Presumpscot River Water Quality Model Recalibration and Status Report

July 2011

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Division of Environmental Assessment

Executive Summary

In 1995 a water quality model was developed for the Presumpscot River, from Little Falls dam downstream to the estuary at Martin Point Bridge. Together with instream monitoring, that model concluded that the lower reaches of the Presumpscot River from Cumberland Mills dam to the estuary were not in attainment of class C water quality criteria. A Total Maximum Daily Load (TMDL) was approved by EPA in 1998 and a Waste Load Allocation (WLA) for the river was written. In 1999 S. D. Warren ceased its pulping operation at their Westbrook mill reducing the BOD loading to the river, and in 2002 the Smelt Hill dam in Falmouth was removed improving hydraulic conditions. These substantial changes to the river from Cumberland Mills dam to Presumpscot Falls necessitated a recalibration of the model.

In 2011 a model run of critical water quality conditions of low flow, high temperature, and licensed loads was performed from Cumberland Mills dam to Presumpscot Falls. The resulting predicted dissolved oxygen (DO) concentration, 6.0 ppm at the sag (lowest DO point in a river reach) directly above Presumpscot Falls, meets dissolved the minimum dissolved oxygen criterion for Class C (5.0 ppm or 60 percent saturation, whichever is higher).

With improved dissolved oxygen levels upstream of Presumpscot Falls, as well as increased reaeration through the falls, the upper section of the estuary that was identified in the Waste Load Allocation as not meeting class SC criterion is now predicted to be in attainment.

The original water quality model was also used to derive a temperature based flow augmentation curve for the Presumpscot River. This curve was set as a condition of the 2007 Waste Discharge License for the S. D. Warren Mill in Westbrook to incrementally increase flows from Sebago Lake when instream temperatures increase from 22°C to 30°C. The recalibrated model was used to demonstrate that this flow augmentation is no longer needed to maintain the class C minimum dissolved oxygen criterion in the lower Presumpscot River.

The TMDL documented non-attainment of class C aquatic habitat criterion because of Total Suspended Solids (TSS) in the reaches below the discharges from the S. D. Warren mill and the Westbrook Publicly Owned Treatment Works, attributing most of the TSS to the mill. In September of 2010, an aquatic life survey of macroinvertebrates was performed in the lower Presumpscot approximately 260 feet above the confluence with Mill Brook. It documented class C attainment.

The Waste Load Allocation (1998) identified non-attainment of the class B minimum dissolved oxygen criterion in the Gambo, Little Falls, Mallison, and Saccarappa dam impoundments during both low and high flow events, This report concluded that during high flow events non-attainment was likely due to non-point source pollution, but during low flow non-attainment was due to the flow conditions caused by the impoundments. A plan of increased spillage at two of the dams and monitoring was adopted as a condition of the 2007 Water Quality Certification (WQC) for these dams. Monitoring in 2010 still showed non-attainment during low flow periods. As a result and as a component of a strategy for river flow and Sebago Lake level management, S.D. Warren has proposed increasing minimum flows in addition to the spillage requirements of the WQC with continued monitoring and coordination with DEP.

Model Recalibration and Class C Attainment

The Presumpscot River, located in Cumberland County in southern Maine, originates as the major outlet flowage from Sebago Lake. It flows in a southeasterly direction through Gorham and Windham, into Westbrook, Portland, and Falmouth before emptying into Casco Bay. Flow in the river is highly regulated from Sebago Lake through the Eel Weir dam owned by S.D. Warren Company (dba Sappi). It has a drainage area of 441 square miles at its source and 596 square miles at its mouth.

In 1995 a water quality model[1] was developed to predict the rivers capacity to assimilate pollutants during critical water quality conditions. From this a Waste Load Allocation (WLA) was written for the river. At this time the lower reaches, from the Cumberland Mills Dam in Westbrook downstream to the estuary were not meeting class C water quality criteria. Non-attainment of both dissolved oxygen and aquatic life criteria was the reason and in November, 1998 a Total Maximum Daily Load (TMDL) for Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) was approved by EPA for the lower 6.5 miles of the Presumpscot River. A supplement to the WLA was also completed in 1998 with additional data and model runs used in writing the TMDL.

The TMDL defined the assimilative capacity of this river segment for point and non-point source discharges. The S.D Warren mill in Westbrook was identified as the major source of BOD and TSS to this reach of river. The water quality model was used to define allowable pollutant loads. In 1999 the pulping operation at the S. D. Warren Westbrook mill was discontinued, decreasing the daily maximum and monthly average licensed BOD loadings from 6,780 ppd[2] and 3,565 ppd respectively to 3,240 ppd and 1,700 ppd.

In addition to a reduced loading to the river, in September, 2002 the Smelt Hill Dam at Presumpscot Falls in Falmouth was removed. Doing so improved the hydraulic conditions in the lower reaches for dissolved oxygen by increasing velocity and reducing residence time.

Both of these events significantly improved the conditions in the river for meeting water quality classification and justifying the need for a recalibration of the model. Because these changes have occurred downstream of the Cumberland Mills dam the model recalibration was only done for these river segments.

[1] A water quality model uses complex mathematics to simulate water quality conditions in a water body. The complexity of the math results in the use of computer software. Models are used to predict worse case water quality of such parameters as dissolved oxygen and algae levels as they relate to pollutant loading, river flow, and temperature. Assumptions used in models are calibrated by actual field data.
[2] pounds per day

The DEP has completed the recalibration and has also preformed subsequent analysis to determine;

- if the river would meet class C water quality criteria under critical water quality conditions of low flow, high temperature, and maximum licensed loadings from dischargers, and
- if the Temperature Based Flow Regulation Curve, which is a requirement in the current Sebago Lake Level Management Plan, is still applicable.

Model Inputs:

Since the Smelt Hill dam removal in 2002, water quality surveys were undertaken in the lower segments of the Presumpscot River during three years (2003, 2004, and 2008) and a dye study was conducted by EPA in 2008. The field and water quality data from the 2008 survey and the 2004 survey were used for the recalibration and validation, respectively.

Other data used in the model recalibration included continuous field measurements of temperature and dissolved oxygen (DO) at two stations (River Mile 1.1 and 4.6) for the months of August and September, 2010 provided by the Presumpscot River Watershed Coalition, daily average flow data from Eel Weir dam provided by S. D. Warren, GIS orthographic data, and field observations in June, 2011.

Hydraulic conditions of a river are the primary driver of the kinetic processes determining DO concentrations. The removal of the Smelt Hill Dam has decreased the depth and volume of water in these reaches, but most importantly the residence time has decreased from 27.5 hours to 15.6 hours during critical low flow. Determination of hydraulic parameters were based on transect data taken during the 2003 field survey and orthographic map interpretation.

In addition to BOD loadings, the primary variables in the mass balance of DO in this river are a depletion resulting from a sediment oxygen demand (SOD) on the river bed and a reaeration at the water surface. In the original model, S. D. Warren provided the SOD rates from a 1993 study and DEP determined reaeration rates through model calibration. In the recalibrated model, DEP used the same SOD rates from the original model with a 50% reduction for the first reach downstream of the Cumberland Mills Dam; this was determined through calibration and justified by a decade of reduced BOD discharges from the mill and expected migration of bed load downstream. Because of the change in hydraulic conditions, DEP generated reaeration rates from algorithms in the model (Covar Method)..

In the original model the diurnal swing in DO levels due to algal photosynthesis and respiration was taken from the field surveys and volunteer monitoring as an average of 0.8 ppm. For determination of the minimum daily value for DO in the river, half of this value (0.4 ppm) was subtracted from the calculated average DO from the mass balance. In the data collected in the field surveys in 2003, 2004, and 2008, that average diurnal swing was 0.6 ppm. The Presumpscot River Watershed Coalition hired a consultant to deploy continuous sondes from July 30th to October 8th, 2010 at two stations in the river. The downstream deployment was by the Turnpike Spur (River Mile 1.1). From those data, the maximum diurnal swing for the period of 8/19/10 to 9/13/10 when the flow was at the critical low level

(270 cfs at Eel Weir). was averaged to be 1.16 ppm. Samples taken during the field surveys were grab samples and there is no assurance that they captures either the minimum or maximum DO reading for the day. The continuous sondes recorded data every 15 minutes for the period of deployment and fully describe the cycle of the DO. Therefore, the sonde data were used and a value of 0.58 ppm (half of the 1.16 total swing) was subtracted from the resulting DO levels in the model.

All other input parameters are the same as in the original model.

Results:

Calibration and Validation

The 2008 field survey data were used to calibrate the model. A plot of the DO (ppm) readings is shown in Figure 1. The dark blue line (Ave DO) is a plot of the average modeled values for each 0.1 river mile segment. The fuchsia points (Obs Ave DO) are the observed daily average field readings and the fuchsia lines are the observed diurnal minimum and maximum values due to plant photosynthesis and respiration The diurnal minimum and maximum modeled values, as discussed in the previous section, were not considered in calibration or validation runs because phytoplankton or periphyton were not modeled. The model correlates reasonably well with the observed average values for both calibration and validation.

Figure 1. Model Calibration Results

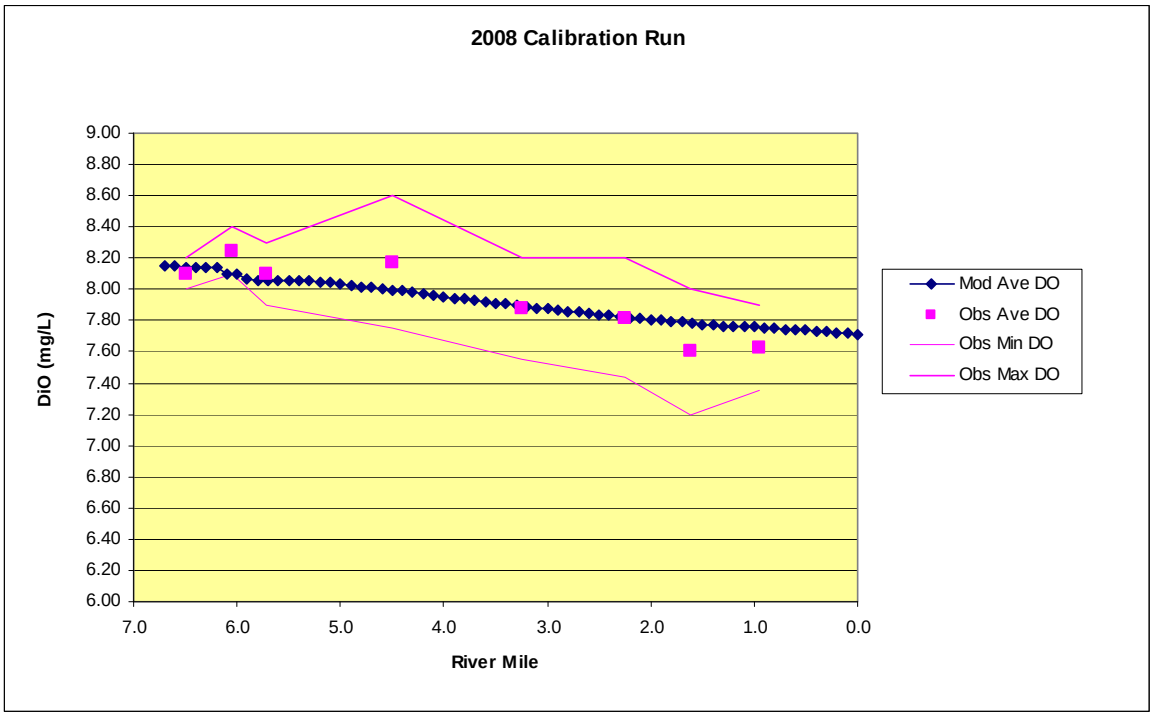
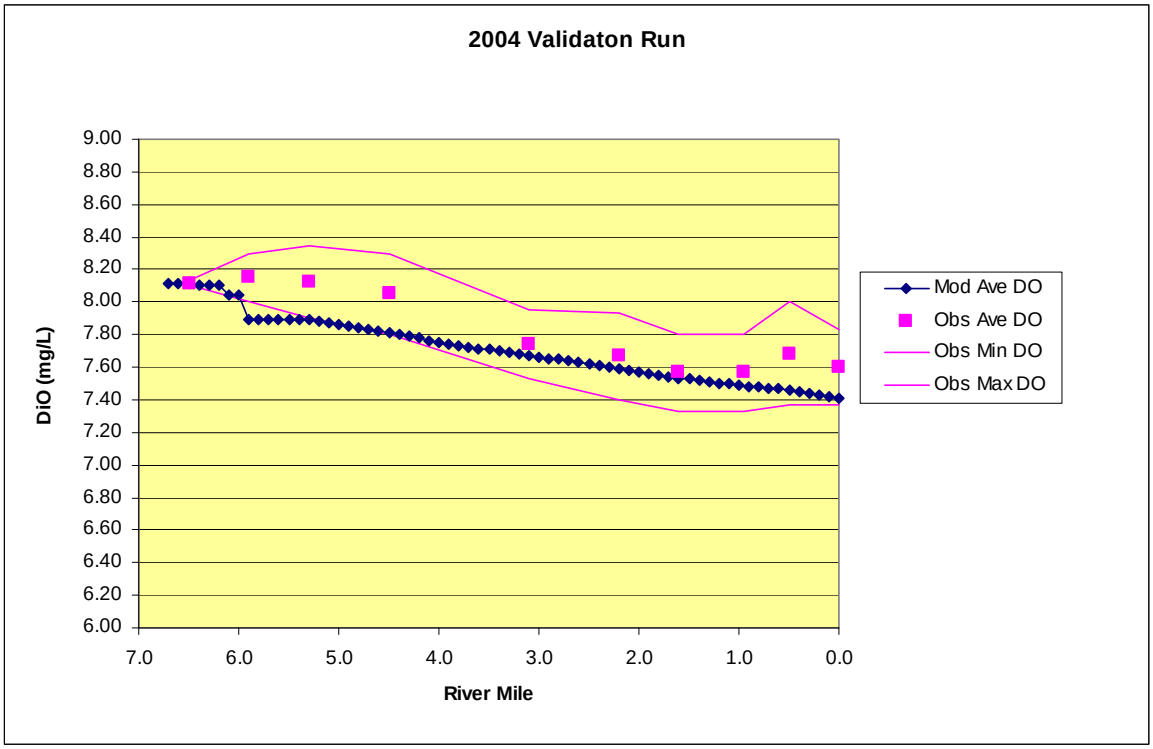


Figure 2. Model Verification Results



Sensitivity Analysis

The 7Q10 model was evaluated for sensitivity of predicted DO to changes in basic parameter rates. Model runs were made with each rate increased and decreased one at a time and the impact on model predictions tabulated. The maximum differences in DO from the calibration run are shown in Table 1 and they demonstrate parameter confidence.

Table 1. Sensitivity Analysis Results

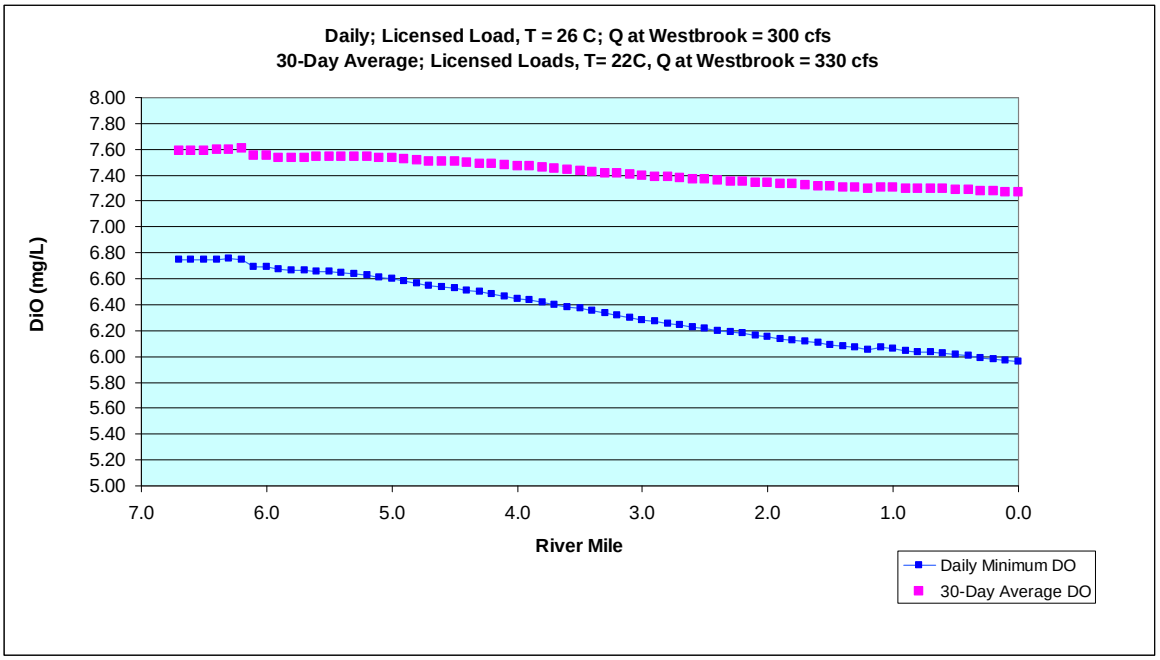
Condition	Constituent	Concentration Difference (ppm)
Reaeration Rate, Ka +50%	DO	0.21
Reaeration Rate, Ka –50%	DO	-0.13
Sediment Oxygen Demand +50%	DO	-0.22
Sediment Oxygen Demand -50%	DO	0.15
CBOD Decay Rate, Kd +25%	DO	-0.18
CBOD Decay Rate, Kd -25%	DO	0.08

Critical Water Quality Conditions

A model run was preformed to determine if the river would be in attainment of the class C criteria at critical water quality conditions. Critical water quality conditions are a critical flow of 300 cfs and 330 cfs for the daily and 30-day average river flows, respectively; daily and monthly average, water temperatures of 26°C and 22°C,and full licensed loads and discharges from the S. D. Warren mill and the Westbrook POTW. The critical flows and temperatures were determined for the Waste Load Allocation. Loadings from the tributaries; Mill Brook and the Piscataqua River were the same values that were used in the 2008 field survey - combined they are less than one percent of the total BOD loading to the river.

Figure 3 shows the results of the daily minimum and 30-day average water quality model runs. The lowest computed daily minimum DO value directly above Presumpscot Falls is 6.0 ppm, and meets the class C minimum DO criterion of 5.0 ppm. The lowest 30-day average DO value directly above Presumpscot Falls is 7.3 ppm, and meets class C monthly average DO criterion of 6.5 ppm.

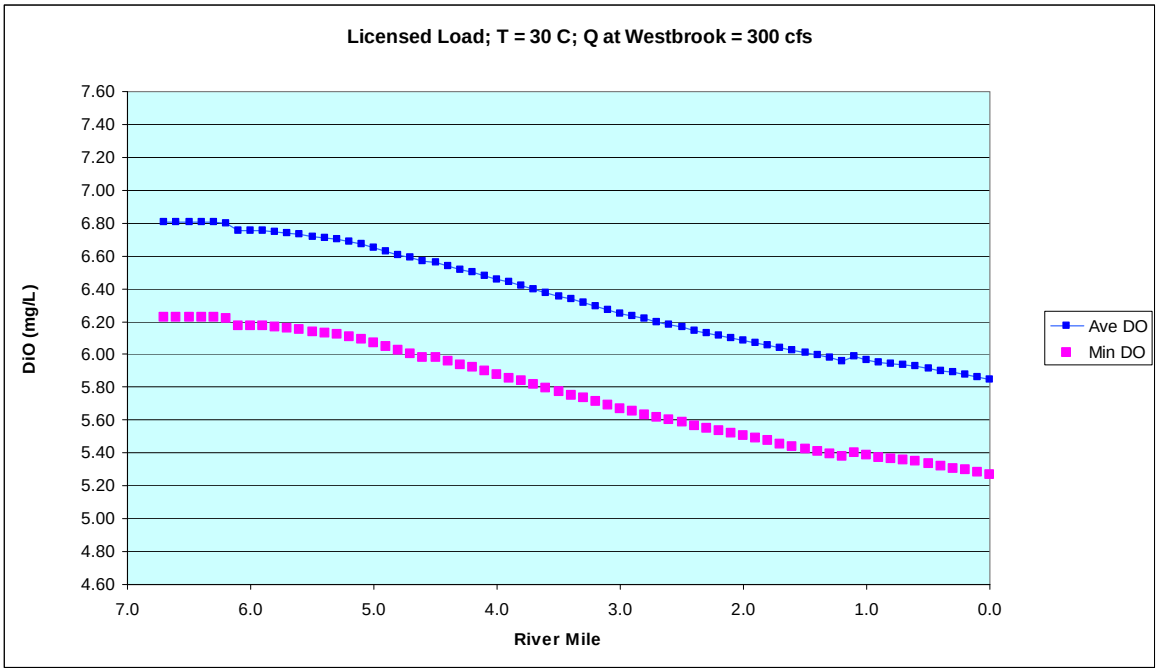
Figure 3. Daily and 30-Day Critical Water Quality Condition Results



Flow Augmentation Curve

As part of the TMDL, the original water quality model was used to develop a temperature based flow augmentation curve as an alternative treatment for non-attainment of class C dissolved oxygen criterion in the lower Presumpscot. The Waste Discharge License (WDL) for the S. D. Warren mill in Westbrook has a condition to comply with a *Temperature Based Flow Regulation Curve for Presumpscot River*. This curve required higher flows from the dam as temperature increased above 22°C to an upper limit of 30°C. A model run was performed with the a flow of 300 cfs, licensed loads and a water temperature of 30°C. The results are shown in Figure 4. At a flow of 300 cfs at Cumberland Mills (270 cfs at Eel Weir) the resulting DO concentration directly above Presumpscot Falls is 5.3 ppm and meets the class C minimum criterion of 5.0 ppm. Under current low flow limits of the WDL, the *Temperature Based Flow Regulation Curve for Presumpscot River* is no longer required to attain class C below Cumberland Mills.

Figure 4. Check of Flow Regulation Curve



Aquatic Life Classification Attainment Study

In September, 2010 An Aquatic Life Classification Attainment Study was performed at a location upstream of the confluence with Mill Brook (River Mile 4.6). An artificial substrate (rock basket) was installed and after approximately six weeks removed and assessed for macroinvertebrate community structure. The final report is included in the appendix.

The aquatic communities were more tolerant to organic pollution and siltation and met the Class C aquatic life criterion, albeit the score was on the low end of the scale; a score of 0.66 with a cut-off at 0.60.

Middle River Impoundments: Gambo to Saccarappa

The Waste Load Allocation (1998) documented non-attainment of class B dissolved oxygen criterion in the Gambo, Little Falls, Mallison, and Saccarappa impoundments during both low and high flow events. The WLA concluded that, during high flow events, non-attainment was primarily due to non-point source pollution from direct runoff and the tributaries, but during low flow events, non-attainment was mostly due to the flow conditions caused by the impoundments. Model runs for the WLA predicted non-attainment of class B criterion within the Little Falls, Mallison Falls and Saccarappa impoundments during critical water quality conditions.

In 2002, as recommended by the DEP, S. D. Warren agreed to provide additional spillage flows of 50 cfs at Dundee and 100 cfs at Gambo whenever river temperatures exceed 22°C, as measured at the Gambo Dam before 8 AM. It was predicted that the increased spillage, in addition to current bypass flow, would provide enough reaeration to attain class B concentrations of DO. This alternative became a condition of the Water Quality Certification (April, 2003) for Presumpscot River Hydro Projects owned by S. D. Warren (Dundee, Gambo, Little Falls, Mallison Falls, and Saccarappa dams). In addition, as part of the condition, S. D. Warren was to continue to monitor and if these impoundments were still in non-attainment, take such actions as are needed to meet dissolved oxygen criteria in the river from Dundee to Saccarappa dam, insofar as the project dams cause or contribute to a violation of these standards under dry weather conditions.

Monitoring in 2008 and 2009 measured DO levels below the class B minimum DO criterion of 7.0 ppm, but both of those years were high flow years and non-point pollution was the expected cause of non-attainment. Monitoring in 2010 (see table 2) documented 14 days with at least one non-attainment reading each day. As a result and as a component of a strategy for river flow and Sebago Lake level management, S. D. Warren has proposed increasing minimum flows from 270 cfs from Sebago Lake to 408 cfs.

In reviewing this proposal, DEP discovered that 400 cfs was used as a critical water flow in our original calculations for the 2002 additional spillage recommendations. As shown in the table, all of the 2010 non-attainment readings occurred at flows below 400 cfs. Assuming S. D. Warren will implement their plan to discharge 408 cfs they will continue to monitor DO levels whenever instream temperatures exceed 22°C. The DEP will continue to review the progress of S. D. Warren as they comply with the conditions of the 2003 Water Quality Certification.

Table 2. Dissolved Oxygen Reading in Middle Impoundments

		GAMBO		LITTLE FALLS		MALLISON		SACCARAPPA	
	Flows	AVE TEMP	AVE DO	AVE TEMP	AVE DO	AVE TEMP	AVE DO	AVE TEMP	AVE DO
DATE	CFS	Deg C	ppm	Deg C	ppm	Deg C	ppm	Deg C	ppm
7/9/2010	**333**	26.7	**6.6**	26.5	**6.5**	26.4	**6.6**	26.9	**6.8**
7/16/2010	**367**	26.5	**6.4**	26.5	**6.6**	26.4	**6.7**	26.1	7.2
7/20/2010	**367**	26.5	**6.6**	26.4	**6.7**	26.3	**6.8**	26.3	7.1
7/23/2010	**367**	25.4	7.3	25.0	7.7	25.0	7.4	24.3	**6.6**
7/26/2010	**367**	24.9	**6.2**	24.7	**6.8**	24.7	**6.8**	24.5	**6.5**
7/29/2010	**367**	26.1	**6.5**	26.0	**6.5**	26.0	**6.6**	25.8	7.0
8/3/2010	**367**	24.9	**6.5**	24.7	**6.8**	24.7	**6.8**	24.4	7.2
8/6/2010	**367**	25.3	**6.9**	25.2	**6.7**	25.1	**6.8**	25.5	7.3
8/9/2010	**333**	25.0	7.0	24.7	**6.9**	24.6	7.0	24.2	7.5
8/19/2010	**270**	24.1	**6.9**	23.8	**6.7**	24.6	**6.9**	23.9	7.0
8/23/2010	**270**	22.9	**6.5**	22.7	**6.7**	22.6	7.0	22.7	7.2
8/31/2010	**270**	23.4	**6.9**	23.2	**6.9**	23.2	7.0	23.0	7.3
9/2/2010	**270**	24.8	**6.7**	24.5	**6.7**	24.5	**6.7**	24.5	7.0
9/8/2010	**270**	23.0	**6.4**	22.7	**6.5**	22.6	**6.7**	22.4	**6.9**

Appendix

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: S-72
Waterbody: Presumpscot River - Station 72
Town: Westbrook
Directions: 3.2 KM BELOW S D WARREN CO.; JUST ABOVE RT. 302 (RIVERTON) BRIDGE

DEP Drainage: Piscataqua - Presumpscot - Saco
HUC8: 01060001
HUC8 Name: Presumpscot
Latitude: 43 42 8.59 N
Longitude: 70 19 32.53 W
Stream Order: 4

Sample Information

Log Number: 1929 Type of Sample: CONE Date Deployed: 7/13/2010
Subsample Factor: X4 Replicates: 3 Date Retrieved: 8/16/2010

Classification Attainment

Statutory Class: C **Final Determination: C** Date: 3/7/2011
Model Result with P>.6: C **Reason for Determination: Model**
Date Last Calculated: 3/4/2011 Comments: Low Class C (.66)

Model Probabilities

First Stage Model			
Class A	0.00	Class C	0.73
Class B	0.02	NA	0.25

C or Better Model	
Class A, B, or C	0.66
Non-Attainment	0.34

B or Better Model	
Class A or B	0.00
Class C or Non-Attainment	1.00

A Model	
Class A	0.00
Class B or C or Non-Attainment	1.00

Model Variables

01 Total Mean Abundance	944.00
02 Generic Richness	30.00
03 Plecoptera Mean Abundance	0.00
04 Ephemeroptera Mean Abundance	37.33
05 Shannon-Wiener Generic Diversity	1.73
06 Hilsenhoff Biotic Index	4.84
07 Relative Abundance - Chironomidae	0.03
08 Relative Generic Richness Diptera	0.37
09 *Hydropsyche* Abundance	2.79
11 *Cheumatopsyche* Abundance	703.82
12 EPT Generic Richness/ Diptera Generic Richness	0.91
13 Relative Abundance - Oligochaeta	0.00
15 Perlidae Mean Abundance (Family Functional Group)	0.00
16 Tanypodinae Mean Abundance (Family Functional Group)	9.33
17 Chironomini Abundance (Family Functional Group)	5.33
18 Relative Abundance Ephemeroptera	0.04
19 EPT Generic Richness	10.00
21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	0.00
23 Relative Generic Richness- Plecoptera	0.00
25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	718.49
26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	26.18
28 EP Generic Richness/14	0.21
30 Presence of Class A Indicator Taxa/7	0.00

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Cheumatopsyche*	74.56
2	*Chimarra*	8.47
3	*Amnicola*	3.39
4	*Maccaffertium*	2.77
5	*Neureclipsis*	1.27
6	*Oecetis*	1.27

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number: S-72 Town: Westbrook Date Deployed: 7/13/2010
Log Number: 1929 Waterbody: Presumpscot River - Station 72 Date Retrieved: 8/16/2010

Sample Collection and Processing Information

Sampling Organization: BIOMONITORING UNIT

Taxonomist: MICHAEL WINNELL

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	26.8 deg C	Temperature:	24.2 deg C
Dissolved Oxygen:	8.2 mg/l	Dissolved Oxygen:	7.9 mg/l
Specific Conductance:	68 uS/cm	Specific Conductance:	66 uS/cm
Velocity:	17 cm/s	Velocity:	
pH:		pH:	6.98
Wetted Width:	40 m	Wetted Width:	40 m
Bankfull Width:	40 m	Bankfull Width:	40 m
Depth:		Depth:	

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain
Upland Hardwood	Open	Flat
Urban		

Potential Stressor	Location	Substrate
Nps Pollution	Below Point Source	
Nutrients		
Urban Runoff		

Landcover Summary - 2004 Data

Sample Comments

7/13/2010 GREEN WATER, FISH. DEPTH NOT MEASURABLE, BUT LOOKED TO BE 2-3M

8/16/2010 GREEN WATER. GOOD FLOW VISIBLE BUT NOT MEASURABLE. D EPTH ALSO NOT MEASURABLE.

Maine Department of Environmental Protection
Biological Monitoring Program

Aquatic Life Taxonomic Inventory Report

Station Number: S-72 Waterbody: Presumpscot River - Station 72 Town: Westbrook

Log Number: 1929 Subsample Factor: X4 Replicates: 3 Calculated: 3/4/2011

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance Actual	Relative Abundance Adjusted
Girardia	03010102002		9.33		--		1.0
Girardia tigrina	03010102002001	9.33			--	1.0	
Placobdella	08030101006		2.67		--		0.3
Placobdella phalera	08030101006006	2.67			--	0.3	
Stylurus	09020302018		1.33	4	PR		0.1
Stylurus spiniceps	09020302018041	1.33			--	0.1	
Argia	09020309048	2.67	2.67	7	PR	0.3	0.3
Heptageniidae	09020402	6.67			--	0.7	
Stenacron	09020402014	8.00	9.82	7	SC	0.8	1.0
Maccaffertium	09020402015	17.33	26.18	4	SC	1.8	2.8
Maccaffertium modestum	09020402015051	4.00			--	0.4	
Tricorythodes	09020411038	1.33	1.33	4	CG	0.1	0.1
Chimarra	09020601003	80.00	80.00	2	CF	8.5	8.5
Neureclipsis	09020603008	12.00	12.00	7	CF	1.3	1.3
Polycentropus	09020603010	8.00	8.00	6	PR	0.8	0.8
Hydropsychidae	09020604	30.67			--	3.2	
Cheumatopsyche	09020604015	673.33	703.82	5	CF	71.3	74.6
Hydropsyche	09020604016		2.79	4	CF		0.3
Hydropsyche placoda	09020604016059	2.67			--	0.3	
Macrostemum	09020604018		1.39	3	CF		0.1
Macrostemum zebratum	09020604018054	1.33			--	0.1	
Oecetis	09020618078	5.33	12.00	8	PR	0.6	1.3
Oecetis persimilis	09020618078157	6.67			--	0.7	
Ablabesmyia	09021011001		5.33	8	PR		0.6
Ablabesmyia mallochi	09021011001004	1.33			--	0.1	
Ablabesmyia monilis	09021011001009	4.00			--	0.4	
Pentaneura	09021011014		4.00	6	PR		0.4
Pentaneura inconspicua	09021011014028	4.00			--	0.4	
Cricotopus	09021011037		1.33	7	SH		0.1
Cricotopus bicinctus	09021011037057	1.33			--	0.1	
Nanocladius	09021011049	1.33	1.33	3	CG	0.1	0.1
Cladotanytarsus	09021011068	1.33	1.33	7	CG	0.1	0.1
Tanytarsus	09021011076	8.00	8.00	6	CF	0.8	0.8
Chironomus	09021011080	1.33	1.33	10	CG	0.1	0.1
Cryptochironomus	09021011082	1.33	1.33	8	PR	0.1	0.1
Polypedilum	09021011102		2.67	6	SH		0.3
Polypedilum ontario	09021011102194	2.67			--	0.3	
Saetheria	09021011132		1.33		--		0.1

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Taxonomic Inventory Report

Station Number: S-72 Waterbody: Presumpscot River - Station 72 Town: Westbrook

Log Number: 1929 Subsample Factor: X4 Replicates: 3 Calculated: 3/4/2011

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance Actual	Relative Abundance Adjusted
Saetheria tylus	09021011132001	1.33			--	0.1	
Hemerodromia	09021016057	1.33	1.33	3	PR	0.1	0.1
Dubiraphia	09021113064	1.33	1.33	6	--	0.1	0.1
Stenelmis	09021113070		1.33	5	SC		0.1
Stenelmis crenata	09021113070055	1.33			--	0.1	
Amnicola	10010104013		32.00		SC		3.4
Amnicola limosa	10010104013018	32.00			--	3.4	
Physa	10010202026	4.00	4.00		SC	0.4	0.4
Sphaeriidae	10020201	2.67	2.67		CF	0.3	0.3