

US EPA ARCHIVE DOCUMENT

## **PROPOSED ASSABET MONITORING PLAN TO ASSESS PROGRESS TOWARDS MEETING THE PHOSPHORUS TMDL**

### **Goal**

In order to assess the progress made towards obtaining the water quality goals set forth in the phosphorus (P) TMDL for the Assabet River, a systematic monitoring plan needs to be established. By conducting long-term monitoring, it will be possible to determine the effectiveness of the management controls as they are implemented, whether water quality standards have been achieved and if additional source controls will be required. The specific goal of the monitoring plan for the Assabet River is to measure the progress of improving water quality as phosphorus loads from POTW point sources and sediment flux are reduced.

Objectives of monitoring water quality in the Assabet River in conjunction with the TMDL for P.

1. To capture some of the variability in the baseline conditions prior to the major reductions of P in POTW effluents and ultimately from sediment from which progress will be measured through monitoring at 12 “sentinel” stations on an annual basis and through a proposed full survey of water quality in 2006 and every five years thereafter.
2. Document the changes in water quality through the surveys mentioned in item 1 as POTWs optimize P removal during the period before treatment facilities are upgraded (note that it is reported that discharges of P have been reduced by 64% since 1998<sup>1</sup>, approximately the time when the current baseline was established.)

### **TMDL Targets**

The following were identified as targets in the Assabet nutrient TMDL for achieving water quality goals (TMDL, page 37, item 6):

- At least a 50% reduction in total biomass compared to July 1999 measured values. The biomass of floating plants will be estimated in the proposed 2006 survey including the use of a photographic technique. This latter method will be continued between 2006 and the next full survey in 2011.

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<sup>1</sup> Camp Dresser and McKee in comments on the draft NPDES permits for the POTWs on the Assabet River

<sup>2</sup> The original TMDL did not stipulate greater than 125% but used total duration of saturation over 100%. The use of the 125% value is in response to comments received on the draft TMDL.

- A 30% reduction in the duration of DO concentrations above 125% saturation caused by biomass<sup>2</sup> based on DO records deployed in selected impoundments and during proposed full surveys in 2006 and 2011.
- Maintenance of DO  $\geq 5$  mg/L at low flow (7Q10 and above) at all times based on DO records deployed in selected impoundments and during proposed full surveys in 2006 and 2011.

These targets were to be achieved through reduced inputs of total phosphorus from the four POTWs with seasonal limits of 0.1 mg P/L and from a 90% reduction of phosphorus released by sediments.

While response variables, rather than ambient total phosphorus in-stream concentration were targeted in the TMDL, TP and DP need to be measured for this monitoring program in order to better define the link between chemistry and response variables in the Assabet River system.

### **Measures of progress through monitoring**

Several variables related to water quality are the metrics by which progress will be measured. These include the following:

- Extent and biomass of duckweed (the principal aesthetic problem)
- Supersaturation duration above 125% as measured by diurnal variation in dissolved oxygen at 5 locations in the Assabet River
- Minimum dissolved oxygen concentrations
- Concentration of Total Phosphorus and Dissolved Phosphorus at 12 (referred to as sentinel) locations in the river as well as in the effluents at the 4 POTWs

In addition to these measurements, this effort will include more extensive measurement of the magnitude of P flux from sediment in both impounded and free flowing portions of the river to better define this important source of phosphorus. The flux from the sediment is expected to respond (over time) to decreases of P concentrations in water column.

To accomplish this, the following monitoring plan is proposed:

1) Monitoring a set of sentinel locations for N and P yearly (starting in 2006 at 6 times during the growing season: late June, mid and late July, mid and late August and mid September). In addition, sampling of TP and DP will be conducted monthly at the inlet (Sudbury Road) and outlet (above dam or below if ice is a problem) of Ben Smith impoundment. The objective is to estimate whether P is accumulating in the impoundment and may require estimating flow (or assuming it is constant).

1. Above Westborough POTW (Maynard Street)
2. Route 9
3. Boundary Road
4. Below Marlborough West (Robin Hill Road)

5. Cox Street (Above Hudson)
6. Route 62 (Below Hudson)
7. Sudbury Rd, Stowe (in Ben Smith impoundment)
8. Ben Smith above dam
9. Outlet of Powdermill impoundment
10. The mouth of Nashoba Brook (to aid in estimating loads from non-point sources)
11. The Assabet just before confluence with Sudbury
12. The Sudbury just before confluence with Assabet

Sentinel stations 11 and 12 are important investments in anticipation of furthering the overall analysis into the Concord River.

The locations are marked on the accompanying photographs.

In addition to the water column sampling of TP, DP, TKN, NH<sub>3</sub> and NO<sub>2</sub>/NO<sub>3</sub>, these need to be measured in discharges by the POTWs along with the other constituents normally monitored.

2) Intensive sampling during two days (Tuesday and Thursday) 3 separate weeks in 2006 including the acquisition of hydrologic and climatologic information necessary to fully assess the data and to include the following stations in addition to the sentinel ones listed previously:

- Above Westborough POTW (Maynard Street)
- Route 9 (below Westborough POTW)
- School Street, Northborough
- Route 20 below dam (above Allen St impoundment)
- Boundary Street above Marlborough Westerly POTW
- Below Marlborough Westerly POTW at Robin Hill Road bridge
- Bigelow St, Marlborough (aka Bridge St, Berlin)
- Chapin Road, Hudson
- Rt 85/Washington St, Hudson
- Above Hudson POTW at Cox Street bridge
- Below Hudson POTW (Gleasondale bridge)
- Sudbury Rd, Stowe (in Ben Smith impoundment)
- White Pond Rd, Stowe (in Ben Smith impoundment)
- Below Maynard/Powdermill Impoundment
- Last station on Assabet
- Last Station on Sudbury

During each week, instrumentation which records dissolved oxygen, temperature pH and conductivity will be deployed at two locations in Ben Smith impoundment and one each in Hudson, Gleasondale and Powdermill impoundments.

Flow needs to be measured at as many of these stations as possible so that loads can be calculated. At a minimum, flows will be estimated based on drainage areas and measurements at the USGS gaging station in Maynard.

### **P Flux from Sediment**

One round of measuring P flux from the sediment should be conducted over a wide spatial range to better capture the role this process plays in the dynamics of P in the Assabet River. This should be done during 2006 if possible, or possibly through the evaluation being conducted by the Army Corps of Engineers, but in any event before the anticipated achievement of the reaching 0.1 mg/L TP in the wastewater effluents. This would be repeated during the 2011 survey, which would be the first comprehensive evaluation after P concentration in the POTW effluents was reduced to 0.1 mg/L.

At least some aspects of sediment (and dam removal) issues will be addressed under the ACOE study. One priority is to better define the magnitude and extent of P flux from the sediment, which the Corps study may be able to pursue.

### **Estimates of Biomass**

Estimates of the extent of duckweed coverage in five impoundments: Allen Street, Hudson, Gleasondale, Ben Smith and Powdermill. This might best be done by aircraft. If done from land, would need to recon best vantage points, not just the bridges. Would be hard to do from a boat. The Riverways Program has prepared a QAPP for photo documentation of changes in the Millers River, which can serve as a template with appropriate modifications.

### **Conclusion and Recommendation**

Pre- and post effluent P reduction to 0.1 mg/L monitoring efforts need to be chosen with respect to the expectations for data usage and for the information the data will supply. Paramount concerns are the natural variability of the Assabet system, which argues for annual monitoring, and a focus on the TMDL targets. The proposed efforts are summarized in the following table.

## Summary of Proposed Monitoring Efforts

<b>YEAR</b>	<b>12 SENTINEL STATIONS<sup>1</sup></b>	<b>Full WQ Survey<sup>2</sup></b>	<b>Measure Sediment P Flux</b>
2005	Reconnaissance		
2006	▼	▼	▼
2007	▼		
2008	▼		
2009	▼		
2010	▼		
2011	▼	▼	▼
2012	▼		

<sup>1</sup> N-Series, TP, DP, Flow, surface coverage by floating plants (Ben Smith) 6 times during the growing season. This effort also includes monthly sampling for TP and DP during the period when winter limits for P are in force at the inlet and outlet of Ben Smith to estimate whether any accumulation of P is occurring.

<sup>2</sup> To be conducted for 3 separate weeks during the growing season. Sampling will be on Tuesday and Thursday during each of the 3 weeks. POTW effluent sampling should be done daily during each week.