

## EPA - NEW ENGLAND'S REVIEW of MAINE'S PRESUMPSCOT RIVER TMDL

Maine Department of Environmental Protection (ME DEP) presented EPA -New England with the final clarification requested for the Presumpscot River TMDLs for biological oxygen demand (BOD) and total suspended solids (TSS) in a letter dated August 28, 1998 (received by EPA September 4, 1998.) The TMDL submittal consists of the following documents:

- *Presumpscot River WLA Final Report, November 1995.*
- Presumpscot River WLA/TMDL clarification letter on additional model runs, dated July 29, 1996 (letter to Stephen Silva, EPA, from David Courtemanch, ME DEP).
- Response to public comment letter dated October 30, 1996 (letter to Paul Porada, Woodard and Curran Environmental Services, from Paul Mitnik, P.E., ME DEP).
- *Presumpscot River Supplemental Report to Waste Load Allocation*, and cover letter dated **March 28, 1998** (letter for public distribution from Paul Mitnik, ME DEP).
- *Lower Presumpscot River TMDL Responses to Public Comment*, and cover letter dated **June 29, 1998** (letter to Stephen Silva, EPA, from Paul Mitnik, ME DEP).
- *Presumpscot River TMDL* clarification letter dated August 28, 1998 (letter to Stephen Silva, EPA, from Paul Mitnik, ME DEP).

Also included in the approval file are the following correspondence to ME DEP from EPA-New England:

- Letter of EPA *Review Comments on the Presumpscot River Waste Load Allocation Report*, to David Courtemanch, ME DEP from Steve Silva, EPA, dated June 27, 1996.
- Letter of EPA comments on a preliminary review of the Presumpscot River TMDL, to Paul Mitnik, ME DEP, from Stephen Silva, EPA, dated May 28, 1998.
- Letter of EPA requests for final clarification and consistency with the Maine State discharge license, to Paul Mitnik, ME DEP, from Stephen Silva, EPA, dated August 24, 1998.

The following review explains how ME DEP's TMDL submittal meets the statutory and regulatory requirements of TMDLs in §303(d) of the CWA and in 40 CFR Part 130:

### **Introduction/Background Information**

The Presumpscot River, located in southern Maine, originates at the outlet of Sebago Lake. The river flows in a southeasterly direction through Gorham and Windham, into Westbrook and Portland, and eventually into Falmouth before emptying into Casco Bay. Flow in the river is highly regulated from Sebago Lake by a dam owned by Sappi (S.D. Warren Co.). The river's drainage area of 441 square miles at its source at Sebago Lake increases to 647 square miles at its mouth at the Martins Point bridge in the tidal estuary. The study reach that was involved in the

water quality studies of 1993, 1994, and 1995 includes that portion of the river from the Gambo Falls dam in Gorham and Windham to the Martins Point bridge in Falmouth: fifteen riverine miles and nearly three estuarine miles.

The TMDLs for BOD and TSS apply only to a 6.5 mile portion of the *lower Presumpscot River*, a subsection of the study area, from Cumberland Mills dam in Westbrook to the Martins Point bridge in Falmouth. This portion of the Presumpscot River is listed on the 1996 and 1998 "Maine Section 303(d) Waters" lists. The TMDLs have been submitted to EPA pursuant to Section 303(d) and are consistent with the listing and ranking approved by EPA October 21, 1998. Causes for impairment are identified in the 1998 303(d) list as BOD, TSS, and color due to point source pollution. The Presumpscot River is indicated in the 1998 303(d) list as a high priority for TMDL development, and is targeted for TMDL completion during the earliest (" $<2000$ ") year category.

The TMDLs show that there are two point sources discharging to the study reach which contribute significantly to the water quality problems due to BOD and TSS:

- one municipal wastewater treatment plant
- one pulp and paper facility.

Impairments to water quality in the Presumpscot River that relate to the TMDLs involve:

- nonattainment of dissolved oxygen (DO) standards due to BOD loadings in the river, and related to water temperatures;
- aquatic life standards due to TSS loadings in the river.

ME DEP's report shows that Sappi (S.D. Warren Co.) is responsible for the predominant share of BOD loading to the river, which contributes significantly to the DO impairment. At a discharge of 6,780 - 12,000 lb/day BOD<sub>5</sub>, Sappi's discharge accounts for 67-72% of the BOD loading to the Lower Presumpscot River.

ME DEP also explains that "The lower Presumpscot River has historically been plagued with high TSS as a result of TSS discharged from the S.D. Warren Co. outfall." Solids settle out and blanket the habitat used by macroinvertebrates; suspended solids also interfere with fish gills' ability to function. "Macroinvertebrate data collected by ME DEP in 1995 and 1996 below the mill outfall have revealed the lower Presumpscot does not attain class C aquatic life standards. In contrast, macroinvertebrate data taken about 1500 feet above the mill outfall in 1996 and preliminary data taken above the mill outfall in both the Gambo and Little Falls impoundments in 1997 indicate attainment of class C aquatic life standards." (March 1998 report, page 21.)

The State also reports an overall poor aesthetic quality due to total suspended solids (TSS) and color, and problems with heat. Critical conditions for the study area occur during the summer time when temperatures are high and flow tends to be low.

## State Public Participation Process

The ME DEP explains that the 1995 WLA study of an 18 mile segment of the Presumpscot River was a cooperative effort among individuals from industry, municipalities, citizen groups, and state agencies. Among the parties participating included:

- ME DEP
- S.D. Warren Co.(now owned by Sappi)
- Portland Water District (PWD)
- Friends of the Presumpscot
- Town of Windham
- Windham Water Resources Commission.

Individuals from these groups participated in the actual field work and the planning of the study. The PWD, SDW Co., and the DEP shared the responsibility of the funding of the study." (Page 1 1995 report)

The March 1998 supplemental report, along with a copy of the 1995 wasteload allocation, was distributed to the same stakeholders involved in the 1995 study and to other interested parties for review and comment on March 28, 1998. The report cover letter explained the updated recommendations for cleanup of the river and asked for comments to be submitted prior to the end of April 1998. The ME DEP also published a public notice in the Portland Press Herald. (Personal communication with Paul Mitnik, ME DEP, Nov. 4, 1998.)

The June 29, 1998 report includes ME DEP's responses to public comment of the TMDL for BOD and TSS of the lower Presumpscot River. ME DEP received four letters of comment: Sappi Fine Paper, Natural Resources Council of Maine, and Friends of the Presumpscot, and EPA. EPA-New England reviewed both the comment letters and ME DEP's summary of and response to comment. We conclude that ME DEP did a thorough job of characterizing and responding to the public comments in the June 29, 1998 report.

## Applicable State Water Quality Standards

The Presumpscot River is listed on Maine's 1998 303(d) list for BOD, TSS, and color from point source pollution. The waterbody is categorized in the highest priority ranking for TMDL development. The TMDL reports are submitted for BOD and TSS for the lower Presumpscot River (Westbrook to Falmouth), and water quality standards for dissolved oxygen and aquatic life for classes C (freshwater) and SC (marine) are applicable. Maine describes the extent and severity of impairment in its TMDL submittal.

The following designated uses for fresh and marine waters serve as goals for both the BOD and TSS TMDLs:

### Class C designated uses:

"Drinking water supply after treatment, fishing, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, except as prohibited under Title 12, section 403, and navigation, and as a habitat for fish and other aquatic life." (38 MRSA

465(4)(A)).

Class SC designated uses (marine):

"Recreation in and on the water, fishing, aquaculture, propagation and restricted harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation and as a habitat for fish and other estuarine and marine life." (38 MRSA 465-B(3)(A)).

The following water quality criteria serve as the numeric (and narrative) water quality targets for the BOD and TSS TMDLs:

***-BOD TMDL***

Applicable numeric criteria for Class C:

"The dissolved oxygen content of Class C water may be not less than 5 parts per million or 60% of saturation, whichever is higher...". (38 MRSA 465(4)(B))

Applicable numerical criterion for freshwater:

As a policy, ME DEP uses EPA's dissolved oxygen criterion of 6.5 ppm monthly average to support cold water fisheries and to assess whether water is of sufficient quality to support "indigenous" fish, as referenced in Maine's statutory narrative criteria for fresh and marine waters (see below).

Applicable numerical criterion for SC (marine):

"The dissolved oxygen content of Class SC waters shall be not less than 70% of saturation." (38 MRSA 465-B(3)(B))

***-TSS TMDL***

Applicable narrative criteria for Class C:

"Discharges to Class C waters may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community." (38 MRSA 465(4)(C))

Applicable narrative criteria for SC:

"Discharges to Class SC waters may cause some changes to estuarine and marine life provided that the receiving waters are of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community." (38 MRSA 465-B(3)(C))

ME DEP has a well established biomonitoring program, methods for determining aquatic life impairment, and procedures for interpreting compliance with the above narrative aquatic life water quality standards. To implement the narrative standard, "maintain the structure and



function of the resident biological community", ME DEP has prepared the following for use in Maine:

- *Methods for Biological Sampling and Analysis of Maine's Inland Waters* (S. Davies and L. Tsomides, Revised June 1997);
- draft DEP regulation *CMR Ch 580 Section 5: Environmental Evaluation: Methods of Water Analysis and Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams*.

The methods document establishes minimum quantitative provisions for biological samples prior to further analysis, and specifies statistical decision models that use quantitative ecological attributes of the macroinvertebrate community to determine attainment of the different classes of standards for aquatic life.

### Analytical Methods Used

Following is a discussion on the approaches used by ME DEP to establish TMDLs for biochemical oxygen demand (BOD) pollutant loading and total suspended solids (TSS). As required per 40 CFR 130.7, the TMDLs were established considering all known pollutant sources and taking critical conditions and seasonal variation into account. A discussion of how a margin of safety (MOS) was included in the TMDLs is presented in a separate section of this document.

ME DEP quantified existing known sources of BOD and TSS to the lower Presumpscot River. Figures 2 and 3 from the June 1998 report show the relative source load contributions for ultimate BOD (figure 2) and TSS (figure 3) at both current permitted design conditions and for the proposed TMDL. As indicated, Sappi Fine Paper's discharge is clearly the largest load to the river for both pollutants. At current conditions, Sappi accounts for more than 70% of the ultimate BOD and 80% of the TSS entering the lower Presumpscot River at low flow conditions. Even with the proposed reduction in place, Sappi's discharge is still estimated to be the source of about 2/3 of the ultimate BOD and TSS entering the lower Presumpscot River.

As shown in Figures 2 and 3 as well as Tables 1 and 2 of the June 1998 report, Maine has also quantified background BOD and TSS loadings which include both natural contributions and nonpoint pollution sources from the contributing watershed. ME DEP reports that when considering nonpoint inputs to the lower Presumpscot, the direct tributary loading of the upper Presumpscot cannot be used due to the fact that assimilation of BOD and settling of solids occurs in the Presumpscot River before encountering the lower Presumpscot. It is the background above the Westbrook and Sappi outfalls which is the relevant amount of pollutants entering the lower Presumpscot.

- **Dissolved Oxygen/Biochemical Oxygen Demand.** ME DEP modeled dissolved oxygen in the Presumpscot River and estuary to establish the cause and effect relationship between the numeric targets for D.O. water quality standards for class C and SC waters, and the identified point sources of BOD. (The numeric targets used were both the Maine standard of 5ppm as a daily

minimum, and the EPA criterion of 6.5 ppm as a monthly average.)

Two different water quality models were used for the modeling analysis in this project. The steady state model, QUAL2E was used for the fifteen miles of fresh water. For the three estuarine miles, the hydro-dynamic water quality model, WASP4 was used to simulate the dynamic conditions that result from the changing of the tides and stratification at the head of the estuary. The modeling was conducted by first running QUAL2E and then using its terminal conditions of dissolved oxygen and BOD as initial boundary conditions for WASP4.

The model (QUAL2E linked to WASP4) was calibrated and verified using a time of flow study, cross sectional data, sediment oxygen demand data and two intensive water quality data sets collected during critical low flow conditions that occurred in the summer of 1993. In addition, the models were re-verified using continuous D.O. data collected during 1994 and 1995. The 1995 WLA report fully describes the water quality model, the hydraulic modeling, chemical calibration of the model, sensitivity analysis, and model projections at design conditions. These model projections at design conditions were updated in the March 1998 report. (See also the July 29, 1996 letter to EPA from ME DEP on the 35 additional verification runs that were undertaken with the appropriate adjustments made in the model.) The 1995 and March 1998 reports by ME DEP explain the basis for assumptions made in the model, strengths and weaknesses in the analytical process, and results from water quality modeling.

Based on our review of the model development documentation and calibration results, we believe the model is well calibrated and suitable for predicting in-stream D.O. levels resulting from various pollutant loading scenarios, and establishing **wasteload allocations (WLAs)** and **load allocations (LAs)** (as per 40 CFR §130.2(g))

- **Total Suspended Solids.** ME DEP contends that the solids loading from Sappi's discharge is the primary, if not the sole, cause of the aquatic life impairment observed below Sappi's discharge. A review of ME's assessment of the data supports this position. The TSS TMDL was established using available solids loading data of Sappi's discharge, in-stream background solids data, and macroinvertebrate data collected upstream and downstream from Sappi's discharge. In addition, ME-DEP utilized similar data collected from the Androscoggin River in the vicinity of International Paper's (IP) discharge before and after significant reductions of solids loadings occurred from IP's discharge. These data revealed that a relationship exists between the magnitude of solids loading from the mills and the level of impact on aquatic life.

Maine assesses attainment of the aquatic life standards by monitoring the macroinvertebrate community using artificial substrates placed in-stream. Using a variety of standard biological indexes, ME DEP quantitatively determines whether an impairment exists. A relationship between the magnitude of solids loading and the attainment or nonattainment of aquatic life standards was demonstrated by plotting the average solids load discharged from Sappi (to the Presumpscot River) and International Paper (to the Androscoggin River) for each of the monitoring periods (two on the Presumpscot and three on the Androscoggin). Then each survey

was identified as either attaining or not attaining aquatic life standards. To assist Maine in establishing the TMDL for critical low flow conditions, the solids loading data were prorated to critical low-flow conditions (30Q10).

In the case of the Presumpscot data, both surveys showed nonattainment while two of the three surveys of the Androscoggin showed attainment. It is important to note that the surveys showing attainment in the Androscoggin were observed following a significant reduction in solids loading from International Paper. Based on this information, ME DEP selected the TMDL for low flow conditions which it believes has a good chance of resulting in attainment of water quality standards when reductions are fully implemented.

One of the strengths of ME DEP's approach is that it relies on in-stream macroinvertebrate data, which are a direct measure of the biological health, under various solids loading conditions. Thus, ME DEP can confidently assert that at certain solids loading conditions aquatic life standards will not be met. The weakness of this approach is that there are limited data to use in a predictive mode. For example, ME DEP cannot confidently predict *exactly* how much Sappi needs to reduce its solids loading in order to attain water quality standards. Although the Androscoggin data are very useful for demonstrating the resulting improvements to water quality following significant reductions in solids discharged by the mill, one must exercise care in interpreting this data to determine necessary solids loading reductions to the Presumpscot River. Caution is warranted primarily due to the physical differences between the two rivers. Strengths and weaknesses of the TSS model are also discussed in the Maine's June 1998 response to public comment. Overall, we believe Maine has used the best available information and we concur with Maine's approach and believe it is reasonable for establishing the TSS TMDL for the lower Presumpscot River.

### **TMDLs for BOD and TSS**

The ME DEP presents the **loading capacity** (as per 40 CFR §130.2(f)) of the lower Presumpscot River as the TMDLs for BOD and TSS which, by definition, are equal to the sum of the WLAs and LAs. The derivation of these TMDLs take into account critical conditions and **seasonal variation** (as per CWA §303(d)(1)(C); 40 CFR§130.7(c)(1)). For both pollutants critical conditions occur during the summer when low flow and high temperature conditions prevail in the Presumpscot River. Thus, the TMDL for BOD was specifically set for the period from June 1 to September 30 of each year and the TMDL for TSS was set for the period from June 1 to October 30 of each year.

During nonsummer conditions the allowable loading capacity of the lower Presumpscot River increases significantly for both pollutants for similar reasons. For BOD, lower temperatures and higher river flows results in a significantly lower oxygen demand exerted in the lower Presumpscot. In addition, as water temperatures decrease the solubility of oxygen increases dramatically and higher levels of DO are more easily maintained. For TSS, higher river flows

are the primary reason the loading capacity increases during the nonsummer period. As flows increase so do flow velocities which results in less deposition of solids to critical areas. Review of USGS flow gaging data reveal that on average flow rates increase by a factor of two to three times from November to the end of May.

These higher flows that occur in the nonsummer months in the Presumpscot are also relevant when evaluating the seasonal variation of background and nonpoint BOD and TSS loadings and their impact on water quality. ME DEP reports that BOD and TSS impact the lower Presumpscot most in the summer low flow period, and that the majority of the loading entering the lower Presumpscot in the nonsummer passes through the system and has minimal impact upon it. Again, accumulation of sediment on the river bottom is typically flushed during high flow periods.

**BOD.** ME DEP performed numerous predictive modeling runs to determine allowable BOD loadings from existing sources for critical low-flow conditions using estimated 7Q10 and 30Q10 flows and a scenario where additional flows are released to the river from Sebago Lake (headwater to the Presumpscot River) depending on river temperatures. For this third scenario, the model was used to derive a flow versus temperature curve (QVT) which specifies how much flow must be released to the Presumpscot depending on river temperature and a constant BOD loading from Sappi. Sappi operates the dam at the outlet of Sebago Lake, and, within certain explicitly specified constraints, has control over how much flow is released to the Presumpscot River. The flow management plan was developed with input from a variety of parties with interests ranging from maintaining adequate lake levels to support lake recreation to public water supply.

Ultimately, the final TMDL for BOD is based on the QVT curve and reduced BOD loadings from Sappi. As mentioned in the introduction, Sappi's discharge is responsible for 67-72% of the BOD loading to the Lower Presumpscot River at discharges of 6,780 - 12,000 lb/day BOD<sub>5</sub>. The reduction in BOD loadings from Sappi (45%) in combination with available river flow based on the final QVT curve, will result in attainment of all dissolved oxygen standards in the lower Presumpscot River and estuary, including minimum class C (5ppm and 60% of saturation), minimum class SC (70% of saturation), and monthly average C (6.5 ppm).

Table 1 presents the seasonal ultimate BOD TMDL for the lower Presumpscot River which includes the wasteload allocations for point sources and load allocations for natural background and nonpoint sources. In actuality, the load allocations to background and nonpoint sources varies in accordance with the QVT curve and is equal to the flow times the background concentration of 2.9 mg/l. For example, for an average 30 day temperature of 26 degrees the required flow to be released from Sebago Lake is 445 cfs. Therefore, the monthly average daily LA is 6950 lbs/day (445 cfs x 2.9 mg/l BOD x a unit correction factor). It should be noted that the load allocations to background and nonpoint sources presented in Table 1 are applicable only for critical low flow conditions (30Q10 flow for monthly average daily load, and 7Q10 for daily maximum load). These numbers were established by multiplying the measured background

concentrations times the estimated critical low flow as specified in footnotes 1 and 2 of Table 1. Because the 7Q10 flow is less than the 30Q10 flow, the daily maximum load allocation is lower than the monthly average daily load.

**Table 1. Ultimate BOD TMDL for Critical Low Flow Conditions**

| Source   | Monthly Average (lb./day)    | Daily Maximum (lb./day)      |
|--|------------------------------|------------------------------|
| <u>Load Allocations</u><br>(Background including NPS)              | 5103 <sup>(1)</sup>          | 4635 <sup>(2)</sup>          |
| <u>Wasteload Allocations</u><br>Sappi Fine Paper<br>Westbrook WWTF | 15794 <sup>(3)</sup><br>4211 | 22712 <sup>(3)</sup><br>6316 |
| <b>Total Maximum Daily Load</b>                                    | <b>25,108</b>                | <b>33,663</b>                |

(1) Applicable only for 30Q10 flow of 330 cfs

(2) Applicable only for 7Q10 flow of 300 cfs

(3) Applicable June 1 to September 30

TSS. ME DEP established a seasonal TSS TMDL for low flow conditions using available data as described previously. Because of the uncertainty involved with accurately establishing the loading capacity for TSS in the lower Presumpscot River, Maine has proposed a phased approach. Under this approach, Sappi is required to make significant reductions in its TSS loadings (e.g., monthly average permitted TSS load to be reduced from 14,400 to 5,500 lbs/day) to the lower Presumpscot while additional monitoring is conducted. If aquatic life standards continue to be in nonattainment following the load reductions, the TMDL and the state discharge license will be revised as soon as the necessary information is available (August 28, 1998 letter). Sappi's discharge license issued by ME DEP in July 1998 requires that Sappi's monthly average solids load be further reduced to 4250 lbs/day if, after five years from the date of the license, the monitoring indicates aquatic life standards are not attained.

Consistent with the concept of the phased approach, a monitoring plan has been developed to collect additional data in the lower Presumpscot River under reduced TSS loading conditions. Because ME DEP believes Sappi's TSS loading is the primary cause of nonattainment, it has required Sappi, by way of a discharge license condition, to conduct annual macroinvertebrate monitoring of the lower Presumpscot during the next five years. A schedule for monitoring and other actions was written into the July 1998 state wastewater discharge license (See August 28, 1998 letter from ME DEP to EPA).

Table 2. presents the seasonal TSS TMDL for the lower Presumpscot which specifies the WLAs and LA. As indicated, the TMDL is expressed as a monthly average daily loading because the macroinvertebrate community is not generally sensitive to short term variations in loadings but is more sensitive to loadings that occurs over an extended period of time. The monthly time frame is also similar to the time period (28 days to 2 months) allowed for the macroinvertebrates to

colonize the artificial substrates. Similar to the BOD TMDL, the TSS load allocations to background and nonpoint sources are applicable for only critical low flow conditions specified as the 30Q10 flow of 330 cfs.

**Table 2. TSS for Critical Low Flow Conditions**

| Source   | Monthly Average (lb./day)   |
|--|-----------------------------|
| <u>Load Allocations</u><br>(Background including NPS)              | 1987                        |
| <u>Wasteload Allocations</u><br>Sappi Fine Paper<br>Westbrook WWTF | 5500 <sup>(1)</sup><br>1126 |
| Total Maximum Daily Load   | 8613                        |

(1) Applicable June 1 to October 30

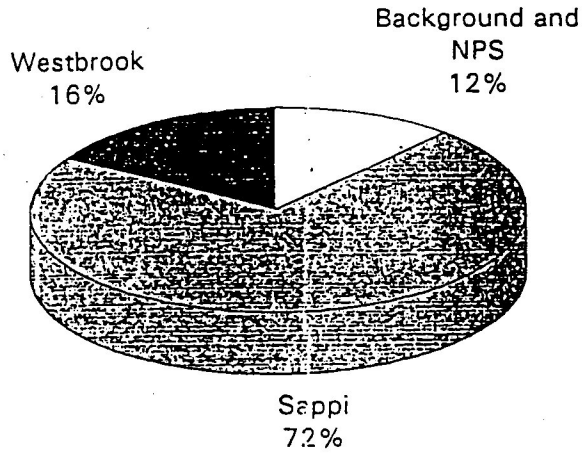
**Margin of Safety (MOS) (CWA §303(d)(1)(c); 40 CFR §130.7(c)(1))**

The Presumpscot River TMDLs for BOD and TSS include implicit margins of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality. The ME DEP lists the conservative assumptions made in the analysis on page 19 of the March 1998 report. The assumptions include the following:

- Rounding up required flows from the temperature based flow regulation (QVT) curve to the nearest 50 cfs.
- Some MOS is also realized due to the fact that the intervening drainage adjustment of 30 cfs for Sebago Lake to Westbrook is based on 10 year low flow conditions. Most of the time, the intervening flow will probably exceed this value resulting in more flow at Westbrook than deduced by this analysis.
- A buffer of 0.1 to 0.2 ppm for dissolved oxygen (DO) is automatically maintained in the lower Presumpscot, since 68% of saturation as a daily average is used to derive the QVT curve (the 68% of saturation above the Smelt Hill dam results in attainment of SC (marine class C) DO standards in the estuary).
- MOS is automatically provided in the estuary since dam reaeration is now provided for 100% of the flow spilling over the Smelt Hill dam. Due to damage in the 1996 flood, the dam is not currently used for hydropower generation. If the dam is refurbished in the future, spillage could be required under low flow situations to maintain the MOS.
- Use of the 30Q10 flow to establish the TSS TMDL is conservative.

Figure 2 Components of Ultimate BOD Loading to Lower Presumpscot River

Components of Ultimate BOD Loading  
To the Lower Presumpscot River  
Sappi at 12000 lb/day BOD5



Components of Daily Maximum Ultimate BOD TMDL  
to the Lower Presumpscot River  
Sappi at 6780 lb/day BOD5

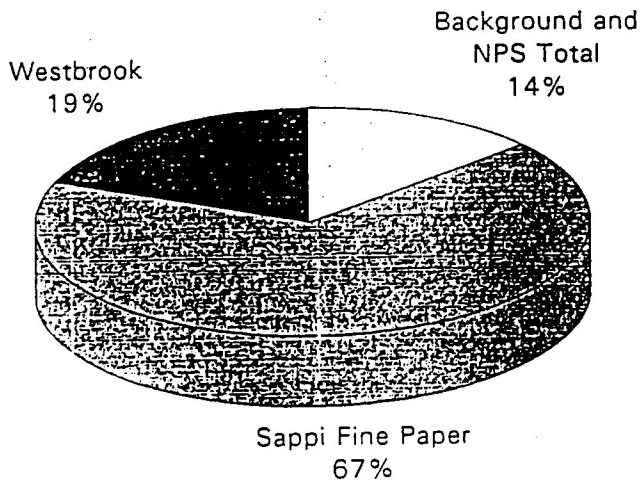
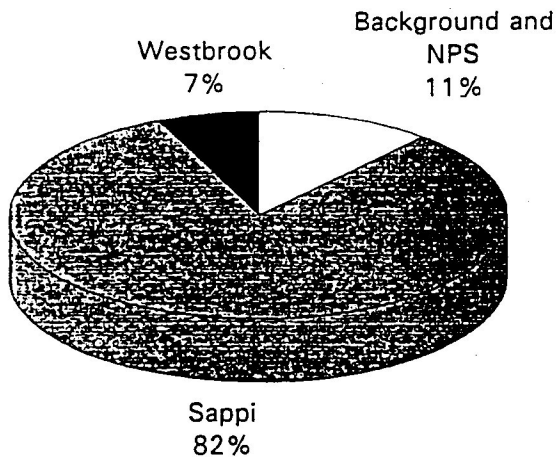




Figure 3 Components of TSS Loading to Lower Presumpscot River

**Components of TSS Loading  
to the Lower Presumpscot River  
Sappi at 14,200 lb/day TSS**



**Components of TSS TMDL  
to the Lower Presumpscot River  
Sappi at 5500 lb/day TSS**

