Proposed Plan

The Cleanup Proposal...

After careful consideration of the information developed as part of the remedial investigation and feasibility study, EPA proposes the following cleanup actions (more details regarding the cleanup approach can be found on pages17 thru 19):

Lord Brook Source Area Alternative LBSA 4: Partial filling of the South Open Cut, including consolidation of TP-4 and portions of the waste rock from the South Mine, and diversion of surface water resulting in discharge of water either to a tributary of Lord Brook or to groundwater in a manner that achieves applicable water quality standards**.** Land use restrictions (institutional controls) to protect the cleanup action.

Upper and Lower Copperas Factories Alternative CF 4: In-place covering of lead-contaminated soil and land use restrictions to protect the cleanup action.

Sediment Alternative SED 2: Monitored natural recovery of the contaminated sediments in Copperas Brook, the mixing zone of the West Branch of the Ompompanoosuc River, and the unnamed tributaries to Lord Brook.

WWII-Era Infrastructure Area IA 4: Monitoring of the surface water run-off from the Mine Infrastructure Area to ensure no negative impacts to water quality downstream in Copperas Brook and land use restrictions.

Site Wide Groundwater SW 2: Long-term monitoring and land use restrictions to prevent groundwater consumption and protect the Superfund Remedy. This alternative includes a waiver, as allowed by the Superfund law, of the groundwater standards for the water within the underground workings based on a finding that it would be technically impracticable from an engineering perspective to restore the water in the underground workings. More information about the Technical Impracticability Waiver can be found in Appendix D of the Feasibility Study and on page 15 and 16 of this Proposed Plan.

The above proposed cleanup actions would also be subject to a review, every five years, to ensure that they remain protective of human health and the environment.

EPA is also seeking public comment on the determination that unavoidable adverse impacts to wetlands and aquatic resources (pit lakes) may occur as part of the cleanup action. Under federal wetlands laws, EPA is required to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of the wetlands" for wetlands that meet federal jurisdictional standards. Using these principles, EPA is further required to select the "least damaging practicable alternative" for reducing environmental risks at the site. EPA's preferred alternative for the sediment component of remedy will minimize disturbance to wetlands along perennial waterways. Contaminated wetlands and water-bodies that are located upgradient of the waterways' perennial flow will be altered or eliminated in order to protect downstream wetland and aquatic resources from acid rock drainage. EPA has made a finding that adverse effects to historic resources will occur and that these adverse effects are unavoidable in order to implement the cleanup action. EPA is also seeking public comment on a Technical Impracticability (TI) Waiver for the groundwater within the mine workings. The TI waiver is based upon a finding that water within the underground workings (mine pool) cannot achieve the standards found in the Safe Drinking Water Act and Vermont Groundwater Protection Rule and Strategy. More information about the TI waiver and the Clean Water Act determinations can be found on pages 15 and 16.

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601 *et seq* (CERCLA) the law that established the Superfund Program, this document summarizes EPA's cleanup proposal for the Elizabeth Mine Superfund Site. For detailed information on the options evaluated for use at the Site, see the Elizabeth Mine Feasibility Study, which is available for review at the Site information repositories. The Site information repositories are located at the Norwich Public Library, Norwich, Vermont and at EPA's Record Center at 1Congress Street in Boston, MA. (See page 20 for more details.)

Elizabeth Mine Superfund Site Strafford/Thetford, VT

You are Invited to Attend!

Two public meetings have been scheduled for the Elizabeth Mine Site. The first meeting will be a public information meeting to allow the community to learn more about this proposed plan. This will be followed, three weeks later, by a second meeting which will be a Public Hearing with a Formal Comment Session to give citizens the opportunity to enter official comments for the public record about this proposed plan.

Public Information Meeting
July 11, 2006
7:00 p.m.
Barrett Hall, Route 132
South Strafford, VT

Public Hearing
August 1, 2006
7:00 p.m.
Barrett Hall, Route 132
South Strafford, VT

Your Opinion Counts!!

EPA is accepting public comment on this cleanup proposal from July 12, 2006 through August 11, 2006. You do not have to be a technical expert to comment. If you have a concern or preference regarding EPA's proposed cleanup plan, EPA wants to hear from you before making a final decision on how to protect your community.

To provide comments on the Proposed Plan, you may:

Offer oral comments during the public hearing on August 1, 2006 (see page 20 for details).
Or
Send written comments postmarked no later than August 11, 2006 to:
Edward Hathaway, RPM
U.S. EPA Region I
1 Congress Street Suite 1100 (HBT)
Boston, MA 02114-2023
Or
E-mail comments by August 11, 2006 to:
hathaway.ed@epa.gov

For further information about this meeting, call EPA Community Involvement Coordinator Pam Harting-Barrat (617) 918-1318, or toll-free at 1-888-372-7341 ext. 81318.

Site History

The Elizabeth Mine has a history of ore extraction and processing that spans 150 years. Both copper and copperas were produced at the Elizabeth Mine. Based on the significance of the copperas works as an early 19th century American industry, several copper processing innovations, the long period of industrial activity, and the unique landscape features, the Elizabeth Mine has been determined to be eligible for the National Register of Historic Places. A brief history of the Site is presented below. A more detailed summary of the operational history and historic significance can be found on page 21.

- Mining and processing of sulfide ore to support production of copperas from about 1809 to 1882.
- Mining and processing of sulfide ore to support production of copper from 1832-1958.
- EPA and Vermont ANR meet with community in 2000.
- Also in 2000, EPA initiates investigation of Elizabeth Mine.
- The 10 member Elizabeth Mine Community Advisory Group (EMCAG) forms in Spring 2000.
- EPA places Elizabeth Mine on National Priorities List in June 2001.
- EPA signs Action Memorandum for Non-Time-Critical Removal Action (NTCRA) in September 2002.
- EPA initiates Time-Critical-Removal Action (TCRA) to address potential failure of the Tailing Dam in Spring 2003.
- As part of TCRA, EPA installs a soil buttress, toe drain, and diversion pipe. TCRA completed in 2005.
- EPA completed the remedial investigation and feasibility study in 2006
- EPA proposes final cleanup plan for Elizabeth Mine in 2006

Scope and Role of this cleanup action:

The cleanup action presented in this Proposed Plan will be the third and final cleanup action for the Elizabeth Mine Site. The two previous cleanup actions are a Non-Time-Critical Removal Action (NTCRA) that was described in an Action Memorandum signed in September 2002 and a Time-Critical Removal Action (TCRA) that was described in an Action Memorandum signed in Spring 2003.

This third cleanup action is intended to address those areas of the Site where the threat to human health and the environment will not be fully resolved through implementation of the NTCRA or TCRA. To identify these areas, a remedial investigation (RI) was implemented from 2000 to 2006. The overall study area for the RI is shown in Figure 1. The study area includes both the areas that are the subject of this Proposed Plan as well as the areas subject to the NTCRA and TCRA. The details of the RI program along with the results of the studies can be found in the Remedial Investigation Report, which is available at the information repositories listed on page 20. A brief update of the NTCRA and TCRA is presented below. The areas of the Site where NTCRA or TCRA activities will occur are shown in Figure 2. The remainder of this Proposed Plan focuses on the areas where cleanup, in addition to the NTCRA and TCRA, was determined to be necessary.

Non-Time-Critical Removal Action (NTCRA):

The NTCRA was the first cleanup action selected for the Elizabeth Mine Site. The NTCRA focused on the three source areas that are responsible for the majority of the acid rock drainage at the Elizabeth Mine Site. These areas are known as Tailing Pile 1 (TP-1), Tailing Pile 2 (TP-2), and Tailing Pile 3 (TP-3). The major components of the NTCRA are:

- Surface water and groundwater diversion
- Slope stabilization
- Infiltration barrier cover system to reduce infiltration into the TP-1, TP-2, or TP-3.
- Collection and treatment of the seeps along the toe of TP-1
- Grading of the steep waste piles of TP-3, with possible re-location of a substantial portion of TP-3, to establish grades suitable for a cover system
- Collection and treatment of any residual run-off from TP-3

The NTCRA Design was initiated in 2005 and will continue for several years. Implementation of certain components of the NTCRA will begin in 2006.

Time-Critical Removal Action (TCRA):

EPA initiated a TCRA in Spring 2003 to address the instability of the Tailing Dam. From 2003 to 2005, the TCRA activities included the installing a soil buttress to fortify the face of the Tailing Dam, drainage structures to move Copperas Brook around the Tailing Dam rather than through the Tailing Dam, and a toe drain and horizontal drains to improve drainage of water within the Tailing Dam. The TCRA was successful in stabilizing the Tailing Dam and was completed in the fall of 2005.

What areas were evaluated in the RI?

The Elizabeth Mine Superfund Site is located in the towns of Strafford and Thetford, Vermont. The study area for the Elizabeth Mine Superfund Site, shown in Figure 1, extends for over 10 miles downriver of the waste piles. The major objective of the RI was to identify the areas of previous mining activity that could have a detrimental effect on the quality of surface water, groundwater, soil, or sediments. The areas of previous mining activity that were evaluated as potential areas of concern are listed below and are shown in Figure 3.

- Tailing Dams TP-1 and TP-2: These areas are the floatation tailing waste associated with copper processing from 1942 to 1958. TP-1 and TP-2 are the major source of iron in Copperas Brook and the West Branch of the Ompompanoosuc River (WBOR). TP-1 and TP-2 contain about 2 million cubic yards of tailing, covering about 34 acres. The control of the release of contamination from TP-1 and TP-2 will be the responsibility of the NTCRA.
- Waste rock and heap leach area TP-3: This is an area of waste rock generated during copper mining from the 1820's through the 1950's and the remnant of roasted material from copperas production from 1809 through 1882. This area is the major source of acidity, aluminum, cadmium, cobalt, copper, and zinc and is also significant source of iron. TP-3 contains about 230,000 cubic yards of waste material covering about 12 acres. The control of the release of contamination from TP-3 will be the responsibility of the NTCRA.
- Waste rock pile referred to as Tailing Pile 4 (TP-4): This is a waste rock pile created from the bedrock that was removed to create access to the South Open Cut. It contains about 17,000 cubic yards of material and is located in the Lord Brook watershed.
- South Open Cut: This is a 1,600-foot-long and 90-foot-deep bedrock cut resulting from surface mining during the 1950's. The estimated volume of material needed to fill the cut is 142,000 cubic yards. Water has accumulated in the cut to form a pit lake that contains about 3.6 million gallons of water. The water from the pit lake discharges to a tributary of Lord Brook in the Lord Brook watershed.
- South Mine: This is a 19th century mining area that has a small pit lake containing about 400,000 gallons of water and about 19,000 cubic yards of waste rock. The South Mine discharges to a tributary that combines with the drainage from the South Open Cut and TP-4 before reaching Lord Brook. The South Mine is also located in the Lord Brook watershed.
- Tyson Smelter Area: An area with relative small volumes of slag, waste rock, and roasted ore in an area near Sargent Brook that was created during 19th century copper extraction and processing.
- Furnace Flats: Two areas, on opposite banks of the WBOR, that contain mostly buried remnants of smelter and roasting operations associated with 19th century copper processing.
- World War II era infrastructure area: This area includes the buildings constructed to process ore and manage the Site from 1942 through 1958, along with two adits that lead into the underground workings. The buildings were constructed on a plateau containing about 57,000 cubic yards of waste rock.
- Underground workings: The underground workings include the extensive area of mine shafts, tunnels, and adits associated with the ore extraction. The underground workings extend for about 8,000 feet from the North Open Cut to about 1,150 feet north of the WBOR. The underground workings extend to a depth of 975 feet below the top of Copperas Hill. The volume of the void space in the workings is estimated at 1.2 million cubic yards. The workings have become partially filled with groundwater, creating a mine pool which contains about 115 million gallons of water.
- Air vent (also known as the Artesian Vent): The former air vent for the underground workings is now a discharge point for the water within the underground workings (mine pool). The water discharges to a small shoreline area and then to the WBOR.
- Copperas Factories: The Copperas Factories are the facilities where the liquid from the leaching operations at TP-3 was evaporated in lead lined vats to form copperas crystals. The remnants of two Copperas Factories remain in an area just below TP-3.
- North Open Cut: This is a 960-foot-long and up to 250 foot-deep bedrock cut at the top of TP-3. Bats have been documented to inhabit the tunnels associated with the North Open Cut.

The RI also evaluated the soil, surface water, sediment, and groundwater in the study area to determine the extent of the areas impacted by the release of waste material, acid rock drainage, or acid mine drainage from those potential source areas. The RI included a comprehensive assessment of the distribution and concentration of the contamination released by the source areas. As discussed in the following section, one component of the RI, the human health and ecological risk assessment, used the data obtained as part of the RI to determine what areas of the Site represent a current or future threat to human health or the environment.

Why is Cleanup Needed?

As part of the RI, a Human Health Risk Assessment Report (HHRA) and Baseline Ecological Risk Assessment (BERA) were completed. These risk assessments provide the basis for identification of the areas of the Site that were evaluated in the Feasibility Study.

The HHRA evaluated the potential threat to human health based upon current and future land use. In the absence of specific prohibitions to prevent development, the potential for residential use of the entire Site area was assumed in the HHRA. A summary of the HHRA and BERA is presented below.

- The lead contaminated soil in the area of the former upper and lower Copperas Factories was determined to represent a current and future threat to human health for persons who may come in contact with this contamination.
- Groundwater beneath and adjacent to TP-1, TP-2, and TP-3 contains levels of contamination that would present a threat to a person who installs a well and ingests this water in the future.
- Groundwater within the underground workings, also known as the mine pool, contains levels of contamination that would present a threat to a person who installs a well and ingests this water in the future.

The HHRA concluded that surface water and sediments throughout the Site were not a threat to human health. Recreational fish consumption was also determined not to be a threat to human health. Figure 4 presents a summary of the areas identified as a potential threat to human health.

The BERA evaluate the potential threat to ecological receptors (fish, birds, mammals, invertebrates, etc.) from the contamination at the Site. The assessment is focused on the potential for community or population level impacts for most species and individual level impacts to threatened or endangered species. The BERA concluded that:

- The aquatic community (including periphyton, benthic macroinvertebrates, fish, and amphibians) is being severely impacted in Copperas Brook, the Mixing Zone of the WBOR, and in the unnamed tributaries to Lord Brook.
- The benthic macroinvertebrate community in the WBOR does not fully recover from the biological impairment caused by the contamination contained within Copperas Brook until Union Village Dam, over four miles downstream from its confluence with Copperas Brook.
- The fish community in the WBOR is impacted for about 1 mile below Copperas Brook.
- The fish and benthic communities in Lord Brook are impacted for about 1 mile from the discharge of the unnamed tributaries.

The BERA concluded that the WBOR upstream of Copperas Brook, including the reach that assimilates the discharge from the air vent, did not present a threat to ecological receptors. In addition, the BERA also concluded that terrestrial habitats, outside of the NTCRA source areas, at the Site did not present a threat to ecological receptors. Figure 5 identifies the areas identified as a threat to ecological receptors

Areas of the Site Where Cleanup Action is Necessary:

Based on the RI, including the HHRA and BERA, the following areas of the Site were identified as potential threats to human health or the environment. EPA developed a Feasibility Study to evaluate cleanup options (remedial action) for each of the areas listed below. These areas are evaluated for cleanup in this Proposed Plan and are shown in Figure 6.

- South Open Cut, South Mine, and TP-4 were identified as the source of surface water and sediment contamination in both the unnamed tributaries to Lord Brook and in Lord Brook.
- The sediments of Copperas Brook, the Mixing Zone of the WBOR, and the unnamed tributaries to Lord Brook were identified as being acutely toxic to benthic organisms.
- The former upper and lower Copperas Factories contain lead contaminated soil that is a threat to human health.
- The run-off from the exposed waste rock in the WWII-Era Infrastructure Area has the potential to cause water quality impairment in Copperas Brook.
- The wall rock and remaining waste rock within the underground workings of the mine were identified as the source of groundwater contamination for the water within the underground workings (mine pool).
- The waste rock within TP-3 was identified as source of bedrock and overburden groundwater contamination in the area beneath and adjacent to TP-3 extending just across Mine Road.
- The Tailing within TP-1 and TP-2 were identified as the source of groundwater contamination in the overburden groundwater beneath and adjacent to TP-1 and TP-2.

Remedial Action Objectives:

To guide the development of cleanup alternatives, EPA developed a set of Remedial Action Objectives. These are based upon the results of the RI, including the HHRA and BERA. The Remedial Action Objectives for the Elizabeth Mine Site are listed below:

Upper and Lower Copperas Factories:

- Prevent direct contact or incidental ingestion of soil containing lead above 400 mg/kg.

Groundwater (underground workings and beneath/adjacent to TP-1, TP-2, and TP-3):

- Prevent ingestion of groundwater containing levels of site specific contamination in excess of federal Safe Drinking Water Act maximum contaminant levels (MCls), non-zero maximum contaminant levels goals (MCLGs), or Vermont Primary Groundwater Protection Standards, whichever is lower or, in their absence, a level that is set at a non cancer hazard quotient of 1 or an excess cancer risk of 1×10^{-6} or less.

For Lord Brook Watershed Source Areas:

- Achieve federal Clean Water Act and Vermont Water Quality Standards for a Class B surface water in Lord Brook and the tributaries of the Lord Brook that drain the South Mine, South Open Cut, and TP-4, by reducing or preventing the release of acid rock drainage (ARD) containing metal concentrations above surface water cleanup levels from these areas.

Sediments (Lower Copperas Brook, WBOR Mixing Zone, and unnamed tributaries to Lord Brook):

- Reduce sediment concentrations to levels that are no longer acutely toxic and allow the surface water to achieve federal Clean Water Act and Vermont Water Quality Standards for a Class B surface water in Copperas Brook, the WBOR, the unnamed tributaries to Lord Brook, and Lord Brook.

WWII –Era Infrastructure Area:

- Control ARD run-off from exposed waste material to allow Copperas Brook and the WBOR to achieve federal Clean Water Act and Vermont Water Quality Standards for a Class B surface water.

Cleanup Standards:

In addition to the Remedial Action Objectives, EPA also identified the standards and criteria that will be used to determine if the cleanup action is protective of human health and the environment. The cleanup standards for the Elizabeth Mine Remedial Action are presented below:

- The cleanup level for the lead contaminated soil in the Copperas Factories shall be 400 mg/kg.

- The cleanup level for sediments in Copperas Brook, the WBOR Mixing Zone, and the unnamed tributaries to Lord Brook shall be based upon toxicity testing. The cleanup standard shall be met when toxicity testing demonstrates that the sediments are no longer acutely toxic to benthic organisms.

- The cleanup standard for surface water shall be to:
  - Achieve federal Clean Water Act and Vermont Water Quality Standards at the point of compliance in Copperas Brook and downstream into the WBOR.
  - Achieve federal Clean Water Act and Vermont Water Quality Standards at the point of compliance in the unnamed tributaries to Lord Brook and downstream into Lord Brook.

- The cleanup standards for groundwater are the Vermont Primary Groundwater Protection Standards and federal Safe Drinking Water Act MCLs and non-zero MCLGs. However, the standards only apply as compliance levels for the purpose of monitoring the Remedial Action due to the following:
  - All of the contaminated groundwater associated with TP-1, TP-2, and TP-3 is within the Waste Management Area for these source areas (See Figure 7). EPA only requires compliance with the groundwater standards at the edge of the Waste Management Area. Therefore, the groundwater cleanup standards will be used to monitor the effectiveness of the NTCRA and Remedial Action.
  - EPA is invoking a Technical Impracticability Waiver, as permitted under CERCLA, for the groundwater within the underground workings. Therefore, no cleanup standards will apply to the water within the underground workings. The cleanup standards will be used as compliance criteria at the edge of the Technical Impracticability Zone (See Figure 7).

Cleanup Alternatives Evaluated for the Remedial Action at the Elizabeth Mine Site

EPA considers a full range of alternatives to clean up a Superfund site before selecting a remedy. Many options are screened out early in the process because site-specific conditions render them ineffective and/or technically or administratively infeasible. Others are eliminated because they are cost prohibitive to implement. The cleanup alternatives that survived the initial screening were subject to a detailed evaluation and comparative analysis in the Feasibility Study for the Elizabeth Mine Site (FS). These cleanup alternatives are summarized below. For consistency, names and numbers of the cleanup alternatives presented below remain the same as those used in the FS.

Five areas of the Site were evaluated independently in the FS. One cleanup alternative from each area was then selected as the proposed final remedy for the Elizabeth Mine Superfund Site. The five areas are:

Lord Brook Source Areas (LBSA) – Four alternatives were evaluated in detail for this area.
Copperas Factories (CF) – Three alternatives were evaluated in detail for this area.
Sediments of lower Copperas Brook, Mixing Zone of the WBOR, and unnamed tributaries to Lord Brook (SED) – Three alternatives were evaluated in detail for this area.
WWII-Era Infrastructure Area (IA) – Four alternatives were evaluated in detail for this area.
Site Wide Groundwater and Land Use Restrictions (SW) –Two alternatives were evaluated in detail for this area.

A brief summary of the alternatives retained for detailed analysis within each area is presented in the following section. The costs for each alternative include the estimated capital costs, the estimated annual operation and maintenance (O & M) cost, and the present value of the combined capital and maintenance costs based on a 30 year time period and 7% discount rate. Annual operation and maintenance costs are for each alternative independently and do not account for the possibility that the O & M for several areas could be performed at the same time and assumes that all work is contracted. For a fund lead Site, the State of Vermont is required to accept responsibility for performing 100% of the O & M. The actual O & M costs may be substantially lower than the estimate in the FS if the State of Vermont were to use staff and other internal resources to perform the necessary activities.

Lord Brook Source Areas (LBSA)

LSBA 1 – No Action. This alternative is required as a baseline to identify the consequence of taking no action at the Site. For this alternative, the ongoing discharge of acid rock drainage and the associated impacts to the unnamed tributary to Lord Brook and to Lord Brook would continue indefinitely. No monitoring or other actions would be taken to protect public health or the environment. There are no capital or long term costs associated with this alternative, except for the cost of conducting a review of the remedy, at a minimum, every five years. The estimated cost for each five year review is $15,000. The present value of the five year reviews is $32,450.

LBSA 2B - Collection and passive treatment of discharge from source areas. This alternative includes the collection of the surface water discharge from the South Mine, TP-4, and the South Open Cut. The flow would be collected in detention basins to retain storm water and spring melt until the storage capacity is reached. Water would be treated with a passive technology such as Sulfate Reducing Bacteria (SRB) bioreactors or a contact media reactor (Bauxsol, appatite). The actual technology would be determined during design studies. The water would be treated to meet discharge standards based on Vermont Water Quality Standards. The treated effluent would discharge to the unnamed tributaries to Lord Brook. Some impacts to wetlands in this area would occur in order to install the detention basins and treatment system. The historic features in this area would remain intact. Long-term monitoring of the effluent and receiving water would be necessary to evaluate the effectiveness of the cleanup. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restrictions) would be put in place to protect the remedy and prevent activities that could cause the exposure and weathering of waste rock. Estimated capital cost: $3.2 million. Estimated annual operation and maintenance costs: $96,550. Present value of capital and maintenance costs: $4.5 million.

LBSA 3 – Complete consolidation of surficial mine waste and elimination of impacted surface water discharges. The objective of this alternative is to achieve the restoration of the surface water quality without a treatment system and to minimize long-term maintenance. The South Open Cut would be filled with waste material from TP-4, South Mine, and possibly other areas of the Site (such as TP-3). The South Open Cut has an estimated capacity of 142,000 cubic yards.

TP-4, estimated at 17,000 cubic yards, would be completely removed and placed within the South Open Cut. The South Mine waste rock would be graded, consolidated, or removed to minimize the discharge of acid rock drainage from that area. An estimated 19,000 cubic yards of South Mine waste rock may be placed in the South Open Cut. A vegetative soil cover would be placed over the exposed waste in the South Open Cut and South Mine. The cover would be graded to promote surface water run-off and limit infiltration. Design studies will determine if amendments, such as a source of alkalinity or organic material, to the waste are necessary. Some impacts to wetlands in this area will occur in order to install the access roads to relocate the waste and fill the cuts. Several small wetlands that are currently receiving acid drainage would be eliminated due to the cleanup efforts. The South Open Cut and South Mine would be eliminated as an aquatic resource. Both the South Open Cut and TP-4 would be eliminated as historic features. Major changes to the South Mine historic features would occur. If possible, portions of the South Mine not causing acid rock drainage will be left exposed. Long-term monitoring of the downstream water quality and aquatic resources would be necessary to evaluate the effectiveness of the cleanup. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restrictions) would be put in place to protect the remedy and prevent activities that could cause the exposure and weathering of waste rock. Estimated capital cost: $7.1 million. Estimated annual operation and maintenance costs: $23,000. Present value of capital and maintenance costs: $7.4 million.

LBSA 4 - Full consolidation of TP-4 and partial consolidation of South Mine and South Open Cut mine wastes with diversion of surface water and discharge of residual water to surface water or groundwater – Preferred Alternative. This alternative includes the consolidation and covering of waste and exposed rock causing the majority of the acid rock drainage and the diversion of water around the South Mine and South Open Cut. The South Open Cut outlet would be dammed to increase the depth of the pit lake in order to serve as a storage basin to allow for a controlled release of water from the pit lake. The South Open Cut has an estimated storage capacity of 6 acre feet. The dry portion of the South Open Cut would be filled. TP-4, estimated at 17,000 cubic yards, would be completely removed and placed within the dry portion of the South Open Cut. The South Mine waste rock that is located immediately down gradient of the South Mine pit lake would also be removed to minimize the discharge of acid rock drainage from that area and placed in the dry portion of the South Open Cut. Up to 19,000 cubic yards of South Mine waste rock may be placed in the South Open Cut. However, it is likely that a much lower volume may be re-located to achieve the cleanup objectives. Once the waste rock is removed, the South Mine pit lake would be re-established. A vegetative soil cover would be placed over the exposed waste in the South Open Cut and South Mine. The cover would be graded to promote surface water run-off and limit infiltration. Design studies will determine if amendments, such as a source of alkalinity or organic material, to the waste are necessary. The South Open Cut outlet would be controlled by installing a dam and outlet pipe. A discharge of approximately 2 gallons per minute would be required to prevent the South Open Cut from overflowing the dam. In addition, the annual average flow from the South Mine after installing the surface water diversion would be 5 gallons per minute. This water would be discharged to either surface water or groundwater. The design would identify the most cost effective long-term discharge approach for the water from the South Open Cut or South Mine. It is unlikely that treatment would be required prior to discharge. If treatment is required, the water would discharge to a passive treatment system. Water would be treated with a passive technology such as Sulfate Reducing Bacteria (SRB) bioreactors or a contact media reactor (Bauxsol, appatite). The actual technology would be determined during design studies. If the water is to be discharged to the unnamed tributaries to Lord Brook it will be treated, if necessary, to meet discharge standards based on Vermont Water Quality Standards. If water is discharged to groundwater it will meet Vermont Groundwater Protection and federal Safe Drinking Water Act standards. Some impacts to wetlands in this area will occur in order to install the access roads, to relocate the waste, dam the pit lake, and fill the cuts. Several small wetlands that are currently receiving acid drainage would be eliminated due to the cleanup efforts. TP-4 would be eliminated as a historic feature. A portion of the South Open Cut would be filled and eliminated as a historic features but the majority of this feature would remain, although the dammed pit lake will partially inundate the area. In addition, all the major features of the South Mine should remain intact since, if possible, the portions of the South Mine not causing acid rock drainage, will be left exposed. Long-term monitoring of the effluent and receiving water would be necessary to evaluate the effectiveness of this alternative. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restrictions) would be put in place to protect the remedy and prevent activities that could cause the exposure and weathering of waste rock.

Estimated capital cost: $3.7 million. Estimated annual operation and maintenance costs: $24,600. Present value of capital and maintenance costs: $4.1 million.

Upper and Lower Copperas Factories (CF)

CF 1 – No Action. This alternative is required as a baseline to identify the consequence of taking no action at the Site. This alternative would not include any actions to limit public exposure to the lead contaminated soil within and surrounding the former upper and lower Copperas Factories which was determined to be a threat to human health. No monitoring or other actions would be included. There are no capital or long term costs associated with this alternative, except for the cost of conducting a review of the remedy, at a minimum, every five years. The estimated cost for each five year review is $15,000. The present value of the five year reviews is $32,450.

CF 2 - Excavation and on-site treatment of lead contaminated soil with on-site disposal. This alternative would include the excavation of approximately 2,700 cubic yards of soil with lead concentrations above 400 mg/kg. The lead contaminated soil would be treated to solidify and/or stabilize the lead such that the soil no longer exhibits the characteristics of a hazardous waste, thus allowing on-Site burial as a solid waste. The treated soil would be placed in TP-1 and buried beneath a two foot soil cover. There would be impacts to the wetlands area adjacent to the Copperas Factories due to construction access and grading. These areas would be restored as part of the cleanup action. The Copperas Factories are historic features. While the excavation program would be implemented to minimize the impact on the foundations, it is possible that the foundations could collapse as a result of the cleanup action. Mitigation of the historic impacts would include data recovery activities prior to the excavation of the contaminated soil. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restrictions) that are developed for TP-1 as part of the NTCRA would include provisions to present any future disturbance of the area where the lead soil is placed. Estimated capital costs: $1.5 million. Estimated annual operation and maintenance costs: $4,350. Estimated present value of capital and maintenance costs $1.6 million.

CF 4 - In place covering of lead contaminated soil and institutional controls – Preferred Alternative. This alternative would involve the placement of a two foot soil cover over the lead contaminated soil. The NTCRA design would determine whether the upper Copperas Factory could remain after implementation of the NTCRA. If the upper Copperas Factory is eliminated by the NTCRA, then the contaminated soil would be consolidated with the lower Copperas Factory. There would be impacts to the wetlands area adjacent to the Copperas Factories due to construction access and grading. These areas may be restored as part of the cleanup action. The Copperas Factories are historic features. While the grading and covering activities would be implemented to minimize the impact on the foundations, it is possible that the foundation could collapse as a result of the cleanup action. Mitigation of the historic impacts would include data recovery activities prior to the excavation of the contaminated soil. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restrictions) would be put in place to protect the remedy. Estimated capital costs: $0.6 million. Estimated annual operation and maintenance costs: $10,830. Estimated present value of capital and maintenance costs $0.8 million.

Site-Wide Sediments (Lower Copperas Brook, WBOR Mixing Zone, Unnamed Tributaries to Lord Brook)

SED 1 – No Action. This alternative is required as a baseline to identify the consequence of taking no action at the Site. This alternative would not include any action to address the sediments that may be acutely toxic to aquatic organisms. This alternative would not include any monitoring or evaluation of the sediments to determine if the sediments remain toxic. There are no costs associated with this alternative, except for the cost of conducting a review of the remedy, at a minimum, every five years. The estimated cost for each five year review is $15,000. The present value of the five year reviews is $32,450.

SED 2 – Monitored natural recovery – Preferred Alternative. This alternative would rely upon natural processes to restore the impacted sediments. Once the source areas are controlled by the implementation of the NTCRA and LBSA cleanup actions, the release of tailing and/or weathered waste rock into Site sediments would cease. This would allow natural scouring and depositional activities to reduce the concentration of contamination in the surficial sediment. Acid mine drainage from upstream would be also be significantly reduced, resulting in less contaminants being chemically leached out of the sediments from the low pH (acidic) run-off. Monitoring of the chemistry and biology of

these systems and additional toxicity testing would be necessary to track long-term progress.
No historic resources would be affected by this alternative and no impacts to wetlands or floodplain areas are anticipated. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Estimated capital costs: $0.1 million for the baseline monitoring program. Estimated annual monitoring costs: $9,750. Present value of the monitoring program is $0.4 million.

SED 3 – Excavation of impacted sediment and on-site consolidation. This alternative would involve the excavation of the sediment identified as toxic to aquatic organisms. This includes lower Copperas Brook, the unnamed tributaries to Lord Brook extending from the source areas (South Mine, South Open Cut, and TP-4) to Lord Brook, and the initial 150 feet of the West Branch of the Ompompanoosuc River below the confluence with Copperas Brook. The excavated sediments would be disposed on site. There would be significant short-term impacts to wetland and floodplain resources from this alternative. However, disturbed areas would be restored after the excavation. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Estimated capital cost: $2.8 million. Estimated annual maintenance and monitoring costs: $36,919. Present value of capital costs and maintenance is $3.3 million.

WWII-Era Infrastructure Area (IA)

IA 1 – No Action: This alternative is required as a baseline to identify the consequences of taking no action at the Site. This alternative would not include any actions to abate or monitor the run-off from the exposed waste rock in the WWII-Era Infrastructure Area. There are no costs associated with this alternative, except for the cost of conducting a review of the remedy, at a minimum, every five years. The estimated cost for each five year review is $15,000. The present value of the five year reviews is $32,450.

IA 2 – Diversion of surface water run-on/run-off; limited regrading and cover of surficial mine wastes. This alternative includes actions to eliminate the discharge of acid rock drainage from this area. A combination of surface water run-on/run-off controls, along with the placement of a cover over the graded mine waste, would eliminate the acid rock drainage from this area. Historic resources would be unavoidably affected by this alternative since several of the WWII buildings, which are in a significant state of decay, would be demolished. There are no wetlands or defined floodplain areas in the area to be altered. Long-term monitoring would be included in this alternative. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restriction) would prevent the exposure and subsequent weathering of the mine waste that is currently covered. Estimated capital costs: $1 million. Estimated annual maintenance and monitoring costs: $15,150. Present value of capital and maintenance costs is $1.2 million.

IA 3 – Complete removal of waste ore with consolidation onto TP-1 This alternative would include the removal of all of the exposed and buried waste rock in the WWII Infrastructure area. The estimated 60,000 cubic yards of material would be placed on TP-1. The excavated area would be graded and vegetated to stabilize the area. Historic resources would be unavoidably affected by this alternative. Many of the WWII era buildings would be demolished. Wetlands adjacent to the 1898 adit may be impacted as part of this alternative. These wetlands currently receive acid mine drainage from the adit. Estimated capital costs: $5 million. Estimated annual monitoring and maintenance costs: $10,435. Present value of capital and maintenance costs: $5.1 million.

IA 4 – Limited Action: Monitoring and land use restrictions – Preferred Alternative. This alternative includes monitoring of surface water run-off from the WWII-Era Infrastructure area and land use restrictions to prevent the exposure and subsequent weathering of the waste rock buried in this area. This alternative assumes that after the NTCRA actions are completed Copperas Brook will achieve federal Clean Water Act and Vermont Water Quality Standards for a Class B water without any additional actions to grade and cover the exposed mine waste in this area. No historic resources will be impacted by this alternative. Long-term monitoring of surface water would be necessary to evaluate the effectiveness of the cleanup action. A review of the cleanup action would be performed every five years to ensure that the cleanup is protective of human health and the environment. Institutional controls (land use restriction) would be utilized to prevent the exposure and subsequent weathering of the mine waste that is currently covered. Estimated annual monitoring costs: $17,850. Present value of long-term monitoring: $0.230 million.

Site Wide Alternatives (Groundwater and Institutional Controls)

SW 1 - No Action. This alternative is required as a baseline to identify the consequence of taking no action at the Site. This alternative would not include any activities to prevent exposure to contaminated groundwater, to protect the actions implemented as part of the NTCRA, or to perform long-term monitoring of the groundwater. There are no costs associated with this alternative, except for the cost of conducting a review of the remedy, at a minimum, every five years. The estimated cost for each five year review is $15,000. The present value of the five year reviews is $32,450.

SW 2 – Institutional controls and long-term monitoring – Preferred Alternative. This alternative includes Institutional Controls (land use restrictions) to prevent:

- future consumption of the groundwater beneath and adjacent to TP-1, TP-2, and TP-3 that is within the Waste Management Area;
- future consumption of groundwater within the underground mine workings; and
- any disturbance of the land occupied by the NTCRA response actions that would reduce the effectiveness or increase the maintenance of the NTCRA response actions.

EPA has made a finding that it would be technically impracticable from an engineering perspective to achieve the cleanup of the groundwater in the underground workings. Therefore, CERCLA permits EPA to waive the regulatory requirements to cleanup the groundwater within the Technical Impracticability Zone (the underground workings). This alternative would also include institutional controls, long-term monitoring, and five-year reviews to ensure that public health is protected. There are no historic resources that would be affected by this alternative, since the underground workings would be left intact. Some unavoidable impacts to wetland and/or floodplain areas may occur as a result of the installation of monitoring wells or as part of the long-term monitoring program. Estimated capital costs for monitoring wells and baseline monitoring: $0.4 million. Estimated annual monitoring costs: $12,450. Prevent value of capital and long-term monitoring costs: $0.54 million.

How Does EPA Choose a Cleanup Plan?

EPA uses nine criteria to evaluate alternatives and select a final cleanup plan (called a remedial action) that meet the statutory goals of protecting human health and the environment, maintaining protection over time and minimizing contamination. These nine criteria make up the assessment process used for all Superfund sites. Of these nine criteria, protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs) are considered threshold criteria that must be met for a candidate cleanup alternative to be selected. The next five criteria, called balancing criteria, are used to evaluate and compare the elements of the alternatives that meet the threshold criteria. This comparison evaluates which alternative provides the best balance of trade-offs with respect to the balancing criteria. State and community acceptance are considered modifying criteria factored into the final balancing of all criteria to a selected remedy. Consideration of state and community comments may prompt EPA to modify aspects of the preferred alternative or decide that another alternative provides a more appropriate balance. These criteria are listed below:

Threshold Criteria

1. Overall Protection of Human Health and the Environment. Will the alternative protect human health and plant and animal life from the contamination released by the Site? The chosen cleanup plan must meet this criterion.

2. Compliance with applicable or relevant and appropriate requirements (ARARs). Does the alternative meet all pertinent federal and state environmental statutes, regulations, and requirements? Is a waiver is required? The chosen cleanup plan must meet this criterion.

Balancing Criteria

3. Long-term Effectiveness and Permanence. How reliable will the alternative be at long-term protection of human health and the environment? Is contamination likely to present a potential risk again?

4. Reduction of Toxicity, Mobility, or Volume through Treatment. Does the alternative incorporate treatment to reduce the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present?

5. Short-term Effectiveness. How soon will the risks be adequately reduced? Are there short-term hazards to workers,

the community, or the environment that could occur during the cleanup process.

6. Implementability. Is the alternative technically and administratively feasible? Are the materials and services needed to implement the cleanup alternative (e.g. treatment machinery, space at an approved disposal facility) readily available?

7. Cost. What is the cost of constructing and maintaining the cleanup alternative? Capital costs and the present value of all costs over the anticipated life of the cleanup alternative are presented.

Modifying Criteria

8. State Acceptance. Do state environmental agencies agree with the recommendations? This criterion considers the state's preferences among or concerns about the alternatives, including comments on ARARs or the proposed use of waivers. This criterion is addressed following state inputs on the FS and Proposed Plan.

9. Community Acceptance. What suggestions or modifications do residents of the community offer during the comment period? What are there preferences and concerns about the alternatives? This criterion is addressed following community inputs on the FS and Proposed Plan.

As part of the Feasibility Study, each alternative is evaluated using the nine criteria. These criteria are also used to compare the alternatives against each other in a process known as a comparative analysis. A detailed presentation of the detailed analysis and comparative analysis can be found in Sections 4-9 of the Elizabeth Mine Feasibility Study Report, which is part of the Administrative Record. The Administrative Record, located in the Norwich Public Library, and at the EPA office in Boston, MA. is a collection of documents generated during the investigation of the Elizabeth Mine site that form the basis for selection of the cleanup action. Additional information about the Elizabeth Mine Site is also available on the EPA New England website: www.epa.gov/ne/superfund/sites (type Elizabeth Mine into the search box). A summary of the comparative analysis is provided below.

Comparative Analysis of Alternatives

Each alternative is evaluated using the two threshold and five balancing criteria in detail as part of the FS. After completion of the detailed evaluation of alternatives, a comparative analysis of the alternatives is performed to identify the alternative that satisfies the two threshold criteria of protection of human health and the environment and compliance with ARARs. Then the alternatives are assessed to determine which is the best option based on the five balancing criteria. The comparative analysis from the FS is summarized below.

Threshold Criteria

1. Overall Protection of Human Health and the Environment.

Lord Brook Source Area Alternatives: LSBA 1, the No Action alternative, would not be protective of human health and the environment since no action would be taken to abate the acid rock drainage that is causing unacceptable ecological impacts to the unnamed tributaries to Lord Brook and to Lord Brook. The other three alternatives (LBSA 2B, LBSA 3, and LBSA 4) would all be protective of human health and the environment by preventing the release of acid rock drainage into the unnamed tributaries to Lord Brook and to Lord Brook. LBSA 3 and LBSA 4 achieve a higher degree of protection of the environment since they include actions to eliminate or control the source of the acid rock drainage.

Copperas Factory Alternatives: CF 1, the No Action Alternative, would not be protective of human health and the environment since no action would be taken to prevent human exposure to the lead contaminated soil that was identified as an unacceptable threat to humans. The other two alternatives, CF-2 and CF-4, would be protective of human health and the environment by preventing human exposure to lead contaminated soil.

Sediment Alternatives: SED 1, the No Action Alternative, would not be protective of human health and the environment since no action would be taken to address the contaminated sediments that were identified as an unacceptable ecological threat to aquatic organisms. SED 2 would be protective of human health and the environment because natural recovery processes, after the completion of the NTCRA and LBSA alternative, will eliminate the source of contaminated sediments thus allowing the natural processes to decrease the sediment toxicity over time. SED 3 would be protective of human health and the environment by removing the contaminated sediments and restoring the impacted areas.

WW II-Era Infrastructure Alternatives: IA 1, the No Action Alternative, would not be protective of human health and the environment since no action would be taken to prevent the release of acid rock drainage from the WWII-Era Infrastructure Area or to monitor

whether the NTCRA has fully addressed the threat from this area. IA 4, the limited action alternative, would be protective of human health and the environment since it includes monitoring to determine whether Copperas Brook achieves water quality standards at the end of the NTCRA and institutional controls to prevent the exposure of mine waste that cause additional acid rock drainage from this area. IA 2 and IA 3 would be protective of human health and the environment by eliminating the discharge of acid rock drainage from this area to Copperas Brook.

Site Wide Alternatives: SW 1, the No Action Alternative, would not be protective of human health and the environment since it would not include any measures to prevent human consumption of contaminated groundwater or any monitoring of contaminated groundwater. SW 2 would be protective of human health and the environment since it would include land use restrictions to prevent consumption of contaminated groundwater beneath and adjacent to TP-1, TP-2, and TP-3 and within the underground mine workings. The land use restrictions in SW 2 would also ensure the long-term effectiveness of the NTCRA response actions and would include long-term monitoring of groundwater.

2. Compliance with ARARs.

Lord Brook Source Area Alternatives: LSBA 1, the No Action alternative, would not comply with ARARs. Specifically, LBSA 1 would allow the surface water of the unnamed tributaries to Lord Brook and to Lord Brook to continue to violate the federal Clean Water Act and the Vermont Water Quality Standards. The other three alternatives (LBSA 2, LBSA 3, and LBSA 4) would all comply with the ARARs identified in the FS. To the extent federal jurisdictional wetlands and aquatic resources would be altered by the alternative, EPA has identified LBSA 4 as the least damaging practicable alternative based on the analysis required in Section 404(b)(1) of the federal Clean Water Act. EPA has also identified unavoidable impacts to historic properties that would be necessary to abate the threat to human health and the environment.

Copperas Factory Alternatives: CF 1, the No Action Alternative, would not comply with ARARs. The other two alternatives, CF-2 and CF-4, would comply with the ARARs identified in the FS. EPA has also identified unavoidable impacts to wetlands and historic properties that would be necessary to abate the threat to human health and the environment.

Sediment Alternatives: SED 1, the No Action Alternative, would not comply with ARARs. The other two alternatives, SED 2 and SED 3, would comply with the ARARs identified in the FS. No impacts to historic resources would be anticipated from these alternatives. EPA has identified unavoidable impacts to wetlands that would be necessary for alternative SED 3 to abate the threat to human health and the environment. EPA has identified SED 2 as the least damaging practicable alternative based on the analysis required in Section 404(b)(1) of the federal Clean Water Act since the environmental cleanup standards can be achieved without physically altering existing wetland and aquatic resources.

WW II-Era Infrastructure Alternatives: IA 1, the No Action Alternative, would not comply with ARARs. The other three alternatives, IA 2, IA 3, and IA 4 would comply with the ARARs identified in the FS. IA 3 may potentially alter wetland resources. EPA has also identified unavoidable impacts to historic properties that would be necessary for alternatives IA 2 and IA 3 to abate the threat to human health and the environment Alternative IA 4 would not impact any wetland or historic resources.

Site Wide Alternatives: SW 1, the No Action Alternative, would not comply with ARARs. SW 2 would comply with the ARARs identified in the FS, except for the requirements of the Vermont Groundwater Protection Rule and Strategy and federal Safe Drinking Water Act to achieve standards for the water within the underground workings (mine pool). EPA has determined that it is technically impracticable, from an engineering perspective, to achieve the Primary Groundwater Enforcement Standards from the Vermont Groundwater Protection Rule and Strategy or maximum contaminant levels (MCLs) or non-zero maximum contaminant level goals (MCLGs) for the water within the underground workings. Therefore, EPA is waiving this ARAR, as permitted under CERCLA. This is due primarily to the fact that there is no practicable option that would prevent water from entering the underground working or which would eliminate the source of sulfur or metals in the bedrock surfaces and remaining waste rock within the underground workings.

Balancing Criteria

3. Long-term Effectiveness and Permanence.

Lord Brook Source Area Alternatives: LBSA 3 would offer the highest degree of long-term effectiveness and permanence by eliminating the release of acid rock drainage and by covering the acid generating waste material. LBSA 4 would offer a similar level of protection by eliminating the most significant sources of acid rock drainage. Alternative LBSA 4 does, however, rely on maintenance of the pit lake and associated dam at the South Open Cut and the assimilation of the low residual flow from the areas of the South Open Cut and South Mine into the groundwater or surface water to achieve full protectiveness. Alternative LBSA 2B would also satisfy this criteria. However, LBSA 2B is dependent upon innovative treatment technologies with no long term record of performance. Both LBSA 4 and 2B are more dependent than LBSA 3 upon long-term operation and maintenance in order to maintain the effectiveness. LBSA 4 would provide a greater degree of effectiveness and permanence than LBSA 2B since it would utilize the substantial capacity of the South Open Cut as a detention basin to prevent an overflow of the system during high flow events. The capacity of the South Open Cut also allows for storage of water when cold weather could cause the discharge pipe to freeze. LBSA 1 would not satisfy this criterion.

Copperas Factory Alternatives: CF 2 and CF 4, would both offer long-term effectiveness and permanence. CF 4 would offer a somewhat higher degree of long-term effectiveness and permanence by excavating the lead contaminated soil from its current location and stabilizing the lead contaminated soil to make it inert. Both CF 2 and CF 4 would rely upon long-term maintenance to maintain the cover system over the lead contamination. CF 1 would not satisfy this criterion.

Sediment Alternatives: SED 2 and SED 3 would both offer long-term effectiveness and permanence. SED 3 would offer a somewhat higher degree of long-term effectiveness by removing the contaminated sediments and placing them in a location that would not allow for re-entry into the aquatic environment. SED 2 would achieve long-term effectiveness and permanence once the sediment burial and transport processes cause the sediments to no longer be acutely toxic and the reduction in the acidity of the waterways would make contaminants less mobile. There is some possibility that re-exposure of buried sediments could occur in the future. However, the potential for the exposure of an area of contaminated sediments causing a significant impact on the aquatic system is low. SED 1 would not satisfy this criterion.

WW II-Era Infrastructure Alternatives: IA 3 would offer the highest degree of long-term effectiveness and permanence by removing the mine waste and placing that waste under a cover system on TP-1. IA 2 would offer a similar degree of long-term effectiveness and permanence by controlling surface water run-on and run-off and covering mine waste to eliminate the acid rock drainage. IA 4 would satisfy this criterion by including a monitoring program to ensure that the post-NTCRA run-off from the WWII-Era Infrastructure Area does not cause a violation of water quality standards in Copperas Brook and land use restrictions to prevent the exposure of additional mine waste. IA 1 would not satisfy this criterion.

Site Wide Alternatives: SW 2 would satisfy this criterion through land-use restrictions that would prevent future consumption of the groundwater within the Waste Management Area for TP-1, TP-2, and TP-3 as well as the water within the underground workings. SW 1 would not satisfy this criterion.

4. Reduction of Toxicity, Mobility, or Volume through Treatment.

Lord Brook Source Area Alternatives: LBSA 2B would include treatment of the surface water discharge from the South Open Cut and South Mine that reduces the toxicity, mobility, or volume of contamination. LBSA 4 would reduce acid generation by increasing the water level in the pit lake and may include a source of alkalinity in the back fill in the South Open Cut and the bottom of the South Mine pit lake to accomplish treatment of acid generating material. LBSA 1 and LBSA 3 do not include treatment.

Copperas Factory Alternatives: CF 2 would include treatment of the lead contaminated soil to stabilize the lead and render is a non-hazardous waste. CF 4 and CF 1 do not include treatment.

Sediment Alternatives: SED1, SED 2 and SED 3 do not include treatment.

WW II-Era Infrastructure Alternatives: IA1, IA 2, IA 3, and IA 4 do not include treatment.

Site Wide Alternatives: SW 1 and SW 2 do not include treatment.

5. Short-term Effectiveness.

Lord Brook Source Area Alternatives: LBSA 3 and LBSA 4 would achieve the cleanup objectives in the shortest time frame. Once the mine waste is deposited in the cut and covered, the acid rock drainage from those areas should cease. Once the treatment system for LBSA 2B was operational, the impacts from the acid rock drainage should cease. However, the treatment systems would require operation in perpetuity for the effectiveness to be maintained. Short term impacts associated with the construction activities of LBSA 2B, LBSA 3, and LBSA 4 would all be addressed through the design and implementation of best management practices. However, LBSA 3 would have significant short-term impacts associated with the excavation of the areas of waste rock at the South Mine and South Open Cut. These areas are currently stable and are not considered to be major contributors to the acid rock drainage at the Site. Additional short term impacts from LBSA 3 could occur if sufficient fill material is not available on-site and substantial quantities of material must be obtained from off-site locations.

Copperas Factory Alternatives: CF 2 and CF 4 would achieve protection in a similar time frame. Short term impacts associated with the construction activities of CF 2 and CF 4 would all be addressed through the design and implementation of best management practices.

Sediment Alternatives: SED 3 would achieve the restoration in the shortest time period. Once the sediments are excavated, the impacts would cease and recovery would occur. Short term impacts associated with the construction activities of SED 3 would all be addressed through the design and implementation of best management practices. SED 2 relies upon longer term natural processes that could require more than ten years to achieve the complete reduction in sediment contamination to eliminate acute toxicity.

WW II-Era Infrastructure Alternatives: IA 2 and IA 3 would achieve the objective of eliminating acid rock drainage in the shortest time period. IA 4 would achieve its objectives once post-NTCRA monitoring demonstrates that Copperas Brook achieves water quality standards. Short term impacts associated with the construction activities of IA 2 and IA 3 would all be addressed through the design and implementation of best management practices.

Site Wide Alternatives: The time period to achieve effectiveness for SW 2 would depend upon the time required to implement the land use restrictions. No short term impacts are associated with this alternative and no individuals are currently consuming mine impacted groundwater.

6. Implementability

Lord Brook Source Area Alternatives: LBSA 2B would use an innovative technology. This technology is believed to be capable of achieving the performance objectives for the Site, but a full scale demonstration would be necessary to ensure that the technology can achieve the performance objectives. LBSA 3 and LBSA 4 would utilize standard construction practices. Some specialty work would be included to stabilize the rock walls of the South Open Cut. The materials and services necessary to implement all of these alternatives are readily available, although LBSA 3 may be more difficult to implement if sufficient material to completely fill the South Open Cut has to be transported from off-site.

Copperas Factory Alternatives: CF 2 and CF 4 are considered to be implementable. The materials and services necessary to implement these alternatives are readily available.

Sediment Alternatives: SED 2 and SED 4 are considered to be implementable. The materials and services necessary to implement these alternatives are readily available.

WW II-Era Infrastructure Alternatives: IA 2, IA 3, and IA 4 are considered to be implementable. The materials and services necessary to implement these alternatives are readily available.

Site Wide Alternatives: SW 2 is considered to be implementable. The materials and services necessary to implement these alternatives are readily available.

7. Cost.

Lord Brook Source Area Alternatives: LBSA 2B and LBSA 4 have similar costs and would be the lowest cost alternatives that meet the threshold criteria. LBSA 3 has higher short term capital costs and a higher present value than the other alternatives.

Copperas Factory Alternatives: CF 4 is the least expensive of the alternatives that meet the threshold criteria. CF 2 is more expensive.

Sediment Alternatives: SED 2 is the least expensive of the alternatives that meet the threshold criteria. SED 3 is more expensive.

WW II-Era Infrastructure Alternatives: IA 4 is the least expensive of the alternatives that meet the threshold criteria. IA 3 is the next lowest cost and IA 2 has the highest cost.

Site Wide Alternatives: SW 2 is the least expensive of the alternatives that meet the threshold criteria.

Modifying Criteria

8. State Acceptance and 9. Community Acceptance.

The evaluation of these criteria is based on the input from the community during the public comment period. EPA has a clear understanding of the State and community perspective with respect to the cleanup options under consideration. Over the past six years, EPA has committed substantial resources to involve both the State and the community in the cleanup process. The alternatives presented in the FS and Proposed Plan reflect the dialogue between EPA, Vermont Agency of Natural Resources (ANR), and the community.

The Vermont ANR has actively participated in the planning, implementation, and assessment of the RI/FS. Vermont ANR is partnered with EPA in the implementation of the cleanup action at the Site. As a fund lead action, Vermont ANR would be responsible for 10% of the capital cost and 100% of the operation and maintenance cost of the cleanup action. Early input was sought from Vermont ANR regarding the cleanup options presented in this Proposed Plan. Vermont ANR has notified EPA that it is in general agreement with the cleanup approach presented in this Proposed Plan and will provide a final response after reviewing the community input.

The Elizabeth Mine Community Advisory Group (EMCAG) has had a major influence on the RI/FS. The regular EMCAG meetings over the past six years have provided an opportunity for EPA to gain insight into the community's perspective on many issues. This input was considered during the development of the FS. Truck traffic, road damage, public health concerns, overall cost and the financial burden to the State of Vermont, impacts to historic resources, restoration of the environmental impacts, and a desire to achieve the cleanup in a permanent manner in the shortest possible time-frame are among the major issues consistently identified by the EMCAG as community concerns. EPA has presented the findings of the RI at EMCAG meetings since 2004 and began introducing the major FS components and issues in late 2005. Discussion between EPA and the community regarding the FS alternatives have been ongoing since January 2006 when EPA presented a summary of the FS alternatives at the January 2006 EMCAG. The Technical Assistance Grant (TAG) and Technical Outreach Services to Communities (TOSC) consultants to the community also had an opportunity to review and comment on the RI/FS documents in advance of the comment period. The EMCAG met on June 14, 2006 to discuss the alternatives presented in the Feasibility Study and this Proposed Plan. The EMCAG concurs with EPA's proposed cleanup approach for the Elizabeth Mine.

Public Notice of CERCLA Technical Impracticability Waiver

EPA is seeking public comment on the following:

EPA is invoking a statutory Technical Impracticability Waiver, as permitted by CERCLA, for the groundwater within the underground workings. EPA has determined that it is technically impracticable, from an engineering perspective, to achieve Federal Maximum Contaminant Levels (MCLs), Maximum Contaminant Level Goals (MCLGs) of the Safe Drinking Water Act and the State of Vermont Primary Groundwater Protection Standards for the water within the underground workings (mine pool). Therefore, EPA is waiving these standards as applicable or relevant and appropriate requirements for the groundwater within the underground workings. This waiver applies to all of the inorganic constituents that are present in the naturally occurring material at the Site and specifically to cadmium, copper, manganese, mercury, and nickel which have been detected in the groundwater of the underground workings at concentrations above either MCLs, MCLGs, or the Vermont Primary Groundwater Protection Standards. The primary basis for this finding is that the source of the contamination, the wall rock and waste rock within the underground workings, will generate the condition that causes the water to exceed the standards for hundreds, if not thousands of years. While it would be practicable to collect and treat the discharge from the underground workings or to prevent the spread of the contamination from the underground workings into the adjacent aquifer, EPA has determined that there are no practicable actions that would result in the water within the underground workings consistently achieving groundwater standards. EPA retains the Federal MCLs, MCLGs, and Vermont Primary Groundwater Enforcement Standards as compliance criteria for the groundwater at the edge of the Technical Impracticability Zone, which is the aquifer surrounding

the underground workings. The Technical Impracticability Zone is shown on Figure 7. EPA has determined that contaminated water within the underground workings is not causing the adjacent bedrock aquifer to exceed federal or state drinking water or groundwater standards. Therefore the proposed remedy incorporating this waiver is protective of human health and the environment as long as land use controls are implemented to prevent drinking water wells from being installed that would draw water from the underground workings. A more detailed discussion of the Technical Impracticability waiver can be found in Appendix D of the Feasibility Study.

Public Notice of Unavoidable Impacts to Wetlands, Aquatic Resources, and Historic Resources

EPA is seeking public comment on the following:

EPA has determined that unavoidable adverse impacts will occur to historic resources at the Site. Direct impacts to the South Open Cut, South Mine, TP-4, Copperas Factories, and Mine Infrastructure Area (World War II era buildings) are necessary to implement the cleanup action. The impacts are in addition to the unavoidable impacts to TP-1, TP-2, and TP-3 that were identified in the Action Memorandum for the NTCRA. The cleanup alternatives all consider ways to avoid or minimize the adverse impacts to the extent practicable. However, since the historic resources are the source of contamination, some impact is necessary to protect human health and the environment.

EPA has determined that there may be unavoidable adverse impacts to wetlands and aquatic resources. To the extent federally regulated wetlands and aquatic resources are located within and adjacent to the South Mine, South Open Cut, TP-4, and Copperas Factories they may be removed and/or altered as part of the cleanup actions. Wherever possible, wetland areas will be re-created. The pit lakes of the South Mine and South Open Cut will be not be completely eliminated as part of the cleanup action, but some portion of these features may be altered as necessary to implement the cleanup action. The pit lake for the South Open Cut will be used as a detention basin to stabilize flow. The pit lake level will be increased by the installation of a dam to inundate more of the acid generating material on the bedrock walls which will reduce the toxicity and mobility of the inorganic contamination. The South Mine pit lake would be re-established after the source removal activities. This pit lake will also serve as a component of the cleanup action by acting as a detention basin. Use of the pit lakes as part of the treatment system is justified because the aquatic resource is located within a naturally occurring acid generating material and cannot be restored to meet water quality standards. EPA has evaluated the requirements of the applicable regulations, including Section 404 of the Clean Water Act and identified the proposed actions as the least damaging practicable alternatives to protect federally regulated wetland and aquatic resources downstream from acid rock drainage.

Why Does EPA Recommend the Preferred Cleanup Alternatives Identified in this Proposed Cleanup Plan?

EPA recommends the preferred cleanup alternatives presented below in this proposed cleanup plan as the best balance of the criteria. These alternatives are recommended because they are protective of human health and the environment, while at the same time being the most cost effective way to achieve the Remedial Action Objectives. EPA believes the proposed cleanup plan achieves the best balance among the criteria used to evaluate various alternatives. The cleanup being proposed provides: both short-term and long-term protection of human health and the environment; attains all Federal and State applicable or relevant and appropriate requirements (or justifies the basis for a waiver); utilizes permanent solutions to the maximum extent practicable by eliminating the most significant sources of acid rock drainage from the Lord Brook Source Area; covers the lead contaminated soil; monitors the natural recovery processes for the sediments and the run-off from the WW II Infrastructure Area; and implements institutional controls to protect the cleanup and prevent consumption of contaminated groundwater that is found within the Waste Management Unit or Technical Impracticability Zone.

A Closer Look at EPA's Cleanup Proposal

EPA has selected a cleanup plan to protect human health and the environment at the Elizabeth Mine Site. The plan includes a cleanup approach for each of the five areas identified as a threat to human health and the environment as a result of the RI. These alternatives are presented in detail in the FS and are summarized below:

Alternative LBSA 4 – Partial consolidation of surficial Mine Waste and surface water diversion with discharge of water to tributary of Lord Brook or Groundwater. This alternative minimizes the discharge of acid rock drainage from the three Lord Brook Source Areas (South Open Cut, South Mine, and TP-4). To accomplish this, exposed waste rock from TP-4 and a portion of the waste rock from the South Mine will be consolidated into the dry portion of the South Open Cut and placed under a cover that will promote surface run-off. The majority of the buried waste rock surrounding the South Open Cut or South Mine will remain in place to minimize disturbance to the forest and the historic features. The amount of material removed from the South Mine area will be determined during design. It is possible that the pit lake from the South Mine may be drained to allow for the removal of waste rock that may be located within the pit lake. The South Mine pit lake would be allowed to re-establish itself. The South Open Cut pit lake would also remain and would have an increased water level due to the installation of a dam at the outlet. The design would determine the optimal location for a dam to prevent the uncontrolled release of water from the South Open Cut pit lake. EPA has determined that LSBA-4 is the least damaging practicable alternative to achieve the protection of downstream wetlands and aquatic resources from acid rock drainage. To extent federally regulated wetlands are identified outside the limits of the waste management area, the altered resources will be restored. EPA has also determined that there will be unavoidable impacts to historic resources. Alternative LBSA 4 is shown in Figure 8.

The primary elements of alternative LBSA 4 are:

- Construction of clean surface water diversions around the South Mine and the South Open Cut/TP-4.
- Excavation of waste ore from the South Mine, with consolidation into the South Open Cut. The amount of material to be re-located will be determined during the design. The objective will be to minimize the extent of disturbance to areas that are not contributing to the acid rock drainage release and to also minimize the impact to historic features. The pit lake would be allowed to restore itself and serve as a detention basin.
- Excavation of TP-4 waste rock and waste ore with consolidation into the dry portion of the South Open Cut.
- Installation of a dam in the vicinity of the haul road from the South Open Cut to contain the pit lake and allow for a controlled release of water from the pit lake.
- Discharge of water from the South Open Cut and South Mine pit lakes via either direct discharge to surface water into the tributary to Lord Brook or infiltration into the ground. Discharge of the water from the South Open Cut to the underground workings will also be evaluated. An estimated flow of 2 gallons per minute for the South Open Cut and 5 gallons per minute from the South Mine are estimated as the long-term discharge rates.
- Covering of areas of consolidated mine wastes in the cuts with a vegetative soil cover to act as a contact barrier and to promote vegetative growth.
- Covering areas from which waste rock has been excavated (e.g., TP-4) to promote vegetative growth.
- Performing maintenance and inspections of the covers.
- Performing monitoring of the unnamed tributaries of Lord Brook and Lord Brook to determine if the actions have restored these waters to federal Clean Water Act and Vermont Class B Water Quality Standards.
- Institutional controls, such as restrictive covenants, to protect the cleanup action from damage and to ensure that buried waste rock is not exposed in the future. Periodic inspections would be performed to ensure compliance with the institutional controls.
- A review of the remedy every 5 years to determine whether the cleanup action remains protective of human health and the environment.

Estimated capital cost of LBSA 4: $3.7 million. Present value of LBSA 4, including capital costs: $4.1 million. Estimated annual operation and maintenance costs: $24,600.

Alternative CF 4 – In-place capping of lead-containing surficial soil and institutional controls. This alternative involves the placement of a two-foot layer of soil over lead contaminated soil within and surrounding the upper and lower Copperas Factories to eliminate the contact risk. Some consolidation of lead contaminated soil may be necessary. In particular, the design will consider whether the upper Copperas Factory should be consolidated into the lower Copperas Factories and if the TP-3 cleanup action would require removal of the upper Copperas Factory. Both the upper and lower Copperas Factories are considered to be within one Area of Contamination and consolidation of material would not trigger federal or state land disposal restrictions or other placement requirements. The design and construction activities will attempt to preserve the exposed foundations of the Copperas Factories as visible features. EPA has determined that CF 4 is the least damaging practicable alternative with respect to the potential unavoidable impacts to federally regulated wetlands. To extent federally regulated wetlands are identified outside the limits of the waste management area, the altered resources will be restored. The design and construction activities will include measures to minimize the impacts on wetlands through the use of best management practices. EPA has also determined that there will be unavoidable impacts to historic resources. Alternative CF-4 is shown in Figure 9.

The primary elements of alternative CF 4 are:

- Placement of a sufficiently thick soil cover over contaminated soil with a lead concentration equal to or exceeding 400 mg/kg to prevent direct contact risk.
- Preserve Copperas Factory foundations to the extent possible or documentation of historic resources that must by disturbed.
- Preservation of historic artifacts, to the extent practicable.
- Performing maintenance and inspections of the covers.
- Institutional controls, such as restrictive covenants, to protect the cleanup action from damage. Periodic inspections would be performed to ensure compliance with the institutional controls.
- A review of the remedy every 5 years to determine whether the cleanup action remains protective of human health and the environment.

Estimated capital cost of CF 4: $0.6 million. Present value of CF 4, including capital costs: $0.7 million. Estimated annual monitoring costs: $10,830.

Alternative SED 2 – Monitored Natural Recovery. This alternative relies upon natural processes, such as long-term burial and dispersion to change the distribution of contaminated sediments. The long-term result will be that the sediments are no longer toxic to aquatic organisms and the sediments do not cause the surface water to fail Class B Water Quality Standards. The NTCRA and LBSA cleanup actions will eliminate the contaminant loading to Copperas Brook, WBOR, and the unnamed tributaries of Lord Brook. There would be no construction activities associated with this alternative. EPA would perform an initial baseline surface water and biological monitoring program. Long-term monitoring of surface water, sediment, and the biological community would be performed. It is possible that some impacts to wetland areas could occur in order to perform the monitoring program. These impacts would be minimized by best management practices and impacted areas would be restored. The cleanup action would be reviewed every five years. Alternative SED 2 is shown in Figures 10A and 10B.

The estimated cost of the baseline monitoring program is $0.1 million. The present value of all monitoring, including the baseline monitoring is $0.4 million. Estimated annual monitoring costs: $9,750.

Alternative IA 4 – Limited Action (institutional controls and monitoring). This alternative relies upon the successful implementation of the NTCRA to achieve Vermont Water Quality Standards at the Point of Compliance in Copperas Brook. As a result, the only necessary activities to prevent an increase in acid rock drainage would be a land use restriction that restricts any alteration of the WWII-Era Mine Infrastructure Area in a manner that would expose waste rock and create additional acid rock drainage. The only costs associated with this alternative would be the actions to implement the land use restrictions, monitoring, and to review this cleanup action every five years. Periodic inspections would be performed to ensure compliance with the institutional controls. Alternative IA 4 is shown on Figure 11.

There are no capital costs associated with this alternative. The present value of the monitoring is estimated $253,841. Estimated annual monitoring costs: $17,850.

Alternative SW 2 – Site Wide Groundwater and Institutional Controls. This alternative includes land use restrictions to prevent future consumption of contaminated groundwater. The contaminated groundwater is found within the underground workings of the Elizabeth Mine and within and adjacent to TP-1, TP-2, and TP-3. Some combination of local ordinances, deed notices, and/or restrictive covenants would be used to provide awareness that the underground workings contain water that is unsuitable for ingestion and to prevent installation of a water supply well into the underground workings. No residential wells are currently installed in the underground workings. In addition, restrictive covenants would also be used to prevent future use of the groundwater beneath and adjacent to TP-1, TP-2, and TP-3. One residential well is located within the Waste Management Area for TP-1, TP-2, and TP-3, however, the property is no longer occupied and the well is not currently in use. The groundwater contamination associated with TP-1, TP-2, and TP-3 is within the Waste Management Area. A cross sectional view of the underground workings is shown in Figure 12. A plan view of the Waste Management Area and groundwater compliance areas is shown on Figure 7.

The restrictive covenants would also include land use restrictions to protect the integrity and long-term effectiveness of the response actions implemented as part of the TCRA and NTCRA. Periodic inspections would be performed to ensure compliance with the institutional controls. The long-term monitoring and maintenance activities for the TCRA and NTCRA will be implemented by the State of Vermont. This alternative includes the installation of additional monitoring wells to provide long-term compliance points. The number and location of the wells will be determined during the design. Long-term monitoring of the groundwater and discharge of the underground workings at the air vent would also be included in this alternative. It is possible that some impacts to wetlands and floodplain areas could occur to allow for the installation of the monitoring wells. These impacts would be minimized by best management practices and impacted areas would be restored.

The estimate cost for the well installation and initial monitoring is estimated to be $0.4 million. The present value of this alternative, including the monitoring well installation and initial monitoring, is $0.6 million. Estimated annual monitoring costs: $12,450.

Points of Compliance

Figure 7 shows the extent of the Waste Management Area and the Technical Impracticability Zone. Groundwater is not required to achieve cleanup levels within these areas. The point of compliance for groundwater will be the outside edge of the Waste Management Area and Technical Impracticability Zone. The surface water points of compliance will generally be the location at which a point source discharges to surface water. The possible locations of the surface water points of compliance are also shown on Figure 7

Summary of cost

The total costs for the five proposed cleanup actions are presented in Table 1. If the cleanup continues as an EPA lead activity, then EPA would implement these cleanup actions. EPA would pay 100% of the costs for the design and 90% of the capital costs to implement the cleanup actions. The State of Vermont would be responsible for 10% of the capital costs and for the full cost and implementation of the long-term operation, maintenance, and monitoring activities.

Table 1

Summary of Cost for Proposed Alternatives

Alternative	Capital or initial monitoring costs (millions)	Estimated annual operation, maintenance, and monitoring costs	Present Value over 30 years
LBSA-4	$3.75	$0.025	$4.1
CF-4	$0.61	$0.011	$0.77
SED-2	$0.01	$0.010	$0.39
IA-4	$0	$0.018	$0.25
SW-2	$0.34	$0.010	$0.54
Total	$4.71	$0.074	$6.05

How You Can Comment On EPA's Cleanup Proposal?

To provide an opportunity for public input on the Proposed Plan, EPA will hold 30-day public comment period, from July 12, 2006 to August 11, 2006. EPA will hold an informational meeting on July 11, 2006 prior to the start of the public comment period. EPA will accept formal written comments and hold a public hearing on August 1, 2006. EPA uses this public input to improve the cleanup proposal. Your formal input and ideas will become part of the official public record. The transcript of comments and EPA's written responses will be issued in a document called a ***Responsiveness Summary*** when EPA releases the final cleanup decision. Once complete, the Responsiveness Summary will be available at the Norwich Public Library for review. There are three different ways in which individuals can express their comments on this Proposed Plan:

- Comments can be submitted in writing to EPA by August 11, 2006.
- Comments can be sent to the EPA RPM by email at:hathaway.ed@epa.gov by August 11, 2006.
- Comments can be spoken into the official public record during the public hearing on August 1, 2006.

EPA encourages anyone with a concern or who favors the cleanup plan to express their opinion during the comment period. All comments are welcome. Any of the three mechanisms above are acceptable for providing comments and all of the comments are given equal weight.

Two types of public meetings will occur with respect to the Proposed Plan. The first will be an informational meeting to explain the proposed cleanup and answer any questions that may arise. This meeting will focus on a discussion of the Proposed Plan and RI/FS and is considered informational only. Comments that are made during this meeting will not be part of the "official record".

The second type of meeting, a public hearing, will occur during the official comment period. At this meeting, EPA will provide a brief summary of the cleanup proposal and then the floor will be open for spoken comments. A stenographer will be present to record all of the comments offered during this comment session. Comments made must be limited in duration in order to allow all individuals present to have an opportunity to speak their comments into the record. EPA does not respond to any of the comments made at the public hearing other than to indicate the time limits or request clarification. At the close of the formal comment session, if time permits, EPA will be available to answer questions.

The comment period will last for thirty days unless an extension is requested. EPA will typically allow a 30 day extension, if requested. Once the comment period has ended, EPA will assemble and evaluate all of the submitted comments. Appropriate revisions to the Proposed Plan will be made based on these comments. EPA will then sign the Record of Decision (ROD) describing the chosen cleanup plan. The ROD and a summary of responses to public comments will be made available to the public at the Norwich Public Library and through EPA Records Center in Boston.

For More Information about the Cleanup:

All of the technical and public information publications prepared to date for the site are available for public review at the following locations:

EPA Records Center
1 Congress Street, Suite 1100
Boston, MA 02114-2023
(617) 918-1453
Hours: 10:00 a.m.-noon, 2:00 p.m.-5:00 p.m.

Norwich Public Library
368 Main St.
Norwich, VT 05055
802-649-1184
Hours: Monday 1:00 p.m. – 8:00 p.m.
Tue, Wed, and Friday: 10:00 a.m. – 5:30 p.m.
Thursday: 10:00 a.m. – 8:00 p.m.
Saturday: 10:00 a.m. – 3:00 p.m.

A copy of all of the major reports are also available at the Vermont Department of Environmental Conservation (DEC) Offices in Waterbury, Vermont. Call (802) 241-2888 if you want to access the files at the Department of Environmental Conservation of the Vermont Agency of Natural Resources.

Public Involvement at the Elizabeth Mine

To address community concerns and to serve as a focal point for discussion with EPA, the Elizabeth Mine Community Advisory Group (EMCAG) was formed in April 2000. It consists of ten member organizations representing a cross section of the community.

The EMCAG member organizations are:

- Town Strafford Selectboard
- Town of Thetford Selectboard
- Elizabeth Mine Study Group (EMSG)
- Citizens for a Sensible Solution (CASS)
- Elizabeth Mine Survivors
- Adjacent Landowners and Residents
- Non-residential Landowners
- Thetford Conservation Commission
- Strafford Planning Commission
- Strafford Historical Society

The EMCAG has been actively engaged in a dialogue with EPA and Vermont ANR for over six years. The EMCAG provided input to shape the NTCRA, TCRA, and the RI/FS. The commitment and perseverance of the EMCAG members is a testament to the community's desire to be integral part of the cleanup action at the Site.

Working with the EMCAG, EPA developed a process for extensive community involvement in shaping the cleanup at the Site. EPA provides the EMCAG with technical briefings presenting design plans, descriptions of investigation programs, and results of studies and investigations in advance of the formal reports. The alternatives under consideration in the RI/FS were presented to the EMCAG six months prior to the public comment period. EPA took the input from the community into consideration in the development and evaluation of the cleanup options.

To further support community involvement, EPA has provided the community with technical resources through the Technical Assistance Grant (TAG) and the Technical Outreach Services to Communities (TOSC) programs. These programs provided the community with independent university and private professional experts to evaluate the EPA Reports. EPA also provided the Towns of Strafford and Thetford with a Redevelopment Initiative Grant which was used to hire experts to assist in evaluating future use options for the Site once the cleanup is complete. EPA will continue its dialogue with the EMCAG during the implementation of the cleanup actions described in the Proposed Plan.

Additional information about the history and historic significance of the Elizabeth Mine

The industrial history of the Elizabeth Mine began with the discovery of a massive sulfide ore body along a ridge located southeast of South Strafford village in 1793. The mine was initially worked for the sulfide mineral pyrrhotite to manufacture copperas. Copperas is a crystalline green hydrous iron sulfate that has been used for a variety of purposes including: production of sulfuric acid; a disinfectant and sheep dip; astringent medicine; to blacken and color leather; and as a drier in ground pigment manufacturing. Major production of Copperas began in 1810 and ended in the 1880's. In 1830, Strafford Copper Works was formed to extract copper from the mine. During the early mining operations, copper was smelted on-site. Underground mining began in the early to mid-1800s. The mine was worked intermittently for copper from 1830 until 1930. In 1942, the mine reopened in response to World War II. Most of the underground copper mining occurred between 1942 and the mine's final closure in 1958.

The copperas production area includes 12 acres at the top of the Copperas Brook watershed adjacent to the North Open Cut. This area contains colorful piles of variably pyrolyzed sulfide ore that are part of the "heap leach" piles from the copperas production. Some of the heap leach piles are overlaid by waste rock from some of the earliest copper mining at the Site. This area is known as TP-3. The tailing in areas designated as TP-1 and TP-2 were generated through the milling of sulfide ores between 1942 and 1958. A sulfide flotation mill was constructed during this period, where the ore was refined and the resulting concentrate was shipped to off-site smelters. The remaining material was pumped to settling ponds, resulting in the formation of the tailing piles. Today, an orange iron-oxide rich "rind" covers the surface of TP-1 and TP-2 to a depth of one to two feet below the tailings surface. Below this oxidized cap, a uniform layer of black sulfide-rich anoxic tailing extends to the base of each pile.

The Elizabeth Mine is an historic resource that embodies the distinctive landscape, engineering, and architectural resources that are characteristic of an early nineteenth- to mid-twentieth-century American metal mining and processing site. It constitutes one of the largest and most intact historic mining sites in New England and includes the only intact cluster of hard-rock mining buildings in the region. The Elizabeth Mine was the site of a major nineteenth century U.S. copperas manufacturing plant and is associated with successful patents for copperas production. It is also associated with a number of significant commercial, scientific, and political figures, including Isaac Tyson, Jr., a Baltimore, Maryland-based chemical and mining figure who was recently inducted into the American Institute of Mining, Metallurgical and Petroleum Engineers' (AIME) Mining Hall of Fame. EPA has determined the Elizabeth Mine Site to be eligible for listing on the National Register of Historic Places. As part of the RI, EPA has documented the historic resources at the Site in several reports that are contained in the Administrative Record for the Site.

Use This Space to Write Your Comments

EPA encourages you to provide your written comments and ideas about the cleanup options under consideration for dealing with the contamination at the Elizabeth Mine Superfund Site. You can use the form below to send written comments. If you have questions about how to comment, please call ***EPA Community Involvement Coordinator Pam Harting-Barrat at 617.918.1318***, or toll-free at 1-888-372-7341 ext. 81318**.** Please mail this form or additional sheets of written comments, postmarked no later than August 11, 2006 to:

Edward Hathaway, Remedial Project Manager
U.S. Environmental Protection Agency Region I,
Mailcode: HBT
1 Congress Street, Suite 1100
Boston, MA 02114 - 2023
or E-Mail to:hathaway.ed@epa.gov

----------(Attach sheets as needed) Comment Submitted by: