Ely Copper Mine Superfund Site

Vershire, VT

U.S. EPA | SUPERFUND CLEANUP PROGRAM AT EPA NEW ENGLAND

THE SUPERFUND PROGRAM *protects human health and the environment by investigating and cleaning up often-abandoned hazardous waste sites and engaging communities throughout the process. Many of these sites are complex and need long-term cleanup actions. Those responsible for contamination are held liable for cleanup costs. EPA strives to return previously contaminated land and groundwater to productive use.*

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA, as the lead agency, will be accepting public comments on this proposed cleanup plan from August 28, 2015 through September 28, 2015. EPA wants to hear from you before making a final decision on how to protect your community. EPA is also requesting comment on the Technical Impracticability Waiver for groundwater and EPA's finding regarding possible adverse effects to historic resources. See pages 3 and 4 for more details. Comments can be sent by mail, email, or fax. People also can offer oral or written comments at the formal public hearing (see page 10 for details).

PUBLIC INFO MEETING & FORMAL PUBLIC HEARING
TUES 9/22/15 • 7 PM
Vershire Town Center Building
27 Vershire Center Rd
Vershire, VT 05079

If you have specific needs for the public meeting or hearing, questions about the facility and its accessibility, or questions on how to comment, please contact Pamela Harting-Barrat whose contact information is provided below.

CLEANUP PROPOSAL SNAPSHOT

The Proposed Cleanup for the OU2/OU3 Underground Workings (hereafter referred to as "Underground Workings") at the Ely Copper Mine Superfund Site generally includes:

- Filling the Deep Adit, Shaft #4, Burleigh Shaft, and Pollard Adit to prevent the release of acid mine drainage from these features;
- Passive treatment of the discharge from the Main Adit;
- Land use restrictions to prevent consumption of groundwater contaminated by the Underground Workings and
- Long-term monitoring of surface water and groundwater.

continued >

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The proposed cleanup also includes measures to minimize impacts to the federally threatened Northern Long-Eared Bat and State Threatened/Endangered bat species; along with the historic resources at the Site. The proposed cleanup action is estimated to cost approximately $3.375 million in net present value and require 1 year of construction activity. "Present value" is the amount of money set aside today to ensure that enough money is available over the expected life of the project, assuming certain economic conditions (e.g., inflation). A more detailed description of this proposal is outlined in this document.

A CLOSER LOOK AT EPA'S PROPOSED CLEANUP APPROACH

Scope and Role of this Cleanup Action

EPA often creates operable units (OUs) to enable cleanup actions to move forward on certain areas of a site while allowing additional investigation in other areas of a site. Four OUs have been created for the Ely Copper Mine Site. The location and general study area for the Ely Copper Mine Site is shown in Figure 1 and the OUs are shown on Figure 2.

- OU1 – waste piles (waste rock, tailing, roast beds) and associated soil, surface water, and sediment contamination. A cleanup decision was made for OU1 in September 2011. EPA is currently developing a design for the OU1 cleanup.
- OU2 – Underground Workings on property currently owned by Ely Mine Forest, Inc. and associated discharge from shafts and adits. This OU is the subject of this proposed cleanup plan.
- OU3 – Underground Workings on property currently owned by Green Crow Corporation. This OU is also the subject of this proposed cleanup plan.
- OU4 – Smelter/slag area, sediment contamination in Schoolhouse Brook, and groundwater contamination on property currently owned by Ely Mine Forest, Inc. This OU remains under investigation and will be the subject of a future cleanup plan.

The Ely Copper Mine OU2/OU3 Remedial Investigation/Feasibility Study Report (RI/FS) supplements the RI developed for the OU1 cleanup (OU1 RI Report) and provides additional delineation of the nature and extent of the contamination associated with the OU2/OU3 areas of the Site. The OU2/OU3 FS evaluated different combinations of cleanup options (also called "alternatives") to restrict access to, contain and/or treat contamination to protect human health and the environment.

Based upon the alternatives evaluated in the FS, EPA is proposing the following long-term cleanup approach for the Underground Workings. Each component of the proposed cleanup approach, including any specific notices regarding historic resources and technical impracticability waivers, is outlined below and is discussed in the OU2/OU3 RI/FS in greater detail.

Proposed Cleanup Approach (UW-2): Deep Adit Filling and Groundwater Use Restrictions

The selected cleanup alternative includes actions to address the groundwater contamination within the Underground Workings as well as actions to address the discharge of contaminated water from adits associated with the Underground Workings to surface water.

UW-2 OU2/OU3 Underground Workings Groundwater Cleanup Proposal:

EPA determined that it was technically impracticable from an engineering perspective to restore the groundwater within the Underground Workings to Vermont Primary Groundwater Quality Standards, promulgated in the Vermont Groundwater Protection Rule and Strategy. Therefore EPA is waiving the requirement to achieve these standards. EPA has also determined that it is technically impracticable from an engineering perspective to restore groundwater within the Underground Workings to the federal risk-based standards for cobalt, iron and manganese. Based on the finding of technical impracticability, the focus of the cleanup action for the groundwater within the Underground Workings will be to prevent consumption of this water and to limit the migration of the contaminated water into the adjacent bedrock aquifer. Alternative UW-2 will address groundwater contamination through Institutional Controls (land use restrictions), rather than through cleaning up the water in the Underground Workings to the risk-based standards. Institutional Controls will prevent consumption of or contact with contaminated groundwater within the Underground Workings. Preventing the installation of water extraction wells within the land use restriction area will also eliminate any pumping stress that could cause the migration of the contaminated groundwater within the Underground Workings into surrounding areas of uncontaminated groundwater. The cleanup approach also includes long-term monitoring of the Institutional Controls, groundwater, and nearby residential wells. Figure 3 shows the extent of the Technical Impracticability Zone (TI Zone), where groundwater cannot be restored, and the current extent of the area where extraction of the groundwater would be

restricted. Figure 4 shows the TI Zone in cross-section. The pre-design and design studies will evaluate whether the groundwater restriction zone should be extended along a possible fracture zone to prevent groundwater use within that zone. Additional groundwater sampling, well installation and geophysical surveys are likely to be included in the pre-design program. The possible fracture zone is shown in Figure 3.

UW-2 OU2/OU3 Adit Discharge Cleanup Proposal:

The Deep Adit and Main Adit are two features of the OU2/OU3 Underground Workings that are known to discharge contaminated water to surface water. The proposed cleanup approach for the Deep Adit would consist of filling the adit void to eliminate the source of the surface water discharge. The Burleigh Shaft is part of the Deep Adit and may also be filled to further reduce the source of contamination. Any fill material used will be non-acid generating and, if practical, fill with alkalinity that can buffer the acid will be used to further limit the generation of acid mine drainage. If the Burleigh Shaft is determined to be habitat for threatened or endangered bats, any cleanup action associated with this feature will be coordinated with the United States Fish and Wildlife Service (USFWS) and Vermont Fish and Wildlife Department (VTFW). The Main Adit is connected to the Main Shaft, which is habitat for threatened and endangered bats. As a result, the proposed cleanup plan includes a passive surface water treatment system to treat the discharge from the Main Adit without changing the air flow in the Main Shaft. A limestone drain or passive treatment system would be installed to increase the pH and precipitate and/or filter the metals within the discharge from the Main Adit. In addition, it is possible that the Pollard Adit and Shaft #4 may contribute to groundwater and surface water contamination. The contribution of these features cannot be confirmed because the discharge from the waste piles of the Upper Waste Area dominates the chemistry of the surface water and groundwater in the area of these features. The Upper Waste Area will be removed as part of the OU1 cleanup. Once uncovered, if the Pollard Adit and Shaft #4 are determined to be a source of groundwater or surface water contamination, they would also be filled. Long-term monitoring of the surface water would be performed to confirm whether the cleanup is successful. If the residual drainage from the Deep Adit does not achieve the cleanup levels, a passive treatment system would be installed to reduce the concentrations in the discharge to cleanup levels. Long-term monitoring of bat populations will also be included to confirm that no significant changes in bat habitat have occurred as a result of the cleanup action. Bat grates may be installed on mine openings, including the Main Shaft and Pollard Shafts, that are considered bat habitat to protect threatened and endangered bat populations. Other mitigation measures to address the potential impact of the cleanup on bat populations may be considered after consultation with USFWS and VTFW.

EPA will also work with historic preservation experts, in consultation with the Vermont State Historic Preservation Office (SHPO), to design the closure of the adit and shaft openings to take into consideration the requirements of the National Historic Preservation Act.
Figure 5 shows the cleanup plan for the Main Adit and Figure 6 shows the cleanup plan for the Deep Adit.

The entire OU2/OU3 proposed cleanup would also include the development of a cleanup design and the performance of Five Year Reviews to ensure that the remedy remains protective of human health and the environment. The estimated capital cost for alternative UW-2 is $2.617 million. The estimated present value of operations, maintenance, monitoring, and Five-Year Reviews is $758,000 with an estimated average annual operation, maintenance, and monitoring cost of $40,000 per year. The estimated total present value of this proposed cleanup approach, including construction, operation and maintenance, and long-term monitoring is approximately $3.375 million.

POTENTIAL COMMUNITY IMPACTS

Potential Impacts

Alternative UW-2 would require the filling of the Deep Adit and Burleigh Shaft and possibly the Pollard Adit and Shaft #4. These Underground Workings are not directly connected to the Main Shaft and, therefore, are not considered habitat for the threatened or endangered bats (which use the Main Shaft as a winter hibernation area). Some truck traffic would be required to bring in the material to fill the Deep Adit and any other features that are to be filled. There would also be some limited disturbance relating to access roads, the potential clearing of some trees that will need to be removed to implement the cleanup, and the installation of additional monitoring wells to refine the limits of the groundwater use restriction area.

EPA is Asking for Public Comment on the Following Proposed Determinations:

Impacts to the Historic Resources

Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470f), requires EPA to take into account the effects of all actions on

historic properties that are eligible for the National Register of Historic Places. The EPA has determined that Ely Copper Mine and its associated on-site historic structures are eligible for the National Register of Historic Places. The areas with potential impacts to historic resources relating to the OU2/OU3 cleanup proposal are within the area delineated in the OU1 Record of Decision as the Area of Potential Effect. The design and implementation will attempt to minimize the adverse effect of the cleanup action on these features, to the extent practicable. To the extent adverse effects are unavoidable, mitigation measure may be taken, in consultation the VT SHPO. More detailed information on impacts to historic resources at the Site can be found in the OU2/OU3 RI/FS.

Technical Impracticability Waiver

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 the Vermont Primary Groundwater Protection Standard for manganese, promulgated in the Vermont Groundwater Protection Rule and Strategy (VT Env. Prot. Rules, Chapter 12), for the water within the Underground Workings. Therefore, EPA is waiving these standards as applicable or relevant and appropriate cleanup requirements for the groundwater within the Underground Workings. This waiver applies to all potential groundwater contaminants that exceed these standards (specifically manganese) which have been detected in the groundwater of the Underground Workings at concentrations above 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. EPA has determined that there are no practicable actions that would result in the water within the Underground Workings consistently achieving groundwater standards and being suitable for use as a drinking water supply. For the same reasons, EPA has also made a determination that federal risk-based standards for cobalt, iron and manganese cannot be achieved within the TI Zone. Therefore, the OU2/OU3 cleanup will not be expected to achieve the federal risk-based standards in the TI Zone. EPA retains the VT Primary Groundwater Quality Standards and federal risk-based standards (along with Federal drinking water standards) as action-specific monitoring standards for the groundwater beyond the edge of the TI Zone and as the basis for requiring Institutional Controls that will prevent potential exposure to the contaminated groundwater within the TI Zone. EPA has determined that contaminated groundwater within the Underground Workings is not causing the adjacent bedrock aquifer to exceed federal or state drinking water or groundwater standards. The remedy also includes a well-restriction zone around the TI Zone that will prevent wells from being installed that may draw contaminated groundwater out from the Underground Workings. Therefore the proposed remedy incorporating this waiver is protective of human health and the environment as long as Institutional Controls are implemented to prevent the extraction of groundwater from locations within the Underground Workings or in a location that could cause the contaminated groundwater in the Underground Workings to migrate to the well. A more detailed discussion of the Technical Impracticability Waiver can be found in Appendix A of the OU2/OU3 RI/FS. The expected extent of the area subject to the Technical Impracticability Waiver and the extent of the proposed Institutional Controls are shown on Figure 3. A cross-sectional view of the TI Zone is shown in Figure 4. The final boundary of the area to be restricted will be determined as part of the Remedial Design process.

SITE DESCRIPTION AND HISTORY

Ely Copper Mine is an abandoned copper mine located in Vershire, Orange County, Vermont, that encompasses about 350 acres. The Site contains an estimated 180,000 cubic yards of waste rock, tailings, roasted ore, slag heaps, smelter wastes, and over 3,000 linear feet of mostly flooded Underground Workings. No buildings remain at the Site. Remnant foundations, pads, and stone walls, including a 1,400-foot-long smoke flue, demark the location of former site structures such as the former flotation mill and the smelter plant.

The ore body was discovered in 1813 and explored in the 1830s. Significant mining activities began in 1853 and lasted until 1905. Mineralogy of the ore body was similar to that in other mines that are part of the Vermont Copper Belt, with ore consisting primarily of pyrrhotite, chalcopyrite and minor pyrite and sphalerite. Prior to 1867, ore was shipped to smelters along the East Coast for processing. On-site smelting operations began in 1867 and were expanded over time to include a large 24-furnace smelter plant. During World War I, a flotation separation mill was constructed and operated for a short period. During World War II, some waste ore from the Ely Copper Mine was transported to the Elizabeth Mine for processing.

There are 12 shafts, adits, vents or other openings that were evaluated as part of

ELY COPPER MINE SITE TIMELINE

1830's - 1905:	Intermittent operation of Underground Workings, roast beds, and smelter. The Ely Copper Mine was most active from 1866 to 1881.
1917-1918:	Flotation mill processing of waste rock piles.
1949-1950:	Waste rock hauled to Elizabeth Mine for processing.
2001:	Placement of Ely Copper Mine on National Priorities List.
2010:	EPA and VT DEC reach settlement agreement with Ely Mine Forest, Inc.
2011:	EPA completed OU1 RI/FS and signed Record of Decision for OU1 and Early Action Decision for OU2 (establish ICs to prevent groundwater use).
2011- :	Design for OU1 cleanup is ongoing.
2015:	OU2 and OU3 RI/FS completed and cleanup proposal released.

the OU2/OU3 RI. These 12 features represent all of the known surface expressions of the Underground Workings. The locations of the Underground Workings and these related surface features are shown in Figure 7. The relationship of these features to the surficial waste rock piles is shown in Figure 8. Figure 9 shows the Underground Workings using a cross-section.

The Main Shaft of the mine is the uppermost opening located along the steep slope above the Upper Waste Rock Piles at an elevation of approximately 1,385 feet. The Main Shaft entrance is approximately 10 feet high and 30 feet wide, and descends underground into the hillside approximately 3,000 feet to the northeast and descends some 1,500 feet vertically at an angle of approximately 25 degrees. Based on ongoing bat population surveys performed by the VTFW, the Main Shaft is believed to be important bat habitat (including VT and federal endangered or threatened species). The flooded level of the mine is estimated at approximately 1,275 feet above sea level.

The Main Adit (also known as the 1861 Pollard Adit) consists of a stone-lined tunnel with sloping sides. The original stonework has partially collapsed, partially obscuring the entrance. The portion of the Main Adit uphill of the opening appears to be partially intact, but the extent of the collapse and structural integrity of the tunnel is unknown. The 1850's Pollard Shaft and Shaft II are located along the Main Adit prior to its terminus at the Main Shaft. Based on ongoing bat population surveys performed by the VTFW, the Main Adit is believed to be associated with important bat habitat (including Vermont and federal endangered or threatened species) in the Main Shaft because it may influence air flow and temperature in the Main Shaft. Ponded surface water is typically visible in the collapsed entrance of the Main Adit with intermittent flow. Discharge from the Main Adit is presumed to infiltrate to overburden groundwater in the Upper Waste Area and be transported downgradient to a surface water discharge point within the Ely Brook watershed. Sample location SW-100 (Figure 7), is the location where samples of the surface water discharge from the Main Adit are collected.

The Deep Adit is located at the southern end of the Underground Workings. This adit has collapsed, but its approach is visible as a north-south gully with a low retaining wall. The historic information suggests that Deep Adit may have been terminated after about 400 linear feet but the plan view and cross-section generated by the USGS in 1943 suggests that it may be almost 600 feet long. Water discharges from the adit, but it is believed to be inaccessible to bats or other wildlife. The Deep Adit discharges the largest volume of surface water that is directly attributed to the Underground Workings. This discharge forms an ephemeral stream that flows to its discharge point at Pond 5, and ultimately to Ely Brook Tributary-2 (Figure 8). The Burleigh Shaft is part of the Deep Adit and located in an approximate 7 foot by 10 foot, bowl-shaped depression and descends to the east at an approximate 15-degree angle. The condition of the Burleigh Shaft beyond the entrance is unknown. It is also unknown whether the Burleigh Shaft is bat habitat.

Shaft #4 is an isolated area where ore was extracted. The entrance has collapsed and the extent of the underground opening is not known. It is not believed to be habitat for bats.

The 1850s Pollard Adit entrance is obscured by waste rock and may be collapsed. Based on historic information, it appears to correspond with Adit II, which was installed 19 feet into bedrock and is likely entirely collapsed. Discharge from the 1850s Pollard Adit would be transported in surface water and overburden groundwater within the Ely Brook watershed. The likely surface water receptors for this discharge are Ely Brook Tributary-2 and/or Ely Brook Tributary-3. It is not a likely habitat for bats.

CURRENT & FUTURE LAND USE

The Site is currently unoccupied and privately owned. The land is undeveloped (with no residents or buildings on site) and has generally been undisturbed since the mining activities stopped. The primary use is for limited commercial timber harvest activities, but the Site is reportedly also frequented for limited recreational use by off-road vehicles, hunters, hikers, and spelunkers. Access is somewhat restricted by a gate across the main access road. Land use in the vicinity of the Site is rural residential and open space. The land surrounding the Site includes residences and forested area. There is no use of, or exposure to, groundwater within the Site. There is no current development within the Site property, although future residential use of portions of the Site property is possible.

WHY CLEANUP IS NEEDED

Acid mine drainage from the Underground Workings has mixed with the bedrock groundwater to create 32.4 million gallons of contaminated groundwater within the Main Shaft feature of the Underground Workings. The overall result is an area of groundwater that contains metals at levels exceeding federal and state criteria for groundwater and drinking water. Cobalt, iron, and manganese are the contaminants of concern in the Underground Workings groundwater.

The Deep Adit and Main Adit discharge low pH water with high concentrations of metals (aluminum, cadmium, copper, and zinc) that contribute to the ecological impacts to Pond 5, the tributaries of Ely Brook, and Ely Brook.

Human health and ecological risk assessments have been prepared for the Site (detailed risk summaries can be found in the OU2/OU3 Human Health Risk Assessment (HHRA) and the OU1 Baseline Ecological Risk Assessment (BERA)). These assessments use a number of possible contamination exposure scenarios to determine if and where there are current or potential future unacceptable risks.

Human Health Risks

Based on the OU2/OU3 HHRA, EPA has identified an unacceptable future potential risk to children and adults who may consume contaminated water associated with the Underground Workings in the future. The threat is based on assumed consumption of 2 liters of water for 350 days per year. As shown in Table 1, the level of cobalt is 3.7 times the level considered acceptable for regular consumption as drinking water. Iron and manganese are 9.4 and 5.7 times the level considered acceptable for regular consumption as drinking water. Contact with the soil, sediment, and surface water during recreational activities (riding off-road vehicles, wading, etc.) did not present an unacceptable risk to human health as documented in the 2011 OU1 HHRA. Fish consumption was not evaluated due to the low abundance of fish in the Site impacted portions of Schoolhouse Brook and Ely Brook.

HOW IS RISK TO PEOPLE EXPRESSED?

In evaluating risk to humans, estimates for risk from carcinogens and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as 1 x 10-4. The EPA acceptable risk range for carcinogens is 1 x 10-6 (1 in 1,000,000) to 1 x 10-4 (1 in 10,000). In general, calculated risks higher than this range would require consideration of clean-up alternatives.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). RfDs are developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse health effects. The exposure dose is divided by the RfD to calculate the measure known as a hazard index (HI) (a ratio). An HI greater than 1 suggests that adverse effects may be possible.

Table 1
Human Health Risk Assessment

Groundwater Contaminant of Concern	Concentration Detected in Underground Workings Groundwater (ug/l)	Hazard Quotient calculated in the OU2/OU3 Human Health Risk Assessment
Cobalt	22	3.7
Iron	132,000	9.4
Manganese	2,460	5.7

Table 2
Ecological Risk Hazard Quotients for Deep Adit

Surface water contaminant of Concern	Concentration detected in surface water discharge from Deep Adit (ug/l)	Hazard Quotient based on ratio of detected concentration to the concentration considered protective of aquatic organisms
Aluminum	23,700	2,721
Cadmium	13.70	12.1
Copper	10,100	1,174.4
Zinc	2,020	19

Table 3
Ecological Risk Quotients for Main Adit

Surface water contaminant of Concern	Concentration detected in surface water discharge from Main Adit (ug/l)	Hazard Quotient based on ratio of detected concentration to the concentration considered protective of aquatic organisms
Aluminum	4,750	54.6
Cadmium	2.70	2.39
Copper	2,140	249
Zinc	2,920	2.75

Table 4
Groundwater Monitoring Performance Standards

Contaminant of Concern	Groundwater Monitoring Performance Standard (ug/l)	Non-cancer Hazard Index for Cleanup Level	Basis for performance standard
Cobalt	6	1	Risk based concentration calculated to be protective of drinking water consumption by children.
Iron	14,000	1	Risk based concentration calculated to be protective of drinking water consumption by children.
Manganese	300	0.6	Risk based concentration calculated to be protective of drinking water consumption by children and interim Vermont Groundwater Protection Standard.

Table 5
Surface Water Cleanup Levels

Contaminant of Concern	Cleanup Levels (ug/l)	Basis
Aluminum	87	National Recommended Water Quality Criteria
Cadmium	1.13*	Vermont Water Quality Standards
Copper	8.6*	Vermont Water Quality Standards
Iron	1,000	Vermont Water Quality Standards
Nickel	52*	Vermont Water Quality Standards
Zinc	106*	Vermont Water Quality Standards

* Denotes COC whose cleanup level is based on the hardness of the receiving water. The cleanup levels are based on a hardness of 100 mg/l. If the hardness of the receiving water is greater than 100 mg/l, the cleanup level will be adjusted accordingly, as allowed by the regulation. Vermont Water Quality Standards, Appendix C (Nat. Res. Brd, Water Res. P. 12-004-052) NRWQC = National Recommended Water Quality Criteria. 2009.

Ecological Risks
Acid mine drainage associated with the discharge from the Underground Workings is contributing to the severe ecological impacts to fish communities and other forms of aquatic life in Pond 5, Ely Brook and its tributaries, as well as within Schoolhouse Brook. Specifically, the surface water discharge from the Deep Adit and Main Adit contain several metals in excess of federal and state water quality standards. These metals, particularly copper, are contributing to the ecological impacts as documented in the OU1 BERA. Tables 2 and 3 show that copper is detected at a concentration 1,174 times the level considered safe for aquatic organisms in the surface water discharge from the Deep Adit and 249 times the level considered safe for aquatic organisms in the surface water discharge from the Main Adit. Aluminum, cadmium, and zinc were also detected at concentrations that could be harmful for aquatic organisms. Figure10 shows the extent of ecological impacts to surface water associated with OU1 and the Underground Workings.

OU2/OU3 Underground Workings Remedial Action Objectives
Remedial Action Objectives (RAOs) are medium-specific goals that define the objective of remedial actions to protect human health and the environment. RAOs specify the contaminants of concern (COCs), potential exposure routes and receptors, and provide a general description of what the cleanup will accomplish. The RAOs are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the selected remedy for OU2/OU3 Underground Workings at the Ely Mine Site are:

Groundwater RAOs:

- Prevent potential exposure from ingestion/dermal contact by a current or future resident to concentrations of contaminants in excess of ARARs and risk-based standards within the compliance boundary for the TI Zone.

- Prevent migration of site contaminants in groundwater from beyond the edge of the compliance boundary of the TI Zone.

Surface Water RAOs:
- Prevent the discharge from the Underground Workings from causing Ely Brook and its perennial tributaries to fail to comply with Vermont's numerical and biological criteria for a Class B surface water and Class B numerical criteria in Pond 5.

Underground Workings Groundwater Monitoring Performance Standards
Since no groundwater cleanup is proposed, based on technical impracticability, monitoring performance standards for the contaminants of concern in groundwater were developed based on Maximum Contaminant Levels (MCLs) and non-zero MCLGs established under the Safe Drinking Water Act, federal risk-based standards, or more stringent State drinking water and/or groundwater standards. The groundwater monitoring performance standards will be used to confirm that contaminated groundwater within the TI Zone has not migrated beyond the TI Zone's compliance boundary into abutting areas of potable groundwater. The groundwater monitoring performance standards are listed in Table 4.

Surface Water Cleanup Levels:
The cleanup level for surface water will be the federal Clean Water Act National Recommended Water Quality Criteria and Vermont Water Quality Standards for a Class B surface water. These standards contain both numerical and biological criteria that should be met when the cleanup is complete. The numerical cleanup goals are listed in Table 5. The point of compliance for surface water is set at the point of perennial flow in the tributaries of Ely Brook or Pond 5.

CLEANUP ALTERNATIVES CONSIDERED

The screening of alternatives resulted in a limited set of cleanup options that would meet the Remedial Action Objectives and other cleanup criteria. A more detailed description and analysis of each alternative developed to address risks from contaminated groundwater and surface water is presented in the OU2/OU3 Feasibility Study Report, which is also available for public review. Outlined below is a synopsis of considered alternatives.

UW-1 (No Action):
This alternative would involve no action to prevent consumption of contaminated groundwater within the Underground Workings. This alternative would also involve no action to prevent the discharge of contaminated surface water from the Deep Adit and Main Adit. There are no capital or annual monitoring or maintenance costs associated with this alternative. There would be a cost to perform five year reviews of the alternative. The 30 year present value of the five year reviews would be $86,863.

UW-2 (Deep Adit Filling and Groundwater Use Restrictions):
This alternative is EPA's preferred alterna-

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses nine criteria to evaluate cleanup alternatives and select a final cleanup plan. EPA has already evaluated how well each of the cleanup alternatives developed for the Underground Workings at the Ely Copper Mine Superfund Site meets the first seven criteria in the OU2/OU3 Feasibility Study. Once comments from the state and the community are received and considered, EPA will select the final cleanup plan.

1. Overall protection of human health and the environment: Will it protect you and the plant and animal life on and near the site? EPA will not choose a cleanup plan that does not meet this basic criterion.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): Does the alternative meet all federal and state environmental statutes, regulations and requirements? The cleanup plan must meet this criterion.

3. Long-term effectiveness and permanence: Will the effects of the cleanup plan last or could contamination cause future risk?

4. Reduction of toxicity, mobility or volume through treatment: Using treatment, does the alternative reduce the harmful effects of the contaminants, the spread of contaminants, and the amount of contaminated material?

5. Short-term effectiveness: How soon will site risks be adequately reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?

6. Implementability: Is the alternative technically feasible? Are the right goods and services (i.e. treatment equipment, space at an approved disposal facility) available?

7. Cost: What is the total cost of an alternative over time? EPA must select a cleanup plan that provides necessary protection for a reasonable cost.

8. State acceptance: Do state environmental agencies agree with EPA's proposal?

9. Community acceptance: What support, objections, suggestions or modifications did the public offer during the comment period?

tive and is discussed in greater detail on page 2 of this Proposed Plan.

UW-3 (Deep Adit discharge active treatment and Groundwater Use Restrictions):
This alternative includes the collection and active treatment of the water discharged from the Deep Adit to eliminate the release of acid mine drainage from this feature. The treatment system would remove metals from the water prior to discharge to a surface water channel that drains to Pond 5. As with UW-2, all or portions of the Burleigh Shaft, Shaft #4, and the Pollard Adit will be filled or made safe. In addition, some of the Deep Adit may be filled to limit the volume of water that would require treatment. This alternative includes the use of low impact passive treatment to address the intermittent discharge from the Main Adit. A limestone drain or passive treatment system would be installed to increase the pH and precipitate and/or filter the metals from the Main Adit's discharge. As with UW-2, this alternative includes a Technical Impracticability Waiver of the chemical-specific ARARs (VT Groundwater Quality Standards), which otherwise would apply to the groundwater in the Underground Workings. This alternative also includes a finding that it would be technically impracticable to clean up the groundwater in the Underground Workings to achieve federal risk-based standards. Because the groundwater within the Underground Workings cannot be restored to groundwater or risk-based standards, the alternative includes the development of a groundwater use restriction zone and the implementation of Institutional Controls to prevent future consumption of or contact with the contaminated groundwater. The Institutional Controls could be in the form of environmental restrictive covenants on individual properties or local ordinances or some combination. The alternative would be designed to avoid any adverse impact to the Northern Long-Eared Bat and other State-listed threatened or endangered bat species. The estimated capital cost for alternative UW-3 is $3.417 million. The estimated present value of operations, maintenance, monitoring, and Five-Year Reviews is $1,731,000 with an estimated average annual operation, maintenance, and monitoring cost of $119,000 per year. The estimated total present value of this proposed cleanup approach, including construction, operation and maintenance, and long-term monitoring is approximately $5.148 million. Figure 11 shows the major components of UW-3.

UW-4 (Deep Adit discharge passive treatment and Groundwater Use Restrictions):
This alternative includes the collection and passive treatment of the water discharged from the Deep Adit to eliminate the release of acid mine drainage from this feature. The treatment system would use a sulfide reducing bacteria approach to remove metals from the water prior to discharge to a surface water channel that drains to Pond 5. As with UW-2, all or portions of the Burleigh Shaft, Shaft #4, and the Pollard Adit will be filled or made safe. In addition, some of the Deep Adit may be filled to limit the volume of water that would require treatment. A low impact passive treatment would address the intermittent discharge from the Main Adit. As with UW-2 and UW-3, this alternative includes a Technical Impracticability Waiver of the chemical-specific ARARs (VT Groundwater Quality Standards), which otherwise would apply to the groundwater in the Underground Workings. This alternative also includes a finding that it would be technically impracticable to clean up the groundwater in the Underground Workings to achieve federal risk-based standards. This alternative also includes Institutional Controls to prevent groundwater use or contact. The alternative would be designed to avoid any adverse impact to the Northern Long-Eared Bat and other State-listed threatened or endangered bat species. The estimated capital cost for alternative UW-4 is $2.710 million. The estimated present value of operations, maintenance, monitoring, and Five-Year Reviews is $892,799 with an estimated average annual operation, maintenance, and monitoring cost of $55,000 per year. The estimated total present value of this proposed cleanup approach, including construction, operation and maintenance, and long-term monitoring is approximately $3.603 million. Figure 12 shows the major components of UW-4.

CLEANUP ALTERNATIVES COMPARISON

The alternatives were compared with each other to identify how well each alternative meets EPA's evaluation criteria. The following discussion presents a general comparison summary of the alternatives by media. Detailed evaluations and comparisons of alternatives are included in the Feasibility Study.

Overall Protection of Human Health and the Environment

The No Action Alternative UW-1 would not be protective of human health and the environment because it will allow future use of the contaminated groundwater within the Underground Workings and not reduce the discharge of acid mine drainage from the Deep Adit and Main Adit which would continue the negative ecological impacts to Pond 5, the tributaries to Ely Brook, and Ely Brook. Because EPA has determined that it is technically impracticable from an engineering perspective to restore the groundwater in the Underground Working to federal and state groundwater and drinking water standards, including risk-based standards, the restoration of the groundwater within the Underground Workings is not a Remedial Action Objective and is not a component of the evaluation of protectiveness. Alternative UW-2, UW-3, and UW-4 achieve protection of human health by preventing consumption of contaminated groundwater within the Underground Workings through the implementation of Institutional Controls and monitoring. Protection of the environment would be achieved by eliminating or treating the release of contaminated surface water from the Underground Workings. Alternative UW-2 would be the most protective because it includes actions to permanently reduce the release of contamination from the Deep Adit to surface water, while UW-3 and UW-4 would be dependent upon the maintenance of a treatment system for the sustained protection. The source control measures to address the Deep Adit are also a more reliable control measure to prevent the generation and release of contamination to surface water. All three action alternatives can be implemented in a manner to protect threatened/endangered bat habitat on the site.

Compliance with ARARs

The No Action Alternative UW-1, would not comply with ARARs as it would not include any measures to address surface water quality violations and would not include a waiver of the chemical-specific ARARs for the groundwater in the Underground Workings. The other alternatives would all comply with federal and state surface water quality regulations. The other alternatives would also be designed to minimize the impact to historic resources, to the extent possible, and minimize any impacts to the federally-endangered Northern Long-Eared Bat and other State threatened and endangered bat species. To ensure compliance with ARARs, EPA will be consulting with the USFWS and the VTFW regarding the measures to protect bats. The State Historic Preservation Office will be consulted regarding measures to protect historic resources.

A Technical Impracticability waiver is being invoked to waive legal requirements to clean up the groundwater within the Underground Workings to achieve chemical-specific ARARs standards. The Technical Impracticability waiver is included in alternatives UW-2; UW-3; and UW-4. The waiver applies specifically to the Vermont Groundwater Protection Standards.

Long-Term Effectiveness and Permanence

The No Action Alternative does not afford any degree of long-term effectiveness or

WHAT IS A FORMAL COMMENT?

EPA will accept public comments during a 30-day formal comment period. EPA considers and uses these comments to improve its cleanup approach. During the formal comment period, EPA will accept written comments via mail, email, and fax. Additionally, verbal comments may be made during the formal Public Hearing on September 22, 2015 during which a stenographer will record all offered comments during the hearing. EPA will not respond to your comments during the formal Public Hearing.

EPA will hold a brief informational meeting prior to the start of the formal Public Hearing on September 22, 2015. Additionally, once the formal Public Hearing portion of the meeting is closed, EPA can informally respond to any questions from the public.

EPA will review the transcript of all formal comments received during the hearing, and all written comments received during the formal comment period, before making a final cleanup decision. EPA will then prepare a written response to all the formal written and oral comments received. Your formal comment 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 plan, in a document referred to as the Record of Decision. The Responsiveness Summary and Record of Decision will be made available to the public on-line, at the Vershire Town Office, and at the EPA Records Center (see addresses below). EPA will announce the final decision on the cleanup plan through the local media and on EPA's website.

permanence. All of the other alternatives would be effective in the long-term. Each of the alternatives has some degree of residual risk due to contamination that will remain on-site within the Underground Workings, but this risk will be managed through Institutional Controls. The effectiveness of the groundwater component of the three other alternatives is dependent on the successful long-term compliance with the Institutional Controls to prevent the installation of water supply wells that could extract water contaminated by the Underground Workings. Alternative UW-2 has the higher degree of long-term effectiveness and permanence because it eliminates the source of acid mine drainage from the Deep Adit. The treatment of the acid mine drainage from the Deep Adit included in alternatives UW-3 and UW-4 will be effective in the long-term but the permanence is less than UW-2 as a result of the dependence upon maintenance. All of the three action alternatives have a similar level of effectiveness and permanence with respect to the passive treatment of the discharge from the Main Adit.

Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment

Alternatives UW-3 and UW-4 achieve the highest degree of reduction in contaminant toxicity, mobility, or volume through treatment with respect to the Deep Adit discharge. If an alkaline fill is used in alternative UW-2, the fill may also act to reduce the toxicity, mobility, or volume through treatment (acid neutralization) of any water remaining in the Deep Adit after it is filled. All three action alternatives would have equal reduction in contaminant toxicity, mobility, or volume through treatment as a result of the passive treatment of the Main Adit discharge. The No Action alternative would not achieve this criterion.

Short Term Effectiveness

Alternative UW-2 is expected to achieve the cleanup goals in the shortest time frame, although alternatives UW-3 and UW-4 would achieve cleanup goals upon successful completion and performance testing of the treatment systems. There will be a somewhat higher degree of short-term impacts associated with the implementation of the filling of the Deep Adit due to the truck traffic associated with transporting the fill material to the site. The remaining components of the alternative, along with alternatives UW-3 and UW-4, would have minimal impacts with respect to truck activity and community disturbance. The No Action alternative would not achieve cleanup levels in a reasonable time frame.

Implementability

All of the action alternatives can be implemented based on readily available materials and technology. Alternative UW-2 relies on being able to fill enough of the Deep Adit to prevent acid mine drainage from being generated and released. The implementability of Alternatives UW-3 and UW-4 relies on long-term operation and maintenance of the respective treatment systems for both alternatives.

Cost
The cost of Alternatives UW-2 and UW-4 are fairly similar, whereas, UW-3 is more expensive as a result of the construction of the active treatment system. Even though alternative UW-3 does not completely fill the Deep Adit, the alternative does include filling of Shaft #4, Burleigh Shaft, Pollard Adit, and a portion of the Deep Adit to limit the flow and chemistry that would have to be addressed by the passive treatment system to be used in alternative UW-4. These costs, along with the cost of the passive treatment system result in UW-4 having a slightly higher capital cost than UW-2. Alternative UW-2 would have the lowest annual maintenance costs and UW-3 would have the highest annual maintenance costs.

State and Community Acceptance
These criteria will be evaluated once feedback is received during the public comment period.

ACRONYMS

ug/l	Micrograms per liter
ARARs	Applicable and Relevant or Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
FS	Feasibility Study
OU	Operable Unit
RI	Remedial Investigation
TI	Technical Impracticability
USFWS	United States Fish and Wildlife Service
UW	Underground Workings
VTDEC	Vermont Department of Environmental Conservation
VTFW	Vermont Fish and Wildlife Department
VTSHPO	Vermont Historic Preservation Office

WHY EPA RECOMMENDS THIS PROPOSED CLEANUP PLAN

EPA believes the proposed cleanup plan for the Underground Workings at the Ely Copper Mine Superfund Site achieves the best overall balance among EPA's nine criteria (excluding state and community acceptance which will be considered following public comment) used to evaluate the various alternatives presented in the OU2/OU3 Feasibility Study. The proposed cleanup approach recognizes that restoration of the groundwater to drinking water standards within the Underground Workings is technically not possible. Therefore, the proposed cleanup approach includes the use of Institutional Controls to prevent consumption of the contaminated groundwater within a restricted zone around the Underground Workings to prevent exposing anyone to the contaminated water within the workings. The cleanup approach for the discharge from the Deep Adit targets the elimination of the acid mine drainage by filling the Deep Adit and associated Burleigh Shaft. This will eliminate this source of contamination and contribute to the cleanup plan developed for OU1. The proposed cleanup for the Main Adit seeks to balance minimal disturbance to the bat habitat by using passive treatment, such as a limestone drain, to reduce the acid mine drainage. The proposed cleanup action is protective of human health and the environment, and uses proven cleanup technologies to achieve the site-specific cleanup objectives in a reasonable timeframe. This cleanup approach provides both short and long-term protection of human health and the environment; attains or waives all applicable or relevant and appropriate federal and state environmental laws and regulations; reduces the toxicity, mobility, and volume of contaminated groundwater and surface water through treatment, to the maximum extent practicable; utilizes permanent solutions and uses land use restrictions to prevent unacceptable exposures in the future to the remaining site-related wastes that will be contained on-site.

The preferred cleanup approach would also minimize impacts to historic resources and bat habitat to the extent possible, and provide restoration or mitigation of unavoidable damage.

FOR MORE DETAILED INFORMATION:

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for the Ely Copper Mine Superfund Site is available for public review and comment at the following locations:

EPA Records and Information Center
5 Post Office Square, First Floor
Boston, MA 02109-3912
617-918-1440

Vershire Town Office
Town of Vershire
6894 VT Route 113
Vershire, VT 05079

Information is also available for review on-line at www.epa.gov/region1/superfund/sites/ely.

SEND US YOUR COMMENTS

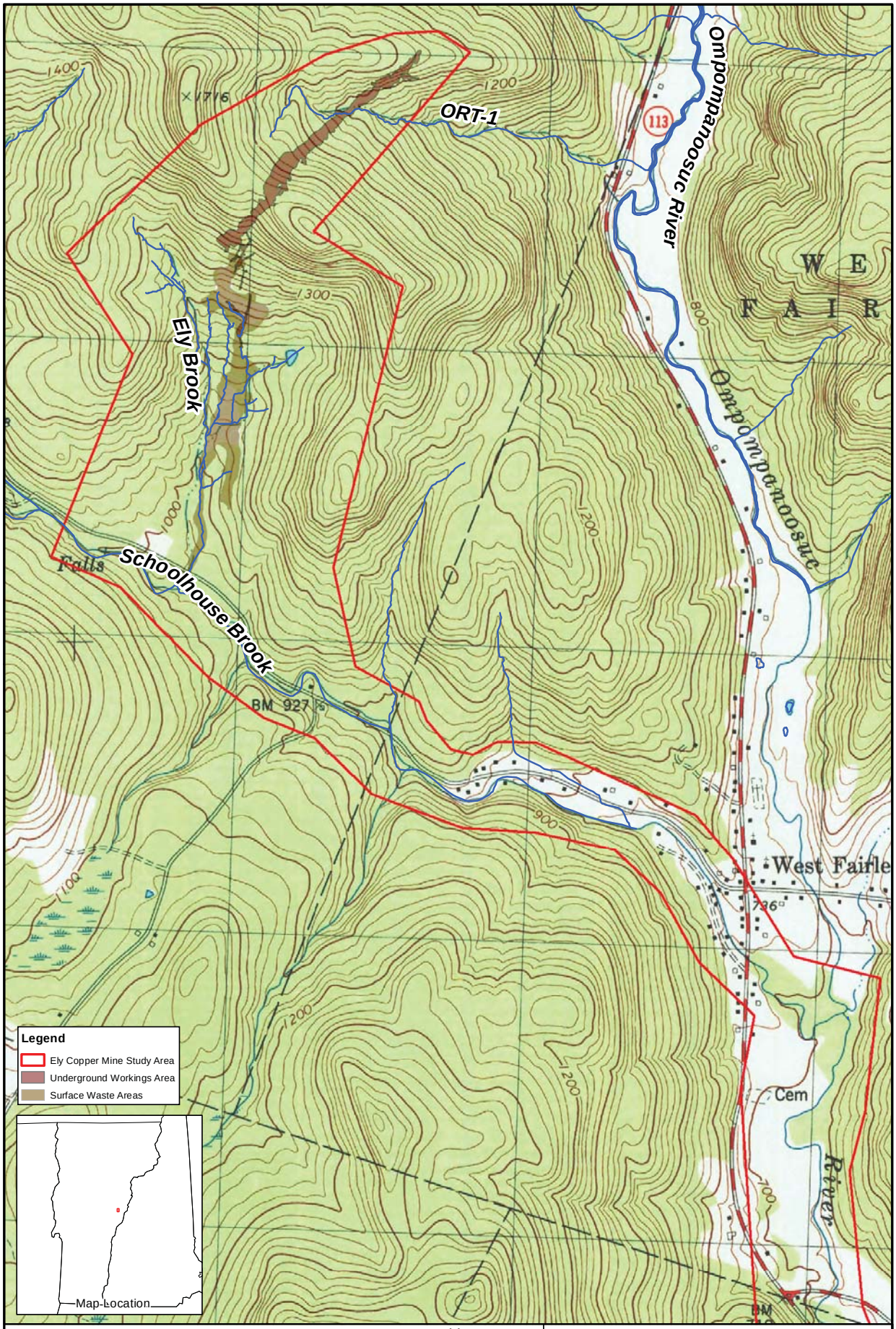
Provide EPA with your written comments about the Proposed Plan for the Ely Copper Mine Superfund Site by October 8, 2015.

Edward Hathaway, RPM
ME/VT/CT Superfund Section
5 Post Office Square
Suite 100 (OSRR07-1)
Boston, MA 02109-3912
Fax (617) 918-0372
Email: hathaway.ed@epa.gov

HOW WILL EPA PROTECT AGAINST AN UNCONTROLLED RELEASE OF WATER FROM THE DEEP ADIT?

Prior to any excavation activities associated with the Deep Adit, a pre-design investigation will be performed to better understand the conditions within the adit. The investigations will include the installation of wells to assess the amount of water and water pressure within the adit, geophysics to better underground the configuration of the adit, water quality sampling, and flow measurements. The design will include measures to remove water that is found to be confined in the currently buried Deep Adit portal prior to any disturbance of that portal. These measures are designed to limit or eliminate the potential for an uncontrolled release of water from the adit. Once the adit entrance is stabilized, a flow-through bulkhead would be installed to regulate the release of water from the adit to allow treatment of the water prior to it discharging to Ely Brook.

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the law that established the Superfund program, this document summarizes EPA's cleanup proposal. For detailed information on the cleanup alternatives evaluated for use at the Ely Copper Mine Superfund Site, see the OU2/OU3 Feasibility Study and other documents contained in the Site's Administrative Record, available for review at the Site information repositories listed on page 12.



Notes:

1. Topographic map from USGS Vershire, VT quadrangle, revised 1983.

2. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

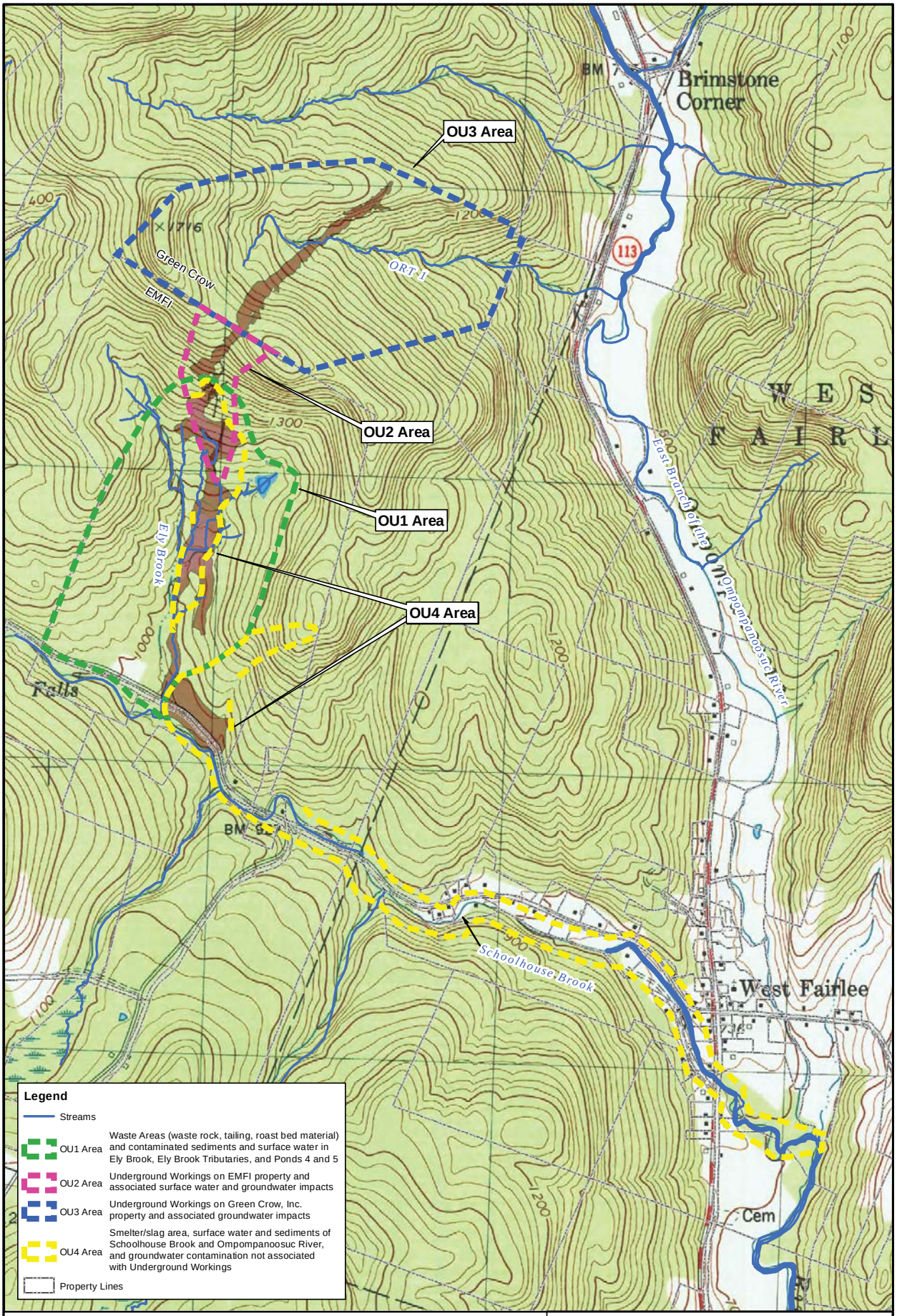
0 500 1,000 2,000

Feet

1 inch = 1,000 feet

N

Ely Copper Mine
Proposed Plan - Figure 1
Site Location



Notes

1. EMFI = Ely Mine Forest, Inc.

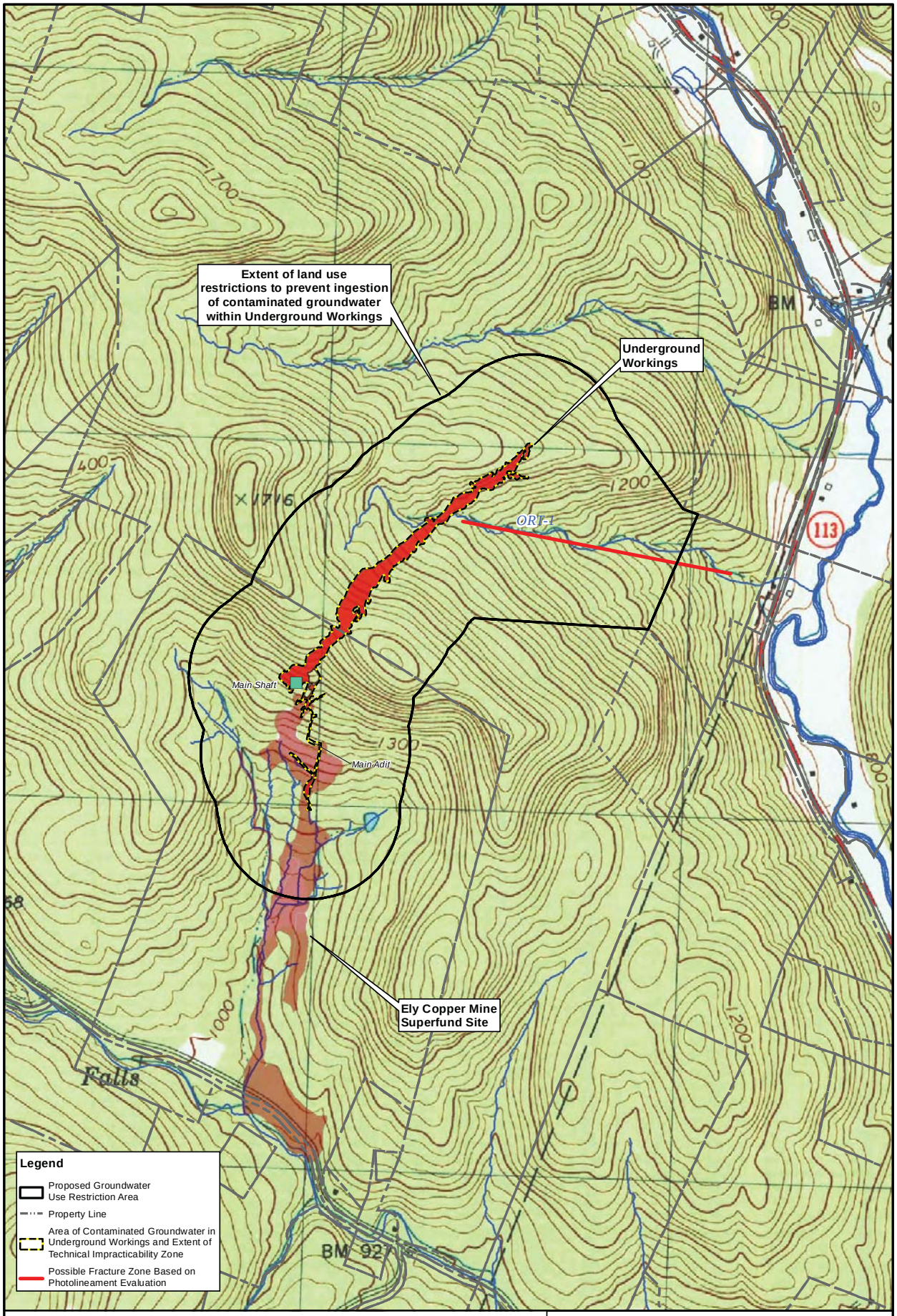
2. Property Lines are from Vermont Center for Geographic Information (VCGI). Topographic map from USGS Vershire, VT quadrangle, revised 1983.

3. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

0 500 1,000 2,000
Feet

N

Ely Copper Mine
Proposed Plan - Figure 2
Operable Units



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Feet
1 inch = 800 feet
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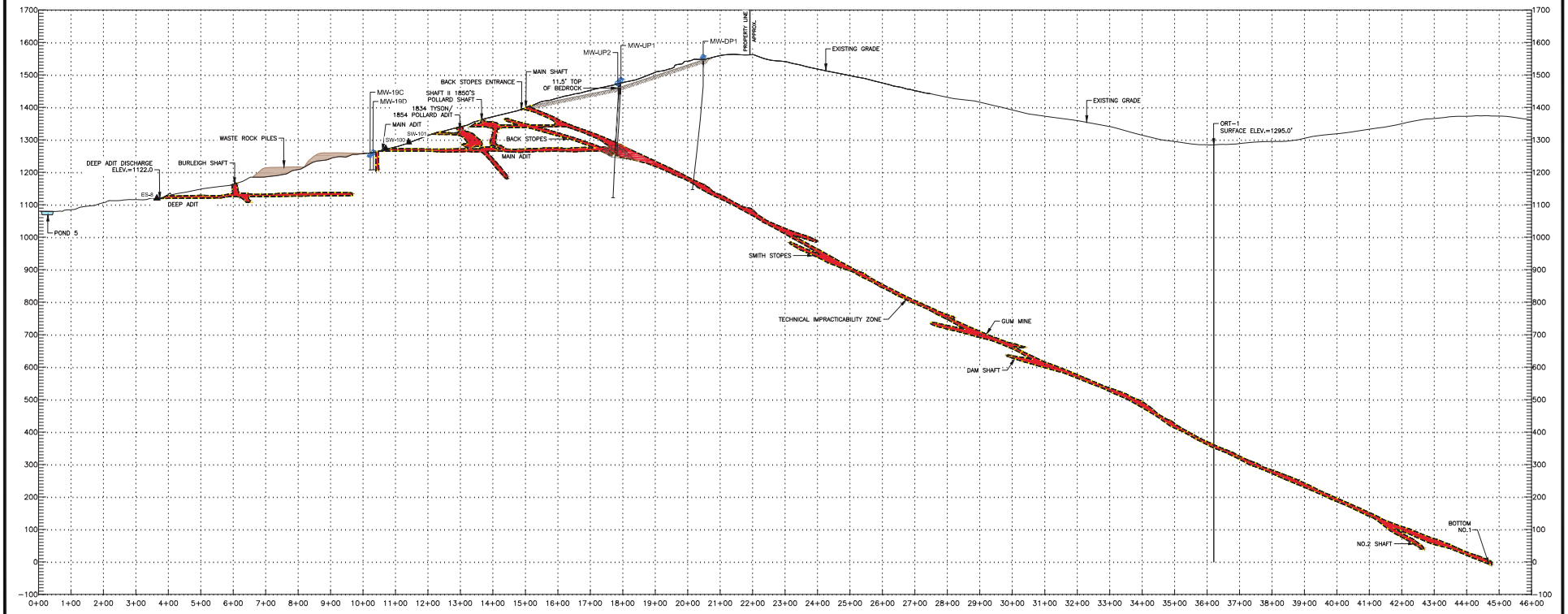
Ely Copper Mine Proposed Plan
Figure 3 - Underground Workings Technical Impracticability Zone and Proposed Groundwater Use Restriction Area



NOTES:

1. REFER TO FIGURE X FOR ADDITIONAL NOTES AND LEGEND.

LEGEND:

- MONITORING WELL
- SIGNIFICANT FRACTURE
- GROUNDWATER SURFACE
- TOP OF BEDROCK
- SW-101 SURFACE WATER SAMPLED FOR MINE WORKINGS INVESTIGATION
- TECHNICAL IMPRACTICABILITY ZONE

HORIZONTAL SCALE IN FEET 0 150' 300'

VERTICAL SCALE IN FEET 0 150' 300'

ELY COPPER MINE PROPOSED PLAN

FIGURE 4 - TECHNICAL IMPRACTICABILITY ZONE CROSS-SECTION

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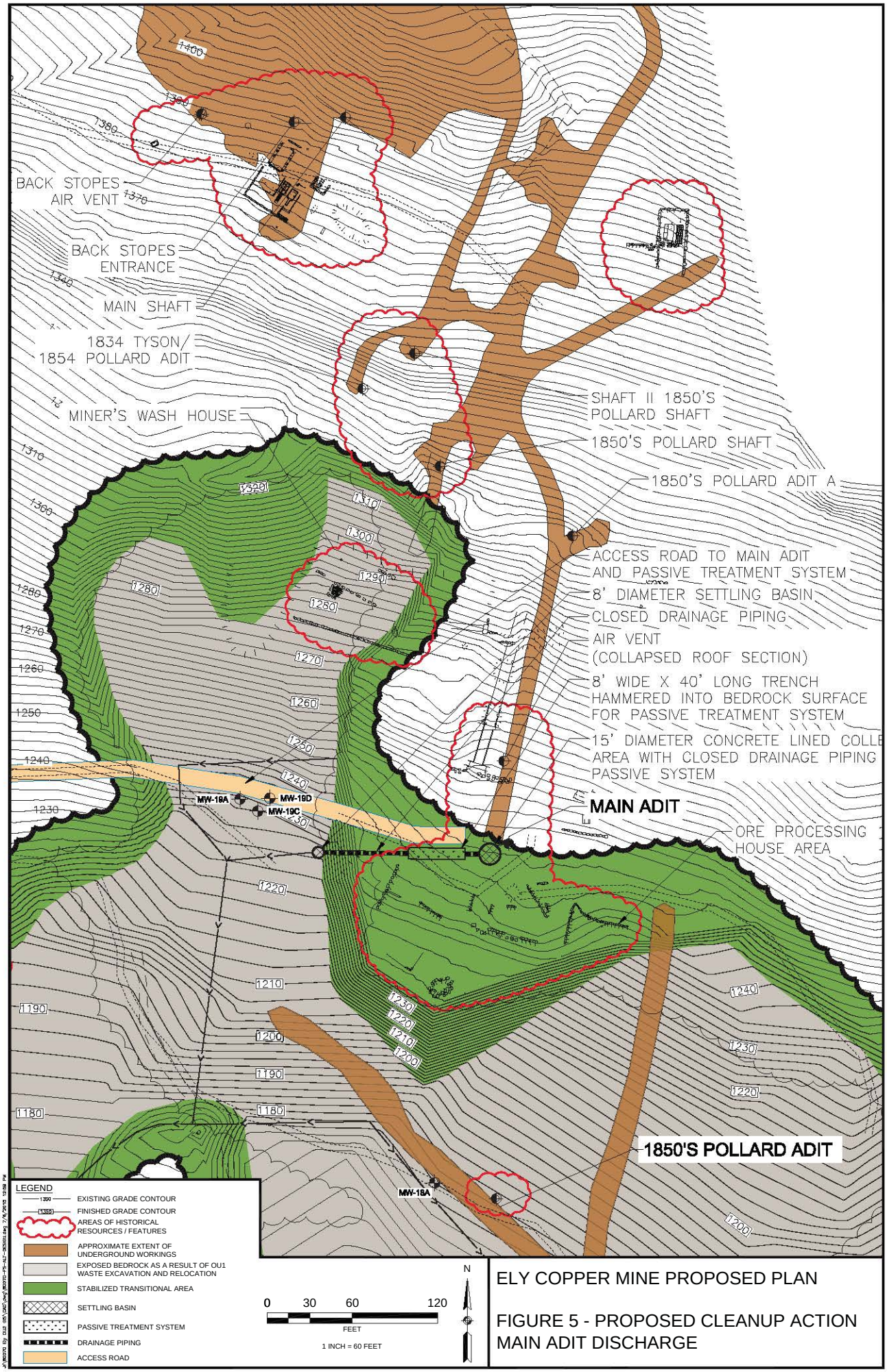

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FIGURE 5 - PROPOSED CLEANUP ACTION
MAIN ADIT DISCHARGE

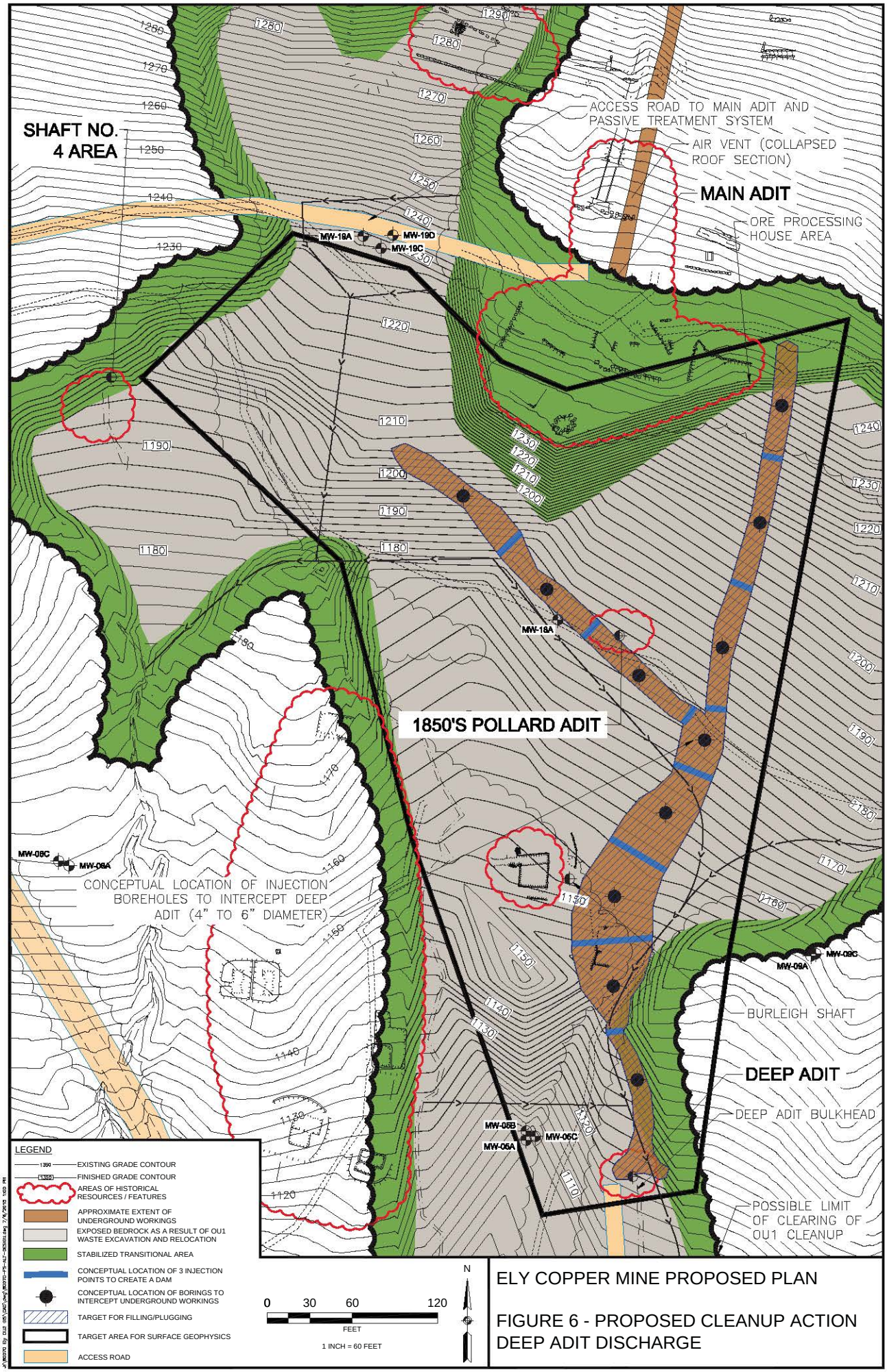

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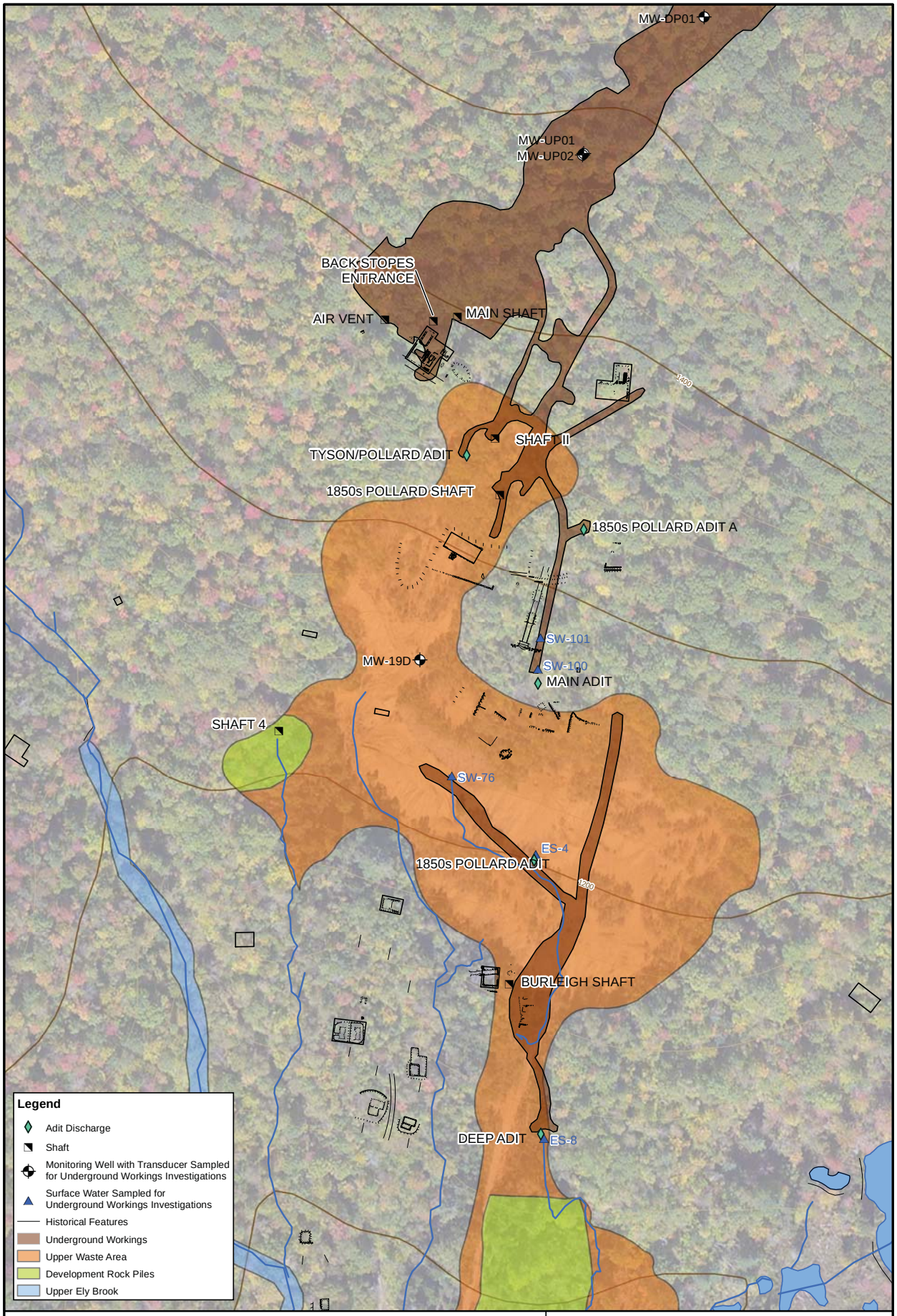
FIGURE 6 - PROPOSED CLEANUP ACTION DEEP ADIT DISCHARGE



Notes:

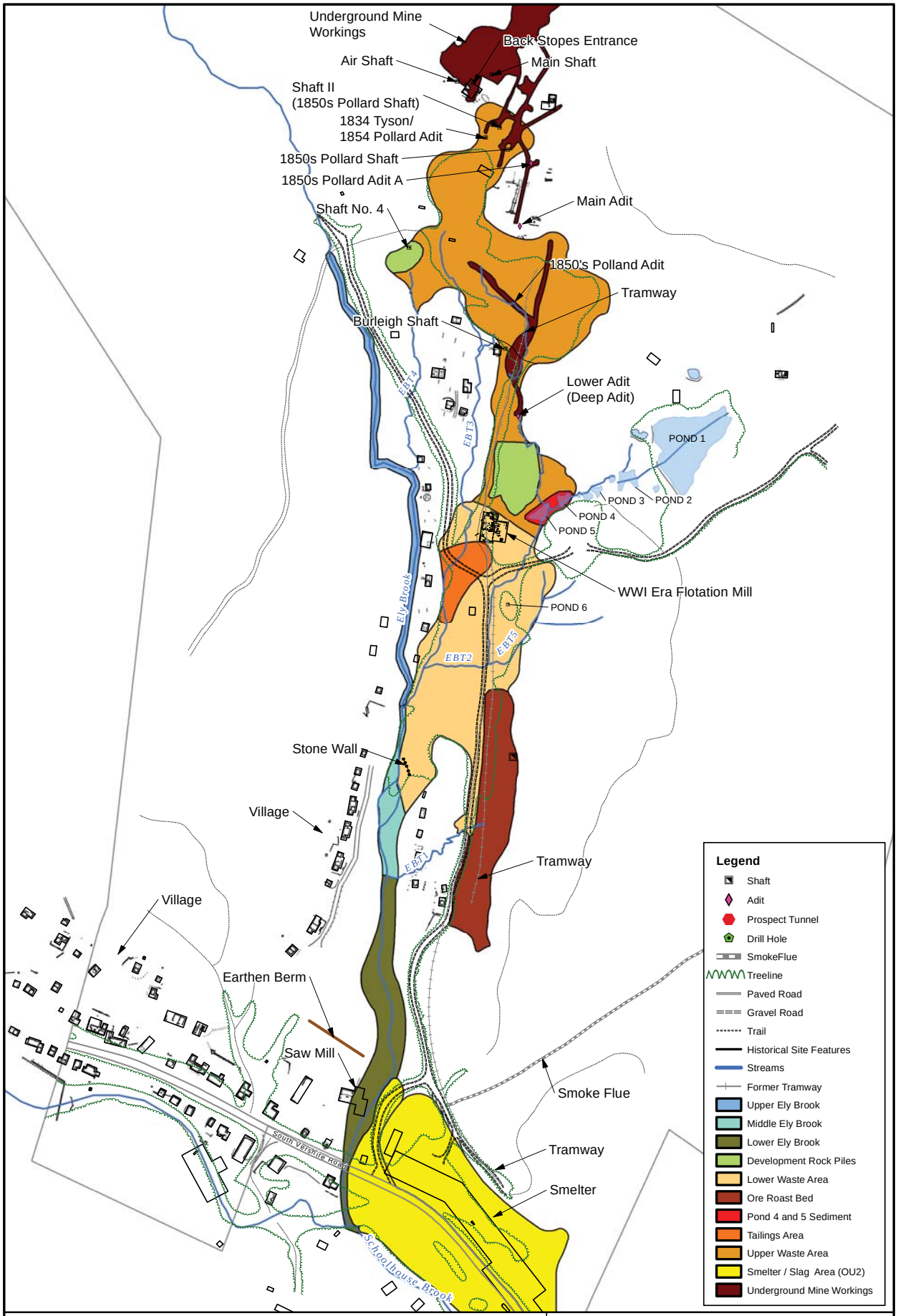
1. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

0 125 250
Feet

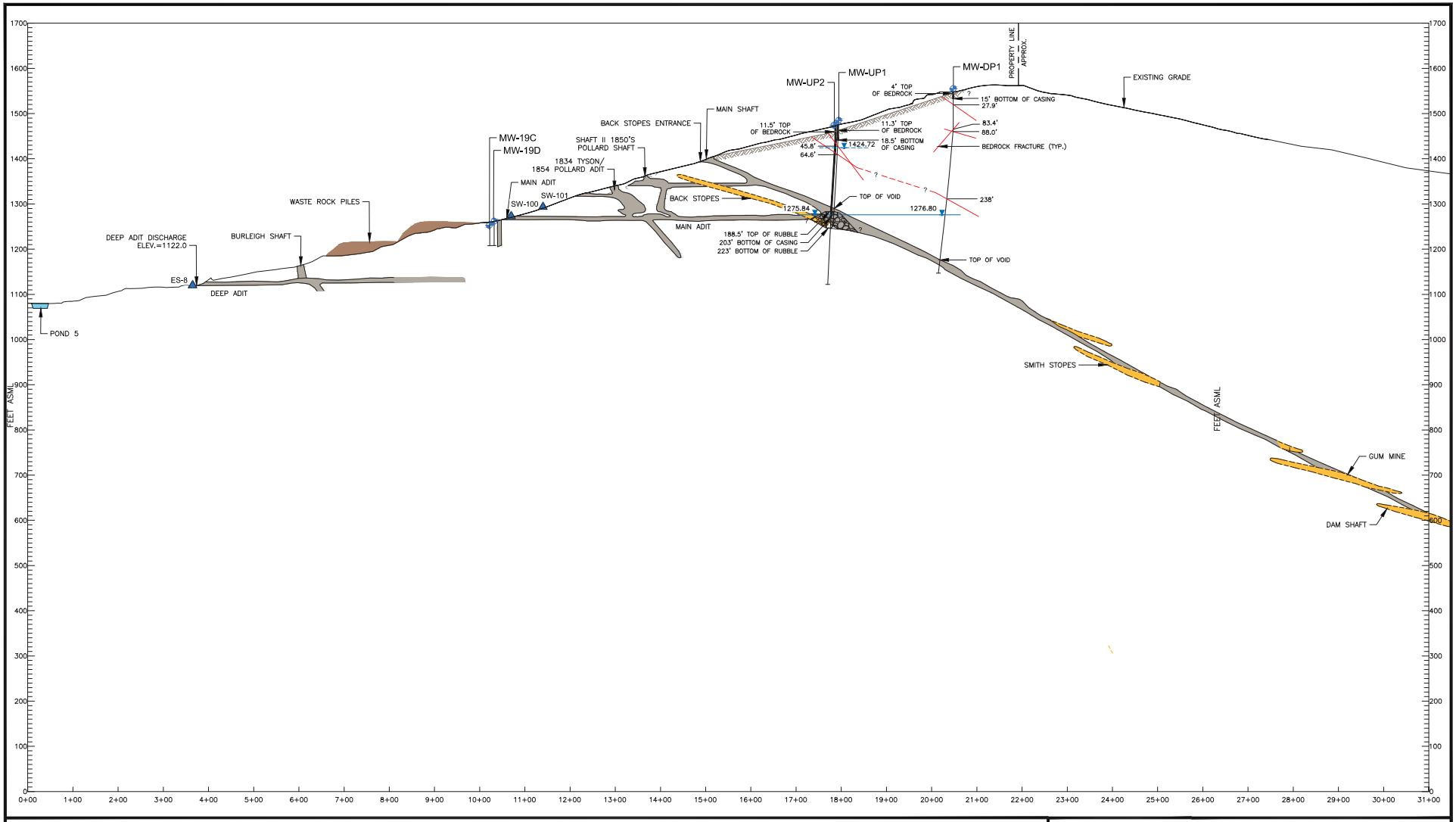
1 inch = 125 feet

N

Ely Copper Mine Proposed Plan
Figure 7 - Surface Features Associated with Underground Workings



Ely Copper Mine Proposed Plan
Figure 8 - Waste Areas and Underground Workings



NOTES:

1. ALL 3 BOREHOLES ARE DEVIATED TO THE SOUTHWEST FROM VERTICAL; ILLUSTRATION APPROXIMATE.
2. DETAILED GEOMETRY WHERE MW-UP1 AND MW-UP2 INTERSECT THE MAIN SHAFT IS MORE COMPLEX THAN SHOWING, WITH VOID, RUBBLE AND MORE COMPACT ROCK PRESENT. VARIATIONS BETWEEN THE TWO BOREHOLES ARE PRESENT.
3. SUBSURFACE INFORMATION IS BASED ON A 1944 UNITED STATES DEPARTMENT OF INTERIOR GEOLOGICAL SURFACE, "STRATEGIC MINERALS INVESTIGATIONS PRELIMINARY MAP PLATE 4".

LEGEND

- MONITORING WELL
- SIGNIFICANT FRACTURE
- GROUNDWATER SURFACE
- 1287.29 GROUNDWATER ELEVATION
- TOP OF BEDROCK
- SW-100 SURFACE WATER SAMPLED FOR MINE WORKINGS INVESTIGATION

HORIZONTAL SCALE IN FEET 0 100 200'

VERTICAL SCALE IN FEET 0 100' 200'

ELY COPPER MINE PROPOSED PLAN

FIGURE 9 - CROSS-SECTION OF UNDERGROUND WORKINGS

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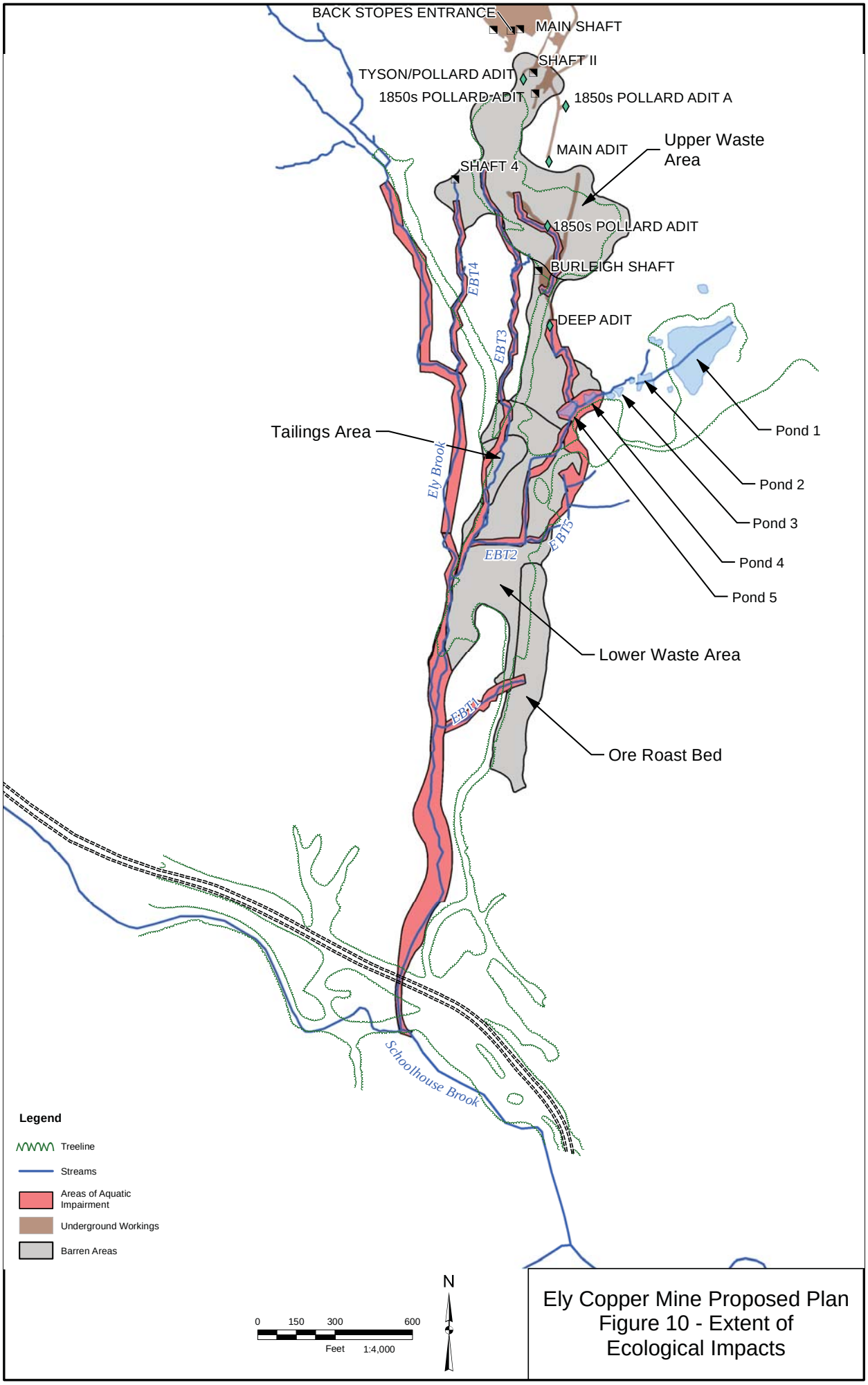

Ely Copper Mine Proposed Plan
Figure 10 - Extent of Ecological Impacts

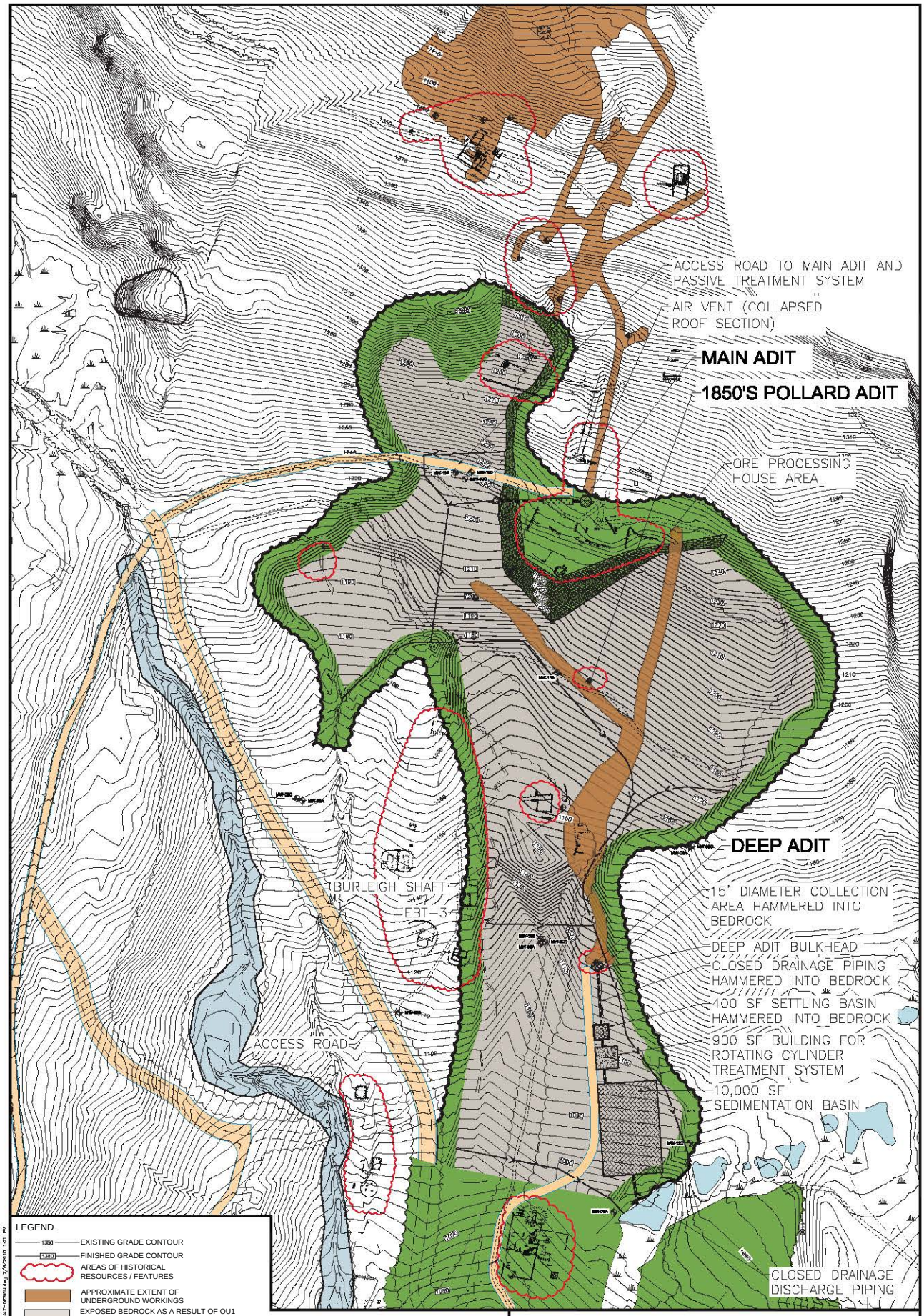

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FIGURE 11 - ALTERNATIVE UW-3

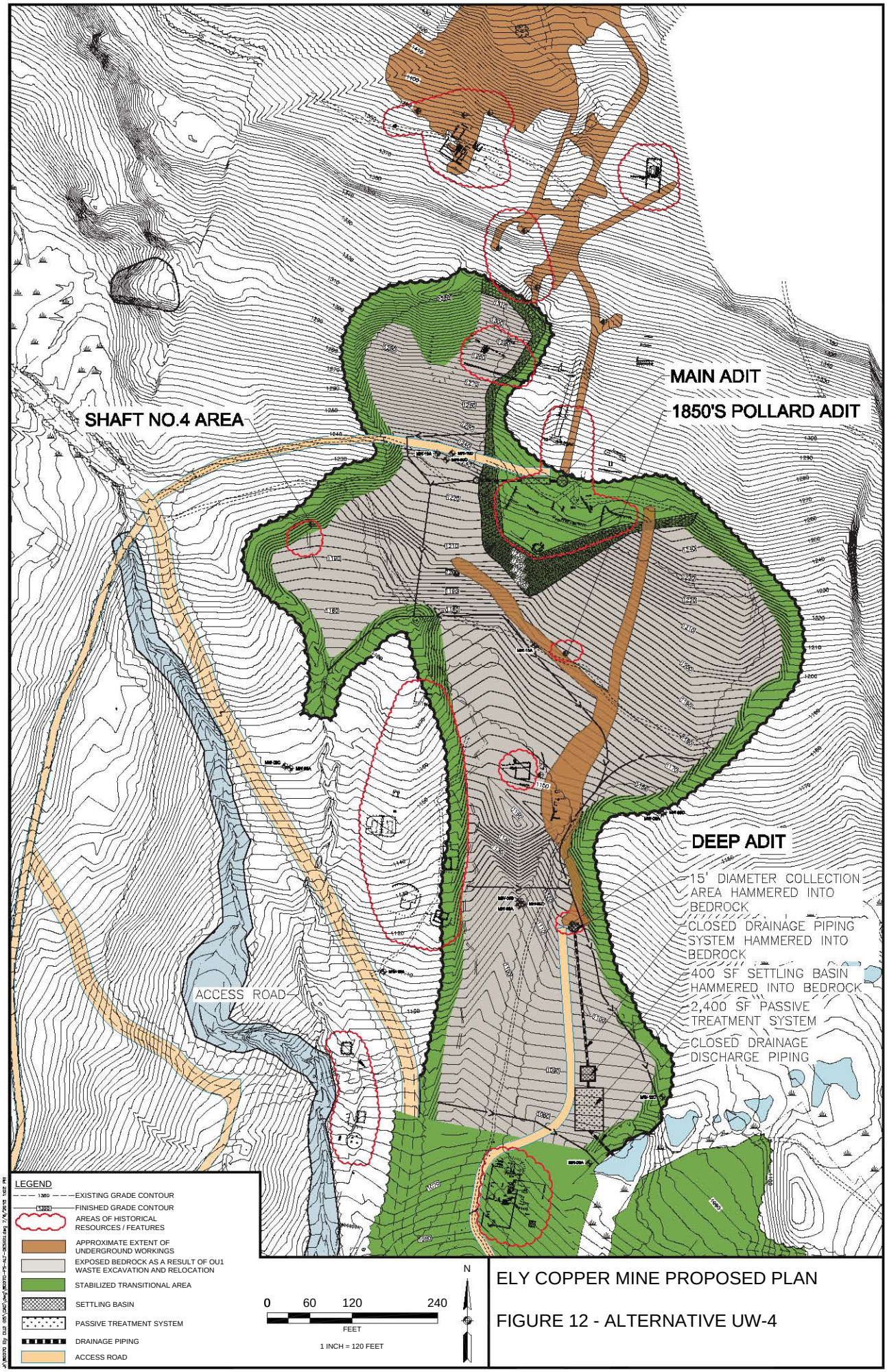

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FIGURE 12 - ALTERNATIVE UW-4