

October 7, 2004

Andrew Fisk  
Maine Department of Environmental Protection  
#17 State House Station  
Augusta, Maine 04333-0017

**SUBJECT: Notification of Approval of Carleton Stream TMDLs**

Dear Mr. Fisk:

Thank you for your submittal of the Carleton Stream Total Maximum Daily Loads (TMDLs) for **five** heavy metals. This waterbody is included on Maine's 2002 303(d) list and has become a high priority for TMDL development due to nonpoint source runoff from old mine sites and other workings.

The U.S. Environmental Protection Agency (EPA) hereby approves Maine's September 29, 2004 Carleton Stream TMDLs received by EPA electronically on September 30, 2004, with subsequent corrections on October 5, 2004. EPA has determined that these TMDLs for **cadmium, copper, iron, lead, and zinc** meet the requirements of §303(d) of the Clean Water Act (CWA), and of EPA's implementing regulations (40 CFR Part 130). Attached is a copy of our approval documentation.

We are very pleased with the quality of Maine's TMDL submittal. Your staff have done an excellent job of developing metals TMDLs which should assist remediation efforts and result in improved stream water quality. My staff and I look forward to continued cooperation with the ME DEP in exercising our shared responsibility of implementing the requirements under Section 303(d) of the CWA.

Sincerely,

Linda M. Murphy, Director  
Office of Ecosystem Protection

cc electronically:  
David Courtemanch, ME DEP  
Melissa Evers, ME DEP

In-house distribution:

Jennie Bridge

Ann Williams, M. Garren, M. Hill, A. Basile, D. Turin, E. Perkins

Steve Silva

## EPA NEW ENGLAND'S TMDL REVIEW

**TMDL:** Carleton Stream, Hancock County, Maine  
ME ID#520R01 located in Blue Hill, ME (HUC ME0105000217)  
2002 303(d) list: Aquatic Life; 2004 TMDL development.

**STATUS:** Final

**IMPAIRMENT/POLLUTANT:** Non-attainment of aquatic life criteria (benthic community) and AWQC due to heavy metals from mine waste nonpoint source pollution. The TMDLs are proposed for cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), and zinc (Zn).

**BACKGROUND:** The Maine Department of Environmental Protection (ME DEP) submitted to EPA New England the final Carleton Stream TMDL for five heavy metals electronically on September 30, 2004 with a transmittal letter dated September 29, 2004. Subsequent corrections were made and received electronically October 5, 2004. All of EPA's August 10, 2004 comments (on the July 2004 public review draft) were taken into account in the final submission.

**REVIEWERS:** Jennie Bridge, 617-918-1685, bridge.jennie@epa.gov

The following review explains how the TMDL submission meets the statutory and regulatory requirements of total maximum daily loads (TMDLs) in accordance with Section 303(d) of the Clean Water Act, and 40 CFR Part 130.

### REVIEW ELEMENTS OF TMDLs

*Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.*

#### 1. **Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking**

*The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future*

*growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll a and phosphorus loadings for excess algae.*

The Carleton Stream TMDL describes the waterbody, the cause of impairment of Class C water quality standards as identified in the 2002 303(d) list (impaired aquatic life) (pages 4-8 TMDL report) and the priority ranking for TMDL development (page 9 TMDL report). Approximately 1.3 miles of stream between Second and First Ponds are listed as impaired for not attaining Class C standards for aquatic life (due to low abundance of organisms and violations of ambient water quality criteria (AWQC)). The stream impairment is caused by nonpoint source pollution from old mine sites located below the outlet of Second Pond.

Historic land use included farming, tree harvesting and copper mining (zinc-copper-lead ore). Current catchment land use is described in terms of five categories: forested (71%), surface water & wetland (19%), open unforested (7%), low density residential (2%), and agricultural (1%) (page 7 TMDL report). The Kerramerican Mine Site shows up as low-density residential development and covers a large area on the southeastern shore of Second Pond. Atmospheric deposition is considered to contribute a non-detectable load of the pollutants of concern (page 10 TMDL report).

Pollutants of concern include five heavy metals from stormwater and nonpoint source pollution: cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), zinc (Zn). ME DEP provides an explanation and analytical basis for expressing the TMDL for impaired aquatic life through the measure of instream aqueous metal concentrations. The separation of natural background from those from human-related sources was not possible with the existing data, would have been very difficult to determine, and would not have added value to the analysis (page 10 TMDL report).

**Assessment:** EPA New England concludes that the ME DEP has done an adequate job of characterizing sources of impairment.

## **2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target**

*The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.*

The Carleton Stream TMDL describes the applicable narrative water quality standard for Class C aquatic life: “discharges to Class C waters may cause some changes to aquatic life, provided that

the receiving water support indigenous fish and maintains the function and structure of the resident biological community.” The report also defines designated uses, and antidegradation policy (pages 10-11 TMDL report).

ME DEP also identifies Maine’s Statewide Water Quality Criteria (SWQC), both criteria chronic concentration (CCC) and criteria maximum concentration (CMC), all based on a hardness value of 20 mg/L, expressed as aqueous values in ppm or mg/L (from Table 4, page 11 TMDL report):

Criteria	Cd	Cu	Fe	Pb	Zn
CCC	0.000321	0.00299	1	0.00041	0.0271
CMC	0.000638	0.000389	No Criteria	0.010523	0.0299

ME DEP selected metal-specific criteria chronic concentrations (CCC) from Maine’s statewide water quality criteria (SWQC) as the numeric targets for the TMDLs. These aqueous or water column criteria are adopted from EPA’s ambient water quality criteria (AWQC) using a hardness of 20 mg/l and are designed to protect aquatic life. The “CCC are typically lower than CMC and [are] chosen as a conservative basis for the TMDL loading comparisons” in order to “insure the stream will achieve Class C ambient water quality standards” (page 11 TMDL report).

**Assessment:** EPA New England concludes that the ME DEP has properly presented its water quality standards, both narrative and numeric, and has made a reasonable interpretation of the narrative water quality criteria in the standards when setting numeric water quality targets for these heavy metal TMDLs.

### 3. Loading Capacity - Linking Water Quality and Pollutant Sources

*As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f) ). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i) ). The TMDL submittal must identify the waterbody’s loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA’s review of the load and wasteload allocations which are required by regulation.*

*In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1) ). The critical condition can be thought of as the “worst case” scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions*

are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

“Loading capacity for Carleton Stream is expressed as an annual load rather than a daily load to account for the spatial and temporal variation associated with instream metal concentrations.” (Page 11, TMDL report). The loading capacities for each metal of concern in Carleton Stream are listed in Table 5 (from page 12 TMDL report), as follows, in terms of **kg/yr**:

Loading Capacity	<b>Cd</b>	<b>Cu</b>	<b>Fe</b>	<b>Pb</b>	<b>Zn</b>
<b>Kg/yr</b>	05.3	49.4	16520	6.8	447.7

Existing metals loads are calculated based on measured aqueous concentrations and the estimated annual mean flow. The target for each metal is the product of the CCC value times the volume of flow or annual mean discharge of 524 L/s, estimated according to a recently published USGS methodology for estimating streamflows for ungaged rivers in Maine (page 20 TMDL report). A spreadsheet model then compares the existing metals loads to the allocated loads and computes the reductions needed to achieve water quality criteria for all pollutants of concern. The percent reductions are applied to load and waste load allocations. Strengths and weaknesses of the analytical method are presented (page 13 TMDL report).

The loading capacities for metals in Carleton Stream are set to protect water quality and support uses during critical conditions, defined as environmental conditions that induce a stress response in aquatic life. “Environmentally stressful conditions may occur throughout the year and depend on the life stage of resident aquatic organisms.” ME DEP describes the complexities involved with varying life stages, fluctuations in flows, and interactions of surface runoff and groundwater discharges (page 13, TMDL report).

ME DEP also explains that metals analysis for Carleton stream is based primarily on data collected as part of remedial investigations designed to assess the environmental impact of the Karamerican Mine Site, reflecting recent conditions and subject to an approved quality assurance plan (page 12 TMDL report).

The total load allocations and % reductions for the metals of concern in Carleton Stream are reported by ME DEP in Tables 7 and 8, summarized as follows (pages 15-16 TMDL report); see also LA and WLA sections below):

**Load Capacity, Load Allocations, and percent reductions for each metal in the TMDL.**

<u>Loads in kg/yr</u>	Cd	Cu	Fe	Pb	Zn
<b>Existing Loads</b>	21.6	303	8262	23.5	15389
<b>Load Capacity(TMDL) &amp; Load Allocations (LA)</b>	5.3	49.4	16520.	6.8	447.7
<b>Waste Load Allocations (WLA)</b>	0	0	0	0	0

<b>% Reductions</b>	75%	84%	0%	71%	97%
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**Assessment:** EPA New England concludes that the loading capacity for each pollutant of concern has been appropriately set at a level necessary to attain and maintain applicable water quality standards. The TMDL is based on a reasonable approach for establishing the relationship between existing data on pollutant loading and water quality in the stream.

EPA New England concurs with expressing the metal TMDLs as annual loadings based on the reasons provided by ME DEP (spatial and temporal variability of instream metal concentrations). Given the sporadic changes in metal solubility over time, the use of annual, as opposed to daily, loads will assure that critical conditions are addressed and water quality standards attained.

#### **4. Load Allocations (LAs)**

*EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.*

*If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.*

ME DEP allocates all of the loading capacity for each metal of concern in Carleton stream as the “load allocation”, a gross allotment to existing and future nonpoint sources (including runoff from roadways and mine drainage, and to natural background (page 15 TMDL report). Calculations of necessary reductions are also provided.

**Assessment:** EPA concludes that the load allocations are adequately specified in the TMDL at levels necessary to attain and maintain water quality standards. The degree of load reductions necessary to achieve the in-stream levels are based on an estimate of current loadings.

#### **5. Wasteload Allocations (WLAs)**

*EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an*

*allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.*

*In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.*

*The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.*

ME DEP sets the wasteload allocation for all the metal in the existing runoff to Carleton Stream at zero because “no portion of Carleton Stream watershed is regulated under Maine’s National Pollution discharge Elimination system (NPDES).”

**Assessment:** EPA New England concurs that the WLA component of the TMDL is appropriately set equal to zero based on ME DEP’s determination that there are no existing point source discharges subject to NPDES permit requirements in the watershed.

## **6. Margin of Safety (MOS)**

*The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.*

The Carleton Stream TMDL includes an implicit margin of safety (MOS) through the conservative assumptions made in the targets chosen (from Maine’s SWQC numeric water quality targets), and the choice of the criteria chronic concentration (CCCs which are typically lower than the CMCs). An additional MOS is provided by modeling the metals individually (page 16 TMDL report).

**Assessment:** EPA New England concludes that adequate MOS is provided because a significant implicit MOS is provided in the selection of in-stream metals concentrations based on the state-wide CCC toxics criteria.

## **7. Seasonal Variation**

*The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)).*



Carleton Stream TMDLs consider seasonal variation “because the allowable annual loads of metals are developed to protect macroinvertebrates and other aquatic life, which are influenced by seasonal fluctuations in environmental conditions such as flow, runoff, and pH” (page 16 TMDL report). ME DEP describes the complex variabilities in flow, instream reducing conditions, metals concentrations, and sources of pollutants over time.

**Assessment:** EPA New England concludes that seasonal variation has been adequately accounted for in the TMDL because the TMDL was developed to protect aquatic life during critical, stressful conditions, whenever they may occur throughout the year.

## **8. Monitoring Plan for TMDLs Developed Under the Phased Approach**

*EPA’s 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA’s guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.*

ME DEP concurs with water quality monitoring recommendations for the impaired segment in Kerramerican Mine Site remedial action plan. ME DEP intends to conduct both future aqueous sampling and biological monitoring evaluations as restoration plans proceed, and assess water quality status under the existing rotating basin sampling schedule (page 17 TMDL report).

**Assessment:** Addressed, though not required.

## **9. Implementation Plans and Reasonable Assurances**

*On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, “New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs),” that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA’s approval of TMDLs.*

*EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This*

*information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.*

*In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and “may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs.”*

The Carleton Stream TMDL report specifies load reductions that provide a guide for remediation plans and engineered solutions that will lower the content of metals runoff and groundwater reaching the stream. The TMDL report coincides with the development of the Kerramerican site remedial action plan, required under Maine’s uncontrolled hazardous substances site law (38 MRSA Section 1361 et seq). “Implementation of the engineering solutions in the plan will provide the best available reasonable assurance that the stream will be restored and meet SWQC after a long history of non-attainment” (page 17 TMDL report).

**Assessment:** Addressed, though not required.

## **10. Public Participation**

*EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii) ). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe’s public participation process, including a summary of significant comments and the State/Tribe’s responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2) ).*

*Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.*

The public participation process for the Carleton Stream TMDL report is described on page 18 of the TMDL report. ME DEP issued public notice of the TMDL availability starting July 15, 2004 via local newspapers, and on ME DEP’s Internet web site. The interested public and EPA were notified directly of a 14-day public comment period (July 27<sup>th</sup> through August 10<sup>th</sup>, 2004). Public comments were received from a representative of Kerramerican, Inc., Jeffrey Brandow of MACTEC Engineering and Consulting. ME DEP’s provided EPA with a copy of the comments, and included a summary and response to comments on page 19 of the TMDL report.

**Assessment:** EPA New England concludes that ME DEP has done an adequate job of involving the public during the development of the TMDL, provided adequate opportunities for the public to comment on the TMDL, and provided reasonable responses to the public comments.



**Data for entry in EPA's National TMDL Tracking System**

TMDL Name	<b>Carleton Stream</b>
Lead State	Maine (ME)
TMDL Status	Final
Pollutant IDs	15 - Cadmium (Cd) 16 - Copper (Cu) 332- Iron (Fe) (ferric +3) 18 - Lead (Pb) 21 - Zinc (Zn)
TMDL End Points	0.00032 - Cadmium (Cd) 0.00299 ppm - Copper (Cu) 1 ppm - Iron (Fe) (ferric +3) 0.00041 ppm - Lead (Pb) 0.0271 ppm - Zinc (Zn)
TMDL Type	Nonpoint Source and Point Source
List ID (from system)	
Impairment ID	Aquatic life and AWQC violations
Cycle (list date)	2002 (enter for 1998 if necessary)
Establishment Date (approval)	October 7, 2004
EPA Developed	No

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