December 19, 2006

Jeffrey Wennberg, Commissioner
Vermont Department of Environmental Conservation
103 South Main Street
Waterbury VT 05671-0408

SUBJECT: **Notification of Approval of Potash Brook TMDL**

Dear Commissioner Wennberg:

Thank you for your submittal of the Total Maximum Daily Load (TMDL) To Address Biological Impairment in Potash Brook. This waterbody is included on Vermont's 2004 303(d) list and was prioritized for TMDL development. The purpose of the TMDL is to address an aquatic life use impairment caused by stormwater runoff.

The U.S. Environmental Protection Agency (EPA) hereby approves Vermont's October, 2006 Potash Brook TMDL submitted with your cover letter dated October 11, 2006. EPA has determined that this TMDL meets the requirements of §303(d) of the Clean Water Act (CWA), and of EPA's implementing regulations (40 CFR Part 130). A copy of our approval documentation is enclosed.

We are very pleased with the quality of your TMDL submittal. Your staff have done an excellent job of preparing a comprehensive and informative TMDL report and supporting documents, and incorporating public comment. My staff and I look forward to continued cooperation with the VT DEC 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

Enclosure

cc:
Wally McLean, VT DEC
Tim Clear, VT DEC

EPA NEW ENGLAND'S TMDL REVIEW

TMDL: Potash Brook

STATUS: Final

DATE: December 19, 2006

IMPAIRMENT/POLLUTANT: Biological impairment (aquatic life support) caused by stormwater-related stressors: the TMDL is proposed for stormwater runoff volume as a surrogate for the pollutant sediment and a variety of other stressors associated with stormwater.

BACKGROUND: The Vermont Department of Environmental Conservation (VTDEC) submitted a draft TMDL on November 18, 2005. A public comment period was held from November 18, 2005 to January 9, 2006. The state submitted the final TMDL with a letter dated October 11, 2006. In addition to the TMDL itself, the submittal included, either directly or by reference, the following additional documents:

- Expanded Technical Analysis: Utilizing Hydrologic Targets as Surrogates for TMDL Development in Vermont's Stormwater Impaired Streams, US EPA and VT DEC, September 2006.

- Stormwater Modeling for Flow Duration Curve Development in Vermont, TetraTech, 2005.

- Final Report – Investigation into Developing Cleanup Plans for Stormwater Impaired Waters, Vermont Water Resources Board, 2004.

- University of Vermont Stormwater Project – Statistical Analysis of Watershed Variables, prepared for VT ANR by the University of Vermont, October 2005

- Public Comments and Responses to the Comments on the Draft Potash Brook TMDL, VT DEC, October 2006.

REVIEWER: Eric Perkins (617) 918-1602.

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 chlorophyl a and phosphorus loadings for excess algae and reduced clarity in the water column.*

A. Description of Waterbody and Background Information

The TMDL document provides a description of Potash Brook, including location, drainage area, and tributary information. It also provides background information on the development of the TMDL, explaining that the roots of TMDL approach go back to the Investigative Docket conducted by the Vermont Water Resources Board in 2004.

B. Pollutant of Concern

The primary pollutant of concern is sediment. However, as the TMDL document explains, the aquatic life impairment is believed to be caused by the mix of pollutants found in stormwater runoff. The TMDL uses the surrogate of stormwater runoff volume to address needed reductions in sediment and other pollutants. This surrogate is appropriate because the amount of pollutant load discharged from a watershed is a function of the amount of stormwater runoff generated from a watershed for a given set of conditions. This relationship is especially strong for sediment and sediment-associated pollutants, as described in the “Expanded Technical Analysis: Utilizing Hydrologic Targets as Surrogates for TMDL Development in Vermont’s Stormwater Impaired Streams” (EPA and VT DEC, 2006). There are no known wastewater or non-stormwater related discharges contributing to the impairment, so the stormwater runoff surrogate effectively represents the pollutants of concern.

Use of this surrogate has the secondary benefit of addressing the physical impacts to the stream channel (such as scour and channel over-widening) caused by stormwater runoff. These physical alterations to the stream are additional contributors to the aquatic life impairment. Also, reductions in stormwater runoff volume will help restore diminished base flow (another aquatic life stressor) by increasing infiltration and groundwater recharge. Because of the difficulty of sorting out the impacts of all the different stressors, both hydrologic and pollutant-related, VT DEC listed this stream on the 2004 Vermont 303(d) list as impaired by “stormwater”.

C. Pollutant Sources

The document explains that the source of the pollutant loads is stormwater runoff from the Potash Brook watershed. In addition to carrying pollutants from the watershed, increased stormwater volume is destabilizing the Potash Brook channel, releasing sediment from the streambanks, degrading stream habitat and washing out biota, as discussed above.

D. Priority Ranking

The 2004 §303(d) list indicates that Potash Brook is scheduled for completion in 2009. However, a subsequent amendment to the Vermont stormwater statute (10 VSA Section 1264) requires that the state complete a group of TMDLs, including the Potash Brook TMDL, by 2007. Hence, the development of this TMDL is now a very high priority.

Assessment: EPA concludes that the TMDL document meets the requirements for describing the waterbodies, pollutant of concern, pollutant sources, and priority ranking.

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 TMDL document describes the applicable water quality standards beginning on page 9. Potash Brook is listed as impaired based on narrative criteria relating to aquatic biota. The impact of excessive stormwater runoff flows into Potash Brook has resulted in a violation of the VTWQS §3-04(B)(4) which states that there shall be:

> *"No change from the reference condition that would prevent the full support of aquatic biota, wildlife, or aquatic habitat uses. Biological integrity is maintained and all expected functional groups are present in a high quality habitat. All life-cycle functions, including overwintering and reproductive requirements are maintained and protected."*

In Vermont, numeric biological indices are used to determine the condition of fish and aquatic life uses. Vermont's Water Quality Standards at 3-01(D)(1) and (2) provide the following regulatory basis for these numeric biological indices:

> *"(1) In addition to other applicable provisions of these rules and other appropriate methods of evaluation, the Secretary may establish and apply numeric biological indices to determine whether there is full support of aquatic biota and aquatic habitat uses. These numeric biological indices shall be derived from measures of the biological integrity of the reference condition for different water body types. In establishing numeric biological indices, the Secretary shall establish procedures that employ standard sampling and analytical methods to characterize the biological integrity of the appropriate reference condition. Characteristic measures of biological integrity include but are not limited to community level measurements such as: species richness, diversity, relative abundance of tolerant and intolerant species, density, and functional composition.*
>
> *(2) In addition, the Secretary may determine whether there is full support of aquatic biota and aquatic habitat uses through other appropriate methods of evaluation, including habitat assessments."*

Pursuant to the above provisions in its water quality standards, VT DEC developed numeric biological indices to aid in the determination of whether aquatic biota and habitat uses are supported. These indices are described in the document: "Biocriteria for Fish and Macroinvertebrate Assemblages in Vermont Wadeable Streams and Rivers" published by VT DEC in February 2004. Biological data collected from Potash Brook were evaluated in accordance with the procedures laid out in this guidance document (or prior versions). Macroinvertebrates were assessed in the poor range for a majority of the samples. The TMDL document explains that in most cases, including this one, biological condition ratings of fair or poor indicate impaired status for Class B waters.

Establishment of the water quality target

Because the impairment is based on biological indices, there is no numeric pollutant criterion to use as the TMDL target. Instead, the instream target is expressed as a measure of the hydrologic condition believed necessary to achieve the Vermont water quality criteria for aquatic life. As described in more detail below, a target of a 16% reduction in the 0.3% flow (the flow that is equaled or exceeded 0.3% of the time) was established for Potash Brook, based on the hydrologic conditions of two reference (or attainment) watersheds where the aquatic life criteria are met. This hydrologic target serves as an indicator for sediment and sediment-associated pollutants, along with the other stressors to aquatic life such as channel scour and loss of pool/riffle habitat. Based on the comparison with the attainment watersheds, the target hydrologic condition represents the condition in which all these stressors are reduced to levels compatible with attainment of the aquatic life criteria. The TMDL document explains which attainment watersheds were selected for Potash Brook, and the statistical and scientific basis for the selection.
The TMDL document notes that the VT Water Resources Board's 2004 report identifies flow duration curves (FDCs) as the best method for defining hydrologic targets. The following pragraph from the TMDL document (page 9) summarizes the benefits of the FDC approach:

"FDCs are very useful for describing the hydrologic condition of a stream/watershed because the curves incorporate the full spectrum of flow conditions (very low to very high, including critical conditions) that occur in the stream system over a long period of time. The FDCs also incorporate any flow variability due to seasonal variations. A comparison of the FDCs for an impaired and appropriate attainment stream/watershed can reveal obvious patterns. For example, a FDC for a stormwater-impaired stream/watershed will typically show significantly higher flow rates per unit area for high flow events and significantly lower flow rates per unit area for low-base flow conditions than the FDC for the attainment watersheds. The increased predominance of high flow events in the impaired watershed creates the potential for increased watershed stormwater pollutant loadings, increased scouring and stream bank erosion events, and the possible displacement of biota from within the system. Also the reduction in stream base flow revealed by the FDC can create a potential loss of habitat for low flow conditions."

For the above reasons, the TMDL used FDCs to establish the hydrologic targets for Potash Brook. A high flow value (0.3%) and a low flow value (95%) were selected as points along the continuum of the FDCs useful for setting specific hydrologic targets. The 0.3% exceedance flow closely matches the one year return flow (the flow level that occurs on average once a year) and the 95% exceedance flow represents a low flow condition comparable to the 7Q10. The 0.3% flow was selected as the high flow target because: 1) The one year flow level is generally considered the channel forming flow for small streams, and by targeting the channel forming flow one can directly reduce key channel altering events that damage biota and produce large amounts of sediment from within the stream system; 2) The 0.3% flow is close to the upper end of the high flow portion of the flow duration curve – selecting a target close to the upper end of the curve helps ensure that the implementation measures chosen to meet the target will also reduce the impact of the full range of storms that drive the shape of the rest of the flow duration curve; and 3) The design specifications for stormwater management measures in Vermont's stormwater manual are largely based on controlling the one year storm events -- the task of determining and implementing the mix of controls necessary to achieve the in-stream target can be accomplished most efficiently if reductions are measured with respect to one year flows.

Since there are limited hydrologic data for either impaired or attainment streams, the Water Resources Board's 2004 report recommended developing synthetic FDCs by employing a calibrated rainfall-runoff model based on land use and cover. Accordingly, FDCs were developed for both impaired and attainment streams and the relative difference between the two was used to establish the flows needed to restore the stream's hydrology. In the TMDL, the hydrologic targets are expressed as percentage reductions or increases relative to the attainment watersheds' FDCs at the representative high and low flow values. Only the high flow target is actually used for the load and wasteload allocations, but the low flow target is included for informational purposes and to help communicate the overall aim and expected result of the TMDL: to match all attainment stream FDC points (both on the high and low ends of the curve).

The TMDL document explains that, based on available data and the model outputs necessary to develop the FDCs, the P8-Urban Catchment Model (P8-UCM) was selected to simulate the hydrology of impaired and attainment watersheds. Inputs to P8-UCM include climatological data, percent watershed imperviousness, pervious curve number, and times of concentration for ground water base flow and surface runoff. After initial calibration and review, additional changes were made to improve the low flow prediction capability of the model and refine the estimated surface runoff time of concentration. Upon final review and model verification, the calibrated model was used to develop FDCs for all impaired and attainment streams. A complete discussion of the model setup, calibration, adjustments and results can be found in the report entitled "Stormwater Modeling for Flow Duration Curve Development in Vermont" (Tetra Tech, 2005).

Assessment: EPA concludes that VTDEC has properly described its water quality standards, the relevant criteria and uses, and the water quality target.

The use of a surrogate hydrologic target in place of a numeric aquatic biota or pollutant target is appropriate in this case because the hydrologic target serves as an indicator for conditions under which the water quality criteria for aquatic life can be attained. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." 40 C.F.R. § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach. 40 C.F.R. § 130.7(c)(1). This flexibility in the expression of TMDLs supports reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment with water quality standards.

As noted in the "Expanded Technical Analysis: Utilizing Hydrologic Targets as Surrogates for TMDL Development in Vermont's Stormwater Impaired Streams," (US EPA and VT DEC, 2006), this surrogate approach is consistent with the recommendations of the "Report of the Federal Advisory Committee on the Total Maximum Daily Load Program" (National Advisory Council for Environmental Policy and Technology, 1998). The report recommends that: "When the impairment is tied to a pollutant for which a numeric criterion is not possible, or where the impairment is identified but cannot be attributed to a single traditional 'pollutant', the state should try to identify another (surrogate) environmental indicator that can be used to develop a quantified TMDL, using numeric analytical techniques where they are available, and best professional judgement where they are not….If they are used, surrogate environmental indicators should be clearly related to the water quality standard that the TMDL is designed to achieve."

In this case, the relationship between the surrogate indicator and the water quality criteria is carefully laid out in the Expanded Technical Analysis report referenced above. This expanded analysis further describes the link between the aquatic biota impairment and sediment (the key pollutant), and then how watershed hydrology is driving sediment levels in the stream (see Table 5-3 for a summary of these links). Based on these clear linkages to Vermont's water quality standards, EPA concludes that the surrogate approach has been used appropriately in this TMDL, and that the surrogate for the water quality target has been appropriately selected. EPA has also reviewed the supplemental report entitled "University of Vermont Stormwater Project: Statistical Analysis of Watershed Variables" (2005), and concluded that the target setting process and the establishment of the surrogate water quality target has been well documented and completed with admirable scientific rigor.

Some comments on the draft TMDL indicated a preference for the inclusion of wash-off sediment targets along with the hydrologic targets, as suggested in the Water Resources Board's 2004 report. In its response to public comments and in subsequent communications with EPA, VT DEC noted that one of the key reasons for not including such sediment targets is that new geomorphic data for Potash Brook (Fitzgerald, 2006) combined with recently published analyses of sediment dynamics in streams with similar geomorphic characteristics (Simon and Rinaldi, 2006) suggest that at least three-quarters of the sediment in Potash Brook is likely coming from within the channel system (e.g. bank erosion) and is mobilized by high flows resulting from stormwater runoff. This means that wash-off sediment targets would likely address less than a quarter of the total sediment load (the portion entering through surface runoff). As documented in many studies (e.g., Zarriello and Barlow, 2002), there is a high correlation between stormwater runoff volume and wash-off sediment loads. And as explained in much more detail in the Expanded Technical Analysis report, there is also a high correlation between in-stream flows and in-stream sediment levels. Hydrologic targets are therefore a reasonable surrogate for both the wash-off sediment loads and the sediment loads generated from within the channel system. EPA believes that VT DEC's decision to rely on hydrologic targets, which can serve as surrogates for total sediment load, is an appropriate and effective strategy in this case.

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.*

Use of stormwater runoff volume as a surrogate for sediment and other pollutants
Just as an instream flow target is used as the surrogate for the instream water quality target, stormwater runoff volume is used as the surrogate for the loading capacity (i.e. the maximum amount of pollutant inputs from the watershed that still allows attainment of Vermont's water quality standards).

As discussed in the TMDL documentation, a combination of pollutants found in stormwater, including sediment (from wash-off and instream sources) and associated pollutants such as metals, is contributing to the aquatic life impairment in Potash Brook. However, there is no information that indicates that any pollutant is causing or contributing to an exceedence of any pollutant specific water quality criterion. Nor is there sufficient information available to identify specific pollutant loadings which, in combination, are contributing to the aquatic life impairment, particularly given the variability in types and amounts of pollutants depending on a range of storm events. On the other hand, there is a strong correlation between pollutant loads and stormwater flows, for the reasons explained in the TMDL and supporting documentation. Therefore the TMDL uses the surrogate measure of stormwater runoff volume to represent the combination of pollutants that contribute to the impairment of Potash Brook.

The supplemental document titled: "Expanded Technical Analysis: Utilizing Hydrologic Targets as Surrogates for TMDL Development in Vermont's Stormwater Impaired Streams" provides a detailed explanation of all stressors potentially contributing to the biological impairment in Potash Brook, and how these stressors are linked to stormwater runoff. The relative importance of each stressor is also described in Table 3-1 of this document. Given that increased sedimentation is believed to be the most important pollutant stressor, the document includes, among other things, substantial detail on the relationship between sediment and streamflow. Figure 5-16 shows, for example, that based on sediment and flow data from similar streams, a 25% decrease in the 1-day flow can result in a 70% reduction in annual sediment load. This means that a relatively modest reduction in stormwater runoff volume can be expected to substantially reduce sedimentation. The document also lays out similar stormwater runoff linkages to all other identified stressors. While the exact levels of sediment needed to be achieved in Potash Brook are not defined, the use of the reference watershed approach ensures that the necessary sediment levels will be achieved. This is because by achieving the reduced stormwater runoff volumes occuring in the attainment watersheds, the corresponding sediment reductions necessary to meet water quality standards are expected to be achieved as well.

The TMDL document and the expanded technical analysis describe how each stressor contributing to the biological impairment is related either directly or indirectly to stormwater runoff volumes. The stressors include: increased watershed pollutant load (e.g. sediment), increased pollutant load from in-stream sources (e.g., bank erosion), habitat degradation (e.g. siltation, scour, over-widening of stream channel), washout of biota, and loss of habitat due to reductions in stream base flow. The stressors associated with stormwater runoff are acting individually or cumulatively to degrade the overall biological community to a point where aquatic life uses are not fully supported and the stream does not attain the VTWQS.

Establishment of stormwater runoff volume targets
In a pollutant-specific TMDL, a stream's loading capacity is the greatest amount of pollutant loading the water can receive without violating water quality standards. In this TMDL, because the "pollutant of concern" is represented by the surrogate measure of stormwater runoff volume, the loading capacity is the greatest volume of stormwater runoff Potash Brook can receive without violating the stream's aquatic life criteria. The challenge is to determine what this maximum stormwater runoff volume is for Potash Brook.

As explained above (in Section 2), the TMDL uses a reference watershed approach in which hydrologic targets are developed by using similar "attainment" watersheds as a guide. The streams within the attainment watersheds meet or exceed the Vermont water quality standards criteria for aquatic life. Based on the comparison of the 0.3% flow point (approximately the one-year flow event) on the flow duration curve (FDC) for Potash Brook with the mean value of the 0.3% points on the FDCs for the two attainment streams, the TMDL establishes a stream flow reduction target of 16% during these high flow events. Because stream flow during the high flow events in Potash Brook is nearly entirely a result of stormwater runoff, the 16% reduction target is used not only as the in-stream surrogate water quality target, but also as the stormwater runoff volume reduction target.

The use of the FDC to establish reduction targets also ensures that critical conditions are accounted for in this TMDL. The impacts to aquatic biota generally occur throughout the year on a cumulative basis – i.e., it is the cumulative effect of the stressors throughout the course of a year (or years) that ultimately degrade conditions and result in an aquatic life impairment. By targeting the conditions underwhich the key stressors are introduced (high flow conditions), the TMDL addresses critical conditions and the cumulative effects caused by these conditions throughout the year. In addition, any one-time impacts (such as the washout of biota due to channel scour) will also be addressed by the TMDL through the reductions of the runoff volume from storm events that cause this damage.

Assessment:
EPA concludes that Vermont selected a reasonable surrogate for the loading capacity, adequately documented the assumptions and strengths and weaknesses in the modeling approach used to support the establishment of the loading capacity, and properly accounted for critical conditions. The basis for each of these conclusions is explained below.

Vermont's use of a surrogate is reasonable and appropriate
While TMDLs are intended to address impairments resulting from pollutants, there is nothing in EPA's regulations that forbids expression of a TMDL in terms of a surrogate for pollutant-related impairments. And as noted above (under Section 2) EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." 40 C.F.R. § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach. 40 C.F.R. § 130.7(c)(1). For the same reasons described above relating to the appropriateness of using stream hydrology as a surrogate water quality target, EPA concludes that the use of stormwater runoff volume as a surrogate for the loading capacity is also reasonable and appropriate. EPA believes this surrogate approach is suitable for small stream systems such as Potash Brook, where the impairment is for aquatic life, where stormwater is the cause of the impairment, and where no specific pollutant criterion is being violated.

The modeling assumptions and strengths and weaknesses are adequately documented
The assumptions and strengths and weaknesses of the modeling approach used to support the establishment of the loading capacity are discussed in the supplemental TMDL report entitled: "Stormwater Modeling for Flow Duration Curve Development in Vermont". Strengths and weaknesses associated with use of the P8 model are discussed on pages 14 and 17, and assumptions pertaining to each step in the modeling process are presented throughout the report. The results of the modeling work are thoroughly presented in this report. In addition, strengths and weaknesses and assumptions related to the use of statistical analyses of the modeling results to select appropriate attainment watersheds for Potash Brook are presented in a second supplemental report entitled: "University of Vermont Stormwater Project: Statistical Analysis of Watershed Variables" (2005). EPA concludes that the assumptions and results of both the modeling and statistical analysis steps are thoroughly documented in these reports.

Critical conditions have been accounted for
The critical conditions for Potash Brook are associated with storm events which, in addition to potential immediate damage to aquatic biota, produce cumulative impacts to the biota over time. Because the TMDL reduction targets directly address these high flow conditions, EPA concludes that critical conditions are adequately accounted for.

Daily Loading
EPA's November 15, 2006 guidance entitled "Establishing TMDL 'Daily' Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in *Friends of the Earth, Inc. v. EPA, et al.,* No.05-5015, (April 25, 2006) and Implications for NPDES Permits," recommends that TMDL submittals express allocations in terms of daily time increments. This guidance also acknowledges that the decision of the U.S. Court of Appeals for the Second Circuit, *NRDC v. Muszynski*, 268 F.3d 91 (2nd Cir. 2001), established the controlling legal precedent for cases brought in the Second Circuit, which includes Vermont. In this decision, the Court required a reasoned explanation for the choice of any particular non-daily load. For the reasons discussed below, the Region believes that Vermont has provided a

reasonable basis for not including daily loads in this case.

Even though the TMDL targets are expected to achieve reductions during all storms large enough to generate runoff throughout the year, the TMDL does not express the loading capacity in terms of specific loadings (or runoff volume amounts) for each day. The rationale for this decision is two-fold:
1) The biological impairment in Potash Brook resulted from the cumulative effects of a range of stormwater runoff events throughout the year over a multiple year period. It is not the magnitude of loadings on any particular day that drives attainment of the biological criteria; instead, attainment will result from a long-term overall reduction in the amount of stormwater runoff. The flow duration curve approach provides for identification of this overall reduction target.
2) Stormwater runoff will vary dramatically from one day to the next depending on rainfall amounts. There will be no runoff on some days, while storms may generate large runoff events on others. Because of this variability, it is neither feasible nor logical to establish specific daily limits linked to attainment of the biological criteria. In the face of such variability, the approach taken in the Potash Brook TMDL, based on percent reductions tied to the flow duration curves, is both a practical and effective way to establish reduction targets. Rather than imposing particular daily limits, this approach establishes percent reduction targets for stormwater runoff volume that effectively apply to all storm events whenever they occur (e.g., on any given day) throughout the year.

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.

The load allocation is presented in Table 7 of the TMDL document. The stormwater runoff volume reduction of 16% was divided into WLA and LA portions, based on major land use categories in the watershed. The three major land use categories in the Potash Brook watershed are urban/developed, agriculture/open, and forest/wetland. The forest/wetland category received a load allocation of zero percent reduction, or no expected change in stormwater runoff, since the runoff characteristics from these areas are considered near optimal with regard to overall watershed hydrology. To assign allocations to the remaining two land use categories, a runoff coefficient was used to determine the relative influence of each land use category on runoff characteristics, and thus the FDC. The following paragraphs from the TMDL document (page 16) explain how this was done:

“A runoff coefficient (R_v) is an expression of the percentage of precipitation that appears as runoff. The value of the coefficient is determined on the basis of climatic conditions and physiographic characteristics of the drainage area and is expressed as a constant between zero and one. By determining the relative contribution to stormwater runoff from each land use category using the R_v, the allocation between WLA and LA can be made accordingly.

The primary influence on R_v is the degree of watershed imperviousness. This is shown through data collected from numerous watersheds during the National Urban Runoff Program Study from which an equation was developed to define the R_v. as shown below (Schueler 1987):

$$R_v = 0.05 + 0.9(I_a)$$

Where: I_a = Impervious fraction

Percent imperviousness was estimated using a previously developed relationship…for the Vermont Center for Geographic Information land use data layer."

Using the runoff coefficients and the area of each land use category, VT DEC determined the weighted influence on runoff to be 91% for uban/developed land and 9% for the agriculture/open category. This suggests that 91% of the runoff in the Potash Brook watershed is coming from the urban/developed portion of the watershed, and only 9% is coming from the agricultural and open land portion.

Given that all stormwater discharges from the urban/developed land category are included in the wasteload allocation portion of the TMDL (for reasons explained below in the WLA section), the load allocation includes only discharges from the agriculture/open land category. There are no CAFOs in the watershed, and the agricultural/open land is outside of the MS4 portion of the watershed, so the TMDL considers all runoff from the agricultural/open category part of the load allocation. Based on the 9% weighting factor, the load allocation works out to 1.4% reduction in stormwater runoff from agricultural and open land areas, as indicated in the TMDL's Table 7.

Assessment: The State's approach to breaking out the load and wasteload allocations is reasonable because the forest/wetlands land use category corresponds to "natural background" conditions, and the urban/developed and agricultural/open space categories are reasonable surrogates for the relative contribution of point and nonpoint source runoff, respectively. The agriculture/open land category is a reasonable reflection of nonpoint source stormwater runoff because there are no regulated point source discharges within this portion of the watershed. The State's use of a runoff coefficient to estimate the amount of runoff from the various land use categories (and subsequently establish the load and wasteload allocations), is a logical approach to this task given the influence of watershed imperviousness on runoff volumes. EPA concludes that the load allocation is adequately specified in the TMDL at a level sufficient (when combined with the wasteload allocation) to attain and maintain water quality standards.

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.

The wasteload allocation is presented in the TMDL's Table 7 and is expressed as a 16.5% reduction in stormwater runoff volume at Q0.3%. Sections 3 and 4, above, explain how an overall allocation was established based on the flow duration curve targets, and how this overall allocation was then divided into load and wasteload components based on land use categories and the amount of runoff generated from each category.

All stormwater discharges from the urban/developed land category were included in the wasteload allocation portion of the TMDL. This was done because EPA interprets 40 C.F.R. §130.2(h) to require that allocations for point source discharges subject to the requirement for an NPDES permit must be included in the wasteload allocation portion of the TMDL. The urban/developed portion of the Potash Brook watershed includes the following types of NPDES permitted stormwater discharges:

- Discharges subject to Phase 2 municipal separate storm sewer system (MS4) permits
- Discharges subject to certain individual stormwater permits
- Discharges subject to Phase 1 and 2 construction site stormwater permits
- Discharges subject to permits for stormwater associated with industrial activities

There are also some areas within the urban/developed part of the Potash watershed that generate nonpoint source runoff and point source runoff not subject to NPDES permits. Discharges from nonpoint sources and point sources not regulated by the NPDES program normally receive load allocations rather than wasteload allocations. In the case of stormwater, however, where it is often difficult to identify and distinguish between discharges subject to NPDES and those that are not, EPA has stated that it is permissible to include all stormwater discharges from a particular land use category in the wasteload allocation portion of the TMDL.
For the Potash Brook watershed, insufficient data are currently available to separate out the parcels that generate stormwater that is not subject to NPDES permits and calculate the runoff volumes from these parcels. Therefore, the wasteload allocation includes runoff from the NPDES regulated stormwater point sources listed above, runoff from nonpoint sources, and runoff from non-NPDES regulated point sources such as commercial areas and small construction sites (under an acre).

The runoff from sources within the urban/developed land category were then lumped into an aggregate wasteload allocation. The rationale for this aggregate allocation is described below.
As indicated above, 40 C.F.R. § 130.2(h) provides that point source discharges must be addressed by the wasteload allocation component of a TMDL. Discharges involving process wastewater, non-contact cooling water, and other non-stormwater discharges are assigned individual waste load allocations pursuant to this regulation. Stormwater discharges, however, are less amenable to individual wasteload allocations. In recognition of this fact, EPA's November 22, 2002 guidance entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on Those WLAs," provides that it is reasonable to express allocations for NPDES-regulated storm water discharges from multiple point sources as a single categorical or aggregate wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs. EPA's guidance recognizes that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated storm water discharges on an outfall-specific basis.

In the case of Potash Brook, VTDEC has determined that because the stormwater discharges are highly variable in frequency and duration, and because insufficient data is available on each parcel (e.g. detailed soils information) it is not feasible to establish specific wasteload allocations for each stormwater outfall. Although the State is developing this capability (to support implementation of the TMDL), it is currently impossible to determine with any precision or certainty runoff amounts for individual discharges or groups of discharges. Therefore, all the stormwater runoff from the urban/developed land use category is combined into the aggregate wasteload allocation presented in Table 7 of the TMDL. Because it was determined that the urban/developed portion of the watershed contributes 91% of the total runoff to Potash Brook (using the runoff coefficient method discussed in the load allocation section, above), the vast majority of the needed reductions (14.6% excluding the future growth allocation) are in the wasteload allocation.

Future Growth
The wasteload allocation includes an allocation for future growth equal to a 1.9% reduction in stormwater flow. The future growth allocation is for runoff expected to result from the maximum projected 10-year growth of single family homes or other small development disturbing less than one acre of impervious cover. Because future growth is expected to be concentrated in the urban/developed portion of the watershed, the future growth allocation is included as part of the wasteload allocation.

The TMDL does not include an allocation for future growth that disturbs more than one acre of impervious cover because this category of development is required by state law to comply with Vermont's stormwater manual. VT DEC believes that the channel protection and groundwater recharge standards in the stormwater manual will prevent stream degradation from this category of growth.

Assessment:
Ideally, if data are available, separate wasteload allocations for each NPDES stormwater discharge would be

established. Given the data limitations discussed above, however, it is acceptable to group all NPDES eligible stormwater discharges into one wasteload allocation for stormwater. In addition, given the difficulty of separating out regulated from unregulated stormwater discharges in this case (as described above), it is also acceptable to include both discharges subject to NPDES as well as nonpoint source runoff in this aggregate wasteload category.

The State's two-pronged approach to accounting for future growth is well thought out, and the allocation for small development projects is based on a reasonable calculation of projected stormwater runoff from this category of development. While some commenters suggested the 10-year timeframe is too short, the State explained in its response to public comments that future monitoring and the adaptive management process will allow the state to determine over time how much new development can be accommodated within the watershed and whether additional controls may be necessary. EPA believes that this is a reasonable approach, especially considering that several major initiatives (not included in the TMDL assumptions) are underway in the watershed aimed at reducing runoff from this category of development.

EPA concludes that the wasteload allocation is adequately specified in the TMDL at a level sufficient (when combined with the load allocation) to attain and maintain water quality standards, and that future growth is adequately addressed.

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 State included a useful description of the MOS in the Responses to Comments on the Draft Potash Brook TMDL (VT DEC, 2006). This description expands on the discussion of MOS in the TMDL document, and includes the following paragraphs:

"The mean flow of two attainment streams was selected as the target flow condition in the Potash Brook TMDL to provide an implicit margin of safety that the selected targets would result in the attainment of the Vermont Water Quality Standards. Due to the rigorous application of the attainment stream approach in the Potash Brook TMDL, the targets are believed to be particularly accurate thus reducing the need for an overly conservative margin of safety.

The use of the attainment stream approach is a particularly good approach to identify flow targets because it relates appropriate flow conditions in streams that comply with the VTWQS (attainment streams) back to Potash Brook. However, haphazard matching of attainment streams, and thus flow targets, to Potash Brook could lead to targets with a high degree of uncertainty as to whether standards would be met. To provide a more rigorous target setting approach, attainment streams for Potash Brook were selected using an analysis described in "Statistical Analysis of Watershed Variables" (Foley, J. and Bowden, 2005). VTDEC believes that by utilizing this approach, Potash Brook was paired with the "most similar" attainment streams available in the Lake Champlain Valley. By identifying the "most similar" attainment streams through standard statistical approaches, a significant amount of uncertainty is eliminated regarding what are the best target values.

According to the attainment stream approach, by definition, the flows for the attainment streams (LaPlatte and Little Otter Creek) represent flows under which the biologic criteria are currently being met. This can be thought of as a range of flows in streams most similar to Potash Brook that are capable of sustaining appropriate aquatic life standards as defined by the VTWQS. At the high flow target interval, this represents a range of flows from 9.02 to 11.52 cfs/sq mi. It is reasonable to assume that attainment of flows at the high end of this range (11.52 cfs/sq mi) would allow Potash Brook to comply with the VTWQS. However, rather than basing the Potash Brook target on the high end of the range for the attainment streams, VTDEC took a more conservative approach by selecting the mean of the range (10.27 cfs/sq mi). This had the effect of providing a 10% margin of safety.

Additionally, it is likely that the flows represented by the attainment stream are not at the "threshold" of attainment. That is, the modeled flows in the streams currently meeting standards likely represent flows somewhat below that which impairment would occur, thus adding an additional level of safety."

Assessment: EPA-New England concludes that the TMDL documentation provides an adequate MOS. The 10% MOS provided by using the mean of the attainment stream targets rather than the higher of the two attainment stream targets is reasonable for this TMDL, given the scientific rigor of the attainment stream selection and target setting process.

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)).

The Clean Water Act and implementing regulations require that a TMDL be established with consideration of seasonal variations. The VT Water Resources Board's 2004 report identifies flow duration curves (FDCs) as the best surrogate for defining hydrologic targets. The FDCs developed for this TMDL are very useful for describing the hydrologic condition of a stream/watershed because the curves incorporate the full spectrum of flow conditions (very low to very high) that occur in the stream system over a long period of time. The FDCs also incorporate any flow variability due to seasonal variations.

As noted above in Section 3, while the high flow targets in the Potash TMDL are established for a particular storm size or flow event (the flow that is equaled or exceeded 0.3 percent of the year) the reductions called for in the TMDL actually apply on a daily basis throughout the year. This is because the ultimate goal of the TMDL is to match the full length of the flow duration curve (which includes targets for all storm sizes) derived from the attainment watersheds. The 0.3% flow point was selected as a representative point to use as a target. Because the stormwater controls to be implemented to meet the 0.3% target will also control the full spectrum of smaller storms (those that produce 99.7% of the flows) throughout the year, it is reasonable to expect that TMDL implementation will result in most other points on the curve coming into alignment with the corresponding points on the attainment curves.

Assessment: Given that the controls necessary to achieve the 16% reduction target for large storms will be effective throughout the year and will also control the full range of smaller storms, EPA concludes that seasonal variation has been adequately accounted for in the TMDL.

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), and EPA's 2006 guidance, Clarification Regarding "Phased" Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach, should include, in addition to the other TMDL elements, a monitoring plan that describes the additional data to be collected, and a scheduled timeframe for revision of the TMDL.

The Potash Brook TMDL is not a phased TMDL, but the document includes a description of a monitoring plan designed to measure progress toward TMDL implementation and attainment of water quality standards. While the monitoring plan for Potash Brook will not be finalized until the State issues a watershed permit for stormwater, the TMDL document indicates that the monitoring will include three main components, as recommended by the VT Water Resources Board's 2004 report. The three components are: 1) tracking stormwater treatment and control practices implemented; 2) monitoring of the primary stressors in the watershed; and 3) monitoring of in-stream habitat and biological and geomorphic condition.

The first component involves tracking progress towards implementing the requirements in the watershed permit. In addition to tracking BMP implementation, VT DEC also expects to track the percentage of stormwater controlled and the percent of land area retrofitted with BMPs in the watershed.

The monitoring of primary stressors will include continuous flow monitoring in the brook (already underway) and the accurate tracking of impervious cover changes within the watershed.

Last but by no means least, monitoring of biological and geomorphic conditions will be key to measuring progress towards attaining water quality standards. Baseline biological and geomorphic assessments have already been completed; regular assessments will be continued as implementation proceeds.

Additionally, the TMDL notes that supplemental in-stream or discharge monitoring (as needed) may be required by the watershed permits – see the discussion in the implemenation plan section, below, for more information on this.

Assessment: Because the monitoring plan will include, at a minimum, both continuous flow monitoring to measure progress towards the TMDL target and on-going biological monitoring to measure progress towards achieving water quality standards, EPA concludes that the proposed monitoring by VTDEC will be sufficient to evaluate the effects of TMDL implementation.

9. Implementation Plans

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.

Although implementation plans are not a required element of a TMDL, and EPA does not approve implementation plans, VT DEC has discussed its implementation strategy on page 22 of the TMDL document.

The State's implementation strategy includes two central permitting components. Vermont is authorized to implement both a federally-authorized NPDES permit program for all Clean Water Act-regulated stormwater discharges (such as stormwater associated with construction and other industrial activities and municipal discharges under the MS4 program) and a state-authorized permitting program for stormwater discharges from impervious surfaces equal to or greater than one acre. This dual permitting authority provides Vermont with powerful tools for requiring the implementation of stormwater treatment and control practices necessary to meet the stormwater runoff reduction targets in this TMDL.

The State anticipates that it will utilize an iterative, adaptive management approach to implementing this TMDL. The first prong of implementation will involve the issuance of a watershed-wide general permit pursuant to Vermont's state stormwater law. Stormwater treatment and control measures will be required in the first-round watershed-wide general permit, including the construction and/or upgrade of stormwater treatment and control systems by specifically identified dischargers of stormwater runoff. The mix of stormwater control practices required by the permit will be calculated to achieve the TMDL stormwater runoff reduction target. The first-round general permit will include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the general permit provides for the attainment of the VTWQS and to determine the appropriate conditions or limitations for subsequent permits. Such a monitoring program may include ambient monitoring, receiving water assessment, discharge monitoring (as needed), or a combination of monitoring procedures designed to gather the necessary information. Based on this information, the permit will be amended, as needed, through the implementation of more widespread and/or more stringent treatment and controls or other best management practices as necessary to meet water quality standards in the stream. This adaptive management approach is a cyclical process in which a TMDL implementation plan is periodically assessed for its achievement of water quality standards and adjustments to the plan are made as necessary.

The second prong of the implementation plan includes NPDES permits issued by the Agency for stormwater discharges subject to the federal Clean Water Act and corresponding state authority (as described above). These permits contain conditions for implementation of appropriate best management practices to provide for attainment of the VTWQS.

In addition, the State plans to aggressively implement a variety of nonpoint source control measures specified in Vermont's Clean and Clear Action Plan. These measures are described in more detail in the reasonable assurances section, below.

Assessment: EPA is taking no action on the implementation plan but notes that the State appears to have a strong implementation strategy in place to achieve the goals of the TMDL.

10. Reasonable Assurances

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."

Given that a (modestly) less stringent wasteload allocation is included in the TMDL based on the assumption that nonpoint source reductions will occur, EPA regulations require that there be reasonable assurance that these nonpoint source reductions will be achieved.

The load allocation applies to discharges from the agriculture/open land use category and is expressed as a 1.4% reduction in stormwater runoff volume. The vast majority of the runoff reduction (14.6%) is assigned to the wasteload allocation. VTDEC believes that nonpoint source control measures being implemented through Vermont's Clean and Clear Action Plan will achieve the modest load reductions set forth in the TMDL. Although the Clean and Clear Action Plan is primarily a phosphorus reduction plan, action items in that Plan will also reduce sediment loadings and otherwise benefit Potash Brook and the other stormwater-impaired streams in the Champlain Basin. As presented in the TMDL, the State plans to:

- Expand the Conservation Reserve Enhancement Program statewide to create conservation easements on farms along streams for buffer implementation.
- Provide technical assistance by Agricultural Resource Specialists to help farmers statewide with best management practices, riparian buffer conservation, nutrient management, compliance with Accepted Agricultural Practices, basin planning, and other technical needs.
- Support agricultural participation in the basin planning process.
- Hire Watershed Coordinators for Lake Champlain Basin watersheds to help develop and implement river basin plans.

- Expand the Department's River Management Program to promote stream stability and reduce phosphorus loading from stream bank and stream channel erosion in the Lake Champlain Basin through a comprehensive program of assessment, protection, management, restoration, and education, with additional federal funding being sought from the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and other agencies.
- Enhance the Vermont Better Backroads Program throughout the Lake Champlain Basin with staffing for technical assistance and increased funding for erosion control grants to towns.
- Offer technical assistance to towns in the Lake Champlain Basin seeking to provide better water quality protection through local ordinances and other municipal actions. This may lead, for example, to improved protection of riparian areas in agricultural and open space areas.
- Protect and/or restore riparian wetlands.

The Responses to Comments on Draft Potash Brook TMDL (VTDEC, 2006) explains that since the TMDL was first drafted, work has progressed on a number of these efforts that will directly address the storm water impacts to Potash Brook. This work includes the following: 1) the State-led basin planning process that includes the Potash watershed is now well underway, and is developing a number of strategies for the conservation of open space and restoration of riparian buffers, etc. – riparian restoration will increase infiltration and reduce stormwater runoff; 2) the State Department of Forests, Parks and Recreation recently established a Wetland Restoration and Protection Program that provides funding for the protection or restoration of wetland areas in the Lake Champlain Basin, and basin planners have noted a number of wetland areas in the upper portion of the Potash watershed that might be good candidates for this program – wetland restoration will result in significant stormwater runoff reductions; 3) an agricultural basin planner has been hired by the Otter Creek Natural Resources Conservation District, and this planner is facilitating input on agricultural components of the basin plan; 4) both phase 1 and 2 geomorphic assessments of Potash Brook have now been completed, and specific recommendations for next steps are laid out; 5) an Agricultural Resource Specialist has been assigned to the region including Potash Brook, and will be conducting a needs survey to determine opportunities for technical assistance on riparian buffer conservation, the Accepted Agricultural Practices, and other technical assistance needs; and 6) The Vermont League of Cities and Towns recently hired a staff person under the Clean and Clear Action Plan to assist municipalities with improvements to conservation oriented ordinances, and this person will be offering assistance to South Burlington.

The TMDL document and the Response to Comments on the TMDL indicate that, taken together, these Potash Brook components of the Clean and Clear Initiative (many of which are already underway) provide reasonable assurance that the modest nonpoint source reductions in the TMDL will be achieved.

Assessment: EPA concurs that the TMDL provides reasonable assurance that the nonpoint source load reductions will be achieved.

11. 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.

A summary of the public participation process is included on page 25. VTDEC provided an opportunity for public comment, beginning on November 18, 2005 and closing on December 19, 2005. However, at the request of the public, the comment period was extended until January 9, 2006. Notice of the comment period was posted on the State's website and announced via newspaper. An informational public meeting was conducted in South Burlington on December 14, 2005 to present the TMDL and answer any questions. At the close of the public comment period, VTDEC received comments from seven (7) parties. A responsiveness summary was developed and submitted with the final TMDL. As a result of the comments, multiple changes were made to the final version of the TMDL and these changes are noted in the responsiveness summary.

Assessment: EPA concludes that VTDEC adequately involved the public during the development of the TMDL, and provided reasonable and thorough responses to the public comments.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

Assessment: VT DEC's letter of October 11, 2006 states that the TMDL is being formally submitted for EPA approval.

References

This document cites the following references in addition to those listed as part of the TMDL submittal package on page 1:

Fitzgerald, E. 2006. *University of Vermont Geomorphic Assessment Project*. Prepared for Vermont Agency of Natural Resources. Burlington VT.

National Advisory Council for Environmental Policy and Technology. July 1998. *Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program.* U.S. Environmental Protection Agency, Office of the Administrator. EPA-100-R-98-006. Washington, DC.

Simon, A. and Rinaldi, M. 2006. *Disturbance, Stream Incision, and Channel Evolution: The Roles of Excess Transport Capacity and Boundary Materials in Controlling Channel Response.*
Geomorphology Vol. 79, p. 361-383.

Zarriello, P.J. and L.K. Barlow. 2002. *Measured and simulated runoff to the Lower Charles River, Massachusetts, October 1999-September 2000*. USGS, Northbrough, Massachusetts, WRIR 02-4129.

Data for entry in EPA's National TMDL Tracking System & Region 1 TMDL Webpage

TMDL Name *	**TMDL to Address Biological Impairment in Potash Brook**
Water body segment names(s)	*Potash Brook*
Number of TMDLs *	1
Lead State	Vermont (VT)
TMDL Status	Final
Pollutant ID(s)	*705 (pollutants in urban stormwater)*
TMDL End Point	*16% reduction in the flow that is equaled or exceeded 0.3% of the time.*
TMDL Type	*Point and Nonpoint Source*
List ID (from system)	VT05-11(F)
Impairment ID(s) (from system)	*546 (unknown) is in the system. The current 303(d) list indicates the impairment is for aquatic life support and the cause is stormwater runoff.*
Cycle (list date)	*1998 and subsequent cycles*
Establishment Date (approval) *	December 19, 2006
EPA Developed	No
Towns affected *	South Burlington

* = data needed for Region 1 "Approved TMDLs" web page