UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
GREAT LAKES NATIONAL PROGRAM OFFICE (G-17J)
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APR 0 5 2007

Steven E. Chester, Director
Michigan Department of Environmental Quality
Constitution Hall
525 West Allegan Street
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Lansing, MI 48909-7973

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Dear Mr. Chester:

This letter is the U.S. Environmental Protection Agency's (U.S. EPA's) official response to the March 14, 2007, letter from Mr. Richard Powers, Chief of your Water Bureau, requesting the delisting of the Fish Tumors and other Deformities Beneficial Use Impairment in the Torch Lake, Michigan Area of Concern (AOC). As Mr. Powers' request points out, and the supplied data support, the statewide restoration criteria for the Fish Tumors and other Deformities Beneficial Use Impairment have been met in the Torch Lake AOC since there have been "*no reports of fish tumors or other deformities due to chemical contaminants which have been verified through observation and analysis by the MDNR or MDEQ for a period of five years.*"

Based upon this review and the supporting data, and upon our shared desire to show progress as we move all of the Great Lakes Areas of Concern toward the restoration of all beneficial use impairments and formal delisting, U.S. EPA approves the request for the delisting of the Fish Tumors and other Deformities Beneficial Use Impairment in the Torch Lake AOC. U.S. EPA will notify the International Joint Commission of this significant positive change in the environmental health of the Torch Lake AOC.

We congratulate all of the parties involved in this Federal/State/local partnership which has been instrumental in achieving this important environmental improvement that will benefit the citizens of the Torch Lake AOC, the State of Michigan, and of the Great Lakes Basin. We look forward to the continuation of this important and productive relationship with the Michigan Department of Environmental Quality and the Torch Lake AOC Public Action Council as we work together to fully restore all of Michigan's AOCs.

If I or my staff can be of further service to you, please do not hesitate to contact me.

Sincerely,

/s/ original signed by
Walter Kovalick
Mary A. Gade
Great Lakes National Program Manager

cc: Senator Carl Levin (Michigan)
Representative Bart Stupak, Michigan - First Congressional District
State Senator Michael Prusi (Michigan District 38)
State Representative Michael Lahti (Houghton County, Michigan)
Karen Vigmostad, Director, Great Lakes Regional Office, International Joint Commission
Richard Powers, Michigan Department of Environmental Quality
Sharon Baker, Michigan Department of Environmental Quality
David Jukuri, Chair, Torch Lake Public Action Council
Dan Lorenzetti, Secretary, Torch Lake Public Action Council
Gary Gulezian, U.S. EPA – Great Lakes National Program Office
Brenda Jones, U.S. EPA – Federal RAP Liaison/Region 5 Superfund
Mark Elster, U.S. EPA – Great Lakes National Program Office
Pete Christich, U.S. EPA – Office of International Activities

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

March 14, 2007

Mr. Gary Gulezian, Director
Great Lakes National Program Office
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard (G-17J)
Chicago, Illinois 60604-3507

Dear Mr. Gulezian:

The purpose of this letter is to request the U.S. Environmental Protection Agency – Great Lakes National Program Office's (U.S. EPA-GLNPO's) concurrence with the removal of the Fish Tumors or Other Deformities Beneficial Use Impairment (BUI) for the Torch Lake Area of Concern (AOC).

The Michigan Department of Environmental Quality (MDEQ) has evaluated the restoration of this BUI based on the process and criteria in the *Guidance for Delisting Michigan's Great Lakes Areas of Concern*, which is consistent with the U.S. Policy Committee's *Delisting Principles and Guidelines* document. The MDEQ has determined that the Torch Lake AOC has met the statewide restoration criteria for the Fish Tumors or Other Deformities BUI and that the BUI should be removed from the list of impairments in the Torch Lake AOC.

Enclosed please find supporting documentation for the removal of the Fish Tumors or Other Deformities BUI in the Torch Lake AOC, including the Technical Information Paper from the MDEQ's technical staff and a letter of support from the Torch Lake Public Action Council (PAC).

We look forward to our continuing partnership in the AOC program, and working closely with the U.S. EPA-GLNPO on the delisting of AOCs. If you need further information or assistance, please contact Ms. Sharon Baker, Aquatic Nuisance Control and Remedial Action Unit, Surface Water Assessment Section, Water Bureau, at 517-335-3310, or you may contact me.

Sincerely,

Richard A. Powers, Chief
Water Bureau
517-335-4176

Enclosures

cc: Ms. Vicki Thomas, U.S. EPA
Ms. Elizabeth LaPlante, U.S. EPA
Mr. Mark Elster, U.S. EPA
Ms. Brenda Jones, U.S. EPA
Mr. David Jukuri, Torch Lake AOC PAC Chair
Mr. Dan Lorenzetti, Torch Lake AOC PAC Liaison
Mr. George Madison, Michigan Department of Natural Resources
Ms. Diana Klemans, MDEQ
Mr. Richard Hobrla, MDEQ
Ms. Sharon Baker, MDEQ

TECHNICAL INFORMATION PAPER
REMOVAL OF THE FISH TUMOR OR OTHER DEFORMITIES
BENEFICIAL USE IMPAIRMENT
FOR THE TORCH LAKE AREA OF CONCERN

Issue or Request

Based upon the collective review of the documentation from the Torch Lake Area of Concern (AOC) related to the Fish Tumors or Other Deformities Beneficial Use Impairment (BUI) by the Torch Lake AOC Technical Committee during the summer of 2006, we recommend removal of the Fish Tumor or Other Deformities BUI in the Torch Lake AOC, per the process outlined in the *Guidance for Delisting Michigan's Great Lakes Areas of Concern (*MDEQ, 2006, page 19, Attachment A). The Committee is composed of Brenda Jones, United States Environmental Protection Agency (U.S. EPA); George Madison, Michigan Department of Natural Resources (MDNR); Roger Eberhardt and Sharon Baker, Michigan Department of Environmental Quality (MDEQ); and members of the Torch Lake Public Action Council (PAC) including Dan Lorenzetti, Larry Stevens, Robert Baillod, Ron Whiton, and James Trevethan

Background/Facts

The 1985 AOC designation was based on the fish consumption advisory issued by the Michigan Department of Public Health (MDPH), now the Michigan Department of Community Health (MDCH), and driven by the presence of gross external and internal tumors in older sauger and walleye (Remediation Plan for the Torch Lake Area of Concern [MDNR, 1987]). The origin of the tumors was not determined (MDNR, 1987; Black et al., 1982; and Black and Evans, 1986).

The Torch Lake AOC is located on the Keweenaw Peninsula in Houghton County, Michigan. The AOC boundary was described in the 1987 Torch Lake Remedial Action Plan (RAP) as ". . . Torch Lake and its immediate environs" (Attachment B).

The Keweenaw Peninsula, "Copper Country," saw production of 14 billion pounds of copper involving mining, milling, and smelting operations beginning in the 1860s and extending for 100 years. These industries generated large quantities of stamp sands, slags, and other process wastes. A portion of the remaining wastes, estimated at 200,000,000 tons of stamp sands and slags, were distributed directly into Torch Lake or along the shoreline filling approximately 20 percent of the volume of the lake (MDNR, 1987).

As reclamation and reprocessing technologies improved, sediment dredging for copper recovery operations were conducted beginning in 1915. These process wastes included creosotes and xanthates, which were suspected as the causative agents responsible for tumor induction in Torch Lake sauger and walleye. They have not been found in the lake due to their rapid degradation, and a direct link with tumor formation was never established (MDNR, 1987).

The combined actions of extracting copper from mined ores, reclaimed stamp sands involving milling and smelting, and raw sewage disposal resulted in increased water

turbidity, suspended fine materials, and deposited process wastes and untreated sewage to the lake. These actions contributed directly to the contaminant loading to Torch Lake resulting in water quality and use impairments (MDNR, 1987).

In 2005, using the 1987 Torch Lake AOC RAP, the MDEQ staff identified three BUIs as described under Annex 2 of the 1987 Great Lakes Water Quality Agreement (International Joint Commission, 1987) for the AOC (Attachment C). These BUIs are Fish Tumors or Other Deformities, Restrictions on Fish Consumption, and Degradation of Benthos. On June 12, 2006, the Torch Lake PAC voted to adopt the state's delisting criteria for the Fish Tumor or Other Deformities BUI. No decision on whether to use the state's criteria or develop local criteria has been reached by the Torch Lake PAC related to the remaining BUIs.

The removal of the Fish Tumors or Other Deformities BUI was discussed at monthly conference calls with the Torch Lake PAC Technical Committee members who were instrumental in the development of this removal document. The document was revised throughout the year until consensus was reached. The PAC supports the removal of this BUI (Attachment D).

The Fish Tumor BUI removal was also discussed with the Torch Lake PAC and the community at a special public meeting held August 14, 2006, in Houghton, Michigan. A briefing in draft format titled *Proposed Removal Recommendation, Fish Tumors or Other Deformities Beneficial Use Impairment, Torch Lake AOC* was available at that meeting. The community and the PAC expressed their support for requesting removal of this BUI to the State of Michigan at the August 14 meeting and in the PAC's letter dated August 31, 2006 (Attachments D and E). No public comments were received during the 30-day public comment period following the August 14 meeting.

<u>Inputs/Source Controls/Remedial Actions</u>

Many remedial actions, source control activities, and changes have occurred within the Torch Lake AOC in the past 30 to 50 years that affected water quality and clarity. Historic inputs, remedial actions, and source control activities have been summarized to document these changes:

- Historically, raw sewage was dumped into Torch Lake from numerous public and private outfalls (MDNR, 1987).
- 1860s: Copper mining and milling activities began in the Keweenaw Peninsula area depositing mine water, and milling and smelting process wastes into the lake (MDNR, 1987; and Wright et al., 1973).
- 1915: Dredging of sediments for copper recovery began, including reclamation and reprocessing operations, disturbing sediments and depositing process wastes into the lake (MDNR, 1987). The sediment reprocessing operations used creosotes and xanthates in the flotation process to separate additional copper from the original process waste materials. Dredging and reprocessing continued through 1968 (MDNR, 1987).
- 1968: Copper production ceased (MDNR, 1987) including mining, milling and smelting operations.

- 1968: Dredging in Torch Lake related to reprocessing sediments for copper production and associated discharges ceased (MDNR, 1987).
- 1970: North Houghton County Water and Sewerage Authority was formed which eliminated effluent discharges to the Trap Rock River system from the communities of Lake Linden, Tamarack, Hubbell, and other local sources (Wright et al., 1973; and MDEQ-NPDES, 2006).
- 1970: Torch Lake Area Sewage Authority found 23 raw sewage outfalls along the Torch Lake shoreline (Williams, 1973).
- 1971-1972: An estimated 27,000 gallons of copper leaching liquor (cupric ammonium sulfate) were discharged from salvage efforts at the Lake Linden leaching plant (Evans, 1973; and Wright et al., 1973). This was not considered a significant source of copper to the lake (Evans, 1973; and MDNR, 1987).
- 1972: Mine dewatering ceased (Wright et al., 1973). Dewatering added high amounts of calcium chloride to the lake.
- 1979: The Torch Lake Area Sewage System-Lake Linden Facility and the Torch Lake Area Sewage System-Tamarack System collection and treatment lagoon systems were put in place ending the discharge of raw sewage into Torch Lake.
- 2004: The National Pollutant Discharge Elimination System (NPDES) Permit for the Torch Lake Area Sewage System-Lake Linden Facility and Tamarack systems continue to authorize stabilization lagoons with seepage beds for wastewater treatment (MDEQ-NPDES, 2006).
- 2006: Current discharges to Torch Lake from industrial sources include only noncontact cooling water and storm water from Peninsula Copper Industries copper recovery operation (MDEQ-NPDES, 2006).

These combined actions have led to increased water quality and clarity and improvement in the trophic status of the lake.

Fisheries Information

Large external and internal fish tumors were found by local fishermen on older sauger and walleye and reported to MDNR district staff beginning in the late 1970s (MDNR, 1987) (MDNR, 1979). Fishermen in Michigan regularly report tumors to local district offices and staff when they are found to make sure that the fish are safe to eat. It is common practice to ask them to bring the fish to the office immediately for a biologist to inspect or freeze them and drop them off at the office when they can. When large fish kills are reported to the MDEQ or the MDNR, staff immediately go to the site to collect fish, water, and sediment samples. District fisheries biologists regularly attend several community outreach meetings a year in the Torch Lake area to communicate fisheries management decisions. These biologists, knowing that fish tumors have been a concern for that area, ask community members at these public meetings if they have encountered fish with tumors and the answer has been negative since at least 1993. Retired MDNR fisheries biologists live in that area and spend a good part of their recreational time fishing on Torch Lake. These retirees know the area's historical problems and what to look for, and have not communicated anything unusual.

The 1983 fish consumption advisory was issued by the MDCH because of the tumors found in the sauger and walleye (Tomljanovich, 1974; and Black et al, 1982). The advisory was issued for the protection of human health. A 1979 MDNR Torch Lake Fisheries Survey Report indicated that the walleye and sauger captured were nine years of age or older.

According to John Hesse, retired MDNR Fisheries Biologist who worked on these issues in December of 2006 the issue of tumors in Torch Lake sauger and walleye was reported by John Black (Black et al., 1982) and in the MDNR 1990 Report (MDNR, 1990), based on fish collected in 1979 and 1980. At the time of the 1982 study from fish collected in 1979, liver tumors or cysts were found in 100 percent of the sauger and about 30 percent of the walleye examined (Hesse, 2006).

Fish populations were sampled and analyzed by the MDNR staff in 1985 and 1988 to determine the status of tumors in fish and developed a report entitled *Michigan Department of Natural Resources, Surface Water Quality Division, Fish Growth Anomalies in Torch and Portage Lakes 1974-1988, Houghton County, Michigan* (MDNR, 1990), which indicated that since the early 1970s over 10,000 fish had been collected in 9 different studies in the Torch Lake, Portage Lake, and Keweenaw Waterway.

John Black, Department of Experimental Biology, Roswell Park Memorial Institute, New York Department of Community Health, performed the tissue analysis for the MDNR's 1990 report. According to the report, no internal or external anomalies were observed on the 485 fish collected in 1988. The 1990 report showed that tumors were no longer present and recommended the removal of the fish tumor consumption advisory. Additionally, no liver neoplasms were observed in the 25 walleye collected in 1985 or the 47 walleye collected in 1988. The MDNR's 1990 report also indicated that the few sauger collected in 1985 were older fish, and that none were collected in 1988, which would seem to indicate that natural reproduction was not occurring. The report indicated a high incidence of tumors found in the historic sauger populations, though that incidence appeared to decline in the 1985 population. Discussions between the MDNR, Fisheries Division, and the MDEQ staff indicated sauger are no longer found within the lake system. It is probable that as the waters became clearer, because of the sauger's preference for murky waters, the improvements in water quality in Torch Lake forced the remaining sauger populations to seek more favorable environments.

Studies of tumor incidence in walleye conducted by Michigan Technological University students and/or faculty showed a decline in tissue anomalies (MDNR, 1987). Tumor rates dropped to a level equivalent to that seen in lakes not impacted by mine wastes (three to four percent), and the decision was made to remove the designation from the advisory in 1993 (Hesse, 2006). Since the Fish Tumor Consumption Advisory was removed in 1993 there have been no reports of fish tumors to the MDNR staff (Nerenberg, 1998 and Madison, 2006) (Table A).

The Fish Contaminant Monitoring Program (FCMP) is a state program that collects fish tissue samples to support development of Fish Consumption Advisories for Michigan's

waters. The MDEQ in cooperation with the MDCH, the Michigan Department of Agriculture, and the MDNR determine what fish to sample and where on a five-year rotational watershed basis. The MDEQ works with the MDNR and the tribes to collect samples. The MDEQ staff process fish to MDCH specifications: skin-on or-skin off fillets, steaks, and gutted/headless (smelt). For each fish, the weight, length, and sex are determined. Gross internal and external tumors or other deformities are noted. To determine sex, the fish are opened and sex is determined based on internal organ examination. Samples are then labeled, frozen, and sent to the MDCH for tissue analysis. Fish advisories are set based on the information discovered during this process. Documentation of recommendation for changes to the Advisory is found in the FCMP Annual Report (MDEQ, 2001).

Table A was developed from the MDNR, the MDCH Fish Consumption Advisories, and information found in the 1987 Torch Lake AOC RAP, and documents the history of the fish advisories from the FCMP Annual Reports.

Table A. Torch Lake Fish Consumption Advisory History

Date	Consumption Advisory In Place For:	Tumors	Mercury	PCBs
1979 and 1980	walleye and sauger tumor reports			
1983	walleye and sauger	**X**		
1989	walleye and sauger	**X**		
1990 - 1992	walleye, sauger, and smallmouth bass	**X**	**X**	
1993	tumor advisory removed		**X**	
1994 - 1998	general mercury only		**X**	
1999 - 2001	walleye and smallmouth bass		**X**	**X**
2002 - present	northern pike added		**X**	**X**

The MDNR began stocking walleye from rearing ponds into Torch Lake in 1987. Stocking continued through 2004, with over 400,000 walleye fingerlings planted in Torch Lake. During this time the MDNR also planted almost 9 million walleye into the connected Portage Lake (MDNR, 1979). This stocking has resulted in a thriving trophy walleye fishery in Torch Lake, culminating in two world class finalist fishing tournaments held in recent years and one tournament round leading to the finalist participant determination. Despite the high numbers of professional fisherman associated with these tournaments, no anomalies have been reported.

The following information documents activities and events to provide a timeline and the basis for the BUI removal removal recommendation:

- 1970s: Large external and internal tumors regularly reported to the MDNR (specifically sauger and walleye).
- 1974: Tomljanovich found undetermined, yet high number of sauger and walleye with neoplasms (Tomljanovich, 1974).
- 1979: Michigan Department of Conservation fish collection summary data sheet notes: *all sauger were heavily infected by internal and external parasites.*
- 1979 and 1980: Internal and external fish tumors identified on old sauger and walleye (MDNR, 1987).
- 1982: First published study of the tumors (Black et al., 1982) found:

  - 100 percent of saugers affected with liver neoplasms and epizootic neoplasms
  - 13 percent of walleye with liver neoplasms
  - Noted that sauger were old
  - External tumors were “highly visible”
- 1983: The MDPH issued tumor-based consumption advisory on sauger and walleye; no tumor inducing agents identified either by chemical analysis or bioassays.
- 1983: Constanzo and Oaks collected many fish. The data showed 56 were sauger. The information in the MDNR 1990 report did not list neoplasms for these fish. Twenty-eight walleye were collected with four reported to have neoplasms (Constanzo and Oaks, 1984).
- 1984: Constanzo and Oaks collected many fish. The data showed 72 were sauger with 72 reported neoplasms and 45 walleye were collected with 2 reported to have neoplasms (Constanzo and Oaks, 1984).
- 1984: Markham reported examining nine sauger and finding nine with neoplasms and 18 walleye with 1 neoplasm (Markham, 1984).
- 1983-1984: Black and Evans collected a total of 434 fish of which 64 were sauger and 34 had neoplasms, and of the 113 walleye collected 4 had neoplasms (Black and Evans, 1986).
- 1985: Spence examined 10 sauger finding 9 with neoplasms and 25 walleye reporting none with neoplasms (Spence, 1986).
- 1987: The MDNR began stocking walleye from rearing ponds into Torch Lake. Stocking continued through 2004, with over 400,000 walleye fingerlings planted.
- 1988: Black and Evans collected 458 fish. Sauger were no longer available to be collected. Forty-seven walleye were collected with no neoplasms reported (MDNR, 1990)
- 1992: The U.S. EPA superfund remedial investigation report found very high levels of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) (known to induce tumors in fish). However, they were only detected in one small area of the 2700-acre lake. This small area is quite unlikely to cause the frequency of the tumors found in the 1970s and 1980s (U.S. EPA, 1992).
- 1993: The MDCH removed the fish consumption advisory for tumors based on a 1990 report (MDNR, 1990). This is a comprehensive study of fish tissue residues and the occurrence of internal and external tumors. The conclusions of the report related to fish tumors are:
  - No internal or external growth anomalies were observed among 458 fish collected in 1988.
  - Saugers disappeared from the lake due to increasing clarity in the lake after cessation of mining activities and building sewerage treatment facilities (Nelson and Walberg, 1977; and Ali et al., 1977).
  - Bioassays of water and sediments do not indicate the presence of carcinogenic substances.
- 1998 and 2006: Sauger are no longer present in the system (Nerenberg, 1998; and Madison, 2006). Data collected in the 1979 fisheries survey by the MDNR

staff indicated that the fish surveyed were older fish (7+ years) and natural recruitment of young fish was not occurring (Juetten, 1979).

- 1998: The MDNR notes no reports of tumors in more than five years. Note that MDNR asks specifically about tumors at public meetings (Nerenberg, 1998).
- 2001: Michigan Fish Contaminant Monitoring Report (fish collected 1998 - 2000), no tumors were noted in the report. The inference is that no tumors were observed (MDEQ, 2001):
    - MDEQ, Water Bureau (WB), Surface Water Assessment Section (SWAS), Procedure No. 31 describes the procedure used to process fish samples.
    - MDEQ, WB, SWAS, Procedure No. 31 states "anomalies such as tumors or lamprey marks. . . " should be noted on the fish processing data sheets.
    - Since no mention was made in the 2001 report of fish anomalies, then it can be inferred that none were noted.
    - Ms. Baker participated in both the fish collection and processing events for Torch Lake fish specifically to observe gross external and internal tumors. None were observed.
- 2003 and 2004: Two In-Fisherman Professional Walleye Trail Tournament Championships sponsored by Mercury Motor Sports were held and drew the top 51 North American fisherman competing for the championship title. No tumors were reported by participants.
- 2006: In-Fisherman Professional Walleye Trail Tournament was held. One of four Super-Pro Tournaments sponsored by Mercury Motor Sports in which 30 top regional walleye fisherman compete for the right to participate in the championship tournament mentioned above. No tumors were reported by participants.
- 2006: Memo from the MDNR, Fisheries Division, indicates that fish tumors had not been reported nor observed (again) for more than five years (Madison, 2006) (Attachment F).
- 2006: The MDEQ held a public meeting to discuss the proposed Tumor BUI Removal and a 30-day public comment period to obtain input related to the proposal. The MDEQ did not receive any input related to the proposed tumor removal from the public (Attachment E).
- 2006: The Large Lakes Assessment Field Protocol used by MDNR when collecting fish clearly states the presence/absence of lymphocystis on walleye and lymphosarcoma on pike and muskie will be noted. This information supports "no tumors were observed nor noted" in the 2001 report.
- 2006: The MDNR creel census manuals indicate that reports of tumors must be noted when fish are collected for the FCMP. This information supports "no tumors were observed nor noted" in the 2001 report.

Analysis

The criteria for removal of the Fish Tumors and Other Deformities BUI in Michigan's AOC is based on a tiered approach. The first tier is whether there have been any verified reports through observation and analysis by the MDNR or the MDEQ of tumors or deformities in fish caught in the AOC for five years. If not, the BUI is considered

restored. If there have been verified reports in the previous five years, then a comparison study must be conducted to determine if the tumor rate is statistically higher (95 percent confidence interval) in the AOC than in a comparable nonimpacted control site. If not, then the BUI is considered restored.

For the past several years a U.S. EPA Superfund Remedial Action has occurred on the upland surrounding Torch Lake to reduce surface runoff through and wind blown erosion of stamp sands to the lake. This remedial action was based on the U.S. EPA Record of Decision for the Torch Lake Superfund Site. All actions were completed in the fall of 2006.

Based on the MDNR 1990 report, the MDCH removed the fish consumption advisory for tumors in Torch Lake in 1993. The tumor advisory was the original cause for listing this AOC. The MDNR's 1990 report documents the sampling and analysis completed, which resulted in the removal of the fish tumor consumption advisory. The MDNR/MDEQ sampling for the FCMP did not note any gross internal or external tumors or deformities in the fish collected for the 1999 advisories.

The MDNR has documented that tumors have not been identified nor reported from Torch Lake to the MDNR since before 1993, which is more than five years, meeting the BUI removal criteria (Madison, 2006; and Nerenberg, 1998). The MDNR staff asks local fisherman at public meetings if anyone has observed any internal or external tumors. This inquiry has met with a negative response, and no one has reported directly to the local MDNR, Fisheries Division, office of the discovery of internal tumors. If internal tumors had been reported, this would have been recorded and investigated by the local district fisheries biologist (Attachment F).

Discussions within the 1987 RAP include an examination of the potential source of the internal tumors. Copper reclamation operations began in 1915. During the flotation process, creosotes and xanthates were used to separate the copper. Creosotes and xanthates were suspected as the causative agents responsible for tumor induction in the sauger and walleye but since they degrade rapidly in water or had adhered to the copper and were destroyed in the smelting process, a direct link was not established.

Xanthates caused extensive liver damage in rainbow trout exposed continuously for 30 days (Leduc and Lee, 1976). In a four-month tumor induction and mutagenicity study by Stensland and Bowen in 1986, the Medaka fish, *Oryzias latipes*, were exposed twice during this period to the copper flotation chemicals, potassium-isopropyl xanthate or combinations of xanthate and creosote in the presence of sediments from either Torch Lake or from a control site (Stensland and Bowen, 1986). Histological evidence revealed hepatic abnormalities such as micronodules after exposure to creosote. This seems to indicate that these chemicals might have caused the tumors. The effect was mitigated with the cessation of process waste discharges in 1968.

Recommendation

Based upon review of the data and input from the MDEQ, U.S. EPA staff and the PAC, including the Technical Committee members, we recommend removal of the Fish Tumors or Other Deformities BUI in the Torch Lake AOC.

Prepared by: Sharon Baker, Environmental Quality Analyst
Surface Water Assessment Section
Water Bureau
Michigan Department of Environmental Quality
March 13, 2007

Attachments

A. Guidance for Delisting Michigan's Great Lakes Areas of Concern-Fish Tumors or Other Deformities
B. AOC Boundary Map
C. Torch Lake PAC Tumor BUI Removal Support Letter
D. Torch Lake PAC Tumor BUI Removal Continued Support Letter
E. Torch Lake AOC Public Meeting Notice Regarding Removal of the Tumor BUI
F. Note from MDNR to MDEQ verifying and supporting the "no reports of tumors on Fish from Torch Lake

References

Ali, M.A., R.A Ryder, and M. Anctil. 1977. *Photoreceptors and Visual Pigments as Related to Behavioral Responses and Preferred Habitats of Perches (Perca spp.) and Pike-perches (Stizostedion spp.)*. Journal of Fisheries Research Board Can. 34:1475-1480.

Black, J.J., E.D. Evans, J.C. Harshbarger, and R.F. Zeigel. 1982. *Epizootic Neoplasms in Fishes from a Lake Polluted by Copper Mining Wastes*, 4th ed.

Black, J.J. and E.D. Evans. 1986. *Environmental Carcinogenesis Studies in a Copper Polluted Lake.* Draft Report to the EPA Great Lakes National Program Office. Chicago, Illinois. EPA Grant R005726-01.

Costanzo, J.P. and J.W. Oakes. 1984. Torch Lake Field Study Report. Michigan Technological University.

Evans, E. 1973. *Evaluation of a Cupric Ammonium Carbonate Spill Into Torch Lake, Houghton County, Michigan*. 13 p.

Hesse, J. 2006. Personal communication to Joe Bohr. December 3, 2006, regarding the Torch Lake fish tumor fish advisory removal.

International Joint Commission. 1987. *Annex 2 of the 1987 Revisions to the 1978 Great Lakes Water Quality Agreement.*

Juetten, R. 1979. Torch Lake Fisheries Survey. MDNR-Surface Water Quality Division. 74 pp.

Leduc, G. and G. Lee. 1976. *Environmental Chemistry of Copper in Torch Lake , Michigan.* Water, Air, and Soil Pollution. 8:373-385.

Madison, G. 2006. Electronic and personnel communication between George Madison, Fisheries Division, MDNR, and Sharon Baker, Torch Lake, MDEQ, AOC Contact. Sauger discussions agreed with earlier assumption that sauger are no longer present in the system due to greater water clarity as sauger prefer murky waters.

Markham, T. 1984. Torch Lake Fish Study Field Report. Michigan Technological University.

MDEQ. 2001. Fish Contaminant Monitoring Program 2001 Annual Report. No fish tumors were noted. Report number MI/DEQ/SWQ-02/035.

MDEQ. 2006. *Guidance for Delisting Michigan's Great Lakes Areas of Concern.* MI/DEQ/WB-06/001.

MDEQ-NPDES. 2006. Review of current status permits in NPDES database by Judith Woodcock, Permits Section, Water Bureau, MDEQ.

MDNR. 1979. Fisheries Division. Stocking Report. Walleye stocking in Torch Lake. For further details go to the MDNR Stocking Report Web site at http://www.michigandnr.com/fishstock/ and select Houghton County, Torch Lake, Walleye.

MDNR. 1987. *MDNR Remediation Plan for Torch Lake Area of Concern*. Surface Water Quality Division, Great Lakes and Environmental Assessment Division. Lansing, MI.

MDNR. 1990. *Fish Growth Anomalies in Torch Lake and Portage Lakes 1974-1988, Houghton County, Michigan*. MDNR, Surface Water Quality Division. Report number MI/DNR/SWQ-90/029.

Nelson, W.R. and C.H. Walberg. 1977. *Population Dynamics of Yellow Perch, Perca flavescens, Sauger, Stizostedion canadense, Walleye, Stizostedion. vitreum vitreum in four main stem Missouri Reservoirs.* Journal of Fisheries Research Board Can. 34:1748-1763.

Nerenberg, V. 1998. Electronic and personnel communication between Sharon Baker, Torch Lake, MDEQ, AOC Contact and Vern Nerenberg, Fisheries Biologist, Fisheries Division, MDNR, Baraga, Michigan, February 5, 1998. He had not had any reports nor seen evidence of fish tumors for more than five years. Sauger are no longer found in the lake due to the increases in water clarity.

Spence, J.A. 1986. *Tumor Incidence and Parasite Survey of Perch, Perca flavescens, Walleye, Stizostedion canadense (Smith), of the Keweenaw Waterway*. MS Thesis. Michigan Technological University.

Stensland, T. and S. Bowen. 1986. *Tumor Induction Study: Exposure of Orzyias latipes to Potassium-isopropyl Xanthate and Potassium-isopropyl Creosote Combinations in the Presence of Torch Lake Sediment*: Effect on Liver Histology. Michigan Technological University.

Tomljanovich, D. 1974. *Growth Phenomena and Abnormalities of the Sauger, Stizostedion canadense (Smith), of the Keweenaw Waterway*. MS. Thesis, Michigan Technological University.

U.S. EPA. 1992. Region 5 ARCS Program. Final Remedial Investigation Report, Operable Unit 2, Torch Lake, Remedial Investigation/Feasibility Study, Houghton County, Michigan, January, Donohue and Associates, Inc., Volume 1.

Williams, S. 1973. MTU study, part of which described the number of untreated outfalls which directly discharged to Torch Lake. Described by Dr. Robert Baillod, MTU Professor and PAC Technical Committee.

Wright, T.D., D.G. Leddy, D.J. Brandt, and T. Virnig. 1973. *Water Quality Alteration of Torch Lake, Michigan by Copper Leach Liquor*. Proceedings 16th Conference, Great Lakes Research. Pages 329-344. International Association of Great Lakes Research.

Attachment A

Guidance for Delisting Michigan's Great Lakes Areas of Concern 2005

Fish Tumors or Other Deformities

Significance in Michigan's Areas of Concern

Four of Michigan's AOCs are identified as impaired for fish tumors, including: Detroit River, Rouge River, Torch Lake, and St. Marys River.

Michigan Restoration Criteria and Assessment

This BUI will be considered restored when:

- No reports of fish tumors or deformities due to chemical contaminants which have been verified through observation and analysis by the MDNR or MDEQ for a period of five years.

OR, in cases where any tumors have been reported:

- A comparison study of resident benthic fish (e.g., brown bullhead) of comparable age and at maturity (3 years), or of fish species which have historically been associated with this BUI, in the AOC and a non-impacted control site indicates that there is no statistically significant difference (with a 95% confidence interval) in the incidence of liver tumors or deformities.

Rationale

Practical Application in Michigan

Comparing tumor and deformity rates in resident benthic fish species, or historically impacted species, between an AOC and an un-impacted control site allows for the determination of whether this impairment is caused by local contaminant sources within an AOC or is a lakewide problem. Brown bullhead is a particularly good indicator species because it is pollution tolerant and primarily a resident fish. However, it is habitat limited in both the Detroit and Rouge River AOCs, so other benthic species may need to be used in some AOCs to evaluate tumor or deformity prevalence.

Research is ongoing to develop background rates for tumor and deformity incidence in the Great Lakes, as well standardized histology and monitoring methods. The MDEQ will incorporate the results of these research efforts, as available and applicable, into the assessment of whether this restoration criterion has been met in Michigan AOCs.

The MDEQ will consider restoration of this BUI on a case-by-case basis for AOCs with circumstances that do not fit exactly into the evaluation steps outlined above.

1991 IJC General Delisting Guideline

When the incidence rates of fish tumors or other deformities do not exceed rates at un-impacted control sites and when survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers.

The IJC general delisting guideline for the BUI is presented here for reference. The Practical Application in Michigan subsection above describes application of specific criteria for restoration based on existing Michigan programs and authorities

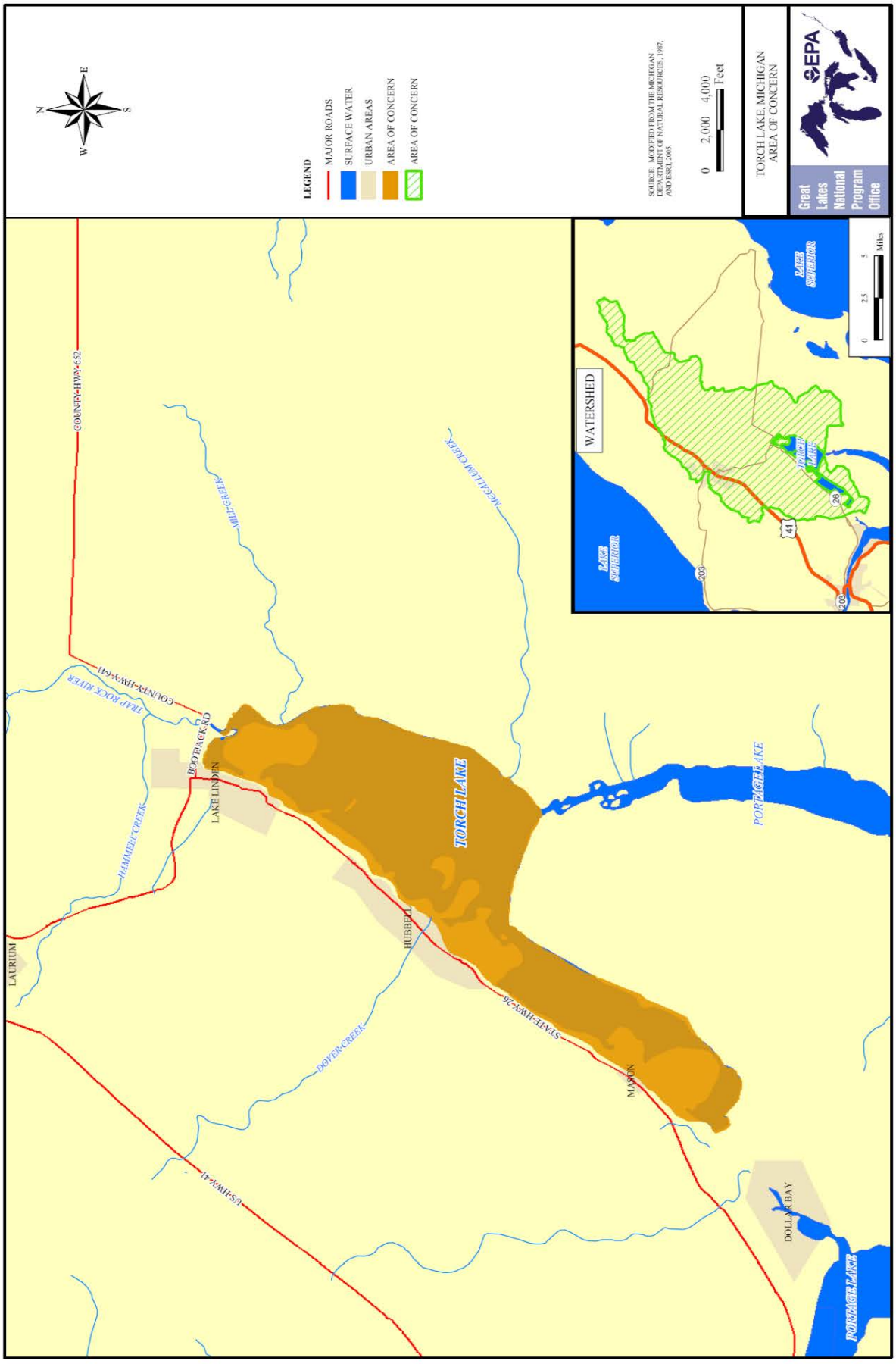
State of Michigan Programs/Authorities for Evaluating Restoration

The MDEQ will coordinate with the MDNR to determine whether there have been any reports of fish tumors or deformities due to chemical contaminants which have been verified through observation and analysis by the appropriate agency in the previous 5 years.

If a study of fish tumors and deformities is necessary, the MDEQ will work with the MDNR to develop a study comparing fish tumors in the AOC to an appropriate control site or reference conditions. Once the assessment is complete, the MDEQ will evaluate whether the data indicate that the restoration criteria for this BUI has been met.

Local AOC communities also have programs for monitoring water quality and related parameters which may be applicable to this BUI. If an AOC would like to use local monitoring data for the assessment of BUI restoration, the data can be submitted to the MDEQ for review. If the MDEQ determines that the data appropriately address the restoration criteria and meet quality assurance and control requirements, it may be used to demonstrate restoration success.

Attachment B. AOC Boundary Map



Attachment C

Torch Lake PAC Tumor BUI Removal Support Letter.

TORCH LAKE PUBLIC ACTION COUNCIL
1306 Jasberg Street
Hancock, MI 49931

WATER DIVISION
JUL 03 2006
SWQAS

June 12, 2006

Dear Sharon,

This letter is in response to your formal request to have the Torch Lake Public Action Council, in conjunction with the state's Area of Concern staff, jointly propose the removal of the Fish Tumor or Other Deformities BUI from the Torch Lake Area of Concern. After consultation with the PAC's Technical Committee, and review of the Interoffice Communication Draft forwarded by you to our group on May 26, 2006 by e-mail which includes the May 25, 2006 letter from George Madison, Fisheries Supervisor MDEQ, the TLPAC agrees with the Area of Concern staff that the Fish Tumor BUI should be removed from the Torch Lake Area of Concern.

The TLPAC also concurs with the Fish Tumor restoration criteria guideline in the State of Michigan's Area of Concern Delisting document. This document addresses this issue clearly in the second paragraph which states: "This BUI will be considered restored when: No reports of fish tumors or deformities due to chemical contaminants which have been verified through observation and analysis by the MDNR or MDEQ for a period of five years." In addition to George Madison's letter, the PAC has found no documentary evidence of tumors being reported since our charter formed in 1997, well over the tumor observation period of five years.

We are ready and willing to assist you in setting up the necessary Public Information Meeting in Houghton, as well as having the notice published in the Daily Mining Gazette. The meeting should be held in the UPPCO building on the lakeshore in Houghton. Our group has designated Ron Whiton to assist you in the writing of the "final" writing of the communication to Richard Powers, Chief of the Water Bureau.

The TLPAC also anxiously awaits the results on testing the "Kerfoot" samples to resolve the final two BUI's in Torch Lake. Just as soon as these results are available we look forward to joint discussions with the MDEQ on total delisting.

Sincerely,

Dave Jukuri, President
TLPAC

Cc:

Brenda Jones
PAC Technical Committee

Attachment D

Torch Lake PAC Tumor BUI Removal Continued Support Letter.

TORCH LAKE PUBLIC ACTION COUNCIL
1306 Jasberg Street
Hancock, MI 49930

WATER DIVIS
AUG 3 1 200
SWQAS

August 28, 2006

Richard Powers, Chief
Water Bureau
Michigan Department of Environmental Quality
P.O. Box 30273
Lansing, Michigan 48909

Dear Mr. Powers,

The Public Action Council (PAC) for the Torch Lake Area of Concern concurs with the recommendation to remove the Fish Tumors or Other Deformities Beneficial Use Impairment (BUI). In our letter dated June 12, 2006, the PAC's Technical Committee, acting on behalf of the PAC accepted the Water Bureau's criteria for removing the Fish Tumors or Other Deformities impairment in the Area of Concern. Those Council members available attended the public meeting on the removal recommendation for the Fish Tumors or Other Deformities impairment held in Houghton on August 14, 2006. At that meeting, no negative comments regarding delisting this BUI were made by attendees. Michigan Department of Environmental Quality staff presented supporting information on the removal recommendation. The Council accepts the agency's recommendations and concurs with the removal of the Fish Tumors or Other Deformities Beneficial Use Impairment in the Torch Lake Area of Concern.

It is encouraging to our group to see positive action being taken on removal of restored use impairments in the Area of Concern. We strongly encourage the agency to continue with assessment of the remaining two use impairments in the Area of Concern, Fish Consumption Advisories and Degraded Benthos with a goal of delisting the site as soon as possible.

Thank you for your time on this issue that is so important to the citizens of the "Copper Country". If you have any questions, please feel free to contact me or Dan Lorenzetti, MDEQ Liaison.

Sincerely,

David Jukuri, Chair
Torch Lake Public Action Council

Cc: Dan Lorenzetti, MDEQ Liaison
Sharon Baker, MDEQ
Brenda Jones, EPA

Attachment E

Torch Lake AOC Public Meeting Notice Regarding Removal of the Tumor BUI. August 14, 2006

PUBLIC MEETING REGARDING THE POTENTIAL REMOVAL OF THE BENIFICIAL USE IMPAIRMENT (BUI), FISH TUMORS OR OTHER DEFORMITIES, IN THE TORCH LAKE AREA OF CONCERN (AOC). Torch Lake is a Great Lakes AOC and in order to be "delisted" as an AOC, all BUIs must be restored. The purpose of the public meeting is to discuss the restoration status of the Fish Tumors and Other Deformities Beneficial Use Impairment (BUI) and to obtain comments on removal of this BUI for the Torch Lake AOC. The public meeting will be held August 14, 2006, at 7:00 p.m. at the UPCO Building on the waterfront, at 600 East Lake Shore Drive, 1st Floor Conference Room, in Houghton, Michigan. Comments on the removal recommendation may also be submitted to Sharon Baker, Michigan Department of Environmental Quality, Water Bureau, P.O. Box 30273, Lansing, Michigan 48909-7773, by September 15, 2006. Information regarding the status assessment of the BUI may be obtained by contacting the Water Bureau. Information contact: ***Sharon Baker,*** Water Bureau, at 517-335-3310, or E-mail: BakerSL@michigan.gov.

Attachment F

Note from MDNR to MDEQ verifying and supporting the "no reports of tumors on fish from Torch Lake."

From: George Madison
To: Sharon Baker
Date: 5/25/2006 11:55:05 AM
Subject: Torch Lake Tumors

Sharon,

For your files, I am providing you this note regarding the issue of tumors in resident fish of Houghton County's Torch Lake. Michigan DNR Fisheries Division has not had any reports of fish tumors for a period of at least 5 years (or since the early 1990's). I have asked attendees at various public meetings in the Houghton-Calumet area if they have seen any evidence of tumors in Torch Lake Fish? Anglers report that they are not observing any tumors in any of the fish from this lake.

If you have any questions, please contact me.

Respectfully,

George Madison, Fisheries Supervisor
Michigan Department of Natural Resources
West Lake Superior Management Unit
Baraga, Michigan 49908

Phone 906 353 6651