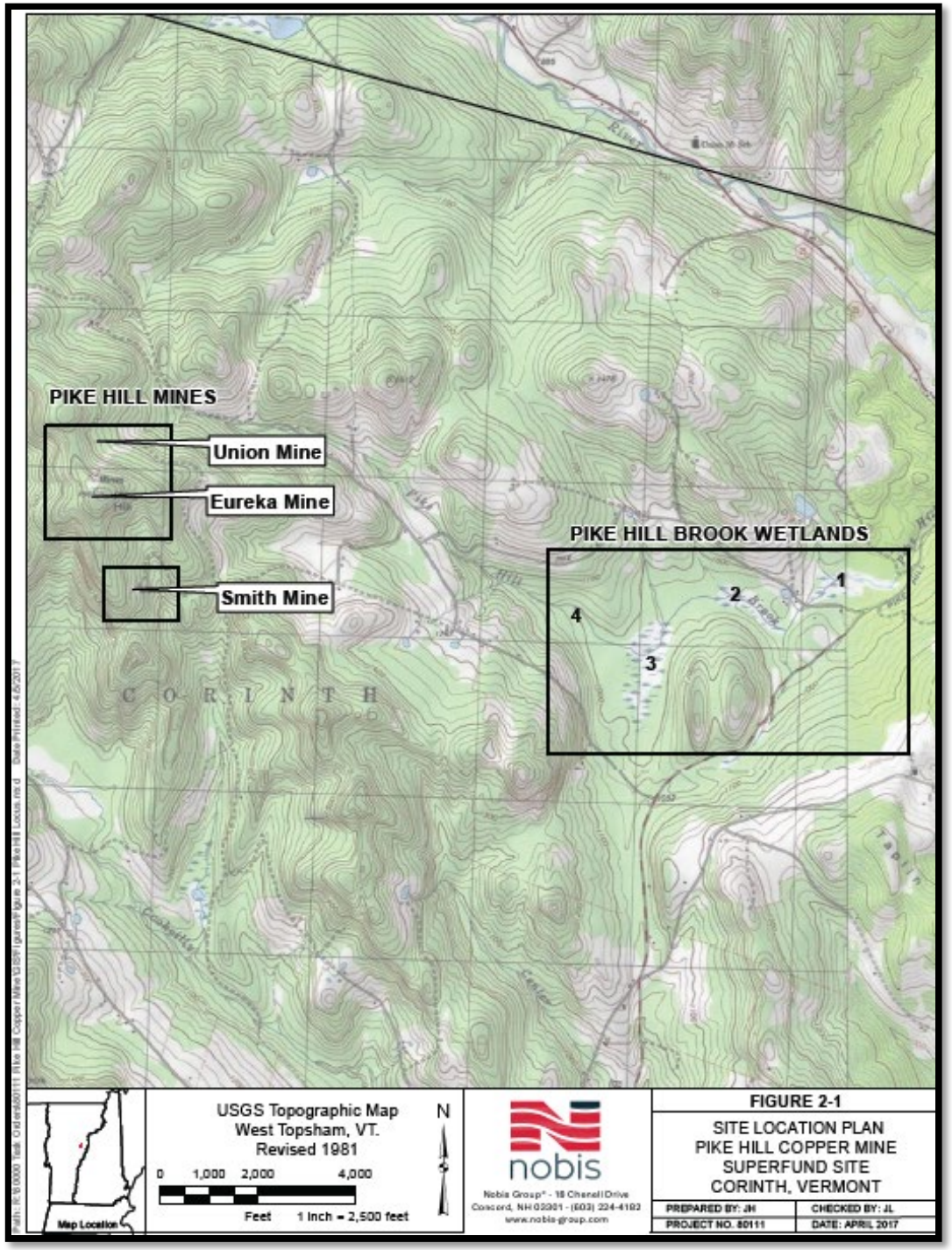
Pike Hill Copper Mine Superfund Site Information Update - June 2022

Pike Hill Copper Mine - Introduction

- The Pike Hill Copper Mine Superfund Site (Site) was placed on the EPA National Priorities List (NPL), also known as the Superfund list, in 2004
- The Pike Hill Copper Mine Superfund Site includes three separate mines along with the impacted areas of Pike Hill Brook and a tributary to Cookville Brook including downstream wetland areas.
- The Site is considered eligible for the National Register of Historic Places triggering the requirements of the National Historic Preservation Act.
- The Site hosts the largest known concentration of state-threatened eastern small-footed bats in Vermont and is historic habitat for the federally threatened northern long-eared bat.



Pike Hill Copper Mine Superfund - Operational History

Mining Activity:

- 1846 – 1919: Period of on-site mining and processing activities at the three separate mines.
- 1878-1882: Ore shipped to Ely Mine smelter.
- Late 1940's and early 1950's: Ore from waste piles shipped to Elizabeth Mine.
- No mining activities since 1950's.
- On-site buildings burned in 1960's.
- 4,300 tons of copper production (6% of Vermont total copper production)
- The three mines are part of the Orange County Copper Belt that also includes Elizabeth Mine and Ely Copper Mine.

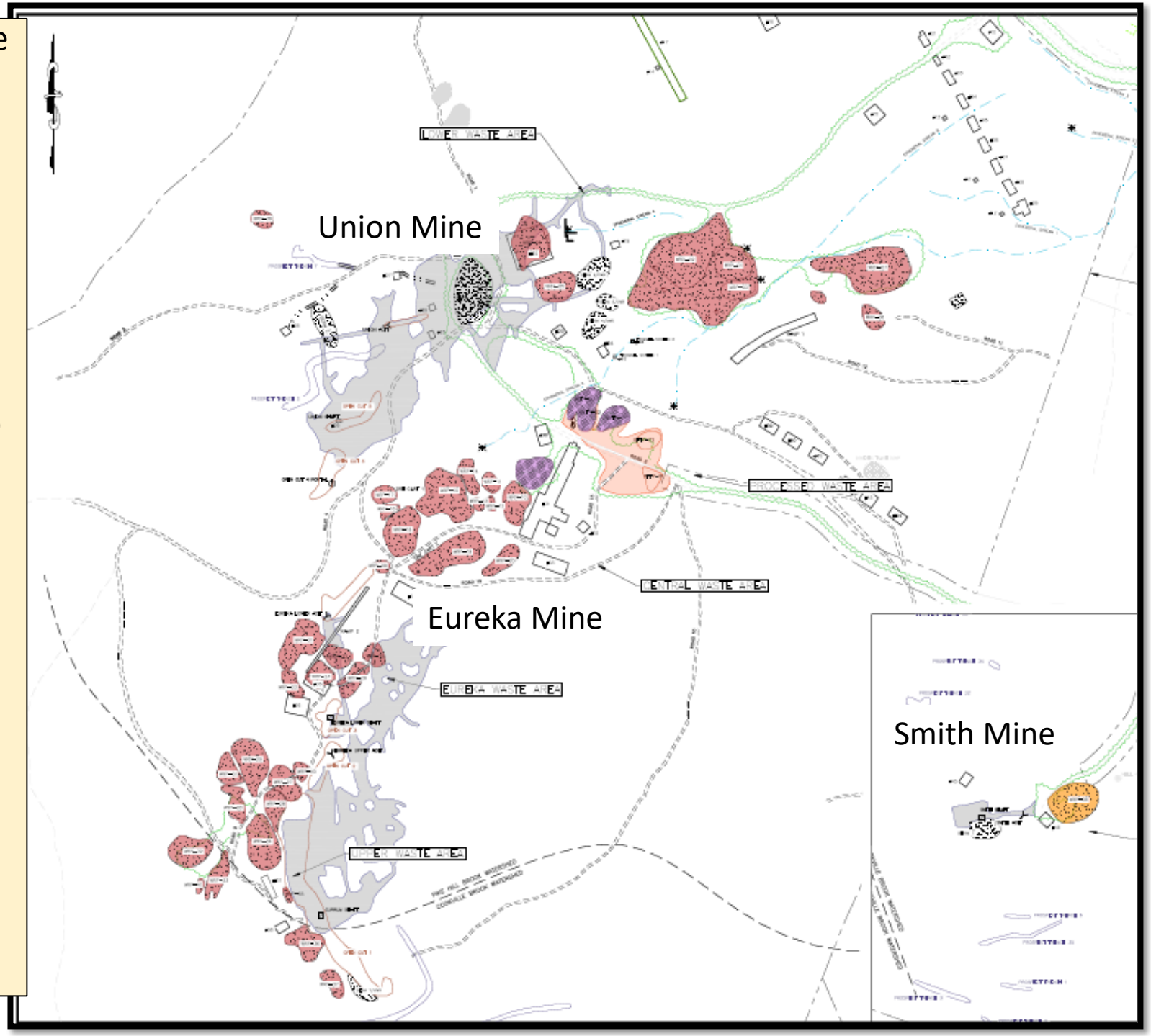
- The Pike Hill Copper Mine Superfund Site contains three sub-areas.

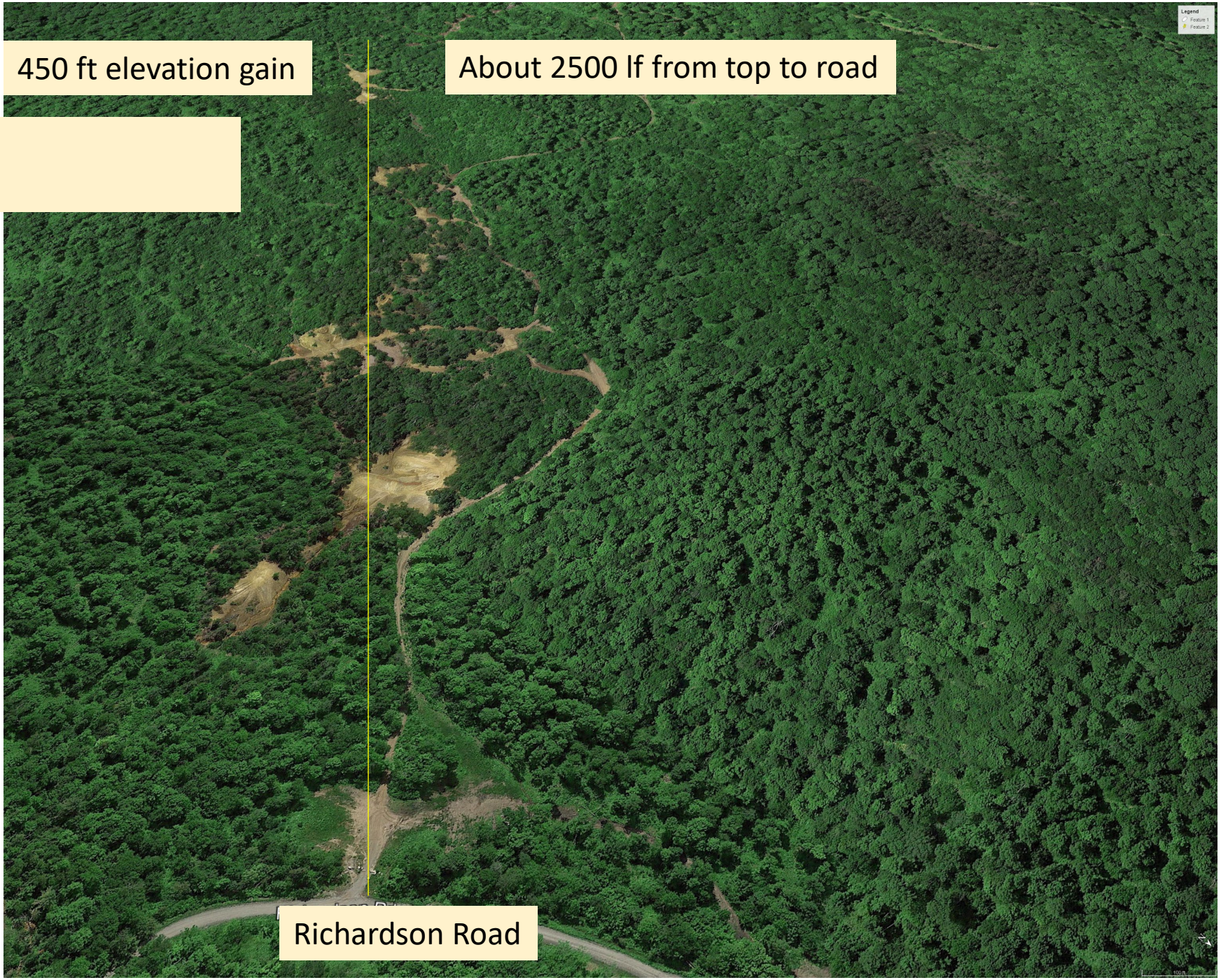
Eureka Mine and Union Mine:

- Within the Pike Hill Brook watershed.
- An estimated 43 waste rock piles and 4 tailing piles extending over about 13 acres.
- About 78,000 cubic yards of waste material.
- Underground workings (shafts and adits) and old foundations.
- The section of Pike Hill Brook immediately downstream of the waste rock piles contains about 4,000 cubic yards of contaminated material.

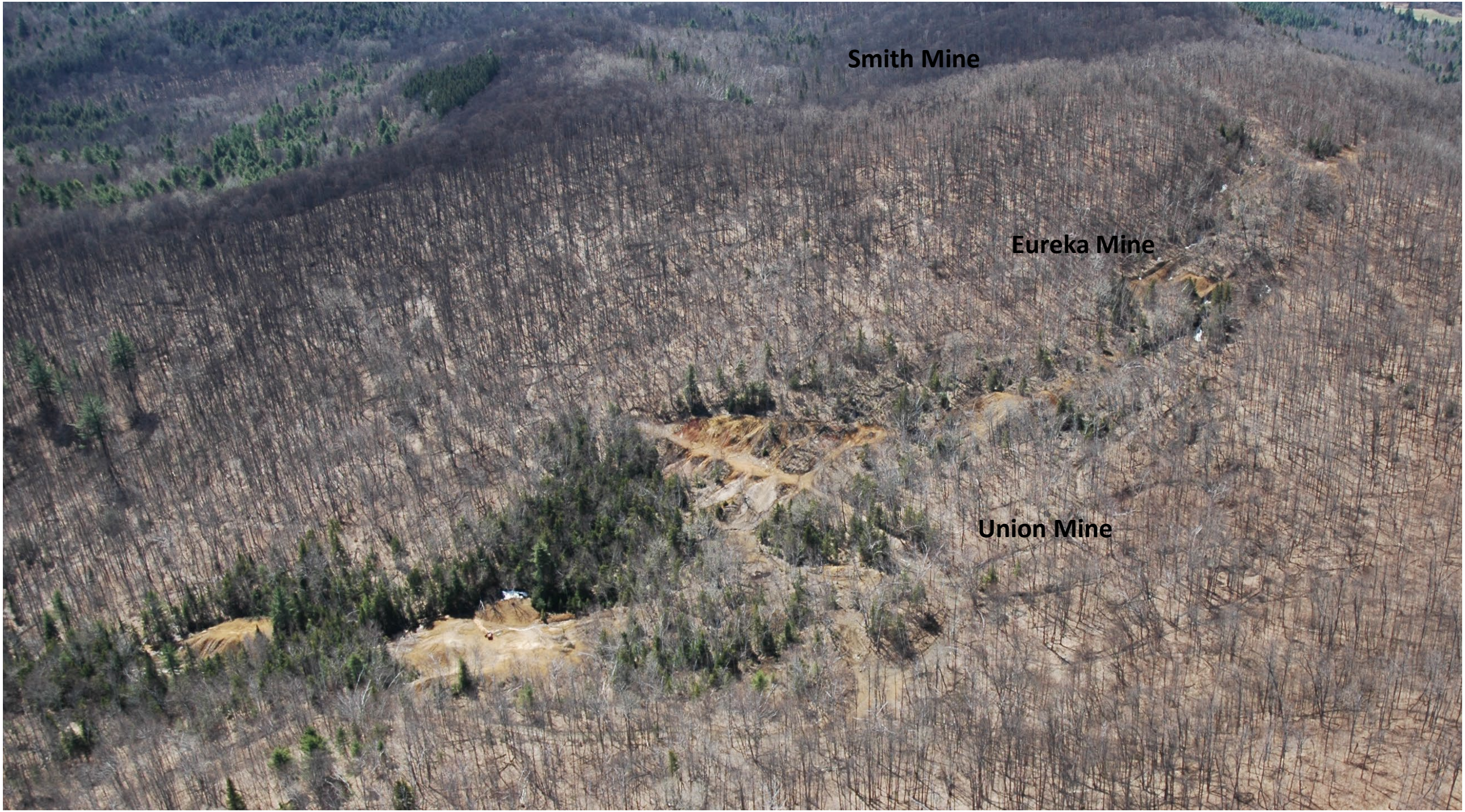
Smith Mine:

- Drains to a tributary of Cookville Brook.
- About 0.5 miles south of the other mines.
- There are three small waste piles over about 1 acre containing about 4,000 cubic yards of waste material.
- Underground workings (shaft and adit)




450 ft elevation gain
About 2500 lf from top to road
Richardson Road


Legend
Feature 1
Feature 2
Google Earth


Smith Mine
Eureka Mine
Union Mine

Pike Hill Copper Mine Superfund Site- Site Investigation Program

- Investigation Work Completed to Date:
  - Mine waste characterization to evaluate metal content and leaching potential.
  - Ecological assessments:
    - Surface water and sediment toxicity testing
    - Benthic and fish community richness and abundance surveys
    - Surface water and sediment data used to develop hazard quotients
    - Fish tissue sampling
  - Site topographical surveys.
  - Historic resource documentation.
  - Failure Modes and Effects Analysis (FMEA) for Underground Workings
  - Surface water and soil sampling.
  - Bat surveys (performed by VT Fish and Wildlife).

Pike Hill Copper Mine Superfund Site – Stream Impact Assessment

- Historic mining operations at Site have left behind sulfide-containing waste rock and mine tailings that are releasing low-pH (acidic) water with elevated levels of metals that is highly toxic to many aquatic organisms.

- This release is causing the following impacts to Pike Hill Brook and a tributary of Cookville Brook:

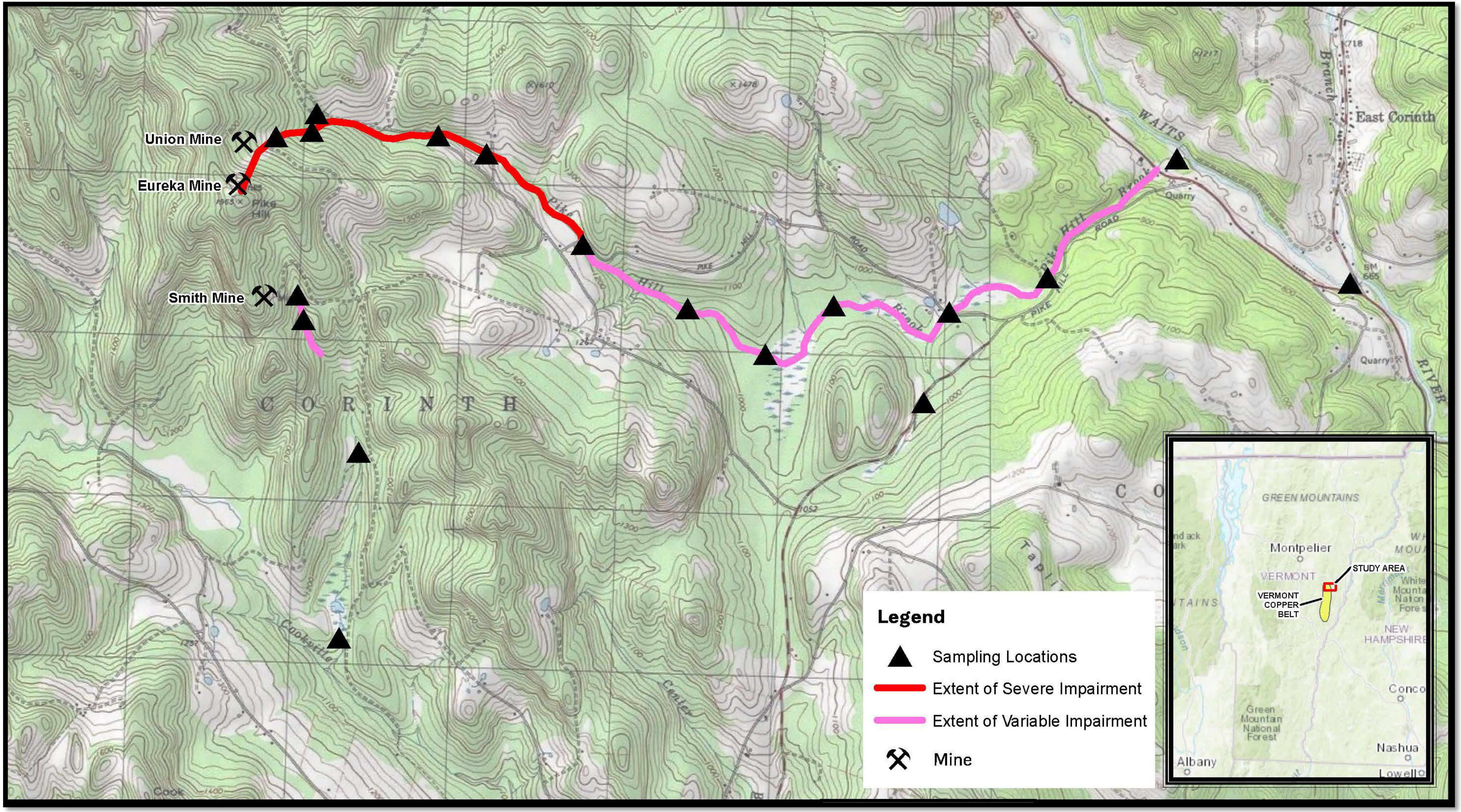
  - The fish and benthic organisms (aquatic bugs) in Pike Hill Brook are significantly depleted for about 1.5 miles below the Site.

  - The concentration of copper being released from the Site greatly exceeds federal and state water quality standards designed to protect aquatic biota (i.e., fish and other aquatic life).

  - The contaminated water for the stretch of Pike Hill Brook from the Site extending 0.5 miles downstream of the Site killed 100% of the fish exposed to this water in laboratory tests.

  - Only 15% of the fish survived when exposed to water from a location 1.5 miles downstream of the Site.

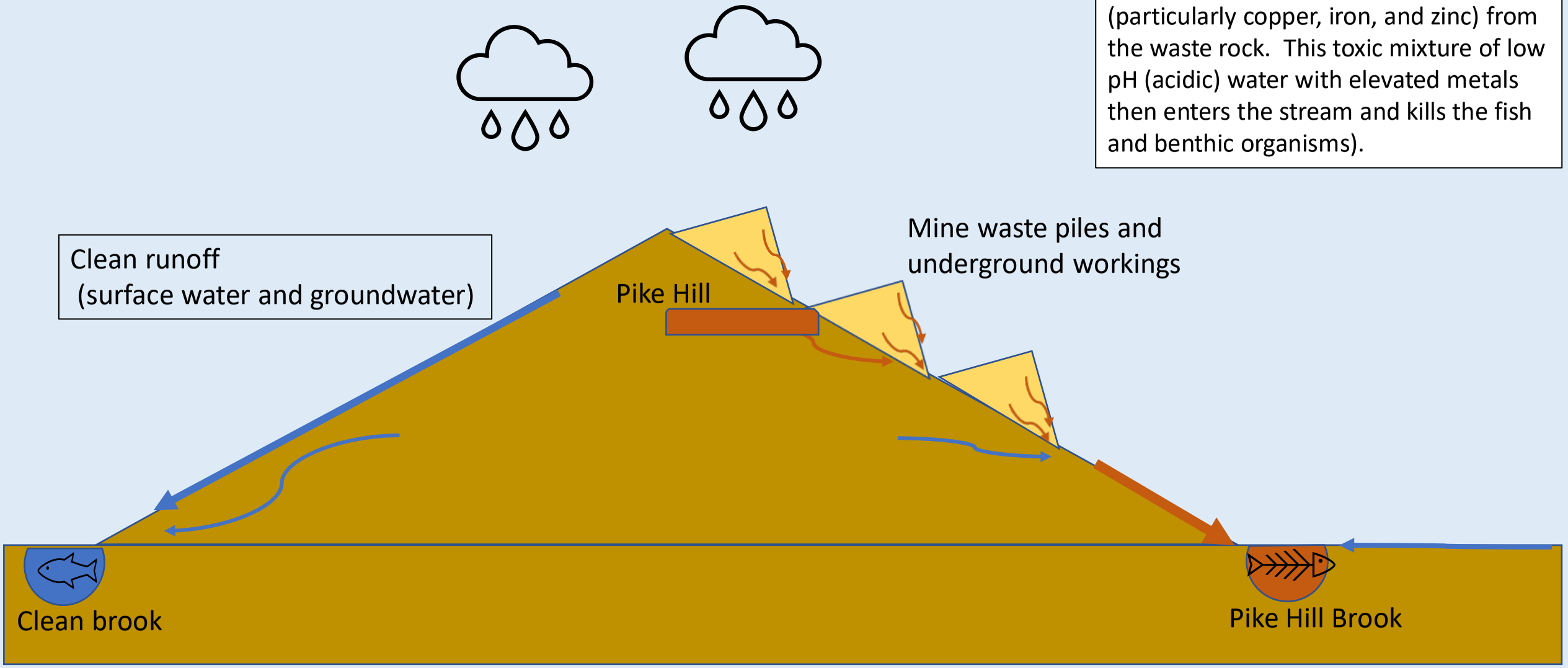
  - For comparison, 95% of the fish survived when exposed to water in Pike Hill Brook downstream of the wetland and in an unimpacted tributary of Pike Hill Brook.



Union Mine
Eureka Mine
Smith Mine
CORINTH
East Corinth
WAITS
RIVER
Quarry
Legend
Sampling Locations
Extent of Severe Impairment
Extent of Variable Impairment
Mine
GREEN MOUNTAINS
Montpelier
VERMONT
STUDY AREA
VERMONT COPPER BELT
NEW HAMPSHIRE
Green Mountain National Forest
Albany
Nashua

Mining Influenced Water (MIW)/Acid Rock Drainage
(surface water, mine discharge, and groundwater)

Atmospheric oxygen and water (from rainfall and snowmelt along with groundwater) react with mine waste that contains sulfide minerals to create sulfuric acid. The acid leaches the metals (particularly copper, iron, and zinc) from the waste rock. This toxic mixture of low pH (acidic) water with elevated metals then enters the stream and kills the fish and benthic organisms).



Pike Hill Brook Density of Benthic Organisms

reference locations

From Pike Hill Mine to 1.5 miles downstream

wetland 2 miles downstream of Site

downstream of wetlands

Vermont Standard for Benthic Organism Density

Density of benthic organisms

1,900
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0

	7.0	6.0	5.0	4.0	3.5	2.6	2.6	2.6	2.5	2.1	2.1	1.9	1.4	1.4	1.4	0.9	0.9	0.4	0.4	0.4	0.3	0.1
PHB Density	506	875	294	30	42	46	150	147	5	154	260	678	433	188	1736	503	589	103	290	429	142	814

Sample Locations

Pike Hill Brook Richness (number of different species)

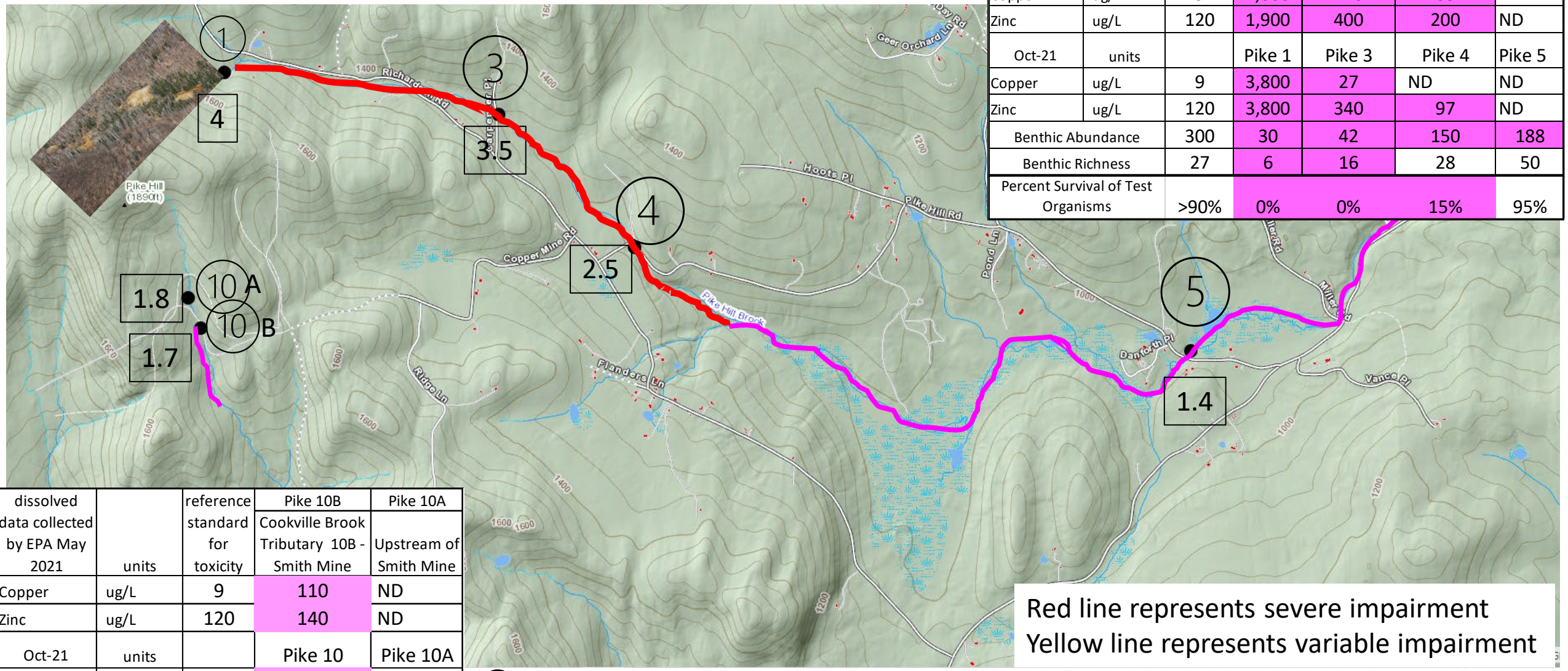
	7.0	6.0	5.0	4.0	3.5	2.6	2.6	2.6	2.5	2.1	2.1	1.9	1.4	1.4	1.4	0.9	0.9	0.4	0.4	0.4	0.3	0.1
Richness	35.0	41.0	42.0	6.0	16.0	9.0	28.0	32.0	4.0	21.0	24.0	28.0	34.0	50.0	52.0	46.0	36.5	28.0	41.0	40.0	20.5	47.0

Examples of aquatic life coated in iron at a VT mine site

Stonefly Caddisfly covered with sediments and iron.

Pike Hill Copper Mine – Water Chemistry

dissolved data collected by EPA May 2021	units	reference standard for toxicity	Pike 1 weir at discharge from Site	Pike 3 0.7 miles downstream of Site	Pike 4 1 mile downstream of Site	Pike 5 Below wetland
Copper	ug/L	9	4,000	170	63	ND
Zinc	ug/L	120	1,900	400	200	ND
Oct-21	units		Pike 1	Pike 3	Pike 4	Pike 5
Copper	ug/L	9	3,800	27	ND	ND
Zinc	ug/L	120	3,800	340	97	ND
Benthic Abundance		300	30	42	150	188
Benthic Richness		27	6	16	28	50
Percent Survival of Test Organisms		>90%	0%	0%	15%	95%



dissolved data collected by EPA May 2021	units	reference standard for toxicity	Pike 10B Cookville Brook Tributary 10B - Smith Mine	Pike 10A Upstream of Smith Mine
Copper	ug/L	9	110	ND
Zinc	ug/L	120	140	ND
Oct-21	units		Pike 10	Pike 10A
Copper	ug/L	9	200	ND
Zinc	ug/L	120	160	ND
Benthic Abundance		300	30	785
Benthic Richness		27	15	44

Red line represents severe impairment
Yellow line represents variable impairment

○ Circle designates a surface water chemistry sample location

□ Square designates a VTDEC/USGS benthic and/or fish community assessment location

Pike Hill Copper Mine Superfund Site– Cleanup Plan

- EPA is developing an Engineering Evaluation and Cost Analysis (EE/CA) to Identify cleanup actions that can be implemented to address the most significant sources of contamination (waste piles).

- The objectives of the cleanup are listed below:

  - Prevent, to the extent practicable, the release of contaminated water from the mine waste at the Site by isolating the waste material from water and oxygen.

  - Prevent, to the extent practicable, the off-site transport of mine waste as a result of erosion and sediment transport processes.

  - Implement the response action in a manner that will minimize, to the extent practical, impacts to federal and state threatened and endangered bats.

  - Implement the response action in a manner that will minimize, to the extent practical, impacts to historic resources at the Site.

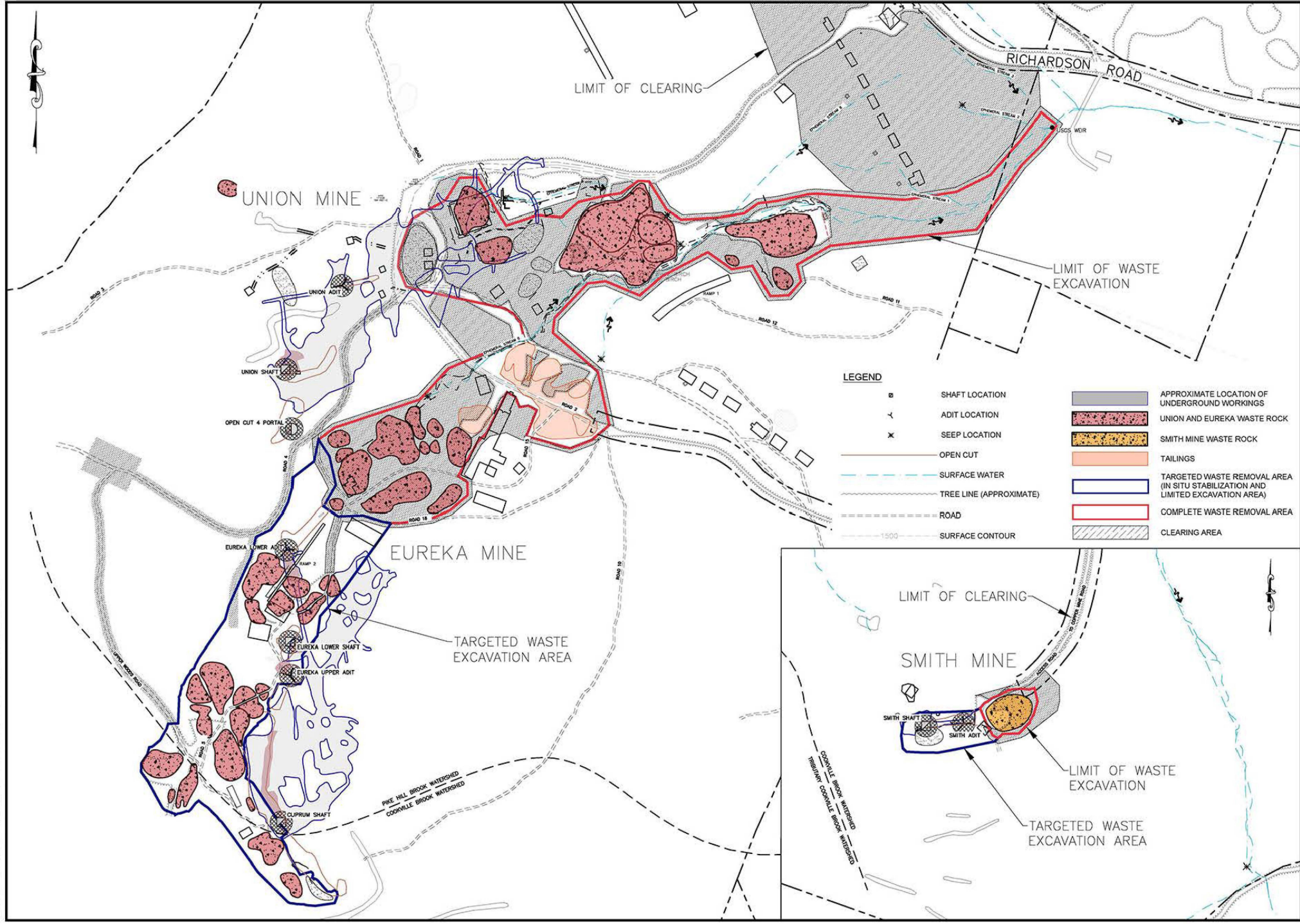
Pike Hill Copper Mine Superfund Site

To accomplish the Removal Action Objectives, the EE/CA will evaluate two options:

1. Excavation and on-site consolidation/capping of mine waste with in-situ stabilization of select areas of mine waste.
2. Excavation and off-site disposal of mine waste with in-situ stabilization of select areas of mine waste.

- Both cleanup approaches would have a similar level on on-site impact to historic resources and wetlands (impacted).

- A significant amount of material is needed to restore the disturbed areas and construct the containment cells.
  - The cleanup work could require about 5,000 truck loads of material to be delivered to the Site.
  - The design will focus on ways to reduce truck deliveries by evaluating the minimum thickness of material needed for restoration and capping and seeking both on-site materials and alternative cover approaches.



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PIKE HILL COPPER MINE

SUPERFUND SITE
CORINTH, VERMONT

NO.	DATE	DESCRIPTION

REVISIONS

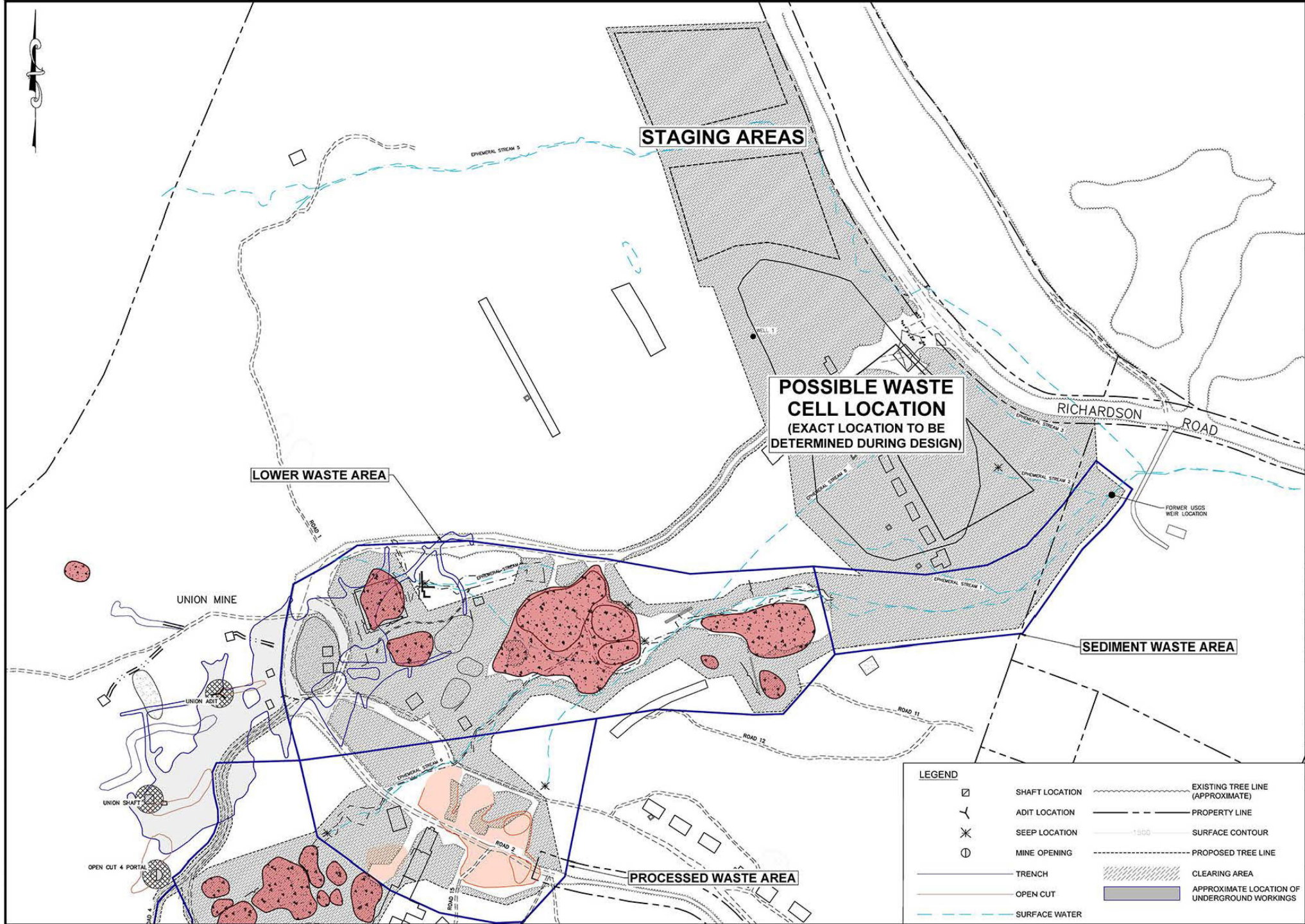
0 100' 200'
GRAPHIC SCALE

DATE	JUNE 2022
NOBIS PROJECT NO.	93201.18
DRAWN BY:	ATB
CHECKED BY:	BJK
CAD DRAWING FILE:	93201.18_SITE.dwg

SHEET TITLE

WASTE EXCAVATION AND CLEARING AREAS

FIGURE
2



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SUPERFUND SITE
CORINTH, VERMONT

NO.	DATE	DESCRIPTION

REVISIONS

0 80' 160'
GRAPHIC SCALE

DATE:	JUNE 2022
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SHEET TITLE

PRELIMINARY WASTE CONTAINMENT CELL AND STAGING AREAS

FIGURE

3

Pike Hill Copper Mine Superfund Site

- Why does EPA recommend implementing a cleanup (Non-Time Critical Removal Action (NTCRA)) at this time?
  - The Site represents a severe ongoing ecological threat as documented by multiple lines of evidence (surface water concentrations, benthic community studies, fish community studies, and toxicity testing).
  - A targeted source control action would:
    - Greatly reduce acute impacts to aquatic organisms;
    - Reduce contaminant loading to downstream wetlands area; and
    - Advance the source control cleanup while EPA continues the investigations to determine whether additional cleanup actions are needed for the groundwater, underground workings, stream sediments, or downstream waters (wetlands and streams) are being completed.
  - This approach was successful at Elizabeth Mine.

Pike Hill Copper Mine Superfund Site – Next Steps

- Public Comment
  - The EE/CA and a fact sheet presenting the recommended cleanup approach will be developed and provided to the community in July/August 2022.
  - 30-day public comment period for the EE/CA, fact sheet and administrative record.
  - A public hearing will be held in August 2022.
  - After EPA reviews and considers all of the comments received, an Action Memorandum will be developed to document the cleanup approach.
- Following the Action Memorandum, EPA would develop a detailed design for the cleanup. The design phase could require 1-2 years.
- The actual cleanup work may not begin until 2024/2025 or later.
- EPA will also continue the investigations to assess other areas of the Site including: Underground Workings, groundwater, stream sediments, and downstream wetland areas.

Pike Hill Copper Mine Superfund Site - Community Involvement

- Our goal is to provide the community with access to information regarding the Site activities, seek input regarding the Site investigation and cleanup, and address questions and comments about the Site activities.

- Keys Outreach Activities:

  - Posting information on the EPA Pike Hill Copper Mine Superfund Site at www.epa.gov/superfund/pikehill
  - Hosting public information meetings to update the community and receive feedback.
  - Providing updates to the Town Officials and attending meetings when requested.
  - Developing fact sheets to summarize site activities and cleanup plans.
  - Direct response to inquiries via email or phone.

Pike Hill Copper Mine Superfund Site - Community Involvement

- EPA is completing a Community Involvement Plan.
- We welcome your input regarding the best methods to engage your community.
  - We are seeking individuals willing to complete surveys or participate in an interview to better understand the community issues and concerns along with the methods to provide information updates.
  - We would like to obtain feedback from you tonight.
  - Please contact the Darriel (Community Involvement Coordinator) or myself, Edward Hathaway, if you would be willing to offer your input.
- Even though the Site is private property, EPA also seeks community input regarding the future potential use of the Site once the cleanup is completed.
- The Community Involvement Plan will be posted to the EPA website for the Pike Hill Copper Mine Superfund Site once it has been completed.

Pike Hill Mine Superfund Site- Site Contact Information

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