



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 08 1998

REPLY TO THE ATTENTION OF:

Mr. Bruce K. Means, Chairman
National Remedy Review Board
U.S. EPA, 5202G
401 M Street, SW
Washington, D.C. 20460

Subject: Region 5's Response to the National Remedy Review Board Recommendations for the Velsicol Chemical Superfund Site, St. Louis, Michigan

Dear Mr. ~~Means~~: *Bruce,*

Region 5 received the National Remedy Review Board (NRRB) Recommendations for the Velsicol Chemical Superfund site dated April 21, 1998. This letter is our response to the four recommendations contained in the April 21 memo.

First Recommendation: The information package presented to the Board did not explicitly indicate whether the Region's preferred alternative will meet federal ambient water quality criteria and/or state surface water quality standards. The package also did not indicate whether any such criteria or standards are "applicable or relevant and appropriate requirements" (ARARs). The Region should clarify whether the criteria or standards are in fact ARARs and, if so, whether the remedy will meet or waive them.

Region 5's Response: U.S. EPA and the State of Michigan believe that removing contaminated sediments above 5 ppm total DDT (99.2% total mass reduction) will meet the applicable state surface water quality standards. The applicable state surface water quality standard for total DDT is 0.000011 ppb, well below the quantification level of 0.01 ppb (U.S. EPA Method 608). Water samples collected from the St. Louis Impoundment on 08/04/98 (before any sediment removal) were non-detect for DDT, DDD, DDE, HBB and PBB. Detection level for all compounds were 0.02 ppb except for HBB where detection was 0.05 ppb.

Second Recommendation: The Regions preferred alternative currently presumes that all dredged material will be sent to a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill. The Board recommends that the Region determine the disposal facility design and operation criteria required to address the dredged material threats. These criteria should guide the region in selecting appropriate disposal site(s) from among available RCRA Subtitle C, Subtitle D, and other landfill designs.

Region 5's Response: The Proposed Plan (see attached fact sheet) recommends alternatives 4, 5 and 6. Alternative 4 consists of removal of contaminated sediments using temporary coffer dams, excavation or dredging, solidification/stabilization and water treatment. Alternative 5 contemplates disposal in a municipal solid waste landfill, Alternative 6 contemplates disposal in a licensed hazardous waste landfill. This will give Region 5 flexibility regarding which type of landfill to dispose of the waste. Region 5 expects that the most highly contaminated sediments will go to a subtitle C landfill. A decision regarding the appropriateness of sending the rest of the contaminated sediments to a subtitle D landfill will be made based on several factors including: level of contamination in the waste, design and operation criteria of the subtitle D landfill and willingness of the subtitle D landfill to accept the waste.

Third Recommendation: The Region's preferred alternative addresses primarily DDT contamination in fish. The Region should discuss in its decision documents whether there are any other "contaminants of concern" for this site (e.g., HBB, PBB, TRIS) and document how the preferred remedy is protective for any such contaminants.

Region 5's Response: The risk assessment in the Remedial Investigation/Feasibility Study Report identifies PBB, total DDT, and HBB as chemicals of concern for the site. The risk assessment determined that the main exposure pathway is through ingestion of contaminated fish. Fish tissue samples collected by the Michigan Department of Environmental Quality (MDEQ) in 1997 were analyzed for all the chemicals listed in Table 4 *Chlorinated organic chemicals and mercury quantified for Michigan's Fish Contaminant Monitoring Program* (see attached). HBB and TRIS are not on Table 4 and therefore were not analyzed. Chemicals detected in fish in 1997 above the detection limit were mercury, DDT and its metabolites, chlordane congeners, PBB, hexachlorobenzene and octachlorostyrene. The DDT concentration in most of the fish collected exceeded the Michigan Department of Community Health (MDCH) Level of Concern of 5 ppm total DDT. The mercury and chlordane concentrations did not exceed the MDCH Levels of Concern. MDCH has no official Level of Concern for the other chemicals detected.

Risk associated with dermal contact considered absorption of total DDT, PBB, and HBB.

DDT and PBB are classified as probable human carcinogens. Both also exert non-cancer effects and are endocrine disruptors.

HBB does not have a carcinogenicity assessment entered into either IRIS or HEAST. An RfD has been calculated for HBB based upon induced serum carboxyl esterase activity and increased liver-to-body weight ratio. The RfD for HBB is 0.002 mg/kg-day. The confidence in the RfD is low because the critical study was of short duration, only one sex was exposed, and few definitive parameters were examined.

According to the FIELDS (Fully Integrated Environmental Location Decision Support system) analysis, to achieve the cleanup goal of 5 ppm total DDT in the area to be dredged all sediments would need to be removed (approximately 260,000 cubic yards). FIELDS estimated an average

dredging depth of 5 feet to the river bottom, which is clay. Since all sediment will be removed, all other contaminants of concern would be removed also. The clay will then be sampled to ensure the cleanup goal is attained. In addition to total DDT, the confirmation samples could also be analyzed for PBB, HBB and TRIS. This language will be added to the Record of Decision (ROD).

Fourth Recommendation: The Region's below-dam sediment samples do not indicate significant contamination. However, fish sampled below the dam do show contamination. The Board therefore recommends that the Region (1) better explain its conclusion that the preferred alternative will be protective for fish below the dam, and (2) continue to monitor contaminant levels in fish both above and below the dam. At a minimum, the significance of these levels should be evaluated in the 5-year review.

Region 5's Response: There are three potential explanations for the presence of contaminants in fish below the dam but not in below-dam sediments: 1) movement of fish from the contaminated St. Louis Impoundment to river sections below the dam, 2) water column exposure below the dam due to partitioning of contaminants from reservoir sediments to surface water and transport below the dam, and 3) alternate sources of contaminants below the dam.

Alternate sources of contaminants below the dam is unlikely. A significant downstream source of contaminants should be reflected in localized hot spot sediment contamination since the contaminants of concern are so poorly water soluble. Since sediment hot spots were not detected below the dam, and no downstream sources have been identified, this possibility is unlikely and will not be considered further.

The relative significance of water column exposure is uncertain. Again, because the contaminants of concern are poorly water soluble, mass movement of these contaminants downstream through partitioning to the water column should not only result in biota uptake, but also increased downstream sediment concentrations (lipophilic substances will partition as readily to sediment organic carbon as they will to biota lipids). Additionally, research in the Great Lakes has shown that food chain exposure is generally a more significant source of DDT uptake by aquatic biota in comparison with water column only exposure. Even if this pathway is significant for the Pine River, remediation of reservoir sediments will address the source of water column contamination.

Movement of fish from above the dam to below the dam is the likely explanation for elevated contaminants in below dam fish. Reservoir fish are exposed through both food chain and water column pathways. Periodic releases of reservoir water allow downstream movement of reservoir-exposed fish. Remediation of reservoir sediment contamination will address the primary source of exposure to fish.

Monitoring of fish contaminant levels above and below the dam is appropriate for assessing the effectiveness of the remedial actions. The ROD will indicate that the State of Michigan will

continue to sample fish tissue for contamination until levels fall below a level that is safe for human consumption.

We hope our responses adequately address your concerns. If you should need further clarification you can contact Beth Reiner at (312)353-6576.

Sincerely,

A handwritten signature in black ink that reads "Bill Munro". The signature is written in a cursive style with a long horizontal stroke at the end.

William E. Munro, Director
Superfund Division

Attachments (Proposed Plan Fact Sheet and Table 4)

cc: Beth Reiner, RPM
Kim Sakowski, MDEQ



Proposed Plan Velsicol Chemical Superfund Site

St. Louis, Michigan

September 1998

This Fact Sheet Will Tell You About

- site background
- the alternatives considered to address site contamination
- EPA's proposed cleanup plan
- upcoming cleanup work
- how to learn more about the site

Public Meeting

U.S. EPA will hold a public meeting to describe the results of the on-site investigations and explain the proposed cleanup plan. Oral and written comments will be accepted at the meeting.

Date: September 16, 1998

Time: 7 p.m.

*Place: Gratiot Community
Senior Center,
1329 Michigan Avenue,
St. Louis*

Public Comment Period

U.S. EPA will accept written comments on the Proposed Plan during a 30-day public comment from September 8 to October 8, 1998. A pre-addressed comment form is included in this Proposed Plan.

Introduction

This Proposed Plan¹ identifies the United States Environmental Protection Agency's (U.S. EPA) recommendation for cleaning up contaminated sediment in the Pine River/St. Louis Impoundment at the Velsicol Chemical Superfund site in St. Louis, Gratiot County, Michigan (see Figure 1). U.S. EPA recommends removing contaminated sediment that exceeds the cleanup standard of 5 ppm for total DDT and placing it in a licensed municipal or hazardous waste landfill (see page 3 for details).

The site's Remedial Investigation (RI) and Feasibility Study (FS) and other documents used to develop the Proposed Plan are available for review at the information repository and administrative record (see back page). The objective of the RI is to determine the nature and extent of contamination at the site and the purpose of the FS is to evaluate alternatives to cleanup contamination at the site.

Public input on the cleanup alternatives and the information that supports these alternatives is an important part of the cleanup process. The public is encouraged to review and comment on the alternatives presented in this Proposed Plan (see sidebar).

Site Background

The Velsicol Chemical Superfund site consists of the 50-acre former Velsicol Chemical plant site and the portion of the Pine River contaminated by the former plant.

The Pine River flows from western Gratiot County, through St. Louis, and into Lake Huron as part of the Saginaw River. The Pine River is

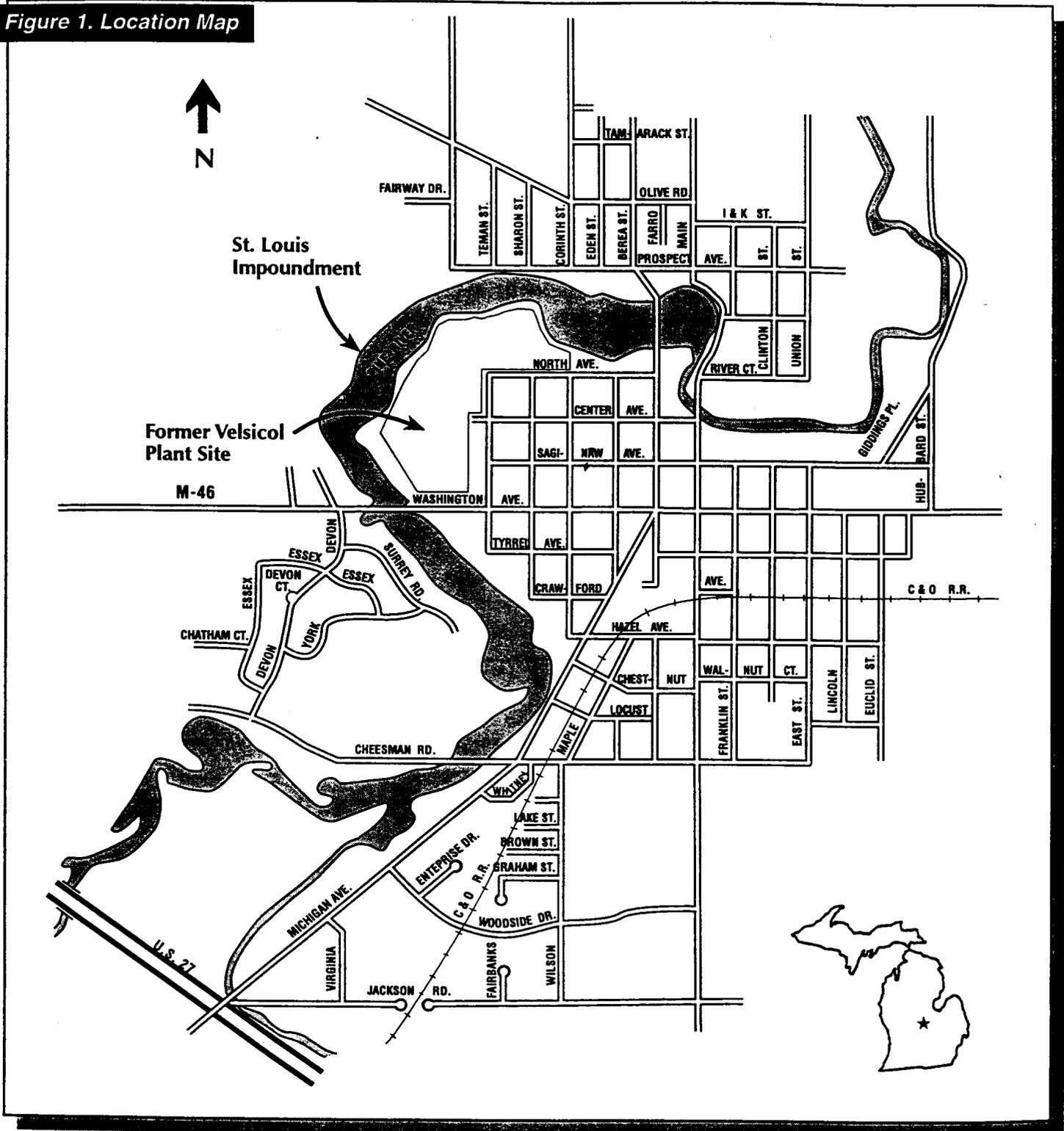
impounded in St. Louis creating a 250- to 350-foot-wide reservoir that extends from the St. Louis dam to just south of Highway 46 (known as the St. Louis Impoundment). The fish in the Pine River and sediment in the St. Louis Impoundment have been contaminated by the former Velsicol Chemical plant. There are residences and two local parks on the west shore of the impoundment (see figure 1 on page 2).

The chemical plant, originally the Michigan Chemical Company, operated for 42 years, from 1936 to 1978. A variety of organic and inorganic chemical compounds were manufactured at the plant including 1,1,1-trichloro-2,2-bis(chlorophenyl) ethane (DDT), hexabromo-benzene (HBB), polybrominated biphenyl (PBB) and tris (2,3-dibromopropyl) phosphate (TRIS). In October 1978, Velsicol closed the plant.

Discharges from the plant contaminated the sediment in the St. Louis Impoundment and soil and ground water at the plant site. Between 1978 and 1980, Michigan Department of Environmental Quality (MDEQ) and U.S. EPA conducted on-site investigations. In 1982, U.S. EPA placed the site on its National Priorities List (NPL), a list of the nation's most serious uncontrolled or abandoned hazardous waste sites. In November 1982, Velsicol agreed to a combined settlement for cleaning up the Velsicol

¹ Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires publication of a notice and a Proposed Plan for the site remediation. The Proposed Plan must also be made available to the public for comment. This Proposed Plan fact sheet is a summary of information for the Velsicol Chemical site. Please consult the administrative record, located at the Theodore Austin Cutler Memorial Library, for more detailed information.

Figure 1. Location Map



plant site, the Gratiot County Landfill, and the Gratiot County Golf Course, but not the sediment in the St. Louis Impoundment. Both the landfill and golf course had been used by Velsicol as disposal sites (the landfill and golf course were added to the NPL in 1981 and the golf course was removed from the NPL in 1983).

The former Velsicol Chemical plant was demolished and its hazardous material was disposed in an on-site landfill. An underground slurry wall was constructed to keep ground water from entering the plant site and a clay cap was installed over the site. The plant site is fenced, and warning signs have been posted to restrict access. The landfill cap is

maintained as a grassy area (see figure 1 for site map). Construction of the clay cap and slurry wall was completed in 1984.

The State of Michigan has been monitoring fish from the St. Louis Impoundment for DDT contamination since 1974. In 1994, fish tissue sampling revealed that DDT-contamination levels had increased significantly

over levels measured in 1989. This increase in the level of contamination caused U.S. EPA and MDEQ to re-evaluate the 1982 decision to leave the sediment in place.

Remedial Investigation (RI)

Results

In May 1996, U.S. EPA began a stream-lined Remedial Investigation (RI)/Feasibility Study (FS) to determine the nature and extent of contamination in the St. Louis Impoundment and Pine River. Sampling of river sediment was conducted in 1996 and 1997. In 1996, samples were collected from twenty locations and at depths ranging from four to 79 inches. The samples showed the greatest concentration of contamination at a depth of six to 28 inches. The 1997 sampling was conducted to supplement the information collected in 1996 and to provide additional information regarding the nature and extent of the DDT contamination. The 1997 samples revealed high levels of DDT contamination and determined that the highest concentration was found at a depth of six to 42 inches, similar to the 1996 sampling results. Fish tissue data was collected in 1995 and 1997 and confirmed the findings from 1994 that the contaminant levels in fish have increased since 1989.

Human and Ecological Risks

Based on the results of the RI, U.S. EPA evaluated the potential health risks posed by the sediment contamination at the site. The evaluation, called a risk assessment, concluded that the current level of contamination presents a significant health hazard to people who consume fish from the Pine River below the Alma Dam (located upstream of the St. Louis Impoundment). DDT and PBB can cause cancer, and are responsible for most of the risk posed at the site. HBB can damage human organs. The State of Michigan has issued a "no consumption advisory" for all species of fish in the Pine River from the Alma Dam to its confluence with the Chippewa River. The advisory has been in effect since 1974 because the concentration of DDT in fish tissue exceed the United States Food and Drug Administration's guidelines.

There is also a risk to people who come in contact with the contaminated sediment or ingest contaminated sediment. People who are exposed to high levels of DDT or PBB may have an increased risk of cancer.

The ecological risk assessment conducted for the site shows that fish-eating birds that consume fish from the St. Louis Impoundment are at risk of reproductive impairment related to eggshell thinning and other adverse effects caused by breakdown products of DDT. Adverse reproductive effects are expected to occur in fish-eating birds that obtain more than one-third of their dietary intake from the St. Louis Impoundment.

Feasibility Study Results

Summary of Cleanup Alternatives

Based on the RI/FS reports and previous investigations, U.S. EPA developed and evaluated five alternatives to address sediment contamination on the site and two alternatives for disposing of the contaminants.

Contamination Cleanup Alternatives

Alternative 1 - No Action

- Estimated Cost: Capital - \$0
- Operation and Maintenance (O&M)² - \$16,000
- Total Cost - \$0.2³ million

The No-Action Alternative involves taking no additional action at the site, but the State of Michigan would continue to maintain fish tissue monitoring and fish advisories that are currently in place. The contaminated sediment would remain in place. This alternative is provided as a baseline for comparison to the other alternatives. Without cleanup, there would be a risk from consuming contaminated fish and direct contact with the sediment.

Alternative 2A - Hydraulic Dredging, Dewatering and Water Treatment

- Estimated Cost: Capital - \$22.4 million
- O&M - \$0
- Total Cost - \$22.4 million

Alternative 2A includes hydraulic dredging of approximately 260,000 cubic yards of sediment with DDT concentrations which exceed U.S. EPA clean-up standards (5 ppm total DDT), dewatering the sediment, mixing with a stabilizing agent, water treatment and discharging treated water to the St. Louis Impoundment.

Hydraulic dredging consists of removing and transporting the sediment using hydraulic pumps and possibly supplemented by diver-assisted dredging. The sediment would then be "dewatered" by placing it on a work pad and mixing it with a stabilization /solidification agent, and the solidified sediment would be disposed of in an off-site landfill. The water that is removed from the sediment will be treated and returned to the impoundment when it meets cleanup standards. Water treatment would consist of clarification, sand filtration, and carbon filtration before discharge into the Pine River. Monitoring would be conducted during dredging operations to ensure protection of workers and the community. The State of Michigan would continue to monitor fish tissue contamination.

Alternative 3A - Mechanical Dredging, Dewatering, and Water Treatment

- Estimated Cost: Capital - \$20.7 million
- O&M - \$0
- Total Cost - \$20.7 million

Alternative 3A is the same as Alternative 2A except that mechanical dredging would be used to dredge the contaminated sediment rather than hydraulic dredging. Under mechanical dredging, the sediment is scooped out by a crane with a clamshell bucket. Monitoring would be conducted during dredging operations to ensure protection of workers and the community. The State of Michigan would continue to monitor fish tissue contamination.

² O&M refers to the activities conducted at a site, following remedial actions, to ensure that the cleanup methods are working properly. The O&M costs shown are the annual costs for O&M activities.

³ The total cost shown are the 30-year present worth costs for the alternative.

Alternative 4 - Excavation, Dewatering and Water Treatment

- Estimated Cost: Capital - \$16.9 million
O&M - \$0
Total Cost - \$16.9 million

Alternative 4 is similar to Alternative 3A except that the sediment would be excavated instead of dredged. In order to excavate the sediment, temporary cofferdams would be placed in the St. Louis Impoundment, and water would be pumped from the cofferdam. Like Alternatives 2A and 3A, the contaminated sediment would be dewatered, the water would be treated and returned to the impoundment, and the solidified sediment would be disposed of in an off-site landfill. Monitoring will be conducted during dredging operations to ensure protection of workers and the community. The State of Michigan will continue to monitor fish tissue contamination.

There are two alternatives for disposing of the contaminated sediment that is removed from the impoundment.

Alternatives 5 and 6 - Sediment Disposal

Alternative 5 calls for the use of a licensed municipal solid waste landfill in the State of Michigan, and Alternative 6 calls for the use of a licensed hazardous waste landfill. The most highly contaminated sediment would be disposed in a hazardous waste landfill while less contaminated sediment might be sent to a municipal solid waste landfill. The cost of disposing of 260,000 cubic yards of waste under Alternative 5 would be \$3.2 million and \$17.4 million for Alternative 6.

Alternative 7 - Capping Contaminated Sediment in Place

- Estimated Cost: Capital - \$7.5 million
O&M - \$30,100
Total Cost - \$7.84 million

This alternative involves capping all the contaminated sediment in place by placing a sand cap with a stone "armor system" consisting of a 20-inch coarse-grained sand cap and 5- to 7.5-inch diameter stone armor layer on top of the contaminated sediment. Monitoring would occur

every 2 to 3 years. The sand and stone "armor system" would need to be replenished every 5 years due to the natural scouring action of the river. The cap is not permanent and if not maintained would eventually be eroded by the river.

Evaluating the Alternatives

The U.S. EPA used nine criteria, which are required by law and described below, to evaluate the alternatives. The evaluation criteria are:

- Overall protection of human health and the environment** determines whether the alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering measures, or treatment.
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets Federal and State environmental statutes, regulations and other requirements that pertain to the site.
- Long-term Effectiveness and Permanence** considers the ability of

Table 1. Cleanup Alternatives Evaluation Table

	Alternative 1 No Action	Alternative 2 Hydraulic Dredging, Dewatering and Water Treatment	Alternative 3 Mechanical Dredging, Dewatering and Water Treatment	Alternative 4 Hydraulic Modification of the Pine River, Excavation, Dewatering and Water Treatment	Alternative 5 Municipal Solid Waste Landfill	Alternative 6 Hazardous Waste Landfill	Alternative 7 Capping Contaminated Sediment in Place
Overall protection of human health and the environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Compliance with Applicable or Relevant and Appropriate Requirements	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Long-term Effectiveness and Permanence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	NA ¹	NA ¹	<input type="checkbox"/>
Short-term Effectiveness	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Implementability	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cost	\$0.2 million	\$22.4 million	\$20.7 million	\$16.9 million	\$3.2 million	\$17.4 million	\$7.84 million
State Acceptance	The Michigan Department of Environmental Quality has reviewed the components of the recommended alternative and acceptance is withheld until after the public comment period.						
Community Acceptance	Community acceptance of the recommended alternative will be evaluated after the public comment period.						

¹ This criteria is not applicable to the disposal alternatives as Alternatives 5 and 6 will be combined with either Alternative 2, 3, or 4, which fully meet the criteria.

Fully Meets Criteria Partially Meets Criteria Does Not Meet Criteria Needs Further Evaluation

the alternative to protect human health and the environment over time and the reliability of such protection.

4. **Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment** evaluates the alternative's effectiveness in the reduction of the harmful effects of principal contaminants, their ability to move in the environment, and the reduction in the amount of contamination present.

5. **Short-term Effectiveness** considers the length of time needed to implement the alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

6. **Implementability** considers the technical and administrative feasibility of implementing the alternative and the availability of goods and services.

7. **Cost** considers the estimated capital, operation and maintenance costs evaluated in the form of present worth costs. Present worth is the total cost of the alternative over time expressed in terms of today's dollars.

8. **State Acceptance** considers whether the State agrees with U.S. EPA's analyses and recommendations of the studies and evaluations performed.

9. **Community Acceptance** will be addressed in the Record of Decision (ROD). The ROD will include a responsiveness summary, which presents public comments and U.S. EPA's responses to those comments. Acceptance of the recommended alternative will be evaluated after the public comment period.

Table 1 on page 4 evaluates the five alternatives against these nine criteria.

Recommended Alternative

Based on the information collected to date on the sediment contamination and associated risks to human health and the environment, U.S. EPA recommends **Alternative 4 - Excavation of Sediment, Dewatering and Water Treatment** for cleaning up the Velsicol site. Alternative 4 also includes disposing contaminated sediment in either a municipal (Alternative 5) or hazardous waste (Alternative 6) landfill. The evaluation table shows that Alternative 4, in combination with either Alternative 5 or 6, fully satisfies the evaluation criteria for the Velsicol site. Alternative 4 would protect human health and the environment, provide long-term effectiveness, comply with state and federal environmental regulations, be implementable and cost effective. The cost of the recommended

alternative depends on the disposal alternative selected and could range from \$20.1 million to \$34.1 million. Based on new information or public comments, U.S. EPA, in consultation with the State of Michigan, may later modify the preferred alternative or select another remedial action presented in this Proposed Plan and the RI/FS. The public, therefore, is encouraged to review and comment on all of the alternatives identified in this Proposed Plan. The RI/FS should be consulted for more information on these alternatives.

In summary, the recommended alternative is believed to provide the best balance of tradeoffs among the alternatives with respect to the nine criteria used to evaluate the remedies.

Next Step

U.S. EPA will consider public comments received during the public comment period before choosing a final cleanup plan for the site. All comments received during the public comment period will be addressed in a "Responsiveness Summary," which will be included in the final decision document called a Record of Decision (ROD). The ROD will be available for public review at the information repository.

Interim Cleanup Underway

U.S. EPA has recently approved a "time-critical" removal action for the Velsicol Chemical site. Currently, construction of the infrastructure that will be used to implement the removal action is underway. The removal action has been authorized to remove approximately 21,500 cubic yards of the most highly DDT-contaminated sediment. Once the removal action is started, U.S. EPA estimates that it will take 120 on-site working days to complete.

The removal action includes but is not limited to the following activities:

- installation of cofferdams prior to beginning excavation;
- construction of necessary access roads to work and staging areas;
- construction of a staging and work pad area to support storage, sediment drying, stabilization, truck loading, truck washing, and general site activity support;
- construction of water treatment and sediment removal/stabilization system;
- excavation of highly DDT-contaminated sediment;
- dewatering of sediment, and treatment of DDT-contaminated water prior to discharge into the St. Louis Impoundment; and
- disposal of DDT-contaminated sediment in an off-site landfill.

Table 4. Chlorinated organic chemicals and mercury quantified for Michigan's Fish Contaminant Monitoring Program.

<u>Standard Analyses</u>	<u>Level of Quantification</u>
Hexachlorobenzene	0.001 ppm
<i>gamma</i> -BHC (Lindane)	0.005 ppm
Aldrin	0.005 ppm
Dieldrin	0.005 ppm
4,4'-DDE	0.003 ppm
4,4'-DDD	0.005 ppm
4,4'-DDT	0.005 ppm
Heptachlor Epoxide	0.003 ppm
Mercury	0.010 ppm
Oxychlorane	0.003 ppm
<i>gamma</i> -Chlordane	0.003 ppm
<i>trans</i> -Nonachlor	0.003 ppm
<i>alpha</i> -Chlordane	0.003 ppm
<i>cis</i> -Nonachlor	0.003 ppm
Octachlorostyrene	0.001 ppm
Hexachlorostyrene	0.001 ppm
Heptachlorostyrene	0.001 ppm
Pentachlorostyrene	0.001 ppm
Heptachlor	0.005 ppm
Terphenyl	0.250 ppm
Toxaphene	0.050 ppm
Mirex	0.005 ppm
PBB (FF-1, BP-6)	0.005 ppm
PCBs (Aroclors 1242, 1248, 1254 and 1260)	0.025 ppm
