COUGHLIN ENVIRONMENTAL SERVICES, LLC

September 19, 2017

U.S. Environmental Protection Agency – Region 1
Office of Ecosystem Protection
EPA/OEP RGP Coordinator
5 Post Office Square – Suite 100 (OEP06-01)
Boston, MA 02109-3912
Attn: Remediation General Permit NOI

To Whom it May Concern,

Coughlin Environmental Services (CES) is pleased to submit the attached revised Notice of Intent (NOI) for the National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) on behalf of L.M. Heavy Civil (LMH). This NOI has been submitted for the management of groundwater discharge from the proposed Massachusetts Bay Transit Authority (MBTA) Wollaston Station upgrades in Quincy, MA.

It is anticipated that two areas of deep excavation within the construction scope may intercept the groundwater table depending upon seasonal variations, an elevator sump within the station and a sewer structure and associated piping (less than 100 feet in length). Both of these areas may require construction dewatering via an excavation sump and pump during the upgrade process. Design plans are included in this package to define the limits and extent of work. The proposed 4 inch gravity sewer and sewer manhole is anticipated to take only 3 days for construction and dewatering activity is anticipated only to be required during the active excavation and installation process which would be 8 to 10 hours per day. The elevator sump area is in the center of the main building and is anticipated to be maintained in a dewatered state for an extended period due to the cast-in-place concrete associated with the installation. A period of 2 to 3 weeks could be anticipated for dewatering activity on a more continuous basis.

Laboratory testing has been performed on samples collected on September 8, 2017 from three (3) nearby existing observation wells at Wollaston Station, labeled B-2, B-303 and B-307. Test results from the observation wells show that the groundwater sampling indicated low levels of contamination of various inorganics, semi-volatile organic carbons (SVOCs), total petroleum hydrocarbons and tert-butyl alcohol (fuel parameters) and trichloroethylene (volatile organic carbons, VOCs). Only a limited amount of these contaminants were above the effluent discharge limits set forth by the RGP. To address the contamination issues, several dewatering, treatment and disposal strategies were examined and a sequential process to deal with the dewatering flows was devised. It is envisioned that the methods would vary depending upon actual dewatering flows needed to facilitate utility and elevator excavation and construction.

As such, it is expected that the primary dewatering and disposal system (Option A) would entail re-infiltrating dewatering flows back into the ground elsewhere on the site. The depths

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of the two excavations are only anticipated to intercept the groundwater table by three to four feet maximum and potentially not at all depending of the seasonal fluctuations experienced during construction. It is envisioned that one or more receiving pits (10 ft by 10 ft by 6 ft deep) would be excavated about 100 feet away and used to re-infiltrate the dewatering waters. The soils observed above the water table are classified as "made-lands" but exhibit a firm and compacted gravelly texture and are projected to have vertical permeabilities in the 6 inch per hour range. Depending upon dewatering flows, the receiver pit(s) could be utilized for re-infiltration of the dewatering waters. The dewatering pump would be nested in a stoned sump installed around a perforated pipe (see attached detail) to enhance groundwater flow to the sump/well. Average pumping rates of 21 GPM were projected with instantaneous fluctuations from 11 to 32 GPM based upon sump filling and lowering. Based upon this rate two receiving pits should have sufficient volume and allowable infiltration to accommodate an 8 to 10 hour work shift and fully infiltrate or recover by the next day. Limiting the extent of open excavation should also help to reduce dewatering flow in the reinfiltration proves limited.

If excessive fines are encountered, blinding of the infiltration sump could become problematic, so it is advisable to prep at least two sumps for alternating use. If TSS levels are excessive, additional siltation removal appurtenances may be needed and incorporated into the treatment scheme to reduce TSS and turbidity. The use of an 18,000 Gallon fractionalization (frac) tank and/or silt collection pillows should be added to the treatment train to enhance longer term use of the re-infiltration area(s). Given that the available staging area has ample room for additional infiltration pits, additional pits could be added sequentially as needed.

If the re-infiltration alternative proves to be insufficient for dewatering water disposal, due to higher than anticipated flows entering the excavations, disposal to the Quincy Municipal Drainage System is an option (Option B). If the dewatering flows are excessive (on average greater than 50 GPM) and Option A proves insufficient to handle the flows, an expanded treatment scheme will be exercised. The Option B treatment train contained in this submission was prepared based upon a treatment system sufficient to allow discrete treatment of the currently targeted parameters which are problematic or above the effluent criteria of the RGP: TSS, turbidity, iron, chloride, copper, nickel, Group I polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), and tert-butyl alcohol. WQBEL concentrations were calculated based upon available water quality data. The table on the following page defines those values and anticipated reductions potentially necessary to meet the WQBEL discharge limits.

Anticipated Treatment Limits
Dewatering Treatment System - MBTA Wollaston Station

Parameter	Highest Concentration Detected (ug/l)*	TBEL (ug/l)	Applicable WQBEL (ug/l)	Potential Reduction Targeted
Copper	26	242	3.7	85.8%
Nickel	15	1,450	8.3	44.7%
Benzo(a)anthracene	0.03	1	0.0038	87.3%
Benzo(a)pyrene	0.02	1	0.0038	81%
Benzo(b)fluoranthene	0.02	1	0.0038	81%
Benzo(k)fluoranthene	0.02	1	0.0038	81%
Chrysene	0.02	1	0.0038	81%

Under Option B, it is anticipated that the use of one or more frac tanks and sand filters may be necessary to facilitate settleable solids and TSS reduction. Results from laboratory testing of three nearby observation well locations indicate levels of iron, chloride, copper, nickel, Group I polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), and tert-butyl alcohol above the Effluent Limitations in Massachusetts for direct salt water discharge. LMH will expand their treatment to include ion exchange filters and a GAC filter(s) for the removal of these contaminants. A pumping system and coarse and fine bag filters will be added to further clarify the flow and extend the backwash cycle time and operational life of the filter units.

It is expected that there will be dewatering discharge for a no more than three weeks. After treatment, under Option B, effluent water will flow to a nearby catch basin where it will enter the Quincy municipal stormwater collection system. It will combine with other municipal drainage and discharge into the Beach Street outfall at Wollaston Beach into Quincy Bay of Boston Harbor. The treatment system discharge will be closely monitored to ensure compliance with the limitations set forth in the RGP.

Location plans and process schematics are attached in appendix materials for each Option. Additional "typical" process component data for the treatment schemes is also included along with anticipated sample locations. A formal Best Management Practices Plan (BMPP) will be formulated, developed and implemented prior to initiating construction excavation activities and will include defined testing parameters, sample recording forms and action levels which would trigger treatment component activation. Should you have any questions or concerns please contact the undersigned.

Sincerely,

Daniel J. Coughlin, P.E.
Principal Engineer

enclosures

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:
MBTA Wollaston Station</td><td colspan="3">Site address: Newport Avenue at Beale Street or Cleaveland Street
Street:</td></tr>
<tr><td>City: Quincy</td><td>State: MA</td><td>Zip: 02171</td></tr>
<tr><td rowspan="4">2. Site owner
Massachusetts Bay Transit Authority

Owner is (check one): ☐ Federal ☐ State/Tribal ☐ Private
☐ Other; if so, specify:</td><td colspan="3">Contact Person: John McCormack</td></tr>
<tr><td colspan="2">Telephone: (617) 222-2631</td><td>Email: JMcCormack@MBTA.com</td></tr>
<tr><td colspan="3">Mailing address: 10 Park Plaza, Suite 3910
Street:</td></tr>
<tr><td>City: Boston</td><td>State: MA</td><td>Zip: 02116</td></tr>
<tr><td rowspan="4">3. Site operator, if different than owner
L.M. Heavy Civil Construction, LLC</td><td colspan="3">Contact Person: Max Gates</td></tr>
<tr><td colspan="2">Telephone: (617) 908-5825</td><td>Email: mgates@lmheavycivil.com</td></tr>
<tr><td colspan="3">Mailing address:
Street: 100 Hancock Street, Suite 901</td></tr>
<tr><td>City: Quincy</td><td>State: MA</td><td>Zip: 02171</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):
RTN 3-31922
☐ 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):
Quincy Bay (Boston Harbor)	MA70-05_2008	SB

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. Impaired waters for pathogens. This are a is included in a Draft Pathogen TMDL for the Boston Harbor Watershed.

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.	N/A (indirect discharge)
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.	N/A (indirect discharge)

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:

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: Arsenic, methyl tert-butyl ether (MTBE), chromium VI and chromium III	
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): Beach Street Outfall, Wollaston Beach	Outfall location(s): (Latitude, Longitude) 42 deg 16' 43" N, 71 deg, 0' 46" W
Discharges enter the receiving water(s) via (check any that apply): ☐ Direct discharge to the receiving water ■ Indirect discharge, if so, specify: Enters Quincy Bay via Quincy's municipal stormwater collection system ☐ 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 No additional requirements established by by the City of Quincy	
Provide the expected start and end dates of discharge(s) (month/year): 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="5">☐ 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								Report mg/L	---
Chloride		✔	3	SM4500C	60000	3340000	1831667	Report µg/l	---
Total Residual Chlorine	✔		3	SM4500CI	20	<20	<20	0.2 mg/L	7.5
Total Suspended Solids		✔	3	SM2540D	5000	220	136.3	30 mg/L	---
Antimony	✔		3	SW6010C	5	<5	<5	206 µg/L	
Arsenic		✔	3	SW6010C	4	22	7.3	104 µg/L	
Cadmium		✔	3	SW6010C	1	4	2.3	10.2 µg/L	
Chromium III	✔		3	SW6010C	1	18	7	323 µg/L	
Chromium VI	✔		3	SM3500C	10	<10	<10	323 µg/L	
Copper		✔	3	SW6010C	5	26	12.67	242 µg/L	3.7
Iron		✔	3	SW6010C	10	17300	6782.7	5,000 µg/L	
Lead		✔	3	SW6010C	2	3	1	160 µg/L	
Mercury	✔		3	SW7470A	0.2	<0.2	<0.2	0.739 µg/L	
Nickel		✔	3	SW6010C	2	15	8.3	1,450 µg/L	8.3
Selenium	✔		3	SW6010C	10	<10	<10	235.8 µg/L	
Silver	✔		3	SW6010C	1	<1	<1	35.1 µg/L	
Zinc		✔	3	SW6010C	2	127	54	420 µg/L	
Cyanide	✔		3	SW9010C/	10	<10	<10	178 mg/L	
B. Non-Halogenated VOCs									
Total BTEX	✔		3	SW8260C	1.0	<1.0	<1.0	100 µg/L	---
Benzene	✔		3	SW8260C	0.7	<0.7	<0.7	5.0 µg/L	---
1,4 Dioxane	✔		3	SW8270D	0.2	<0.2	<0.2	200 µg/L	---
Acetone	✔		3	SW8260C	25	<25	<25	7.97 mg/L	---
Phenol	✔		3	E420.4	15	<15	<15	1,080 µg/L	

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	SW8260C	1	<1	<1	4.4 µg/L	
1,2 Dichlorobenzene	✔		3	SW8260C	1	<1	<1	600 µg/L	---
1,3 Dichlorobenzene	✔		3	SW8260C	1	<1	<1	320 µg/L	---
1,4 Dichlorobenzene	✔		3	SW8260C	1	<1	<1	5.0 µg/L	---
Total dichlorobenzene	✔		3	SW8260C	1	<1	<1	763 µg/L in NH	---
1,1 Dichloroethane	✔		3	SW8260C	1	<1	<1	70 µg/L	---
1,2 Dichloroethane	✔		3	SW8260C	0.60	<0.60	<0.60	5.0 µg/L	---
1,1 Dichloroethylene	✔		3	SW8260C	1	<1	<1	3.2 µg/L	---
Ethylene Dibromide	✔		3	SW8260C	1	<1	<1	0.05 µg/L	---
Methylene Chloride	✔		3	SW8260C	1	<1	<1	4.6 µg/L	---
1,1,1 Trichloroethane	✔		3	SW8260C	1	<1	<1	200 µg/L	---
1,1,2 Trichloroethane	✔		3	SW8260C	1	<1	<1	5.0 µg/L	---
Trichloroethylene		✔	3	SW8260C	1	4	1.9	5.0 µg/L	---
Tetrachloroethylene	✔		3	SW8260C	1	<1	<1	5.0 µg/L	
cis-1,2 Dichloroethylene	✔		3	SW8260C	1	<1	<1	70 µg/L	---
Vinyl Chloride	✔		3	SW8260C	1	<1	<1	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates								190 µg/L	
Diethylhexyl phthalate								101 µg/L	
Total Group I PAHs		✔	3	SW8270D	0.02	0.12	0.04	1.0 µg/L	---
Benzo(a)anthracene		✔	3	SW8270D	0.02	0.03	0.01	As Total PAHs	0.0038
Benzo(a)pyrene		✔	3	SW8270D	0.02	0.02	0.0067		0.0038
Benzo(b)fluoranthene		✔	3	SW8270D	0.02	0.02	0.0067		0.0038
Benzo(k)fluoranthene		✔	3	SW8270D	0.02	0.02	0.0067		0.0038
Chrysene		✔	3	SW8270D	0.02	0.03	0.01		0.0038
Dibenzo(a,h)anthracene	✔		3	SW8270D	0.01	<0.01	<0.01		
Indeno(1,2,3-cd)pyrene	✔		3	SW8270D	0.02	<0.02	<0.02		

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		✔	3	SW8270D	0.09	2.82	0.94	100 µg/L	---
Naphthalene	✔		3	SW8270D	0.09	<0.09	<0.09	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs								0.000064 µg/L	---
Pentachlorophenol								1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons		✔	3	SW8260C	50	236	87.7	5.0 mg/L	---
Ethanol								Report mg/L	---
Methyl-tert-Butyl Ether		✔	3	SW8260C	1	33	11	70 µg/L	
tert-Butyl Alcohol		✔	3	SW8260C	50	230	76.7	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether	✔		3	SW8260C	5	<5	<5	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	SM4500H		7.29	7.1		
Temperature			3	E170.1		3.4	3.4		

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:

Turbidity and TSS removal by: frac tank, bag filters and silt pillow

2. Provide a written description of all treatment system(s) or processes that will be applied to the effluent prior to discharge.

Water will be pumped from the excavation with a sump pump and then enter a frac tank for TSS and turbidity removal. The water will be recharged into the ground after this ("Option A"). If recharge capacity is exceeded, the water will be discharged into the Quincy municipal stormwater collection system ("Option B"). Please see the attached treatment schematics for details on additional treatment for both options.

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: Ion resin exchange filters, granulated carbon filters, silt pillow

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: Under Option A- silt/dewatering bag; Under Option B- ion exchange filters Is use of a flow meter feasible? (check one): ■ Yes ☐ No, if so, provide justification:	70
Provide the proposed maximum effluent flow in gpm.	70
Provide the average effluent flow in gpm.	21
If Activity Category IV applies, indicate the estimated total volume of water that will be discharged:	N/A

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:
A polymer flocculant may be used to promote settleing in the frac tanks, a dilute solution would be added at the head of the tank. Product :LRT E50 (see MSDA sheet)
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.

Location maps and construction plans detailing the work to be performed are attached. Analytical Lab data from wells nearby the areas of excavation are also attached. Also attached is supporting information for the Endangered Species Act determination and the National Historic Preservation Act eligibility determination. RTN 3-31992 is attached. Appendix materials also contain information on the two treatment trains (Option A- a first phase dewatering scheme and Option B- an advanced treatment scheme to be implemented if needed.

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

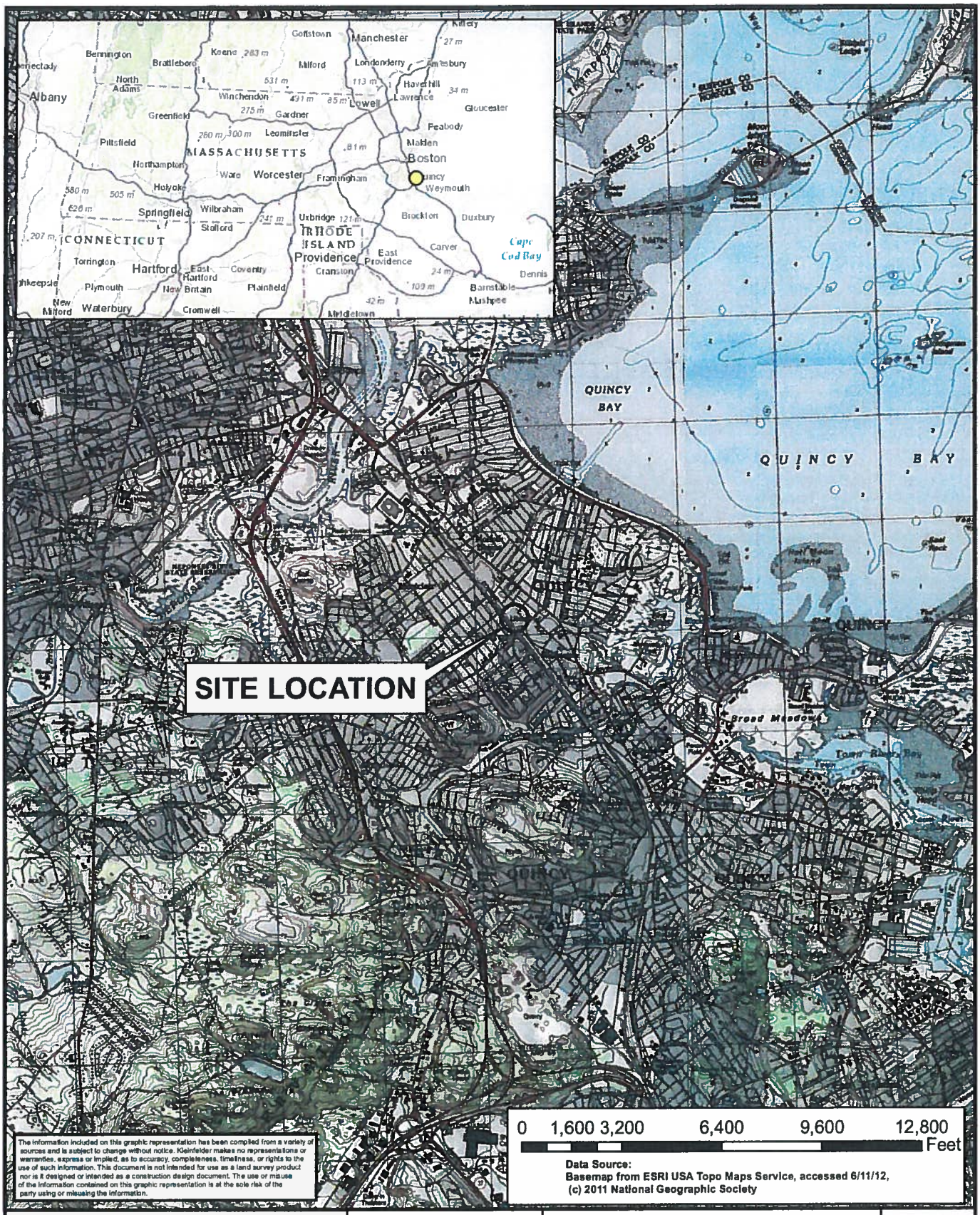
J. Certification requirement

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:	A BMPP meeting the requirements of this general permit will be implemented upon the submittal of this NOI.
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:	Date: 8-25-17
Print Name and Title:	Joe Cincotta - Assistant Project Manager

APPENDIX A

Location and Locus Maps



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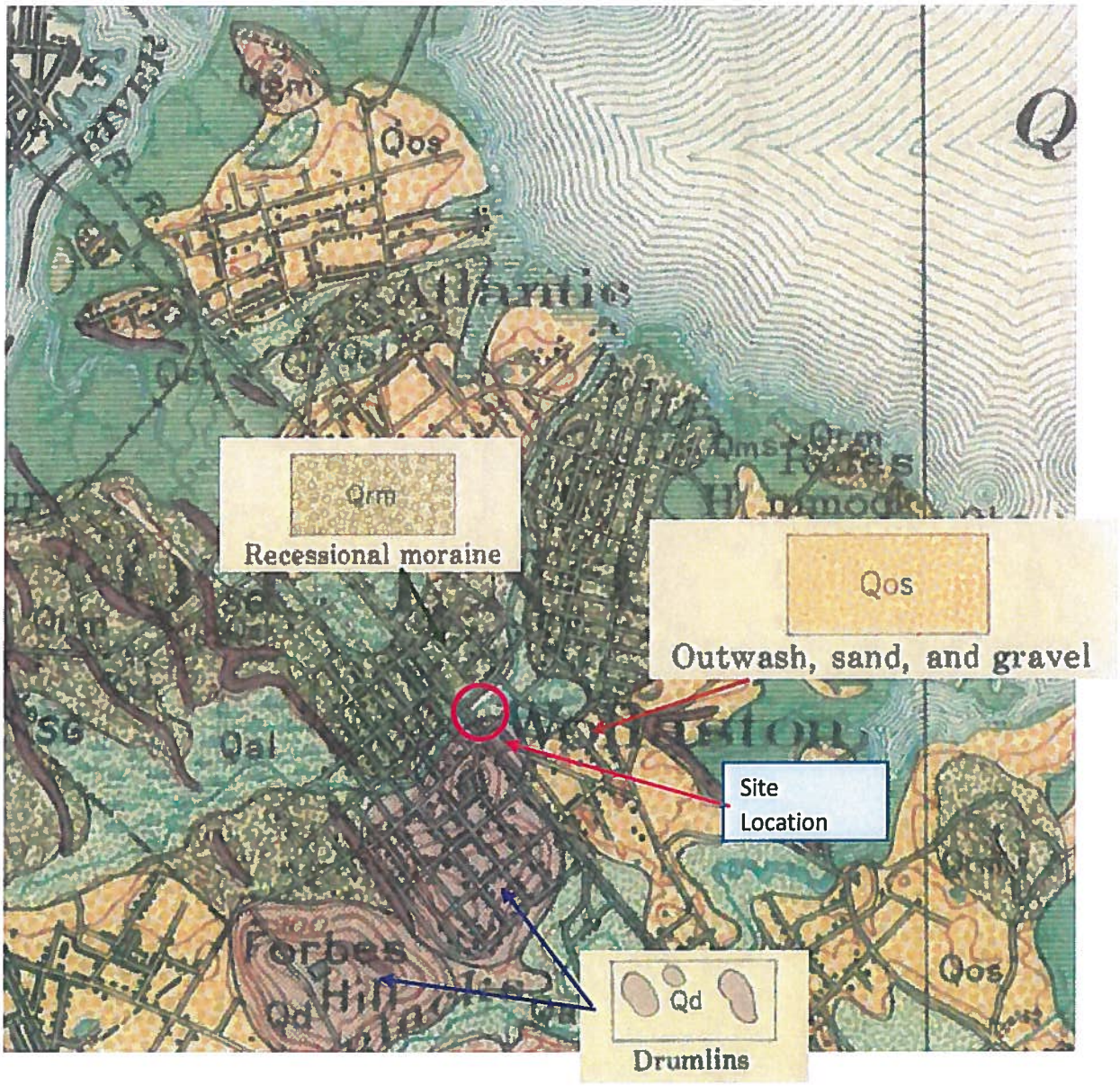
PROJECT NO.	20155273
DRAWN:	12/25/15
DRAWN BY:	NRW
CHECKED BY:	
FILE NAME:	MBTA_Wollaston_Site

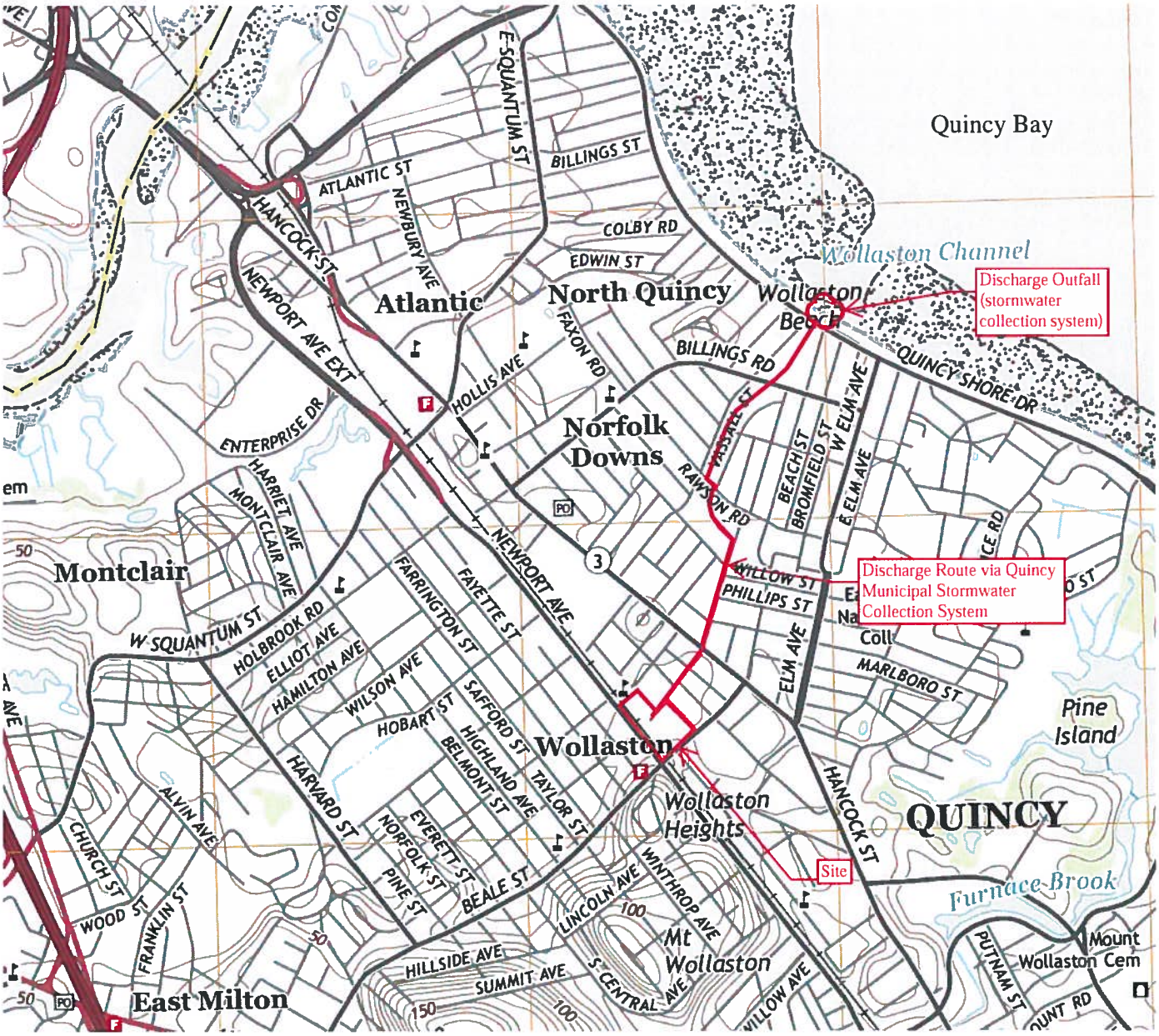
Site Location Plan

MBTA Wollaston Station
Station Improvements
Quincy, Massachusetts

FIGURE
1



Images copied from Plate 2 of the 1932 "Geology of the Boston Area, Massachusetts" map by Laurence La Forge (U. S. Geological Survey, Bulletin 839).

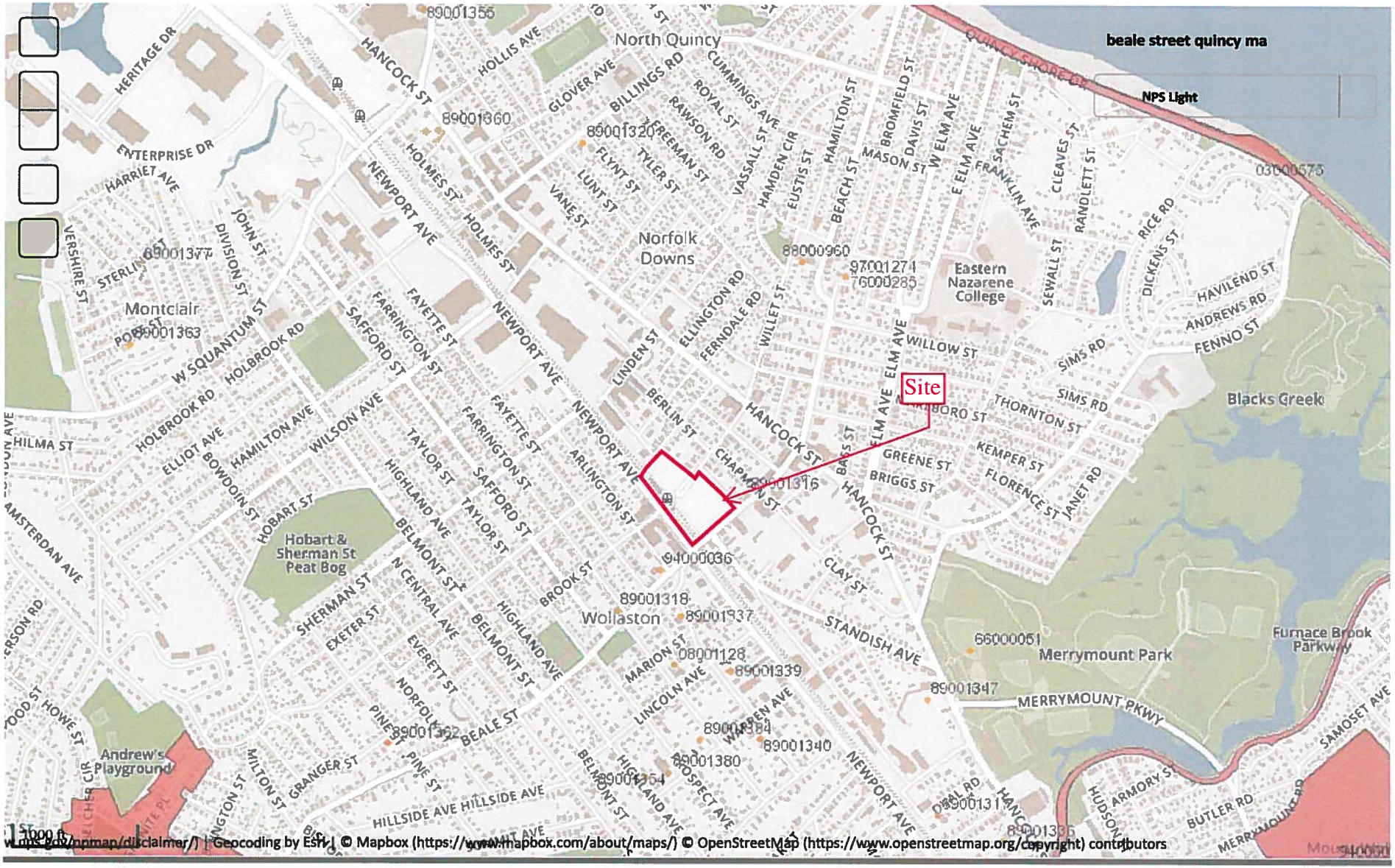


Location Map

National Register of Historic Places

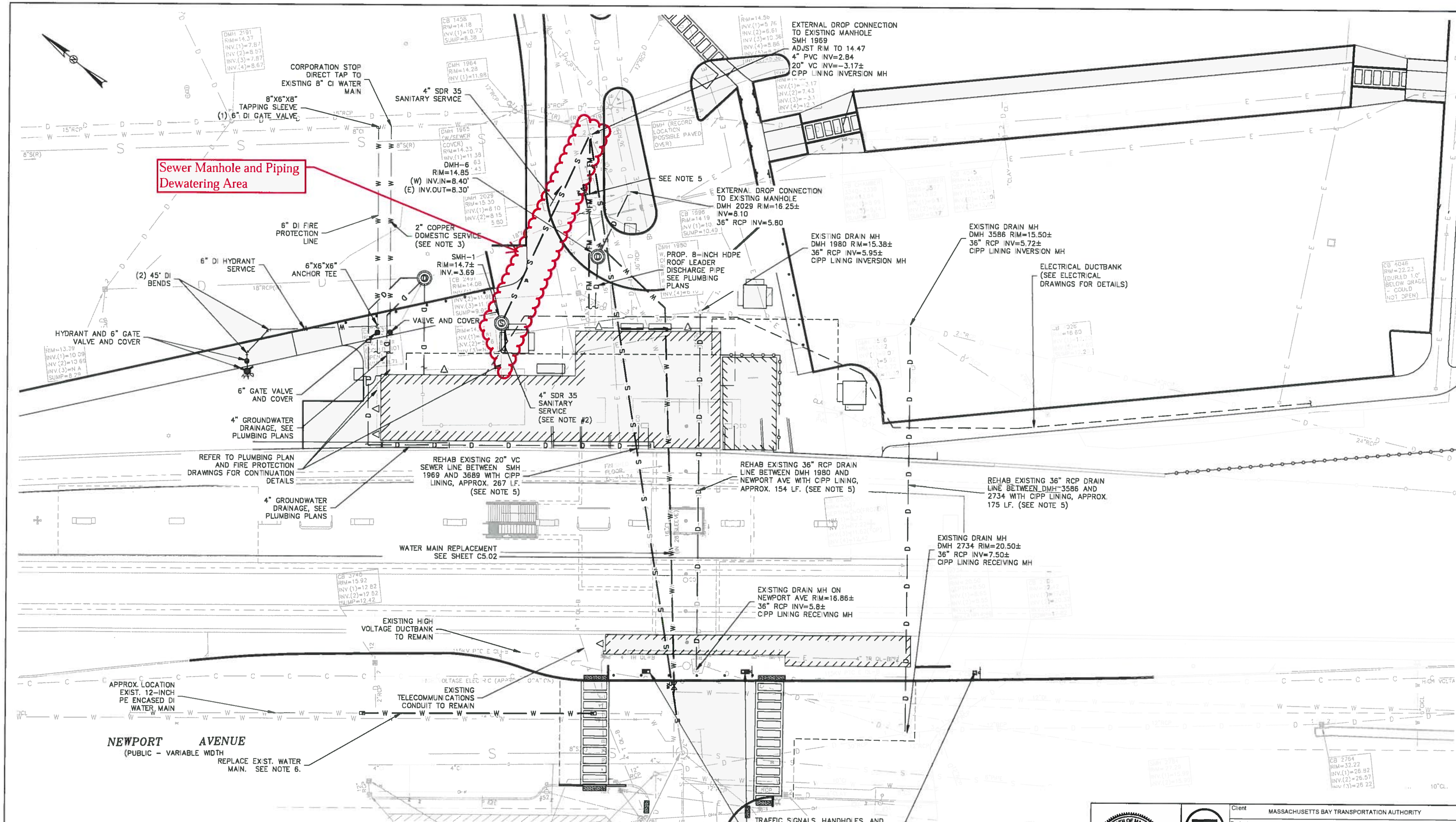
National Park Service
U.S. Department of the Interior

Public, non-restricted data depicting National Register spatial data processed by the Cultural Resources GIS facility. ...



APPENDIX B

Proposed Construction Plan
Areas Requiring Dewatering


Sewer Manhole and Piping Dewatering Area
CORPORATION STOP DIRECT TAP TO EXISTING 8" CI WATER MAIN
8"X6"X8" TAPPING SLEEVE
(1) 6" DI GATE VALVE
4" SDR 35 SANITARY SERVICE
DMH-6 RIM=14.85 (W) INV.IN=8.40' (E) INV.OUT=8.30'
EXTERNAL DROP CONNECTION TO EXISTING MANHOLE SMH 1969 ADJUST RIM TO 14.47 4" PVC INV=2.84 20" VC INV=-3.17± CIPP LINING INVERSION MH
SEE NOTE 5
EXTERNAL DROP CONNECTION TO EXISTING MANHOLE DMH 2029 RIM=16.25± INV=8.10 36" RCP INV=5.80
6" DI FIRE PROTECTION LINE
2" COPPER DOMESTIC SERVICE (SEE NOTE 3)
6" DI HYDRANT SERVICE
6"X6"X6" ANCHOR TEE
(2) 45° DI BENDS
SMH-1 RIM=14.7± INV.=3.69
PROP. 8-INCH HDPE ROOF LEADER DISCHARGE PIPE SEE PLUMBING PLANS
EXISTING DRAIN MH DMH 1980 RIM=15.38± 36" RCP INV=5.95± CIPP LINING INVERSION MH
EXISTING DRAIN MH DMH 3586 RIM=15.50± 36" RCP INV=5.72± CIPP LINING INVERSION MH
ELECTRICAL DUCTBANK (SEE ELECTRICAL DRAWINGS FOR DETAILS)
HYDRANT AND 6" GATE VALVE AND COVER
VALVE AND COVER
6" GATE VALVE AND COVER
4" GROUNDWATER DRAINAGE, SEE PLUMBING PLANS
4" SDR 35 SANITARY SERVICE (SEE NOTE #2)
REFER TO PLUMBING PLAN AND FIRE PROTECTION DRAWINGS FOR CONTINUATION DETAILS
REHAB EXISTING 20" VC SEWER LINE BETWEEN SMH 1969 AND 3689 WITH CIPP LINING, APPROX. 267 LF. (SEE NOTE 5)
REHAB EXISTING 36" RCP DRAIN LINE BETWEEN DMH 1980 AND NEWPORT AVE WITH CIPP LINING, APPROX. 154 LF. (SEE NOTE 5)
REHAB EXISTING 36" RCP DRAIN LINE BETWEEN DMH 3586 AND 2734 WITH CIPP LINING, APPROX. 175 LF. (SEE NOTE 5)
4" GROUNDWATER DRAINAGE, SEE PLUMBING PLANS
EXISTING DRAIN MH DMH 2734 RIM=20.50± 36" RCP INV=7.50± CIPP LINING RECEIVING MH
WATER MAIN REPLACEMENT SEE SHEET C5.02
EXISTING DRAIN MH ON NEWPORT AVE RIM=16.86± 36" RCP INV=5.8± CIPP LINING RECEIVING MH
EXISTING HIGH VOLTAGE DUCTBANK TO REMAIN
APPROX. LOCATION EXIST. 12-INCH PE ENCASED DI WATER MAIN
EXISTING TELECOMMUNICATIONS CONDUIT TO REMAIN
NEWPORT AVENUE
(PUBLIC - VARIABLE WIDTH
REPLACE EXIST. WATER MAIN. SEE NOTE 6.
TRAFFIC SIGNALS, HANDHOLES, AND CONDUIT TO BE RELOCATED ALONG FACE OF PROPOSED NEWPORT AVENUE ENTRANCE (TYP). COORDINATE FINAL LOCATION WITH CITY OF QUINCY.
EXISTING MANHOLE SMH 3689 RIM=16.82± 20" VC INV=-2.68± CIPP LINING RECEIVING MH
GRAPHIC SCALE
0 20 40 60

NOTES

1. ALL SITE LIGHTING CONDUIT POWERING REMOVED SITE LIGHTING FIXTURES SHALL BE REMOVED.
2. LIMITS FOR WATER AND SANITARY SERVICES BEGINS 10 OUTSIDE OF BUILDING FOUNDATION. SEE PLUMBING DRAWINGS FOR CONTINUATION DETAILS.
3. COORDINATE WITH MBTA AND KEOLIS FOR STATION ELECTRIC FEEDERS.
4. CURED IN PLACE PIPE (CIPP) LINING SHALL REQUIRE CONTRACTOR TO PERFORM PIPE CLEANING CCTV INSPECTION AND FLOW BY-PASS. CONTRACTOR MAY NEED TO REMOVE AND RESET CONICAL SECTION OF MANHOLE FRAME AND COVER OF EXISTING STRUCTURE TO FACILITATE CIPP LINING.
5. EXISTING SANITARY FORCE MAIN FROM PUMP ROOM TO BE MAINTAINED UNTIL FLOOR DRAIN COLLECTION IS REROUTED TO PROPOSED SANITARY SERVICE. CAP EXISTING MATERIAL AT SMH 1 6 WHEN PROPOSED SANITARY SERVICE IS COMPLETED.
6. CONTRACTOR SHALL REPLACE EXISTING 12-INCH POLYETHYLENE ENCASED DUCTILE IRON WATER MAIN WITH 100-LINEAR FEET OF 12-INCH C 00 PVC WATER MAIN AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL PROVIDE ALL FITTINGS COUPLINGS RESTRAINTS DISINFECTION AND PRESSURE TESTING REQUIRED TO INSTALL THE WATER MAIN COMPLETE. CONTRACTOR SHALL COORDINATE TEST PITTING AND FINAL LIMITS OF WATER MAIN REPLACEMENT WITH THE CITY OF QUINCY WATER DEPARTMENT.

KEY PLAN

HEADHOUSE NORTH CENTER SOUTH

COMMONWEALTH OF MASSACHUSETTS FRANCIS M McPARTLAN CIVIL No. 49572 REGISTERED PROFESSIONAL ENGINEER

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Project: WOLLASTON STATION IMPROVEMENTS MBTA CONTRACT NO. A47CN01

Drawing: UTILITY PLAN

No.	Description	Date

KLEINFELDER

APPROVED BY: Project Manager / Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

APPROVED BY: Project Manager / Date

SCALE: AS NOTED	DES BY	DR BY	CHK BY	PLAN NO. 182 82	ISSUE
DATE: 0_/08/16	KD	IG	FM	SHEET C5.01	

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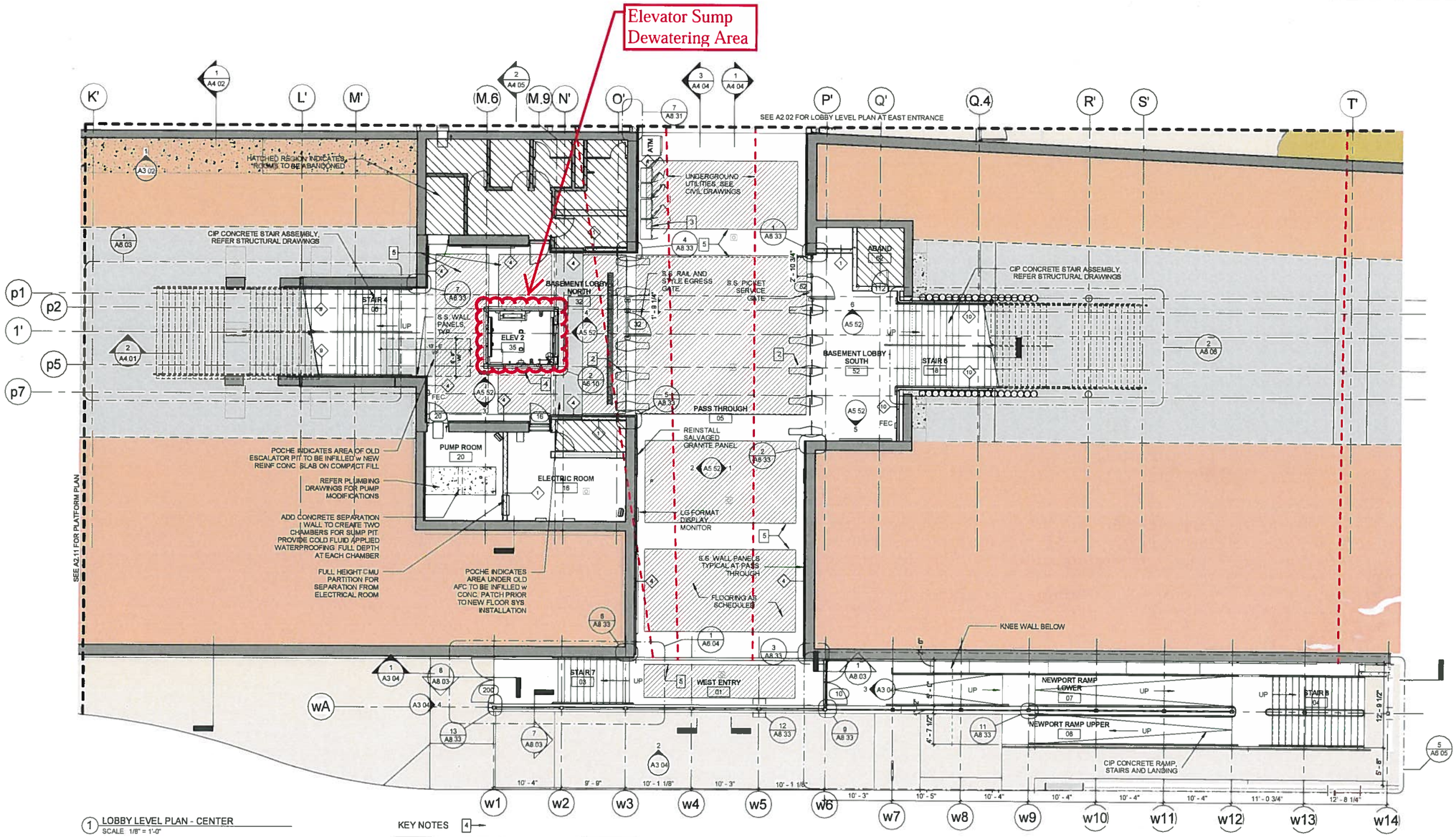

1 LOBBY LEVEL PLAN - CENTER
SCALE 1/8" = 1'-0"

PLAN GENERAL NOTES

1. REFER TO DRAWING A0.01 FOR ARCHITECTURAL ABBREVIATIONS, SYMBOLS AND GENERAL NOTES.
2. REFER TO DRAWING A0.03 FOR TYPICAL EXTERIOR WALL ASSEMBLIES.
3. REFER TO DRAWING A0.03 FOR STATION FINISHES "BASIS OF DESIGN".
4. REFER TO DRAWING A0.04 FOR TYPICAL PARTITION TYPES.
5. REFER TO DRAWING A7.01 FOR ROOM FINISH SCHEDULE.
6. REFER TO DRAWINGS A7.10 FOR DOOR SCHEDULE, DOOR TYPES AND DETAILS.
7. ANY DISCREPANCIES IN DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION.
8. REFER TO X-SERIES DRAWINGS FOR ELEVATOR INFORMATION.
9. REFER TO SI-SERIES WAYFINDING SIGN DRAWINGS FOR SIGN PANEL SIZES, TYPES AND ARTWORK.

KEY NOTES

1. METAL STAIRWAY - CAST ALUMINUM TREADS AND RISERS, PAINTED GALVANIZED STEEL FRAMING, TYPICAL
2. AUTOMATIC FARE COLLECTION EQUIPMENT, REFER ELECTRICAL DRAWINGS
3. FARE VENDING EQUIPMENT, REFER ELECTRICAL DRAWINGS
4. MACHINE ROOM LESS ELEVATOR(MRL), REFER X-SERIES DRAWINGS
5. PROVIDE CEMENTITIOUS UNDERLAYMENT AT AREAS WHERE FLOOR TILES WERE REMOVED TO ENSURE LEVEL AND SOUND UNDERLAYMENT FOR NEW FLOORING, TYPICAL
6. PREFINISHED ALUMINUM ENTRY SYSTEM W/ OVERHEAD SIGNAGE
7. HIGH SPEED AUTOMATIC SLIDING DOORS W/ OVERHEAD SIGNAGE
8. METAL PANEL RAINSCREEN CLADDING SYSTEM
9. MBTA WAYFINDING PANEL (4'x4'). REFER TO "SI" SERIES WAYFINDING SIGN DRAWINGS FOR SIGN PANEL SIZES, TYPES AND ARTWORK.
10. PREFINISHED ALUMINUM STOREFRONT AT BRIDGE AND PLATFORM STAIR ENCLOSURES
11. SEALED CONCRETE FLOOR, TYPICAL AT BACK OF HOUSE ROOMS
12. STAINLESS STEEL PICKET STYLE SECURITY FENCING

0 8 16 24
GRAPHIC SCALE

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PROJECT

CENTER
KEY PLAN

REGISTERED ARCHITECT — MICHAEL A. KEPP — No. 4470 — BOSTON, MA — COMMONWEALTH OF MASSACHUSETTS
7/28/16

No	Description	Date

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Project: WOLLASTON STATION IMPROVEMENTS MBTA CONTRACT NO. A47CN01
Drawing: LOBBY LEVEL PLAN - CENTER & WEST

KLEINFELDER — APPROVED BY Project Manager — Date
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY — APPROVED BY Project Manager — Date

DES BY	DR BY	CHK BY
RB	IS/RB	KLF

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DATE: 09/08/16
PLAN NO. 183005
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ISSUE

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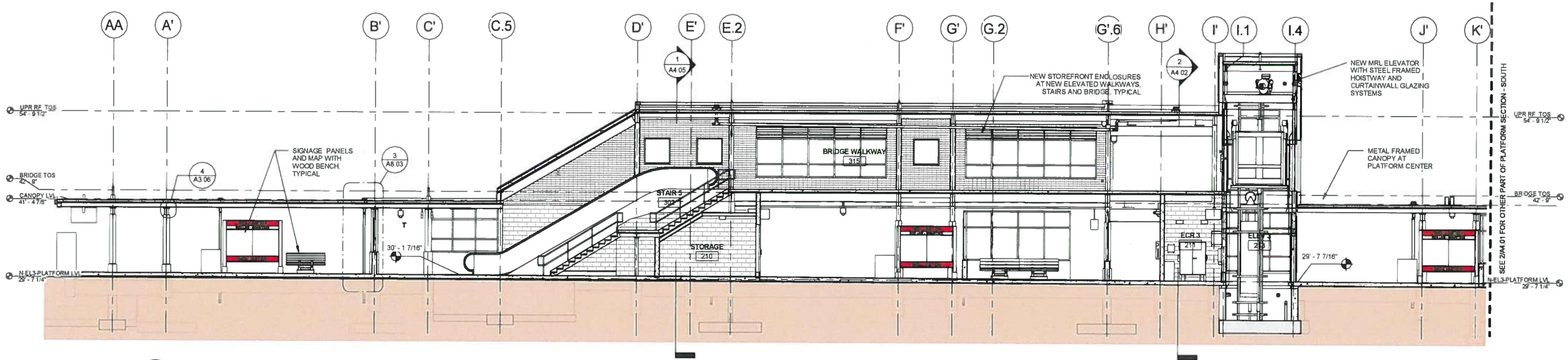
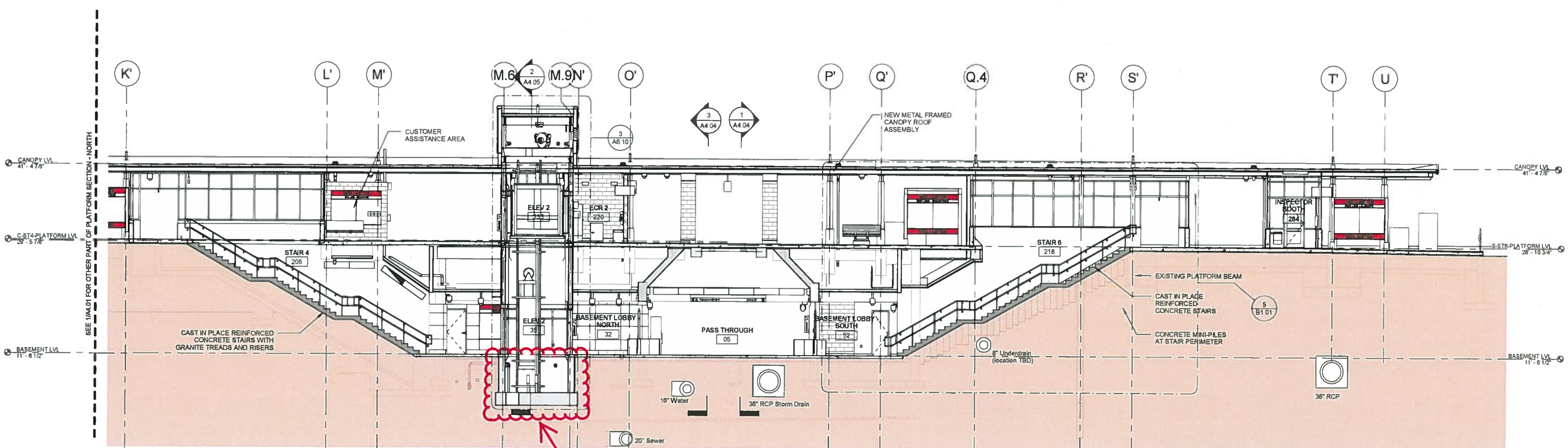


ENLARGED STATION SECTION - NORTH PLATFORM
SCALE 1/8" = 1'-0"



Elevator Sump Dewatering Area

ENLARGED STATION SECTION - LOBBY AND SOUTH PLATFORM
SCALE 1/8" = 1'-0"

KEY PLAN

REGISTERED ARCHITECT MICHAEL A. EPP No. 4470 BOSTON, MA COMMONWEALTH OF MASSACHUSETTS
7/28/16

Client	MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Project	WOLLASTON STATION IMPROVEMENTS MBTA CONTRACT NO. A47CN01
Drawing	OVERALL STATION SECTIONS AT PLATFORM

No.	Description	Date

KLEINFELDER
APPROVED BY
Project Manager — Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
APPROVED BY
Project Manager — Date

SCALE	AS NOTED	DES BY	DR BY	CHK BY	PLAN NO.	183031	ISSUE
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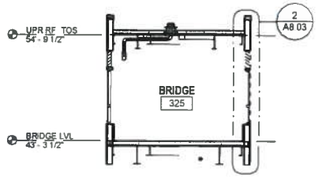
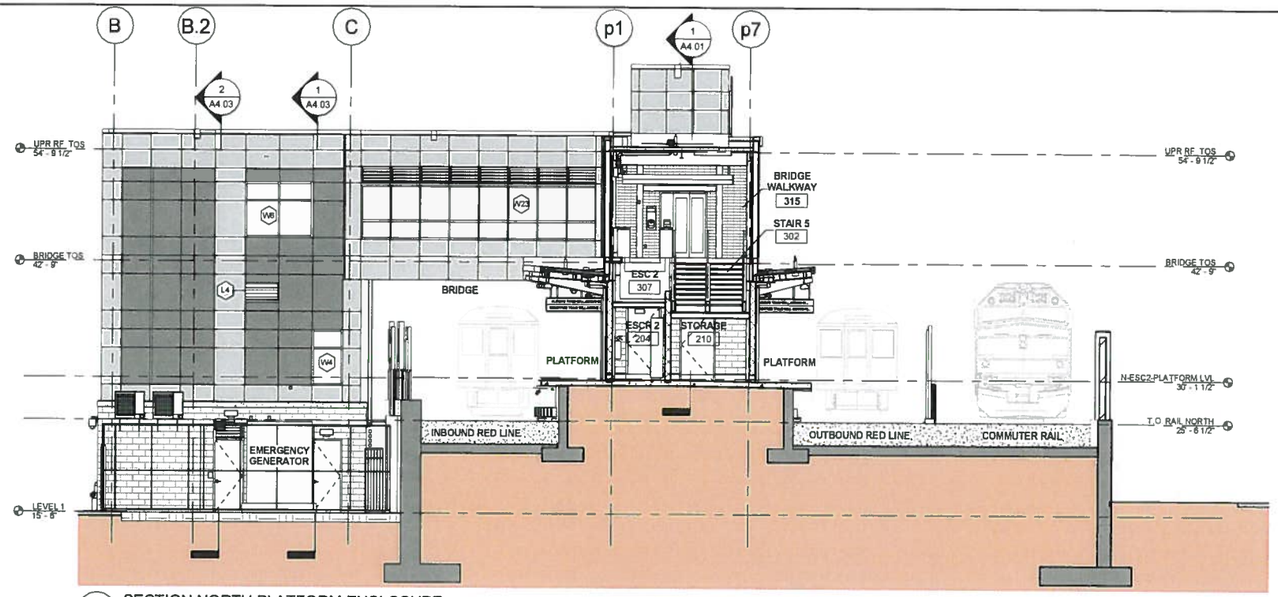
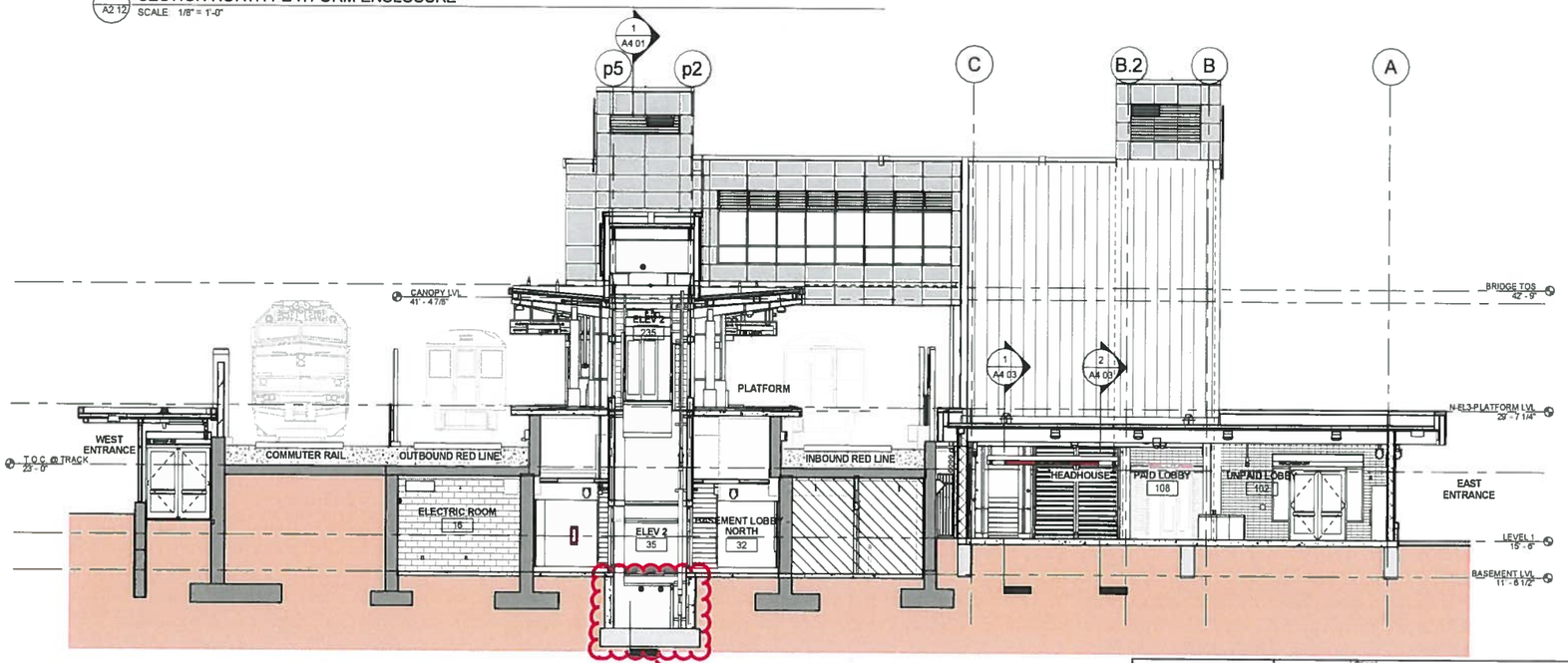


3 SECTION ACROSS BRIDGE
SCALE 1/8" = 1'-0"



1 SECTION NORTH PLATFORM ENCLOSURE
A2.12 SCALE 1/8" = 1'-0"



2 BUILDING SECTION AT PASS THROUGH ELEVATOR
A2.02 SCALE 1/8" = 1'-0"

Elevator Sump
Dewatering Area

KEY PLAN

REGISTERED ARCHITECT
MICHAEL A. EPSTEIN
No. 4470
BOSTON, MA
COMMONWEALTH OF MASSACHUSETTS
7/28/16

Client MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Project WOLLASTON STATION IMPROVEMENTS
MBTA CONTRACT NO A47CN01

Drawing SECTIONS AT HEADHOUSE

No	Description	Date

KLEINFELDER
APPROVED BY: Project Manager Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
APPROVED BY: Project Manager Date

DES. BY	DR. BY	CHK. BY
RB	IS/RB	KLF

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DATE: 09/08/16

PLAN NO. 183035
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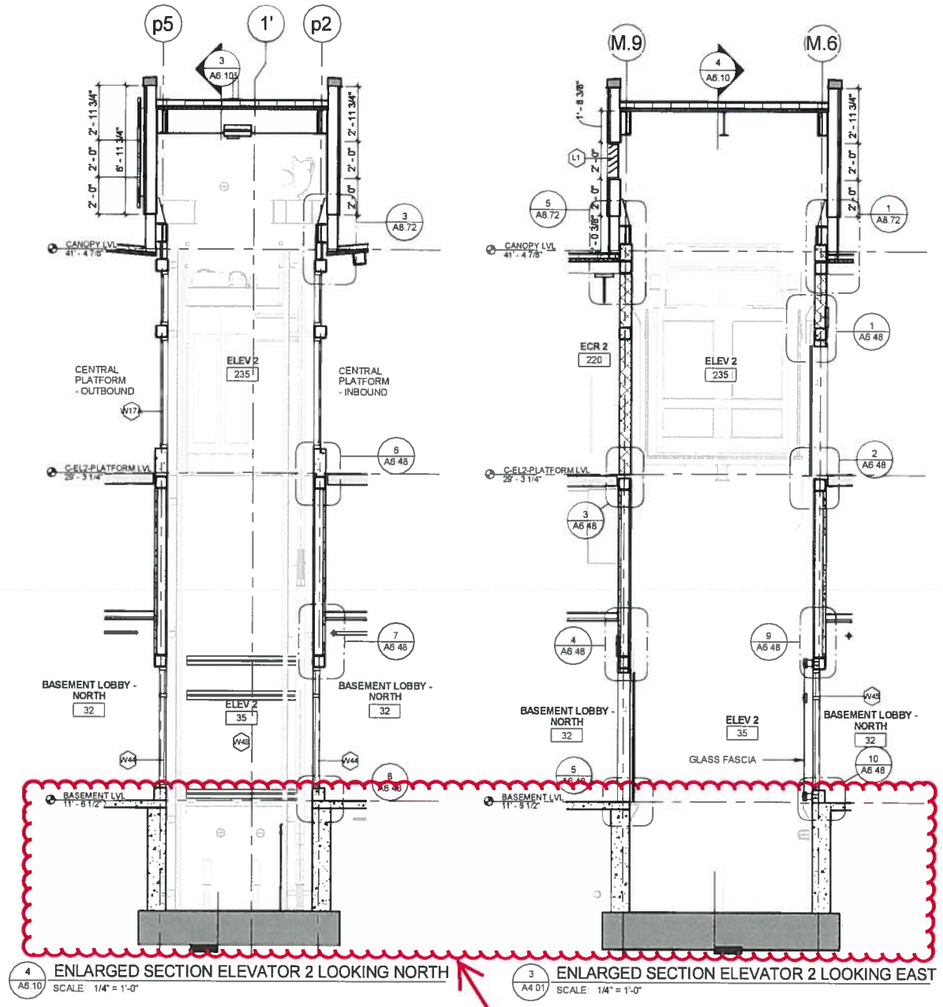
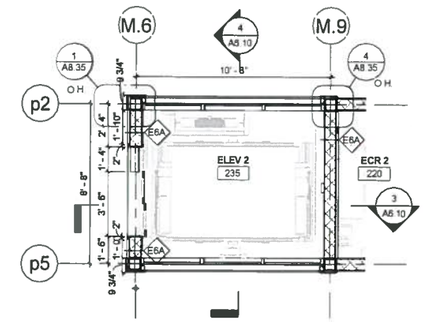


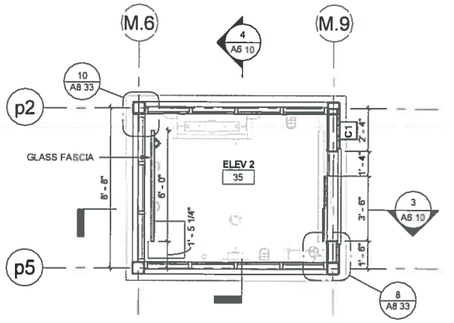
4 A6.10 ENLARGED SECTION ELEVATOR 2 LOOKING NORTH
SCALE: 1/4" = 1'-0"

3 A4.01 ENLARGED SECTION ELEVATOR 2 LOOKING EAST
SCALE: 1/4" = 1'-0"

Elevator Sump Dewatering Area



1 A2.13 ENLARGED PLAN ELEVATOR 2 - PLATFORM LEVEL
SCALE: 1/4" = 1'-0"



2 A2.03 ENLARGED PLAN ELEVATOR 2 - BASEMENT LEVEL
SCALE: 1/4" = 1'-0"

NOTES

1. REFER TO DRAWING A0.01 FOR ARCHITECTURAL ABBREVIATIONS, SYMBOLS AND GENERAL NOTES
2. ANY DISCREPANCIES IN DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION
3. REFER TO X-SERIES DRAWINGS FOR ELEVATOR INFORMATION

REGISTERED ARCHITECT — MICHAEL A. EPSTEIN — No. 4470 — BOSTON, MA — COMMONWEALTH OF MASSACHUSETTS

7/28/16

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Project: WOLLASTON STATION IMPROVEMENTS
MBTA CONTRACT NO. A47CN01

Drawing: ENLARGED PLANS AND SECTIONS - ELEVATOR 2

No.	Description	Date

KLEINFELDER

APPROVED BY: Project Manager Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

APPROVED BY: Project Manager Date

SCALE: AS NOTED	DES. BY	DR. BY	CHK. BY	PLAN NO. 183055	ISSUE
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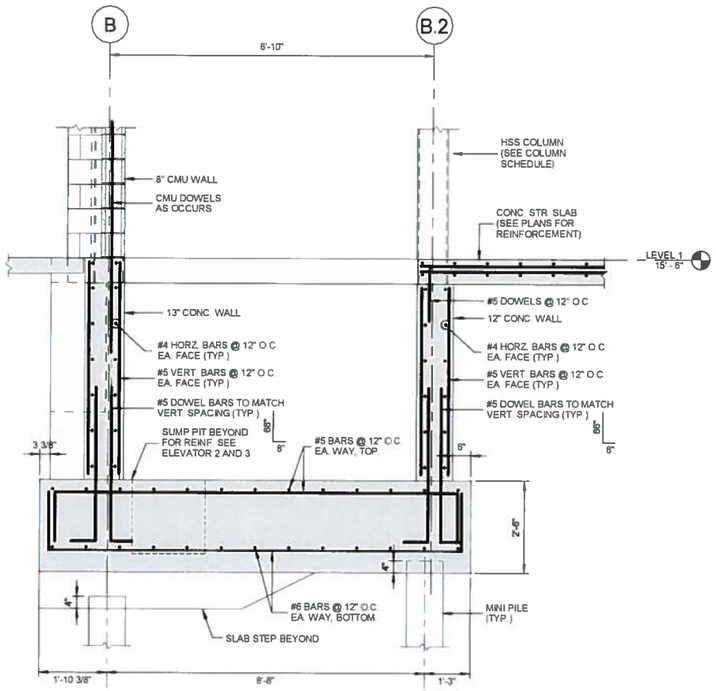

1 S2.01 SECTION
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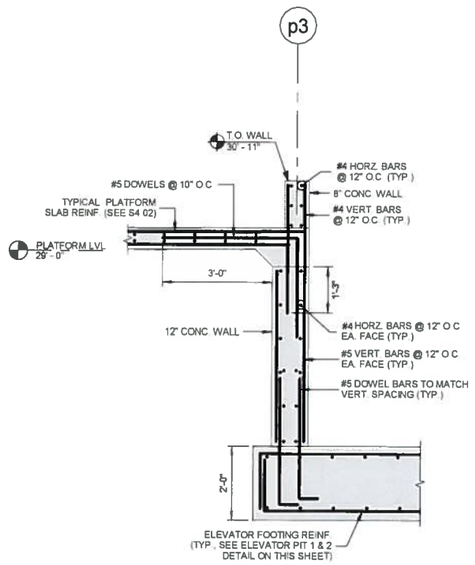

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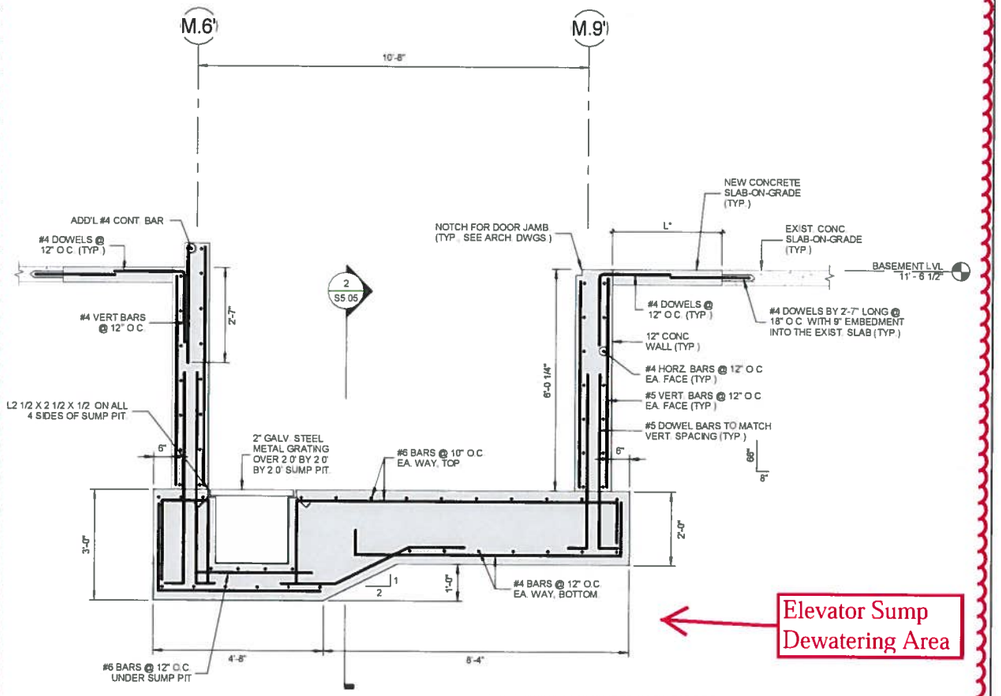
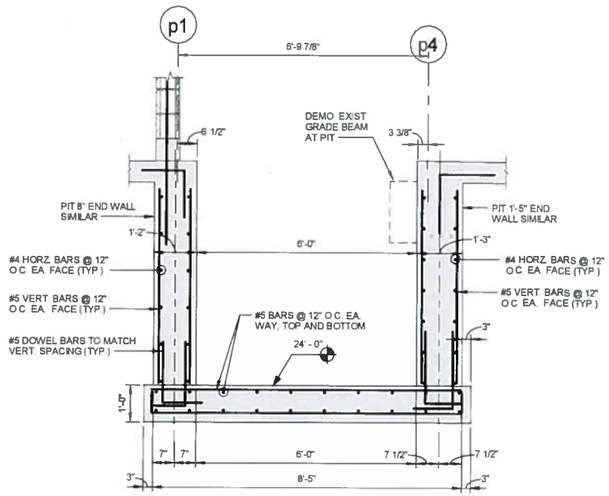


Elevator Sump Dewatering Area

* - CUT BACK SLAB AS NEED TO ALLOW FOR PIT EXCAVATION (3'-0" MIN.)

ELEVATOR PIT 2 DETAIL (ELEVATOR 3 SIM.)

3 S2.03 SECTION
SCALE: 1/2" = 1'-0"



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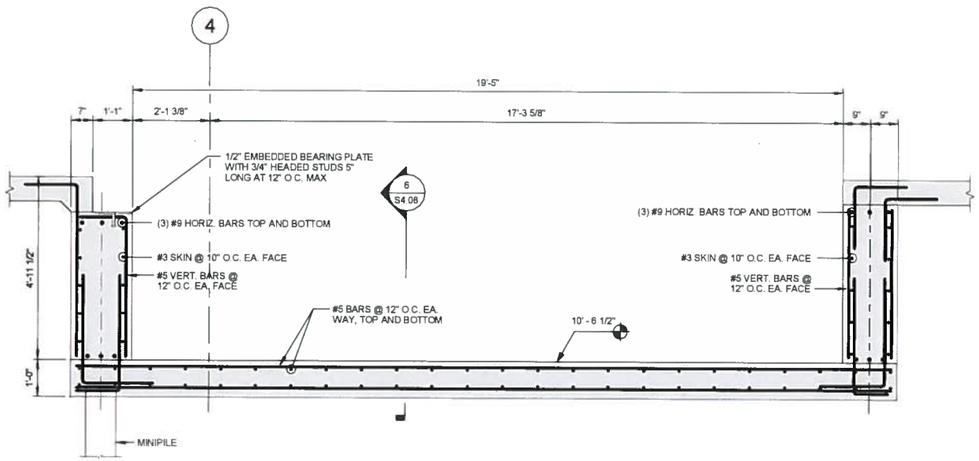

5 S2.01 SECTION
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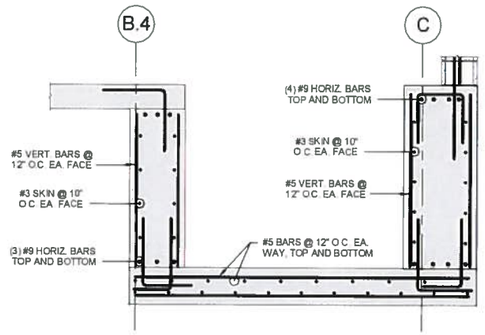

6 S2.01 SECTION
SCALE: 1/2" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
DOUGLAS E. PETERSON
STRUCTURAL
No. 41848
REGISTERED
PROFESSIONAL ENGINEER
03-29-16

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Project: WOLLASTON STATION IMPROVEMENTS
MBTA CONTRACT NO. A47CN01

Drawing: CONCRETE DETAILS

No.	Description	Date

KLEINFELDER

APPROVED BY: _____ Project Manager Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

APPROVED BY: _____ Project Manager Date 11/10/16

DES. BY	DR. BY	CHK. BY
SMC	JFC	AAO

SCALE: AS NOTED
DATE: 09/08/16

PLAN NO. 183132
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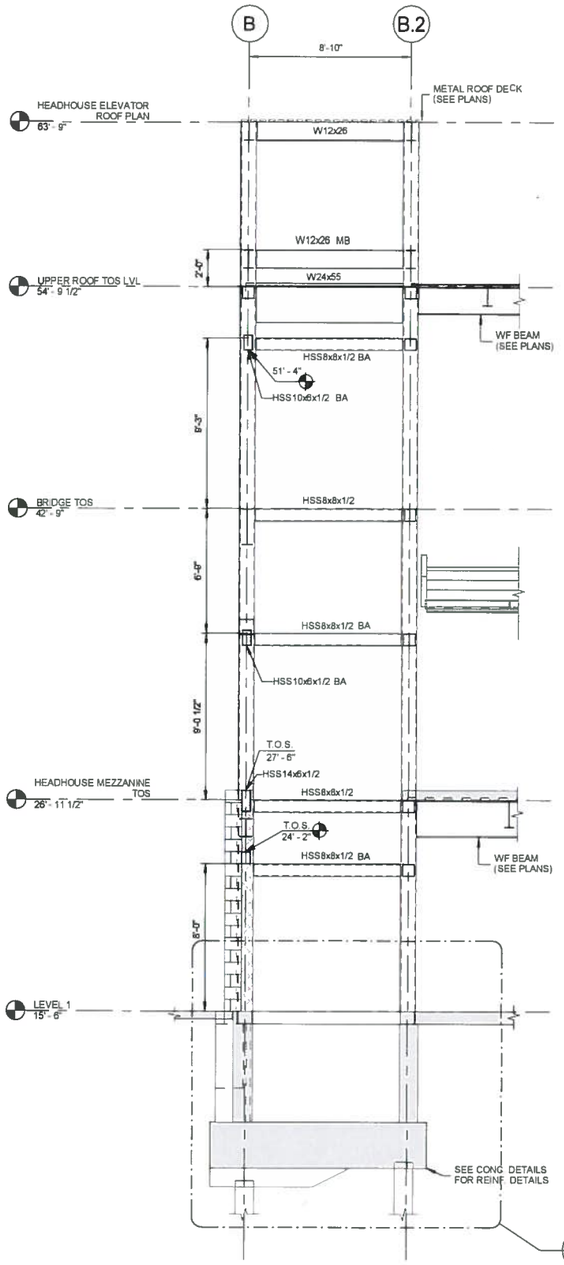
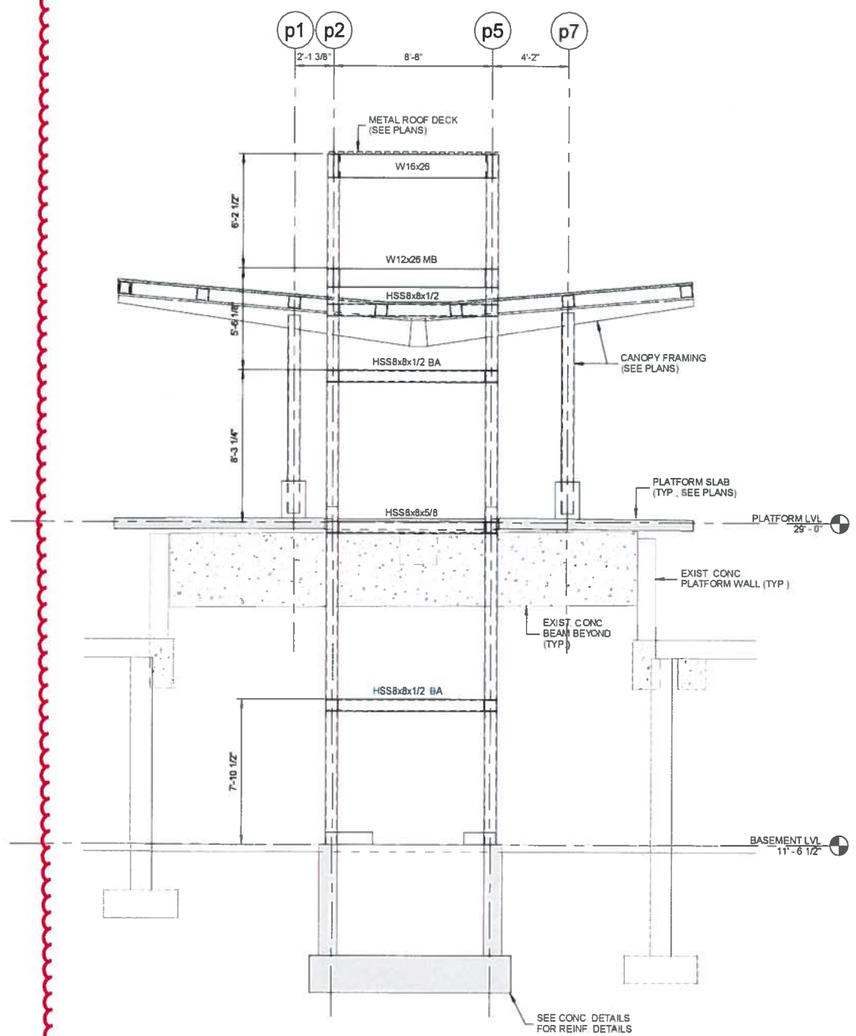


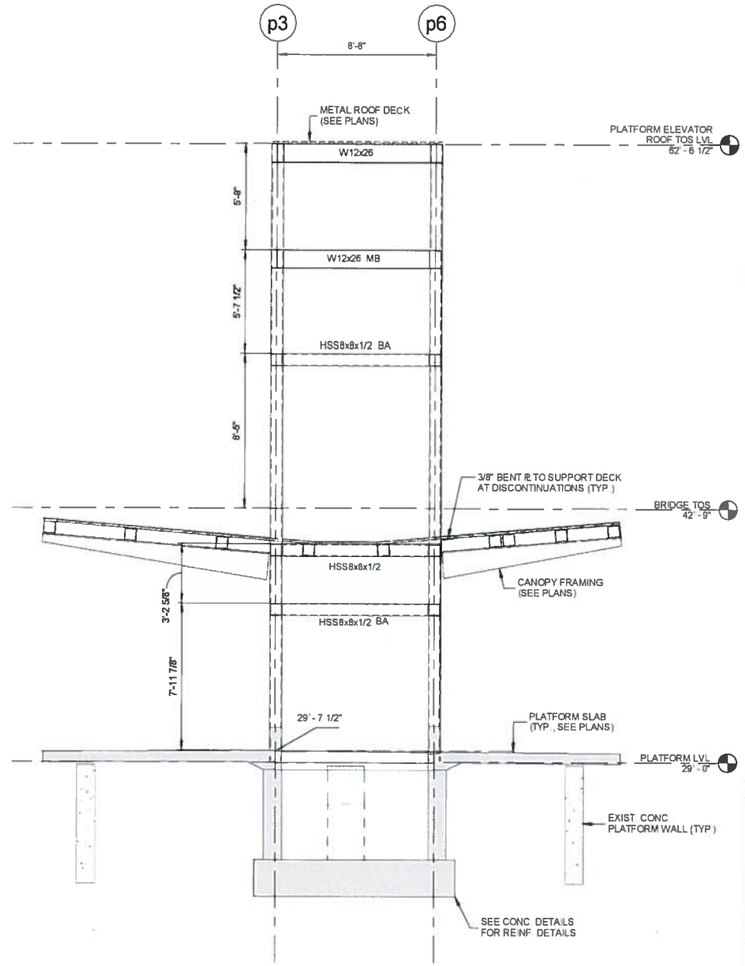
1 S2.11 ELEVATOR 1 SECTION
SCALE: 1/4" = 1'-0"

NOTES

1. MB - INDICATES ELEVATOR MACHINE BEAM SUPPORT FRAMING. PROVIDE FRAMING ON ALL 4 SIDES OF THE ELEVATOR SHAFT. CONNECTION TYPE SHALL BE TYPE Z (SEE S0.09).
2. BA - INDICATES ELEVATOR RAIL BRACKET ATTACHMENT FRAMING MEMBER. PROVIDE FRAMING ON ALL 4 SIDES OF THE ELEVATOR SHAFT. CONNECTION TYPE SHALL BE TYPE Z (SEE S0.09).



2 S2.03 ELEVATOR 2 SECTION
SCALE: 1/4" = 1'-0"



3 S2.02 ELEVATOR 3 SECTION
SCALE: 1/4" = 1'-0"

0 8 16 24
GRAPHIC SCALE

N PROJECT

No.	Description	Date

DOUGLAS E. PETERSON STRUCTURAL ENGINEER No. 41848 REGISTERED PROFESSIONAL ENGINEER
05-29-16

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Project: WOLLASTON STATION IMPROVEMENTS MBTA CONTRACT NO. A47CN01
Drawing: STEEL DETAILS

KLEINFELDER
APPROVED BY: Project Manager Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
APPROVED BY: Project Manager Date 11/09/16

SCALE: AS NOTED	DES. BY: SMC	DR. BY: JFC	CHK. BY: AAO	PLAN NO. 183137	ISSUE
DATE: 09/08/16				SHEET S5.05 OF	

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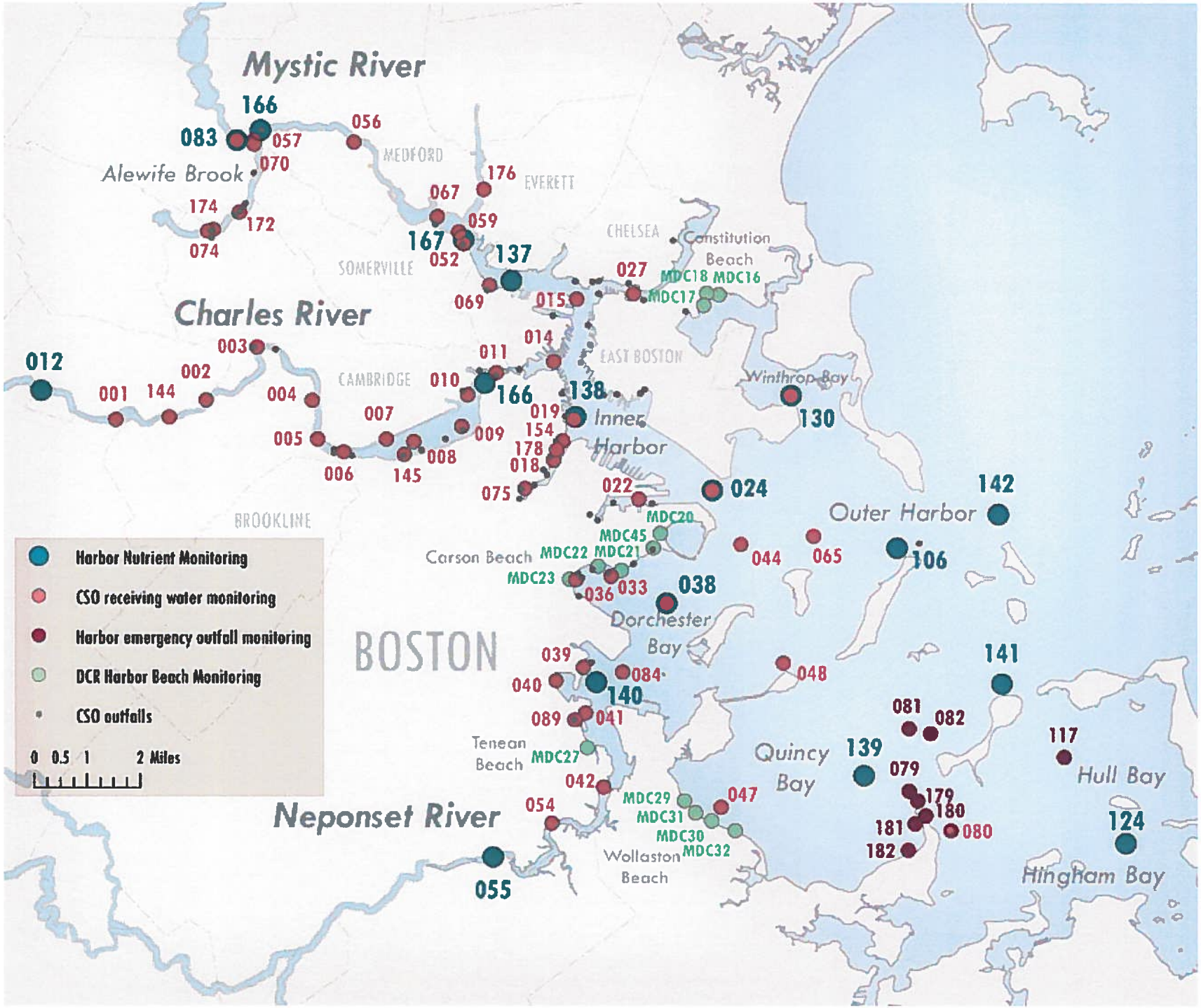
APPENDIX C

WQBEL
Summary and Support

Enter number values in green boxes below		Notes:
Enter values in the units specified		
↓		Freshwater Q_R equal to the 7Q10, enter alternate Q_R if approved by the State, enter 0 if no dilution factor approved
0	Q_R = Enter upstream flow in **MGD**	Saltwater (estuarine and marine) enter Q_R if approved by the State, enter 0 if no entry
0 0576	Q_P = Enter discharge flow in **MGD**	Discharge flow is equal to the design flow or 1 MGD, whichever is less
0	Downstream 7Q10	Only if approved by State as the entry for Q_R, leave 0 if no entry
Enter a dilution factor, if other than zero		Saltwater (estuarine and marine) only if approved by the State
↓		Leave 0 if no entry
1		
Enter values in the units specified		
↓		
0	C_d = Enter influent hardness in **mg/L** $CaCO_3$	Freshwater only
20	C_s = Enter receiving water hardness in **mg/L** $CaCO_3$	
Enter **receiving water** concentrations in the units specified		pH, temperature, and ammonia required for all discharges
↓		Hardness required for freshwater
7 94	pH in **Standard Units**	Salinity required for saltwater (estuarine.and marine)
14	Temperature in **°C**	Metals required for all discharges if present and if dilution factor is > 1
0 1	Ammonia in **mg/L**	Enter 0 if non-detect or testing not required
1000	Hardness in **mg/L** $CaCO_3$	
0	Salinity in **ppt**	
0	Antimony in **µg/L**	
0	Arsenic in **µg/L**	
0	Cadmium in **µg/L**	
0	Chromium III in **µg/L**	
0	Chromium VI in **µg/L**	
0	Copper in **µg/L**	
0	Iron in **µg/L**	
0	Lead in **µg/L**	
0	Mercury in **µg/L**	
0	Nickel in **µg/L**	
0	Selenium in **µg/L**	
0	Silver in **µg/L**	
0	Zinc in **µg/L**	
Enter **influent** concentrations in the units specified		if >1 sample, enter maximum
↓		if >10 samples, may enter 95th percentile
0	TRC in **µg/L**	Enter 0 if non-detect or testing not required
31 7	Ammonia in **mg/L**	
0	Antimony in **µg/L**	
7 3	Arsenic in **µg/L**	
2 3	Cadmium in **µg/L**	
7	Chromium III in **µg/L**	
0	Chromium VI in **µg/L**	
12 67	Copper in **µg/L**	
6782 7	Iron in **µg/L**	
1	Lead in **µg/L**	
0	Mercury in **µg/L**	
8 3	Nickel in **µg/L**	
0	Selenium in **µg/L**	
0	Silver in **µg/L**	
54	Zinc in **µg/L**	
0	Cyanide in **µg/L**	
0	Phenol in **µg/L**	
0	Carbon Tetrachloride in **µg/L**	
1 9	Tetrachloroethylene in **µg/L**	
0	Total Phthalates in **µg/L**	
0	Diethylhexylphthalate in **µg/L**	
0 01	Benzo(a)anthracene in **µg/L**	
0 0067	Benzo(a)pyrene in **µg/L**	
0 0067	Benzo(b)fluoranthene in **µg/L**	
0 0067	Benzo(k)fluoranthene in **µg/L**	
0 01	Chrysene in **µg/L**	
0	Dibenzo(a,h)anthracene in **µg/L**	
0	Indeno(1,2,3-cd)pyrene in **µg/L**	
11	Methyl-tert butyl ether in **µg/L**	

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	**7.5**	µg/L	50	µg/L
Total Suspended Solids	**30**	mg/L	---			
Antimony	**206**	µg/L	640	µg/L		
Arsenic	**104**	µg/L	36	µg/L		
Cadmium	**10.2**	µg/L	8.9	µg/L		
Chromium III	**323**	µg/L	100.0	µg/L		
Chromium VI	**323**	µg/L	50	µg/L		
Copper	242	µg/L	**3.7**	µg/L		
Iron	**5000**	µg/L	---	µg/L		
Lead	**160**	µg/L	8.5	µg/L		
Mercury	**0.739**	µg/L	1.11	µg/L		
Nickel	1450	µg/L	**8.3**	µg/L		
Selenium	**235.8**	µg/L	71	µg/L		
Silver	**35.1**	µg/L	2.2	µg/L		
Zinc	**420**	µg/L	86	µg/L		
Cyanide	**178**	mg/L	1.0	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	**7.97**	mg/L	---			
Phenol	**1,080**	µg/L	300	µg/L		
C. Halogenated VOCs						
Carbon Tetrachloride	**4.4**		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	0.1	µg/L
Benzo(a)pyrene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Benzo(b)fluoranthene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Benzo(k)fluoranthene	1.0	µg/L	**0.0038**	µg/L	0.1	µg/L
Chrysene	1.0	µg/L	**0.0038**	µg/L	0.1	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	---			


Mystic River
Charles River
Neponset River
Alewife Brook
MEDFORD
EVERETT
SOMERVILLE
CHELSEA
Constitution Beach
CAMBRIDGE
EAST BOSTON
Winthrop Bay
Inner Harbor
Outer Harbor
Carson Beach
BROOKLINE
BOSTON
Dorchester Bay
Tenean Beach
Quincy Bay
Hull Bay
Wollaston Beach
Hingham Bay
166
083
057
056
070
176
067
174
172
074
059
167
052
137
027
MDC18
MDC16
MDC17
069
015
014
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012
003
002
001
144
004
010
166
138
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178
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018
075
022
024
142
MDC20
MDC45
MDC22
MDC21
MDC23
044
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036
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040
140
089
041
081
082
MDC27
042
139
079
117
MDC29
047
MDC31
MDC30
MDC32
054
179
180
181
080
182
124
055
Harbor Nutrient Monitoring
CSO receiving water monitoring
Harbor emergency outfall monitoring
DCR Harbor Beach Monitoring
CSO outfalls
0 0.5 1 2 Miles

MWRA Harbor Physical Measurements, collected 1989 through 2016

Note: Blank cells indicate that data was either suspect or not collected. Prior to 2001, bottom readings were collected only when station depth exceeded 3 m.

This spreadsheet includes marine sampling stations only (no freshwater stations).

Project ID	Region	Subregion	DEP segment	Station ID	Surface or Bottom	Date/time (EASTERN STANDARD TIME)	Depth of measurement (m)	Temperature (C)	Salinity (PSU)	Specific Conductance (mS/cm)	Dissolved Oxygen (mg/L)	DO Pct Saturation (%)	pH	Turbidity (NTU)
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	06-Jan-16	5.78	2.77	31.28	49.38	10.54	96.3	7.93	7.3
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	06-Jan-16	0.1	2.67	31.26	49.38	10.55	96.1	7.93	5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	14-Jan-16	4.14	3.13	31.56	49.69	10.24	94.6	7.97	6.4
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	14-Jan-16	0.1	2.88	31.44	49.58	10.46	96	7.95	5.5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	04-Feb-16	4.7	4.57	31.88	49.84	10.48	100.5	7.91	3.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	04-Feb-16	0.1	4.79	31.8	49.68	10.47	100.9	7.92	3.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	23-Feb-16	4.8	2.98	31.59	49.77	10.95	100.7	7.93	5.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	23-Feb-16	0.1	2.94	31.55	49.73	10.96	100.8	7.92	5.3
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	09-Mar-16	5.69	4.47	31.86	49.83	10.75	102.8	7.91	8.2
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	09-Mar-16	0.1	4.5	31.84	49.8	10.65	101.9	7.92	7.9
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	16-Mar-16	1.44	6.58	31.27	48.63	9.55	95.7	7.37	27.8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	16-Mar-16	0.1	6.61	31.26	48.62	9.52	95.4	7.21	23.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	17-Mar-16	1.77	6.83	31.21	48.52	9.98	100.5	8.01	9.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	17-Mar-16	0.1	6.97	30.97	48.16	10.12	102.1	8	8.3
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	23-Mar-16	3.94	5.53	31.65	49.34	10.11	99.1	8.02	7.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	23-Mar-16	0.1	5.55	31.59	49.25	10.1	98.9	8.03	7.4
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	24-Mar-16	0.1	5.58	31.52	49.14	10.09	98.9	8	65.1
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	06-Apr-16	5.7	5.23	31.44	49.09	10.61	103.1	8.04	10.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	06-Apr-16	0.1	5.16	31.38	49.03	10.71	103.8	8.05	9.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	25-Apr-16	3.1	9.71	31.07	47.99	11.15	119.7	8.09	8.2
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	25-Apr-16	0.1	10.15	30.94	47.76	11.31	122.5	8.14	5.9
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	27-Apr-16	1.2	9.75	30.66	47.41	9.43	101.1	8.04	20.1
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	27-Apr-16	0.1	10.6	30.57	47.21	9.65	105.2	8.01	16.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	28-Apr-16	0.1	10.39	30.56	47.22	9.79	106.3	7.9	23.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	29-Apr-16	1.1	11.25	30.7	47.35	10.35	114.6	8.07	16.6
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	29-Apr-16	0.1	11.28	30.7	47.35	10.42	115.5	8.08	15.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	02-May-16	2.3	11.38	30.82	47.5	9.86	109.6	8.12	10.9
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	02-May-16	0.1	11.41	30.81	47.49	9.97	110.9	8.12	9.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	03-May-16	2.9	11.16	30.75	47.42	9.57	105.9	8.04	10.4
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	03-May-16	0.1	10.84	30.45	47.02	9.77	107.1	8.04	8.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	04-May-16	3.7	11	30.59	47.22	9.15	100.8	8.01	8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	04-May-16	0.1	11.06	30.59	47.21	9.2	101.4	8	7.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	18-May-16	5.4	11.25	31.28	48.15	9.77	108.7	8.05	9.6
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	18-May-16	0.1	11.5	31.29	48.14	9.85	110.1	8.05	6.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	26-May-16	3.3	12.58	31.78	48.76	9.01	103.4	7.99	8.4
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	26-May-16	0.1	15.27	31.57	48.35	8.8	106.4	7.97	5.8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	06-Jun-16	0.1	17.04	31.36	48.04	8.2	102.6	7.9	7.6
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	07-Jun-16	0.1	17.61	31.36	48.03	8.43	106.6	7.92	10.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	10-Jun-16	0.1	15.89	31.53	48.28	9.81	120.2	8.06	16.4
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	16-Jun-16	5.6	15.83	31.44	48.17	9.01	110.2	8	4.6
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	16-Jun-16	0.1	16.31	31.37	48.05	9.11	112.4	7.99	1.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	17-Jun-16	3.4	18.4	31.24	47.86	8.93	114.6	7.97	5.9
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	17-Jun-16	0.1	18.62	31.24	47.85	9.06	116.8	7.96	4.9
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	27-Jun-16	4.3	14.06	32.02	49.03	9.17	108.5	8.05	5

MWRA Harbor Physical Measurements, collected 1989 through 2016

Note: Blank cells indicate that data was either suspect or not collected. Prior to 2001, bottom readings were collected only when station depth exceeded 3 m.

This spreadsheet includes marine sampling stations only (no freshwater stations).

Project ID	Region	Subregion	DEP segment	Station ID	Surface or Bottom	Date/time (EASTERN STANDARD TIME)	Depth of measurement (m)	Temperature (C)	Salinity (PSU)	Specific Conductance (mS/cm)	Dissolved Oxygen (mg/L)	DO Pct Saturation (%)	pH	Turbidity (NTU)
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	27-Jun-16	0.1	17.65	31.91	48.78	8.95	113.7	8.03	3.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	13-Jul-16	5.33	17.33	31.94	48.83	8.83	111.5	7.94	9
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	13-Jul-16	0.1	17.99	31.93	48.81	8.96	114.5	7.95	6.6
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	18-Jul-16	2.83	20.9	31.9	48.77	8.08	109.1	7.92	11.2
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	18-Jul-16	0.1	23.15	31.93	48.85	8.17	114.8	7.98	7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	20-Jul-16	2.39	21.13	31.87	48.74	7.73	104.8	7.9	11
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	20-Jul-16	0.1	21.21	31.87	48.74	7.9	107.2	7.83	10.4
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	21-Jul-16	0.1	21.12	31.98	48.87	7.23	98	7.94	20.9
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	25-Jul-16	3.43	18.5	32.13	49.07	8.24	106.5	7.98	6.3
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	25-Jul-16	0.1	22.98	32.11	49.1	7.87	110.3	7.92	4.4
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	26-Jul-16	0.77	22	31.99	48.91	7.51	103.4	7.89	16
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	26-Jul-16	0.1	22	32.01	48.93	7.58	104.5	7.89	13.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	27-Jul-16	1.75	22.06	32.01	48.93	6.88	94.9	7.89	9.1
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	27-Jul-16	0.1	23.32	32.07	49.05	6.42	90.6	7.84	6.2
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	28-Jul-16	1.75	21.39	32.1	49.04	7.16	97.5	7.86	7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	28-Jul-16	0.1	23.89	32.18	49.2	6.84	97.5	7.78	4.6
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	29-Jul-16	2.27	21.38	31.97	48.87	7.35	100	7.9	8.8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	29-Jul-16	0.1	21.4	31.97	48.87	7.71	105.1	7.93	7.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	09-Aug-16	3.7	19.12	32.02	48.93	7.87	102.8	7.91	11.8
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	09-Aug-16	0.1	21.38	32.05	48.98	8.07	110	7.92	7.9
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	25-Aug-16	3.3	18.83	32.35	49.38	7.66	99.7	7.94	7.3
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	25-Aug-16	0.1	20.03	32.31	49.32	7.65	101.8	7.92	4.9
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	29-Aug-16	3	20.61	32.31	49.33	7.55	101.6	7.82	6.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	29-Aug-16	0.1	20.76	32.32	49.34	7.53	101.5	7.8	4.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	30-Aug-16	3.7	20.98	32.2	49.19	7.63	103.4	7.93	8.1
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	30-Aug-16	0.1	21.56	32.22	49.21	7.68	105	7.93	5.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	31-Aug-16	1.7	20.16	32.29	49.29	7.63	101.8	7.82	8.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	31-Aug-16	0.1	20.17	32.29	49.29	7.63	101.8	7.82	5.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	02-Sep-16	1.06	19.83	32.19	49.16	6.86	91	7.78	17.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	02-Sep-16	0.1	19.82	32.19	49.16	7.12	94.4	7.78	13.8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	07-Sep-16	1.4	19.35	32.14	49.09	7.24	95.1	7.67	6.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	07-Sep-16	0.1	19.52	32.15	49.09	7.32	96.4	7.64	3.5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	08-Sep-16	3.6	18.79	32.32	49.34	8.13	105.8	7.9	6.6
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	08-Sep-16	0.1	19.26	32.32	49.34	8.76	115	7.94	2.8
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	09-Sep-16	1.62	20.53	32.27	49.27	8.03	107.8	7.79	10.7
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	09-Sep-16	0.1	21.2	32.24	49.23	8.28	112.5	7.79	4.9
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	05-Oct-16	4	15.29	32.32	49.39	8.31	101.1	7.86	7.5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	05-Oct-16	0.1	15.32	32.32	49.38	8.34	101.5	7.82	7.5
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	B	18-Oct-16	0.7	15.39	31.26	47.93	9.02	109.1	7.91	4.3
CSORWM	Quincy/Wollaston	Quincy Bay	MA70-05	047	S	18-Oct-16	0.1	15.39	31.23	47.88	8.91	107.9	7.86	3.6
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	19-Oct-16	3.1	15.33	31.96	48.89	8.19	99.5	7.86	6
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	19-Oct-16	0.1	15.36	31.95	48.88	8.28	100.6	7.86	5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	09-Nov-16	4.81	10.13	32.03	49.28	9.51	103.7	8.01	6.4
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	09-Nov-16	0.1	10.03	31.94	49.16	9.47	102.9	7.99	6.2

MWRA Harbor Physical Measurements, collected 1989 through 2016

Note: Blank cells indicate that data was either suspect or not collected. Prior to 2001, bottom readings were collected only when station depth exceeded 3 m.

This spreadsheet includes marine sampling stations only (no freshwater stations).

Project ID	Region	Subregion	DEP segment	Station ID	Surface or Bottom	Date/time (EASTERN STANDARD TIME)	Depth of measurement (m)	Temperature (C)	Salinity (PSU)	Specific Conductance (mS/cm)	Dissolved Oxygen (mg/L)	DO Pct Saturation (%)	pH	Turbidity (NTU)
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	28-Nov-16	6.02	6.75	31.92	49.53	10.1	102	8.15	4.5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	28-Nov-16	0.1	6.73	31.86	49.45	10.01	101	8.14	4.7
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	07-Dec-16	4.4	6.14	31.91	49.61	10.46	104.1	8.09	9.4
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	07-Dec-16	0.1	6.07	31.77	49.43	10.35	102.7	8.07	7.2
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	B	14-Dec-16	6.35	5.03	32.02	49.96	10.37	100.6	8.16	7.5
BHWQM	Quincy/Wollaston	Quincy Bay	MA70-05	139	S	14-Dec-16	0.1	5.01	32.02	49.95	10.35	100.4	8.15	7.2
							1.62	13.87	31.68	48.79	8.99	104.23	7.94	9.19

APPENDIX D

Endangered Species Act Eligibility Determination

IPaC Information for Planning and Consultation

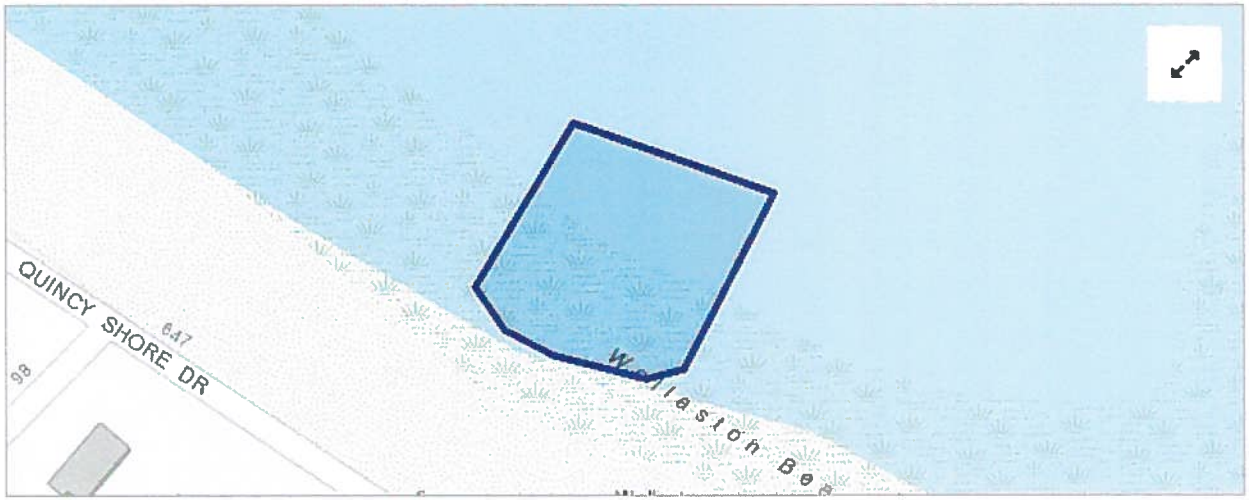
MY PROJECTS

Wollaston Station Norfolk County, Massachusetts

PROJECT HOME REGULATORY REVIEW

Wollaston Station

No description provided.



LOCATION Norfolk County, Massachusetts

CREATED August 15, 2017

1 MEMBER 1 DOCUMENT

Species determinations

For listed species 1 not covered by determination keys, an impact analysis should be performed to reach a conclusion about how this project will impact the species. These conclusions will result in *determinations* for each species, which will be used in consultation with the U.S. Fish and Wildlife Service.

Mammals

NAME	DETERMINATION
Northern Long-eared Bat Myotis septentrionalis	None

Birds

NAME	DETERMINATION
Red Knot Calidris canutus rufa	None
Roseate Tern Sterna dougallii dougallii	None

Critical habitats

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

U.S. Fish & Wildlife Service

Northern Long-Eared Bat

Myotis septentrionalis

The northern long-eared bat is federally listed as a threatened species under the Endangered Species Act. ***Endangered*** species are animals and plants that are in danger of becoming extinct. ***Threatened*** species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's Endangered Species Program.

Photo by Steve Taylor, University of Illinois

This northern long-eared bat, observed during an Illinois mine survey, shows visible symptoms of white-nose syndrome.

What is the northern long-eared bat?

Appearance: The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

Winter Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

Summer Habitat: During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. They rarely roost in human structures like barns and sheds.

Reproduction: Breeding begins in late summer or early fall when males begin to swarm near hibernacula. After copulation, females store sperm during hibernation until spring. In spring, females emerge from their hibernacula, ovulate and the stored sperm fertilizes an egg. This strategy is called delayed fertilization.

After fertilization, pregnant bats migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been observed. Numbers of bats in roosts typically decrease from the time of pregnancy to post-lactation. Most bats within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Maximum lifespan for the northern long-eared bat is estimated to be up to 18.5 years.

Feeding Habits: Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

Range: The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

Why is the northern long-eared bat in trouble?

White-nose Syndrome: No other threat is as severe and immediate as

this. If this disease had not emerged, it is unlikely that northern long-eared bat populations would be experiencing such dramatic declines. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast; an area that includes the core of the northern long-eared bat's range, where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to continue to spread throughout the United States in the foreseeable future.

Other Sources of Mortality:

Although no significant population declines have been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's viability until we find ways to address WNS.

Impacts to Hibernacula: Gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their energy stores, which may lead to bats not surviving through winter.

Loss or Degradation of Summer Habitat: Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat and are activities prevalent in many areas of this bat's range. Many forest management activities benefit bats by keeping areas forested rather than converted to other uses. But, depending on type and timing, some forest management activities can cause mortality and temporarily remove or degrade roosting and foraging habitat.

Wind Farm Operation: Wind turbines kill bats, and, depending on the species, in very large numbers. Mortality from windmills has been documented for northern long-eared bats, although a small number have been found to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

What Is Being Done to Help the Northern Long-Eared Bat?

Disease Management: Actions have been taken to try to reduce or slow the spread of white-nose syndrome through human transmission of the fungus into caves (e.g. cave and mine closures and advisories; national decontamination protocols). A national plan was prepared by the Service and other state and federal agencies that details actions needed to investigate and manage white-nose syndrome. Many state and federal agencies, universities and non-governmental organizations are researching this disease to try to control its spread and address its affect. See www.whitenosesyndrome.org/ for more.

Addressing Wind Turbine Mortality: The Service and others are working to minimize bat mortality from wind turbines on several fronts. We fund and conduct research to determine why bats are susceptible to turbines, how to operate turbines to minimize mortality and where important bird and bat migration routes are located. The Service, state natural resource agencies, and the wind energy industry are developing a Midwest Wind Energy Habitat Conservation Plan, which will provide wind farms a mechanism to continue operating legally while minimizing and mitigating listed bat mortality.

Listing: The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Listing a species affords it the protections of the Act and also increases the priority of the species for funds, grants, and recovery opportunities.

Hibernacula Protection: Many federal and state natural resource agencies and conservation organizations have protected caves and mines that are important hibernacula for cave-dwelling bats.

What Can I Do?

Do Not Disturb Hibernating Bats: To protect bats and their habitats, comply with all cave and mine closures, advisories, and regulations. In areas without a cave and mine closure policy, follow approved decontamination protocols (see http://whitenosesyndrome.org/topics/decontamination). Under no circumstances should clothing, footwear, or equipment that was used in a white-nose syndrome affected state or region be used in unaffected states or regions.

Leave Dead and Dying Trees Standing: Like most eastern bats, the northern long-eared bat roosts in trees during summer. Where possible and not a safety hazard, leave dead or dying trees on your property. Northern long-eared bats and many other animals use these trees.

Install a Bat Box: Dead and dying trees are usually not left standing, so trees suitable for roosting may be in short supply and bat boxes may provide additional roost sites. Bat boxes are especially needed from April to August when females look for safe and quiet places to give birth and raise their pups.

Support Sustainability: Support efforts in your community, county and state to ensure that sustainability is a development goal. Only through sustainable living will we provide rare and declining species, like the northern long-eared bat, the habitat and resources they need to survive alongside us.

Spread the Word: Understanding the important ecological role that bats play is a key to conserving the northern long-eared and other bats. Helping people learn more about the northern long-eared bat and other endangered species can lead to more effective recovery efforts. For more information, visit www.fws.gov/midwest/nleb and www.whitenosesyndrome.org

Join and Volunteer: Join a conservation group; many have local chapters. Volunteer at a local nature center, zoo, or national wildlife refuge. Many state natural resource agencies benefit greatly from citizen involvement in monitoring wildlife. Check your state agency websites and get involved in citizen science efforts in your area.

Northern Long-Eared Bat (*Myotis septentrionalis*) Species Guidance

Family: Vespertilionidae- the evening bats

State Status: Threatened

State Rank: S1S3

Federal Status: None

Global Rank: G4

Wildlife Action Plan Area of Importance Score: 3

Range of the northern long-eared bat in Wisconsin. Source: WI Bat Program 2012

Dave Redell, Wisconsin DNR

Species Information

General Description: The northern long-eared bat, also referred to as the northern bat, is a medium-sized member of the genus *Myotis*. Adults weigh five to nine grams (0.2-0.3 oz). Individual weights vary seasonally and are lowest in the spring as bats emerge from hibernation (WI Bat Program 2010). Total length is 77-92 mm (3.0-3.63 in), adult forearm length is 34-38 mm (1.3-1.5 in), and females are generally larger than males (Kurta 1995). Wingspan is 23-26 cm (9.1-10.2 in; Barbour and Davis 1969). Fur color is light to dark brown. The northern long-eared bat is classified as a cave bat because it uses caves and mines for hibernation.

Similar Species: Three bat species in Wisconsin- the northern long-eared bat, the little brown bat (*Myotis lucifugus*) and the Indiana (*Myotis sodalis*) bat – are best distinguished by close (in-hand) inspection. The northern long-eared bat is most often confused with the little brown bat. The northern long-eared bat has longer ears than the little brown bat, and when folded alongside the head, the tips of the ears should extend 3 mm or more past the tip of the nose. Little brown bat ear length in Wisconsin, however, can be highly variable, and tragus shape and length in relation to the rest of the ear are the two best features to use to distinguish these two species (Fig. 1). The tragus of the northern long-eared bat is more pointed and spear-like than that of the little brown bat. The little brown bat also has a glossier appearance than the northern long-eared. The northern long-eared bat may also be confused with the Indiana bat, but the two can be distinguished much the same way as the little brown bat from the northern long-eared bat. The Indiana bat's keeled calcar, a spur of cartilage extended from the ankle and supporting the interfemoral membrane, is a distinguishing feature that the northern long-eared bat lacks. The northern long-eared bat can be identified by the echolocation call (Fig. 2), however both other *Myotis* species share similar call characteristics, and only trained individuals should positively identify the species through echolocation calls.

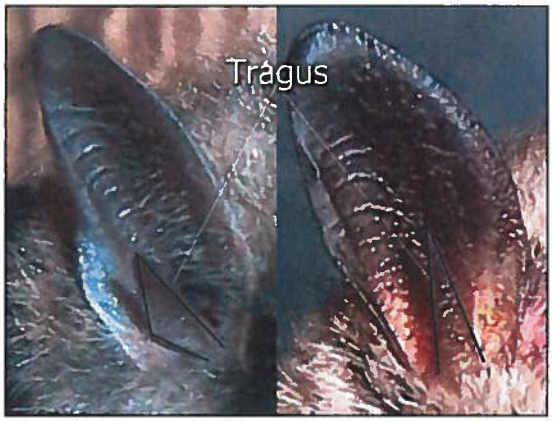


Figure 1. The asymmetrical tragus of the little brown bat (left), and the symmetrical, spear-like tragus of the northern long-eared bat (right). Dave Redell, Wisconsin DNR

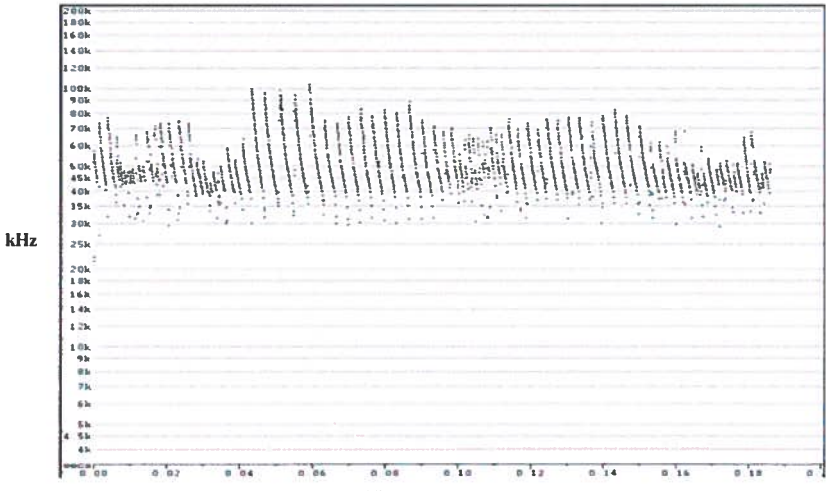


Figure 2. Echolocation call: Northern long-eared bats produce high-frequency calls of a shorter duration, broader bandwidth and lower intensity than other *Myotis* species. The call frequency ranges between 126 and 40 kHz (Caceres and Barclay 2000). The northern long-eared bat sonogram may appear similar to the little brown bat and the Indiana bat.

Associated Species: Northern long-eared bat predators include owls, hawks, occasionally snakes, and raccoons (*Procyon lotor*). As many as 13 feral cats have also been observed congregating at a mine entrance at dusk to prey upon bats as they leave the hibernaculum (D. Redell pers. obs.). Northern long-eared bats often share hibernacula with other bat species such as the tri-colored bat (*Perimyotis subflavus*), the little brown bat, the big brown bat (*Eptesicus fuscus*) and the Indiana bat, but the northern bat rarely, if ever, forms hibernating clusters with other species. Northern long-eared bats forage with other bat species, but there is no evidence of direct competition between species.

State Distribution and Abundance: Northern long-eared bats are found throughout the state of Wisconsin (but see "Threats" section below), but they are never abundant (Jackson 1961, WDNR 2013).

Global Distribution and Abundance: Northern long-eared bats are widely distributed in the eastern United States and Canada, with the exception of the very southeastern United States and Texas (see Fig. 3, BCI 2012).

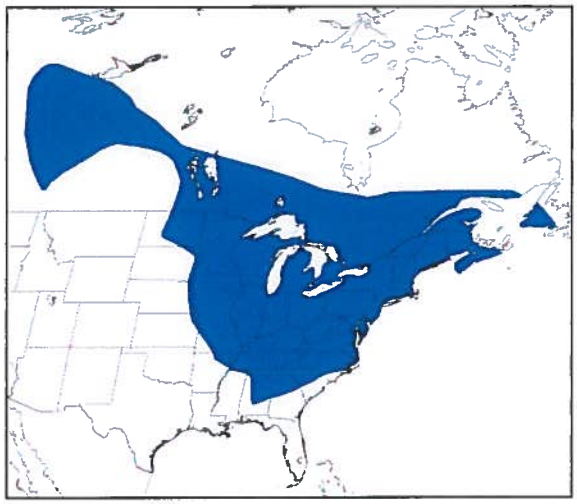
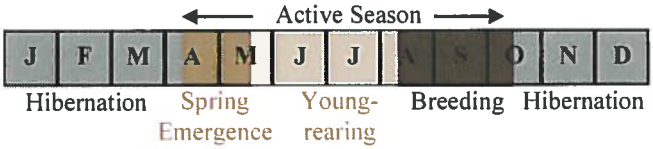


Figure 3. Global distribution of *Myotis septentrionalis*. (BCI 2012)

Diet: The northern long-eared bat is insectivorous and uses echolocation to locate and capture prey. Northern long-eared bat prey includes moths (*Lepidoptera*), flies (*Diptera*) and beetles (*Coleoptera*). This species is commonly referred to as a gleaning bat because it often catches insects that are at rest on leaves or twigs, in addition to catching insects that are flying (Lee and McCracken 2004).

Reproductive Cycle: The reproductive cycle for the northern long-eared bat begins when breeding occurs in the fall and sometimes into winter hibernation. Sperm is stored in the uterus of the female until April or May when the females emerge from hibernation and fertilization occurs. Females form small maternity colonies of up to 30 bats in late spring and females give birth to a single pup in June or early July (Caceres and Barclay 2000, Owen et. al. 2002). Pups are born hairless and flightless. The pup nurses for about a month and is left at the roost nightly while the mother goes out to feed. The pup begins to fly and explore on its own at four to six weeks. Maternity colonies disperse shortly after young are volant (able to fly) and bats move closer to hibernacula in the fall and mate before they hibernate. Young of the year do not usually mate, but some juvenile males appear reproductively active (WI Bat Program 2009, 2010). More research is needed to determine breeding and reproductive behavior of the northern long-eared bat.



Ecology: Female and male northern long-eared bats emerge from hibernation in April and May. In summer, the northern long-eared bat roosts alone, or females may form a colony with some other females. The northern long-eared bat chooses day roosts in tall trees and snags. Night roosts for this species include caves and rock shelters where they will rest between feeding bouts (Caceres and Barclay 2000). Roost fidelity is low in this species, and individual bats switch roosts about every two days in the summer (Foster and Kurta 1999). This species is a relatively long lived mammal for its size, and usually lives up to 8-10 years. Banding records indicated a northern long-eared bat caught in the wild lived up to 18 years (Caceres and Barclay 2000). In the fall, northern long-eared bats will make short migrations from summer habitat to winter hibernacula (caves and abandoned mines), and will often return to the same hibernaculum but not always in sequential seasons (Caceres and Barclay 2000). This species hibernates with other species such as the little brown bat and tri-colored bat, but often in different parts of the hibernaculum. The northern long-eared bat hibernates deep in crevices, rather than clustering on exposed surfaces like other cave bats, which makes it difficult to survey and monitor for this species during the winter (Caceres and Barclay 2000). More research is needed on northern long-eared bats' basic life history and behavior.

Natural Community Associations: (WDNR 2005 and WDNR 2009)

Many bat species are associated more with structural features within natural communities than with any particular natural community or group of natural communities (see "Habitat" section).

Significant: coldwater streams, coolwater streams, ephemeral pond
Moderate: alder thicket, bog relict, boreal rich fen, calcareous fen (southern), central sands pine – oak forest, coastal plain marsh, emergent aquatic, floodplain forest, hemlock relict, inland lakes, northern dry forest, northern dry-mesic forest, northern hardwood swamp, northern mesic forest, northern sedge meadow, oak barrens, oak woodland, open bog, shrub carr, southern dry forest, southern

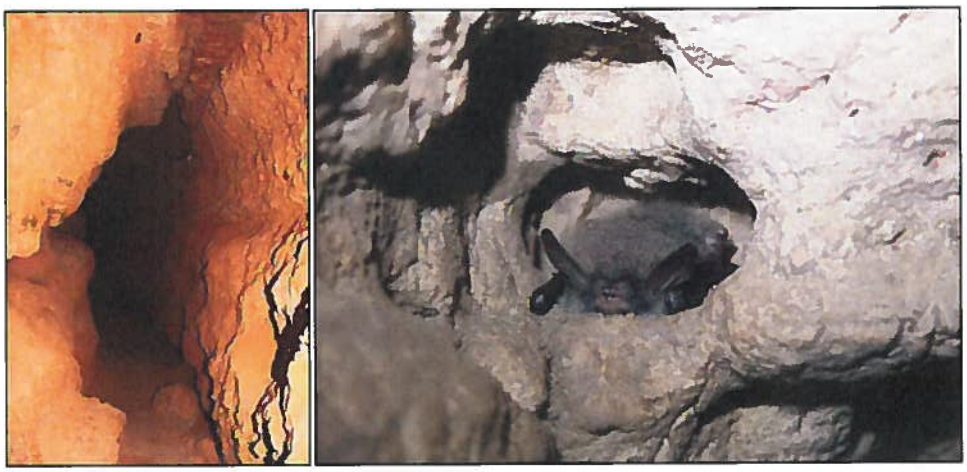
dry-mesic forest, southern hardwood swamp, southern mesic forest, southern sedge meadow, submergent aquatic, submergent aquatic-oligotrophic marsh, warmwater rivers, warmwater streams, white pine – red maple swamp
Minimal: none

Habitat: Northern long-eared bat habitat use changes over the course of the year, and varies based on sex and reproductive status. Reproductive females often use different summer habitat from males and non-reproductive females.

Summer: Northern long-eared bats commonly roost in trees but have been known to roost in man-made structures. This species often roosts under bark or close to the tree trunk in crevices of tree species such as maples and ashes (Foster and Kurta 1999). Northern long-eared bats prefer to roost in tall trees with a dynamic forest structure including old growth and some young trees (Foster and Kurta 1999). Females form small maternity colonies which are located in trees, under shingles, and in buildings. Northern long-eared bats commonly forage within the forest and below the canopy mainly in upland forests on hillsides and ridges (Owen et al. 2003), but have also been noted to forage along paths, ponds and streams, and at forest edges. Foster and Kurta (1999) found all roost trees to be close to wetlands. More information is needed to more fully describe northern long-eared bat foraging habitats and summer roosting in Wisconsin.

Home range: Northern long-eared bats use approximately 150 acres for their home range in summer (Owen et al. 2003). More information is needed to accurately describe northern long-eared bat home range and habitat in Wisconsin.

Winter: The northern long-eared bat hibernates in caves and abandoned mines in winter and tends to be found in deep crevices (Kurta 1994, Caceres and Barclay 2000). More research is needed to determine what characteristics make suitable caves and mines for northern long-eared bat hibernation.



Northern long-eared bat hibernacula in southwestern Wisconsin: Passage of a mine in Grant County that houses northern bats (left), and solitary northern long-eared bat in a crevice in Pierce County (right). Heather Kaarakka, Wisconsin DNR

Edge habitat (transition zone between two types of vegetation) is important for northern long-eared bats as they migrate and forage. When bats migrate from wintering caves to summer habitat or commute from roosts to feeding grounds, they move through the landscape in a manner that protects them from wind and predators. Instead of flying the shortest distance across a field, for instance, bats will take longer routes that follow edge habitat. In addition to offering protection, this behavior may also allow bats more feeding opportunities because food is more abundant around edge habitat (Limpens and Kapteyn 1991). Commuting along edge habitat may assist the bats with navigation and orientation through use of linear edges as landmarks (Verboom and Huitema 1997).

Threats: Lack of information on bat species' basic ecology is one of the greatest threats to bat conservation in Wisconsin. The northern long-eared bat faces two emerging threats, and several ongoing threats. White-nose syndrome (WNS) was discovered in 2006 in a hibernaculum in New York State, and appears as a white, powdery substance on the bat's face, tail and wings. White-nose syndrome has spread rapidly since 2007 to other hibernacula in neighboring states (USFWS 2012). Infected little brown bat and northern bat hibernacula in New York and surrounding states have experienced mortality rates of over 90%. White-nose syndrome has been called the "most precipitous wildlife decline in the past century in North America" (BCI 2009), and is caused by a fungus called *Geomyces destructans* (Lorch et al. 2011). This fungus grows best in the cool, wet conditions of hibernacula (Verant et al. 2012). Mortality from the fungus appears to come from increased arousals during torpor, which deplete bats' fat reserves and cause starvation (Reeder et al. 2012) and dehydration (Cryan et al. 2010). For up-to-date WNS information, see the USFWS WNS website and the USGS National Wildlife Health Center website (see *Additional Information).* Neither the fungus nor the disease has been found in Wisconsin as of this writing. Cave-hibernating bats, including the northern long-eared bat, should be monitored closely for any

indication of WNS; the Wisconsin Bat Program conducts WNS surveillance and monitoring in the state.

Wind power is another emerging threat to bats – wind turbines have been shown to fatally impact all bat species in Wisconsin (Johnson 2003, Arnett et al. 2008). Wind-turbine blades cause mortality through direct impact or through the pressure differential caused by the motion of the spinning blades. This pressure differential causes a bat's lungs to fill with fluid as it flies near the spinning blades, and this phenomenon (known as barotrauma) kills the bat instantly (Baerwald et. al. 2008). More research is under way to better understand bat wind-turbine vulnerabilities, but current studies suggest that bats face the greatest risk during migration from summer foraging sites to wintering grounds (tree bats) or hibernacula (cave bats) (Johnson 2003, Kunz et al. 2007). Research is needed on all Wisconsin bat species to better understand wind-turbine mortality in the state and the long term population impacts of turbine-related deaths.

Northern long-eared bats also face the ongoing threat of habitat degradation. Habitat degradation is caused by increased agricultural, industrial, and household pesticide use, and it has negative effects on bats through direct exposure and through dietary accumulation (O'Shea et al. 2001). Pesticides are a threat to many taxa, but bats may be more vulnerable than other small mammals due to certain life characteristics (Shore et al. 1996, O'Shea et al. 2001). Bats' longevity and high trophic level means pesticides can concentrate in their body fat (Clark and Prouty 1977, Clark 1988). Even after pesticide exposure ceases, residues can be passed on to nursing young (Clark 1988). Bat species that migrate long distances may be more affected because pesticide residues become increasingly concentrated in the brain tissue as fat reserves are depleted during long-distance flights. This concentration can lead to convulsions and even death (Geluso et al. 1976, Clark 1978).

Northern long-eared bats also face the ongoing threat of hibernaculum disturbance from humans entering hibernacula in winter and waking bats from torpor. Bats in torpor reduce their metabolism and body temperature to low levels that require less energy than being fully awake. Interrupting torpor costs energy; a little brown bat uses up to 100 mg of fat reserves waking and the returning to torpor (and more if the bat starts flying), or the energetic equivalent of up to 67 days of torpor (Thomas et al. 1990, Thomas 1992). This loss clearly represents a large percentage of total body weight of the bat, and repeated arousals may cause bats to run out of energy reserves before spring arrives and therefore starve in the hibernaculum or die from exposure if they seek food outside (Thomas 1995).

Climate Change Impacts: The effects of climate change on the northern long-eared bat are unclear. Predictions suggest a northward expansion in the ranges of all cave-bat species, in pursuit of optimal hibernation (Humphries et al. 2002, USFWS 2007). This prediction assumes an abundance of suitable caves and other hibernaculum structures further north, but this assumption may not hold for karst-free regions at higher latitudes. Bat species may adapt by reducing torpor depth and duration during winter if prey insect species are available for more of the year (Weller et al. 2009), but bats' adaptive capacities in this regard may be limited and are not well known. Shifts in prey insect emergence may also cause mismatches with bat emergence and cause food shortages in the spring or fall.

Survey Guidelines: Persons handling northern long-eared bats must possess a valid Endangered and Threatened Species Permit. If surveys are being conducted for regulatory purposes, survey protocols and surveyor qualifications must first be approved by the Endangered Resources Review Program (see *Contact Information*).

Acoustic surveys, which should be done by trained individuals, are performed for all Wisconsin bat species in spring, summer, and fall; and are used to determine presence/absence, phenology, and distribution around the state. The Wisconsin Bat Program's eventual goal is to use acoustic survey data to determine bat population trends in Wisconsin. Northern long-eared bats are ubiquitous around the state, and therefore surveys can be done wherever appropriate habitat exists. Acoustic recording systems that detect echolocation calls can survey bats as they fly through an area. The bat detection system detects and records these acoustic signals as bats fly by, and records the date and time of each encounter. The Wisconsin Bat Program currently uses broadband frequency division ultrasound detection equipment with a PDA (Personal Data Assistant) and a Global Positioning System. Start acoustic surveys half an hour after sunset, but only if the daytime temperature exceeds 50° F, and conduct the survey for at least one hour. There are three seasons for acoustic surveys: spring (April and May), summer (June and July), and fall (August and September). Acoustic surveys record bat passes, which can then be identified to species by trained individuals. These surveys could be used by land managers to create inventories of species distribution and relative abundance. Visit the Wisconsin bat monitoring website for additional information.

Wisconsin DNR also conducts a roost monitoring program to determine abundance of bats roosting in buildings and bat houses. People with bat houses or other roost sites identify species and count bats over the summer at night as bats leave the roost. People who find a bat roost while doing field surveys should contact the Wisconsin Bat Program to report the information.

Summarize results, including survey dates, times, weather conditions, number of detections, detection locations, and behavioral data and submit via the WDNR online report: <http://dnr.wi.gov, keyword "rare animal field report form">

Management Guidelines

The following guidelines typically describe actions that will help maintain or enhance habitat for the species. These actions are not mandatory unless required by a permit, authorization or approval.

Summer Management

Roost availability is thought to limit northern long-eared bat populations, as it does for many bat species, and thus habitat management is important for the continued survival of this species (Duchamp et al. 2007). Northern long-eared bats are forest dwelling bats, and forest management to promote occupation by this species should increase roosting and foraging habitat (see Habitat section above). Northern long-eared bats have been shown to use both live and dead trees for roosting sites (Foster and Kurta 1999). These bats often roost under exfoliating bark, and therefore snags and dying trees may be important for encouraging northern long-eared bats. Forest managers are encouraged to promote mixed-species, mixed-aged plots as the northern long-eared bat chooses trees based on suitability of crevices and bark as roosts, rather than on tree species (Foster and Kurta 1999). The northern long-eared bat is known to switch roost trees frequently (about every 2 days) over the course of the summer, and therefore this species needs a large number of trees (Foster and Kurta 1999). As with many bat species, suitable forested habitat for northern long-eared bats is a multi-species matrix that contains some open areas (Owen et al. 2003).

Linear corridors are important for migrating and commuting bats, and forests may be managed such that suitable foraging habitat is connected by corridors; this may include managing edge habitat along roads, logging trails and riparian habitat. Land managers should also make an effort to reduce or eliminate burdock (*Arctium minus*), an exotic weed that produces seeds that trap bats and cause death from exposure.

Special consideration should be given to protecting snags or dying trees, especially those near known roost locations, particularly from June 1 through August 15 while bats may have pups at the roost.

Seasonal pools in woodlands may be important foraging and water sources for the northern long-eared bat and other Wisconsin bat species because they provide areas for feeding and drinking in an otherwise closed-canopy forest (Francl 2008). Pool size and depth do not appear to determine usage by northern long-eared bats; instead the presence of an opening in the forest is enough to encourage foraging and drinking (Francl 2008).

Fall Management

During fall swarm, large proportions of Wisconsin's cave bat population gather near entrances of the state's hibernacula (see "Habitat" section), and become concentrated and vulnerable to direct impacts. To avoid disturbance during crucial life history events, management activities such as logging and use of heavy machinery within 0.25 miles of hibernacula entrances should be avoided during fall swarm (August 15-October 15) or during spring emergence (April 1-May 15) because bats may use the surrounding area for roosting during those time periods.

Winter Management

Little is known about how northern long-eared bats choose hibernation sites, but suitable Wisconsin hibernacula typically have steady temperatures between 4° C and 12° C (39-53° F), high humidity, and no human disturbance. Artificial sites that can mimic this environment may provide suitable hibernacula. Artificial hibernacula include bunkers, food storage-caves and basements. Contact the Wisconsin Bat Program to inquire about developing artificial hibernacula.

Natural hibernacula can also be managed to encourage bat use. For example, closing but not sealing the entrance to an abandoned mine not only buffers temperature and humidity, but also reduces disturbance from humans and predators. Eliminating disturbance from humans, except for WNS surveillance, is the best management activity for natural cave hibernacula. Contact the Wisconsin Bat Program for more information about managing bat hibernacula.

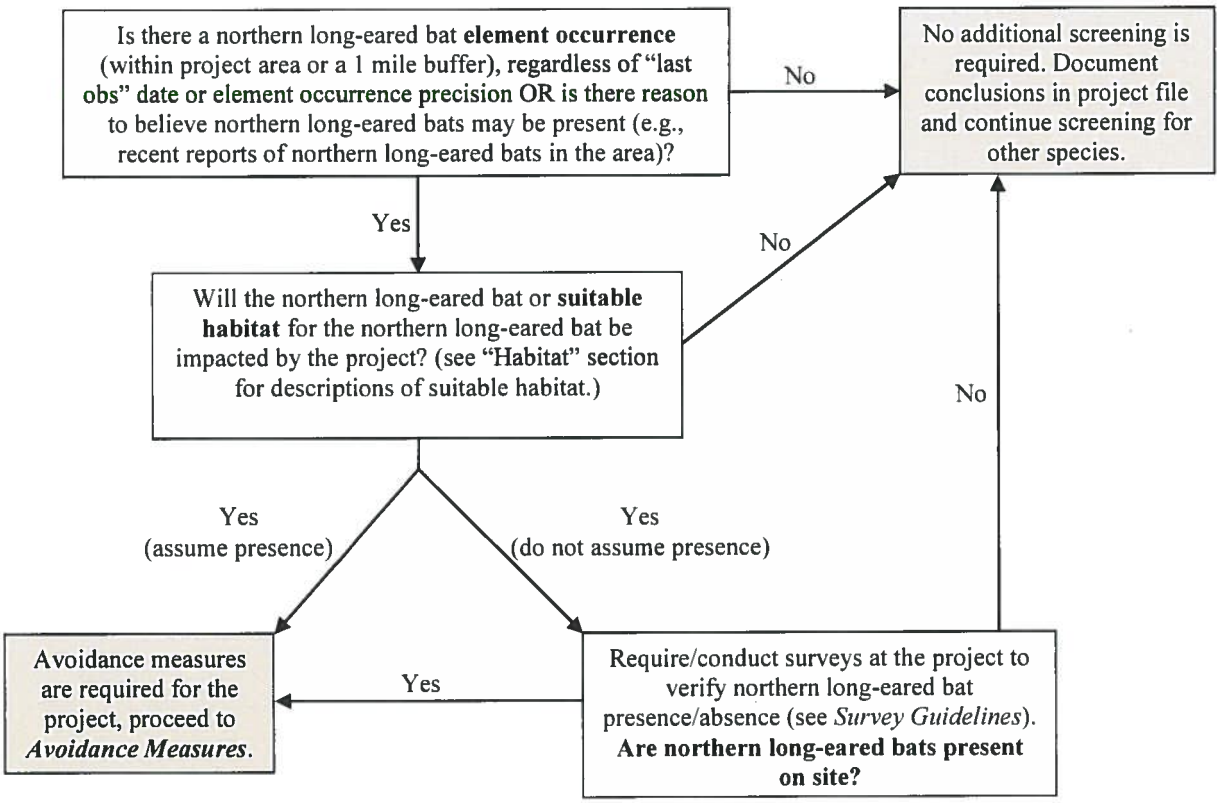
Northern long-eared bats – and their populations as a whole – are particularly vulnerable during winter hibernation because they are concentrated in just a few major hibernacula and because repeated disturbance during hibernation can lead to mortality (see "Threats" section above). Each time a bat is aroused from torpor, it uses up a substantial proportion of the fat reserves it relies on to hibernate through the winter and faces greater odds of starvation before spring (see "Threats" section above). Therefore, avoid entering hibernacula from October 1 through May 15 unless conducting approved and permitted management, surveillance, or research.

Screening Procedures

The following procedures must be followed by DNR staff reviewing proposed projects for potential impacts to the species.

Follow the "Conducting Endangered Resources Reviews: A Step-by-Step Guide for Wisconsin DNR Staff" document (summarized below) to determine if northern long-eared bats will be impacted by a project (WDNR 2012):

Those seeking to complete wind farm projects should review and follow the Guidance for Minimizing Impacts to Natural Resources from Terrestrial Commercial Wind Energy Development created by the WDNR.



Avoidance Measures

The following measures are specific actions required by DNR to avoid take (mortality) of state threatened or endangered species per Wisconsin's Endangered Species law (s. 29.604, Wis. Stats.) These guidelines are typically not mandatory for non-listed species (e.g., special concern species) unless required by a permit, authorization or approval.

According to Wisconsin's Endangered Species Law (s. 29.604, Wis. Stats.), it is illegal to take, transport, possess, process, or sell any wild animal on the Wisconsin Endangered and Threatened Species List (ch. NR 27, Wis. Admin. Code). Take of an animal is defined as shooting, shooting at, pursuing, hunting, catching or killing.

If *Screening Procedures* above indicate that avoidance measures are required for a project, follow the measures below. If you have not yet read through *Screening Procedures*, please review them first to determine if avoidance measures are necessary for the project.

1. The simplest and preferred method to avoid take of northern long-eared bats is to avoid directly impacting individuals, known northern long-eared bat locations, or areas of suitable habitat (described above in the "Habitat" section and in *Screening Procedures*). The U.S. Fish and Wildlife Services identifies humans and their equipment as a possible vectors for spores of *Geomyces destructans* – the fungus that causes white-nose syndrome (WNS) – and therefore simply entering hibernacula at any time of year and moving between them poses threats to bats. Cavers and researchers must observe all cave and mine closures and decontamination protocols (s. NR 40.07, Wis. Admin. Code; see *Additional Information*). In addition, it is illegal to use pesticides and poisons when attempting to evict bats from house roosts (s. 94.708, Wis. Stats.).

2. If suitable habitat cannot be avoided, follow these time-of-year restrictions to avoid take:

Summer Avoidance **(June 1-Aug 15)**

Reproductive females and their young are highly vulnerable to mass mortality during the species' maternity period (June 1 – August 15) because they may aggregate in maternity colonies, and because pups cannot fly and therefore cannot leave the roost for several weeks after birth. Maternity colonies may occur in human structures, and those seeking to exclude bats from a building or other roost must follow the Cave Bat Broad Incidental Take Permit and Authorization (see *Additional Information*).

3. If impacts cannot be avoided during restoration or management activities, including wind projects and forestry management, but activities are covered under the Cave Bat Broad Incidental Take Permit and Authorization; the project is covered for any unintentional take that may occur. For information about natural roost avoidance, see *Management Guidelines* and "Habitat" section above.

4. If northern long-eared bat impacts cannot be avoided, please contact the Natural Heritage Conservation Incidental Take Coordinator (see *Contact Information*) to discuss possible project-specific avoidance measures. If take cannot be avoided, an Incidental Take Permit or Authorization (see *Additional Information*) is necessary.

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Linked Websites:

- Cave bat Broad Incidental Take Permit and Authorization:< http://dnr.wi.gov/topic/erreview/itbats.html>
- Natural Communities of Wisconsin: <http://dnr.wi.gov/org/land/er/communities/>
- Natural Heritage Conservation Permit Requirements: <http://dnr.wi.gov/topic/EndangeredResources/permits.html>

- Rare Animal Field Report Form: <http://dnr.wi.gov, key word "rare animal field report form">
- USFW WNS Website: <http://www.whitenosesyndrome.org>
- USGS National Wildlife Health Center: <http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/>
- Wind Guidance: <http://dnr.wi.gov/topic/Sectors/documents/energy/WindGuidelines.pdf>
- Wisconsin Bat Program Exclusion Instructions: <http://wiatri.net/inventory/bats/Monitoring/Roosts/docs/BatExclusion.pdf>
- Wisconsin Bat Program: <http://wiatri.net/inventory/bats>
- WDNR Decontamination Protocols for Preventing Spread of White-nose syndrome: <http://dnr.wi.gov/topic/WildlifeHabitat/documents/WNS_DeconProtocols.pdf>
- Wisconsin Endangered and Threatened Species: <http://dnr.wi.gov, key word "endangered resources">
- Wisconsin Endangered and Threatened Species Permit: <http://dnr.wi.gov, key word "endangered species permit">"
- Wisconsin Initiative on Climate Change Impacts: <http://www.wicci.wisc.edu/>
- Wisconsin Natural Heritage Inventory Working List Key: <http://dnr.wi.gov/topic/NHI/WList.html>
- Wisconsin's Wildlife Action Plan: <http://dnr.wi.gov/topic/wildlifehabitat/actionplan.html>

Funding

- Natural Resources Foundation of Wisconsin: <http://www.wisconservation.org/>
- USFWS State Wildlife Grants Program: <http://wsfrprograms.fws.gov/subpages/grantprograms/swg/swg.htm>
- Wisconsin Natural Heritage Conservation Fund
- Wisconsin DNR Division of Forestry

Endangered Resources Review Program Contacts

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Summary of Essential Fish Habitat (EFH) Designations

Name of Estuary/ Bay/ River: Boston Harbor, Massachusetts

10□ x 10□ latitude and longitude squares included in this bay or estuary or river (southeast corner boundaries):

4220/7100; 4210/7050; 4210/7100

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic salmon *(Salmo salar)*					
Atlantic cod *(Gadus morhua)*	S	S	M,S	M,S	S
haddock *(Melanogrammus aeglefinus)*	S	S			
pollock *(Pollachius virens)*	S	S	M,S		
whiting *(Merluccius bilinearis)*	S	S	M,S	M,S	
offshore hake *(Merluccius albidus)*					
red hake *(Urophycis chuss)*		S	S	S	
white hake *(Urophycis tenuis)*	S	S	S	S	
redfish *(Sebastes fasciatus)*	n/a				
witch flounder *(Glyptocephalus cynoglossus)*					
winter flounder *(Pleuronectes americanus)*	M,S	M,S	M,S	M,S	M,S
yellowtail flounder *(Pleuronectes ferruginea)*	S	S	S	S	S
windowpane flounder *(Scopthalmus aquosus)*	M,S	M,S	M,S	M,S	M,S
American plaice *(Hippoglossoides platessoides)*	S	S	S	S	S
ocean pout *(Macrozoarces americanus)*			S	S	
Atlantic halibut *(Hippoglossus hippoglossus)*	S	S	S	S	S
Atlantic sea scallop *(Placopecten magellanicus)*					
Atlantic sea herring *(Clupea harengus)*		S	M,S	M,S	
monkfish *(Lophius americanus)*					
bluefish *(Pomatomus saltatrix)*			M,S	M,S	
long finned squid *(Loligo pealei)*	n/a	n/a			
short finned squid *(Illex illecebrosus)*	n/a	n/a			

Atlantic butterfish *(Peprilus triacanthus)*	S	S			
Atlantic mackerel *(Scomber scombrus)*	M,S	M,S	M,S	M,S	
summer flounder *(Paralicthys dentatus)*					
scup *(Stenotomus chrysops)*					
black sea bass *(Centropristus striata)*					
surf clam *(Spisula solidissima)*	n/a	n/a			
ocean quahog *(Artica islandica)*	n/a	n/a			
spiny dogfish *(Squalus acanthias)*	n/a	n/a			
tilefish *(Lopholatilus chamaeleonticeps)*					

Natural Heritage & Endangered Species Program
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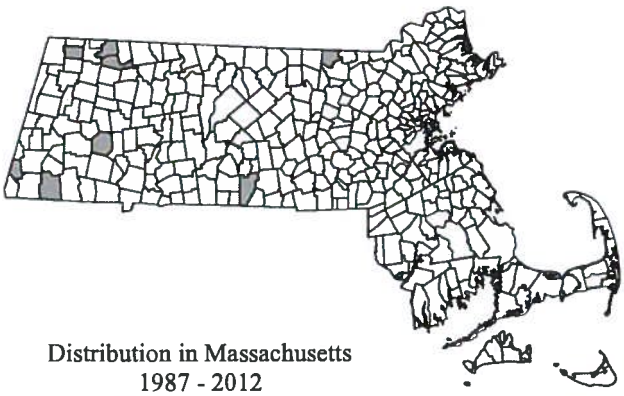
Northern Long-eared Bat

Myotis septentrionalis

State Status: **Endangered**
Federal Status: **Threatened**

Description: The Northern Long-eared Bat is a small bat with large ears, which when pushed forward extend at least 4 mm past its nose. Its fur and wing membranes are light brown, giving it an overall somewhat uniform brown appearance. The hairs on its back are bicolored, with a dark base and lighter tip. The Northern Long-eared Bat averages 50-95 mm in total length, with a tail of 35-42 mm. In weight, it averages 5-8 g. This bat is typically found roosting in trees and feeding in forested habitats, but may occasionally be found in human habitations.

Similar Species: The best diagnostic character to distinguish the Long-eared Bat from other species in Massachusetts is its long ears. The Little Brown Myotis and rare Indiana Myotis are similar in appearance, but have shorter ears which typically do not extend beyond their nose when pushed forward. The Little Brown Myotis also has glossier fur and a shorter tail relative to its body length. The Indiana Myotis has a keeled calcar (a ridge of cartilage between the foot and the tail), which the Northern Long-eared Bat lacks. Other features of interest in identification include the bat's hairless interfemoral membrane (the skin stretching between the legs and tail) and lack of a black face mask (which is characteristic of Small-footed Myotis).



Distribution in Massachusetts
1987 - 2012
Based on records in the
Natural Heritage Database

Photo: Tammy Ciesla, MassWildlife

Habitat in Massachusetts: In the warmer months, colonies of Northern Long-eared Bats may be found roosting and foraging in forested areas. Preferred roosts are in clustered stands of large trees, especially in live or dead hardwoods with large, tall cavities. These bats are found in other tree roosts as well, and occasionally in human-made structures. Northern Long-eared Bats forage under the forest canopy in structurally complex habitats, often above small ponds, vernal pools or streams, along gravel paths or roads, and at the forest edge. The bats are widespread in Massachusetts, and have been found in 11 of 14 counties. In winter, Northern Long-eared Bats hibernate in natural caves and abandoned mines, preferring habitats where the humidity is so high that water droplets sometimes cover their fur. Winter hibernacula (hibernation sites) have been reported in Berkshire, Franklin, Hampden, Middlesex, and Worcester counties.

Range: The Northern Long-eared Bat is found across forested parts of the eastern United States and Canada, west to British Columbia, Wyoming, and Montana, and south into Florida. It was historically common in New England, the Canadian Maritimes, Quebec and Ontario, and uncommon in the western extremes of its range.

Life Cycle/Behavior: In the summer months, Northern Long-eared Bats emerge at dusk from daytime roosts for the first in a series of feeding flights. Their long tails and large wing membranes allow the bats to fly slowly and navigate through cluttered environments. These special adaptations also enable them to glean prey from foliage, in addition to catching insects on the fly. These bats locate resting insects through a combination of passive listening and the emission of high frequency echolocation calls.

Between August and October, the body weight of Northern Long-eared Bats increases by up to 45%, as they store fat for winter. In late summer, the bats begin to "swarm" around the entrances of caves, and are thought to be testing the air of possible hibernacula. This is the time when mating occurs, with females storing the sperm within their bodies until spring. By early November, the bats enter hibernation sites. Their metabolisms slow and they enter torpor, but will rouse occasionally throughout the winter to drink water. Northern Long-eared Bats share caves with a number of other species, but tend to hibernate singly or in small groups in deep cracks or crevices. They return to the same hibernacula in multiple years, but may not hibernate in the same location every year. Little data are available on migration, but the bats are known to travel up to 56 km from foraging sites to winter hibernacula.

Females bear and rear single young from mid-May through July. The longevity record for the Northern Long-eared Bat is 18 years.

Population status in Massachusetts, including Threats: The Northern Long-eared Bat is listed as Endangered under the Massachusetts Endangered Species Act. All listed species are protected from killing, collecting, possessing, or sale and from activities that would destroy habitat and thus directly or indirectly cause mortality or disrupt critical behaviors. In addition, listed animals are specifically protected from activities that disrupt nesting, breeding, feeding, or migration.

Once a common species in the northern United States, populations of the Northern Long-eared Bat have been devastated by the spread of White-nose Syndrome. Populations in infected hibernacula in the Northeast have suffered catastrophic losses of 90-100%. White-nose Syndrome is caused by *Geomyces destructans*, a species new to science, but closely related to fungi that naturally grow in caves. The fungus grows over bats while they hibernate, causing them to rouse from dormancy frequently, lose valuable stored fat, and fail to survive the winter. The fungus is believed to be passed from cave to cave primarily by the movements of breeding male bats, but human transport is also thought to be responsible for the infection of some hibernacula.

Management Recommendations: The U.S. Fish & Wildlife Service is working in concert with government and non-profit groups to understand the spread of the fungus and potential for stopping its spread, as well as exploring opportunities for captive breeding of the most vulnerable species. Access to suitable, undisturbed hibernacula is essential to the survival of the Northern Long-eared Bat, and protection of known sites is paramount. Human disturbance of hibernacula can be discouraged or prevented with the use of gated entrances, in order to avoid arousal of hibernating bats and the spread of fungal spores.

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Hamilton, Jr., W.J., and J.O. Whitaker, Jr. 1979. *Mammals of the Eastern United States*, Second Edition. Cornell University Press: Ithaca, NY.

U.S. Fish & Wildlife Service. 2012. "White-nose Syndrome." http://whitenosesyndrome.org/

Updated 2012
Map Updated 2012

Northern Long-Eared Bat

Myotis septentrionalis

The northern long-eared bat is federally listed as a threatened species under the Endangered Species Act. ***Endangered*** species are animals and plants that are in danger of becoming extinct. ***Threatened*** species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's Endangered Species Program.

Photo by Steve Taylor, University of Illinois

This northern long-eared bat, observed during an Illinois mine survey, shows visible symptoms of white-nose syndrome.

What is the northern long-eared bat?

Appearance: The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches and a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

Winter Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

Summer Habitat: During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. They rarely roost in human structures like barns and sheds.

Reproduction: Breeding begins in late summer or early fall when males begin to swarm near hibernacula. After copulation, females store sperm during hibernation until spring. In spring, females emerge from their hibernacula, ovulate and the stored sperm fertilizes an egg. This strategy is called delayed fertilization.

After fertilization, pregnant bats migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies of females and young generally have 30 to 60 bats at the beginning of the summer, although larger maternity colonies have also been observed. Numbers of bats in roosts typically decrease from the time of pregnancy to post-lactation. Most bats within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Maximum lifespan for the northern long-eared bat is estimated to be up to 18.5 years.

Feeding Habits: Like most bats, northern long-eared bats emerge at dusk to feed. They primarily fly through the understory of forested areas feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation or by gleaning motionless insects from vegetation.

Range: The northern long-eared bat's range includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. The species' range includes 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

Why is the northern long-eared bat in trouble?

White-nose Syndrome: No other threat is as severe and immediate as

this. If this disease had not emerged, it is unlikely that northern long-eared bat populations would be experiencing such dramatic declines. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly from the Northeast to the Midwest and Southeast; an area that includes the core of the northern long-eared bat's range, where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99 percent in the Northeast. Although there is uncertainty about the rate that white-nose syndrome will spread throughout the species' range, it is expected to continue to spread throughout the United States in the foreseeable future.

Other Sources of Mortality:

Although no significant population declines have been observed due to the sources of mortality listed below, they may now be important factors affecting this bat's viability until we find ways to address WNS.

Impacts to Hibernacula: Gates or other structures intended to exclude people from caves and mines not only restrict bat flight and movement, but also change airflow and microclimates. A change of even a few degrees can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating. Arousal during hibernation causes bats to use up their energy stores, which may lead to bats not surviving through winter.

Loss or Degradation of Summer Habitat: Highway construction, commercial development, surface mining, and wind facility construction permanently remove habitat and are activities prevalent in many areas of this bat's range. Many forest management activities benefit bats by keeping areas forested rather than converted to other uses. But, depending on type and timing, some forest management activities can cause mortality and temporarily remove or degrade roosting and foraging habitat.

Wind Farm Operation: Wind turbines kill bats, and, depending on the species, in very large numbers. Mortality from windmills has been documented for northern long-eared bats, although a small number have been found to date. However, there are many wind projects within a large portion of the bat's range and many more are planned.

What Is Being Done to Help the Northern Long-Eared Bat?

Disease Management: Actions have been taken to try to reduce or slow the spread of white-nose syndrome through human transmission of the fungus into caves (e.g. cave and mine closures and advisories; national decontamination protocols). A national plan was prepared by the Service and other state and federal agencies that details actions needed to investigate and manage white-nose syndrome. Many state and federal agencies, universities and non-governmental organizations are researching this disease to try to control its spread and address its affect. See www.whitenosesyndrome.org/ for more.

Addressing Wind Turbine Mortality: The Service and others are working to minimize bat mortality from wind turbines on several fronts. We fund and conduct research to determine why bats are susceptible to turbines, how to operate turbines to minimize mortality and where important bird and bat migration routes are located. The Service, state natural resource agencies, and the wind energy industry are developing a Midwest Wind Energy Habitat Conservation Plan, which will provide wind farms a mechanism to continue operating legally while minimizing and mitigating listed bat mortality.

Listing: The northern long-eared bat is listed as a threatened species under the federal Endangered Species Act. Listing a species affords it the protections of the Act and also increases the priority of the species for funds, grants, and recovery opportunities.

Hibernacula Protection: Many federal and state natural resource agencies and conservation organizations have protected caves and mines that are important hibernacula for cave-dwelling bats.

What Can I Do?

Do Not Disturb Hibernating Bats: To protect bats and their habitats, comply with all cave and mine closures, advisories, and regulations. In areas without a cave and mine closure policy, follow approved decontamination protocols (see http://whitenosesyndrome.org/topics/decontamination). Under no circumstances should clothing, footwear, or equipment that was used in a white-nose syndrome affected state or region be used in unaffected states or regions.

Leave Dead and Dying Trees Standing: Like most eastern bats, the northern long-eared bat roosts in trees during summer. Where possible and not a safety hazard, leave dead or dying trees on your property. Northern long-eared bats and many other animals use these trees.

Install a Bat Box: Dead and dying trees are usually not left standing, so trees suitable for roosting may be in short supply and bat boxes may provide additional roost sites. Bat boxes are especially needed from April to August when females look for safe and quiet places to give birth and raise their pups.

Support Sustainability: Support efforts in your community, county and state to ensure that sustainability is a development goal. Only through sustainable living will we provide rare and declining species, like the northern long-eared bat, the habitat and resources they need to survive alongside us.

Spread the Word: Understanding the important ecological role that bats play is a key to conserving the northern long-eared and other bats. Helping people learn more about the northern long-eared bat and other endangered species can lead to more effective recovery efforts. For more information, visit www.fws.gov/midwest/nleb and www.whitenosesyndrome.org

Join and Volunteer: Join a conservation group; many have local chapters. Volunteer at a local nature center, zoo, or national wildlife refuge. Many state natural resource agencies benefit greatly from citizen involvement in monitoring wildlife. Check your state agency websites and get involved in citizen science efforts in your area.

U.S. Fish & Wildlife Service

Rufa red knot

Calidris canutus rufa

Skilled aviator Rear Admiral Richard E. Byrd flew over both the North and South poles. But what this renowned man accomplished with the help of sled dogs, ships and airplanes, a little shorebird weighing less than a cup of coffee completes every year of its life. The red knot is truly a master of long-distance aviation.

On wingspans of 20 inches, some red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom. About 9 inches long, red knots are about the size of a robin. Biologists have identified six subspecies, three of them living in the Western Hemisphere: *C.c. islandica, C.c. roselaari,* and *C.c. rufa.* This last, the red knot known as rufa, winters at the tip of South America in Tierra del Fuego, in northern Brazil, throughout the Caribbean, and along the U.S. coasts from Texas to North Carolina. The rufa red knot breeds in the tundra of the central Canadian Arctic from northern Hudson Bay to the southern Queen Elizabeth Islands.

Surveys of wintering knots along the coasts of southern Chile and Argentina and during spring migration in Delaware Bay on the U.S. coast indicated a serious population decline during the 2000. Biologists from the U.S. Fish and Wildlife Service, state natural resource agencies, and non-profit organizations all share a concern for the rufa red knot and are pooling efforts to identify what needs to be done to prevent further losses.

A red knot banded in May 1987 was seen on Delaware Bay in May 2000. During those 13 years, the bird had flown about 242,350 miles, a distance farther than from the earth to the moon.

Strength in numbers

Red knots winter and migrate in large flocks containing hundreds of birds. While we can guess at some of the benefits of traveling in large flocks, such as protection from predators, we can also see the downside - susceptibility to habitat change and loss, oil spills, toxins, red tides, diseases, collisions with wind turbines, storms, and hunting. Red knots were heavily hunted in the early 20th century, and may have never recovered in eastern North America. Knots are still hunted in parts of the Caribbean and South America.

Eating like a bird

For much of the year red knots eat small clams, mussels, snails and other invertebrates, swallowing their prey whole – shell and all. Migrating knots can complete nonstop flights of 1,500 miles and more, converging on critical stopover areas to rest and refuel along the way. In order to endure their long journeys, red knots undergo extensive physical changes. Flight muscles enlarge, while leg muscles shrink. Stomachs and gizzards decrease, while fat mass increases by more than 50 percent. Due to these physical changes, knots arriving from long migration flights are not able to feed maximally until their digestive systems regenerate, a process that may take several days. Thus, migrating birds require stopover habitats rich in easily digested foods – with thin or no shells – in order to gain enough weight to fuel the next flight. In spring, migrating knots seem to follow a northward "wave" in quality prey – by timing their stopovers with the spawning seasons of intertidal invertebrates, knots take advantage of readily digestible food resources like juvenile clams and mussels and horseshoe crab eggs. Red knots arrive at stopovers areas very thin, sometimes emaciated. They eat constantly to gain enough weight to continue their journeys, adding up to 10 percent of their body weight each day and nearly doubling their body weights during some stopovers.

Requirements for survival

The red knot's unique and impressive life history depends on suitable habitat, food, and weather conditions at far-flung sites across the Western Hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. Further, red knots need to encounter these favorable habitat, food, and weather conditions within narrow seasonal windows as the birds hopscotch along migration stopovers between wintering and breeding areas. For example, the red knot population decline that occurred in the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, exacerbated by small changes in the timing that red knots arrived at the Delaware Bay. Red knots may also be particularly vulnerable to global climate change, which is likely to affect the arctic tundra ecosystem where the knots breed; the quality and quantity of coastal habitats due to rising sea levels; the quantity and timing of invertebrate food resources throughout the bird's range; and the severity, timing, and location of storm and weather patterns.

Horseshoe crab harvests are now managed with explicit goals to stabilize and recover red knot populations; red knot number appear to have stabilized in the past few years, but at low levels relative to earlier decades. Red knots fascinate biologists, bird watchers and people who appreciate the complex beauty of the natural world. Together with these partners, the U.S. Fish and Wildlife Service is dedicated to working to conserve this extraordinary bird.

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http://northeast.fws.gov

Federal Relay Service
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U.S. Fish and Wildlife Service
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September 2013

Roseate Tern: North American Subspecies

Sterna dougallii dougallii

Introduction
The roseate tern is a federally protected and endangered seabird that is mainly found in the Northern Hemisphere on the northeastern coast of North America, extending from Nova Scotia to the southern tip of Florida, as well as several islands in the Caribbean Sea. It is also found in northwestern Europe, south and west Africa, and Western Australia.

The roseate tern is divided into four subspecies based on small differences in size and bill color. The North American subspecies is divided into two separate breeding populations; one in the northeastern U.S. and Nova Scotia and another in the southeastern U.S. and Caribbean. Roseate terns are most common in the central portion of this range, from Massachusetts to Long Island, N.Y.

Kirk Rogers/USFWS

Roseate tern

Populations in the northeastern U.S. greatly declined in the late 19th century due to hunting for the millinery, or hat trade. In the 1930s, protected under the Migratory Bird Act Treaty, the population reached a high of about 8,500, but since then, population numbers have declined and stayed in the low range of 2,500 to 3,300. The species was listed in 1987 as endangered in the northeastern U.S. Populations in Florida, Georgia, North Carolina, Puerto Rico, South Carolina and the Virgin Islands are listed as threatened.

Characteristics
The roseate tern is a medium-sized, gull-like tern about 15 inches long. When not in breeding season, it has a black bill, black legs, white forehead and most of the crown, and a long, deeply forked tail. During this time, the roseate tern is often difficult to distinguish from common terns, among which it nests in the Northeast.

During breeding season, it is paler than other terns, with most of its plumage turning silver-gray above and creamy white below a rosy-pink chest and a black cap. It also develops long white tail-streamers that it loses after the breeding season. In the northeastern birds, the black bill becomes orange-red at the base and the black legs also turn orange-red.

The roseate tern is a specialist feeder eating almost exclusively small fish, primarily the American sand lance in northeastern populations. It captures food mainly by plunge-diving, completely submerging its body underwater to catch prey, but it also feeds in shallow waters and even steals food from common terns.

Life Cycle
Roseate terns nest on small barrier islands, often at ends or breaks. They nest in hollows or under dense vegetation, debris or rocks hidden from predators. Roseate terns in northeastern North America almost always nest in colonies with common terns. Roseate terns begin arriving to breeding areas at the end of April and begin laying eggs as early as the third or fourth week of May. They lay about one to two eggs, rarely three, and rely on the more aggressive Arctic and common terns in the surrounding colony to defend them.

In the winter, roseate terns migrate south in late August to early September. They migrate from the northeastern U.S. to the waters off Trinidad and northern South America from the Pacific coast of Columbia to eastern Brazil.

European roseate populations usually migrate to western and southern Africa.

Threats and Recovery Efforts

Habitat for northeastern North American populations has been greatly reduced by human activity and development on barrier islands, predation, and competition from expanding numbers of large gulls. Roseate terns are highly sensitive to disturbances and will desert a whole colony if they feel threatened. The move to less desirable, often inadequate areas exposes the roseate tern to high predation and affects its ability to reproduce.

Roseate terns often desert their colonies and eggs at night when they become subject to predation, leaving eggs and young exposed and vulnerable to predatory mammals such as foxes, skunks and brown rats. Predatory birds, such as the great-horned owl and black-crowned night heron, pose a greater threat because they can fly to the more protected island nesting sites. Roseate terns are quick to abandon a nesting site when predators are active.

An increase in great-blacked gull and herring populations has displaced roseate terns from their traditional nesting colonies in the Northeast. Roseate terns compete with gulls for nesting sites and food; the aggressiveness and larger size of the gulls give them an advantage. Gulls also compete for habitat with terns by nesting before the terns do, leading the roseate terns to retreat and abandon their historical sites.

The loss of habitat from erosion, a possible result of rising sea levels, is another major factor contributing to the decline of roseate tern populations.

The spit—a narrow land comprised of gravel and sand extending into the ocean—on Falkner Island, in the Long Island sound, is home to one of the largest tern populations in the northeastern U.S. It is estimated that Falkner Island is losing about 800 to 900 square feet per year due to erosion, and in the next two to five years, the spit will be in a tidal zone, leaving roseate terns without their prime habitat.

In areas like Falkner Island, biologists work hard to create artificial habitats for the terns to counteract the move and make new, less desirable sites appealing. Inverted boxes or half-buried tires are commonly used to provide covered nesting sites.

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May 2011

ESA Eligibility Criteria for the National Marine Fisheries Service (NMFS)

Coughlin Environmental Services reviewed the listings of species under the jurisdiction of the NMFS under the RGP, the ESA and NMFS completed consultation, as well as the Essential Fish Habitat (EFH) species under jurisdiction of NMSF in the Boston Harbor included in Appendix II of the RGP and has concluded that the discharge will have no effect on any federally threatened or endangered species or critical habitat under the jurisdiction of NMFS and will not result in any take of listed species.

An IPaC search of the discharge area from the U.S. Fish and Wildlife Service indicated that there are Northern Long Eared Bats present in the discharge are as well as Red Knot and Roseate Tern birds. None of these species are listed under the jurisdiction of NMFS or the EFH for the Boston Harbor.

The IPaC search of the discharge area from the U.S. Fish and Wildlife Service also indicated that there are no critical habitats in the location of the discharge.

Summary of Essential Fish Habitat (EFH) Designations

Name of Estuary/ Bay/ River: Boston Harbor, Massachusetts

10° x 10° latitude and longitude squares included in this bay or estuary or river (southeast corner boundaries):

4220/7100; 4210/7050; 4210/7100

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic salmon *(Salmo salar)*					
Atlantic cod *(Gadus morhua)*	S	S	M,S	M,S	S
haddock *(Melanogrammus aeglefinus)*	S	S			
pollock *(Pollachius virens)*	S	S	M,S		
whiting *(Merluccius bilinearis)*	S	S	M,S	M,S	
offshore hake *(Merluccius albidus)*					
red hake *(Urophycis chuss)*		S	S	S	
white hake *(Urophycis tenuis)*	S	S	S	S	
redfish *(Sebastes fasciatus)*	n/a				
witch flounder *(Glyptocephalus cynoglossus)*					
winter flounder *(Pleuronectes americanus)*	M,S	M,S	M,S	M,S	M,S
yellowtail flounder *(Pleuronectes ferruginea)*	S	S	S	S	S
windowpane flounder *(Scopthalmus aquosus)*	M,S	M,S	M,S	M,S	M,S
American plaice *(Hippoglossoides platessoides)*	S	S	S	S	S
ocean pout *(Macrozoarces americanus)*			S	S	
Atlantic halibut *(Hippoglossus hippoglossus)*	S	S	S	S	S
Atlantic sea scallop *(Placopecten magellanicus)*					
Atlantic sea herring *(Clupea harengus)*		S	M,S	M,S	
monkfish *(Lophius americanus)*					
bluefish *(Pomatomus saltatrix)*			M,S	M,S	
long finned squid *(Loligo pealei)*	n/a	n/a			

short finned squid *(Illex illecebrosus)*	n/a	n/a			
Atlantic butterfish *(Peprilus triacanthus)*	S	S			
Atlantic mackerel *(Scomber scombrus)*	M,S	M,S	M,S	M,S	
summer flounder *(Paralicthys dentatus)*					
scup *(Stenotomus chrysops)*					
black sea bass *(Centropristus striata)*					
surf clam *(Spisula solidissima)*	n/a	n/a			
ocean quahog *(Artica islandica)*	n/a	n/a			
spiny dogfish *(Squalus acanthias)*	n/a	n/a			
tilefish *(Lopholatilus chamaeleonticeps)*					

Coastal embayments and nearshore marine waters are associated with over 160 miles of coastline in Massachusetts and New Hampshire. They include the southern Massachusetts coastline, the south and east coast of Cape Cod, the coastline north of Cape Anne, and the coastline of New Hampshire from the Massachusetts border to the entrance of Great Bay. These coastal areas are in addition to the coastal embayments and nearshore marine waters described as part of the rivers and major bays discussed above. These habitats are relatively shallow and associated with coastline features that variety from rocky shorelines to marshy and sandy areas. The shoreline area of Massachusetts is irregular and indented by numerous small embayments. Aside from the Great Bay area of New Hampshire (discussed above), the coastline of that state is relatively uniform.

Because, by definition, this habitat is near the shoreline, the water quality can vary and is influenced by runoff from the land. The type and volume of runoff is related to the geology of the near shore area as well as the anthropogenic activities that take place in the coastal watersheds of Massachusetts and New Hampshire. Oceanographic effects due to currents and wind patterns may not influence the habitat of these areas as much as the impact from localized coastal land characteristics and land use activities within the respective watershed.

3. NMFS Listed Species and Critical Habitat in the Action Area

The following are federally protected ESA species under the jurisdiction of NMFS in Massachusetts and New Hampshire:

Massachusetts (2)	**New Hampshire (2)**
Atlantic sturgeon (*Acipenser oxyrinchus*)	Atlantic sturgeon (*Acipenser oxyrinchus*)
Shortnose sturgeon (*Acipenser brevirostrum*)	Shortnose sturgeon (*Acipenser brevirostrum*)

This correspondence will not discuss the effects of the action on any threatened or endangered species under the jurisdiction of the USFWS and is only intended for use during informal consultation under Section 7 of the ESA with the National Marine Fisheries Service (NMFS). According to information obtained from the NMFS website, as well as information provided via September 3, 2013 and October 26, 2016, electronic correspondence between NMFS and EPA regarding this and/or other General Permits, ESA listed species potentially present within the Action Area include two species of listed fish: 1) shortnose sturgeon (*Acipenser brevirostrum*); and 2) Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus).* NOAA's Fisheries Service announced a final decision to list five Distinct Population Segments (DPSs) of Atlantic sturgeon in 2012. Only three DPSs fall under the jurisdiction of the Northeast Region of NOAA Fisheries; these are the Gulf of Maine DPS (threatened) and the New York Bight and Chesapeake Bay DPSs which are both listed as endangered ((77 FR 5880, 2012). However, since the range of all five DPSs overlaps and extends from Canada through Cape Canaveral, FL, the other two DPS of Atlantic sturgeon, namely the endangered Carolina and South Atlantic DPSs, have also been included in this document (77 FR 5914, 2012).

In addition, the following are federally protected marine species that are present in the near coastal waters of Massachusetts and New Hampshire. These species are listed under the jurisdiction of NMFS:

Marine Reptiles (5)	**Marine Mammals (3)**
Loggerhead Sea Turtle *(Caretta caretta)*	North Atlantic Right Whale *(Eubalaena glacialis)*
Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*	Fin Whale *(Balaenoptera physalus)*
Leatherback Sea Turtle *(Dermochelys coriacea)*	
Green Sea Turtle *(Chelonia mydas)*	
Hawksbill Sea Turtle *(Eretmochelys imbricata)***	

** Species rare in near shore Massachusetts and New Hampshire coastal waters

Two species of federally endangered whales are found seasonally in New England waters, including those off the coast of Massachusetts. These include the North Atlantic right whale (*Eubalaena glacialis*), and the fin whale (*Balaenoptera physalus).* The Cape Cod Bay Critical Habitat Area for North Atlantic Right Whales (*Eubalaena glacialis*) falls within a portion of the Action Area. The aforementioned critical habitat is part of the broader Northeast Atlantic critical habitat, which was designated in 1994. Following review by NMFS (78 FR 53391, 2013), the North Pacific population of humpback whale (*Megaptera novaeangliae*), which previously fell within a portion of the Action Area, has been delisted. The final rule was published on September 8, 2016 and became effective October 11, 2016 (81 FR 62018, 2016). RGP outfalls (in general) do not extend any measurable distance from the shoreline. Based upon this information and the listed whales' expected distributions, contact between these three endangered whales and the projected transient RGP discharge plume is extremely unlikely to occur. A discussion of the status of these protected whales and potential impacts to these species from the federal action is included in this correspondence to support a conservative approach to the informal consultation.

Four species of ESA listed sea turtles are found seasonally in New England waters, including those off the coast of Massachusetts. These include the endangered Kemp's ridley sea turtle *(Lepidochelys kempii),* the threatened Northwest Atlantic Distinct Population Segment (DPS) of the Loggerhead sea turtle (*Caretta caretta*), the endangered Leatherback sea turtle (*Dermochelys* coriacea), and the Green Turtle *(Chelonia mydas).* Based upon this information and the sea turtles' expected distribution, contact between these turtle species and the projected transient RGP discharge plumes is extremely unlikely to occur. A discussion of the status of these protected sea turtles and potential impacts to these species from the federal action is included in this correspondence to support a conservative approach to the informal consultation.

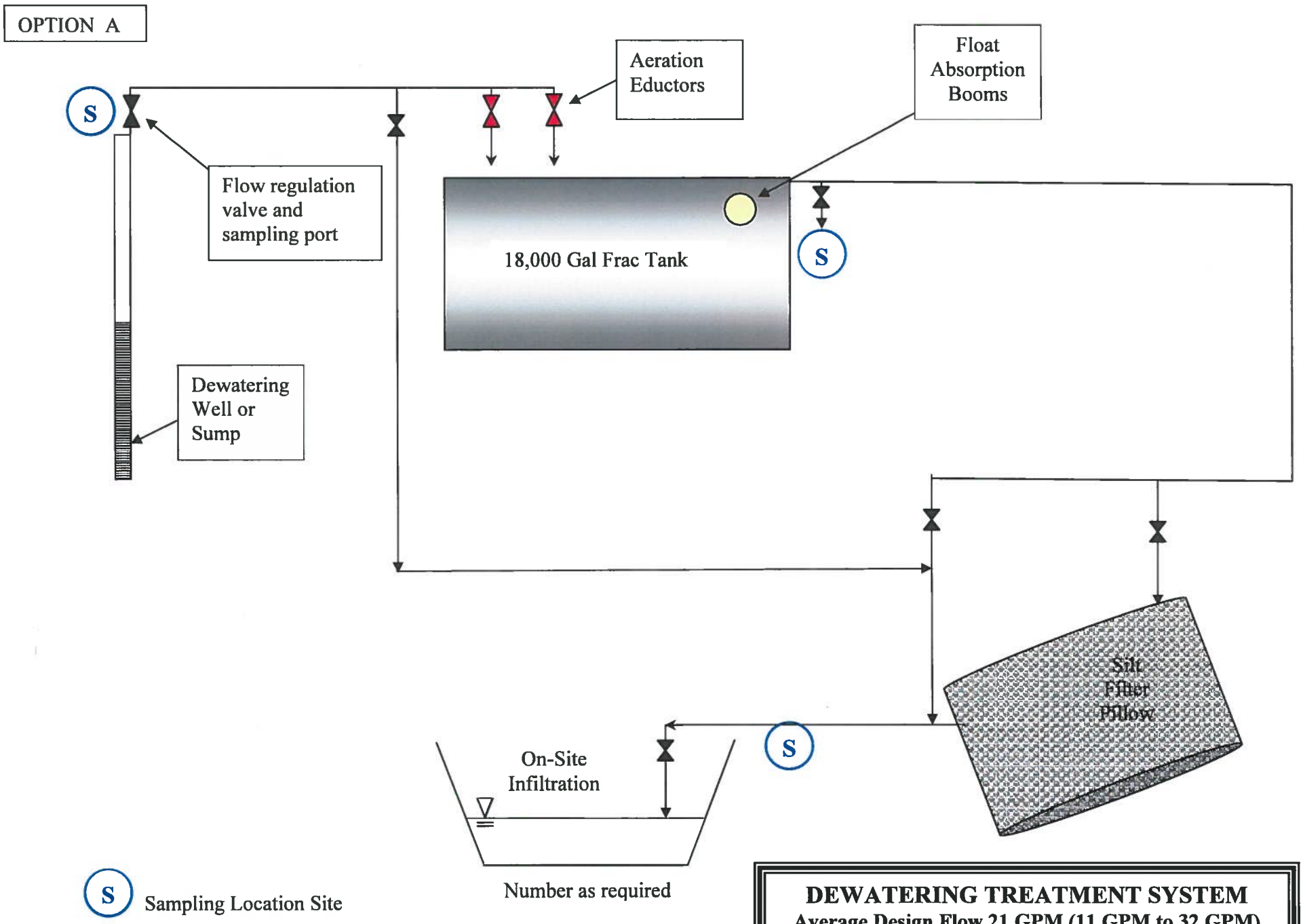
ESA-listed species and critical habitat that are present in the action area are described below. For each species, EPA has summarized available information regarding: 1) Life stages present and listed species' activities (e.g., foraging, migrating, spawning, overwintering); 2) Status of listed species; 3) Listed species' population and distribution including critical habitat used by the listed species; and 4) Population risks and stressors.

a. Shortnose Sturgeon (*Acipenser brevirostrum*) – Endangered

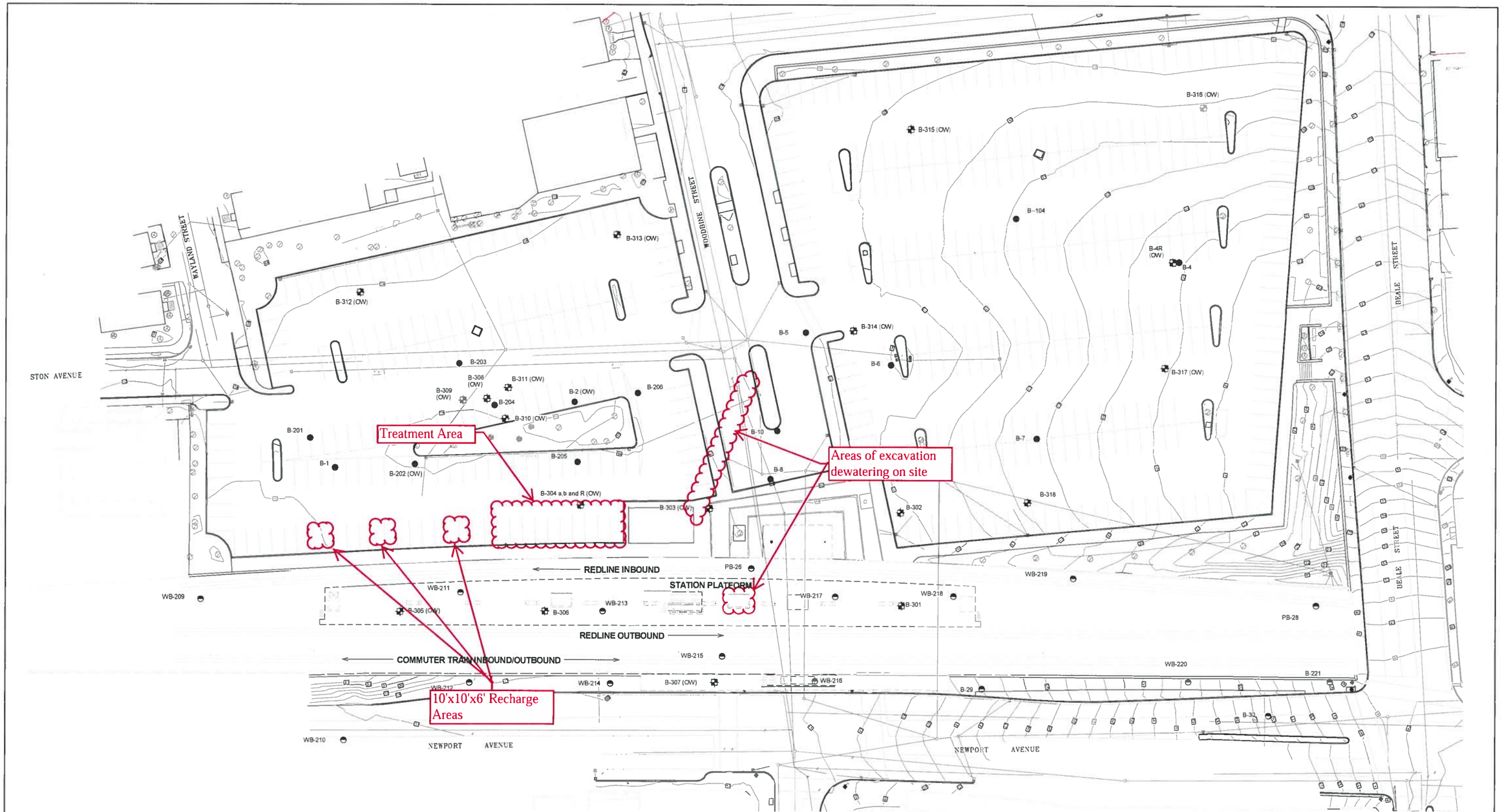
APPENDIX E

Option A Treatment Scheme

OPTION A



DEWATERING TREATMENT SYSTEM
Average Design Flow 21 GPM (11 GPM to 32 GPM)



Detailed Location Map - Option A (Recharge)

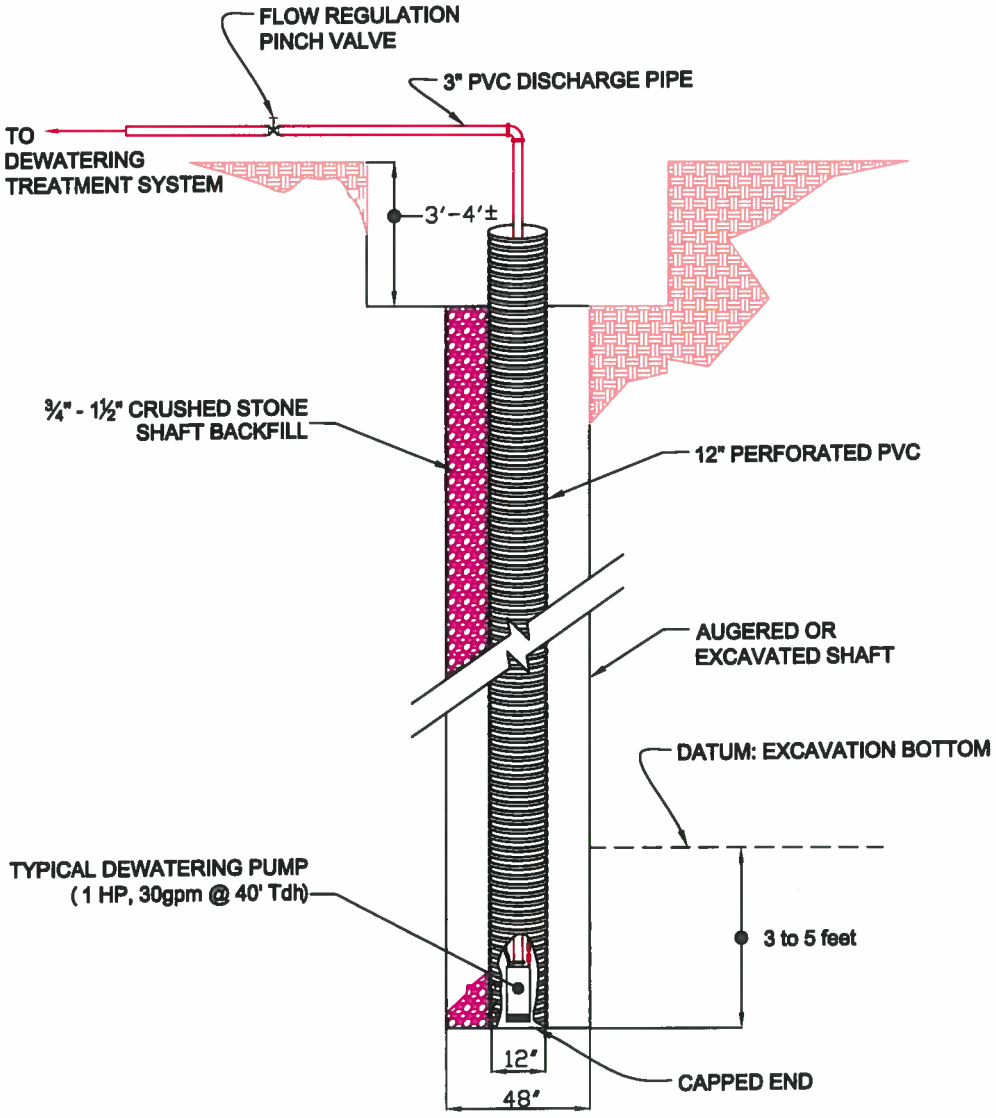
LEGEND

- APPROXIMATE LOCATION OF BORING ADVANCED BY C.L. GUILD DRILLING AND BORING CO. INC. OF BRAINTREE, MA. BORING LOCATIONS BASED ON DRAWING TITLED "RETAINING WALLS GENERAL PLAN," DATED DECEMBER 8, 1967, PREPARED FOR THE MBTA SOUTH SHORE PROJECT AREA 3, WOLLASTON STATION COMPLEX BY CLARKSON, CLOUGH & YOKEL.
- APPROXIMATE LOCATION OF BORING ADVANCED BY CARR-DEE CORP. OF MEDFORD, MA, AND OBSERVED BY KLEINFELDER IN 2013 FOR THE MBTA WOLLASTON STATION STORM AND SANITARY SEWER IMPROVEMENTS PROJECT.
- APPROXIMATE LOCATION OF BORING ADVANCED BY GEOLOGIC EARTH EXPLORATIONS, INC. OF NORFOLK, MA AND OBSERVED BY KLEINFELDER IN 2015 FOR THE MBTA WOLLATON STATION IMPROVEMENTS PROJECT.

(OW) INDICATES A GROUNDWATER OBSERVATION WELL WAS INSTALLED AT THE BORING LOCATION.

C:\Users\AMoreira\Documents\ARCH_MBTA_Wollaston_Central_amoreiraDFR6T.rvt

7/20/2016 5:23:21 PM



DEWATERING WELL/SUMP

MBTA CONTRACT A47CN01
WOLLASTON STATION – QUINCY, MA

COUGHLIN ENVIRONMENTAL SERVICES, LLC
CONSULTING ENGINEERS AND PLANNERS
62 Montvale Avenue
Stoneham, MA 02180-3637
Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

REV.	DATE:

DATE: August 2017
SCALE: N.T.S

TECHNICAL BROCHURE
B2DW R2

FEATURES

Impeller: Polyurethane for wear and corrosion resistance.

Adjustable Discharge: Discharge can be installed for either vertical or horizontal installation using only 2 screws.

Diffuser: Polyurethane for wear and corrosion resistance.

Mechanical Seal: Dual seals for double leakage protection, outer seal – silicon carbide.

Rubber Liner: Protects against wear around impeller.

Bottom Strainer: Made of impact absorbing EPDM rubber, suction holes allow for low pump down.

2DW

SUBMERSIBLE DEWATERING PUMP

GOULDS
WATER TECHNOLOGY
a xylem brand

APPLICATIONS

Specifically designed to remove water from:

- Drainage ditches
- Trenches
- Basements
- Manholes
- Excavating drainage In the building trades

SPECIFICATIONS

Pump:

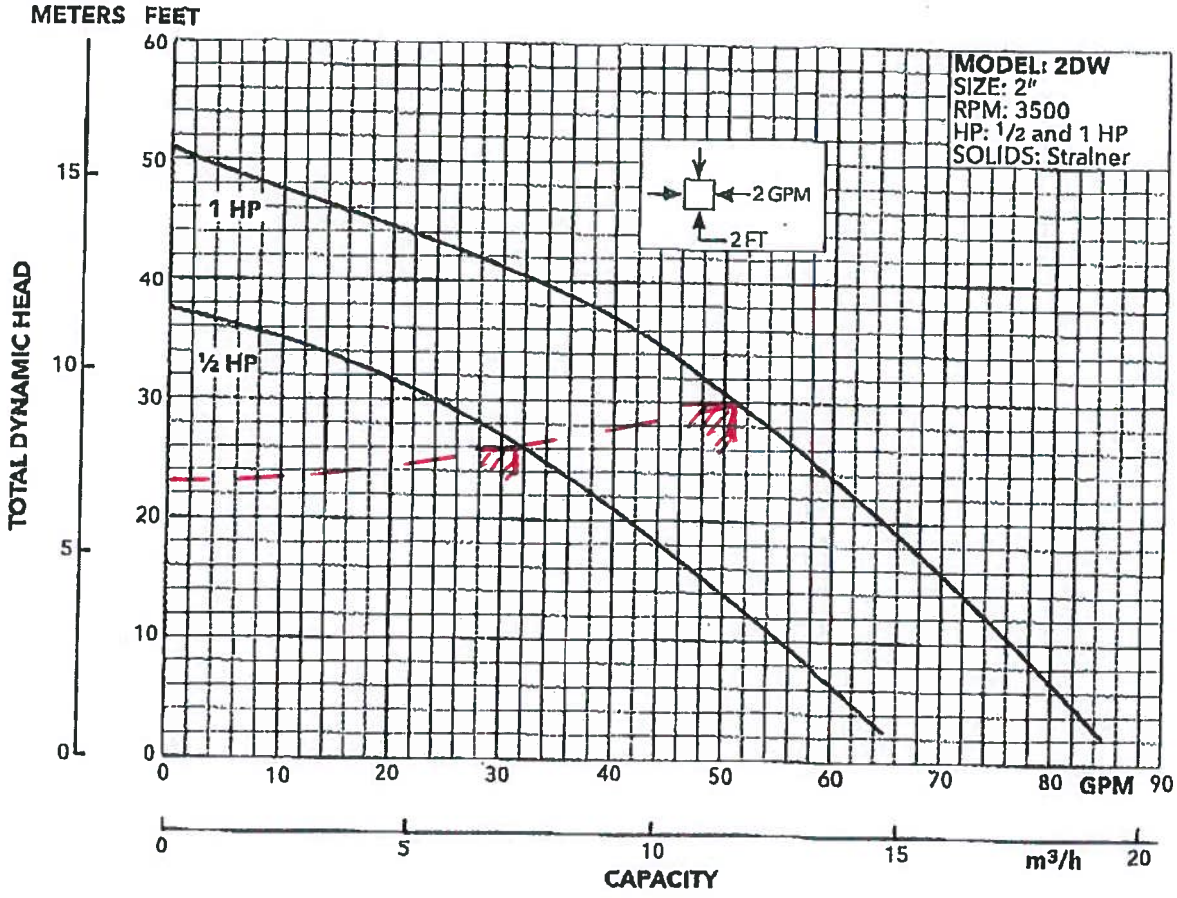
- Discharge size: 2" NPSM threaded hose coupling design, can be rotated
- Capacities: up to 84 GPM
- Total heads: up to 51 feet
- Maximum solids: any particles passing through strainer
- Mechanical seals: outer seal - silicon carbide, inner seal - carbon ceramic
- Temperature limit: 95°F (35° C) maximum
- Depth of immersion: 16.5 feet (5m) maximum

Motor:

- Single phase: 3500 RPM, ½ HP and 1 HP, 115 and 230 V, 60 Hz
- Built-in starter with full overload and temperature protection.
- Class F Insulation.
- Air filled design.
- Upper and lower heavy duty ball bearing construction.
- Power cord: 50 feet.

AGENCY LISTINGS

Tested to UL778 and CSA 22.2 108 standards by Canadian Standards Association.
NRTL File #LR13533



REPLACEMENT KITS

Each kit contains the following parts:

Impeller Kit (15K97 for ½ HP, 15K98 for 1 HP) - Impeller, impeller screw, protective plug, washer, assembly instruction

Diffuser Kit (15K99 for both ½ HP and 1 HP) - Diffuser, barrel nuts, screws, washers, assembly instruction, sticker

Outer seal Kit (15K14 for both ½ HP and 1 HP) - Mechanical face-seal unit, assembly instruction, sticker

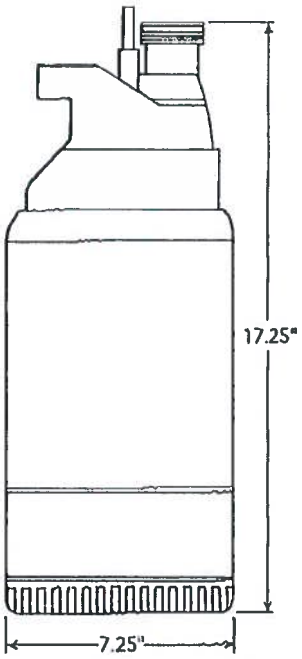
O-ring Kit (15K100 for both ½ HP and 1 HP) - All o-rings

MODEL INFORMATION

Order No.	HP	Volts	Phase	Maximum Amp	RPM	Height (in.)	Weight (lbs.)
2DW0511	½	115	1	5.5	3500	17.25	26
2DW0512		230		2.9			
2DW1011	1	115		9.8			32
2DW1012		230		4.9			

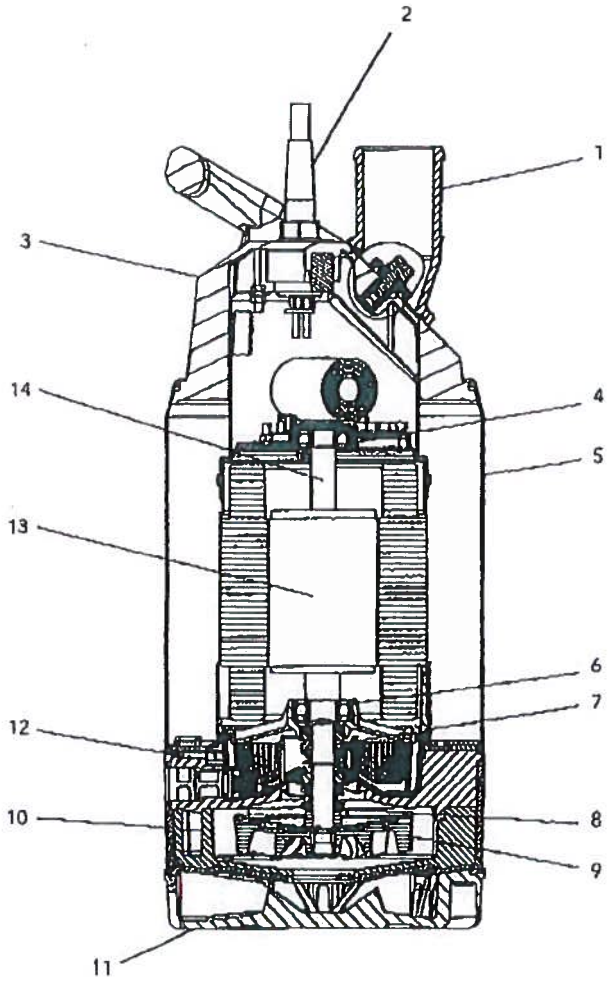
↑ AS REQUIRED

DIMENSIONS



COMPONENTS

Item No.	Description	
1	Discharge	Not Available
2	Power cord	Not Available
3	Handle/cover	Not Available
4	Support bearing	Not Available
5	Pump casing	Not Available
6	Main bearing	Not Available
7	Inner mechanical seal	Not Available
8	Outer mechanical seal	Available
9	Impeller	Available
10	Suction cover/diffuser	Available
11	Strainer	Not Available
12	Oil plug	Not Available
13, 14	Motor	Not Available



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Xylem, Inc.
2881 East Bayard Street Ext., Suite A
Seneca Falls, NY 13148
Phone: (866) 325-4210
Fax: (888) 322-5877
www.xyleminc.com/brands/goulds watertechnology

Elasto-Valve Rubber Products., Inc.
1691 Pioneer Road Sudbury, ON
Canada P3G 1B2
Phone: 705-523-2026
Email: sales@evrproducts.com
Website: www.evrproducts.com

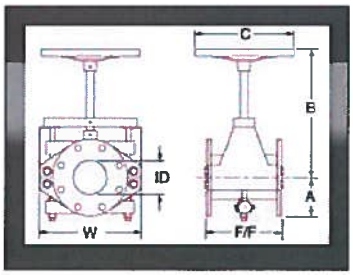
Series 1000 Manual Pinch Valve

- Centerline closure for streamline flow
- Tight shut-off even with small trapped solids
- Built-in over-pinch protection
- Positive opening tabs standard on all sleeves
- Valve position easily visible

The Series 1000 Pinch Valve features a simple, proven and cost-effective design. Virtually maintenance-free, the sleeve is the valve's only wetted part, eliminating possible contamination of the process materials.

The 1000 Series Valve has no seats that require grinding, no packing glands or stuffing boxes which require repacking. The valve will not become locked or jammed even when dealing with solids in the flow. Reduce port, funnel port or double wall sleeves are available for these applications.

When placing your order, please Indicate sleeve material by appending elastomer abbreviation (CR, NR, etc) to the model name. IE: Series 1000-CR



1

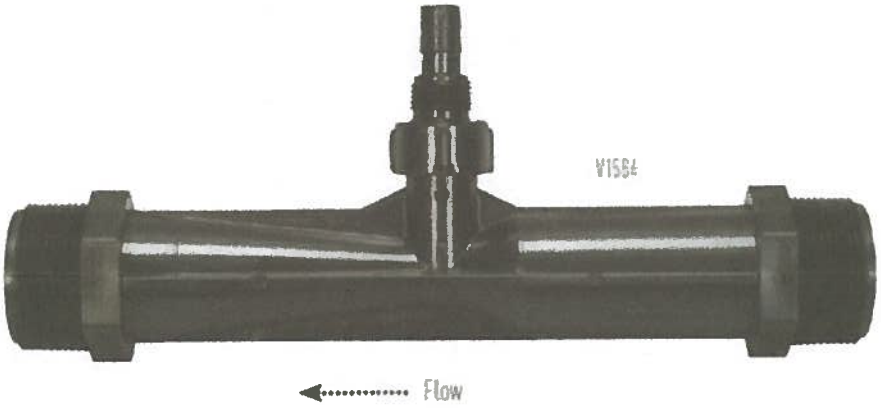
Item #	Inside Diameter	Length F/F	Width W	A	Max. Work Pressure	Weight (est.)
1000-1/2	1/2 in	4 in	3 1/2 in	1 3/4 in	200 psi	5.0 Pound
1000-3/4	3/4 in	5 in	5 in	2 in	200 psi	7 Pound
1000-1	1 in	5 1/2 in	6 in	2 1/8 in	150 psi	10 Pound
1000-1-1/2	1 1/2 in	6 1/2 in	6 5/8 in	2 1/2 in	150 psi	15 Pound
1000-2	2 in	7 in	8 3/8 in	3 in	150 psi	24 Pound
1000-2-1/2	2 1/2 in	7 1/2 in	9 1/4 in	3 1/2 in	150 psi	30 Pound
1000-3	3 in	8 in	10 1/8 in	3 3/4 in	150 psi	37 Pound

Item #	Inside Diameter	Length F/F	Width W	A	Max. Work Pressure	Weight (est.)
1000-4	4 in	N/A	11 3/4 in	4 1/2 in	150 psi	55 Pound
1000-5	5 in	10 in	14 in	5 in	125 psi	73 Pound
1000-6	6 in	10 1/2 in	15 1/2 in	5 1/2 in	125 psi	88 Pound
1000-8	8 in	16 in	20 in	6 3/4 in	75 psi	142 Pound
1000-10	10 in	20 in	24 in	8 in	75 psi	275 Pound
1000-12	12 in	24 in	28 in	9 1/2 in	75 psi	378 Pound
1000-14	14 in	28 in	31 3/8 in	10 1/2 in	50 psi	440 Pound
1000-16	16 in	32 in	35 in	1 3/4 in	50 psi	500 Pound
1000-18	18 in	36 in	37 1/4 in	12 1/2 in	50 psi	550 Pound
1000-20	20 in	40 in	44 in	13 3/4 in	50 psi	650 Pound
1000-24	24 in	48 in	51 3/4 in	16 in	50 psi	900 Pound

PENTAIR

Venturi Injectors

PART #: V384 to V514



'hen you need to inject air, oxygen, or ozone into ater, a venturi injector is one of the best ıethods to use. Tests have shown that when stalled properly, these injectors can transfer zone into water with efficiencies as high as 99%. 'hile typically used for ozone, air, or oxygen jection, venturi injectors are also compatible ith liquids.

ot every air injector is also an ozone injector. zone can react with certain materials, such as pes of rubber, breaking them down over a ıatter of days or weeks. Our venturi injectors are ɔnstructed of PVDF, a highly non-reactive .astic that is very resistant to ozone, chlorine, V, and other damaging substances.

lazzei® venture injectors have no moving parts nd provide trouble-free operation. All models xcept the **V514** include a 1/4" barbed ozone afe check valve. Maximum operating pressure t 100°F (38°C) is 400 psi.

Model	GPM	Inlet/Outlet	CFH	Price	Qty
V384	1	1/2" MNPT	1	**$70.39**	0
V584	4	3/4" Barb	5	**$56.69**	0
V584-2	4	3/4" MNPT	5	**$62.99** **4+ $56.69 EA**	0
V978	7	1" MNPT	9	**$135.49**	0

V1584	31 GPM X2	1 1/2" MNPT	72	$185.89	0
V514	57	2" MNPT	394	$388.49	0

ADD TO CART

PRODUCT REVIEWS

CUSTOMER REVIEWS

Venturi Injector Review by Jim

Best design to inject air, ozone or oxygen into process water

(Posted on 5/24/2017)

Write Your Own Review

MAZZEI TECHNICAL BULLETIN No. 2

REMOVAL OF IRON AND MANGANESE BY AERATION

It is a straight forward task to determine the theoretical amount of air which is required to oxidize and precipitate iron and/or manganese from water. The actual amount of air can then be estimated quite accurately so as to determine the correct Mazzei Injector to use and the recommended operating conditions for that injector.

A. Water Chemistry

Water pH is a critical parameter in the oxidation and precipitation of iron and manganese. For iron oxidation by aeration, the water pH should be at least 7.2, and ideally, maintained in the range of 7.5 to 8.0. If manganese is present, the minimum recommended pH is 9.5. Below that pH, air oxidation of manganese is quite slow. In water with low pH or low levels of alkalinity, it may be necessary to feed supplemental alkaline materials such as sodium hydroxide to elevate water pH.

B. Other Factors

Air oxidation of iron and manganese is not instantaneous. For this reason it is advisable to employ a retention, or contact tank to allow for sufficient residence time for complete oxidation and precipitation to occur. Depending upon actual conditions, contact times may range from 5 to 15 minutes.

C. Formulas

The following reaction describes the oxidation of ferrous iron by oxygen

$$4Fe(HCO_3)_2 + O_2 + 2H_2O \; 4Fe(OH)_3 + 8CO_2$$

The following reaction describes the oxidation of manganous manganese by oxygen

$$2Mn(HCO_3)_2 + O_2 + 2H_2O \; 2Mn(OH)_4 + 4CO_2$$

D. Ratios

1. Iron

   The atomic weight of iron is 55.847. As one oxygen molecule reacts with four iron atoms, the iron reaction weight is four times this, or 223.39. The molecular weight of oxygen is 31.999. The reaction ratio is thus (31.999) / (223.39), or 0.1432. This

means that 0.1432 mg/l of oxygen is required for each mg/l of iron (measured as iron).

2. Manganese

   The atomic weight of manganese is 54.938. As two atoms of manganese reacts with one molecule of oxygen., the manganese reaction weight is twice times this, or 109.88. The molecular weight of oxygen is 31.999. The reaction ratio is thus (31.999) / (109.88), or 0.2912. This means that 0.2912 mg/l of oxygen is required for each mg/l of manganese (measured as manganese).

E. Oxygen Residual

Sufficient air must be injected to maintain the required oxygen residual. Maintaining an oxygen residual serves several purposes. First, it provides a buffer of oxygen to react with surges of iron or manganese. Second, it produces a more palatable water. Third, the air required to maintain the oxygen residual provides mixing so that iron and manganese can react quickly and efficiently with oxygen.

An accepted value of residual oxygen is 5.0 mg/l. Sufficient air must be injected to maintain this level. The initial oxygen level in waters with iron and/or manganese present is typically zero. If there is an initial oxygen residual present, this may be subtracted from the desired level of 5.0 mg/l when determining the amount of oxygen required.

F. Theoretical Oxygen Required

The theoretical amount of oxygen required to oxidize iron and manganese may be calculated from the following formula:

Oxygen Required = $X_f \cdot (Fe) + X_m \cdot (Mn) + R$, where

X_f = Iron reaction factor
(Fe) = Iron concentration in mg/l
X_m = Manganese reaction factor
(Mn) = Manganese concentration in mg/l
R = Final oxygen residual = (5.0 – Initial Oxygen) in mg/l

An example for (Fe) = 10 mg/l, (Mn) = 2.5 mg/l and Initial Oxygen = 0.0 mg/l:

Oxygen Required = (0.1432)(10) + (0.2912)(2.5) + (5.0 –0.0)
= 1.432 + 0.728 + 5.0
= 7.16 mg per liter of water flow

G. Theoretical Air Required

Air has a density of 1.2047 g/l at 20o C. and 1.0 atmosphere of pressure. Under these same conditions, air contains 20.95% oxygen. Thus, each liter of air contains (1.2047 g/l)(0.2095) = 0.2524 g/l of oxygen = 252.4 mg/l of oxygen. In order to determine the theoretical amount of air required for oxidation of iron and manganese, the water flow rate must be known. If the levels of iron and manganese are known, a convenient unit of flow is "per 1,000 liters".

For example, using the contaminant levels in the previous example, and a flow rate of 100 l/min, the theoretical amount of air required would be:

$$\frac{(100 \text{ l/min})(7.16 \text{ mg/l})}{(252.4 \text{ mg/l})} = 2.84 \text{ l/min of air}$$

Using this value, the theoretical amount of air required would be 28.4 liters per 1,000 liters of water.

H. Actual Amount of Air Required

The oxygen transfer efficiency of aeration devices ranges from a low end of ~5% to a high end of 25% to 35% for Mazzei Injectors. Using a figure of 25% for Mazzei Injectors is conservative and is supported by both laboratory and field data. This means that the actual amount of air required is approximately four times the theoretical amount of air required.

For the examples above, if the theoretical amount of air required is 2.84 l/m (or 28.4 liters per 1,000 liters of water), the actual amount of air required would be four times this amount or 11.4 l/m (or 113.6 liters per 1,000 liters of water). Depending upon particular circumstances, it may be wise to add to this amount an additional "safety factor" of 10% to 20%.

To aid in converting to English Units:

1 l/m of water flow = 0.264 gal/min
1 gal/min of water flow = 3.785 l/m

1 l/m of air flow = 0.03531 ft^3/min
1 ft^3/min of air flow = 28.3 l/m

Steel Tank

Flip Top Weir

Overview:

18,100 gallon flip top weir tanks from Rain for Rent have a standard "V" shaped floor for ease of draining all stored liquids completely through a 4" butterfly valve with Buna seals standard.

Features:

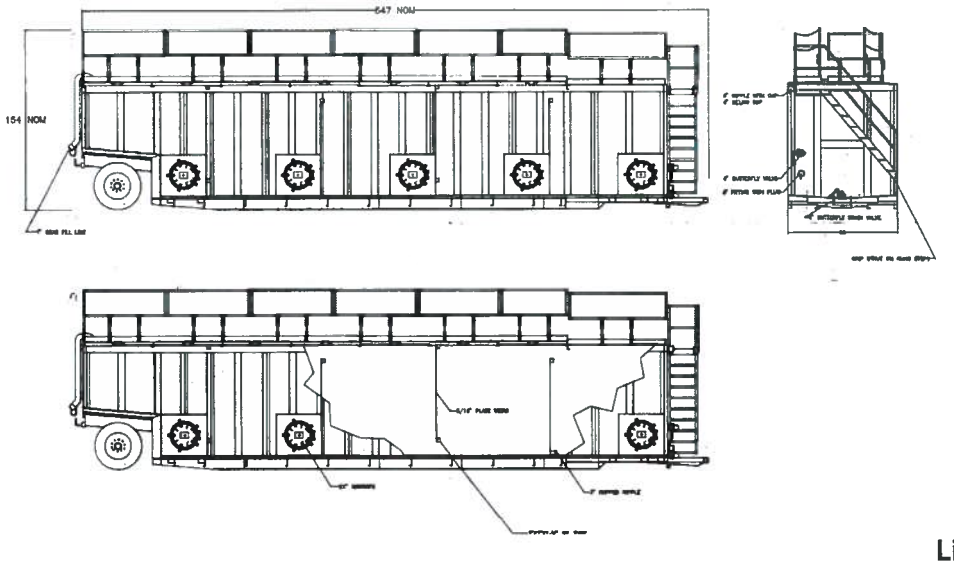
Store liquids with confidence with Rain for Rent's 18,100 gallon flip top weir tank. Permanently attached axels for maximum maneuverability allow this 18,100 gallon tank to be moved with ease on the jobsite and a safety staircase ensures proper protection for workers on site. Internal weirs allow for extra filtration and settling of materials.

Specs:

Manways	Four 22" hatches
Material	Steel
Capacity	18,100 gallons
Dry weight	27,000 lbs.
Footprint:	516" x 96" x 126"

Accessories:

- Spillguard
- Suction and Discharge Hoses
- Level gauges



PUMPS • TANKS • FILTRATION • PIPE • SPILLGUARDS

Liquid ingenuity.™

800-742-7246
rainforrent.com

New Pig

Free 24 Can Oval Cooler with a $250 order

PIG® Oil-Only Absorbent Boom

BOM406 ★★★★★ (5) Write a Review

3" x 10', Absorbs up to 2 gal. per boom, 8 booms

As Low As **$91.00**

Confine and absorb oil and fuel spills on land or water. Read More ▸

PRICING (Based on quantity)

1 - 4 $99.00	5 - 11 $95.00	12 + $91.00 Best Buy

Always in stock. Ships in 24 hours.

EXCLUSIVE

OPTIONS

Qty 1 **$99.00**

- ◉ Ship One Time
- ○ **Buy with Autoship**

Get a Free Gift with every delivery! Learn More ▸

ADD TO CART

Description

Confine and absorb oil and fuel spills on land or water.

- Field-proven performance works in all conditions to absorb oil spills on land or water
- Floats to confine and soak up spills on water; hugs ground for land-based spills
- Tough outer mesh is UV resistant for long-term outdoor use without degradation; lets fluids easily pass through to filler material
- Rope running along length of boom withstands up to 400-lb. loads, adding strength for deployment and retrieval
- Spunbond polypropylene skin is UV resistant up to 12 months; meets NFPA 99 standards for static decay
- Booms float at surface for easy retrieval, even when saturated
- Absorbs and retains oils and oil-based liquids - including lubricants and fuels - without taking in a drop of water
- Strong, zinc-plated carbon steel attachment clips and rings allow you to link booms together for greater length
- Bright white color makes booms easier to see in outdoor environments and clearly shows saturation level
- Can be incinerated after use to reduce waste or for fuels blending

Specifications

Fluid Absorbed	**Oil-Based Liquids - Not Water**
Color	**White**
Dimensions	**ext. dia. 3" x 10' L**
Recycled Content	**98% Pre-Consumer Recycled Polypropylene Filler**
Absorbency	**Up to 16 gal. per bag**
Absorbency per	**Up to 2 gal. per boom**
Clip/Ring	**Zinc Plated Carbon Steel**

Configuration	Boom
Filler	Polypropylene
Skin/Outer Mesh	Skin - Polypropylene, Outer Mesh - Polyester
Sold as	8 booms per bag
Weight	24 lbs.
NSN (National Stock Number)	7930-01-436-8327
# per Pallet	18
Composition	Outer Mesh Skin - Polyester Inner Skin - Polypropylene Pulp Filler - Polypropylene Clip/Ring - Zinc Plated Carbon Steel
Application	Spill Response
UNSPSC	47131907
Pigalog® Page Number	Page 63

Accessories for BOM406

MAT405-01

PIG® Oil-Only Skimming Sweep

- Lightweight
- 17" x 50'
- 1 each

$46.00 - $56.

Reviews

★★★★★ Show All

WRITE A REVIEW

★★★★★

By **Leslie**4/26/2016

Boom!

New Pig has done a great job with this product and are always on top of their game in it arriving FAST!

★★★★★

By **Billy**11/24/2015

Great product, great service

The product arrived in a timely matter as always with PIG and was put to use instantly. It worked as advertised. I will definitely be buying these as well as other absorbent products from PIG as well.

★★★★★

By **Dan**1/31/2013

BOM406- Lives up to the title of a Hog.

I am currently the point of contact for a 24 hour hazardous response line within my company. I always make sure to have New Pig 10' and 20' oil absorbent boom stocked in my spill kits. The boom consistently preforms as it is supposed to and collects oil based liquids while shedding water. The other consistent feature that I have discovered with the Pig booms is that they will last as a barrier, where other competitors products will allow product to bleed through.

Show All

Additional Information

Product Data Sheet (PDS) ▸

UV-Resistance Comparison Testing of Spunbond and Meltblown ▸

Instructions for Using PIG® Absorbent Booms ▸

Spill Response Training: Absorbent Booms ▸

Safety Data Sheet (SDS) for PIG® Oil-Only Absorbents ▸

40 CFR 112.7 ▸
SPCC planning requirements state that facilities subject to these regulations must have written plans in place discussing the products, countermeasures and procedures that are in place, or will be taken by the facility to prevent discharge of oil into waters of the United States.

40 CFR 122.26 ▸
When applying for a National Pollutant Discharge Elimination System (NPDES) permit, facilities must have a plan in place that describes actions, procedures, control techniques, management practices and equipment available to prevent illegal discharge of pollutants into waterways.

Certifications, Approvals and Ratings

NFPA 99

ONE PORK AVENUE • PO BOX 304 • TIPTON, PA 16684-0304

1-855-493-HOGS (493-4647) • Fax: 1-800-621-PIGS (621-7447) • hothogs@newpig.com

DeWatering Bag

FLT617 For Oil; Sediment, For Up to a 6" Dia. Discharge Hose, 15' x 15'

High surface area designs remove oil and sediment from higher-volume pumping outflows.

- Accommodates up to a 6" discharge hose for high-volume pumping
- Captures both sediment and oils for extra water filtration
- Non-woven polypropylene construction resists chemicals, and full bag can hold approximately 4,320 lb.
- Extra-large Bag has a greater capacity for extensive dewatering
- Disperses water to help prevent erosion
- Useful as a best management practice for stormwater pollution prevention
- Ideal for spill cleanup or pumping out containment areas, sumps, lagoons or ponds
- Non-biodegradable skin has low ash and high BTU value
- Landfillable or incinerable for waste reduction/fuels blending

Specifications

Capacity	225 cu. ft.
Style	Oil, Water, Sediment Separators
Use With	Up to a 6" Dia. Discharge Hose
Color	Black
Dimensions	15' W x 15' L
Recycled Content	100% Post-Consumer Recycled Textiles
Absorbency	Up to 22.6 gal.
Micron Rating	180 Microns
Separator Type	Dewatering & Silt Bags & Socks
Substance Filtered	Oil; Sediment
Sold as	1 each
Weight	27.684 lbs.
# per Pallet	16
Composition	Non-Woven Polypropylene Geotextile

Maximum Flow Rate	500 gal./Minute
UNSPSC	47101525
Pigalog® Page Number	Page 293

Metric Equivalent

Absorbency	Up to 85.5 L
Dimensions	4.6m W x 4.6m L
Weight	12.6 kg

Technical Information

Technical Documents

Why is there no SDS?

40 CFR 122.26

New Pig
World's best stuff for leaks, drips and spills.

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CertainTeed

Certa-Lok® Yelomine™

Specifications & Dimensions

Restrained Joint PVC Pressure Piping System

GENERAL INFORMATION

CertainTeed's Certa-Lok® Yelomine™ Restrained Joint PVC Pressure Pipe meets the performance requirements of ASTM D2241 "Standard Specification for Poly (Vinyl Chloride) (PVC), Pressure Rated Pipe (SDR Series)."

Certa-Lok® Yelomine pipe and couplings are manufactured from a specially formulated PVC compound that **contains impact modifiers and ultraviolet inhibitors to give higher impact strength over an extended period of time.** CertainTeed Certa-Lok® Yelomine compound meets or exceeds cell classification 12454 per ASTM D1784.

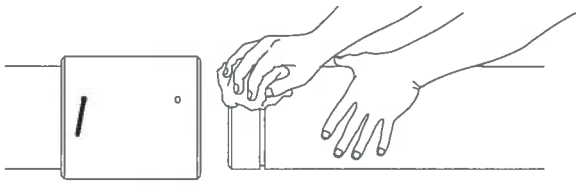
The Certa-Lok® system provides a noncorrosive restrained joint by utilizing precision-machined grooves on the pipe and in the coupling which, when aligned, allow a spline to be inserted, locking the pipe and coupling together. A flexible elastomeric seal (O-ring) in the coupling provides a hydraulic seal.

Certa-Lok® Yelomine couplings are boxed and shipped including splines and factory installed O-rings (gaskets). Note: Specify permanent or non-permanent joint when ordering.

Certa-Lok® Yelomine joints meet the requirements of ASTM D3139 "Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals."

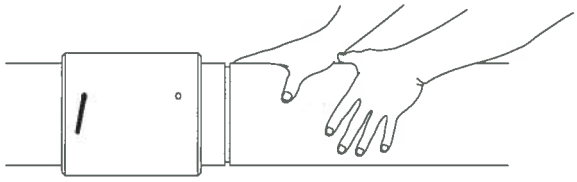
O-rings meet the requirements of ASTM F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe."

JOINT ASSEMBLY



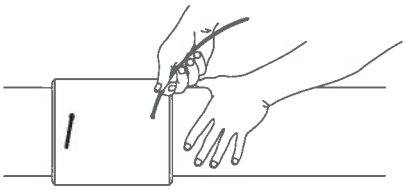
1

Clean joining surfaces.



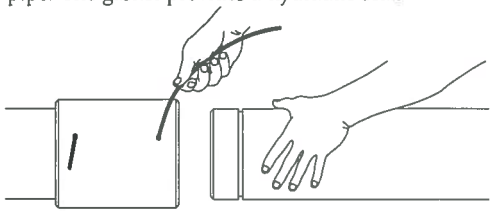
2

Align and insert pipe into Certa-Lok® coupling and push home. When the pipe end seats against the coupling stop, the locking grooves are automatically aligned for spline insertion.



3

The spline is then inserted through the insertion hole in the coupling, until it is fully seated. This securely locks the coupling to the pipe. The gasket provides a hydraulic seal.



4

When needed, the joint can be disassembled and reused.

IMPORTANT: *For pipe sizes 2" through 4", using non-perm rings, CertainTeed recommends using lubricant when assembling the joint. Pipe sizes 6" and above (non-perm), and all sizes using perm rings, require lubricant to assemble. CertainTeed supplies sufficient lubricant to join the pipe. When using lubricant, apply a small amount to the rubber rings and pipe ends. Note: Specify permanent or non-permanent joint when ordering.*

CertainTeed
SAINT-GOBAIN

NSF-INTERNATIONAL LISTINGS

It should be noted that the NSF-14 establishes minimum physical, performance, health effect, quality assurance, marking and record keeping requirements for plastic piping products. Similarly, NSF-61 specifically covers requirements pertaining to the environmental aspects of piping used for potable drinking water. A potable drinking water product that has an NSF-14 listing must (by default) also have an NSF-61 listing. In contrast, a product that is NSF-61 listed (for use in potable water applications) may not necessarily have an NSF-14 "performance specification" listing.

Certa-Lok® Yelomine restrained joint pipe and couplings up to class 250 PSI are listed under NSF-14 and include compliance with NSF-61 for potable water applications. Certa-Lok® Yelomine restrained joint PVC and coupling class 315 PSI, Certa-Lok® Yelomine Integral Bell pipe and 16" fiber-wound couplings are listed under NSF-61 only (in compliance with general market and application usage requirements).

Independent laboratory test data pertaining to all listings and certifications is available upon request.

CERTIFICATION OF QUALITY

1) The Yelomine formulation will contain sufficient impact modifier to demonstrate approximately twice the Izod impact level of conventional white PVC pipe, and shall meet or exceed the below listed plant production specifications.
2) The Yelomine formulation will contain a sufficient amount of high-purity TiO_2 to prevent surface discoloration and to provide superior long-term UV protection against impact strength degradation.
3) All Certa-Lok® YELOMINE pipe will be manufactured at CertainTeed's Lodi, California, and McPherson, Kansas extrusion plants. All fabricated fittings will be manufactured at CertainTeed's McPherson, KS, fabrication facility.

PIPE IMPACT PRODUCTION SPECIFICATIONS

NOM. SIZE (IN.)	SDR 26 (FT-LBS.)	SDR 21 (FT-LBS.)	SDR 17 & 13.5 (FT-LBS.)
2"	—	—	170
3"	—	—	245
4"	210	255	320
6"	305	380	470
8"	400	495	610
10"	500	530	—
12"	500	530	—
14"	500	530	—
16"	500	530	—

NOMINAL PROPERTY VALUES

PIPE PROPERTY	TEST METHOD	VALUE
Izod Impact	ASTM D256	1.15 ft.- lbs./ in. of notch
Tensile Strength	ASTM D638	7,000 psi
Modulus of Elasticity	ASTM D638	400,000 psi
Deflection Temperature	ASTM D648	158°F
Flammability	ASTM D635	Self-Extinguishing

NON-PERMANENT USE AND PERMANENT USE CERTA-LOK® JOINTS

Certa-Lok® Yelomine pipe and fittings have been successfully servicing the industry for many years. In order to enhance performance and better accommodate customer needs, CertainTeed offers two types of Certa-Lok® Yelomine...Permanent Use and Non-Permanent Use. Non-Permanent O-rings have a slightly reduced cross-section for easy assembly and disassembly. Permanent Use O-rings have a slightly larger cross-section and are not designed for disassembly. Permanent Use Certa-Lok® Joint requires lubricant to assemble, which is supplied in sufficient quantities by CertainTeed.

NON-PERMANENT USE CERTA-LOK® JOINT

Non-Permanent Use Certa-Lok® Joints, which utilize a Teflon coated O-ring, are typically used in above-ground, exposed installations such as mining, irrigation, temporary bypass or slurry lines or any installation that will require disassembly and reuse.

CAUTION: Non-Permanent Use Certa-Lok® joints should not be used in buried or submerged applications.

PERMANENT USE CERTA-LOK® JOINT

Permanent Use Certa-Lok® Joints utilize a Teflon-coated O-ring with a slightly larger cross-section. The joint assembles easily with lubricant. Disassembly can be achieved, but can be extremely difficult depending on the diameter of the piping system.

Permanent Use Certa-Lok® Joints are intended for use in all installations which do not require disassembly during the service life of the system. Applications include buried installations, bridge, river and road crossings, and all installations in which joints are subjected to long-term or excessive misalignment due to external loads. CertainTeed supplies sufficient lubricant for Permanent Use Certa-Lok® Joint installations.

If in doubt as to which coupling system, Non-Permanent or Permanent Use, is best suited for your application, contact your local CertainTeed distributor or CertainTeed Territory Sales Manager.

PIPE GROOVING INSTRUCTIONS

CERTA-LOK® YELOMINE RESTRAINED JOINT

***CAUTION:** Unplug router before removing or inserting bits. Always wear eye protection. Support the pipe near the end to be grooved.*

***CAUTION:** Certain products are factory end-thickened and should not be cut and re-grooved. See page 4, Note 3.*

PREPARATION

The pipe must first be cut square, to ensure that the spline groove will align properly with mating grooves in the Certa-Lok® Yelomine Coupling. Check with a square.

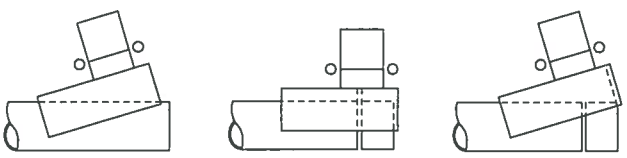
APPLICATION

1) Select and install the proper bit for conformance with the groove dimensions shown. The bit must be tightly secured in the router, and the router must be tightly fastened to the jig. Use the black plastic spacer under the router to achieve motor support.

PIPE SIZE	GROOVE WIDTH (IN.)	GROOVE DEPTH (IN.)	BEVEL LENGTH (IN.)
4"	0.375	.135	0.188 (0.25 IB)
6"	0.375	.135	0.313 (0.25 IB)
8"	0.500	.145	0.656
10"	0.500	.215	0.656
10" IRR	0.500	.145	0.656
12"	0.750	.215	0.656
12" IRR	0.500	.145	0.656
14"	0.500	.215	0.656
16"	0.750	.215	0.656

2) Make short trial cuts on a scrap piece of pipe before grooving the line pipe.
3) Turn router on, hold handles firmly, and set the jig on the pipe with the rear slide bar and forward guide post resting on the pipe (figure A). Slide the jig toward the pipe and maintain pressure against the pipe end with the forward guide post (figure B). Move the jig slowly and firmly clockwise around the pipe, or better, rotate the pipe to achieve the same motion. Best results are obtained when the jig is held on the top of the pipe with the pipe to your right, and the pipe is rotated slowly towards you.
4) To remove the jig, tilt the guide post end up while maintaining contact with the pipe end (figure C). This prevents the cutter from ruining the groove by gouging the sides
5) Bevel pipe end.

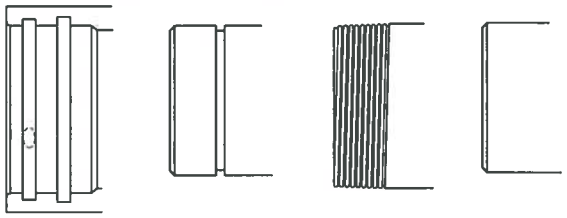
A B C



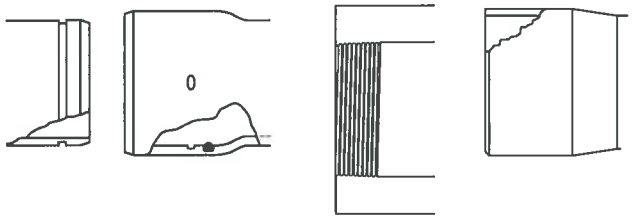
DEFINITIONS & ABBREVIATIONS

C/L	Certa-Lok®
C/LM	Certa-Lok® Grooved (male) Pipe End
FIPT	IPS (female) Pipe Thread (NPT)
SW	Solvent Weld
C/LF	Certa-Lok® Gasketed (female)
MIPT	IPS (male) Pipe Thread (NPT)
SWBE	Solvent Weld Bell End
PE	Plain End
HP	High Pressure
DT	Double Tapped
IB	Integral Bell
SMG	Standard Metal Groove

C/LF (female) C/LM (male) MIPT PE



IB FIPT SWBE



FLEXIBILITY

Certa-Lok® Yelomine can bend easily around many obstructions, typically reducing the number of fittings required. The pipe ***should not*** be bent to a lesser (tighter) radius than shown.

PIPE DIA.	MIN. R. CURVATURE (FT.)	OFFSET/ 20 FT. (IN.)
2"	40	59
3"	58	41
4"	75	32
6"	110	22
8"	144	17
10"	179	13
12"	213	11
14"	233	10
16"	267	9

NOTE: Values shown are for pressure-pipe applications.

YELOMINE INTEGRAL BELL (IB) PIPING PRODUCTS

Gasket (O-ring) and Spline included

SIZE (IN.)	PSI	SDR	OD	BOD	P	C	MIN. WALL	APP. WT. (LBS./FT.)	NON-PERM PART NO.	PERM PART NO.
4"	200	21	4.500	5.11	0.25	3.00	.214	1.89	266225	266324
4"	250	17	4.500	5.27	0.25	3.00	.265	2.29	266218	266317
6"	200	21	6.625	7.50	0.25	3.00	.316	4.07	266249	266348
6"	250	17	6.625	7.74	0.25	3.00	.390	4.94	266232	266331
8"	200	21	8.625	9.75	0.656	3.16	.410	6.72	266379	266362

CERTA-LOK® YELOMINE PIPE

WITH COUPLINGS

Certa-Lok® Coupling, Gaskets (O-ring) and Spline included

SIZE (IN.)	PSI	SDR	OD	BOD	L	P	C	MIN. WALL	WT. (LBS./FT.)	PART NO.
2" ②	250	17	2.375	3.20	5.25	0.188	1.75	.140	0.69	216213
3" ②	250	17	3.500	4.38	7.25	0.188	2.50	.206	1.48	217210
4" ②	200	21	4.500	5.47	8.25	0.188	3.00	.214	2.11	226212
4"	250	17	4.500	5.47	8.25	0.188	3.00	.265	2.50	218217
4" HP ②	315	13.5	4.500	5.96	8.25	0.188	3.00	.333	3.10	250217
6"	160	26	6.625	7.84	8.25	0.313	3.00	.255	3.58	235214
6"	200	21	6.625	7.84	8.25	0.313	3.00	.316	4.30	227219
6"	250	17	6.625	7.84	8.25	0.313	3.00	.390	5.18	219214
6" HP ②	315	13.5	6.625	8.37	8.25	0.313	3.00	.491	6.59	251214
8"	160	26	8.625	10.19	10.13	0.656	3.16	.332	6.07	236211
8"	200	21	8.625	10.19	10.13	0.656	3.16	.410	7.26	228216
8"	250	17	8.625	10.19	10.13	0.656	3.16	.508	8.71	220210
8" HP ②	315	13.5	8.625	10.95	10.13	0.656	3.16	.639	11.30	237218
10"	160	26	10.750	12.44	12.13	0.656	3.50	.413	9.73	214219
10"	200	21	10.750	12.44	12.13	0.656	3.50	.511	11.60	230219
12"	160	26	12.750	14.65	12.13	0.656	3.63	.490	13.63	215223
12"	200	21	12.750	14.65	12.13	0.656	3.63	.606	16.21	239229
14"	160	26	14.000	16.00	12.13	0.656	3.50	.538	14.70	247217
14"	160 ①	21	14.000	16.00	12.13	0.656	3.50	.666	18.03	247200
16"	90 ①	26	16.000	17.40	12.13	0.656	3.61	.615	20.37	248214 ③
16"	160	26	16.000	17.22	12.00	0.656	3.61	.615	20.22	248214 ③
16"	200	21	16.000	17.22	12.00	0.656	3.61	.762	24.85	248337

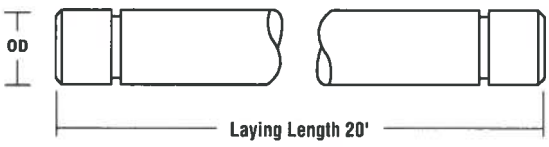
Laying length on Yelomine IB and Yelomine is 20'.

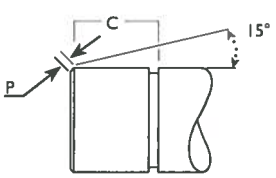
Note: All dimensions are in inches and are subject to normal manufacturing tolerances (all charts in this brochure).

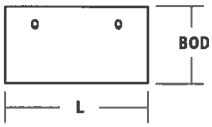
① *PSI on this item is limited by the pressure rating of the coupling.*

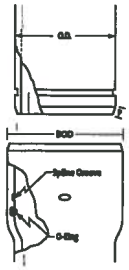
② *These products are produced with thickened ends to accommodate the Certa-Lok® groove while maintaining their designed pressure rating. NOTE: Grooving the non-thickened pipe body will result in less-than-designed pressure rating for the new joint and ultimately the entire system. When fabrication is required for thickened end products, apply a Certa-Lok® by solvent weld coupling or apply a Certa-Lok® adapter.*

③ *Specify desired pressure rating on P.O.*







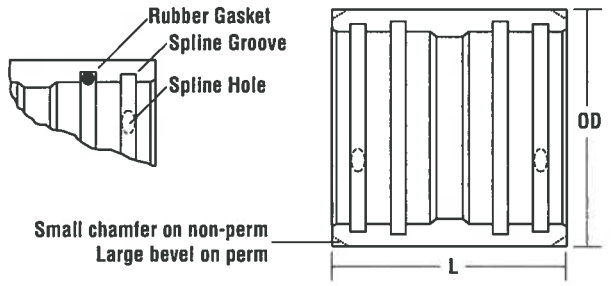


CERTA-LOK® YELOMINE COUPLING

COMPLETE WITH SPLINES AND O-RINGS

SIZE (IN.)	PSI	L (IN.)	WT./PC. (LBS.)	OD (IN.)	PART NO. NON PERM. USE	PART NO. PERM. USE
2"	250	5.25	1.05	3.20	705021	715020
3"	250	7.25	2.17	4.38	705038	715037
4"	250	8.25	4.92	5.47	705045	715044
4" HP	315	8.25	5.00	5.96	745034	—
6"	250	8.25	6.20	7.84	705069	715068
6" HP	315	8.25	10.40	8.37	745041	—
8"	250	10.13	10.93	10.19	705076	715075
8" HP	315	10.13	20.00	10.95	745058	—
10"	200	12.13	21.70	12.44	705106	715105
12"	200	12.13	28.80	14.65	716669	716652
14"	160	12.13	40.00	16.00	745010	745218
16" ①	90	12.13	30.00	17.40	745027	745225
16" ②	200	12.00	27.00	17.22	745416	745409

① PVC, 16"
② Composite 16"



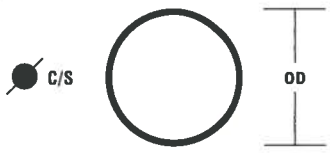
CERTA-LOK® YELOMINE O-RING

NON-PERMANENT USE

Teflon coated for easy assembly
No lubricant required to assemble 2"-4"

SIZE (IN.)	C/S (IN.)	MATERIAL	OD (IN.)	PART NO.
2"	.210	NBR	2.770	861215
3"	.210	NBR	3.895	861222
4"	.210	NBR	4.895	861239
6"	.275	NBR	7.176	861277
8"	.375	IR/SBR	9.350	862717
10"	.407	IR/SBR	11.500	861697
12"	.407	IR/SBR	13.500	861703
14"	.407	IR/SBR	14.825	861765
16"	.407	IR/SBR	16.825	861772

NBR – Nitrile Butadiene Rubber
IR/SBR – Isoprene/Styrene Butadiene Blend



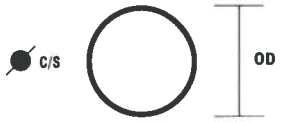
CERTA-LOK® O-RING

PERMANENT USE

Teflon coated for ease of assembly
Maximum compression, high disassembly effort
Lubricant required to assemble all sizes.

SIZE (IN.)	C/S (IN.)	OD (IN.)	PART NO.
2"	.240	2.770	860607
3"	.240	3.900	860614
4"	.240	4.910	860621
6"	.313	7.176	860638
8"	.400	9.270	860645
10"	.438	11.500	860652
12"	.438	13.500	860669
14"	.438	14.825	860683
16"	.438	16.825	860690

Material = IR/SBR – Isoprene/Styrene Butadiene Blend



CERTA-LOK® SPLINES

SIZE (IN.)	L (IN.)	C/S (IN.)	CONFIGURATION	PART NO.
2"	10.5	.188	ROUND	864605
3"	16.0	.250	ROUND	864612
4"	18.0	.250	ROUND	864629
4" HP	18.0	.250	SQUARE	864889
6"	24.0	.250	ROUND	864636
6" HP	24.0	.250	SQUARE	865060
8"	32.0	.313	SQUARE	864643
8" HP	32.0	.313	SQUARE	864643
10"	39.0	.375	SQUARE	864650
12"	46.0	.375 x .625	RECTANGLE	867309
14"	48.0	.375	SQUARE	864902
16"	56.0	.375 x .625	RECTANGLE	865336

CERTA-LOK®

ACID RESISTANT SPLINES

SIZE (IN.)	L (IN.)	C/S (IN.)	CONFIG.	MATERIAL	PART NO.
3"	16.0	0.250	Round	PVDF	865718
4"	18.0	0.250	Round	PVDF	865725
6"	24.0	0.250	Round	PVDF	865749
8"	32.0	0.313	Square	PVDF	865756
10"	39.0	0.313	Round	PP	864735
12"	46.0	0.313	Round	PP	865299

**2" is available on special-order basis only*
PVDF-Polyvinylidene Fluoride
PP-Polypropylene

CERTA-LOK® SPLINE INSERTION TOOL

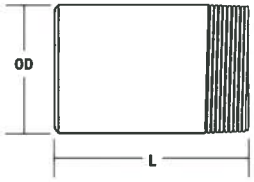
SPLINE SIZE	PART NO.
0.25" ROUND & 0.25" SQUARE	707964
0.313" SQUARE & 0.313" x 0.375" RECTANGLE	707971
0.375" SQUARE	707995
0.375" x 0.625" RECTANGLE	707940

CAUTION: Care must be taken not to overlap the spline when using insertion tool.

CERTA-LOK® NIPPLE

PE x MIPT

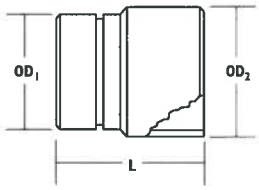
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	200	0.60	2.375	5.25	705892
3"	190	1.25	3.500	6.50	705908
4"	160	2.50	4.500	7.00	705915
6"	140	5.70	6.625	9.00	705922
8"	120	10.25	8.625	10.40	705939



CERTA-LOK® BY CAST IRON ADAPTER NIPPLE

C/L MALE x CAST IRON O.D. ADAPTER

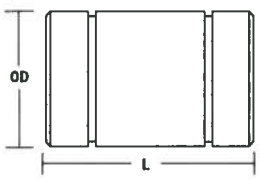
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD_1 (IN.)	L (IN.)	OD_2 (IN.)	PART NO.
4"	250	2.62	4.500	10.0	4.80	708855
6"	250	6.25	6.625	12.0	6.90	708862
8"	250	12.52	8.625	13.0	9.05	708879
10"	200	21.50	10.750	16.0	11.10	707810
12"	200	23.00	12.750	16.0	13.20	707827



CERTA-LOK® NIPPLE

C/L MALE x C/L MALE

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
4"	250	2.3	4.500	10.0	711008
6"	250	5.2	6.625	12.0	711015
8"	250	9.7	8.625	13.0	711022



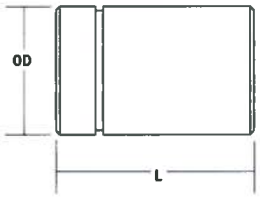
DESCRIPTION	PART NO.
1 1/2 HP PORTABLE ROUTER (110VOLT)	860072
4" JIG FIXTURE	860102
6" JIG FIXTURE	860119
8" JIG FIXTURE	860126
10" JIG FIXTURE	860133
12" JIG FIXTURE	860140
14" JIG FIXTURE	860416
16" JIG FIXTURE	860423
15 ° BEVELING BIT	860904
3/8" BIT ①	860171
1/2" BIT ②	860188
3/4" BIT ③	860362

① for 4"-6" diameter ② for 8"-10" diameter ③ for 12", 14", and 16" diameter

CERTA-LOK® NIPPLE

C/L MALE x PE

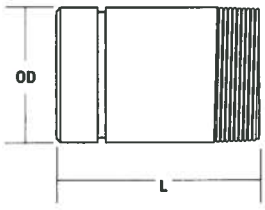
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	0.60	2.375	7.0	705847
3"	250	1.40	3.500	9.0	705854
4"	250	2.30	4.500	10.0	705861
4" HP	315	3.10	4.500	10.0	706646
6"	250	5.20	6.625	12.0	705878
6" HP	315	7.20	6.625	12.0	706653
8"	250	9.70	8.625	13.0	705885
8" HP	315	13.80	8.625	13.0	706660
10"	200	11.07	10.750	16.0	706325
12"	200	15.50	12.750	16.0	706806
14"	160	20.25	14.000	18.0	706349
16"	200	25.00	16.000	18.0	706356



CERTA-LOK® NIPPLE

C/L MALE x MIPT

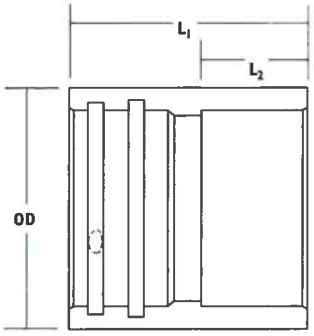
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	200	0.60	2.375	7.00	705991
3"	190	1.30	3.500	9.00	706004
4"	160	2.40	4.500	10.00	706011
6"	140	5.20	6.625	12.00	706028
8"	120	9.00	8.625	13.00	706035



CERTA-LOK® X SOLVENT WELD COUPLING

C/L FEMALE x SOLVENT WELD SOCKET END

SIZE (IN.)	PSI	WT./PC. (LBS.)	L_1	L_2	OD	PART NO. NON PERM. USE	PART NO. PERM. USE
2"	250	1.00	5.50	2.375	3.20	705359	715358
3"	250	2.20	8.00	3.500	4.38	705366	715365
4"	250	3.50	9.00	4.000	5.47	705373	715372
6"	250	6.40	9.00	4.000	7.84	705380	715389
8"	250	11.30	10.13	4.500	10.19	705397	715396
10"	200	16.00	12.13	5.750	12.44	705083	715082
12"	200	17.80	12.13	5.750	14.65	705090	715099
14"	160	36.60	12.13	5.750	16.00	705205	715129
16"	90	22.00	12.13	5.750	17.40	705212	715136

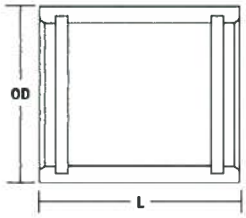


IPS REPAIR COUPLING

UNRESTRAINED

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	1.52	3.20	9.0	742026
3"	250	2.32	4.38	9.0	742040
4"	250	3.38	5.47	9.0	742064
6"	250	6.12	7.84	9.0	742088
8"	250	10.17	10.19	10.13	742095
10"	200	14.25	12.44	12.13	742101
12"	200	21.50	14.65	12.13	742118

Note: When used with Certa-Lok® Yelomine system, which is a restrained system, repair couplings must be externally restrained. If a restrained joint is required, it must be applied externally.

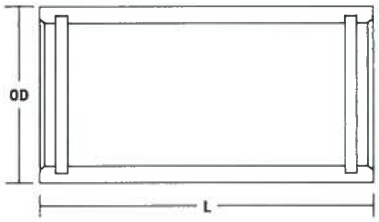


IPS REPAIR COUPLING

LONG LENGTHS 18" UNRESTRAINED

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	3.81	3.20	18.0	741029
3"	250	5.76	4.38	18.0	741043
4"	250	7.91	5.47	18.0	741067
6"	250	14.13	7.84	18.0	741081
8"	250	24.38	10.19	18.0	741098
10"	200	34.46	12.44	18.0	741104
12"	200	45.78	14.65	18.0	741111

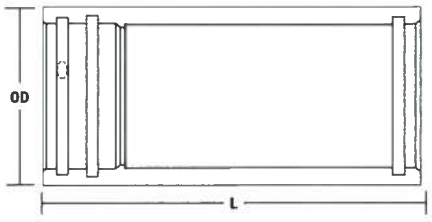
Note: When used with Certa-Lok® Yelomine system, which is a restrained system, repair couplings must be externally restrained. If a restrained joint is required, it must be applied externally.



CERTA-LOK® YELOMINE X IPS EXPANSION COUPLING

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	3.32	3.20	18.00	716423
3"	250	5.00	4.38	18.00	716430
4"	250	6.98	5.47	18.00	716447
6"	250	12.69	7.84	18.00	716454
8"	250	21.30	10.19	18.00	716461
10"	200	28.13	12.44	18.00	716478
12"	200	37.45	14.65	18.00	716485
14"	160	49.00	16.00	18.00	716522
16"	200	47.45	17.40	18.00	716539

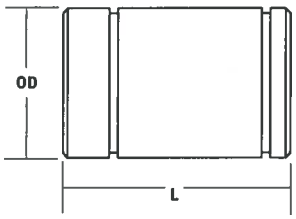
Note: Expansion couplings are not a restrained joint.



CERTA-LOK® TRANSITION FITTING

C/L MALE x STANDARD METAL GROOVE (SMG)

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	**	0.60	2.375	7.0	710315
3"	**	1.60	3.500	9.0	710322
4"	**	2.50	4.500	10.0	710339
4" HP	**	3.10	4.500	10.0	706523
6"	**	5.20	6.625	12.0	710346
6" HP	**	7.20	6.625	12.0	706530
8"	**	9.00	8.625	13.5	710353
10"	**	11.07	10.750	16.0	707834
12"	**	19.20	12.750	16.0	707841
14"	**	20.25	14.000	18.0	710360
16"	**	25.00	16.000	18.0	710377



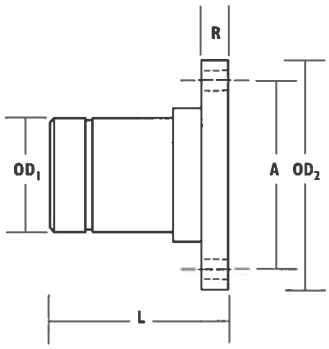
**Caution: Certa-Lok® to "SMG" Adapters, when assembled with the proper Victaulic, Grinnell or similar coupling, have long-term hydrostatic strengths equal to all other Certa-Lok® fittings. However, the resistance of the grooved adapter and coupling assembly to thrust loads is significantly less than that of Certa-Lok® couplings. Therefore, these adapters should be supported against thrust loads.*

***Unrestrained pressure rating (PSI) to be determined by the Victaulic coupling or similar coupling manufacturer, as each manufacturer's rating may be different due to design.*

CERTA-LOK® FLANGE ADAPTER

C/L MALE x FLANGE

SIZE (IN.)	PSI	WT/PC. (LBS.)	OD_1 (IN.)	OD_2 (IN.)	NOM. R. (IN.)	L (IN.)	BOLT CIRCLE DIA. A (IN.)	NO. HOLES	PART NO.
2"	150	1.60	2.375	6.00	0.813	7.19	4.75	4	705748
3"	150	3.20	3.500	7.50	1.063	9.25	6.00	4	705755
4"	150	5.00	4.500	9.00	1.125	10.25	7.50	8	705762
6"	150	9.00	6.625	11.00	1.281	12.44	9.50	8	705779
8"	150	16.00	8.625	13.50	1.375	13.38	11.75	8	705786
10"	150	25.40	10.750	16.00	1.625	16.69	14.25	12	707773
12"	150	36.70	12.750	19.00	1.500	16.63	17.00	12	707780
14"	150	75.00	14.000	21.00	2.000	18.50	18.75	12	706479
16"	150	105.00	16.000	23.50	2.375	18.75	21.25	16	706486

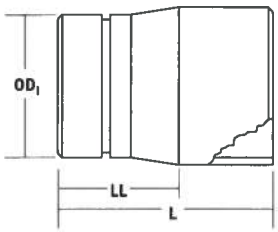


① *All flanges Van Stone style with glass-filled PVC ring.*

CERTA-LOK® ADAPTER

C/L MALE x SOLVENT WELD BELL

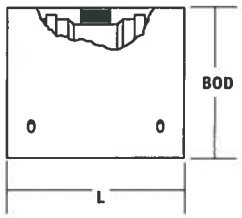
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD_1 (IN.)	L (IN.)	LL (IN.)	PART NO.
2"	250	0.50	2.375	6.625	4.125	705304
3"	250	1.40	3.500	8.625	5.125	705311
4"	250	2.30	4.500	9.250	4.875	705328
4" HP	315	6.10	4.500	9.250	4.875	706493
6"	250	5.30	6.625	11.375	5.375	705335
6" HP	315	10.70	6.625	11.375	5.375	706509
8"	250	9.00	8.625	12.875	6.875	705342
8" HP	315	18.60	8.625	12.875	6.875	706516
10"	200	11.00	10.750	15.250	9.250	705168
12"	200	15.00	12.750	15.250	9.250	705175



CERTA-LOK® TAPPED COUPLING

C/L FEMALE x C/L FEMALE • FIPT OUTLET

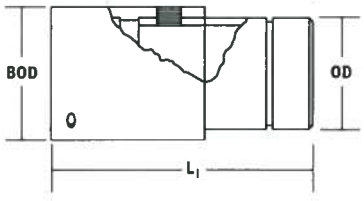
SIZE (IN.)	PSI	WT./PC. (LBS.)	OUTLET SIZE (IN.)	BOD (IN.)	L (IN.)	PART NO. NON PERM. USE	PART NO. PERM. USE
2" x 2"	200	1.50	0.75	3.20	7.00	705403	715402
2" x 2"	200	1.40	1.00	3.20	7.00	705441	715440
3" x 3"	200	2.60	0.75	4.38	9.50	705410	715419
3" x 3"	200	2.90	1.00	4.38	9.50	705458	715457
3" x 3"	160	2.70	1.50	4.38	9.50	705465	715464
4" x 4"	200	4.10	0.75	5.47	10.50	705427	715426
4" x 4"	200	4.10	1.00	5.47	10.50	705472	715471
4" x 4"	200	4.00	1.50	5.47	10.50	705489	715488
4" x 4" HP	250	8.50	1.50	5.96	10.50	706585	716584
6" x 6"	200	7.90	0.75	7.84	11.25	705434	715433
6" x 6"	200	7.90	1.00	7.84	11.25	705496	715495
6" x 6"	200	7.90	1.50	7.84	11.25	705502	715501
6" x 6" HP	250	14.00	1.50	8.37	11.25	706592	716591
6" x 6"	160	7.90	2.00	7.84	11.25	705540	715549
6" x 6"	160	9.83	2.00 DT	7.84	11.25	705557	715556
8" x 8"	200	15.00	1.00	10.19	12.50	705519	715518
8" x 8"	200	15.00	1.50	10.19	12.50	705526	715525
8" x 8"	160	15.00	2.00	10.19	12.50	705533	715532
8" x 8"	160	17.30	2.00 DT	10.19	12.50	705564	715563
8" x 8"	130	19.50	3.00	10.19	13.50	705588	715587
8" x 8"	130	19.50	3.00 DT	10.19	13.50	705571	715570
10" x 10"	200	18.90	1.50	12.44	15.00	707858	717857
10" x 10"	160	19.00	2.00	12.44	15.00	707797	717796
10" x 10"	130	27.30	3.00 DT	12.44	16.00	705595	—



CERTA-LOK® TAPPED COUPLING

C/L FEMALE x C/L MALE • FIPT OUTLET

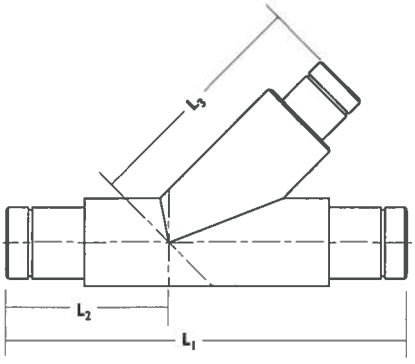
SIZE (IN.)	PSI	WT./PC. (LBS.)	OUTLET SIZE (IN.)	OD (IN.)	BOD (IN.)	L (IN.)	PART NO. NON PERM. USE	PART NO. PERM. USE
2" x 2"	250	1.60	0.75	2.375	3.20	10.13	700651	710650
2" x 2"	250	1.50	1.00	2.375	3.20	10.13	700668	710667
3" x 3"	250	3.60	1.50	3.500	4.38	13.50	705687	715686
4" x 4"	250	5.80	1.50	4.500	5.47	15.00	705694	715693
6" x 6"	250	11.50	1.50	6.625	7.84	17.00	700569	710568
6" x 6"	250	11.40	2.00	6.625	7.84	17.00	700576	710575
8" x 8"	250	20.60	1.50	8.625	10.19	19.00	705724	715723
8" x 8"	250	21.40	2.00	8.625	10.19	19.00	705731	715730
10" x 10"	200	27.00	2.00	10.750	12.44	22.25	705663	715662
12" x 12"	200	33.00	2.00	12.750	14.65	22.25	705670	715679



CERTA-LOK® WYES

C/L MALE X C/L MALE X C/L MALE

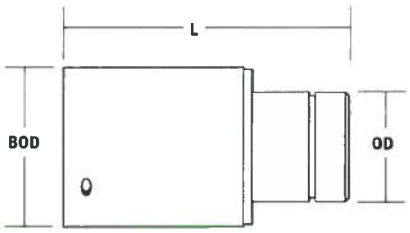
SIZE (IN.)	PSI	WT/PC (LBS.)	DIMENSIONS (IN.) L1	L2	L3	PART NO.
4"	150	11.00	26.25	10.78	16.03	707018
6"	150	27.70	33.88	13.41	20.63	706677
8"	100	69.00	44.75	18.06	26.69	706721



CERTA-LOK® REDUCER

C/L FEMALE x C/L MALE

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	BOD (IN.)	L (IN.)	PART NO. NON PERM. USE	PART NO. PERM. USE
3" x 2"	250	4.30	2.375	4.380	13.88	706134	—
4" x 2"	250	5.00	2.375	5.470	15.25	706141	716140
4" x 3"	250	5.70	3.500	5.470	16.56	706158	716157
6" x 2"	250	10.40	2.375	7.840	15.75	706165	716164
6" x 3"	250	11.00	3.500	7.840	16.50	706318	716317
6" x 4"	250	11.10	4.500	7.840	17.38	706172	716171
8" x 2"	250	11.10	2.375	10.190	17.00	706189	716188
8" x 4"	250	24.10	4.500	10.190	15.63	706196	716195
8" x 6"	250	24.60	6.625	10.190	18.50	706202	716201
10" x 8"	200	42.00	8.625	12.440	19.75	706219	716218
12" x 8"	200	54.00	8.625	14.650	19.25	706226	716225
12" x 10"	200	44.10	10.750	14.650	22.25	706257	—
14" x 12"	160	52.20	12.750	16.000	22.25	706233	716232
16" x 10"	90	27.00	10.750	17.400	24.25	707025	—
16" x 12"	90	70.35	12.750	17.400	24.25	706400	—

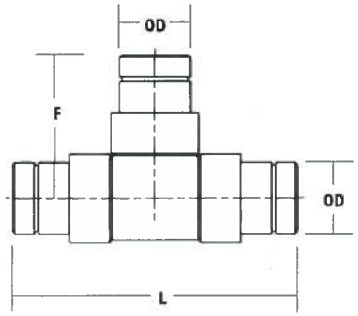


CERTA-LOK® TEE

C/L MALE x C/L MALE x C/L MALE

SIZE (IN.)	PSI	WT/PC. (LBS.)	OD (IN.)	L (IN.)	F (IN.)	PART NO.
2" x 2" x 2"	250	2.30	2.375	16.50	10.88	704918
3" x 3" x 3"	250	5.80	3.500	21.50	11.25	704925
4" x 4" x 4"	250	10.70	4.500	24.75	12.38	704628
4" x 4" x 4" HP	315	12.90	4.500	24.75	12.38	706608
6" x 6" x 6"	250	25.00	6.625	31.00	15.50	704635
8" x 8" x 8"	250	48.00	8.625	36.25	17.75	704642
10" x 10" x 10"	200	63.00	10.750	45.38	22.70	704581
12" x 12" x 12"	200	86.00	12.750	45.00	22.50	704598
14" x 14" x 14"	160	164.30	14.000	52.00	26.00	704529
16" x 16" x 16"	200	216.00	16.000	54.00	27.00	704536

Note: Also available on special order with pipe threaded branch in size 2" through 8"

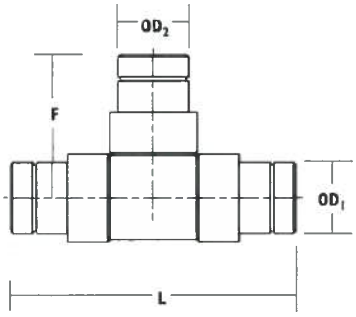


CERTA-LOK® REDUCING TEE

C/L MALE x C/L MALE x C/L MALE

SIZE (IN.)	PSI	WT/PC. (LBS.)	OD_1 (IN.)	OD_2 (IN.)	L (IN.)	F (IN.)	PART NO.
3" x 3" x 2"	250	5.00	3.500	2.375	21.00	8.84	704932
4" x 4" x 2"	250	10.10	4.500	2.375	22.88	9.47	704673
4" x 4" x 3"	250	10.80	4.500	3.500	24.19	11.66	704680
6" x 6" x 2"	250	23.83	6.625	2.375	28.13	11.63	704697
6" x 6" x 3"	250	24.20	6.625	3.500	28.13	12.75	704703
6" x 6" x 4"	250	24.40	6.625	4.500	29.19	13.75	704710
8" x 8" x 6"	250	50.90	8.625	6.625	33.50	16.81	704727
10" x 10" x 6"	200	62.10	10.750	6.625	39.75	17.84	704543
12" x 12" x 4"	200	87.00	12.750	4.500	42.75	16.75	704505
12" x 12" x 6"	200	89.40	12.750	6.625	47.00	21.75	704567
12" x 12" x 8"	200	98.60	12.750	8.625	41.56	24.63	704574

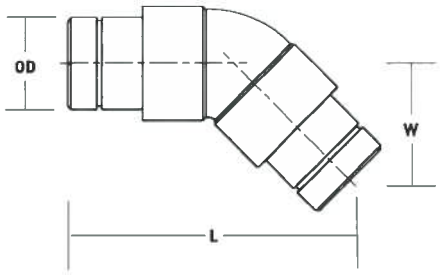
Note: Also available on special order with pipe threaded branch in size 2" through 8"



CERTA-LOK® 45° ELLS

C/L MALE x C/L MALE

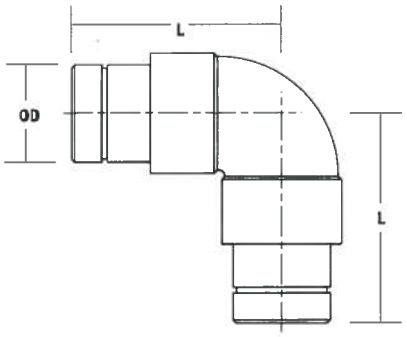
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	W (IN.)	PART NO.
2"	250	1.60	2.375	12.964	5.370	704949
3"	250	3.90	3.500	16.858	6.983	704956
4"	250	7.10	4.500	18.939	7.845	704826
4" HP	315	8.60	4.500	18.939	7.845	706615
6"	250	16.10	6.625	23.473	9.723	704833
8"	250	30.90	8.625	25.607	10.607	704840
10"	200	37.00	10.750	31.750	13.150	704789
12"	200	65.00	12.750	32.600	13.500	704796
14"	160	82.00	14.000	37.750	15.650	705007
16"	200	144.00	16.000	39.800	16.500	705014



CERTA-LOK® 90° ELLS

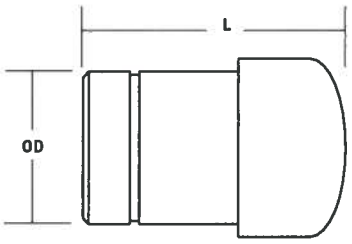
C/L MALE x C/L MALE

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	1.70	2.375	8.44	704963
3"	250	4.10	3.500	11.06	704970
4"	250	7.50	4.500	12.63	704888
4" HP	315	10.00	4.500	12.63	706622
6"	250	17.40	6.625	15.75	704895
8"	250	33.70	8.625	17.75	704901
10"	200	65.00	10.750	21.78	704765
12"	200	83.00	12.750	22.88	704772
14"	160	141.50	14.000	31.50	704741
16"	200	172.40	16.000	33.50	704758



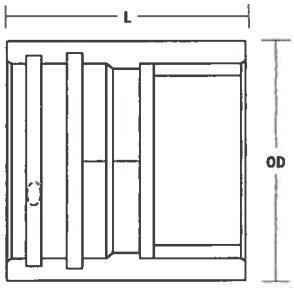
CERTA-LOK® END PLUG

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO.
2"	250	0.90	2.375	7.50	704987
3"	250	2.00	3.500	10.00	704994
4"	250	3.70	4.500	11.00	706288
4" HP	315	4.40	4.500	11.00	706639
6"	250	8.50	6.625	14.00	706295
8"	250	16.20	8.625	17.50	706301



CERTA-LOK® END CAP

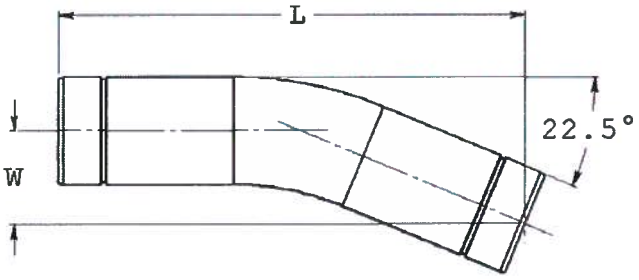
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	PART NO. (NON-PERM)
4"	250	4.20	5.47	9.00	700002
6"	250	9.00	7.84	9.00	700019
8"	250	17.00	10.19	12.125	700026
10"	200	22.00	12.638	12.125	700033
12"	200	28.00	14.668	12.125	700040



CERTA-LOK® 22.5° SWEEP BENDS

C/L MALE x C/L MALE

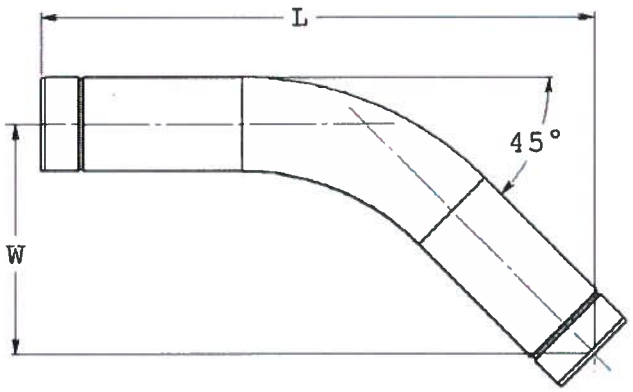
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	W (IN.)	PART NO.
2"	250	2.00	2.375	17-5/16	3-7/16	710780
3"	250	4.90	3.500	26	5-3/16	710797
4"	250	7.50	4.500	26-1/16	5-3/16	710803
6"	250	18.30	6.625	28-15/16	5-3/4	710810
8"	250	35.00	8.625	43-3/8	8-5/8	710827
10"	200	87.00	10.750	69-7/16	13-13/16	705236
12"	200	105.00	12.750	69-7/16	13-13/16	705243
14"	160	105.40	14.000	83-7/8	16-11/16	706417
16"	200	119.00	16.000	83-7/8	16-11/16	706424



CERTA-LOK® 45° SWEEP BENDS

C/L MALE x C/L MALE

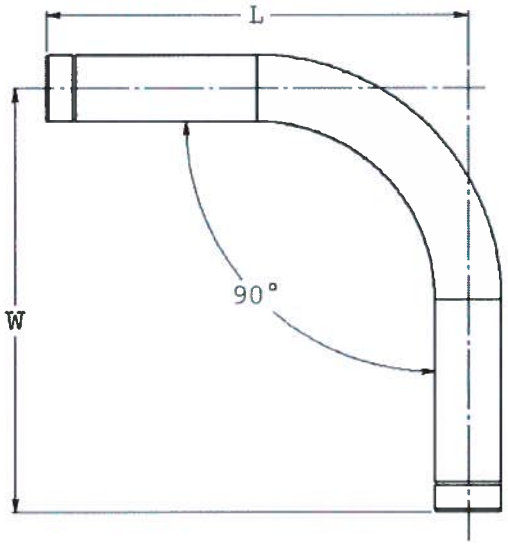
SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	W (IN.)	PART NO.
2"	250	2.00	2.375	18-1/8	7-1/2	710834
3"	250	4.90	3.500	25-11/16	10-3/4	710841
4"	250	7.50	4.500	28-3/4	11-7/8	710858
4" HP	315	11.60	4.500	28-3/4	11-7/8	706561
6"	250	18.30	6.625	39-3/16	16-1/4	710865
6" HP	315	26.20	6.625	39-3/16	16-1/4	706578
8"	250	35.00	8.625	52	21-9/16	710872
10"	200	87.00	10.750	72-7/8	30-3/16	705250
12"	200	105.00	12.750	72-15/16	30-3/16	705274
14"	160	151.00	14.000	85-7/8	35-9/16	706431
16"	200	162.00	16.000	85-7/8	35-9/16	706448



CERTA-LOK® 90° SWEEP BENDS

C/L MALE x C/L MALE

SIZE (IN.)	PSI	WT./PC. (LBS.)	OD (IN.)	L (IN.)	W (IN.)	PART NO.
2"	250	2.40	2.375	16-1/16	16-1/16	710889
3"	250	6.40	3.500	23-1/8	23-1/8	710896
4"	250	12.70	4.500	30-1/4	30-1/4	710902
4" HP	315	14.90	4.500	30-1/4	30-1/4	706547
6"	250	31.00	6.625	42	42	710919
6" HP	315	45.30	6.625	42	42	706554
8"	250	59.00	8.625	46-5/8	46-5/8	710926
10"	200	120.00	10.750	71-3/8	71-3/8	705267
12"	200	165.00	12.750	71-13/16	71-13/16	705281
14"	160	217.00	14.000	78-5/8	78-5/8	706455
16"	200	234.00	16.000	78-5/8	78-5/8	706462



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SAINT-GOBAIN

Restrained Joint PVC Pressure Fittings

Couplings and Fittings for Certa-Lok™ Yelomine™ Pipe

Certa-Lok™ fittings, like the pipe, provide the simplicity and integrity of the Certa-Lok™ joint. Adaptors allow easy connections to other piping materials and joints.

All Yelomine™ fittings are compatible with respect to chemical resistance and pressure ratings with Yelomine™ pipe (see Section A). Spline couplings are as strong as the pipe with respect to both internal pressure and axial forces resulting from internal pressure.

Definitions & Abbreviations

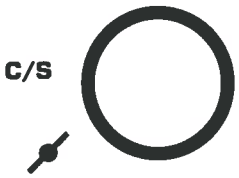
- C/L..... Certa-Lok
- C/LF ..... Certa-Lok Gasketed (female)
- C/LM .... Certa-Lok Grooved (male) Pipe End
- MIPT .... IPS (male) pipe thread (NPT)
- FIPT ..... IPS (female) pipe thread (NPT)
- SW.....Solvent Weld
- PE.....Plain End
- BE.....Bell End

Splines

DESCRIPTION	PRODUCT NUMBER
2" Certa-Lok Spline	23044
3" Certa-Lok Spline	23134
4" Certa-Lok Spline	23138 1
6" Certa-Lok Spline	23347
8" Certa-Lok Spline	23368 15
10" Certa-Lok Spline*	23400 15
12" Certa-Lok Spline*	23510 15
8" Spline Insertion Tool	23540
10" & 12" Spline Insertion Tool	23540 1

Permanent Use "O"-Ring

Maximum compression, high disassembly effort. Lubricant required to assemble.

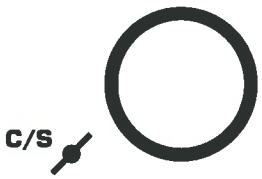


SIZE	MATERIAL	PRODUCT NUMBER
2"	IR	23043 1
3"	IR	23133 1
4"	IR	23238 01
6"	IR	23346 01
8"	IR	23368 1
10"	IR	23400 1
12"	IR	23510 1

IR–Polyisoprene Rubber

Non-Permanent Use "O"-Ring

Teflon coated for easy assembly. No lubricant required to assemble 2"–6".



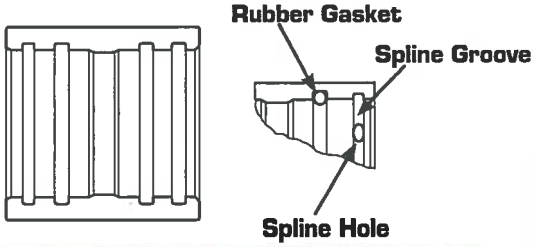
SIZE	MATERIAL	PRODUCT NUMBER
2"	NBR	23043
3"	NBR	23133
4"	NBR	23238
6"	NBR	23346
8"	IR	23368 1
10"	IR	23400 1
12"	IR	23510 1

NBR–Nitrile Butadiene Rubber
IR– Polyisoprene Rubber

Water, Sewer & Drain Fittings B-60

Restrained Joint PVC Pressure Fittings

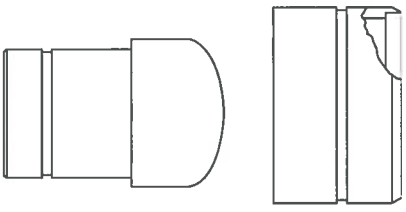
Yelomine™ Couplings (With Splines and "O"-Rings)



SIZE	PRESSURE RATING (psi)	NON-PERMANENT
2"	250	23042
3"	250	23132
4"	250	23237
6"	250	23345
8"	200	23368
10"	160	23400
12"	160	23510

SIZE	PRESSURE RATING (psi)	PERMANENT USE
2"	250	23042 05
3"	250	23132 05
4"	250	23237 05
6"	250	23345 05
8"	200	23368 05
10"	160	23400 05
12"	160	23510 03

Certa-Lok End Plug

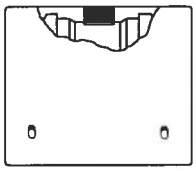


2" & 8" 10" & 12"

SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	250	23084
3	250	23132 9
4	250	23288
6	250	23355
8	200	23368 9
10	160	23410
12	160	23520

Certa-Lok Tapped Couplings

(C/L Female x C/L Female) (FIPT Outlet)

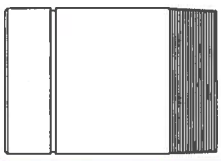


SIZE (in.)	OUTLET SIZE (in.)	PSI RATING (psi)	PRODUCT NUMBER USE	
			NON-PERMANENT	PERMANENT
2 × 2	¾	200	23052	23042 34
2 × 2	1	200	23042 35	23042 36
3 × 3	¾	200	23132 32	23132 33
3 × 3	1	200	23132 34	23132 35
3 × 3	1½	160	23132 36	23132 37
4 × 4	¾	200	23373	23273 01
4 × 4	1	200	23373 02	23273 03
4 × 4	1½	160	23373 04	23273 05
6 × 6	¾	200	23323	23323 01
6 × 6	1	200	23323 02	23323 03
6 × 6	1½	200	23323 04	23323 05
8 × 8	1	200	23368 44	23368 45
8 × 8	1½	200	23368 46	23368 47
8 × 8	2	160	23368 48	23368 49
10 × 10	1½	160	23400 42	23400 43
10 × 10	2	160	23400 44	23400 45
12 × 12	1½	160	23510 42	23510 43
12 × 12	2	160	23510 44	23510 45

NOTE: Maximum outlet sizes are as shown above. Outlet sizes ½", ¾", 1", 1¼" if not shown above are available on a special order basis only. Contact your local Team EJP sales office for price and availability.

Certa-Lok Nipple

(C/L Male x Male Pipe Threads (NPT))



SIZE	PRESSURE RATING (psi)	PRODUCT NUMBER
2"	200	23011
3"	190	23102
4"	160	23277
6"	120	23351
8"	110	23368 18

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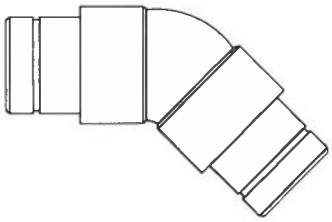
Restrained Joint PVC Pressure Fittings

Certa-Lok 45° Ells

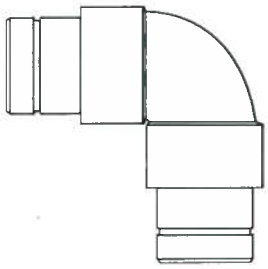
(C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	160	23035
2	250	23035 1
3	160	23135 1
3	250	23135 2
4	250	23231 1
6	250	23313
8	200	23369 1
10	200	23405 1
12	200	23515 1

Certa-Lok 90° Ells

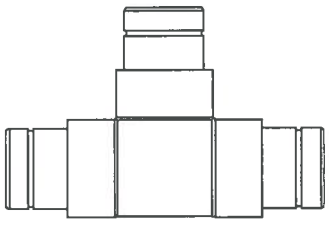
(C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	160	23022
2	250	23022 1
3	160	23135 4
3	250	23135 5
4	250	23218
6	250	23305
8	200	23369 3
10	200	23405 3
12	200	23515 3

Certa-Lok Tee

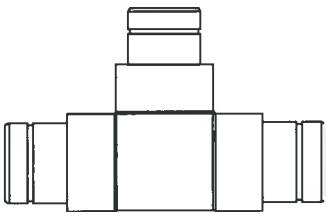
(C/L Male x C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2 × 2 × 2	160	23047
2 × 2 × 2	250	23047 1
3 × 3 × 3	160	23136
3 × 3 × 3	250	23136 1
4 × 4 × 4	250	23245
6 × 6 × 6	250	23320 1
8 × 8 × 8	250	23370
10 × 10 × 10	200	23407
12 × 12 × 12	200	23517

Certa-Lok Reducing Tee

(C/L Male x C/L Male x C/L Male)

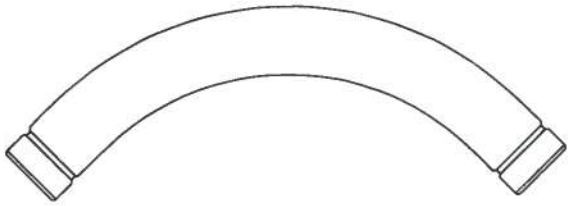


SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
3 × 3 × 2	250	23136 2
4 × 4 × 2	250	23268
4 × 4 × 3	250	23268 1
6 × 6 × 2	250	23336
6 × 6 × 3	250	23336 1
6 × 6 × 4	250	23334
8 × 8 × 6	200	23370 1

Restrained Joint PVC Pressure Fittings

Certa-Lok 90° Sweep Bend

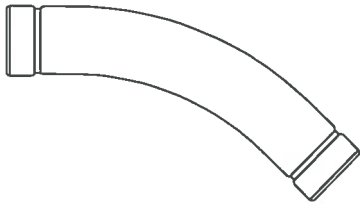
(C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	250	23022 2
3	250	23135 6
4	250	23218 1
6	250	23305 1
8	200	23369 4
10	160	23405 4
12	160	23515 4

Certa-Lok 45° Sweep Bend

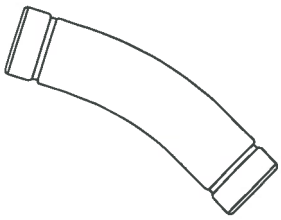
(C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	250	23035 2
3	250	23135 3
4	250	23231 2
6	250	23313 1
8	200	23369 2
10	160	23405 2
12	160	23515 2

Certa-Lok 22½° Sweep Bend

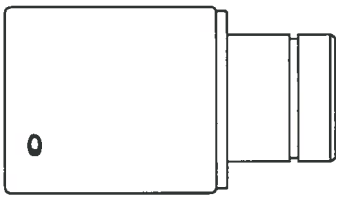
(C/L Male x C/L Male)



SIZE (in.)	PRESSURE RATING (psi)	PRODUCT NUMBER
2	250	23036
3	250	23135
4	250	23233
6	250	23315
8	200	23369
10	160	23405
12	160	23515

Certa-Lok Reducer

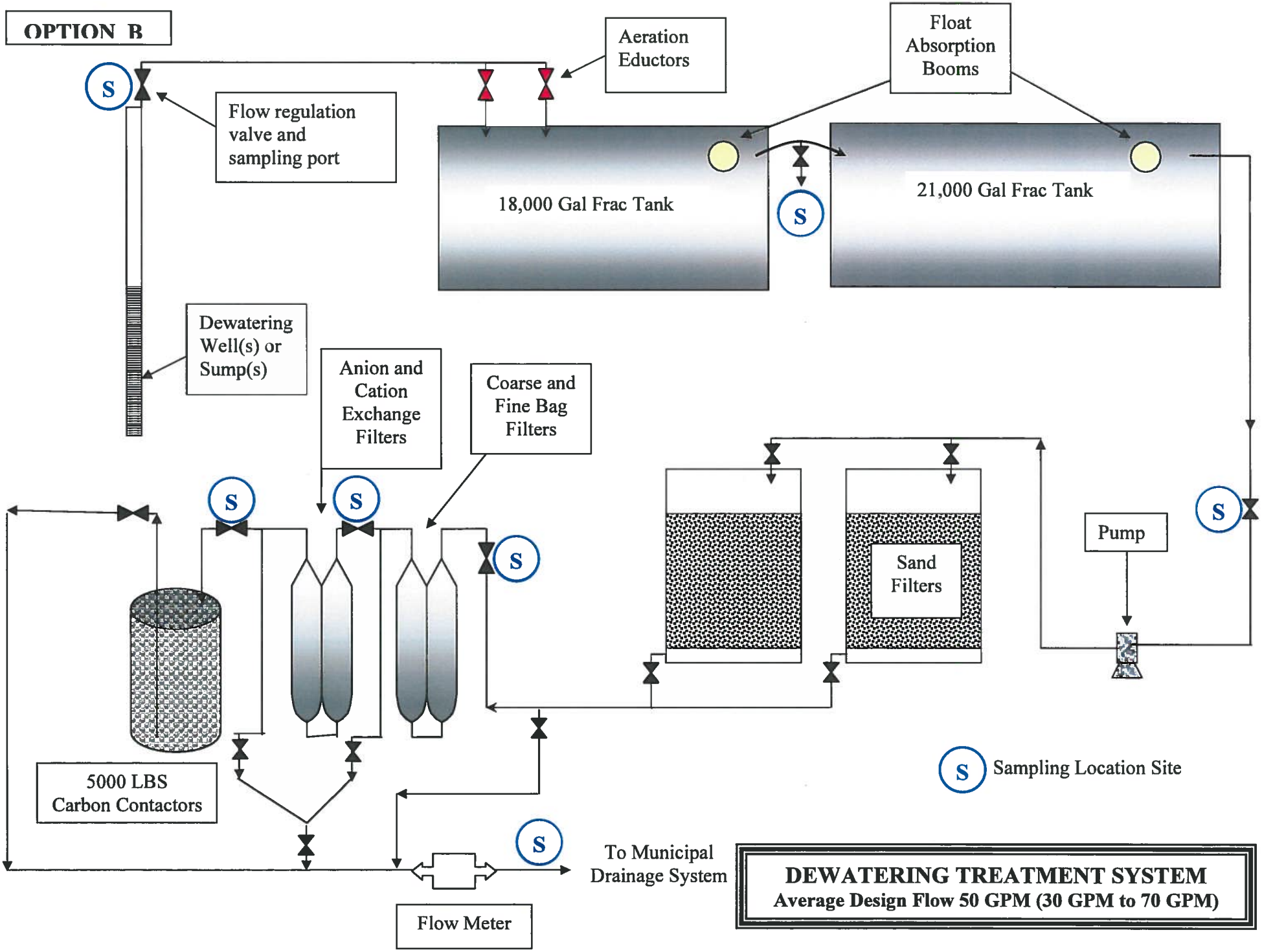
(C/L Female x C/L Male)

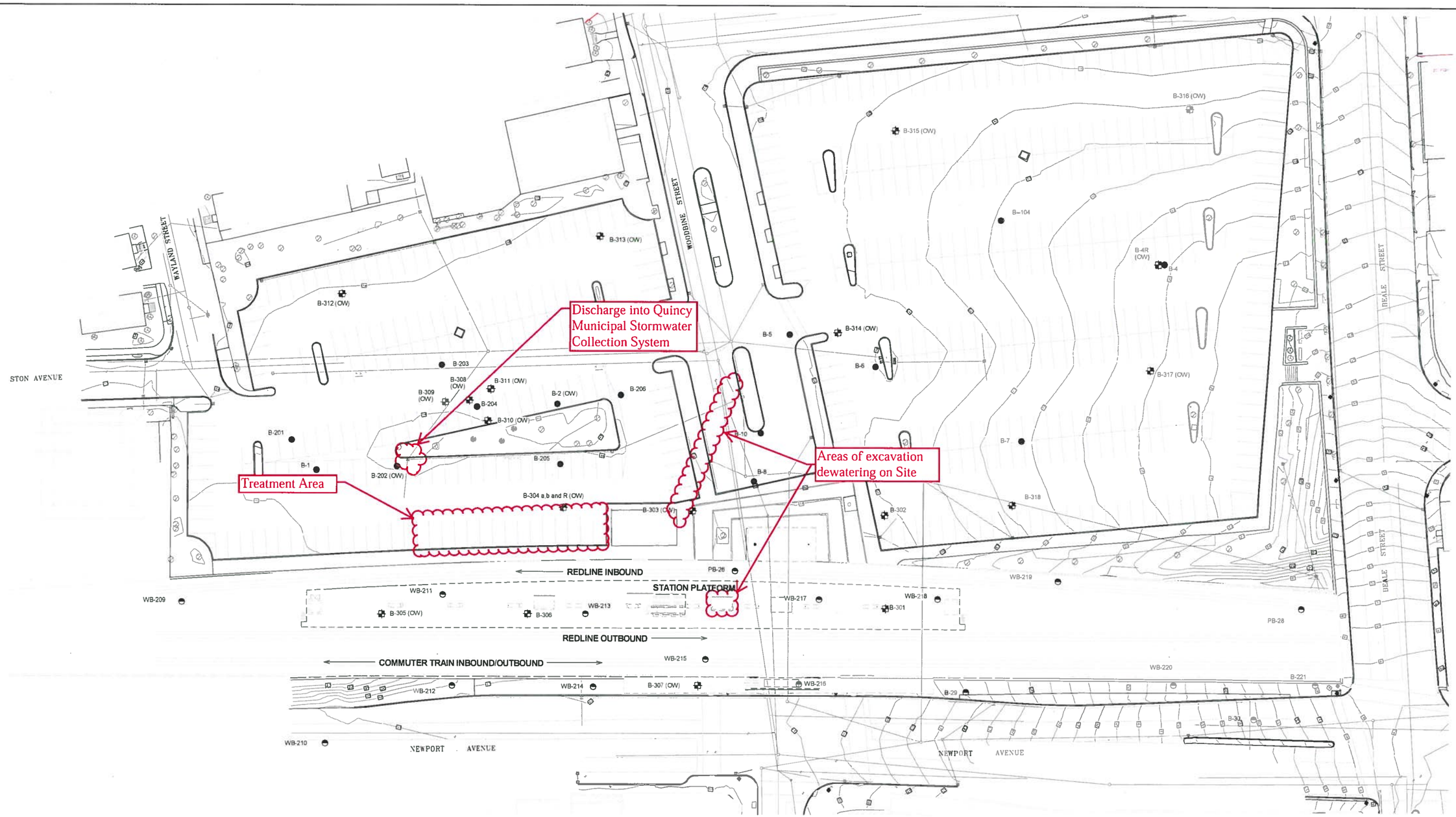


SIZE (in.)	PSI	PRODUCT NUMBER	
		NON-PERMANENT USE	PERMANENT USE
4 × 2	250	23244 15	23244 20
4 × 3	250	23244	23244 1
6 × 2	250	23346 60	23346 61
6 × 4	250	23346 62	23346 63
8 × 2	200	23368 70	23368 71
8 × 4	200	23368 72	23368 73
8 × 6	200	23368 74	23368 75
10 × 8	160	23400 70	23400 71
12 × 8	160	23510 70	23510 71

APPENDIX F

Option B Treatment Scheme


OPTION B
Aeration Eductors
Float Absorption Booms
Flow regulation valve and sampling port
18,000 Gal Frac Tank
21,000 Gal Frac Tank
Dewatering Well(s) or Sump(s)
Anion and Cation Exchange Filters
Coarse and Fine Bag Filters
Sand Filters
Pump
5000 LBS Carbon Contactors
S
Sampling Location Site
Flow Meter
To Municipal Drainage System
DEWATERING TREATMENT SYSTEM
Average Design Flow 50 GPM (30 GPM to 70 GPM)



Detailed Location Map - Option B
(Discharge into Stormwater Collection System)

LEGEND

- APPROXIMATE LOCATION OF BORING ADVANCED BY C.L. GUILD DRILLING AND BORING CO. INC. OF BRAINTREE, MA. BORING LOCATIONS BASED ON DRAWING TITLED "RETAINING WALLS GENERAL PLAN," DATED DECEMBER 8, 1967, PREPARED FOR THE MBTA SOUTH SHORE PROJECT AREA 3, WOLLASTON STATION COMPLEX BY CLARKSON, CLOUGH & YOKEL.
- APPROXIMATE LOCATION OF BORING ADVANCED BY CARR-DEE CORP. OF MEDFORD, MA, AND OBSERVED BY KLEINFELDER IN 2013 FOR THE MBTA WOLLASTON STATION STORM AND SANITARY SEWER IMPROVEMENTS PROJECT.
- APPROXIMATE LOCATION OF BORING ADVANCED BY GEOLOGIC EARTH EXPLORATIONS, INC. OF NORFOLK, MA AND OBSERVED BY KLEINFELDER IN 2015 FOR THE MBTA WOLLATON STATION IMPROVEMENTS PROJECT.

(OW) INDICATES A GROUNDWATER OBSERVATION WELL WAS INSTALLED AT THE BORING LOCATION.

C:\Users\AMoreira\Documents\ARCH_MBTA_Wollaston_Central_amoreiraDFR6T.rvt

7/20/2016 5:23:21 PM

Refer to Option A for treatment components anticipated to be in place prior to initiation of this Option B alternative (if warranted).

Steel Tank

Flat Top Corrugated Wall

Overview:

Store water for frac sites, groundwater remediation projects, or other temporary applications with this easy to clean 21,000 gallon flat top, smooth wall tank.

Features:

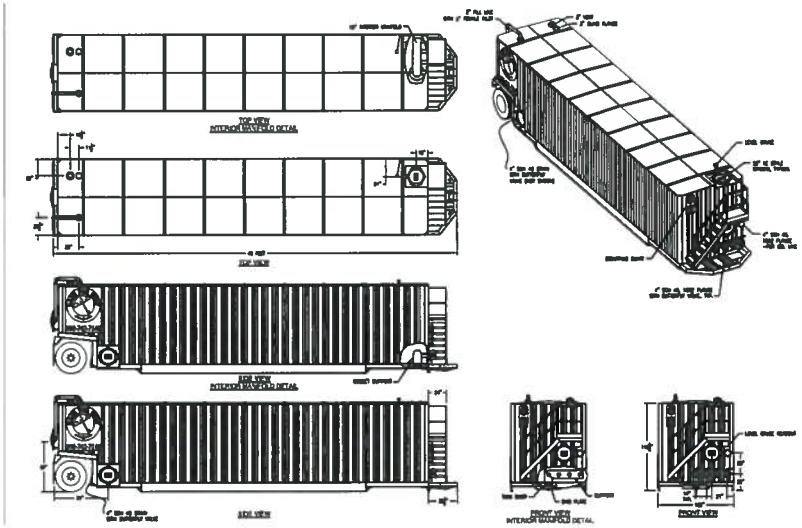
Store liquids with confidence with Rain for Rent's 21,000 gallon flat top tank. Permanently attached axels for maximum maneuverability allow this 21,000 gallon tank to be moved with ease on the jobsite and a safety staircase ensures proper protection for workers on site.

Specs:

Material	Steel
Capacity	21,000 gallons
Dry weight	26,000 lbs.
Footprint:	516" x 96" x 141"

Accessories:

- Spillguard
- Suction and discharge hoses
- Level gauges
- Steam coils



PUMPS • TANKS • FILTRATION • PIPE • SPILLGUARDS

Liquid ingenuity.™

800-742-7246

rainforrent.com

21,000 GALLON WORKSAFE ™ STEEL BI-LEVEL TANK

Features

- Unique safety stairway
- Totally enclosed tank
- Quick Kleen "V" shaped floor with two 4" valves at floor level
- Easy to move
- Optional vapor tight features and liquid level gauge
- Optional steam coils

Technical

WORKSAFE™ Bi-Level steel tanks are available with or without an epoxy coated interior. This tank has a "V" shaped Quick Kleen floor which allows any residual fluid in the tank to be easily flushed out the floor level 4" valves. Staircase guard rails and three 22" confined space entry hatches are standard equipment. Optional epoxy coatings offer increased chemical resistance and higher degree of cleanliness for sensitive environmental applications. (Chemical resistance charts are available.) High strength steel walls hold fluids up to 16 pounds per gallon.

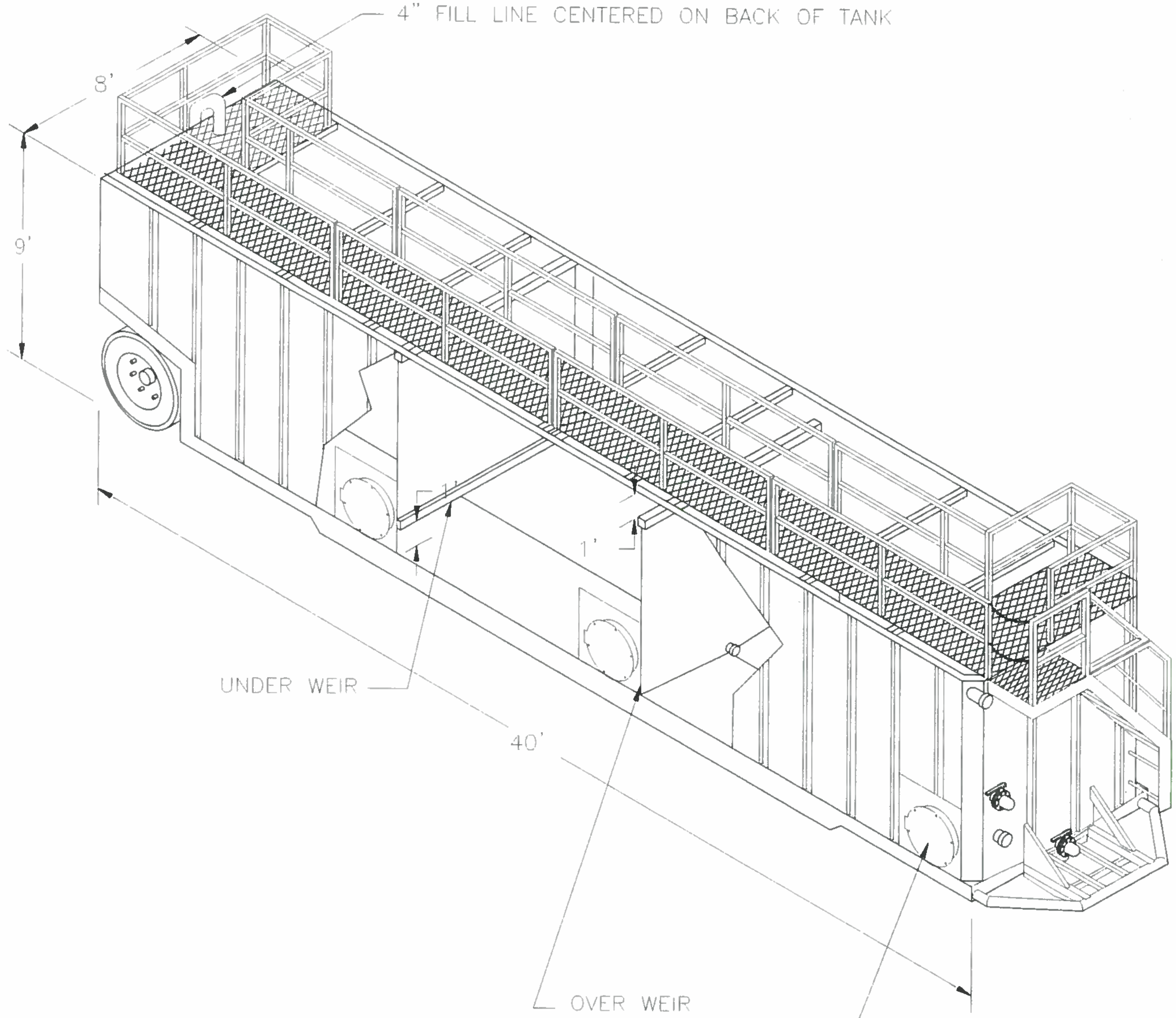
Material Specifications

Steel construction, totally enclosed, and optional internal two part epoxy coating. Two 4" butterfly valves with Buna seals standard located at either end of the "V" shaped floor. Permanently attached axles for maximum maneuverability. Staircase attached to the front and a collapsible guard rail system on the roof of the tank. Optional level gauge. Vacuum pressure relief valve standard. Optional vapor recovery fitting. Three 22" vapor tight access hatches. Other gasket materials needs available to match your application.

Rain for Rent
P.O. Box 2248
Bakersfield CA 93303
800-742-7246
661-393-1542
FAX 661-393-1542
www.rainforrent.com
info@rainforrent.com

REV NO.	DESCRIPTION	PREVIOUS DWG	BY	DATE

ITEM	QTY.	REF.	DESCRIPTION



DATE 1-1-2002
SCALE FULL
DRAWN

WEIR TANK

18,100 GALLON WORKSAFE TANK

DETAIL

Rain For Rent
Engineering

1 of 1

103422

1030004

WATER PUMPS DIRECT

Honda WH20 XT - 119 GPM (2") High Pressure Water Pump

In-Stock

Ships Monday, Aug 21st

Estimate Arrival

Enter Zip Go

Our Price

$699.00

As low as $22/month at 10% APR with Affirm

Tax-Free Guarantee

Except Illinois

Free Shipping

On This Product

Add To Cart

Model: WH20

What's This?

14 Reviews

Features | Specs | Q&A | Reviews | Articles | Shipping | Accessories

Inlet Size	Style	GPM	Engine
2"	DEWATERING	119 Gallons	

The Honda WH20X1 - 119 gpm (2") high pressure water pump is available for purchase today.

Read Honda WH20 reviews before checking out.

High Pressure, Centrifugal, Self-Priming Water Pump - 84 PSI Max

- Perfect for high-pressure applications like sprinklers or nozzles

Commercial Grade 163cc Honda OHV GX160 4-Cycle Engine

- Reliable, technologically advanced & easy to start
- Provides excellent torque & fuel efficiency

Rigged-Mounted Cast Iron Volute & Cast Iron Impeller

- Provides enhanced durability against wear & tear

Carbon/Ceramic Seals

- Abrasion-resistant designed for extended wear

Lightweight Aluminum Case

- Provides a sturdy base and reduces overall weight

Tubular Steel Roll Cage

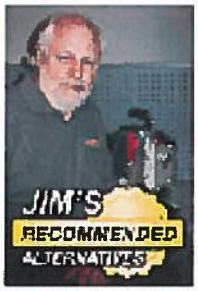
- Heavy-duty design provides protection and makes it easier to move

4.9 ★★★★★ Google Customer Reviews

EPA Approved & CARB Compliant

3-Year Residential & Commercial Warranty

- Strainer Included



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$219.00

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Shop for the Honda WH20XT - 119 GPM (2") High Pressure Water Pump at Water Pumps Direct. Research Honda 7265102001700gas dewatering water pumps online. Find Honda WH20XTAF gas dewatering water pumps & 2" high pressure water pump features and specifications. Compare Honda WH20 prices now. Buy the WH20XTAF now and save.

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Typical Honda Pump Applications

	DE-WATERING			MULTI-PURPOSE	CONSTRUCTION		SUBMERSIBLE
	LIGHTWEIGHT	GENERAL PURPOSE	HIGH PRESSURE		TRASH	DIAPHRAGM	ELECTRIC
Type of Water	WX	WB	WH	WMP*	WT	WDP	WSP
Clear Water***	✔	✔	✔	✔	✔	✔	✔
Slimy Water	✔	✔	✔	✔	✔	✔	✔
Muck Water	✔	✔	✔	✔	✔	✔	✔**
Silt Water		✔	✔	✔	✔	✔	✔
High Solid Content					✔	✔	✔**
Slow Seepage						✔	✔
Fast Seepage	✔	✔	✔	✔	✔		
Manholes		✔	✔	✔	✔	✔	✔
Cofferdams		✔	✔	✔	✔	✔	
Quarries		✔	✔	✔	✔	✔	
Septic Tank					✔	✔	✔
Industrial/Agriculture Chemical Dispersement*				✔			
Supply to:							
Mixer or Paver		✔	✔	✔	✔		
Concrete Curing	✔	✔	✔	✔	✔		
Water Wagons***		✔	✔	✔	✔		
Sprinklers or Nozzle	✔		✔				

* See approved chemical applications on pump specifications page.
** WSP50AA and WSP100AA only
*** Non-potable only

Always use the Honda-supplied strainer.

Tough, rugged, reliable. And they clean up nicely, too.

It all starts with the legendary Honda four-stroke engine because, let's face it, that's the heart of any pump. These engines have long been recognized as the industry leader in providing reliable, quiet and fuel-efficient power.

Why are the engines on Honda pumps better?

Reliability. Our four-stroke technology absolutely sets the standard for reliability. That's precisely why rental shops and working professionals greatly prefer Honda equipment. There's virtually no downtime and they last longer than you can even imagine.

Fuel Efficient and Quiet. The fact that our four-strokes are exceptionally fuel efficient and quiet are two more attributes. On the job site, this counts for a lot.

Easy to Start. Honda is also easy to start and easy to use. All of our pumps and engines are perfectly matched and Honda-engineered for quality and precision.

With a Honda engine providing the power, we've put together a line of 16 different portable pumps to cover almost any usage, from de-watering to multi-purpose, even submersible.

Check out the following pages to learn more about Honda Pumps. You'll quickly see why Honda is the smart choice for you.

De-Watering Pumps

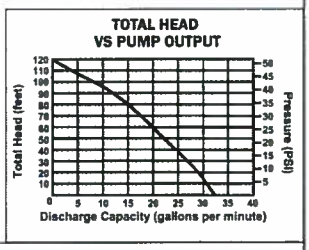
Honda de-watering pumps are designed for applications including irrigation, flood control, light construction, and swimming pool draining. Choose from an extensive selection of models with different features, pumping capacity and technical characteristics. With all these choices, there's no doubt you'll find one that fits your needs perfectly. Plus, every one of these pumps is compact, lightweight, and features something that professionals worldwide already count on – legendary Honda performance.

LIGHTWEIGHT PUMPS

Honda's WX series pumps are an excellent choice for homeowners, gardeners and boat owners. Powered by Honda's easy-starting, quiet-running mini four-stroke engine, these models deliver exceptional performance in a truly lightweight package.

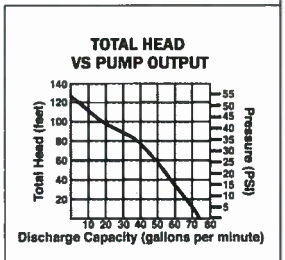
WX10T

- Lightweight aluminum pump – weighs only 13 lbs.
- 32 gal/min capacity
- Includes garden hose adaptor, 16.5' suction hose, clamps and strainer
- Powerful, easy-starting, Honda mini four-stroke engine
- Uses regular gasoline – no mixing of oil and gas



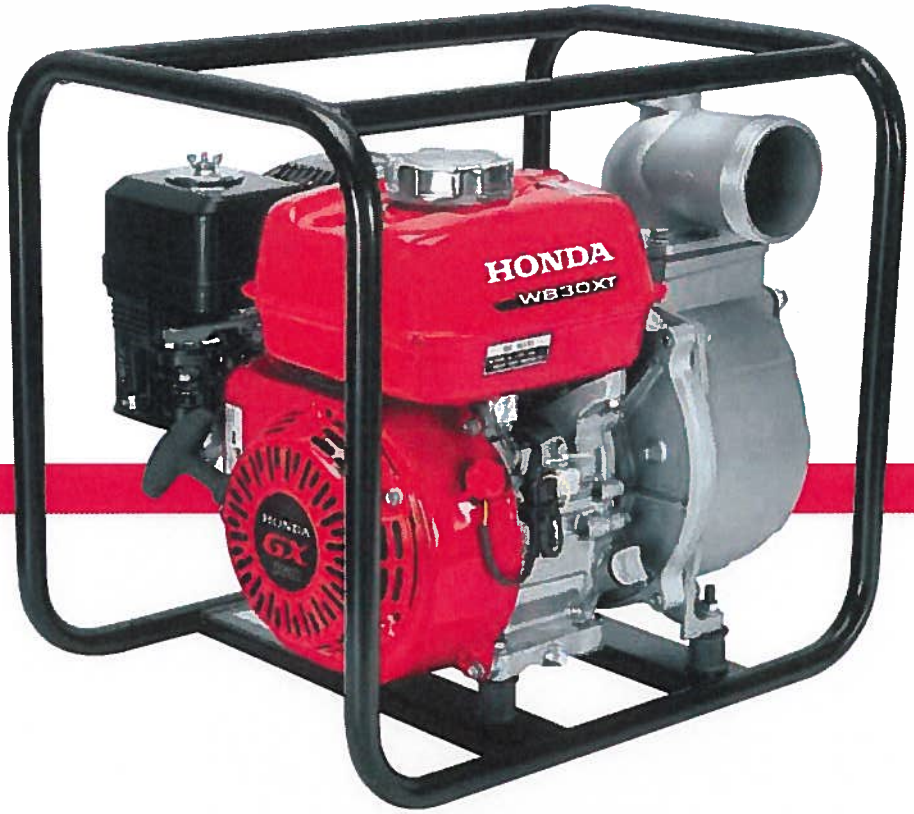
WX15T

- Lightweight aluminum pump – weighs only 20 lbs.
- 74 gal/min capacity
- Powerful, easy-starting, Honda mini four-stroke engine
- Protected by Honda Oil Alert®
- Hose clamps and strainer included



GENERAL PURPOSE PUMPS

Honda's WB series pumps offer the best features at a value price. Featuring Honda's commercial-grade engines and rugged full frame protection with anti-vibration mounts, these pumps feature a fixed-mounted cast iron volute and Honda-exclusive, 4-vane, high-efficiency impeller with a silicon carbide seal. This is the ultimate combination of features to provide unsurpassed performance and durability in the toughest conditions.



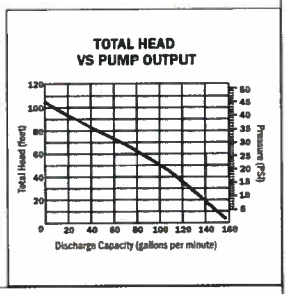
WB series pumps feature Honda's reliable, easy-to-start, commercial-grade overhead valve engines, backed by world-renowned Honda technology.

WB Series Features

High-performance mounts minimize vibration.

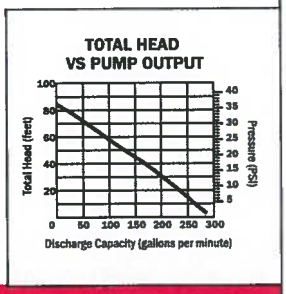
WB20XT3

- Centrifugal, self-priming 2" pump
- 164 gal/min capacity
- Easy-starting, Honda OHV commercial-grade engine
- Silicon carbide mechanical seal
- Cast iron volute and Honda-exclusive, 4-vane, high-efficiency impeller
- Heavy-duty full frame protection
- Isolation mounted engine and pump
- Protected by Honda Oil Alert®



WB30XT3

- Centrifugal, self-priming 3" pump
- 290 gal/min capacity
- Easy-starting, Honda OHV commercial-grade engine
- Silicon carbide mechanical seal
- Cast iron volute and Honda-exclusive, 4-vane, high-efficiency impeller
- Heavy-duty full frame protection
- Isolation mounted engine and pump
- Protected by Honda Oil Alert®



4-vane, Honda-designed, high-efficiency impeller for improved performance.

Silicon carbide mechanical seal for high durability.

The Honda WB strainer is large and allows 8 mm (5/16 in.) solids to pass and helps prevent clogging.

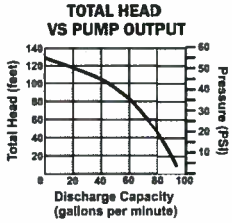
Honda Oil Alert® protects the engine by shutting it down if the oil level becomes too low.

HIGH-PRESSURE PUMPS

The WH series pumps offer high-pressure output, so they're perfect for high-pressure applications such as sprinklers or nozzles. High-pressure pumps are compact, easy to start, extremely reliable and feature a powerful Honda four-stroke commercial-grade overhead valve engine offering superior torque and fuel efficiency.

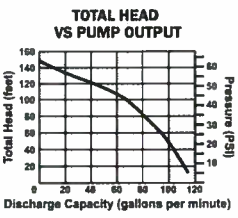
WH15XTA

- High-pressure (57 psi max.), centrifugal, self-priming 1.5" pump
- 98 gal/min capacity
- Easy-starting Honda OHV commercial-grade engine
- Lightweight aluminum case
- Cast iron impeller & volute
- Easy-carry handle



WH20XTAF

- High-pressure (64 psi max.), centrifugal, self-priming 2" pump
- 119 gal/min capacity
- Easy-starting Honda OHV commercial-grade engine
- Lightweight aluminum case
- Cast iron impeller & volute
- Full frame protection



Honda quiet

Thanks to the use of Honda four-stroke engines and superior technology, Honda water pumps offer smooth, quiet operation.

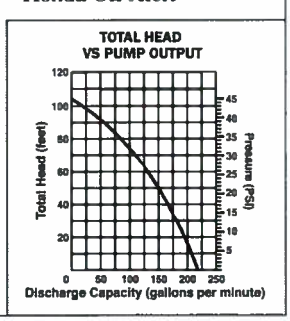
Multi-Purpose Pump

This versatile pump is specially designed to pump various industrial and agricultural chemicals* in addition to clear water applications. The WMP series pump features EPDM seals for chemical resistance, a reinforced thermoplastic pump housing and impeller, and full frame protection with vibration-damping mounts. This 2" pump features Honda's commercial-grade engine with Honda Oil Alert® to provide outstanding performance for chemical applications.

**See approved chemical applications on pump spec page.*

WMP20X1

- Multi-purpose, centrifugal self-priming 2" pump
- 220 gal/min capacity
- Honda OHV commercial-grade engine
- Thermoplastic pump housing and EPDM seals for chemical capability*
- Full frame protection
- Isolation mounted engine and pump
- Protected by Honda Oil Alert®



Construction Pumps

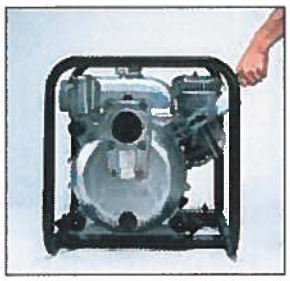
The construction and rental businesses have relied on Honda Pumps for over twenty years. Why? In a word, performance. They're so durable there's virtually no downtime, yet they're extremely long-lasting. When it comes to value, what more could you ask for? Well, how about full frame protection, Honda reliability and a complete selection of models offering pumping capabilities up to 423 gallons per minute.

You get it all with Honda.

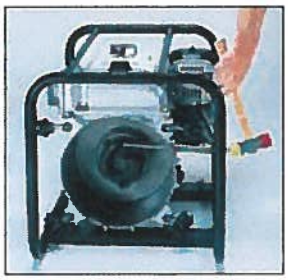
TRASH PUMPS

Honda trash pumps are specially designed for job sites and applications where high volume trash water capacity is required. Honda WT series pumps offer highly desired features including our legendary, easy-starting and reliable OHV commercial-grade engine, rugged full frame protection, quick release clean-out and durable silicon carbide mechanical seals. Other Honda WT features include a unique conical impeller for improved priming and durability, replaceable stainless steel wear plate for extended life and a convenient multi-tool for on-site pump servicing and clean-out.

WT Series Features

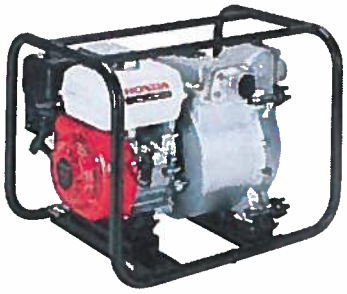


Convenient multi-tool for on-site pump servicing and clean-out.



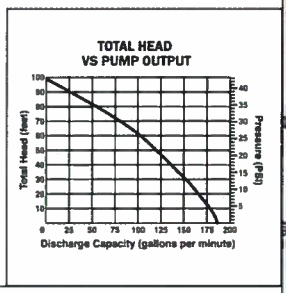
Easy service access port.

TRASH PUMPS



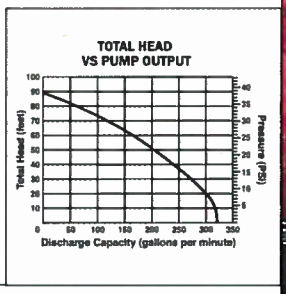
WT20XK4

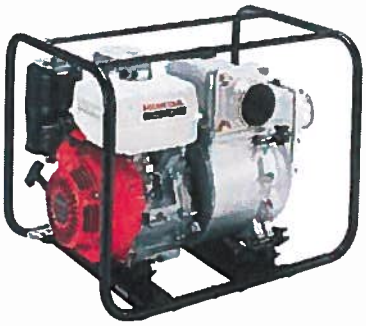
- Heavy-duty 2" construction trash pump
- Easy-starting Honda OHV commercial-grade engine
- 185 gal/min capacity
- Solid handling capability up to 13/16"
- Easy-to-use quick clean out port
- Easy-to-service impeller wear plate
- Standard strainer and service tool
- Protected by Honda Oil Alert®



WT30XK4

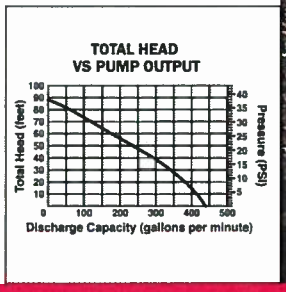
- Heavy-duty 3" construction trash pump
- Easy-starting Honda OHV commercial-grade engine
- Full frame protection
- 317 gal/min capacity
- Solid handling capability up to 1 1/16"
- Easy-to-use quick clean out port
- Standard strainer and service tool
- Easy-to-service impeller wear plate
- Protected by Honda Oil Alert®

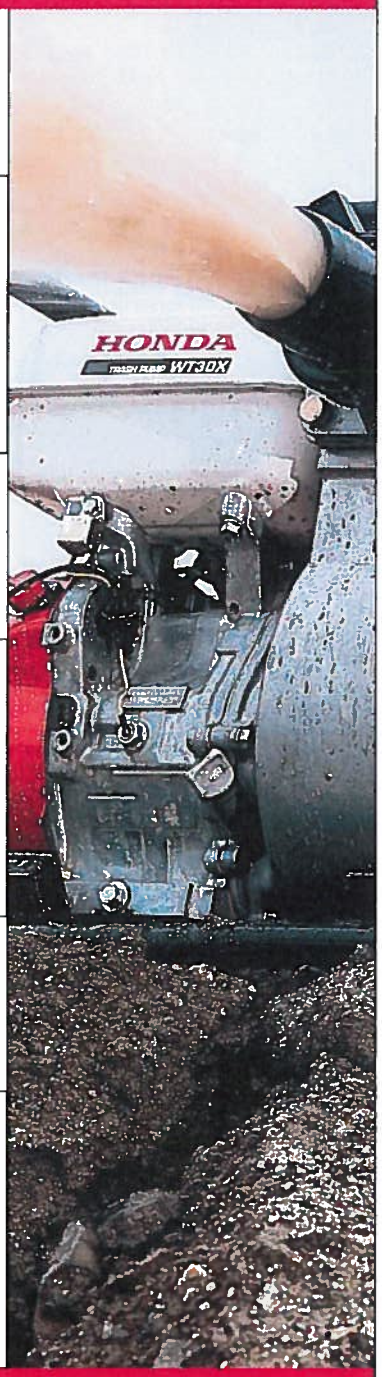




WT40XK3

- Heavy-duty 4" construction trash pump
- Easy-starting Honda OHV commercial-grade engine
- Full frame protection
- 423 gal/min capacity
- Solid handling capability up to 1 1/16"
- Easy-to-use quick clean out port
- Standard strainer and service tool
- Easy-to-service impeller wear plate
- Protected by Honda Oil Alert®





Silicon carbide mechanical seal for high durability.

High-performance mounts minimize vibration.

Rugged full frame.

Conical impeller and stainless steel wear plate for superior performance.

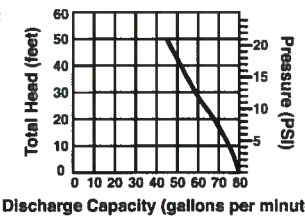
DIAPHRAGM PUMP

The Honda diaphragm pump is one of the most rugged and durable pump models available. The Honda self-priming, positive displacement diaphragm pump offers "run dry" capability and is ideally suited for muddy water, sludge or any water with a high percentage of solids. This pump offers an easy-starting, durable, Honda commercial-grade OHV engine. Superior performance and durability are the result of a unique combination of features including die cast aluminum case, air cushion chamber, special rock channel that allows solids to easily pass, spring-protected connecting rod to prevent case damage, rugged neoprene diaphragm with nylon insert and the ability to pass solids up to 2.4". With the standard wheel kit for easy transport, this pump offers an exceptional value for construction, water treatment and agricultural applications.

WDP30XK2AT

- Dry, self-priming 3" diaphragm pump
- Easy-starting Honda OHV commercial-grade engine
- Pumps up to 80 gallons per minute
- Special "rock channel" prevents case damage
- Spring protected connecting rod
- Perfect when low volume, run dry operation is required
- Protected by Honda Oil Alert®
- Wheel kit standard

TOTAL HEAD VS PUMP OUTPUT



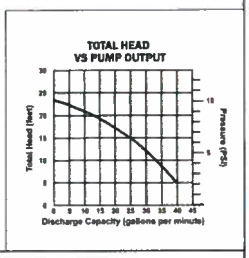
Submersible Pumps

The submersible line of Honda Pumps features high quality stainless steel casings, which means no rust or corrosion and a long life span. All five models are lightweight and offer truly automatic operation. They also feature built-in thermal resets to protect the pump from running dry. All five models feature a float switch, providing automatic starting for convenience. Honda offers top discharge and trash models to meet your application needs.

SUBMERSIBLE WATER PUMPS

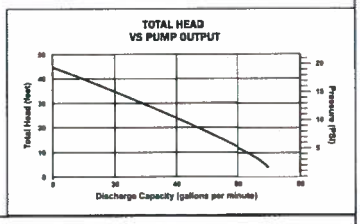
WSP33K1AA

- 1/3 hp, 115V submersible pump
- 40 gal/min capacity
- Lightweight and durable stainless steel casing
- Automatic non-mercury float switch
- Built-in thermal reset switch
- 20' heavy-duty cord
- Single oil filled mechanical seal construction
- Garden hose adaptor included
- UL listed



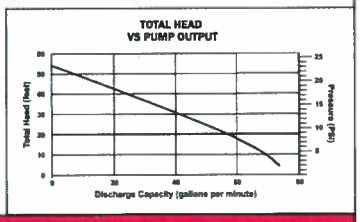
WSP53AA

- 1/2 hp, 115V submersible top discharge pump
- 70 gal/min capacity
- Automatic non-mercury float switch
- Lightweight and durable stainless steel impeller and case
- Rated for continuous duty use
- Double mechanical seal construction
- 50' heavy-duty cord
- UL listed



WSP73AA

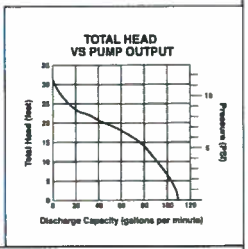
- 3/4 hp, 115V submersible top discharge pump
- 74 gal/min capacity
- Automatic non-mercury float switch
- Lightweight and durable stainless steel impeller and case
- Rated for continuous duty use
- Double mechanical seal construction
- 50' heavy-duty cord
- UL listed



SUBMERSIBLE TRASH PUMPS

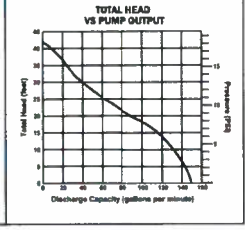
WSP50AA

- 1/2 hp, 115V submersible trash pump
- 110 gal/min capacity
- Lightweight and durable stainless steel casing
- Automatic non-mercury float switch
- Built-in thermal reset switch
- 25' heavy-duty cord
- 2" solids handling
- Double mechanical seal



WSP100AA

- 1 hp, 115V submersible trash pump
- 150 gal/min capacity
- Lightweight and durable stainless steel casing
- Automatic non-mercury float switch
- Built-in thermal reset switch
- 25' heavy-duty cord



WATER PUMP SPECIFICATIONS

	De-Watering				
	LIGHTWEIGHT		GENERAL PURPOSE		HIGH
Model	WX10T	WX15T	WB20XT3	WB30XT3	WH15SXTA
Honda 4-stroke, single cylinder, air cooled engine	GX25 OHV	GXH50 OHV	GX120 OHV	GX160 OHV	GX120 OHV
Displacement	25cc	49cc	118cc	163cc	118cc
Compression ratio	8.0:1	8.0:1	8.5:1	9.0:1	8.5:1
Honda Oil Alert®	N/A	Std	Std	Std	N/A
Pump type	Lightweight Centrifugal Self-priming	Lightweight Centrifugal Self-priming	General Purpose Centrifugal Self-priming	General Purpose Centrifugal Self-priming	High Pressure Centrifugal Self-priming
Volute	Aluminum	Aluminum	Rigid Mounted Cast Iron	Rigid Mounted Cast Iron	Rigid Mounted Cast Iron
Impeller	Aluminum	Aluminum	4 Vane Cast Iron	4 Vane Cast Iron	Cast Iron
Mechanical Seal (Pump case/impeller)	Carbon/Ceramic	Carbon/Ceramic	Silicon Carbide/ Silicon Carbide	Silicon Carbide/ Silicon Carbide	Carbon/Ceramic
Priming time	80 sec. at 16.4 ft.	120 sec. at 16.4 ft.	110 sec. at 16.4 ft.	150 sec. at 16.4 ft.	80 sec. at 16.4 ft.
Drive system	Direct	Direct	Direct	Direct	Direct
Discharge capacity	32 gal/min	74 gal/min	164 gal/min	290 gal/min	98 gal/min
Suction port diameter	1.0" NPT	1.5" NPT	2" NPT	3" NPT	1.5" NPT
Discharge port diameter	1.0" NPT	1.5" NPT	2" NPT	3" NPT	1.5" NPT
Total head lift	121 ft.	121 ft.	105 ft.	85 ft.	131 ft.
Suction head lift	26 ft.	26 ft.	25 ft.	25 ft.	26 ft.
Maximum pressure	52 psi	52 psi	45 psi	37 psi	57 psi
Maximum solids handling†	0.25"	0.25"	0.315"	0.315"	0.125"
Dimensions (LxWxH)	13.4" x 8.7" x 11.6"	14.0" x 10.8" x 14.8"	19.3" x 14.4" x 16.5"	20.1" x 15.2" x 17.9"	16.3" x 14.2" x 16.3"
Dry weight	13 lbs.	20 lbs.	44 lbs.	57 lbs.	49 lbs.
3-Year Limited Residential and Commercial Warranty			•	•	•

	Construction				Multi-Purpose
	TRASH			DIAPHRAGM	
Model	WT20XK4A	WT30XK4A	WT40XK3A	WDP30XK2AT	WMP20X1
Honda 4-stroke, single cylinder, air cooled engine	GX160 OHV	GX270 OHV	GX390 OHV	GX120 OHV	GX160 OHV
Displacement	163cc	270cc	390cc	118cc	163cc
Compression Ratio	9.0:1	8.5:1	8.2:1	8.5:1	9.0:1
Honda Oil Alert®	STD	STD	STD	STD	STD
Pump type	Trash Centrifugal Self-priming	Trash Centrifugal Self-priming	Trash Centrifugal Self-priming	Diaphragm Self-priming	Multi-Purpose Centrifugal Self-priming
Volute	Rigid Mounted Cast Iron w/ Stainless Wear Plate	Rigid Mounted Cast Iron w/ Stainless Wear Plate	Rigid Mounted Cast Iron w/ Stainless Wear Plate	N/A	Rigid Mounted Fiberglass Reinforced Polyester
Impeller	Conical Cast Iron	Conical Cast Iron	Conical Cast Iron	N/A	Fiberglass Reinforced Polyester
Mechanical seal (Pump case/impeller)	Silicon Carbide/ Silicon Carbide	Silicon Carbide/ Silicon Carbide	Silicon Carbide/ Silicon Carbide	N/A	Carbon/Ceramic
Priming time	60 sec. at 16.4 ft.	90 sec. at 16.4 ft.	150 sec. at 16.4 ft.	20 sec. at 20.0 ft.	65 sec. at 16.4 ft.
Drive system	Direct	Direct	Direct	Direct	Direct
Discharge capacity	185 gal/min	317 gal/min	423 gal/min	80 gal/min	220 gal/min
Suction port diameter	2" NPT	3" NPT	4" NPT	3" NPT	2" NPT
Discharge port diameter	2" NPT	3" NPT	4" NPT	3" NPT	2" NPT
Total head lift	85 ft.	82 ft.	82 ft.	50 ft.	102 ft.
Suction head lift	26 ft.	26 ft.	26 ft.	24 ft.**	26 ft.
Maximum pressure	37 psi	36 psi	36 psi	N/A	44 psi
Maximum solids handling†	0.8125"	1.0625"	1.0625"	2.4"	N/A
Dimensions (LxWxH)	24.4" x 18.1" x 18.3"	26.0" x 19.5" x 20.3"	28.9" x 21.1" x 22.2"	31.5" x 30.5" x 25.7"*	20.5" x 15.7" x 17.7"
Dry weight	104 lbs.	134 lbs.	172 lbs.	163 lbs.	57 lbs.
3-Year Limited Residential and Commercial Warranty	•	•	•	•	•
Wheel Kit	OPT	OPT	OPT	STD	N/A

†Based on included strainer spec * With handlebar over engine ** 16 ft dry, 24 ft primed

PRESSURE	Submersible					
WH20XTAF	WSP33K1AA	WSP53AA	WSP73AA	WSP50AA	WSP100AA	Model
GX160 OHV	Submersible Standard	Submersible Standard	Submersible Standard	Submersible Trash pump	Submersible Trash pump	Pump Type
163cc	Automatic	Automatic	Automatic	Automatic	Automatic	Starting Type
8.5:1	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Casing
N/A	1/3	1/2	3/4	1/2	1	Motor (HP)
High Pressure Centrifugal Self-priming	115	115	115	115	115	Voltage
Rigid Mounted Cast Iron	10	36	48	34	47	Starting amps
Cast Iron	4	9	12.2	8.3	11.1	Running amps
Carbon/Ceramic	Continuous	Continuous	Continuous	Continuous	Continuous	Duty
	Class F	Class F	Class F	Class F	Class F	Motor Insulation
80 sec. at 16.4 ft.	Built-In Thermal Automatic Reset	Built-In Thermal Automatic Reset	Built-In Thermal Automatic Reset	Built-In Thermal Automatic Reset	Built-In Thermal Automatic Reset	Overheat protection
Direct	40 gal/min	70 gal/min	74 gal/min	110 gal/min	150 gal/min	Discharge capacity
119 gal/min	23	44	54	32	42	Max. head (feet)
2" NPT	1.25 FNPT	1.5 FNPT †	1.5 FNPT †	2.0 FNPT	2.0 FNPT	Port diameter (inches)
2" NPT	10 psi	19 psi	23 psi	14 psi	18 psi	Maximum psi
148 ft.	0.375"	0.375"	0.375"	2.0"	2.0"	Solids handling
26 ft.	Glass-filled Noryl	Stainless Steel	Stainless Steel	Single Channel Stainless Steel	Single Channel Stainless Steel	Impeller
64 psi	Single Carbon Ceramic Upper/Rubber Lip Lower	Tandem Mechanical Carbon/Ceramic-upper SIC/SIC-lower	Tandem Mechanical Carbon/Ceramic-upper SIC/SIC-lower	Tandem Mechanical Carbon/Ceramic-upper SIC/SIC-lower	Tandem Mechanical Carbon/Ceramic-upper SIC/SIC-lower	Seals
0.125"	20	50	50	25	25	Cord length (feet)
20.5" x 15.7" x 18.1"	Heavy-Duty 115V	Heavy-Duty 115V	Heavy-Duty 115V	Heavy-Duty 115V	Heavy-Duty 115V	Cord type
60 lbs.	6.4" x 10.3"	8.3" x 17.2"	8.3" x 17.2"	9.0" x 21.5"	9.0" x 22.8"	Dimensions (WxH)
•	6.4"	8.3"	8.3"	9.0"	9.0"	Pump diameter
	11 lbs.	27 lbs.	27 lbs.	36 lbs.	41 lbs.	Dry weight (lbs.)

WMP20X1 Approved Pumping Applications

Industrial Chemicals

- Acetic Acid, 20%
- Aluminum Sulfate
- Ammonium Nitrate
- Ammonium Sulfate
- Barium Sulfate
- Borax (Sodium Borate)
- Calcium Chloride*
- Citric Acid
- Copper Sulfate
- Detergents (general)
- Ethylene Glycol
- Fatty Acids
- Ferric Nitrate
- Ferric Sulfate
- Ferrous Sulfate
- Formaldehyde, 40%
- Glycerine (Gycerol)
- Lactic Acid
- Lead Acetate
- Magnesium Chloride
- Magnesium Nitrate
- Magnesium Sulfate
- Maleic Acid
- Nickel Chloride
- Nickel Sulfate
- Oleic Acid
- Phosphoric Acid, 0-80%
- Potassium Carbonate
- Potassium Chloride
- Potassium Nitrate
- Potassium Sulfate
- Soaps (neutral)
- Sodium Acetate
- Sodium Bicarbonate
- Sodium Bisulfate
- Sodium Carbonate, 10%
- Sodium Chlorate
- Sodium Chloride
- Sodium Nitrate
- Sodium Silicate
- Sodium Sulfate
- Stearic Acid
- Sulfuric Acid, 0-29%
- Tartaric Acid
- Vinegar
- Water (clear)
- Water (salt)
- Zinc Sulfate

*Temperature does not exceed 27°C (80°F).

Agricultural Chemicals

- Aatrex
- Amiben
- Ammonium Thiosulfate
- Avenge
- Banvel
- Basagran
- Bicep
- Bladex
- Dual
- Eradicane
- Extrazine
- Larsban
- Lasso
- URAN Solutions
- Modown
- N-Serve 24
- Phosphoric Acid Solutions
- Poly-N
- Ranger
- Round-Up
- Sutan
- Treflan
- Vernam

- Do not use the WMP20X1 for pumping liquids for human consumption.
- After each use, drain the pump housing into a suitable container and flush with fresh water.
- The temperature operating range of the pump is between -7 and 54°C (20 and 130°F).

† 2" adaptor included

PUMP ACCESSORIES

BOXED PIN LUG HOSE KITS
INCLUDES 20' GREEN SUCTION, 50' BLUE DISCHARGE HOSE, 3/8" HOLE STEEL STRAINER
COUPLED WITH MALE & FEMALE PIN LUG COUPLINGS

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15	124015-1145-PINKT	1-1/2" PIN LUG SUCTION & DISCHARGE HOSE KIT
WB20X/WT20X/WMP20X/WDP20X	124020-1145-PINKT	2" PIN LUG SUCTION & DISCHARGE HOSE KIT
WB30X, WT30X, WDP30X	124030-1145-PINKT	3" PIN LUG SUCTION & DISCHARGE HOSE KIT
WT40X	124040-1145-PINKT	4" PIN LUG SUCTION & DISCHARGE HOSE KIT

BOXED PIN LUG HOSE KITS (WH SERIES PUMPS)
INCLUDES 20' GREEN SUCTION, 50' BLUE DISCHARGE HOSE, NOZZLE, 1/8" HOLE STEEL STRAINER
COUPLED WITH MALE & FEMALE PIN LUG COUPLINGS

PUMP MODEL	PART NUMBER	DESCRIPTION
WH15X (High Pressure)	124015H-1145-WHKT	1-1/2" PIN LUG SUCTION & DISCHARGE HOSE KIT
WH20X (High Pressure)	124020H-1145-WHKT	2" PIN LUG SUCTION & DISCHARGE HOSE KIT

BOXED CAMLOCK HOSE KITS
INCLUDES 20' GREEN SUCTION, 50' BLUE DISCHARGE HOSE, 3/8" HOLE STEEL STRAINER
COUPLED WITH CAMLOCK AND PIPE NIPPLE (INCLUDES MALE ADAPTERS)

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15	124015-1145-CLKT	1-1/2" CAMLOCK SUCTION & DISCHARGE HOSE KIT
WB20X/WT20X/WMP20X/WDP20X	124020-1145-CLKT	2" CAMLOCK SUCTION & DISCHARGE HOSE KIT
WB30X, WT30X, WDP30X	124030-1145-CLKT	3" CAMLOCK SUCTION & DISCHARGE HOSE KIT
WT40X	124040-1145-CLKT	4" CAMLOCK SUCTION & DISCHARGE HOSE KIT

GREEN PVC WATER SUCTION HOSE ASSEMBLIES
WITH A RIGID PVC REINFORCEMENT
SUCTION HOSE COUPLED MALE & FEMALE PIN LUG

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1240-1500-20H	1-1/2" X 20' GRN PVC, PIN LUG COUPLING
WB20X/WH20X/WT20X/WMP20X/WDP20X	1240-2000-20H	2" X 20' GRN PVC, PIN LUG COUPLING
WB30X, WT30X, WDP30X	1240-3000-20H	3" X 20' GRN PVC, PIN LUG COUPLING
WT40X	1240-4000-20H	4" X 20' GRN PVC, PIN LUG COUPLING

SUCTION HOSE COUPLED CAMLOCK AND PIPE NIPPLE

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1240-1500-20CNH	1-1/2" X 20' GRN PVC, CAMLOCK AND PIPE NIPPLE
WB20X/WH20X/WT20X/WMP20X/WDP20X	1240-2000-20CNH	2" X 20' GRN PVC, CAMLOCK AND PIPE NIPPLE
WB30X, WT30X, WDP30X	1240-3000-20CNH	3" X 20' GRN PVC, CAMLOCK AND PIPE NIPPLE
WT40X	1240-4000-20CNH	4" X 20' GRN PVC, CAMLOCK AND PIPE NIPPLE

DISCHARGE HOSE ASSEMBLIES
DISCHARGE HOSE COUPLED MALE & FEMALE PIN LUG

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1145-1500-50H	1-1/2" X 50' BLUE 90 PSI DISCH'G, PIN LUG COUPLING
WB20X/WH20X/WT20X/WMP20X/WDP20X	1145-2000-50H	2" X 50' BLUE 80 PSI DISCH'G, PIN LUG COUPLING
WB30X, WT30X, WDP30X	1145-3000-50H	3" X 50' BLUE 55 PSI DISCH'G, PIN LUG COUPLING
WT40X	1145-4000-50H	4" X 50' BLUE 50 PSI DISCH'G, PIN LUG COUPLING

DISCHARGE HOSE COUPLED CAMLOCK ASSEMBLIES

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1145-1500-50CEH	1-1/2" X 50' BLUE 90 PSI DISCH'G, (CAMLOCK)
WB20X/WH20X/WT20X/WMP20X/WDP20X	1145-2000-50CEH	2" X 50' BLUE 80 PSI DISCH'G, (CAMLOCK)
WB30X, WT30X, WDP30X	1145-3000-50CEH	3" X 50' BLUE 55 PSI DISCH'G, (CAMLOCK)
WT40X	1145-4000-50CEH	4" X 50' BLUE 50 PSI DISCH'G, (CAMLOCK)

HEAVY DUTY MILL HOSE
DISCHARGE HOSE COUPLED MALE & FEMALE PIN LUG

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1130-1500-50H	1-1/2" X 50' MILL 125 PSI DISCH'G, PIN LUG COUPLING
WB20X/WH20X/WT20X/WMP20X/WDP20X	1130-2000-50H	2" X 50' MILL 125 PSI DISCH'G, PIN LUG COUPLING
WB30X, WT30X, WDP30X	1130-3000-50H	3" X 50' MILL 125 PSI DISCH'G, PIN LUG COUPLING
WT40X	1130-4000-50H	4" X 50' MILL 125 PSI DISCH'G, PIN LUG COUPLING

HEAVY DUTY MILL HOSE
DISCHARGE HOSE COUPLED CAMLOCK ASSEMBLIES

PUMP MODEL	PART NUMBER	DESCRIPTION
WX15, WH15X	1130-1500-50CEH	1-1/2" X 50' MILL 125 PSI DISCH'G, (CAMLOCK)
WB20X/WH20X/WT20X/WMP20X/WDP20X	1130-2000-50CEH	2" X 50' MILL 125 PSI DISCH'G, (CAMLOCK)
WB30X, WT30X, WDP30X	1130-3000-50CEH	3" X 50' MILL 125 PSI DISCH'G, (CAMLOCK)
WT40X	1130-4000-50CEH	4" X 50' MILL 125 PSI DISCH'G, (CAMLOCK)

To see our complete line of Water Pump Accessories visit us online at www.powerequipment.honda.com

HONDA PUMPS

Visit us at www.pumps.honda.com

Rain for Rent

Model 36-2 SSK

Sand Media Filtration

Features

- Filter tanks are constructed out of 304 stainless steel
- Skid is constructed out of carbon steel with integral forklift slots
- Stainless steel inlet, outlet and backwash manifolds
- Corrosion resistant
- AC and DC powered automatic filter backwash controller that allows for timed, pressure differential or manual backwash intervals
- Equipped with continuous acting air vents
- System can stand alone or be used in combination with additional filtration equipment

Technical

- Consists of two 36" filter tanks
- Fitted with air vents and pressure gauges
- Tanks provide 14.2 square feet of filtration area
- Inlet and outlet manifold connection are 6" Victaulic
- Backwash manifold connection is 4" female NPT
- 8" media loading ports
- 8" media removal ports
- 100 psig working pressure
- 400 lbs. of gravel per tank
- 800 lbs. of sand per tank
- Most effective backwash rate is 110 GPM min.
- Footprint: ~120" long by ~48" wide
- Pressure sustaining valve to aid in backwash operation
- Solar battery charger for DC operation in remote locations

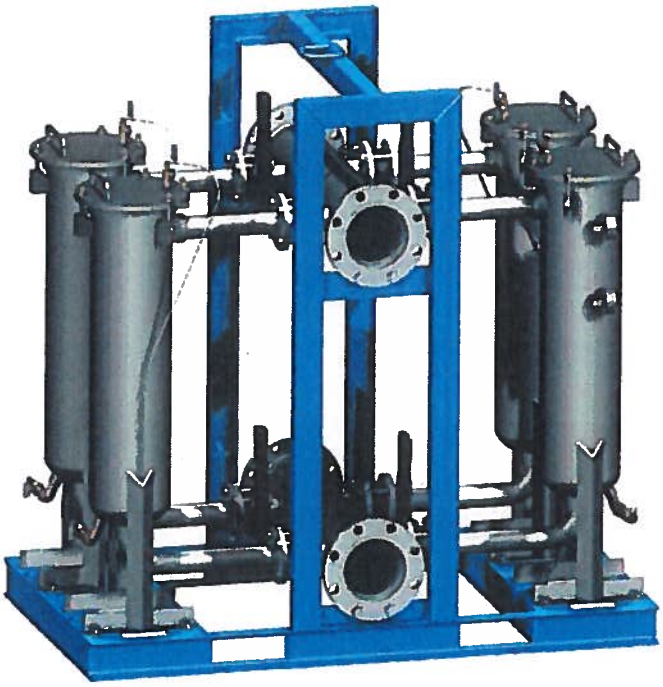
Maximum PSI: 100
Maximum Flow: 284 GPM

Available Accessories

- Power Prime Pumps
- Spill Guard Containment berms
- Stainless Steel 304 and Carbon Steel storage tanks in
- Bi-Level, Mixer, Weir and Manifold configurations
- Polyethylene storage tanks
- Cartridge and bag filters
- HDPE pipe and fittings
- Roll off boxes, dewatering bins and vacuum boxes
- Flow meters and pressure reducing/ sustaining valves
- Aluminum Victaulic pipe and fittings
- Suction and discharge hose

Rain for Rent
P.O. Box 2248
Bakersfield CA 93303
800-742-7246
661-393-1542
FAX 661-393-1542
www.rainforrent.com
info@rainforrent.com

BF 400
Up to 400 GPM



Features

- Manifold connections are 6" 150 lb flanges
- Quadruple bag filter
- Bag filter for high solids holding capacity
- Replaceable bag filters from 100 to 1 micron nominal rating
- No moving parts
- Skid mounted

Technical

- Bag filter chambers connect in parallel
- Units are fitted with bleed valves and pressure gauges
- System can stand alone for sediment removal or be used in combination with filter equipment
- Footprint: 62" long x 36" wide x 61" high
- Dry weight: 1,150 lbs.

Material Specifications

- Chambers constructed of 304 Stainless Steel
- Piping constructed of 304 stainless steel
- Each bag filter chamber holds one (1) 7" x 30" double- stitched filter bag
- Maximum operating pressure: 125psi
- Stainless Steel inlet and outlet manifolds

Available Accessories

- Power Prime Pumps
- Spill Guard Containment berms
- Stainless Steel 304 and Carbon Steel storage tanks in
- Bi-Level, Mixer, Weir and Manifold configurations
- Polyethylene storage tanks
- Cartridge and bag filters
- HDPE pipe and fittings
- Roll off boxes, dewatering bins and vacuum boxes
- Flow meters and pressure reducing/ sustaining valves
- Aluminum Victaulic pipe and fittings
- Suction and discharge hose

Rain for Rent
P.O. Box 2248
Bakersfield CA 93303
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661-393-1542
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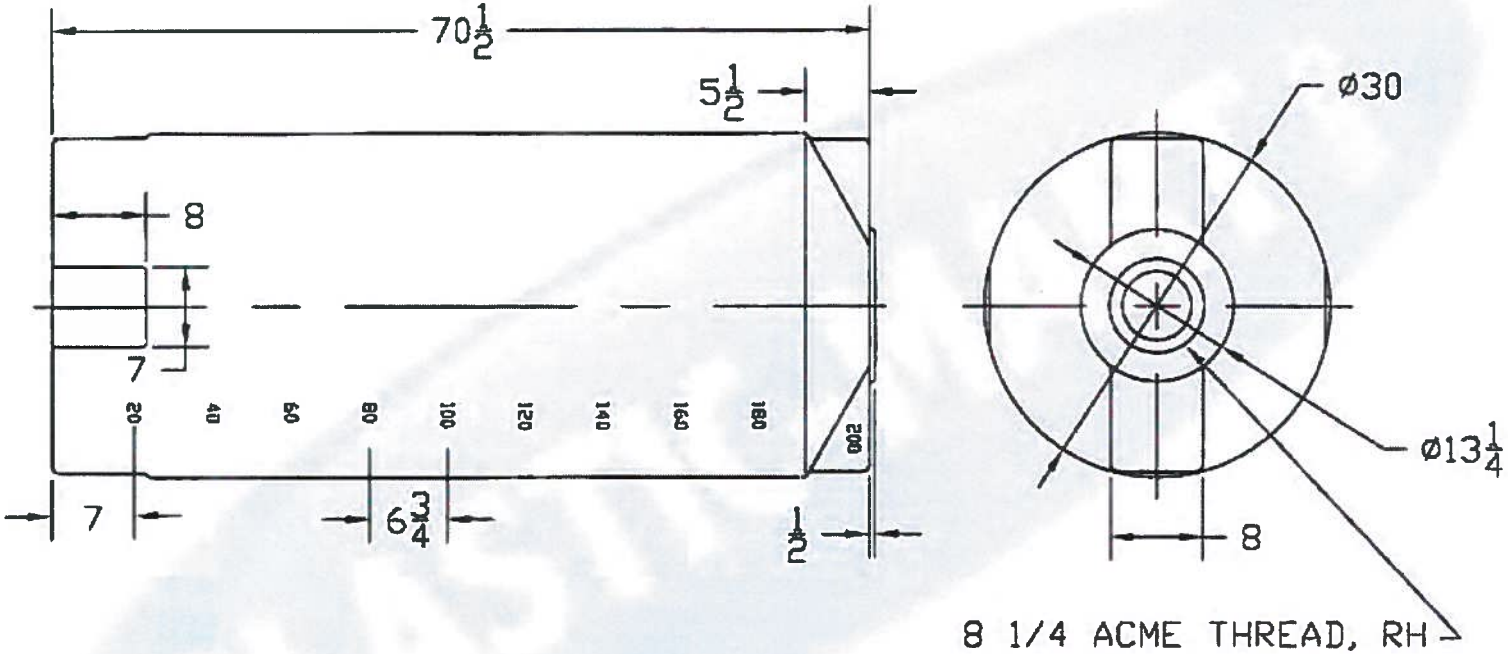
www.rainforrent.com
info@rainforrent.com

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



PLASTIC-MART | 866-310-2556

200 GALLON VERTICAL TANK X 30 DIA

JTP 11JUL03	SIZE A	FSCM NO.	DWG NO.	REV
	SCALE 1/16		SHEET	

Tetrasolv Filtration

Our Company | News | Catalog | Services | RFQs | Contact

Catalog

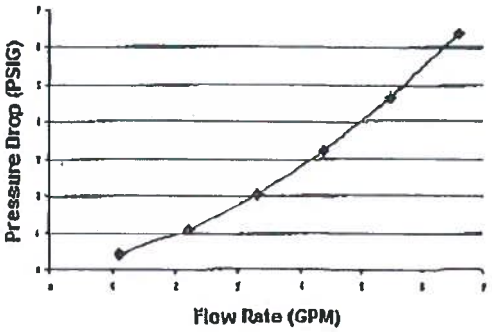
Contents:

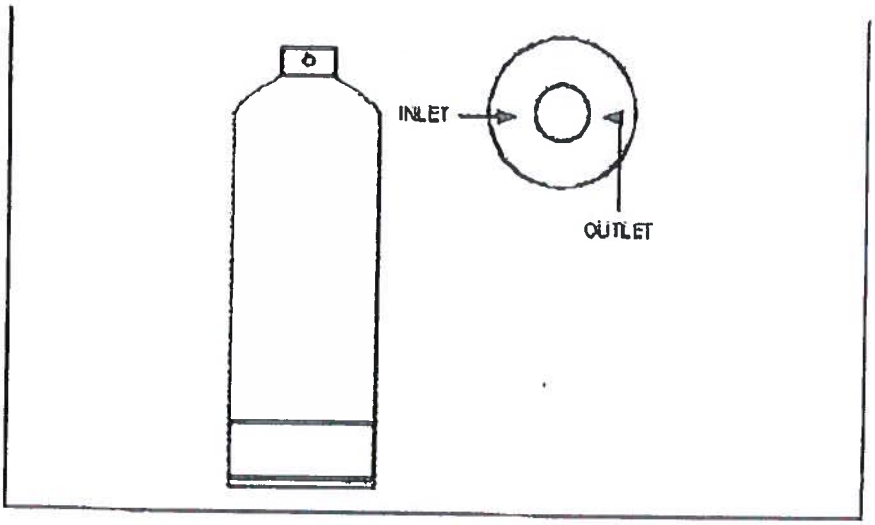
HPP SERIES FILTERS
MODEL HPP-100

The HPP-100 filter is a media filter vessel designed to treat liquid streams. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. Some applications include:

- Dissolved Organic Removal (Activated Carbon)
- Suspended Solids Removal (Sand Filter)
- Dissolved Minerals (Softener Resin)
- Oil and Grease Removal (Organo-Clays)
- Dissolved and Precipitated Metals Removal
- Special Organics (Resin/Carbon Blend)
- Catalytic Reactor (Chlorine and Peroxide Removal)
- Bio-Remediation Contactor Unit

PRESSURE DROP GRAPH
*(As Filled - 8*30 GAC)*





HPP-100 SPECIFICATIONS			
Overall Height	4'7"	Vessel/Internal Piping Materials	Polyetheylene / SCH40 PVC
Diameter	12"	Internal Coating	Polyamide Epoxy Resin
Inlet / Outlet (FNPT)	3/4"	External Coating	Polyetheylene
Drain / Vent (FNPT)	NA	Maximum Pressure / Temp	125 PSIG / 120° F
GAC Fill (lbs)	100	Cross Sectional Bed Area	0.7 FT^2
Shipping / Operational Weight (lbs)	130/245	Bed Depth/Volume	4.7 FT / 3.3 FT^3

Tetrasolv Filtration, Inc. • 1200 East 26th Street • Anderson, Indiana 46016 • USA
Toll Free: 800-441-4034 Telephone: 765-643-3941 • Fax: 765-643-3949
www.tetrasolv.com • info@tetrasolv.com

RESINTECH INC.
INNOVATIONS IN ION EXCHANGE

MATERIAL SAFETY DATA SHEET

ION EXCHANGE RESINS

Product Name: CG10-H, CG10-H-ULTRA, CG10-H-LTOC, CG10-H-SC, CG10-H-NG, CG10-H-C, CG10-H-F, CG10-H-UPS, CG8-H, CG8-H-ULTRA, CG8-H-LTOC, CG8-H-SC, CG8-H-NG, CG8-H-C, CG8-H-F, CG8-H-UPS, CGS-H, CGS-H-C, CGS-H-F, CGS-H-UPS, CG6-H, GP-SAC-H

Cation Exchange Resin, Hydrogen Form

Effective Date: 11/1/07

1. Company Information:

Company Address:

ResinTech, Inc.
1 ResinTech Plaza
160 Cooper Road
West Berlin, NJ 08091 USA

Information Numbers:

Phone Number: 856-768-9600
Fax Number: 856-768-9601
Email: ixresin@resintech.com
Website: www.resintech.com

2. Composition/Ingredients:

Sulfonated copolymer of styrene and divinylbenzene in the hydrogen form. CAS# 69011-20-7 (35 – 65%)

Water CAS# 7732-18-5 (35 – 65%)

This document is prepared pursuant to the OSHA Hazard Communication Standard (29CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

3. Physical/Chemical Data:

Boiling Point:	Not Applicable
Vapor Pressure (MM HG):	Not Applicable
Evaporation Rate (water = 1):	1
Appearance & Odor:	Amber solid beads. No to low odor.
Specific Gravity:	1.2 (water = 1)
Melting Point (deg. F)	Not applicable
Solubility in Water:	Insoluble
Thermal:	May yield oxides of carbon and nitrogen
Vapor Density:	Not Applicable

Product Hazard Rating	Scale
Toxicity = 0	0 = Negligible
Fire = 0	1 = Slight
Reactivity = 0	2 = Moderate
Special – N/A	3 = High
	4 = Extreme

4. Fire & Explosion Hazard Data

Flammable Limits:	800 ° Deg. F
Unusual Fire & Explosion Hazards:	Product is not combustible until moisture is removed, then resin starts to burn in flame at

	230 C. Autoignition occurs above 500C. Possible fire.
Combustion Products:	Hazardous combustion products may include and are not limited to: hydrocarbons, sulfur oxides, organic sulfonates, carbon monoxide, carbon dioxide, benzene compounds.
Extinguishing Media:	Water, CO_2, Talc, Dry Chemical
Special Fire Fighting Procedures:	MSHA/NIOSH approved self-contained breathing gear.

5. Reactivity Data

Stability:	Stable
Conditions to Avoid:	Temperatures above 400° F
Hazardous by Products:	See Section 3 above for possible combustion products.
Materials to avoid contact with:	Strong oxidizing agents (i.e. nitric acid)
Hazardous Polymerization:	Material does not polymerize
Storage:	Store in a cool dry place

6. Health Hazards & Sara (Right to Know)

Emergency First Aid Procedures:	Contact with eyes can and skins can cause irritation.
Skin Absorption:	Skin absorption is unlikely due to physical properties.
Ingestion:	Single dose oral LD50 has not been determined. Single does oral toxicity is believed to be low. No hazards anticipated from ingestion incidental to industrial exposure.
Inhalation:	Vapors are unlikely due to physical properties.
Systemic & Other Effects:	No specific data available, however, repeated exposures are not anticipated to cause any significant adverse effects.
Carcinogenicity:	Not Applicable
Sara – title 3, sections 311 & 312:	All ingredients are non-hazardous

7. First Aid

Eyes:	Irrigate immediately with water for at least 5 minutes. Mechanical irritation only.
Skin:	No adverse effects anticipated by this route of exposure.
Ingestion:	No adverse effects anticipated by this route of exposure incidental to proper industrial handling.
Inhalation:	No adverse effects anticipated by this route of exposure.

8. Control Measures

Respiratory protection:	Not required for normal uses if irritation occurs from breathing-get fresh air!
Eye protection:	Splash goggles
Ventilation:	Normal
Protective Gloves:	Not required.

9. Safe handling procedures

In Case of Spills:	Sweep up material and transfer to containers. Use caution – the floor will be slippery!

Disposal Method:	Bury resin in licensed landfill or burn in approved Incinerator according to local, state, and federal regulations. For resin contaminated with hazardous material, dispose of mixture as hazardous material according to local, state and federal regulations.

10. Additional Information:

Special precautions to be taken in handling and storage:	Practice reasonable care and caution. Metal equipment with feed, regenerant, resin form, and effluent of that process.
TSCA Considerations:	Every different salt or ionic form of an ion-exchange resin is a separate chemical. If you use an ion-exchange resin for ion-exchange purposes and then remove the by-product resin from its vessel or container prior to recovery of the original or another form of the resin or of another chemical, the by-product resin must be listed on the TSCA Inventory (unless an exemption is applicable). It is the responsibility of the customer to ensure that such isolated, recycled by-product resins are in compliance with TSCA. Failure to comply could result in substantial civil or criminal penalties being assessed by the Environmental Production Agency.
MSDS Status:	Canadian regulatory information added.

11. Regulatory Information: (Not meant to be all-inclusive—selected regulations represented.)

Notice:	The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

12. Canadian Regulations:

WHMIS Information:	The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is: This product is not a "Controlled Product" under WHMIS.
Canadian TDG Information:	For guidance, the Transportation of Dangerous Good Classification for this product is: Not Regulated.

Material Safety Data Sheet

RESINTECH, Inc.

Product Name: SBG1, SBG1-HP, SBG1-UPS, SBG1-C, SBG1P, SBG1P-HP, SBG1P-UPS, SBG1P-C, GP-SBA

Strong Base Anion Exchange Resin Chloride Form

1. Company Information:

Company Address:

ResinTech, Inc.
1 ResinTech Plaza
160 Cooper Road
West Berlin, NJ 08091 USA

Information Numbers:

Phone Number: 856-768-9600
Fax Number: 856-768-9601
Email: ixresin@resintech.com
Website: www.resintech.com

2. Composition/Ingredients:

Trimethylamine functionalized chlormethylated copolymer of styrene and divinylbenzene in the chloride form. **CAS# 60177-39-1 (35 – 65%)**

Water **CAS# 7732-18-5 (35 – 65%)**

This document is prepared pursuant to the OSHA Hazard Communication Standard (29CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

3. Physical/Chemical Data:

Boiling Point:	Not Applicable
Vapor Pressure (MM HG):	Not Applicable
Evaporation Rate (water = 1):	1
Appearance & Odor:	Light cream to light yellow. May have amine odor.
Specific Gravity:	1.2 (water = 1)
Melting Point (deg. F)	Not applicable
Solubility in Water:	Insoluble
Thermal:	May yield oxides of carbon and nitrogen
Vapor Density:	Not Applicable

Product Hazard Rating	Scale
Toxicity = 0	0 = Negligible
Fire = 0	1 = Slight
Reactivity = 0	2 = Moderate
Special – N/A	3 = High
	4 = Extreme

4. Fire & Explosion Hazard Data

Flammable Limits:	800 ° Deg. F
Unusual Fire & Explosion Hazards:	Product is not combustible until moisture is removed, then resin starts to burn in flame at 230 C. Autoignition occurs above 500C. Possible fire.
Combustion Products:	Alkylbenzenes, vinylbenzenes, naphthalene, benzaldehydes, phenol, carbon dioxide, water, organic amines, chlorine, nitrogen oxides, ammonia, methyl chloride.

Extinguishing Media:	Water, CO_2, Talc, Dry Chemical
Special Fire Fighting Procedures:	MSHA/NIOSH approved self-contained breathing gear.

5. Reactivity Data

Stability:	Stable
Conditions to Avoid:	Temperatures above 400° F
Hazardous by Products:	See Section 3 above for possible combustion products.
Materials to avoid contact with:	Strong oxidizing agents (i.e. nitric acid)
Hazardous Polymerization:	Material does not polymerize
Storage:	Store in a cool dry place

6. Health Hazards & Sara (Right to Know)

Emergency First Aid Procedures:	Contact with eyes can and skins can cause irritation.
Skin Absorption:	Skin absorption is unlikely due to physical properties.
Ingestion:	Single dose oral LD50 has not been determined. Single does oral toxicity is believed to be low. No hazards anticipated from ingestion incidental to industrial exposure.
Inhalation:	Vapors are unlikely due to physical properties.
Systemic & Other Effects:	No specific data available, however, repeated exposures are not anticipated to cause any significant adverse effects.
Carcinogenicity:	Not Applicable
Sara – title 3, sections 311 & 312:	All ingredients are non-hazardous

7. First Aid

Eyes:	Irrigate immediately with water for at least 5 minutes. Mechanical irritation only.
Skin:	No adverse effects anticipated by this route of exposure.
Ingestion:	No adverse effects anticipated by this route of exposure incidental to proper industrial handling.
Inhalation:	No adverse effects anticipated by this route of exposure.

8. Control Measures

Respiratory protection:	Not required for normal uses if irritation occurs from breathing-get fresh air!
Eye protection:	Splash goggles
Ventilation:	Normal
Protective Gloves:	Not required.

9. Safe handling procedures

In Case of Spills:	Sweep up material and transfer to containers. Use caution – the floor will be slippery!
Disposal Method:	Bury resin in licensed landfill or burn in approved Incinerator according to local, state, and federal regulations. For resin contaminated with hazardous material, dispose of mixture as hazardous material according to local, state and federal regulations.

10. Additional Information:

Special precautions to be taken in handling and storage:	Practice reasonable care and caution. Metal equipment with feed, regenerant, resin form, and effluent of that process.
TSCA Considerations:	Every different salt or ionic form of an ion-exchange resin is a separate chemical. If you use an ion-exchange resin for ion-exchange purposes and then remove the by-product resin from its vessel or container prior to recovery of the original or another form of the resin or of another chemical, the by-product resin must be listed on the TSCA Inventory (unless an exemption is applicable). It is the responsibility of the customer to ensure that such isolated, recycled by-product resins are in compliance with TSCA. Failure to comply could result in substantial civil or criminal penalties being assessed by the Environmental Production Agency.
MSDS Status:	Canadian regulatory information added.

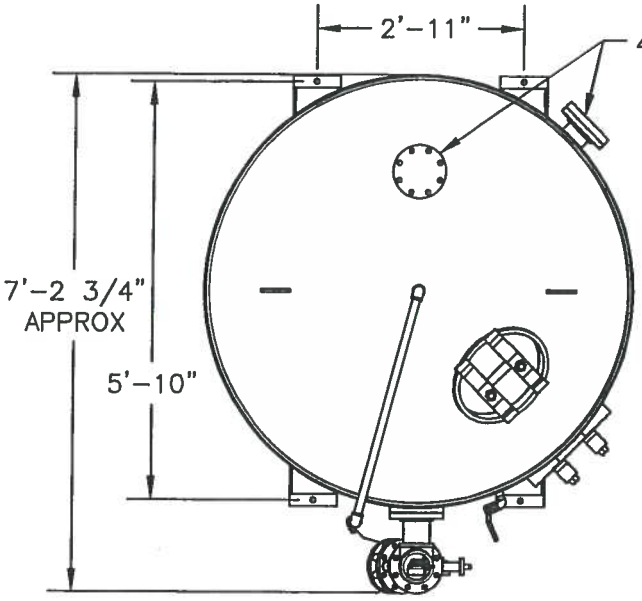
11. Regulatory Information: (Not meant to be all-inclusive—selected regulations represented.)

Notice:	The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

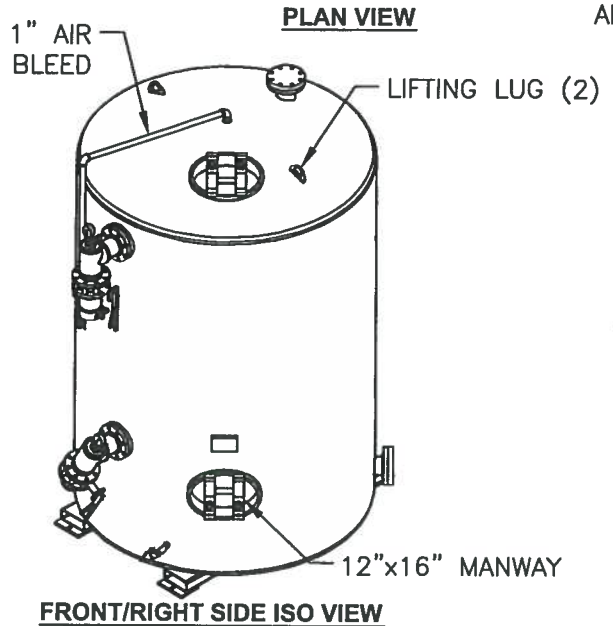
12. Canadian Regulations:

WHMIS Information:	The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is: This product is not a "Controlled Product" under WHMIS.
Canadian TDG Information:	For guidance, the Transportation of Dangerous Good Classification for this product is: Not Regulated.

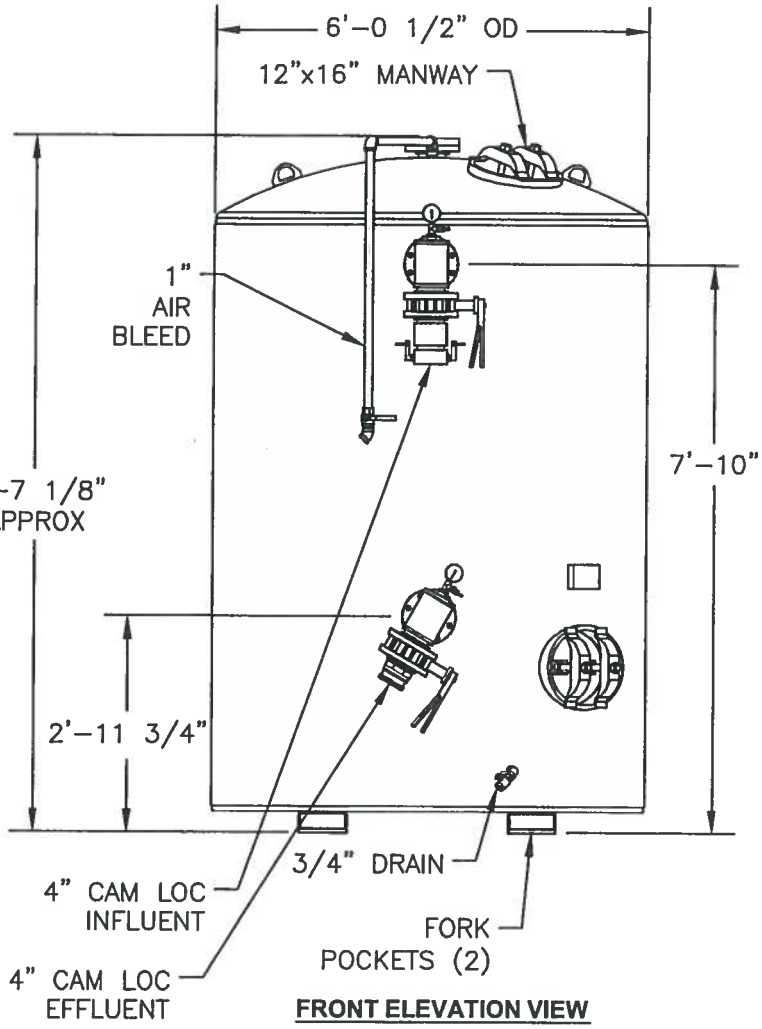
Liquid Phase Carbon Absorber — MPC 28



PLAN VIEW



FRONT/RIGHT SIDE ISO VIEW



FRONT ELEVATION VIEW

Vessel Specifications

Flow Range (gpm):	14 - 200
Carbon Capacity (lb):	5000
Empty Weight (lb):	3150
Loaded Weight (lb):	8150
Operating Weight (lb):	17,450
Design Pressure (psi):	75
Maximum Temperature (°F):	125
Minimum Temperature (°F):	34

Options

Hose Kit
Flow Meter
Anti-Siphon Piping

Note: Actual dimensions and orientations may vary slightly than shown above.

Dwg # 212879

MINNESOTA: (Corp. Hdqrtrs)
Carbonair
2731 Nevada Ave. No.
New Hope, MN 55427
PH: 800.526.4999
763.544.2154
FAX: 763.544.2151 Homepage: www.carbonair.com

FLORIDA:
Carbonair
4710 Dignan Street
Jacksonville, FL 32254
PH: 800.241.7833
904.387.4465
FAX: 904.387.5058

VIRGINIA:
Carbonair
4328 West Main Street
Salem, VA 24153
PH: 800.204.0324
540.380.5913
FAX: 540.380.5920

TEXAS:
Carbonair
4889 Hunter Rd. Bldg 1-C
San Marcos, TX 78666
PH: 800.893.5937
512.392.0085
FAX: 512.392.0066

Material Safety Data Sheet

Product Name: LRT E50
MSDS #: 40

Effective date: 3/15/2004

Section 1 – Chemical Product and Company Information

PRODUCT NAME: LRT E50
SYNONYMS: Water And Wastewater Treatment Coagulant/Flocculant
DISTRIBUTOR: Lockwood Remediation Technologies, LLC
89 Crawford Street, Leominster, Massachusetts 01453
Tel: 774-450-7177
Fax: 885-835-0617

NFPA Rating		HMIS Rating	
HEALTH:	1	HEALTH:	1
FLAMMABILITY:	0	FLAMMABILITY:	0
REACTIVITY:	0	REACTIVITY:	0

EMERGENCY TELEPHONE NUMBER: CHEMTREC 1-800-424-9300

EMERGENCY OVERVIEW

Clear to slightly hazy, colorless to yellow liquid with no appreciable odor. May cause skin, eye and respiratory irritation.

Section 2 - Composition Information

INGREDIENTS	CAS NO.	% WT/WT	PEL		TLV	
Trade Secret Ingredients	Trade Secret	100	*15	mg/m^3 (TD)	SOLUBLE SALTS:	
			*5	mg/m^3 (RF)	*2	mg/m^3 (TWA)

*Aluminum metal, (as Al)

LISTED AS CARCINOGEN BY:

IARC: NO NTP: NO
OSHA: NO ACGIH: NO

PEL:	OSHA Permissible Exposure Limit	TWA:	Time Weighted Average, 8-hr	TD:	Total dust
STEL:	Short Term Exposure Limit	TLV:	ACGIH Threshold Limit	ND:	Nuisance dust
HI:	Hazardous Ingredient	C.LIM:	Ceiling Limit	INP:	Inhalable Particulate
OM:	Oil mist	WF:	Wax fume	RF:	Respirable fraction
ST:	Skin TWA				

Material Safety Data Sheet

Section 3 - Hazards Identification

ROUTES OF EXPOSURE

INHALATION: Inhalation of mist or spray may irritate respiratory tract.

SKIN CONTACT: May cause skin irritation, especially on prolonged contact.

SKIN ABSORBTION: No Data

EYE CONTACT: Direct eye contact may cause irritation, redness, and swelling. Prolonged exposure to Aluminum salts may cause conjunctivitis.

INGESTION: May cause gastrointestinal irritation, nausea, vomiting and diarrhea.

EFFECTS OF OVEREXPOSURE

ACUTE OVEREXPOSURE: Possible eye, skin and respiratory tract irritation.

CHRONIC OVEREXPOSURE: May aggravate existing skin, eye, and lung conditions. Persons with kidney disorders have an increased risk from exposure based on general information found on aluminum salts.

Section 4 - First Aid Measures

EYES: Immediately flush with plenty of water for at least 15 minutes, holding eyelids apart to ensure flushing of the entire surface. Washing within one minute is essential to achieve maximum effectiveness. Seek medical attention.

SKIN: Wash thoroughly with soap and water, remove contaminated clothing and footwear. Wash clothing before reuse. Get medical attention if irritation should develop.

INHALATION: Remove to fresh air.

INGESTION: Seek medical attention immediately. Give large amounts of water to drink. If vomiting should occur spontaneously, keep airway clear. Never give anything by mouth to an unconscious person.

NOTES TO PHYSICIAN: Aluminum soluble salts may cause gastroenteritis if ingested. Treatment includes the use of demulcents. Note: Consideration should be given to the possibility that overexposure to materials other an this product may have occurred.

Section 5 - Fire Fighting Measures

FLASHPOINT: NAPL

AUTOIGNITION TEMPERATURE: NAPL

FLAMMABLE LIMITS IN AIR, % BY VOLUME:

LOWER FLAMMABILITY LIMIT: NAPL

UPPER FLAMMABILITY LIMIT: NAPL

EXTINGUISHING MEDIA: Water Spray, Carbon Dioxide, Foam, Dry Chemical.

FIRE OR EXPLOSION HAZARDS: May produce hazardous fumes or hazardous decomposition products.

FIRE FIGHTING PROCEDURES: Product is a water solution and nonflammable. In a fire, this product may build up pressure and rupture a sealed container; cool exposed containers with water spray. Use self-contained breathing apparatus in confined areas; avoid breathing vapors or dust.

Material Safety Data Sheet

Section 6 - Accidental Release Measures

Stop leaks. Clean up spill immediately. Build dikes as necessary to contain flow of large spills. Do not allow liquid to enter stream or waterways. For small spills, use soda ash or lime to neutralize, an inert material to absorb, or wash product to a chemical sewer. Place contaminated materials into containers and store in a safe place to await proper disposal. Wear adequate personal protective clothing and equipment. Caution use of soda ash or lime may generate carbon dioxide gas. Provide adequate ventilation to spill area. Approved breathing apparatus may be necessary.

Section 7 - Handling and Storage

PRECAUTIONARY STATEMENTS:

CAUTION!
MAY CAUSE IRRITATION.
Avoid contact with eyes, skin, and clothing.
Avoid breathing mist or spray.
Wear chemical splash goggles, gloves, and protective clothing when handling.
Use with adequate ventilation and employ respiratory protection where mist or spray may be generated.
Wash thoroughly after handling.
May be harmful if swallowed or inhaled.
Keep away from heat and open flame.
Keep container closed when not in use.
FOR INDUSTRIAL USE ONLY.

HANDLING/STORAGE REQUIREMENTS:

Store in a cool, dry place away from direct heat. Keep container tightly closed when not in use. Do not store in unlined metal containers. Product may slowly corrode iron, brass, copper, aluminum and mild steel.

Section 8 - Exposure Controls/Personal Protection

VENTILATION REQUIREMENTS:	Local exhaust ventilation recommended.
EYE PROTECTION:	Chemical splash goggles and/or face shield.
SKIN PROTECTION:	Chemical resistant gloves.
RESPIRATORY PROTECTION:	When exposures exceed the PEL, use NIOSH/MSHA approved respirator in accordance with OSHA Respiratory Protection Requirements under 29 CFR 1910.134.
OTHER REQUIRED EQUIPMENT:	Standard work clothing and work shoes. Safety shower and eye wash located in immediate area.

Material Safety Data Sheet

Section 9 - Physical and Chemical Properties

APPEARANCE:	Clear to slightly hazy, colorless to yellow liquid			
ODOR:	Odorless			
SOLUBILITY IN WATER:	Soluble	pH:	3.5 (AS IS)	
SPECIFIC GRAVITY (WATER=1):	1.33-1.35	DENSITY @ 25°C:	11.0-11.3	lb/gal
BOILING POINT:	~220°F(104°C)	MELTING POINT:	NAV	
FREEZING POINT:	~19°F(-7°C)	EVAPORATION RATE:	NAV	
VAPOR PRESSURE:	NAV	VAPOR DENSITY (AIR=1):	NAV	
VISCOSITY:	<50 cps	VOLATILES BY WEIGHT:	40-50%	

Section 10 - Stability and Reactivity

STABLE: YES HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID:	NONE
IINCOMPATIBLE MATERIALS:	Product is incompatible with alkalis.
DECOMPOSITION PRODUCTS:	Thermal decomposition may release toxic and/or hazardous gases such as aluminum, Cl2, and HCl.

Section 11 Toxicological Information

Skin Irritation (human): 150 mg/3D-I Mild irritation effects (1)

(1) "Cutaneous Toxicity" Drill, V. A. and P. Lazar, eds., New York, NY, Academic Press, 1977

Material Safety Data Sheet

Section 12 - Ecological Information

BOD5:	mg 02/mg:	NAV
	ppm:	NAV
	Biodegradable, %:	NAV
BOD28:	mg 02/mg:	NAV
	ppm:	NAV
	Biodegradable, %:	NAV
COD:	mg 02/mg:	NAV
	ppm:	NAV
	Biodegradable, %:	NAV

Aquatic Toxicity:

LC 50 (24 hour, static)	50 mg/L	Ceridaphnia dubia (1)
LC 50 (48 hour, static)	5 mg/L	Ceridaphnia dubia (1)

LC 50: Lethal concentration at which 50% of the subjects die

Generated from tests conducted by SEAUS Testing Laboratories Nov., 1993 using EPA /600-4-90/027

Section 13 - Disposal Considerations

Dispose of in accordance with all applicable federal, state and local regulations.

Section 14 - Transportation Information

DOT Proper Shipping Name:
NOT APPLICABLE, NOT RESTRICTED

Harmonized Tariff Schedule Number: 2827.49.50 00

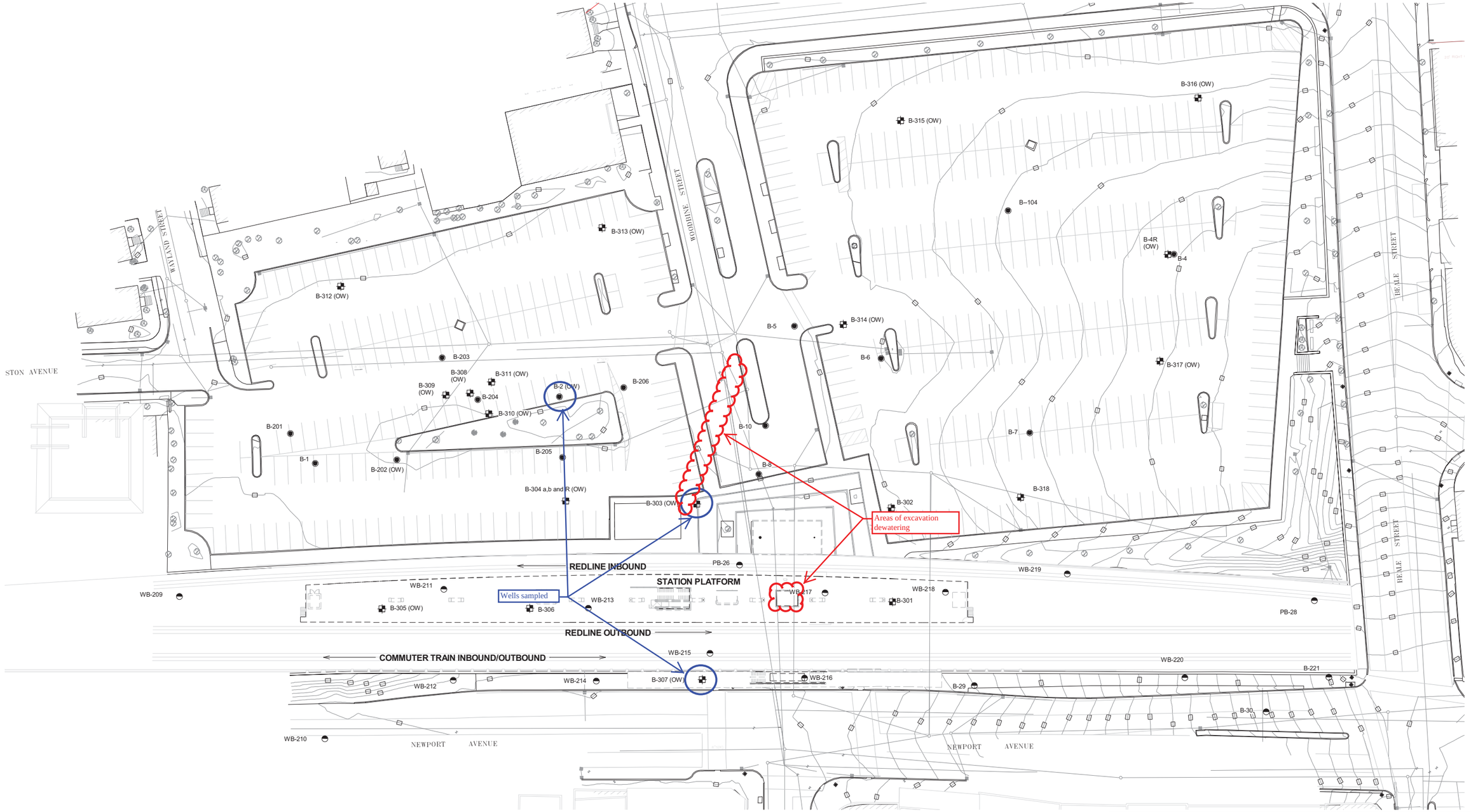
Section 15 - Regulatory Information

This product does not contain any ingredients subject to the reporting requirements of SARA Title III, Section 313 (40 CFR Part 372).

SARA Section 311/312: Acute Health Hazard.
TSCA: Components found in TSCA Inventory.

APPENDIX G

Water Quality Data



LEGEND

- APPROXIMATE LOCATION OF BORING ADVANCED BY C.L. GUILD DRILLING AND BORING CO, INC. OF BRAINTREE, MA. BORING LOCATIONS BASED ON DRAWING TITLED "RETAINING WALLS GENERAL PLAN," DATED DECEMBER 8, 1967, PREPARED FOR THE MBTA SOUTH SHORE PROJECT AREA 3, WOLLASTON STATION COMPLEX BY CLARKSON, CLOUGH & YOKEL.
- APPROXIMATE LOCATION OF BORING ADVANCED BY CARR-DEE CORP. OF MEDFORD, MA, AND OBSERVED BY KLEINFELDER IN 2013 FOR THE MBTA WOLLASTON STATION STORM AND SANITARY SEWER IMPROVEMENTS PROJECT.
- APPROXIMATE LOCATION OF BORING ADVANCED BY GEOLOGIC EARTH EXPLORATIONS, INC. OF NORFOLK, MA AND OBSERVED BY KLEINFELDER IN 2015 FOR THE MBTA WOLLATON STATION IMPROVEMENTS PROJECT.

(OW) INDICATES A GROUNDWATER OBSERVATION WELL WAS INSTALLED AT THE BORING LOCATION.

COMMONWEALTH OF MASSACHUSETTS — TIMOTHY A. FOLEY — No. 45220 — REGISTERED PROFESSIONAL ENGINEER — 7-21-2016

No.	Description	Date

Client: MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

Project: WOLLASTON STATION IMPROVEMENTS
MBTA CONTRACT NO. A47CN01

Drawing: EXISTING CONDITIONS AND BORING LOCATION PLAN

KLEINFELDER

APPROVED BY: Project Manager — Date

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

APPROVED BY: Project Manager — Date

DES. BY	DR. BY	CHK. BY
JM	AVM	TF

SCALE: AS NOTED
DATE: 09/08/16

PLAN NO. 182954

SHEET B1.10 29 OF

ISSUE

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7/20/2016 5:23:21 PM

PHOENIX
Environmental Laboratories, Inc.

Friday, September 15, 2017

Attn: Mr. Phil Peterson
Terra Environmental LLC
P.O. Box 473
Reading, MA 01867

Project ID: WOLLASTON
Sample ID#s: BY98193 - BY98195

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

September 15, 2017

FOR: Attn: Mr. Phil Peterson
Terra Environmental LLC
P.O. Box 473
Reading, MA 01867

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		09/08/17	10:00
Location Code:	TERRA-ENV	Received by:	SW	09/08/17	16:48
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	17-122				

Laboratory Data

SDG ID: GBY98193
Phoenix ID: BY98193

Project ID: WOLLASTON
Client ID: B-2

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.001	0.001	mg/L	1	09/13/17	MA	SW6010C
Arsenic	0.022	0.004	mg/L	1	09/13/17	MA	SW6010C
Cadmium	0.001	0.001	mg/L	1	09/13/17	MA	SW6010C
Chromium	0.018	0.001	mg/L	1	09/13/17	MA	SW6010C
Copper	0.026	0.005	mg/L	1	09/13/17	MA	SW6010C
Iron	17.3	0.010	mg/L	1	09/13/17	MA	SW6010C
Mercury	< 0.0002	0.0002	mg/L	1	09/12/17	RS	SW7470A
Nickel	0.003	0.001	mg/L	1	09/13/17	MA	SW6010C
Lead	0.003	0.002	mg/L	1	09/13/17	MA	SW6010C
Antimony	< 0.005	0.005	mg/L	1	09/13/17	MA	SW6010C
Selenium	< 0.010	0.010	mg/L	1	09/13/17	MA	SW6010C
Zinc	0.015	0.002	mg/L	1	09/13/17	MA	SW6010C
Chloride	1360	60.0	mg/L	20	09/08/17	MI	SM4500CLE-97,-11
Chlorine Residual	< 0.02	0.02	mg/L	1	09/08/17 18:14	O	SM4500Cl-G-00
Chromium, Hexavalent	< 0.01	0.01	mg/L	1	09/08/17 17:52	O	SM3500CRB-09,-11
Phenolics	< 0.015	0.015	mg/L	1	09/11/17	BS	E420.4
pH	7.29	1.00	pH Units	1	09/08/17 22:57	RR/EG	SM4500-H B-00
Total Cyanide	< 0.010	0.010	mg/L	1	09/13/17	O/GD	SW9010C/SW9012B
Total Suspended Solids	180	5.0	mg/L	1	09/12/17	KH	SM2540D-97,-11
Mercury Digestion	Completed				09/12/17	W/W	SW7470A
Semi-Volatile Extraction	Completed				09/08/17	P/D	SW3520C
Total Metals Digestion	Completed				09/12/17	AG	
Extraction of TPH	Completed				09/08/17	P/D	SW3510C/SW3520C
TPH by GC (Extractable Products)							
Aviation Fuel/Kerosene	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #2/ Diesel Fuel	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #4	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO

Project ID: WOLLASTON
Client ID: B-2

Phoenix I.D.: BY98193

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Fuel Oil #6	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Motor Oil	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Other Oil (Cutting & Lubricating)	**	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Unidentified	0.72	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
QA/QC Surrogates							
% n-Pentacosane	56		%	1	09/11/17	KCA	SW8015D DRO
Ethylene Dibromide	ND	0.02	ug/L	1	09/12/17	JRB	SW8011
Volatiles							
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,1-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
1,1,2-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloropropene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromo-3-chloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromoethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloroethane	ND	0.60	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3,5-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,4-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Hexanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
2-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Methyl-2-pentanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Acetone	ND	25	ug/L	1	09/12/17	MH	SW8260C
Acrylonitrile	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Benzene	ND	0.70	ug/L	1	09/12/17	MH	SW8260C
Bromobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromochloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromodichloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Bromoform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Carbon Disulfide	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Carbon tetrachloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chlorobenzene	1.5	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C

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Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
cis-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
cis-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Dibromochloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Dibromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Dichlorodifluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Ethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Hexachlorobutadiene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Isopropylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
m&p-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Methyl ethyl ketone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Methyl t-butyl ether (MTBE)	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Methylene chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Naphthalene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Propylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
o-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
p-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
sec-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Styrene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
tert-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrachloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrahydrofuran (THF)	ND	2.5	ug/L	1	09/12/17	MH	SW8260C
Toluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Total Xylenes	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
trans-1,4-dichloro-2-butene	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Trichloroethene	1.7	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorofluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorotrifluoroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Vinyl chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
QA/QC Surrogates							
% 1,2-dichlorobenzene-d4	96		%	1	09/12/17	MH	70 - 130 %
% Bromofluorobenzene	99		%	1	09/12/17	MH	70 - 130 %
% Dibromofluoromethane	90		%	1	09/12/17	MH	70 - 130 %
% Toluene-d8	100		%	1	09/12/17	MH	70 - 130 %
Tert-amyl-methyl-ether	ND	5.0	ug/L	1	09/13/17	HM	SW8260C
Tert-butyl alcohol	ND	50	ug/L	1	09/13/17	HM	SW8260C
Semivolatiles by SIM							
2-Methylnaphthalene	0.29	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthene	0.74	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthylene	0.15	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Anthracene	0.15	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benz(a)anthracene	0.03	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(a)pyrene	0.02	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(b)fluoranthene	0.02	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(ghi)perylene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(k)fluoranthene	0.02	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)

Project ID: WOLLASTON
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Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Chrysene	0.03	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Dibenz(a,h)anthracene	ND	0.01	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluoranthene	0.12	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluorene	1.3	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Indeno(1,2,3-cd)pyrene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Naphthalene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Phenanthrene	0.25	0.07	ug/L	1	09/11/17	DD	SW8270D (SIM)
Pyrene	0.11	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
QA/QC Surrogates							
% 2-Fluorobiphenyl	56		%	1	09/11/17	DD	30 - 130 %
% Nitrobenzene-d5	58		%	1	09/11/17	DD	30 - 130 %
% Terphenyl-d14	58		%	1	09/11/17	DD	30 - 130 %
1,4-dioxane							
1,4-dioxane	ND	0.20	ug/l	1	09/11/17	LA	SW8270DSIM
QA/QC Surrogates							
% 1,4-dioxane-d8	89		%	1	09/11/17	LA	30 - 130 %
Extraction for 1,4-Dioxane	Completed				09/08/17	C/C	
Temperature; Field Analysis	3.4		deg. C	1	09/11/17	SW	E170.1

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

The temperature was performed at time of sample collection.

The regulatory hold time for Chlorine is immediately. This Chlorine was performed in the laboratory and may be considered outside of hold-time.

TPH Comment:
**Petroleum hydrocarbon chromatogram contains a multicomponent hydrocarbon distribution in the range of C10 to C24. The sample was quantitated against a C9-C36 alkane hydrocarbon standard.

If there are any questions regarding this data, please call Phoenix Client Services.

Phyllis Shiller, Laboratory Director
September 15, 2017
Reviewed and Released by: Ethan Lee, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

September 15, 2017

FOR: Attn: Mr. Phil Peterson
Terra Environmental LLC
P.O. Box 473
Reading, MA 01867

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		09/08/17	11:40
Location Code:	TERRA-ENV	Received by:	SW	09/08/17	16:48
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	17-122				

Laboratory Data

SDG ID: GBY98193
Phoenix ID: BY98194

Project ID: WOLLASTON
Client ID: B-303 OW

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.001	0.001	mg/L	1	09/13/17	MA	SW6010C
Arsenic	< 0.004	0.004	mg/L	1	09/13/17	MA	SW6010C
Cadmium	0.004	0.001	mg/L	1	09/13/17	MA	SW6010C
Chromium	0.001	0.001	mg/L	1	09/13/17	MA	SW6010C
Copper	< 0.005	0.005	mg/L	1	09/13/17	MA	SW6010C
Iron	0.358	0.010	mg/L	1	09/13/17	MA	SW6010C
Mercury	< 0.0002	0.0002	mg/L	1	09/12/17	RS	SW7470A
Nickel	0.015	0.001	mg/L	1	09/13/17	MA	SW6010C
Lead	< 0.002	0.002	mg/L	1	09/13/17	MA	SW6010C
Antimony	< 0.005	0.005	mg/L	1	09/13/17	MA	SW6010C
Selenium	< 0.010	0.010	mg/L	1	09/13/17	MA	SW6010C
Zinc	0.020	0.002	mg/L	1	09/13/17	MA	SW6010C
Chloride	695	15.0	mg/L	5	09/08/17	MI	SM4500CLE-97,-11
Chlorine Residual	< 0.02	0.02	mg/L	1	09/08/17 18:14	O	SM4500Cl-G-00
Chromium, Hexavalent	< 0.01	0.01	mg/L	1	09/08/17 17:53	O	SM3500CRB-09,-11
Phenolics	< 0.015	0.015	mg/L	1	09/11/17	BS	E420.4
pH	7.11	1.00	pH Units	1	09/08/17 22:59	RR/EG	SM4500-H B-00
Total Cyanide	< 0.010	0.010	mg/L	1	09/13/17	O/GD	SW9010C/SW9012B
Total Suspended Solids	9.0	5.0	mg/L	1	09/12/17	KH	SM2540D-97,-11
Mercury Digestion	Completed				09/12/17	W/W	SW7470A
Semi-Volatile Extraction	Completed				09/08/17	P/D	SW3520C
Total Metals Digestion	Completed				09/12/17	AG	
Extraction of TPH	Completed				09/08/17	P/D	SW3510C/SW3520C
TPH by GC (Extractable Products)							
Aviation Fuel/Kerosene	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #2/ Diesel Fuel	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #4	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO

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Project ID: WOLLASTON
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Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Fuel Oil #6	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Motor Oil	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Other Oil (Cutting & Lubricating)	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Unidentified	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
QA/QC Surrogates							
% n-Pentacosane	69		%	1	09/11/17	KCA	SW8015D DRO
Ethylene Dibromide	ND	0.02	ug/L	1	09/12/17	JRB	SW8011
Volatiles							
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,1-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
1,1,2-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloropropene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromo-3-chloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromoethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloroethane	ND	0.60	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3,5-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,4-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Hexanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
2-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Methyl-2-pentanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Acetone	ND	25	ug/L	1	09/12/17	MH	SW8260C
Acrylonitrile	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Benzene	ND	0.70	ug/L	1	09/12/17	MH	SW8260C
Bromobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromochloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromodichloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Bromoform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Carbon Disulfide	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Carbon tetrachloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C

Project ID: WOLLASTON
Client ID: B-303 OW

Phoenix I.D.: BY98194

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
cis-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
cis-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Dibromochloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Dibromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Dichlorodifluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Ethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Hexachlorobutadiene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Isopropylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
m&p-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Methyl ethyl ketone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Methyl t-butyl ether (MTBE)	33	5.0	ug/L	5	09/13/17	MH	SW8260C
Methylene chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Naphthalene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Propylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
o-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
p-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
sec-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Styrene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
tert-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrachloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrahydrofuran (THF)	ND	2.5	ug/L	1	09/12/17	MH	SW8260C
Toluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Total Xylenes	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
trans-1,4-dichloro-2-butene	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Trichloroethene	4.0	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorofluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorotrifluoroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Vinyl chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
QA/QC Surrogates							
% 1,2-dichlorobenzene-d4	98		%	1	09/12/17	MH	70 - 130 %
% Bromofluorobenzene	102		%	1	09/12/17	MH	70 - 130 %
% Dibromofluoromethane	87		%	1	09/12/17	MH	70 - 130 %
% Toluene-d8	98		%	1	09/12/17	MH	70 - 130 %
Tert-amyl-methyl-ether	ND	5.0	ug/L	1	09/13/17	HM	SW8260C
Tert-butyl alcohol	230	50	ug/L	1	09/13/17	HM	SW8260C
Semivolatiles by SIM							
2-Methylnaphthalene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthylene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Anthracene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benz(a)anthracene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(a)pyrene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(b)fluoranthene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(ghi)perylene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(k)fluoranthene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)

Project ID: WOLLASTON
Client ID: B-303 OW

Phoenix I.D.: BY98194

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Chrysene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Dibenz(a,h)anthracene	ND	0.01	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluoranthene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluorene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Indeno(1,2,3-cd)pyrene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Naphthalene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Phenanthrene	ND	0.07	ug/L	1	09/11/17	DD	SW8270D (SIM)
Pyrene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
QA/QC Surrogates							
% 2-Fluorobiphenyl	62		%	1	09/11/17	DD	30 - 130 %
% Nitrobenzene-d5	53		%	1	09/11/17	DD	30 - 130 %
% Terphenyl-d14	88		%	1	09/11/17	DD	30 - 130 %
1,4-dioxane							
1,4-dioxane	ND	0.20	ug/l	1	09/11/17	LA	SW8270DSIM
QA/QC Surrogates							
% 1,4-dioxane-d8	91		%	1	09/11/17	LA	30 - 130 %
Extraction for 1,4-Dioxane	Completed				09/08/17	C/C	
Temperature; Field Analysis	3.4		deg. C	1	09/11/17	SW	E170.1

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

The temperature was performed at time of sample collection.

The regulatory hold time for Chlorine is immediately. This Chlorine was performed in the laboratory and may be considered outside of hold-time.

If there are any questions regarding this data, please call Phoenix Client Services.

Phyllis Shiller, Laboratory Director
September 15, 2017
Reviewed and Released by: Ethan Lee, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

September 15, 2017

FOR: Attn: Mr. Phil Peterson
Terra Environmental LLC
P.O. Box 473
Reading, MA 01867

Sample Information		Custody Information		Date	Time
Matrix:	GROUND WATER	Collected by:		09/08/17	13:45
Location Code:	TERRA-ENV	Received by:	SW	09/08/17	16:48
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	17-122				

Laboratory Data

SDG ID: GBY98193
Phoenix ID: BY98195

Project ID: WOLLASTON
Client ID: B-307 OW

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.001	0.001	mg/L	1	09/13/17	MA	SW6010C
Arsenic	< 0.004	0.004	mg/L	1	09/13/17	MA	SW6010C
Cadmium	0.002	0.001	mg/L	1	09/13/17	MA	SW6010C
Chromium	0.002	0.001	mg/L	1	09/13/17	MA	SW6010C
Copper	0.007	0.005	mg/L	1	09/13/17	MA	SW6010C
Iron	2.69	0.010	mg/L	1	09/13/17	MA	SW6010C
Mercury	< 0.0002	0.0002	mg/L	1	09/12/17	RS	SW7470A
Nickel	0.007	0.001	mg/L	1	09/13/17	MA	SW6010C
Lead	< 0.002	0.002	mg/L	1	09/13/17	MA	SW6010C
Antimony	< 0.005	0.005	mg/L	1	09/13/17	MA	SW6010C
Selenium	< 0.010	0.010	mg/L	1	09/13/17	MA	SW6010C
Zinc	0.127	0.002	mg/L	1	09/13/17	MA	SW6010C
Chloride	3440	60.0	mg/L	20	09/08/17	MI	SM4500CLE-97,-11
Chlorine Residual	< 0.02	0.02	mg/L	1	09/08/17 18:15	O	SM4500Cl-G-00
Chromium, Hexavalent	< 0.01	0.01	mg/L	1	09/08/17 17:54	O	SM3500CRB-09,-11
Phenolics	< 0.015	0.015	mg/L	1	09/11/17	BS	E420.4
pH	6.83	1.00	pH Units	1	09/08/17 23:04	RR/EG	SM4500-H B-00
Total Cyanide	< 0.010	0.010	mg/L	1	09/13/17	O/GD	SW9010C/SW9012B
Total Suspended Solids	220	5.0	mg/L	1	09/12/17	KH	SM2540D-97,-11
Mercury Digestion	Completed				09/12/17	W/W	SW7470A
Semi-Volatile Extraction	Completed				09/08/17	P/D	SW3520C
Total Metals Digestion	Completed				09/12/17	AG	
Extraction of TPH	Completed				09/08/17	P/D	SW3510C/SW3520C
TPH by GC (Extractable Products)							
Aviation Fuel/Kerosene	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #2/ Diesel Fuel	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Fuel Oil #4	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO

Ver 1

Project ID: WOLLASTON
Client ID: B-307 OW

Phoenix I.D.: BY98195

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Fuel Oil #6	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Motor Oil	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Other Oil (Cutting & Lubricating)	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
Unidentified	ND	0.47	mg/L	1	09/11/17	KCA	SW8015D DRO
QA/QC Surrogates							
% n-Pentacosane	68		%	1	09/11/17	KCA	SW8015D DRO
Ethylene Dibromide	ND	0.02	ug/L	1	09/12/17	JRB	SW8011
Volatiles							
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,1-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
1,1,2-Trichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,1-Dichloropropene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,3-Trichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2,4-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromo-3-chloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dibromoethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloroethane	ND	0.60	ug/L	1	09/12/17	MH	SW8260C
1,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3,5-Trimethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,3-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
1,4-Dichlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2,2-Dichloropropane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
2-Hexanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
2-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Chlorotoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
4-Methyl-2-pentanone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Acetone	ND	25	ug/L	1	09/12/17	MH	SW8260C
Acrylonitrile	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Benzene	ND	0.70	ug/L	1	09/12/17	MH	SW8260C
Bromobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromochloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromodichloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Bromoform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Bromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Carbon Disulfide	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Carbon tetrachloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chlorobenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloroform	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Chloromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C

Project ID: WOLLASTON
Client ID: B-307 OW

Phoenix I.D.: BY98195

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
cis-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
cis-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Dibromochloromethane	ND	0.50	ug/L	1	09/12/17	MH	SW8260C
Dibromomethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Dichlorodifluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Ethylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Hexachlorobutadiene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
Isopropylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
m&p-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Methyl ethyl ketone	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Methyl t-butyl ether (MTBE)	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Methylene chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Naphthalene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
n-Propylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
o-Xylene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
p-Isopropyltoluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
sec-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Styrene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
tert-Butylbenzene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrachloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Tetrahydrofuran (THF)	ND	2.5	ug/L	1	09/12/17	MH	SW8260C
Toluene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Total Xylenes	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,2-Dichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
trans-1,3-Dichloropropene	ND	0.40	ug/L	1	09/12/17	MH	SW8260C
trans-1,4-dichloro-2-butene	ND	5.0	ug/L	1	09/12/17	MH	SW8260C
Trichloroethene	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorofluoromethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Trichlorotrifluoroethane	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
Vinyl chloride	ND	1.0	ug/L	1	09/12/17	MH	SW8260C
QA/QC Surrogates							
% 1,2-dichlorobenzene-d4	99		%	1	09/12/17	MH	70 - 130 %
% Bromofluorobenzene	101		%	1	09/12/17	MH	70 - 130 %
% Dibromofluoromethane	92		%	1	09/12/17	MH	70 - 130 %
% Toluene-d8	96		%	1	09/12/17	MH	70 - 130 %
Tert-amyl-methyl-ether	ND	5.0	ug/L	1	09/13/17	HM	SW8260C
Tert-butyl alcohol	ND	50	ug/L	1	09/13/17	HM	SW8260C
Semivolatiles by SIM							
2-Methylnaphthalene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Acenaphthylene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Anthracene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benz(a)anthracene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(a)pyrene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(b)fluoranthene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(ghi)perylene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Benzo(k)fluoranthene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)

Project ID: WOLLASTON
Client ID: B-307 OW

Phoenix I.D.: BY98195

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Chrysene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Dibenz(a,h)anthracene	ND	0.01	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluoranthene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Fluorene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Indeno(1,2,3-cd)pyrene	ND	0.02	ug/L	1	09/11/17	DD	SW8270D (SIM)
Naphthalene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
Phenanthrene	ND	0.07	ug/L	1	09/11/17	DD	SW8270D (SIM)
Pyrene	ND	0.09	ug/L	1	09/11/17	DD	SW8270D (SIM)
QA/QC Surrogates							
% 2-Fluorobiphenyl	62		%	1	09/11/17	DD	30 - 130 %
% Nitrobenzene-d5	59		%	1	09/11/17	DD	30 - 130 %
% Terphenyl-d14	74		%	1	09/11/17	DD	30 - 130 %
1,4-dioxane							
1,4-dioxane	ND	0.20	ug/l	1	09/11/17	LA	SW8270DSIM
QA/QC Surrogates							
% 1,4-dioxane-d8	92		%	1	09/11/17	LA	30 - 130 %
Extraction for 1,4-Dioxane	Completed				09/08/17	C/C	
Temperature; Field Analysis	3.4		deg. C	1	09/11/17	SW	E170.1

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

The temperature was performed at time of sample collection.

The regulatory hold time for Chlorine is immediately. This Chlorine was performed in the laboratory and may be considered outside of hold-time.

If there are any questions regarding this data, please call Phoenix Client Services.

Phyllis Shiller, Laboratory Director
September 15, 2017
Reviewed and Released by: Ethan Lee, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

QA/QC Report

September 15, 2017

QA/QC Data

SDG I.D.: GBY98193

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 400973 (mg/L), QC Sample No: BY98401 (BY98193, BY98194, BY98195)													
Mercury - Water	BRL	0.0002	<0.0002	<0.0002	NC	96.8			91.5			75 - 125	30
Comment:													
Additional Mercury criteria: LCS acceptance range for waters is 80-120% and for soils is 75-125%													
QA/QC Batch 401063 (mg/L), QC Sample No: BY98614 (BY98193, BY98194, BY98195)													
ICP Metals - Aqueous													
Antimony	BRL	0.0025	<0.003	<0.0025	NC	100			97.6			75 - 125	20
Arsenic	BRL	0.0020	<0.002	<0.0020	NC	99.7			98.0			75 - 125	20
Cadmium	BRL	0.0005	<0.001	<0.0005	NC	93.6			90.2			75 - 125	20
Chromium	BRL	0.0005	0.006	0.0068	12.5	98.9			95.3			75 - 125	20
Copper	BRL	0.0025	0.046	0.0451	2.00	97.7			95.1			75 - 125	20
Iron	BRL	0.0050	4.92	4.80	2.50	104			NC			75 - 125	20
Lead	BRL	0.0010	0.004	0.0052	NC	96.1			92.1			75 - 125	20
Nickel	BRL	0.0005	0.021	0.0207	1.40	101			97.7			75 - 125	20
Selenium	BRL	0.0050	<0.005	<0.0050	NC	90.6			89.6			75 - 125	20
Silver	BRL	0.0005	<0.001	<0.0005	NC	91.8			89.9			75 - 125	20
Zinc	BRL	0.0010	0.249	0.248	0.40	96.3			94.5			75 - 125	20

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

QA/QC Report

September 15, 2017

QA/QC Data

SDG I.D.: GBY98193

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
QA/QC Batch 400489 (mg/L), QC Sample No: BY95614 (BY98193, BY98194, BY98195)														
Chloride	BRL	3.0	184	176	4.40	111			104			90 - 110	20	I
Comment:														
The LCS recovery is above method criteria for Chloride. All other QC is within criteria. No bias is suspected.														
QA/QC Batch 400829 (pH), QC Sample No: BY97700 (BY98193, BY98194, BY98195)														
pH			7.03	7.01	0.30	98.8						85 - 115	20	
Comment:														
Additional: LCS acceptance range is 85-115% MS acceptance range 75-125%.														
QA/QC Batch 400845 (mg/L), QC Sample No: BY97774 (BY98193, BY98194, BY98195)														
Phenolics	BRL	0.015	<0.008	<0.015	NC	104			103			90 - 110	20	
QA/QC Batch 400785 (mg/L), QC Sample No: BY97794 (BY98193, BY98194, BY98195)														
Chlorine Residual	BRL	0.02	<0.02	<0.02	NC	96.8								
QA/QC Batch 400994 (mg/L), QC Sample No: BY98087 (BY98193, BY98194, BY98195)														
Total Suspended Solids	BRL	5.0	<5.0	<5.0	NC	95.0						85 - 115		
QA/QC Batch 400784 (mg/L), QC Sample No: BY98194 (BY98193, BY98194, BY98195)														
Chromium, Hexavalent	BRL	0.01	<0.01	<0.01	NC	103			108			90 - 110	30	
QA/QC Batch 401074 (mg/L), QC Sample No: BY98194 (BY98193, BY98194, BY98195)														
Total Cyanide	BRL	0.01	<0.010	<0.01	NC	97.6			97.0			90 - 110	30	
Comment:														
Additional soil criteria LCS acceptance range is 80-120% MS acceptance range 75-125%.														

I = This parameter is outside laboratory LCS/LCSD specified recovery limits.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

QA/QC Report

September 15, 2017

QA/QC Data

SDG I.D.: GBY98193

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 400758 (mg/L), QC Sample No: BY97708 (BY98193, BY98194, BY98195)										
TPH by GC (Extractable Products) - Ground Water										
Ext. Petroleum H.C. (C9-C36)	ND	0.10	63	63	0.0				50 - 150	20
% n-Pentacosane	75	%	74	72	2.7				50 - 150	20
Comment:										
The ETPH/DRO LCS has been normalized based on the alkane calibration.										
QA/QC Batch 400757 (ug/L), QC Sample No: BY97708 (BY98193, BY98194, BY98195)										
Semivolatiles by SIM - Ground Water										
2-Methylnaphthalene	ND	0.05	51	52	1.9				30 - 130	30
Acenaphthene	ND	0.05	72	73	1.4				30 - 130	30
Acenaphthylene	ND	0.04	67	67	0.0				30 - 130	30
Anthracene	ND	0.02	82	84	2.4				30 - 130	30
Benz(a)anthracene	ND	0.02	76	77	1.3				30 - 130	30
Benzo(a)pyrene	ND	0.02	75	78	3.9				30 - 130	30
Benzo(b)fluoranthene	ND	0.02	83	85	2.4				30 - 130	30
Benzo(ghi)perylene	ND	0.02	53	59	10.7				30 - 130	30
Benzo(k)fluoranthene	ND	0.02	83	85	2.4				30 - 130	30
Chrysene	ND	0.02	79	80	1.3				30 - 130	30
Dibenz(a,h)anthracene	ND	0.01	61	72	16.5				30 - 130	30
Fluoranthene	ND	0.04	81	84	3.6				30 - 130	30
Fluorene	ND	0.05	75	77	2.6				30 - 130	30
Indeno(1,2,3-cd)pyrene	ND	0.02	59	68	14.2				30 - 130	30
Naphthalene	ND	0.05	45	45	0.0				30 - 130	30
Phenanthrene	ND	0.05	74	76	2.7				30 - 130	30
Pyrene	ND	0.02	84	86	2.4				30 - 130	30
% 2-Fluorobiphenyl	74	%	61	61	0.0				30 - 130	30
% Nitrobenzene-d5	72	%	46	50	8.3				30 - 130	30
% Terphenyl-d14	86	%	88	94	6.6				30 - 130	30
Comment:										
Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 10-110%, for soils 30-130%)										
QA/QC Batch 400759 (ug/l), QC Sample No: BY97903 (BY98193, BY98194, BY98195)										
1,4dioxane - Ground Water										
1,4-dioxane	ND	0.25	109	104	4.7	113	103	9.3	30 - 130	20
% 1,4-dioxane-d8	89	%	92	88	4.4	94	88	6.6	30 - 130	20
QA/QC Batch 401305 (ug/L), QC Sample No: BY98051 (BY98194 (5X))										
Volatiles - Ground Water										
Methyl t-butyl ether (MTBE)	ND	1.0	82	96	15.7				70 - 130	30
Comment:										
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.										
Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.										

QA/QC Data

SDG I.D.: GBY98193

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 401159 (ug/L), QC Sample No: BY98194 (BY98193, BY98194, BY98195)										
Oxygenates - Ground Water										
tert-amyl alcohol	ND	25	114	117	2.6	105	101	3.9	70 - 130	30
tert-butyl alcohol	ND	25	114	117	2.6	107	98	8.8	70 - 130	30
QA/QC Batch 401154 (ug/L), QC Sample No: BY98401 (BY98193, BY98194, BY98195)										
Volatiles - Ground Water										
1,1,1,2-Tetrachloroethane	ND	1.0	96	92	4.3				70 - 130	30
1,1,1-Trichloroethane	ND	1.0	89	91	2.2				70 - 130	30
1,1,2,2-Tetrachloroethane	ND	0.50	99	92	7.3				70 - 130	30
1,1,2-Trichloroethane	ND	1.0	99	88	11.8				70 - 130	30
1,1-Dichloroethane	ND	1.0	99	96	3.1				70 - 130	30
1,1-Dichloroethene	ND	1.0	90	95	5.4				70 - 130	30
1,1-Dichloropropene	ND	1.0	92	96	4.3				70 - 130	30
1,2,3-Trichlorobenzene	ND	1.0	98	91	7.4				70 - 130	30
1,2,3-Trichloropropane	ND	1.0	78	73	6.6				70 - 130	30
1,2,4-Trichlorobenzene	ND	1.0	97	94	3.1				70 - 130	30
1,2,4-Trimethylbenzene	ND	1.0	95	95	0.0				70 - 130	30
1,2-Dibromo-3-chloropropane	ND	1.0	93	83	11.4				70 - 130	30
1,2-Dibromoethane	ND	1.0	96	90	6.5				70 - 130	30
1,2-Dichlorobenzene	ND	1.0	96	94	2.1				70 - 130	30
1,2-Dichloroethane	ND	1.0	99	89	10.6				70 - 130	30
1,2-Dichloropropane	ND	1.0	98	93	5.2				70 - 130	30
1,3,5-Trimethylbenzene	ND	1.0	96	95	1.0				70 - 130	30
1,3-Dichlorobenzene	ND	1.0	98	97	1.0				70 - 130	30
1,3-Dichloropropane	ND	1.0	98	89	9.6				70 - 130	30
1,4-Dichlorobenzene	ND	1.0	97	97	0.0				70 - 130	30
2,2-Dichloropropane	ND	1.0	96	97	1.0				70 - 130	30
2-Chlorotoluene	ND	1.0	97	101	4.0				70 - 130	30
2-Hexanone	ND	5.0	72	62	14.9				40 - 160	30
2-Isopropyltoluene	ND	1.0	83	82	1.2				70 - 130	30
4-Chlorotoluene	ND	1.0	96	96	0.0				70 - 130	30
4-Methyl-2-pentanone	ND	5.0	81	68	17.4				40 - 160	30
Acetone	ND	5.0	80	72	10.5				40 - 160	30
Acrylonitrile	ND	5.0	74	60	20.9				70 - 130	30
Benzene	ND	0.70	96	95	1.0				70 - 130	30
Bromobenzene	ND	1.0	95	97	2.1				70 - 130	30
Bromochloromethane	ND	1.0	97	87	10.9				70 - 130	30
Bromodichloromethane	ND	0.50	98	90	8.5				70 - 130	30
Bromoform	ND	1.0	90	82	9.3				70 - 130	30
Bromomethane	ND	1.0	87	90	3.4				40 - 160	30
Carbon Disulfide	ND	1.0	86	90	4.5				70 - 130	30
Carbon tetrachloride	ND	1.0	82	85	3.6				70 - 130	30
Chlorobenzene	ND	1.0	95	96	1.0				70 - 130	30
Chloroethane	ND	1.0	89	88	1.1				70 - 130	30
Chloroform	ND	1.0	93	89	4.4				70 - 130	30
Chloromethane	ND	1.0	82	84	2.4				40 - 160	30
cis-1,2-Dichloroethene	ND	1.0	96	94	2.1				70 - 130	30
cis-1,3-Dichloropropene	ND	0.40	101	92	9.3				70 - 130	30
Dibromochloromethane	ND	0.50	97	90	7.5				70 - 130	30
Dibromomethane	ND	1.0	101	93	8.2				70 - 130	30
Dichlorodifluoromethane	ND	1.0	81	86	6.0				40 - 160	30
Ethylbenzene	ND	1.0	95	95	0.0				70 - 130	30

QA/QC Data

SDG I.D.: GBY98193

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
Hexachlorobutadiene	ND	0.40	94	101	7.2				70 - 130	30	
Isopropylbenzene	ND	1.0	95	95	0.0				70 - 130	30	
m&p-Xylene	ND	1.0	95	93	2.1				70 - 130	30	
Methyl ethyl ketone	ND	5.0	86	75	13.7				40 - 160	30	
Methyl t-butyl ether (MTBE)	ND	1.0	86	72	17.7				70 - 130	30	
Methylene chloride	ND	1.0	93	89	4.4				70 - 130	30	
Naphthalene	ND	1.0	100	93	7.3				70 - 130	30	
n-Butylbenzene	ND	1.0	94	90	4.3				70 - 130	30	
n-Propylbenzene	ND	1.0	94	94	0.0				70 - 130	30	
o-Xylene	ND	1.0	98	97	1.0				70 - 130	30	
p-Isopropyltoluene	ND	1.0	95	92	3.2				70 - 130	30	
sec-Butylbenzene	ND	1.0	98	92	6.3				70 - 130	30	
Styrene	ND	1.0	96	94	2.1				70 - 130	30	
tert-Butylbenzene	ND	1.0	95	91	4.3				70 - 130	30	
Tetrachloroethene	ND	1.0	93	90	3.3				70 - 130	30	
Tetrahydrofuran (THF)	ND	2.5	77	60	24.8				70 - 130	30	I
Toluene	ND	1.0	97	95	2.1				70 - 130	30	
trans-1,2-Dichloroethene	ND	1.0	93	92	1.1				70 - 130	30	
trans-1,3-Dichloropropene	ND	0.40	94	86	8.9				70 - 130	30	
trans-1,4-dichloro-2-butene	ND	5.0	80	75	6.5				70 - 130	30	
Trichloroethene	ND	1.0	96	97	1.0				70 - 130	30	
Trichlorofluoromethane	ND	1.0	74	79	6.5				70 - 130	30	
Trichlorotrifluoroethane	ND	1.0	72	75	4.1				70 - 130	30	
Vinyl chloride	ND	1.0	81	88	8.3				70 - 130	30	
% 1,2-dichlorobenzene-d4	102	%	101	98	3.0				70 - 130	30	
% Bromofluorobenzene	102	%	99	96	3.1				70 - 130	30	
% Dibromofluoromethane	97	%	95	88	7.7				70 - 130	30	
% Toluene-d8	96	%	102	100	2.0				70 - 130	30	

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.

I = This parameter is outside laboratory LCS/LCSD specified recovery limits.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
September 15, 2017

Friday, September 15, 2017

Criteria: MA: CAM

State: MA

Sample Criteria Exceedances Report

GBY98193 - TERRA-ENV

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
BY98193	$8260GWR	trans-1,4-dichloro-2-butene	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98193	$8260GWR	Tetrahydrofuran (THF)	MA / CAM Protocol / VOA AQ RL	ND	2.5		2	ug/L
BY98193	$8260GWR	Carbon Disulfide	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98193	$8260GWR	Acrylonitrile	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98193	$8260GWR	Acetone	MA / CAM Protocol / VOA AQ RL	ND	25		10	ug/L
BY98194	$8260GWR	trans-1,4-dichloro-2-butene	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98194	$8260GWR	Tetrahydrofuran (THF)	MA / CAM Protocol / VOA AQ RL	ND	2.5		2	ug/L
BY98194	$8260GWR	Carbon Disulfide	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98194	$8260GWR	Acrylonitrile	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98194	$8260GWR	Acetone	MA / CAM Protocol / VOA AQ RL	ND	25		10	ug/L
BY98195	$8260GWR	trans-1,4-dichloro-2-butene	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98195	$8260GWR	Tetrahydrofuran (THF)	MA / CAM Protocol / VOA AQ RL	ND	2.5		2	ug/L
BY98195	$8260GWR	Carbon Disulfide	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98195	$8260GWR	Acrylonitrile	MA / CAM Protocol / VOA AQ RL	ND	5.0		2	ug/L
BY98195	$8260GWR	Acetone	MA / CAM Protocol / VOA AQ RL	ND	25		10	ug/L

MassDEP Analytical Protocol Certification Form

Laboratory Name: Phoenix Environmental Laboratories, Inc. **Project #:**

Project Location: WOLLASTON **RTN:**

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

BY98193, BY98194, BY98195

Matrices: ☑ Groundwater/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 ☑	MassDEP VPH CAM IV A ☐	8081 Pesticides CAM V B ☐	7196 Hex Cr CAM VI B ☐	MassDEP APH CAM IX A ☐
8270 SVOC CAM II B ☑	7010 Metals CAM III C ☐	MassDEP EPH CAM IV B ☐	8151 Herbicides CAM V C ☐	8330 Explosives CAM VIII A ☐	TO-15 VOC CAM IX B ☐
6010 Metals CAM III A ☑	6020 Metals CAM III D ☐	8082 PCB CAM V A ☐	9012 Total Cyanide/PAC CAM V1 A ☐	6860 Perchlorate CAM VIII B ☐	

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature*) in the field or laboratory, and prepared/analyzed with method holding times? (* see narrative)	☑ Yes ☐ No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	☑ Yes ☐ No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☑ Yes ☐ No
D	Does the laboratory report comply with all the reporting requirements speified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	☑ Yes ☐ No
E	a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 methods only: Was the complete analyte list reported for each method?	☐ Yes ☐ No ☐ Yes ☐ No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	☑ Yes ☐ No

Responses to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☐ Yes ☑ 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? See Sections: LACHAT, VOA Narrations .	☐ Yes ☑ No
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☐ Yes ☑ No

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.

Authorized Signature: Ethan Lee

Date: Friday, September 15, 2017

Printed Name: Ethan Lee

Position: Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

SDG Comments

Metals Analysis:
The client requested a shorter list of elements than the 6010 MCP list.

8260 Volatile Organics:
The following compounds from the MCP 8260 analyte list were not performed: TAME, diethyl ether, diisopropyl ether, and ETBE.

8270 Semi-volatile Organics:
Only the PAH constituents are reported as requested on the chain-of-custody. In order to achieve the requested reporting levels for the target compounds, the sample was extracted and analyzed via 8270 selective ion monitoring (SIM).

Phoenix reporting levels may exceed those referenced in the CAM protocol. Please refer to criteria sheet for comparisons to requested MCP standards.

504

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

AU-ECD2 09/11/17-1 Jeff Bucko, Chemist 09/11/17

BY98193, BY98194, BY98195

The initial calibration (504911AI) RSD for the compound list was less than 20% except for the following compounds: None.
The initial calibration (504911BI) RSD for the compound list was less than 20% except for the following compounds: None.
The continuing calibration %D for the compound list was less than 15% except for the following compounds:None.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Cyanide Narration

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

LACHAT 09/13/17-1 Dustin Harrison, Greg Danielewski, Chemist 09/13/17

BY98193, BY98194, BY98195

The samples were distilled in accordance with the method.
The initial calibration met criteria.

The calibration check standards (ICV,CCV) were within 15% of true value and were analyzed at a frequencey of one per ten samples.
The continuing calibration blanks (ICB,CCB) had concentrations less than the reporting level.

The method blank, laboratory control sample (LCS), and matrix spike were distilled with the samples.

QC (Batch Specific):

Batch 401074 (BY98194)

BY98193, BY98194, BY98195

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September 15, 2017

SDG I.D.: GBY98193

Cyanide Narration

All LCS recoveries were within 90 - 110 with the following exceptions: None.
Additional soil criteria LCS acceptance range is 80-120% MS acceptance range 75-125%.
Additional soil criteria LCS acceptance range is 80-120% MS acceptance range 75-125%.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

ETPH Narration

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

AU-XL1 09/11/17-1 Jeff Bucko, Chemist 09/11/17

BY98193, BY98194, BY98195

The initial calibration (ETPH818I) RSD for the compound list was less than 30% except for the following compounds: None.
The continuing calibration %D for the compound list was less than 30% except for the following compounds:None.

QC (Batch Specific):

Batch 400758 (BY97708)

BY98193, BY98194, BY98195

All LCS recoveries were within 50 - 150 with the following exceptions: None.
All LCSD recoveries were within 50 - 150 with the following exceptions: None.
All LCS/LCSD RPDs were less than 20% with the following exceptions: None.
The ETPH/DRO LCS has been normalized based on the alkane calibration.
The ETPH/DRO LCS has been normalized based on the alkane calibration.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Hexavalent Chromium (Aqueous)

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

BECKMAN DU720 09/08/17-1 Dustin Harrison, Chemist 09/08/17

BY98193, BY98194, BY98195

The initial calibration met all criteria including a standard run at the reporting level.
All calibration verification standards (ICV, CCV) met criteria.
All calibration blank verification standards (ICB, CCB) met criteria.

QC (Batch Specific):

Batch 400784 (BY98194)

BY98193, BY98194, BY98195

All LCS recoveries were within 90 - 110 with the following exceptions: None.

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MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

Hexavalent Chromium (Aqueous)

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Mercury Narration

Were all QA/QC performance criteria specified in the analytical method achieved? Yes.

Instrument:

MERLIN 09/12/17 09:07 Rick Schweitzer, Chemist 09/12/17

BY98193, BY98194, BY98195

The method preparation blank contains all of the acids and reagents as the samples; the instrument blanks do not.
The initial calibration met all criteria including a standard run at or below the reporting level.
All calibration verification standards (ICV, CCV) met criteria.
All calibration blank verification standards (ICB, CCB) met criteria.
The matrix spike sample is used to identify spectral interference for each batch of samples, if within 85-115%, no interference is observed and no further action is taken.
The following Initial Calibration Verification (ICV) compounds did not meet criteria: None.
The following Continuing Calibration Verification (CCV) compounds did not meet criteria: None.

QC (Batch Specific):

Batch 400973 (BY98401)

BY98193, BY98194, BY98195

All LCS recoveries were within 75 - 125 with the following exceptions: None.
Additional Mercury criteria: LCS acceptance range for waters is 80-120% and for soils is 75-125%
Additional Mercury criteria: LCS acceptance range for waters is 80-120% and for soils is 75-125%

ICP Metals Narration

Were all QA/QC performance criteria specified in the analytical method achieved? Yes.

Instrument:

BLUE 09/12/17 06:17 Mike Arsenault, Chemist 09/12/17

BY98193, BY98194, BY98195

The initial calibration met criteria.
The continuing calibration standards met criteria for all the elements reported. The linear range is defined daily by the calibration range.
The continuing calibration blanks were less than the reporting level for the elements reported.
The ICSA and ICSAB were analyzed at the beginning and end of the run and were within criteria.The linear range is defined daily by the calibration range.
The following Initial Calibration Verification (ICV) compounds did not meet criteria: None.
The following Continuing Calibration Verification (CCV) compounds did not meet criteria: None.
The following ICP Interference Check (ICSAB) compounds did not meet criteria: None.

QC (Batch Specific):

Batch 401063 (BY98614)

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Certification Report

September 15, 2017

SDG I.D.: GBY98193

ICP Metals Narration

BY98193, BY98194, BY98195

All LCS recoveries were within 75 - 125 with the following exceptions: None.

LACHAT

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? No.

QC Batch 400489 (Samples: BY98193, BY98194, BY98195): -----

The LCS and/or the LCSD recovery is above the upper range for one or more analytes that were not reported in the sample(s), therefore no significant bias is suspected. (Chloride)

Instrument:

LACHAT 09/08/17-3 Michael Tran, Chemist 09/08/17

BY98193, BY98194, BY98195

The initial calibration met all criteria including a standard run at the reporting level.
All method verification standards and blanks met criteria.

QC (Batch Specific):

Batch 400489 (BY95614)

BY98193, BY98194, BY98195

All LCS recoveries were within 90 - 110 with the following exceptions: Chloride(111%)
The LCS recovery is above method criteria for Chloride. All other QC is within criteria. No bias is suspected.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

PHENOLS

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

LACHAT 09/11/17-1 Brian Sheriden, Chemist 09/11/17

BY98193, BY98194, BY98195

The initial calibration met all criteria including a standard run at the reporting level.
All method verification standards and blanks met criteria.

QC (Batch Specific):

Batch 400845 (BY97774)

BY98193, BY98194, BY98195

All LCS recoveries were within 90 - 110 with the following exceptions: None.

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

PHENOLS

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SVOA-Dioxane

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

CHEM22 09/11/17-1 Lauren Muirhead, Chemist 09/11/17

BY98193, BY98194, BY98195

Initial Calibration Verification (CHEM22/DIOX_0905):
100% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet a minimum response factors: None.

Continuing Calibration Verification (CHEM22/0911_07-DIOX_0905) (MCP Compliance):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
100% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet minimum response factors: None.

QC (Batch Specific):

Batch 400759 (BY97903)

BY98193, BY98194, BY98195

All LCS recoveries were within 30 - 130 with the following exceptions: None.
All LCSD recoveries were within 30 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 20% with the following exceptions: None.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SVOASIM Narration

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

CHEM04 09/11/17-1 Damien Drobinski, Chemist 09/11/17

BY98193, BY98194, BY98195

The DDT breakdown and pentachlorophenol & benzidine peak tailing were evaluated in the DFTPP tune and were found to be in control.

In the event that lower detection levels were requested, the samples may have been analyzed by selective ion monitoring (SIM) mode.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

SVOASIM Narration

Initial Calibration Verification (CHEM04/SIM_0825):
94% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet a minimum response factors: None.

Continuing Calibration Verification (CHEM04/0911_02-SIM_0825) (MCP Compliance):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
94% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet minimum response factors: None.

QC (Batch Specific):

Batch 400757 (BY97708)

BY98193, BY98194, BY98195

All LCS recoveries were within 30 - 130 with the following exceptions: None.
All LCSD recoveries were within 30 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 10-110%, for soils 30-130%)
Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 10-110%, for soils 30-130%)

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

VOA Narration

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? No.

QC Batch 401154 (Samples: BY98193, BY98194, BY98195): -----

The LCS and/or the LCSD recovery is below the method criteria. All of the other QC is acceptable, therefore no significant bias is suspected. (Acrylonitrile, Tetrahydrofuran (THF))

Instrument:

CHEM17 09/12/17-1 Michael Hahn, Chemist 09/12/17

BY98193, BY98194, BY98195

Initial Calibration Verification (CHEM17/VT-S0907):
96% of target compounds met criteria.
The following compounds had %RSDs >20%: Acrylonitrile 21% (20%), Bromomethane 27% (20%)
The following compounds did not meet recommended response factors: 1,2-Dibromo-3-chloropropane 0.040 (0.05), 2-Hexanone 0.071 (0.1), 4-Methyl-2-pentanone 0.090 (0.1), Acetone 0.047 (0.1), Methyl ethyl ketone 0.056 (0.1), Tetrahydrofuran (THF) 0.040 (0.05)
The following compounds did not meet a minimum response factors: None.

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MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

VOA Narration

Continuing Calibration Verification (CHEM17/0912_03-VT-S0907) (MCP Compliance):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
99% of target compounds met criteria.
The following compounds did not meet % deviation criteria: 1,2,3-Trichloropropane 22%L (20%)
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: 1,2-Dibromo-3-chloropropane 0.035 (0.05), 2-Hexanone 0.061 (0.1), 4-Methyl-2-pentanone 0.085 (0.1), Acetone 0.043 (0.1), Bromoform 0.092 (0.1), Methyl ethyl ketone 0.053 (0.1), Tetrahydrofuran (THF) 0.036 (0.05)
The following compounds did not meet minimum response factors: None.

CHEM17 09/13/17-2 Michael Hahn, Chemist 09/13/17

BY98194

Initial Calibration Verification (CHEM17/VT-S0913):
96% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet a minimum response factors: None.

Continuing Calibration Verification (CHEM17/0913_12-VT-S0913) (MCP Compliance):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
100% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet minimum response factors: None.

QC (Batch Specific):

Batch 401154 (BY98401)

BY98193, BY98194, BY98195

All LCS recoveries were within 70 - 130 with the following exceptions: None.
All LCSD recoveries were within 70 - 130 with the following exceptions: Acrylonitrile(60%), Tetrahydrofuran (THF)(60%)
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.
Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.
Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.

Batch 401305 (BY98051)

BY98194

All LCS recoveries were within 70 - 130 with the following exceptions: None.
All LCSD recoveries were within 70 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.
Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.
Additional 8260 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is 10%.

We attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

MCP Certification Report

September 15, 2017

SDG I.D.: GBY98193

VOA Narration

VOA-OXY Narration

Were all QA/QC performance criteria specified in the MADEP document CAM achieved? Yes.

Instrument:

CHEM23 09/13/17-1 Harry Mullin, Chemist 09/13/17

BY98193, BY98194, BY98195

Initial Calibration Verification (CHEM23/OXY0912):
100% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet a minimum response factors: None.

Continuing Calibration Verification (CHEM23/0913_02-OXY0912) (MCP Compliance):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
100% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: None.
The following compounds did not meet minimum response factors: None.

QC (Batch Specific):

Batch 401159 (BY98194)

BY98193, BY98194, BY98195

All LCS recoveries were within 70 - 130 with the following exceptions: None.
All LCSD recoveries were within 70 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Cooler: Yes [✓] No [ ]
Coolant: IPK [ ] ICE [✓] No [ ]

PHOENIX
Environmental Laboratories, Inc.

CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Temp 3.1°C Pg of

Data Delivery:
[ ] Fax #:
[ ] Email: jmcmullen@terra-env.com

Customer: TERRA Environmental
Address: 34 Gould Street
Unit 202
Reading, MA 01867

Project: Wollaston
Report to: TERRA
Invoice to: TERRA
Phone #:
Fax #:

Project P.O: 17-122

This section MUST be completed with Bottle Quantities.

Sampler's Signature: [signature] Date: 9-8-17

Client Sample - Information - Identification

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	RCP	pH	GL 250 Amber Not Field Filtered	Soil VOA Vials [ ]	GL Soil container [ ]	40 ml VOA Vial [2]	GL Amber 1000ml [ ]	PL As is [ ]	PL H2SO4 [1]	PL HNO3 250ml	PL NaOH 250ml	Bacteria (as is)	Bacteria (w/thio)	32 oz Amber As Is	32 oz Amber H2SO4	40 ml Amber As Is	40 ml Amber H2SO4
98193	B-2	GW	9-8-17	1000	X	X	2		5	1	1	1	1			3	1	2	17		
98194	B-303 OW	↓	↓	1140	X	X	↓		1	↓	↓	↓	↓			↓	↓	↓	17		
98195	B-307 OW	↓	↓	1345	X	X	↓		1	↓	↓	↓	↓			↓	↓	↓	17		

Relinquished by:	Accepted by:	Date:	Time:
[signature]	[signature]	9-8-17	14:25
[signature]	[signature]	9-8-17	16:45

Comments, Special Requirements or Regulations:
* Not Field Filtered
-Sample B-2 32oz Amber transfer to 250mL H2SO4
-Sample B-307 32 oz Amber to 950 mL As Is
-Sample B-307 32 oz Amber As Is add H2SO4

Turnaround:
[ ] 1 Day*
[ ] 2 Days*
[ ] 3 Days*
[X] Standard
[ ] Other
* SURCHARGE APPLIES

RI
[ ] Direct Exposure (Residential)
[ ] GW
[ ] Other

CT
[ ] RCP Cert
[ ] GW Protection
[ ] SW Protection
[ ] GA Mobility
[ ] GB Mobility
[ ] Residential DEC
[ ] I/C DEC
[ ] Other

MA
[X] MCP Certification
[ ] GW-1
[ ] GW-2
[ ] GW-3
[ ] S-1
[ ] S-2
[ ] S-3
[ ] MWRA eSMART
[ ] Other

State where samples were collected: MA

Data Format
[X] Excel
[ ] PDF
[ ] GIS/Key
[ ] EQuIS
[ ] Other

Data Package
[ ] Tier II Checklist
[ ] Full Data Package*
[ ] Phoenix Std Report
[ ] Other
* SURCHARGE APPLIES

Login Sample Receipt Checklist

(Rejection Criteria Listing - Using Sample Acceptance Policy)

Any False statement will be brought to the attention of Client

Question	Answer (True/False) T/F/NA	Comment
1) The cooler's custody seal, if present, is intact.	NA	
2) The cooler or samples do not appear to have been compromised or tampered with.	T	
3) Samples were received on ice.	T	
4) Cooler Temperature is acceptable.	T	
5) Cooler Temperature is recorded.	T	
6) COC is filled out in ink and legible.	T	
7) COC is filled out with all pertinent information.	T	
8) Field Sampler's name present on COC.	T	
9) There are no discrepancies between the sample IDs on the container and the COC.	T	
10) Samples are received within Holding Time.	T	
11) Sample containers have legible labels.	T	
12) Containers are not broken or leaking.	T	
13) Air Cassettes are not broken/open.	NA	
14) Sample collection date/times are provided.	T	
15) Appropriate sample containers are used.	T	
16) Proper collection media used.	T	
17) No headspace sample bottles are completely filled.	T	
18) There is sufficient volume for all requsted analyses, including any requested MS/MSDs.	T	
19) Trip blanks provided if applicable.	NA	
20) VOA sample vials do not have head space or bubble is <6mm (1/4") in diameter.	NA	
21) Samples do not require splitting or compositing.	T	

Who notified of False statements? **Date/Time:**

Doc #277 Rev. 4 August 2013 **Log-In Technician Initials:** KOB **Date/Time:** 11-26-13 1435

MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 13K1086
Project Location: MBTA Wollaston	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

13K1086-01 thru 13K1086-02

Matrices: Water

CAM Protocol (check all that below)

8260 VOC CAM II A ( )	7470/7471 Hg CAM IIIB (X)	MassDEP VPH CAM IV A (X)	8081 Pesticides CAM V B ( )	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
8270 SVOC CAM II B (X)	7010 Metals CAM III C ( )	MassDEP EPH CAM IV A (X)	8151 Herbicides CAM V C ( )	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )
6010 Metals CAM III A ( )	6020 Metals CAM III D (X)	8082 PCB CAM V A ( )	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )	

Affirmative response to Questions A throughF is 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	☐ No[1]
B	Were the analytical method(s) and all associated QC requirements specificed in the selected CAM protocol(s) followed?	☑ Yes	☐ No[1]
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	☐ No[1]
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidlines for the Acquisition and Reporting of Analytical Data?	☑ Yes	☐ No[1]
E a	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	☑ Yes	☐ No[1]
E b	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes	☐ No[1]
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Qestions A through E)?	☑ Yes	☐ No[1]

A response to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☑ Yes	☐ No[1]

<u>Data User Note:</u> 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 perfomance standards specified in the CAM protocol(s) achieved?	☑ Yes	☐ No[1]
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☐ Yes	☑ No[1]

[1] *All Negative responses must be addressed in an attached Environmental Laboratory case 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:  Position: Laboratory Manager

Printed Name: Daren J. Damboragian Date: 12/09/13

con-test ANALYTICAL LABORATORY
Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

CHAIN OF CUSTODY RECORD 15F0659

39 Spruce Street
East Longmeadow, MA 01028

Company Name:	KLEINFELDER
Address:	215 First Street Suite 320, Cambridge MA 02142
Phone:	617-498-4678
Project Name:	MBTA WOLLASTON STATION
Project Location:	WOLLASTON STATION
Project Number:	20155273.001A
Project Manager:	MARTHA ZIRBEL
Con-Test Bid:	
Invoice Recipient:	
Sampled By:	STEFANIE BRIDGES

Requested Turnaround Time
7-Day ☑ 10-Day ☐
Other:

Rush-Approval Required
1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery
Format: PDF ☑ EXCEL ☑
Other:
Enhanced Data Package Required: ☐
Email To: ZIRBEL@KLEINFELDER.CO
Fax To #: (mzirbel@kleinfelder.com

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	[1] Matrix Code	Conc Code	Total Pb and Cr	EPH (MaDEP)	VPH (MaDEP)	VOCS BY 8260	SVOCs by 8270	PCBS BY 8082	RCRA 8 METALS	TPH BY 8015	CONDUCTIVITY	Ph & REACT/FLASH	FLASH
								2	1	1/2	2							
								I	M	M/B	I							
								A	V	V/V								
01	B-303 6-8'	0700	6/12/15	X		S		X										
						S												
						S												
						S												
						S												
						S												
						S												
						S												
						S												
						S												

ANALYSIS REQUESTED

# of Containers
[2] Preservation Code
[3] Container Code

Dissolved Metals Samples
○ Field Filtered
○ Lab to Filter

Orthophosphate Samples
○ Field Filtered
○ Lab to Filter

Comments: Use sample composite for VPH M.C.

Please use the following codes to indicate possible sample concentration within the Conc Code column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil/Solid
SL = Sludge
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

[3] **Container Codes:**
A = Amber Glass
G = Glass
P = Plastic
ST = Sterile
V = Vial
S = Summa Canister
T = Tedlar Bag
O = Other (please define)

Relinquished by: (signature) Stefanie Bridges	Date/Time: 6/12/15 1250
Received by: (signature)	Date/Time: 6/12/15 12:50
Relinquished by: (signature)	Date/Time: 6/12/15 1600
Received by: (signature)	Date/Time: 6/17/15 1600
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Detection Limit Requirements
MA — RCS-1
CT
Other:

Program Information
○ YES-MCP Analytical Certification Form Required
○ RCP Analysis Certification Form Required
○ MA State DW Form Required
PWSID # _____

NELAC and AIHA-LAP, LLC Accredited

TURNAROUND TIME (BUSINESS DAYS) STARTS AT 9:00 AM THE DAY AFTER SAMPLE RECEIPT UNLESS THERE ARE QUESTIONS ON THIS CHAIN. IF THIS FORM IS NOT FILLED OUT COMPLETELY OR IS INCORRECT, TURNAROUND TIME CANNOT START UNTIL ALL QUESTIONS HAVE BEEN ANSWERED.

PLEASE BE CAREFUL NOT TO CONTAMINATE THIS DOCUMENT

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