitable habitat during the active season?

    Yes

Project Questionnaire

1. Have you made a No Effect determination for *all* other species indicated on the FWS IPaC generated species list?

   Yes

2. Have you made a May Affect determination for *any* other species on the FWS IPaC generated species list?

   No

Avoidance And Minimization Measures (AMMs)

These measures **were accepted** as part of this determination key result:

GENERAL AMM 1

Ensure all operators, employees, and contractors working in areas of known or presumed bat habitat are aware of all FHWA/FRA/FTA (Transportation Agencies) environmental commitments, including all applicable AMMs.

LIGHTING AMM 1

Direct temporary lighting away from suitable habitat during the active season.

Determination Key Description: FHWA, FRA, FTA Programmatic Consultation For Transportation Projects Affecting NLEB Or Indiana Bat

This key was last updated in IPaC on February 05, 2018. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the threatened **Northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

Molly Coughlin

From: vonOettingen, Susi <susi_vonoettingen@fws.gov>
Sent: Friday, February 02, 2018 1:10 PM
To: Derek McClellan
Subject: Re: Concurrence Verification

Hi Derek,

I think all you had to do is follow the instructions regarding the verification. If your project is a not likely to adversely affect determination, and it appears to be so, then you just complete the verification step and you're done.

"To submit a project for concurrence verification, the lead Federal action agency or designated non-federal representative should log into IPaC using their agency email account and click "Submit a project for verification". They will need to enter the record locator **996-10957979."**

We get notified automatically, and have the chance to review the information. In this case, I think we're done. Everything looks fine.

Susi

****
Susi von Oettingen
Endangered Species Biologist
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301
(W) 603-227-6418
(Fax) 603-223-0104

www.fws.gov/newengland

On Tue, Jan 30, 2018 at 4:45 PM, Derek McClellan <dmcclellan@tataandhoward.com> wrote:

> We are preparing an NOI application for a NPDES Remediation General Permit on behalf of the Town of Wayland for dewatering during a water main replacement project. Attached is the Consistency Letter generated from the IPaC website for consultation and concurrence verification. If there are other steps we need to take for the concurrence verification please let us know. Thank you.
>
> Best Regards,
>
> **Derek S. McClellan**

Project Scientist

TATA & HOWARD

Unsurpassed Solutions
in the Water Environment

67 Forest Street Marlborough, MA 01752

Direct: (508) 214-4161

Cell: (508) 561-4959

Phone: (508) 303-9400 x115 Fax: (508) 449-9400

Email: dmcclellan@tataandhoward.com

Help save the environment: think before you print.

Appendix F

TATA & HOWARD

RECEIVED

MAR 0 6 2018

MASS. HIST. COMM

RC.64029

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Wayland 2018 Water Main Improvements Project

Location / Address: Boston Post Road (Route 20) from Cochituate Road to approximately #397 Boston Post Road and Pelham Island Road from Boston Post Road to Old Sudbury Road

City / Town: Wayland

After review of MHC files and the materials you submitted, it has been determined that this project is unlikely to affect significant historic or archaeological resources.

RC. 64028

4/2/18
Date

Jonathan K. Patton
Archaeologist / Preservation Planner
Massachusetts Historical Commission

xc: Steve McCurdy, DEP-SRF

Project Proponent

Name: Wayland Department of Public Works

Address: 66 River Road

City/Town/Zip/Telephone: Wayland, MA 01778 (508) 358-3678

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
MassDEP	Drinking Water State Revolving Fund
MassDEP	BRP WS 32 Distribution System Modifications
MassDOT	State Highway Access Permit
EPA	NPDES Remediation General Permit
MassDEP	Notice of Intent/Order of Conditions

Project Description (narrative):

See attached project narrative.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

No above grade demolition is proposed. The existing water main below grade will be abandoned in place.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

No.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).
The project includes new construction of a water main. The construction includes approximately 2,400 linear feet of new 12-inch ductile iron and 14-inch HDPE water main. No new building construction is included in this project. Refer to the attached project narrative and locus map for additional information.

APPENDIX A (continued)

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

No.

What is the total acreage of the project area?

Woodland	acres	Productive Resources:	
Wetland	acres	Agriculture	acres
Floodplain	acres	Forestry	acres
Open space	acres	Mining/Extraction	acres
Developed 0.23	acres	Total Project Acreage 0.23	acres

What is the acreage of the proposed new construction? 0.23 acres

What is the present land use of the project area?

Paved MassDOT State Highway (Boston Post Road) Sta. 108+75 to Sta. 87+50, and Pelham Island Road which is a Town owned roadway.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

Refer to Figure No. 1 in Appendix A.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: Tom Holder Date: 3-2-18

Name: Thomas Holder, Director of Public Works

Address: 66 River Road

City/Town/Zip: Wayland, MA 01778

Telephone: (508) 358-3678

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

Appendix G

TATA & HOWARD

Enter number values in green boxes below

Enter values in the units specified

↓

0	Q_R = Enter upstream flow in **MGD**
0.144	Q_P = Enter discharge flow in **MGD**
0	Downstream 7Q10

Enter a dilution factor, if other than zero

↓

0

Enter values in the units specified

↓

246	C_d = Enter influent hardness in **mg/L** $CaCO_3$
43.1	C_s = Enter receiving water hardness in **mg/L** $CaCO_3$

Enter **receiving water** concentrations in the units specified

↓

7.99	pH in **Standard Units**
5.56	Temperature in **°C**
0	Ammonia in **mg/L**
43.1	Hardness in **mg/L** $CaCO_3$
0	Salinity in **ppt**
0	Antimony in **µg/L**
0.7	Arsenic in **µg/L**
0.07	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
2.4	Copper in **µg/L**
693	Iron in **µg/L**
1	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
0	Silver in **µg/L**
33.4	Zinc in **µg/L**

Notes:

Freshwater: Q_R equal to the 7Q10; enter alternate Q_R if approved by the State; enter 0 if no dilution factor approved

Saltwater (estuarine and marine): enter Q_R if approved by the State; enter 0 if no entry

Discharge flow is equal to the design flow or 1 MGD, whichever is less

Only if approved by State as the entry for Q_R; leave 0 if no entry

Saltwater (estuarine and marine): only if approved by the State

Leave 0 if no entry

Freshwater only

pH, temperature, and ammonia required for all discharges

Hardness required for freshwater

Salinity required for saltwater (estuarine and marine)

Metals required for all discharges if present and if dilution factor is > 1

Enter 0 if non-detect or testing not required

Enter **influent** concentrations in the units specified

if >1 sample, enter maximum

if >10 samples, may enter 95th percentile

Enter 0 if non-detect or testing not required

↓	
0	TRC in **µg/L**
2.18	Ammonia in **mg/L**
0	Antimony in **µg/L**
13.4	Arsenic in **µg/L**
0.15	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
7.6	Copper in **µg/L**
39100	Iron in **µg/L**
0.8	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
1.9	Silver in **µg/L**
401	Zinc in **µg/L**
0	Cyanide in **µg/L**
0	Phenol in **µg/L**
0	Carbon Tetrachloride in **µg/L**
276	Tetrachloroethylene in **µg/L**
5.8	Total Phthalates in **µg/L**
0	Diethylhexylphthalate in **µg/L**
0	Benzo(a)anthracene in **µg/L**
0	Benzo(a)pyrene in **µg/L**
0	Benzo(b)fluoranthene in **µg/L**
0	Benzo(k)fluoranthene in **µg/L**
0	Chrysene in **µg/L**
0	Dibenzo(a,h)anthracene in **µg/L**
0	Indeno(1,2,3-cd)pyrene in **µg/L**
4.4	Methyl-tert butyl ether in **µg/L**

I. Dilution Factor Calculation Method

A. 7Q10

Refer to Appendix V for determining critical low flow; must be approved by State before use in calculations.

B. Dilution Factor

Calculated as follows:

$$Df = \frac{Q_R + Q_P}{Q_P}$$

Q_R = 7Q10 in MGD

Q_P = Discharge flow, in MGD

II. Effluent Limitation Calculation Method

A. Calculate Water Quality Criterion:

Step 1. Downstream hardness, calculated as follows:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

C_r = Downstream hardness in mg/L

Q_d = Discharge flow in MGD

C_d = Discharge hardness in mg/L

Q_s = Upstream flow (7Q10) in MGD

C_s = Upstream (receiving water) hardness in mg/L

Q_r = Downstream receiving water flow in MGD

Step 2. Total recoverable water quality criteria for hardness-dependent metals, calculated as follows:

Total Recoverable Criteria = $\exp\{m_c [\ln(h)] + b_c\}$

m_c = Pollutant-specific coefficient (m_a for silver)

b_c = Pollutant-specific coefficient (b_a for silver)

ln = Natural logarithm

h = Hardness calculated in Step 1

Step 3. Total recoverable water quality criteria for non-hardness-dependent metals, calculated as follows:

$$\text{WQC in } \mu g/L = \frac{\text{dissolved WQC in } \mu g/L}{\text{dissolved to total recoverable factor}}$$

B. Calculate WQBEL:

Step 1. WQBEL calculated as follows for parameter sampled in and detected in the receiving water:

$$C_d = \frac{Q_r C_r - Q_s C_s}{Q_d}$$

C_r = Water quality criterion in µg/L

Q_d = Discharge flow in MGD

C_d = WQBEL in µg/L
Q_s = Upstream flow (7Q10) in MGD
C_s = Ustream (receiving water) concentration in µg/L
Q_r = Downstream receiving water flow in MGD

Step 2. WQBEL calculated as follows for parameter not sampled in or not detected in receiving water:

$$C_d = (Q_r/Q_d) \times C_r$$

C_r = Water quality criterion in µg/L
Q_d = Discharge flow in MGD
Q_r = Downstream receiving water flow in MGD

C. Determine if a WQBEL applies:

Step 1. For parameter sampled in and detected in receiving water, downstream concentrations calculated as follows:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

C_r = Downstream concentration in µg/L
Q_d = Discharge flow in MGD
C_d = Influent concentration in µg/L
Q_s = Upstream flow (7Q10) in MGD
C_s = Upstream (receiving water) concentration in µg/L
Q_r = Downstream receiving water flow in MGD

The WQBEL applies if:

1) the projected downstream concentration calculated in accordance with Step 1, above, and the discharge concentration of a parameter are greater than the WQC calculated for that parameter in accordance with II.A, above

AND

2) the WQBEL determined for that parameter in accordance with II.B, above, is less than the TBEL in Part 2.1.1 of the RGP for that parameter. Otherwise, the TBEL in Part 2.1.1

of the RGP for that parameter applies.

Step 2. For a parameter not sampled in or not detected in receiving water, the WQBEL applies if:

1) the discharge concentration of a parameter is greater than the WQBEL determined for that parameter in accordance with II.A or II.B, above;

AND

2) the WQBEL determined for that parameter in accordance with II.A or II.B, above is less than the TBEL in Part 2.1.1 of the RGP for that parameter. Otherwise, the TBEL in

Part 2.1.1 of the RGP for that parameter applies.

I. Dilution Factor Calculation Method

A. 7Q10

Refer to Appendix V for determining critical low flow; must be approved by State before use in calculations.

B. Dilution Factor

Calculated as follows:

$$Df = \frac{Q_R + Q_P}{Q_P}$$

Q_R = 7Q10 in MGD

Q_P = Discharge flow, in MGD

II. Effluent Limitation Calculation Method

A. Calculate Water Quality Criterion:

Step 1. Downstream hardness, calculated as follows:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

C_r = Downstream hardness in mg/L

Q_d = Discharge flow in MGD

C_d = Discharge hardness in mg/L

Q_s = Upstream flow (7Q10) in MGD

C_s = Upstream (receiving water) hardness in mg/L

Q_r = Downstream receiving water flow in MGD

Step 2. Total recoverable water quality criteria for hardness-dependent metals, calculated as follows:

Total Recoverable Criteria = $\exp\{m_c [\ln(h)] + b_c\}$

m_c = Pollutant-specific coefficient (m_a for silver)

b_c = Pollutant-specific coefficient (b_a for silver)

ln = Natural logarithm

h = Hardness calculated in Step 1

Step 3. Total recoverable water quality criteria for non-hardness-dependent metals, calculated as follows:

$$\text{WQC in } \mu g/L = \frac{\text{dissolved WQC in } \mu g/L}{\text{dissolved to total recoverable factor}}$$

B. Calculate WQBEL:

Step 1. WQBEL calculated as follows for parameter sampled in and detected in the receiving water:

$$C_d = \frac{Q_r C_r - Q_s C_s}{Q_d}$$

C_r = Water quality criterion in µg/L

Q_d = Discharge flow in MGD

C_d = WQBEL in µg/L
Q_s = Upstream flow (7Q10) in MGD
C_s = Ustream (receiving water) concentration in µg/L
Q_r = Downstream receiving water flow in MGD

Step 2. WQBEL calculated as follows for parameter not sampled in or not detected in receiving water:

$$C_d = (Q_r/Q_d) \times C_r$$

C_r = Water quality criterion in µg/L
Q_d = Discharge flow in MGD
Q_r = Downstream receiving water flow in MGD

C. Determine if a WQBEL applies:

Step 1. For parameter sampled in and detected in receiving water, downstream concentrations calculated as follows:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

C_r = Downstream concentration in µg/L
Q_d = Discharge flow in MGD
C_d = Influent concentration in µg/L
Q_s = Upstream flow (7Q10) in MGD
C_s = Upstream (receiving water) concentration in µg/L
Q_r = Downstream receiving water flow in MGD

The WQBEL applies if:

1) the projected downstream concentration calculated in accordance with Step 1, above, and the discharge concentration of a parameter are greater than the WQC calculated for that parameter in accordance with II.A, above

AND

2) the WQBEL determined for that parameter in accordance with II.B, above, is less than the TBEL in Part 2.1.1 of the RGP for that parameter. Otherwise, the TBEL in Part 2.1.1

of the RGP for that parameter applies.

Step 2. For a parameter not sampled in or not detected in receiving water, the WQBEL applies if:

1) the discharge concentration of a parameter is greater than the WQBEL determined for that parameter in accordance with II.A or II.B, above;

AND

2) the WQBEL determined for that parameter in accordance with II.A or II.B, above is less than the TBEL in Part 2.1.1 of the RGP for that parameter. Otherwise, the TBEL in

Part 2.1.1 of the RGP for that parameter applies.

Dilution Factor	1.0					
A. Inorganics	TBEL applies if bolded		WQBEL applies if bolded		Compliance Level applies if shown	
Ammonia	**Report**	mg/L	---			
Chloride	**Report**	µg/L	---			
Total Residual Chlorine	0.2	mg/L	**11**	µg/L	50	µg/L
Total Suspended Solids	**30**	mg/L	---			
Antimony	**206**	µg/L	640	µg/L		
Arsenic	104	µg/L	**10**	µg/L		
Cadmium	**10.2**	µg/L	0.5272	µg/L		
Chromium III	**323**	µg/L	180.1	µg/L		
Chromium VI	**323**	µg/L	11.4	µg/L		
Copper	**242**	µg/L	20.1	µg/L		
Iron	5000	µg/L	**1000**	µg/L		
Lead	**160**	µg/L	10.01	µg/L		
Mercury	**0.739**	µg/L	0.91	µg/L		
Nickel	**1450**	µg/L	111.7	µg/L		
Selenium	**235.8**	µg/L	5.0	µg/L		
Silver	**35.1**	µg/L	17.8	µg/L		
Zinc	420	µg/L	**256.9**	µg/L		
Cyanide	**178**	mg/L	5.2	µg/L	---	µg/L
B. Non-Halogenated VOCs						
Total BTEX	**100**	µg/L	---			
Benzene	**5.0**	µg/L	---			
1,4 Dioxane	**200**	µg/L	---			
Acetone	**7970**	µg/L	---			
Phenol	**1,080**	µg/L	300	µg/L		
C. Halogenated VOCs						
Carbon Tetrachloride	**4.4**	µg/L	1.6	µg/L		
1,2 Dichlorobenzene	**600**	µg/L	---			
1,3 Dichlorobenzene	**320**	µg/L	---			

1,4 Dichlorobenzene	**5.0**	µg/L	---			
Total dichlorobenzene	**---**	µg/L	---			
1,1 Dichloroethane	**70**	µg/L	---			
1,2 Dichloroethane	**5.0**	µg/L	---			
1,1 Dichloroethylene	**3.2**	µg/L	---			
Ethylene Dibromide	**0.05**	µg/L	---			
Methylene Chloride	**4.6**	µg/L	---			
1,1,1 Trichloroethane	**200**	µg/L	---			
1,1,2 Trichloroethane	**5.0**	µg/L	---			
Trichloroethylene	**5.0**	µg/L	---			
Tetrachloroethylene	5.0	µg/L	**3.3**	µg/L		
cis-1,2 Dichloroethylene	**70**	µg/L	---			
Vinyl Chloride	**2.0**	µg/L	---			
D. Non-Halogenated SVOCs						
Total Phthalates	**190**	µg/L	---	µg/L		
Diethylhexyl phthalate	**101**	µg/L	2.2	µg/L		
Total Group I Polycyclic Aromatic Hydrocarbons	**1.0**	µg/L	---			
Benzo(a)anthracene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Benzo(a)pyrene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Benzo(b)fluoranthene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Benzo(k)fluoranthene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Chrysene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Dibenzo(a,h)anthracene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Indeno(1,2,3-cd)pyrene	**1.0**	µg/L	0.0038	µg/L	---	µg/L
Total Group II Polycyclic Aromatic Hydrocarbons	**100**	µg/L	---			
Naphthalene	**20**	µg/L	---			
E. Halogenated SVOCs						
Total Polychlorinated Biphenyls	**0.000064**	µg/L	---		0.5	µg/L
Pentachlorophenol	**1.0**	µg/L	---			
F. Fuels Parameters						

Total Petroleum Hydrocarbons	**5.0**	mg/L	---	
Ethanol	**Report**	mg/L	---	
Methyl-tert-Butyl Ether	**70**	µg/L	20	µg/L
tert-Butyl Alcohol	**120**	µg/L	---	
tert-Amyl Methyl Ether	**90**	µg/L	---	

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