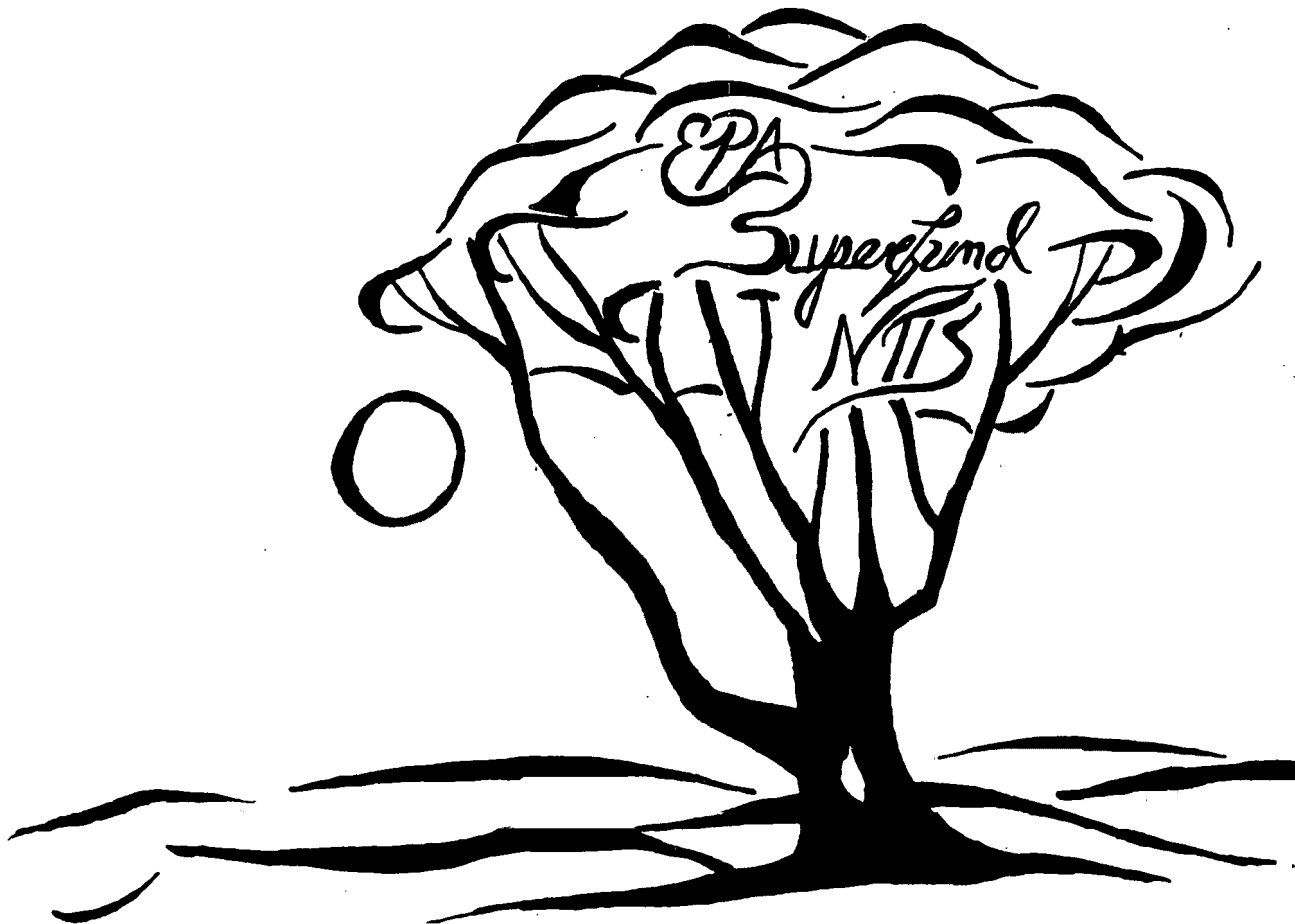


PB94-964137
EPA/ROD/R05-94/264
April 1995

EPA Superfund Record of Decision:

**Torch Lake Site (O.U. 2)
Houghton County, MI
3/31/1994**



DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Torch Lake Site, Operable Unit II
Houghton County, Michigan.

STATEMENT OF BASIS

This decision document presents the selected remedial action for the Torch Lake Superfund Site, Operable Unit (OU) II (OU II consists of groundwater, surface water, and sediments associated with the site), in Houghton County, Michigan, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. This decision is based upon the contents of the Administrative Record for the site. The attached index identifies the items which comprise the Administrative Record upon which the selection of the remedial action is based.

The State of Michigan concurs with the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

U.S. EPA has selected a "No Action" remedy for OU II.

The remedy selected for OU II takes into consideration and relies upon:

- The reduction of stampsand loading to surface water bodies expected as a result of the remedial action which will be taken at OUs I & III.
- Ongoing natural sedimentation and detoxification such as that which is occurring in other surface water bodies in the area.
- Institutional programs and practices controlling potential future exposure to site-affected groundwater which are administered at the county and state level.

- The long-term monitoring and the five year review process monitoring requirements of the remedy selected for OUs I & III under a previous Record of Decision for this site.

DECLARATION

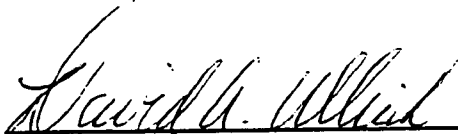
U.S. EPA has determined that the sediment and surface water contamination associated with OU II poses no unacceptable threat to human health. The shallow groundwater associated with OU II which has come into contact with stampsands (waste from copper ore milling) exhibits inorganic contamination which results in unacceptable potential future risks, however these risks are only applicable if, in the future, the stampsands are developed for residential use and drinking water is taken from the shallow groundwater. The practice in the region is to drill drinking water wells into the sandstone aquifer which underlies the stampsands. Since the sandstone aquifer has been found to be unaffected by stampsand contamination, any future risk from contaminated groundwater is unlikely. The Houghton County Health Department and the Michigan Department of Public Health regulate the installation of drinking water wells in the vicinity of the site. These local authorities have been alerted to the potential future threat and currently have permitting programs and development review procedures in place which provide further assurances against future public exposure to stampsand-affected groundwater. Thus, treatment of groundwater to permanently and significantly reduce the toxicity, mobility and volume of contaminants was not found to be necessary to protect human health.

U.S. EPA has determined, however, that contamination associated with Torch Lake sediments currently poses a limited ecological threat. Much of the lake bottom sediment consists of stampsands which were deposited in the lake over many years of active copper ore milling. Levels of contamination (primarily copper) in the stampsand sediments are sufficient to create an inhospitable lake bottom habitat and thus suppress the organisms which are normally expected to inhabit lake sediments. However, given the wide distribution (the lake covers 2,700 acres) and large volumes (approximately 200,000,000 tons) of stampsands deposited in Torch Lake, remediation of the lake bottom is not practical, feasible, nor potentially, in the long run, necessary. Preliminary research information seems to suggest that Torch Lake may be undergoing a recovery in those deeper areas which are not directly subject to the sands eroded from the shoreline. U.S. EPA is hopeful that once the remedy for OUs I & III has been implemented, Torch Lake will cease to be affected by sands eroding from the shore and thus may be able to recover naturally.

Monitoring of the OU II study area will be provided for as an outgrowth of the remedy and the five year review process for OUs I & III. Since the effectiveness of the remedy chosen for OUs I & III will in part be measured by assessing effects on Torch Lake, the monitoring program for OUs I & III will provide sufficient information on the status of the OU II study area. Groundwater, surface water, sediment, and general ecological monitoring, including an evaluation of the rate and effectiveness of organic sediment build-up and the recovery of the

benthic community, will be included as part of the Operation and Maintenance (O&M) plan for OUs I & III. This monitoring will provide information on the effectiveness of the remedy and on the extent of environmental impacts, if any.

Therefore, U.S. EPA has determined that no remedial action is necessary for OU II. As this is a decision for "No Action", the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory five-year review will be undertaken pursuant to this Record of Decision. However, five year reviews will be conducted for this site pursuant to the Record of Decision for OUs I & III. As mentioned above, the future status of OU II is directly related to the effectiveness of the remedy selected for OUs I & III. Therefore, five year reviews of the remedy for OUs I & III will also assess the OU II study area, and as such will include an evaluation of the status of Torch Lake sediments and ecology, and a reassessment of the necessity for remedial action should the extent of the lake's recovery fall short of expectations.



fr
Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency

3/31/94
Date

RECORD OF DECISION
DECISION SUMMARY
TORCH LAKE SUPERFUND SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN

Prepared By U.S. EPA

REGION V

MARCH 1993

**RECORD OF DECISION
TORCH LAKE SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN**

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APPENDIX I : LOCATION OF INFORMATION REPOSITORIES

I. SITE NAME, LOCATION, AND DESCRIPTION

The Torch Lake Superfund site (the "Site") is located on the Keweenaw Peninsula in Houghton County, Michigan (See Figure 1). The Site includes Torch Lake, the west shore of Torch Lake, the northern portion of Portage Lake, the Portage Lake Canal, Keweenaw Waterway, the North Entry to Lake Superior, Boston Pond, Calumet Lake, and other areas associated with the Keweenaw Basin. Stampsand piles and slag piles/beach deposited along the western shore of Torch Lake, Northern Portage Lake, Keweenaw Waterway, Lake Superior, Boston Pond, and Calumet Lake are also included as part of the Site. These stampsand piles include stampsands in Lake Linden, Hubbell/Tamarack City, Mason, Calumet Lake, Boston Pond, Michigan Smelter, Isle-Royale, Lake Superior, and Gross Point. The slag piles/beach are located in Quincy Smelter and Hubbell (See Figure 2).

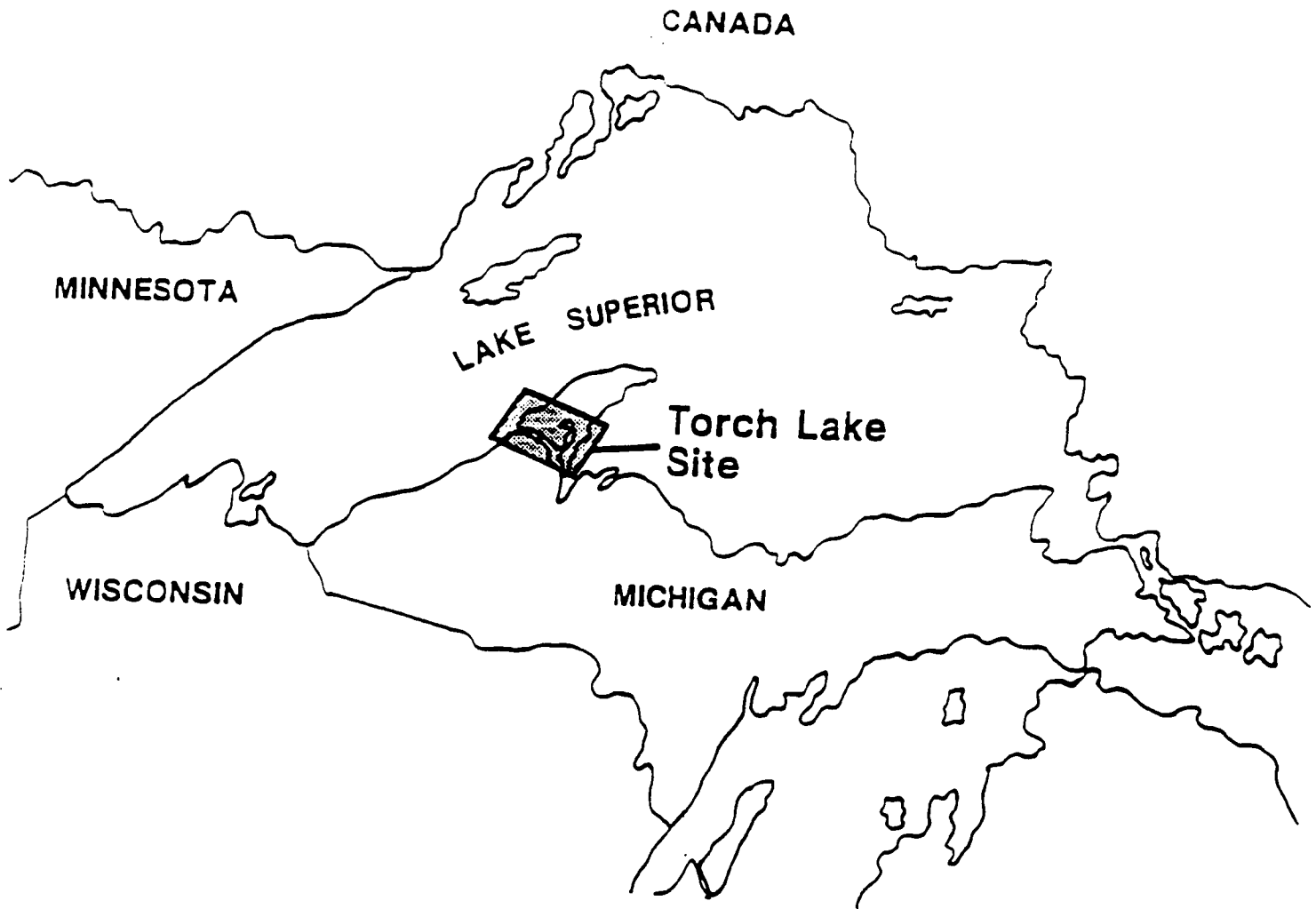
Several small communities are located on the west shore of Torch Lake, the largest of which are Lake Linden, Hubbell/Tamarack City, and Mason. Two large cities, Houghton and Hancock, are located on the south and north side of Keweenaw Waterway. Calumet City is located 5 miles north of Torch Lake (See Figure 2). Torch Lake has a surface area of approximately 2,700 acres, a mean depth of 56 feet, a maximum depth of 115 feet, and a volume of 5.2×10^9 cubic feet. The Trap Rock river and several small creeks discharge into Torch Lake. Torch Lake is used for fishing, boating, limited contact recreation (swimming), non-contact cooling water supply, treated municipal waste assimilation, and wildlife habitat. Wetlands are located on the east portion of the Lake Linden stampsand pile, on the eastern edge of the Hubbell stampsand pile, around Boston Pond, and the eastern shore of Torch Lake. Two nests of bald eagles, which are designated as Endangered Species, are located on the northern side of Portage Lake.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Torch Lake was the site of copper milling and smelting facilities and operations for over 100 years. The lake was a repository of milling wastes, and served as the waterway for transportation to support the mining industry. The first mill opened on Torch Lake in 1868. At the mills, copper was extracted by crushing or "stamping" the rock into smaller pieces, grinding the pieces, and driving them through successively smaller meshes. The copper and crushed rock were separated by gravimetric sorting in a liquid medium. The copper was sent to a smelter. The crushed rock particles, called "stampsands," were discarded along with mill processing water, typically by pumping into the lakes.

Mining output, milling activity, and stampsand production peaked in the Keweenaw Peninsula in the early 1900s to 1920. All of the mills at Torch Lake were located on the west shore of the lake and many other mining mills and smelters were located throughout the peninsula. In about 1916, advances in technology allowed recovery of copper from stampsands previously deposited in Torch Lake. Dredges were used to collect submerged stampsands, which were then screened, recrushed, and gravity separated. An ammonia

Figure 1



Donohue

MARCH 1989

SITE LOCATION MAP

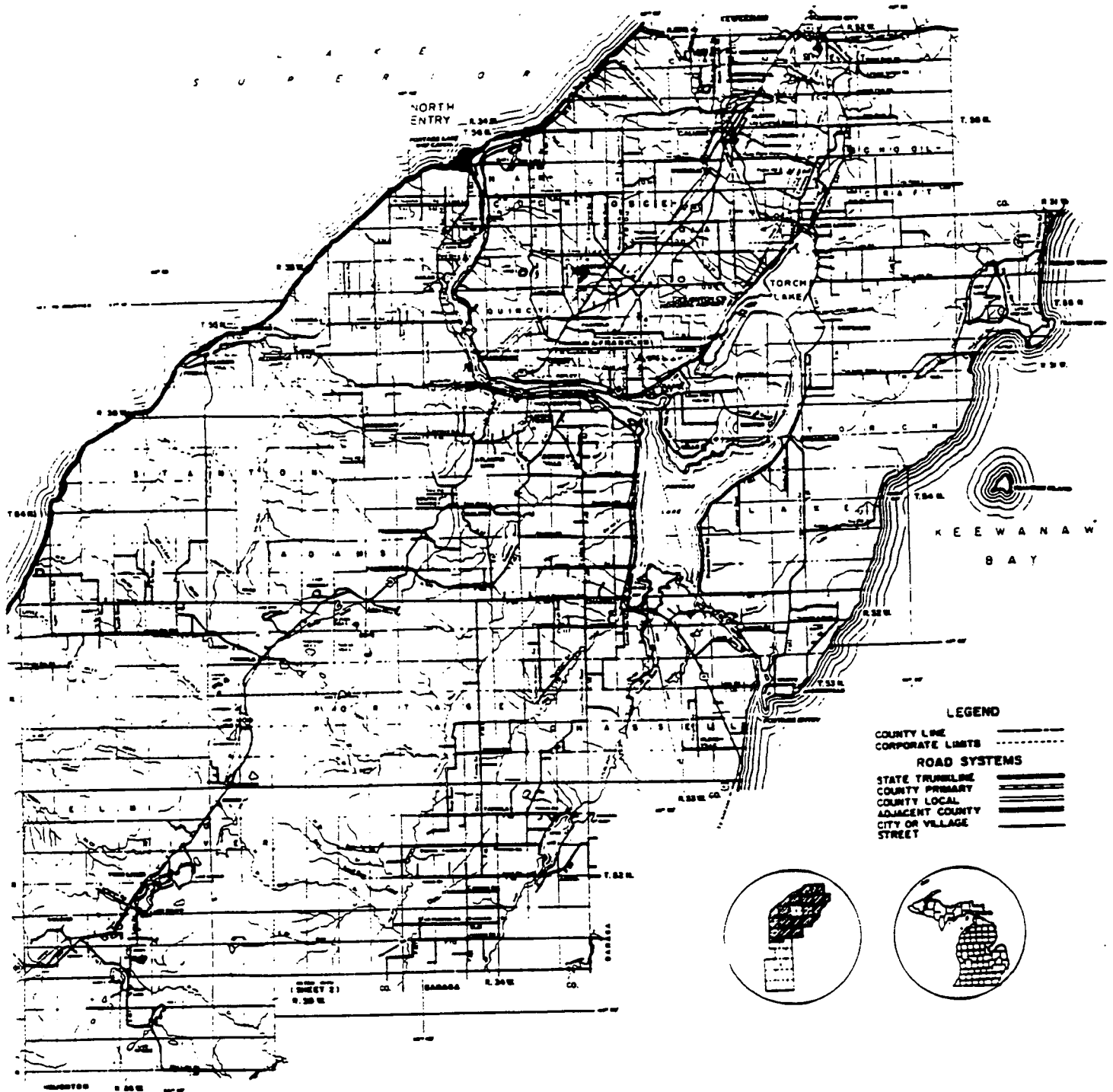
TORCH LAKE

**REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HOUGHTON COUNTY, MICHIGAN**



Engineers • Architects • Scientists

Figure 2



Donohue

JUNE 1989

TORCH LAKE SITE

TORCH LAKE

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
HOUGHTON COUNTY, MICHIGAN

Engineers • Architects • Scientists

C-51132

leaching process involving cupric ammonium carbonate was used to recover copper and other metals from conglomerate stampsands. During the 1920s, chemical reagents were used to further increase the efficiency of reclamation. The chemical reagents included lime, pyridine oil, coal tar creosote, wood creosote, pine oil, and xanthates. After reclamation activities were complete, chemically treated stampsands were returned to the lakes. In the 1930s and 1940s, the Torch Lake mills operated mainly to recover stampsands in Torch Lake. In the 1950s, copper mills were still active, but by the late 1960s, copper milling had ceased.

Over 5 million tons of native copper was produced from the Keweenaw Peninsula and more than half of this was processed along the shores of Torch Lake. Between 1868 and 1968, approximately 200 million tons of stampsands were dumped into Torch Lake filling at least 20 percent of the lake's original volume.

In June 1972, a discharge of 27,000 gallons of cupric ammonium carbonate leaching liquor occurred into the north end of Torch Lake from the storage vats at the Lake Linden Leaching Plant. The Michigan Water Resources Commission (MWRC) investigated the spill. The 1973 MWRC report discerned no deleterious effects associated with the spill, but did observe that discoloration of several acres of lake bottom indicated previous discharges.

In the 1970s, environmental concern developed regarding the century-long deposition of stampsands into Torch Lake. High concentrations of copper and other heavy metals in Torch Lake sediments, toxic discharges into the lakes, and fish abnormalities prompted many investigations into long-and short-term impacts attributed to mine waste disposal. The International Joint Commission Water Quality Board designated Torch Lake as a Great Lakes Area of Concern in 1983. Also in 1983, the Michigan Department of Public Health announced an advisory against the consumption of Torch Lake sauger and walleye. The Torch Lake site was proposed for inclusion on the National Priorities List (NPL) in October of 1984. The Site was placed on the NPL in June 1986. The Torch Lake site is also on the Act 307 Michigan Sites of Environmental Contamination Priority List. In Early 1993, the MDPH lifted the fish consumption advisory.

A Draft Remedial Action Plan ("RAP") for Torch Lake was developed by MDNR in October, 1987 to address the contamination problems assumed to be associated with observed fish abnormalities and to recommend remedial action for Torch Lake. Although studies showed no cause and effect relationship between the contaminants of the stampsands and the fish tumors, revegetation of lakeshore stampsands to minimize air-borne particulate matter was one of the recommended remedial actions in the RAP. The RAP recommended natural sedimentation as the only feasible approach to remediating the lake bottom.

In May and June 1988, Remedial Investigation/Feasibility Study (RI/FS) Special Notice Letters were issued to Potentially Responsible Parties (PRPs). Negotiations for a RI/FS Consent Order with the PRPs were not successful. Subsequently, U.S. EPA contracted with Donohue & Associates in November 1988 to perform the RI/FS at the Site.

Due to the size and complex nature of the Site, three Operable Units (OUs) have been defined for the Site (see Figure 3). The western shoreline of Torch Lake constitutes OU I. Torch Lake itself, and other water bodies comprise OU II. OU III consists of locations outside this area. This ROD is being developed for OU II.

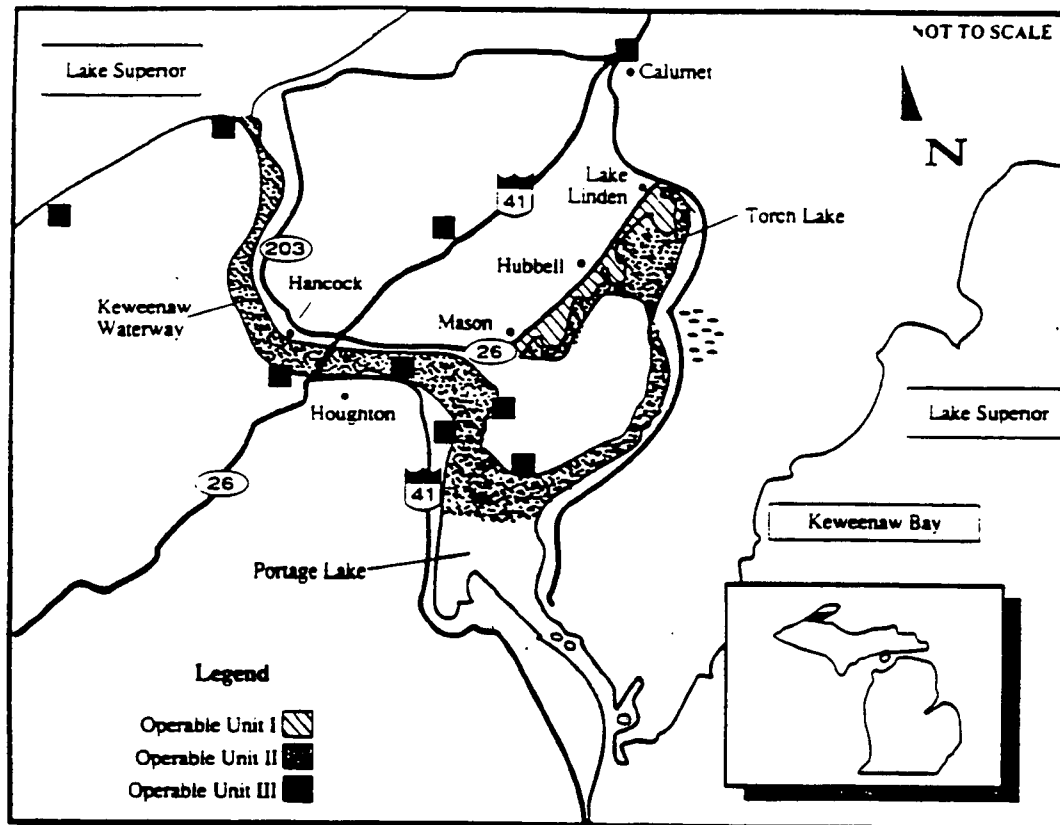


Figure 3

OU I includes surface stampsands, drums, and slag pile/beach on the western shore of Torch Lake. An estimated 440 acres of stampsands are exposed surficially in OU I. A smaller deposit of smelter slag pile/beach, encompassing approximately 9 acres, is located near Hubbell, south of the Peninsula Reclamation Plant.

OU II includes groundwater, surface water, submerged stampsands and sediments in Torch Lake, Portage Lake, the Portage Channel, Keweenaw Waterway, Lake Superior, Boston Pond, and Calumet Lake.

OU III includes stampsands and slag deposits located in the north entry of Lake Superior, Michigan Smelter, Quincy Smelter, Calumet Lake, Isle-Royale, Boston Pond, and Grosse-Point.

The Remedial Investigations (RI) have been completed for all three OUs. The RI and Baseline Risk Assessment (BRA) reports for OU I were finalized in July 1991. The RI and BRA reports for OU III were finalized on February 7, 1992. The RI and BRA reports for OU II were finalized in April 1992. The OU II RI addendum no. 1 (Additional bodies of water) was completed in March, 1992, and another addendum addressing the "hot spot" was completed in July 1992. The Ecological Assessment for the Site was finalized in May 1992. The Feasibility Study (FS) and Proposed Plan which contains the U.S. EPA's recommended remedy for OU I and III were issued to the public on May 1, 1992, and a ROD for OUs I & III was signed on September 30, 1992.

In response to reports that drums may have been dumped into the lake, the U.S. EPA conducted a subbottom profile (seismic) survey of the lake bottom in May 1989. The area in which this survey was conducted is immediately off-shore from the old Calumet and Hecla smelting mill site. The survey located several point targets (possibly drums) on the bottom of Torch Lake. Based on the seismic survey and the discovery of drums at various points along the western shore of Torch Lake, U.S. EPA and six companies and individuals entered into an Administrative Order on Consent, dated July 30, 1991, whereby the companies and individuals agreed to sample and remove drums located on the shore and lake bottom. Pursuant to the Administrative Order, these entities removed 20 drums with unknown contents from off-shore of Peninsula Copper Inc., and the old Calumet and Hecla smelting mill site in September 1991. 808 empty drums were found in the lake bottom. These empty drums were not removed from the lake bottom.

U.S. EPA determined that a full-blown FS was not necessary for OU II. Instead, U.S. EPA produced a Remedy Position Paper which presents the results of the efforts undertaken by U.S. EPA to evaluate the remedial options for OU II (the Remedy Position Paper may be found in the Administrative Record). This approach to remedy evaluation was predicated upon a recognition of the unique nature of the Torch Lake site and was intended to take advantage of an opportunity to streamline the deliberative process. The Remedy Position Paper, which will serve as the Focused Feasibility Study for OU II, summarizes U.S. EPA's view of the scope and complexity of OU II, describes the operative site conditions and various potential remedial measures, assesses the feasibility considering the conditions, documents U.S. EPA's position regarding the measures which have been considered, and describes the Proposed Plan for OU II. The various discussions embodied within the position paper are presented in a qualitative fashion. The preamble to the NCP (53 FR 51423) provides for "tailoring selection and documentation of the remedy based on the limited scope or complexity of the site problem and remedy". U.S. EPA believes that this language anticipates and encourages the sort of streamlined approach to remedy deliberation and documentation employed by the position paper.

III. COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the Site was finalized in July 1988. This document lists contacts and interested parties throughout the local government and community. It also

establishes communication pathways to ensure timely dissemination of pertinent information. An RI "Kickoff" meeting was held on August 8, 1989 to explain the RI process for the Site. A fact sheet was developed in conjunction with this meeting. Advertisements were placed in the Daily Mining Gazette and a press release was sent to all local media.

A public meeting was held on August 27, 1990 to explain the results of the OU I investigation and the scope of work for the OU II and III investigations. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media.

A public meeting was held on October 17, 1991 to update the investigation results for OUs II and III, and the drum removal activity. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media.

The RI/FS and the Proposed Plan for OUs I and III were released to the public in May 1992. A public meeting was held on May 12, 1992 to present the results of the RI/FS and the recommended alternatives as presented in the Proposed Plan. Pertinent site related documents were made available in the information repositories maintained at the Lake Linden-Hubbell Public Library and Portage Lake District Library. The administrative record for the site was placed at the Portage Lake District Library. A notice of the availability of these documents was published in the Daily Mining Gazette on April 29, 1992 in conjunction with the release of the Proposed Plan for OUs I & III. Press releases were also sent to all local media. A public comment period for the OUs I & III ROD was held from May 1, 1992 to June 1, 1992. Requests for an extension of that comment period were made and the public comment period was extended until July 13, 1992. All comments which were received by U.S. EPA during the public comment period, including those expressed verbally at the May 12 public meeting, were addressed in the Responsiveness Summary which is the third section of the ROD for OUs I & III. The ROD for OUs I & III was signed on September 30, 1992. A public meeting was held on October 8, 1992 to explain the final ROD for OUs I & III.

On December 12, 1992 a public meeting was held to explain the results of the OU II investigation. The Proposed Plan for OU II was released to the public in February 1994. A notice and press release were sent out in conjunction with the OU II Proposed Plan. A public meeting was held to explain the Proposed Plan for OU II on March 3, 1994. The comment period for OU II extended from February 17 to March 18, 1994. All comments which were received by U.S. EPA during the public comment period, including those expressed verbally at the March 3 public meeting, were addressed in the Responsiveness Summary which is the third section of the ROD for OU II.

IV. SCOPE & ROLE OF OPERABLE UNIT

As discussed in Section II, U.S. EPA has divided the Site into three operable units. OUs I & III are being addressed by a ROD signed in September 1992. OU II includes areas of potential contamination in and around Torch Lake, including groundwater, submerged stampsands at the bottom of the lake (i.e. sediment), and surface water. OU II is related to OUs I & III primarily in that wind-blown and eroded stampsands from the latter end up in the former. These conditions serve as a continuing source of environmentally harmful contamination to the lake and diminish the effectiveness of the lake's natural sedimentation process. The remedy chosen for OUs I & III, stabilization and revegetation of the stampsand piles near the lake, was in part selected because it will address the erosion problem. Furthermore, Torch Lake may already be undergoing a recovery in those portions which are not subject to the sands eroded from the shoreline. Once the remedy for OUs I & III has been implemented, near shore areas may also recover.

Future monitoring of the status and progress of the OU II study area will be provided for as a component of the monitoring program for the remedy for OUs I & III and the five year review process associated with OUs I & III. Groundwater, surface water, sediment, and general ecological monitoring including an evaluation of the rate and effectiveness of organic sediment build-up and the recovery of the benthic community will be included as part of the O&M plan for OUs I & III. This monitoring will provide information on the effectiveness of the remedy and on the extent of environmental impacts, if any. Since the effectiveness of the remedy chosen for OUs I & III will in part be measured by assessing effects on Torch Lake, the monitoring program for OUs I & III would be incomplete if it did not encompass the OU II study area. In addition, the five year review process will include an evaluation of the status of Torch Lake sediments and ecology, and will reassess the necessity for remedial action should the extent of the lake's recovery fall short of expectations.

V. SITE CHARACTERISTICS AND RISK SUMMARY

Pursuant to the authorities under CERCLA, as amended by SARA, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), an RI was conducted at the site. The RI was conducted by U.S. EPA between 1989 and 1992. A Baseline Risk Assessment and an Ecological Risk Assessment were prepared by the U.S. EPA to evaluate the level of risk to human health and the environment. This section summarizes the analysis presented in the RI Report and addenda and the Baseline Risk Assessment (finalized April 1992) and the Ecological Assessment (finalized April 1992).

The remedial investigation of OU II was conducted to determine the nature and extent of contamination in groundwater, lake bottom sediments, and lake surface waters to assess the potential adverse health and environmental effects resulting from releases of hazardous substances from the stampsands deposited into the lake from copper mining and processing operations.

The OU II RI report documents activities performed to characterize the physical and chemical environment of OU II including characterization of the physical extent of the stampsand deposits in the lake, characterization of groundwater flow, chemical characterization of groundwater, sediments, and surface water and assessment of human health and environmental impacts.

INVESTIGATION RESULTS

A bathymetric survey of the lake was conducted and the findings were compared to an 1864 bathymetric survey of Torch Lake. In 1990, it was determined that the shoreline measures 20.3 miles, the lake surface is approximately 2,700 acres, and the lake contains 103,000 acre feet of water. This is a net gain of nearly 5 miles of shoreline, but a net loss of approximately 600 acres of surface water area, and nearly 111,000 acre feet of water volume from the 1864 lake configuration. A total of approximately 179 million cubic yards of stampands were deposited below the water level of Torch Lake. Submerged stampands deposited in Torch Lake range in thickness from 25 feet (at the bottom) to more than 130 feet thick.

Sediment samples were collected at 25 locations along the lake bottom to characterize their physical structure and to assess potential contaminant presence in the sediments. Lake bottom sediments were found to be comprised of an organic layer overlaying conglomeritic or amygdaloidal stampands/sediment at all locations. The organic layer typically included two distinct layers: An upper, thin layer comprised primarily of soft organic materials such as leaves and plant fibers; and a thicker, lower layer of more homogeneous decomposed plant matter mixed with very fine grained stampands. The thickness of the organic layer tended to vary across the lake. Silt and clay size stampands were encountered in deeper water, while fine to medium sand size stampands were prevalent in shallower water.

An apparent "hot spot" in the sediment was measured at sampling location SDO9, offshore of the former Calumet and Hecla Smelter at Hubbell. Sampling location SDO9 measured significantly high for several inorganic and organic compounds in relation to both background and other study area samples. Sediment samples from the area offshore from Hubbell had high concentrations of arsenic, chromium, copper, lead, nickel, and silver; and high concentrations of polyaromatic hydrocarbons and one congener of PCB, Arachlor 1254. Concentrations were highest within the thin organic layer, representative of the most recent sediment deposition in this area. It is not clear if the metal contaminants derived from the stampands. With the exception of arsenic, chromium, and lead most metals detected in the sediment samples have concentrations similar to stampands concentrations detected during the OU I remedial investigation.

Surface water samples were collected concurrently with sediment samples. Surface water samples were taken (two at each location) based on measurement and determination of the warmer epilimnion and colder hypolimnion. Several chemicals detected in the water column exceed the State of Michigan's Rule 57(2) of Act 245. Chemical characterization of the

surface water for contaminants of potential concern indicated a relatively uniform distribution of inorganic compounds at low levels. Only two organic compounds were detected, each at one location and at low concentrations.

A total of 18 groundwater monitoring, irrigation, and residential wells were measured to evaluate groundwater conditions, and sampled to assess contaminant levels. The highest levels of aluminum, chromium, cobalt, copper, iron, magnesium, nickel, and vanadium were detected at a Portage Lake Water Sewage Authority monitoring well - PLWSA No. 1. Arsenic, barium, and manganese were detected in their highest levels in well nests constructed as part of the RI at the north end of the lake. A distinct contaminant plume or indication of contaminant migration has not been determined in the media sampled at Torch Lake.

Groundwater occurs between 7 and 23 feet below ground surface within the stampsands. Groundwater flow within the Jacobsville Sandstone and the stampsands is to the south-southeast with groundwater discharge to Torch Lake. Horizontal and vertical gradients within the stampsands are high enough to move groundwater relatively quickly through the stampsands with discharge to Torch Lake and natural lake bottom sediments.

The fate and transport of inorganic and organic contaminants of potential concern are determined largely by sorption and complexation processes as well as processes of oxidation, precipitation, and ion exchange for inorganic compounds. The complex interaction of these processes tends to limit the mobility of the organic and inorganic compounds of concern. Moreover, supplementary studies by the U.S. Bureau of Mines found that the sands release very little metal. Potential contaminant movement to Torch Lake is primarily due to erosion and infiltration of precipitation through stampsands, throughflow, and subsequent discharge to the lake.

BASELINE RISK ASSESSMENT

The baseline risk assessment for OU II was performed to evaluate the potential adverse health effects for both current and future residents at Torch Lake resulting from exposures to hazardous substances determined to be in the groundwater, lake sediments, and lake surface waters. Since the hot spot is located offshore in approximately 30 to 75 feet of water, human contact was not deemed realistic, so the hot spot was not evaluated for human health risk. The carcinogenic risk for OU II is dominated by exposure to groundwater for hypothetical future adult and child residents living atop the stampsands at Torch Lake. Chemicals contributing to these risks are mainly arsenic and beryllium. For noncarcinogenic risks, ingestion of groundwater by hypothetical future residents also dominates the risk assessment.

The risk assessment compared the potential excess lifetime cancer risks calculated for various OU II study area scenarios to U.S. EPA's acceptable risk range (1×10^{-6} to 1×10^{-4}). This exercise provides estimated upper limits of additional cancer cases that could occur as a

result of repeated exposures in the future to site related contaminants (these risks were estimated by assuming a person would be exposed to the contaminants of concern every day over a period of a lifetime). The excess lifetime cancer risks should be regarded as conservative estimates of the potential cancer risk rather than the actual representations of true cancer risks.

Exposure risks from carcinogenic health hazards (based on one-in-one million criteria) was calculated to be 1 additional case per 1,000 people exposed (1×10^{-3}) for hypothetical future child and adult residents of Torch Lake stampsands for the ingestion of groundwater. The future risk scenario is defined by the possibility that, in the future, people could build homes on these sands, construct wells which would draw groundwater from the water table aquifer which would exhibit levels of contamination identical to the most contaminated wells sampled during the investigation, and use these wells as a drinking water supply continuously throughout a 70 year lifetime. This risk, in addition to being solely attributable to the potential future convergence of unlikely circumstances, is further mitigated by actual practices in the region. No one in the study area is currently drinking groundwater taken from stampsand zones. Locally, drinking water supply wells are installed in the sandstone aquifer which underlies the stampsands, and there is no evidence that the sandstone aquifer is affected by contamination from stampsands. Residential wells which were sampled during the RI are located upgradient of the Torch Lake sands and are considered to be reflective of background conditions. The results of RI analysis of samples taken from two deep irrigation wells installed beneath the stampsands near Lake Linden and near Hubbell/Tamarack City show that groundwater below the stampsands is not impacted. Also, the City of Houghton water supply wells are set beneath the Isle Royale stampsands and are not affected.

Furthermore, the Houghton County Health Department has institutionalized local practices with respect to groundwater use by employing increased scrutiny to any building or development involving property which contains stampsands. The County Health Department will ensure that the existing county well permitting program and the building permit program will serve as locally imposed Institutional Controls to prevent the public from installing drinking water wells which would be screened so as to draw from groundwater which has come into contact with stampsands. In addition, the Michigan Department of Public Health (MDPH) has informed U.S. EPA that existing permitting and review controls at the state level would provide further assurances that stampsand-affected groundwater would not be permitted as drinking water. U.S. EPA is satisfied that these measures, which are administered at the local and state levels through the Houghton County Health Department and the MDPH, will provide sufficient impediment to the public use of stampsand-affected groundwater.

Carcinogenic health hazards for current residents range from 6 additional cases per 100,000 people exposed (6×10^{-5}) to 3 additional cases per 10,000 people exposed (3×10^{-4}) based on ingestion of surface waters, sediments, fish from Torch Lake, and from dermal contact (swimming) in the lake. Approximately two-thirds of the estimated cancer risk from lake media is attributable to the fish ingestion pathway. The major portion of the risk from fish

ingestion is contributed by PCBs (Aroclor 1254). It must be noted that Aroclor 1254 was not detected in any surface water sample at Torch Lake and it is unlikely that benthic food-chain organisms are present in the vicinity of elevated PCB sediment concentrations, due to copper toxicity. There presently is no clear link between OU II contamination and the contamination detected in Torch Lake fish. In addition, the PCB concentration in Torch Lake fish tissue (0.025 to 0.151 mg/kg) is at the low end of the average PCB levels found in Great Lakes and inland Michigan lakes fish and is considerably below the FDA advisory level for PCBs in fish of 2 mg/kg.

The measure of noncarcinogenic health risk is termed a hazard index (HI). When the HI exceeds 1.0, there is a potential for adverse health effects. Subchronic and chronic, noncarcinogenic health hazard indices greater than 1.0 have been calculated for future residents at Torch Lake from ingestion of groundwater. However, no noncarcinogenic health hazard indices greater than 1.0 have been calculated for current or future residents at Torch Lake from ingestion of surface water, sediments, or fish, once toxicity endpoints (that is, the part of the body that the individual chemicals have been found to affect) have been taken into consideration.

ECOLOGICAL RISK ASSESSMENT

The ecological risk assessment found that levels of copper and other metals in the stampsand sediments are sufficiently high to pose significant risk to those organisms which would normally reside in the lake bottom sediments (benthic organisms). In fact, for much of Torch Lake, copper levels in the stampsand sediments are high enough to be toxic to native benthic organisms and thus completely suppress benthic communities. The hot spot, due to contaminant levels elevated above those of the rest of the lake, was found to pose the greatest incremental risk to exposed populations. However, the actual potential for exposure to hot spot contaminants strongly mitigates this statement of incremental ecological risk, since sediment toxicity is already high enough to suppress benthic organisms. Absent this link in the food chain, the normal transfer mechanism from sediment to higher order organisms is basically inoperative. Although the sediment effect constitutes a bona fide degradation of the Torch Lake ecology, this appears to be the sole demonstrable ecological risk-related impact, perhaps in part due to the lack of a food chain connector. Torch Lake continues to support a healthy fishery, and no impacts to eagles or gulls could be ascertained. Furthermore, supplemental to the ecological risk assessment, further study conducted by the MDNR could discern no conclusive cause for the fish tumors found in earlier studies.

SUMMARY

In summary, the risk assessment shows there is no unacceptable current or future health risk from exposure to site surface water or sediment. Groundwater, however, based on several samples taken from wells installed in the stampsands, was found to pose an unacceptable risk to anyone who may, in the future, build a home on the stampsands and take drinking water from the water table aquifer which flows through the sands. However, as discussed above,

U.S. EPA is satisfied that permitting and development review procedures which are administered at the local and state levels through the Houghton County Health Department and the MDPH, will provide sufficient impediment to the public use of stampsand-affected groundwater.

Ecological affects are currently severe. Levels of contamination (primarily copper) in the stampsand sediments are sufficient to create an inhospitable lake bottom habitat and thus suppress the organisms which are normally expected to inhabit lake sediments. However, given the wide distribution (the lake covers 2,700 acres) and large volumes (approximately 200,000,000 tons) of stampsands deposited in Torch Lake, remediation of the lake bottom is not practical, feasible, nor potentially, in the long run, necessary. Preliminary research information seems to suggest that Torch Lake may be undergoing a recovery in those deeper areas which are not directly subject to the sands eroded from the shoreline. U.S. EPA is hopeful that once the remedy for OUs I & III has been implemented, Torch Lake will cease to be affected by sands eroding from the shore and thus may be able to recover naturally. U.S. EPA has detailed the reasons for this position in the Torch Lake OU II Remedy Position Paper which serves as a Focused Feasibility Study for OU II (the Remedy Position Paper may be found in the Administrative Record).

VI. EXPLANATION OF SIGNIFICANT CHANGES

There are no significant changes from the recommended alternative described in the Proposed Plan.

APPENDIX I

LOCATION OF INFORMATION REPOSITORIES

An information repository contains laws, work plans, community relations plans, technical reports, and other documents relevant to the investigation and cleanup of Superfund sites. The information repositories for the Torch Lake Superfund site have been set up at the following locations:

Lake Linden-Hubbell Public Library
610 Calumet
Lake Linden, Michigan 49945
(906) 296-0698

Portage Lake District Library
105 Huron
Houghton, Michigan 49931
(906) 482-4570

Administrative record repositories have been established at Portage Lake District Library in Houghton and at U.S. EPA's Region 5 office in Chicago. The administrative record contains all of the documents, reports, laboratory data, and other material U.S. EPA relied upon in reaching a decision on the selection of the proposed plan.