

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name	<u>MANISTIQUE RIVER/HARBOR</u>	ProjectID: 05-10
Last Updated:	01/21/04	
City:	Manistique	
County:	Schoolcraft	
State:	MI	
Country:	USA	
Bodies of Water:	Manistique River; Manistique Harbor; Lake Michigan	
US EPA Region:	V	
Status (Active, Complete, or Monitoring Only):	Complete	
Date On NPL:	N/A	
ROD/ESD Date:	N/A	
Operable Unit:	N/A	
Areas of Concern (length or acres):	The areas of concern include one 2-acre hot spot to be dredged in a backwater area (Area B) and two other hot spots, one 2 acre area (Area C) in the river and one 15 acre area (Area D) in the 97-acre harbor which were originally to be capped; they now will be dredged.	
Other Characteristics of Water Body:	Manistique Harbor is located at the mouth of the Manistique River, and flows into Lake Michigan. The site extends from the mouth of the harbor, which is formed by the outlet in a stone breakwater, upstream to a dam that impounds the river at a location about 1.4 miles above the outlet to the lake. The harbor includes a federally authorized navigation project. The federal channel was constructed by blasting the bedrock to the required channel depth and width. The authorized depth is 18 to 19 feet, but these depths have not been maintained due to a decline in commercial demand.	
Contaminants of Concern:	PCBs (1248)	
Source of Contamination:	Contamination is the result of historical discharges from upstream paper and other industries, including but not limited to, Manistique Papers, Inc.; Edison Sault Electric; Warshawsky Brothers Iron and Metal; and the Old Mountain Company.	
Contaminated Area Physical Characteristics:	<p>As summarized in Reference M-204: The sediment sampling and analysis described in the EE/CA focused mainly on the federal navigation channel and immediately adjacent areas. These sediments overlie bedrock within the channel with sediment thickness of one to five feet. Physical characterization data presented in the EE/CA indicated that the contaminated sediments were about 15% woodchips and sawdust; 75% fine sand; and 10% silt/clay. However, personnel who conducted sampling in the area have described the sediments as very heterogeneous, with lenses of paper waste and fibrous material, and pockets of sludge-like materials. It is unclear whether large wood chips and fibrous material were separated from the samples prior to sieve analysis. The EE/CA sediment characterization did not include any engineering tests (e.g., shear strength or consolidation tests).</p> <p>According to the EE/CA (Reference M-204), the surficial areas of PCB contamination within the harbor were: 50.2 acres with concentrations greater than 1 ppm; 22 acres greater than 10 ppm; and 13.1 acres greater than 50 ppm. The vertical PCB distribution within the sediments averages 14 ppm at depths from 3 inches to 2 feet and 130 ppm at depths of 2 feet or greater. While these data indicate a generally increasing sediment concentration with depth, the sediments were heterogeneous and with areas of high concentration at or near the surface.</p> <p>In the course of the removal action, PCB concentrations in sediment in excess of 10,000 ppm were identified.</p>	

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Type of Regulatory Action: Final (CERCLA Removal Action Authority); Action Memoranda - October 1993 and June 1995 (amended October 1995 and September 1996); Removal Action Recommendation, August 1994. Fund-Lead after PRP cash-out.

Overall Status Summary: The USEPA issued a Removal Action Recommendation and Action Memorandum in lieu of a ROD and the PRPs executed a buy-out for just over \$6 million in 1996. The USEPA started dredging in a backwater hot spot area in September 1995 (Area B); 10,000 cy were reportedly removed from Area B in 1995, with about 97% of the dewatered sediments sent to a non-TSCA landfill and the remaining 3% to a TSCA landfill. An additional 15,000 cy from Area B and a newly identified nearby hot spot were reportedly removed in 1996 with about 70% being sent to a non-TSCA landfill. Another 2-acre hot spot (7,000 cy) (Area C) and part of the 15-acre area in the harbor (Area D) were dredged in 1997 with about 70% of the dewatered material being sent to a non-TSCA landfill. The dredging of Harbor hot spots (Area D) resumed in May 1998 and ended in October 1998 following removal of an estimated 31,000 cy of material. Dredging continued in 1999 first in Area B, then in Area D; dredging in 2000 was performed in Area D only, beginning in May and ending on October 21. In 1999 and 2000, the percent of the dewatered sediments sent offsite to a TSCA landfill increased markedly, with 78% being sent to a TSCA landfill.

The project has been beset by numerous difficulties, some of which include:

- Difficulties in achieving the target cleanup level of 10 ppm PCBs, in part due to the inherent difficulties in achieving low cleanup levels by hydraulic dredging, in part due to the heterogeneous nature of the sediments which include layers of paper pulp and slab wood, in part due to the fact that PCB levels in some areas increase with depth with the highest levels found near the bedrock interface, and in part due to the difficulties in achieving efficient sediment removal at the irregular bedrock interface;
- Weather-related delays including a short construction season, strong winds, and wind-driven waves (which disrupt dredge positioning and barge movement); and
- On-land water handling limitations.

After completing dredging, which encompassed six years (1995-2000), cumulative totals as reported in Bi-Weekly Pollution Reports are as follows:

- Dredged volume: somewhere between 93,259 cy and 178,708 cy, depending on method of calculation
- Water treated: 665 million gallons
- Dewatered TSCA sediments landfilled: 19,901 tons + 16,125 cy
- Dewatered non-TSCA sediments landfilled: 22,167 tons + 666 cy
- Clean sand (<1 ppm PCBs) separated out of dredged material and stockpiled: 4,091 tons + 3,700 cy
- Total cost: \$47.5 million

It is not entirely clear which of the volume-of-dredged-sediments totals reported above is the closest to actual. Initially, at the end of the 1998 season, the total removal volume was

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estimated at 118,000 cy (reported in EPA's Bi-Weekly Pollution Reports). By April 1999 (Pollution Report No. 57), EPA had adjusted the total downward to 72,000 in-situ cubic yards. The reason for the adjustment was not explained but was apparently either due to using the results of a bathymetric survey of the dredged areas or to using a revised method of calculating dredged volume (first documented in EPA's Pollution Report of September 15, 1999). In the latter instance, EPA calculated "ex-situ" volumes for 1999 by back-calculating volumes from dewatered tonnages. Thus the 25,050 cy reported for 1999 (in Pollution Report No. 70) and the 20,491 cy reported for 2000 (in Pollution Report No. 83) are ex-situ cubic yards, while the 72,000 cy reported through 1998 are defined by EPA as in-situ cubic yards.

Dredging of Harbor hot spots continued into October 2000. The EPA removal contractor continued to utilize several equipment modifications in 2000 that were successfully introduced in 1999. These, as reported by EPA, included (1) use of a "modified dredge spread" arrangement which has provided greater dredge stability in windy conditions; (2) placing a shroud around the "matchbox" design dredge head to reduce the opening and create more suction, and utilizing a water jet system within the dredge head to loosen sediment on the bedrock surface, allowing more effective removal at the bedrock interface; (3) replacing the 8-inch hydraulic pumps used to pump slurry from barges to the wastewater treatment plant (at 1,500 gpm) with higher capacity electric pumps (capable of 2,100 gpm); and (4) installing a transfer pump in the settling chambers of the wastewater treatment plant to provide greater flow through the sand and carbon filters. These modifications in 1999 reportedly resulted in an increased volume of dredged slurry generated per day. Average dredge production rates for the period September 25 to October 17, 1999 were reported by EPA as 350-400 cubic yards of sediment per day.

Year 2000 dredging was performed during one 12-hour shift, while solids handling and water treatment were performing during two 12-hour shifts. Divers were used to direct dredging operations. As of October 21, 2000, somewhere between 24,500 cy (ex-situ) and 33,100 (in-situ) were removed for the year, resulting in a 6-year removal total of between 93,259 cy (ex-situ) and 178,708 cy (in-situ). The "ex-situ" and "in-situ" refer to two different methods of calculating removed volume. The "ex-situ" and "in-situ" methods of calculation are explained in Reference B-503 (Pollution Report No. 85) as follows:

"An "ex-situ" volume estimate of sediment removed from the North Bridge area and Harbor was calculated by START utilizing disposal data and daily volume estimates from Pad 5. Total tonnage of clean stockpiled sand, TSCA, and non-TSCA material were converted to cubic yards taking into account the volume per ton of the sand, woodchips, and cake generated within the treatment system. Approximately 24,150 cubic yards of material have been shipped offsite or stockpiled during the 2000 dredge season. An anti-fluff factor of 1.355 was used to estimate the "in-situ" volume of sediment removed from the North Bridge Area and Harbor. Results indicated that dredging activities conducted from May 2000 through November 2000 removed approximately 33,000 cubic yards of sediments from the harbor proper and North Bridge Area (24,450 ex-situ x 1.355 percent fluff = app. 33,000 cubic yards)."

"ERRS contractor . . . calculated an "in-situ" volume removed estimate for the 2000 dredge season utilizing data from the dimensions of each dredge area and the depth of sediment of each dredge area obtained from SSS grid logs. Results of the calculations indicated that dredging activities conducted from May 2000 through November 2000 removed approximately 30,300 cubic yards of sediments from the harbor proper and North Bridge Area, which is comparable to the 33,000 cubic yard estimate calculated by START."

In certain of the Harbor hot spot areas, it became exceedingly difficult to try to achieve the

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targeted 10 ppm PCB cleanup level, particularly as the depth of removal increased and the bedrock interface was approached and as layers of light fluffy paper pulp or slab wood were encountered (these materials, with their high organic carbon content, preferentially adsorb PCBs). This is illustrated by the high levels of PCBs still being found in sediment confirmation samples collected in 1999, even after three years of dredging in the Harbor. For example, an average concentration of 1,200 ppm PCBs was detected in a five-foot thick layer of paper pulp (May 1999); wood chip samples as high as 3,316 ppm (June 1999); in Dredge Area 16, confirmation samples exhibited PCBs ranging from 64 to 10,042 ppm (July 1999) - - after an additional pass with the dredge, confirmation samples ranged from ND to 788 ppm; and confirmation sample results from Dredge Area 26 exhibited PCB concentrations ranging from ND to 1,208 ppm (August 1999).

Throughout 2000, End-of-Project (EOP) confirmation sediment samples were collected from the river and harbor on a 50-foot spacing. A total of 422 locations was sampled. Samples were collected from the zero to 12 inch depth interval (or fraction thereof) at all locations and analyzed for PCBs; at some locations the 12 to 24 inch and 24 to 36 inch intervals (or fraction thereof) were also sampled. Overall arithmetic average PCB concentration in the zero to 12 inch layer was 9 ppm, with a max. discrete concentration of 884 ppm. Overall arithmetic average PCB concentration for all 583 samples analyzed was 7.9 ppm. It is important to recognize that these sample results are for the river and harbor as a whole, and are not confined just to the dredging areas.

By September 22, 2000, EPA had identified approximately 30 localized hot spots remaining to be dredged. The size and location of each hot spot were not specified; the hot spots reportedly comprised both recently identified undredged areas and previously dredged areas; both were found to contain elevated levels of PCBs (up to 3,000 ppm).

All dredging ceased at the project on October 21, 2000. Demob of equipment from the site began immediately and was completed in Spring 2001. A program of clean sand placement in the river and harbor was implemented in Fall 2000. Treated sand was to be placed over areas in the harbor with surface PCBs above 10 ppm. The first attempt caused resuspension of fine sediments and was discontinued. Subsequently, 1,400 cy of sand were broadcast into the river and were allowed to distribute naturally into the harbor.

In February 2001, EPA restated the project objective in an Action Memo as follows "...the objective of 95% removal of the total PCB mass from within the AOC and an average concentration of not more than 10 ppm throughout the sediment column shall be verified."

During May 2001, Final Sampling (FS) confirmation sediment samples were collected from the river and harbor. A total of 391 locations was sampled. Samples were collected from the zero to 12 inch interval (or fraction thereof) at all locations and analyzed for PCBs; at some locations the 12 to 24 inch and the 24 to 36 inch intervals (or fraction thereof) were also sampled. Overall arithmetic average PCB concentration in the zero to 12 inch layer was 7.3 ppm, with a max. discrete concentration of 543 ppm. Overall arithmetic average PCB concentration for all 672 samples analyzed was 7 ppm. It is important to recognize that these sample results are for the river and harbor as a whole, and are not confined just to the dredging areas. A breakdown of the PCB ranges vs. number of samples follows:

- 568 of the 672 samples (84.5%) exhibited non-detect (<1 ppm) for PCBs
- 41 of the 672 samples (6.1%) exhibited between 1-10 ppm PCBs

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- 42 of the 672 samples (6.3%) exhibited between 10-50 ppm PCBs
- 21 of the 672 samples (3.1%) exhibited greater than 50 ppm PCBs

A project completion report was issued in November 2002. Additionally, MDEQ performed caged fish studies in the harbor to assist in setting fish advisories.

Recalculated totals for the volume of sediment removed, water treated, and quantities of dewatered materials sent to landfills were presented in the November 2002 project completion report. These final reported results, for the entire project period of 1995-2001, differ from the cumulative totals in the Bi-Weekly Pollution Reports previously stated herein (and also presented in Report 04A, herein). The final reported totals are:

Dredged volume: 187,500 cy

Water treated: 673 million gallons

Total TSCA and non-TSCA solids shipped to landfills: 71,400 tons

Total cost (including mob and demob): \$48.2 million

Calculations of the total PCB mass remaining in the river and harbor were prepared and reported in the project completion report. These calculations were based on both the 2000 and 2001 confirmation sample results and an assumed range of specific gravities for the in-situ sediments. These calculations indicated that dredging achieved somewhere between 82% and 97% removal of the total PCB mass.

Remedial Action Planned: ☒

Risk Assessment: ☒

Remedial Action Implemented: ☒

Status of Dredging ☒

PRPs: ☒

Contacts: ☒

References: ☒

Modeling: ☒

Fishing Advisory: ☒

Key Conditions: capping, commercial landfill, dredging, Great Lakes AOC, hydrodynamic modeling, particle separation/soil washing, post monitoring, specialty dredge, water handling limitations

REMEDIAL ACTION PLANNED

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Target Sediment Cleanup Standards (TSCS):	(Source: September 10, 1996 Action Memorandum): "Removal of contaminated sediment in Areas C and D with PCB levels >10 ppm;" "Covering residual PCB-contaminated sediments (>10 ppm) that remain in the dredged area with clean sand."	
How TSCS Established:	<p>Source: Excerpts from Reference A-201 ("PCB Action Level," EPA Region V)</p> <p>"To generate sediment cleanup levels, a two step process was used. The first step is to calculate target fish levels which were based on a given risk level (i.e., 10-4) and appropriate exposure assumptions. These fish levels were then plugged into a bioaccumulation model, the Biota to Sediment Accumulation Factor (BSAF), to calculate target sediment levels to which fish can be exposed."</p> <p>"As part of applying the BSAF model, a site-specific estimate of bioaccumulation, or BSAF factor, is calculated to most accurately estimate the relationship between sediments and fish for this area. The ideal data to perform this calculation is "paired" sediment and fish data, where both sediment and fish samples are taken at the same time. Unfortunately, this data was not available for Manistique, and several assumptions had to be made... it is important to note that the BSAF factors used may be an underestimate of bioaccumulation and thus the lower end of the cleanup levels will be in closer agreement to more conservative assumptions regarding bioaccumulation."</p> <p>"For the noncancer portion of the analysis, two health endpoints were assessed: reproductive and immunotoxic. Results for each effect were compared and the lower was provided. In this way, the values shown will be protective of both endpoints. In all cases, because of the reference dose value, immunotoxicity was the endpoint the cleanup level is based upon."</p> <p>"Action levels below 10 ppm could be justified on the basis of risk analysis,... and high-end fish consumption scenarios, which include bottom fish. However, regional and nationally, EPA has selected PCB sediment cleanup numbers closer to 10 ppm considering volume of sediment to be remediated, the PCB mass which may remain following remediation, the goals of the project, and costs."</p> <p>"In selection of the 10 ppm action level, consideration has been given to (1) volumes of sediments removed (90%) and contained (5% or more) with capping, (2) the potential for results better than 10 ppm following remediation, due to dredging actions (e.g., diver assisted), and (3) reduction of PCB levels in non-capped areas with time due to addition of clean sediment cover."</p> <p>"The proposed combination remedy, whereby all PCB contamination above 10 ppm would be dredged from erosion prone areas, with sediments in other locations having from 10 to 50 ppm PCBs capped, will provide excellent long-term protection of Lake Michigan... the combination remedy yields very good protection for average to high-end sportfish consumers who would include a few meals per year of bottom fish in their diet. Levels of PCBs in bottom fish will decline over time, although it is uncertain when limited consumption of bottom fish could occur."</p>	
Target Bank and Floodplain Cleanup Levels (if applicable):	N/A	
Other Target:	None	
Environmental Sample Data References:	<ul style="list-style-type: none">• Sediment:	

REMEDIAL ACTION PLANNED

Project Name	<u>MANISTIQUE RIVER/HARBOR</u>	ProjectID: 05-10
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	<ul style="list-style-type: none">• Water:• Fish:	
Estimated Target Volume:	One 1.5-acre hot spot is to be dredged in a dead-end backwater area (Area B). Two other hot spots, one in river of 2 acres (Area C) and one in harbor of 15 acres (Area D) were to be capped, now they will be dredged. Initially targeted for removal were 97,000 cy (15-acre Harbor; Area D); 7,000 cy (2-acre Inner Harbor; Area C); and 23,000 cy (1.5 acre embayment; Area B).	
Planned Disposal Method:	Dredged materials would be disposed of in an upland confined disposal facility (CDF) complying with TSCA requirements. Either a new facility would be constructed or existing disposal facilities (landfills with a design determined to be sufficiently protective) in the region would be utilized, if approved by the EPA Region 5 Regional Administrator. Any disposal facility selected must comply with TSCA disposal requirements under 40 CFR § 761.60 (a)5. (Source: Reference A-200, Removal Action Recommendation, 8/5/94)	
Estimated Calendar Time to Implement Remedy:	Original project estimated for three years: 1995-1997.	
Estimated Time to Implement Remedy:	Three years	
Estimated Cost to Implement Remedy:	<ul style="list-style-type: none">• Removal Action Recommendation (8/5/94): \$10.2 million for (1) dredging all sediments >50 ppm; (2) dredging erosive areas >10 ppm; (3) capping low energy zones >10 ppm and <50 ppm; and (4) disposing dredged materials in an upland CDF complying with TSCA.• Action Memorandum (6/7/95): \$4.24 million for dredging >10 ppm PCBs from Hotspots A and B, and disposing of dewatered, size-classified sediments in offsite commercial landfills. (After investigation of Area A it was determined that sediments >10 ppm were not present and Area A was deleted from further action.)• Action Memorandum (9/10/96): \$14.8 million for dredging and disposal of sediments with PCBs >10 ppm from Areas B, C, and D (estimated 121,000 cy). The previous plan to cap Areas C and D was rescinded in this Action Memorandum based on EPA's perception of successful implementation of dredging in Area B.	
Stated Remedial Action Objectives (and Source):	"It is recommended that the primary remediation goal be the long-term protection of Lake Michigan. The secondary goal should be achieving risk reduction to persons, as well as wildlife, consuming fish from the harbor. The in-place containment of PCBs over the 50 ppm regulatory level given in the PCB regulations (40 CFR 761), promulgated under the Toxic Substances Control Act (TSCA), would not provide adequate protection of the environment in comparison to other more protective, PCB containment approaches (e.g., TSCA landfill). Federal and state PCB water quality criteria may not be met if all PCBs were capped in place. The removal of PCBs above the 10 ppm PCB action level is consistent with the goal of the Great Lakes Water Quality Agreement to "virtually eliminate" persistent toxic substances in the Great Lakes basin." (Source: Reference A-201, "PCB Action Level," EPA Region V)	
Measures of Success to be Used:	No written plans identified measures for evaluating effectiveness. Ultimately the target is a reduction of fish PCB levels to less than the FDA limit of 2 ppm.	
Planned Monitoring and Restoration:	The initial plan called for post-removal sediment verification sampling with residual sediment >10 ppm to be capped. (Note: capping is no longer planned.)	

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Agency Position on Sediment Removal (and Source): RAR, August 1994 (Reference A-200):

"Action levels below 10 ppm could be justified on the basis of risk analysis, . . . and fish consumption scenarios, which include bottom fish. However, regional and nationally, EPA has selected PCB sediment cleanup numbers closer to 10 ppm considering volume of sediment to be remediated, the PCB mass which may remain following remediation, the project goals, and costs."

"In selecting the 10 ppm action level, consideration has been given to (1) volumes of sediments removed (90%) and contained (5% or more) with capping, (2) the potential for results better than 10 ppm due to dredging actions (e.g., diver assisted), and (3) reduction of PCB levels in non-capped areas with time due to addition of clean sediment cover."

"The proposed combination remedy, whereby all PCB contamination above 10 ppm would be dredged from erosion prone areas, with sediments in other locations having from 10 to 50 ppm PCBs capped, will provide excellent long-term protection of Lake Michigan. The combination remedy yields very good protection for average to high-end sport fish consumers who would include a few meals per year of bottom fish in their diet. Levels of PCBs in bottom fish will decline over time, although it is uncertain when limited consumption of bottom fish could occur."

Interagency Review Team, April 1995 (Reference A-173):

CONCLUSION: "Although dredging presents its own uncertainties (principally, locating a landfill for the sediments), dredging contaminated sediments has a longer performance record than capping. The adverse effects of implementing dredging (the additional 900 lbs. of PCBs released to the harbor) are equivalent to 9 years of PCB loading at the current rate; the review team considered this an acceptable tradeoff..."

OBSERVATIONS: "Dredging could be expected to leave behind a residual of approximately 700 lbs. of PCBs based on an assumed 95% removal of contaminated sediments; the residual sediment layer will have an average concentration of 22 ppm. Over a period of years, this mass of PCBs will migrate into the water column. Region 5 estimates that water quality could recover from the effects of dredging in 8-14 years. At this time, water quality would be acceptable and fish advisories could be lifted."

"A figure of 2% for release due to resuspension appears reasonable, based on professional judgment. Even at a 2% release rate, a 280 lb. PCB loss during dredging is only equivalent to a 2 to 3 year loss of PCB under existing conditions."

"After dredging, new sediments are expected to accumulate more rapidly than current sedimentation rates. This resedimentation (at an avg. rate of 1.5 inches per year) is also expected to reduce the impact of the remaining PCB residuals."

September 10, 1996 Action Memo (Reference A-198):

"During the course of conducting dredging operations in Area B, US EPA Region V gained substantial experience which demonstrated that the dredging technique used succeeded in minimizing the potential risks of resuspension and redistribution of contaminated sediments. The modified response action consists of dredging and disposal of PCB - contaminated sediments exceeding 10 ppm in areas C and D (Lower River and Harbor). This (i.e., dredging Areas C and D immediately after Area B) is an important factor in the US EPA decision to modify the response action due to the high potential for migration of PCBs from the River and Harbor into Lake Michigan in the event of a substantial storm or scouring event."

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RISK ASSESSMENT

Project Name **MANISTIQUE RIVER/HARBOR** ***ProjectID:*** 05-10

Last Updated: 02/24/00

RA Type: Human Health

RA Status: Complete

RA Objectives: Evaluate baseline and post-dredging or capping conditions

Company TERRA, Inc.

Performing RA:

RA Reference Report: Streamlined Human Health Risk Assessment for Manistique Harbor - Revised Draft 6/16/94.

RA Summary and Conclusions: I. Streamlined Human Health Risk Assessment for Manistique Harbor - Revised Draft 6/16/94; by TERRA, Inc.

Key Findings:

- Baseline:
 - cancer risks: >10-4, except for average recreational fish exposure
 - non-cancer HI >1, except for average recreational fish exposure
- Post-dredging:
 - cancer risk: <10-4, except for high-end recreational and subsistence fish exposure
 - non-cancer HI >1, except for average recreational fish exposure
- Post-capping:
 - cancer risks < 10-4, except high-end subsistence and some high-end recreational fish exposure
 - non-cancer HI <1, except for some high-end subsistence (reproductive endpoints) and some high-end recreational and all high-end subsistence (immunological end points)

II. Monte Carlo Analysis of PCB Noncancer Hazards and Cancer Risks for Manistique River and Harbor: Capping Alternative (6/16/94), by TERRA, Inc.

Risks (fish consumption) following capping will be within USEPA acceptable ranges.

III. Manistique River and Harbor Qualitative Ecological Risk Assessment - Revised Draft 4/25/94; by TERRA, Inc.

Key Findings:

- Although no adverse affects to benthos from PCBs under baseline conditions, dredging may stress organisms due to potential increased PCB levels.
- Potential risks to mink from PCBs could be minimized by capping.

Reference E-34 describes how sediment cleanup goals derived from risk-based fish levels were calculated by EPA Region V. Using a BSAF-based approach, EPA first (1) set the acceptable PCB level in fish (to achieve a 10-4 to 10-6 risk level or an HI of 1.0), then (2) calculated total organic carbon in the sediment, then (3) determined target fish based on fish consumption patterns, then (4) either calculated a site-specific BSAF or chose a literature value, and finally (5) used the information from (1) through (4) to calculate a sediment cleanup goal. For an "average" scenario, EPA calculated a variety of sediment cleanup goals ranging from 0.13 ppm PCBs for the subsistence fishing cancer risk scenario (10-6) up to 1.3 ppm PCBs for the recreational fishing cancer risk scenario (10-6) up to 25 ppm PCBs for the recreational fishing non-cancer risk scenario (HI equals 1). EPA evaluated target cleanup levels between 0.13 ppm and

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25 ppm and settled on 10 ppm PCBs which, if achieved and averaged with the rest of the river bottom, would result in the 1.3 ppm or similar low overall average.

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Physical Target:	There are two 2-acre hot spots: one is adjacent to a dead-end backwater area (Area B) and one is in a nearshore river area (Area C). In addition, there is a 15-acre hot spot in harbor (Area D).	
Goals:	Removal of all material over 10 ppm PCBs with the objective of reducing transport to Lake Michigan. In February 2001, EPA restated the project objective in an Action Memo as follows "...the objective of 95% removal of the total PCB mass from within the AOC and an average concentration of not more than 10 ppm throughout the sediment column shall be verified."	
Primary Contractor:	Superior Special Services (dredging)	
Other Contractors:	Environmental Quality Management (oversight); Dorocher Dock and Dredge (barges); Ecology and Environment; Coleman Engineering (sediment sampling)	
Generic Remediation Method:	Hydraulic dredging; diver-assisted	
Equipment:	<ul style="list-style-type: none">• Custom hydraulic auger dredge with twin suction pumps and a modified dredgehead; some diver assisted dredging.• For 2000 dredging, a modified "match box-type" design dredgehead with a jet spray system was used. The "match box-type" design is an enclosed dredgehead used to remove residual sediment at the bedrock interface. The jet spray system (operating at 30-1,000 psi) has been added to assist in loosening sediment from the irregular bedrock surface in an attempt to expedite and efficiently remove these materials. Twin suction pumps are operated at ~ 3,000 gpm total and the jet spray system is operated at ~ 1,000 gpm, creating a net negative pressure environment within the dredgehead to help minimize resuspension of the removed sediment. Initial problems with the system developed when the dredgehead "match box"-type cover began to collapse as a result of the relative pressure differential; operational adjustments were subsequently made to reduce the pressure differential and eliminate these occurrences.• For the 2-acre area dredged (Area B), a diver assisted dredge with hose/pump was used at water depths of 10-15 ft.; dredging reportedly removed 2-3 ft. of sediment.• In 1995, vacuum removal was performed by dive teams in the backwater area, supplemented by small a hydraulic auger dredge; in 1996 and 1997, a hydraulic auger dredge was used; in late 1996, the dredge operation was upgraded to a 10" hose line and pump; in 1997, twin suction pumps were added to the dredge; in 1999 a shroud was added to the dredgehead to increase suction; silt curtains and floating booms were installed around dredging areas. <p>For 2000 dredging:</p> <ul style="list-style-type: none">• Facility operations were run 7 days per week, 24 hours per day with dredging for one 12-hour shift per day and solids handling and water treatment for two 12-hour shifts per day.• Personnel at the site were a combination of Superior (prime contractor) and other subcontractor personnel. Specifically, 12 Superior persons manned the land-based operations (6 during day shift and 6 during night shift) and 6 persons were assigned to dredging (day shift only); subcontractor personnel included tugboat operators, truck drivers, and four belt press operators (2 per shift) for one belt press.• USEPA reportedly used onsite Doppler Radar to track local weather patterns on a real-time basis; wind direction and magnitude apparently determined which areas of the harbor were worked	

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daily and could significantly impacted daily sediment removal rates.

- An onsite laboratory equipped with GC/MS was used for quick turn around of PCB analysis for both solids and treated water.

Material Handling:

In sequence: on land, coarse screen, vibrating screen, rotary screen, FRAC tank for settling; hydrocyclones (added 8/96); four chambered settling basins; and belt filter presses. For example, slurry was pumped to a screening box (>2") on shore, then to a treatment pad with vibratory screens (>2 mm), then to a rotary screen (>0.5 mm), then a FRAC tank for settling, then to 4 settling basins, then the belt filter press. In 1997, removed sediment was pumped from the dredge to barges and then barged to a pump station; about 617 barge loads (using 1,200 cy barges) were completed using this procedure. A similar procedure was used in 1998, 1999, and 2000.

Details for 2000 dredging are as follows:

DREDGING AND SLURRY TRANSPORT

- Dredging in Area D (the harbor) was directed by divers based on visual identification of sediment at the bedrock interface. According to EPA, dredging was not to be performed in areas where divers were unable to visually identify pockets of sediment for removal.
- Dredging in a "final pass" mode utilized a "match box-type," shrouded cutterhead on the dredge. The dredge head was equipped with a series of nozzles attached to a common header pipe for delivering jets of water at a combined rate of 400 gallons per minute. The water jets were reportedly successful at loosening sediment at the bedrock surface. Slurry was pumped from the dredge head at between 2,000 and 2,500 gpm, creating a negative pressure within the shroud head. Apparently this design could be operated in the water jet or cutterhead modes. Superior considers this dredge head design proprietary.
- The project was started using an extensively modified hull and power unit of a IMS 4010 Auger Dredge; Superior later developed a mono hull configuration of the same dredge. Horizontal auger dredge heads ranging in length from 4 to 14 ft. have been used for certain applications. The 14-foot horizontal auger was equipped with two Vortex pumps mounted directly on either side of the dredge head. EPA reports that the Vortex pumps were reliable and resisted the clogging typical of other dredge designs. Reportedly, when a Vortex pump or attached line became obstructed (in one case by a car tire), resuspension during backflushing of the clogged line was minimized through continued operation of the unaffected pump.
- The dredge was attached to an operations barge equipped with I-beams protruding horizontally from each end. A stainless steel cable was suspended between the I-beams to act as a guideline for controlling movement of the dredge across the water. The operations barge was equipped with four spuds to maintain stability (originally equipped with two spuds; two spuds were recently added due to difficulties anchoring on the bedrock surface as a result of removal of nearly all soft sediment in the dredge area). The operations crane was an 18-ton crane originally used for debris removal.
- The dredge discharged through about 200 feet of flexible hose to a slurry barge (35 ft. wide x 195 ft. long x about 11 ft. deep) moored alongside the operations barge opposite the dredge. Two slurry barges were actively used with a third barge maintained as standby (Note: standby rates applied for rental of the third barge).

Note: Superior originally considered discharging the sediment slurry directly to the pre-processing

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unit through a pipeline. Cost, permitting, and design issues, and the high potential for clogging, all were factors for not using the pipeline. In retrospect, Superior believes this to be the correct decision; they feel that the amount of debris found in the harbor (primarily slab wood) would have made the successful transfer of sediment slurry through an extended pipeline difficult.

- The slurry barges each were equipped with four ballast tanks, one at each corner, that were used to prevent listing during loading and to assist in settled solids unloading.
- During Year 2000, slurry barges were loaded to a maximum draft of 6 feet (results in ~ 220,000 gallons of capacity per barge). Allowable draft was continually reduced throughout the project due to steady lowering of Lake Michigan water levels due to drought conditions. The shallowest point (at about 6.5 to 7 feet of water depth) was beneath the Rt. 2 bridge.
- Year 2000 daily production reportedly was 8 to 12 slurry barge loads (average of 10) per one 12-hour shift. This represented an average of about 2.2 million gallons, or 3,055 gpm, higher than the discharge rate provided for the dredge. This discrepancy may be the result of over estimation of the volume of water in each barge or the number of barge loads per day (nine barges containing 200,000 gallons each equates to about 1.8 million gallons, or 2,500 gpm, the high-end discharge rate provided for the dredge).
- One slurry barge was transported, unloaded of slurry water only, and returned to the operations barge before filling of the second slurry barge was complete; a complete cycle typically took 50-55 minutes. (Note: Only slurry water was unloaded during dayshift - settled solids remained in the barge and were unloaded from the slurry barges during nightshift).
- Two tugboats were continuously available for transporting the slurry barges to and from the unloading area. On days with little wind, one tug was used for barge movement while the second tug ensured clear passage and assisted in maneuvering the barge into place at the unloading area; during windy days both tugs were attached to the barge during transport.

SLURRY UNLOADING AND PRE-PROCESSING

- The sediment slurry processing system had a maximum capacity of 2,400 gpm but typically operated at 1,500 gpm.
- The unloading area comprised a working barge tethered to a storage barge. A 60-ton crane was mounted to the working barge for raising and lowering two transfer pump screened intakes into and out of the slurry barges.
- The screened intakes were attached to two 5,000 gpm electric transfer pumps by about 200 ft. of hose. The pumps transferred water from the slurry barges to the storage barge during dayshift (a complete transfer took about 20 minutes). Settled solids remained in the slurry barge until dredging was complete for the day.
- A 5,000 gpm electric pump was used to transfer 2,000 gpm of water from the storage barge to the slurry processing area. The remaining flow of 3,000 gpm was recirculated back to the storage barge to assist in maintaining solids in suspension.
- Offloading of settled solids from the slurry barges was performed during night shift. A second-hand fire-fighting nozzle was used (typical of those used on fire-fighting boats) to create a high-powered water jet to loosen and slurry the collected solids (typically about 1.5 feet deep). Using

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the nozzle, the slurry was pushed to a corner of the barge where it was pumped at 1,200 to 1,500 gpm to the pre-processing area. The process was expedited by adding water to one of the slurry barge ballast tanks to create a low corner in the barge from which the slurried solids could be more easily removed.

- Offloading of solids from two slurry barges and transferring the remaining water from the storage barge to the pre-processing area was completed during one 12-hour nightshift.
- The offloaded slurry and water mixture was directed through three 500-micron (0.02 inches) vibratory screens (operated in parallel) to remove wood chips and oversized rock and debris. The wood chips were typically heavily contaminated with PCBs, ranging between 50-4,000 ppm. The removed material was stockpiled in the solids handling area for air drying and sampling prior to disposal.
- Slurry water from the screens passed through a bank of four hydrocyclones (operated in parallel) to remove the sand fraction. A fifth hydrocyclone was added two years ago for backup but was not typically used.
- Slurry water from the hydrocyclones dropped into a tank equipped with a weir. Water passing over the weir was pumped to the water treatment facility for processing.
- According to EPA, the added cost of using hydrocyclones to remove sand from the sediment slurry was justified on a cost basis by: 1) reductions in disposal costs associated with not having to dispose of sand at either a TSCA or non-TSCA landfill, and 2) reductions in belt filter press maintenance costs, such as less belt and roller cleaning and replacement costs.
- Material removed by the hydrocyclones constituted primarily sand with a small amount of intermixed fine organic material and typically contained >1 ppm PCBs (solids containing <1 ppm PCBs have no special handling or disposal requirements). A standard garden hose was used to wash the organic fines from the sand and reduce PCB levels to <1 ppm, allowing the "clean" sand to be stockpiled onsite. The organic fines washed from the sand were directed to a sump and redirected back to the slurry processing unit for treatment.
- In Year 2000, approximately three times as much sand was removed by the hydrocyclones as was removed in the three previous years of operation combined. EPA believes this to be the result of a combination of two factors: 1) minimal amounts of in-situ sediment remaining in areas currently being dredged, and 2) the natural process of sand deposition typical of the river.

SOLIDS HANDLING

- The area consisted of an asphalt slab with metal roof and was located adjacent to the pre-processing area. The area was used to stockpile and dry solids designated for offsite disposal. A 4-foot-high concrete block wall was installed around most of the perimeter to define the boundary of contamination. A dedicated front-end loader was used to move material within the contaminated area and to load trucks being used to transport solids to the offsite landfills.
- Material removed by the vibratory screens was placed directly onto piles in the solids handling area using the dedicated front-end loader. Belt filter press cake was transported to and placed on the other side of the perimeter block wall using a second front-end loader. These materials remained segregated until loaded into trucks for disposal.

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	<ul style="list-style-type: none">• Solids piles were sampled a minimum of once every 12 hours, but usually 3 times during each day shift, and then separated as either TSCA (≥ 50 ppm PCBs) or non-TSCA (<50 ppm PCBs). In Year 2000, $>95\%$ of solids processed (wood chips and belt filter press cake) were disposed as TSCA -- in previous years 60 to 70% was typical.• Solids remained stockpiled for 7 to 10 days to maximize drying prior to disposal. Materials typically ranged between 20-30% moisture when shipped for offsite disposal.• Typically, 5-6 truckloads containing about 30 tons each were shipped for disposal each day, five days per week. A weigh station was located nearby to weigh each truck prior to leaving for and returning from the landfills. Each truckload typically contained approximately one-half wood chips and one-half filter cake by loading material from two separate stock piles alternately until a truck was fully loaded. The moisture-laden bottom one-foot of each solids pile was left in place and subsequently added to another pile for further drying.	
Volume Removed:	The total volume removed is variously reported. The first report is 121,500 cy, with 72,000 cy described as in-situ cubic yards and 49,500 cy (in 1999 and 2000) described as ex-situ cubic yards (back-calculated from dewatered tonnage). Refer to Full Report 04A in this Database, which was compiled from the Bi-Weekly Pollution Reports from 1995-2000. Subsequently, total volume removed was reported as 93,259 cy (ex-situ calculation method) and 178,708 cy (in-situ calculation method) in a summary table in Reference B-503 (final Bi-Weekly Pollution Report for Year 2000). Finally, in the November 2002 project completion report, the total volume removed is reported as 187,500 cy.	
Calendar Time:	1995 through 2000; demobilization in Spring 2001	
Time To Implement:	3 months in 1995; 6 months in 1996 and 1997; 5 months in 1998; 6 months each in 1999 and 2000. Dredging was completed on October 21, 2000. In 1997 and 1998, the dredging schedule was seven days per week, weather permitting. Operating days in 1997 and 1998 typically achieved about 6 hours of dredging per operating day.	
Total Cost:	\$48.2 million (1995 - 2000). Refer to Full Report 04A in this Database for a year by year breakdown.	
Dredging Cost:	Not available	
Disposal of Sediment:	In 1995, about 97% of dewatered solids at <50 ppm PCBs went to a subtitle D landfill (\$29 per cy), and 3% of dewatered solids at >50 ppm went to a TSCA landfill in Utah (\$160 per cy). Since then (1996-1999), 51% (20,795 tons) of dewatered solids were disposed at an in-state subtitle D landfill as non-TSCA waste and 49% (19,869 tons) of dewatered solids were disposed at an out-of-state TSCA landfill. In 2000, 1,750 cy of dewatered solids were disposed as non-TSCA and 18,500 cy of dewatered solids were disposed as TSCA (these values were reported in cubic yards in 2000 instead of tons).	
Volume of Water:	16 million gallons (1995); 35.2 million gallons (1996); 122.1 million gallons (1997); 129.1 million gallons (1998); 204.5 million gallons (1999); 159.1 million gallons (2000). Refer to Full Report 04A.	
Method of Water Treatment:	Water was treated through dual media (sand/coal), then activated carbon; water return was set at ND (0.5 ppb PCBs) and was typically met. In 1998, increased to 2,500 gpm water treatment capacity (five 500 gpm treatment trains).	

Water treatment for 2000 dredging was as follows:

- Water was pumped from the post-weir section of the hydrocyclone discharge tank to the water treatment system. Cationic and anionic polymer (polymer manufacturer: Vulcan) were added to the

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water at two locations for cationic and at one location for anionic prior to the water being discharged to a trough located at the head of the settling basin. According to EPA, the addition of both polymer types was necessary to promote adequate floc development and settling. The types of polymer used and the number and location of injection points in the transfer pipe were repeatedly adjusted "hit or miss" over the years. Floc periodically collected in the trough in sufficient quantity to inhibit water flow through the entire length of the trough. EPA stated that they periodically remove settled solids from the trough to maintain adequate flow.

- Turbidity levels were measured in the settling basins hourly using portable meters. The amount of polymer being added to the incoming slurry water was adjusted manually based on these readings.
- The settling basin was divided into four equally sized chambers (about 240,000-gallon capacity each) separated by 7-foot high block walls and silt curtains attached to booms. The discharge trough was located in the first chamber and the water moved sequentially by gravity flow from one chamber to the next. The silt curtains were added to aid in settling, however, the USEPA believes they were unnecessary. The booms were installed to keep floating oil from reaching the sand and carbon filtration units located downstream of the settling basin. The USEPA estimates that <90% of settleable solids was removed in Chamber 1, 7-8% was removed in Chamber 2, and that all removal occurred prior to Chamber 4.
- Settled solids were pumped from the settling chambers and discharged to a mixing (fractionation) tank using a pneumatic truck-mounted sludge pump, a "Sludge Buster." The Sludge Buster removed settled solids by suctioning them through a special head connected to a hose and attached to the end of a boom arm. The boom-mounted suction head appeared to be able to reach at least the first two chambers along their full width.
- The settled solids (about 10-12% solids maximum; higher solids content must be diluted) were pumped as slurry from the mixing tank to a single belt filter press (manufacturer: Lefco). Polymer was added directly to the transfer pipe to assist in dewatering. The belt filter press cake ranged 45-55% solids (EPA also believes that remaining polymer from that added to the incoming water stream promotes flocculation and dewatering). Filtrate was directed back to the discharge trough for retreatment. A small front-end loader (Bobcat) was used to load a larger front-end loader with filter cake for transport to the solids handling area. In Year 2000, about 96% of the filter press cake required disposal as TSCA material (typical in previous years was 60-70%).
- The belt filter press was continuously cleaned using groundwater pumped from an above-ground horizontal 5,000-gallon storage tank. The storage tank was painted black to promote solar heating of the water. Cleaning efficiency of the filter press belt was apparently increased with increasing temperature of the rinse water. During warm weather, the sun alone was capable of heating the water from ~42F to ~55F; electrical power was used during colder weather.
- Water treatment was continued by pumping from Chamber 4 through a series of five filter trains (operated in parallel), each consisting of one sand and one carbon filter. The sand filters contained two different media; about one foot of gravel on the bottom and about 3 feet of 1.5 to 1.8 micron (5.9×10^{-5} to 7.1×10^{-5} inches) sand. The carbon units each contained about 12,000 pounds of carbon. Both types of filters were back-washed as needed (as determined by line back-pressure), but were typically back-washed once every 24 hours. Carbon was typically replaced after every 60 million gallons of water treated.
- The treated water was discharged to one of two in-ground, geomembrane-lined, 1.2 million-

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	<p>gallon holding ponds. Once full, a water sample was collected from the pond for onsite PCB analysis prior to discharging the water in the pond back to the river (discharge limit: 0.1 ppb PCBs). The discharge limit was reportedly consistently met.</p>	
Water Discharge Limit:	Set at nondetectable PCBs (0.1 ppb) which is 100 ppt (EPA Progress Report)	
Air Monitoring During Remediation:	None (other than limited monitoring during the first year of dredging near the dredge and sediment off-loading area).	
Water Monitoring During Remediation:	Monitoring of treated water before discharge. Turbidity (twice background) and PCBs were monitored outside the silt curtains during dredging. By 2000, the silt curtains were no longer being used, reportedly as a result of consistently low turbidity readings from around the dredge area.	
Outcome:	<p>Six years of environmental dredging have been completed at three hot spot areas in the river and numerous hot spot areas in the harbor. Removed volume has been variously reported. In the November 2002 project completion report, a removed volume of 187,500 cy is reported. A total of 42,068 dewatered tons (about 53% classified as non-TSCA and 47% TSCA) had been disposed at offsite landfills and 4,091 tons classified as clean sand had been stockpiled on-site, through 1999. All dredging ceased at the project on October 21, 2000. Demob of equipment from the site began immediately and was completed in Spring 2001. A program of clean sand placement in the river and harbor was implemented in Fall 2000. Treated sand was to be placed over areas in the harbor with surface PCBs above 10 ppm. The first attempt caused resuspension of fine sediments and was discontinued. Subsequently, 1,400 cy of sand were broadcast into the river and were allowed to distribute naturally into the harbor.</p> <p>Hundreds of verification samples have been collected over the six-year period as a check on whether the 10 ppm PCB target level has been reached. Verification sampling in the harbor hot spot areas in 1999 has demonstrated the difficulty in reaching the cleanup level as the depth of dredging increases and the bedrock interface is approached and as paper pulp layers and slab wood are encountered. In certain harbor areas, PCB levels have increased as dredging has progressed. As a result, the ability to reach the 10 ppm cleanup level became increasingly uncertain as the dredging continued.</p> <p>Throughout 2000, End-of-Project (EOP) confirmation sediment samples were collected from the river and harbor on a 50-foot spacing. A total of 422 locations was sampled. Samples were collected from the zero to 12 inch depth interval (or fraction thereof) at all locations and analyzed for PCBs; at some locations the 12 to 24 inch and 24 to 36 inch intervals (or fraction thereof) were also sampled. Overall arithmetic average PCB concentration in the zero to 12 inch layer was 9 ppm, with a max. discrete concentration of 884 ppm. Overall arithmetic average PCB concentration for all 583 samples analyzed was 7.9 ppm. It is important to recognize that these sample results are for the river and harbor as a whole, and are not confined just to the dredging areas.</p> <p>In February 2001, EPA restated the project objective in an Action Memo as follows "...the objective of 95% removal of the total PCB mass from within the AOC and an average concentration of not more than 10 ppm throughout the sediment column shall be verified."</p> <p>During May 2001, Final Sampling (FS) confirmation sediment samples were collected from the river and harbor. A total of 391 locations was sampled. Samples were collected from the zero to 12 inch interval (or fraction thereof) at all locations and analyzed for PCBs; at some locations the 12 to 24 inch and the 24 to 36 inch intervals (or fraction thereof) were also sampled. Overall arithmetic average PCB concentration in the zero to 12 inch layer was 7.3 ppm, with a max. discrete concentration of 543 ppm. Overall arithmetic average PCB concentration for all 672 samples analyzed was 7 ppm. It is important to recognize that these sample results are for the river and</p>	

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harbor as a whole, and are not confined just to the dredging areas. A breakdown of the PCB ranges vs. number of samples follows:

- 568 of the 672 samples (84.5%) exhibited non-detect (<1 ppm) for PCBs
- 41 of the 672 samples (6.1%) exhibited between 1-10 ppm PCBs
- 42 of the 672 samples (6.3%) exhibited between 10-50 ppm PCBs
- 21 of the 672 samples (3.1%) exhibited greater than 50 ppm PCBs

Restoration and Post-Monitoring:

According to USEPA on March 30, 1999, a long-term monitoring plan had yet to be developed, but one was to be in place prior to year end 1999. It still has yet to be identified or obtained.

Site-Specific Difficulties:

Wood and wood debris in targeted dredging areas. In 1997, dredge production rate exceeded land-based handling and water treatment capacity, limiting dredging to 1 - 2 hours per day. Weather-related shutdowns of dredging activity were a result of disruption of barge spuds. The procedure used to estimate solids removed may be biased high, since reported cubic yards don't correlate with (greatly exceed) reported tons of solids sent off-site for disposal. Wind-driven waves in 1998 caused extensive down-time.

Excerpts from the EPA bi-weekly Pollution Reports follow, which provide useful details regarding site-specific difficulties experienced:

- POLREP No. 57 (April 22, 1999): "The total water level of Lake Michigan and the harbor area has dropped approximately 2.0 feet lower than 1998 levels. According to Army Corps of Engineers' data from the April 5, 1999 USACOE Great Lakes update; 'The average monthly water level for Lake Michigan in March was 20 inches below what it was in March 1998. Lake Michigan is expected to begin its seasonal rise in April and continue into July. The forecasted water level in July is expected to be about 7 inches above the current water level.' Due to decrease in water depth in the Manistique River, a bedrock obstruction has surfaced in the barge channel. Areas of the obstruction rise to a depth of approximately 6.0 feet from the surface. Tug boats require approximately 8 feet of draft to operate. Activities to remove up to 2.5 feet of the bedrock will begin on April 23, 1999. Based on a diver survey and test borings completed on April 19, 1999, it has been determined that the obstruction is comprised of fractured bedrock. A 3,000 lb. hydraulic hammer mounted on a 225 excavator will be utilized to break up the obstruction. The broken bedrock will be removed with a shore-based 225 excavator."
- POLREP No. 60 (May 26, 1999): "The ERRS subcontractor continued diver-assisted dredging in dredge area DD2. Approximately 5-feet of gray fluffy paper pulp and woodchips were discovered in a diver-assisted excavation north of the U.S. 2 Bridge. This was below a 2 to 3 foot slab wood layer. Samples were collected by divers from the pulp/woodchip layer. Sample results collected by divers from this layer indicated an average PCB concentration of 1,200 ppm. Due to the high concentrations of PCBs located in the North Bridge area, the flow rate at the WWTP has been reduced to 750 gpm. A new polymer has been introduced into the WWTP to reduce the increased suspended solids occurring from the fluffy paper pulp."
- POLREP No. 61 (June 30, 1999): "Large amounts of debris continue to be encountered and continue to slow the dredge operation. Wood chip samples were as high as 3,316 ppm. Hydraulic dredging will continue with periodic stoppage to remove debris from dredge area . . . On June 23, Coleman Engineering, subcontracted by ERRS, arrived on site and placed a sectional barge in the harbor. A drill rig is to be placed on the barge for sampling south of the U.S. 2 Bridge and east of

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area DD1. The drill rig is to be used for sampling because divers cannot pound a sampling tube through the slabwood in this area."

- POLREP No. 62 (July 15, 1999): "On June 23, 1999, MDOT visited site to assess the potential impact of dredging activities on the U.S. 2 Bridge. According to the MDOT representative, any work within 100-feet of the bridge required MDOT concurrence. Coleman Engineering Co. was contracted to provide an engineering analysis of the impacts of dredging activities around the bridge pier and abutment located on the western side of the U.S. 2 Bridge. Results of the engineering analysis indicated that dredging activities could impact the bridge. U.S. EPA is currently exploring conducting limited dredging activities followed by capping."
- POLREP No. 63 (August 5, 1999): "On July 24 through August 1, 1999, the rudder on the primary tugboat was damaged and could no longer operate. Two tugboats are required to safely transport barges to and from the dredge area. Due to the breakdown, dredging activities were postponed and the downtime was utilized to upgrade three pumps within the treatment system. The 8" hydraulic pump utilized to remove slurry from containment barges was replaced with an 8" electric pump that will be operated at approximately 2,100 gpm. The 6" hydraulic pump utilized to pump water from the hydrocyclone basin to the wastewater treatment plant (WWTP) was replaced with an 8" electric pump that will be operated at approximately 2,100 gpm. Each of these pumps was previously operated at an approximate rate of 1,500 gpm. An additional pump was also installed between settling chamber 2 and 3 at the WWTP. The pump will be utilized to transfer water from chambers 2 and 3 into chamber 4. The transfer will allow the sand and activated carbon units to be operated at a greater flow rate. The average flow rate to the effluent lagoons has currently increased from 1,500 gpm to 2,000 gpm. With these upgrades, dredging production has already increased by approximately 200,000 gallons of dredge slurry per day with expectations of an additional 100,000 gallons of dredge slurry. Due to the increased treatment capacity, the cutterhead on the hydraulic dredge has been moved at a faster rate. The increased movement of the cutterhead has approximately doubled the volume of solids dredged daily without any significant sediment resuspension as measured 25-feet downstream from the dredge with a turbidity monitor."

"Dredging was completed in Dredge Area 16 on July 17, 1999. Confirmation samples were collected with a Wilco Petite Ponar dredge. Analytical results received from the EQM on-site laboratory indicated PCB concentrations ranging from 64 to 1,042 ppm. The dredge was placed back in Dredge Area 16 to complete an additional pass through areas with concentrations greater than 10 ppm. Confirmation samples were collected from the dredged area. Analytical results indicated PCB concentrations ranging from non-detect to 788 ppm. On July 27, 1999 confirmation samples were collected from Dredge Area 22. Analytical results indicated PCB concentrations ranging from non-detect to 1,600 ppm."

- POLREP No. 65 (September 15, 1999): "Confirmation samples were collected from dredge areas 16, 25, 27, 31 and 33 with a Wilco Petite Ponar dredge. Analytical results from Dredge Area 25 indicated PCB concentrations ranging from 3.39 to 95.36 ppm. Analytical results from Dredge Area 27 indicated PCB concentrations ranging from 2.8 to 1121.96 ppm. Analytical results from Dredge Area 31 indicated PCB concentrations ranging from 6.03 to 514.55 ppm. Analytical results from Dredge Area 33 indicated PCB concentrations ranging from non-detect to 228.72 ppm."
- POLREP No. 66 (September 24, 1999): "U.S. EPA ERT/REAC divers were on-site during the week of September 13, 1999. A total of 98 core samples were collected with Lexan tubes to further delineate future dredge areas and for dredging confirmation purposes. Analytical results indicated PCB concentrations ranging from non-detect to 1756.59 ppm."

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- POLREP No. 71 (January 27, 2000): "Sample results from the November 1999 harbor proper sampling activity were received from the on-site laboratory. Sample results ranged from <1 to 1,103.19 ppm. Out of the 235 locations sampled, 27 of the samples contained PCB concentrations above 50 ppm, 27 contained PCB concentrations ranging from 10.01 to 49.93 ppm, and 138 of the samples had concentrations ranging from <1 to 9.58 ppm. A sample could not be retrieved from 43 of the 235 locations due to the absence of sediment or an obstruction within the sample area. An average concentration of the 235 sample locations was derived utilizing all of the sample results and assigning a value of 0 ppm for all sample locations that did not yield a sample. The average PCB concentration of all sample locations is 21.38 ppm."
 - POLREP No. 72 (May 1, 2000): "Due to the low water levels in the harbor, a survey was performed to locate the low points along the channel used to transport barges back and forth between the treatment plant and the dredge. Low areas were marked with buoys. The Army Corps of Engineers and the National Oceanic and Atmospheric Administration has estimated an additional water elevation drop of 1 foot by late summer and are approaching record lows (Attachment 3); therefore, bedrock may be removed previous to dredging activities."
 - POLREP No. 78 (August 9, 2000): "During this reporting period, the ERRS subcontractor, Superior Special Services, Inc. (SSS), performed dredging activities on 9 of 14 days with 4 days taken off for dredge motor replacement and mechanical maintenance and ½ day taken off for inclement weather."
- "Analytical results of diver core samples taken along the northern and southern edges of DA-00-36 (see Attachment 2) indicated PCB levels in excess of 5,000 and 7,000 ppm, respectively. The 5,000 ppm hit is the highest recorded PCB concentration of the 2000 dredge season."
- POLREP No. 83 (October 13, 2000): "Based on analytical results of the end of project (EOP) core samples collected in July and August of 2000, the average concentration in the sediment column is approximately 11 ppm. This average is based on the following assumptions:
 - "Areas with elevated confirmation ponar results will be redredged. For example, EOP-096, 0-12" had an original PCB concentration of 46 ppm. Once that area had been dredged, a ponar (EOP-096C) was collected to confirm cleanup. However, EOP-096C had a PCB concentration of 1575 ppm. SSS is currently dredging this hit of 1575 ppm (DA-00-84)."
 - "EOP samples that fell into non-dredgable areas were not factored into the average in the sediment column. An area is considered non-dredgeable if the dredge spread cannot be positioned over the area, if the divers' safety is put in jeopardy, or if rock associated with the breakwall repair covers the area."

Monitoring Data

References:

- *Sediment*
- *Water:*
- *Fish:*

STATUS OF DREDGING^ (THRU 2000)

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<u>CATEGORY</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>TOTALS</u>
EPA Dredged Volume (cubic yards)	10,000	15,000	62,000# (est.); (25,200#)	31,000# (est.); (21,800#)	25,050# (est.)	24,450# (est.)	--
Type of Dredge	divers	6-inch hydraulic auger; divers	hydraulic auger (2 suction pumps)	hydraulic auger (2 suction pumps)	hydraulic auger (2 suction pumps and sometimes a shroud to increase suction)	hydraulic auger (2 suction pumps) plus dredgehead with water jets	--
Barge Loads	N/A	N/A	617	NI	NI	NI	--
Water Treated* (gallons)	16 million	35.2 million	122.1 million	129.1 million	204.5 million	147.5 million	654.4 million
Dewatered TSCA Sediment (tons)	32	589	3736	5937	9607	**	--
Dewatered Non-TSCA Sediment* (tons)	1,372	1,527	8,309	6,686	4,273	**	--
Clean Sand+ (tons)	--	--	50	2,287	1,754	**	--
Total Tons	1,404	2,116	12,095	14,910	15,634	**	--
Total Cost (\$)	3.9 million	3.8 million	7.8 million	10.1 million	10.3 million	9.3 million	45.2 million
Unit Cost (\$ per cy)	390	253	126; (310)	306; (463)	411	454	--

^ Source: Bi-Weekly "Pollution Reports" by EPA On-Scene Coordinator (called "POLREPs"). Inconsistencies in individual entries and cumulative totals have been resolved by GE/AEM/BBL based on judgment and comparisons between consecutive bi-weekly reports. Entries in this table differ in some instances to final totals in the November project completion report. No attempt has been made to reconcile the differences.

Estimated based on 20% solids in the dredged slurry, per Dec. 5, 1997 EPA bi-weekly report. Subsequently, the 1997 and 1998 volume estimates were revised sharply downward based on harbor survey data or on a new method of calculating "ex-situ" volumes (introduced in the POLREP of 10/18/99), or both. Revised volumes are in parentheses.

* Discharge limit of 0.1 ppb PCBs.

+ Separated out in a screw classifier and <1 ppm PCBs.

NI - not identified

** Year 2000 quantities are reported in cy, not tons. Year 2000 quantities are 16,125 cy (dewatered TSCA), 666 cy (dewatered non-TSCA), and 3,700 cy (clean sand).

POTENTIALLY RESPONSIBLE PARTIES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

PRP Name: PRP INFORMATION NOT RELEASED

PRPID:

Street Address:

City:

State:

KEY CONTACTS

Project Name **MANISTIQUE RIVER/HARBOR**

ProjectID: 05-10

Last Name: KEY CONTACT INFORMATION NOT RELEASED

Contact ID:

First Name:

Title:

Company:

Address:

City:

State:

Postal Code:

Work Phone # :

Other Phone #:

Fax # :

Email Address:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 117

Title: *Memo re: Capping TSCA Regulated Sediments in the Manistique River and Harbor*

Location: AEM

Category: Site Update

Prepared by/Author: Phyllis Reed, Chief

Preparer/Author Address: US EPA Region V,
Pesticides and Toxic Substances Branch
Chicago, IL

Prepared For: William E. Muno, Director, Waste Management Division, US EPA Region V

Date Published: July 15, 1994

Key Words and Phrases:

Reference Type: A

ReferenceID: 173

Title: *Assessment of Remediation Technologies; Manistique River and Harbor Area of Concern*

Location: AEM

Category: Contaminated Sediments: Treatment Technologies

Prepared by/Author: Interagency Review Team

Preparer/Author Address:

Prepared For: US EPA

Date Published: April 10, 1995

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 196

Title: *Action Memorandum: Request to Conduct a Time-Critical Removal Action and an Emergency Exemption to the \$2 Million Statutory Limit to Address PCB Hotspots Upstream in the Manistique River at the Manistique Harbor Site*

Location: AEM

Category: Site Update

Prepared by/Author: Walter Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: Valdas V. Adamkus, Regional Administrator, US EPA Region V

Date Published: June 7, 1995

Key Words and Phrases:

Reference Type: A

ReferenceID: 197

Title: *Action Memorandum: Request for an Exemption to the 12-Month Statutory Limit for the Time-Critical Removal Action at the Upstream Portion of the Manistique Harbor Site*

Location: AEM

Category: Site Update

Prepared by/Author: Walter Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: William E. Muno, Director, Waste Management Division, US EPA Region V

Date Published: November 28, 1994

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 198

Title: *Action Memorandum: Request for a Ceiling Increase and Modification to Response Action and Emergency Exemption to the \$2 Million Statutory Limit at Manistique River Site.*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: William E. Muno

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: Valdas V. Adamkus, Regional Administrator, US EPA Region V

Date Published: September 10, 1996

Key Words and Phrases:

Reference Type: A

ReferenceID: 199

Title: *Fact Sheet: Manistique River / Harbor Area of Concern*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: August 1994

Key Words and Phrases:

Reference Type: A

ReferenceID: 200

Title: *Removal Action Recommendation*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: August 5, 1994

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 201

Title: *Subject: PCB Action Level for Manistique River and Harbor*

Location: AEM

Category: Cleanup Levels and Risks

Prepared by/Author: J. Milton Clark, Senior Health and Science Advisor

**Preparer/Author
Address:** US EPA Region V
Chicago, IL

Prepared For: William E. Muno, Director, Waste Management Division, US EPA Region V

Date Published: August 4, 1994

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 212

Title: *Post Dredging Sediment Sampling of Manistique Harbor*

Location: AEM

Category: Site Update

Prepared by/Author: Blasland, Bouck & Lee, Inc

**Preparer/Author
Address:** 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214

Prepared For: Fox River Group

Date Published: May 22, 1998

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 278

Title: *Monte Carlo Analysis of PCB Noncancer Hazards and Cancer for Manistique River and Harbor: capping alternative*

Location: BBL

Category: Risk Assessment

Prepared by/Author: TERRA, Inc.

**Preparer/Author
Address:**

Prepared For: PRPs

Date Published: June 14, 1994

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 306

Title: *Manistique River and Harbor Qualitative Ecological Risk Assessment, Revised Draft*

Location: BBL

Category: Risk Assessment

Prepared by/Author: TERRA, Inc.

**Preparer/Author
Address:**

Prepared For: PRPs

Date Published: April 25, 1994

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 307

Title: *Streamlined Human Health Risk Assessment for Manistique Harbor, Revised Draft*

Location: BBL

Category: Risk Assessment

Prepared by/Author: TERRA, Inc.

**Preparer/Author
Address:**

Prepared For: PRPs

Date Published: June 16, 1994

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 531

Title: *Fact Sheet: Update No. 8: Dredging Activities Continue*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: January 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 613

Title: *Dredging-Related Sampling of Manistique Harbor - 1999 Field Study*

Location: AEM

Category: Monitoring, Post

Prepared by/Author: Blasland, Bouck & Lee, Inc.

Preparer/Author Address: 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214

Prepared For: Fox River Group

Date Published: June 2000

Key Words and Phrases:

Reference Type: A

ReferenceID: 681

Title: *US EPA Memorandum re: Enforcement Action Memorandum - Determination of Threat to Public Health or Welfare or the Environment at the Manistique River/Harbor Area of Concern*

Location: BBL

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: William E. Muno

Preparer/Author Address: Director, Superfund Division
Chicago, IL

Prepared For:

Date Published: October 6, 1995

Key Words and Phrases:

Reference Type: A

ReferenceID: 947

Title: *Engineering Evaluation / Cost Analysis (Volume I of II)*

Location: AEM

Category: RI/FS

Prepared by/Author: Blasland, Bouck & Lee, Inc.

Preparer/Author Address: 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214

Prepared For: Manistique Papers, Inc. and Edison Sault Electric Company

Date Published: April 1994

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: A

ReferenceID: 948

Title: *Final Comprehensive Post-Removal Summary Report*

Location: AEM

Category: Close-Out Report

Prepared by/Author: Weston Solutions, Inc.

Preparer/Author Address: 750 East Bunker Court, Suite 500
Vernon Hills, IL 60061

Prepared For: US EPA Region V
Emergency and Remedial Response Branch
77 West Jackson Boulevard
Chicago, IL 60604

Date Published: November 12, 2002

Key Words and Phrases:

Reference Type: A

ReferenceID: 949

Title: *Final Comprehensive Post-Removal Summary Report (CD-ROM)*
Refer to Reference A-948 for Hard Copy

Location: AEM

Category: Close-Out Report

Prepared by/Author: Weston Solutions, Inc.

Preparer/Author Address: 750 East Bunker Court, Suite 500
Vernon Hills, IL 60061

Prepared For: US EPA Region V
Emergency and Remedial Response Branch
77 West Jackson Boulevard
Chicago, IL 60604

Date Published: November 12, 2002

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 5

Title: *Transmittal of the Technical Review Team Report for the Manistique, Michigan River and Harbor Area of Concern*

Location: AEM

Category: Site Update

Prepared by/Author: Laws, Elliott P. and Goldman, Lynn R.

Preparer/Author Address: US EPA HQ
Washington, D.C. 20460

Prepared For: Valdas V. Adamkus, Regional Administrator, Region V

Date Published: April 11, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 6

Title: *Memo re: Final Report of the Manistique Technical Review Team*

Location: AEM

Category: Site Update

Prepared by/Author: Luftig, Stephen D., Acting Director

Preparer/Author Address: US EPA HQ
Office of Emergency and Remedial Response
Washington, D.C. 20460

Prepared For: Elliott P. Laws, Asst. Administrator

Date Published: March 31, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 7

Title: *Study Details Failure of EPA's Dredging at Manistique Harbor*

Location: AEM

Category: Site Update

Prepared by/Author: Press Release

Preparer/Author Address:

Prepared For: General Public

Date Published: May 6, 1998

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 131

Title: *Manistique River / Harbor Dredging Project.*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Journal of Great Lakes Research. 22:602-623; CSN No. 18

Date Published: 1997 Winter

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 174

Title: *EPA Selects Response Action and Completes the Majority of
Dredging Activities*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:** Chicago, IL

Prepared For: General Public

Date Published: November 1995

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 175

Title: *Laboratory Data for the Federal Channel at Manistique Michigan*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: William W. Willis

**Preparer/Author
Address:** U.S. Army Corps of Engineers
Detroit, MI

Prepared For: US EPA Region V

Date Published: February 8, 1989

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 176

Title: *Letter re: Manistique River / Harbor Area of Concern,
Manistique, Michigan Proposed Scope of Work for Core Sediment
Sampling*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: Jerome Kujawa, Asst. Regional Counsel

**Preparer/Author
Address:** US EPA Region V
Chicago, IL

Prepared For: Steven Nadeau, esq. and Richard Baron, esq.

Date Published: May 13, 1993

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 177

Title: *Manistique Site Update No. 3*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:** Chicago, IL

Prepared For: General Public

Date Published: September 1996

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 178

Title: *Sediment Sample Log - Manistique Harbor - Manistique,
Michigan*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:** Chicago, IL

Prepared For:

Date Published: 1995 circa

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 179

Title: *Scott Cooper's Summary of Manistique Sampling Results (handwritten) (part of Administrative Record)*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: Scott Cooper

Preparer/Author Address: Unknown

Prepared For:

Date Published: 1986 circa

Key Words and Phrases:

Reference Type: B

ReferenceID: 180

Title: *Remarks: Results from 5/12/86 Soil & Sludge Samples at Manistique Papers*

Location: AEM

Category: Contaminated Sediments: Investigation/Delineation

Prepared by/Author: Steve Casey

Preparer/Author Address: MDNR

Prepared For: Dan Patulski, US EPA Region V

Date Published: June 2, 1986

Key Words and Phrases:

Reference Type: B

ReferenceID: 181

Title: *Administrative Record for Manistique River and Harbor*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: May 27, 1993

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 182

Title: *Administrative Record for Manistique River and Harbor: Update #1*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: September 30, 1993

Key Words and Phrases:

Reference Type: B

ReferenceID: 183

Title: *Administrative Record for Manistique River and Harbor: Update #2*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: July 6, 1994

Key Words and Phrases:

Reference Type: B

ReferenceID: 184

Title: *Administrative Record for Manistique River and Harbor: Update #3*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: August 5, 1994

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 185

Title: *Administrative Record for Manistique River and Harbor: Update #4*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: March 2, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 186

Title: *Administrative Record for Manistique River and Harbor: Update #5*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: April 6, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 187

Title: *Administrative Record for Manistique River and Harbor: Update #6*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: May 18, 1995

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 188

Title: *Administrative Record for Manistique River and Harbor: Update #7*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: June 13, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 189

Title: *Administrative Record for Manistique River and Harbor: Update #9*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: October 17, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 190

Title: *Administrative Record for Manistique River and Harbor: Update #10*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: March 25, 1996

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 191

Title: *Letter re: Freedom of Information Act Request Manistique River and Harbor Site*

Location: AEM

Category: Site Update

Prepared by/Author: Michael S. Elder, Counsel

Preparer/Author Address: General Electric Co.

Prepared For: US EPA FOI Officer, Region V

Date Published: November 18, 1997

Key Words and Phrases:

Reference Type: B

ReferenceID: 192

Title: *Letter re: Manistique River and Harbor Assessment*

Location: AEM

Category: Site Update

Prepared by/Author: Samuel I. Gutter

Preparer/Author Address: Sidley & Austin

Prepared For:

Date Published: April 27, 1995

Key Words and Phrases:

Reference Type: B

ReferenceID: 193

Title: *News Release*

Location: AEM

Category: Site Update

Prepared by/Author: Donald Sawruk, Executive VP

Preparer/Author Address: Edison Sault Electric Co.
Sault Sainte Marie, MI 49783

Prepared For: Press Release

Date Published: March 22, 1996

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B
Title: *EPA, Companies Strike Deal on PCB Cleanup*
Location: AEM
Category: Site Update
Prepared by/Author: News Release (AP)
Preparer/Author Address:
Prepared For: General Public
Date Published: January 9, 1997
Key Words and Phrases:

ReferenceID: 194

Reference Type: B
Title: *US EPA Pollution Report No. 38 (for September 10-27, 1997)*
Location: AEM
Category: Site Update
Prepared by/Author: Walter F. Nied, On-Scene Coordinator
Preparer/Author Address: US EPA Region V
Chicago, IL
Prepared For: US EPA Distribution
Date Published: September 29, 1997
Key Words and Phrases:

ReferenceID: 195

Reference Type: B
Title: *US EPA Pollution Report No. 39 (for September 28 - October 16, 1997)*
Location: AEM
Category: Site Update
Prepared by/Author: Walter F. Nied, On-Scene Coordinator
Preparer/Author Address: US EPA Region V
Chicago, IL
Prepared For: US EPA Distribution
Date Published: October 20, 1997
Key Words and Phrases:

ReferenceID: 196

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 197

Title: *US EPA Pollution Report No. 40 (for October 17 - December 1, 1997)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: December 5, 1997

Key Words and Phrases:

Reference Type: B

ReferenceID: 200

Title: *U.S. EPA Proposes Changes to Cleanup Work*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: March 1996

Key Words and Phrases:

Reference Type: B

ReferenceID: 243

Title: *Note to Correspondents: EPA Revises PCB Contamination Estimate For Manistique River and Harbor; Cleanup Goals Still on Target*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address:

Prepared For: General Public

Date Published: October 18, 2000

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 306

Title: *Manistique River - Area of Concern Progress Report 1997-98*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: General Public

Date Published: Undated

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 329

Title: *US EPA Pollution Report No. 41 (March 5-19, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: March 20, 1998

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 330

Title: *US EPA Pollution Report No. 42 (March 24 - April 7, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: April 8, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B
Title: *Untitled (Amended: March 1998)*
Location: AEM
Category: Site Update
Prepared by/Author: Steven C. Nadeau
Preparer/Author Address: Honigman, Miller, Schwartz, and Cohn
Detroit, MI
Prepared For:
Date Published: March 1998
Key Words and Phrases:

ReferenceID: 331

Reference Type: B
Title: *Letter re: Manistique Harbor*
Location: AEM
Category: Site Update
Prepared by/Author: James J. Hahnenberg
Preparer/Author Address: US EPA Region V
Prepared For: Mark Brown; BB&L
Date Published: June 4, 1998
Key Words and Phrases:

ReferenceID: 332

Reference Type: B
Title: *Letter re: Manistique Harbor (Reference B-332)*
Location: AEM
Category: Site Update
Prepared by/Author: Mark P. Brown
Preparer/Author Address: Blasland, Bouck & Lee, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Prepared For: James J. Hahnenberg, US EPA
Date Published: June 19, 1998
Key Words and Phrases:

ReferenceID: 333

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 404

Title: *US EPA Pollution Report No. 11 (for September 24 - October 1, 1995)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 2, 1995

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 405

Title: *US EPA Pollution Report No. 20 (for June 13 - 27, 1996)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: June 27, 1996

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 406

Title: *US EPA Pollution Report No. 25 (for September 28 - October 16, 1996)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 11, 1996

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 407

Title: *US EPA Pollution Report No. 36 (for August 17 - 23, 1997)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: August 23, 1997

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 408

Title: *US EPA Pollution Report No. 50 (for July 16 - 30, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: July 31, 1998

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 409

Title: *US EPA Pollution Report No. 53 (for August 26 - September 10, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: September 11, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 410

Title: *US EPA Pollution Report No. 54 (for September 11 - 23, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: September 24, 1998

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 411

Title: *US EPA Pollution Report No. 55 (for September 24 - October 8, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 8, 1998

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 412

Title: *US EPA Pollution Report No. 56 (for October 9 - 27, 1998)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 27, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 413

Title: *US EPA Pollution Report No. 57 (for October 28 - April 16, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: April 22, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 414

Title: *US EPA Pollution Report No. 58 (for April 17 - May 6, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 7, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 415

Title: *US EPA Pollution Report No. 59 (for May 7 - 20, 1999) dated
May 20, 1999*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 20, 1999

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 416

Title: *US EPA Pollution Report No. 60 (for May 7 - 21, 1999) dated May 26, 1999*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 26, 1999

Key Words and Phrases:

Reference Type: B

ReferenceID: 417

Title: *US EPA Pollution Report No. 61 (for June 12 - 24, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: June 30, 1999

Key Words and Phrases:

Reference Type: B

ReferenceID: 418

Title: *US EPA Pollution Report No. 62 (for June 24 - July 14, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: July 15, 1999

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 419

Title: *US EPA Pollution Report No. 63 (for July 15 - August 4, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: August 5, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 420

Title: *US EPA Pollution Report No. 64 (for August 4 - 23, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: August 26, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 421

Title: *US EPA Pollution Report No. 65 (for August 24 - September 10, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: September 15, 1999

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 422

Title: *US EPA Pollution Report No. 66 (for September 11 - 24, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: September 24, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 423

Title: *US EPA Pollution Report No. 67 (for September 25 - October 7, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 8, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 424

Title: *US EPA Pollution Report No. 68 (for October 8 - 17, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 18, 1999

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 425

Title: *US EPA Pollution Report No. 69 (for October 18 - 31, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: November 2, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 426

Title: *US EPA Pollution Report No. 70 (for October 31 - November 22, 1999)*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: November 23, 1999

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 447

Title: *Manistique Site Update: U S EPA Continues Dredging Activities at the Manistique River and Harbor Site*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author

Address:

Prepared For: General Public

Date Published: August 1998

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 480

Title: *US EPA Pollution Report No. 80 (for August 22 - September 10, 2000) dated September 10, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: September 10, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 481

Title: *US EPA Pollution Report No. 82 (for September 18 - October 2, 2000) dated October 2, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 2, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 482

Title: *US EPA Pollution Report No. 83 (for October 13, 2000) dated October 13, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: October 13, 2000

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 498

Title: *US EPA Pollution Report No. 75 (for June 3 - June 23, 2000)
dated June 23, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

**Preparer/Author
Address:** US EPA Region V

Prepared For: US EPA Distribution

Date Published: June 23, 2000

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 499

Title: *US EPA Pollution Report No. 76 (for June 23 - July 5, 2000)
dated July 5, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

**Preparer/Author
Address:** US EPA Region V

Prepared For: US EPA Distribution

Date Published: July 5, 2000

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 500

Title: *US EPA Pollution Report No. 78 (for July 21 - August 7, 2000)
dated August 9, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

**Preparer/Author
Address:** US EPA Region V

Prepared For: US EPA Distribution

Date Published: August 9, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 501

Title: *US EPA Pollution Report No. 79 (for August 8 - August 21, 2000) dated August 22, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V

Prepared For: US EPA Distribution

Date Published: August 22, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 502

Title: *US EPA Pollution Report No. 84 (for October 13 - October 24, 2000) dated November 1, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V

Prepared For: US EPA Distribution

Date Published: November 1, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 503

Title: *US EPA Pollution Report No. 85 (for October 25 - December 4, 2000) dated December 4, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V

Prepared For: US EPA Distribution

Date Published: December 4, 2000

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B
Title: *Michigan 2001 Fish Advisory*
Location: AEM
Category: Fish/Biota
Prepared by/Author: Michigan Department of Community Health
Preparer/Author Address: Lansing, MI
<http://www.mdch.state.mi.us/pha/fish/fishadvisory.pdf>
Prepared For: General Public
Date Published: March 2001
Key Words and Phrases:

ReferenceID: 574

Reference Type: B
Title: *Manistique River and Harbor Site Fact Sheet*
Location: AEM
Category: Site Update
Prepared by/Author: US EPA Region V
Preparer/Author Address: Chicago, IL
Prepared For: General Public
Date Published: February 1998
Key Words and Phrases:

ReferenceID: 576

Reference Type: B
Title: *Manistique River and Harbor Site Fact Sheet*
Location: AEM
Category: Site Update
Prepared by/Author: US EPA Region V
Preparer/Author Address: Chicago, IL
Prepared For: General Public
Date Published: September 1995
Key Words and Phrases:

ReferenceID: 577

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 578

Title: *EPA Fact Sheet: Manistique Harbor, Manistique, Michigan*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:** Chicago, IL

Prepared For: General Public

Date Published: May 1994

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 674

Title: *Letter: US EPA Region V to Thomas G. Echikson re: Freedom of Information Act Request Identification Number: 05-RIN-02326-98*

Location: AEM

Category: Miscellaneous

Prepared by/Author: Ignacio L. Arrazola, Associate Regional Counsel

**Preparer/Author
Address:** US EPA Region V

Prepared For: Sidley & Austin

Date Published: August 5, 1998

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 675

Title: *Transcript from Manistique Harbor - 8/29/00 EPA Media Day*

Location: AEM

Category: Site Update

Prepared by/Author: Various Speakers (including Bart Stupak, Bill Muno, Leif Christensen)

**Preparer/Author
Address:** Various

Prepared For: General Public

Date Published: August 29, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 676

Title: *US EPA Pollution Report No. 71 (for December 4, 1999 - February 3, 2000) dated January 27, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: January 27, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 677

Title: *US EPA Pollution Report No. 72 (for April 24 - May 1, 2000) dated May 1, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 1, 2000

Key Words and Phrases:

Reference Type: B

ReferenceID: 678

Title: *US EPA Pollution Report No. 73 (for May 1 - May 20, 2000) dated May 23, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 23, 2000

Key Words and Phrases: Turbidity Monitoring Plan attached

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 679

Title: *US EPA Pollution Report No. 74 (for May 21 - June 2, 2000)
dated June 5, 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: June 5, 2000

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 680

Title: *US EPA Pollution Report No. 87 (for April 23 - May 7, 2001)
dated May 7, 2001*

Location: AEM

Category: Site Update

Prepared by/Author: Walter F. Nied, On-Scene Coordinator

Preparer/Author US EPA Region V

Address: Chicago, IL

Prepared For: US EPA Distribution

Date Published: May 7, 2001

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 760

Title: *Memo re: Post-Dredging PCB Analysis for Manistique River and
Harbor Sediment*

Location: AEM

Category: Monitoring, Post

Prepared by/Author: Matthew Williams

Preparer/Author US EPA Region V

Address:

Prepared For: James Hahnenberg, RPM, Manistique SACM Site

Date Published: December 30, 1994

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B

ReferenceID: 767

Title: *Realizing Remediation I - Great Lakes Contaminated Sediments
Manistique River and Harbor
(see Reference A-905)*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: US EPA Great Lakes National Program Office (GLNPO)

**Preparer/Author
Address:** 77 West Jackson Boulevard (G-17J)
Chicago, IL 60604

Prepared For: General Public

Date Published: August 1, 2002

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 818

Title: *Realizing Remediation II - Updated Summary:
Manistique River and Harbor
(see Reference A-907)*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: US EPA Great Lakes National Program Office (GLNPO)

**Preparer/Author
Address:** 77 West Jackson Boulevard (G-17J)
Chicago, IL 60604

Prepared For: General Public

Date Published: July 2000

**Key Words and
Phrases:**

Reference Type: B

ReferenceID: 926

Title: *Region 5 Fields Team - - Manistique River and Harbor Site*

Location: AEM

Category: Monitoring, Post

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:**

Prepared For: General Public

Date Published: June 26, 2002

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: B
Title: *e-mail re: Manistique stats*
Location: AEM
Category: Site Update
Prepared by/Author: Janet Briot
Preparer/Author Address: BBL, Inc.
Prepared For: AEM, Inc.
Date Published: September 7, 2000
Key Words and Phrases:

ReferenceID: 1034

Reference Type: C
Title: *Manistique River capping bids near*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: Superfund Week
Date Published: June 30, 1995
Key Words and Phrases:

ReferenceID: 129

Reference Type: C
Title: *EPA wants Manistique site sediment demos*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: Superfund Week
Date Published: April 5, 1996
Key Words and Phrases:

ReferenceID: 130

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: C
Title: *EPA opts for dredging at Manistique River*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: Superfund Week
Date Published: October 4, 1996
Key Words and Phrases:

ReferenceID: 132

Reference Type: C
Title: *Manistique River cleanup plan proposed*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: Superfund Week
Date Published: September 2, 1994
Key Words and Phrases:

ReferenceID: 134

Reference Type: C
Title: *Manistique sediment capping bid*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: Superfund Week
Date Published: September 8, 1995
Key Words and Phrases:

ReferenceID: 135

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: C

ReferenceID: 160

Title: *EPA gearing up for Manistique dredge work*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Superfund Week

Date Published: May 16, 1997

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 171

Title: *PCB sediment removal considered*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Superfund Week

Date Published: August 20, 1993

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 285

Title: *EPA hopes to finish Manistique this year*

Location: AEM

Category: Site Update

Prepared by/Author:

Preparer/Author

Address:

Prepared For: Superfund Week

Date Published: February 27, 1998

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: C

ReferenceID: 328

Title: *EQM Nearly Finishes Dredging Manistique River in Michigan*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: October 16, 1998

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 582

Title: *Sediment Remediation Can Improve Great Lakes Water Quality*

Location: AEM

Category: Miscellaneous

Prepared by/Author: (1) John H. Hartig, (2) Lisa Maynard, (3) Michael A. Zarull, (4) Gail Krantzberg

**Preparer/Author
Address:** (1) Greater Detroit American Heritage River Institute
Detroit, MI

(2) International Joint Commission
Windsor, Ontario, Canada

(3) National Water Research Institute
Burlington, Ontario, Canada

(4) Ontario Ministry of Environment

Prepared For: Water Environment & Technology (WE&T)

Date Published: October 1999

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: C

ReferenceID: 596

Title: *Manistique River PCB Dredging Failing, According to Blasland, Bouck & Lee*

Location: N/A

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: June 30, 2000

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 603

Title: *Contractor Rejects EPA Claim It Botched Manistique Site Studies*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Report

Date Published: October 2, 2000

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 620

Title: *Dredging at Manistique River May Be Raising PCB Levels*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: November 17, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: C

ReferenceID: 670

Title: *Industry: Manistique Cleanup Shows EPA's Inaccurate Cost Estimates*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Report

Date Published: September 18, 2000

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 770

Title: *EPA Region V Heralds Michigan Removal as Model Sediment Cleanup*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Report

Date Published: May 14, 1997

**Key Words and
Phrases:**

Reference Type: D

ReferenceID: 5

Title: *PCB dredging to resume soon*

Location: AEM

Category: Site Update

Prepared by/Author: Mike Tobin, Kate McKee

**Preparer/Author
Address:** Associated Press

Prepared For: The Detroit (MI) Free Press

Date Published: May 29, 1997

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: D

ReferenceID: 29

Title: *Study attacks dredging but EPA says results are from incomplete project*

Location: AEM

Category: Site Update

Prepared by/Author: Susan Campbell

Preparer/Author Address: Press Gazette

Prepared For: The Green Bay (WI) Press-Gazette

Date Published: May 7, 1998

Key Words and Phrases:

Reference Type: D

ReferenceID: 72

Title: *EPA Signs Landmark Agreement to Clean up Manistique River, Harbor*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region V

Preparer/Author Address: Chicago, IL

Prepared For: General Public

Date Published: May 14, 1997

Key Words and Phrases:

Reference Type: D

ReferenceID: 115

Title: *EPA dredging to resume in spring of 2000*

Location: AEM

Category: Site Update

Prepared by/Author: Carol Hollenbeck

Preparer/Author Address:

Prepared For: The Escanaba (MI) Daily Press

Date Published: October 29, 1999

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: D
Title: *Manistique marina tests positive for PCBs*
Location: AEM
Category: Site Update
Prepared by/Author: Carol Hollenbeck
Preparer/Author Address:
Prepared For: The Escanaba (MI) Daily Press
Date Published: December 14, 1999
Key Words and Phrases: Results are incorrectly reported as ppm instead of ppb.

ReferenceID: 116

Reference Type: D
Title: *EPA clean-up project nearing completion*
Location: AEM
Category: Site Update
Prepared by/Author: Paul Olson
Preparer/Author Address:
Prepared For: The Manistique (MI) Pioneer Tribune
Date Published: September 14, 2000
Key Words and Phrases:

ReferenceID: 182

Reference Type: D
Title: *Manistique River cleanup nears finish*
Location: AEM
Category: Site Update
Prepared by/Author:
Preparer/Author Address:
Prepared For: The Chicago (IL) Tribune News Service
Date Published: August 30, 2000
Key Words and Phrases:

ReferenceID: 251

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: D
Title: *Harbor clean-up has two years to go*
Location: AEM
Category: Site Update
Prepared by/Author: Joel Donofrio
Preparer/Author Address:
Prepared For: The Manistique (MI) Pioneer-Tribune
Date Published: May 20, 1999
Key Words and Phrases:

ReferenceID: 252

Reference Type: D
Title: *Dredging continues at Manistique Site*
Location: AEM
Category: Site Update
Prepared by/Author: Carol Hollenbeck
Preparer/Author Address:
Prepared For: The Escanaba (MI) Daily Press
Date Published: May 19, 1999
Key Words and Phrases:

ReferenceID: 253

Reference Type: D
Title: *Stupak reviews harbor clean-up*
Location: AEM
Category: Site Update
Prepared by/Author: Paul F. Olson
Preparer/Author Address:
Prepared For: The Manistique (MI) Pioneer-Tribune
Date Published: October 10, 1996
Key Words and Phrases:

ReferenceID: 254

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: D
Title: *EPA nearing final plan for Manistique River*
Location: AEM
Category: Site Update
Prepared by/Author: Tim Bishop
Preparer/Author Address:
Prepared For: The Escanaba (MI) Daily Press
Date Published: June 9, 1995
Key Words and Phrases:

ReferenceID: 255

Reference Type: D
Title: *Pollution remedy has mixed record*
Location: AEM
Category: Site Update
Prepared by/Author: Alex Nussbaum
Preparer/Author Address:
Prepared For: The Hackensack (NJ) Record
Date Published: August 27, 2001
Key Words and Phrases:

ReferenceID: 268

Reference Type: D
Title: *EPA: clean-up project almost complete*
Location: AEM
Category: Site Update
Prepared by/Author: Paul Olson
Preparer/Author Address:
Prepared For:
Date Published: 2000 circa
Key Words and Phrases:

ReferenceID: 454

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: E

ReferenceID: 31

Title: *Full-Scale Sediment Remediation in North America: A Survey of Recently Completed Projects*

Location: AEM

Category: Site Update

Prepared by/Author: (1) S. Garbaciak and (2) D. Averett

Preparer/Author Address: (1) Hart Crowser, Inc. and
(2) U.S. Army Corps of Engineers

Prepared For: Proceedings of the WEDA, Charleston, SC

Date Published: June 29 - July 2, 1997

Key Words and Phrases:

Reference Type: E

ReferenceID: 34

Title: *Bioaccumulation Models and Applications: Setting Sediment Cleanup Goals in the Great Lakes (Saginaw and Manistique Rivers)*

Location: AEM

Category: Fish/Biota

Prepared by/Author: Amy Pelka

Preparer/Author Address: US EPA Region V
Chicago, IL

Prepared For: National Sediment Bioaccumulation Conference

Date Published: September 1996

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: E

ReferenceID: 127

Title: *Sediment Management Seminar 2000 Proceedings (Reference E-121)*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: Blasland, Bouck & Lee, Inc.

Preparer/Author Address: 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214

Prepared For: Attendees

Date Published: February 10-11, 2000

Key Words and Phrases:

Reference Type: E

ReferenceID: 142

Title: *Sediment Management Seminar February 9-10, 1998 Proceedings (Reference E-137)*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: Blasland, Bouck & Lee, Inc

Preparer/Author Address: 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214

Prepared For: Attendees

Date Published: February 9-10, 1998

Key Words and Phrases:

Reference Type: E

ReferenceID: 245

Title: *Remediation of Sediments by Dredging: Methods and Case Histories*

Location: AEM

Category: Dredging: Remedial (Contaminated Sediments)

Prepared by/Author: Bradford S. Cushing

Preparer/Author Address: AEM, Inc.

Prepared For: WODCON XV Conference, Las Vegas, NV

Date Published: June 28 - July 2, 1998

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: G
Title: *Presentation Handouts from EPA meeting*
Location: AEM
Category: Site Update
Prepared by/Author: US EPA Region V
Preparer/Author Address:
Prepared For: Public Meeting
Date Published: September 1996
Key Words and Phrases:

ReferenceID: 5

Reference Type: G
Title: *EPA Overheads Re: Status*
Location: AEM
Category: Site Update
Prepared by/Author: US EPA Region V
Preparer/Author Address:
Prepared For: Public Meeting
Date Published: September 1996
Key Words and Phrases:

ReferenceID: 6

Reference Type: G
Title: *Overheads Re: Dredging Successes (including Manistique River)*
Location: AEM
Category: Dredging; Remedial (Contaminated Sediments)
Prepared by/Author: Jim Hahnenberg
Preparer/Author Address: US EPA Region V
Chicago, IL
Prepared For: Presentation to Fox River Group
Date Published: November 1997
Key Words and Phrases:

ReferenceID: 9

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: G
Title: *Dredging Successes*
Location: AEM
Category: Dredging: Remedial (Contaminated Sediments)
Prepared by/Author: Jim Hahnenberg
Preparer/Author Address: US EPA Region V
Chicago, IL
Prepared For: Fox River PRPs
Date Published: November 13, 1997
Key Words and Phrases:

ReferenceID: 12

Reference Type: H
Title: *Map of Manistique, Michigan*
Location: AEM
Category: Miscellaneous
Prepared by/Author:
Preparer/Author Address:
Prepared For: Schoolcraft County Chamber of Commerce
Date Published:
Key Words and Phrases:

ReferenceID: 4

Reference Type: K
Title: *Manistique River Superfund Project (1997 - 1998)*
Location: AEM
Category: Dredging: Remedial (Contaminated Sediments)
Prepared by/Author: Superior Special Services, Inc.
Preparer/Author Address:
Prepared For: Distribution
Date Published: 1999 circa
Key Words and Phrases:

ReferenceID: 14

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: L
Title: *Memo re: Manistique River Summary*
Location: AEM
Category: Site Update
Prepared by/Author: AEM, Inc.
Preparer/Author Address: Malvern, PA 19355
Prepared For: Internal file
Date Published: July 15, 1997
Key Words and Phrases:

ReferenceID: 2

Reference Type: L
Title: *Memo re: Manistique River*
Location: AEM
Category: Site Update
Prepared by/Author: AEM, Inc.
Preparer/Author Address: Malvern, PA 19355
Prepared For: Internal file
Date Published: September 30, 1997
Key Words and Phrases:

ReferenceID: 30

Reference Type: L
Title: *Memo re: Reconnaissance of Manistique River and Harbor Remedial Dredging Project*
Location: AEM
Category: Site Update
Prepared by/Author: AEM, Inc.
Preparer/Author Address: Malvern, PA 19355
Prepared For: General Electric
Date Published: September 13, 2000
Key Words and Phrases:

ReferenceID: 102

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: L

ReferenceID: 141

Title: *Maximum Baseline Cancer Risks for Contaminated Sediment Sites*

Location: AEM

Category: Risk Assessment

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: Distribution

Date Published: October 22, 2001

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 179

Title: *EPA's Evolving Position on Remedial Dredging*

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:** Malvern, PA 19355

Prepared For: Internal Distribution

Date Published: Undated

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 205

Title: *Results of Research for Short-Term Impacts on Sediment and Fish PCB Concentrations Due to Sediment Removal*

Location: AEM

Category: Fish/Biota

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: File

Date Published: March 19, 2001

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: L

ReferenceID: 221

Title: *e-mail re: Update on Manistique*

Location: AEM

Category: Site Update

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: Distribution

Date Published: August 6, 2000

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 222

Title: *e-mail re: Update on Manistique*

Location: AEM

Category: Site Update

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: Distribution

Date Published: August 11 and September 13, 2000

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 223

Title: *Memo re: Conversation with Walter Nied, USEPA On-Site
Coordinator for the Manistique River and Harbor Remedial
Dredging Project*

Location: AEM

Category: Site Update

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: File

Date Published: September 22, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: L
Title: *e-mail re: Futher Update on Manistique*
Location: AEM
Category: Site Update
Prepared by/Author: AEM, Inc.
Preparer/Author Address:
Prepared For: Distribution
Date Published: September 13, 2000
Key Words and Phrases:

ReferenceID: 224

Reference Type: M
Title: *Technical Report: Dredging-Related Sampling of Manistique Harbor - 1998 Field Study*
Location: AEM
Category: Dredging: Remedial (Contaminated Sediments)
Prepared by/Author: Blasland, Bouck & Lee, Inc.
Preparer/Author Address: 6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Prepared For: Fox River Group
Date Published: March 1999
Key Words and Phrases:

ReferenceID: 167

Reference Type: M
Title: *EPA Dredging Update - Manistique Harbor (Winter, 1997-8)*
Location: AEM
Category: Site Update
Prepared by/Author: Steven C. Nadeau
Preparer/Author Address: Honigman, Miller, Schwartz, and Cohn
Detroit, MI
Prepared For: BBL Sediment Management Seminar (New Orleans), 1998
Date Published: March 1998
Key Words and Phrases:

ReferenceID: 203

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: M

ReferenceID: 204

Title: *Appendix E: USACOE Report (two selected pages)*

Location: AEM

Category: Site Update

Prepared by/Author: Michael Palermo

Preparer/Author U.S. Army Corps of Engineers

Address: U.S. Army Engineer Waterways Experiment Station
Vicksburg, MS

Prepared For:

Date Published: March 30, 1995

**Key Words and
Phrases:**

Reference Type: M

ReferenceID: 253

Title: *Environmental Dredging: An Evaluation of Its Effectiveness in
Controlling Risks*

Location: AEM

Category: Contaminated Sediments: Overview of Issues

Prepared by/Author: Blasland, Bouck & Lee, Inc.

Preparer/Author 6723 Towpath Road

Address: P.O. Box 66
Syracuse, NY 13214

Prepared For: General Electric

Date Published: August 2000

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: M

ReferenceID: 283

Title: *Manistique Harbor, Manistique, MI, Chapter 4 of: The Effectiveness of Environmental Dredging: A Study of Three Sites (Reference M-281)*

Location: AEM

Category: Miscellaneous

Prepared by/Author: Karl T. Duckworth

Preparer/Author Address: Louisiana State University

Prepared For: Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College

Date Published: May 2000

Key Words and Phrases: Master's Thesis

Reference Type: M

ReferenceID: 373

Title: *New Study Confirms Potential Downfalls of Dredging as an Environmental Remediation Alternative*

Location: AEM

Category: Site Update

Prepared by/Author: Fox River Group

Preparer/Author Address:

Prepared For: Press Release

Date Published: June 13, 2000

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: M

ReferenceID: 424

Title: *Results of Contaminated Sediment Cleanups Relevant to the Hudson River:
Manistique Harbor, Michigan (Manistique River / Harbor)*

Location: AEM

Category: Contaminated Sediments: Overview of Issues

Prepared by/Author: Joshua Cleland

**Preparer/Author
Address:**

Prepared For: Scenic Hudson
9 Vassar Street
Poughkeepsie, NY 12601

Date Published: October 2000

**Key Words and
Phrases:**

Reference Type: M

ReferenceID: 434

Title: *(1) Memo Summarizing Manistique Harbor Report (Weston,
November 12, 2002)
(2) e-mail transmittal (12/05/02)*

Location: AEM

Category: Close-Out Report

Prepared by/Author: Steven C. Nadeau

**Preparer/Author
Address:**

Prepared For: Sediment Management Work Group

Date Published: December 3, 2002

**Key Words and
Phrases:**

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: M **ReferenceID:** 435
Title: *Memo re: Manistique Harbor PCB Sampling Data (Draft)*
Location: AEM
Category: Monitoring Plan/Report
Prepared by/Author: Blasland, Bouck & Lee, Inc.
Preparer/Author Address:
Prepared For: Distribution
Date Published: July 27, 2000
Key Words and Phrases:

Reference Type: M **ReferenceID:** 445
Title: *Congressionally Requested Comparison of the Sheboygan, WI Superfund Capping Site with the Manistique, MI River/Harbor Site (one page from A-173)*
Location: AEM
Category: Miscellaneous
Prepared by/Author: Interagency Review Team
Preparer/Author Address:
Prepared For: US EPA
Date Published: April 1995
Key Words and Phrases: river flows and width

Reference Type: N **ReferenceID:** 5
Title: *Phone Conversation with Amy Pelka re Calculation of Target Level in Fish at Manistique*
Location: AEM
Category: Cleanup Levels and Risks
Prepared by/Author: AEM, Inc.
Preparer/Author Address:
Prepared For: AEM, Inc.
Date Published: April 17-18, 1996
Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: N

ReferenceID: 21

Title: *Fax re: Manistique Harbor Sample Calculation Method*

Location: AEM

Category: Cleanup Levels and Risks

Prepared by/Author: Stephen C. Nadeau

Preparer/Author Address: Honigman Miller Schwartz and Cohn LLP
2290 First National Building
660 Woodward Avenue
Detroit, MI 48226-3583

Prepared For: Bill Bolen, US EPA Region V

Date Published: May 24, 2001

Key Words and Phrases:

Reference Type: P

ReferenceID: 8

Title: *Analytical Report*

Location: AEM

Category: Analytical Data

Prepared by/Author: White Water Associates, Inc.

Preparer/Author Address: 429 River Lane, P.O. Box 27
Amasa, MI 49903

Prepared For: City of Manistique

Date Published: December 1, 1999

Key Words and Phrases: Refer to Reference D-116

Reference Type: P

ReferenceID: 13

Title: *Year 2000 USEPA Ponar Sample Results*

Location: AEM

Category: Analytical Data

Prepared by/Author: US EPA HQ

Preparer/Author Address:

Prepared For: US EPA

Date Published: September 2000

Key Words and Phrases:

REFERENCES

Project Name MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Reference Type: P

ReferenceID: 27

Title: *Summary of Manistique Harbor Surface Sediment Total PCB Results*

Location: AEM

Category: Monitoring, Post

Prepared by/Author: Blasland, Bouck & Lee, Inc.

**Preparer/Author
Address:**

Prepared For: File

Date Published: 2002

**Key Words and
Phrases:**

Reference Type: P

ReferenceID: 34

Title: *Compilation (by AEM) of EOP and FS Sample Data into Excel Spreadsheet*

Location: AEM

Category: Analytical Data

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: AEM, Inc.

Date Published: January 22, 2004

**Key Words and
Phrases:**

MODELING

Project Name: MANISTIQUE RIVER/HARBOR

ProjectID: 05-10

Last Updated: 08/11/98

Modeling Performed: a) PCB diffusion through a 20-inch cap
b) Simple exposure assessment modeling

Modeling Objectives: a) Estimate non-scour migration of PCB from bed sediment to water column.
b) Determine cleanup level and evaluate effectiveness of remedial alternative.

Modeling Description: a) Estimate of mass transport under existing conditions and various dredging and capping alternatives and non-advective conditions.

Company Performing Modeling: a) Blasland, Bouck & Lee, Inc.
b) Terra, Inc. (with input from BBL)

Modeling Status: a) Completed 1994
b) completed

Modeling Summary: a) Under existing (1993) conditions migration to the water column by diffusion is approximately 0.5 kg/yr. Short-term diffusion post-dredging is estimated to increase by a factor of 5 to 6. With groundwater advection (1 m/yr assumed through 20-inch cap and TOC = 0.5 percent in cap), breakthrough of PCBs would take 160 years. For diffusive assumption, cap-breakthrough would be 1,400 years with steady state flux at approximately 1 percent of current flux rate (0.5 kg/yr).

b) Results indicated that substantial risk reduction could be achieved by natural recovery. Initial risk reductions were enhanced by capping areas containing >50 ppm PCB concentrations (50 ppm represents a 93% reduction from pre-remediation risk). Dredging the >50 ppm areas would result in only a 33% reduction in human health risk.

The estimated risk reduction is achievable by various remedial alternatives.

FISH ADVISORIES

Project Name **MANISTIQUE RIVER/HARBOR**

ProjectID: 05-10

<i>Advisory:</i>	Manistique River	<i>AdvisoryID:</i> 833
<i>Extent:</i>	Schoolcraft County downstream from M-94/Old U.S. 2	
<i>Pollutant:</i>	PCBs (total)	
<i>Species:</i>	catfish-channel	
<i>Population:</i>	RSP	
<i>Population Definition:</i>	Restricted Consumption-Subpopulation(s): Advises subpopulations potentially at greater risk, e.g., pregnant or nursing women, and/or small children, to restrict the size of the organism and/or frequency of meals consumed.	
<i>Advisory Type:</i>	River	<i>Advisory Number:</i> 248
<i>Status (Active or Rescinded):</i>	Active	<i>Date Rescinded:</i>
<i>Contact Name:</i>	David R. Wade	<i>Contact Number:</i> 517-335-8834
<hr/>		
<i>Advisory:</i>	Manistique River	<i>AdvisoryID:</i> 1019
<i>Extent:</i>	Schoolcraft Co. downstream from M-94/Old U.S. 2	
<i>Pollutant:</i>	PCBs (total)	
<i>Species:</i>	carp-common	
<i>Population:</i>	NCGP	
<i>Population Definition:</i>	No Consumption-General Population: Advise against consumption by the general population.	
<i>Advisory Type:</i>	River	<i>Advisory Number:</i> 248
<i>Status (Active or Rescinded):</i>	Active	<i>Date Rescinded:</i>
<i>Contact Name:</i>	David R. Wade	<i>Contact Number:</i> 517-335-8834
<hr/>		
<i>Advisory:</i>	Manistique River	<i>AdvisoryID:</i> 158
<i>Extent:</i>	Schoolcraft County downstream from M-94/Old U.S. 2.	
<i>Pollutant:</i>	PCBs (total)	
<i>Species:</i>	carp-common	
<i>Population:</i>	NCSP	
<i>Population Definition:</i>	No Consumption-Subpopulation(s): Advises against consumption for populations that are potentially at greater risk, e.g., pregnant or nursing women, and small children.	
<i>Advisory Type:</i>	River	<i>Advisory Number:</i> 248
<i>Status (Active or Rescinded):</i>	Active	<i>Date Rescinded:</i>
<i>Contact Name:</i>	David R. Wade	<i>Contact Number:</i> 517-335-8834
