PART FOUR: PUBLIC HEALTH RELATED ASSESSMENTS

Size of Water Affected by Toxicants

With the exception of fish consumption advisories described in Appendix D, there are no waterbodies where toxicants are known to be impairing uses related to public health. Nonetheless, NPDES monitoring by permit holders and water supply monitoring by suppliers continue to provide data and other information related to environmental occurrences of toxicants in permitted municipal and industrial discharges and public water supplies, respectively.

Fish Consumption Monitoring

During the reporting period, an additional ~150 individual fishes beyond those reported during the 2004 305b Report were acquired from Lake Champlain waters for the purpose of revising fish consumption advisories. Analysis of mercury (Hg) from these fish samples has been completed by the DEC LaRosa Laboratory in Waterbury. Testing of these fishes for PCB's is not complete as methods previously used by the LaRosa Laboratory are no longer compliant with currently accepted methods, and the laboratory is no longer sufficiently staffed to carry out method development. DEC remains interested in testing a subset of fishes for polybrominated diphenyl ether flame retardants. DEC will determine whether EPA may provide potential assistance in this regard.

In addition, DEC scientists have provided testimony to Vermont legislative committees regarding formalization of fish tissue monitoring approaches, and subsequently prepared a comprehensive fish-tissue monitoring plan, which was delivered to the Vermont Legislature just following the close of the reporting period. The structure of this plan, which is easily extended to other contaminants, is articulated in the following.

The plan answers the charge established by 10 V.S.A. Chapter164, Section 7114, to prepare a plan addressing fish mercury contamination, and how it changes in response to management actions over time. The resulting proposed freshwater fish tissue monitoring program is specifically designed to document the occurrence of, and trends in, mercury contamination in freshwater fishes of Vermont, for lakes and rivers, and relate observed changes to management actions. This plan has been developed by the Fish Contaminant Monitoring Committee which consists of members from DEC and the Vermont departments of Fish and Wildlife (DFW) and Health (VDH).

The proposed freshwater fish tissue monitoring program is comprised of three biennially-recurring "rounds" of tissue sampling. In sampling round one, target fishes in specified size ranges are tested from Lakes Champlain and Memphremagog, Vermont's largest freshwater resources. In round two (two years later), a similar suite of fish species within target size ranges are tested from a suite of 15 inland lakes, and 15 inland third-order or larger rivers. These so-called indicator waters are those which, along with Champlain and Memphremagog, will be used to assess trends in fish mercury, accounting for factors that impact mercury bioaccumulation. In round three (two years following round two), fish mercury testing in a 15-lake and 15-stream randomized selection of waterbodies will be carried out, to provide a statistical assessment of Statewide fish mercury contamination levels. The assessment cycle then begins anew with Champlain and Memphremagog at the next biennium.

In the plan, information is also provided regarding where mercury emissions, deposition, and product recycling figures are tracked and maintained. These figures form the basis for overall tracking of the management of mercury. Discussion is provided on how fish mercury changes can be related to management actions, and an example figure is provided showing changes in fish mercury in Lake Champlain to date.

In order to transition from the existing fish monitoring approach to the more rigorous program described above, resources are needed in terms of field support and analytical chemistry. Under the current fish monitoring program, DEC, DFW, and VDH jointly manage the program and some of the analytical chemistry costs of the proposed program are already accommodated by DEC under its current budget. The total cost for the program, per biennial sampling round, is estimated at approximately $63,000. A considerable portion of these costs are analytical and at present a portion of these are already accommodated by the Department.

A series of recommendations are provided for implementation of this plan. These include: charging the existing ad-hoc Fish Contaminant Monitoring Committee with management of the program; adoption of the proposed program design; and dedication of resources for field efforts and analytical chemistry. Two specific recommendations regard adding a DMA Mercury Analyzer to the DEC laboratory, and transitioning from fillet sample types to biopsy-plugs. Implementation of these important recommendations would significantly reduce sample processing time, analytical chemistry costs, and the numbers of fish sacrificed for contaminant testing.

Mercury (Hg) Monitoring

The following text summarizes monitoring and analytical activities related to Hg contamination in Vermont during the 2006 305b reporting period. Some of these items are not specifically from Vermont but all bear on Vermont's future approach to dealing with the Hg problem. Vermont remains interested in seeing a final issuance of EPA's long-anticipated fish contaminant report for the Connecticut River.

Release of Ecotoxicology *studies and* Mercury Connections *report*

The issue of environmental Hg contamination received a considerable boost in profile in March 2005 with the release of the studies on Hg contamination across northeast North America and published in the journal *Ecotoxicology* and summarized in the report entitled *Mercury Connections.* These studies quantified the extent and magnitude of Hg contamination of all types of biota, including fish, loons, other aquatic biota, and even terrestrial birds. The House Committee on Fish, Wildlife and Water Resources was briefed on the content of *Mercury Connections* in April 2005.

Forthcoming important synthesis studies by Hubbard Brook Research Foundation

The Hubbard Brook Research Foundation has convened a team of scientists who have further analyzed the northeastern Hg database summarized by *Mercury Connections.* The Foundation has written two new important publications that will stand as statements on the overall footprint of the Hg problem in the northeast. The first study describes the mechanisms by which Hg moves from emissions source to northeastern biota, and projected improvements based on

reductions in air emissions under several scenarios. The second study identifies the locations and causes of biological Hg "hotspots" on the landscape. There are two such hotspots formally identified in Vermont. These studies will be published during early-mid 2006 in the journal *BioScience*.

New measurements of dry deposition at the Underhill mercury monitoring station
The Hg monitoring station at Underhill, Vermont was shut down temporarily when a major windstorm toppled the tower on which many physical sensors were attached. The tower was restored during the fall of 2005 and measurement of wet and dry mercury deposition continue thanks to appropriations from Vermont's congressional delegation. Using new techniques, researchers at Underhill have developed stronger evidence than ever before that certain Hg deposition events measured at Underhill are directly attributable to Hg emissions from Midwestern sectors.

The first accounting of mercury inputs and outputs to Lake Champlain
A team of regional scientists recently published a comprehensive accounting of Hg inputs to Lake Champlain. This project quantified mercury loads to the lake from river inputs as well as from direct atmospheric deposition to the lake surface. Tributary inputs of Hg accounted for 56.4% of the total annual load, followed by direct deposition at 38%, and directly-discharging wastewater treatment at 5.6%. As part of this project, the team reconstructed the history of Hg deposition to the lake at several locations. Mercury accumulation to lake sediments is presently 2.8 times the pre-industrial background. The Lake Champlain project is continuing, with additional focus on improving wastewater release estimates, and on the biological pathways that control Hg accumulation into fish and fish-eating wildlife.

Mercury emissions from the northeast region have been reduced tremendously
The Northeast States for Cooperative Air Use Management (NESCAUM) has finalized a new emissions inventory for the region. As compared to a similar inventory developed in 1998, Hg emissions from the northeast have been reduced from 15,900 kg to 4,700 kg, representing a 71% reduction. Point emission sources of Hg comprise 76% of the current total emissions and releases from products and bulbs, home heating, dental discharges, and other minor sources comprise the remainder. Presently, out-of-region emission sources comprise 85% of the Hg deposited to the northeast and in-region sources comprise 15%.

Terrestrial mercury contamination is becoming more evident
Researchers at the Vermont Institute of Natural Science (VINS) are continuing to identify the mechanisms by which the Bicknell's thrush and other upland songbirds are contaminated with mercury. VINS carried out field testing on Stratton Mountain, Mount Mansfield, and East Mountain in East Haven on several species of birds along with the food that is consumed.

Continuation of mercury monitoring by USGS and the Loon Recovery Project
The United States Geological Survey (USGS) is continuing to support studies of Hg cycling in Lake Champlain and in the Sleepers River watershed. Additional results from the Lake Champlain project beyond those discussed above suggest that stormwater may be a significant source of Hg export from urban areas. Discussions are currently underway to make Hg monitoring a routine element of the overall water quality monitoring activities of DEC and the

Lake Champlain Basin Program. In addition, a steady stream of abandoned loon eggs and feathers from Vermont lakes continues to be analyzed for Hg in conjunction with the Loon Recovery Project.

Field sampling of northeastern reservoirs is complete
In an effort to understand the role played by water-level management on the bioaccumulation of Hg in fish, researchers have recently completed a two-year field project on northeastern reservoirs. This project is aimed at understanding to what degree fish-mercury concentrations are enhanced by the management/fluctuation of reservoir water levels.

Cyanobacteria
Monitoring for cyanobacteria continued on Lake Champlain in 2004 and 2005 as funded by the Lake Champlain Basin Program and the University of Vermont. The tiered sampling and analysis program first implemented in 2003 expanded to include citizen monitors in the southern Vermont and northern New York portions of the lake. The University of Vermont (UVM) continues to manage the program, collect samples, conduct taxonomic assessments and analyze for the presence of microcystin. The DEC Lake Champlain team collects algae samples from stations around the lake each week during its routine sampling and sends them, along with pertinent observations, to UVM for analysis. Monitoring emphasizes identification and rapid enumeration of potentially toxic cyanobacteria, with testing for microcystin and anatoxin occurring as conditions warrant. Results are distributed weekly to stakeholders, including health agencies in Vermont, New York and Quebec. Health alert notices remain the responsibility of each respective agency and are posted when algal counts or toxin levels reach a defined threshold[1]. Microcystin remains the focus of the monitoring program on Lake Champlain because it is the most frequently detected cyanotoxin and rapid assessment capabilities exist at several facilities. In 2005, the Vermont Department of Health (VDH) implemented a new recreational standard of 6 µg/L microcystin. VDH also updated its cyanobacteria webpage to include the Lake Champlain weekly monitoring results in a map format, a photo gallery to assist in identifying cyanobacteria, and general information about cyanobacteria and toxins.

Cyanobacteria were present in many areas of the northern lake by early July, with accumulations of *Microcystis* in Missisquoi Bay. Detectable microcystin, below the new recreational level, was found by July 14th. Microcystin concentrations of 10 - 20 µg/l were present in Missisquoi Bay by July 22nd. In late July, algal cell densities remained high, but microcystin had dropped below 6 µg/L and remained low for the rest of the summer. While moderate densities of cyanobacteria were found in other areas of the lake during the summer, microcystin levels were not a concern.

Small Community Untreated Waste Discharges
Several small communities throughout the state have been discharging untreated wastes to waters of the state due to lack of treatment facilities. The discharges from these areas constitute threats to public health. The Village of East St. Johnsbury constructed several individual and shared non-discharging, soil based sewage treatment systems in 2005. Warren Village completed construction of a sewerage project including sewers, pump stations and a large soil based, non-

[1] One may contact the Vermont Department of Health within Vermont by dialing 800-464-4343 or visiting their web site: www.healthyvermonters.info.

discharging leachfield in 2005. In 2005, three villages in the Town of Pownal began construction of their sewer systems in 2004 and on their direct discharging treatment plant.

DEC is providing direct funding and technical assistance to several other communities to help them evaluate and plan for their wastewater needs. It is anticipated there will be a steady demand by several small communities for wastewater evaluations and planning in the coming years. These communities have not been identified in the past as being the sources of surface water pollution, but residents are now realizing that they may have problems with their small lot and older on-site sewage systems. Part of the impetus for this interest appears to be a change in state law which will require designs and permits for all failed septic system repairs beginning in 2007. Currently, repairs at single family houses require no permitting or compliance with design standards. Another factor is the economic viability of small communities which cannot have commercial or residential growth due to limiting soil conditions for septic system leachfields.

Sites of Known Sediment Contamination

The removal of contaminated sediments from Lake Memphremagog at the Lake Memphremagog-South Bay railyard site in Newport, Vermont is complete. On-site composting to reduce contaminant levels in removed sediments is on-going.

Risk assessment activities are being conducted by EPA in regard to elevated contaminant levels found in sediments in and around the confluence of the Ompompanoosuc River with the Connecticut River. Contaminants are thought to be related to historical mining activities (but no longer occurring) at certain locations within the Ompompanoosuc watershed. EPA has completed a Baseline Environmental Risk Assessment (BERA) for the Superfund site known as the Elizabeth Mine site on the West Branch of the Ompompanoosuc River in Strafford, Vermont. The BERA is currently undergoing final review. Additional CERCLA risk assessment activities are in the preliminary planning and implementation phase for other historical mining sites in the watershed.

Sediment testing in the Hoosic River has found PCB concentrations up to 0.041 mg/kg. The sediments tested are in the vicinity of the former Pownal tannery. Sediment sampling on the Hoosic River upstream in Massachusetts also found PCBs as well as a number of metals.

Hewitt Brook and Pond B at the old Bennington landfill site were analyzed for metals and PCBs. Twenty sediment samples were taken. Five metals were found at concentrations above the Low Effects Level (LEL). Arsenic was found at three sample locations above the Severe Effects Level (SEL). PCB concentrations were above the LEL in 14 of the 20 sediment samples. Monitoring is continuing at this site.

A number of compounds have been found in the sediments of Stevens Brook in St. Albans. Near the former St. Albans Gas & Light Property, one volatile organic compound, eight semi-volatile organic compounds, and four inorganics (cadmium, cyanide, barium, and zinc) were found in the sediments at three times or more the reference value. Monitoring is continuing at this site.

Arsenic has been found in the sediments of Jewell Brook, a tributary to the upper Black River in Ludlow. Further investigation of the Jewell Brook Mill site is being conducted by DEC and others.

Restrictions on Bathing Areas During the 2006 Reporting Period

Lake Champlain

Bayside Beach (Colchester) was closed on several occasions during the reporting period due to the presence of indicator bacteria in excess of Vermont's standard of 77 *E. coli* / 100ml. In the Burlington area, two beaches were closed once during the reporting period (North Beach and Oakledge).

Blanchard Beach (Burlington) continues to remain closed to swimming due to continuously high *E. coli* concentrations.

The following Lake Champlain State Park beaches were closed (number of closures in parentheses) for short periods then reopened. These four Lake Champlain State Park beaches were re-opened for bathing when follow up monitoring revealed safe levels of indicator bacteria. In every case, re-sampling taken the day that high results were received by the beaches revealed *E. coli* concentrations below the Vermont standard.

Knight Point (4) Sandbar Beach (3) Kingsland Bay (3) Alburg Dunes (3)

Inland Lakes

These seven inland lake State Park beaches, located at the respective Vermont State Park, were closed during the reporting period (number of closures in parentheses). In every case, re-sampling taken the day that high results were received by the beaches revealed *E. coli* concentrations below the Vermont standard.

Half Moon Pond (1) Maidstone Lake (2) Lake Carmi (1) Crystal Lake (1)
Lake Dunmore (1) Lake Elmore (1) Ricker Pond (1)

The following 3 inland reservoir beaches, located at facilities owned and operated by the US Army Corps of Engineers, were reported as closed for swimming (expressed as estimated number of days) during the reporting period:

Facility Name	10/1/03-9/30/04
Ball Mountain Lake	8
Townsend Lake	4
Union Village Dam	30

These figures are identical to those reported in Vermont's 2004 305b Report. Newer data for the 2005 swimming season are not yet available from the Army Corps of Engineers.

Rivers and streams – citizen monitoring-based closures.

Of the eleven groups currently participating in the LaRosa Environmental Monitoring Partnership Program, two groups (Huntington Conservation Commission/Huntington River and

West River Watershed Partnership/West River) carry out *E. coli* bacteria monitoring efforts at swimming holes and post the results of their sampling efforts. The Friends of the Mad River also monitor and post *E.coli* results obtained at swimming locations (posted online at www.friendsofthemadriver.org). Table 4.1 identifies the rivers and counts of sites, monitored by the Huntington Conservation Commission and the West River Partnership, that were posted for elevated *E. coli* levels during the last three summers.

Table 4.1. Count of weekly samples greater than 77 E. coli/100ml.

Project Name	Site Location	2003	2004	2005
Huntington Cons. Comm.	7 Falls	1	1	5
Huntington Cons. Comm.	Audubon Hemlock	3	19	9
Huntington Cons. Comm.	Audubon Horseshoe	7	5	9
Huntington Cons. Comm.	Brace Bridge	2	4	
Huntington Cons. Comm.	Brent Field	2	3	8
Huntington Cons. Comm.	Bridge Street	6	5	9
Huntington Cons. Comm.	Carse Bridge	3	5	7
Huntington Cons. Comm.	Cemetary	4	5	9
Huntington Cons. Comm.	East Street	3	5	6
Huntington Cons. Comm.	Rec. Field	2	3	15
Huntington Cons. Comm.	Shaker Mountain	2	3	7
Huntington Cons. Comm.	Sheldrake	5	6	6
Huntington Cons. Comm.	Spence Bridge	2	5	7
West River Watershed Assoc.	Bartonsville Covered Bridge	5	5	*
West River Watershed Assoc.	Brookline Bridge	5	2	*
West River Watershed Assoc.	Deyo's	1	2	*
West River Watershed Assoc.	Dummerston Cvd. Bridge	3	2	*
West River Watershed Assoc.	Gassets/Talc Mine	1	2	*
West River Watershed Assoc.	Jamaica State Park	3	2	*
West River Watershed Assoc.	Milkhouse Meadows	6	5	*
West River Watershed Assoc.	Newfane Swim Hole	4	4	*
West River Watershed Assoc.	North Bridge (Chester)	4	4	*
West River Watershed Assoc.	Pikes Falls	2	1	*
West River Watershed Assoc.	Quarry Rd	2	1	*
West River Watershed Assoc.	Scott Covered Bridge	3	2	*
West River Watershed Assoc.	West Rock Confluence	1	2	*

Restrictions on Surface Drinking Water Supplies During the 2006 Reporting Period

There are no standing boil-water notices to report for the 2006 reporting period. While numerous smaller community or private non-transient systems were subject to short-term boil notices due to minor exceedances of Safe Drinking Water Act criteria for finished water, none were of such a magnitude as to trigger a long-term notice. In addition, none of the boil-water situations warranted enforcement actions.

Chronic or Recurring Fish Kills

There were no known chronic or recurring fish kills in Vermont during the 2006 reporting period, save the commonly observed, natural mortality associated with post-spawning stress. Such fish mortality often occurs on lakes and ponds in Vermont during late spring and early summer. The Vermont Department of Fish and Wildlife maintains a fish pathology laboratory which responds to reports of fish kills and maintains records of the events.

During the 2006 reporting period, there were a total of eight fish kills documented by the fish pathology laboratory that were more than incidental in magnitude and exceeded typical mortality associated with post-spawning stress. Two of the events were attributable to discharges for which enforcement actions by the Agency of Natural Resources were taken. The remaining six events were attributed to natural causes. These eight reported fish kills are as follows:

2004:

1) February – a large-scale but natural kill of carp occurred on the upper Dead Creek, due to prolonged ice cover and complete freeze of the waterbody. This killed thousands of carp, and attracted a wide variety of piscivorous waterfowl including osprey and several bald eagles.
2) July - A major complete kill of 0.62 miles of the Dog River was attributed to a chlorine spill from an upstream wastewater treatment facility. Over 20K individual fishes were estimated to be lost.

2005:

1) June - Lake Rescue – evidence of a minor fish kill attributed to post-spawning stress.
2) June - Silver Lake (Leicester) – evidence of a minor fish kill, with very few fish evidenced.
3) July – Wolcott Pond - evidence of a minor fish kill attributed to rapid water warming.
4) July – Lake Eden - evidence of a minor fish kill attributed to rapid water warming.
5) July – South Bay of Lake Memphremagog - evidence of a minor fish kill attributed to rapid water warming.
6) July – A major complete kill of five miles of the upper Winooski River resulted from an ammonia spill at a cheese and yogurt processing plant.