PRELIMINARY

Health Assessment for

TORCH LAKE

CERCLIS NO. MID980901946

HOUGHTON COUNTY, MICHIGAN

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

PRELIMINARY HEALTH ASSESSMENT
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MID980901946
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Background

Torch Lake is a 2,700 acre lake (maximum depth 105 feet) located in the Keweenaw Waterway in Michigan's Upper Peninsula. The lake is on the U.S. Environmental Protection Agency (U.S. EPA) National Priorities List (NPL) due to a high incidence of tumors found in certain species of game fish. The causative agent of the tumors is unknown. The high incidence of tumors in the fish resulted in a precautionary fish consumption advisory to be issued in 1982 by the Michigan Department of Public Health (MDPH).

Copper mining activities in the area from the 1890's to 1969 produced mill tailings (also known as stamp sands) which contaminated the lake sediments and shoreline. The stamp sands deposited in the lake and on the shoreline were dredged up during the early part of the 1900's and processed with flotation chemicals (creosotes and xanthates) to reclaim copper. The processed stamp sand and much of the flotation chemicals were returned to the lake and shoreline. The lake has also received mine pumpage (chloride-rich mine water), leaching chemicals, explosives residues and by-products, municipal and industrial trash, and sanitary wastes (until 1980).

The only active industry on the Torch Lake shoreline is the Peninsula Copper Company which is owned by the Michigan Technological University (MTU). This company reclaims copper oxide from scrap electronic circuit boards.

In 1986, MTU conducted an evaluation study to investigate the incidence of fish tumors, environmental fate, sources, and distribution of copper and other materials in Torch Lake.

Recently, the Michigan Department of Natural Resources allocated funds for a remedial action plan which would continue monitoring the lake and restock fish populations.

An EPA Remedial Investigation/Feasibility Study (RI/FS) was slated to begin in June 1988.

Environmental Contamination and Physical Hazards

It is estimated that 200 million tons of copper mill tailings contaminate the surface water sediment and the western shoreline of Torch Lake. The contaminated sediments are believed to be 70 feet thick in some areas, and surficial sediments contain up to 2,000 ppm copper. Approximately 20 percent of the lake has been filled in by mine tailings. The stamp sands deposited on the shoreline of the lake are barren and thus become a source of wind-blown particulates which enter the lake. Limited success has occurred with revegitating the stamp sands by applying sewage sludge as a source of essential nutrients and to retain moisture. Stamp sands are used in the area as a road building material and are spread on icy roads in the winter to help prevent accidents. Stamp sand has also been used to make blocks and bricks to be used in construction.

The flotation chemicals used in the past, although not persistent in the environment, have been implicated in tumor induction and liver problems in fish.

During the 1950's and early 1960's, mine tailings were dredged from the lake and treated with cupric ammonium carbonate to reclaim additional copper. The tailings and some of the leaching agent were then dumped back into the lake.

In 1972, an estimated 27,000 gallons of cupric ammonium carbonate was released into the lake from storage vats. Aquatic vegetation and bottom dwelling organisms in the area of the release were killed.

Barrels have been found at several sites along the shoreline of the lake; however, it is unknown if the barrels were empty at the time of their disposal. One barrel which contained some residue was sampled and found to contain polynuclear aromatic hydrocarbons (PAHs). Recent magnetometer studies conducted by MTU discovered a number of metallic objects (possibly barrels) buried in the stamp sands at one site on the shoreline.

During the early 1980's, the Peninsula Copper Industry dumped processing water containing 2,400 times the local sewage authority's allowable limit for copper (0.5 ppm) and 100 times the allowable limit for ammonia (5.0 ppm) into the Tamarack lagoon system. Area officials were afraid the discharge would damage the lagoon system.

Physical hazards include: abandoned buildings, old machinery and equipment, and other discarded metal objects (including rusting barrels) which can be found on the shoreline and in the water.

Torch Bay connects Torch Lake to Portage Lake (located to the south), and an explosives company dump site has been found within one quarter mile of the bay. Groundwater in this area is suspected to flow toward the bay, and there are residences with private wells along the shoreline of the bay.

Potential Environmental and Human Exposure Pathways

Potentially contaminated environmental media include the food chain (especially fish), surface soil, lake sediments, surface water, groundwater and air. Human exposure pathways include: ingestion of contaminated fish, direct contact with the soil, sediment, and water, and inhalation of contaminated air and/or particulates.

Demographics

The population within one mile of the lake is estimated at 4,000. Most of the drinking water in the area comes from springs or a municipal well located one-quarter mile north of the lake near the Trap Rock River. A public boat launch, beach and park have been built on the northern shore of Torch Lake near the Village of Lake Linden.

Evaluation and Discussion

The exposure pathway which has caused the most concern is the consumption of fish from Torch Lake. Nearly all of the sauger and a significant number of the walleye in the lake have tumors. The causative agent for the tumors has not been identified, and these two fish species have reportedly not reproduced successfully in the lake since the early 1970's. The fish consumption advisory issued by the MDPH was a precautionary measure and it was not based on known human health risks. However, it should be mentioned that fish from Torch Lake are a major food source for many low income residents who live near the lake. The number of bottom dwelling organisms in Torch Lake is much smaller than other nearby lakes, which indicates that other organisms, in addition to fish, appear to be affected by the contamination in Torch Lake.

Water samples collected and analyzed for a wide variety of organic and inorganic contaminants in the spring of 1984 found no toxic chemicals present which would pose a threat to human health due to direct contact with the water. Direct contact with the soil and sediment does not appear to be a human health threat based on previous findings (Torch Lake Study, 1986).

Although areawide groundwater has not been specifically studied, the municipal well in the Village of Lake Linden has been monitored for contaminants. To date, none have been found. The municipal well for the Village of Lake Linden is located to the north of Torch Lake in a shallow drift aquifer, and the groundwater flow is to the southwest. The soil in the area is a sandy loam, loam and silt.

Occasional complaints by area residents have been made regarding dust and particulate pollution originating from the stamp sand piles, however investigations suggest that the mine tailing dust and particulates are unlikely to pose a threat to human health.

Conclusions and Recommendations

Based upon the information reviewed, this site is of potential public health concern because of the risk to human health that could result from the possible exposure to presently unknown etiologic agents at the levels that may result in adverse health effects over time. As noted in Section II above, human exposure to a presently unknown agent may be occurring.

Although Torch Lake is polluted with copper and other contaminants, no known health effects have been linked to the problem. The incidence of cancer deaths over a period from 1970 to 1981 indicates that all but stomach cancer were at or below the state average for age-adjusted cancer mortality. Stomach cancer in this locale may be higher because of the predominantly Scandinavian descent of the population. It has been indicated from previous studies that Scandinavians have an apparently higher incidence for stomach cancer.

Rumors regarding the dumping of chemicals and barrels into the lake during the 1950's and 1960's should be investigated. Additional information is also needed concerning the contents of the barrels which are found at several sites around the lake. Private wells in the area of Torch Bay should be sampled and analyzed for contaminants.

Fish populations in Torch Lake should be studied to determine: (1) if other species have abnormally high incidence of tumors, as do the walleye and sauger, (2) the causative agent of the tumors, (3) why certain species are apparently unable to reproduce in the lake, and (4) the risk to human health from the consumption of the fish. Extensive monitoring of the groundwater in the area may be needed if a causative agent is found. It is further recommended that the abandoned buildings and industrial scrap materials on the shoreline of Torch Lake be cleaned up to reduce physical hazards.

In accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended, the Torch Lake site has been evaluated for appropriate follow-up with respect to health studies. Although there is currently a potential for human exposure to on-site/off-site contaminants, there are no indications in the information and data reviewed for this Health Assessment that human exposure is actually occurring at the present time or has occurred in the past. Accordingly, the site is not being considered for follow-up health studies at this time. However, if data become available suggesting that human exposure is currently occurring or has occurred in the past, ATSDR will re-evaluate this site for any indicated follow-up.

Sources

ATSDR Site Visit - 7/88
ATSDR Site Summary Sheet - 5/88
Michigan Department of Natural Resources (MDNR) Site Status February 1988.
MDNR Torch Lake Remedial Action Plan - 10/87.
MDNR Hazard Ranking System - 7/84.
MDNR Interoffice Communication.
Michigan Technological University Torch Lake Study - 1986.

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