

Orion Environmental Inc.

✓ 2955 Redondo Avenue Long Beach, CA 90806 562 988-2755 PHONE 562 988-2759 FAX

DBA Arctos Environmental

O 2332 5th Street, Suite A Berkeley, CA 94710 510 525-2180 PHONE 510 525-2392 FAX

26 September 2018 Project No. 02WMA

United States Environmental Protection Agency, Region 1 5 Post Office Square, Suite 100 Mail Code: OEP06-1 Boston, MA 02109-3912

Subject: Notice of Intent for Remediation General Permit

Northrop Grumman Guidance and Electronics Company, Inc.

180 State Road East, Westminster, Massachusetts

MassDEP Release Tracking No. 2-000165

Dear Permits Section:

Orion Environmental Inc., on behalf of Northrop Grumman Guidance and Electronics Company, Inc. (Northrop Grumman), is submitting this Notice of Intent for a Remediation General Permit (RGP) for the subject site. The RGP is required for discharge to the Whitman River associated with remediation activities to address a historic release of cadmium to wetland hydric soil, riverbank soil, and river sediment in and near the Whitman River in the drainage swale area (Area 2) of the site.

On 30 May 2017, Northrop Grumman submitted a Phase IV Remedy Implementation Plan (RIP) to the Massachusetts Department of Environmental Protection. The RIP included a detailed description of a comprehensive remedial action for Area 2, which includes excavation of cadmium-impacted wetland hydric soil, riverbank soil, and river sediment. Following completion of excavation activities, Northrop Grumman will restore disturbed portions of the wetland, riverbank, and riverbed in-kind. The enclosed package includes the Notice of Intent for an RGP and a memorandum summarizing the site background, site description, and proposed scope of work including excavation and restoration plans. All response actions are being conducted under the supervision of the Licensed Site Professional-of-Record, James F. Begley (LSP No. 2061), of MT Environmental Restoration located in Duxbury, Massachusetts.

United States Environmental Protection Agency Region 1 26 September 2018 Page 2



If you have any questions or comments regarding this Notice of Intent package, please call either Steve Hash at 562/988-2755 or Scott Lutz of Northrop Grumman at 310/331-1716.

Very truly yours,

ORION ENVIRONMENTAL INC.

Steve Hash, P.E.

Senior Project Engineer

Copy: Scott Lutz, Northrop Grumman Corporation

James Begley, MT Environmental Restoration

Attachments: Notice of Intent for Remediation General Permit

Scope of Work Memorandum

WQBEL Spreadsheet (attached as separate Excel file)

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

A. General site information:

1. Name of site:	Site address:						
	Street:						
	City:		State:	Zip:			
2. Site owner	Contact Person:						
	Telephone:	Email:					
	Mailing address:	l					
	Street:						
Owner is (check one): ☐ Federal ☐ State/Tribal ☐ Private ☐ Other; if so, specify:	City:	State:	Zip:				
3. Site operator, if different than owner	Contact Person:						
	Telephone:	Email:					
	Mailing address:						
	Street:						
	City:		State:	Zip:			
4. NPDES permit number assigned by EPA:	5. Other regulatory program(s) that apply to the site	(check all th	at apply):				
	☐ MA Chapter 21e; list RTN(s):	□ CERCL	LΑ				
NPDES permit is (check all that apply: □ RGP □ DGP □ CGP	☐ NH Groundwater Management Permit or	□ UIC Pro	•				
☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:		☐ POTW Pretreatment					
L MISSI L Marriada M DES permit L Suici, ii so. seccir.	Groundwater Release Detection Permit:	□ CWA S					

D. Necelving water intolliation.	В.	Receiving	water	information	:
----------------------------------	----	-----------	-------	-------------	---

1. Name of receiving water(s):	Waterbody identification of receiving water	(s): Classifi	cation of receiving water(s):
Receiving water is (check any that apply): □ Outstan	ding Resource Water □ Ocean Sanctuary □ territo	rial sea □ Wild and Scenic R	iver
2. Has the operator attached a location map in accord	ance with the instructions in B, above? (check one)	: □ Yes □ No	
Are sensitive receptors present near the site? (check of If yes, specify:	one): □ Yes □ No		
3. Indicate if the receiving water(s) is listed in the Stapollutants indicated. Also, indicate if a final TMDL is 4.6 of the RGP.			
4. Indicate the seven day-ten-year low flow (7Q10) o Appendix V for sites located in Massachusetts and A			0.924 cubic feet per second or 0.597 million gallons per day
5. Indicate the requested dilution factor for the calcul accordance with the instructions in Appendix V for s			
6. Has the operator received confirmation from the ap If yes, indicate date confirmation received: 7. Has the operator attached a summary of receiving	-		
(check one): ☐ Yes ☐ No			
C. Source water information:			
1. Source water(s) is (check any that apply):			
☐ Contaminated groundwater	☐ Contaminated surface water	☐ The receiving water	☐ Potable water; if so, indicate municipality or origin:
Has the operator attached a summary of influent sampling results as required in Part 4.2 of the RGP	Has the operator attached a summary of influent sampling results as required in Part 4.2 of the	☐ A surface water other	
in accordance with the instruction in Appendix VIII? (check one):	RGP in accordance with the instruction in Appendix VIII? (check one):	than the receiving water; if so, indicate waterbody:	☐ Other; if so, specify:
□ Yes □ No	□ Yes □ No		

2. Source water contaminants:	
a. For source waters that are contaminated groundwater or contaminated surface water, indicate are any contaminants present that are not included in	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
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.	with the instructions in Appendix VIII? (check one): ☐ Yes ☐ No
3. Has the source water been previously chlorinated or otherwise contains resid	dual chlorine? (check one): □ Yes □ No
D. Discharge information	
1.The discharge(s) is a(n) (check any that apply): \Box Existing discharge \Box New	w discharge □ New source
Outfall(s):	Outfall location(s): (Latitude, Longitude)
Discharges enter the receiving water(s) via (check any that apply): □ Direct di	scharge to the receiving water □ Indirect discharge, if so, specify:
☐ A private storm sewer system ☐ A municipal storm sewer system If the discharge enters the receiving water via a private or municipal storm sew	ver system:
Has notification been provided to the owner of this system? (check one): ☐ Ye	es 🗆 No
Has the operator has received permission from the owner to use such system for obtaining permission:	or discharges? (check one): \square Yes \square No, if so, explain, with an estimated timeframe for
Has the operator attached a summary of any additional requirements the owner	of this system has specified? (check one): \square Yes \square No
Provide the expected start and end dates of discharge(s) (month/year):	
Indicate if the discharge is expected to occur over a duration of: \square less than 1	2 months \square 12 months or more \square is an emergency discharge
Has the operator attached a site plan in accordance with the instructions in D, a	above? (check one): □ Yes □ No

2. Activity Category: (check all that apply)	3. Contamination Type Category: (check all that apply)				
	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 				
 □ I – Petroleum-Related Site Remediation □ II – Non-Petroleum-Related Site Remediation 	b. If Activity Category III, IV, V, VI, VII or VIII: (check either G or H)				
 □ 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 	□ G. Sites with Known Contamination 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	□ H. Sites with Unknown Contamination d. If Category III-H, IV-H, V-H, VI-H, VII-H or VIII-H Contamination Type Categories A through F apply			

4. Influent and Effluent Characteristics

	Known	Known		_		Inf	luent	Effluent Liı	nitations
Parameter	or believed absent	or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
A. Inorganics					WQBEL only a	applies for total res	idual chlorine and ca	spreadsheet. Based on th dmium. For all other ino ed to this permit applicati	rganics, the TBEL
Ammonia								Report mg/L	
Chloride								Report µg/l	
Total Residual Chlorine								0.2 mg/L	
Total Suspended Solids								30 mg/L	
Antimony								206 μg/L	
Arsenic								104 μg/L	
Cadmium								10.2 μg/L	
Chromium III								323 μg/L	
Chromium VI								323 μg/L	
Copper								242 μg/L	
Iron								5,000 μg/L	
Lead								160 μg/L	
Mercury								0.739 μg/L	
Nickel								1,450 µg/L	
Selenium								235.8 μg/L	
Silver								35.1 μg/L	
Zinc								420 μg/L	
Cyanide								178 mg/L	
B. Non-Halogenated VOCs	1								
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	

	Known	Known		_		Infl	luent	Effluent Lin	nitations
Parameter	or believed absent	or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
C. Halogenated VOCs									
Carbon Tetrachloride								4.4 μg/L	
1,2 Dichlorobenzene								600 μg/L	
1,3 Dichlorobenzene								320 µg/L	
1,4 Dichlorobenzene								5.0 μg/L	
Total dichlorobenzene								763 µg/L in NH	
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	
cis-1,2 Dichloroethylene								70 μg/L	
Vinyl Chloride								2.0 μg/L	
D. Non-Halogenated SVO	Cs	_							
Total Phthalates								190 μg/L	
Diethylhexyl phthalate								101 μg/L	
Total Group I PAHs								1.0 μg/L	
Benzo(a)anthracene								_	
Benzo(a)pyrene								_	
Benzo(b)fluoranthene								<u> </u>	
Benzo(k)fluoranthene								As Total PAHs	
Chrysene								_	
Dibenzo(a,h)anthracene								_	
Indeno(1,2,3-cd)pyrene									

	Known	Known				Inf	luent	Effluent Lin	nitations
Parameter	or believed absent	or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
Total Group II PAHs								100 μg/L	
Naphthalene								20 μg/L	
E. Halogenated SVOCs									
Total PCBs								0.000064 µg/L	
Pentachlorophenol								1.0 μg/L	
	1			•					
F. Fuels Parameters Total Petroleum		1	1	1		1 1		<u> </u>	
Hydrocarbons								5.0 mg/L	
Ethanol								Report mg/L	
Methyl-tert-Butyl Ether								70 μg/L	
tert-Butyl Alcohol								120 μg/L in MA 40 μg/L in NH	
tert-Amyl Methyl Ether								90 μg/L in MA 140 μg/L in NH	
Other (i.e., pH, temperatur	re, hardness,	salinity, LC	50, addition	al pollutar	ats present);	if so, specify:			

E. Treatment system information

1. Indicate the type(s) of treatment that will be applied to effluent prior to discharge: (check all that apply)	
□ Adsorption/Absorption □ Advanced Oxidation Processes □ Air Stripping □ Granulated Activated Carbon ("GAC")/Liquid Phase Carbon Adsorption □ Ion Exchange □ Precipitation/Coagulation/Flocculation □ Separation/Filtration □ Other; if so, specify:	
2. Provide a written description of all treatment system(s) or processes that will be applied to the effluent prior to discharge.	
Identify each major treatment component (check any that apply): □ Fractionation tanks□ Equalization tank □ Oil/water separator □ Mechanical filter □ Media filter □ Chemical feed tank □ Air stripping unit □ Bag filter □ Other; if so, specify:	
Indicate if either of the following will occur (check any that apply): □ Chlorination □ De-chlorination	
3. Provide the design flow capacity in gallons per minute (gpm) of the most limiting component. Indicate the most limiting component: Is use of a flow meter feasible? (check one): □ Yes □ No, if so, provide justification:	
Provide the proposed maximum effluent flow in gpm.	
Provide the average effluent flow in gpm.	
If Activity Category IV applies, indicate the estimated total volume of water that will be discharged: Not applicable. Activity Categories II and VIII.	
4. Has the operator attached a schematic of flow in accordance with the instructions in E, above? (check one): Yes No treatment system is shown on Figure Scope of Work Memorandum	

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. 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): \square Yes \square 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? Not applicable.
(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) \square the operator \square EPA \square Other; if so, specify:

□ NMFS Criterion : A determination made by EPA is affirmed by the operator that the to adversely affect" any federally threatened or endangered listed species or critical	
listed species. Has the operator previously completed consultation with NMFS? (ch	· ·
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 S	Not applicable. The proposed work will have no effect on any federally-listed threatened or
H. National Historic Preservation Act eligibility determination	endangered species or designated critical habitat. Refer to the Endangered Species section and Attachment C of the attached Scope of Work Memorandum for additional information.
1. Indicate under which criterion the discharge(s) is eligible for coverage under this general perm	nit:
☐ Criterion A : No historic properties are present. The discharges and discharge-relate historic properties.	ed activities (e.g., BMPs) do not have the potential to cause effects on
☐ Criterion B: Historic properties are present. Discharges and discharge related activity	ities do not have the potential to cause effects on historic properties.
☐ Criterion C : Historic properties are present. The discharges and discharge-related a effect on historic properties.	activities have the potential to have an effect or will have an adverse
2. Has the operator attached supporting documentation of NHPA eligibility in accordance with the	he instructions in H, above? (check one): Yes No
Does the supporting documentation include any written agreement with the State Historic Preser	vation Officer (SHPO), Tribal Historic Preservation Officer (TPHO), or
other tribal representative that outlines measures the operator will carry out to mitigate or preven	at any adverse effects on historic properties? (check one): \Box Yes \Box No
properties are required. However	operties are present. Therefore no measures to prevent or mitigate adverse effects on historic ver, best management practices will be implemented. Refer to the Historic Properties section and Scope of Work Memorandum for additional information.
Describe any supplemental information being provided with the NOI. Include attachments if requ	uired or otherwise necessary.
	·
Has the operator attached data, including any laboratory case narrative and chain of custody used	l to support the application? (check one): ☐ Yes ☐ No
Has the operator attached the certification requirement for the Best Management Practices Plan (Influent and receiving water are the same. (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 a that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and be no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are information, including the possibility of fine and imprisonment for knowing violations.	persons who manage t elief, true, accurate, a	the system, or those nd complete. I have
BMPP certification statement:		
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		
$permit(s). \ Additional \ discharge \ permit \ is \ (check \ one): \ \square \ RGP \ \square \ DGP \ \square \ CGP \ \square \ MSGP \ \square \ Individual \ NPDES \ permit$	Check one: Yes □	No □ NA □
☐ Other; if so, specify:		
Signature: Dat	de:	
Print Name and Title:		

Emily Chow

From: Vakalopoulos, Catherine (DEP) <Catherine.Vakalopoulos@MassMail.State.MA.US>

Sent: Tuesday, July 17, 2018 1:55 PM

To: Emily Chow

Subject: RE: Westminster: 7Q10 and Dilution Factor for EPA Remediation General Permit

Hi Emily,

Thanks for the quick response. This part of the Whitman River is in the Nashua River watershed. Its segment ID is MA81-11 and it's classified as Class B. There are no TMDLs written for this river and this is not an Outstanding Resource Water (ORW). Normally you would find any impairments by searching "MA81-11" here: https://www.mass.gov/files/documents/2016/08/sa/14list2_0.pdf. But in this case, the Whitman River is not fully assessed so I couldn't find any impairments.

So with a design flow of 150 gpm = 0.216 MGD and a 7Q10 of 0.924 cfs = 0.597 MGD Dilution factor = (0.216 + 0.597)/0.216 = 3.76

Please also note that if this is a site that is <u>not currently</u> regulated under the Massachusetts Contingency Plan, you will have to apply with the state. It's not a tedious process since we basically require a copy of the NOI, a transmittal form, and a \$500 fee (unless fee exempt, e.g. municipalities). Here is the link to the instructions: https://www.mass.gov/how-to/wm-15-npdes-general-permit-notice-of-intent.

Please let me know if you have any additional questions.

Cathy

Cathy Vakalopoulos, Massachusetts Department of Environmental Protection 1 Winter St., Boston, MA 02108, 617-348-4026

A Please consider the environment before printing this e-mail

From: Emily Chow [mailto:echow@orionenv.com]

Sent: Tuesday, July 17, 2018 4:34 PM **To:** Vakalopoulos, Catherine (DEP)

Subject: RE: Westminster: 7Q10 and Dilution Factor for EPA Remediation General Permit

Hi Cathy – Thanks for looking into this. The design flow is 150 gpm. Let me know if there's any other information that would be helpful.

Thanks again!

Emily

From: Vakalopoulos, Catherine (DEP) < Catherine. Vakalopoulos @ MassMail. State. MA. US>

Sent: Tuesday, July 17, 2018 1:31 PM **To:** Emily Chow <echow@orionenv.com>

Subject: RE: Westminster: 7Q10 and Dilution Factor for EPA Remediation General Permit

Hi Emily,

You gave me the estimated discharge flow (100 gpm). Please let me know what the design flow is of the system, i.e. the maximum flow through the treatment system, since we need to calculate the dilution factor under worst case conditions (low river flow and max effluent discharge). In the meantime, I'll look up the water quality information that you need for the NOI (segment ID, TMDLs, etc.).

Thanks. Cathy

Cathy Vakalopoulos, Massachusetts Department of Environmental Protection 1 Winter St., Boston, MA 02108, 617-348-4026

A Please consider the environment before printing this e-mail

From: Emily Chow [mailto:echow@orionenv.com]

Sent: Monday, July 16, 2018 11:04 AM To: Vakalopoulos, Catherine (DEP)

Subject: Westminster: 7Q10 and Dilution Factor for EPA Remediation General Permit

Good Morning Cathy, I've been talking to Shauna Little and she mentioned that I should confirm my 7Q10 and dilution factor with you. We're going to obtain an EPA remediation general permit for proposed work in the Whitman River at 180 State Road East in Westminster, MA. We'll be including the 7Q10 and dilution factor in our remediation general permit application. Based on the StreamStats Report, our 7Q10 is 0.924 cubic feet per second (page 3 of the attached StreamStats Report). I calculated a dilution factor of 5.15 using the 7Q10 and an estimated discharge flow of 100 gpm. Please see the attached excel file for dilution factor calculations. Would you please confirm our 7Q10 of 0.924 cubic feet per second and dilution factor of 5.15? Please let me know if you need any other information or have any questions.

Thank you-

Emily Chow Project Scientist Orion Environmental Inc. 2955 Redondo Avenue Long Beach, California 90806 Office: 562/988-2755



THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Buffalo 10 Hazelwood Drive Amherst, NY 14228-2298 Tel: (716)691-2600

TestAmerica Job ID: 480-110346-2

Client Project/Site: Surface Water Sampling

For:

Orion Environmental, Inc. 2955 Redondo Ave. Long Beach, California 90806

Attn: Steve Hash



Authorized for release by: 12/7/2016 11:14:25 AM

Joe Giacomazza, Project Management Assistant II joe.giacomazza@testamericainc.com

Designee for

Steve Hartmann, Project Manager I (413)572-4000

steve.hartmann@testamericainc.com

LINKS

Review your project results through

Total Access

Have a Question?



Visit us at: www.testamericainc.com The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Detection Summary	6
Client Sample Results	7
QC Sample Results	8
QC Association Summary	10
Lab Chronicle	11
Certification Summary	12
Method Summary	13
Sample Summary	14
Chain of Custody	15
Receipt Chacklists	16

4

7

9

10

12

13

Definitions/Glossary

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

RL

RPD

TEF TEQ Reporting Limit or Requested Limit (Radiochemistry)

Toxicity Equivalent Factor (Dioxin)

Toxicity Equivalent Quotient (Dioxin)

Relative Percent Difference, a measure of the relative difference between two points

Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio

Case Narrative

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Job ID: 480-110346-2

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative 480-110346-2

Receipt

The samples were received on 12/2/2016 1:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.0° C.

Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

4

7

8

9

10

13

	MassDEP Analytical Protocol Certification Form										
Laboi	ratory Name:	TestAmer	ica Buffalo	Project #:	480-1103	46-2					
Proje	ect Location:	Westn	ninster	RTN:							
This f	This form provides certifications for the following data set: list Laboratory Sample ID Number(s):										
	180-10346-5										
Matric	es:	Groundwater/Surfa	ce Water	Soil/Sediment	Drinking Water Air	Other:					
		check all that ap	· · · · ·								
8260		7470/7471 Hg	Mass DEP VPH	8081 Pesticides	7196 Hex Cr	Mass DEP APH					
8270	II A ∟∟ SVOC	CAM III B 7010 Metals	Mass DEP EPH	CAM V B L 8151 Herbicides	CAM VI B 8330 Explosives	CAM IX A LI					
CAM		CAM III C	CAM IV B	CAM V C	CAM VIII A	CAM IX B					
				9014 Total							
6010 CAM	Metals Ⅲ A	6020 Metals CAM III D	8082 PCB CAM V A	Cyanide/PAC CAM VI A	6860 Perchlorate CAM VIII B						
				F are required for "	Presumptive Certainty" st	atus					
Α	Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding time.										
В	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?										
С			-	esponse actions spe ce standard non-con	ecified in the selected CAM formances?	■Yes □ No					
D			•	• .	ecified in CAM VII A, nd Reporting of Analytical	Yes No					
E	modification((s)? (Refer to the inc	dividual method(s) f	ethod conducted with or a list of significan e analyte list reporte	t modifications).	Yes No					
F				nce standard non-co	onformances identified and stions A through E)?	Yes No					
	Respons	ses to Questions C	6, H and I below ar	e required for "Pre	sumptive Certainty" statu	S					
G	protocol(s)?			ing limits specified ir		Yes No ¹					
				r" status may not ned 1056 (2)(k) and WCS	essarily meet the data usabi -07-350	lity and					
Н	l			e CAM protocol(s) a		Yes No ¹					
ı	Were results	reported for the co	mplete analyte list s	specified in the selec	ted CAM protocol(s) ?	Yes No ¹					
¹ All n	egative respo	onses must be addre	essed in an attache	d laboratory narrative	9.						
obtair		mation, the material o			oon my personal inquiry of the best of my knowledge and						
Signa		-	g i acomagger	Position:	Project Manager	Assistant II					
Printe	Printed Name: Joseph V. Giacomazza Date: 12/07/2016 11										

Detection Summary

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Client Sample ID: 11124818-J1130-SW2-011216

Lab Sample ID: 480-110346-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Antimony	0.19	J	1.0	0.15	ug/L		_	6020A	Dissolved
Arsenic	0.48	J	1.0	0.078	ug/L	1		6020A	Dissolved
Barium	10		1.0	0.014	ug/L	1		6020A	Dissolved
Chromium	0.070	J	1.0	0.070	ug/L	1		6020A	Dissolved
Copper	1.3		1.0	0.22	ug/L	1		6020A	Dissolved
Lead	0.14	J	1.0	0.069	ug/L	1		6020A	Dissolved
Nickel	0.67	J	1.0	0.11	ug/L	1		6020A	Dissolved
Thallium	0.019	J	1.0	0.0080	ug/L	1		6020A	Dissolved
Zinc	5.0		5.0	1.1	ua/L	1		6020A	Dissolved

7

10

11

Client Sample Results

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

Date Received: 12/02/16 01:30

Mercury

TestAmerica Job ID: 480-110346-2

Lab Sample ID: 480-110346-5

12/02/16 14:22

Matrix: Water

Client Sample ID: 11124818-J1130-SW2-011216
Date Collected: 12/01/16 11:30

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.19	J	1.0	0.15	ug/L		12/02/16 11:35	12/03/16 03:58	1
Arsenic	0.48	J	1.0	0.078	ug/L		12/02/16 11:35	12/03/16 03:58	1
Barium	10		1.0	0.014	ug/L		12/02/16 11:35	12/03/16 03:58	1
Beryllium	ND		1.0	0.030	ug/L		12/02/16 11:35	12/03/16 03:58	1
Cadmium	ND		1.0	0.071	ug/L		12/02/16 11:35	12/03/16 03:58	1
Chromium	0.070	J	1.0	0.070	ug/L		12/02/16 11:35	12/03/16 03:58	1
Copper	1.3		1.0	0.22	ug/L		12/02/16 11:35	12/03/16 03:58	1
Lead	0.14	J	1.0	0.069	ug/L		12/02/16 11:35	12/03/16 03:58	1
Molybdenum	ND		1.0	0.087	ug/L		12/02/16 11:35	12/03/16 03:58	1
Nickel	0.67	J	1.0	0.11	ug/L		12/02/16 11:35	12/03/16 03:58	1
Selenium	ND		1.0	0.44	ug/L		12/02/16 11:35	12/05/16 20:44	1
Silver	ND		1.0	0.014	ug/L		12/02/16 11:35	12/03/16 03:58	1
Thallium	0.019	J	1.0	0.0080	ug/L		12/02/16 11:35	12/03/16 03:58	1
Vanadium	ND		1.0	0.18	ug/L		12/02/16 11:35	12/03/16 03:58	1
Zinc	5.0		5.0	1.1	ug/L		12/02/16 11:35	12/03/16 03:58	1
Method: 7470A - Mercury	(CVAA) - Dissolved								
Analyte	,	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.00020

0.00012 mg/L

12/02/16 08:35

ND

TestAmerica Job ID: 480-110346-2

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 480-334455/1-A

Matrix: Water

Analysis Batch: 334781

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 334455

MB	MB							
Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
ND		1.0	0.15	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.078	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.014	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.030	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.071	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.070	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.22	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.069	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.087	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.11	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.014	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.0080	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		1.0	0.18	ug/L		12/02/16 11:35	12/03/16 03:39	1
ND		5.0	1.1	ug/L		12/02/16 11:35	12/03/16 03:39	1
	Result ND ND ND ND ND ND ND ND ND N	ND N	Result Qualifier RL ND 1.0 ND 1.0	Result Qualifier RL MDL ND 1.0 0.15 ND 1.0 0.078 ND 1.0 0.014 ND 1.0 0.030 ND 1.0 0.071 ND 1.0 0.070 ND 1.0 0.069 ND 1.0 0.087 ND 1.0 0.011 ND 1.0 0.014 ND 1.0 0.0080 ND 1.0 0.0080 ND 1.0 0.0080 ND 1.0 0.018	Result Qualifier RL MDL Unit ND 1.0 0.15 ug/L ND 1.0 0.078 ug/L ND 1.0 0.014 ug/L ND 1.0 0.071 ug/L ND 1.0 0.070 ug/L ND 1.0 0.069 ug/L ND 1.0 0.087 ug/L ND 1.0 0.011 ug/L ND 1.0 0.014 ug/L ND 1.0 0.0080 ug/L ND 1.0 0.0080 ug/L ND 1.0 0.018 ug/L	Result Qualifier RL MDL Unit D ND 1.0 0.15 ug/L ug/L ND 1.0 0.078 ug/L ND 1.0 0.014 ug/L ND 1.0 0.030 ug/L ND 1.0 0.071 ug/L ND 1.0 0.070 ug/L ND 1.0 0.069 ug/L ND 1.0 0.011 ug/L ND 1.0 0.014 ug/L ND 1.0 0.0080 ug/L ND 1.0 0.0080 ug/L ND 1.0 0.014 ug/L	Result Qualifier RL MDL Unit D Prepared ND 1.0 0.15 ug/L 12/02/16 11:35 ND 1.0 0.078 ug/L 12/02/16 11:35 ND 1.0 0.014 ug/L 12/02/16 11:35 ND 1.0 0.030 ug/L 12/02/16 11:35 ND 1.0 0.071 ug/L 12/02/16 11:35 ND 1.0 0.070 ug/L 12/02/16 11:35 ND 1.0 0.022 ug/L 12/02/16 11:35 ND 1.0 0.087 ug/L 12/02/16 11:35 ND 1.0 0.011 ug/L 12/02/16 11:35 ND 1.0 0.014 ug/L 12/02/16 11:35 ND 1.0 0.0080 <	Result Qualifier RL MDL Unit D Prepared Analyzed ND 1.0 0.15 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.078 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.014 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.030 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.071 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.070 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.022 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.087 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.014 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.11 ug/L 12/02/16 11:35 12/03/16 03:39 ND 1.0 0.014 ug/L 12/02/16 11:35 12/03/16 03:3

Lab Sample ID: MB 480-334455/1-A

Matrix: Water

Analysis Batch: 334945

Prep Type: Total/NA

Prep Batch: 334455

Client Sample ID: Method Blank

MB MB Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Selenium ND 1.0 0.44 ug/L 12/02/16 11:35 12/05/16 20:28

Lab Sample ID: LCS 480-334455/2-A

Matrix: Water

Applyeic Patch: 224794

Client Sample ID: Lab Control Sample Prep Type: Total/NA

						Prep Ball	ch: 334455
Spike	LCS	LCS				%Rec.	
Added	Result	Qualifier	Unit	D	%Rec	Limits	
20.0	19.8		ug/L		99	80 - 120	
20.0	19.9		ug/L		100	80 _ 120	
20.0	19.5		ug/L		98	80 - 120	
20.0	20.6		ug/L		103	80 - 120	
20.0	19.8		ug/L		99	80 _ 120	
20.0	19.9		ug/L		100	80 - 120	
20.0	20.0		ug/L		100	80 _ 120	
20.0	19.7		ug/L		99	80 - 120	
20.0	20.2		ug/L		101	80 - 120	
20.0	20.1		ug/L		100	80 _ 120	
20.0	20.4		ug/L		102	80 _ 120	
20.0	20.0		ug/L		100	80 _ 120	
20.0	20.3		ug/L		101	80 - 120	
50.0	48.2		ug/L		96	80 - 120	
	Added 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.	Added Result 20.0 19.8 20.0 19.9 20.0 20.6 20.0 19.8 20.0 19.9 20.0 20.0 20.0 20.0 20.0 20.2 20.0 20.1 20.0 20.4 20.0 20.0 20.0 20.0 20.0 20.4 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	Added Result Qualifier 20.0 19.8 19.9 20.0 19.5 19.5 20.0 20.6 20.6 20.0 19.8 20.0 20.0 20.0 20.0 20.0 20.0 20.2 20.0 20.1 20.4 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.3 20.3	Added Result Qualifier Unit 20.0 19.8 ug/L 20.0 19.9 ug/L 20.0 19.5 ug/L 20.0 20.6 ug/L 20.0 19.8 ug/L 20.0 19.9 ug/L 20.0 20.0 ug/L 20.0 19.7 ug/L 20.0 20.2 ug/L 20.0 20.1 ug/L 20.0 20.4 ug/L 20.0 20.0 ug/L 20.0 20.0 ug/L	Added Result Qualifier Unit D 20.0 19.8 ug/L ug/L 20.0 19.9 ug/L ug/L 20.0 20.6 ug/L ug/L 20.0 19.8 ug/L ug/L 20.0 19.9 ug/L ug/L 20.0 20.0 ug/L ug/L 20.0 20.2 ug/L 20.0 20.1 ug/L 20.0 20.4 ug/L 20.0 20.0 ug/L 20.0 20.0 ug/L 20.0 20.3 ug/L	Added Result Qualifier Unit D %Rec 20.0 19.8 ug/L 99 20.0 19.9 ug/L 100 20.0 19.5 ug/L 98 20.0 20.6 ug/L 103 20.0 19.8 ug/L 99 20.0 19.9 ug/L 100 20.0 20.0 ug/L 100 20.0 20.0 ug/L 99 20.0 20.2 ug/L 101 20.0 20.1 ug/L 100 20.0 20.4 ug/L 102 20.0 20.0 ug/L 102 20.0 20.0 ug/L 100	Spike LCS LCS %Rec. Added Result Qualifier Unit D %Rec Limits 20.0 19.8 ug/L 99 80 - 120 20.0 19.9 ug/L 100 80 - 120 20.0 20.6 ug/L 98 80 - 120 20.0 19.8 ug/L 99 80 - 120 20.0 19.9 ug/L 100 80 - 120 20.0 20.0 ug/L 100 80 - 120 20.0 19.7 ug/L 99 80 - 120 20.0 20.2 ug/L 101 80 - 120 20.0 20.1 ug/L 101 80 - 120 20.0 20.4 ug/L 102 80 - 120 20.0 20.4 ug/L 100 80 - 120 20.0 20.3 ug/L 100 80 - 120

Lab Sample ID: LCS 480-334455/2-A

Matrix: Water

Analysis Batch: 334945

Client Sample ID: Lab Control Sample Prep Type: Total/NA **Prep Batch: 334455**

LCS LCS %Rec. Spike Analyte Added Result Qualifier Unit %Rec Limits Selenium 20.0 21.0 ug/L 105 80 - 120

TestAmerica Buffalo

TestAmerica Job ID: 480-110346-2

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 334455

Prep Batch: 334374

Prep Batch: 334374

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCSD 480-334455/3-A	ab Sample ID: LCSD 480-334455/3-A Client Samp									
Matrix: Water						Prep Type: Total/NA				
Analysis Batch: 334781		Prep I	Batch: 334455							
	Spike	LCSD	LCSD				%Rec.		RPD	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Antimony	20.0	19.7		ug/L		99	80 - 120	0	20	
Arsenic	20.0	19.2		ug/L		96	80 - 120	4	20	
Barium	20.0	19.8		ug/L		99	80 - 120	2	20	
Beryllium	20.0	20.4		ug/L		102	80 - 120	1	20	
Cadmium	20.0	19.5		ug/L		98	80 - 120	1	20	
Oharaniana	20.0	40.0		/1		00	00 100	2	20	

Chromium 80 - 120 20.0 19.6 ug/L 98 20 20.0 19.9 99 80 - 120 20 Copper ug/L 80 - 120 20 Lead 20.0 19.8 ug/L 99 20.0 20.1 101 80 - 120 20 Molybdenum ug/L Nickel 20.0 19.7 ug/L 98 80 - 120 20 Silver 20.0 19.9 ug/L 99 80 - 120 20 Thallium 20.0 20.0 ug/L 100 80 - 120 20 Vanadium 20.0 19.5 ug/L 98 80 - 120 20 Zinc 50.0 47.6 ug/L 80 - 120 20

Lab Sample ID: LCSD 480-334455/3-A

Matrix: Water

Analysis Batch: 334945

	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Selenium	20.0	20.9		ug/L		105	80 - 120	1	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 480-334374/1-A Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 334507

MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00012	mg/L		12/02/16 08:35	12/02/16 13:53	1

Lab Sample ID: LCS 480-334374/2-A Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 334507

Mercury

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits

Mercury 0.00667 0.00692 104 80 - 120 mg/L

Lab Sample ID: LCSD 480-334374/19-A Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 334507 Prep Batch: 334374 Spike LCSD LCSD %Rec. **RPD** Analyte Added Result Qualifier Unit %Rec Limits RPD Limit 0.00667

0.00677

mg/L

101

80 - 120

TestAmerica Buffalo

QC Association Summary

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling TestAmerica Job ID: 480-110346-2

Metals

Prep I	Batcl	h: 3	343	74
--------	-------	------	-----	----

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-110346-5	11124818-J1130-SW2-011216	Dissolved	Water	7470A	
MB 480-334374/1-A	Method Blank	Total/NA	Water	7470A	
LCS 480-334374/2-A	Lab Control Sample	Total/NA	Water	7470A	
LCSD 480-334374/19-A	Lab Control Sample Dup	Total/NA	Water	7470A	

Prep Batch: 334455

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-110346-5	11124818-J1130-SW2-011216	Dissolved	Water	3020A	
MB 480-334455/1-A	Method Blank	Total/NA	Water	3020A	
LCS 480-334455/2-A	Lab Control Sample	Total/NA	Water	3020A	
LCSD 480-334455/3-A	Lab Control Sample Dup	Total/NA	Water	3020A	

Analysis Batch: 334507

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-110346-5	11124818-J1130-SW2-011216	Dissolved	Water	7470A	334374
MB 480-334374/1-A	Method Blank	Total/NA	Water	7470A	334374
LCS 480-334374/2-A	Lab Control Sample	Total/NA	Water	7470A	334374
LCSD 480-334374/19-A	Lab Control Sample Dup	Total/NA	Water	7470A	334374

Analysis Batch: 334781

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-110346-5	11124818-J1130-SW2-011216	Dissolved	Water	6020A	334455
MB 480-334455/1-A	Method Blank	Total/NA	Water	6020A	334455
LCS 480-334455/2-A	Lab Control Sample	Total/NA	Water	6020A	334455
LCSD 480-334455/3-A	Lab Control Sample Dup	Total/NA	Water	6020A	334455

Analysis Batch: 334945

Lab Sa	mple ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-11	0346-5	11124818-J1130-SW2-011216	Dissolved	Water	6020A	334455
MB 480)-334455/1-A	Method Blank	Total/NA	Water	6020A	334455
LCS 48	80-334455/2-A	Lab Control Sample	Total/NA	Water	6020A	334455
LCSD 4	480-334455/3-A	Lab Control Sample Dup	Total/NA	Water	6020A	334455

Lab Chronicle

Client: Orion Environmental, Inc.
Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Lab Sample ID: 480-110346-5

Matrix: Water

Client Sample ID: 11124818-J1130-SW2-011216
Date Collected: 12/01/16 11:30

Date Received: 12/02/16 01:30

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Dissolved	Prep	3020A			334455	12/02/16 11:35	MVZ	TAL BUF
Dissolved	Analysis	6020A		1	334781	12/03/16 03:58	MTM2	TAL BUF
Dissolved	Prep	3020A			334455	12/02/16 11:35	MVZ	TAL BUF
Dissolved	Analysis	6020A		1	334945	12/05/16 20:44	MTM2	TAL BUF
Dissolved	Prep	7470A			334374	12/02/16 08:35	RMZ	TAL BUF
Dissolved	Analysis	7470A		1	334507	12/02/16 14:22	RMZ	TAL BUF

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

-

5

7

0

3

11

Certification Summary

Client: Orion Environmental, Inc.

TestAmerica Job ID: 480-110346-2

Project/Site: Surface Water Sampling

Laboratory: TestAmerica Buffalo

Unless otherwise noted, all analytes for this laboratory were covered under each certification below.

thority	Program		EPA Region	Certification ID	Expiration Date
assachusetts	State Pro	ogram	1	M-NY044	06-30-17
The following analytes	are included in this report, b	out certification is not of	fered by the governing a	authority:	
Analysis Method	Prep Method	Matrix	Analyt	te	
6020A	3020A	Water	Antim	ony	
6020A	3020A	Water	Arsen	ic	
6020A	3020A	Water	Bariur	n	
6020A	3020A	Water	Berylli	ium	
6020A	3020A	Water	Cadm	ium	
6020A	3020A	Water	Chron	nium	
6020A	3020A	Water	Сорре	er	
6020A	3020A	Water	Lead		
6020A	3020A	Water	Molyb	denum	
6020A	3020A	Water	Nickel		
6020A	3020A	Water	Seleni	ium	
6020A	3020A	Water	Silver		
6020A	3020A	Water	Thalliu	ım	
6020A	3020A	Water	Vanac	dium	
6020A	3020A	Water	Zinc		
7470A	7470A	Water	Mercu	IIV	

3

4

5

6

0

9

10

13

Method Summary

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Method	Method Description	Protocol	Laboratory
6020A	Metals (ICP/MS)	SW846	TAL BUF
7470A	Mercury (CVAA)	SW846	TAL BUF

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

5

4

5

6

10

11

12

13

Sample Summary

Client: Orion Environmental, Inc. Project/Site: Surface Water Sampling

TestAmerica Job ID: 480-110346-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-110346-5	11124818-J1130-SW2-011216	Water	12/01/16 11:30	12/02/16 01:30

2

4

5

7

8

4.6

11

Login Sample Receipt Checklist

Client: Orion Environmental, Inc.

Job Number: 480-110346-2

Login Number: 110346 List Source: TestAmerica Buffalo

List Number: 1

Creator: Williams, Christopher S

Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
s the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time (Excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	True	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Sampling Company provided.	True	ORION
Samples received within 48 hours of sampling.	True	
Samples requiring field filtration have been filtered in the field.	N/A	
Chlorine Residual checked.	N/A	

2

3

4

5

7

Q

10

12

2

3

7

9

11

13



THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Buffalo 10 Hazelwood Drive Amherst, NY 14228-2298

Tel: (716)691-2600

TestAmerica Job ID: 480-135301-1

Client Project/Site: J1130 NG Westminster

For:

Orion Environmental, Inc. 2955 Redondo Ave. Long Beach, California 90806

Attn: Steve Hash

Authorized for release by: 5/24/2018 3:32:05 PM

Steve Hartmann, Project Manager I (413)572-4000

steve.hartmann@testamericainc.com

.....LINKS

Review your project results through

Total Access

Have a Question?



Visit us at: www.testamericainc.com The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Detection Summary	6
Client Sample Results	7
QC Sample Results	9
QC Association Summary	16
Lab Chronicle	19
Certification Summary	21
Method Summary	22
Sample Summary	23
Chain of Custody	24
Receipt Checklists	26

4

J

9

10

11

13

Definitions/Glossary

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster TestAmerica Job ID: 480-135301-1

Qualifiers

Metals

Qualifier	Qualifier Description
В	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description				
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.				
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.				
Н	Sample was prepped or analyzed beyond the specified holding time				
F1	MS and/or MSD Recovery is outside acceptance limits.				
*	LCS or LCSD is outside acceptance limits.				
*	RPD of the LCS and LCSD exceeds the control limits				
В	Compound was found in the blank and sample.				

Glossary

These commonly used abbreviations may or may not be present in this report.
Listed under the "D" column to designate that the result is reported on a dry weight basis
Percent Recovery
Contains Free Liquid
Contains No Free Liquid
Duplicate Error Ratio (normalized absolute difference)
Dilution Factor
Detection Limit (DoD/DOE)
Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
Decision Level Concentration (Radiochemistry)
Estimated Detection Limit (Dioxin)
Limit of Detection (DoD/DOE)
Limit of Quantitation (DoD/DOE)
Minimum Detectable Activity (Radiochemistry)
Minimum Detectable Concentration (Radiochemistry)

IVIDO	William Detectable Conce
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)

NC Not Calculated

Not Detected at the reporting limit (or MDL or EDL if shown) ND

PQL Practical Quantitation Limit

QC **Quality Control**

RER Relative Error Ratio (Radiochemistry)

RL Reporting Limit or Requested Limit (Radiochemistry)

RPD Relative Percent Difference, a measure of the relative difference between two points

Toxicity Equivalent Factor (Dioxin) TEF **TEQ** Toxicity Equivalent Quotient (Dioxin)

TestAmerica Buffalo

Page 3 of 26 5/24/2018

Case Narrative

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

TestAmerica Job ID: 480-135301-1

Job ID: 480-135301-1

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative 480-135301-1

Comments

No additional comments.

Receipt

The samples were received on 5/3/2018 1:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.6° C.

HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals

At the request of the client, an abbreviated MCP analyte list was reported for this job.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry

Method SM 2540D: The following samples were analyzed outside of analytical holding time due to lab wide power outages that took down the ovens used in processing. J1130-SW2-050218 (480-135301-1) and J1130-SW4-050218 (480-135301-2)

Method SM 4500 CI G: This analysis is normally performed in the field and has a method-defined holding time of 15 minutes. The following samples has been qualified with the "HF" flag to indicate analysis was performed in the laboratory outside the 15 minute timeframe: J1130-SW2-050218 (480-135301-1) and J1130-SW4-050218 (480-135301-2).

Method 9012B: Reanalysis of the following samples were performed outside of the analytical holding time due to failure of quality control parameters in the initial analysis. J1130-SW2-050218 (480-135301-1), J1130-SW4-050218 (480-135301-2), (480-135301-1-1-B DU) and (480-135301-J-2-B MS) MCP requires an LCS and LCSD to be analyzed and the original analysis only contained an LCS.

Method SM 4500 H+ B: This analysis is normally performed in the field and has a method-defined holding time of 15 minutes. The following samples has been qualified with the "HF" flag to indicate analysis was performed in the laboratory outside the 15 minute timeframe: J1130-SW2-050218 (480-135301-1) and J1130-SW4-050218 (480-135301-2).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

3

4

6

7

8

4 4

12

13

	MassDEP Analytical Protocol Certification Form									
Laboratory Name:		: TestAmerica Buffalo		Project #:	Project #: 480-135					
Proje			Vestminster	RTN:						
This	This form provides certifications for the data set for the following Laboratory Sample ID Number(s):									
480-1	35301-[1-2]									
Matric	ces:	Groundwater/Surfa		Soil/Sediment	Drinking Water	∐Other:				
0000	VOC		Mass DEP VPH	ck all that apply be		IMaga DED ADU				
8260 CAM		7470/7471 Hg CAM III B	CAM IV A	8081 Pesticides CAM V B	7196 Hex Cr CAM VI B	Mass DEP APH CAM IX A				
	SVOC	7010 Metals	Mass DEP EPH	8151 Herbicides	8330 Explosives	TO-15 VOC				
CAM	II B	CAM III C	CAM IV B	CAM V C	CAM VIII A	CAM IX B				
6010 CAM	Metals III A ■	6020 Metals CAM III D	8082 PCB CAM V A	9012 / 9014/ 4500CN Total Cyanide/PAC CAM VI A	6860 Perchlorate					
	Affirmative	Responses to Que	stions A througl	h F are required for "	Presumptive Certainty" st	atus				
Α	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding time.									
B Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?										
С	· ·		•	I response actions speance standard non-cor	ecified in the selected CAM nformances?	Yes No				
D	Yes No									
Е	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?									
F	Were all app evaluated in	licable CAM protoco a laboratory narrativ	ol QC and perform re (including all "N	nance standard non-c lo" responses to Que	onformances identified and stions A through E)?	Yes No				
	Respons	ses to Questions G	6, H and I below	are required for "Pre	sumptive Certainty" statu	S				
G	protocol(s)?			orting limits specified in		Yes No ¹				
	<u>Data User I</u>				not necessarily meet the dat). 1056 (2)(k) and WCS-07-350					
Н	Were all QC	performance stand	ards specified in	the CAM protocol(s) a	chieved?	Yes No ¹				
I	Were results	reported for the co	mplete analyte lis	t specified in the selec	cted CAM protocol(s) ?	Yes No ¹				
1 All neç	gative responses m	ust be addressed in an attac	hed laboratory narrative.							
I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.										
Signa	Signature: Service Center Manager Position: TestAmerica Westfield									
	d Name: n has been electror	Steven C.	Hartmann	Date:	5/24/18 1	5:27				

Page 5 of 26 5/24/2018

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

3

Client Sample ID: J1130-SW2-050218

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	4.3		0.50	0.10	mg/L	1	_	6010	Total/NA
Iron	0.20		0.050	0.019	mg/L	1		6010	Total/NA
Magnesium	0.91	В	0.20	0.043	mg/L	1		6010	Total/NA
Calcium	4.2		0.50	0.10	mg/L	1		6010	Dissolved
Iron	0.12		0.050	0.019	mg/L	1		6010	Dissolved
Magnesium	0.91		0.20	0.043	mg/L	1		6010	Dissolved
Chloride	48		0.50	0.28	mg/L	1		300.0	Total/NA
Cyanide, Total	0.0068	J F1	0.010	0.0050	mg/L	1		9012B	Total/NA
Cyanide, Total	0.0071	JHB*	0.010	0.0050	mg/L	1		9012B	Total/NA
Hardness as calcium carbonate	28		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Chlorine, Total Residual	0.010	J HF	0.020	0.010	mg/L	1		SM 4500 CI G	Total/NA
Hardness as calcium carbonate	12		4.0	1.1	mg/L	1		SM 2340C	Dissolved
Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	6.8	HF	0.1	0.1	SU	1	_	SM 4500 H+ B	Total/NA
Temperature	20.5	HF	0.001	0.001	Degrees C	1		SM 4500 H+ B	Total/NA

Client Sample ID: J1130-SW4-050218

Lab Sample ID: 480-135301-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Calcium	4.1		0.50	0.10	mg/L	1	_	6010	Total/NA
Iron	0.17		0.050	0.019	mg/L	1		6010	Total/NA
Magnesium	0.87	В	0.20	0.043	mg/L	1		6010	Total/NA
Calcium	4.3		0.50	0.10	mg/L	1		6010	Dissolved
Iron	0.13		0.050	0.019	mg/L	1		6010	Dissolved
Magnesium	0.91		0.20	0.043	mg/L	1		6010	Dissolved
Chloride	48		0.50	0.28	mg/L	1		300.0	Total/NA
Cyanide, Total	0.0072	J	0.010	0.0050	mg/L	1		9012B	Total/NA
Hardness as calcium carbonate	20		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Chlorine, Total Residual	0.010	J HF	0.020	0.010	mg/L	1		SM 4500 CI G	Total/NA
Hardness as calcium carbonate	20		4.0	1.1	mg/L	1		SM 2340C	Dissolved
Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	6.7	HF	0.1	0.1	SU	1	_	SM 4500 H+ B	Total/NA
Temperature	20.8	HF	0.001	0.001	Degrees C	1		SM 4500 H+ B	Total/NA

This Detection Summary does not include radiochemical test results.

5/24/2018

2

Λ

5

7

Q

10

12

13

Client Sample Results

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster TestAmerica Job ID: 480-135301-1

Client Sample ID: J1130-SW2-050218

Date Collected: 05/02/18 14:30 Date Received: 05/03/18 01:30

Lab Sample ID: 480-135301-1

Matrix: Water

Method: 6010 - Metals (ICP) Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	4.3		0.50	0.10	mg/L		05/07/18 08:52	05/16/18 15:37	1
Chromium	ND		0.0050	0.0010	mg/L		05/07/18 08:52	05/16/18 15:37	1
Iron	0.20		0.050	0.019	mg/L		05/07/18 08:52	05/16/18 15:37	1
Magnesium	0.91	В	0.20	0.043	mg/L		05/07/18 08:52	05/16/18 15:37	1

Method: 6010 - Metals (ICP) - Dissolved										
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Calcium	4.2	0.50	0.10	mg/L		05/05/18 08:37	05/14/18 22:32	1		
Chromium	ND	0.0050	0.0010	mg/L		05/05/18 08:37	05/14/18 22:32	1		
Iron	0.12	0.050	0.019	mg/L		05/05/18 08:37	05/14/18 22:32	1		
Magnesium	0.91	0.20	0.043	mg/L		05/05/18 08:37	05/14/18 22:32	1		

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	48		0.50	0.28	mg/L			05/08/18 18:57	1
Ammonia	ND		0.020	0.0090	mg/L			05/14/18 17:44	1
Chromium, trivalent	ND		0.010	0.0060	mg/L			05/24/18 15:07	1
Cyanide, Total	0.0068	J F1	0.010	0.0050	mg/L		05/14/18 16:04	05/15/18 12:23	1
Cyanide, Total	0.0071	JHB*	0.010	0.0050	mg/L		05/16/18 13:30	05/17/18 13:27	1
Hardness as calcium carbonate	28		4.0	1.1	mg/L			05/15/18 11:20	1
Chlorine, Total Residual	0.010	J HF	0.020	0.010	mg/L			05/05/18 09:39	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	ND	H	4.0	4.0	mg/L			05/10/18 16:50	1
pH	6.8	HF	0.1	0.1	SU			05/03/18 16:16	1
Temperature	20.5	HF	0.001	0.001	Degrees C			05/03/18 16:16	1

General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		0.010	0.0050	mg/L			05/03/18 12:20	1
Hardness as calcium carbonate	12		4.0	1.1	mg/L			05/15/18 11:20	1

Client Sample ID: J1130-SW4-050218 Lab Sample ID: 480-135301-2

Date Collected: 05/02/18 14:50 Date Received: 05/03/18 01:30

Method: 6010 - Metals (ICP) Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	4.1		0.50	0.10	mg/L		05/07/18 08:52	05/16/18 15:41	1
Chromium	ND		0.0050	0.0010	mg/L		05/07/18 08:52	05/16/18 15:41	1
Iron	0.17		0.050	0.019	mg/L		05/07/18 08:52	05/16/18 15:41	1
Magnesium	0.87	В	0.20	0.043	mg/L		05/07/18 08:52	05/16/18 15:41	1

Analyte	Result Qualifier	· RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	4.3	0.50	0.10	mg/L		05/05/18 08:37	05/14/18 23:02	1
Chromium	ND	0.0050	0.0010	mg/L		05/05/18 08:37	05/14/18 23:02	1
Iron	0.13	0.050	0.019	mg/L		05/05/18 08:37	05/14/18 23:02	1
Magnesium	0.91	0.20	0.043	mg/L		05/05/18 08:37	05/14/18 23:02	1

Page 7 of 26

Matrix: Water

Client Sample Results

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

TestAmerica Job ID: 480-135301-1

Lab Sample ID: 480-135301-2

Matrix: Water

Client Sample ID: J1130-SW4-050218

Date Collected: 05/02/18 14:50 Date Received: 05/03/18 01:30

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	48		0.50	0.28	mg/L			05/08/18 19:05	1
Ammonia	ND		0.020	0.0090	mg/L			05/14/18 17:46	1
Chromium, trivalent	ND		0.010	0.0060	mg/L			05/24/18 15:07	1
Cyanide, Total	0.0072	J	0.010	0.0050	mg/L		05/14/18 16:04	05/15/18 12:26	1
Cyanide, Total	ND	H F1 *	0.010	0.0050	mg/L		05/16/18 13:30	05/17/18 13:30	1
Hardness as calcium carbonate	20		4.0	1.1	mg/L			05/15/18 11:20	1
Chlorine, Total Residual	0.010	J HF	0.020	0.010	mg/L			05/05/18 09:39	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Total Suspended Solids	ND	H	4.0	4.0	mg/L			05/10/18 16:50	1
pH	6.7	HF	0.1	0.1	SU			05/03/18 16:19	1
Temperature	20.8	HF	0.001	0.001	Degrees C			05/03/18 16:19	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND	 -	0.010	0.0050	mg/L			05/03/18 12:20	1
Hardness as calcium carbonate	20		4.0	1.1	mg/L			05/15/18 11:20	1

5/24/2018

Page 8 of 26

2

3

0

7

9

10

11

4.0

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-412694/1-A **Matrix: Water**

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 412694

Analysis Batch: 414326 MB MB

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		0.50	0.10	mg/L		05/05/18 08:37	05/14/18 22:25	1
Chromium	ND		0.0050	0.0010	mg/L		05/05/18 08:37	05/14/18 22:25	1
Iron	ND		0.050	0.019	mg/L		05/05/18 08:37	05/14/18 22:25	1
Magnesium	ND		0.20	0.043	mg/L		05/05/18 08:37	05/14/18 22:25	1

Lab Sample ID: LCS 480-412694/2-A **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA Analysis Batch: 414326 **Prep Batch: 412694** Spike LCS LCS %Rec.

	- 1					
Analyte	Added	Result Qualific	er Unit	D %Rec	Limits	
Calcium	10.0	9.93	mg/L	99	80 - 120	
Chromium	0.200	0.196	mg/L	98	80 - 120	
Iron	10.0	10.2	mg/L	102	80 - 120	
Magnesium	10.0	9.84	mg/L	98	80 - 120	

Lab Sample ID: LCSD 480-412694/18-A Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA Analysis Batch: 414585 Prep Batch: 412694 Spike LCSD LCSD %Rec. Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Calcium 10.0 9.94 mg/L 99 80 - 120 0 20 Chromium 0.200 0.200 100 80 - 120 20 mg/L 2 Iron 10.0 10.4 mg/L 104 80 - 120 20 Magnesium

Lab Sample ID: MB 480-412781/1-A **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA

10.0

Analysis Batch: 414595 Prep Batch: 412781

9.77

mg/L

98

80 - 120

05/07/18 08:52 05/17/18 10:47

20

		MB	MB							
	Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
i	Calcium	ND		0.50	0.10	mg/L		05/07/18 08:52	05/15/18 20:14	1
	Chromium	ND		0.0050	0.0010	mg/L		05/07/18 08:52	05/15/18 20:14	1
	Iron	ND		0.050	0.019	mg/L		05/07/18 08:52	05/15/18 20:14	1
	Magnesium	0.0643	J	0.20	0.043	mg/L		05/07/18 08:52	05/15/18 20:14	1

Lab Sample ID: MB 480-412781/1-A **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA **Analysis Batch: 414975 Prep Batch: 412781**

MB MB **Analyte** Result Qualifier RI MDL Unit Prepared Analyzed Dil Fac Calcium ND 0.50 0.10 mg/L 05/07/18 08:52 05/17/18 10:47 Chromium ND 0.0050 0.0010 mg/L 05/07/18 08:52 05/17/18 10:47 Iron ND 0.050 0.019 mg/L 05/07/18 08:52 05/17/18 10:47

0.20

0.043 mg/L

0.0713 J

Magnesium

TestAmerica Buffalo

5/24/2018

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Method: 6010 - Metals (ICP) (Continued)

Lab Sample ID: LCS 480-412781/2-A				Client	Samp	ole ID	: Lab Control Sample
Matrix: Water							Prep Type: Total/NA
Analysis Batch: 414595							Prep Batch: 412781
-	Spike	LCS	LCS				%Rec.
Analyte	Added	Result	Qualifier	Unit	D %	Rec	Limits
Calcium	10.0	9.09		ma/l		91	80 - 120

	Spike	LUS	LUS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Calcium	10.0	9.09		mg/L		91	80 - 120	
Chromium	0.200	0.185		mg/L		92	80 - 120	
Iron	10.0	9.64		mg/L		96	80 - 120	
Magnesium	10.0	9.10		mg/L		91	80 - 120	

Lab Sample ID: LCS 480-412781/2-A Matrix: Water Analysis Batch: 414975			Clie	ent Sar	mple ID	Prep Ty	ntrol Sample oe: Total/NA atch: 412781	
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Calcium	10.0	9.61		mg/L		96	80 - 120	
Chromium	0.200	0.191		mg/L		95	80 - 120	
Iron	10.0	10.0		mg/L		100	80 - 120	
Magnesium	10.0	9.55		mg/L		95	80 - 120	

Lab Sample ID: LCSD 480-412781/25-A Matrix: Water Analysis Batch: 414595			(Client Sa	imple	ID: Lab	Prep Ty	Sample Dup pe: Total/NA atch: 412781		
	Spike	LCSD	LCSD				%Rec.		RPD	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Calcium	10.0	8.77		mg/L		88	80 - 120	4	20	
Chromium	0.200	0.176		mg/L		88	80 - 120	5	20	
Iron	10.0	9.38		mg/L		94	80 - 120	3	20	
Magnesium	10.0	8.75		mg/L		88	80 - 120	4	20	

Lab Sample ID: 480-135301 Matrix: Water	I-1 MS				Client Sample ID: J1130-SW2-05 Prep Type: Disso							
Analysis Batch: 414326	Sample	Spike	MS	MS					atch: 412694			
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits			
Calcium	4.2		10.0	14.2		mg/L		99	75 - 125			
Chromium	ND		0.200	0.196		mg/L		98	75 - 125			
Iron	0.12		10.0	10.2		mg/L		101	75 - 125			
Magnesium	0.91		10.0	10.5		mg/L		96	75 - 125			

Lab Sample ID: 480-135301 Matrix: Water Analysis Batch: 414326	-1 MSD					Cli	ent Sa		D: J1130- Prep Type Prep Ba	e: Diss	olved
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Calcium	4.2		10.0	14.2		mg/L		100	75 - 125	0	20
Chromium	ND		0.200	0.198		mg/L		99	75 - 125	1	20
Iron	0.12		10.0	10.4		mg/L		103	75 - 125	2	20
Magnesium	0.91		10.0	10.7		mg/L		98	75 - 125	2	20

TestAmerica Buffalo

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Method: 300.0 - Anions	, Ion Chromatography
------------------------	----------------------

Lab Sample ID: MB 480-413138/29 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 413138

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac D Prepared Chloride 0.50 05/08/18 17:17 ND 0.28 mg/L

Lab Sample ID: LCS 480-413138/28 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 413138

Spike LCS LCS %Rec. Added Limits **Analyte** Result Qualifier Unit %Rec Chloride 50.0 50.4 mg/L 101 90 - 110

Method: 350.1 - Nitrogen, Ammonia

Lab Sample ID: MB 480-414271/3 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

MB MB Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac 0.0090 mg/L Ammonia 0.020 05/14/18 16:39 ND

Lab Sample ID: MB 480-414271/75 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

MR MR Analyte Result Qualifier **MDL** Unit Prepared Analyzed Ammonia ND 0.020 0.0090 mg/L 05/14/18 17:42

Lab Sample ID: LCS 480-414271/4 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits 1.00 1.02 Ammonia mg/L 102 90 - 110

Lab Sample ID: LCS 480-414271/76 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

Spike LCS LCS %Rec. Result Qualifier Added Analyte Unit %Rec Limits Ammonia 1.00 0.992 mg/L 99 90 - 110

Lab Sample ID: 480-135301-1 MS Client Sample ID: J1130-SW2-050218 **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

Sample Sample Spike MS MS %Rec. Added Analyte Result Qualifier Result Qualifier Unit D %Rec Limits Ammonia ND 0.200 0.214 mg/L 107 90 - 110

TestAmerica Buffalo

5/24/2018

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Method: 350.1 - Nitrogen, Ammonia (Continued)

Lab Sample ID: 480-135301-1 DU Client Sample ID: J1130-SW2-050218 **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414271

Sample Sample DU DU RPD Analyte Result Qualifier Result Qualifier Unit D RPD Limit ND ND NC Ammonia mg/L 20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 480-412473/3 Client Sample ID: Method Blank Prep Type: Total/NA

Matrix: Water

Analysis Batch: 412473

MB MB RI Analyte Result Qualifier MDL Unit Analyzed Dil Fac Prepared 0.010 Chromium, hexavalent $\overline{\mathsf{ND}}$ 0.0050 mg/L 05/03/18 12:20

Lab Sample ID: LCS 480-412473/4 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 412473

Spike LCS LCS %Rec. Analyte Added Result Qualifier Limits Chromium, hexavalent 0.200 80 - 120 0.210 mg/L

Lab Sample ID: LCSD 480-412473/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 412473

LCSD LCSD Spike %Rec. **RPD** Added Result Qualifier Limits **RPD** Limit Unit %Rec Chromium, hexavalent 0.200 0.201 100 80 - 120 ma/L

Lab Sample ID: 480-135301-2 MS Client Sample ID: J1130-SW4-050218 **Prep Type: Dissolved**

Matrix: Water

Analysis Batch: 412473

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Limits Analyte Unit %Rec Chromium, hexavalent ND 0.200 0.182 mg/L 91 75 - 125

Lab Sample ID: 480-135301-1 DU Client Sample ID: J1130-SW2-050218 **Prep Type: Dissolved**

Matrix: Water

Analysis Batch: 412473

Sample Sample DU DU **RPD** Result Qualifier RPD Analyte Result Qualifier Unit Limit Chromium, hexavalent ND ND NC mg/L 20

Method: 9012B - Cyanide, Total and/or Amenable

Lab Sample ID: MB 480-414262/1-A Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414406

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Cyanide, Total ND 0.010 0.0050 mg/L 05/14/18 16:04 05/15/18 11:36

TestAmerica Buffalo

5/24/2018

Prep Batch: 414262

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Method: 9012B - Cyanide, Total and/or Amenable (Continued)

ı	Lab Sample ID: LCS 480-414262/2-A				Clier	nt Sample ID:	: Lab Control Sample
	Matrix: Water						Prep Type: Total/NA
	Analysis Batch: 414411						Prep Batch: 414262
		Spike	LCS	LCS			%Rec.
	Analyte	Added	Result	Qualifier	Unit	D %Rec	Limits
l	Cyanide, Total	0.250	0.226		mg/L	90	90 - 110

Lab Sample ID: 480-13530			CI	ient Sa	ımple II	D: J1130-SW2-050218			
Matrix: Water							Prep Type: Total/NA		
Analysis Batch: 414411									Prep Batch: 414262
	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Cvanide, Total	0.0068	J F1	0.100	0.0306	F1	ma/L		24	90 - 110

Lab Sample ID: MB 480-414765		Client Sample ID: Method Blank							
Matrix: Water							Ī	Prep Type: To	otal/NA
Analysis Batch: 414953								Prep Batch:	414765
<u> </u>	MB	MB						-	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.00515	J	0.010	0.0050	mg/L		05/16/18 13:30	05/17/18 13:22	1

Lab Sample ID: LCS 480-414765/2-A				Clie	nt Sar	mple ID	: Lab Control Sample
Matrix: Water							Prep Type: Total/NA
Analysis Batch: 414953							Prep Batch: 414765
	Spike	LCS	LCS				%Rec.
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Cyanide, Total	0.250	0.209	*	mg/L		84	90 - 110

Lab Sample ID: LCSD 480-414765/3-A			(Client S	Sample	ID: Lab	Control		
Matrix: Water							Prep Ty	pe: Tot	al/NA
Analysis Batch: 414953							Prep Ba	atch: 4	4765
-	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Cyanide, Total	0.250	0.159	*	mg/L		64	90 - 110	27	15

Lab Sample ID: 480-135301-2 MS						CI	ient Sa	ımple II	D: J1130-	SW4-050218
Matrix: Water									Prep Typ	oe: Total/NA
Analysis Batch: 414953									Prep Ba	tch: 414765
_	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Cyanide, Total	ND	H F1 *	0.100	0.0555	F1	mg/L		56	90 - 110	

Lab Sample ID: 480-13530	1-1 DU				CI	ient San	nple ID: J1130-SW2-0	50218
Matrix: Water							Prep Type: Tot	:al/NA
Analysis Batch: 414953							Prep Batch: 4°	14765
_	Sample	Sample	DU	DU			•	RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Cyanide, Total	0.0071	JHB*	ND	*	mg/L			15

Client: Orion Environmental, Inc. TestAmerica Job ID: 480-135301-1 Project/Site: J1130 NG Westminster

Method: SM 2340C - Hardness, Total (mg/l as CaC03)

MR MR

MB MB

Lab Sample ID: MB 480-414729/27 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414729

Analyte Result Qualifier RL **MDL** Unit D Analyzed Dil Fac Prepared 2.0 05/15/18 11:20 Hardness as calcium carbonate ND 0.53 mg/L

Lab Sample ID: MB 480-414729/51 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414729

Analyte Result Qualifier RL MDL Unit Analyzed Dil Fac Prepared Hardness as calcium carbonate $\overline{\mathsf{ND}}$ 2.0 0.53 mg/L 05/15/18 11:20

Lab Sample ID: LCS 480-414729/28 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 414729

Spike LCS LCS %Rec. Added Result Qualifier Limits Analyte Unit D %Rec Hardness as calcium carbonate 173 164 mg/L

Lab Sample ID: LCS 480-414729/52 **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 414729

Spike LCS LCS %Rec. Added Result Qualifier Unit %Rec Limits Hardness as calcium carbonate 173 160 92 mg/L 90 _ 110

Method: SM 2540D - Solids, Total Suspended (TSS)

Lab Sample ID: MB 480-413720/1 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 413720

MR MR Result Qualifier RL **RL** Unit Dil Fac Analyte Prepared **Analyzed** 1.0 1.0 mg/L **Total Suspended Solids** ND 05/10/18 16:50

Lab Sample ID: LCS 480-413720/2 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 413720

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits 225 **Total Suspended Solids** 243 mg/L 92 88 - 110

Method: SM 4500 CI G - Chlorine, Residual

Lab Sample ID: MB 480-412774/3 **Client Sample ID: Method Blank** Prep Type: Total/NA

Matrix: Water

Analysis Batch: 412774

MB MB Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Chlorine, Total Residual ND 0.020 0.010 mg/L 05/05/18 09:39

TestAmerica Buffalo

5/24/2018

QC Sample Results

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

рН

Method: SM 4500 Cl G - Chlorine, Residual (Continued)

TestAmerica Job ID: 480-135301-1

Analyte Result Qualifier O.0100 J HF O.0100 J Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Client Sample ID: Lab Control Sample ID: Lab Control Sample ID: LCS 480-412456 Analyte Added Result Qualifier Unit D WRec Limits SU D D WRec Limits PH Total Sample ID: LCS 480-412456/45 Client Sample ID: Lab Control Sample ID: Lab Sample ID: Lab Contro			-	•								
Analyte	-	-412774/4					Clie	ent Sa	mple ID			
Spike LCS LCS LCS Result Qualifier Unit D Rec Limits										Fieb iy	pe. Tot	ai/iv
Analyte	Analysis Batch: 412//4			Omiles	1.00	1.00				0/ D = =		
Chlorine, Total Residual O.900 O.890 Img/L O.900 Orep Type: Total O.900 Orep Type: Total O.900 O.890 Img/L O.900 Orep Type: Total O.900 O.890 Img/L O.900 Orep Type: Total	Ameliate			•			1114	_	0/ 🗖			
Lab Sample ID: 480-135301-2 DU Matrix: Water Analysis Batch: 412774 Sample Result Qualifier Result Chlorine, Total Residual 0.010 JHF 0.0100 J mg/L 0 Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Matrix: Water Analysis Batch: 412456 Analyte Result Qualifier Result Qualifier Result Qualifier Mg/L 0 Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Matrix: Water Analysis Batch: 412456 Spike LCS LCS Collent Sample ID: Lab Control Sample DH		_				Qualifier		Б				
Matrix: Water Sample DU D	Chlorine, Total Residual			0.900	0.890		mg/L		99	90 - 110		
Natrix: Water	Lab Sample ID: 480-1353	01-2 DU					Cli	ent S	ample I	D: J1130-	SW4-0	50218
Analysis Batch: 412774 Analyte Result Qualifier Result Qualifier Dunit D mg/L 0 Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Matrix: Water Analysis Batch: 412456 Analyte Added Result PH Town Town Town Town Town Town Town Town									•			
Sample Sample DU DU Result Qualifier Result Qualifier Result Qualifier Du Du RPD Du RPD Du RPD Du Du Du Du Du Du Du											,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Chlorine, Total Residual 0.010 J HF 0.0100 J mg/L 0 Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Client Sample ID: Lab Control Sam Prep Type: Total Analysis Batch: 412456 Analyte Added Result Qualifier Unit D %Rec Limits SU 100 99-101 Lab Sample ID: LCS 480-412456/45 Client Sample ID: Lab Control Sam Prep Type: Total Analysis Batch: 412456 Spike LCS LCS %Rec. Client Sample ID: Lab Control Sam Prep Type: Total Analysis Batch: 412456 Spike LCS LCS %Rec.	7 maryone Datem 112111	Sample	Sample		DU	DU						RP
Method: SM 4500 H+ B - pH Lab Sample ID: LCS 480-412456/23 Matrix: Water Analysis Batch: 412456 Spike Analyte Added Added Result PH Added Result Result PH Added Result Result PH Added Result Resul	Analyte	Result	Qualifier		Result	Qualifier	Unit	D			RPD	Limi
Lab Sample ID: LCS 480-412456/23 Matrix: Water Analysis Batch: 412456 Spike LCS LCS Spike LCS LCS Spike LCS LCS Spike LCS LCS Spike Spik	Chlorine, Total Residual	0.010	JHF		0.0100	J	mg/L				0	2
Matrix: Water Analysis Batch: 412456 Spike LCS LCS	Method: SM 4500 H+	B - pH										
Analysis Batch: 412456 Spike LCS LCS	Lab Sample ID: LCS 480-	-412456/23					Clie	nt Sa	mple ID	: Lab Cor	ntrol Sa	ample
Analysis Batch: 412456 Spike LCS LCS	Matrix: Water									Prep Ty	pe: Tot	al/NA
Analyte Added Result Qualifier Unit D WRec Limits PH 7.00 7.00 7.0 SU 100 99 - 101 Lab Sample ID: LCS 480-412456/45 Client Sample ID: Lab Control Sam Matrix: Water Analysis Batch: 412456 Spike LCS LCS WRec.	Analysis Batch: 412456										'	
The phonon of th				Spike	LCS	LCS				%Rec.		
Lab Sample ID: LCS 480-412456/45 Matrix: Water Analysis Batch: 412456 Spike Client Sample ID: Lab Control San Prep Type: Total Rec.	Analyte			Added	Result	Qualifier	Unit	D	%Rec	Limits		
Matrix: Water Analysis Batch: 412456 Spike LCS LCS %Rec.	рН			7.00	7.0		SU		100	99 - 101		
Matrix: Water Analysis Batch: 412456 Spike LCS LCS %Rec.	- I ah Sample ID: I CS 480.	-412456/45					Clie	nt Sa	mple ID)· I ab Cor	ntrol Sa	mpl
Analysis Batch: 412456 Spike LCS LCS %Rec.		112100/10										
Spike LCS LCS %Rec.										. ich iy	po. 10t	WII 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Analysis Daten. 412430			Spike	LCS	LCS				%Rec.		
	Analyte			Added			Unit	D	%Rec	Limits		

7.00

7.0

SU

101

99 - 101

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Metals

Prep	o Bat	tch:	412	694
------	-------	------	-----	-----

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Dissolved	Water	3005A	
480-135301-2	J1130-SW4-050218	Dissolved	Water	3005A	
MB 480-412694/1-A	Method Blank	Total/NA	Water	3005A	
LCS 480-412694/2-A	Lab Control Sample	Total/NA	Water	3005A	
LCSD 480-412694/18-A	Lab Control Sample Dup	Total/NA	Water	3005A	
480-135301-1 MS	J1130-SW2-050218	Dissolved	Water	3005A	
480-135301-1 MSD	J1130-SW2-050218	Dissolved	Water	3005A	

Prep Batch: 412781

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	3005A	
480-135301-2	J1130-SW4-050218	Total/NA	Water	3005A	
MB 480-412781/1-A	Method Blank	Total/NA	Water	3005A	
LCS 480-412781/2-A	Lab Control Sample	Total/NA	Water	3005A	
LCSD 480-412781/25-A	Lab Control Sample Dup	Total/NA	Water	3005A	

Analysis Batch: 414326

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Dissolved	Water	6010	412694
480-135301-2	J1130-SW4-050218	Dissolved	Water	6010	412694
MB 480-412694/1-A	Method Blank	Total/NA	Water	6010	412694
LCS 480-412694/2-A	Lab Control Sample	Total/NA	Water	6010	412694
480-135301-1 MS	J1130-SW2-050218	Dissolved	Water	6010	412694
480-135301-1 MSD	J1130-SW2-050218	Dissolved	Water	6010	412694

Analysis Batch: 414585

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCSD 480-412694/18-A	Lab Control Sample Dup	Total/NA	Water	6010	412694

Analysis Batch: 414595

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-412781/1-A	Method Blank	Total/NA	Water	6010	412781
LCS 480-412781/2-A	Lab Control Sample	Total/NA	Water	6010	412781
LCSD 480-412781/25-A	Lab Control Sample Dup	Total/NA	Water	6010	412781

Analysis Batch: 414856

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	6010	412781
480-135301-2	J1130-SW4-050218	Total/NA	Water	6010	412781

Analysis Batch: 414975

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-412781/1-A	Method Blank	Total/NA	Water	6010	412781
LCS 480-412781/2-A	Lab Control Sample	Total/NA	Water	6010	412781

General Chemistry

Analysis Batch: 412456

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	SM 4500 H+ B	

TestAmerica Buffalo

5/24/2018

Page 16 of 26

2

3

4

6

8

16

11

12

4 4

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

General Chemistry (Continued)

Analysis Batch: 412456 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-2	J1130-SW4-050218	Total/NA	Water	SM 4500 H+ B	
LCS 480-412456/23	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	
LCS 480-412456/45	Lab Control Sample	Total/NA	Water	SM 4500 H+ B	

Analysis Batch: 412473

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Dissolved	Water	7196A	
480-135301-2	J1130-SW4-050218	Dissolved	Water	7196A	
MB 480-412473/3	Method Blank	Total/NA	Water	7196A	
LCS 480-412473/4	Lab Control Sample	Total/NA	Water	7196A	
LCSD 480-412473/5	Lab Control Sample Dup	Total/NA	Water	7196A	
480-135301-2 MS	J1130-SW4-050218	Dissolved	Water	7196A	
480-135301-1 DU	J1130-SW2-050218	Dissolved	Water	7196A	

Analysis Batch: 412774

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	SM 4500 CI G	
480-135301-2	J1130-SW4-050218	Total/NA	Water	SM 4500 CI G	
MB 480-412774/3	Method Blank	Total/NA	Water	SM 4500 CI G	
LCS 480-412774/4	Lab Control Sample	Total/NA	Water	SM 4500 CI G	
480-135301-2 DU	J1130-SW4-050218	Total/NA	Water	SM 4500 CI G	

Analysis Batch: 413138

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	300.0	
480-135301-2	J1130-SW4-050218	Total/NA	Water	300.0	
MB 480-413138/29	Method Blank	Total/NA	Water	300.0	
LCS 480-413138/28	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 413720

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	SM 2540D	
480-135301-2	J1130-SW4-050218	Total/NA	Water	SM 2540D	
MB 480-413720/1	Method Blank	Total/NA	Water	SM 2540D	
LCS 480-413720/2	Lab Control Sample	Total/NA	Water	SM 2540D	

Prep Batch: 414262

Client Sample ID	Prep Type	Matrix	Method	Prep Batch
J1130-SW2-050218	Total/NA	Water	9012A	
J1130-SW4-050218	Total/NA	Water	9012A	
Method Blank	Total/NA	Water	9012A	
Lab Control Sample	Total/NA	Water	9012A	
J1130-SW2-050218	Total/NA	Water	9012A	
	J1130-SW2-050218 J1130-SW4-050218 Method Blank Lab Control Sample	J1130-SW2-050218 Total/NA J1130-SW4-050218 Total/NA Method Blank Total/NA Lab Control Sample Total/NA	J1130-SW2-050218 Total/NA Water J1130-SW4-050218 Total/NA Water Method Blank Total/NA Water Lab Control Sample Total/NA Water	J1130-SW2-050218 Total/NA Water 9012A J1130-SW4-050218 Total/NA Water 9012A Method Blank Total/NA Water 9012A Lab Control Sample Total/NA Water 9012A

Analysis Batch: 414271

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	350.1	
480-135301-2	J1130-SW4-050218	Total/NA	Water	350.1	
MB 480-414271/3	Method Blank	Total/NA	Water	350.1	
MB 480-414271/75	Method Blank	Total/NA	Water	350.1	
LCS 480-414271/4	Lab Control Sample	Total/NA	Water	350.1	

TestAmerica Buffalo

Page 17 of 26

5/24/2018

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

General Chemistry (Continued)

Analysis Batch: 414271 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 480-414271/76	Lab Control Sample	Total/NA	Water	350.1	
480-135301-1 MS	J1130-SW2-050218	Total/NA	Water	350.1	
480-135301-1 DU	J1130-SW2-050218	Total/NA	Water	350.1	

Analysis Batch: 414406

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 480-414262/1-A	Method Blank	Total/NA	Water	9012B	414262

Analysis Batch: 414411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	9012B	414262
480-135301-2	J1130-SW4-050218	Total/NA	Water	9012B	414262
LCS 480-414262/2-A	Lab Control Sample	Total/NA	Water	9012B	414262
480-135301-1 MS	J1130-SW2-050218	Total/NA	Water	9012B	414262

Analysis Batch: 414729

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Dissolved	Water	SM 2340C	
480-135301-1	J1130-SW2-050218	Total/NA	Water	SM 2340C	
480-135301-2	J1130-SW4-050218	Dissolved	Water	SM 2340C	
480-135301-2	J1130-SW4-050218	Total/NA	Water	SM 2340C	
MB 480-414729/27	Method Blank	Total/NA	Water	SM 2340C	
MB 480-414729/51	Method Blank	Total/NA	Water	SM 2340C	
LCS 480-414729/28	Lab Control Sample	Total/NA	Water	SM 2340C	
LCS 480-414729/52	Lab Control Sample	Total/NA	Water	SM 2340C	

Prep Batch: 414765

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	9012A	
480-135301-2	J1130-SW4-050218	Total/NA	Water	9012A	
MB 480-414765/1-A	Method Blank	Total/NA	Water	9012A	
LCS 480-414765/2-A	Lab Control Sample	Total/NA	Water	9012A	
LCSD 480-414765/3-A	Lab Control Sample Dup	Total/NA	Water	9012A	
480-135301-2 MS	J1130-SW4-050218	Total/NA	Water	9012A	
480-135301-1 DU	J1130-SW2-050218	Total/NA	Water	9012A	

Analysis Batch: 414953

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	9012B	414765
480-135301-2	J1130-SW4-050218	Total/NA	Water	9012B	414765
MB 480-414765/1-A	Method Blank	Total/NA	Water	9012B	414765
LCS 480-414765/2-A	Lab Control Sample	Total/NA	Water	9012B	414765
LCSD 480-414765/3-A	Lab Control Sample Dup	Total/NA	Water	9012B	414765
480-135301-2 MS	J1130-SW4-050218	Total/NA	Water	9012B	414765
480-135301-1 DU	J1130-SW2-050218	Total/NA	Water	9012B	414765

Analysis Batch: 416291

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-135301-1	J1130-SW2-050218	Total/NA	Water	7196A	_
480-135301-2	J1130-SW4-050218	Total/NA	Water	7196A	

TestAmerica Buffalo

5/24/2018

Page 18 of 26

2

3

4

6

g

10

13

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

Lab Sample ID: 480-135301-1

Matrix: Water

Client Sample	ID: J1130-SW2-	050218
---------------	----------------	--------

Date Collected: 05/02/18 14:30 Date Received: 05/03/18 01:30

_	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Dissolved	Prep	3005A			412694	05/05/18 08:37	KMP	TAL BUF
Dissolved	Analysis	6010		1	414326	05/14/18 22:32	AMH	TAL BUF
Total/NA	Prep	3005A			412781	05/07/18 08:52	KMP	TAL BUF
Total/NA	Analysis	6010		1	414856	05/16/18 15:37	LMH	TAL BUF
Total/NA	Analysis	300.0		1	413138	05/08/18 18:57	RJS	TAL BUF
Total/NA	Analysis	350.1		1	414271	05/14/18 17:44	DCB	TAL BUF
Dissolved	Analysis	7196A		1	412473	05/03/18 12:20	MDL	TAL BUF
Total/NA	Analysis	7196A		1	416291	05/24/18 15:07	LMH	TAL BUF
Total/NA	Prep	9012A			414262	05/14/18 16:04	JMP	TAL BUF
Total/NA	Analysis	9012B		1	414411	05/15/18 12:23	MDL	TAL BUF
Total/NA	Prep	9012A			414765	05/16/18 13:30	JMP	TAL BUF
Total/NA	Analysis	9012B		1	414953	05/17/18 13:27	MDL	TAL BUF
Dissolved	Analysis	SM 2340C		1	414729	05/15/18 11:20	MDL	TAL BUF
Total/NA	Analysis	SM 2340C		1	414729	05/15/18 11:20	MDL	TAL BUF
Total/NA	Analysis	SM 2540D		1	413720	05/10/18 16:50	CDC	TAL BUF
Total/NA	Analysis	SM 4500 CI G		1	412774	05/05/18 09:39	ALZ	TAL BUF
Total/NA	Analysis	SM 4500 H+ B		1	412456	05/03/18 16:16	DSC	TAL BUF

Client Sample ID: J1130-SW4-050218 Lab Sample ID: 480-135301-2

Date Collected: 05/02/18 14:50 Date Received: 05/03/18 01:30

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Dissolved	Prep	3005A			412694	05/05/18 08:37	KMP	TAL BUF
Dissolved	Analysis	6010		1	414326	05/14/18 23:02	AMH	TAL BUF
Total/NA	Prep	3005A			412781	05/07/18 08:52	KMP	TAL BUF
Total/NA	Analysis	6010		1	414856	05/16/18 15:41	LMH	TAL BUF
Total/NA	Analysis	300.0		1	413138	05/08/18 19:05	RJS	TAL BUF
Total/NA	Analysis	350.1		1	414271	05/14/18 17:46	DCB	TAL BUI
Dissolved	Analysis	7196A		1	412473	05/03/18 12:20	MDL	TAL BUI
Total/NA	Analysis	7196A		1	416291	05/24/18 15:07	LMH	TAL BUI
Total/NA	Prep	9012A			414262	05/14/18 16:04	JMP	TAL BUI
Total/NA	Analysis	9012B		1	414411	05/15/18 12:26	MDL	TAL BUI
Total/NA	Prep	9012A			414765	05/16/18 13:30	JMP	TAL BUI
Total/NA	Analysis	9012B		1	414953	05/17/18 13:30	MDL	TAL BUI
Dissolved	Analysis	SM 2340C		1	414729	05/15/18 11:20	MDL	TAL BUI
Total/NA	Analysis	SM 2340C		1	414729	05/15/18 11:20	MDL	TAL BUI
Total/NA	Analysis	SM 2540D		1	413720	05/10/18 16:50	CDC	TAL BU
Total/NA	Analysis	SM 4500 CI G		1	412774	05/05/18 09:39	ALZ	TAL BU
Total/NA	Analysis	SM 4500 H+ B		1	412456	05/03/18 16:19	DSC	TAL BU

TestAmerica Buffalo

Matrix: Water

Lab Chronicle

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

TestAmerica Job ID: 480-135301-1

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

3

4

5

7

8

9

11

Accreditation/Certification Summary

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster TestAmerica Job ID: 480-135301-1

Laboratory: TestAmerica Buffalo

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

luthority	Program		EPA Region	Identification Number	Expiration Date
Massachusetts	State Pro	gram	1	M-NY044	06-30-18 *
The following analyte:	s are included in this repo	rt, but accreditation/	certification is not off	ered by the governing auth	ority:
Analysis Method	Prep Method	Matrix	Analyt	е	
6010	3005A	Water	Calciu	m	
6010	3005A	Water	Chrom	nium	
6010	3005A	Water	Iron		
6010	3005A	Water	Magne	esium	
7196A		Water	Chrom	nium, hexavalent	
7196A		Water	Chrom	nium, trivalent	
9012B	9012A	Water	Cyanio	de, Total	
SM 4500 CI G		Water	Chlori	ne, Total Residual	
SM 4500 H+ B		Water	рН		
SM 4500 H+ B		Water	Tempe	erature	

^{*} Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

TestAmerica Job ID: 480-135301-1

Method	Method Description	Protocol	Laboratory
6010	Metals (ICP)	SW846	TAL BUF
300.0	Anions, Ion Chromatography	MCAWW	TAL BUF
350.1	Nitrogen, Ammonia	MCAWW	TAL BUF
7196A	Chromium, Hexavalent	SW846	TAL BUF
7196A	Chromium, Trivalent (Colorimetric)	SW846	TAL BUF
9012B	Cyanide, Total and/or Amenable	SW846	TAL BUF
SM 2340C	Hardness, Total (mg/l as CaC03)	SM	TAL BUF
SM 2540D	Solids, Total Suspended (TSS)	SM	TAL BUF
SM 4500 CI G	Chlorine, Residual	SM	TAL BUF
SM 4500 H+ B	pH	SM	TAL BUF
8005A	Preparation, Total Metals	SW846	TAL BUF
9012A	Cyanide, Total and/or Amenable, Distillation	SW846	TAL BUF

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

3

4

5

7

8

9

11

12

13

Sample Summary

Client: Orion Environmental, Inc. Project/Site: J1130 NG Westminster

TestAmerica Job ID: 480-135301-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-135301-1	J1130-SW2-050218	Water	05/02/18 14:30	05/03/18 01:30
480-135301-2	J1130-SW4-050218	Water	05/02/18 14:50	05/03/18 01:30

6

3

4

__

6

8

9

10

12

13

TestAmerica Buffalo													Toct	TestAmerica	7
10 Hazelwood Drive Amherst, NY 14228-2298 Phone (718) 691-2600 Eav (718) 691-7991	35023 - 11	Chain of	of Cus	Chain of Custody Record	Recor	<u>ة</u> ك	٦	J. Charles	716	3	3	1 CAT	a Malovan and	But tradely in graning inaction testing	7 E S
	Sampler		1						Carrie	Carrier Tracking No(s)	(s)0	7	COC No:	1	Г
Client Information			1			7			30	360-Westflag	Milain		480-89653-21868.1	868.1	7
Cilent Contact: Emily Chow	Phone:			E-Mail.		A.V			_		3		Page:		
Company: Orion Environmental: Inc.						01	Ā	Analysis Requested	edues	ed			Jop #:		
Address: 2955 Redondo Ave	Due Date Requested:	:p:			Chick	לענ	62	21		6	-	1	Preservation Codes:	Sodes:	Г
City. Long Beach	TAT Requested (days):	ıys):			12.0	3N	5	112	20	45		V.0)	A - HCL B - NaOH	M - Hexane N - None	_
State, Zip.						wo	531	n12W	12	31			D - Nitric Acid	P - Na204S O - Na2SO3	
Phone:	,# Od					THI	10	est.	120	00	10-		F - MeOH G - Amchlor		
Email:	:#OM		+		Contract of the last) - !))	17	w .	by 1941.	the pet		H - Ascorbic Acid I - Ice		e
ecnow@orlonenv.com Project Name:	Project #:				Or N	25	TAN I	la	N	45	-	SS	_	V - MCAA W - pH 4-5	_
			1		_	1	1.7	1-	1	210	74	and the second		Z - other (specify)	-
Site:	SSOW#:		1	99		17	4 -	¥ -	707 - 0	1 -	1 (00 10	Other:		
		Sample	Sample Type (C=comp,	Matrix (Wwater, S=solid, O=wastefoll,	MiSM miored	0152	70/27	~941t	1012m	20100100	20002	A 9PJF		2	
Sample Identification	Sample Date	E N	G=grab) Preserve	Preservation Code:	_		60		0	7	All diffs	-	Special	Ĭ,	
ノー ぶっ	5/2/16	14 30	5	Water	7	1.	1			TOTAL SERVICE		3			1
1-1-17		(11)	17	Water	7	7	-				+	617		- 480-135301 COC	T
1 20	0) 1/1	1450	5				-			+					T
						-	+	+							T
								-	-	-	+				1
						4			-	-		QUI.		14	T
													10,100		
												200	AC VISI		
												503	all and a		
										,			200		
												MULES	/96/99		
													Activity (Control of the Control of		
Possible Hazard Identification	Doison B		lacinoloibad	1	Sam	ple Dis	le Disposal (A i	fee may !	oe asse:□	sed if sa	imples a	Tre retai	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)	an 1 month)	
Deliverable Requested: 1, III, IV, Other (specify)			orgonome	6	Spec	ial Instr	uctions/C	Special Instructions/QC Requirements	ments:	ents:	9	Ĩ	AICHING LOL	Wonins	T
Empty/Kit Rejinquished by:		Date:			Time:					Method of Shipment	Shipment:	l			
Relinduished W: N	Date/Time:	1535		Company		Received by	1/1	M	\		DateTime	₹	1535	Company	Γ
Relinquished by:	Date/fime;		CC11	Company TS 1		Real Co	My				Date/Time:	ح.	Que	Company	
Relinquished by:	Date/Time:			Company		Seived by	oy:				Date/Time	.; e		Company	
Custody Seals Intact: Custody Seal No.:					1	Cooler Ter	nperature(Cooler Temperature(s) °C and Other Remarks:	er Remark	100				# 93	
						1	1	1	1	E			E		

TestAmerica Buffalo								ToctAr	TactAmarica
10 Hazelwood Drive Amherst, NY 14228-2298 Phone (716) 691-2600 Fax (716) 691-7991	Chair	Shain o	of Cust	Chain of Custody Record	Record	Storath and	0 SJAGGER		CELTADER IN ENVIRONMENTAL, IESTING
	Sampler. 1		1		1	$\overline{}$	3		
Client Information	Ž.						SRT. MocH.	480-89653-21868.1	
Client Contact: Emily Chow	Phone;			E-Mail:			1	Page 2 of 7	
Company: Orion Environmental, Inc.			/			Analysis Requested	pe	Job #:	
Address: 2955 Redondo Ave.	Due Date Requested:	ed:							8:
City: Long Beach	TAT Requested (days):	ays):	_					B - NaOH C - Zn Acetate	M - Hexane N - None O - AsNaO2
State, Zip: CA, 90806			_						P - Na204S Q - Na2SO3
Phone:	#Od		-						R - Na2S2O3 S - H2SO4
Email: echow@orionerv.com	WO#:		-					H - Ascorbic Acid I - Ice J - Di Water	T - TSP Dodecahydrate U - Acetone V - MCAA
Project Name:	Project #.				1 10 se			K-EDTA L-EDA	W - pH 4-5 Z - other (specify)
Sile WG STWING IS	SSOW#:	1						Other:	×
o di	0	Sample	Sample Type (C=comp,	Matrix (W=water, S=solid, O=waste/oil,	MISM matter Mism matter My matter			TedmuM listo	
Sample Identification	Sample Date		Preserva	Preservation Code:					Special Instructions/Note:
5-100	5/2/16	1930	ь	Water	2			12	
5 m/s	17	140	(4	Water	2			6	
			5						
	-							731	
								Min	
								· Al	
Possible Hazard Identification Non-Hazard Plammable Skin Irritant	Poison B Un	Unknown	Radiological	le	Sample Di	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) Return To Client Mon	assessed if samples are rei	tained longer than 1 Archive For	month) Months
sted: I, III, III, IV, O			B		Special Ins	Special Instructions/QC Requirements:			
Empty Kit Refinquishedby:		Date:			Time:		Method of Shipment:		
Relinquished by:	Date/Time: 16	153	6	Company	Received by:	d by:	5/2/18	1735	Company
Relinquished by:	S /2 //S		(100	Company	Receive	Russell	Date/Time:	0130	Company
- 1	Date: Inde			Company	RECEIVED DV.	g by:			Company
Custody Seals Intact: Custody Seal No.:					Copler T	Codier Temperature(s) °C and Other Remarks:		2	/# "
					1	1 1 1			

Login Sample Receipt Checklist

Client: Orion Environmental, Inc.

Job Number: 480-135301-1

Login Number: 135301 List Source: TestAmerica Buffalo

List Number: 1

Creator: Williams, Christopher S

Creator. Williams, Christopher 3		
Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time (Excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	N/A	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Sampling Company provided.	True	ORION
Samples received within 48 hours of sampling.	True	
Samples requiring field filtration have been filtered in the field.	True	
Chlorine Residual checked.	N/A	

__

4

Q

4.0

4.0

13



Orion Environmental Inc.

2955 Redondo Avenue Long Beach, CA 90806 562 988-2755 PHONE 562 988-2759 FAX

DBA Arctos Environmental

O 2332 5th Street, Suite A Berkeley, CA 94710

510 525-2180 PHONE 510 525-2392 FAX

Memorandum

To: United States Environmental Protection Agency, Region 1

Permits Section

From: Steve Hash, Orion Environmental Inc.

Copy: Scott Lutz, Northrop Grumman Corporation

Jim Begley, MT Environmental Restoration

Date: 18 September 2018

Subject: Permit Application Package for Wetland Hydric Soil,

River Sediment, and River Bank Soil Excavation

Former Drainage Swale Area (Area 2)

Cresticon Westminster Site

180 State Road East, Westminster, Massachusetts

Orion Environmental Inc. (Orion), on behalf of Northrop Grumman Guidance and Electronics Company, Inc. (Northrop Grumman), has prepared this memorandum summarizing the scope of wetland hydric soil, river sediment, and river bank soil excavation in and near the Whitman River in the drainage swale area (Area 2) of the subject site (Figure 1).

Site Background

A drainage swale is located at the northwestern edge of a manufacturing facility parking lot and is referred to as Area 2. The drainage swale area covers portions of Parcel 76-20, owned by Illinois Tool Works (ITW), and Parcel 76-21, owned by Northrop Grumman. The drainage swale area extends towards the Whitman River into Parcel 76-27, which is owned by Crocker Pond Properties, Inc. (CPPI). Northrop Grumman has active access agreements with ITW and CPPI (Attachment A). Three drainage pipes that are currently part of a stormwater management system discharge to the swale. A distinct channel has developed over time from the outfall area towards the Whitman River. The channel is present up to approximately 250 feet away from the outfalls at which point discharge appears to disperse.

Previous site investigations indicated that upland and riverbank soils and groundwater in Area 2 are impacted by cadmium at concentrations exceeding regulatory screening levels. Erosion of soil impacts and discharge of impacted groundwater to the Whitman River have impacted wetland soil, river sediments, and river bank soil to greater than site-specific risk-based cleanup goals. Site plans and natural resources areas are provided on Figures 2 through 4.



General Site Description and Regulatory Designations

The proposed work will be conducted at the wetland (Bordering Vegetated Wetland [BVW]/Freshwater Wetland) and within and near the Whitman River (Land Under Waterbodies and Waterways; Figures 4 and 5). The wetland is largely an emergent plant community dominated by cinnamon ferns, various sedges, false hellebore, and a small patch of purple-stemmed Angelica (Horsley Witten Group [Horsley Witten], 2017). The Whitman River is a non-tidal, freshwater waterway. Based on field observations, the river bed in the proposed work area consists of sediment underlain by cobble. The river stage in the proposed work area ranges from approximately 1 to 3 feet based on previous field observations. Additional information on the wetland is in Horsley Witten's 2017 Resource Area Delineation Report included as Attachment B. Photos of the Whitman River are in Attachment C.

Iurisdictional Areas

As noted, the proposed work will be within a portion of the Whitman River, its associated Inland Bank, and within the BVW, as well as within the 100-foot Wetland Buffer Zone and 200-Foot Riverfront Area (Figure 4). These wetland and riverfront resource areas are jurisdictional under Massachusetts Wetlands Protection Act (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), the Town of Westminster Wetlands Bylaw (Chapter 202), and/or the Federal Clean Water Act (33 U.S.C. 1251, et seq.). Therefore, an evaluation of alternatives for mitigation is required to demonstrate that proposed work within jurisdictional resource areas and waters of the U.S. has been avoided and minimized to the extent practicable, and that the proposed work (the preferred alternative) will provide sufficient mitigation for work in these areas. Evaluations of Wetland and Riverfront Mitigation Alternatives are in Attachments D and E, respectively.

Federal Emergency Management Agency Designation

According to the most recent version of the Federal Emergency Management Agency (FEMA) National Flood Insurance Rate, the property is located partially within areas of 100-year flood and areas of minimal flooding. Additional FEMA information is in Horsley Witten's 2017 Resource Area Delineation Report included as Attachment B.

Endangered Species, Areas of Critical Environmental Concern, and Historic Properties

The project **does not** fall within areas of Priority Habitat of Rare Species (Priority Habitat) or Estimated Habitat of Rare Wildlife (Estimated Habitat) as designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). Priority Habitats are based on the known geographical extent of habitat for all state-listed endangered, threatened, or special concern plant and animal species. Estimated Habitats are a subset of the Priority Habitats and are based on the geographical extent of habitat of state-listed rare wetlands wildlife. There is one certified vernal pool located offsite approximately 400 feet south of the work area. Additional habitat information is in Horsley Witten's 2017 Resource Area



Delineation Report included as Attachment B¹. Copies of the Massachusetts Bureau of Geographic Information (MassGIS) online maps showing Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife are in Attachment F.

Per the United States Environmental Protection Agency (USEPA) instructions for the Remediation General Permit, Orion used the United States Fish and Wildlife Service's Information, Planning, and Conservation (IPaC) online system to conduct a preliminary evaluation of federally-listed species or designated critical habitats within the work area. Based on this preliminary evaluation, the Northern Long-Eared Bat may potentially be affected by activities in the work area. The Northern Long-Eared Bat is a federally-listed threatened species under the Endangered Species Act and a state-listed endangered species under the Massachusetts Endangered Species Act. As discussed above, the project does not fall within areas of Priority or Estimated Habitats. Additionally, Orion conducted further research and concluded the project does not fall within or near a Northern Long-Eared Bat habitat, including a maternity roost tree or hibernacula, based on a MassGIS online map from NHESP. Based on this information, the proposed project will have no effect on the Northern Long-Eared Bat. The Endangered Species Act also stipulates that projects requiring tree removal activities must comply with Rule 4(d), which states that incidental take of an endangered or threatened species resulting from tree removal is prohibited if either of the following criterion are met:

- Tree removal occurs within 0.25-mile radius of known Northern Long-Eared 1 Bat hibernacula.
- 2. Tree removal cuts or destroys known occupied maternity roost trees or any other trees within a 150-foot radius from the known maternity tree during the pup season (June 1 through July 31).

Tree removal related to the project will be limited to the extent feasible. Any tree removal that is required will not occur within a 0.25-mile radius of known Northern Long-Eared bat hibernacula and will not cut or destroy known maternity trees during pup season from 1 June through 31 July. A copy of the IPaC-generated preliminary evaluation and the MassGIS map showing Northern Long-Eared Bat maternity roost tree and hibernacula areas are in Attachment F.

The project does not fall within an Area of Critical Environmental Concern (ACEC) as designated by the Massachusetts Department of Conservation and Recreation. ACECs are places in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources. Orion confirmed the project does not fall within an ACEC by accessing the MassGIS online map on 5 July 2018. A copy of the MassGIS map showing ACECs is in Attachment F.

¹ Note that the Natural Heritage Atlas was updated since Horsley Witten's letter, effective August 1, 2017. However, the designations for rare species habitat have not changed for this site,



Historical properties are not present within the work area. Orion confirmed no historic properties are present within the work area by accessing the Massachusetts Cultural Resource Information System (MACRIS) online database. MACRIS is maintained by the Massachusetts Historical Commission and includes records including, but not limited to, the National Register of Historic Places, Inventory of Historical Assets of the Commonwealth, State Register of Historic Places, and local and district study reports. A table from MACRIS summarizing historic properties in Westminster, Massachusetts is in Attachment F.

Selection of Remedy

Northrop Grumman completed a Phase III process defined in Sections 40.0850 through 40.064 of the Massachusetts Contingency Plan (MCP) to develop and evaluate comprehensive remedial action alternatives for cadmium-impacted media in Area 2. The selected remedial action includes (1) excavation of cadmium-impacted surficial/vadose zone soil, wetland hydric soil, and river sediments and (2) polysulfide precipitation to treat the soluble cadmium groundwater plume. This remedial action is reasonably likely to result in a Permanent Solution as defined in the MCP and near-background concentrations of cadmium in soil, sediments, and groundwater.

Northrop Grumman is currently implementing the selected comprehensive remedial action. Because of site-specific characteristics, excavation of soil impacts and remediation of the soluble cadmium plume are required before excavating cadmium-impacted wetland hydric soil and river sediments. Excavation of river bank soil will be completed during excavation of hydric soil and sediments. Remediation of soil and groundwater impacts began during September 2017 under an Order of Conditions issued by the Westminster Conservation Commission (WCC) on 26 June 2017. Soil remediation was completed in October 2017. Groundwater remediation was suspended in December 2017 because of inclement weather. Groundwater remediation is anticipated to resume during August 2018 and anticipated to be completed during October 2018. Assuming soil impacts are removed and polysulfide precipitation eliminates cadmium mass flux to the Whitman River, remediation of impacted wetland hydric soil, river sediments, and river bank soil is proposed for February 2019. The proposed 2019 work areas are shown on Figure 5.

Objectives and Scope of Work

The objectives of this scope of work are to (1) remove wetland hydric soil, river sediments, and river bank soil with cadmium concentrations exceeding site-specific remedial objectives, and (2) restore the wetland, river bed, and river bank. To meet these objectives, Northrop Grumman will conduct the scope of work below.

- Obtain the following regulatory reviews and permits for remediation 1. activities:
 - Environmental Notification Form from the Massachusetts **Environmental Policy Act Office**



- Order of Conditions from the WCC
- Remediation General Permit from the United States Environmental **Protection Agency**
- General Permit from the United State Army Corps of Engineers
- Chapter 91 Permit and 401 Water Quality Certification from the Massachusetts Department of Environmental Protection (MassDEP)
- 2. Implement a site-specific health and safety program to protect site workers, site employees, and the general public
- 3. Mobilize for field activities, which will include marking for DigSafe and notifying surrounding property owners of the proposed work
- Cut back the slope near the edge of the wetland to create an access point for 4. equipment for cofferdam installation and excavation
- 5. Re-route the recreational trail around the work area; potentially raise the rerouted portion of the trail to control overland flow to the Whitman River
- 6. Install a temporary non-embedded cofferdam to isolate the excavation area; the temporary cofferdam will be installed approximately 8 feet from the excavation area to allow for proper cofferdam stabilization and provide an excavation buffer
- 7. Dewater the enclosed portion of the river using pumps and treat water via filtration for sediments and ion exchange for cadmium; final water treatment will be designed based on discharge limits established in approved permits
- 8. Discharge treated water to the Whitman River downgradient of the work area
- 9. Install at least one sump in the dry river bed to collect surface runoff and river infiltration, which will be managed with submersible pumps to maintain dewatering
- 10. Cover the wetland area with a swamp mat to allow excavation equipment to access the river sediment excavation area
- 11. Excavate 52 cubic yards of impacted river bank soil along the embankment above the river (e.g., within Riverfront Area/Buffer Zone) starting from the point in the river farthest from the access point back towards the wetland area to reduce potential for cross contamination; remaining river bank soils that are inaccessible from the river will be accessed from the upgradient area (Riverfront Area/Buffer Zone) and excavated using smaller excavators or hand tools
- 12. Excavate approximately 162 cubic yards of impacted river bed sediments (Land Under Waterbodies and Waterways) starting from the point in the river farthest from the access point back towards the wetland area to reduce potential for cross contamination



- 13. Remove the swamp mat and excavate approximately 119 cubic yards of impacted wetland soil
- Collect samples from excavation floors and walls to confirm that impacted 14. soil and sediments have been removed to the remedial objective
- 15. Temporarily store excavated soil and sediments onsite to allow for dewatering prior to proper offsite treatment and disposal at a licensed and regulated disposal facility
- 16. Backfill the excavations with clean imported soil pending results of excavation confirmation sampling
- Restore the wetland in-kind in its current location and monitor vegetation 17. growth in the area over a minimum of two growing seasons or based on sitespecific permit conditions
- 18. Evaluate results of the river bank soil, hydric soil, and sediment-specific remedial action and incorporate findings into a Phase IV Status Report for submittal to MassDEP.

Excavation activities and construction sequencing will be refined by the contractor after contractor selection. Orion will provide a copy of the detailed project execution schedule to the permitting agencies at a later date. The sediment excavation area shown on Figure 5 is based on our current understanding of river sediment distribution. To reduce potential for incomplete remediation, Orion recommends excavation of all river sediments, including potential unimpacted sediments, in the work area.

Cutback and sloping of the river bank and vegetation removal will be necessary to allow access for equipment for cofferdam installation and excavation. In general, vegetation removal for work area access will be limited to undergrowth and trees with a diameter of 4 inches or less as measured approximately 3 feet from the ground surface. Removal of largerdiameter, mature trees may be required as part of site preparation and grading. However, removal of mature vegetation is expected to be limited. Northrop Grumman will notify the WCC and other regulatory agencies, as needed, if larger diameter trees need to be removed. Northrop Grumman will implement industry standard best management practices (BMPs) for controlling erosion and sedimentation, which are discussed below.

Wetland and River Mitigation

The contractor will backfill and compact soil to return the excavation areas to the original grade, to the extent practicable. Excavations will be backfilled with clean imported soil of compatible grain size and organic content. Samples will be collected from the imported soil before backfilling. Imported soils will be placed and compacted in discrete lifts. Compaction requirements will be specified by a licensed engineer. The surface of the river bank (Riverfront Area) excavation will be finished with 4 inches of compacted topsoil, lined with erosion control fabric (i.e., coconut or jute matting), and covered with hydroseed. Wetland and river bank vegetation (i.e., grass, shrubs, etc.) will be planted as part of wetland



and riverbank mitigation. Excavated areas will be monitored and inspected to evaluate the integrity and relative success of site restoration. Additional measures will be conducted on an as-needed basis. Design plans and the written restoration plan for wetland, riverbed, and riverbank restoration are in Attachment G.

Protection of Resource Area Interests

The following sections describe methods to protect resource area interests including control of accidental releases and BMPs. Measures to control accidental releases and BMPs are in Attachment G.

Control of Accidental Releases

No chemicals or remedial additives will be used during hydric soil, river bank soil, and river sediment excavation. Excavated soil and sediments will be temporarily stockpiled on site in lined and covered stockpiles or in covered roll-off containers. Temporary stockpiles will have bermed edges to prevent infiltration of stormwater or precipitation and discharge of leachate. Temporary stockpiles for hydric soil and river sediments will be allowed to drain back into the river excavation area. Stockpiles and roll-off bins will be covered at the end of each day as a dust mitigation measure.

Best Management Practices

Potential risks to the Whitman River during excavation activities are limited and can be controlled by industry standard BMPs including:

- Construction Road Stabilization: The work area is accessible by an existing access path originating on Parcel 76-21. A 6-inch-thick layer of gravel has been placed on the path to reduce erosion by construction equipment.
- Construction Road Entrance Stabilization: Gravel has been placed at the construction road entrance to reduce tracking of sediment onto a paved parking lot of Parcel 76-20. If necessary, tire washing will be implemented to remove sediment from construction vehicles leaving the work area. A drainage ditch will be used to direct runoff to a sediment trapping device.
- Surface Runoff Control: Silt fences and straw wattles/straw bales shall be positioned as necessary to intercept and reduce the velocity of sediment-laden construction runoff. Silt fences and straw wattles/straw bales will be installed along the river bank adjacent to the excavation areas and on the river-side of the temporary soil stockpile and temporary water treatment system. Surface runoff controls will be maintained for the duration of activities. Details of siltfencing and straw wattles/straw bales are in Attachment G.
- Sweeping and Vacuuming: Sweeping and vacuuming of the parking lot of Parcel 76-20 will be conducted on an as-needed basis to remove tracked soil and sediment and reduce the potential for soil and sediment to enter a storm drain. Potential sediment tracking locations will be monitored daily by visual observation.



- <u>Inlet Protection</u>: No storm drain inlets are located within the proposed work area. However, storm drain inlets are located in a paved parking lot located at the construction road entrance. Filter fabric fences, gravel bag barriers, or similar will be used to remove sediment from construction runoff before discharging to storm drains.
- <u>Preventative Maintenance</u>: Daily visual inspections of all water treatment system components will be conducted to confirm the system is in effective operating condition.
- Effluent Flow Control and Outfall Protection: A flow meter and valve will be installed at the water treatment system to control effluent flow and prevent discharge in exceedance of the design flow of the discharge. Additionally, crushed stone and an erosion control blanket will be installed at the outfall of the water treatment system to reduce the velocity of treated water before discharging to the river. Details of the water treatment system outfall are shown in Attachment G.

Waste Disposal

Excavated hydric soil, river sediment, and river bank soil will be transported and disposed of offsite. Waste will be transported by a licensed transporter and will be disposed of at a licensed and regulated facility pending waste characterization. Previously, cadmiumimpacted soils have been profiled as non-hazardous waste. Cadmium-impacted soils have been disposed of at the following facilities:

- ENPRO Services of Maine, Inc. located at 106 Main Street, South Portland, Maine (United States Environmental Protection Agency [USEPA] Number MED019051069)
- Spring Grove Resource Recovery Inc. located at 4879 Spring Grove Avenue in Cincinnati, Ohio (USEPA Number OHD000816629)
- Waste Management RCI Fitchburg Landfill located at 101 Fitchburg Road in Westminster, Massachusetts
- Waste Management Turnkey Landfill located at 90 Rochester Neck Road in Rochester, New Hampshire.

Attachments: Figure 1 – Site Location Map

Figure 2 – Site Plan

Figure 3 – Site Plan, Area 2 Drainage Swale

Figure 4 – Resource Area Delineation

Figure 5 – River Sediment and Hydric Soils Excavation



Attachment A – Access Agreement

Attachment B – Resource Area Delineation Report

Attachment C – Whitman River Photos and StreamStats Report

Attachment D – Wetland Mitigation Alternatives Evaluation

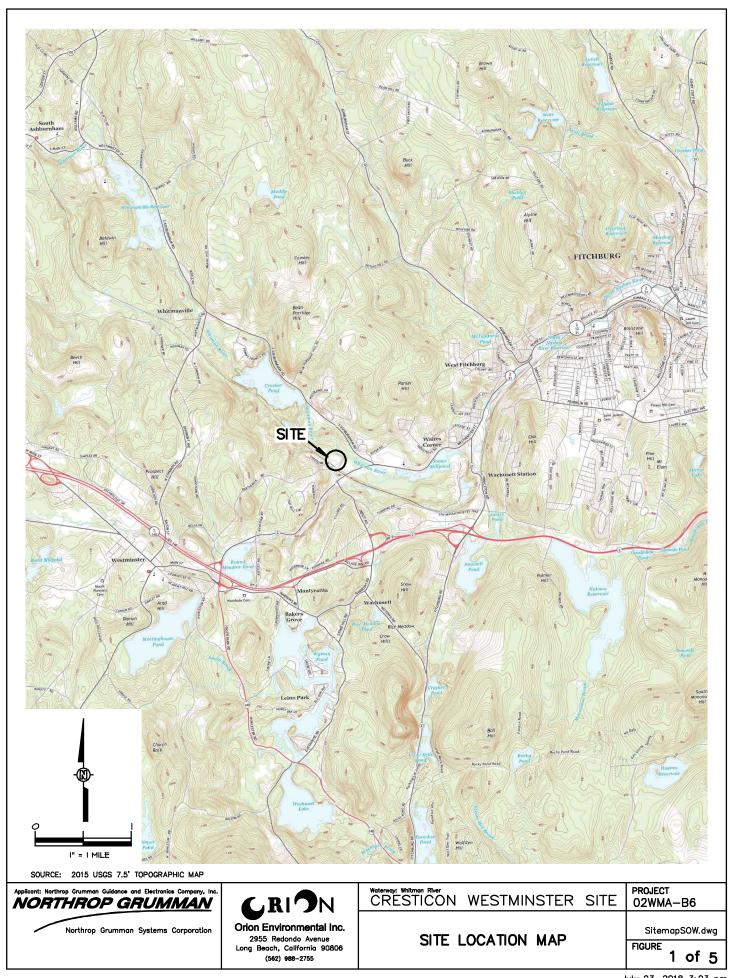
Attachment E – Riverfront Area Alternatives Evaluation

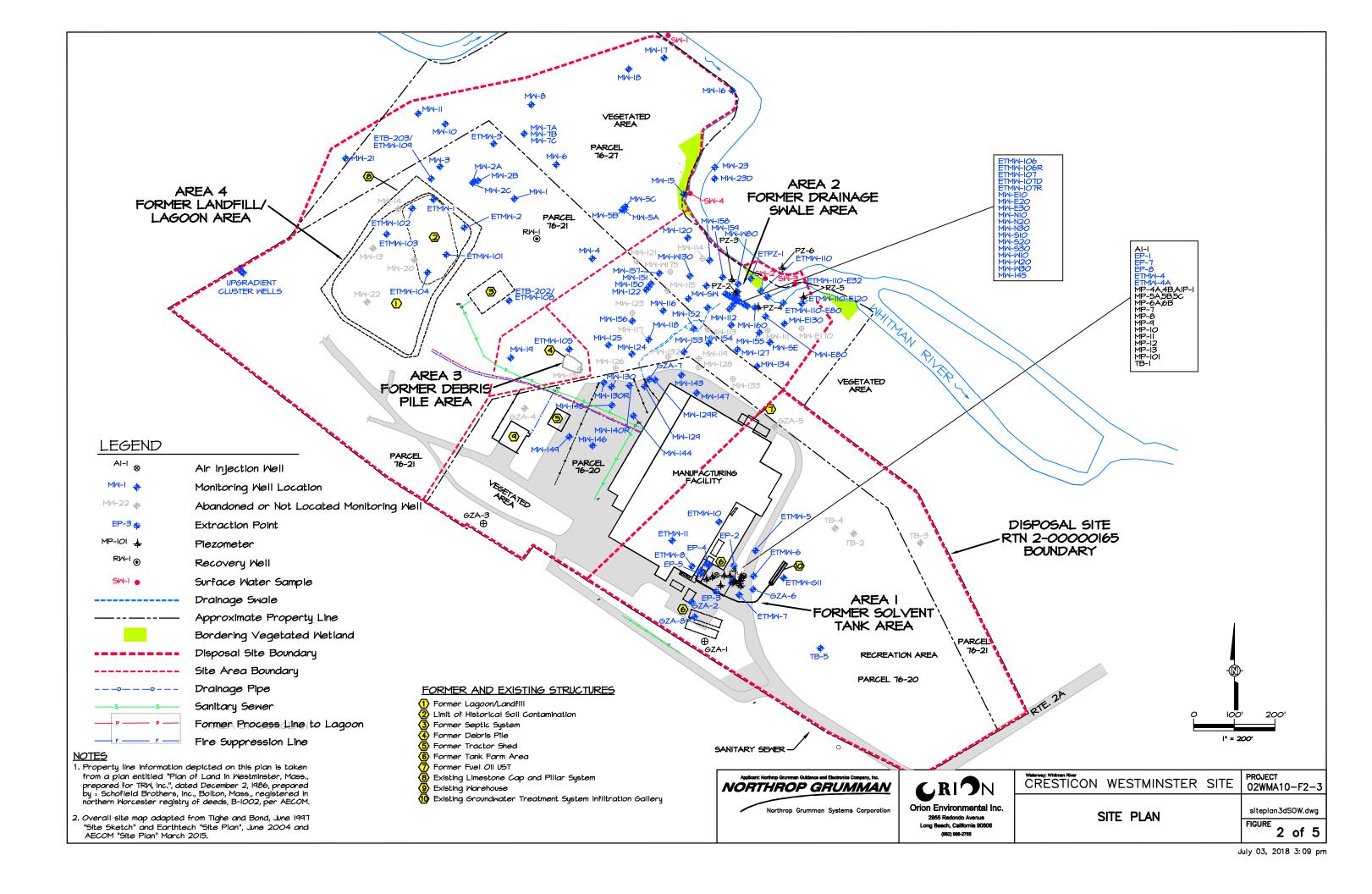
Attachment F - Endangered Species, Areas of Critical Environmental Concern, and Historic Properties Documentation

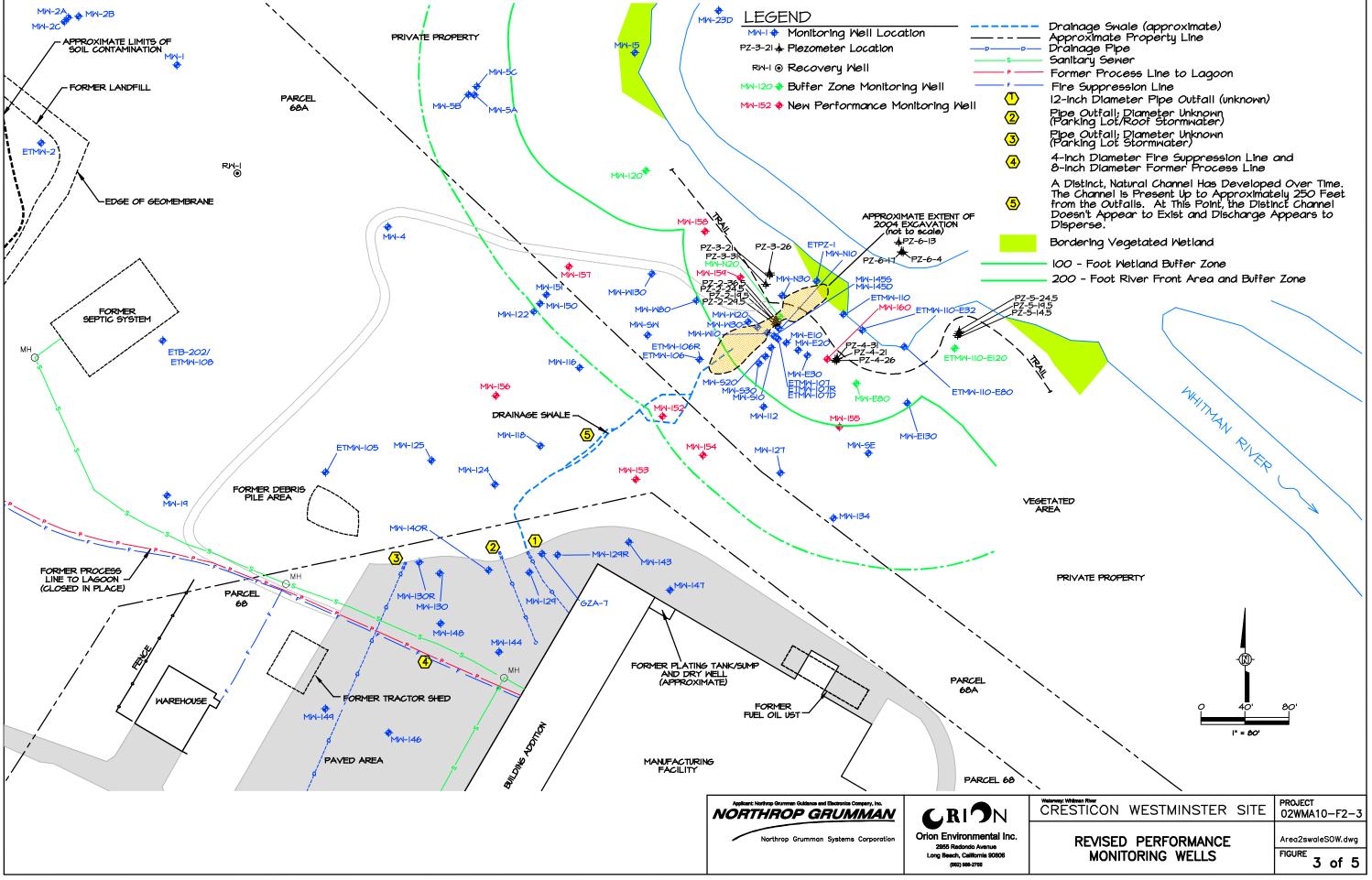
Attachment G – Design Plans and Written Restoration Plan

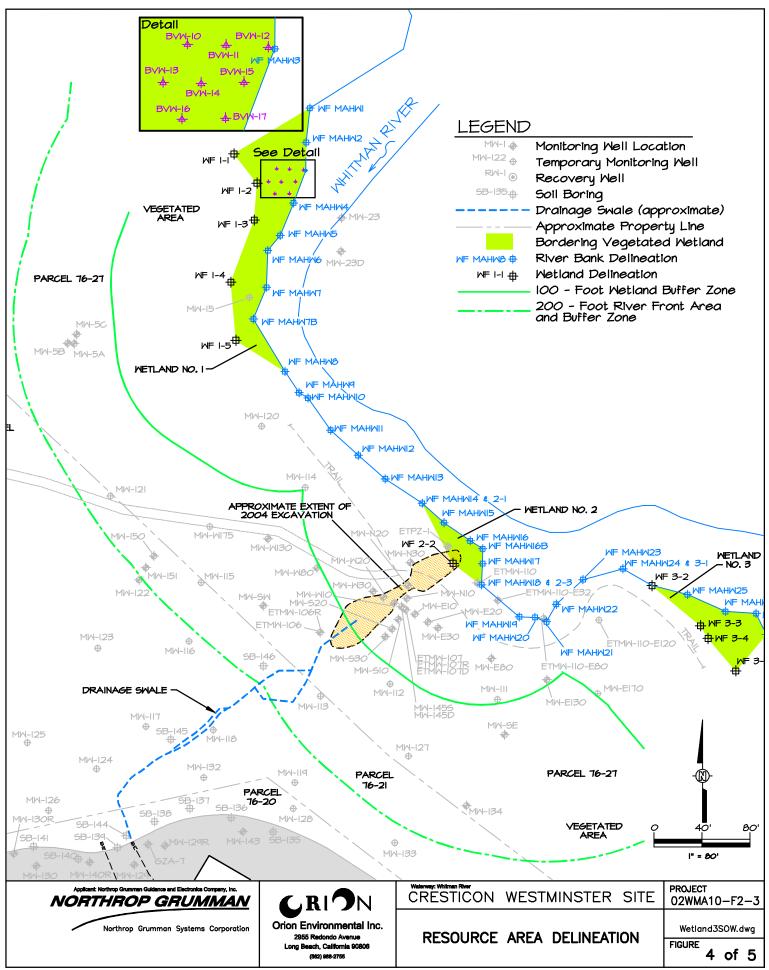
References

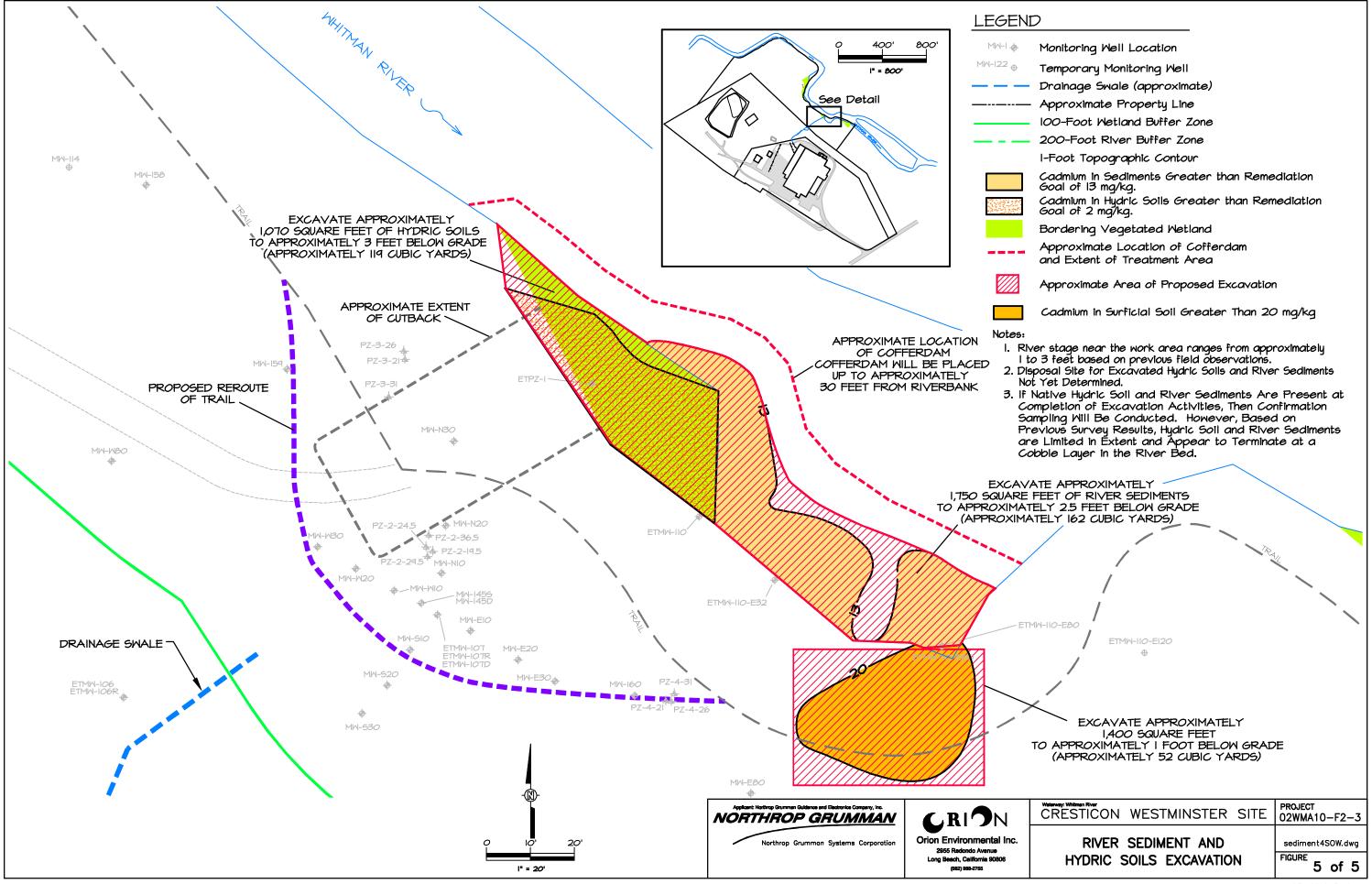
Horsley Witten Group, 2017. "Resource Area Delineation Report, Northrop Grumman Guidance and Electronics Property, 180 State Road East, Westminster, MA," 21 June.













ATTACHMENT A ACCESS AGREEMENT

RECEIPT Printed: May 17, 2017 @ 13:16:07 WORCESTER NORTHERN REGISTRY OF DEED KATHLEEN R. DAIGNEAULT, REGISTER

Oper: MARCIA Trans#: 5557

Book: 8818 Page: 71 Inst#: 8033 (Ctl#: 40 Rec:5-17-2017 @ 1:16:04p WEST STATE RD EAST

S 9

T

MEST SINIE	ND LITTO		
DOC DESCR	IPTION	TRANS	AMT
AGREEMENT Surcharge CP 50.00 record 5.00 TECH FE	ing fee	5	0.00 0.00 5.00
Total	fees:	7	5.00
*** Total ch	arges:	7	5.00
CHECK PM 217	8224	7	5.00

Bk 8818 Pa71 05-17-2017 @ 01:16p #8033

SPACE ABOVE RESERVED FOR COUNTY CLERK AND RECORDER'S USE

Current Record Owner: Crocker Pond Properties,

Incorporated

EASEMENT AGREEMENT FOR ENVIRONMENTAL ACCESS

THIS EASEMENT AGREEMENT FOR ENVIRONMENTAL ACCESS "Agreement"), made and entered into this 30 day of APRIL between Crocker Pond Properties, Incorporated ("Owner"), having an address of 97 Oakmont Avenue, Westminster, MA 01473 and Cresticon, Inc. ("Cresticon") with a principal address of c/o Northrop Grumman Corporation, 2980 Fairview Park Drive, Falls Church, Virginia 22042;

WITNESSETH

WHEREAS, Owner is the holder of fee simple title to the real property located in Worcester County, Massachusetts shown on Westminster Town Tax Assessor Parcel Map 76 Lot 27 comprising approximately 10 acres as more particularly described as Parcel D on Exhibit A attached hereto and made a part hereof (the "Property"); and

WHEREAS, Cresticon is completing environmental cleanup of the property adjacent to the Property shown on Westminster Town Tax Assessor Parcel Map 76 Lot 21 comprising of approximately 14.98 acres more particularly described on Exhibit B attached hereto (the "Cresticon Property") pursuant to the Massachusetts Contingency Plan ("MCP") under the oversight of the Massachusetts Department of Environmental Protection ("MDEP"); and

WHEREAS, Cresticon and the Owner had a previous access agreement dated July 8, 2004 (the "2004 Access Agreement") which granted access to the Property to install, monitor,

36102107v.7

maintain and sample groundwater monitoring wells on the Property in furtherance of the work required by MDEP on the Cresticon Property; and

WHEREAS, the parties seek to extend the terms and conditions of the 2004 Access Agreement in the form of this Easement Agreement for Environmental Access; and

WHEREAS, Owner and Cresticon desire to create and establish certain easements, rights, privileges and obligations affecting the Property as more particularly hereinafter set forth to allow Cresticon to implement the cleanup on the Cresticon Property until the MDEP final approval of such cleanup (the "MDEP Final Approval"); and

WHEREAS, Owner has agreed that Cresticon may record this Agreement for the benefit of Cresticon, its legal representatives, successors, successors-in-title and assigns.

NOW, THEREFORE, for and in consideration of TEN AND NO/100 DOLLARS (\$10.00) and other good and valuable consideration, the receipt, adequacy and sufficiency of which are hereby acknowledged by the parties hereto, Owner and Cresticon, intending to be legally bound, agree as follows:

- 1. Grant of Easement in Gross for the Benefit of Cresticon. Owner does hereby grant unto Cresticon a perpetual, non-exclusive easement in gross under, through, upon and across the Property for the installation, monitoring, maintenance and sampling of groundwater wells and remediation of soils, groundwater, and sediments on the Property and decommissioning of the wells in compliance with all requirements of MDEP and the MCP until MDEP Final Approval of the cleanup, completion of any post-remediation monitoring and proper abandonment/closure of any borings and/or monitoring wells on the Property in accordance with applicable laws (collectively, the "Environmental Work"), including, but not limited to, the following purposes:
 - a. operating, maintaining, sampling and closing the groundwater monitoring wells; and
 - b. conducting other MDEP-required environmental remediation, inspections, and/or samplings of soil, water, air, and biota associated with the Environmental Work.

Owner hereby covenants and agrees not to interfere, damage or move in any manner any monitoring well or equipment associated with the Environmental Work located on the Property unless expressly approved by Cresticon in writing.

2. <u>Performance of the Environmental Work.</u>

a. Cresticon shall provide Owner with prior notice of all planned Environmental Work and will coordinate with Owner the timing and locations of the Environmental Work, as appropriate, provided that Owner will use reasonable efforts to accommodate Cresticon's planned Environmental Work.

- b. Cresticon shall be solely responsible for the conduct of its employees, agents, affiliates, consultants, contractors, and subcontractors while they are on the Property for the purposes of performing the Environmental Work, and Cresticon shall be solely responsible for the payment of all expenses in connection with Cresticon's performance of the Environmental Work and Cresticon shall indemnify and hold Owner harmless from and against any type of mechanics lien or other claim arising on account of the Environmental Work.
- c. Cresticon shall not drill within two (2) feet of subsurface utility lines in areas of the Property where utility lines or other underground structures or improvements exist and Cresticon shall be solely liable for any damage or liability arising on account of the same and shall hold Owner harmless from and against any such liability or damage.
- d. Cresticon shall cause its agents, employees, contractors and subcontractors to remove any soil cuttings, disposable sampling supplies and well purge water (hereinafter "investigation derived waste" or "IDW") generated as a result of the Environmental Work. However, such IDW may be stored on the Property until it can be properly characterized and disposed.
- e. Cresticon agrees within 60 days of completion of the Environmental Work to restore any portion of the Property, which has been subject to Environmental Work to substantially the same condition and cleanliness as existed prior to the commencement of the Environmental Work in accordance with applicable laws.
- f. Cresticon shall indemnify and hold Owner harmless from and against any claim for bodily injury or property damage against Owner resulting from the negligent actions of Cresticon, its agents, employees, contractors, subcontractors and all others under the control, direct or indirect, of Cresticon while performing the Environmental Work (hereafter the "Claims"). This indemnification shall continue for a period of one (1) year following the date the MDEP Final Approval date.
- g. The parties hereby declare that the provisions of this Agreement are unique and it is impossible to measure in money the damages which would accrue if one party fails to perform its obligations hereunder. Therefore, if either party fails to abide by or perform its obligations hereunder, or institutes any action to limit the enforcement of the provisions hereof, the other party shall have the right to have the provisions of this Agreement specifically enforced, in addition to any other remedy which may be available at law or in equity. In addition, the prevailing party in any litigation concerning the provisions of this Agreement shall be entitled, in addition to any other award rendered by the court, to its reasonable attorney's fees, court costs, costs of expert witnesses, and investigative costs, which shall be imposed against the party who failed to so prevail.

- h. Notwithstanding the foregoing, Cresticon shall have no obligation to indemnify, defend or hold harmless Owner from Owner's gross negligence or willful misconduct related in any manner to this Agreement.
- 3. <u>Duration</u>. The easement created by this Agreement shall remain in force and effective for a period of one year following receipt by Cresticon of written MDEP Final Approval of the cleanup of Cresticon Property and any post-cleanup monitoring required on the Property. Cresticon shall provide Owner with a copy of the MDEP Final Approval following receipt by Cresticon thereof.
- 4. **Notice.** Written notice and correspondence shall be given to the respective parties at the following addresses:

If to Owner:

Crocker Pond Properties, Inc. 97 Oakmont Avenue Westminster, MA 01473

If to Cresticon:

Cresticon, Inc. c/o Northrop Grumman Systems Corporation One Space Park Drive, MS - ES-4/D2 Redondo Beach, California 90278 Attn: Corporate Real Estate Department - Legal Notices

With a copy to:

Northrop Grumman Systems Corporation 2980 Fairview Park Drive Falls Church, Virginia 22102 Attn: General Counsel - Real Estate

With a copy to:

Seyfarth Shaw LLP Attn: Christa L. Dommers, Esq. 975 F Street NW Washington DC 20004 Telephone: 202-828-3521

E-mail: cdommers@seyfarth.com

- 5. <u>Binding Effect</u>. This Agreement shall run with the land and be binding upon and inure to the benefit of Cresticon, its successors and assigns. Owner shall reference this Agreement in any deed of conveyance or any other instrument transferring any interest in all or a portion of the Property.
- 6. <u>Time of Essence</u>. Time is of the essence of this Agreement.
- 7. <u>Severability</u>. If any section, provision, term or clause of this Agreement shall be held invalid, void or illegal by a court of competent jurisdiction, all other sections, provisions, terms and clauses of this Agreement shall not be affected or invalidated thereby.
- 8. <u>Headings</u>. All headings contained herein are for convenience only and shall not affect, modify, limit or expand any of the provisions of this Agreement.
- 9. <u>Modifications</u>. This Agreement may be modified or amended only by a written instrument intended for that purpose and executed by the party against which enforcement thereof is asserted.
- 10. Entire Agreement. This Agreement [and any other necessary recording] sets forth the entire agreement between the Owner and Cresticon concerning the easements, rights and privileges set forth herein, and supersede the 2004 Access Agreement. This Agreement may be executed in any number of counterparts, each of which shall be deemed to be an original, and all of such counterparts shall constitute one Agreement.
- 11. <u>Governing Law</u>. This Agreement shall be governed by, and construed in accordance with, the laws of the Commonwealth of Massachusetts.
- 12. Construction of Agreement. The terms and provisions of this Agreement represent the results of negotiations between the parties, each of which has been represented or been given the opportunity to be represented by counsel of its own choosing and neither of which has acted under any duress or compulsion, whether legal, economic or otherwise. No provision of this Agreement shall be construed against or interpreted to the disadvantage of any party by reason of such party having, or being deemed to have, structured, dictated or drafted such provision.
- 13. <u>Authority</u>. Owner warrants and represents to Cresticon that it holds fee simple legal title to the Property as set forth in the recitations of this Agreement. Owner further represents and warrants to Cresticon that it has full power and authority to enter into this Agreement and has obtained all necessary consents and approvals to enter into this Agreement and be bound by the terms and provisions hereof.

[SIGNATURES ON BEGIN ON FOLLOWING PAGE]

IN WITNESS WHEREOF, Owner has caused this Agreement to be executed and sealed, as of the day and year first above written.

	CROCKER INCORPORAT		PROPERTIES,
	By: Robert Title: Preside	A FRANC H Trea	ill surer
Commonwealth of Massachusetts			
Commonwealth of Massachusetts			
County of WORCESTER } ss.			
On this the 30 TH day of APRIL Day Month ELISHA W. EKB Name of Notary Public			Notary Public,
personally appeared ROBERT T. FI	RANCIS		,
proved to me through satisfactory ev PERSONALLY KNOWN Description of Evidence of Iden	idence of id	entity, wh	nich was/were
to be the person whose name is signed on acknowledged to me that he signed it voluntariauthorized by CROCKER POND PROPERTIES, II	the preceding ily for its stated	Easement A	Agreement, and
RY PUBLCO ON PUBLCO PUBLCO ON PUBLCO PUBLCO PUBLCO PUBLCO PUBLCO PUBLCO PUBL	ELISHA	gnature of Notary I	'B ary

Place Notary Seal and/or Any Stamp Above

IN WITNESS WHEREOF, Cresticon has caused this Agreement to be executed and sealed, as of the day and year first above written.

	CRESTICON/INC.
	By:
	Name: A. J. Paz
	Title: Corporate Director of Real Estate
A notary public or other officer completing this cer individual who signed the document, to which this truthfulness, accuracy, or validity of that document	certificate is attached, and not the
State of California County of WS Mylles	
Subscribed and sworn to (or affirmed) before me or Paz proved to me on the basis of satisfactory evider me.	n this day of, 2017, by A.J. nce to be the person(s) who appeared before
(Seal) DALIA SOFIA RIOS Commission # 2056723 Notary Public - California Los Angeles County My Comm. Expires Feb 2, 2018	Signature Mana Para
	Signature of Notary Public
	Printed Name of Notary
	My Commission Expires
Place Notary Seal and/or Any Stamp Above	

EXHIBIT A

Property Depiction and Legal Description

See attached

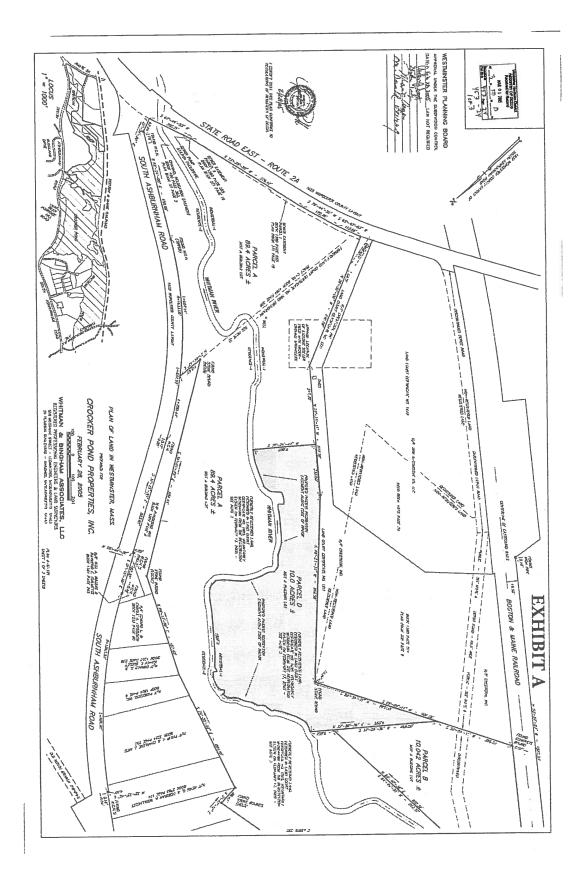


Exhibit B

Legal Description from the Survey:

The land in Westminster, Worcester County, Massachusetts, situated on State Road, and being shown as Parcel 4 on a plan entitled, "Plan of Land in Westminster, Mass.," dated December 2, 1986, prepared by Scofield Brothers, Inc., and recorded with the Worcester North District Registry of Deeds in Plan Book 306, Plan 9, to which plan reference is hereby made for a more particular description.

Parcel 4 contains 12± acres, according to said plan.

And also land being shown as Lot 3 on a plan entitled, "Subdivision Plan of Land in Westminster," dated December 2, 1986, prepared by Scofield Brothers, Inc., and recorded with the Land Registration Office as Plan No. 1008C, to which plan reference is hereby made for a more particular description.

Together with the rights and easements reserved in Deed from Cresticon, Inc. to TRW Inc. dated April 14, 1987, recorded in Book 1561, Page 383 and filed as Document No. 5157.

Surveyor's Description

Beginning at a point at the southeasterly corner of the subject property, on the northerly line of State Road East at land of the Town of Westminster, said point also being N16°30'05"E 0.38 feet from a stone bound;

Thence S70°44'10"W 54.00' along the northerly line of State Road East to a point at land of TRW Automotive US LLC;

Thence N15°09'56"W 601.58' along land of TRW Automotive US LLC;

Thence continuing along land of TRW Automotive US LLC N41°23'03"W 609.02' to a point;

Thence continuing along land of TRW Automotive US LLC S89°23'44"W 499.96' to a point;

Thence continuing along land of TRW Automotive US LLC S55°12'30"W 300.37' to a point;

Thence continuing along land of TRW Automotive US LLC S16°32'41"W 9.60' to a point at land of Pan Am Southern LLC;

Thence N42°45'12"W 764.60' along land of Pan Am Southern LLC to a bound at land of the Town of Westminster;

Thence N71°06'21"E 915.30' passing through a bound to a point, said point being N71°06'21"E 13.91' from said bound;

Thence continuing along land of the Town of Westminster S35°11'22"E 818.50' to a point;

Thence continuing along land of the Town of Westminster S41°23'03"E 577.76' to a point;

Thence continuing along land of the Town of Westminster S15°09'56"E 610.58' to the point of beginning.

Said parcel containing 652,363 square feet or 14.9762 acres±.

ATTEST NO. WORC. REGISTRY OF DEEDS KATHLEEN REYNOLDS DAIGNEAULT, REGISTER



ATTACHMENT B RESOURCE AREA DELINEATION REPORT



June 21, 2017

VIA EMAIL

Ms. Emily Chow Orion Environmental, Inc. 2955 Redondo Avenue Long Beach, CA 90806

Re: Resource Area Delineation Report

Northrop Grumman Guidance and Electronics Property, 180 State Road East, Westminster, MA

Dear Ms. Chow:

In response to your request, Horsley Witten Group, Inc. (HW) conducted a field evaluation on June 1, 2017, at the above referenced site. The purpose of this evaluation was to confirm the presence of wetland resource areas as protected under Massachusetts Wetlands Protection Act (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), and the Town of Westminster Wetlands Bylaw (Chapter 202) and to re-delineate the boundary of Bordering Vegetated Wetland (BVW) and the mean annual high-water line along the southwestern portion (left bank) of Whitman River in closest proximity to the on-going testing at this site¹.

The following report provides a brief site description, describes our methodology, and summarizes the wetland resource areas encountered.

General Site Description

The site is located off of State Road East along the Whitman River in Westminster, Massachusetts (Figures 1 and 2).

The site consists of an open upland forested community with a network of footpaths traversing the gently rolling topography, including one well-established path that parallels the river. Dominant vegetation observed within the forested upland includes a canopy of eastern hemlock (*Tsuga canadensis*) and eastern white pine (*Pinus strobus*) with occasional American beech (*Fagus grandifolia*). The open shrub community contains scattered clumps of mountain laurel (*Kalmia latifolia*) and scattered individuals of witch-hazel (*Hamamelis virginiana*) with carpets of lowbush blueberry (*Vaccinium angustifolium*), Canada mayflower (*Maianthemum canadense*), various mosses, and occasional pink lady's slipper (*Cypripedium acaule*). Steep embankments lead to the Whitman River.

¹ Please recall that wetland resource areas at this site have been previously delineated, most recently by AECOM in October 2014.





Ms. Emily Chow June 21, 2017 Page 2 of 7

FEMA Designation

According to the most recent version of the FEMA National Flood Insurance Rate Map (Community Panel No. 250347 0005 B, effective July 19, 1982), the property is located partially within Zone A, "Areas of 100-year flood; base flood elevations and flood hazard factors not determined," as well as within Zone C, "Areas of minimal flooding (No shading)" (Figures 3 and 3A).

State-listed Rare Species Habitat

According to the most recent version of the Massachusetts Natural Heritage Atlas (13th Edition, October 1, 2008), the project does not fall within areas of Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species as designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). There is one certified vernal pool located off-site to the south of this site (CVP 4005) (Figure 4).



Photo 1. Steeply sloping embankments along Whitman River

Methodology

An HW professional wetland scientist (PWS) conducted the site visit to review existing conditions and site features, topography, and wetland resource areas.

Prior to conducting field delineations, HW reviewed existing source data, including USGS Geological Survey 7.5 minute topographic maps, USDA Natural Resources Conservation Service (NRCS) soils survey, U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps, and other source data available through the Massachusetts Geographic Information System (MassGIS) to identify the presence of jurisdictional wetlands and waters of the United States within the project area. HW also reviewed the report prepared by AECOM.

During the site visit, HW identified the extent of wetland resource areas subject to jurisdiction under the Massachusetts Wetlands Protection Act, local wetlands bylaw, and or the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*), and determined the boundary of Bordering Vegetated Wetland (BVW) and the extent of mean annual high water (MAHW) along Whitman River.

HW followed wetland resource area identification and on-site delineation procedure guidelines described in the Massachusetts Department of Environmental Protection (DEP) handbook, entitled Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act (March, 1995), the Massachusetts Wetlands Protection Act Regulations, the Westminster Wetlands

Ms. Emily Chow June 21, 2017 Page 3 of 7

Bylaw, and the multi-parameter approach as defined in the U.S. Army Corps of Engineers Wetland Delineation Manual (87 Manual) and the Northcentral and Northeast Regional Supplement (Regional Supplement) (U.S. Army Corps of Engineers 1987, 2010). As this area has been previously delineated, HW will confirmed and re-flagged the resource area boundaries, but did not prepare additional Delineation Field Data Forms. However, HW observed that the data presented in the previously prepared data sheets is consistent with our field observations in terms of vegetation, soils, and supporting hydrology.

HW Professional Land Surveyors survey-located the wetland flagging. Survey data will be combined with other survey plans prepared by HW as an existing conditions plan for future use.

Resource Area Descriptions

Bordering Vegetated Wetland

Bordering Vegetated Wetland (BVW) is defined at 310 CMR 10.55(2)(a) as "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants.

The boundary of Bordering Vegetated Wetland is defined at 310 CMR 10.55 (2)(c) as the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist."

The BVW associated with this site includes three discontinuous areas along the river, typically within the inside bends in the river, at the base of a steep slope. Each of these areas is ultimately hydrologically connected to Whitman River, but disconnected from each other.

• Wetland Area 1. The most up-stream BVW consists of a transitional forested swamp-shrub swamp-emergent marsh community with occasional red maple (Acer rubrum), hemlock, and white pine with a sparse shrub community of hemlock seedlings, highbush blueberry (Vaccinium corymbosum), spicebush (Lindera benzoin), and elderberry (Sambucus canadensis) and patches of mountain laurel and witch-hazel along the periphery. The



Photo 2. Wetland Area 1

majority of the wetland area is dominated by a fern community of cinnamon fern (Osmundastrum cinnamomeum), sensitive fern (Onoclea sensibilis), New York fern (Thelypteris noveboracensis),

and marsh fern (*Thelypteris palustris*) with false hellebore (*Veratrum viride*), and tussock sedge (*Carex stricta*). Canada mayflower and sessile-leaved bellwort (*Uvularia sessilifolia*) were observed along the periphery of the wetland boundary. The boundary of Wetland Area 1 is demarcated with pink flagging stations labeled W1-1 through W1-6.

Wetland Area 2. The second BVW area encountered is largely an emergent plant community dominated by cinnamon, sensitive, marsh, and New York ferns, patches of jewelweed (*Impatiens capensis*), various sedges (*Carex* spp.), false hellebore, and a small patch of purple-stemmed Angelica (*Angelica atropurpurea*). Just three flagging stations mark the boundary of this BVW, Flags W2-1 through W2-3.



Photo 3. Wetland Area 2

• Wetland Area 3. The most downstream BVW is similar to BVW Area 1 also consists of a transitional forested swamp-shrub swamp-emergent marsh community with occasional red maple in the canopy. This wetland area is dominated by patches of cinnamon fern with occasional clumps of interrupted fern (Osmunda claytoniana). This wetland supports a band of hay-scented fern (Dennstaedtia punctilobula) and wild sarsaparilla (Aralia nudicaulis) that runs parallel to the river where the topography is slightly elevated. The boundary of Wetland Area 3 is demarcated flagging stations W3-1 through W3-5.



Photo 4. Wetland Area 3

Inland Bank, Land Under Waterbodies and Waterways, and Riverfront Area

Bank is defined at 310 CMR 10.54(2)(a) as the portion of land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent floodplain, or, in the absence of these, it occurs between a water body and an upland. A Bank may be partially or totally vegetated, or it may be comprised of exposed soil, gravel or stone. The upper boundary of a Bank is first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level [310 CMR 10.54(2)(c)].

<u>Land Under Water Bodies and Waterways</u> is defined at 310 CMR 10.56(2)(a) as the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of LUW is the mean annual low water level.

Whitman River is shown on the current USGS map as a perennial stream and therefore meets the presumptive definition under the regulations and has an associated 200-foot Riverfront Area. At this location, the river is of variable width, 20 or more feet wide within a meandering floodplain, with a moderate flow. The left bank along the river is marked by a distinct break in slope at the base of high, steep embankments. Mean low water marks the upper boundary of Land Under Waterbodies and Waterways.



Photo 5. View of Whitman River looking upstream. Wetland Area 1 is to the left.

Riverfront Area is defined at 310 CMR 10.58(2)(a)3 as the area of land between a river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away, except that the parallel line is located 25 feet away in Boston, Brockton, Cambridge, Chelsea, Everett, Fall River, Lawrence, Lowell, Malden, New Bedford, Somerville, Springfield, Winthrop, and Worcester;

The Regulations further state in section 310 CMR 10.58(2)(a)1.a.ii.:

If a river or stream is shown as perennial on the current U.S.G.S. map or more recent map provided by the Department, an assertion that it is intermittent must be supported by evidence by the person making the assertion or by the issuing authority upon its own initiative, which may include field observations that the river is not flowing, provided the date of observation is not within an extended drought; absence of a channel or banks; soils information showing the groundwater elevation is not at or near the surface; or other evidence.

The mean annual high water line (MAHW) of a river is defined as "the line that is apparent from visible markings or changes in the character of soils or vegetation due to the prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land" (310 CMR 10.58(2)(a)2). HW observed that the distinct break in slope typically marked the boundary of MAHW; however, pursuant to the regulations, field indicators of "bankfull conditions" (changes in slope, changes in vegetation, stain lines, top of point bars, changes in bank materials or bank undercuts) were also used to determine the MAHW associated with Whitman River at this site. HW

Ms. Emily Chow June 21, 2017 Page 7 of 7

marked the boundary of MAHW with consecutively numbered blue flagging stations labeled MAHW 1 through 28.

Regulatory Implications and Recommendations

Wetland resource areas on this site include BVW, Riverfront Area, Inland Bank, and Land Under Waterbodies and Waterways. HW marked the boundaries of BVW and MAHW. The BVW has a 100-foot jurisdictional buffer zone, while the Riverfront Area extends 200 feet landward from the MAHW line as demarcated in the field. Riverfront Area encompasses the BVW as well as forested uplands at this site.

In addition, the Westminster Wetlands Bylaw maintains a 25-foot no alteration buffer to Bank and BVW for lots created after May 1, 2004. However, in accordance with Section 201 § 202-2:

Alterations will be allowed within 25 feet of any resource area on any preexisting lot when the alteration is required to protect public health and safety, or the lot would become unbuildable without the alteration and that reasonable alternatives are presented to the Commission, in which the resource area will be enhanced or enlarged and protected permanently through a conservation restriction or other means acceptable to the Commission.

Any activities proposed within these resource areas, within 100 feet of the BVW boundary, or within the Riverfront Area will require filing of a permit application with the Westminster Conservation Commission and the Massachusetts Department of Environmental Protection (MassDEP).

If you have any questions regarding our findings, or if I may be of further assistance, please do not hesitate to contact me at (508) 833-6600.

Sincerely,

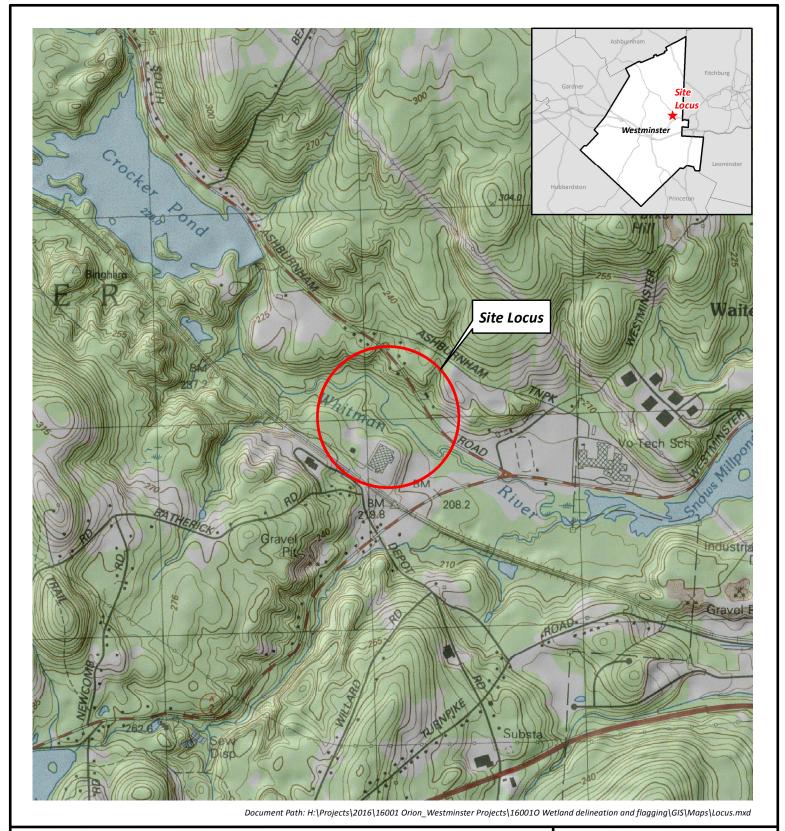
Horsley Witten Group, Inc.

Amy M. Ball, PWS, CWS

Project Manager – Senior Ecologist

Enclosures

cc: Jesse Bean, Horsley Witten Group



0 1,500 1" = 1,500 feet

*Gardner & Fitchburg Topographic Quadrangles



USGS Locus 180 State Road East Westminster, MA

Date: 6/21/2017 Figure 1



 $Document\ Path:\ H:\ Projects\ 2016\ 16001\ Orion_Westminster\ Projects\ 16001O\ Wetland\ delineation\ and\ flagging\ GIS\ Maps\ Aerial.mxd$

1" = 500 feet





Aerial Photo 180 State Road East Westminster, MA

Date: 6/21/2017

Figure 2

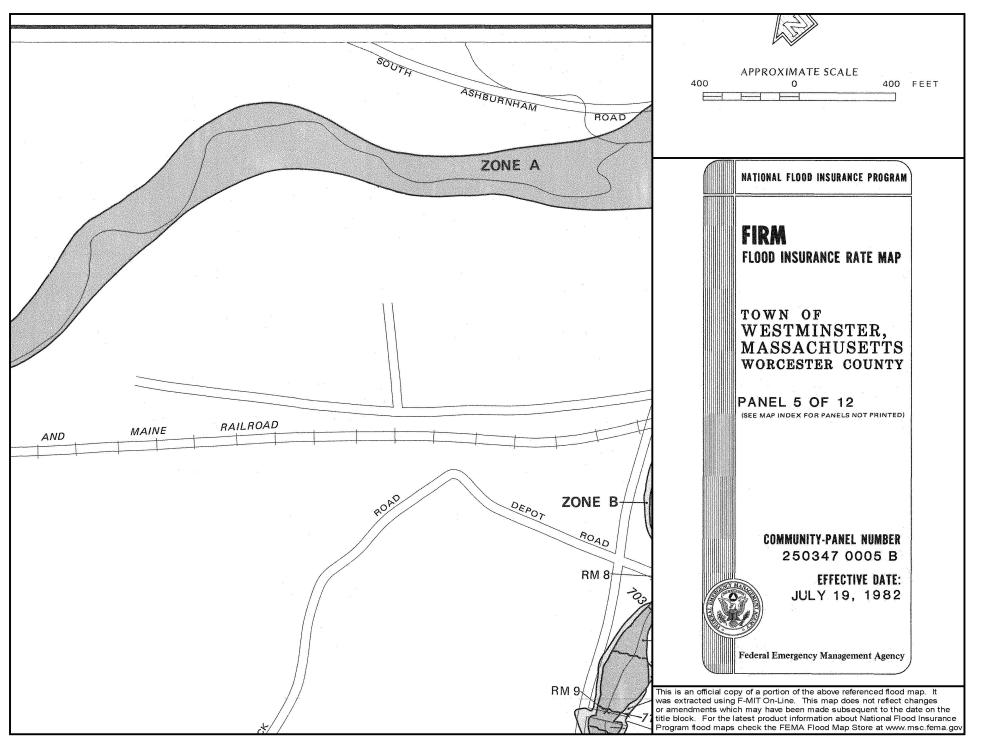
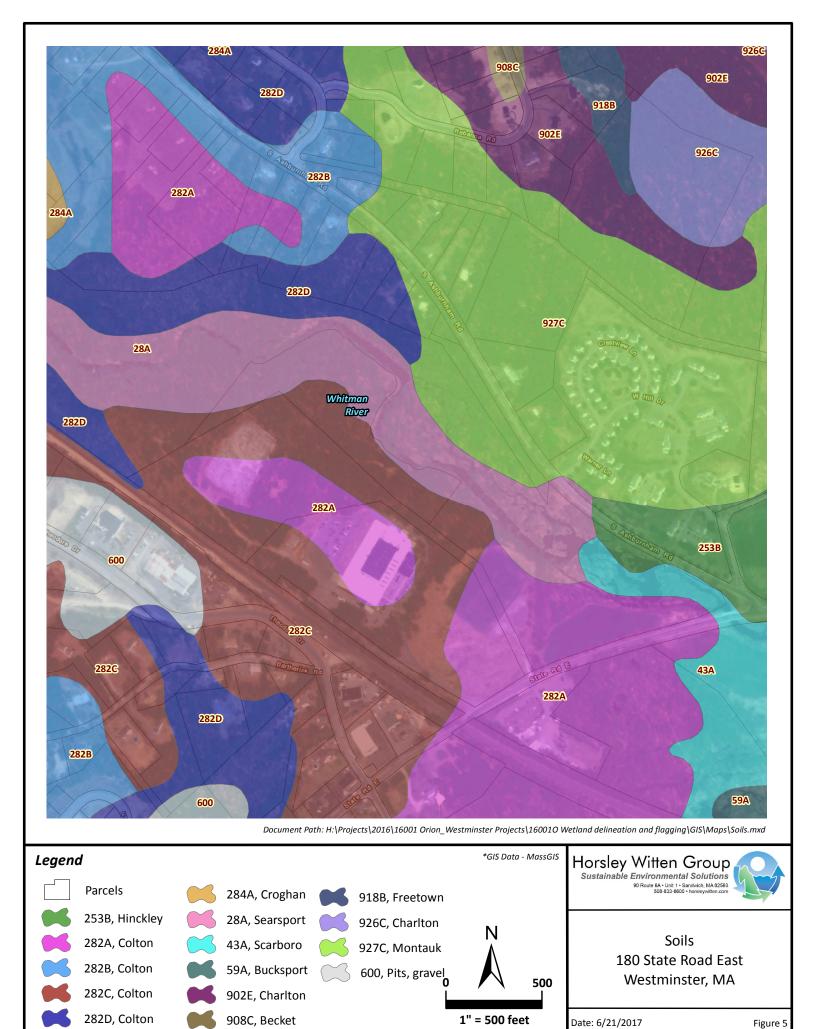


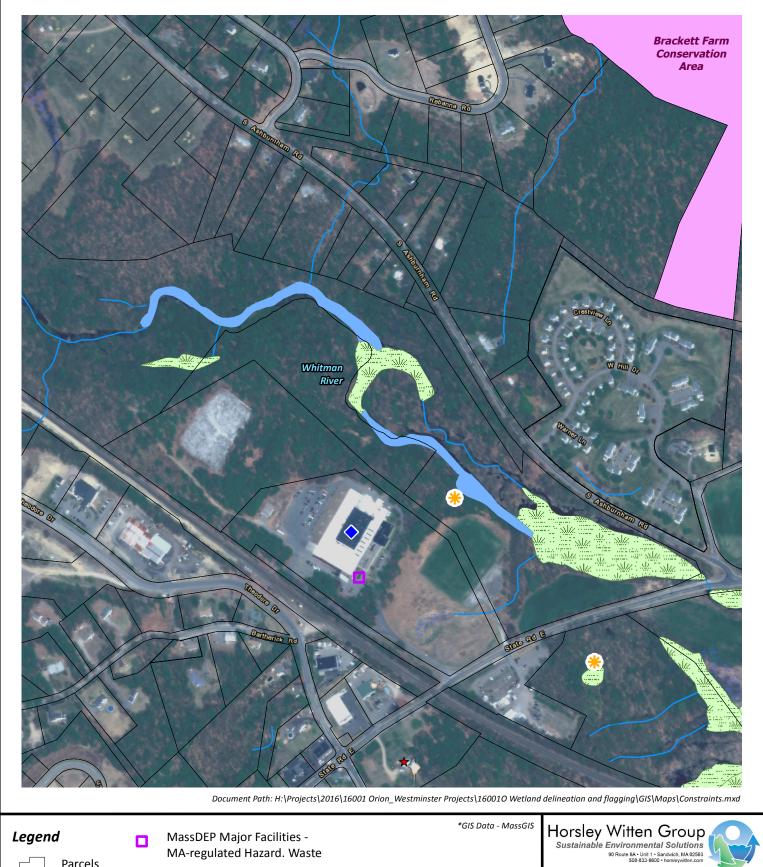
Figure 3





ATTACHMENT C WHITMAN RIVER PHOTOS AND STREAMSTATS REPORT







Hazardous Material Sites (MGL c. 21E)

Existing Constraints 180 State Road East Westminster, MA

Date: 6/21/2017

1" = 500 feet

Figure 4



12/15/2017 StreamStats

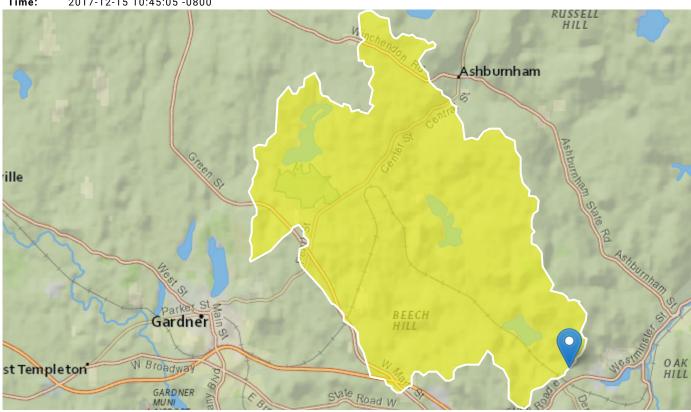
StreamStats Report - Downloaded on 12/15/17

Region ID:

Workspace ID: MA20171215184447157000

Clicked Point (Latitude, Longitude): 42.56203, -71.87176

2017-12-15 10:45:05 -0800 Time:



Basin Characteristics						
Parameter Code	Parameter Description	Value	Unit			
DRNAREA	Area that drains to a point on a stream	22	square miles			
ELEV	Mean Basin Elevation	1030	feet			
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	10.2	percent			
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.45	percent			
DRFTPERSTR	Area of stratified drift per unit of stream length	0.0936	square mile per mile			
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless			
BSLDEM10M	Mean basin slope computed from 10 m DEM	7.634	percent			
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	16.71	percent			
FOREST	Percentage of area covered by forest	74.52	percent			
ACRSDFT	Area underlain by stratified drift	3.7				
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	165135				

Parameter Code	Parameter Description	Value	Unit
CENTROIDY	Basin centroid vertical (y) location in state plane units	927562.9)
CRSDFT	Percentage of area of coarse-grained stratified drift	16.71	percent
LAKEAREA	Percentage of Lakes and Ponds	4.04	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	10.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	2.71	percent
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	13.4	
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	169475	
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	923555	
PRECPRIS00	asin average mean annual precipitation for 1971 to 2000 from PRISM	48.5	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	39.6	miles
WETLAND	Percentage of Wetlands	5.77	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	0.16	512
ELEV	Mean Basin Elevation	1030	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	10.2	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SEp
2 Year Peak Flood	596	ft^3/s	299	1190	42.3
5 Year Peak Flood	991	ft^3/s	490	2000	43.4
10 Year Peak Flood	1310	ft^3/s	633	2720	44.7
25 Year Peak Flood	1790	ft^3/s	832	3840	47.1
50 Year Peak Flood	2190	ft^3/s	986	4850	49.4
100 Year Peak Flood	2620	ft^3/s	1140	6000	51.8
200 Year Peak Flood	3090	ft^3/s	1310	7300	54.1
500 Year Peak Flood	3770	ft^3/s	1570	9070	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

12/15/2017 StreamStats

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.45	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0936	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
7 Day 2 Year Low Flow	2.09	ft^3/s	0.715	5.87	49.5	49.5
7 Day 10 Year Low Flow	0.924	ft^3/s	0.25	3.18	70.8	70.8

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.0936	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	4.45	percent	0.32	24.6

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
50 Percent Duration	22.3	ft^3/s	13.5	36.8	17.6	17.6
60 Percent Duration	16	ft^3/s	9.62	26.5	19.8	19.8
70 Percent Duration	9.23	ft^3/s	4.18	20.2	23.5	23.5
75 Percent Duration	7.05	ft^3/s	3.17	15.5	25.8	25.8
80 Percent Duration	5.72	ft^3/s	2.44	13.2	28.4	28.4
85 Percent Duration	4.42	ft^3/s	1.82	10.5	31.9	31.9
90 Percent Duration	3.32	ft^3/s	1.29	8.38	36.6	36.6
95 Percent Duration	2.09	ft^3/s	0.734	5.76	45.6	45.6
98 Percent Duration	1.3	ft^3/s	0.392	4.08	60.3	60.3
99 Percent Duration	0.998	ft^3/s	0.286	3.27	65.1	65.1

12/15/2017 StreamStats

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	7.634	percent	2.2	23.9

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
Bankfull Width	51.4	ft	21.3
Bankfull Depth	2.34	ft	19.8
Bankfull Area	120	ft^2	29
Bankfull Streamflow	403	ft^3/s	55

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	16.71	percent	0	100
FOREST	Percent Forest	74.52	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

Probability Statistics Disclaimers [Perennial Flow Probability]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Probability Statistics Flow Report [Perennial Flow Probability]

Statistic	Value	Unit
Probability Stream Flowing Perennially	0.987	dim

https://streamstats.usgs.gov/ss/ 4/5

12/15/2017 StreamStats

Probability Statistics Citations

Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.45	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0936	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SE	SEp
August 50 Percent Duration	4.5	ft^3/s	1.84	10.8	33.2	33.2

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)



ATTACHMENT D WETLAND MITIGATION ALTERNATIVES EVALUATION



MEMORANDUM

To: Emily Chow, Orion

From: Amy M. Ball, PWS, CWS

Date: May 17, 2018

Re: Alternatives Analysis for Wetland Mitigation – Northrop Grumman site, State

Road East, Westminster, MA

Horsley Witten Group, Inc. (HW) has prepared this memorandum to provide a discussion of the various alternatives for mitigation at the referenced site. The purpose of this exercise is to meet the performance standards under the Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40) and the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*) by demonstrating that proposed work within jurisdictional wetland resource areas and waters of the U.S. has been avoided and minimized to the extent practicable, and that the proposed work (the preferred alternative) will provide sufficient mitigation for work in these areas.

Background and Regulatory Framework

As HW understands, cadmium contamination has migrated from its upland source(s) on site through the sediments and groundwater toward the Whitman River. Cadmium concentrations observed in the wetlands soils along the river's edge exceed regulatory thresholds. Analyses of cadmium concentration from sediment samples indicates the need for complete removal of the soils within wetland resource areas, along with associated activities, in order to remediate an unacceptable risk to public health and the environment under the applicable regulatory standards set forth in the Massachusetts Contingency Plan (MCP). The proposed response actions under the MCP will necessarily result in impacts to a Bordering Vegetated Wetland (BVW), inland Bank, Land Under Waterbodies and Waterways of the Whitman River, and the adjacent 200-foot Riverfront Area, due to the need for sediment removal.

These wetland resource areas are jurisdictional under Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), the Town of Westminster Wetlands Bylaw (Chapter 202), and/or the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*), necessitating permits from various regulatory agencies.

Under the Massachusetts Wetlands Protection Act, the proposed remediation efforts can be permitted under the limited project provisions at 310 CMR 10.53(3), and specifically under subsection (q), for "The Assessment, monitoring, containment, mitigation, and remediation of, or other response to, a release or threat of release of oil and/or hazardous material in accordance with the provisions of 310 CMR 40.0000: Massachusetts Contingency Plan …" Following the regulatory performance standards, the proponent must remediate these activities to a level





Ms. Emily Chow May 17, 2018 Page 2 of 4

needed to achieve "No Significant Risk" as defined in the MCP regulations. These provisions also require that the proponent demonstrate the following:

- 1. there are no practicable alternatives to the response action being proposed that are consistent with the provisions of 310 CMR 40.0000: Massachusetts Contingency Plan and that would be less damaging to resource areas. The alternatives analysis shall include, at a minimum, the following:
 - a. an alternative that does not alter resource areas, which will provide baseline data for evaluating other alternatives; and
 - b. an assessment of alternatives to both temporary and permanent impacts to resource areas.

Accordingly, HW has prepared the following Alternatives Analysis to address these performance standards.

Alternatives Considered

No Action Alternative

The No Action alternative would allow the existing wetland resource areas to remain in place, but would not result in remediation of contaminated sediments. This alternative would result in unabated contaminants to remain within the sediments in the wetland resource areas, and potentially to migrate further downstream from natural processes. This alternative would also not address the provisions of the MCP that require remediation activities within the contaminated areas to achieve the level of "No Significant Risk" as defined in the MCP regulations. Therefore the No Action alternative was dismissed, as it would not meet the project purpose.

Alternative Mitigation Approaches

The proponents have considered alternative approaches to providing mitigation in a different location (upstream or downstream of the impacted area), at an alternative site, or else through out-of-kind means as allowable by regulation.

Considerations for alternative mitigation measures include the following:

- Under the Massachusetts Wetlands Protection Act The project, as proposed under the limited project provisions of the Massachusetts Wetlands Protection Act regulations, affords the issuing authority (Westminster Conservation Commission) discretion in approving the project provided that proposed mitigation measures must contribute to the interests of the Massachusetts Wetlands Protection Act.
- Under the Local Wetlands Bylaw Section § 202-2 D states that "Any permanent alteration or change of habitat of the resource area on a preexisting lot will require 150% replication of that area within that resource area."

Under the Federal *Clean Water Act* – The Mitigation Rule allows for flexibility in mitigation options, provided lost functions and values of a given wetland are provided with a broader watershed-based approach. The Mitigation Rule also establishes a hierarchical preference for mitigation, placing preference for Mitigation Bank credits and In-Lieu Fee (ILF) program credits above permittee-responsible mitigation (either under a watershed approach or on-site and/or in-kind mitigation). Off-site and/or out-of-kind permittee-responsible mitigation is only allowed if no other alternative is available. Massachusetts currently has an ILF Program in place (this site falls within the Quabbin/Worcester Plateau Service Area), but does not have a Mitigation Bank at this time. Additionally, the Army Corps of Engineers (ACOE) and Massachusetts Department of Environmental Protection (MassDEP) require mitigation ratios. Typically, for emergent wetlands, the mitigation ratio is 2:1, which would require additional land area for mitigation sustainability.

Off-Site Wetland Expansion and Enhancement

HW assessed the potential for creating additional wetlands (new or expanded wetland) within the same reach of the river, including the expansion of one of the other two wetland areas encountered on site (i.e., BVW #s 1 and/or 3). This mitigation option would potentially require additional study of riverine processes at this site, and would also require in-stream stabilization measures to allow for the establishment of new or expanded wetlands. It is uncertain if adequate area exists adjacent to BVW #s 1 and 3 to accept the necessary wetlands expansion within the hydraulic constraints of the riverine processes. Considerations for stream navigability would also need to be taken into account. Expansion of a different wetland area would not negate the need for in-stream restoration of the riverbed or the steeply sloped areas within Riverfront Area, and may result in additional temporary alteration to Riverfront Area and or buffer zones in order to expand the BVW elsewhere.

On-Site Out-of-Kind Restoration

HW also considered the potential for providing out-of-kind restoration along this reach of the river, such as bank restoration, slope stabilization, or invasives management to enhance the habitat along the river. However, the site in its current condition is relatively stable, but for ongoing resident beaver activity, and is free of non-native invasive species.

Off-Site Out-of-Kind Restoration and/or ILF Contribution

HW also considered the option of providing out of kind, off-site comparable mitigation that will contribute to the interests of the Massachusetts Wetlands Protection Act (e.g., wetland restoration or replacement at a site nearby (within the same watershed); habitat enhancements/invasive species management; or participation in In-Lieu Fee program). As we understand it, the Project Team had identified a site along State Road East (#180) with potential for wetland restoration, which may be a viable option. However, a certain amount of restoration will be required at this site, regardless of alternative off-site mitigation efforts or ILF contributions. Further, all regulatory agencies must be consulted to determine the full extent of the wetland mitigation efforts if on-site, in-kind mitigation is not proposed.

Ms. Emily Chow May 17, 2018 Page 4 of 4

Given the existing site conditions where steep slopes and riverbed sediments would be disturbed as a result of the required remediation activities, notwithstanding the direct BVW alterations and need for wetland mitigation, the surrounding landscape cannot remain in a disturbed state without causing further harm from erosion and sedimentation that has the potential to result in downstream alterations to additional wetland resources and the potential for lost wetland values. Therefore, restoration to some extent at the site will be required regardless.

Based upon the various considerations discussed above, it was determined that on-site, in-situ restoration is the preferred alternative.

<u>Preferred Alternative – In-Situ Restoration of Resource Areas</u>

The preferred alternative, in-situ restoration, will result in restored resource areas that are designed to function similarly to the existing resource areas, but that will also contain significantly lower levels of cadmium contamination.

The proposed mitigation plan will restore the wetland areas in configuration and elevation, restoring underlying soils by replacing contaminated sediments with clean materials of similar grain size, distribution, and organic content, and revegetating the areas with native plant species consistent with the existing conditions. Riverbank stabilization will also be conducted to both restore the areas disturbed during remediation and to protect the restored wetland area from river erosion during grow-in. Temporary erosion control measures will remain in place until all sediments are stabilized with vegetation. It is anticipated that long-term monitoring will be required to ensure that the restoration site is successfully restored.

The preferred alternative will result in restored resources areas and improved water quality over existing conditions, allowing for the restored areas to better serve the interests under the Massachusetts Wetlands Protection Act and the local wetlands bylaw, while also meeting the regulatory requirements of other wetland regulatory agencies.

Details and further discussion regarding the restoration areas are forthcoming under a separate Mitigation Plan to be prepared by HW.



ATTACHMENT E RIVERFRONT AREA ALTERNATIVES EVALUATION



ATTACHMENT E RIVERFRONT AREA ALTERNATIVES EVALUATION

The proposed wetland hydric soil, river sediment, and river bank soil excavations involve activities within the Riverfront Area protected under the Massachusetts Wetlands Protection Act and Chapter 202 of the Town of Westminster Wetlands Protection Bylaw. Therefore, performance standards specified in 310 CMR 10.58(4) and reiterated within Chapter 202 of the Town of Westminster Wetlands Protection Bylaw must be met. Performance standards in 310 CMR 10.58(4)(c) state that there must be no practicable and substantially equivalent economic alternatives to the proposed work with less adverse effects on the interests identified in M.G.L. c.131 § 40. Additionally, the proposed work, including wetland, river, and river bank mitigation, will have no significant adverse impact on the Riverfront Area to protect the interests identified in M.G.L. c.131 § 40. The required analysis of possible alternatives according to the Riverfront Area regulations is presented below. Site plans and natural resource areas are provided on Figures 1 through 3.

Practicable and Substantially Equivalent Economic Alternatives

The regulations at 310 CMR 10.58(4)(c) state that an alternative is practicable and substantially equivalent economically if it is available and capable of being implemented after taking the following into consideration:

- 1. The costs associated with an alternative project must be reasonable and not prohibitive. Costs must also be commensurate with the proposed use and project purpose from an economic perspective and commensurate with costs reasonably expected from the type of proponent.
- 2. Existing technology, including best available measures, should be utilized to reduce project impacts.
- 3. An alternative project must match the proposed use or project purpose.
- 4. The logistics associated with an alternative project, including the presence or absence of physical site characteristics or legal constraints, must be practicable.

The objective of the comprehensive remedial action is to achieve a condition of no significant risk, as defined in the Massachusetts Contingency Plan. Alternatives examined under the requirements of the Riverfront Regulations at 310 CMR 10.58 include alternatives that meet this objective and are discussed below. The scope of work of the proposed project is to excavate and remove cadmium-impacted hydric soil, river sediments, and river bank (Riverfront Area) soil as part of a comprehensive remedial action in accordance with 310 CMR 40.0800 (Figure 4).



Scope of Alternatives

Cadmium-impacted hydric soil, river sediments, and river bank soil are located in the proposed work area. Alternatives to the proposed work include excavating a smaller area, excavating in a different area, or conducting no excavation. While the scope of alternatives does not specifically address this work under 310 CMR 10.58(4)(c)2., the regulations state the scope of alternatives under consideration shall be commensurate with the type and size of the project. Therefore, the area under consideration for practical alternatives is limited to the proposed work area.

Further, the project is filed under the limited project provisions per 310 CMR 10.53(3)(q). Limited project provisions are designed to provide the issuing authority with the discretion to allow certain work to proceed although the work may not meet performance standards set for in 310 CMR 10.54 through 10.57. The project is designed to address the performance standards for practicable alternatives to the response action consistent with the provisions per 310 CMR 40.0000. Per 310 CMR 10.53(3)(q), the alternatives analysis shall include, at a minimum, the following:

- 1. An alternative that does not alter resource areas, which will provide baseline data for evaluating other alternatives
- 2. An assessment of alternatives to both temporary and permanent impacts to resource areas.

Based on the extent of cadmium impacts, options are only viable if the work is conducted within the current proposed wetland resource areas, including within Riverfront Area. The extent of excavation of hydric soils, river sediments, and river bank soils has been minimized to the greatest extent practicable while still meeting the objective of the comprehensive remedial action. The only alternative to this proposed work is to not excavate soils or sediments. However, this is not viable to meet the objective. Therefore, there is no alternative to the proposed work that is practicable and substantially equivalent economically.

Minimizing Significant Adverse Impacts

Per 310 CMR 10.58(4)(d), the work, including proposed mitigation measures, must have no significant adverse impact on the Riverfront Area to protect the interests identified in M.G.L. Ch. 131 § 40. The issuing authority may allow the alteration of (1) up to 5,000 square feet or 10 percent of the Riverfront Area within the lot, whichever is greater, on a lot recorded on or before 6 October 1997, or (2) up to 10 percent of the Riverfront Area within a lot recorded after 6 October 1997. The proposed work is located in Parcel 76-27 within the 200-foot Riverfront Area. The proposed work will result in alternation of approximately 37,000 square feet of Riverfront Area. This is approximately 12 percent of the total 200-foot Riverfront Area within Parcel 76-27 of approximately 300,000 square feet. There are four provisions to this regulation:



- 1. At a minimum, a 100-foot-wide area of undisturbed vegetation is provided.
 - Based on the location of cadmium-impacted soils and sediments, maintaining a 100-foot-wide area of undisturbed vegetation will not be feasible. However, the impacts to the resource area are temporary and will be restored, revegetated, and monitored upon removal of contaminated media.
- 2. Stormwater is managed according to standards established by the Department.
 - Not applicable. The proposed project is exempt from the Massachusetts Department of Environmental Protection Stormwater Management Policies.
- 3. Proposed work does not impair the capacity of the Riverfront Area to provide important wildlife habitat functions.
 - The proposed activities will temporarily disturb wildlife habitat in the work area. However, the work area will be restored at the completion of excavation activities. Restoration activities will likely enhance wildlife habitat in the work area through vegetation enhancements.
- 4. Proposed work shall not impair groundwater or surface water quality.
 - A sedimentation and erosion control barrier consisting of staked straw wattles, compost filter tubes, or straw bales and silt fencing will be installed prior to the start of excavation activities as shown on Figure 5. Erosion control barriers will minimize the potential for eroded soils to impact the river. Erosion control barriers will remain in place and maintained in good condition until all field activities have been completed. Excavation activities are not expected to impact groundwater.

Sedimentation and Erosion Control

As discussed above, a sediment and erosion control barrier consisting of staked straw wattles, compost filter tubes or straw bales and silt fencing will be installed prior to the start of excavation activities. Erosion control barriers will remain in place and will be maintained in good condition until all soils have been stabilized. Details of erosion control measures are in Attachment G.

Additional Performance Standards under 310 CMR 10.53 (3)(q)

Per 310 CMR 10.53(3)(q), work conducted as part of a comprehensive remedial action shall be designed, constructed, implemented, operated, and maintained to avoid or minimize impacts to resource areas where avoidance is not practicable, and shall meet the following standards to the maximum extent practicable.



- a. Hydrological changes to resource areas shall be minimized.
 - The wetland and riverbed will be replaced in-kind and the upgradient river bank (Riverfront Area) will be restored in-kind to the maximum extent practicable to minimize hydrological changes to resource areas.
- b. Best management practices shall be used to minimize adverse impacts during construction, including prevention of erosion and siltation of adjacent water bodies and wetlands in accordance with standard United States Department of Agriculture (USDA) Soil Conservation Service methods.
 - Best management practices including construction road stabilization, surface runoff control, sweeping and vacuuming, storm drain inlet protection, and water treatment system outfall protection will be implemented to minimize adverse impacts to the environment including adjacent water bodies and wetlands. Sediment and erosion control are discussed above. Other best management practices are discussed in the Memorandum above.
- c. Mitigating measures shall be implemented that contribute to the protection of the interests identified in M.G.L. c.131 § 40.
 - Mitigation, including wetland and riverbed replacement in-kind, as well as riverbank restoration and stabilization, will be implemented in accordance with the design plans in Attachment F.
- d. Compensatory storage shall be provided in accordance with the standards of 310 CMR 10.57(4)(a)1 for all flood storage volume that will be lost.
 - The proposed work is not anticipated to reduce flood storage volume that will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.
- e. No access road, assessment, or monitoring devices, or other structure or activity shall restrict flows so as to cause an increase in flood stage or velocity.
 - Dewatering of the work area is required for excavation activities. Therefore, a temporary non-embedded cofferdam will be installed in the river to allow the excavation area to be dewatered. The temporary cofferdam will be placed as close as possible to the proposed excavation to minimize restriction of river flow.
- f. Temporary structures and work areas in resource areas, such as access roads and assessment and monitoring devices, shall be removed within 30 days of completion of the work. Temporary alterations to resource areas shall be substantially restored to preexisting hydrology and topography. At least 75 percent of the surface of any area of disturbed vegetation shall be reestablished with indigenous wetland plant species within two growing seasons and prior to said vegetative reestablishment any exposed soil in the area of disturbed vegetation shall be temporarily stabilized to prevent erosion in accordance with standard USDA Soil Conservation Service methods.



Temporary structures, work areas, and alterations to resource areas are those that no longer are necessary to fulfill the requirements of the MCP.

Temporary structures, including a temporary non-embedded cofferdam, will be removed within 30 days of completion of the work. Resource areas will be restored in accordance with the design plans in Attachment F. Design plans also include temporary soil stabilization to prevent erosion in areas of disturbed vegetation. Restored vegetation shall be monitored for two growing seasons to confirm at least 75 percent of the disturbed area has been reestablished.

- g. Work in resource areas shall occur only when the ground is sufficiently frozen, dry, or otherwise stable to support the equipment being used.
 - Work in the resource area will only occur once the area is dewatered and the contractor deems the ground is sufficiently stable to support the temporary non-embedded cofferdam and excavation equipment.

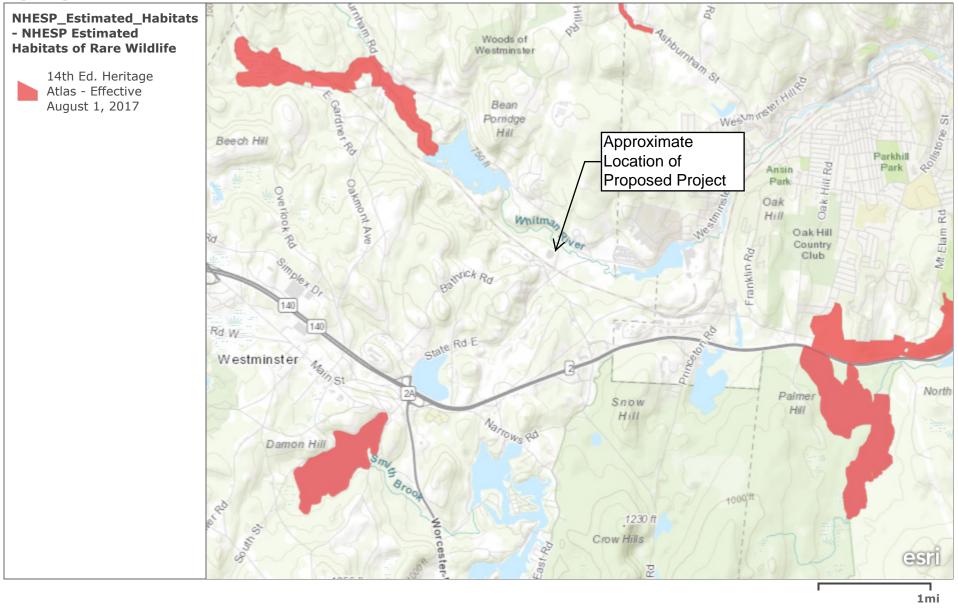


ATTACHMENT F

ENDANGERED SPECIES, AREAS OF CRITICAL ENVIRONMENTAL CONCERN, AND HISTORIC PROPERTIES DOCUMENTATION

7/5/2018 ArcGIS - My Map

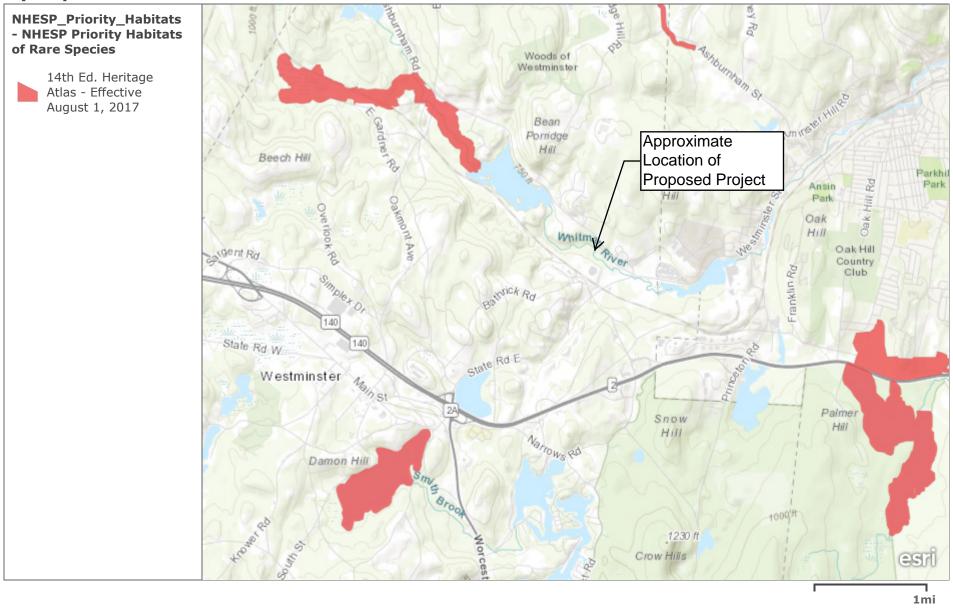
My Map



MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA

7/5/2018 ArcGIS - My Map

My Map



MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA

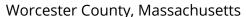
IPaCU.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location





Local office

New England Ecological Services Field Office

(603) 223-2541

(603) 223-0104

70 Commercial Street, Suite 300 Concord, NH 03301-5094

http://www.fws.gov/newengland

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

- 1. Draw the project location and click CONTINUE.
- 2. Click DEFINE PROJECT.
- 3. Log in (if directed to do so).
- 4. Provide a name and description for your project.
- 5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the <u>Ecological Services Program</u> of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact <u>NOAA Fisheries</u> for <u>species under their jurisdiction</u>.

- 1. Species listed under the <u>Endangered Species Act</u> are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the <u>listing status page</u> for more information.
- 2. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME STATUS

Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045 **Threatened**

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act^{1} and the Bald and Golden Eagle Protection Act^{2} .

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described <u>below</u>.

- 1. The Migratory Birds Treaty Act of 1918.
- 2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds
 http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the <u>USFWS Birds of Conservation Concern</u> (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ <u>below</u>. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the <u>E-bird data mapping tool</u> (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found <u>below</u>.

IPaC: Explore Location

7/5/2018

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A
BREEDING SEASON IS INDICATED
FOR A BIRD ON YOUR LIST, THE
BIRD MAY BREED IN YOUR
PROJECT AREA SOMETIME WITHIN
THE TIMEFRAME SPECIFIED,
WHICH IS A VERY LIBERAL
ESTIMATE OF THE DATES INSIDE
WHICH THE BIRD BREEDS
ACROSS ITS ENTIRE RANGE.
"BREEDS ELSEWHERE" INDICATES
THAT THE BIRD DOES NOT LIKELY
BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

https://ecos.fws.gov/ecp/species/1626

Black-billed Cuckoo Coccyzus erythropthalmus

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

https://ecos.fws.gov/ecp/species/9399

Bobolink Dolichonyx oryzivorus

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler Cardellina canadensis

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cape May Warbler Setophaga tigrina

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prairie Warbler Dendroica discolor

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Dec 1 to Aug 31

Breeds May 15 to Oct 10

Breeds May 20 to Jul 31

Breeds May 20 to Aug 10

Breeds Jun 1 to Jul 31

Breeds May 1 to Jul 31

Rusty Blackbird Euphagus carolinus

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Jul 20

Wood Thrush Hylocichla mustelina

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

- 1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
- 2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
- 3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (=)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (1)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

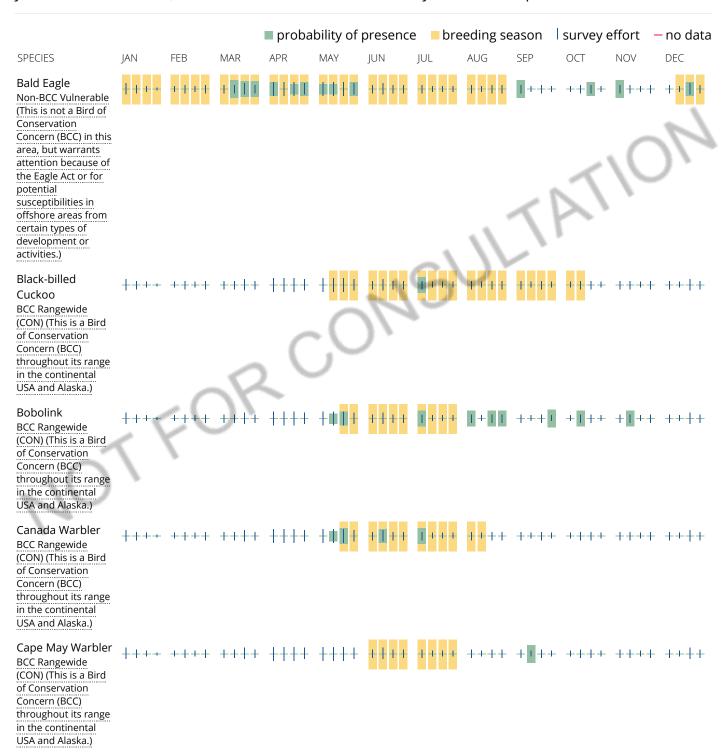
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

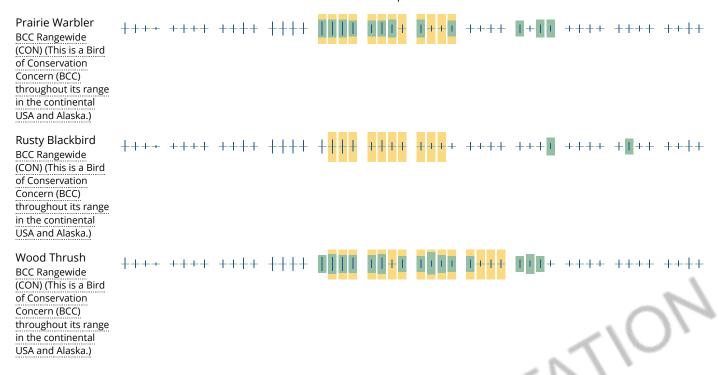
No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS <u>Birds of Conservation Concern (BCC)</u> and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the <u>Avian Knowledge Network (AKN)</u>. The AKN data is based on a growing collection of <u>survey, banding, and citizen science datasets</u> and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (<u>Eagle Act</u> requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the <u>E-bird Explore Data Tool</u>.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the <u>Avian Knowledge Network (AKN)</u>. This data is derived from a growing collection of <u>survey</u>, <u>banding</u>, <u>and citizen</u> science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

- 1. "BCC Rangewide" birds are <u>Birds of Conservation Concern</u> (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
- 2. "BCC BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
- 3. "Non-BCC Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the <u>Eagle Act</u> requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the <u>Northeast Ocean Data Portal</u>. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the <u>NOAA NCCOS</u> <u>Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf</u> project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the <u>Diving Bird Study</u> and the <u>nanotag studies</u> or contact <u>Caleb Spiegel</u> or <u>Pam Loring</u>.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to <u>obtain a permit</u> to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look

carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory Impacts to NWI wetlands and other across 1. . .

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of **Engineers District.**

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

PFO1C

FRESHWATER POND

PUBH

RIVERINE

R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

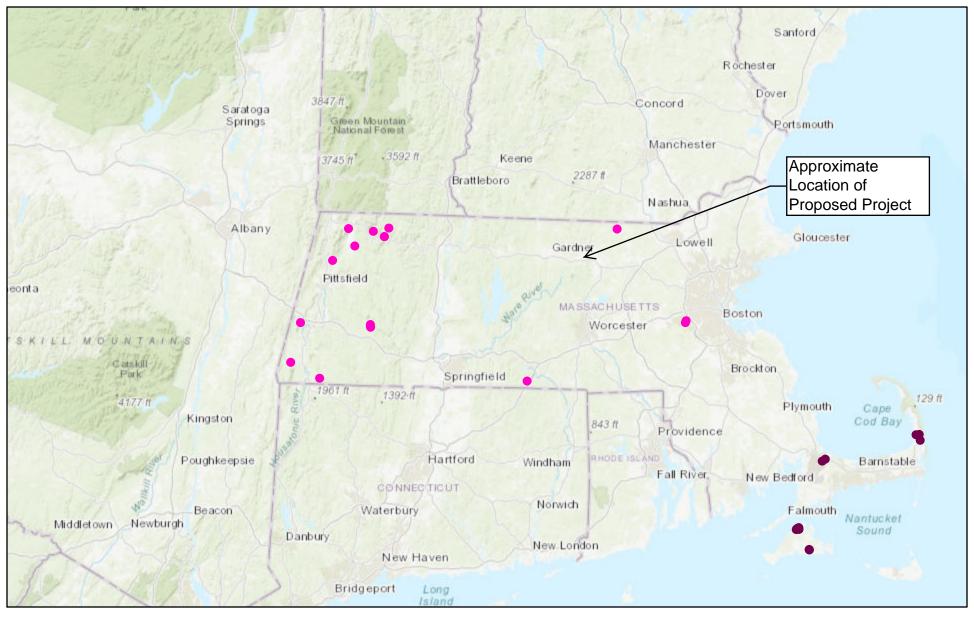
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

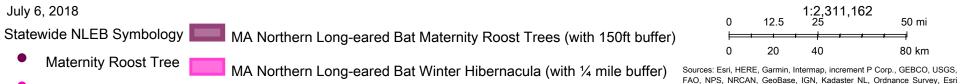
Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

TFOR

Northern Long-Eared Bat Maternity Roost Trees and Hibernaculum

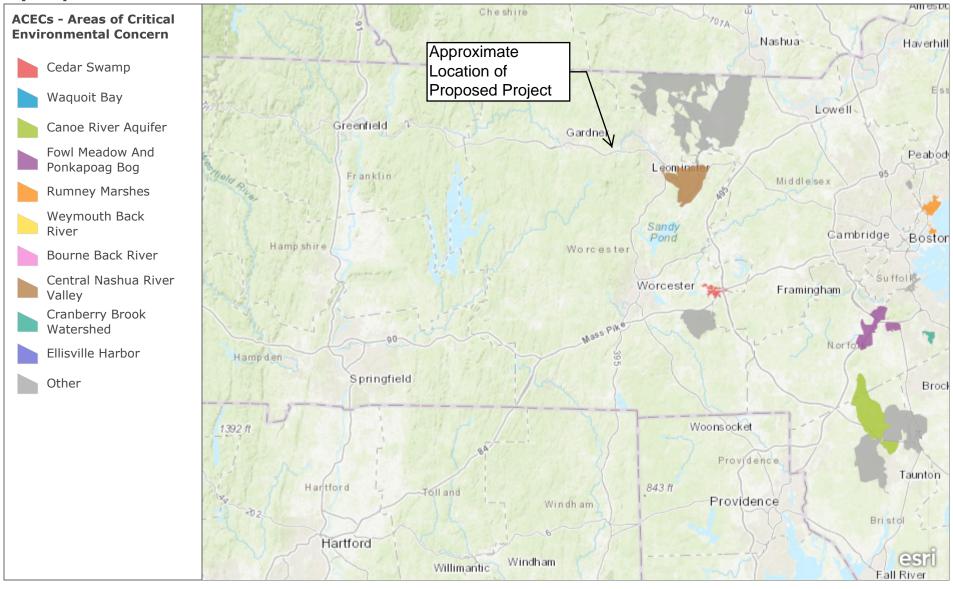




Hibernaculum

7/5/2018 ArcGIS - My Map

My Map



Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS

Massachusetts Cultural Resource Information System MACRIS

MACRIS Search Results

Search Criteria: Town(s): Westminster; Resource Type(s): Area, Building, Burial Ground, Object, Structure;

Inv. No.	Property Name	Street	Town	Year
WST.A	Westminster Village - Academy Hill Historic Dist.		Westminster	
WST.B	Leominster State Forest - CCC Camp Area		Westminster	
WST.C	Leominster State Forest - Crow Hill Pond Area		Westminster	
WST.D	Wachusett Mountain State Reservation		Westminster	
WST.918	Cowee - Smith Farm Complex		Westminster	
WST.902	First Meeting House Marker	Academy Hill	Westminster	c 1935
WST.29	Merriam, Artemas House	5 Academy Hill Rd	Westminster	c 1870
WST.34	Peckham, Dea. Robert House	12 Academy Hill Rd	Westminster	1820
WST.176	Upton School	13 Academy Hill Rd	Westminster	1912
WST.30	Wood, Abraham - Foote House	19 Academy Hill Rd	Westminster	1829
WST.911	Westminster Academy Marker	19 Academy Hill Rd	Westminster	1923
WST.33	Dustin, Alexander House	22 Academy Hill Rd	Westminster	c 1809
WST.32	Beaman, Silas House	34 Academy Hill Rd	Westminster	1793
WST.178		6 Academy St	Westminster	c 1894
WST.187	Whitman, Widow House	10 Adams St	Westminster	c 1845
WST.903	Ashburnham State Road Bridge over Phillips Brook	Ashburnham State Rd	Westminster	1926
WST.69	Westminster Town Hall	3 Bacon St	Westminster	1839
WST.906	Spanish - American War Memorial	3 Bacon St	Westminster	1946
WST.186	Cutting, Nathan Howard House	6 Bacon St	Westminster	c 1830
WST.182	Minott, J. Nelson House	7 Bacon St	Westminster	c 1838
WST.67	Lamb, Greenlief House	8 Bacon St	Westminster	r 1840
WST.68	Ames, Jacob House	9 Bacon St	Westminster	1837
WST.185	Whitney, Jonas House	10 Bacon St	Westminster	1834
WST.132	Whitney, Benjamin House	11 Bacon St	Westminster	c 1836
WST.156	Holden, Jonas House	12 Bacon St	Westminster	c 1814
WST.183	Merriam, Alfred - Whitney, Stillman House	13 Bacon St	Westminster	1850
WST.70	Whitman, Jerome House	14 Bacon St	Westminster	1850
WST.133	Cowie, Joel House	15 Bacon St	Westminster	1850
WST.71	Darby, Joseph House	16 Bacon St	Westminster	c 1800

WST.184	Morse, Stedman House	17 Bacon St	Westminster	r 1835
WST.72	Raymond, Aretas House	18 Bacon St	Westminster	1830
WST.127	Holden, Betsey House	19 Bacon St	Westminster	c 1836
WST.157	Lewis, John - Goodridge, John House	22 Bacon St	Westminster	1837
WST.73	Thurston, Moses House	54 Bacon St	Westminster	c 1778
WST.144	Bemis, William House	23 Battles Rd	Westminster	1747
WST.131	Edgell, John - Sawyer, Amos House	59 Bean Porridge Hill	Westminster	c 1800
WST.117	Conant, Thomas House	6 Brooks Ave	Westminster	c 1759
WST.46	White, James House	10 Carter Rd	Westminster	c 1798
WST.37	Miles, Reuben House	34 Carter Rd	Westminster	c 1754
WST.38	Damon, Timothy Jr. House	53 Carter Rd	Westminster	1789
WST.111	Eager, Horatio House	64 Carter Rd	Westminster	c 1819
WST.39	Damon House, Old	71 Carter Rd	Westminster	c 1771
WST.138	Jackson, Edward House	74 Chapel St	Westminster	1804
WST.907	Miles, Abner Grave Marker	Colony Rd	Westminster	1951
WST.109	Adams, George House	23 Cross Rd	Westminster	c 1819
WST.50	Garfield, Benjamin House	91 Davis Rd	Westminster	c 1741
WST.64	Harrington, Daniel House	189 Davis Rd	Westminster	r 1820
WST.160	Seaver, Asahel House	197 Davis Rd	Westminster	c 1838
WST.56	Walker, Daniel House	218 Davis Rd	Westminster	c 1789
WST.54	Whitney, Nathan House	260 Davis Rd	Westminster	1752
WST.31	Mann, Rev. Cyrus House	6 Dawley Rd	Westminster	c 1815
WST.48	Eager, Augustus House	18 Dawley Rd	Westminster	c 1849
WST.910	Westminster Town Pound	18 Dawley Rd	Westminster	1810
WST.905	New Meeting House Marker	Dean Hill Rd	Westminster	1904
WST.139	Laws, James Jr. House	54 Dean Hill Rd	Westminster	1797
WST.94	Curtis House	57 Depot Rd	Westminster	c 1761
WST.148	Curtis House	74 Depot Rd	Westminster	c 1870
WST.130	Sanger, John House	4 East Gardner Rd	Westminster	c 1751
WST.125		5 East Rd	Westminster	c 1800
WST.123	Brown, Jonathan House	34 East Rd	Westminster	c 1771
WST.124	Brown, Joseph House	40 East Rd	Westminster	c 1800
WST.62	Hoar, Timothy - Benjamin, Ahija House	115 East Rd	Westminster	c 1790
WST.65	Burpee Place	185 East Rd	Westminster	c 1845
WST.129	Penniman, William House	7 Eaton St	Westminster	1827
WST.40	Bigelow, Elisha House - Bigelow Tavern	51 Ellis Rd	Westminster	c 1757
WST.165	Kenney, James House	87 Ellis Rd	Westminster	r 1850
WST.175	Rice, Rev. Asaph House	3 Foster St	Westminster	c 1855
WST.118	Wyman, David - Rice, Sherman House	15 Hanks Hill Rd	Westminster	r 1860
WST.52	Sawin, Samuel House	10 Harrington Rd	Westminster	c 1741
WST.49	Hosley, Joseph House	46 Harrington Rd	Westminster	c 1741
WST.57	Baker, Richard House	68 Harrington Rd	Westminster	c 1755
WST.43	Gately, Patrick House	70 Knower Rd	Westminster	c 1855

WST.44	Sawin, Luke House	129 Knower Rd	Westminster	c 1835
WST.47	Darby, Andrew Jr. House	104 Knowler Rd	Westminster	c 1763
WST.205	Flagg, Edward R Lucander, Kustaa House	32 Lanes Rd	Westminster	r 1865
WST.204	Merriam, Thomas House	33 Lanes Rd	Westminster	1777
WST.203	Merriam, Jonas - Nickerson, Sarah House	45 Lanes Rd	Westminster	c 1825
WST.202	Merriam, Caleb - Merriam, Oliver House	47 Lanes Rd	Westminster	c 1800
WST.55	Mirick, George Alonzo House - Orchard, The	79 Lanes Rd	Westminster	1900
WST.53	Whitney, John House	98 Lanes Rd	Westminster	1793
WST.207		98 Lanes Rd	Westminster	c 2007
WST.901	Westminster World War I Memorial	Leominster St	Westminster	1920
WST.99	Westminster Cracker Bakery	1 Leominster St	Westminster	c 1842
WST.27		3 Leominster St	Westminster	r 1770
WST.195		4 Leominster St	Westminster	r 1925
WST.28	Everett, Joshua House - Penniman Tavern	5 Leominster St	Westminster	c 1765
WST.35	Corey, Nathan House	6 Leominster St	Westminster	1818
WST.84	Miles, Isaac Inn	8 Leominster St	Westminster	1801
WST.181	Baker, Adin F. House	10 Leominster St	Westminster	c 1870
WST.177	Drury, Lyman M. House	11 Leominster St	Westminster	1892
WST.179	Miller, Frank. A House	13 Leominster St	Westminster	c 1890
WST.85	Minott, Luke House	14 Leominster St	Westminster	c 1827
WST.180	Merriam, Sarah House	15 Leominster St	Westminster	c 1890
WST.196		16 Leominster St	Westminster	c 1827
WST.86	Wetherbee, Joseph House	24 Leominster St	Westminster	1875
WST.194	Westminster Farmer's Cooperative Building	62 Leominster St	Westminster	c 1932
WST.1	Hoar, John House	24 Main St	Westminster	r 1755
WST.162	Kendall, S. Gerrish House	29 Main St	Westminster	r 1845
WST.2	Gardner Third Center School	30 Main St	Westminster	1789
WST.112	Mudge, Joseph House	31 Main St	Westminster	1804
WST.3	Eaton, Thomas House	32 Main St	Westminster	c 1855
WST.19	Pierce, Jarvis House	41 Main St	Westminster	1800
WST.4	Nichols, Marcus House	42 Main St	Westminster	r 1865
WST.20	Perry, Silas	57 Main St	Westminster	1768
WST.5	Eaton, Stillman House	58 Main St	Westminster	1850
WST.113	Kendall, Edward House	65 Main St	Westminster	r 1850
WST.170		87 Main St	Westminster	c 1847
WST.6	Everett, Dr. Jeremiah House	90 Main St	Westminster	c 1763
WST.7	Bartlett, Dr. Daniel House	94-96 Main St	Westminster	1780
WST.164	Westminster Hotel Bowling Alley	97A Main St	Westminster	1904
WST.10	Edgell House	98 Main St	Westminster	c 1820
WST.11	Upham, Alvin House	100 Main St	Westminster	r 1820
WST.8	Lane, Mary W. House	104 Main St	Westminster	1840
WST.9	Mayo, William House	106 Main St	Westminster	1841
WST.12	Darby, Joseph Hossue	110 Main St	Westminster	c 1804

WST.13	Hill, David W. House	112 Main St	Westminster	1870
WST.163	Minott, Joseph House	113 Main St	Westminster	r 1820
WST.14	First Baptist Parsonage	116 Main St	Westminster	r 1860
WST.900	Miles, Daniel C. Marker	116 Main St	Westminster	
WST.21	Second Baptist Church	117 Main St	Westminster	r 1865
WST.15	Forbush Memorial Library	118 Main St	Westminster	1901
WST.22	Whitman, Joseph General Store	121 Main St	Westminster	1829
WST.23	Whitman, Joseph House	123 Main St	Westminster	1830
WST.24	Universalist Church	127 Main St	Westminster	1822
WST.172	Cutting, Jonas House	128 Main St	Westminster	c 1825
WST.114	Fire Station, Old	129 Main St	Westminster	c 1855
WST.25	Titus, Otis House	133 Main St	Westminster	c 1812
WST.16	Titus, Otis House	134 Main St	Westminster	1823
WST.199		135 Main St	Westminster	1973
WST.26	Cutler, Amos Marritt House	137 Main St	Westminster	c 1855
WST.17	First Congregational Church	138 Main St	Westminster	1942
WST.904	Westminster Soldiers - Civil War Monument	138 Main St	Westminster	1868
WST.18	Bigelow, Jabez House	142 Main St	Westminster	r 1755
WST.200		144 Main St	Westminster	1909
WST.121	Baptist Parsonage	2 Marshall Hill Rd	Westminster	1836
WST.171	Fenno, Frank Carriage House	6 Marshall Hill Rd	Westminster	r 1850
WST.88	Bemis, Philip Jr. House	25 Merriam Rd	Westminster	r 1775
WST.59	Powers Place, Old	59 Mile Hill Rd	Westminster	1766
WST.41	Knower, Thomas House	67 Minnott Rd	Westminster	1780
WST.42	Sawin, Jonathan - Wheeler, Mary Dike House	82 Minnott Rd	Westminster	1838
WST.45	Sawin, Jonathan House	1 Minott Rd	Westminster	r 1820
WST.800	Woodside Cemetery	9 Narrows Rd	Westminster	1742
WST.908	Hadley - Urban Memorial Arch and Gateway	9 Narrows Rd	Westminster	1913
WST.909	Westminster Revolutionary War Monument	9 Narrows Rd	Westminster	1905
WST.126	Derby, Ezra House	50 Narrows Rd	Westminster	c 1810
WST.168	Leland, Hollis J. House	90 Narrows Rd	Westminster	r 1845
WST.166	Underwood, J. House	95 Narrows Rd	Westminster	r 1845
WST.119	Perkins, Harrison House	98 Narrows Rd	Westminster	
WST.167	Baker, Elmer House	99 Narrows Rd	Westminster	c 1830
WST.103	Wyman, Harrison House	137 Narrows Rd	Westminster	c 1845
WST.120	Lucas, Henry House	139 Narrows Rd	Westminster	r 1820
WST.169	Wyman, Benjamin House	171 Narrows Rd	Westminster	r 1825
WST.89	Wyman, David House	177 Narrows Rd	Westminster	c 1793
WST.90	Robbins, Ephraim House	185 Narrows Rd	Westminster	c 1783
WST.150	Newcomb House	22 Newcomb Rd	Westminster	r 1770
WST.110		7 Nichols St	Westminster	c 1830
WST.36	White, Marshall House	9 Nichols St	Westminster	c 1820
WST.115	Bigelow, John House	15 Nichols St	Westminster	c 1808

WST.77	Rand, John House	82 North Common Rd	Westminster	1751
WST.75	Graves, Levi Jr. House	96 North Common Rd	Westminster	c 1850
WST.76	Morse, Farwell House	102 North Common Rd	Westminster	c 1840
WST.78	Taylor, Ebenezer House	110 North Common Rd	Westminster	c 1757
WST.137	Seaver, Isaac House	139 Overlook	Westminster	c 1773
WST.136	Spaulding, Merari House	99 Overlook Rd	Westminster	c 1800
WST.80	Smith, Charles House - Smith Tavern	21 Pierce Rd	Westminster	1792
WST.141	Fessenden, Timothy House	1 Pleasant St	Westminster	1837
WST.161	Wears, Abigail House	3 Pleasant St	Westminster	c 1839
WST.154		4 Pleasant St	Westminster	c 1840
WST.95	Cutting, Dr. Flavel House	5 Pleasant St	Westminster	c 1850
WST.197	•	9 Pleasant St	Westminster	c 1930
WST.87	Hager, Joseph House	11 Pleasant St	Westminster	c 1837
WST.912	Potato Hill Road Bridge over Phillips Brook	Potato Hill Rd	Westminster	c 1958
WST.149	Bacon, Edward House	10 Roper Rd	Westminster	1772
WST.151	Murdock, William House	16 Roper Rd	Westminster	c 1774
WST.201	Leominster State Forest - CCC Headquarters	Rt 31	Westminster	1933
WST.914	Leominster State Forest - CCC Camp Foundations	Rt 31	Westminster	1933
WST.915	Leominster State Forest - Crow Hill Pond	Rt 31	Westminster	1936
WST.916	Leominster State Forest - Crow Hill Pond Steps	Rt 31	Westminster	1936
WST.917	Leominster State Forest - Crow Hill Pond Dam	Rt 31	Westminster	1936
WST.173	Darby, Nathan House	83 Sargent Rd	Westminster	c 1823
WST.140	White, James House	2 Seaver St	Westminster	c 1830
WST.155	Beard, Joseph House	73 Shady Ave	Westminster	1777
WST.79	Whitman, Zechariah House - Whitman Tavern	238 South Ashburnham Rd	Westminster	c 1780
WST.51	Houghton, Lemuel House	6 Spruce Rd	Westminster	1761
WST.135	Jackson, Edward House - Town Farm	State Colony	Westminster	c 1766
WST.913	State Road East Bridge over Whitman River	State Rd East	Westminster	1925
WST.153	Barnes, Plympton House	56 State Rd East	Westminster	c 1840
WST.152	Raymond Saw Mill, Old	69 State Rd East	Westminster	1761
WST.147	Merriam, Caleb House	149 State Rd East	Westminster	1848
WST.93	Wood, Ezra - Warner, Levi Place	165 State Rd East	Westminster	c 1759
WST.116	Doty, Timothy House	131 State Rd West	Westminster	r 1825
WST.81	Warren, Simeon House	2 Syd Smith Rd	Westminster	r 1800
WST.82	Whitney, Phinneas House	9 Syd Smith Rd	Westminster	c 1788
WST.146	Stearns, Thomas House	46 Town Farm Rd	Westminster	c 1792
WST.96	Hartwell, Leander House	121 Town Farm Rd	Westminster	r 1800
WST.142	Smith, Joseph House	17 Turnpike Rd	Westminster	1779
WST.192	Dupee, Isaac Carriage House	44 Turnpike Rd	Westminster	c 1765
WST.92	Dupee, Isaac House	45 Turnpike Rd	Westminster	c 1764
WST.193	Dupee, Isaac Barn	46 Turnpike Rd	Westminster	c 1765
WST.91	Garfield, Solomon House	57 Turnpike Rd	Westminster	c 1766
WST.143	Miles, Daniel House	103 Turnpike Rd	Westminster	c 1845

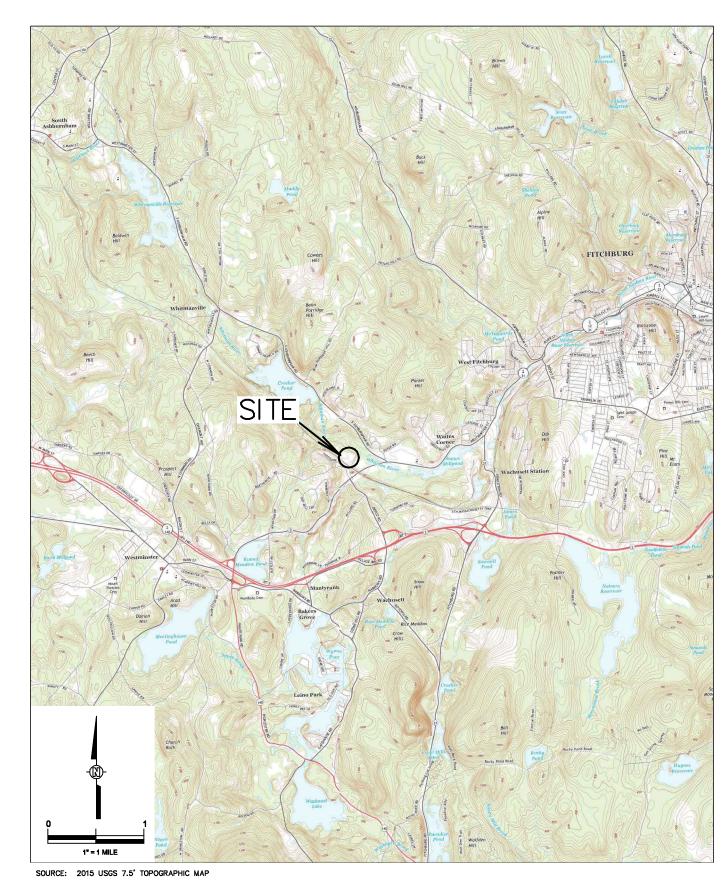
WST.104	Nelson, Gen. Miles House	104 Turnpike Rd	Westminster	c 1824
WST.83	Jackson, Josiah House	85 West Main St	Westminster	1757
WST.122	Raymond, George - Getchell, Warren E. House	36 West Princeton Rd	Westminster	1842
WST.206	Miller, Jonas House	93 West Princeton Rd	Westminster	c 1855
WST.58	Miller, Ezra House	109 West Princeton Rd	Westminster	1792
WST.102	Bemis, William - Day, Michael House	201 West Princeton Rd	Westminster	r 1820
WST.134	Lombard, Franklin House	12 Whitmanville Rd	Westminster	c 1839
WST.191		16 Whitney Rd	Westminster	c 1900
WST.190		56 Whitney St	Westminster	c 1900
WST.189	Crowell House	924 Whitney St	Westminster	c 1780
WST.66	Moore, Fairbanks House	26A Worcester Rd	Westminster	1737
WST.159	Harrington, Seth House	86 Worcester Rd	Westminster	c 1750
WST.63	Wood, Nathan House	164 Worcester Rd	Westminster	c 1756
WST.174	Wood, N. House	174 Worcester Rd	Westminster	c 1756
WST.61	Wood, Ahijah House	175 Worcester Rd	Westminster	c 1795
WST.158		196 Worcester Rd	Westminster	c 1800
WST.60	Williams, Isaac House	302 Worcester Rd	Westminster	c 1775



ATTACHMENT G DESIGN PLANS AND WRITTEN RESTORATION PLAN

WETLAND AND RIVER EXCAVATION AND RESTORATION CRESTICON WESTMINSTER - RTN 2-000165 75% PERMITTING DESIGN

AUGUST 2018



SITE LOCATION MAP

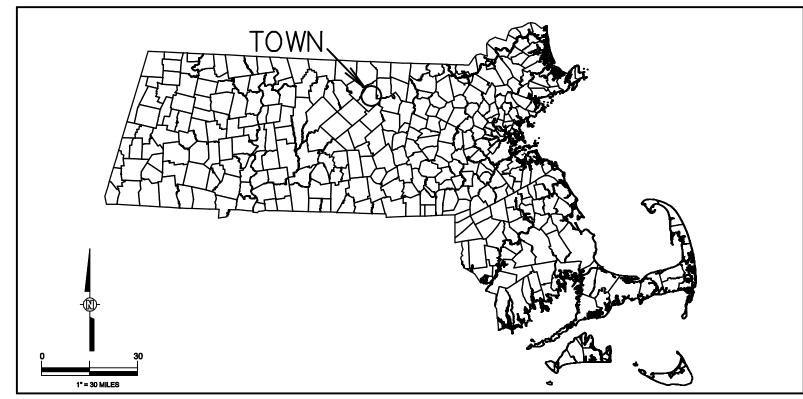
Scope of Work

The Contractor shall furnish all labor, materials, supplies, and utilities to complete the activities described below and in the specfications (the Work) to the satisfaction of Orion. The Work shall be conducted in accordance with all applicable Federal, State, and local laws and regulations. The Contractor must be liensed for the Work by the State Contractor's License Board. The scope of work shall consist of the folloing major activities:

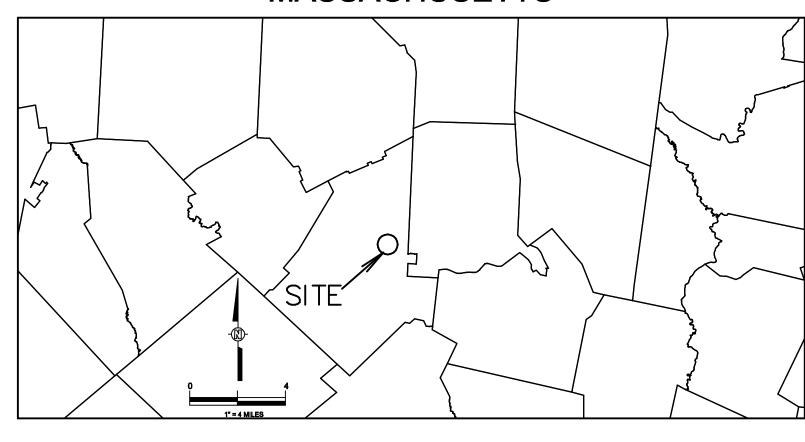
- Mobilization and demobilization
- Utility location confirmation
- Installation of temporary cofferdam and dewatering of work area
- Wetland, river bed, and river bank excavation and backfill
- Wetland, river bed, and river bank restoration.

Engineers:
Steve Hash P.E.
Orion Environmental Inc.
2955 Redondo Avenue
Long Beach, California 90806
(562) 988-2755

Richard A. Claytor, P.E. Horsley Witten Group, Inc. 90 Route 6A Sandwich, Massachusetts 02563 (508) 833-6600 Owner:
Northrop Grumman Guidance
and Electronics Company, Inc.
101 Continental Blvd., MS: D12/XE6D21
El Segundo, California 90245
(310) 331-1716



MASSACHUSETTS



TOWN

List of Drawings:

G-1 Title Sheet (Orion)

G-2 Construction Notes (Orion)

C-1 Plot Plan (Orion)

C-2 Erosion and Sediment Controls with Effluent Flow Schematic (Orion)

C-3 Excavation Areas (Orion)

R-1 Site Preparation Plan (Horsley Witten)

R-2 Bank Restoration Plan (Horsley Witten)

R-3 Planting Plan (Horsley Witten)
R-4 Planting Details (Horsley Witten)

Plans accompanying Petition of Northrop Grumman Guidance and Electronics Company, Inc., for fill in waterway.

NOTE: IF THIS SCALE
BAR IS NOT 1 INCH
LONG, THIS DRAWING
IS NOT TO SCALE.

_						Applicant: Northrop Grumman Guidance and Electronics Company, Inc.
_						
_						NORTHROP GRUMMAN
_						NONTINOF GROWINAIV
_						Northrop Grumman Systems Corporation
_	75 Percent Design Plan for Permitting	EC	SH	JPG	8/8/18	
,	DESCRIPTION OF REVISION	BY	СНК	REV	DATE	



		DESIGNE	р ЕС
	STEVEN M. HASH	DRAWN	505
	STEVEN M. HASH	CHECKED	SH
_	NO. 52804	REVIEWE	D SH
	PORTSSIONAL ENGIN	SCALE	AS SHOWN
	TONAL	DATE	8/8/18

EC	WETLAND AND RIVER EXCAVATION AND RESTORATION
505	CRESTICON WESTMINSTER - RTN 2-00165 WESTMINSTER, MASSACHUSETTS - WHITMAN RIVER
	•
SH	
SH	TITLE SHEET
AS SHOWN	

PROJECT WMA02-

Sheet 1 of 9

G-1

GENERAL CONSTRUCTION NOTES:

- 1. ALL SITE WORK TO COMPLETE THIS PROJECT AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- 2. IMMEDIATELY CONTACT AND COORDINATE WITH THE ENGINEER AND OWNER IF ANY DEVIATION OR ALTERATION OF THE WORK PROPOSED ON THESE DRAWINGS IS REQUIRED. CONTRACTOR MUST RECEIVE APPROVAL FROM ENGINEER AND OWNER BEFORE IMPLEMENTING ANY CHANGES TO THE APPROVED SCOPE OF WORK.
- UTILIZE ALL PRECAUTIONS AND MEASURES TO ENSURE THE SAFETY OF THE PUBLIC, ALL PERSONNEL AND PROPERTY DURING CONSTRUCTION IN ACCORDANCE WITH OSHA STANDARDS, INCLUDING THE INSTALLATION OF TEMPORARY FENCING BARRICADES,
- SAFETY LIGHTING, CONES, POLICE DETAIL AND/OR FLAGMEN AS DETERMINED NECESSARY BY THE TOWN/CITY/LOCAL MUNICIPALITY. THE CONTRACTOR IS RESPONSIBLE FOR THE COST OF POLICE DETAIL AND FOR COORDINATING WITH THE LOCAL OR STATE POLICE DEPARTMENT FOR ALL REQUIRED POLICE DETAIL.
- 4. MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY CONSTRUCTION PERMITS, PAY ALL FEES INCLUDING POLICE DETAILS AND POST ALL BONDS, IF NECESSARY, ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE OWNER AND THE ENGINEER.
- 5. ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE AND ARE BASED ON THE BEST INFORMATION AVAILABLE. PRIOR TO THE START OF CONSTRUCTION VERIFY THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLING ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
- 6. THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS INDICATED ON THE DRAWINGS ARE BASED ON RECORDS OF VARIOUS UTILITY COMPANIES, AND WHEREVER POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED UPON AS BEING EXACT OR COMPLETE. VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES IN THE FIELD PRIOR TO THE START OF CONSTRUCTION. CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY IN THE TOWN, AND "DIGSAFE" (811) AT LEAST THREE BUSINESS DAYS PRIOR TO ANY EXCAVATION WORK IN PREVIOUSLY UNALTERED AREAS TO REQUEST EXACT FIELD LOCATION OF UTILITIES. THE CONTRACTOR MUST RESOLVE CONFLICTS BETWEEN THE PROPOSED UTILITIES AND FIELD-LOCATED UTILITIES AND REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED, INCOMPLETELY OR INACCURATELY SHOWN. THE CONTRACTOR MUST MAINTAIN ACCURATE RECORDS OF THE LOCATION AND ELEVATION OF ALL WORK INSTALLED AND EXISTING UTILITIES FOUND DURING CONSTRUCTION FOR THE PREPARATION OF THE AS-BUILT PLAN.
- 7. COORDINATE AND MAKE ALL CONNECTION ARRANGEMENTS WITH UTILITY COMPANIES, AS REQUIRED.
- 8. IMPORT ONLY CLEAN MATERIAL. MATERIAL FROM AN EXISTING OR FORMER 21E SITE AS DEFINED BY THE MASSACHUSETTS CONTINGENCY PLAN 310 CMR 40.0000 WILL NOT BE ACCEPTED. THE CONTRACTOR SHALL LIMIT THE NUMBER OF BORROW SITES FROM WHICH IT OBTAINS BACKFILL SOIL TO A MAXIMUM OF THREE SITES. THE CONTRACTOR SHALL COLLECT AND ANALYZE AT LEAST ONE SOIL SAMPLE OF IMPORTED SOIL FROM EACH BORROW SITE FOR THE PRESENCE OF ANY CONTAMINANTS. THE CONTRACTOR SHALL CONTRACT A LABORATORY TO ANALYZE EACH SOIL SAMPLE FOR VOCS BY USEPA METHOD 8260C AND FULL-LIST METALS BY USEPA METHODS 6010C AND 7410. ANALYTICAL RESULTS SHALL BE PROVIDED TO NORTHROP GRUMMAN AT LEAST 1 WEEK BEFORE ARRIVING ON SITE. ANY SOIL TESTED BY THE NORTHROP GRUMMAN REPRESENTATIVE THAT IS FOUND TO BE UNACCEPTABLE SHALL NOT BE USED AT THE SITE.
- 9. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH AND MAINTAIN ALL CONTROL POINTS AND BENCHMARKS DURING CONSTRUCTION INCLUDING BENCHMARK LOCATIONS AND ELEVATIONS AT CRITICAL AREAS. COORDINATE WITH THE ENGINEER THE LOCATION OF ALL CONTROL POINTS AND BENCHMARKS.
- 10. SITE LAYOUT SURVEY REQUIRED FOR CONSTRUCTION MUST BE PROVIDED BY THE CONTRACTOR AND PERFORMED BY A MASSACHUSETTS' REGISTERED PROFESSIONAL LAND SURVEYOR. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE SURVEYOR FOR ALL SITE SURVEY WORK.
- 11. MAINTAIN ALL GRADE STAKES SET BY THE SURVEYOR. GRADE STAKES ARE TO REMAIN UNTIL A FINAL INSPECTION OF THE ITEM HAS BEEN COMPLETED BY THE ENGINEER. RE-STAKING OF PREVIOUSLY SURVEYED SITE FEATURES IS THE RESPONSIBILITY (INCLUDING COST) OF THE CONTRACTOR.
- 12. UNLESS OTHERWISE INDICATED ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS, ALL SITE CONSTRUCTION MATERIALS AND METHODOLOGIES ARE TO CONFORM TO THE MOST RECENT VERSION OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (THE MASSACHUSETTS HIGHWAY DEPARTMENT 1988 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE 2002 SUPPLEMENTAL SPECIFICATIONS, AND THE 2005 STANDARD SPECIAL PROVISIONS)
- 13. PROVIDE ALL CONSTRUCTION SERVICE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS REGARDING NOISE, VIBRATION, DUST, SEDIMENTATION CONTAINMENT, AND TRENCH WORK. SITE-SPECIFIC ACTION LEVELS SHALL BE ESTABLISHED BEFORE EXCAVATION IN ACCORDANCE WITH "REAL-TIME AIR MONITORING AT CONSTRUCTION AND REMEDIATION SITES TO ESTIMATE RISKS OF CONTAMINATED DUST MIGRATION" PUBLISHED BY MASSDEP IN OCTOBER 1997 OR THE MOST CURRENT MASSDEP GUIDANCE.
- 14. COLLECT SOLID WASTES AND STORE IN A SECURED DUMPSTER. THE DUMPSTER MUST MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS.
- 15. RESTORE ALL SURFACES EQUAL TO THEIR ORIGINAL CONDITION AFTER CONSTRUCTION IS COMPLETE PER SPECIFICATIONS. LEAVE ALL AREAS NOT DISTURBED BY CONSTRUCTION IN THEIR NATURAL STATE. TAKE CARE TO PREVENT DAMAGE TO SHRUBS, TREES, OTHER LANDSCAPING AND/OR NATURAL FEATURES. WHEREAS THE PLANS DO NOT SHOW ALL LANDSCAPE FEATURES, EXISTING CONDITIONS MUST BE VERIFIED BY THE CONTRACTOR IN ADVANCE OF THE WORK.
- 16. PROVIDE A UNIT PRICE COST IN CUBIC YARD MEASURE FOR LEDGE AND/OR BOULDER REMOVAL. LEDGE AND/OR BOULDERS LESS THAN 1 CUBIC YARD IN SIZE BASED ON THE AVERAGE DIMENSIONS WILL NOT BE CONSIDERED PAYABLE ROCK. PROVIDE UNIT PRICES FOR BOTH ON AND OFF SITE DISPOSAL. IF ADDITIONAL FILL MATERIAL IS REQUIRED INCLUDE THE COST OF ALL FILL MATERIAL.
- 17. REGULARLY INSPECT THE PERIMETER OF THE PROPERTY TO CLEAN UP AND REMOVE LOOSE CONSTRUCTION DEBRIS BEFORE IT LEAVES THE SITE. PROMPTLY REMOVE ALL DEMOLITION DEBRIS FROM THE SITE TO AN APPROVED DUMP SITE.
- 18. ALL TRUCKS LEAVING THE SITE MUST BE COVERED AND FREE OF DEBRIS AND MUD.
- 19. BURIAL OF ANY STUMPS, SOLID DEBRIS, AND/OR STONES/BOULDERS ONSITE IS PROHIBITED. DO NOT USE ROAD SALT OR OTHER DE-ICING CHEMICALS ON THE ACCESS ROADWAY.
- 20. AT THE END OF CONSTRUCTION, REMOVE ALL CONSTRUCTION DEBRIS AND SURPLUS MATERIALS FROM THE SITE [AS INDICATED IN THE SPECIFICATIONS]. PERFORM A THOROUGH INSPECTION OF THE WORK PERIMETER. COLLECT AND REMOVE ALL MATERIALS AND BLOWN OR WATER CARRIED DEBRIS FROM THE SITE.

BASIC CONSTRUCTION SEQUENCE:

1. SURVEY AND STAKE THE PROPOSED LIMIT OF DISTURBANCE AND LIMIT OF SEDIMENTATION BARRIERS.

USED TO GAIN ACCESS TO THE SITE BY ANY CONSTRUCTION OR DELIVERY VEHICLES.

- 2. PLACE SEDIMENTATION BARRIERS (STRAWBALES, SILT SOCK, SILT FENCE, ETC.) AS INDICATED ON DRAWINGS AND STAKED OUT IN THE FIELD. UNDER NO CIRCUMSTANCES IS THE LIMIT OF WORK TO EXTEND BEYOND THE SEDIMENTATION BARRIERS/LIMIT OF DISTURBANCE AS INDICATED ON DRAWINGS AS APPROVED BY APPROPRIATE PERMITTING AGENCIES.
- 3. INSTALL TEMPORARY CONSTRUCTION ENTRANCES IN LOCATIONS INDICATED ON DRAWINGS. NO OTHER ENTRANCES ARE TO BE
- 4. CUT BACK THE SLOPE NEAR THE EDGE OF THE WETLAND TO CREATE AN ACCESS POINT FOR EQUIPMENT FOR COFFERDAM INSTALLATION AND EXCAVATION. RE-ROUTE THE RECREATIONAL TRAIL AROUND THE WORK AREA.
- 5. INSTALL A TEMPORARY NON-EMBEDDED COFFERDAM TO ISOLATE THE EXCAVATION AREA. DEWATER THE ENCLOSED PORTION OF THE RIVER USING PUMPS AND TREAT TO BELOW LEVELS SPECIFIED IN SITE-SPECIFIC PERMITS. TREATED WATER SHALL BE DISCHARGED TO THE WHITMAN RIVER DOWNGRADIENT OF THE WORK AREA IN ACCORDANCE WITH APPLICABLE PERMITS.
- 6. EXCAVATE AND BACKFILL RIVERBANK EXCAVATION AREA AS SHOWN ON SHEET R-3. BACKFILL WILL BE COMPLETED AFTER RECEIVING ANALYTICAL RESULTS OF EXCAVATION CONFIRMATION SAMPLES.
- 7. EXCAVATE AND BACKFLL RIVERBED EXCAVATION AREA AS SHOWN ON SHEET R-3. BACKFILL WILL BE COMPLETED AFTER RECEIVING ANALYTICAL RESULTS OF EXCAVATION CONFIRMATION SAMPLES.
- 8. EXCAVATE AND BACKFILL WETLAND EXCAVATION AREA AS SHOWN ON SHEET R-3. BACKFILL WILL BE COMPLETED AFTER RECEIVING ANALYTICAL RESULTS OF EXCAVATION CONFIRMATION SAMPLES.
- 9. REMOVE TEMPORARY COFFERDAM AND BACKFILL CONSTRUCTION ACCESS ROAD IN ACCORDANCE WITH SHEET R-3.
- 10. RESTORE RIVERBANK, RIVERBED, AND WETLAND EXCAVATION AREAS IN ACCORDANCE WITH SHEET R-3. PERMANENTLY SEED ALL DISTURBED AREAS AND COMPLETE ALL REMAINING PLANTING AND SEEING IN ACCORDANCE WITH SHEET R-3.
- 11. RESTORE RECREATIONAL TRAIL. RESTORED TRAIL WILL BE DESIGNED BASED ON FINISHED CONDITIONS AND WITH COOPERATION FROM TOWN OF WESTMINSTER CROCKER POND RECREATIONAL AREA COMMITTEE.
- 12. ENGINEER TO APPROVE THE REMOVAL OF ALL TEMPORARY SOIL EROSION AND SEDIMENTATION CONTROL MEASURES FOLLOWING VEGETATIVE ESTABLISHMENT OF ALL DISTURBED AREAS AND DETERMINE WHEN THE CONTRIBUTING AREA HAS REACHED A MINIMUM OF 80% STABILIZATION.

EROSION & SEDIMENT CONTROL NOTES:

- 1. PRIOR TO THE START OF CONSTRUCTION A NOTICE OF INTENT (NOI) MUST BE FILED WITH THE TOWN OF WESTMINSTER CONSERVATION COMMISSION (WCC). OWNER AND ENGINEER WILL OBTAIN ORDER OF CONDITIONS FROM WCC. CONTRACTOR SHALL COMPLY WITH ALL EROSION & SEDIMENT CONTROL REQUIREMENTS INCLUDED IN THE ORDER OF CONDITIONS.
- DESIGNATE THE SITE CONSTRUCTION FOREMAN AS THE ON-SITE PERSONNEL RESPONSIBLE FOR THE DAILY INSPECTION AND
 MAINTENANCE OF ALL SEDIMENT AND EROSION CONTROLS AND IMPLEMENTATION OF ALL NECESSARY MEASURES TO CONTROL
 EROSION AND PREVENT SEDIMENT FROM LEAVING THE SITE.
- 3. INSTALL ALL EROSION AND SEDIMENT CONTROL (ESC) MEASURES AS INDICATED ON DRAWINGS IN CONSULTATION WITH THE CONSERVATION AGENT, AND ENGINEER BEFORE ANY CONSTRUCTION ACTIVITIES BEGIN. INSPECT, MAINTAIN REPAIR AND REPLACE EROSION CONTROL MEASURES, AS NECESSARY, DURING THE ENTIRE CONSTRUCTION PERIOD OF THE PROJECT.
- 4. MAINTAIN A MINIMUM SURPLUS OF 100 FEET OF EROSION CONTROL BARRIER (SILT FENCE, STRAWBALE, &/OR SILT SOCK) ONSITE AT ALL TIMES.
- 5. PROTECT THE ADJACENT RESOURCE AREA FROM SEDIMENTATION DURING PROJECT CONSTRUCTION UNTIL ACCEPTANCE BY THE OWNER & IN CONFORMANCE WITH THE ORDER OF CONDITIONS.
- 6. PROVIDE CONSTRUCTION EXITS AS INDICATED ON DRAWINGS TO SHED DIRT FROM CONSTRUCTION VEHICLE TIRES. CLEAN AND/OR REPLACE THE CRUSHED STONE PAD, AS NECESSARY, TO MAINTAIN ITS EFFECTIVENESS.
- 7. KEEP THE LIMIT OF CLEARING, GRADING AND DISTURBANCES TO A MINIMUM WITHIN THE PROPOSED AREA OF CONSTRUCTION. PHASE THE SITE WORK IN A MANNER TO MINIMIZE AREAS OF EXPOSED SOIL. IF TREES ARE TO BE CUT, CLEAR AND GRUB ONLY THOSE AREAS WHICH ARE ACTIVELY UNDER CONSTRUCTION. PROPERLY INSTALL THE SEDIMENTATION CONTROLS PRIOR TO BEGINNING ANY LAND CLEARING ACTIVITY AND/OR OTHER CONSTRUCTION RELATED WORK.
- 8. MONITOR LOCAL WEATHER REPORTS DURING CONSTRUCTION AND PRIOR TO SCHEDULING EARTHMOVING OR OTHER CONSTRUCTION ACTIVITIES WHICH LEAVE LARGE DISTURBED AREAS UNSTABILIZED. IF INCLEMENT WEATHER IS PREDICTED, USE BEST PROFESSIONAL JUDGEMENT AND GOOD CONSTRUCTION PRACTICES WHEN SCHEDULING CONSTRUCTION ACTIVITIES AND ENSURE THE NECESSARY EROSION CONTROL DEVICES ARE INSTALLED AND FUNCTIONING PROPERLY TO MINIMIZE EROSION FROM ANY IMPENDING WEATHER EVENTS.
- 9. INSPECT EROSION AND SEDIMENT CONTROL DEVICES AND STABILIZED SLOPES ON A WEEKLY BASIS AND AFTER EACH RAINFALL EVENT OF .25 INCH OR GREATER. REPAIR IDENTIFIED PROBLEMS WITHIN 24 HOURS TO ENSURE EROSION AND SEDIMENT CONTROLS ARE IN GOOD WORKING ORDER. RESET OR REPLACE MATERIALS AS REQUIRED.
- 10. SURROUND THE PERIMETER OF SOIL STOCKPILES WITH SILT SOCK, SILT FENCE, STRAWBALES, OR A COMBINATION OF SILT FENCE WITH STRAWBALE. AS DETERMINED NECESSARY.
- 11. DISTURBED AREAS AND SLOPES MUST NOT BE LEFT UNATTENDED OR EXPOSED FOR EXCESSIVE PERIODS OF TIME SUCH AS THE INACTIVE WINTER SEASON. PROVIDE APPROPRIATE STABILIZATION PRACTICES ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED, REINFORCE TEMPORARY AREAS HAVING A SLOPE GREATER THAN 4:1 WITH EROSION BLANKETS OR APPROVED EQUAL UNTIL THE SITE IS PROPERLY STABILIZED. TEMPORARY SWALES MAY ALSO BE REQUIRED IF DETERMINED NECESSARY IN THE FIELD BY THE
- 12. SMALL SEDIMENTATION BASINS MAY BE CONSTRUCTED ON AN AS-NEEDED BASIS DURING CONSTRUCTION TO AID IN THE CAPTURE OF SITE RUNOFF AND SEDIMENT. IT WILL BE THE RESPONSIBILITY OF THE SITE CONTRACTOR, IN CONSULTATION WITH THE ENGINEER, TO SIZE AND CREATE THESE BASINS IN APPROPRIATE LOCATIONS.
- 13. UPON THE INSTALLATION OF EACH CATCH BASIN, INSTALL A SILT SACK OR APPROVED EQUIVALENT. INSPECT SILT SACKS AFTER EACH SIGNIFICANT STORM EVENT AND REMOVE AND EMPTY AS NEEDED FOR THE DURATION OF THE CONSTRUCTION PERIOD.
- 14. CONTAIN ALL SEDIMENT ONSITE. SWEEP ALL EXITS FROM THE SITE AS NECESSARY INCLUDING ANY SEDIMENT TRACKING. SWEEP PAVED AREAS AS NEEDED TO REMOVE SEDIMENT AND POTENTIAL POLLUTANTS ACCUMULATED DURING SITE CONSTRUCTION.
- 15. REMOVE ACCUMULATED SEDIMENT FROM ALL TEMPORARY PRACTICES AND DISPOSE OF IN A PRE-APPROVED LOCATION.
- 16. PROVIDE ON SITE OR MAKE READILY AVAILABLE THE NECESSARY EQUIPMENT AND SITE PERSONNEL DURING CONSTRUCTION HOURS FOR THE DURATION OF THE PROJECT TO ENSURE ALL EROSION AND SEDIMENTATION CONTROL DEVICES ARE PROPERLY MAINTAINED AND REPAIRED IN A TIMELY AND RESPONSIBLE MANNER. IF SITE WORK IS SUSPENDED DURING THE WINTER MONTHS THE CONTRACTOR MUST CONTINUE TO PROVIDE PERSONNEL AND EQUIPMENT EITHER ON SITE OR READILY AVAILABLE TO PROPERLY MAINTAIN AND REPAIR ALL EROSION AND SEDIMENTATION CONTROL DEVICES IN A TIMELY AND RESPONSIBLE MANNER
- 17. CONTROL DUST BY WATERING OR OTHER APPROVED METHODS AS NECESSARY, OR AS DIRECTED BY THE ENGINEER.
- 18. THE CONTRACTOR IS RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE DURING CONSTRUCTION OF ALL STORMWATER FACILITIES INSTALLED OR AFFECTED BY THE PROJECT. REMOVE SEDIMENT OR DEBRIS COLLECTED WITHIN THESE FACILITIES FROM THE PROJECT WORK PRIOR TO THE OWNER'S ACCEPTANCE.

Orion Environmental Inc.
2955 Redondo Avenue

Long Beach, California 90806

(562) 988-2755

DESIGNED
EC
DRAWN
SCS
CHECKED
SH
NO. 52804
SCALE
AS SHOWN
DATE 8/8/18

WETLAND AND RIVER EXCAVATION AND RESTORATION CRESTICON WESTMINSTER - RTN 2-00165 WESTMINSTER, MASSACHUSETTS - WHITMAN RIVER

CONSTRUCTION NOTES

PROJECT WMA02-

Sheet 2 of 9

G-2

Notes—SOW.dwg August 27, 2018 10:42 am

NOTE: IF THIS SCALE
BAR IS NOT 1 INCH
LONG, THIS DRAWING
IS NOT TO SCALE.

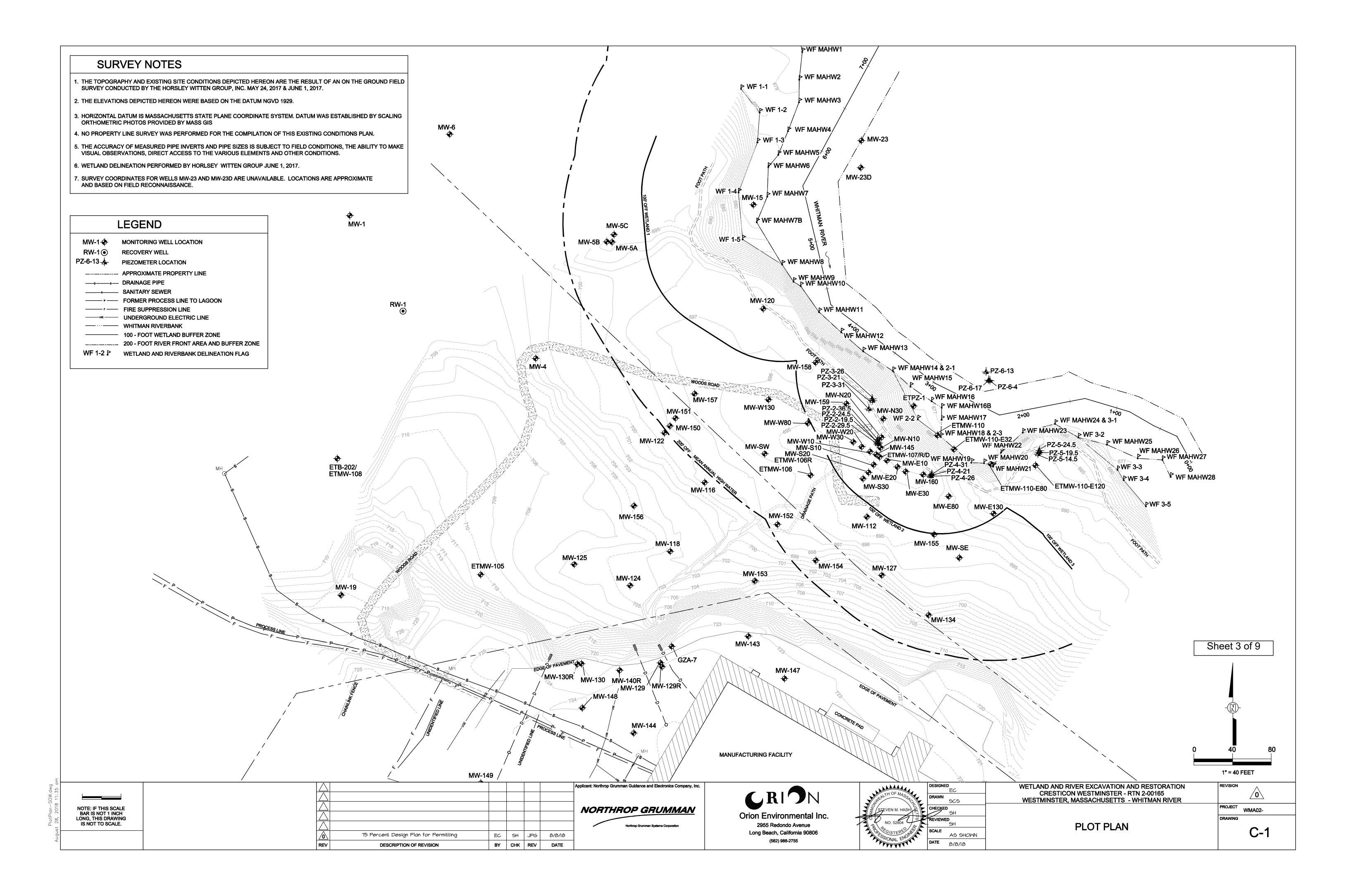
Applicant: Northrop Grumman Guidance and Electronics Company, Inc.

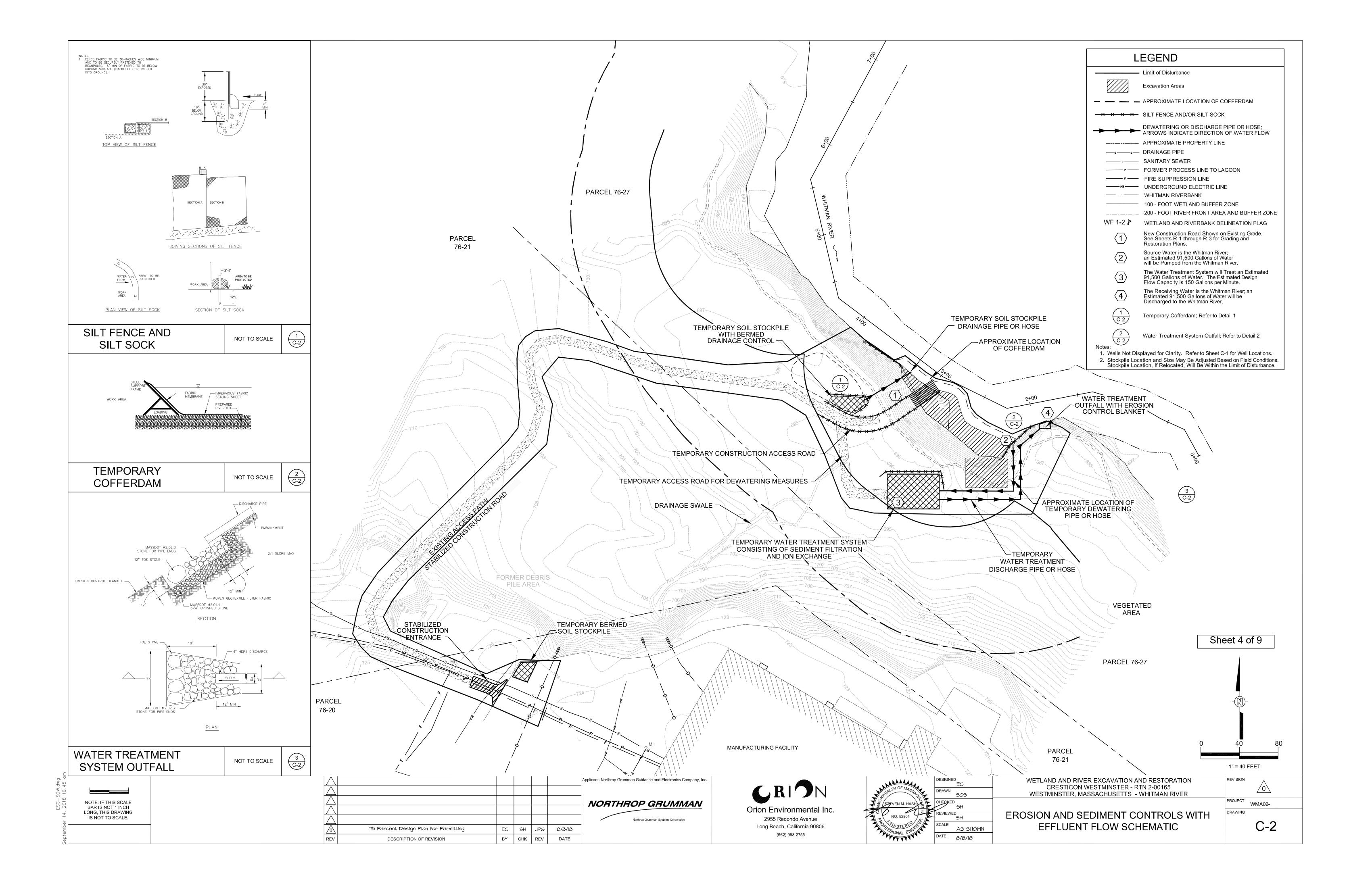
NORTHROP GRUMMAN

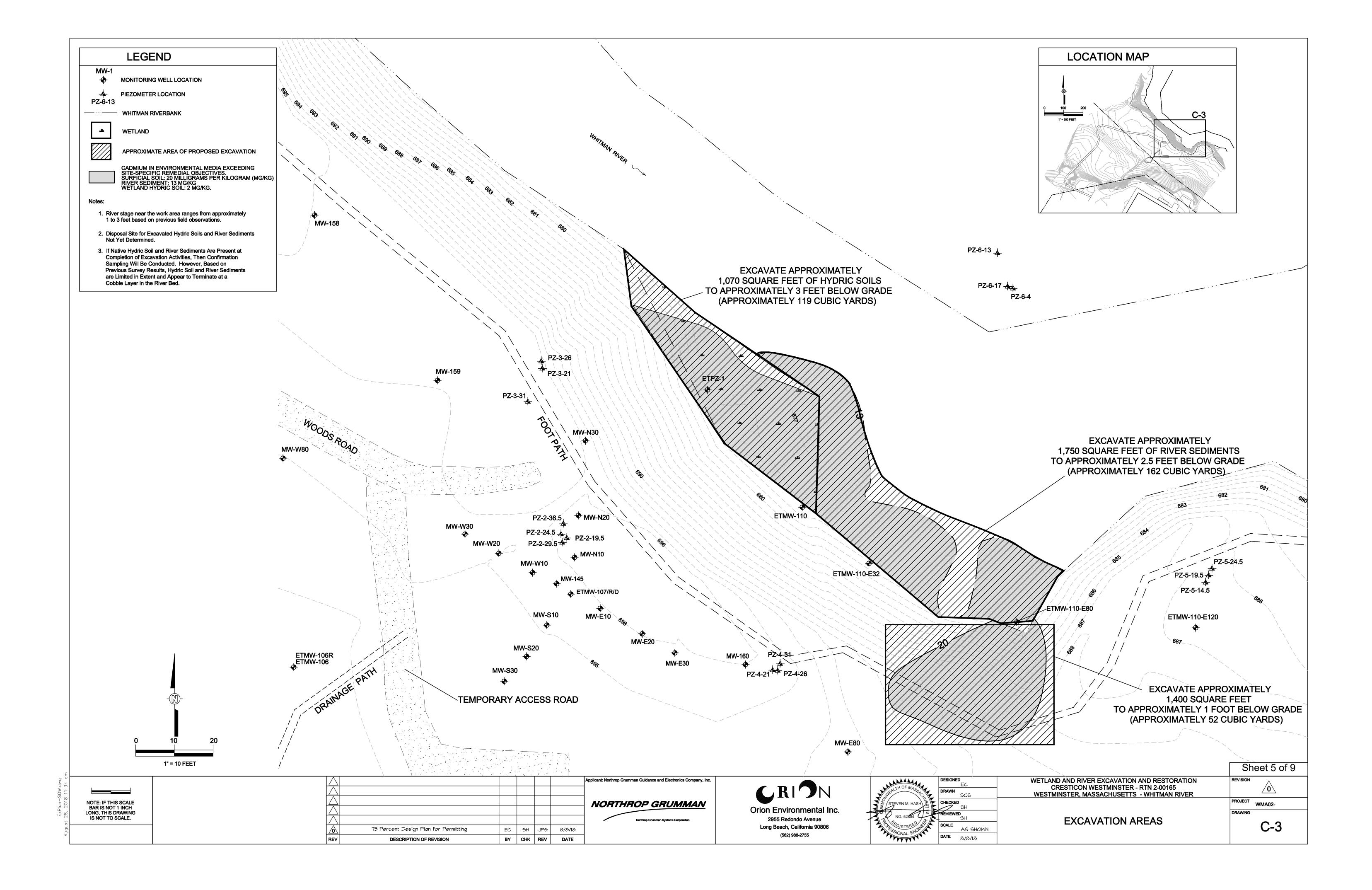
Northrop Grumman Systems Corporation

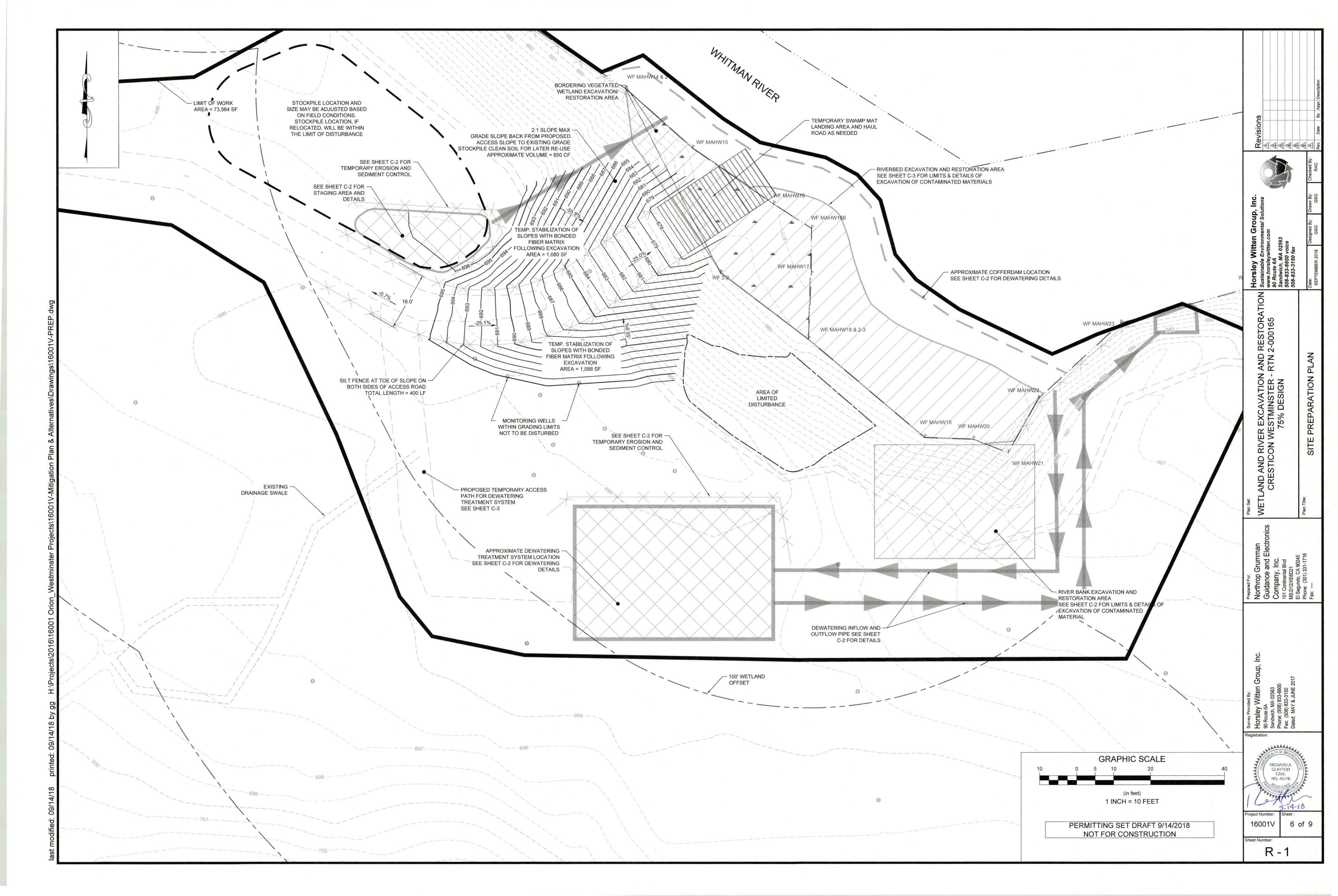
T5 Percent Design Plan for Permitting Ec SH JPG 8/8/18

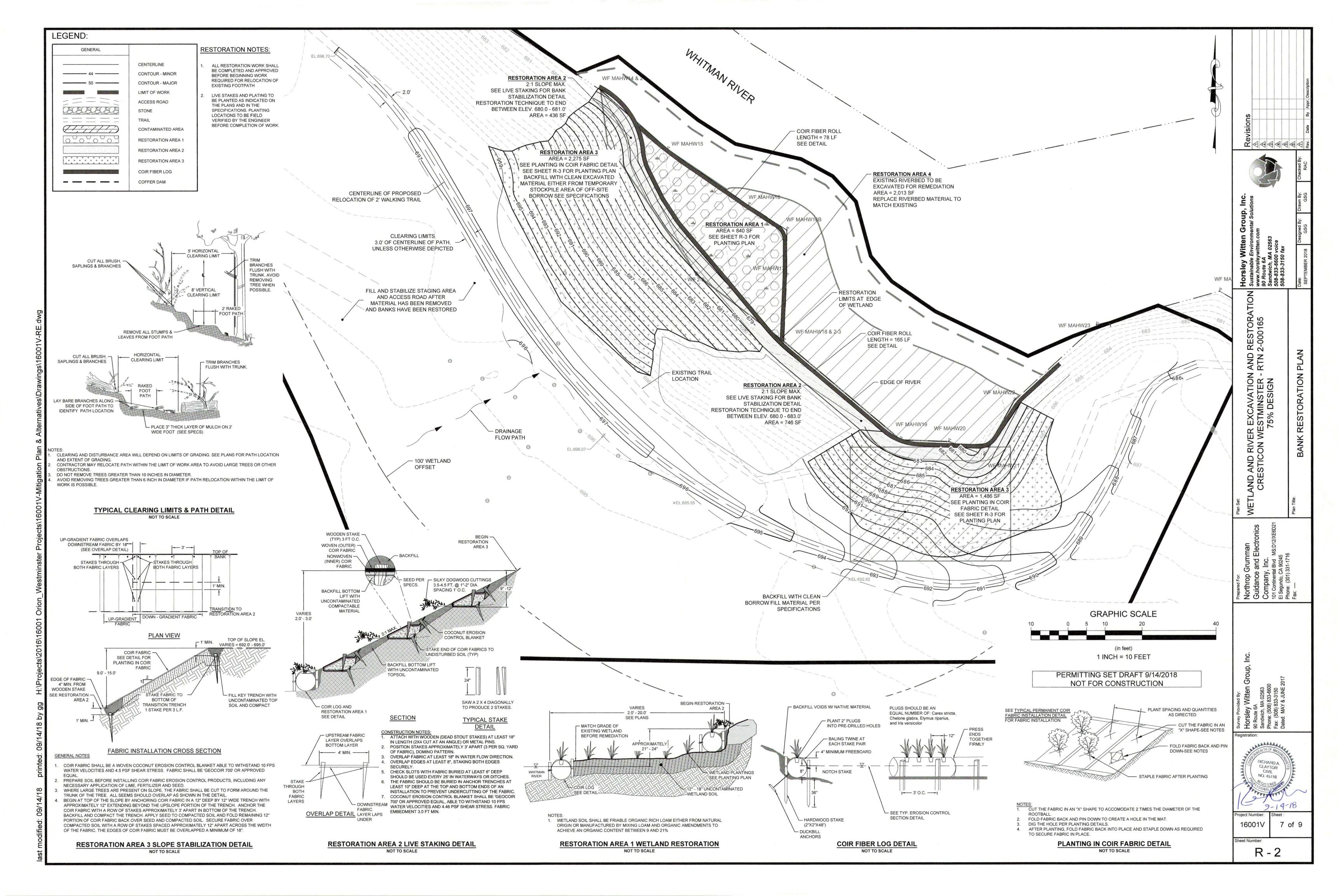
DESCRIPTION OF REVISION BY CHK REV DATE

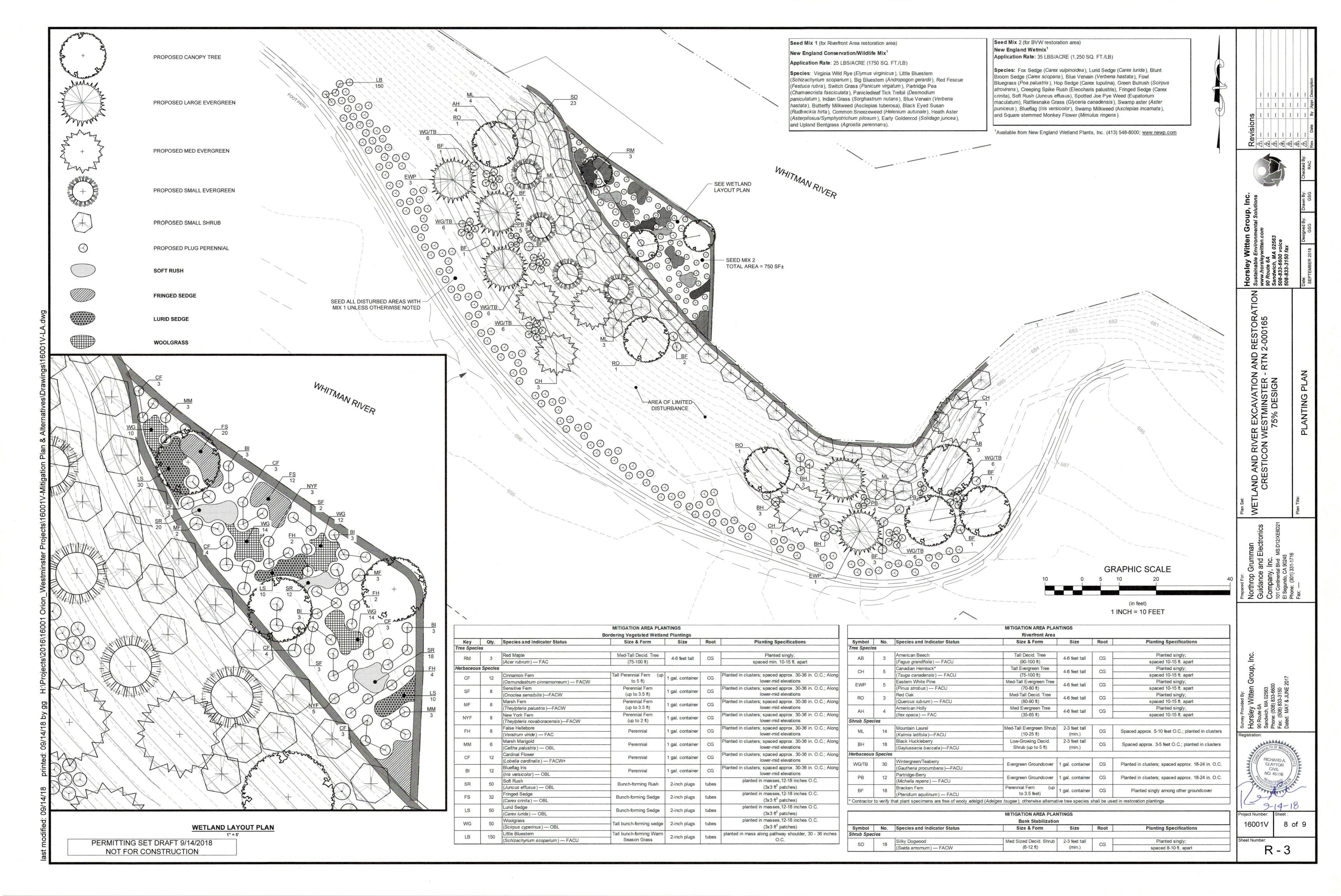












GENERAL PLANTING NOTES:

- 1. THE FOLLOWING NOTES ARE PROVIDED AS GENERAL PLANTING GUIDELINES ONLY. THOROUGHLY REVIEW THE PROJECT SPECIFICATIONS FOR ALL RESTORATION PLANTING REQUIREMENTS PRIOR TO THE COMMENCEMENT OF ANY PLANTINGS. SUBMIT IN WRITING TO THE BIOLOGIST OR CLIENT REPRESENTATIVE ANY QUESTIONS OR CLARIFICATIONS REQUIRED AT A MINIMUM OF 30 DAYS PRIOR TO ORDERING ANY MATERIALS OR BEGINNING ANY LANDSCAPE CONSTRUCTION.
- 2. SUBMIT TO THE BIOLOGIST OR CLIENT REPRESENTATIVE FOR REVIEW AND APPROVAL ALL REQUIRED PLANTING SUBMITTALS AS DESCRIBED IN THE SPECIFICATIONS INCLUDING A PLANT LIST WITH PLANT SIZE AND QUANTITIES TO BE ORDERED PRIOR TO DELIVERY TO THE PROJECT SITE.
- 3. FURNISH AND INSTALL ALL PLANTS AS SHOWN ON THE DRAWINGS AND IN THE SIZE AND QUANTITIES SPECIFIED ON THE PLANTING SCHEDULE. PLANT SUBSTITUTION SELECTION MUST BE APPROVED BY BIOLOGIST OR CLIENT REPRESENTATIVE PRIOR TO INSTALLATION.
- 4. ALL PLANTS TO COMPLY WITH APPLICABLE REQUIREMENTS OF ANSI Z60.1
 "AMERICAN STANDARD FOR NURSERY STOCK." LATEST EDITION, PUBLISHED BY
 THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION INC.
- 5. PLANTS TO BE GROWN UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT FOR AT LEAST TWO (2) YEARS. USE HEALTHY NURSERY GROWN PLANTS, FREE OF DISEASE, INSECTS, AND PESTS. EGGS OR LARVAE, AND HAVE A WELL DEVELOPED ROOT SYSTEM.
- 6. INSTALL PLANTS WITHIN ONE (1) WEEK OF PURCHASE. IF PLANTS ARE TO BE STORED AT THE SITE PRIOR TO PLANTING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THEY ARE PROPERLY MAINTAINED, WATERED, AND REMAIN HEALTHY.
- 7. PROCEED WITH PLANTING ONLY WHEN EXISTING AND FORECASTED WEATHER CONDITIONS PERMIT. SUBMIT TO THE BIOLOGIST OR CLIENT REPRESENTATIVE IN WRITING THE PROPOSED PLANTING SCHEDULE. OBTAIN APPROVAL OF PLANTING SCHEDULE FROM THE BIOLOGIST OR CLIENT REPRESENTATIVE PRIOR TO PERFORMING ANY WORK.

8. SEASONS FOR PLANTING:

SPRING:	DECIDUOUS:	APRIL 15 TO JUNE 15
	EVERGREEN:	APRIL 15 TO JUNE 15
	PERENNIALS:	APRIL 30 TO JUNE 1
	GROUNDCOVERS:	APRIL 30 TO JUNE 1

APRIL 30 TO JUNE 1

ALL: DECIDUOUS: SEPTEMBER 15 TO NOVEMBER 15
EVERGREEN: SEPTEMBER 15 TO NOVEMBER 15
PERENNIALS: SEPTEMBER 15 TO NOVEMBER 15

GROUNDCOVERS: SEPTEMBER 15 TO NOVEMBER 15

LIVE STAKES: PLANTS WHILE DORMANT FROM DECEMBER 1ST THROUGH

- 9. PLANTING UNDER FROZEN CONDITIONS IN EITHER THE SPRING OR FALL WILL NOT BE PERMITTED. PLANTING BEFORE OR AFTER THE ABOVE REFERENCED PLANTING DATES WILL INCREASE THE LIKELIHOOD OF PLANT OR GRASS SEED ESTABLISHMENT FAILURE. ANY DEVIATION FROM THE ABOVE REFERENCED PLANTING DATES IS UNDERTAKEN AT SOLE RISK OF THE CONTRACTOR AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ANY ADDITIONAL MAINTENANCE AND WATERING WHICH MAY BE REQUIRED TO ENSURE SATISFACTORY PLANT AND SEED ESTABLISHMENT.
- 10. FURNISH ONE YEAR MANUFACTURER WARRANTY FOR TREES, PLANTS, AND GROUND COVER AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH, EXCEPT FOR DEFECTS RESULTING FROM LACK OF ADEQUATE MAINTENANCE, NEGLECT, OR ABUSE BY OWNER, OR ABNORMAL WEATHER CONDITIONS UNUSUAL FOR WARRANTY PERIOD. THE DATE OF FINAL ACCEPTANCE OF ALL COMPLETED PLANTING WORK ESTABLISHES THE END OF INSTALLATION AND INITIAL MAINTENANCE PERIOD AND THE COMMENCEMENT OF THE GUARANTEE PERIOD.
- 11. ALL TREES WITHIN 5'-0" OF PATHWAY TO HAVE A 6'-8" STANDARD BRANCHING HEIGHT
- 12. INSPECT ALL AREAS TO BE PLANTED OR SEEDED PRIOR TO PLANTING. REPORT ANY DEFECTS SUCH AS INCORRECT GRADING, INCORRECT SUBGRADE ELEVATIONS OR DRAINAGE PROBLEMS, ETC. TO THE BIOLOGIST OR CLIENT REPRESENTATIVE PRIOR TO BEGINNING WORK. COMMENCEMENT OF WORK INDICATES ACCEPTANCE OF SUBGRADE AREAS TO BE PLANTED, AND THE LANDSCAPE CONTRACTOR ASSUMES RESPONSIBILITY FOR ALL LANDSCAPE WORK.
- 13. PROVIDE PROPER PREPARATION OF ALL PROPOSED PLANTED AND SEEDED AREAS PER THE NOTES AND SPECIFICATIONS.
- 14. ALL PLANT LAYOUT AND ACTUAL PLANTING LOCATIONS ARE TO BE FIELD VERIFIED BY BIOLOGIST OR CLIENT REPRESENTATIVE PRIOR TO PLANTING. NOTIFY THE LANDSCAPE ARCHITECT AT A MINIMUM OF 48 HOURS IN ADVANCE PRIOR TO SCHEDULING ANY FIELD INSPECTIONS.
- 15. BALL AND BURLAP: REMOVE BURLAP AND WIRE BASKETS FROM TOPS OF BALLS AND FROM TOP HALF OF ROOTBALL AS INDICATED ON DRAWINGS. REMOVE PALLETS, IF ANY, BEFORE SETTING.
- 16. POTTED PLANTS: REMOVE THE PLANT FROM THE POT AND LOOSEN OR SCORE THE ROOTS BEFORE PLANTING TO PROMOTE OUTWARDS ROOT GROWTH INTO THE SOIL.
- 17. PLUGS: PLANT UPRIGHT AND NOT AT AN ANGLE. DIG PLANTING HOLES LARGE ENOUGH AND DEEP ENOUGH TO ACCOMMODATE THE ENTIRE ROOT MASS. PLANT PLUGS WITH NO TWISTED OR BALLED ROOTS AND WITH NO ROOTS EXPOSED ABOVE THE GRADE LINE. HAND PACK THE SOIL AROUND THE ENTIRE PLUG ROOT
- 18. DIG THE THE PLANTING HOLE TO THE SAME DEPTH AS THE ROOT BALL AND TWO TO THREE TIMES WIDER. SCORE ALL SIDES OF THE HOLE, PLACE THE PLANT IN THE HOLE SO THE TOP OF ROOT BALL IS EVEN WITH SOIL SURFACE. FILL THE HOLE HALFWAY AND THEN ADD WATER ALLOWING IT TO SEEP INTO BACK FILLED MATERIAL. BE SURE TO REMOVE ALL AIR POCKETS FROM BACK FILLED SOIL. DO NOT SPREAD SOIL ON TOP OF THE ROOTBALL. IF SOIL IS EXTREMELY POOR, REPLACE BACK FILL WITH GOOD QUALITY TOP SOIL. AMEND THE SOIL, AS NECESSARY.
- 19. CREATE A 2" TO 4" BERM AROUND THE EDGE OF PLANTING HOLE WITH REMAINING SOIL TO RETAIN WATER.
- 20. REMOVE ALL PLANT TAGS AND FLAGS FROM THE PLANTS.
- 21. MULCH ALL PLANTING BEDS AS INDICATED ON DRAWINGS. UNLESS NOTED OTHERWISE, ALL PLANTS TO RECEIVE 2-3 INCHES OF MULCH. DO NOT PILE OR MOUND MULCH AROUND THE PLANT STEMS OR TRUNK.
- 22. TRIM BROKEN AND DEAD BRANCHES FROM TREES AND SHRUBS AFTER PLANTING. NEVER CUT A LEADER.

GENERAL SEEDING NOTES:

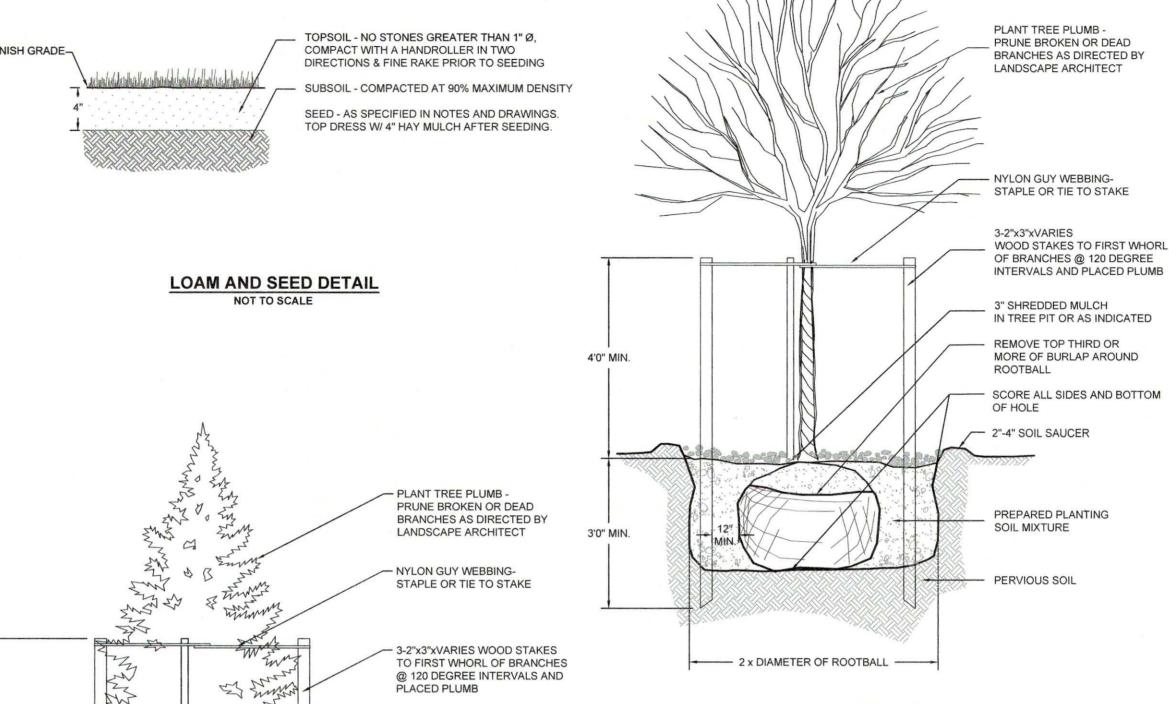
- SEND A REPRESENTATIVE SAMPLE OF THE TOPSOIL TO A TESTING LABORATORY FOR STANDARD SOIL ANALYSIS AS DESCRIBED IN THE SPECIFICATIONS. SUBMIT TO THE LANDSCAPE ARCHITECT AND ENGINEER TEST RESULTS WITH RECOMMENDED SOIL TREATMENTS TO PROMOTE PLANT AND GRASS GROWTH. CORRECT DEFICIENCIES IN THE LOAM AND STOCKPILED TOPSOIL AS DIRECTED BY THE TESTING AGENCY.
- 2. ALL AREAS THAT ARE DISTURBED AND/OR GRADED DURING CONSTRUCTION ARE TO BE BROUGHT TO FINISHED GRADE WITH AT LEAST 4" MINIMUM DEPTH OF GOOD QUALITY LOAM AND SEEDED WITH A QUICK GERMINATING GRASS SEED SUCH AS NEW ENGLAND EROSION CONTROL RESTORATION MIX OR AS SPECIFIED ON THE PLANS.
- 3. PRIOR TO THE PLACEMENT OF TOP SOIL, LOOSEN THE SUBGRADE OF ALL PROPOSED SEEDED AREAS TO A DEPTH OF 6" AND RAKE TO REMOVE STONES LARGER THAN 1 INCH, STICKS, ROOTS, RUBBISH AND OTHER EXTRANEOUS MATTER AND LEGALLY DISPOSE TO AN OFF SITE LOCATION.
- DO NOT SPREAD TOPSOIL IF THE SUBGRADE IS FROZEN, EXCESSIVELY WET, COMPACTED OR NOT PROPERLY PREPARED PER THE NOTES AND SPECIFICATIONS.

WATERING NOTES

- 1. PROVIDE PROPER PLANT CARE, MAINTENANCE AND WATERING ON SITE UNTIL SUCH TIME AS THE LANDSCAPING IS ACCEPTED BY THE PROPERTY OWNER AS SATISFACTORY PER THE SPECIFICATIONS OR AS DETERMINED BY ANY WRITTEN AGREEMENTS BETWEEN THE CONTRACTOR AND PROPERTY OWNER.
- ESTABLISH AN APPROPRIATE WATERING SCHEDULE FOR ALL PLANT MATERIAL BASED UPON PLANT SPECIES REQUIREMENTS AND PROVIDE IN WRITING TO THE BIOLOGIST OR CLIENT REPRESENTATIVE AND OWNER FOR REVIEW AND APPROVAL, ADHERE TO THE APPROVED SCHEDULE UNTIL PLANTS ARE FULLY ESTABLISHED.
- 3. AT A MINIMUM THE NEWLY SEEDED AND/OR HYDROSEEDED LAWNS SHOULD BE WATERED DAILY THROUGHOUT THE ESTABLISHMENT PERIOD AND DURING DROUGHT CONDITIONS. SPECIAL CARE SHOULD BE TAKEN TO ENSURE THAT THE LAWN IS NOT SATURATED DURING WATERING. IF AN IRRIGATION SYSTEM IS NOT PROVIDED, A TEMPORARY IRRIGATION SYSTEM OR HANDHELD GARDEN HOSE SHALL BE USED FOR WATERING SEEDED AREAS. THE AREA MUST BE MAINTAINED CONSISTENTLY MOIST FOR THE BEST GERMINATION RESULTS. ADDITIONAL WATERING WILL BE REQUIRED IF PLANTING AND SEEDING OCCUR OUTSIDE OF THE RECOMMENDED PLANTING SEASONS.

PLANTING LAYOUT NOTES

HATCHED AREAS - DO NOT PLANT LARGE AREAS OF THE SAME SPECIES.
RANDOMLY PLANT AS INDICATED ON THE PLANTING PLANS INTO SMALL GROUPINGS
OF THE SAME SPECIES TO CREATE A MORE NATURALISTIC APPEARANCE. PLANT
THE SAME PLANT SPECIES IN GROUPS OF 3-7 AND NOT LARGER THAN 7,
DEPENDING ON THE OVERALL NUMBER OF PLANTINGS.



BURLAP AT ROOTBALL

IN TREE PIT OR AS INDICATED

PREPARED PLANTING

SOIL MIXTURE

PERVIOUS SOIL

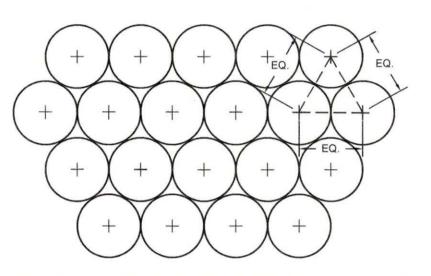
2x DIAMETER OF ROOT BALL

EVERGREEN TREE PLANTING DETAIL

NOT TO SCALE

- 3" SHREDDED MULCH

TREE PLANTING DETAIL NOT TO SCALE

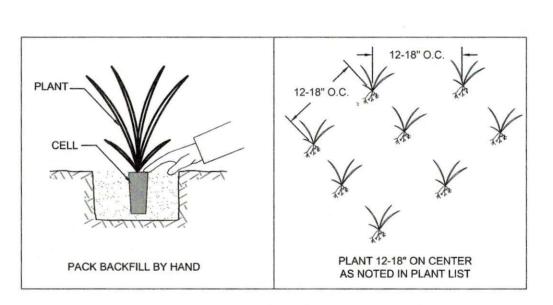


USE EQUIDISTANT TRIANGULAR SPACING FOR PLANTS - FOR ACTUAL SPACING

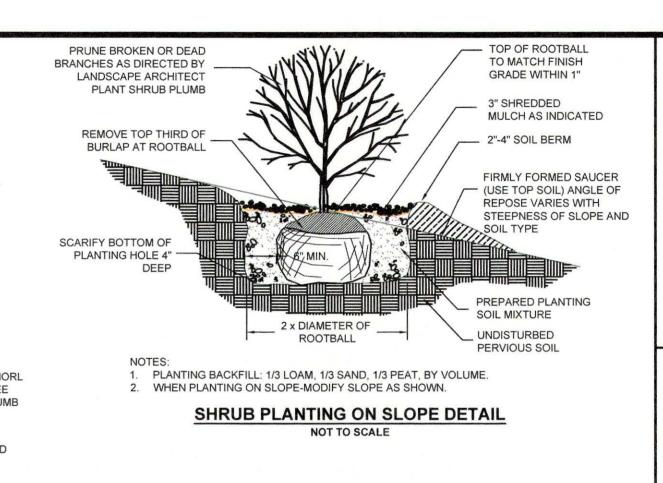
PLANTING SPACING DETAIL

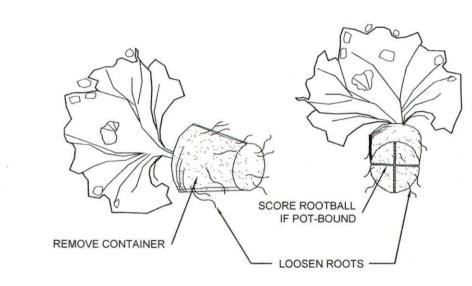
NOT TO SCALE

SEE PLANS OR PLANTING SCHEDULE

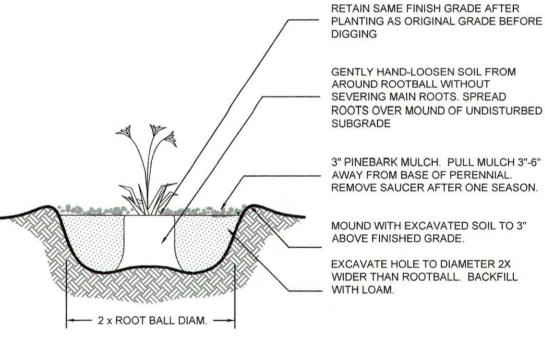


PLUG PLANTING DETAIL NOT TO SCALE



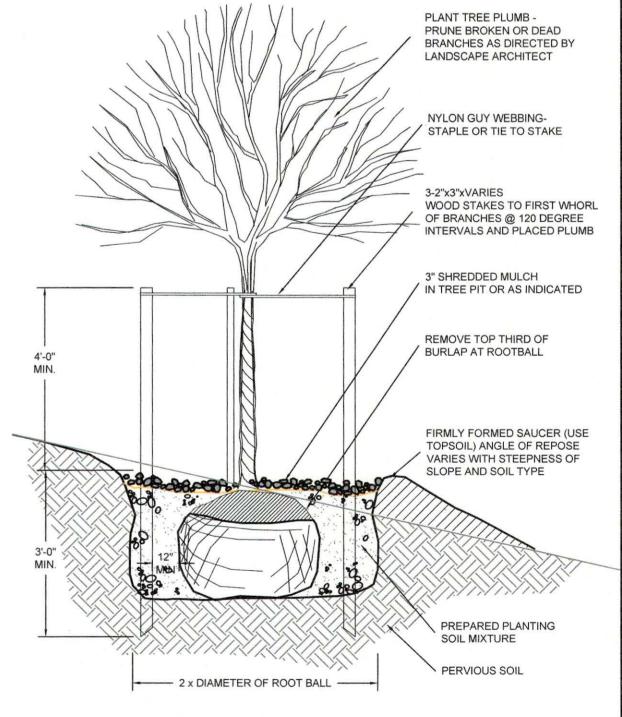


CONTAINER PLANT ROOTBALL TREATMENT NOT TO SCALE



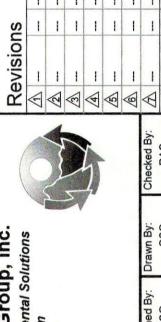
PERENNIAL PLANTING DETAIL

NOT TO SCALE



TREE PLANTING ON SLOPE DETAIL

NOT TO SCALE



ION Sustainable Environmental Solutions www.horsleywitten.com 90 Route 6A Sandwich, MA 02563 508-833-8600 voice 508-833-3150 fax

VETLAND AND RIVER EXCAVATION AND RESTORATIO
CRESTICON WESTMINSTER - RTN 2-000165
75% DESIGN
PLANTING DETAILS

Northrop Grumman
Guidance and Electronics
Company, Inc.
101 Continental Blvd MS:D12/XE6D21
El Segundo, CA 90245
Phone: (301) 331-1716
Fax: ---

Horsley Witten Group, Inc.

90 Route 6A
Sandwich, MA 02563
Phone: (508) 833-6600
Fax: (508) 833-3150
Dated: MAY & JUNE 2017

Registration:

RICHARD A.

CLAYTOR

CIVIL

NO. 45116

9-14-18

Project Number: Sheet:

16001V 9 of 9

R - 4

PERMITTING SET DRAFT 9/14/2018

NOT FOR CONSTRUCTION

WETLAND RESTORATION PLAN

for

Cresticon Westminster Site

180 State Road East, Westminster, Massachusetts

Prepared By:

Horsley Witten Group, Inc. in conjunction with Orion Environmental, Inc.

Prepared For:

Northrop Grumman Guidance and Electronics Company, Inc.

101 Continental Boulevard El Segundo, California 90245

September 2018



WETLAND RESTORATION PLAN

Cresticon Westminster Site, Westminster, Massachusetts

Table of Contents

Intr	oduct	ion and Project Objectives	1
A.	Gen	neral Information	2
	A.1	Mitigation Plan and Documentation Submitted As One Package	2
	A.2	Site Location	2
	A.3	Locus Maps	3
	A.4	Aerial Photos	3
	A.5	Latitude/Longitude of Restoration Area (in decimal format)	3
	A.6	8-digit Hydrologic Unit Code for Mitigation Area(s)	4
	A.7	General Site Description	4
	A.8	FEMA Designation	4
	A.9	State-listed Rare Species Habitat	5
В.	lmp	act Area(s)	5
	B.1	Impact Area 1 – Freshwater Wetlands	5
	B.2	Impact Area 2 – Land Under Waterbodies and Waterways	6
	B.3	Additional Impact Areas	6
	B.4	Cowardin Classification	8
	B.5	HGM Classification	8
	B.6	Other Aquatic Resources	8
	B.7	Functional Assessment	8
	B.8	Work Proposed	10
	B.9	Watershed or Regional Plans	10
C.	Miti	gation Areas	11
	C.1	Mitigation Alternatives	11
	C.2	Preferred Alternative – In-Situ Restoration of Resource Areas	13
	C.3	Mitigation Background	13
	C.4	Mitigation Proposed – On-Site, In-Kind Restoration	15
	C.5	Specific Aquatic Resource Checklist Information Appended	26

D.	Grading Plan	26
	D.1 Plan View	26
	D.2 Representative Cross-Sections	27
E.	Erosion Controls	27
	E.1 Removal Deadline	27
F.	Invasive Species Control Plan	27
	F.1 Risks	27
	F.2 Constraints	28
	F.3 Control Strategy	28
G.	Off-Road Vehicle Use	28
Н.	Monitoring and Assessment	28
	H.1 Monitoring Plan	28
	H.2 Notification of Construction Completion	28
	H.3 Monitoring Reports	29
l.	Contingency	32
	I.1 Contingency Plan	32
J.	Long-term Stewardship	32
	J.1 Long-term Stewardship Plan	32
K.	Financial Assurances	33
L.	References	33

ATTACHMENTS

Attachment A – Locus Maps

Figure 1 – USGS Topographic Map

Figure 2 – Aerial Photograph

Figure 3 – FEMA Flood Zones and National Flood Insurance Program, Flood Insurance Rate Maps

Figure 4 – Environmental Constraints

Figure 5 – NRCS Soils Map

Attachment B - "Appendix F" - Stream Module

WETLAND RESTORATION PLAN

Cresticon Westminster Site, Westminster, Massachusetts

INTRODUCTION AND PROJECT OBJECTIVES

The following report constitutes the Restoration Plan (the Plan) for the historic release of cadmium to soil and groundwater at the Northrop Grumman Guidance and Electronics Company, Inc. – Cresticon Westminster Site (the Site), in Westminster, Massachusetts. This document was prepared in conformance with Section IV of the Army Corps of Engineers (ACOE) New England District Compensatory Mitigation Guidance¹ (the Guidance), which incorporates the requirements for the Mitigation Rule² and Regulatory Guidance Letter 08-03³to meet mitigation requirements under the Federal *Clean Water Act* (33 U.S.C. 1251, *et seg.*).

The Site contains an unlined natural drainage swale, located at the northeastern edge of the manufacturing facility parking lot (referred to as "Area 2"), upgradient of the Whitman River. Previous site investigations have indicated that upland and riverbank soils and groundwater in Area 2 are impacted by cadmium at concentrations exceeding regulatory screening levels. Erosion of soil and discharge of impacted groundwater have impacted wetland soil, river sediments, and river bank soil along the Whitman River to greater than site-specific risk-based cleanup goals. Cadmium concentrations in sediments along the river's edge (including hydric and surficial soils) exceed regulatory and site-specific thresholds, which range from 2 to 20 mg/kg.

The objective of the proposed work is to restore riverbank, wetland, and river habitats that are disturbed during soil, hydric soil, and river sediment remediation activities. Analysis of cadmium concentrations in soil samples indicate the need for complete removal of the hydric soils within wetland resource areas, along with associated activities, in order to remediate an unacceptable risk to public health and the environment under the applicable regulatory standards set forth in the Massachusetts Contingency Plan (MCP).Response actions under the MCP will be conducted under the supervision of the Licensed Site Professional-of-Record, James F. Begley (LSP No. 2061) of MT Environmental Restoration located in Duxbury, MA.

As a result, the proposed response actions under the MCP will necessarily result in impacts to aquatic resources including a freshwater wetland(Bordering Vegetated Wetland or BVW), inland Bank, Land Under Waterbodies and Waterways of the Whitman River, and the adjacent State- and locally-jurisdictional 200-foot Riverfront Area (under the Massachusetts Wetlands Protection Act), due to the need for sediment removal. These wetland resource areas are jurisdictional under Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40), its implementing Regulations (310 CMR 10.00), the Town of Westminster Wetlands Bylaw (Chapter 202), and/or the Federal *Clean Water Act* (33 U.S.C. 1251, *et seq.*).

¹ U.S. Army Corps of Engineers. 2010. *New England District Compensatory Mitigation Guidance*. New England District, Regulatory Division. July 20, 2016; 94 pp. <u>Note</u> that italicized font indicates required language as prescribed in the Guidance.

 ² 33 CFR Parts 325 and 332. Compensatory Mitigation for Losses of Aquatic Resources. Final Rule 4/10/08.
 ³ U.S. Army Corps of Engineers. 2008. Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving Restoration, Establishment, and/or Enhancement of Aquatic Resources. Regulatory Guidance Letter 08-03. October 10, 2008, 6 pp.

In addition to the jurisdictional areas above, the Westminster Wetlands Bylaw regulates a 25-foot no alteration buffer zone to Bank and BVW for lots created after May 1, 2004, noting that in accordance with Section 201 § 202-2:

Alterations will be allowed within 25 feet of any resource area on any preexisting lot when the alteration is required to protect public health and safety, or the lot would become unbuildable without the alteration and that reasonable alternatives are presented to the Commission, in which the resource area will be enhanced or enlarged and protected permanently through a conservation restriction or other means acceptable to the Commission.

Activities proposed within these aquatic resources and within other jurisdictional resource areas necessitate permitting through a number of regulatory agencies, including, but not limited to, the following:

- Order of Conditions (OOC) issued by the Westminster Conservation Commission and the Massachusetts Department of Environmental Protection (MassDEP);
- Local Wetlands permit issued by the Westminster Conservation Commission under the local wetlands bylaw;
- Water Quality Certification (WQC) issued by MassDEP;
- Chapter 91 Permit issued by MassDEP; and
- General Permit (PGP) issued by the U.S. ACOE.

This Restoration Plan has been developed following the prescribed Mitigation Checklist from the ACOE's New England District Compensatory Mitigation Guidance, with additional information included to address other restoration requirements under other wetlands laws and regulations.

This Restoration Plan addresses areas that require restoration following removal of cadmium-contaminated soils and sediments. Details are shown on the project plans, entitled, "Wetland and River Excavation and Restoration, Cresticon Westminster-RTN-2-00165, Westminster, Massachusetts," prepared by Orion Environmental and Horsley Witten Group, Inc. (HW), and dated August 2018. On the plans, four areas have been identified for on-site restoration. Areas to be revegetated include: Restoration Area 1 (Freshwater Wetland/BVW);Restoration Area 2 (Bank); Restoration Area 3 (Riverfront Area), and Restoration Area 4 (Land Under Waterbodies and Waterways/Streambed). These areas are discussed below. Additional mitigation measures, including construction-related management will also be implemented.

A. GENERAL INFORMATION

A.1 Mitigation Plan and Documentation Submitted As One Package

The Mitigation Plan is submitted herein as a single package. The plan includes in-kind restoration following site remediation activities.

A.2 Site Location

The Site spans three parcels in the Town of Westminster, Massachusetts. The restoration work is contained within a single 10-acre parcel (76-27) of vacant, residential land owned by Crocker Ponds Properties, Inc. (CPPI) in the Town of Westminster, Massachusetts. Parcel 76-27 is located northeast of a manufacturing facility owned and operated by Illinois Tool Works (ITW; Parcel 76-20)

and undeveloped land owned by Northrop Grumman (Parcel 76-21). The Whitman River flows along the northeast of the Site.

A.3 Locus Maps

Figures 1 through 5 (Attachment A) include locus maps and vicinity maps showing overall site conditions and impact areas.

A.4 Aerial Photos

Aerial photographs showing overall site conditions and approximate locations of Impact Areas are provided in the attached locus map Figure 4. Photo 1 (below) also provides an aerial view of the Site.



Photo 1. Aerial view of the site. The approximate area of impact and restoration is circled. Google image.

A.5 Latitude/Longitude of Restoration Area (in decimal format)

The site is located at 42.56182778, -71.87250000

A.6 8-digit Hydrologic Unit Code for Mitigation Area(s).

The 8-digit Hydrologic Unit Code for all impact areas and Mitigation Areas included in this Mitigation Plan is 01070004, the Nashua River Watershed.

A.7 General Site Description

The site, located off of State Road East along the Whitman River in Westminster, Massachusetts, consists of an open upland forested community with a network of footpaths traversing the gently rolling topography, including one well-established path that parallels the river. Dominant vegetation observed within the forested upland includes a canopy of eastern hemlock (*Tsuga canadensis*) and eastern white pine (*Pinus strobus*) with occasional American beech (*Fagus grandifolia*). The open shrub community contains scattered clumps of mountain laurel (*Kalmia latifolia*) and scattered individuals of witch-hazel (*Hamamelis virginiana*) with carpets of lowbush blueberry (*Vaccinium angustifolium*), Canada mayflower (*Maianthemum canadense*), various mosses, and occasional pink lady's slipper (*Cypripedium acaule*). Steep embankments lead to the Whitman River.



Photo 2. Steeply sloping embankments along the Whitman River.

A.8 FEMA Designation

According to the most recent version of the FEMA National Flood Insurance Rate Map (Community Panel No. 250347 0005 B, effective July 19, 1982), the property is located partially within Zone A,

"Areas of 100-year flood; base flood elevations and flood hazard factors not determined," as well as within Zone C, "Areas of minimal flooding (No shading)" (Figures 3 and 3A).

A.9 State-listed Rare Species Habitat

According to the most recent version of the Massachusetts Natural Heritage Atlas (14thEdition, August 1, 2017), the project does not fall within areas of Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species as designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). There is one certified vernal pool located off-site to the south of this site (CVP 4005) (Figure 4).

B. IMPACT AREA(S)

The alterations involving excavation, soil replacement, and restoration will occur within adjacent freshwater wetland, along an inland Bank, and within Land Under Waterbodies and Waterways. Work will also occur within the adjacent buffer zone and within the State-regulated 200-foot Riverfront Area. Wetland impacts have been avoided and minimized to the extent practicable in accordance with the Federal Clean Water Act (33 U.S.C. 1251, et seq.), the Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40), and the local Town of Westminster *Wetlands Protection Bylaw* (Chapter 202 of the Westminster General Bylaws) as discussed in Section C, below. Table 1 provides a summary of the wetland acreage(B.1.), Cowardin classification(B.2.), and hydrogeomorphic (HGM) classification (B.3.) for each impact area within aquatic resources. A description of the wetland resources within each impact area is provided below, as determined during previous wetland delineations performed by the Horsley Witten Group, Inc. (HW).Additional descriptions of the impacted portions of buffer zone and Riverfront Area are also provided.

Table 1. Size and Classification of Proposed Impacts to Aquatic Resources

Impact Areas	Cowardin Classification ⁴	HGM Classification ⁵	Estimated amount of aquatic resource in review area	Class of Aquatic Resource
Impact Area 1 - Freshwater Wetland (BVW)	PEM	Slope/Riverine floodplain	840 SF	non-section 10 – wetland
Impact Area 2 – Land Under Waterbodies and Waterway	R3RB/R3UB	Riverine, non-tidal	2,013 SF	section 10 – wetland

B.1 Impact Area 1 – Freshwater Wetlands

Bordering Vegetated Wetland (BVW) is defined under the Massachusetts Wetlands Protection Act regulations at 310 CMR 10.55(2)(a) as "freshwater wetlands that border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that

⁴ Cowardin, et al. 1979. *Classification of wetlands and deepwater habitats of the United States.* Office of Biological Services, FWS/OBS-79/31, December.

⁵ Brinson, M.M. 1993. *A hydrogeomorphic classification for wetlands.* Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

they support a predominance of wetland indicator plants. The boundary of Bordering Vegetated Wetland is defined at 310 CMR 10.55 (2)(c) as the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist."

The adjacent Freshwater Wetland/BVW associated with this project site includes three discontinuous wetland areas along the river, typically within the inside bends in the river, at the base of a steep slope. Each of these areas is ultimately hydrologically connected to Whitman River, but disconnected from each other. "Wetland 2" is the impacted wetland area. It is described as an emergent plant community dominated by cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), marsh fern (*Thelypteris palustris*), and New York fern (*Thelypteris noveboracensis*), patches of jewelweed (*Impatiens capensis*), various sedges (*Carex* spp.), false hellebore (*Veratrum viride*), and a small patch of purple-stemmed Angelica (*Angelica atropurpurea*). Three flagging stations mark the landward boundary of this wetland area, Flags W2-1 through W2-3.

B.2 Impact Area 2 – Land Under Waterbodies and Waterways

Land Under Water Bodies and Waterways is defined at 310 CMR 10.56(2)(a) as the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of LUW is the mean annual low water level.

The Whitman River at the location where the proposed remediation activities will occur is of variable width, 20 or more feet wide within a meandering floodplain that extends beyond the river's left bank. Flows have been observed as slow to moderate during various site visits. The stream bed is variable, with areas of open sand and deposits of cobble and occasional boulders. Flows eddy in the bend of the river just downgradient of the Mean low water marks the upper boundary of Land Under Waterbodies and Waterways.

The Nashua River Watershed Association identifies streamflow within the Whitman River watershed as having significant seasonal changes, in part because the surrounding topography is generally hilly, encompassing numerous flatter wetlands, broad valleys, and floodplains.

B.3 Additional Impact Areas

In addition to the aquatic resources, two additional areas, jurisdictional under the Massachusetts Wetlands Protection Act and the local wetlands bylaw will be impacted during site remediation activities. These include inland Bank and the 200-foot Riverfront Area. A brief description of these areas follows.

Inland Bank

Bank is defined at 310 CMR 10.54(2)(a) as the portion of land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent floodplain, or, in the absence of these, it occurs between a water body and an upland. A Bank may be partially or totally vegetated, or it may be comprised of exposed soil, gravel or stone. The upper boundary of a Bank is first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a Bank is the mean annual low flow level [310 CMR 10.54(2)(c)].

The Banks of Whiteman River are approximately 12-18 inches high, and are well defined and stable. In places, the banks are undercut. The right bank is contiguous with a steep embankment (Photo 3).



Photo 3. Well-defined banks along Whitman River.

Approximately 250 linear feet of inland Bank will be impacted and restored following site remediation activities.

Riverfront Area

Riverfront Area is defined at 310 CMR 10.58(2)(a)as "the area of land between a river's mean annual high water line and a parallel line measured horizontally. The riverfront area may include or overlap other resource areas or their buffer zones..." This state-regulated resource area is further defined at 310 CMR 10.58(2)(a)3 as "the area of land between a river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away, ..." which at this site extends landward along the steeply sloping embankment that also constitutes the wetland and inland bank buffer zone.

Whitman River is shown on the current United States Geological Survey map as a perennial stream and therefore meets the presumptive definition under the regulations at 310 CMR 10.58(2)(a)1.a.and has an associated 200-foot Riverfront Area. The mean annual high water line (MAHW) of a river is defined as "the line that is apparent from visible markings or changes in the character of soils or

vegetation due to the prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land" (310 CMR 10.58(2)(a)2).HW observed that the distinct break in slope typically marked the boundary of MAHW; however, pursuant to the regulations, field indicators of "bankfull conditions" (changes in slope, changes in vegetation, stain lines, top of point bars, changes in bank materials or bank undercuts) were also used to determine the MAHW associated with Whitman River at this site. As a result of the remediation activities, as well as related activities to provide access to the wetland and the river bed, approximately 52,263 SF (1.2 ac) of Riverfront Area will be disturbed and restored.

As the 100-foot Buffer Zone to the Inland Bank overlaps with the inner 100-foot Riverfront Area at this site, the Buffer Zone will also be restored. In addition, the Westminster Wetlands Bylaw maintains a 25-foot no alteration buffer to BVW for lots created after May 1, 2004. The bylaw allows for alteration of this area in certain circumstances in accordance with Section 201 § 202-2, which reads:

Alterations will be allowed within 25 feet of any resource area on any preexisting lot when the alteration is required to protect public health and safety, or the lot would become unbuildable without the alteration and that reasonable alternatives are presented to the Commission, in which the resource area will be enhanced or enlarged and protected permanently through a conservation restriction or other means acceptable to the Commission.

This locally-regulated area will also be restored as part of the restoration activities.

B.4 Cowardin Classification

(Refer to Table 1 above.)

B.5 HGM Classification

(Refer to Table 1 above.)

B.6 Other Aquatic Resources

There are no vernal pools, Submerged Aquatic Vegetation, or mudflats present within the impacted areas of the Site. A portion of the Whitman River will be necessarily impacted to allow for remediation of impacted streambed sediments. Please see Appendix F – Stream Module for additional information (Attachment B).

B.7 Functional Assessment

Wetland areas can provide a variety of functions depending upon their individual characteristics. The Massachusetts *Wetlands Protection Act* identifies and protects eight specific interests that wetland resource areas provide: water supply protection, groundwater protection, flood control, storm damage prevention, water quality improvement, as well as the protection of fisheries, shellfish, and wildlife habitat. The Town of Westminster Wetlands Protection By-law (Chapter 202) protects these same interests, as well as erosion, sedimentation, wildlife, and recreation.

Wetlands within the impact areas have the following functions and values:

- water supply protection;
- groundwater protection;
- flood control:
- storm damage prevention;
- water quality improvement;
- protection of wildlife and wildlife habitat; and
- recreational interests.

The impacted aquatic areas contribute to flood storage and flood storage control by retaining stormwater runoff and allowing for slow groundwater recharge. These wetlands also contribute to water quality by removing sediments and attenuating pollutants. The topography, soil structure, plant community composition and structure, and hydrologic regime of these wetlands contribute to the protection of wildlife and wildlife habitat by providing food, shelter, migratory and overwintering areas, and breeding areas for birds, mammals, reptiles, and amphibians. Based on site observations, these resources and the adjacent buffer zones are suitable habitat for beavers (Photos 4 and 5). The site also protects recreational interests, as the Whitman River is navigable, and may also provide opportunities for recreational fishing, etching addition, the existing recreational trail located at the top of the steep slope overlooking the river provides for passive recreational opportunities.



Photo 4. Beaver damage to trees in the area



Photo 5. Displaced beaver dam due to storm damage.

B.8 Work Proposed

A comprehensive remedial action is proposed that includes treating impacted groundwater and excavating surficial soil, hydric soil, and river sediments prior to restoration measures. Excavation of soil impacts and remediation of the soluble cadmium plume will be required before excavating cadmium-impacted wetland soil and sediments to mitigate the potential for re-impacting wetland soil and sediments.

Following site remediation efforts, the property owner will restore the wetland resource areas in configuration and elevation, restoring underlying soils by replacing contaminated sediments with clean materials, and revegetating the areas with native plant species consistent with the existing conditions. Riverbank stabilization will also be conducted to both restore the areas disturbed during remediation and to protect the restored wetland area from river erosion during grow-in.

Potential risks to the wetland and Whitman River during soil excavation are limited and can be controlled by industry standard Best Management Practices (BMPs). The proposed work includes the placement of a temporary, non-embedded cofferdam within the river (as shown on the project plans) prior to excavation, and the use of temporary erosion and sedimentation control measures as well as permanent stabilization with vegetation. Temporary erosion control measures will remain in place until all sediments are stabilized with vegetation. It is anticipated that long-term monitoring will be required to ensure that the restoration site is successfully restored.

B.9 Watershed or Regional Plans

The Nashua River Watershed Association, a non-profit organization, maintains stewardship of the Nashua River Watershed, which identifies five major aggregate subwatersheds: North Nashua River, Wachusett Reservoir, Nashua River mainstem, and the Squannacook and Nissitissit Rivers watersheds. Whitman River is part of the North Nashua River subwatershed, which includes the following major tributaries: Fall Brook, Falulah/Baker Brook, Flag Brook, Monoosnoc Brook, Phillips Brook, Wekepeke Brook, and Whitman River.

The Watershed Association released the "Nashua River Watershed Five Year Action Plan 2003-2007" in 2003. Developed in association with the with the former Massachusetts Watershed Initiative Nashua Team, a collaboration of watershed interests consisting of state and federal environmental agencies, municipal agencies, non-profit organizations, citizens, and other interested parties, and approved by the Commonwealth of Massachusetts, this plan identified major water resource issues as well as many goals for resource protection, protection of wildlife habitat and migration corridors, protection of high priority open space, vistas and community character, recommendations for increasing recreational opportunities, recommendations for improving water quality and for reducing negative effects of development in the sub-basin.

Clean up of contaminated sediments and groundwater contributing to the Whitman River is in keeping with these goals for protection of water quality. Following restoration, any disruption to the existing wildlife corridor will be restored and enhanced with additional native plantings.

C. MITIGATION AREAS

C.1 Mitigation Alternatives

This mitigation plan considers the following alternatives for mitigation of unavoidable impacts to aquatic resources and other jurisdictional resource areas. This alternatives analysis also addresses the provisions under the Massachusetts Wetlands Protection Act regulations for a "limited project." As noted, the proposed remediation efforts can be permitted under the limited project provisions at 310 CMR 10.53(3), and specifically under subsection (q), for "*The Assessment, monitoring, containment, mitigation, and remediation of, or other response to, a release or threat of release of oil and/or hazardous material in accordance with the provisions of 310 CMR 40.0000: Massachusetts Contingency Plan ..." Following the regulatory performance standards, the proponent must remediate these activities to a level needed to achieve "No Significant Risk" as defined in the MCP regulations. These provisions also require that the proponent demonstrate the following:*

- 1. there are no practicable alternatives to the response action being proposed that are consistent with the provisions of 310 CMR 40.0000: Massachusetts Contingency Plan and that would be less damaging to resource areas. The alternatives analysis shall include, at a minimum, the following:
- a. an alternative that does not alter resource areas, which will provide baseline data for evaluating other alternatives; and
 - b. an assessment of alternatives to both temporary and permanent impacts to resource areas.

The following alternatives analysis addresses these performance standards as well as those required under the Federal Clean Water Act for Compensatory Mitigation under 33 CFR Parts 325 and 332. The alternatives considered include the No Action Alternative, alternative mitigation approaches, including on-site and off-site alternatives, and the Preferred Alternative.

C.1.a No Action Alternative

The No Action alternative would allow the existing wetland resource areas to remain in place, but would not result in remediation of contaminated sediments. This alternative would result in unabated contaminants to remain within the sediments in the wetland resource areas, and potentially to migrate further downstream from natural processes. This alternative would also not address the provisions of the MCP that require remediation activities within the contaminated areas to achieve the level of "No Significant Risk" as defined in the MCP regulations. Therefore the No Action alternative was dismissed, as it would not meet the project purpose.

C.1.b Alternative Mitigation Approaches

The proponents have considered alternative approaches to providing mitigation in a different location (upstream or downstream of the impacted area), at an alternative site, or else through out-of-kind means as allowable by regulation.

Considerations for alternative mitigation measures include the following:

 Under the Massachusetts Wetlands Protection Act – The project, as proposed under the limited project provisions of the Massachusetts Wetlands Protection Act regulations, affords the issuing authority (Westminster Conservation Commission) discretion in approving the

- project provided that proposed mitigation measures must contribute to the interests of the Massachusetts Wetlands Protection Act.
- Under the Local Wetlands Bylaw Section§ 202-2 D states that "Any permanent alteration or change of habitat of the resource area on a preexisting lot will require 150% replication of that area within that resource area."
- Under the Federal Clean Water Act The Mitigation Rule allows for flexibility in mitigation options, provided lost functions and values of a given wetland are provided with a broader watershed-based approach. The Mitigation Rule also establishes a hierarchical preference for mitigation, placing preference for Mitigation Bank credits and In-Lieu Fee (ILF) program credits above permittee-responsible mitigation (either under a watershed approach or on-site and/or in-kind mitigation).Off-site and/or out-of-kind permittee-responsible mitigation is only allowed if no other alternative is available. Massachusetts currently has an ILF Program in place (this site falls within the Quabbin/Worcester Plateau Service Area), but does not have a Mitigation Bank at this time. Additionally, the Army ACOE of Engineers (ACOE) and Massachusetts Department of Environmental Protection (MassDEP) require mitigation ratios. Typically, for emergent wetlands, the mitigation ratio is 2:1, which would require additional land area for mitigation sustainability.

Off-Site Wetland Expansion and Enhancement

HW assessed the potential for creating additional BVW wetlands (new or expanded wetland) within the same reach of the river. This mitigation option would potentially require additional study of riverine processes at this site, and would also require in-stream stabilization measures to allow for the establishment of new or expanded BVW wetlands. It is uncertain if adequate area exists to accept the necessary wetlands expansion within the hydraulic constraints of the riverine processes. Considerations for stream navigability would also need to be taken into account. Expansion of a different wetland area would not negate the need for in-stream restoration of the riverbed or the steeply sloped areas within Riverfront Area, and may result in additional temporary alteration to Riverfront Area and or buffer zones in order to expand the BVW elsewhere.

On-Site Out-of-Kind Restoration

HW also considered the potential for providing out-of-kind restoration along this reach of the river, such as bank restoration, slope stabilization, or invasives management to enhance the habitat along the river. However, the site in its current condition is relatively stable, but for on-going resident beaver activity, and is free of non-native invasive species.

Off-Site Out-of-Kind Restoration and/or ILF Contribution

HW also considered the option of providing out of kind, off-site comparable mitigation that will contribute to the interests of the Massachusetts Wetlands Protection Act (e.g., wetland restoration or replacement at a site nearby (within the same watershed); habitat enhancements/invasive species management; or participation in In-Lieu Fee program). As we understand it, the Project Team had identified a site along State Road East (#180) with potential for wetland restoration, which may be a viable option. However, a certain amount of restoration will be required at this site, regardless of alternative off-site mitigation efforts or ILF contributions. Further, all regulatory agencies must be consulted to determine the full extent of the wetland mitigation efforts if on-site, in-kind mitigation is not proposed. Massachusetts does not currently have a Mitigation Banking option at this time.

Given the existing site conditions where steep slopes and riverbed sediments would be disturbed as a result of the required remediation activities, notwithstanding the direct alterations and need for wetland mitigation, the surrounding landscape cannot remain in a disturbed state without causing further harm from erosion and sedimentation that has the potential to result in downstream alterations to additional wetland resources and the potential for lost wetland values. Therefore, restoration to some extent at the site will be required regardless.

Based upon the various considerations discussed above, it was determined that on-site, in-situ restoration is the preferred alternative.

C.2 Preferred Alternative – In-Situ Restoration of Resource Areas

The preferred alternative, in-situ restoration, will result in restored resource areas that are designed to function similarly to the existing resource areas, but that will also contain significantly lower levels of cadmium contamination.

The proposed mitigation plan will restore the wetland areas in configuration and elevation, restoring underlying soils by replacing contaminated sediments with clean materials of similar grain size, distribution, and organic content, and revegetating the areas with native plant species consistent with the existing conditions. Riverbank stabilization will also be conducted to both restore the areas disturbed during remediation and to protect the restored wetland area from river erosion during grow-in. Temporary erosion control measures will remain in place until all sediments are stabilized with vegetation. It is anticipated that long-term monitoring will be required to ensure that the restoration site is successfully restored.

The preferred alternative will result in restored resources areas and improved water quality over existing conditions, allowing for the restored areas to better serve the interests under the Massachusetts Wetlands Protection Act and the local wetlands bylaw, while also meeting the regulatory requirements of other wetland regulatory agencies.

C.3 Mitigation Background

C.3.a Existing Wildlife Use

HW completed an initial assessment of wildlife habitat and rare species habitat at the Site in 2017, supplemented with additional data collection in 2018. Habitat at the Site is anticipated to support a variety of resident and migratory bird species, typically found within open forested or woodland habitats. The presence of numerous snags and dead trees, likely serve as nesting sites or cavities for birds, small mammals, reptiles, amphibians, and/or invertebrate species. In general, the vegetation community offers suitable habitat for food and cover for mammalian species common to the area such as deer. The presence of downed trees and displaced in-stream beaver dams (due to recent storm damage in March 2018) indicate suitable beaver habitat (see Photos 4 and 5). The presence of a water source indicates that the surrounding woodlands may also support upland habitat for aquatic amphibian species dependent on an aquatic environment for at least a portion of their life cycle.

As noted above, the site does not support rare species habitat in accordance with the NHESP.As with all of Massachusetts (and the majority of the eastern half of the U.S.), the area is mapped as potential habitat fort eh Federally Endangered Northern Long-eared Bat; however, the nearest identified hibernacula is more than 10 miles away in the Town of Pepperell, MA.

There is no critical habitat identified in the vicinity of this Site⁶.

C.3.b Existing Soil

According to NRCS maps the soils are Colton gravelly loamy sand, which are very deep, excessively drained soils formed in glacis-fluvial deposits (see Figure 5). They are on terraces, kames, eskers, and outwash plains. Large rounded stones indicative of high-energy glacis-fluvial deposition were observed throughout the uplands areas and along steep slopes adjacent to the river.

In addition, HW collected soil sediments from the wetland area to be impacted as well as from the riverbed (LUWW) to determine the organic content and grain size for use in the restoration of these areas. Within the wetland, under existing conditions, surface sediments contain an average of almost 40% organic material, with a 20% organic content in the subsoils. The grain size analysis from the wetland area indicates that the subsoils are comprised of primarily fine sands and silts (see attached laboratory analyses).

C.3.c Existing Vegetation

Freshwater Wetland

As described above, the wetland is characteristic of an emergent plant community dominated by herbaceous species and ferns (see Section B.1.).

Land Under Waterbodies and Waterways

This area is permanently submerged and does not support vegetation.

Inland Bank

Vegetation in this area is minimal, and is generally limited to moss species and some overhanging vegetation from other areas.

Riverfront Area

Riverfront Area at this Site includes steeply sloping embankments as well as the area beyond the break in slope. This area is forested with a mix of deciduous and evergreen mature trees such as eastern white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), paper birch (*Betula papyrifera*), northern red oak (*Quercus rubra*), and occasional red maple (*Acer rubrum*). The sparse shrub community includes occasional mountain laurel (*Kalmia latifolia*) and witch-hazel (*Hamamelis virginiana*). Groundcover is also somewhat sparse and includes patches of sheep laurel (*Kalmia angustifolia*), wintergreen (*Gaultheria procumbens*), and partridgeberry (*Mitchella repens*). This jurisdictional resource area also encompasses the existing walking trail that currently follows the top of the steeply sloping embankments; the outer portions of this resource area also includes a part of the ITW manufacturing facility.

⁶iPaC (https://ecos.fws.gov/ipac/) See official list from US Fish & Wildlife Service.

C.3.d Surrounding Land Uses

The surrounding land uses as of 2003 include forest, forested wetland, water, industrial (ITW manufacturing facility), and open land/open space. An area of "participation recreation" (ball fields) are located to the southeast. Approximately 2,000 feet upgradient of the site is a dam that supports Crocker Pond (Photo 6; see also Figure 1 attached).

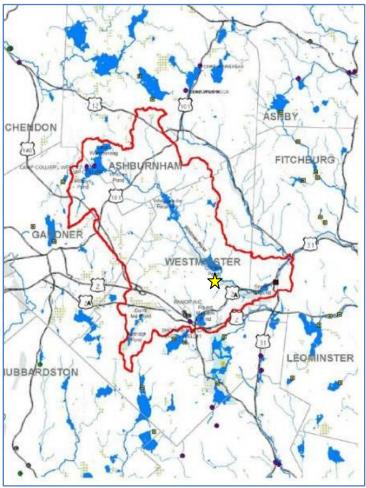


Photo 6.Excerpt from the Nashua River Watershed 5 Year Action Plan 2003-2007 (2003). The Site is indicated with a star. Crocker Pond is the waterbody shown just above the site.

C.4 Mitigation Proposed – On-Site, In-Kind Restoration

The goal of the proposed restoration is to restore in-kind, the temporarily-disturbed aquatic resources and jurisdictional wetland resource areas, mimicking the existing functions and values of the wetlands without the contaminants. In-kind restoration addresses the performance standards under the WPA and the local by-law, as well as the mitigation requirements under the Federal Mitigation Rule. Wetland mitigation is proposed at a 1:1 ratio on-site.

On-site, in-kind wetland resource area restoration is proposed for Freshwater Wetlands (BVW), Inland Bank, Land Under Waterbodies and Waterways, and Riverfront Area, as described below. A summary of the proposed restoration sites for this project is provided in Table 2 below.

Table 2. Summary of proposed restoration sites.

Mitigation Area	Area	Type of Mitigation	Cowardin Classification	HGM Classification
Restoration Area 1 (Freshwater Wetland/BVW)	1,070 SF	Restoration	PEM	Slope/riverine floodplain
Restoration Area 2 (Inland Bank)	248 LF	Restoration	N/A	N/A
Restoration Area 3 – combined north and south sections (Riverfront Area)	34,701 SF	Restoration	N/A	N/A
Restoration Area 4 (Land Under Waterbodies and Waterways/Streambed)	3,400 SF	Restoration	R3RB/R3UB	Riverine, non-tidal

Note that Restorations Areas 2 and 3 are non-aquatic jurisdictional resource areas under the Massachusetts Wetlands Protection Act and local Wetlands Bylaw.

The aquatic resources and other jurisdictional wetland resource areas will be restored after completion of the proposed response actions and mandatory monitoring periods under c. 21E and the necessary response actions under the MCP.

Site access will be facilitated by the construction of a temporary haul road for heavy equipment that will be temporarily stabilized with a bonded fiber matrix, which will also be restored upon completion of remediation efforts. Temporary swamp mats will be installed as needed at the base of the haul road (in the wetland and in the dewatered river channel) to provide additional stabilized areas for remediation and restoration efforts during construction. A general construction sequence is provided on the site plans.

Restoration activities will generally be accomplished by removing contaminated soils, and replacing these with sediments of compatible grain size and, where applicable, organic content, and revegetating the areas with native plant species consistent with the existing conditions.

The proposed resource area restoration is designed to contribute to the interests protected by the Massachusetts Wetlands Protection Act and the Town of Westminster Wetlands Protection Bylaw, by resulting in restored wetland areas, adjacent buffers, and Riverfront Area that are designed to function similarly to the existing (lost) areas and/or nearby reference areas that will not be impacted by the proposed remediation activities. The restored areas will also support improved wetlands soils and vegetation with lower levels of cadmium contamination.

Additional details of the proposed site remediation activities and restoration are provided on the project plans entitled, "Wetland and River Excavation and Restoration, Cresticon Westminster – RTN 2-000165, 75% Permitting Design, August 2018," prepared by Orion Environmental, Inc., in conjunction with Horsley Witten Group, Inc.

C.4.a Excavation of Contaminated Sediments

Because of site-specific characteristics, excavation of soil impacts will be required before excavating cadmium-impacted wetland soil and sediments. Table 3 below summarizes proposed excavation to remove contaminated sediments, based on extensive testing performed under the supervision of the site's LSP. Erosion control/sediment trapping devices and a temporary cofferdam will be installed

within the Whitman River to protect the existing channel and denote limits of work in advance of commencing excavation activities. The area will also be dewatered as necessary prior to excavation of contaminated soils.

Contaminated soils will be transported off-site to a suitable disposal facility in accordance with all applicable state and local laws.

Table 3. Summary of proposed excavation to remove contaminated sediments.

Soil Type and Cadmium Concentration	Proposed excavation (approximate)	
Hydric Soils – Cadmium concentrations greater than remediation goal of 2mg/kg	1,070SF to approximately 3 feet below grade (119 CY)	
River Sediments – Cadmium concentrations greater	1,750 SF of river sediments to approximately 2.5 feet	
than Remediation Goal of 13 mg/kg	below grade (162 CY)	
Surficial Soil – Cadmium concentrations greater than	1,400 SF to approximately 1 foot below grade (52 CY)	
20 mg/kg	1,400 SI* to approximately 1 loot below grade (52 CT)	

Following excavation and removal of contaminated sediments to the satisfaction of the on-site LSP, the following restoration efforts will be conducted.

C.4.b Restoration Area 1– Freshwater Wetlands

Restoration Area 1 will involve the restoration of approximately 1,070SF of a freshwater adjacent aquatic wetland, with the goals of restoring this area to the previous condition as a Palustrine Emergent Wetland (PEM) that is supported hydrologically by groundwater/groundwater seep from the adjacent steeply sloping embankment as well as by flooding from the adjacent Whitman River.



Photo 7. View of existing freshwater wetland ("Wetland Area 2") to be remediated and restored.

Freshwater wetland restoration will generally involve excavation of contaminated sediments (as described above and on the site plans); placement of coir fiber logs to redefine the wetland area (matching the grade of the existing wetland prior to remediation activities); replacement of lost sediments matching volume, sediment size, and organic content; placement of coarse woody debris or rocks to provide enhanced wildlife habitat; creating pita and mound microtopography; revegetation with native wetland plants similar to those found within the lost area; over-seeding with a native seed mix to help stabilize the area; and long-term monitoring to ensure restoration success.

Following removal of contaminated sediments, a 12-inch coir fiber log will be installed and staked in place at the downgradient boundary (riverside edge) of the previous Wetland Area #2along the Whitman River. The coir fiber log will be planted with 2-inch wetland plants (an equal number of Tussock sedge (*Carex Stricta*), White turtlehead (*Chelone glabra*), Riverbank Wild Rye (*Elymus riparius*), and Northern blue flag (*Iris versicolor*)).

The area will then be back-filled with sediments matching volume, sediment size, and organic content. The upper 12-18 inches of soil will be restored with a minimum 40% organic content⁷. Restored sediments will be allowed to settle for a minimum of 48 hours before planting. The upper edge of the restored wetland (e.g., wetland boundary) will be further stabilized by coir fiber logs and erosion control blanket placed just upgradient of the restored wetland along the lower

_

⁷ Based upon previous soil testing.

reaches of the steeply sloping embankment. This area will also be planted with live stakes and shrubs (see Sheet R-2 for details).

Proposed plantings in Restoration Area 1 are summarized in Table 1 below, and as shown on Sheet R-3.

Table 4. Restoration Area 1 Plantings

Species and Indicator Status	Size	Planting Specifications
Tree Species		
Red Maple	4.0.54.4-11	Planted singly;
(Acer rubrum) — FAC	4-6 feet tall	spaced min. 10-15 ft. apart
Herbaceous Species		
Cinnamon Fern	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Osmundastrum cinnamomeum) — FACW	i gai. containei	
Sensitive Fern	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Onoclea sensibilis)—FACW	i gai. containei	
Marsh Fern	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Theylpteris palustris)—FACW	i gai. containei	
New York Fern	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Theylpteris novaboracensis)—FACW	i gai. containei	
False Hellebore	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Veratrum viride) — FAC	i gai. containei	
Marsh Marigold	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Caltha palustris) — OBL	i gai. containei	
Cardinal Flower	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Lobelia cardinalis) — FACW+		
Blueflag Iris	1 gal. container	Planted in clusters; spaced approx. 30-36 in. O.C.
(Iris versicolor) — OBL		
Soft Rush	2-inch plugs	planted in masses,12-18 inches O.C.
(Juncus effusus) — OBL		(3x3 ft ² patches)
Fringed Sedge	2-inch plugs	planted in masses,12-18 inches O.C.
(Carex crinita) — OBL	2-inch plugs	(3x3 ft² patches)
Lurid Sedge	2-inch plugs	planted in masses,12-18 inches O.C.
(Carex lurida) — OBL	2-inch plags	(3x3 ft ² patches)
Woolgrass	2-inch plugs	planted in masses,12-18 inches O.C.
(Scirpus cyperinus) — OBL	2-inch plags	(3x3 ft ² patches)
Little Bluestem	2-inch plugs	planted in mass along pathway shoulder, 30 - 36
(Schizachyrium scoparium) — FACU	2-mon plags	inches O.C.

A wetland seed mix will be introduced to stabilize disturbed soils within the wetland restoration area. Appropriate seed mixes that contain native seeds suitable for most wetland mitigation and restoration sites are commercially available. A native seed mix, such as the "New England Wetmix," supplied by New England Wetland Plants, Inc. (www.newp.com) or equivalent, will be introduced to stabilize the soil surface. According to the NEWP website, the New England Wetmix "contains a wide variety of native seeds which are suitable for most wetland restoration sites that are not permanently inundated. All species are best suited to moist disturbed ground as found in most wet

meadows, scrub shrub, or forested wetland restoration areas."Following the planting of woody vegetation and fern species, the seed mix will be introduced at the recommended application rate of 1 LB/2500 SF and lightly raked in as recommended by NEWP.

Species included within this wetland seed mix include: fox sedge (*Carex vulpinoidea*), lurid sedge (*Carex lurida*), blunt broom sedge (*Carex scoparia*), blue vervain (*Verbena hastata*), fowl bluegrass (*Poa palustris*), Hop Sedge (*Carex lupulina*), Green Bulrush (*Scirpus atrovirens*), creeping spike rush (*Eleocharis palustris*), fringed sedge (*Carex crinita*), soft rush (*Juncus effusus*), spotted Joe Pye weed (*Eupatorium maculatum*), rattlesnake grass (*Glyceria canadensis*), swamp aster (Aster *puniceus*), blueflag (*Iris versicolor*), swamp milkweed (*Asclepias incarnata*), and square stemmed monkey flower (*Mimulus ringens*).

All plantings will be watered during the two to three week grow-in period as necessary.

C.4.c Restoration Area 2 – Inland Bank

Impacts to Inland Bank will be restored with the use of "soft engineering" practices to both establish the limits of the river and protect the restored areas from riverine processes post-restoration. Similar to that for the freshwater wetland restoration, approximately 248 linear feet of coir fiber logs will be staked in place the base of the slope. Upgradient of this area, the slope will be regraded at a 2:1 slope, mimicking the pre-existing grade, and stabilized with a coconut erosion control blanket, backfilled with clean soils, and planted with live stakes of silky dogwood (*Swida amomum*) to help stabilize this resource area and provide additional wildlife habitat. Details of Restoration Area 2 are on Sheet R-2 of the planset.

C.4.d Restoration Area 3 – Riverfront Area and Buffer Zone

Riverfront Area and buffer zone stabilization will also be conducted to both restore the areas disturbed during remediation and to protect the downgradient wetland areas. Restoration Area 3 is divided into two sections (north and south – see Sheet R-1) with approximately 34,701 SF (1.2 ac) of restored area. The restored embankment will be graded at a maximum slope of 2:1, mimicking the pre-existing conditions (see Photos 2 and 3). Details of the proposed slope stabilization are provided on Sheet R-2.

As this area was previously forested, restoration plantings are proposed that mimic the existing forested community. A summary of the planting schedule is provided below in Table 5.In addition, the 25-foot locally-regulated buffer will be restored and enhanced with plantings of silky dogwood.

Table 5.Restoration Area 3 Plantings

Species and Indicator Status	Size & Form	Planting Specifications	
Tree Species			
American Beech	Tall Decid. Tree	Planted singly;	
(<i>Fagus grandifolia</i>) — FACU	(90-100 ft)	spaced 10-15 ft. apart	
Canadian Hemlock*	Tall Evergreen Tree	Planted singly;	
(Tsuga canadensis) — FACU	(75-100 ft)	spaced 10-15 ft. apart	
Eastern White Pine	Med-Tall Evergreen	Planted singly;	
(<i>Pinu</i> s strobus) — FACU	(70-80 ft)	spaced 10-15 ft. apart	
Red Oak	Med-Tall Decid. Tree	Planted singly;	
(Quercus rubrum) — FACU	(80-90 ft)	spaced 10-15 ft. apart	
American Holly	Med Evergreen Tree	Planted singly;	
(Ilex opaca) — FAC	(35-65 ft)	spaced 10-15 ft. apart	
Shrub Species	·		
Mountain Laurel	Med-Tall Evergreen	Spaced approx. 5-10 feet O.C.; planted in clusters	
(Kalmia latifolia)—FACU	Shrub (10-25 ft)	Spaced applox: 5-10 leet O.C., planted in clusters	
Black Huckleberry	Low-Growing Decid.	Spaced approx. 3-5 feet O.C.; planted in clusters	
(<i>Gaylussacia baccata</i>)—FACU	Shrub (up to 5 ft)	Spaced approx. 3-3 leet O.C., planted in clusters	
Herbaceous Species			
Wintergreen/Teaberry	Evergreen Groundcover	Planted in clusters; spaced approx. 18-24 in. O.C.	
(Gautheria procumbens)—FACU	Evergreen Groundcover		
Partridge-Berry	Evergreen Groundcover	Planted in clusters; spaced approx. 18-24 in. O.C.	
(Michella repens) — FACU	L vergreen Groundcover	r lanteu in clusters, spaceu approx. 16-24 in. O.C.	
Bracken Fern	Perennial Fern	Planted singly among other groundcover	
(Pteridium aquilinum) — FACU	(up to 3.5 feet)		

^{*} Contractor to verify that plant specimens are free of wooly adelgid (*Adelges tsugae*); otherwise alternative tree species shall be used in restoration plantings

As with the adjacent wetland, Restoration Area 3 will also be over seeded with a conservation seed mix, such as the "New England Conservation/Wildlife Mix," which will provide a permanent cover of native grasses, herbaceous species, and wildflowers to stabilize the soils and provide added wildlife habitat during grow-in of the a mature forested area. This seed mix will be introduced at the recommended application rate of 25 lbs/acre.

According to the NEWP websites, species within the wildlife mix include the following species, Virginia wild rye (*Elymus virginicus*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), red fescue (*Festuca rubra*), switch grass (*Panicum virgatum*), partridge pea (*Chamaecrista fasciculata*), panicled leaf tick trefoil (*Desmodium paniculatum*), Indian grass (*Sorghastrum nutans*), blue vervain (*Verbena hastata*), butterfly milkweed (*Asclepias tuberosa*), black eyed Susan (*Rudbeckia hirta*), common sneezeweed (*Helenium autunale*), heath aster (*Asterpilosus/Symphyotrichum pilosum*), early goldenrod (*Solidago juncea*), and upland bentgrass (*Agrostis perennans*).

Also occurring in Restoration Area 3 is the relocation of the existing pathway at the top of the steep slope (Photo 8). This path will be relocated further inland to protect the newly restored areas while maintaining the existing recreational values provided by this site. Details of this relocated pathway are shown on Sheet R-2 of the planset.

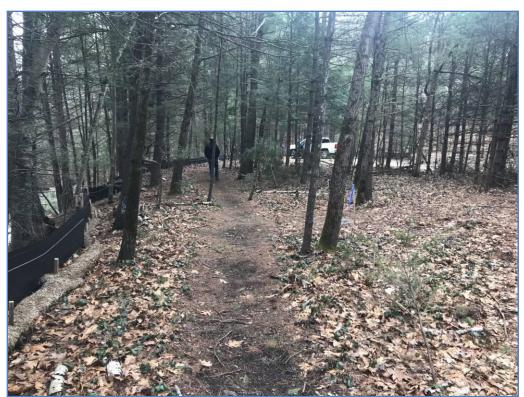


Photo 8. View of existing path that follows the top of the steeply sloping embankment overlooking Whitman Rivera portion of this pat will be relocated landward to avoid the newly restored areas.

C.4.e Restoration Area 4 – Land Under Water Bodies and Waterways (Streambed)

Restoration Area 4 will consist of the restored area or riverbed (LUW) of the Whitman River. Approximately 3,400 SF (0.08 ac) of stream bed will be altered by proposed site remediation activities. As noted, contaminated portions of the river bed will be cordoned off with a temporary cofferdam, and the area dewatered (Sheet C-2) prior to excavation of contaminated sediments add restoration activities. The intent is to restore this area with clean sediments of compatible grain size and rocks as under existing conditions (Photo 9), restoring this reach of the river to its pre-existing condition. Details of the streambed restoration are provided on the project plans (see Sheet C-3). Additional information is provided in the attached "Appendix F – Stream Module."



Photo 9.Existing stream bed of Whitman River near the remediation site. Streambed sediments consist of a mix of coarse sands, pebbles, and small and medium-sized rocks.

C.4.f Other Aquatic Resources Proposed at Each Site

As noted above, there are no vernal pools, submerged aquatic vegetation, or mudflats at this site. As such, none of these special aquatic features are proposed within the Restoration Areas.

C.4.g Functions and Values Proposed

The project elements will result in unavoidable impacts to freshwater aquatic resources and their adjacent jurisdictional buffers and Riverfront Area. The Mitigation Areas have been designed to mimic lost habitat to the greatest extent practicable in order to preserve and protect the functions and values of the resource areas, including flood storage/flood control; groundwater and water quality; and wildlife habitat characteristics for resident and migratory species.

C.4.h Reference Site(s)

As noted above, in addition to the existing conditions of the areas slated for remediation, nearby unaltered adjacent freshwater wetlands, inland Banks, and upgradient upland areas (buffer zones and Riverfront Area)will serve as reference sites. As previously described, the freshwater wetland (BVW) associated with this Site includes three discontinuous areas along the river with unaffected wetland areas located both upstream and downstream of Wetland Area #2, and providing for additional reference sites for the restored aquatic habitats. Brief descriptions of each area provided in the attached wetland memo prepared by HW and dated June 21, 2017.

C.4.i Design Constraints

The proposed restoration plan takes into consideration several design constraints, including the need for site remediation due to cadmium contamination in the soils, the steeply sloping riverbank, riverine processes, and the presence of beavers, which have the potential to undermine remediation efforts.

Remediation activities will be overseen by both a Licensed Site Professional as well as an Environmental Monitor (see section C.4. j. below) to ensure that remediation activities are completed to the standards set forth under the MCP and that the resource areas are protected during and post remediation activities, and the restoration activities are successful.

The restoration plan is designed such that the restored aquatic resources and adjacent jurisdictional areas will be stabilized by both vegetation (plantings) and other measures as appropriate for the site conditions. The design accounts for riverine processes, such that the wetland area and the inland bank will be protected by staked-in-place coir fiber logs sized to accommodate the stream flows and velocities. The steeply sloping embankments will be further stabilized by the use of staked jute netting, with the lower reaches further reinforced by live stakes. In order to protect newly planted vegetation within the restoration areas against beaver destruction, saplings will be surrounded with a cylindrical wire mesh cage made of heavy gauge wire, with a small mesh size, 3-4 feet tall. Alternatively, clusters of vegetation or even the entire restoration site may be encircled to protect against beaver herbivory.

C.4.j Construction Oversight

A qualified wetlands scientist, hydrogeologist, or other qualified professional will be contracted to act as the Environmental Monitor (EM) for all phases of the wetland restoration area construction including long term monitoring. This individual will be on-site to monitor construction of the mitigation area(s) to ensure compliance with the mitigation plan and to make adjustments when appropriate to meet mitigation goals. The EM will be a qualified professional with training in wetland science and who has a minimum of 5 years of experience in the construction of wetland replication and restoration areas and general construction practices. The EM will be on-site to monitor the excavation, grading, and planting of the restoration areas. The wetlands professional will photodocument all phases of the restoration process. The EM will be responsible for providing progress and monitoring reports to the ACOE, the Massachusetts Department of Environmental Protection (MassDEP), and the Westminster Conservation Commission.

In addition, all site remediation activities will be overseen by a qualified LSP, who will oversee the excavation, removal, and disposal of cadmium-contaminated sediments, and follow-up testing and monitoring. This individual will work in tandem with the EM to determine the appropriate timing for restoration activities as prescribed by the MCP standards.

C.4.k Project Construction Timing

In accordance with the requirements under the Clean Water Act regulations, compensatory mitigation shall be initiated not later than 90 days after initiation of project construction and completed within 6 months of commencement of mitigation construction. However, timing of the restoration activities will be dictated by the successful remediation activities, and the restoration timing may fall outside of this timeframe. Currently, the projected timeframe for remediation activities is eight weeks (August though September 2019), predicated on permitting and bidder schedules.

The project schedule will be refined by the selected contractor and provided to the regulatory agencies.

C.4.I Construction Sequence

The general construction sequence for site remediation and restoration is as follows.

- 1. Survey and stake the proposed limit of disturbance and limit of sedimentation barriers.
- Place sedimentation barriers (strawbales, silt sock, silt fence, etc.) As indicated on drawings and staked out in the field. Under no circumstances is the limit of work to extend beyond the sedimentation barriers/limit of disturbance as indicated on drawings as approved by appropriate permitting agencies.
- 3. Install temporary construction entrances in locations indicated on drawings. No other entrances are to be used to gain access to the site by any construction or delivery vehicles
- Cut back the slope near the edge of the wetland to create an access point for equipment for cofferdam installation and excavation. Re-route the recreational trail around the work area.
- 5. Install a temporary non-embedded cofferdam to isolate the excavation area. Dewater the enclosed portion of the river using pumps and treat to below levels specified in site-specific permits. Treated water shall be discharged to the Whitman River downgradient of the work area in accordance with applicable permits.
- 6. Excavate and backfill riverbank excavation area as shown on Sheets R-3. Backfill will be completed after receiving analytical results of excavation confirmation samples.
- 7. Excavate and back fill riverbed excavation area as shown on Sheets R-3. Backfill will be completed after receiving analytical results of excavation confirmation samples.
- 8. Excavate and backfill wetland excavation area as shown on Sheets R-3. Backfill will be completed after receiving analytical results of excavation confirmation samples.
- 9. Remove temporary cofferdam and backfill construction access road in accordance with Sheets R-3.
- Restore riverbank, riverbed, and wetland excavation areas in accordance with Sheets R-3.
 Permanently seed all disturbed areas and complete all remaining planting and seeing in accordance with Sheets R-3.
- 11. Restore recreational trail. Restored trail will be designed based on finished conditions and with cooperation from town of Westminster Crocker Pond Recreational Area committee.
- 12. Engineer to approve the removal of all temporary soil erosion and sedimentation control measures following vegetative establishment of all disturbed areas and determine when the contributing area has reached a minimum of 80% stabilization.

C.4.m Responsible Parties for All Aspects of the Project

Northrop Grumman will be responsible for all aspects of the project with the assistance of the Site LSP and the designated EM.

C.5 Specific Aquatic Resource Checklist Information Appended

Details regarding the wetland restoration areas described in this Restoration Plan are shown on the project permitting plan set. There are no vernal pools, submerged aquatic vegetation, or other aquatic resources at this site. Appendix F – Stream Module is provided as Attachment B and provides additional details regarding restoration of the altered stream bed.

D. GRADING PLAN

Approximately 119 CY of contaminated sediments are proposed to be removed from the freshwater wetland; 162 CY from LUW, plus additional 52 CY from the upgradient Riverfront Area/buffer zone (see Table 3 above). Proposed restoration of these areas will require replacement of appropriate compatible sediments, and regrading to re-create (restore) pre-existing grades, and incorporation of microtopography in each of these areas.

Upon excavation and removal of contaminated sediments, clean fill materials will be introduced into the restoration areas in order to match pre-existing grades and mimic existing conditions. For aquatic resources, this will be a critical component to ensuring that the existing supporting hydrology of this aquatic resource will be re-established to mimic that of the impacted wetlands.

Specific to the freshwater wetland area, this will require careful introduction of clean sediments in a manner that allows for compatible sediment size and organic content, matching both the surficial sediments (e.g., A- and O-horizons) and the underlying sediments (B-horizon).

D.1 Plan View

D.1.a Existing and proposed grading plans

Existing and proposed grading plans are included in Sheets R-1and R-2 of the planset.

D.1.b Microtopography

Once the fill material is introduced and rough-graded, the restoration areas will be graded to create pit and mound microtopography. The on-site environmental monitor will be afforded discretion for field adjustments during construction.

D.1.c Site access

A primary access route for remediation and restoration of the mitigation areas will be gained through the creation of an access path and landing areas shown on Sheet R-1.In order to accommodate the steeply sloping embankment, extensive excavation and regrading will be necessary. Uncontaminated native soils will be stockpiled on site in designated areas, separating topsoil from underlying sediments, for later reuse. This access road will facilitate the remediation and restoration efforts in the river, along its bank, in the freshwater wetland, and ultimately along the steeply sloping Riverfront Area/buffer zone. Following full restoration of downgradient resources, this access road will be regraded, mimicking the pre-existing grade and slope and will be stabilized and revegetated.

D.2 Representative Cross-Sections

Sheets R-2provides representative cross sections showing the existing and proposed grading plan within the restoration areas, as well as the expected range of shallow groundwater table elevations or surface water level consistently expected.

E. EROSION CONTROLS

In addition to other protective measures, downgradient resource areas will be protected by implementing an erosion and sedimentation control program, to be installed prior to construction. Siltation socks, straw wattles, and/or siltation fencing will be placed at the limit of work and/or as shown in the project plans. Erosion control barriers will remain in place and will be maintained in good condition until all work is complete and all soils have been stabilized. In addition, erosion control measures will be installed around the perimeter during site construction. A minimum surplus of 100 feet of erosion control barrier will be maintained on-site at all times. Construction exits as will be provided to shed dirt from construction vehicle tires, as indicated on drawings.

In stream work will be facilitated through the use of a cofferdam. Details of the cofferdam are provided on Sheet C-2.

The amount of land disturbed during construction will be minimized to the extent practicable, particularly given the existing steeply sloping embankment upgradient of the river. Prompt surface stabilization will be practiced to control erosion in areas where disturbances cannot be avoided during construction. Temporary seeding or other soil stabilization measures will be provided where construction activities have ceased at the site. When the site's final grade has been established, permanent vegetation will be planted on the disturbed areas.

E.1 Removal Deadline

The following requirements are part of the ACOE mitigation template.

Temporary devices and structures to control erosion and sedimentation in and around mitigation sites will be properly maintained at all times. The devices and structures shall be disassembled and properly disposed of as soon as the site is stable but no later than November 1st of the third full growing period after planting. Sediment collected by these devices will be removed and placed upland in a manner that prevents its erosion and transport to a waterway or wetland.

F. INVASIVE SPECIES CONTROL PLAN

F.1 Risks

Invasive species were not observed at the site. Monitoring for invasive species will be commensurate with monitoring for success of the mitigation areas. Precautions will be taken to minimize the introduction of invasive species within the newly restored wetland area, including requiring the use of certified clean, weed-free soils, and equipment BMPs to reduce the risk of introducing non-native invasive species at this restoration site.

F.2 Constraints

There do not appear to be any constraints to implementation of an invasive species control plan for this site.

F.3 Control Strategy

Any observed seedlings found within the restoration area and associated stream channel will be pulled by hand, bagged, and removed off-site. It is recommended that any invasive species observed within the restoration area be removed in a similar manner during the grow-in and two-year monitoring period, as it is easier to manage an invasive species before it becomes established within an area rather than deal with it after it becomes established. It has been documented (by others) that the grab-and-pull method is easier and more successful in the winter than in the summer. Additional site visits may be necessary between monitoring periods to remove plants, if invasive species are detected during the growing season.

G. OFF-ROAD VEHICLE USE

The property on which the restoration activities will occur is privately owned. An existing walking trail follows along the top of the steeply sloped embankment along the Whitman River, and is open to the public for passive recreational purposes. No motorized vehicles are allowed on the recreational trail. No evidence of off-road vehicle use has been observed on Parcel 76-27 outside of equipment related to ongoing remediation activities at the site.

H. MONITORING AND ASSESSMENT

H.1 Monitoring Plan

During and immediately following restoration activities, monitoring will occur on a weekly basis to ensure that the site remains stable and to monitory the initial establishment of introduced plantings for the first two months, and bi-weekly thereafter during the first growing season.

Following the grow-in period and in accordance with the regulatory guidance, the restoration areas will be monitored twice annually for a minimum of five growing seasons to determine the relative success of the restored aquatic resources and adjacent jurisdictional areas.

Observations will occur at least two times during the growing period – in late spring/early summer and again in late summer/early fall. Each annual monitoring report, in the format provided in the New England District Compensatory Mitigation Guidance, will be submitted to the ACOE, Regulatory Division, Policy and Technical Support Branch, no later than December 15 of the year being monitored.

H.2 Notification of Construction Completion

In accordance with the Compensatory Rule Guidance, the following measures will also occur, post-completion of the restoration of aquatic resources. These measures are required as part of the Mitigation Plan.

Within 60 days of completing a mitigation project that includes restoration, creation, and/or rehabilitation, the applicant will submit a signed letter to the ACOE, Policy and Technical Support Branch, specifying the date of completion of the mitigation work and the ACOE permit number. If mitigation construction is initiated in, or continues throughout the year, but is not completed by December 31 of any given year, the permittee will provide the ACOE, Policy and Technical Support Branch, a letter providing the date mitigation work began and the work completed as of December 31. The letter will be sent no later than January 31 of the next year. The letter will include the ACOE permit number.

H.3 Monitoring Reports

Semi-annual site inspections conducted during late spring and late summer will include an assessment of the relative health and vigor of the newly planted vegetation, percent cover of vegetation, percent cover of wetland species, general compliance with the performance standards under 310 CMR 10.55(4)(b)(1 through 7) for BVW restoration, and in accordance with the Federal Compensatory Mitigation Guidance and the regional supplement.

Additional details of the monitoring efforts will be developed during the permitting phase in cooperation with the various regulatory agencies.

Written reports detailing the findings of each monitoring event will be submitted on an annual basis for five years to the ACOE, MassDEP, and the Westminster Conservation Commission, concerning the restoration activities. Monitoring reports will provide details on the assessment of the restoration areas, including any remedial actions recommended or taken during a given year. Photographic documentation taken from established photo points will be incorporated within each monitoring report.

Specific to the requirements for the ACOE, monitoring reports will include the following.

> 10-pg maximum + Electronic submission strongly encouraged

H.3.a Monitoring Report Guidance

The following Monitoring Report Guidance is provided by the ACOE, and must be included in the Restoration Plan.

> For each of the first [specify number] full growing periods following construction of the mitigation site(s), the site(s) will be monitored and annual monitoring reports submitted. Observations will occur at least two times during the growing period – in late spring/early summer and again in late summer/early fall. Each annual monitoring report, in the format provided in the New England District Compensatory Mitigation Guidance, will be submitted to the ACOE, Regulatory Division, Policy and Technical Support Branch, no later than December 15 of the year being monitored. Failure to perform the monitoring and submit monitoring reports constitutes permit non-compliance. A self-certification form9 will be completed and signed as the transmittal coversheet for each annual monitoring report and will indicate the permit number and the report number (Monitoring Report 1 of 5, for example). The reports will address the following performance standards in the summary data section and will address the additional items noted in the monitoring report requirements, in the appropriate section. The reports will also include the monitoring-report appendices. The first year of monitoring will be the first year that the site has been through a full growing period after completion of construction and planting. For these permit special conditions, a growing period starts no later than May 31. However, if there are problems that need to be

addressed and if the measures to correct them require prior approval from the ACOE, the permittee will contact the ACOE by phone (800-362-4367 in MA, 800-343-4789 in NH, CT, and RI, 207-623-8367 in ME, and 802-872-2893 in VT) or letter as soon as the need for corrective action is discovered.

- Remedial measures will be implemented at least two years prior to the completion of the monitoring period to attain the performance standards described below within [specify number] growing periods after completion of construction of the mitigation site(s). Should measures be required within two years of the end of the original monitoring period, the monitoring period will be extended as necessary to ensure two years of monitoring after the remedial work is completed. Measures requiring earth movement or changes in hydrology will not be implemented without written approval from the ACOE.
- At least one reference site adjacent to or near each mitigation site will be described and shown on a locus map.

H.3.b Performance Standards

[Section reserved for site-specific performance standards]

H.3.c Monitoring Report Format

Monitoring reports should generally follow a 10-page maximum report format per site, with a self-certification form transmittal. Submission of electronic formats (e.g., pdf) is strongly encouraged. The information required should be framed within the following format.

1) Project Overview (1 page)

Highlighted summary of problems which need immediate attention (e.g., problem with hydrology, severe invasive species problem, serious erosion, major losses from herbivory, etc.). This should be at the beginning of the report and highlighted in the self-certification form and the project overview (Appendix D).

2) Requirements (1 page)

List all mitigation-related requirements as specified in the approved mitigation plan and special conditions of the permit including: the monitoring and performance standards, required financial assurances, required preservation, etc., and note whether required documents have been provided and evaluate whether the compensatory mitigation project site is effectively achieving the approved performance standards or trending toward meeting them.

3) Summary Data (max 4 pages)

Summary data must be provided to substantiate the progress and/or potential challenges associated with the compensatory mitigation project.

Photo documentation should be provided to support the findings and recommendations, and placed in the Appendix.

4) Maps/Plans (max 3 pages)

Maps must be provided to show the location of the compensatory mitigation site relative to other landscape features, habitat types, locations of photographic reference points, transects, sampling data points, and/or other features pertinent to the mitigation plan.

In addition, the submitted maps/plans must clearly delineate the mitigation site boundaries to assist in proper locations for subsequent site visits.

Each map or diagram must fit on a standard 8 ½ x 11" piece of paper and include a legend, bar scale, and the location of any photos submitted for review.

Plans should be at the same orientation and scale as those found in the original mitigation plan attached to the permit.

5) Conclusions (1 page)

A general statement must be included describing the conditions of the compensatory mitigation project. If performance standards are not being met, a brief discussion of the difficulties and potential remedial actions proposed by the permittee, including a timetable, must be provided.

6) Monitoring Report Appendices

<u>Appendix A</u> -- An as-built plan showing topography to 1-foot contours, any inlet/outlet structures and the location and extent of the designed plant community types (e.g., shrub swamp). Within each community type the plan shall show the species planted—but it is not necessary to illustrate the precise location of each individual plant. There should also be a soil profile description and the actual measured organic content of the topsoil. This should be included in the first monitoring report unless there is grading or soil modifications or additional plantings of different species in subsequent years.

<u>Appendix B</u> – A vegetative species list of each plant community type. The species list should, at a minimum, include those that cover at least 5% of their vegetative layer. The list should include both planted and volunteer species.

<u>Appendix C</u> -- Representative photos of each mitigation site taken from the same positions, angles, and magnification for each monitoring event. Photos should be dated and clearly labeled with the direction from which the photo was taken. The photo sites must also be identified on the appropriate maps.

H.3.d Monitoring Report Requirements

As required, monitoring reports will include the following elements.

- Address achievement of performance standards and/or measures to attain the standards.
- Describe the monitoring inspections, and provide their dates, that occurred since the last report.
- Soils data, commensurate with the requirements of the soils portion of the most recent ACOE of Engineers Wetland Delineation Manual and Regional Supplement to the ACOE of Engineers Wetland Delineation Manual:

- Northcentral and Northeast should be collected after construction and every alternate
 year throughout the monitoring period. If IRIS tubes (Rabenhorst 2008), monitoring wells,
 or gauges were installed as part of the project, this hydrology data should be submitted
 annually.
- Concisely describe remedial actions done during the monitoring year to meet the
 performance standards actions such as removing debris, replanting, controlling
 invasive plant species (with biological, herbicidal, or mechanical methods), regrading the
 site, applying additional topsoil or soil amendments, adjusting site hydrology, etc. Also
 describe any other remedial actions done at each site.
- Report the status of all erosion control measures on the compensation site(s). Are they in place and functioning? If temporary measures are no longer needed, have they been removed?
- Give visual estimates of (1) percent vegetative cover for each mitigation site and (2) percent cover of the invasive species required (by performance standard) to be controlled in each mitigation site.
- What fish and wildlife use the site(s) and what do they use it for (nesting, feeding, shelter, etc.)?
- By species planted, describe the general health and vigor of the surviving plants, the prognosis for their future survival, and a diagnosis of the cause(s) of morbidity or mortality.

I. CONTINGENCY

I.1 Contingency Plan

I.1.a Plan for Dealing with Unanticipated Site Conditions or Changes

If at any time during construction, restoration activities, or post-restoration monitoring should unforeseen circumstances arise with respect to site conditions that would alter the restoration plan or preclude the restoration activities from be carried out as described in this Restoration Plan and on the project plans, the responsible parties will immediately contact the regulatory agencies, including the ACOE, MassDEP, and the Westminster Conservation Commission to discuss alternative approaches.

J. LONG-TERM STEWARDSHIP

J.1 Long-term Stewardship Plan

Plan for long-term stewardship is included. Appropriate provisions must be made to support the mitigation site in perpetuity. The owner of the site or the holder of a conservation easement will be responsible for ensuring the mitigation site(s) is in compliance with the permit in perpetuity. A long-term management plan must be developed and approved by the ACOE. This plan may be modified periodically to address changing circumstances.

The project proponent will coordinate the details and the logistics of a Long-term Stewardship Plan, as necessary, during permitting review.

K. FINANCIAL ASSURANCES

In accordance with the Mitigation Rule, financial assurances will be required when the ACOE determines it is appropriate to ensure effective implementation of the mitigation, to include 1) mitigation construction; 2) monitoring, including remedial actions; 3) contingency procedures; and 4) a long-term stewardship endowment. Assurances for construction and monitoring will include most projects where the mitigation work is not accomplished in its entirety prior to the permitted impacts to aquatic resources.

The project proponent coordinate out the details and the logistics of Financial Assurances, as necessary, during permitting review.

L. REFERENCES

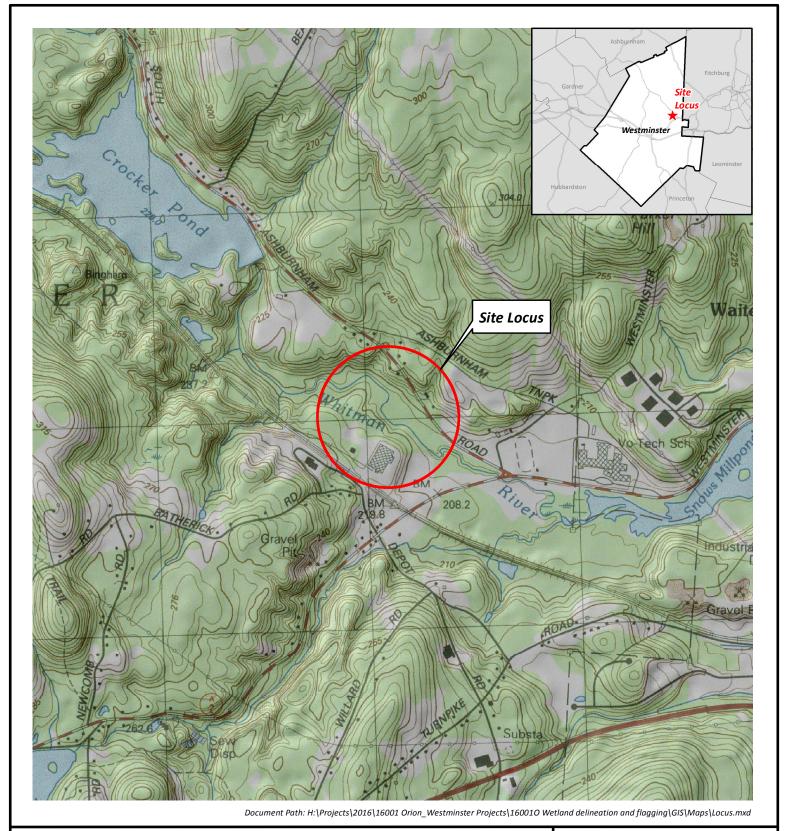
- Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.
- Cowardin, Lewis M., V. Carter, F.C. Golet, and E.T. LaRoe. December 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Fish and Wildlife Service U.S. Department of the Interior, FWS/OBS-79/31.
- Horsley Witten Group, Inc. Resource Area Delineation Report Northrop Grumman Guidance and Electronics Property, 180 State Road East, Westminster, MA. June 21, 2017, prepared for Orion Environmental.
- Jackson, S. and T. Decker. Beavers in Massachusetts: Natural History, Benefits, and Ways to Resolve Conflicts Between People and Beavers, University of Massachusetts Extension and Massachusetts Division of Fisheries and Wildlife, Revised June 2004. Available at https://www.mass.gov/files/2017-08/beavers-in-mass.pdf.

Nashua River Watershed Association (https://www.nashuariverwatershed.org/)

Nashua River Watershed 5 Year Action Plan 2003-2007, Nashua River Watershed Association and the Massachusetts Watershed Initiative Nashua Team (https://www.nashuariverwatershed.org/5yr_plan/watershed/index.html)

ATTACHMENT A – LOCUS MAPS

Figure 1 – USGS Topographic Map
Figure 2 – Aerial Photograph
Figure 3 – FEMA Flood Zones and NFIP, Flood Insurance Rate Maps
Figure 4 – Environmental Constraints
Figure 5 – NRCS Soils Map



0 1,500 1" = 1,500 feet

*Gardner & Fitchburg Topographic Quadrangles



USGS Locus 180 State Road East Westminster, MA

Date: 6/21/2017 Figure 1



 $Document\ Path:\ H:\ Projects\ 2016\ 16001\ Orion_Westminster\ Projects\ 16001O\ Wetland\ delineation\ and\ flagging\ GIS\ Maps\ Aerial.mxd$

1" = 500 feet





Aerial Photo 180 State Road East Westminster, MA

Date: 6/21/2017

Figure 2

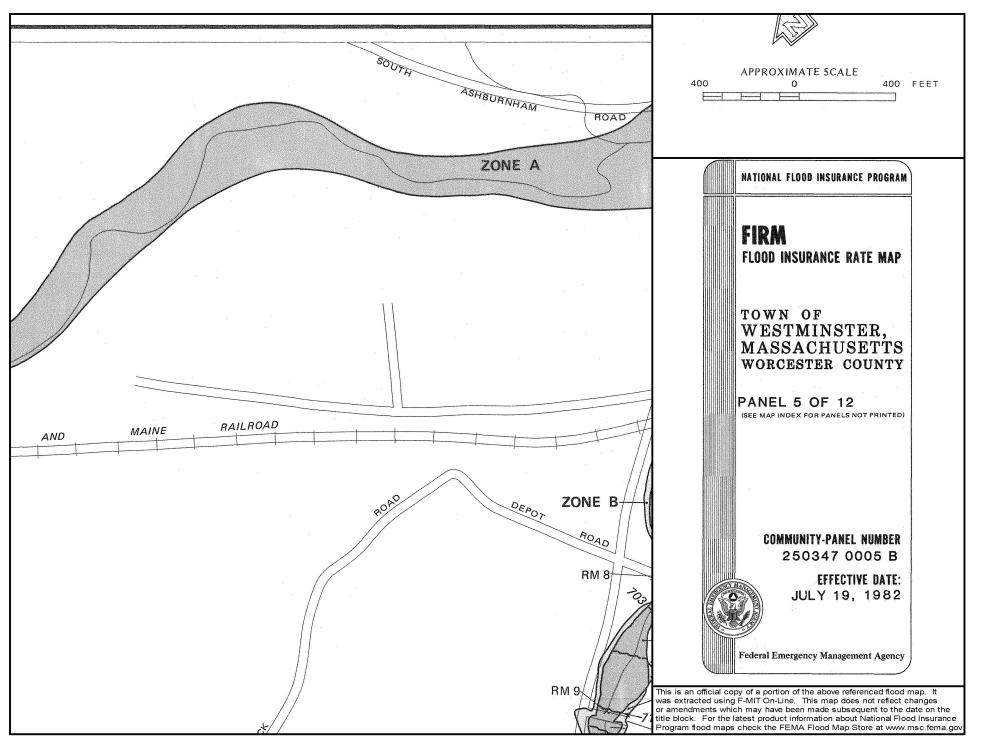
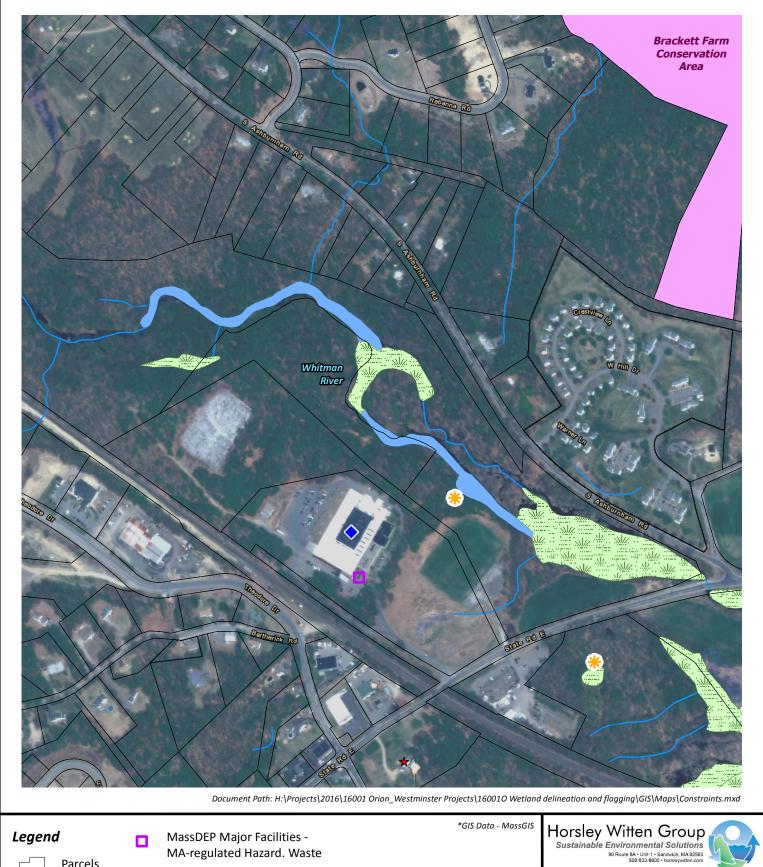


Figure 3





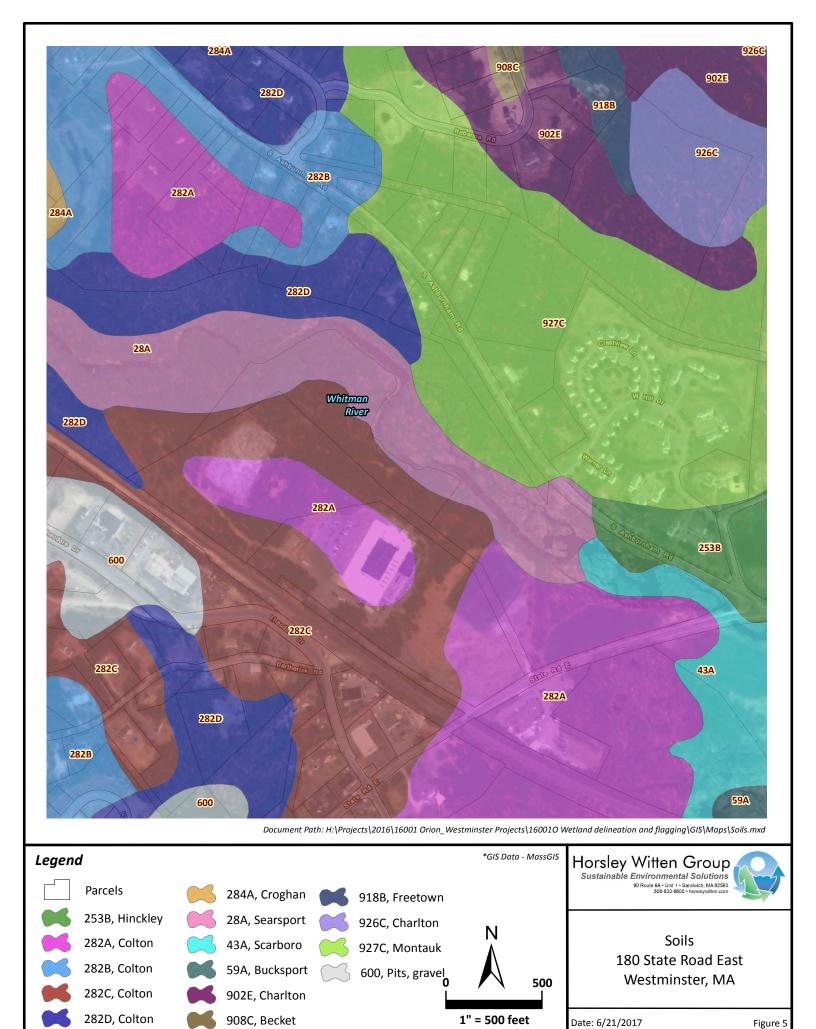
Hazardous Material Sites (MGL c. 21E)

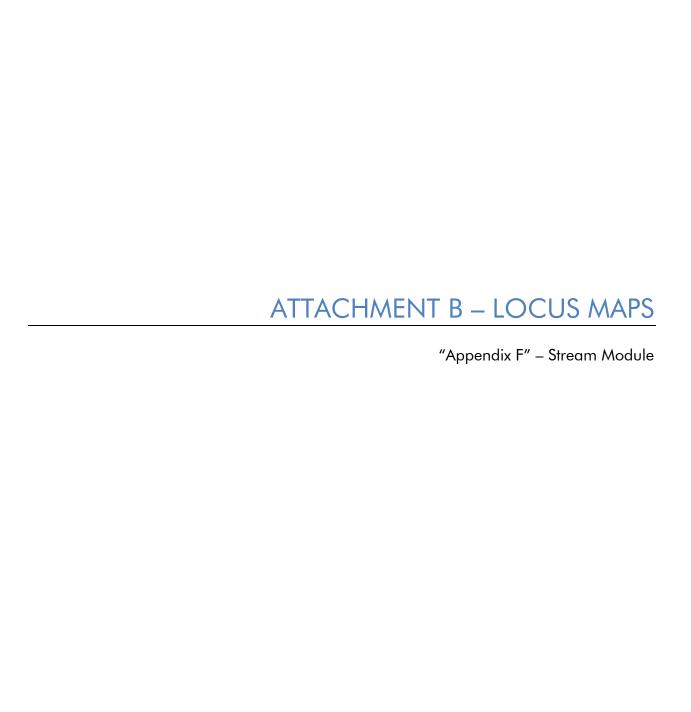
Existing Constraints 180 State Road East Westminster, MA

Date: 6/21/2017

1" = 500 feet

Figure 4





Appendix F - STREAM MODULE CHECKLIST

I. HYDROLOGY

1. [X] Flow Regime.

The Whitman River is shown on the current USGS map as a perennial stream. The Nashua River Watershed Association identifies stream flow within the Whitman River watershed as having significant seasonal changes, in part because the surrounding topography is generally hilly, encompassing numerous flatter wetlands, broad valleys, and floodplains.

The Whitman River at the location where the proposed remediation activities will occur is of variable width, 20 or more feet wide within a meandering floodplain that extends beyond the river's left bank. Flows have been observed as slow to moderate during various site visits. Flows eddy in the bend of the river just downgradient of proposed remediation activities.

Stream gauge data was obtained during field surveys on April 13, 2018 and May 2, 2018 by Horsley Witten Group. April sampling included a location downstream (Transect 1) of the project site, as well as a location upstream (Transect 2) of the project site. May sampling included downstream and upstream locations, as well as readings from the project site (Transect 3). Results are summarized in Table 1 below.

Table 1. Summary of stream flow measurements from April and May site visits.

Date	Transect 1 (downstream)	Transect 2 (upstream)	Transect 3 (at project site)
April 13, 2018	38.206 cfs	55.261 cfs	Data unavailable
May 2, 2018	39.686 cfs	44.809 cfs	49.85 cfs

2. [X] Watershed Size.

The Whitman River near Westminster has a drainage area of 21.7 square miles (From Table 2-11, pp 2-33).¹

3. [X] Location in Watershed.

The Whitman River is located in the Whitman River Sub-basin, on the western edge of the Nashua River Watershed. Proposed remediation activities will occur less than a mile downstream of the dam at Crocker Pond (**Figure 1**).

_

¹ https://www.mass.gov/files/documents/2016/08/wp/nashua-hydrologic-assess-rpt.pdf



Figure 1. Location within the Nashua River Watershed.

4. [X] Water Source(s).

A major water source for the Whitman River is Crocker Pond, less than one mile upstream to the northwest from the project location (**Figure 2**).

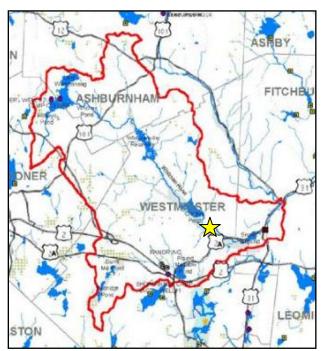


Figure 2. Project Site within the Whitman River sub-basin of the Nashua River Watershed

5. [X] Salinity, if applicable.

Not applicable.

II. SUBSTRATE

1. [X] Substrate Type.

The channel is transport stream. The stream bed is variable, with areas of open sand and deposits of cobble and occasional boulders.

2. [X] Proposed source of material.

Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris. Fill material will be provided by the contractor in accordance with the contract specifications. Stone to be used for the mitigation site will be washed prior to placement in waters.



Photo 1. View of Whitman River substrate from the center of the river, looking upstream. Approximate project site location circled. April 2018.

3. [X] Material Size.

Stone used in the stream Restoration Area will be adequately sized to withstand high flows and will be of compatible grain size as existing conditions. Information on material size and source is indicated on the mitigation plan.

III. STRUCTURE AND STABILITY

- 1. [X] Plans show existing and proposed channel form.
- a. [] Cross section and profile.
- b. [X] Channel width.
- c. [] Length of reach.
- 2. [X] Sediment Transport Model.

Not applicable.

3. [X] Identify reference reach.

The reference reach is the section of the river less than one mile downstream of the Crocker Pond dam. This reach is typical of reaches on the property. HW collected stream data in three locations: at the project site, at one upstream transect, and one downstream transect.

IV. RIPARIAN BUFFER PLANTING PLAN

- 1. [X] Plans use scientific names.
- 2. [] Plant materials are native and indigenous to the area of the site(s); invasive species, nonnative species, and/or cultivars are not proposed for planting or seeding.

Not applicable. Other restoration areas will be planted with native species.

3. [] Plan view drawings show proposed locations of planted stock.

Not applicable. Other restoration areas will be planted with native species.

4. [] Seed mix composition is provided.

Not applicable. Other restoration areas will be planted with native species.

5. [] Relocation of plantings allowed when appropriate.

Not applicable. Other restoration areas will be planted with native species.

6. [] Other - Specific staff recommendations related to planting.

Not applicable. Other restoration areas will be planted with native species.

V. V. COARSE WOODY MATERIAL AND OTHER IN-STREAM STRUCTURES

1. [] Maintenance Plan.

Not applicable.

2. [] Appropriate amounts and location of coarse woody material are proposed.

Not applicable.

3. [] Plan view showing approximate location of materials.

Not applicable.

VI. VI. FLOODPLAINS

1. [X] Level of connectivity to floodplain.

The biodiversity and productivity exhibited by the Site, as well as the habitat complexity of the stream ecosystem, is reflective of high floodplain connectivity. Further, the Site provides sediment and nutrient retention, as well as access for organisms to refuge and reproductive habitat.

2. [X] Permanence of coarse woody material placed in floodplain.

Coarse woody debris will be introduced as appropriate within the targeted portions of the Restoration Areas; however, the goal of the restoration is to mimic existing conditions, and will be subject to field discretion by the EM.

3. [X] Floodplain width

The floodplain width is approximately 153 feet at the site.

VII. VII. MONITORING

1. [X] Length of time and frequency of stream monitoring.

Monitoring will take place for 5 years (years 1, 2, 3, 5). Monitoring will include assessment for signs of disturbance to the restoration work as well as the relative health of this reach of the Whitman River.

Assessment of healthy functioning will be based on the Stream Visual Assessment Protocol Version 2 and will include observations of the physical characteristics such as channel condition, hydrologic alteration, the riparian zone, bank condition, and the appearance of the water.²

_

² https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_042678.pdf

A post-construction assessment of the condition of the restoration site will be performed at the end of the monitoring period.

2. [X] Adaptive management measures.

Should unanticipated conditions, such as unanticipated beaver activity, unexpected sub-grade texture, and/or unearthing an unexpected archaeological site, be encountered in the Restoration area, the conditions will be assessed with respect to potential impacts and implications to the proposed stream Restoration Plan and potential adaptive management will be considered. Measures may be necessary that include replacement or restoration of displaced sediments.

3. [X] Maintenance measures.

Not applicable.

4. [X] Performance standards.

Standards of healthy functioning will be based on assessment using the Stream Visual Assessment Protocol Version 2.

5. [X] Representative photos of the channel, banks, and side slopes.



Photo 2. View upstream of project site from steep slope above right bank (looking upstream).



Photo 3. View of well-defined banks along the Whitman River (looking upstream)



Photo 4. View of steeply sloping embankment above right bank of Whitman River. Wetland restoration site is to the left.



Photo 5. Wetland restoration site (with newly fallen pine). Stream restoration is proposed just downstream of wetland beginning approximately at blue flag.