Section 5-8
Weskeag River & Tributaries (Great Old Broads for Wilderness)

Weskeag River & Tributaries

The Weskeag River/Marsh is one of the largest tidal marshes in midcoast Maine and is recognized for its abundant resource values by state and federal agencies. It is listed as one of the most threatened estuarine systems in the state because of its proximity to development (it is proximate to the Route One corridor, and its watershed includes coastal, industrial, and commercial development). It is also recognized as a state focus area by the Beginning with Habitat Program, by The Nature Conservancy as a portfolio site and by Georges River Land Trust as a conservation focus area because it is a known shorebird area and it is a saltmarsh in good condition. The estuary includes 1,100 acres of brackish tidal marsh and salt marsh, extensive tidal flats and eelgrass beds. The brackish marsh, spartina saltmarsh and the mixed graminoid-form saltmarsh are all state identified significant communities. The marsh is host to thousands of migratory shorebirds as well as tidal and water birds including the state threatened Saltmarsh sharp-tailed sparrow. As many species are in decline, estuarine systems, such as the Weskeag, are increasingly important.

In the 1800s the marsh was ditched for haying which altered the wetland's hydrology. In 1997, the Maine Department of Inland Fisheries & Wildlife initiated a salt marsh restoration project with the National Corporate Wetlands Restoration Partnership (CWRP) to restore portions of the marsh that had been degraded by the 19th century ditching, through this project ~137 acres of the upper marsh were restored by plugging ditches, widening a culvert, deepening pannes and removing a small population of *Phragmites australis*, an invasive species. Post restoration monitoring was completed in 2004.

Dragon Cement (plant and mines), Rockland Industrial Park and the Owls Head Airport are at the edges of the watershed. Impacts of mining operations and cement production on water quality and quantity in the Weskeag River estuary are unknown. Impacts from various industries in the Industrial Park and from commercial development along Route One on water supply and quality are unknown. Portions of the upper Weskeag drainage have been filled for residential and commercial development (above Thomaston Street). The freshwater marsh between Dragon Cement and the Industrial Park is degraded.

Monitoring History

There are no biomonitoring sites (aquatic macroinvertebrates or algae) on the Weskeag to assess the health of biological communities in the river. Limited water quality data was collected on the Weskeag River from 2015-2016 as part of the VRMP. Results showed low dissolved oxygen at some of the sampling sites and very high bacteria at the freshwater sites. As described in State Statute, the freshwater portion of the river is classified as Class B waters, and the estuary is Class SB.

The entire Weskeag River has been designated as "restricted" for shellfish harvesting because of moderate pollution levels. Shellfish grown or harvested in the river must be taken to a depuration plant or relayed to a cleaner site before sale.

The objectives of the current Weskeag monitoring program are to:

1) Provide information on current watershed conditions.
2) Track water quality changes over time.
3) Identify areas with degraded water quality for further assessment and/or watershed best management practices' implementation.

Methods and Sampling Sites

Water quality sampling sites (Figure 5-8-1 and Table 5-8-1) have been established at 9 locations. Four of the sites are freshwater, 1 site is brackish and 4 are tidal.

Following training by, and under the guidance of the MDEP, the volunteer sampling team conducted bi-weekly sampling from June to October. The team also attempted to sample on the day following each significant rain event. The sampling equipment was provided by the MDEP. Volunteer monitors took direct measurements of water temperature, dissolved oxygen, and specific conductance (*freshwater sites*) or salinity (*marine sites*) using YSI Pro2030 meters. The monitors also collected water samples to measure bacteria for either *E. coli (freshwater sites)* or *Enterococcus (marine sites)*. Unfortunately, the *Enterococcus* samples were not processed according to the Standard Operating Procedure and results were not valid.

At freshwater sites, the monitoring was done before 8:00 AM whenever possible, as this is the time of day when dissolved oxygen is at the lowest level. At the tidal sites, monitors attempted to sample during the outgoing or ebb tide.

Bacteria was analyzed using the IDEXX method. *E. Coli* was analyzed at the City of Rockland WWTF Lab, a State certified lab using Colilert®.

Weskeag River & Tributaries Sampling Sites

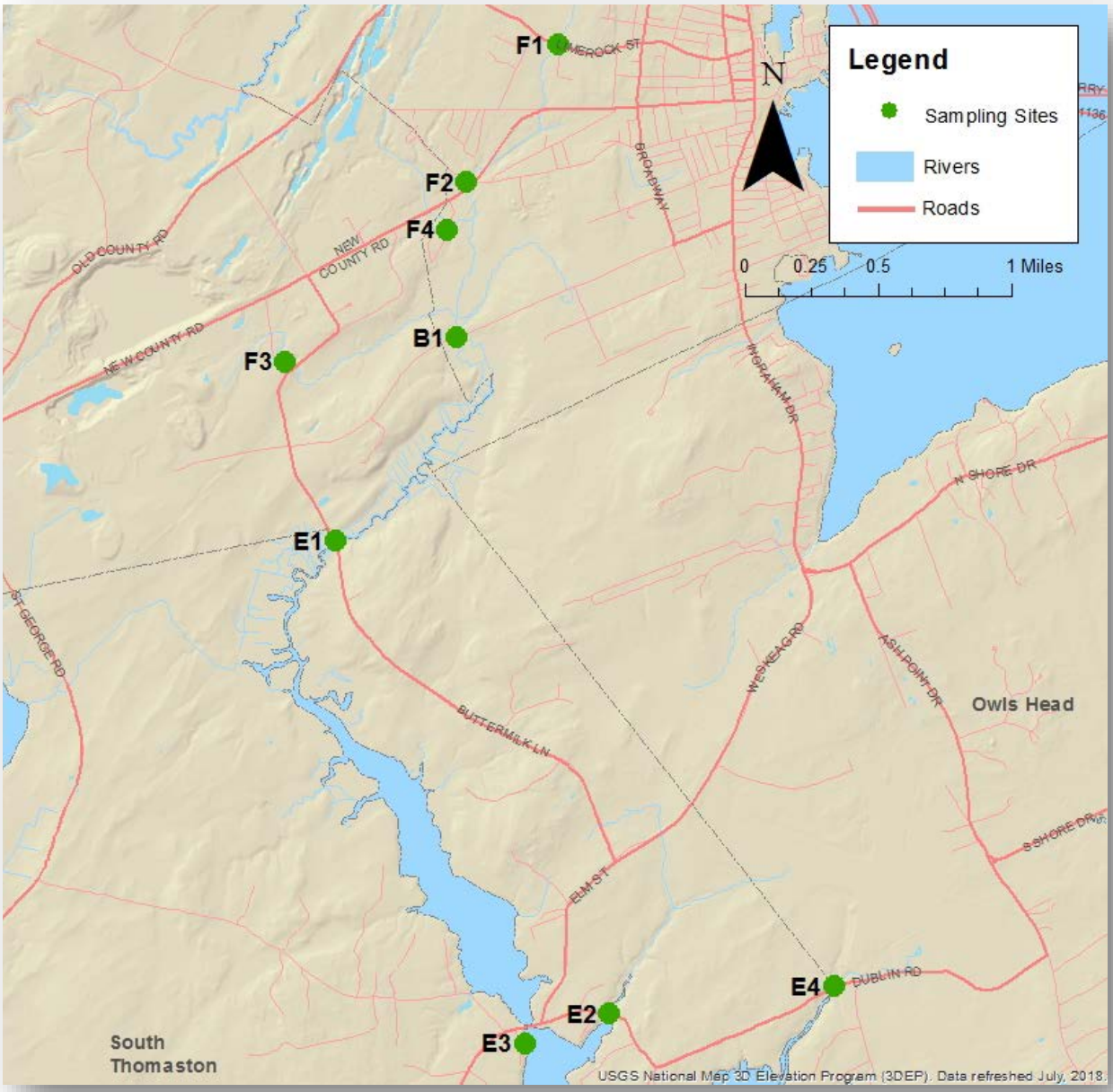

Figure 5-8-1: Map of Weskeag River sampling sites 2019.

Table 5-8-1: Rockport Harbor and Tributaries Sampling Sites. **Sites sampled in 2019 are in bold.**

VRMP Site ID	Organization Site Code	Sample Location	Class
UNNAMED TRIBUTARY-NWGMRUB08-VRMP	F1	Limerock St	B
UNNAMED TRIBUTARY-NWGMRUB02-VRMP	F2	Route 1	B
UNNAMED TRIBUTARY-NWGMRUA15-VRMP	F3	Upper Buttermilk Ln	B
MARSH BROOK - NWGMR29 - VRMP	F4	Glenwood	B
MARSH BROOK-NWGMR23-VRMP	B1	Thomaston St	B
MARSH BROOK-NWGMR-08-VRMP	E1	Lower Buttermilk Ln	SB
UNNAMED TRIBUTARY-NWGUC-03-VRMP	E2	Dublin Rd - Cuddy Cove Creek	SB
WESKEAG RIVER-NWG-28-VRMP	E3	Route 73 - Town Pier	SB
UNNAMED TRIBUTARY-NWGUD-18-VRMP	E4	Dublin Rd - Bally Hac Cove	SB

Parameters

Dissolved Oxygen

Dissolved oxygen levels are generally lowest early in the morning and then increase during the day, peaking mid to late afternoon. Monitors should try to collect some samples early in the morning. Dissolved oxygen is also affected by flow conditions and temperature. During high flow conditions, more oxygen is added to the river from the atmosphere as the water is more turbulent and there is more opportunity for mixing. If flow during the summer months is higher or lower than normal, dissolved oxygen will be affected.

Class B criteria for dissolved oxygen are a minimum of 7 mg/l (milligrams/liter) or 75% saturation. To meet water quality criteria, both concentration and saturation standards must be met. The Class SB standard is 85% saturation.

Water Temperature

Maine's Regulations Relating to Temperature (06-096 CMR Chapter 582) require that discharge of pollutants not raise the temperature of any river and stream above the EPA criteria for indigenous species (23 °C maximum and 19 °C weekly average) or 0.3 °C (0.5 °F) above the temperature that would naturally occur outside a mixing zone established by the Board of Environmental Protection. Pollutant is defined in statute as many things including dirt and heat. For tidal waters, discharge of pollutants may not raise the temperature more than 4 °F (2.2 °C) or more than 1.5 °F (0.8 °C) from June 1 to September 1, and may not cause the temperature of any tidal waters to exceed 85 °F (29 °C) at any point outside a mixing zone established by the Board of Environmental Protection.

Specific Conductance

Specific conductance is related to the amount of dissolved materials in the water. While there are no numerical standards, a relationship exists between conductivity and chloride which has numerical criteria. In general, streams located in urban areas tend to have high specific conductance due to polluted urban stormwater runoff. This may also in large part be due to salt buildup in surface and groundwater from road maintenance practices.

Bacteria

Enterococcus bacteria are used as the indicator organism for marine waters and *E. coli* bacteria are used for freshwaters. While these types of bacteria are not pathogens, their presence in the water may indicate the presence of other organisms including bacteria and viruses that can cause gastrointestinal illnesses.

Class B criteria (effective August 1, 2018) are as follows: "Between April 15th and October 31st, the number of Escherichia coli bacteria in these waters may not exceed a geometric mean of 64 CFU per 100 milliliters over a 90-day interval or 236 CFU per 100 milliliters in more than 10% of the samples in any 90-day interval." Class SB criteria (effective August 1, 2018) are as follows: "Between April 15th and October 31st, the number of enterococcus bacteria in these waters may not exceed a geometric mean of 8 CFU per 100 milliliters in any 90-day interval or 54 CFU per 100 milliliters in more than 10% of the samples in any 90-day interval." Geometric means are calculated instead of average because it is more appropriate to use this calculation for an indicator such as bacteria where there may be one or more very high or low values that can skew the mean.

Discussion and Recommendations

There are numerous sources of pollution and other stresses to the Weskeag River and tributaries that could potentially have a collective impact on water quality. Some of those sources of pollution and stress may include:

- Non-point source pollution (e.g., septic systems, eroded soil, fertilizers, pesticides, heavy metals, petroleum residues, road salt, wildlife, livestock and pet feces) and polluted stormwater originating from impervious surfaces (e.g., streets, parking lots, driveways, rooftops, industries), agriculture, and forestry.
- Ponds and impoundments (which often create more pond-like aquatic habitat conditions that may have higher water temperatures and lower dissolved oxygen concentrations than free-flowing waters).
- Natural effects of wetlands (such as contributing waters to a stream/river that have low dissolved oxygen levels due to the decomposition of large amounts of organic matter, respiration of abundant plant matter, and low re-aeration rates that is characteristic of many wetlands).

The following are recommendations for future monitoring:

- Bacteria samples should be collected at least six times over the sampling season and include both baseflow and storm event samples. Some sites have had high bacteria values (see Figure 5-8-2).
- Continue monitoring at all stations to develop a long-term trend database and identify areas of concern. Some sites, particularly F1, E1, B1, and E4 have had some low dissolved oxygen readings (see Figures 5-8-3 and 5-8-4).

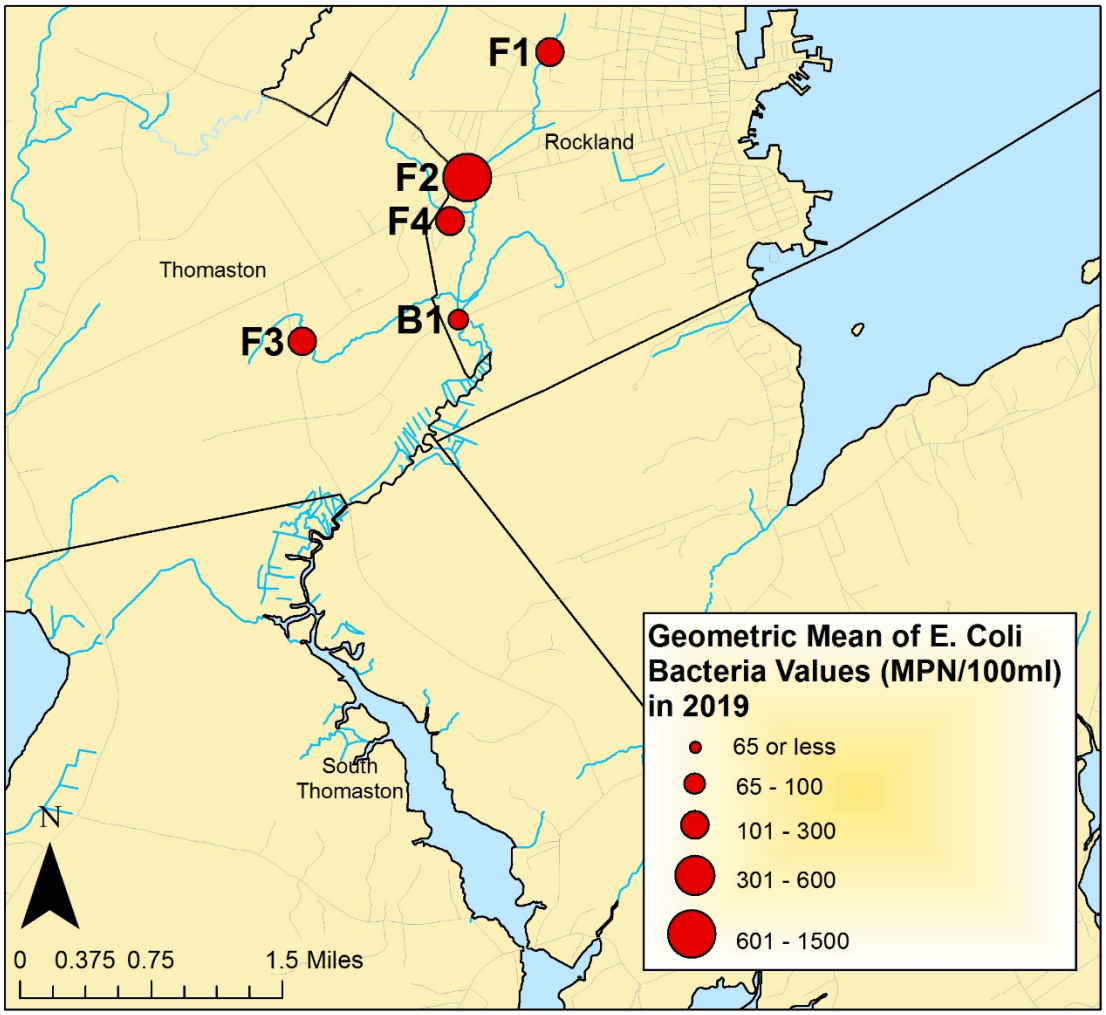

Figure 5-8-2: Weskeag River *E. Coli* bacteria geometric means at sampling sites in 2019.

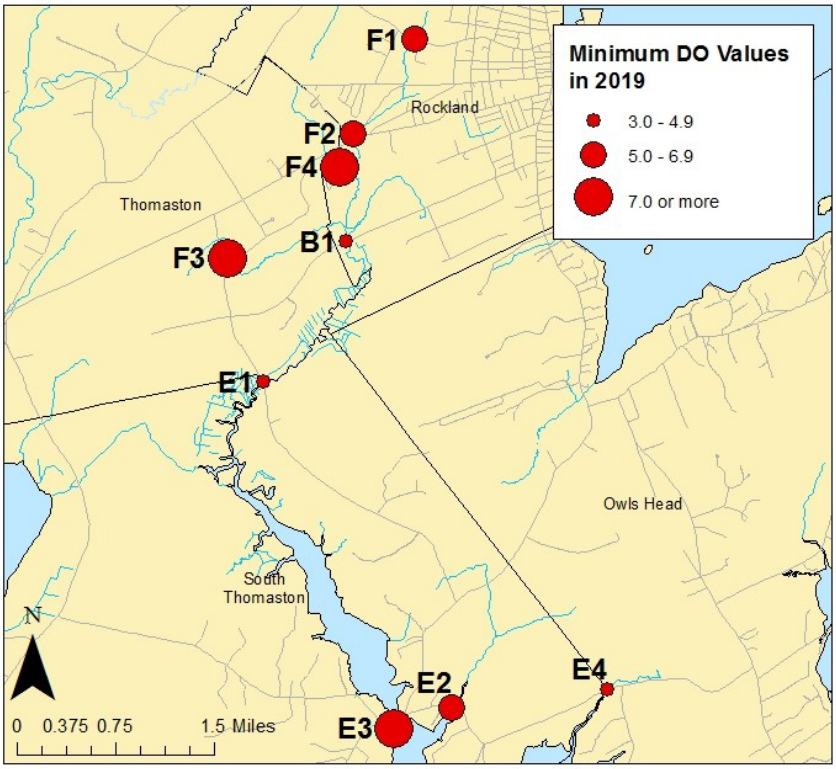

Figure 5-8-3: Weskeag River minimum dissolved oxygen values at sampling sites in 2019.

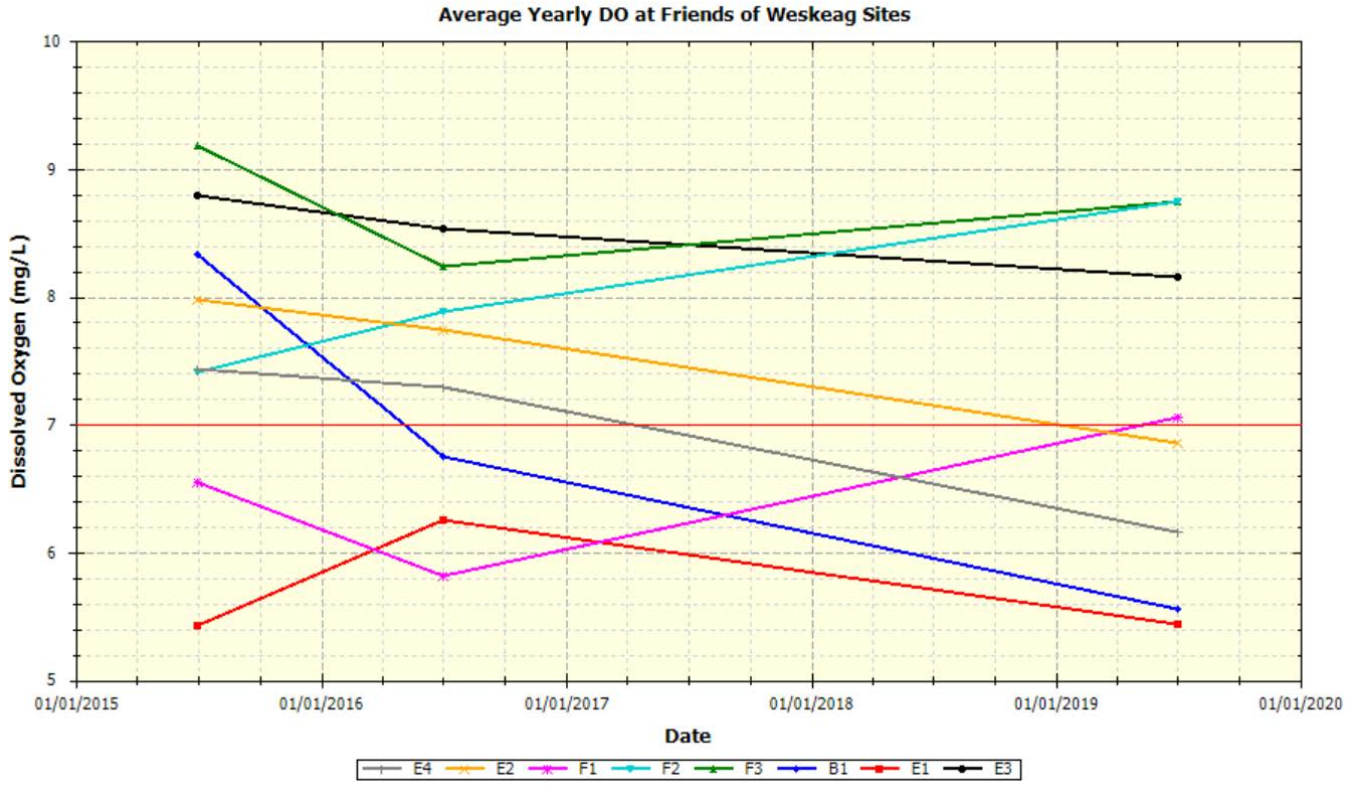

Figure 5-8-4: Weskeag River average dissolved oxygen values at sampling sites in 2015, 2016, and 2019.

Summary of Data by Site and Parameter (2015-2019)

F1

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: **F1**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	6.5	2.9	10.9	7	6
2016	B	5	5.8	3.9	8.3	7	3
2019	B	4	7.1	5.9	7.7	7	1

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: **F1**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	59.3	34.3	85.6	75	9
2016	B	5	57.2	37.1	78.2	75	3
2019	B	4	68.0	61.0	72.0	75	4

A summary of mean, minimum and maximum water temperature (°C) values at Weskeag River monitoring site: **F1**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	B	10	13.6	3.0	19.3	n/a	n/a
2016	B	5	15.8	12.4	20.5	n/a	n/a
2019	B	5	13.4	10.0	16.6	n/a	n/a

A summary of mean, minimum and maximum specific conductance (µS/cm) values at Weskeag River monitoring site: **F1**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2015	B	10	454	210	660	n/a	n/a
2016	B	5	376	274	530	n/a	n/a
2019	B	5	392	315	502	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: F1								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	B	E. Coli	9	174	22	980	236/64	3
2016	B	E. Coli	1	--	--	1300	236/64	1
2019	B	E. Coli	4	--	74	167	236/64	0

***At least 6 samples should be collected to calculate the geometric mean**

F2

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: F2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	8.0	2.1	12.0	7	4
2016	B	7	7.9	6.3	9.8	7	1
2019	B	7	8.7	6.5	9.8	7	1

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: F2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	73.4	18.0	96.7	75	4
2016	B	7	79.6	63.1	92.4	75	2
2019	B	7	84.4	69.0	91.0	75	1

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: F2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	B	10	13.4	3.7	18.9	n/a	n/a
2016	B	7	16.3	12.6	20.3	n/a	n/a
2019	B	7	14.1	11.1	18.3	n/a	n/a

A summary of mean, minimum and maximum specific conductance (µS/cm) values at Weskeag River monitoring site: F2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2015	B	10	772	300	1060	n/a	n/a
2016	B	7	684	421	840	n/a	n/a
2019	B	9	683	490	837	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: F2								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	B	E. Coli	8	1314	326	2419	236/64	8
2016	B	E. Coli	5	--	517	>2420	236/64	5
2019	B	E. Coli	9	1054	93	>2420	236/64	8

***At least 6 samples should be collected to calculate the geometric mean**

F3

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: F3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	9.2	7.3	11.6	7	0
2016	B	7	8.2	7.1	8.8	7	0
2019	B	7	8.7	7.6	9.6	7	0

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: F3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	86.5	72.4	93.0	75	1
2016	B	7	84.1	79.1	88.2	75	0
2019	B	7	84.4	76.0	91	75	0

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: **F3**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	B	10	13.6	3.3	19.3	n/a	n/a
2016	B	7	16.4	12.9	20.7	n/a	n/a
2019	B	8	14.3	11.1	18.0	n/a	n/a

A summary of mean, minimum and maximum specific conductance (µS/cm) values at Weskeag River monitoring site: **F3**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2015	B	10	844	490	1120	n/a	n/a
2016	B	7	877	676	1006	n/a	n/a
2019	B	9	821	546	1070	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: **F3**								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	B	E. Coli	9	196	64	548	236/64	5
2016	B	E. Coli	7	694	222	>2420	236/64	6
2019	B	E. Coli	9	157	18	1300	236/64	2

***At least 6 samples should be collected to calculate the geometric mean**

F4

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: **F4**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2019	B	2	9.7	9.4	9.9	7	0

A summary of mean, minimum and maximum **dissolved oxygen saturation (%) values** at Weskeag River monitoring site: **F4**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2019	B	2	90.0	87.0	93.0	75	0

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: **F4**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2019	B	4	12.9	9.7	14.5	n/a	n/a

A summary of mean, minimum and maximum **specific conductance (µS/cm) values** at Weskeag River monitoring site: **F4**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2019	B	4	643	582	686	n/a	n/a

A summary of geometric mean, minimum and maximum **bacteria (MPN/100 mL) values** at Weskeag River monitoring station: **F4**								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2019	B	E. Coli	3	--	96	276	236/64	1

***At least 6 samples should be collected to calculate the geometric mean**

B1

A summary of mean, minimum and maximum **dissolved oxygen concentration (mg/l) values** at Weskeag River monitoring site: **B1**							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	8.4	5.1	11.8	7	3
2016	B	7	6.8	4.7	8.4	7	5
2019	B	7	5.6	4.2	7.6	7	6

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: B1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	B	10	77.2	49.0	87.9	75	3
2016	B	7	66.7	51.0	78.7	75	6
2019	B	7	54.5	45.0	66.0	75	7

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: B1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	B	10	13.3	2.9	19.4	n/a	n/a
2016	B	7	15.5	13.2	19.8	n/a	n/a
2019	B	9	15.1	10.9	19.3	n/a	n/a

A summary of mean, minimum and maximum specific conductance (µS/cm) values at Weskeag River monitoring site: B1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2015	B	10	647	370	820	n/a	n/a
2016	B	7	591	427	637	n/a	n/a
2019	B	8	632	539	685	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: B1								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	B	Entero	7	7	1	37	n/a	n/a
2016	B	E. Coli	7	523	37	>2420	236/64	4
2019	B	E. Coli	9	82	21	548	236/64	1

***At least 6 samples should be collected to calculate the geometric mean**

E1

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: E1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	5.4	4.8	6.1	n/a	n/a
2016	SB	9	6.3	4.3	9.4	n/a	n/a
2019	SB	10	5.4	3.4	7.0	n/a	n/a

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: E1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	3	76.7	60.4	85.6	85	2
2016	SB	9	82.0	55.1	108.1	85	5
2019	SB	10	64.7	39.8	75.0	85	10

A summary of mean, minimum and maximum water temperature (°C) values at Weskeag River monitoring site: E1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	SB	3	21.9	20.1	25.3	n/a	n/a
2016	SB	9	22.8	17.2	28.4	n/a	n/a
2019	SB	12	19.7	13.5	25.1	n/a	n/a

A summary of mean, minimum and maximum salinity (PPTH) values at Weskeag River monitoring site: E1							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2019	SB	12	15.1	0.5	27.4	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: E1								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	SB	Entero	7	16	3	66	54/8	1

***At least 6 samples should be collected to calculate the geometric mean**

E2

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: E2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	8.0	7.8	8.1	n/a	n/a
2016	SB	9	7.7	6.4	9.0	n/a	n/a
2019	SB	10	6.9	5.3	9.4	n/a	n/a

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: E2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	90.5	77.0	104.0	85	1
2016	SB	9	102.4	80.5	117.4	85	1
2019	SB	10	84.6	66.3	110.0	85	7

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: E2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	SB	2	19.1	18.4	19.7	n/a	n/a
2016	SB	9	20.2	15.4	23.7	n/a	n/a
2019	SB	12	17.9	14.9	21.9	n/a	n/a

A summary of mean, minimum and maximum salinity (PPTH) values at Weskeag River monitoring site: E2							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2019	SB	12	24.2	1.1	30.5	n/a	n/a

E3

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: E3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	8.8	8.4	9.2	n/a	n/a
2016	SB	9	8.6	7.4	10.6	n/a	n/a
2019	SB	10	8.2	7.3	9.5	n/a	n/a

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: E3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	3	107.6	100.9	113.1	85	0
2016	SB	9	104.0	93.5	121.6	85	0
2019	SB	10	97.9	92.0	115.0	85	0

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: E3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	SB	3	15.5	14.7	16.7	n/a	n/a
2016	SB	9	16.2	13.0	18.1	n/a	n/a
2019	SB	11	16.1	13.2	18.4	n/a	n/a

A summary of mean, minimum and maximum salinity (PPTH) values at Weskeag River monitoring site: E3							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2019	SB	11	29.0	22.3	30.8	n/a	n/a

E4

A summary of mean, minimum and maximum dissolved oxygen concentration (mg/l) values at Weskeag River monitoring site: E4							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	7.4	6.5	8.3	n/a	n/a
2016	SB	9	7.3	4.3	9.7	n/a	n/a
2019	SB	10	6.2	3.7	9.4	n/a	n/a

A summary of mean, minimum and maximum dissolved oxygen saturation (%) values at Weskeag River monitoring site: E4							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
2015	SB	2	92.2	77.2	107.2	85	1
2016	SB	9	95.9	51.7	118.2	85	1
2019	SB	10	71.1	44.0	118.0	85	8

A summary of mean, minimum and maximum **water temperature (°C) values** at Weskeag River monitoring site: E4							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
2015	SB	2	19.0	17.7	20.2	n/a	n/a
2016	SB	9	20.3	14.5	26.4	n/a	n/a
2019	SB	12	16.2	12.0	19.8	n/a	n/a

A summary of mean, minimum and maximum salinity (PPTH) values at Weskeag River monitoring site: E4							
Year	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**#Exceeding Criterion**
2019	SB	12	24.7	17.9	29.1	n/a	n/a

A summary of geometric mean, minimum and maximum bacteria (MPN/100 mL) values at Weskeag River monitoring station: E4								
Year	**Class**	**Bacteria Type**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion Instant/Geo**	**# Exceeding Criterion**
2015	B	Entero	8	9	0	57	54/8	1

***At least 6 samples should be collected to calculate the geometric mean**

Appendix A

* Sampling depths are only reported for Tier 1 VRMP sites.

** "N/A" = normal environmental sample ; "D" = field duplicate; "L" = lab duplicate.

*** D.O. = dissolved oxygen; "Spec. Cond" = specific conductance; "TDS" = Total disolved solids; "TSS" = total suspended solids."

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	*** D.O. (MG/L)	*** D.O. Sat. (%)	*** Spec. Cond. (US/CM)	Salinity (PPTH)	Turbidity (NTU)	*** TDS (MG/L)	*** TSS (MG/L)	E. coli Bacteria (MPN/ 100ML)
B1	MARSH BROOK-NWGMR23-VRMP	6/4/2019	8:46 AM	NA			11.3	6.6	66.0	661	0.3				46
B1	MARSH BROOK-NWGMR23-VRMP	6/17/2019	8:20 AM	NA			14.9	5.1	50.0	583					66
B1	MARSH BROOK-NWGMR23-VRMP	7/1/2019	8:20 AM	NA			15.7	5.0	50.0	539					548
B1	MARSH BROOK-NWGMR23-VRMP	7/15/2019	8:21 AM	NA			16.9	5.0	51.0	619					125
B1	MARSH BROOK-NWGMR23-VRMP	7/29/2019	8:16 AM	NA			17.7	4.2	46.0	673					
B1	MARSH BROOK-NWGMR23-VRMP	7/29/2019	8:16 AM	D			17.7	4.4	45.0	675					
B1	MARSH BROOK-NWGMR23-VRMP	8/1/2019	10:02 AM	NA											73
B1	MARSH BROOK-NWGMR23-VRMP	8/1/2019	10:02 AM	D											50
B1	MARSH BROOK-NWGMR23-VRMP	8/12/2019	8:17 AM	NA			19.3								72
B1	MARSH BROOK-NWGMR23-VRMP	8/26/2019	8:22 AM	NA			12.4	6.5	62.0	685					21
B1	MARSH BROOK-NWGMR23-VRMP	9/9/2019	8:20 AM	NA			10.9	7.6	66.0	609					124
B1	MARSH BROOK-NWGMR23-VRMP	9/23/2019	8:13 AM	NA			13.9			648					61
E1	MARSH BROOK-NWGMR-08-VRMP	6/12/2019	10:19 AM	NA											
E1	MARSH BROOK-NWGMR-08-VRMP	6/15/2019	8:35 AM	NA			13.5	7.0	67.0	1598	0.8				
E1	MARSH BROOK-NWGMR-08-VRMP	6/27/2019	8:40 AM	NA											
E1	MARSH BROOK-NWGMR-08-VRMP	6/29/2019	8:20 AM	NA			19.2	5.1	55.0	2055	1.1				
E1	MARSH BROOK-NWGMR-08-VRMP	7/11/2019	8:25 AM	NA											
E1	MARSH BROOK-NWGMR-08-VRMP	7/14/2019	8:25 AM	NA			19.4			4233	2.3				
E1	MARSH BROOK-NWGMR-08-VRMP	7/25/2019	9:10 AM	NA			23.2	5.9	75.0	23501	14.2				
E1	MARSH BROOK-NWGMR-08-VRMP	7/27/2019	8:24 AM	NA			25.1				21.4				
E1	MARSH BROOK-NWGMR-08-VRMP	8/10/2019	7:23 AM	NA			19.8	3.4	39.8	849	0.5				
E1	MARSH BROOK-NWGMR-08-VRMP	8/14/2019	12:28 PM	NA			22.1	5.8	75.0	33845	21.3				
E1	MARSH BROOK-NWGMR-08-VRMP	8/14/2019	12:28 PM	D			22.1	5.8	75.0	33822	21.2				
E1	MARSH BROOK-NWGMR-08-VRMP	8/24/2019	8:20 AM	NA			22.0	4.9	61.3	27521	16.9				
E1	MARSH BROOK-NWGMR-08-VRMP	9/7/2019	8:31 AM	NA			15.4	5.5	65.0	42494	27.3				
E1	MARSH BROOK-NWGMR-08-VRMP	9/9/2019	9:15 AM	NA			16.1	6.1	68.0	28180	17.4				
E1	MARSH BROOK-NWGMR-08-VRMP	9/21/2019	7:23 AM	NA			17.0	5.3	62.9	37912	24.1				
E1	MARSH BROOK-NWGMR-08-VRMP	9/24/2019	9:40 AM	NA			21.0	5.1	68.0	42618	27.4				
F1	UNNAMED TRIBUTARY-NWGMRUB08-VRMP	5/27/2019	8:01 AM	NA			10.5			502	0.3				
F1	UNNAMED TRIBUTARY-NWGMRUB08-VRMP	6/4/2019	7:50 AM	NA			10.0	7.7	68.0	357	0.2				74
F1	UNNAMED TRIBUTARY-NWGMRUB08-VRMP	6/17/2019	7:45 AM	NA			14.6	7.5	72.0	366.4					133
F1	UNNAMED TRIBUTARY-NWGMRUB08-VRMP	7/1/2019	7:45 AM	NA			15.2	7.1	71.0	314.5					167
F1	UNNAMED TRIBUTARY-NWGMRUB08-VRMP	7/15/2019	7:45 AM	NA			16.6	5.9	61.0	422					133

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	*** D.O. (MG/L)	*** D.O. Sat. (%)	*** Spec. Cond. (US/CM)	Salinity (PPTH)	Turbidity (NTU)	*** TDS (MG/L)	*** TSS (MG/L)	E. coli Bacteria (MPN/ 100ML)
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	6/4/2019	8:12 AM	NA			11.1	9.8	87.0	673	0.3				921
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	6/17/2019	8:00 AM	NA			14.1	9.2	89.0	630					488
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	7/1/2019	8:00 AM	NA			15.2	9.1	91.0	490					461
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	7/15/2019	7:55 AM	NA				8.7	89.0	699					>2419.6
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	7/29/2019	7:45 AM	NA			18.3	6.5	69.0	837					
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	8/1/2019	9:37 AM	NA											93
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	8/1/2019	9:37 AM	D											50
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	8/12/2019	7:48 AM	NA						616					>2419.6
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	8/12/2019	7:48 AM	D						607					>2419.6
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	8/26/2019	7:46 AM	NA			12.6	9.0	86.0	787					>2419.6
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	9/9/2019	7:50 AM	NA			11.8	8.9	80.0	659					>2419.6
F2	UNNAMED TRIBUTARY-NWGMRUB02-VRMP	9/23/2019	7:47 AM	NA			15.4			835					>2419.6
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	6/4/2019	8:24 AM	NA			11.1	9.6	87.0	781					18
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	6/17/2019	8:10 AM	NA			14.2	8.2	80.0	701					76
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	7/1/2019	8:10 AM	NA			15.3	7.6	76.0	640					194
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	7/15/2019	8:05 AM	NA				9.0	91.0	771					153
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	7/29/2019	8:04 AM	NA			18.0	8.2	87.0	1020					
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	8/1/2019	9:48 AM	NA											88
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	8/1/2019	9:48 AM	D											50
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	8/12/2019	8:02 AM	NA			15.7			916					186
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	8/26/2019	8:09 AM	NA			12.4	9.4	87.0	1070					1300
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	9/9/2019	8:00 AM	NA			11.9	9.2	83.0	546					130
F3	UNNAMED TRIBUTARY-NWGMRUA15-VRMP	9/23/2019	8:00 AM	NA			15.4			944					517
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	6/12/2019	9:30 AM	NA											
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	6/15/2019	8:58 AM	NA			14.9	9.4	101.0	2509	1.1				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	6/27/2019	9:40 AM	NA											
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	6/29/2019	8:37 AM	NA			18.6	6.7	81.0	35993	2.8				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	7/11/2019	7:44 AM	NA											
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	7/14/2019	8:40 AM	NA			19.2			38797	24.7				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	7/25/2019	8:20 AM	NA			19.5	5.8	74.0	42585	27.5				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	7/27/2019	8:39 AM	NA			21.9				29.1				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	8/10/2019	7:40 AM	NA			18.5	6.5	81.0	40836	22.9				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	8/14/2019	12:59 PM	NA			19.9	8.4	110.0	45528	29.5				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	8/24/2019	8:35 AM	NA			17.9	5.3	66.3	44730	28.9				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	9/7/2019	8:42 AM	NA			15.4	6.7	80.3	44917	29.1				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	9/9/2019	9:56 AM	NA			15.0	7.6	98.0	44480	28.7				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	9/21/2019	7:39 AM	NA			15.3	5.9	71.1	44885	29.1				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	9/24/2019	8:50 AM	NA			18.6	6.5	84.0	46784	30.5				
E2	UNNAMED TRIBUTARY-NWGUC-03-VRMP	9/24/2019	8:50 AM	D			18.6	6.5	84.0	46773	30.4				

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	*** D.O. (MG/L)	*** D.O. Sat. (%)	*** Spec. Cond. (US/CM)	Salinity (PPTH)	Turbidity (NTU)	*** TDS (MG/L)	*** TSS (MG/L)	E. coli Bacteria (MPN/ 100ML)
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	6/12/2019	9:45 AM	NA											
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	6/15/2019	9:11 AM	NA			12.0	9.1	97.0	34265	19.6				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	6/27/2019	7:37 AM	NA											
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	6/29/2019	8:48 AM	NA			15.7	7.0	74.0	36698	23.7				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	7/11/2019	7:29 AM	NA											
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	7/14/2019	8:47 AM	NA			16.8			42127	27.2				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	7/25/2019	8:05 AM	NA			18.3	4.9	58.0	31850	19.9				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	7/25/2019	8:05 AM	D											
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	7/27/2019	8:48 AM	NA			19.8				24.8				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	8/10/2019	7:49 AM	NA			15.8	5.7	68.4	44914	29.1				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	8/14/2019	1:11 PM	NA			18.1	9.4	118.0	44164	28.6				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	8/24/2019	8:45 AM	NA			16.9	4.0	48.0	40324	25.7				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	8/24/2019	8:45 AM	D				3.7	44.0	39929	25.5				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	9/7/2019	8:52 AM	NA			14.0	6.9	76.1	32149	17.9				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	9/9/2019	10:11 AM	NA			13.7	6.9	77.0	43000	28.1				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	9/21/2019	7:47 AM	NA			14.7	5.0	56.5	36501	22.5				
E4	UNNAMED TRIBUTARY-NWGUD-18-VRMP	9/24/2019	8:37 AM	NA			18.0	5.2	65.0	43976	28.4				
E3	WESKEAG RIVER-NWG-28-VRMP	6/12/2019	9:48 AM	NA											
E3	WESKEAG RIVER-NWG-28-VRMP	6/15/2019	8:15 AM	NA			13.2	8.7	95.0		22.3				
E3	WESKEAG RIVER-NWG-28-VRMP	6/27/2019	8:18 AM	NA											
E3	WESKEAG RIVER-NWG-28-VRMP	6/29/2019	8:07 AM	NA			15.7	8.6	101.0	41453	26.7				
E3	WESKEAG RIVER-NWG-28-VRMP	7/11/2019	8:03 AM	NA											
E3	WESKEAG RIVER-NWG-28-VRMP	7/14/2019	8:04 AM	NA			18.4								
E3	WESKEAG RIVER-NWG-28-VRMP	7/25/2019	8:55 AM	NA			18.3	8.2	103.0	45046	29.2				
E3	WESKEAG RIVER-NWG-28-VRMP	7/27/2019	8:12 AM	NA			18.2				29.3				
E3	WESKEAG RIVER-NWG-28-VRMP	8/10/2019	7:08 AM	NA			15.7	8.0	95.6	44690	29				
E3	WESKEAG RIVER-NWG-28-VRMP	8/14/2019	12:43 PM	NA			15.7	9.5	115.0	46935	30.5				
E3	WESKEAG RIVER-NWG-28-VRMP	8/24/2019	8:09 AM	NA			17.2	7.6	93.7	45809	29.9				
E3	WESKEAG RIVER-NWG-28-VRMP	9/7/2019	8:22 AM	NA			14.9	8.0	94.1	45695	29.7				
E3	WESKEAG RIVER-NWG-28-VRMP	9/9/2019	9:36 AM	NA			15.0	8.6	102.0	46160	30				
E3	WESKEAG RIVER-NWG-28-VRMP	9/21/2019	7:13 AM	NA			15.1	7.8	92.2	45603	29.6				
E3	WESKEAG RIVER-NWG-28-VRMP	9/24/2019	9:05 AM	NA				7.3	93.0	47000	30.6				
E3	WESKEAG RIVER-NWG-28-VRMP	9/24/2019	9:05 AM	D				7.5	92.0	47299	30.8				
F4	MARSH BROOK - NWGMR29 - VRMP	5/27/2019	9:00 AM	NA			9.7			668	0.3				
F4	MARSH BROOK - NWGMR29 - VRMP	8/26/2019	7:55 AM	NA			13.1	9.9	93.0	582					96
F4	MARSH BROOK - NWGMR29 - VRMP	9/9/2019	8:30 AM	NA			12.7	9.4	87.0	596					140
F4	MARSH BROOK - NWGMR29 - VRMP	9/23/2019	8:30 AM	NA			14.5			686					276
F4	MARSH BROOK - NWGMR29 - VRMP	9/23/2019	8:30 AM	D			14.4			684					