

FINAL REPORT

VOLUME II

**ARCHEOLOGICAL DATA RECOVERY
UPPER AND LOWER COPPERAS FACTORIES AND
INTERCOPPERAS AREAS
AND MONITORING MITIGATION FOR A NON-TIME-CRITICAL
REMOVAL ACTION (NTCRA)
ELIZABETH MINE SITE (VT-OR-28)
South Strafford and Thetford, Vermont**

**Contract #W912WJ-09-D-0001
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EXECUTIVE SUMMARY

An archaeological data recovery program and archaeological monitoring efforts were conducted at the Elizabeth Mine Site (VT-OR-28) in South Strafford, Orange County, Vermont. These investigations were conducted in support of the Non-Time-Critical Removal Action (NTCRA) at Tailings Pile 3 (TP 3) at the Elizabeth Mine being performed by the United States Army Corps of Engineers-New England District (USACE) for Region 1 of the Environmental Protection Agency (EPA) through Interagency Agreement. The archaeological data recovery and monitoring investigations were conducted in the Cleanup Action's Area of Potential Effect (APE) in accordance with Stipulations III and V of the Memorandum of Agreement (MOA) for the cleanup of the Elizabeth Mine, signed and dated March 2010.

The EPA NTCRA Cleanup Action activities were determined to result in irreversible impacts to the Copperas Factories Subsite (Upper and Lower Copperas Factories, Inter-Copperas Factory area) within TP 3 within the Elizabeth Mine Site. The archaeological data recovery and construction monitoring were conducted for these portions of TP 3 to mitigate the adverse effects of the cleanup impacts to these site elements. The data recovery plan was developed in conjunction with the cleanup design to minimize the adverse effects of the remediation on the significant Copperas Factories Subsite. Cleanup activities necessitated additional data recovery investigations in 2009 and 2010 in the area of the North Berm and Copperas Brook within the Copperas Factories Subsite, and the Pine Grove area situated both within and in proximity to the Subsite. The research design/questions for the original data recovery program and additional work areas expanded on the themes presented in the 2003 PAL technical report, *Historic/Archaeological Mapping and Testing, Elizabeth Mine Site, Stratford and Thetford, Vermont*. The research questions included the general process of copperas manufacture, particularly within the factories where the boiling, cooling, crystallizing and packing took place. The data recovery methodology was designed to address the research questions. The methodology consisted of field investigations, additional documentary research, and laboratory processing and analysis of recovered data.

The 2009 and 2010 data recovery and construction (mine waste removal) monitoring at the Elizabeth Mine copperas factories uncovered extensive, and in some cases, unanticipated industrial archaeological features associated with copperas manufacturing. The 2009 field season work at the visible foundation at the Upper Factory uncovered tiered remains of copperas boiling, cooling and crystallizing process structures and vessels. The 2009 field season work at the visible foundation at the Lower Factory uncovered an unusually intact assemblage of workspace features and artifacts, as well as the remains of copperas processing equipment both comparable to and different from that found at the Upper Factory. Work in 2009 in the North Berm and South Berm areas and the 2010 work in the Copperas Brook Corridor revealed additional copperas processing features and factory structural remains, and revealed that the Upper Factory site as originally understood was more complex and much larger than anticipated and may have contained the remains of more than one of the reported factories at that location. Subsequent mine waste removal monitoring in several of these areas revealed additional information that contributed to the understanding of the site.

The 2009 and 2010 archaeological data recovery campaigns provided sufficient data to address the research questions for the Copperas Factories Subsite posed in the 2003 PAL survey report and data recovery research design. The data recovery investigations contributed to the understanding of the copperas manufacturing process and plant construction and layout at the Elizabeth Mine site. The excavations confirmed and documented locations, relationships and construction of vessel structures

associated with the successive steps of copperas production. In the case of the Upper Factory the data recovered corresponded elegantly with the tiered boiler-cooler-crystallizer sequence on the landscape as described in the historical record. The different layout of the Lower Factory indicated an alternate arrangement of the manufacturing process, and the artifacts indicated an additional multi-use workshop function. The presence of additional boiler features in the North Berm and South Berm suggested the remains of another factory or factories, or steps in copperas manufacturing undocumented in the written historical record.

The data recovery investigations were also successful in documenting deep and/or expansive heavy masonry and timber substructures and brick and stone construction of copperas boilers, coolers and crystallizers that add to the understanding of nineteenth-century rural industrial site construction methods. The excavations demonstrated the site's three-dimensional, spatial and structural complexity and four-dimensional (temporal) complexity in remains that appear to reflect different factories operating in successive phases or in ways not described in historical record. The site analysis demonstrated the importance of the use of archival research materials and careful examination and creative use of the written historical record, which is not always accurate, for site interpretation. The site analysis also underscored the importance of consulting knowledgeable experts in the areas of applicable disciplines including mining engineering, chemistry, economic and structural geology, and even maple sugar pan construction and operation to inform an accurate understanding of industrial and natural processes and constraints affecting the manufacturing and post-manufacturing behavior of and impacts to the site and associated materials.

The 2009 and 2010 data recovery investigations also suggested that interpretation of archaeological data at similar types of industrial sites may be complicated by the action of mining and post-mining period natural and human-aggravated phenomena including steep topography, wet soils, waste material disturbance/movement/re-deposition, erosion, unusual rock and soil chemistry, rock alteration, and timber preservation and decay. The appearance and behavior of these phenomena can challenge the traditional understanding of soil stratigraphy, artifact and structure preservation, etc. The universal physics of natural processes obviously apply everywhere, but topographic or chemical anomalies can accelerate those processes, and mining activity disturbance can violate the basic principle of stratigraphic superposition. What applies in an undisturbed, or residential, or agricultural, etc. setting may not always apply in an industrial or mining setting.

Despite the extensive data recovery efforts in 2009 and 2010, the surviving unexcavated portions of the copperas factories still have the potential to provide information about copperas manufacturing at the Elizabeth Mine. EPA cleanup design elements for the copperas factories and small parts of TP 3 were changed during archaeological data recovery to balance the removal of mine waste with protection of significant archaeological resources. The South Berm, where a copperas liquor boiler was discovered, was set aside for preservation in exchange for the data recovery and monitoring of removal of the boiler feature at the adjacent North Berm in consultation and agreement with the VT State Archaeologist. At the Upper Factory and Lower Factory, instead of removing the mine waste after the data recovery, the archaeological sites were retained and covered with a geotextile fabric marker layer and capped with distinctive round tan granite river cobbles, the boundary of which corresponds with the larger, lead-contaminated soil area and contrasts with the gray, irregular crushed rock of the sedimentation basin lining. This capping and marking method delineates the extent of cleanup archaeological investigations, protects the factory archaeological sites from looting, and preserves them for potential additional future archaeological investigations.

Should ongoing mine water or other environmental testing lead to a decision that the copperas factories or the South Berm are continuing to contribute to water quality issues, additional data recovery would add to the information collected during the 2009 and 2010 seasons. Data recovery within the unexcavated portions of the Upper Factory has the potential to reveal additional copperas manufacturing vessels, and most significantly, to expose the remaining underlying timbers and bedrock, potentially confirming interpretation of the sloping timber structure explored and documented in 2009 and 2010. Data recovery at the South Berm would confirm the function of the boiler feature located there; the apparent integrity of that feature suggests that careful bisection would add significantly to the understanding of its construction and operation. PAL does not recommend any additional data recovery at the Lower Factory; the 2009 data recovery uncovered the majority of the factory working floor and subsequent removal of mine waste at the north foot of the factory wall precludes work in that area. PAL's conclusion that the Inter-Copperas Area was associated with temporary copperas storage suggests that additional work in that area would not make a major contribution to the understanding of the manufacturing process and would not benefit from additional data recovery.

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APPENDIX A

**CATALOG OF CULTURAL MATERIALS RECOVERED DURING THE DATA
RECOVERY EXCAVATIONS**

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Copperas Brook Corridor</i>									
EU01 10-20 CMBS, Rubble			Coarse Earthenware	Brick	Fragment	Red		<input type="checkbox"/>	1
			Coarse Earthenware Redware Lead Glaze	Ceramic Sherd	Complete	Brown	1600 Present	<input type="checkbox"/>	1
			Glass Molded Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	1
			Tar					<input type="checkbox"/>	1
			Wood		Charred			<input type="checkbox"/>	1
EU02 10-20 CMBS, Fill			Glass Molded Glass	Flat Glass	Fragment	Brown		<input type="checkbox"/>	1
EU02-NW 0-0 CMBS, Surface			Glass Molded Glass	Bottle/Jar	Lip/Neck Collared Ring	Brown	1910 1920	<input type="checkbox"/>	1
EU03-NE 0-10 CMBS, Fill			Coarse Earthenware	Brick	Fragment	Red		<input type="checkbox"/>	2
			Iron Ore		Fragment	Heat Altered		<input type="checkbox"/>	4
			Lead	Spatter	Fragment			<input type="checkbox"/>	2
EU03-NE 20-30 CMBS, Fill			Lead	Spatter	Fragment			<input type="checkbox"/>	1
			Lead	Trimnings	Fragment			<input type="checkbox"/>	1
EU03-NW 0-10 CMBS, Fill			Igneous Granite		Fragment	Heat Altered	Red	<input type="checkbox"/>	1
			Iron Ore		Complete	Heat Altered		<input type="checkbox"/>	3
			Lead	Spatter	Fragment			<input type="checkbox"/>	1
EU03-SE 20-30 CMBS, Fill			Lead	Trimnings	Fragment			<input type="checkbox"/>	1
EU03-SW 0-10 CMBS, Fill			Coarse Earthenware	Brick	Fragment	Red		<input type="checkbox"/>	2
			Lead	Spatter	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count	
<i>Copperas Brook Corridor</i>										
EU04 0-10 CMBS, Fill			Iron	Unidentified	Fragment			<input type="checkbox"/>	3	
			Iron	Nail Unidentified Nail	Fragment			<input type="checkbox"/>	2	
			Iron	Unidentified Tool	Complete			<input type="checkbox"/>	1	
EU04 10-20 CMBS, Fill 2			Iron	Unidentified				<input type="checkbox"/>	7	
			Lead	Trimnings				<input type="checkbox"/>	1	
EU04 20-30 CMBS, Fill 2			Iron	Unidentified	Fragment			<input type="checkbox"/>	10	
			Lead	Trimnings				<input type="checkbox"/>	1	
surface 0-0 10ths of Ft, Surface			Iron	File	Mostly Complete			<input type="checkbox"/>	1	
			Iron	Wrench	Mostly Complete			<input type="checkbox"/>	1	
			Iron	Miscellaneous Hardware	Mostly Complete			<input type="checkbox"/>	1	
			Iron	Unidentified	Fragment			<input type="checkbox"/>	1	
			Iron	Animal Shoe	Fragment			<input type="checkbox"/>	3	
TR03 0-1 10ths of Ft, Alluvial	05		Glass	Bottle/Jar	Rim/Body	Flared Ring	Clear, Rust	<input type="checkbox"/>	1	
	05		Glass	Lens	Complete		Clear	<input type="checkbox"/>	1	
	05		Glass	Curved Glass	Fragment		Brown	<input type="checkbox"/>	2	
	05		Glass Molded Glass	Bottle/Jar	Neck/Shoulder		Clear	<input type="checkbox"/>	1	
	05		Glass Molded Glass	Curved Glass	Fragment		Clear, Rust	<input type="checkbox"/>	1	
	05		Glass Molded Glass	Bottle/Jar	Base		Green	1940 present	<input type="checkbox"/>	1
	05		Glass Molded Glass	Curved Glass	Fragment		Brown, Rust	<input type="checkbox"/>	1	

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Copperas Brook Corridor</i>									
TR03 0-1 10ths of Ft, Alluvial	05		Igneous Granite	Quarry Debris	Fragment	Gray, Rust, White		<input type="checkbox"/>	1
TR03-SW 0-0, Surface			Glass Molded Glass	Bottle/Jar	Base/Body	Brown	1940 present	<input checked="" type="checkbox"/>	1
			Glass Molded Glass	Curved Glass	Fragment	Brown, Clear		<input type="checkbox"/>	2
TR04 0-2 10ths of Ft, Fill 1	04 and 06		Glass	Flat Glass	Fragment	Clear, Rust		<input type="checkbox"/>	2
	04 and 06		Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	5
	04 and 06		Glass	Curved Glass	Base/Body	Clear		<input type="checkbox"/>	1
	04 and 06		Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	6
	04 and 06		Glass Molded Glass	Curved Glass	Rim/Body	Clear, Rust		<input type="checkbox"/>	1
	04 and 06		Glass Molded Glass	Bottle/Jar Beer Bottle	Body Sherd Embossed Script	Brown		<input type="checkbox"/>	1
	04 and 06		Glass Molded Glass	Curved Glass	Fragment	Clear, Rust, Turquoise	1940 present	<input type="checkbox"/>	1
	04 and 06		Glass Molded Glass	Bottle/Jar	Base	Clear, Rust	1938 1970s	<input checked="" type="checkbox"/>	1
	04 and 06		Glass Molded Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	2
	04 and 06		Glass Molded Glass	Bottle/Jar	Base	Clear	1940 present	<input checked="" type="checkbox"/>	1
04 and 06		Refined Earthenware Whiteware Molded Rim	Ceramic Sherd	Rim	Rust, White	1820 Present	<input type="checkbox"/>	1	
04 and 06		Stoneware American Stoneware Bristol/Albany	Holloware	Body Sherd	Brown, Mottled, White	1850 1930	<input type="checkbox"/>	2	

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Copperas Brook Corridor</i>									
TR05 0.08-0.2 10ths of Ft, Fill 1	07		Iron	Pulley Machine Pulley	Fragment			<input type="checkbox"/>	1
TR05 0.53-0.7 10ths of Ft, Fill 1	07		Iron	Pulley Machine Pulley	Fragment			<input type="checkbox"/>	1
TR05 0-1.55 10ths of Ft, Fill 1	07		Bone	Mammal	Fragment	Butchered		<input type="checkbox"/>	1
	07		Ferrous	Unidentified		Rust		<input type="checkbox"/>	1
	07		Glass	Curved Glass	Fragment	Brown, Rust		<input type="checkbox"/>	2
	07		Glass	Bottle/Jar	Body Sherd Script	Embossed Brown, Rust		<input type="checkbox"/>	1
	07		Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	2
	07		Glass	Curved Glass	Fragment	Melted Clear, Rust		<input type="checkbox"/>	1
	07		Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	5
	07		Glass	Flat Glass	Fragment	Clear, Rust		<input type="checkbox"/>	1
	07		Glass Molded Glass	Curved Glass	Rim/Body	Clear, Rust		<input type="checkbox"/>	1
	07		Glass Molded Glass	Bottle/Jar	Body	Embossed Script Clear, Rust		<input type="checkbox"/>	2
	07		Glass Molded Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	2
	07		Glass Molded Glass	Bottle/Jar Liquor Bottle	Mostly Complete Script 4-piece Mold	Embossed Brown, Rust	1935	<input checked="" type="checkbox"/>	4
	07		Iron	Unidentified				<input type="checkbox"/>	4
	07		Refined Earthenware Whiteware Molded Rim	Ceramic Sherd	Rim/Body	Gold, Rust, White	1820 Present	<input type="checkbox"/>	1
	07		Tar	Tar	Fragment			<input type="checkbox"/>	2
TR05-SW 0-1.3 10ths of Ft, Fill 1	07		Iron	Unidentified				<input type="checkbox"/>	3
	07		Iron	Unidentified				<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Copperas Brook Corridor</i>									
TR05-SW 0-1.3 10ths of Ft, Fill 1	07		Iron	Unidentified				<input type="checkbox"/>	2
TR06 0-1.9 10ths of Ft, Fill	1, 2, & 3		Iron	Unidentified				<input type="checkbox"/>	1
	1, 2, & 3		Iron	Plate Door Knob Plate				<input type="checkbox"/>	1
Total: Copperas Brook Corridor									134
<i>Elizabeth Mine Pine Grove</i>									
TR02-NE 2-3.4 10ths of Ft, Fill 1/2	01		Coarse Earthenware	Brick	Fragment	Red		<input type="checkbox"/>	1
	01		Coarse Earthenware Redware Lead Glaze	Ceramic Sherd	Fragment	Red	1600 Present	<input type="checkbox"/>	1
	01		Coarse Earthenware Redware Trailed Slipware	Ceramic Sherd	Complete	Brown, Red	1700 1830	<input type="checkbox"/>	1
	01		Glass	Curved Glass	Fragment	Green		<input type="checkbox"/>	1
	01		Glass	Curved Glass	Fragment	Olive		<input type="checkbox"/>	2
	01		Glass	Fiat Glass	Fragment	Clear, Rust		<input type="checkbox"/>	41
	01		Glass Molded Glass	Curved Glass	Rim/Body	Clear		<input type="checkbox"/>	1
	01		Glass Molded Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	1
	01		Glass Molded Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	2
	01		Iron	Nail Unidentified Nail	Fragment			<input type="checkbox"/>	3
	01		Kaolin	Smoking Pipe	Bowl Fragment	Black, White		<input type="checkbox"/>	1
	01		Plastic	Unidentified	Fragment			<input type="checkbox"/>	1
	01		Refined Earthenware Whiteware	Ceramic Sherd	Fragment	White	1820 Present	<input type="checkbox"/>	6
	01		Refined Earthenware Whiteware	Ceramic Sherd	Base	White	1820 Present	<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Elizabeth Mine Pine Grove</i>									
TR02-NE 2-3-4 10ths of Ft, Fill 1/2	01		Refined Earthenware Whiteware Mocha	Ceramic Sherd	Fragment	Polychrome	1820 1900	<input type="checkbox"/>	1
	01		Stoneware American Stoneware Albany Slip/Salt Glaze	Ceramic Sherd	Fragment	Brown, Red, Rust	1800 1880	<input type="checkbox"/>	3
	01		Textile	Unidentified	Fragment			<input type="checkbox"/>	2
	01		Unidentified Metal	Unidentified		Rust		<input type="checkbox"/>	2
TR02-NE 3-4 10ths of Ft, Fill 2	01		Cork	Cork	Complete			<input type="checkbox"/>	1
	01		Glass Molded Glass	Bottle/Jar Prescription Bottle	Complete piece Mold	Clear	1840 1880	<input type="checkbox"/>	1
	01		Leather	Unidentified	Fragment			<input type="checkbox"/>	3
	01		Rubber	Unidentified	Fragment	Black, Rust		<input type="checkbox"/>	2
	01		Textile	Unidentified	Fragment	Rust		<input type="checkbox"/>	1
TR02-W 3-4 10ths of Ft, Fill 2	01		Bone	Mammal	Complete Burned			<input type="checkbox"/>	1
	01		Glass	Flat Glass	Fragment	Clear, Rust		<input type="checkbox"/>	7
	01		Glass	Curved Glass	Fragment	Clear, Rust		<input type="checkbox"/>	2
	01		Glass	Curved Glass	Fragment	Green		<input type="checkbox"/>	2
	01		Glass	Curved Glass	Fragment	Amber, Rust		<input type="checkbox"/>	1
	01		Glass Molded Glass	Curved Glass	Rim/Body	Clear		<input type="checkbox"/>	1
	01		Leather	Unidentified	Fragment			<input type="checkbox"/>	5
	01		Leather	Boot/Shoe Boot	Fragment			<input type="checkbox"/>	2
	01		Leather	Unidentified	Fragment Burned			<input type="checkbox"/>	1
	01		Leather	Belt	Fragment			<input type="checkbox"/>	2

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Elizabeth Mine Pine Grove</i>									
TR02-W 3-4 10ths of Ft, Fill 2	01		Refined Earthenware Whiteware	Ceramic Sherd	Fragment	White	1820 Present	<input type="checkbox"/>	3
	01		Rubber	Unidentified	Fragment			<input type="checkbox"/>	6
	01		Stoneware American Stoneware Albany Slip/Salt Glaze	Holloware Crock	Base/Body	Black, Gray, Red	1800 1880	<input type="checkbox"/>	1
Total: Elizabeth Mine Pine Grove									113
<i>Inter Copperas Factory</i>									
EU03 0-10 CMBS, Cobble Floor			Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	9
			Wood	Wood	Fragment			<input type="checkbox"/>	3
TR-01 1-1.1 10ths of Ft, Cobble Floor			Iron	Nail	Fragment			<input type="checkbox"/>	1
TR-02 0-0 10ths of Ft, Surface			Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	2
TR-04 1-2 10ths of Ft, Boiler			Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	1
			Lead	Spatter	Complete			<input type="checkbox"/>	2
Total: Inter Copperas Factory									18
<i>Lower Copperas Factory</i>									
Stripped 01 0.48- 0.48 Inches, Feature	LC-F01	II	Leather	Unidentified		Brown		<input type="checkbox"/>	2
	LC-F01	II	Refined Earthenware Whiteware	Holloware		White	1820 Present	<input type="checkbox"/>	1
Stripped 01 1.6- 1.7 10ths of Ft, Feature	LC-F01	I	Stoneware American Stoneware Albany Slip	Holloware	Body	Brown	1840 1930	<input type="checkbox"/>	4

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 01 1.6-3 10ths of Ft, Feature	LC-F01	I	Coal		Complete			<input type="checkbox"/>	2
	LC-F01	I	Coal Anthracite					<input type="checkbox"/>	4
	LC-F01	I	Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	1
	LC-F01	I	Iron	Axe Double-Bit Wedge Axe				<input type="checkbox"/>	1
	LC-F01	I	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	1
	LC-F01	I	Iron	Shovel	Fragment			<input type="checkbox"/>	1
	LC-F01	I	Iron	Shovel	Fragment			<input type="checkbox"/>	1
	LC-F01	I	Iron	Plate Door Knob Plate	Complete			<input type="checkbox"/>	1
	LC-F01	I	Leather	Boot/Shoe Shoe	Fragment			<input type="checkbox"/>	5
	LC-F01	I	Leather	Boot/Shoe Footware Unidentified	Fragment			<input type="checkbox"/>	2
	LC-F01	I	Refined Earthenware Whiteware	Holloware	Base/Body	White	1820 Present	<input type="checkbox"/>	1
	LC-F01	I	Rubber	Unidentified	Fragment			<input type="checkbox"/>	19
	LC-F01	I	Tin	Sheet	Fragment			<input type="checkbox"/>	2
Stripped 01 1.63- 1.63 10ths of Ft, Feature	LC-F01	III	Stoneware American Stoneware Albany Slip/Salt Glaze	Holloware Jug	Body	Brown, Gray	1800 1880	<input type="checkbox"/>	4
Stripped 01 2.44- 2.44 10ths of Ft, Feature	LC-F01	II	Refined Earthenware Whiteware	Holloware	Body	White	1820 Present	<input type="checkbox"/>	1
Stripped 02 0-0.3 10ths of Ft, Ao	IV-Brk Flr		Copper	Unidentified	Fragment			<input type="checkbox"/>	4
	IV-Brk Flr		Glass	Flat Glass	Fragment			<input type="checkbox"/>	2
	IV-Brk Flr		Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	1

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Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 02 0-0.3 10ths of Ft, Ao		IV-Brk Flr	Glass	Bottle/Jar	Lip/Neck Ground	Clear		<input type="checkbox"/>	1
		IV-Brk Flr	Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	2
		IV-Brk Flr	Glass	Flat Glass	Fragment	Aqua		<input type="checkbox"/>	9
		IV-Brk Flr	Iron	Unidentified	Fragment			<input type="checkbox"/>	1
		IV-Brk Flr	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	2
		IV-Brk Flr	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	6
		IV-Brk Flr	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	2
		IV-Brk Flr	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	11
		IV-Brk Flr	Iron	Spike	Fragment			<input type="checkbox"/>	1
		IV-Brk Flr	Iron	Handle	Mostly Complete			<input type="checkbox"/>	1
		IV-Brk Flr	Iron	Boiler Boiler Plate	Fragment			<input type="checkbox"/>	2
		IV-Brk Flr	Lead	Utility Pipe	Fragment			<input type="checkbox"/>	3
		IV-Brk Flr	Lead	Spatter	Complete			<input type="checkbox"/>	1
		IV-Brk Flr	Lead	Solder Rod	Fragment			<input type="checkbox"/>	1
		IV-Brk Flr	Leather	Unidentified	Fragment			<input type="checkbox"/>	6
		IV-Brk Flr	Leather	Unidentified	Fragment			<input type="checkbox"/>	1
		IV-Brk Flr	Tin	Unidentified	Fragment			<input type="checkbox"/>	27
	IV-Brk Flr	Unidentified Mineral	Unidentified	Industrial Waste	Complete		<input type="checkbox"/>	1	
Stripped 02 0-0.3 10ths of Ft, Feature	LC-F02	II	Bone	Mammal	Fragment Butchered			<input type="checkbox"/>	2
	LC-F02	II	Charcoal	Wood	Charred			<input type="checkbox"/>	6

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count	
<i>Lower Copperas Factory</i>										
Stripped 02 0-0.3 10ths of Ft, Feature	LC-F02	II	Coarse Earthenware	Brick	Fragment			<input type="checkbox"/>	3	
	LC-F02	V	Coarse Earthenware	Brick	Fragment	Brown, Red		<input type="checkbox"/>	2	
	LC-F02	II	Copper	Industrial Waste				<input type="checkbox"/>	6	
	LC-F02	V	Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	4	
	LC-F02	II	Glass	Flat Glass	Fragment	Colorless		<input type="checkbox"/>	6	
	LC-F02	V	Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	56	
	LC-F02	IV	Glass	Curved Glass	Fragment	Aqua		<input type="checkbox"/>	1	
	LC-F02	V	Glass	Bottle/Jar	Body	Olive		<input type="checkbox"/>	2	
	LC-F02	IV	Glass	Bottle/Jar Canning Jar	Lip/Neck	Ground	Clear	1850 1910	<input type="checkbox"/>	1
	LC-F02	V	Glass	Bottle/Jar	Body	Aqua		<input type="checkbox"/>	4	
	LC-F02	IV	Glass	Curved Glass	Rim	Clear		<input type="checkbox"/>	1	
	LC-F02	V	Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	3	
	LC-F02	IV	Glass	Tube	Fragment	Aqua		<input type="checkbox"/>	1	
	LC-F02	IV	Glass	Bottle/Jar Canning Jar	Body	Embossed	Aqua	1890 1920	<input checked="" type="checkbox"/>	1
	LC-F02	IV	Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	15	
	LC-F02	V	Glass	Flat Glass	Fragment	Aqua		<input type="checkbox"/>	36	
	LC-F02	V	Glass	Curved Glass	Fragment	Lavender		<input type="checkbox"/>	11	
	LC-F02	IV	Glass	Flat Glass	Fragment	Aqua		<input type="checkbox"/>	9	
	LC-F02	V	Glass	Tube	Fragment	Aqua		<input type="checkbox"/>	1	
	LC-F02	II	Iron		Nail Machine Cut Nail	Mostly Complete			<input type="checkbox"/>	21
LC-F02	II	Iron		Unidentified	Fragment			<input type="checkbox"/>	5	

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 02 0-0.3 10ths of Ft, Feature	LC-F02	II	Iron	Utility Pipe	Fragment			<input type="checkbox"/>	1
	LC-F02	II	Iron	Rivet Sheared Rivet				<input type="checkbox"/>	77
	LC-F02	II	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	1
	LC-F02	II	Iron	Industrial Waste				<input type="checkbox"/>	25
	LC-F02		Iron	Miscellaneous Hardware	Fragment			<input type="checkbox"/>	2
	LC-F02	II	Iron	Animal Shoe Horse Shoe	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Unidentified	Fragment			<input type="checkbox"/>	3
	LC-F02	IV	Iron	Axe	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Unidentified	Fragment			<input type="checkbox"/>	11
	LC-F02	IV	Iron	Spike	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Bracket	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Nail Unidentified Nail	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Lock/Latch	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Bracket	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Axe	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	IV	Iron	Axe	Fragment			<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Iron	Unidentified	Fragment			<input type="checkbox"/>	18
	LC-F02	V	Iron	Hook	Fragment			<input type="checkbox"/>	1
	LC-F02	V	Iron	Unidentified	Fragment			<input type="checkbox"/>	7
	LC-F02	V	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	7
	LC-F02	IV	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 02 0-0.3 10ths of Ft, Feature	LC-F02	IV	Iron	Unidentified Tool	Fragment			<input type="checkbox"/>	1
	LC-F02	V	Iron	Unidentified	Fragment			<input type="checkbox"/>	2
	LC-F02	V	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	20
	LC-F02	V	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	14
	LC-F02	IV-Brk Flr	Iron	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	5
	LC-F02	IV-Brk Flr	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	14
	LC-F02	IV-Brk Flr	Iron	Nail	Fragment			<input type="checkbox"/>	6
	LC-F02	IV-Brk Flr	Iron	Unidentified	Fragment			<input type="checkbox"/>	2
	LC-F02	IV	Iron Cast Iron	Unidentified	Fragment			<input type="checkbox"/>	2
	LC-F02		Iron Wrought Iron	Ladle	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	II	Lead	Trimming				<input type="checkbox"/>	25
	LC-F02	V	Lead	Trimming	Complete			<input type="checkbox"/>	17
	LC-F02	IV-Brk Flr	Lead	Rivet Sheared Rivet	Fragment			<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Lead	Trimming	Complete			<input type="checkbox"/>	32
	LC-F02	IV-Brk Flr	Lead	Sheet	Fragment			<input type="checkbox"/>	19
	LC-F02	IV	Lead	Utility Pipe	Fragment			<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Lead	Spatter	Complete			<input type="checkbox"/>	58
	LC-F02	IV	Lead	Utility Pipe	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Lead	Rivet Sheared Rivet	Mostly Complete			<input type="checkbox"/>	1
	LC-F02	II	Lead	Spatter				<input type="checkbox"/>	136
	LC-F02	IV	Lead	Whetstone	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 02 0-0.3 10ths of Ft, Feature	LC-F02	V	Lead	Spatter	Complete			<input type="checkbox"/>	28
	LC-F02	IV	Lead	Solder Rod	Fragment			<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Leather	Unidentified	Fragment			<input type="checkbox"/>	3
	LC-F02	IV	Leather	Unidentified	Fragment			<input type="checkbox"/>	4
	LC-F02	V	Leather	Unidentified	Fragment			<input type="checkbox"/>	3
	LC-F02	V	Mortar					<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Plant Part	Nutshell	Fragment			<input type="checkbox"/>	1
	LC-F02	IV	Rubber	Button	Complete	Black	1855 1870	<input checked="" type="checkbox"/>	1
	LC-F02	II	Unidentified Metal	Bullet Bullet Casing	Complete			<input type="checkbox"/>	1
	LC-F02	IV-Brk Flr	Unidentified Metal	Unidentified	Fragment			<input type="checkbox"/>	3
	LC-F02	V	Unidentified Metal	Unidentified	Complete			<input type="checkbox"/>	4
	LC-F02	IV-Brk Flr	Unidentified Mineral	Industrial Waste	Complete			<input type="checkbox"/>	14
	LC-F02	V	Unidentified Mineral	Industrial Waste	Complete			<input type="checkbox"/>	20
	LC-F02	II	Wood	Wood	Fragment			<input type="checkbox"/>	5
	LC-F02	IV	Wood	Handle Tool Handle	Fragment			<input type="checkbox"/>	4
LC-F02	IV-Brk Flr	Wood	Wood	Fragment			<input type="checkbox"/>	7	
Stripped 02 0- 1.15 10ths of Ft, Feature	LC-F02	III	Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	1
	LC-F02	III	Glass Molded Glass	Bottle/Jar	Body	Aqua		<input type="checkbox"/>	1
	LC-F02	III	Iron	Hinge	Fragment			<input type="checkbox"/>	1
	LC-F02	III	Iron	Handle	Mostly Complete			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 02 0-1.15 10ths of Ft, Feature	LC-F02	III	Wood	Unidentified	Fragment			<input type="checkbox"/>	2
Stripped 03 0.11-0.11 10ths of Ft, Feature	LC-F04	F04-III	Iron	Rake	Fragment			<input type="checkbox"/>	1
Stripped 03 0-0.42 10ths of Ft, Feature	LC-F04		Unidentified Metal	Currency/Token American Currency Penny	Complete			<input type="checkbox"/>	1
Stripped 03 0-0.5 10ths of Ft, Feature	LC-F04	I	Iron	Rod	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Spike	Mostly Complete			<input type="checkbox"/>	1
	LC-F04	I	Iron	Unidentified	Fragment			<input type="checkbox"/>	2
	LC-F04	I	Iron	Hook	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Animal Shoe Horse Shoe	Fragment			<input type="checkbox"/>	13
	LC-F04	I	Iron	Axe	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Bracket	Fragment			<input type="checkbox"/>	2
	LC-F04	I	Iron	Animal Shoe Horse Shoe	Mostly Complete			<input type="checkbox"/>	5
	LC-F04	I	Iron	Unidentified	Fragment			<input type="checkbox"/>	4
	LC-F04	I	Iron	Lock/Latch Cabin Hook	Complete			<input type="checkbox"/>	1
	LC-F04	I	Iron	Rod	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Chisel	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Axe	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Axe	Mostly Complete			<input type="checkbox"/>	1
	LC-F04	I	Iron	Axe	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Lower Copperas Factory</i>									
Stripped 03 0-0.5 10ths of Ft, Feature	LC-F04	I	Iron	Nail Unidentified Nail	Fragment			<input type="checkbox"/>	4
	LC-F04	I	Iron	Hook	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Iron	Axe	Fragment			<input type="checkbox"/>	1
	LC-F04	I	Lead	Trimming	Complete			<input type="checkbox"/>	1
	LC-F04	I	Lead	Spatter	Complete			<input type="checkbox"/>	1
	LC-F04	I	Lead	Trimming	Complete			<input type="checkbox"/>	2
TR-02 2.6-3 10ths of Ft, Fill 3			Coarse Earthenware	Brick Handmade Brick	Fragment	Gray, Red		<input type="checkbox"/>	2
			Mortar					<input type="checkbox"/>	13
TR-03 0.7-2 10ths of Ft, Fill 1			Wood	Packing Barrel Barrel Stave	Fragment			<input type="checkbox"/>	4
TR-04 0.5-2.9 10ths of Ft, Fill 1			Glass	Flat Glass	Fragment	Clear		<input type="checkbox"/>	1
			Iron	Unidentified	Fragment			<input type="checkbox"/>	2
			Refined Earthenware Whiteware	Ceramic Sherd	Fragment	White	1820 Present	<input type="checkbox"/>	1
TR-05 0-1 10ths of Ft, Overburden			Iron	Unidentified	Fragment			<input type="checkbox"/>	2
Unprovenienced 0-0 10ths of Ft, Surface			Iron	Handle Tool Handle	Fragment			<input type="checkbox"/>	1
			Iron Cast Iron	Shovel	Handle	Rust	1809 1954	<input type="checkbox"/>	1
Unprovenienced 0-24 Inches, Fill			Refined Earthenware Red-Bodied Refined	Smoking Pipe Unmarked Pipe	Bowl	Red	1809 1884	<input type="checkbox"/>	1
Total: Lower Copperas Factory									1039

Upper Copperas Factory

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Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
Monitoring 0-0 , Sed Basin			Wood	Packing Barrel Barrel Stave				<input type="checkbox"/>	4
Monitoring 0-0 10ths of Ft, Unknown	Plank Feat		Leather	Boot/Shoe Boot	Fragment			<input type="checkbox"/>	5
	Plank Feat		Wood	Wheel	Mostly Complete			<input type="checkbox"/>	1
	Plank Feat		Wood	Packing Barrel Barrel Stave	Fragment			<input type="checkbox"/>	3
Stripped 01 0.7- 0.8 10ths of Ft, Feature	UC-F01	F01-I	Iron	Boiler Boiler Grate	Fragment			<input type="checkbox"/>	1
	UC-F01	F01-I	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	2
	UC-F01	F01-I	Lead	Miscellaneous Hardware	Fragment			<input type="checkbox"/>	1
Stripped 01 0.71- 0.71 10ths of Ft, Feature	UC-F01		Glass	Bottle/Jar	Lip Oil/Ring	Dk Olive	1850 1920	<input type="checkbox"/>	1
	UC-F01		Iron	Damper Wheel	Complete			<input type="checkbox"/>	1
Stripped 01 0-0.3 10ths of Ft, Feature	UC-F01	I	Stoneware American Stoneware Salt Glaze	Holloware	Handle	Gray	1760 1870	<input type="checkbox"/>	1
Stripped 01 0-4.3 10ths of Ft, Feature	UC-F01	I	Coarse Earthenware Redware Lead Glaze	Holloware	Rim	Brown, Red	1600 Present	<input type="checkbox"/>	1
	UC-F06		Glass	Bottle/Jar Beer Bottle	Base Parison Mold	Brown	1910s 1950s	<input type="checkbox"/>	1
	UC-F06		Glass	Bottle/Jar	Body Pattern Mold	Clear		<input type="checkbox"/>	4
	UC-F01	III	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	4
	UC-F01	I	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	1
	UC-F01	I	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	2

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
Stripped 01 0-4.3 10ths of Ft, Feature	UC-F01	I	Lead	Spatier	Complete			<input type="checkbox"/>	4
	UC-F01	I	Refined Earthenware Whiteware	Ceramic Sherd	Fragment	White	1820 Present	<input type="checkbox"/>	1
	UC-F01	I	Refined Earthenware Whiteware	Ceramic Sherd	Fragment	Dk Green, Lt Green, White	1820 Present	<input type="checkbox"/>	1
	UC-F01	I	Refined Earthenware Whiteware	Ceramic Sherd	Body	White	1820 Present	<input type="checkbox"/>	1
Stripped 01 4-4.3 10ths of Ft, Feature	UC-F01	II	Coarse Earthenware	Brick	Fragment	Red		<input checked="" type="checkbox"/>	1
	UC-F01	II	Iron	Sheet Hole(s) Punched	Fragment			<input type="checkbox"/>	1
	UC-F01	II	Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	3
	UC-F01	II	Lead	Spatier	Complete			<input type="checkbox"/>	2
	UC-F01	II	Lead	Trimnings	Complete			<input type="checkbox"/>	1
Stripped 02 0-0.5 10ths of Ft, Ao/Dev A	UC-F05		Brass	Buckle	Mostly Complete			<input type="checkbox"/>	1
	UC-F05		Brass	Buckle	Mostly Complete			<input type="checkbox"/>	1
	UC-F05		Iron	Animal Shoe Horse Shoe	Fragment			<input type="checkbox"/>	1
	UC-F05		Iron	Handle Door Handle	Mostly Complete			<input type="checkbox"/>	1
	UC-F05		Iron	Miscellaneous Hardware	Fragment			<input type="checkbox"/>	2
	UC-F05		Iron	Wrench	Fragment			<input type="checkbox"/>	1
	UC-F05		Lead	Utility Pipe	Fragment			<input type="checkbox"/>	1
Stripped 03 0-2.5 10ths of Ft, Feature	UC-F07		Coarse Earthenware Redware Lead Glaze	Holloware	Fragment		1600 Present	<input type="checkbox"/>	1
	UC-F07		Iron	Unidentified	Fragment			<input type="checkbox"/>	2

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
Stripped 03 0-2.5 10ths of Ft, Feature	UC-F07		Iron	Unidentified	Fragment			<input type="checkbox"/>	11
			Iron	Nail	Fragment			<input type="checkbox"/>	2
			Iron	Wedge	Complete			<input type="checkbox"/>	1
			Lead	Spatter	Complete			<input type="checkbox"/>	1
			Lead	Trimmings	Complete			<input type="checkbox"/>	1
			Lead	Washer	Complete			<input type="checkbox"/>	1
TR-01 0-3.3 10ths of Ft, Colluvium			Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	3
			Lead	Trimmings	Complete			<input type="checkbox"/>	1
			Mortar					<input type="checkbox"/>	5
TR-01-N 0-3.3 10ths of Ft, Colluvium			Iron	Slag	Complete			<input type="checkbox"/>	1
			Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	4
TR-01-S 0-3.3 10ths of Ft, Colluvium			Glass	Curved Glass	Fragment	Clear		<input type="checkbox"/>	1
			Iron	Unidentified	Mostly Complete			<input type="checkbox"/>	1
			Iron	Bolt	Fragment			<input type="checkbox"/>	1
			Iron	Nail Machine Cut Nail	Mostly Complete			<input type="checkbox"/>	30
			Lead	Unidentified	Fragment			<input type="checkbox"/>	1
			Lead	Trimmings	Complete			<input type="checkbox"/>	2
			Leather	Unidentified	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
TR-01-S 0-3.3 10ths of Ft, Colluvium			Unidentified Mineral	Unidentified	Fragment	Gray		<input type="checkbox"/>	1
TR-02 0-3.14 10ths of Ft, Alluvium			Glass	Bottle/Jar Milk Bottle	Lip/Neck Capseat	Colorless	1889 1950s	<input type="checkbox"/>	1
			Glass	Bottle/Jar Canning Jar	Lid	Colorless	1900 1922	<input type="checkbox"/>	1
			Glass Molded Glass	Holloware	Body	Amber	1809 1954	<input type="checkbox"/>	1
			Glass Molded Glass	Holloware	Lip/Neck	Colorless	1809 1954	<input type="checkbox"/>	1
			Lead	Sheet	Fragment			<input type="checkbox"/>	1
TR-02 2.7-3.9 10ths of Ft, Alluvium	UC-F02		Glass	Flat Glass	Fragment	Colorless	1865 1879	<input type="checkbox"/>	2
	UC-F02		Glass	Curved Glass	Fragment	Colorless		<input type="checkbox"/>	1
	UC-F02		Iron	Unidentified	Fragment			<input type="checkbox"/>	1
	UC-F02		Iron	Unidentified	Fragment			<input type="checkbox"/>	2
	UC-F02		Lead	Industrial Waste	Fragment			<input type="checkbox"/>	5
TR-02 3.65-3.8 10ths of Ft, Alluvium	UC-F02		Lead	Sheet	Fragment			<input type="checkbox"/>	1
TR-03 0-18 Inches, Fill 1	UC-F03		Iron	Nail	Fragment			<input type="checkbox"/>	40
	UC-F03		Iron	Slag	Complete			<input type="checkbox"/>	24
	UC-F03		Iron	Nail Machine Cut Nail	Fragment			<input type="checkbox"/>	79
	UC-F03		Lead	Spatter	Complete			<input type="checkbox"/>	1
	UC-F03		Unidentified Mineral	Industrial Waste	Complete			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
TR-05 0.5-0.6 10ths of Ft, Overburden		North Berm	Iron	Plate	Fragment			<input type="checkbox"/>	1
		North Berm	Iron	Plate	Fragment			<input type="checkbox"/>	3
		North Berm	Iron	Plate	Fragment			<input type="checkbox"/>	5
TR-05 0.54-0.54 10ths of Ft, Overburden			Glass Molded Glass	Holloware Cup Tumbler	Base	Colorless	1809 1884	<input type="checkbox"/>	1
TR-05 0-3.5 10ths of Ft, Overburden/Fill		N Extensn	Lead	Trimnings	Complete			<input type="checkbox"/>	1
TR-06 0-2.9 10ths of Ft, Overburden/Fill		North Berm	Coarse Earthenware	Brick Handmade Brick	Fragment			<input type="checkbox"/>	1
		North Berm	Coarse Earthenware	Brick	Fragment			<input type="checkbox"/>	1
		North Berm	Iron	Plate	Fragment			<input type="checkbox"/>	1
		North Berm	Iron	Unidentified	Fragment			<input type="checkbox"/>	2
		North Berm	Iron	Boiler Boiler Plate	Fragment			<input type="checkbox"/>	5
		North Berm	Lead	Sheet	Fragment			<input type="checkbox"/>	1
		North Berm	Lead	Sheet	Fragment			<input type="checkbox"/>	1
		North Berm	Wood	Unidentified	Fragment			<input type="checkbox"/>	1
TR-07 0-5.1 10ths of Ft, Overburden/Rubble	UC-F04		Iron	Unidentified	Fragment			<input type="checkbox"/>	4
	UC-F04		Lead	Spatter	Fragment			<input type="checkbox"/>	1

Appendix A. Catalog of Cultural Materials, Elizabeth Mine Copperas Factories, Data Recovery.

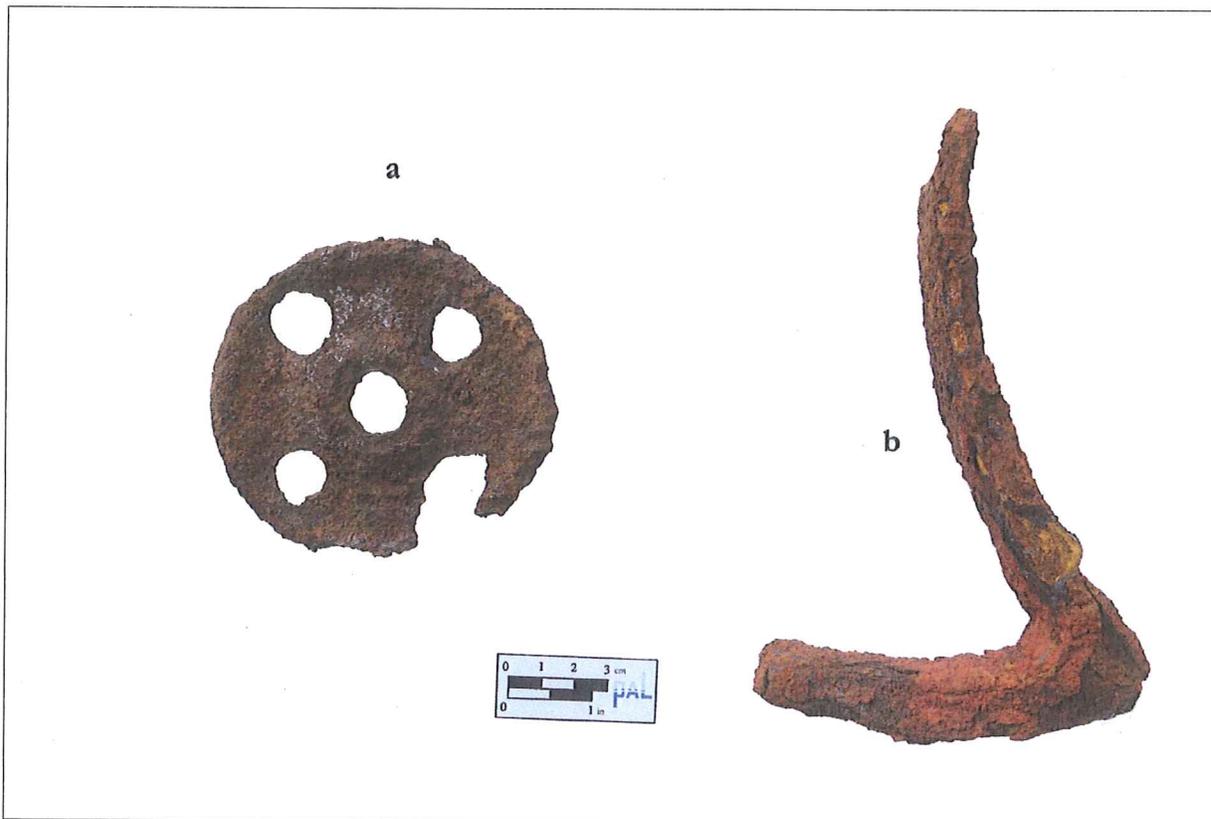
Provenience	Feature	Context	Material	Object	Attributes	Color(s)	Manufacture Date	Makers Mark	Count
<i>Upper Copperas Factory</i>									
TR-08-SE 0-2.9			Lead	Spatter	Complete			<input type="checkbox"/>	1
10ths of Ft, Overburden/Rubbl e			Leather	Unidentified	Fragment			<input type="checkbox"/>	1
TR-11 0.3-0.9			Iron	Pulley	Fragment			<input type="checkbox"/>	1
10ths of Ft, Colluvium			Iron	Plate	Fragment			<input type="checkbox"/>	1
			Refined Earthenware	Ceramic Sherd	Fragment	Brown, White		<input type="checkbox"/>	2
Unprovenienced			Lead	Spatter	Complete			<input type="checkbox"/>	1
0-0 CMBS, Surface			Lead	Sheet Hole(s) Punched	Fragment			<input type="checkbox"/>	1
			Wood	Packing Barrel Barrel Stave	Fragment			<input type="checkbox"/>	4
			Wood	Wood	Complete			<input type="checkbox"/>	1
Total: Upper Copperas Factory									332
Total:									1636

APPENDIX B

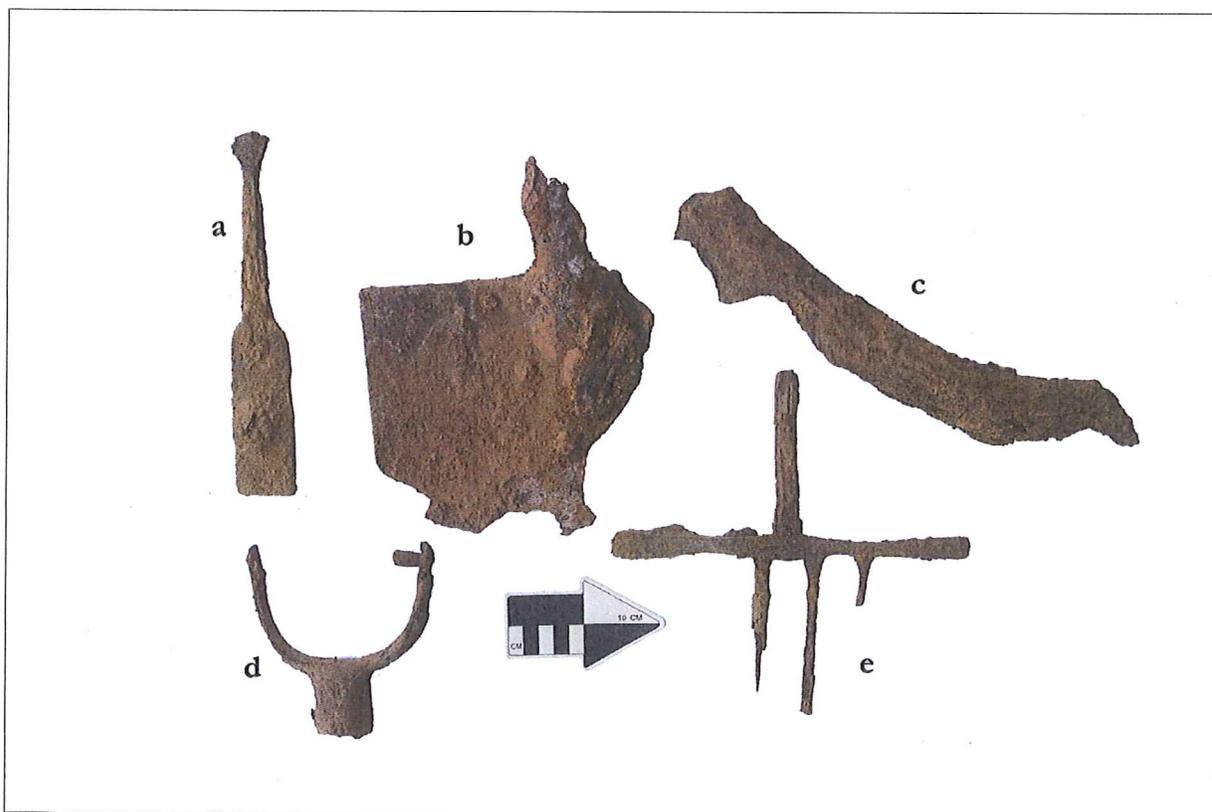
ARTIFACT PHOTOGRAPHS AND DRAWINGS

- B.1 PHOTOGRAPHS OF REPRESENTATIVE ARTIFACTS RECOVERED
DURING THE FIELD INVESTIGATIONS**

- B.2 SELECT OBJECTS PHOTOGRAPHED AND/OR DRAWN IN THE FIELD
DURING THE DATA RECOVERY AND MONITORING
(NOT REMOVED FROM THE SITE)**



B.1-1. Iron objects recovered from the North Berm at Upper : (a) iron damper wheel, FEA-1-UC in ST-1-UC; (b) iron drive wheel shaft fragment, TR-5-UC.



B.1-2. Examples of metal tools recovered at the Lower and Upper Factories: (a) chisel, FEA-4-LC in ST-3-LC; (b) shovel, FEA-1-LC in ST-1-LC; (c) curved wrench, FEA-5-UC in ST-2-UC; (d) tool handle, FEA-2-LC in ST-2-LC; (e) rake, FEA-4-LC in ST-3-LC.



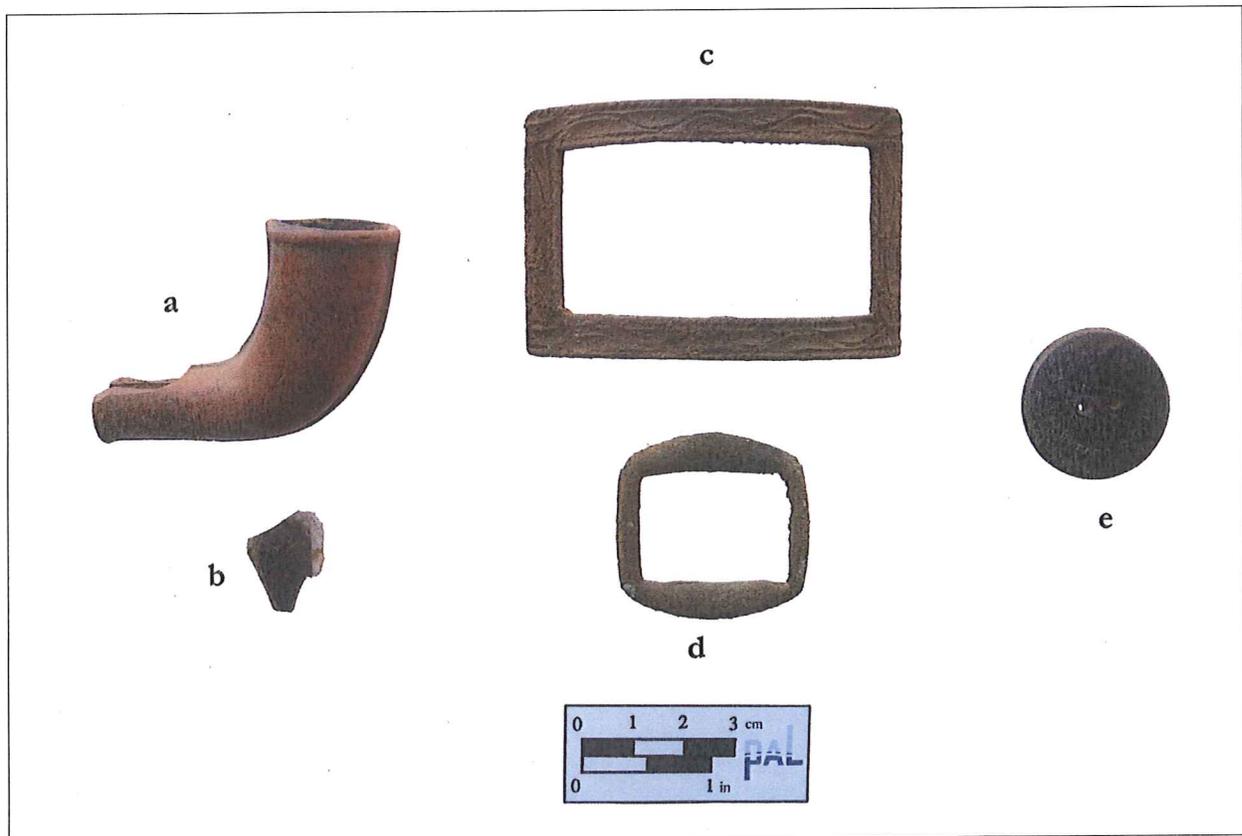
B.1-3. Iron nails recovered from FEA-3-UC in TR-3-UC, before exposure to copperas liquor.



B.1-4. Iron nails recovered from FEA-3-UC in TR-3-UC, after exposure to copperas liquor.



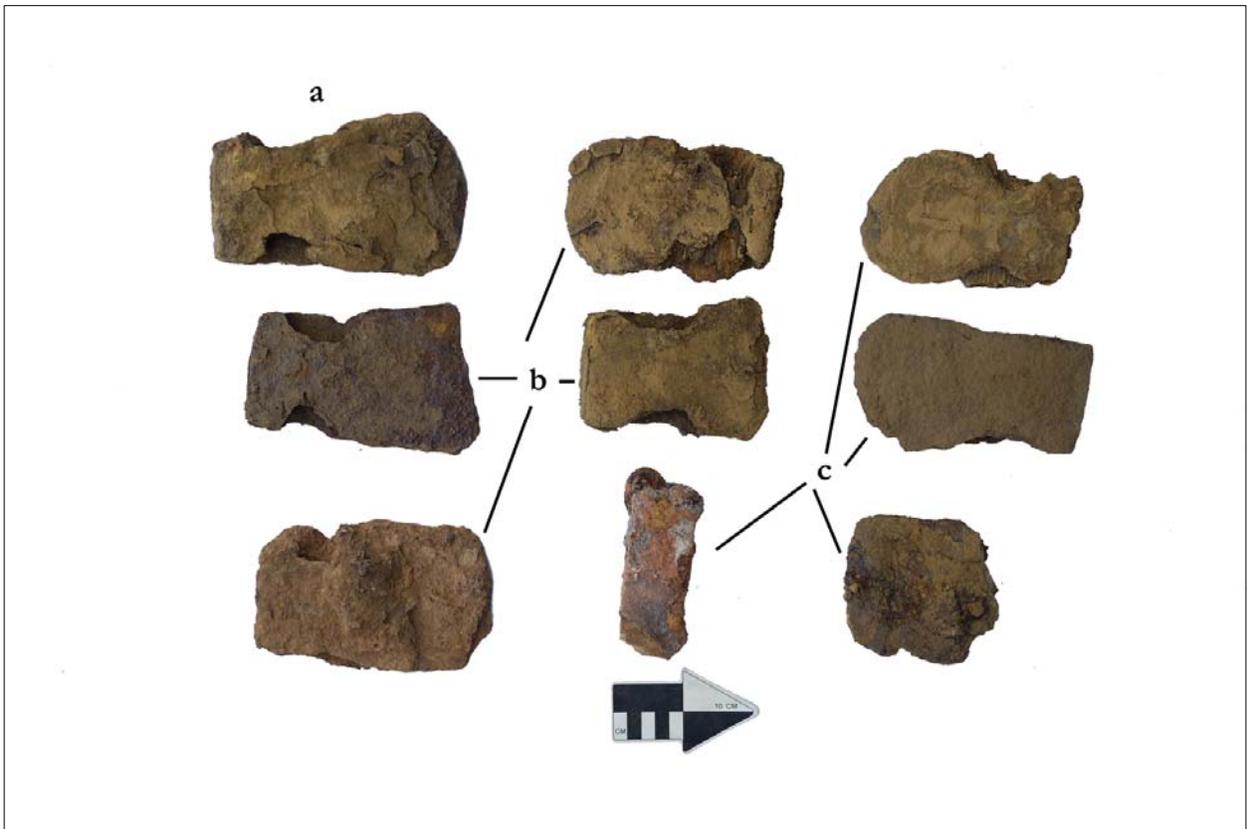
B.1-5. Glass bottle base with unfinished pontil star, North Berm, TR-5-UC.



B.1-6. Examples of personal items recovered at the Upper and Lower Factories and Pine Grove area: (a) kaolin smoking pipe bowl, unprovenienced, Lower Factory; (b) kaolin smoking pipe bowl fragment, FEA-1-PG in TR-2-PG; (c) brass buckle with decoration, FEA-5-UC in ST-2-UC; (d) brass buckle with no decoration, FEA-5-UC in ST-2-UC; (e) vulcanized rubber button, FEA-2-LC in ST-2-LC.



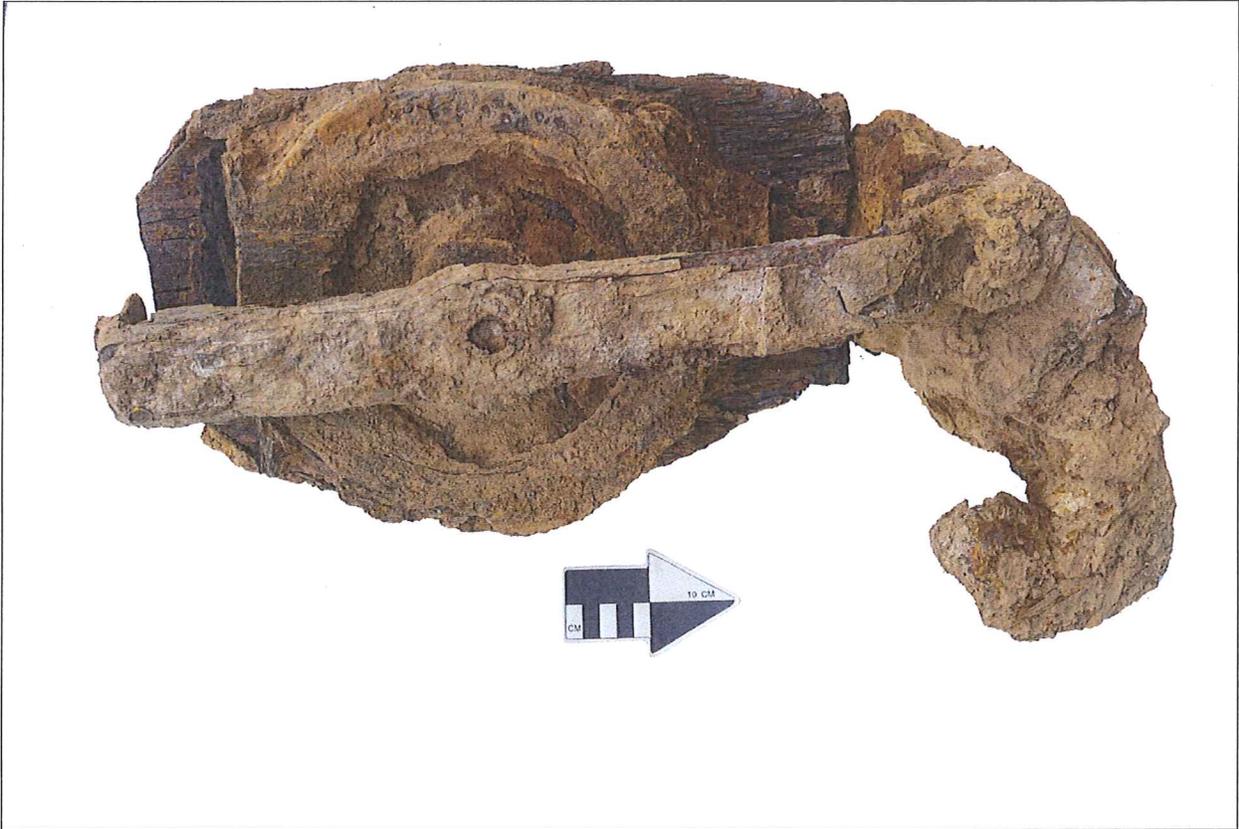
B.1-7. Iron ladle bowl, FEA-2-LC in ST-2-LC. Note: white lead spatter in the bottom of the bowl.



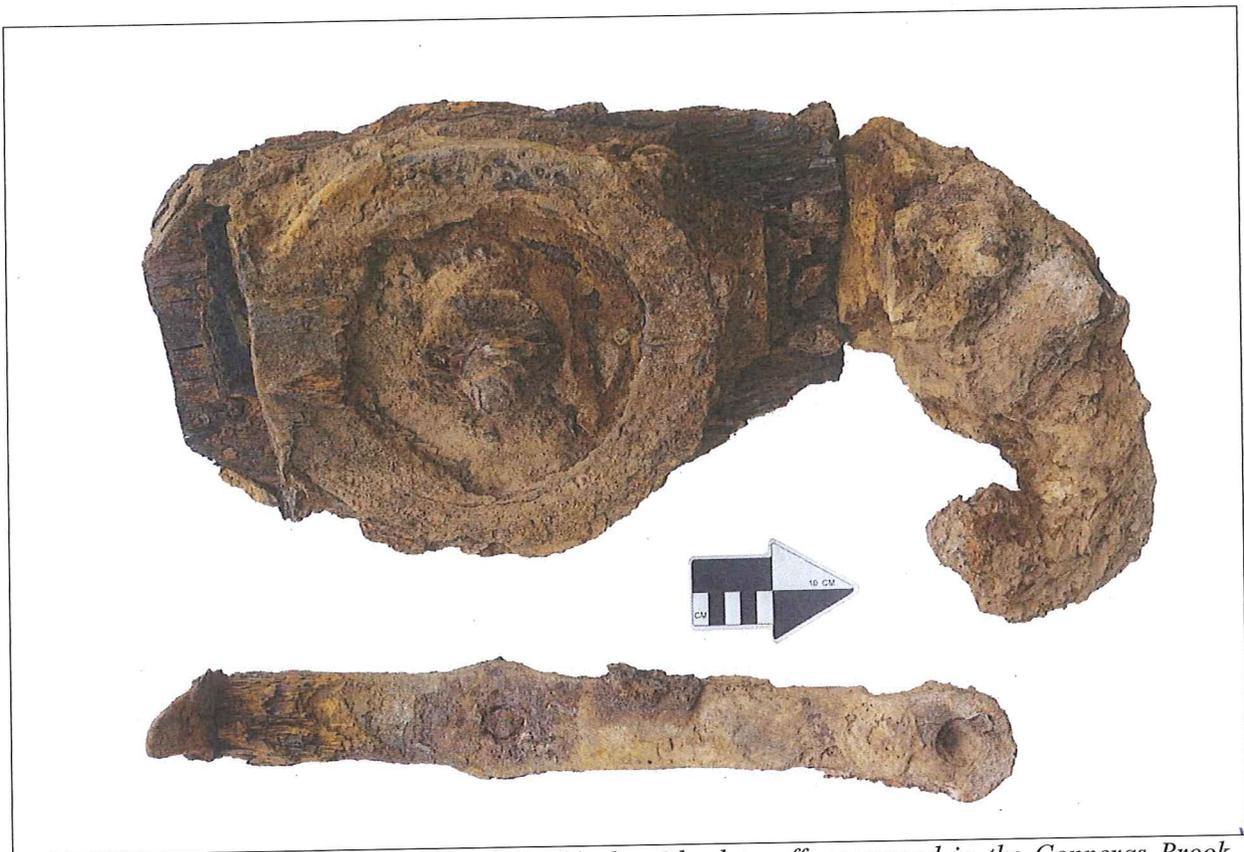
B.1-8. Iron axe heads recovered at the Lower Factory: (a) FEA-1-LC in ST-1-LC; (b) FEA-2-LC in ST-2-LC; (c) FEA-4-LC in ST-3-LC.



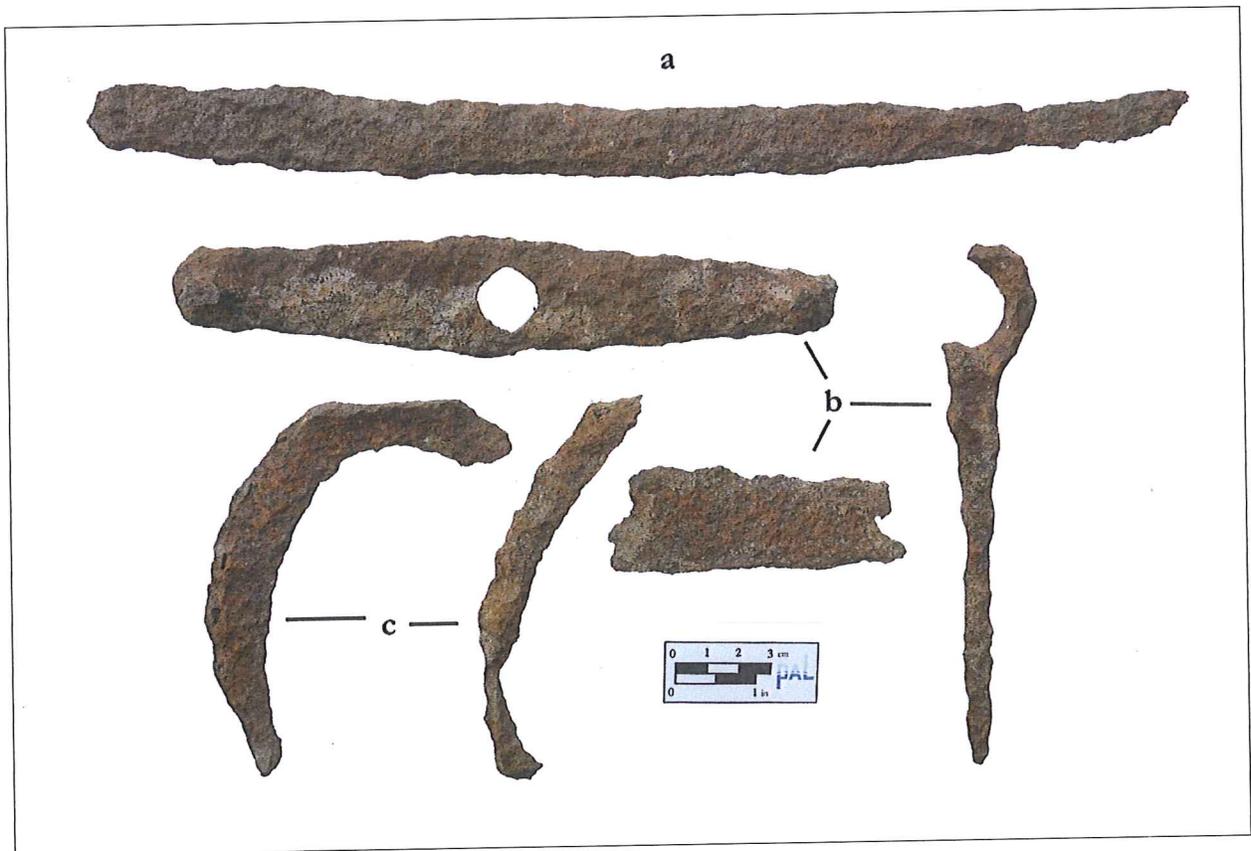
B.1-9. Rivets collected from Context II in ST-2-LC used for recharging the copperas liquor.



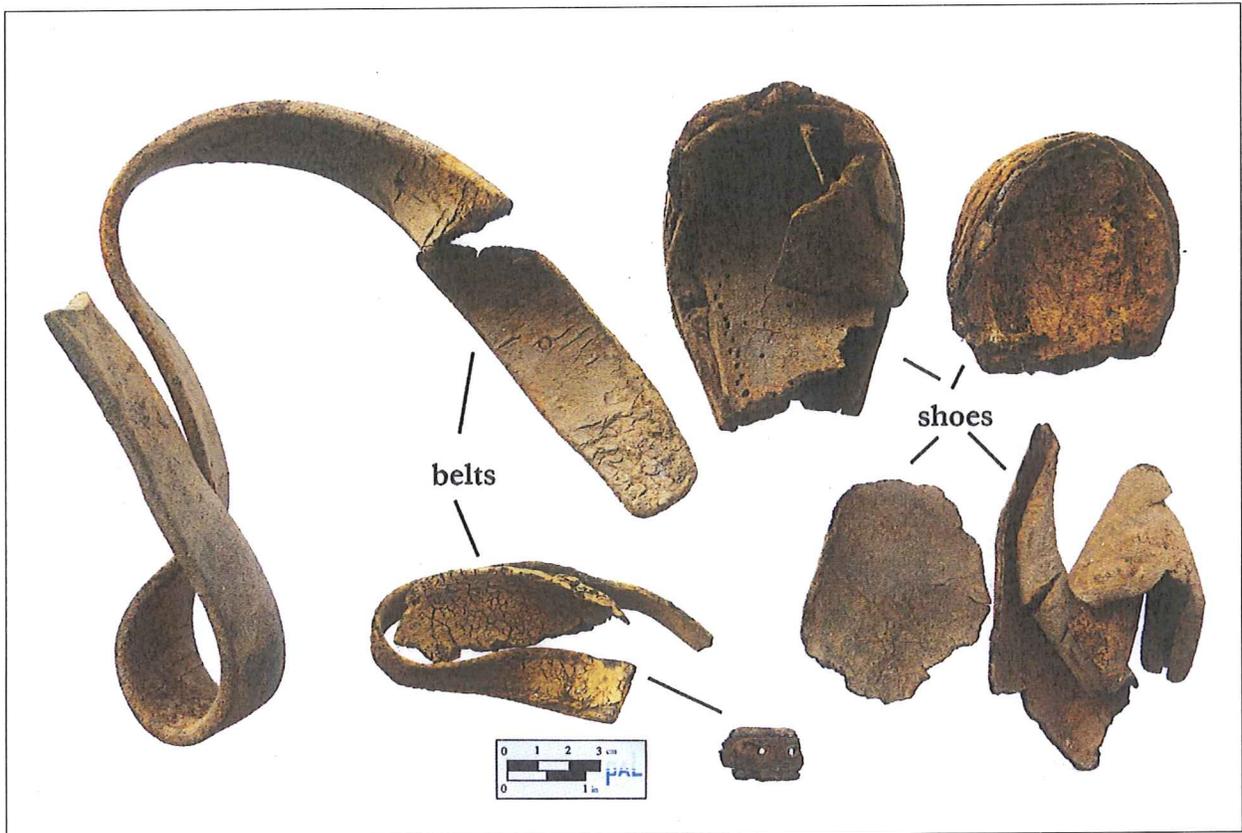
B.1-10. Iron and wood double-pulley hoist block, with plate on, recovered in the Copperas Brook Corridor, FEA-7-BC in TR-5-BC.



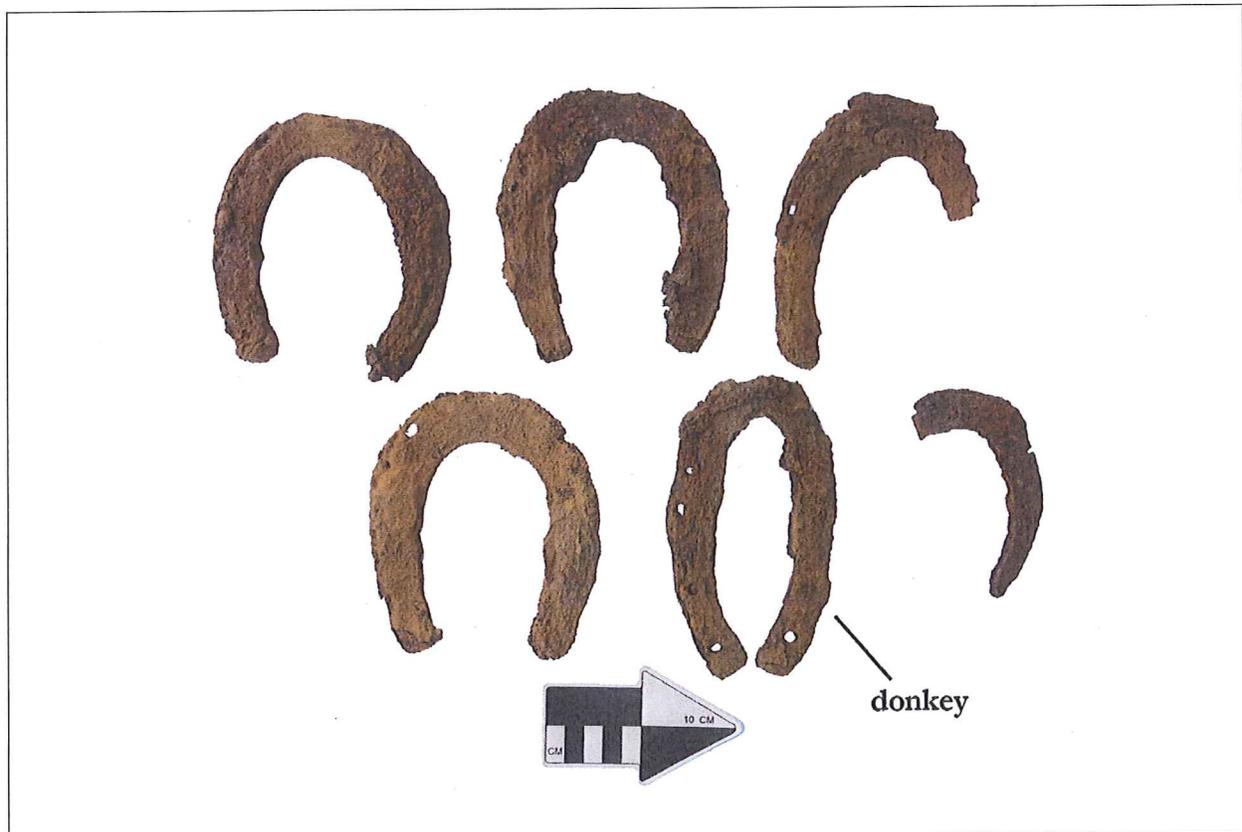
B.1-11. Iron and wood double-pulley hoist block, with plate off, recovered in the Copperas Brook Corridor, FEA-7-BC in TR-5-BC.



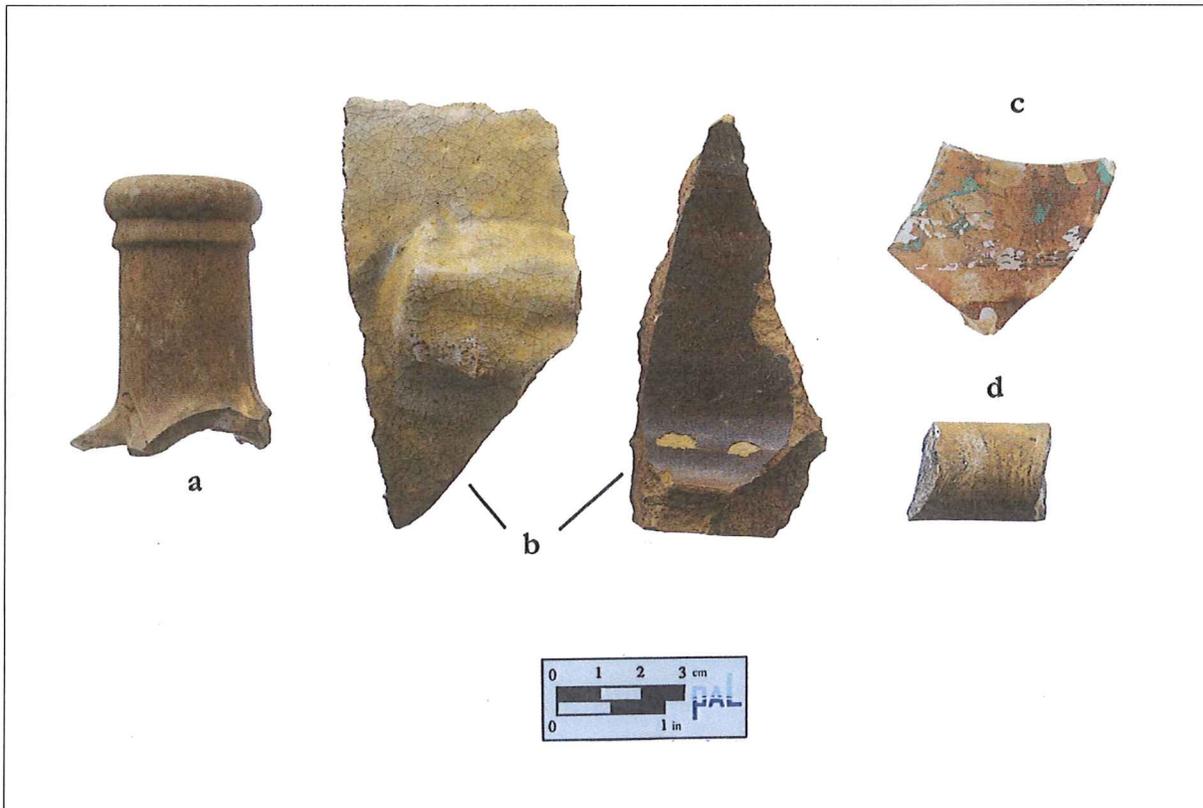
B.1-12. Miscellaneous metal tools and objects collected from the surface scatter within the Copperas Brook Corridor, northwest of EU-4-BC: (a) metal file; (b) misc. hardware items; (c) animal shoe fragments.



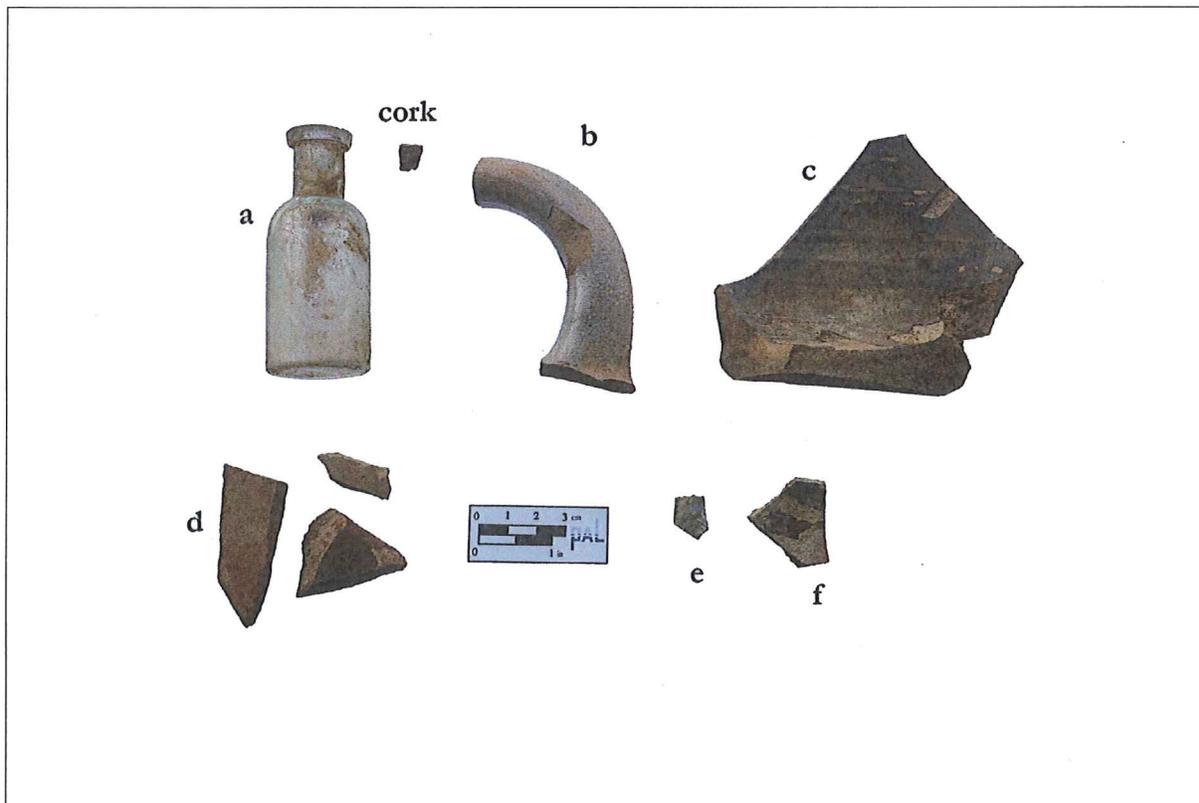
B.1-13. Examples of leather belt and shoe fragments recovered at the Lower Factory and Pine Grove Area, FEA-1-LC in ST-1-LC; FEA 2-LC in ST-2-LC; and FEA-1-PG in TR-2-PG.



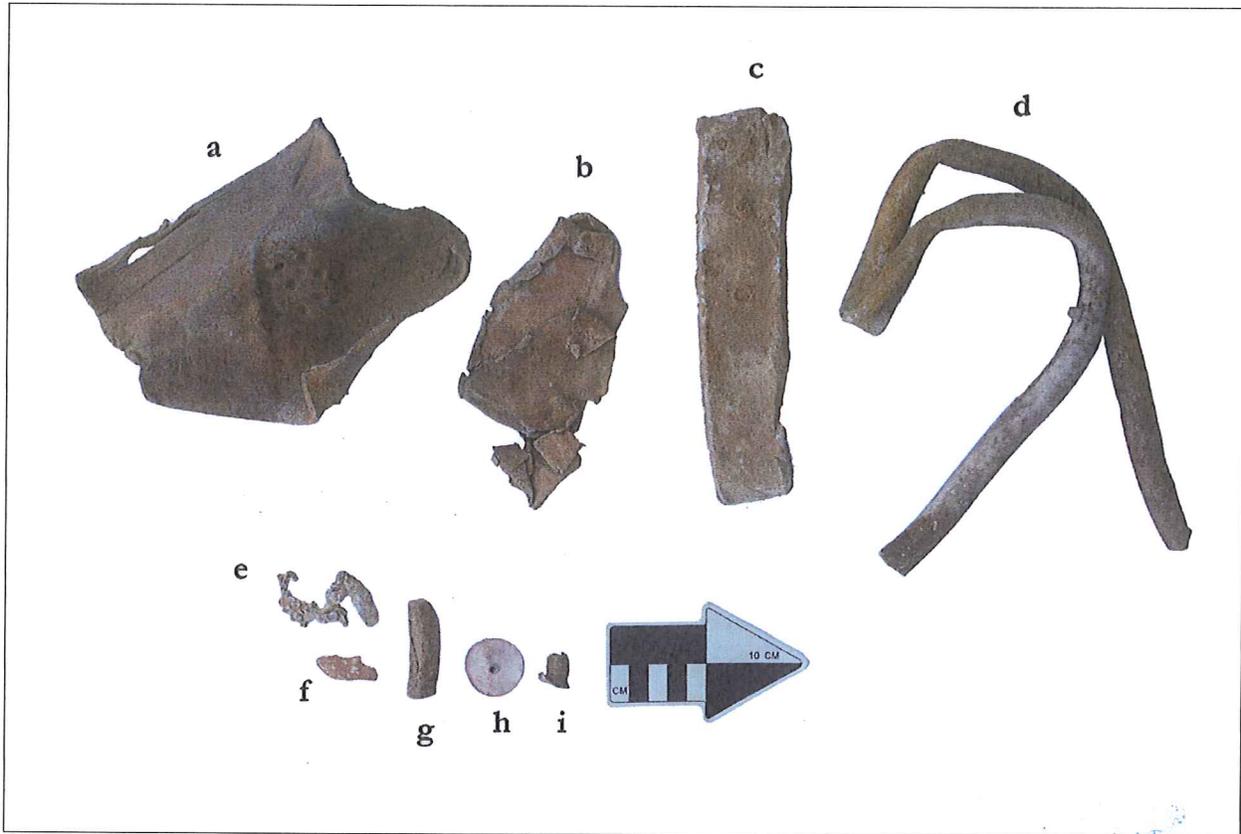
B.1-14. Examples of animal (donkey and horse) shoes recovered at the Lower Factory, FEA-4-LC in ST-3-LC.



B.1-15. Examples of artifacts recovered in alluvial deposits in the Copperas Brook Corridor: (a) glass bottle fragment, 1910-1920, surface of EU-2-BC; (b) American stoneware, interior and exterior surfaces, body sherds, 1850-1930, TR-4-BC; (c) hand-painted glass fragment, 1940-present, TR-4-BC; (d) drill core fragment, TR-4-BC.



B.1-16. Domestic artifacts recovered at the Pine Grove Area: (a) glass medicine bottle, 1840-1880; (b) American stoneware-jug handle, 1760-1870; (c) American stoneware jug body sherd, 1860-1880; (d) American stoneware sherds; (e) whiteware sherd-mocha pattern, 1820-1900; (f) slip trailed redware ceramic sherd, 1700-1830.

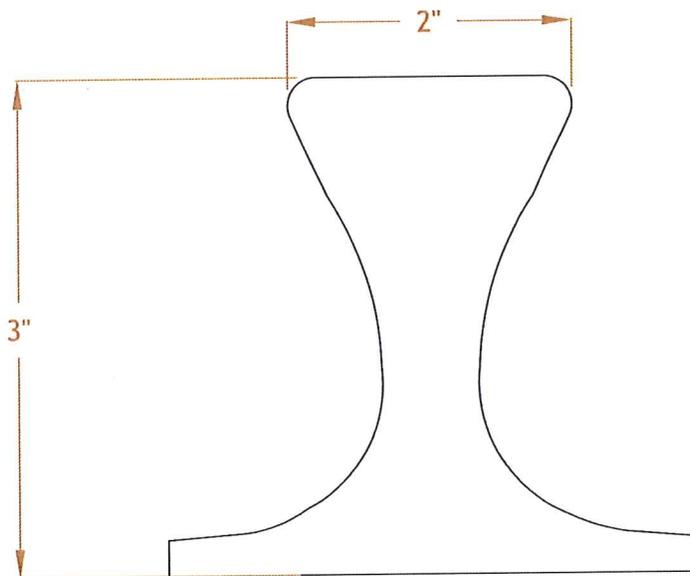
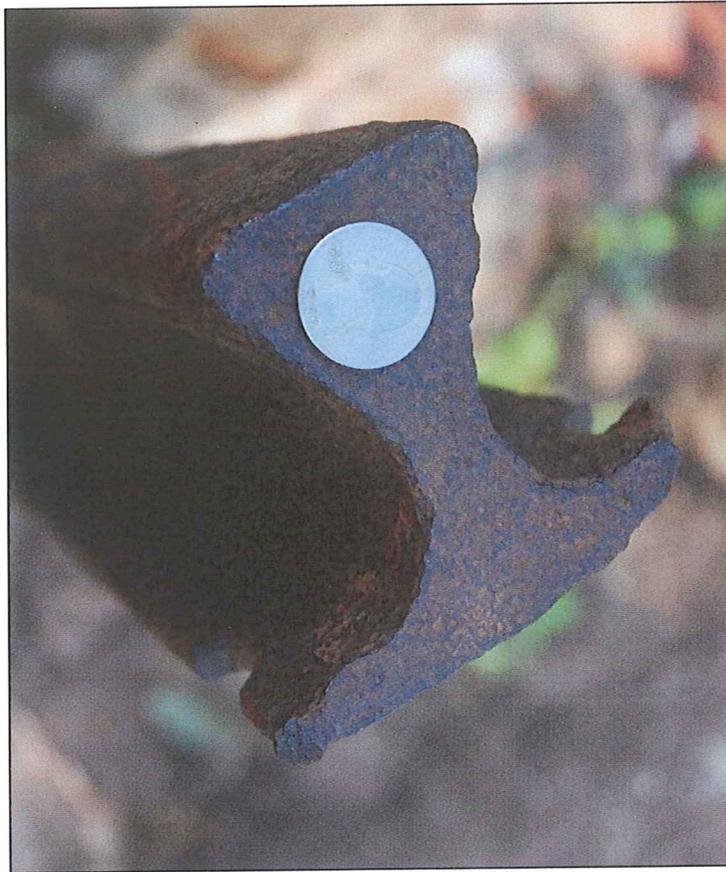


B.1-17. Examples of lead artifacts recovered at the Upper and Lower Factories: (a) drain fragment, unprovenanced Upper Factory; (b) sheeting, TR-6-UC; (c) plate with holes, FEA-1-UC in ST-1-UC; (d) small pipe diameter, ST-2-LC; (e) spatter, FEA-2-LC; (f) trimming, FEA-7-UC in ST-3-UC; (g) solder rod, FEA-2-LC in ST-2-LC; (h) washer, ST-1-UC; (i) rivet, FEA-2-LC in ST-2-LC.



B.2-1. L Brackets from FEA-3-UC in TR-3-UC.

Iron Stanchion



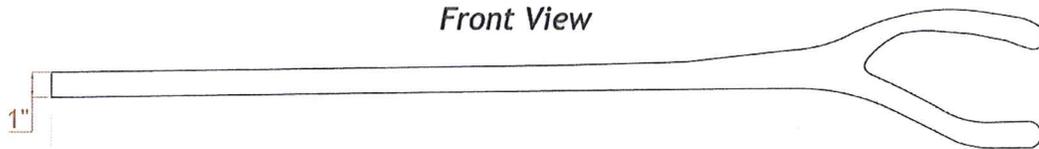
PAL August 2011

B.2-2. Cross-section of stanchion/upright rail from FEA- 6-UC in ST-1-UC

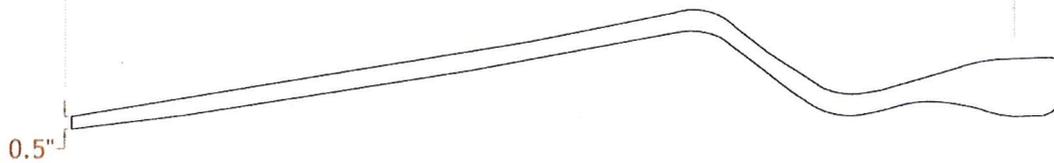
(A) Iron Tool



Front View



Side View

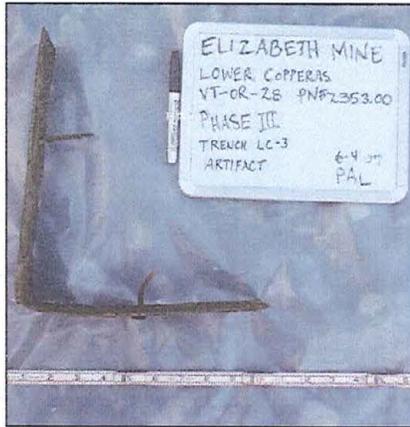


(B) Wood Fragment

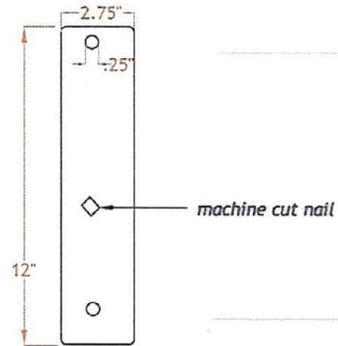


B.2-3. Iron tool and wood fragment from TR-2-LC.

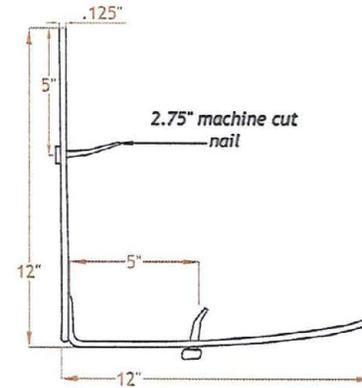
2 Piece L-Bracket



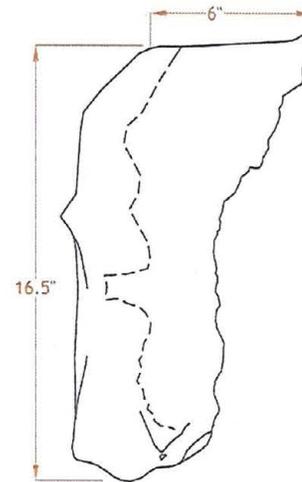
Individual (front view)



Joined (side view)



1" Thick Iron Plate



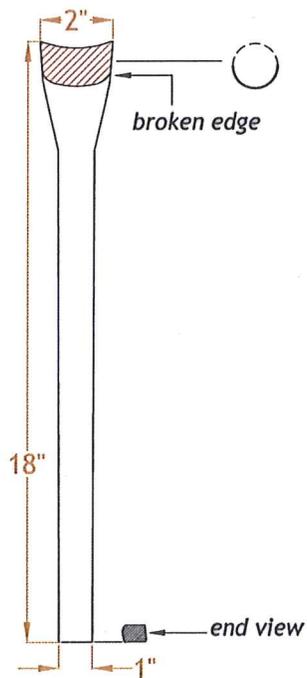
PAL August 2011

B.2-4. L-brackets and iron plate from TR-3-LC.

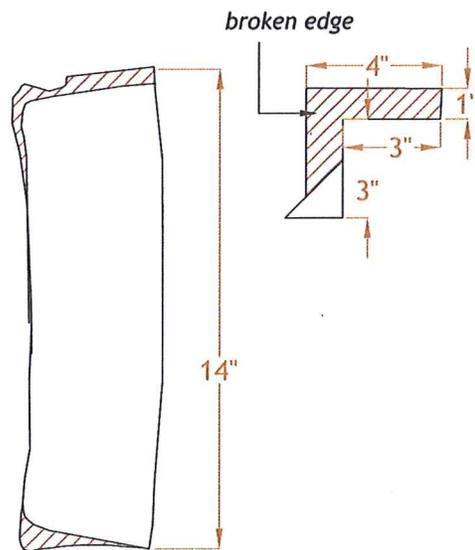
Bricks



Iron Rod



Cast Iron L-Section

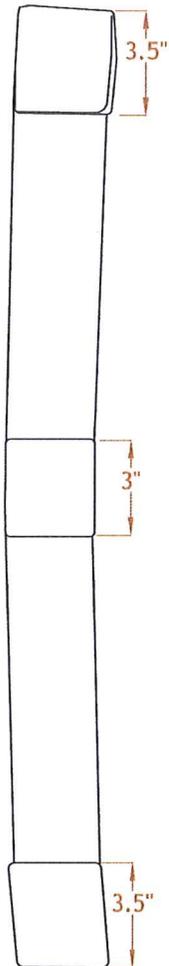


PAL August 2011

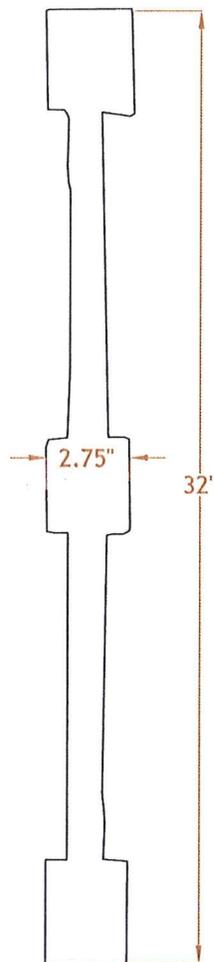
Iron Boiler or Furnace Grate Bar



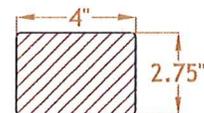
Front View



Side View



End View

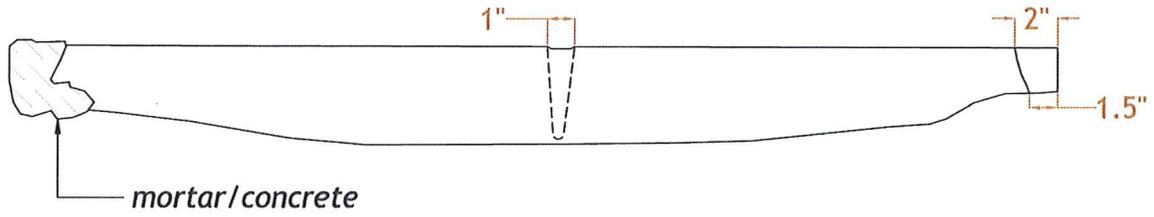


PAL August 2011

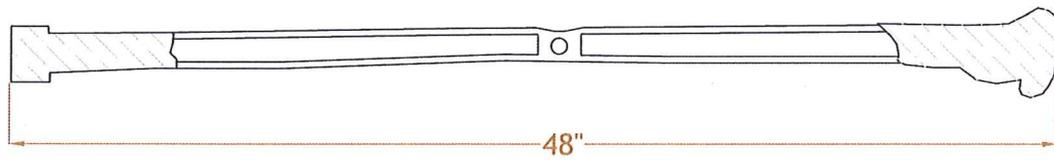
Iron Furnace Grate Bar



Top View



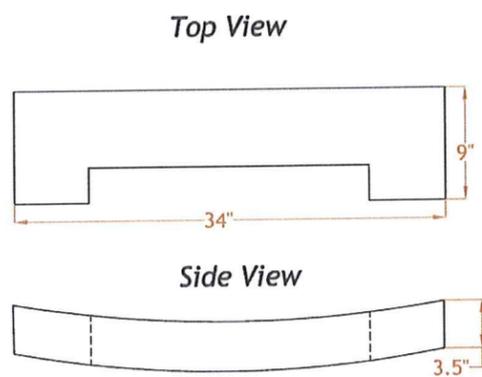
Side View



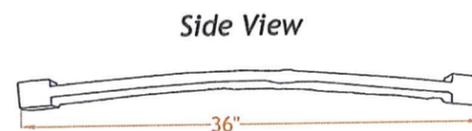
PAL August 2011

B.2-7. Iron furnace grate bar with a shallow "fishbelly" curve from TR-8-LC

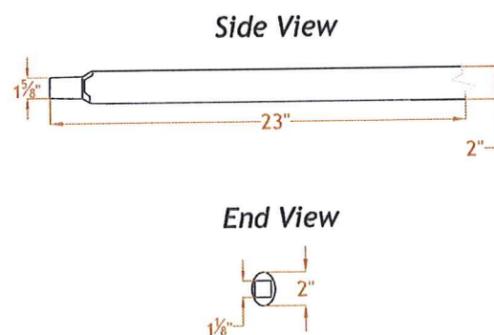
(A) Iron Lintel



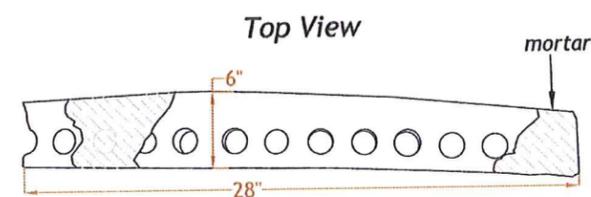
(B) Boiler Grate Bars



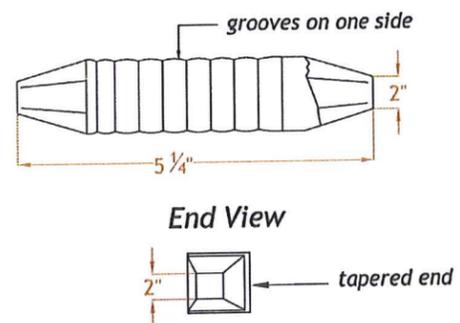
(C) Splined Shaft



(D) Iron Plates with Holes



(E) Anvil-like Piece



APPENDIX C

**VERMONT DIVISION OF HISTORIC PRESERVATION SITE FORM FOR COPPERAS
FACTORIES SUBSITE OF ELIZABETH MINE SITE**

VERMONT ARCHAEOLOGICAL INVENTORY SITE SURVEY FORM

Segment GMNF #	Other Site #	
GMNF ICA #	Other GMNF #	
Town STRAFFORD	County Orange	
Site Type Historic	Precontact	Historic Complex
Cultural Affiliation Euro-american		
Site Report Date 11/30/2013		
Located By CRM professional, NOT in an organizational capacity		
Specify		
Site Reporter Suzanne Cherau / PAL		
Address 1 26 Main Street		
Address 2		
City PAWTUCKET	State RI	Zip 02860-
Phone (401) 728-8780	Email scherau@palinc.com	
Date Site Found 08/30/2003	Located How Surface Survey	
Site Finder PAL		
Address 1 26 Main Street		
Address 2		
City PAWTUCKET	State RI	Zip 02860-
Phone (401) 728-8780	Email scherau@palinc.com	
Land Owner Type Private		
Land Owner Multiple		
Address 1		
Address 2		
City	State	Zip
Phone	Email	
Project Name Elizabeth Mine-Non-Time-Critical Removal Action		
Study Phase Phase 3		
Project Sponsor(s)		
DHP <input type="checkbox"/>		
VTrans <input type="checkbox"/>		
NRCS <input type="checkbox"/>		
USFS <input type="checkbox"/>		
Other Federal Agency <input checked="" type="checkbox"/>		
Other Fed. Agency Name: Army Corps / EPA		
Other State Agency <input type="checkbox"/>		
Other State Agency Name:		
Private Developer <input type="checkbox"/>		
Utility <input type="checkbox"/>		
Non Profit <input type="checkbox"/>		
Non Profit Name:		
Academic Institution <input type="checkbox"/>		
Not Applicable <input type="checkbox"/>		
Jurisdiction		
Section 106 <input checked="" type="checkbox"/>		
Act 250 <input type="checkbox"/>		
22 VSA 14 <input type="checkbox"/>		
Other <input type="checkbox"/>		
Not Applicable <input type="checkbox"/>		

VERMONT ARCHAEOLOGICAL INVENTORY SITE SURVEY FORM

<p>Greatest Depth Range of Data Found: > 100 cm</p> <p>Data Collection Methodology</p> <p><input checked="" type="checkbox"/> Surface Collection <input type="checkbox"/> Eroding Surface <input type="checkbox"/> Metal Detecting w/ Truthing <input checked="" type="checkbox"/> Subsurface Testing <input checked="" type="checkbox"/> Backhoe Trenching <input type="checkbox"/> Underwater Recording <input type="checkbox"/> Archival <input type="checkbox"/> Oral History <input type="checkbox"/> Other</p> <p>Specify:</p>	<p>Dating Method</p> <p><input type="checkbox"/> C14 <input type="checkbox"/> OCR <input checked="" type="checkbox"/> Diagnostic Artifacts <input checked="" type="checkbox"/> Archival <input type="checkbox"/> Other Dating Technique</p> <p>Specify:</p>	<p><input type="checkbox"/> Excavation Applicable Number of Total Units Excavated:</p> <p><input type="checkbox"/> Test Unit(s) Excavated Applicable Test Unit(s) Sizes, Volumes, and Number (if various sizes and volumes, indicate # of units per size/volume):</p> <p><input type="checkbox"/> Positive Unit(s) Excavated Applicable Number of Positive Units Excavated:</p> <p><input checked="" type="checkbox"/> Total Site Area Is Known Total Site Area: ~800 acres</p>
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Artifact Data Repository when Form Completed: Professional CRM consulting organization

Other:

Artifact Repository Address: 26 Main Street, Pawtucket, RI 02860

Precontact data requirements for significance, in accordance with DHP Guidelines, Section 4.4.1. site significance matrix:

- Insufficient information
- Site contains items, deposits, and/or surfaces that can provide inferences about relevant past activities
- Site contains items or deposits that can identify the site's time period
- Site possesses spatial relationships among items, deposits and/or surfaces which can be reconstructed
- Site contains deposits with floral, pollen, faunal or other botanical and zoological data
- Site contains items whose potential source area(s) can be identified
- Site contains the remains of at least one Inhumation sufficiently preserved to permit analysis of diet, health, pathologies, or demographic data; or contains evidence of at least one cremation
- Site contains non-utilitarian items or deposits that can provide inferences about past beliefs
- Site contains natural or cultural deposits or surfaces with data pertinent to paleo-environmental reconstruction (including past vegetation, fauna, landscape, water sources, or climate) of the locale or larger region

Historic Period significance criteria: Priority Themes from DHP Guidelines, Section 4.5.2:

- Insufficient information
- Native people and their communities after European contact
- 17th and 18th century military history
- War of 1812 and Civil War in Vermont
- Abandoned communities (Vermont's "ghost towns")
- 18th Century French in Vermont
- Early Euro-american settlement (ca. 1760 - 1800, although may be later in northern Vermont), including farmstead economy and technology, industry and commerce, health and nutrition, and transportation
- Pre-1870 industries and commercial enterprises
- Unanswered questions about Vermont's ethnic and minority groups
- Vermont's maritime history
- Unwritten stories of important Vermonters (pre-1900)
- Unique, rare, highly unusual, and exceptional federal, state, and local public works
- Unique, rare, highly unusual, and exceptional sites

VERMONT ARCHAEOLOGICAL INVENTORY SITE SURVEY FORM

State/National Historic Register Status Eligible for listing on State and National Registers

Determination Date

NR Criteria of Significance A B C D

Statement Of Significance

EPA, pursuant to 36 CFR § 800.4 (c), has determined the Elizabeth Mine, its associated features and landscapes including, but not limited to, Sargent Brook Smelter, Tailings Piles 1 and 2 (TP-1, TP-2), waste rock piles (TP-3 and TP-4), the North Open Cut, the South Open Cut, the Old South Mine, Furnace Flat, the World War II (WWII) structures, the Copperas works, the Lower Copperas Factory, stone foundations, adits and air vents to be eligible for inclusion in the National Register of Historic Places (NR) under Criteria A, B, C, and D; and the Elizabeth Mine Site is one component of the Orange County Mining District, encompassing also Ely Mine in Vershire, VT, and the Pike Hill Mines in Corinth, VT, a district that has been determined to be eligible for the NR.

Site Description

The site is focused on the approximately ~800-acre core area of historic mining activity, although the total land area historically associated with the mine reached 8,000 acres where the mining company(s) had copper ore mining rights. Tailings Pile 3 or simply "TP 3" identifies the area of historic mining activity and mine waste extending from the North Open Cut at the west to the Mine Road vicinity to the east. TP 3, where the copperas mining and manufacturing process was located, is one of the major cultural and technological landscapes included within the boundaries of the Elizabeth Mine Site. The data recovery excavations were conducted at the Copperas Factories Subsite at the eastern side of TP 3 identified during the 2002 historic/archaeological mapping and testing survey. The Copperas Factories Subsite consists of the Upper Copperas Factory and its associated Copperas Brook features on the east side of TP 3 at the bottom of the hillside; the Lower Copperas Factory just south of the bend in Mine Road where a large L-shaped stone foundation and associated features were located; the Inter-Copperas factory area located west of the Lower Copperas Factory foundation; the North Berm, Copperas Brook corridor, and Pine Grove area not specifically identified during the 2002 survey investigations, but identified during the data recovery test trenching and archaeological monitoring during the EPA removal work.

Data Found

The data recovery report (final dated November 2013) contains detailed information regarding all identified structural remains and features as well as artifact types, densities, materials collected for curation and materials not collected, but recorded at the site.

From the Executive Summary (PAL Report November 2013) below:

The 2009 and 2010 data recovery and construction (mine waste removal) monitoring at the Elizabeth Mine copperas factories uncovered extensive, and in some cases, unanticipated industrial archaeological features associated with copperas manufacturing. The 2009 field season work at the visible foundation at the Upper Factory uncovered tiered remains of copperas boiling, cooling and crystallizing process structures and vessels. The 2009 field season work at the visible foundation at the Lower Factory uncovered an unusually intact assemblage of workspace features and artifacts, as well as the remains of copperas processing equipment both comparable to and different from that found at the Upper Factory. Work in 2009 in the North Berm and South Berm areas and the 2010 work in the Copperas Brook Corridor revealed additional copperas processing features and factory structural remains, and revealed that the Upper Factory site as originally understood was more complex and much larger than anticipated and may have contained the remains of more than one of the reported factories at that location. Subsequent mine waste removal monitoring in several of these areas revealed additional information that contributed to the understanding of the site.

The 2009 and 2010 archaeological data recovery campaigns provided sufficient data to address the research questions for the Copperas Factories Subsite posed in the 2003 PAL survey report and data recovery research design. The data recovery investigations contributed to the understanding of the copperas manufacturing process and plant construction and layout at the

VERMONT ARCHAEOLOGICAL INVENTORY SITE SURVEY FORM

<p>Site Integrity</p> <p><input checked="" type="checkbox"/> Apparently Intact</p> <p><input type="checkbox"/> Apparently Disturbed</p> <p><input type="checkbox"/> Never Plowed</p> <p><input type="checkbox"/> Plowed</p> <p><input type="checkbox"/> Disturbed</p> <p><input type="checkbox"/> Heavily Disturbed</p> <p><input type="checkbox"/> Road</p> <p><input type="checkbox"/> Erosion</p> <p><input type="checkbox"/> Vandalism</p> <p><input type="checkbox"/> Development</p> <p><input type="checkbox"/> Other</p> <p>Specify:</p>	<p>Report Status Completed</p> <p>Report Author Kierstead, Matthew, Erin Timms, and Suzanne Cherau</p> <p>Report Date 11/30/2013</p> <p>Report Title Archeological Data Recovery, Upper and Lower Copperas Factories and InterCopperas Areas and Monitoring Mitigation for a Non-Time-Critical Removal Action (NTCRA), Elizabeth Mine Site (VT-OR-28), South Strafford and Thetford, Vermont</p> <p>Report Number 2358</p> <p>Report Prepared By PAL</p> <p>Report Prepared For US Army Corps of Engineers and EPA</p> <p>Additional Report Volumes I and II</p>
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Previous Collections

Other Site Information

DHP Information

Recorded by 36 CFR 61 Certified Professional

DHP Staff QA/QC Verification

DHP Date(s) Verified

Relevant Permits under 22VSA 14

Management/Easement/Permit Status

Easement Holder

APPENDIX D

PUBLIC PRESENTATIONS AND SCHOLARLY RESEARCH PAPERS

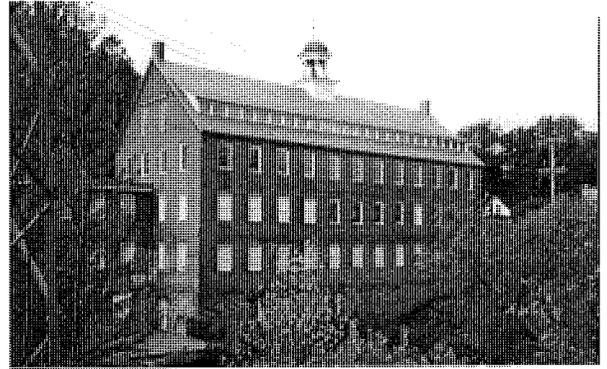
2010 SIA VERMONT Fall Tour

September 16-19, 2010

THURSDAY, September 16, 2010

Tour T1: IA of Windsor/Springfield (early departure, all day tour)

We will leave from Montpelier and drive to Windsor to visit the **American Precision Museum**. We will tour the museum's machine tool collection, and Christopher Marston and John Johnson will discuss the HAER documentation of the waterwheel pit. We will then take a short walk to the **Cornish-Windsor covered bridge**, the longest covered bridge in the country. We will then proceed to the **Harpoon Brewery**. Here members will have the option to tour the brewery or the **Simon Pearce Glass Blowing Studio** next door. Lunch and beer samples will follow at the brewery. After lunch we will head to Springfield, where we will tour some of the machine tool manufacturers located along the Black River. **Lovejoy Tool** (1900) is still active and produces specialty tool parts for heavy industry. We will also visit the former **Fellows Gear Shaping Mill** (1897) which is undergoing conversion into a health center and mixed use development. At our final stop, we will examine the **Stellafane Museum's** display of historic telescopes before returning to Montpelier.



American Precision Museum (1846) originally the Robbins & Lawrence Armory. Jet Lowe, HAER.

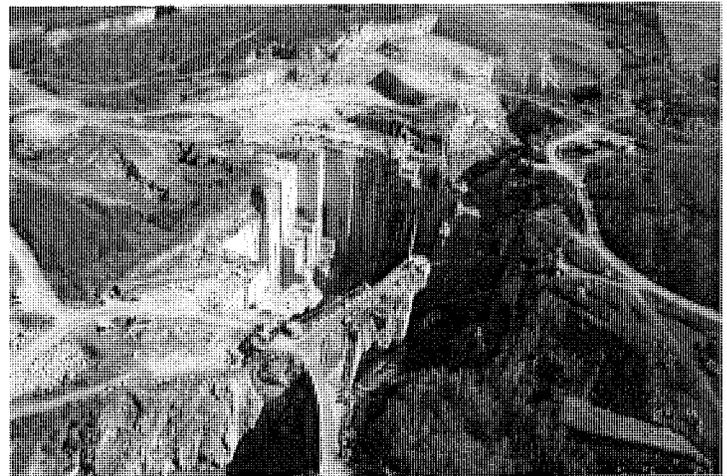
Opening Reception Vermont Historical Society (VHS), Downtown Montpelier - evening

The state's premier history museum and bookstore will be open during the reception. Local Vermont food and beverage will be featured at a sit down meal. The evening program will include welcoming comments from Vermont SHPO Giovanna Peebles, and an introduction to Barre-area granite quarry history from Todd Paton, Director of Visitor Services for Rock of Ages.

FRIDAY, September 17, 2010

Friday Tour F1: "All Granite, All Day" (early departure, all day tour)

Friday's F1 tour will explore the breadth and variety of nearby Barre's still-active historic granite industry. Barre's 4-mile-long world-class deposit of fine-grained granite has been quarried commercially for dimension and carving stone since the 1820s. Population and production swelled with a late-nineteenth century influx of immigrant labor, particularly Italians, who spawned a radical anarchist labor movement. The industry grew during the twentieth century with introduction of labor-saving



Aerial photograph of Rock of Ages granite quarry.

technology and consolidation of quarry ownership. The Barre granite district, which has supplied stone for one-third of the funerary monuments in the U.S., has a rich history as an industrial arts center. Friday's tour will provide a cross-section of the industry from quarry pit to cemetery. The tour begins at **Rock of Ages Corporation**, the granite industry leader in Barre and the U.S., with a visit to the 500 ft deep E.L. Smith quarry, the world's largest dimension stone quarry, as well as behind-the-scenes tours of the cutting shed and old air compressor house.

The F1 tour will visit a major local cutting shed to see modern equipment for large-scale sawing, cutting, and polishing of dimension stone. Lunch will be at the Jones Bros. Co. cutting shed, now under development by the **Vermont Granite Museum**, where we will have a guided tour of the shed and archaeological remains. The tour will include a visit to a small one-man figurative sculpture studio, and a specialty stone cutting and carving tool manufacturing operation. The day will end with a visit to **Hope Cemetery** with sculptor Giuliano Cecchinelli. The entire tour will be within Barre, and will be conducted by bus and on foot. Attendees must supply appropriate closed footwear and their own hard hats; SIA will supply eye and ear protection, which is required at many of the workplaces.

Friday Tour F2 – Characteristically Vermont, IA of Waterbury/Hardwick (morning departure, all day tour)

The area from Waterbury to Hardwick is one of the more picturesque and popular tourist trails in Vermont, due to the many traditional food and craft tours offered along that route. The SIA will get a little off the well-worn tourist track to investigate two industries – dairying and small-scale manufacturing – that are uniquely characteristic of Central Vermont. Our tour will begin with a stop at **Ben & Jerry's** main ice cream plant in Waterbury, nestled in a rolling pasture overlooking the Worcester Range. We will see ice cream being made, and learn more about this successful Vermont company founded by two childhood friends. Before we leave we will visit the tasting room for free samples of the flavor of the day. At **Concept Two Rowing** in Morrisville, we will see the start-to-finish production process for carbon fiber racing oars and review other manufacturing and logistic processes. Concept Two was founded by two Olympic rower brothers in 1976, and continues to produce state-of-the-art rowing machines, racing oars and other rowing products. We will have a very special luncheon in Hardwick at **Claire's Restaurant**, whose gourmet kitchen specializes in local Vermont foods, which will be at the peak of perfection in mid-September. After lunch we will visit Hardwick-area industries including a 19th-century granite shed, a tofu production facility at **Vermont Soy**, and **Vermont Natural Coatings**, which makes durable wood finishes from dairy byproducts to serve the "green" building industry.

SATURDAY, September 18, 2010

Saturday Tour S1: All Copper, All Day Tour (early departure, all day tour)

This tour will travel approximately 50 miles southeast of Montpelier to visit two of the three Appalachian sulfide copper mines of the Orange County "Copper Belt." We will spend the morning at the largely undisturbed remains of the **Ely Mine** (1854-1905) in Vershire, an important mid-nineteenth century U.S. copper producer, where we will walk through sites representing all aspects of copper production including mining,

beneficiating, roasting, and smelting as well as the remains of an extensive mining village. In the afternoon we will visit the larger, nearby **Elizabeth Mine** (1809-1958) in South Strafford. One of the top 20 U.S. copper mines in 1950s, it is an EPA superfund site currently undergoing reclamation. During the tour EPA staff will explain cleanup planning and engineering, and staff from EPA Cultural Resources consultants PAL, Inc. will interpret the undisturbed, reclaimed and restored mining sites and landscapes, including an unusual nineteenth-century copperas (iron sulfate) works. This industrial archaeology and landscapes tour will use vans for transportation to and around these rugged sites; be prepared for some moderately serious hiking. This tour would be inappropriate for members with mobility challenges. Participants must be able to safely negotiate rough, steep terrain, and are required by our EPA hosts to wear substantial boots that come above the ankles.



*Tyson Shaft (Shaft No. 1), Elizabeth Mine, ca. 1880-1888
Credit: Strafford Historical Society, Strafford, VT*

Saturday Tour S2: Burlington Tour (early departure, all day tour)

Vermont's Queen City provides the backdrop for this tour, which will feature numerous stops in the general vicinity of Burlington. On our way north, we will shadow the force and influence of the Winooski River. Our first stop will place us at **Green Mountain Power's Plant No. 19**, which has been generating electricity at Hubbel Falls since 1917. The 10,000 horsepower plant was at that time the largest in the state. Today, Plant 19 provides power to 4,000 area homes, saving roughly 60,000 barrels of oil annually. Moving closer to Lake Champlain, the **Shelburne Museum** will host a guided tour of one its prize pieces, the 220' side-wheeler **steam ferry Ticonderoga**. The *Ticonderoga* is considered to be the only extant unmodified vessel of its type and features one of the only two remaining "walking-beam" marine steam engines remaining in the United States. Now located several miles inland on the museum grounds, this steel vessel was the last coal-powered ship in service on Lake Champlain and remains essentially unchanged. The tour will give special attention to Ticonderoga's engine room and related machinery. Nearby on the Lake Champlain waterfront, **Shelburne Farms** operates as a non-profit organization dedicated to the stewardship of natural and agricultural resources. The property features three major agricultural buildings—the Farm Barn, Breeding Barn, and Coach Barn and—and a number of other structures. Our tour will highlight the commodious agricultural buildings and the farm's artisanal cheese-making process. As we near Burlington proper, the tour will divert to one of the northeast's fastest growing brewing companies. Based in South Burlington, the **Magic Hat Brewery** has been supplying New England with superb ales since 1994. The operation now produces 400 bottles of beer every minute and has since moved into the top 10 of all US craft brewers. Join us on a tour of Magic Hat's brewing process as it plays out within a unique facility that promises to enchant with its wild aromas and ambiance. If time permits, the tour may highlight the Burlington waterfront, including the decommissioned Moran Plant (coal-fired power plant) and remnants of the former lumber industry.



Steam ferry Ticonderoga, with its walking-beam marine engine, at the Shelburne Museum. Jet Lowe, HAER.

Saturday Banquet - evening

The banquet will be held at the **Socialist Labor Party Hall** (a National Historic Landmark) in the heart of the industrial center of Barre. The hall was constructed in 1900 by volunteers of the Italian community in Barre, as a meeting hall for the Socialist Labor Party. From 1900 to 1936 the Hall served the community as a location to hold union meetings, political rallies, dances and sporting events, and a cooperative store opened in the hall's basement in 1901. The building has undergone some restoration work and again acts as a community hall. We will be welcomed by the venue's manager, Karen Lane, who is also Director of Barre's Aldrich Public Library. Ilaria Brancoli Busdraghi of Middlebury College will speak on the immigration of Italian granite workers to Barre.

SUNDAY, September 19, 2010

Sunday Tour Su1: Barre Architectural Walking Tour (morning to noon)

Joelen Mulvaney of the Barre Historical Society will lead a 2-3 hour walking tour of Barre architecture, monuments and Hope Cemetery, where we will be joined by sculptor Giuliano Cecchinelli.

Sunday Tour Su2: Granite Quarry Mountain Biking Tour (morning to noon)

Millstone Hill Trails is a large trail system linking many dozens of old quarries in Barre. Operator and quarry buff Pierre Couture has agreed to lead a mountain biking tour of the quarry trail and to provide interpretation. Participants may bring their own bikes, helmets and transportation, or they may be rented for an additional \$25. Note: only six rental bikes are available.

Sunday Tour Su3: Mills and Barns Tour (morning to noon)

We will visit the **Old West Church** (1825) and the **Robinson Saw Mill** (1803) at Kent's Corner, which has a turbine and saw dating to 1876. **Ben Thresher's Mill** (1872) in Barnet Center features a recently reconstructed penstock and an outstanding collection of 19th century wood and metal working machinery. The mill, which was a HAER documentation project in 1979, is now a museum. At Marshfield we will visit Vermont's only extant covered 'farm bridge' and one of the largest dairy barns ever built. Note: tour size is limited.

Lodging

To keep your costs low, we have reserved a block of Vermont College of Fine Arts (VCFA) dorm rooms at the amazing rate of only \$50 for a two-bed room! To guarantee a reservation, you must respond by August 15. If you do not want to relive your college days, please make your own arrangements for accommodation and (if needed) transportation. This is the beginning of "Leaf Peeping" season, so reserve alternate lodging promptly. Tour buses will depart from VCFA, which is within walking distance of most points in downtown Montpelier, but please consult a map if you plan to stay off-site, and be sure to arrive at VCFA in plenty of time for early morning departures. If you would like to reserve a VCFA dorm room, please note the following:

- You must pay in advance (with registration) before August 15 -- \$50 per night (that charge is per room, so two people can stay in one room for \$25 per person), plus \$5 for wireless internet access (that charge is for your entire stay). If double occupancy, you must register both names with your reservation.
- Check in before 8:00 p.m. Check out before 10:00 a.m. (except by pre-arrangement in both cases).
- No smoking; No pets.
- Rooms do not have air conditioning (not usually an issue in September) or phones (bring your mobile).
- Gender-separated shared bathrooms.
- The college provides bedding and towels.
- Parking is free with a pass. We will email a parking pass to all who need one.

Transportation

Montpelier is located along Interstate 89, and is served by Amtrak's "Vermonter." The closest commercial air service is located 35 miles (56 km) northwest of Montpelier, at the Burlington International Airport. Manchester Boston Regional Airport (130 miles southeast) also offers affordable air service.

Logistics

Weather in mid-September can be variable, with hot humid days still possible, and cool nights. Rain is possible.

All of the usual SIA Road Rules will apply. Take special note of the hard hat requirement for the Friday Granite Tour (F1) and the shoe requirements for the Saturday Copper Mine Tour (S1). Please note the SIA Policy on Refunds. Tours and content are always subject to change, including cancellation. The SIA Fall Tour web site will have the latest available information.

Conference on New England Archaeology (CNEA) Newsletter, Spring 2011

Elizabeth Mine Copperas Factories, Orange County, Vermont

Contributed by Erin Timms, Matt Kierstead, and Suzanne Cherau

In 2009 and 2010 PAL completed data recovery investigations and archaeological monitoring at the Elizabeth Mine copperas factories in Orange County, Vermont. The archaeological investigations were conducted in support of the Non-Time-Critical Removal Action (NTCRA) on Tailings Pile 3 (TP 3) of the Elizabeth Mine being performed by the United States Army Corps of Engineers-New England District (USACE) for Region 1 of the Environmental Protection Agency (EPA) through Interagency Agreement. The Elizabeth Mine Site (VT-OR-28) encompasses approximately 800 acres of land within the Ompompanoosuc River drainage, a major tributary of the Connecticut River. The majority of the mine site is located in South Strafford in the southern part of the town of Strafford, with an eastern portion in Thetford and small portions at its southern extremity in Sharon and Norwich, which are located in Windsor County. The site is focused on the core area of historic mining activity, although the total land area historically associated with the mine reached 8,000 acres where the mining company(s) had mining rights only.

Copperas is a fourteenth-century term for crystalline green hydrous iron sulfate, an important early industrial chemical compound derived from processing iron sulfide ores. Copperas had a multitude of uses over the centuries. Copperas production was a simple process that is well documented in sixteenth and seventeenth-century accounts, and changed little until the late nineteenth century. The process manipulated the landscape through extraction, various stages of lixiviation, concentration and crystallization. The process was a “cascading” one that made use of water and took advantage of gravity, with successive manufacturing steps typically located on a hillside. The manufacture of copperas from natural materials ended in the 1880s when large, inexpensive sources of iron sulfate became available as a by-product of the steel industry.

The Upper Copperas Factory and its associated Copperas Brook features are located at the bottom of the hillside, at the eastern extreme side of TP 3. The features within Copperas Brook appear to have been designed to channel the flow of the brook, likely as a means of transporting copperas liquor on its course down the hillside. The foundation remains of the Upper Copperas Factory itself are located just north of Copperas Brook. The stone walls and terraces of the Upper Copperas Factory run directly into the Office area (part of the North Village). The Lower Copperas Factory is located just south of the bend in Mine Road and consists of a large L-shaped stone foundation and associated features. Similar to the Upper Copperas Factory, the Lower Factory is built into the hillside with the north edge extending about 6 feet above the ground while the south end is at ground level.

Elizabeth Mine was established in the early nineteenth century and operated to the mid-twentieth century. After the failure to produce iron, attention shifted to copperas production. Copperas was produced on the east slope of Copperas Hill from 1809 to 1880s. The owners of the South Strafford copperas works

expanded and improved their works several times. Innovative methods employed to accelerate the ore decomposition and lixiviation process contributed to higher yields making them one of the largest producers in the country. Historical accounts and company records describe some of the methods as well as arrangement of the works. Elizabeth Mine is one of two copperas works excavated in the world. The integrity of the site created a rare opportunity to study the archaeological remains of the constructed landscape. The 2009 and 2010 data recovery investigations of the Elizabeth Mine Copperas Factories and archaeological construction monitoring of Copperas Hill documented extensive features that closely correspond to the historical accounts. Key activity areas including the two factory remains as well as individual features such as crystallizers, fire boxes, boilers, and associated artifact assemblages provide insight into the full spectrum of copperas production at Elizabeth Mine. The site interpretations are currently ongoing and a full technical report will be available for scholarly research in late 2011.

Elizabeth Mine Superfund Site, South Strafford, Vermont
Data Recovery and Monitoring

By Matthew Kierstead, Senior Industrial Historian, and Erin Timms, Industrial Archaeologist

The Public Archaeology Laboratory, Inc. (PAL)

In 2009 and 2010 PAL completed data recovery investigations and archaeological monitoring at the Elizabeth Mine copperas factories in Orange County, Vermont. The archaeological investigations were conducted in support of the Non-Time-Critical Removal Action (NTCRA) on Tailings Pile 3 (TP 3) of the Elizabeth Mine being performed by the United States Army Corps of Engineers-New England District (USACE) for Region 1 of the Environmental Protection Agency (EPA) through Interagency Agreement.

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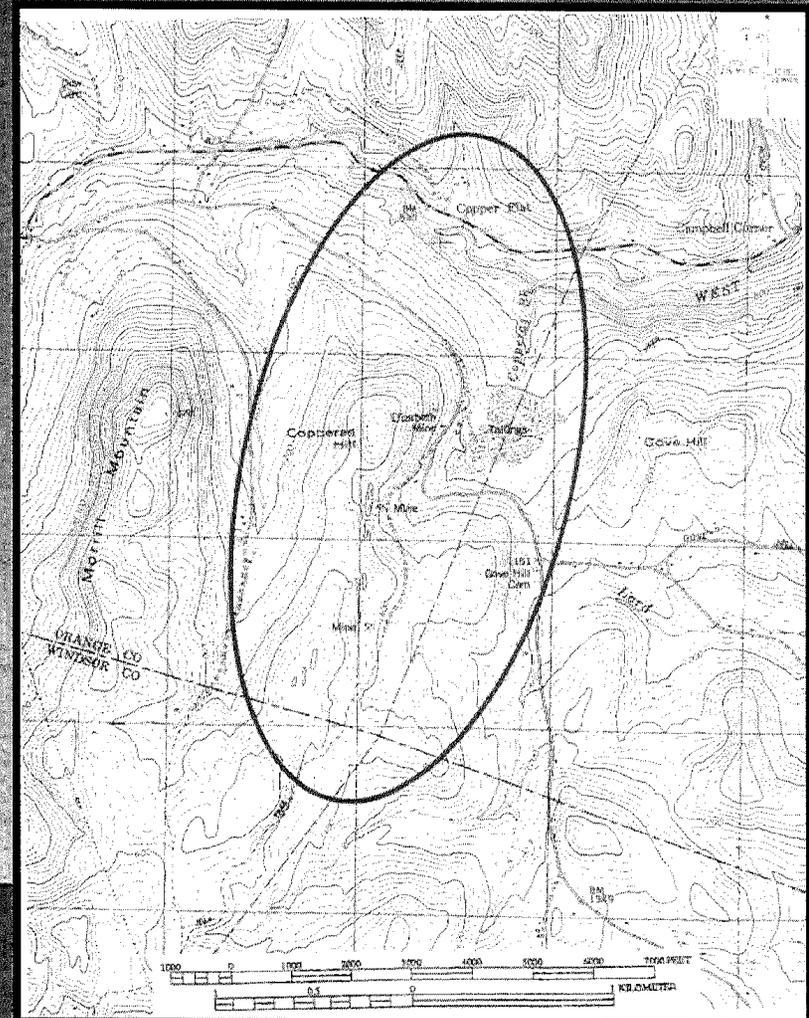
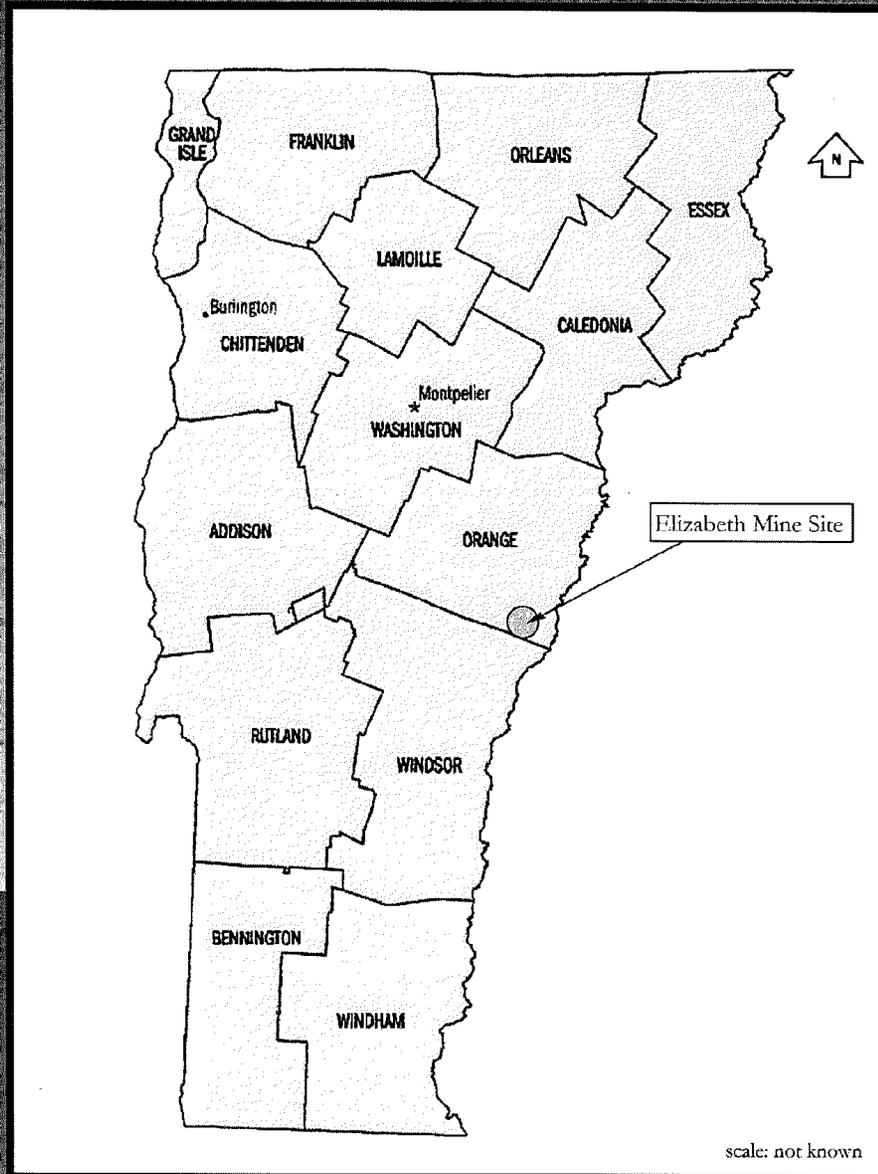
Elizabeth Mine Copperas Works

Archaeological Data Recovery

By

Matt Kierstead and Erin Timms

Location of Elizabeth Mine Site

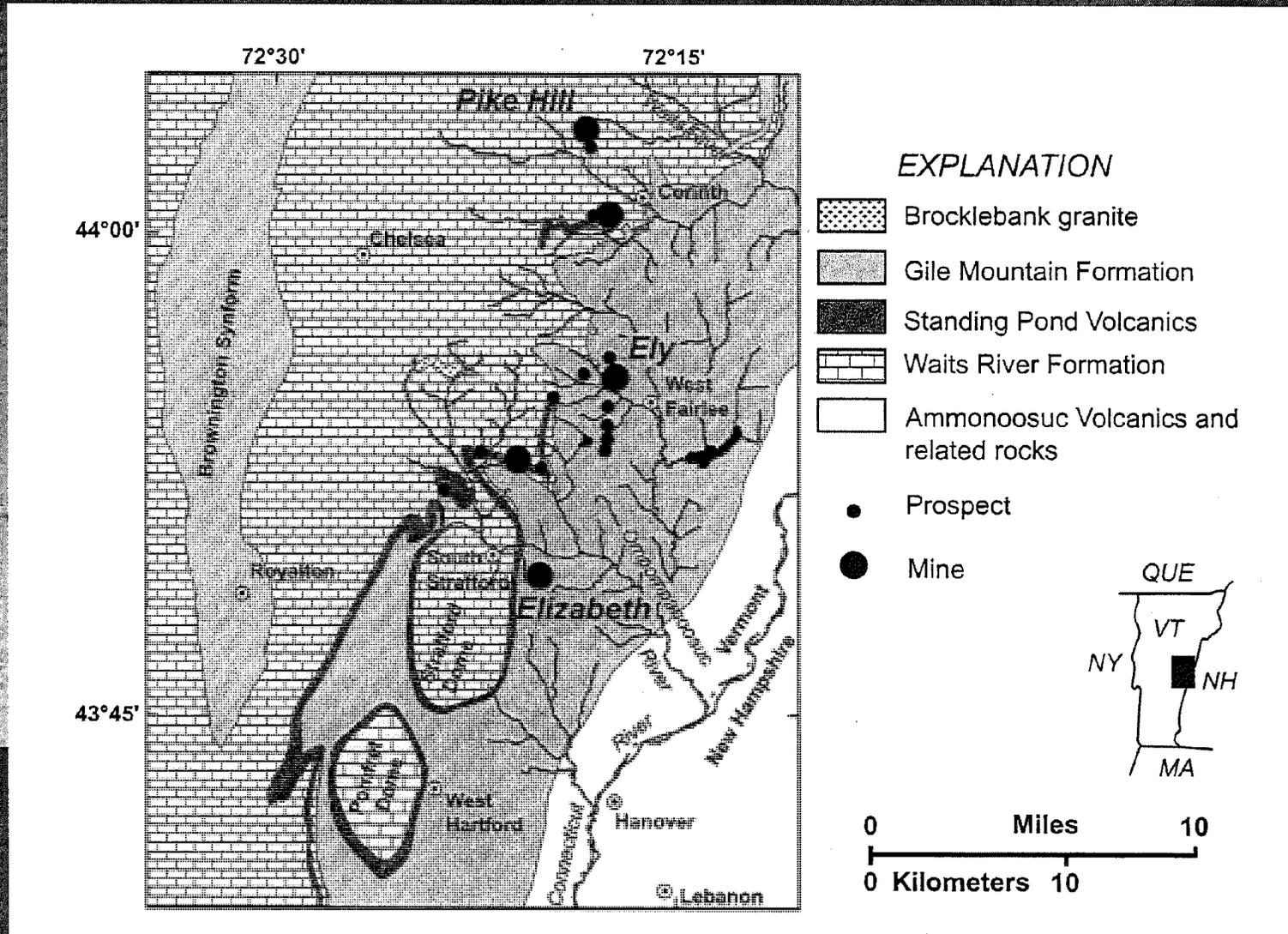


Above: Vermont USGS Topographic Quadrangle 7-5 Series

Left: County Map of Vermont



Geologic Map of the Vermont Copper Belt



Environmental Geochemistry and Mining History of the Massive Sulfide Deposits in the Vermont Copper Belt. (Seal et al. 2001)

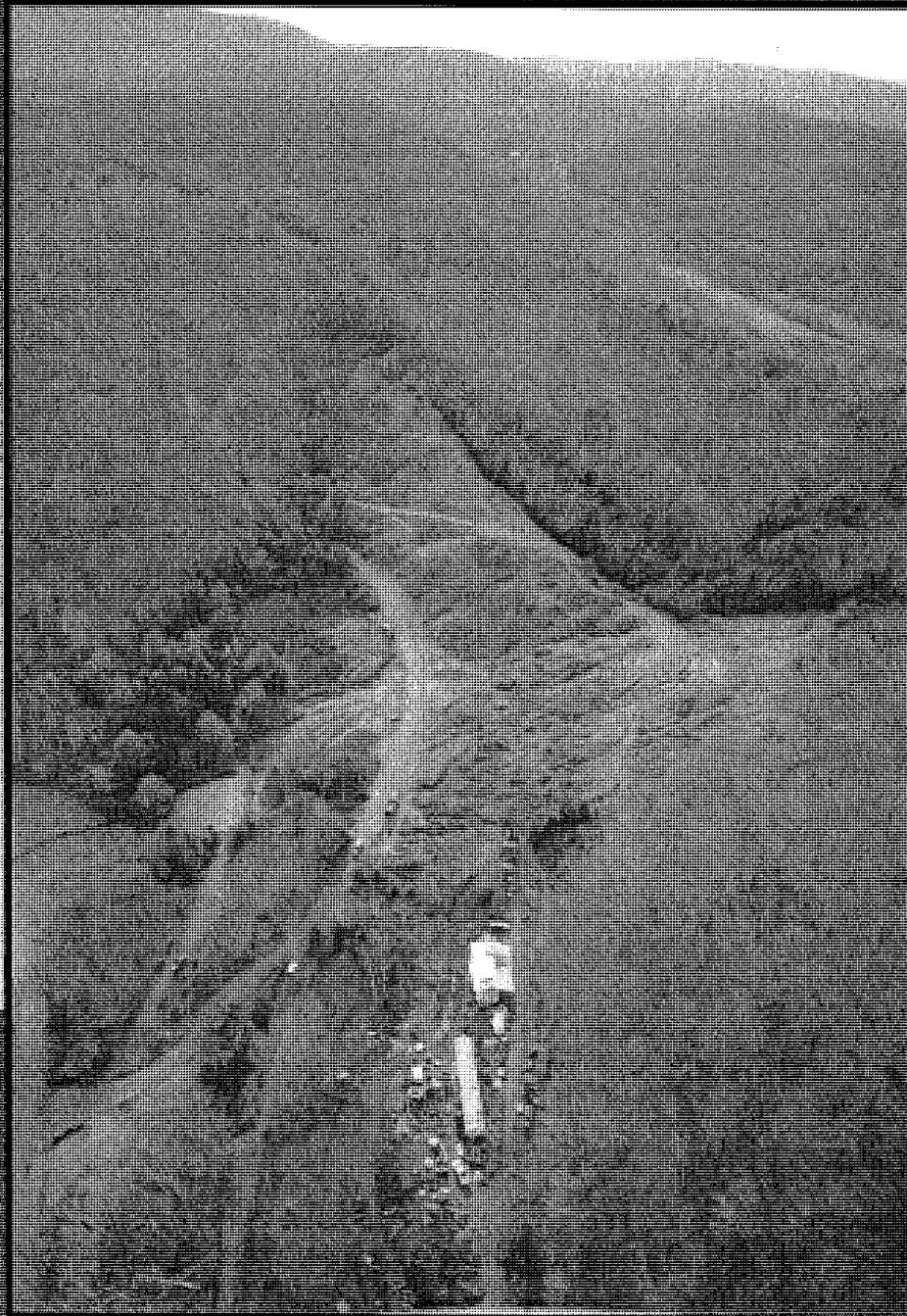


JAL



1971







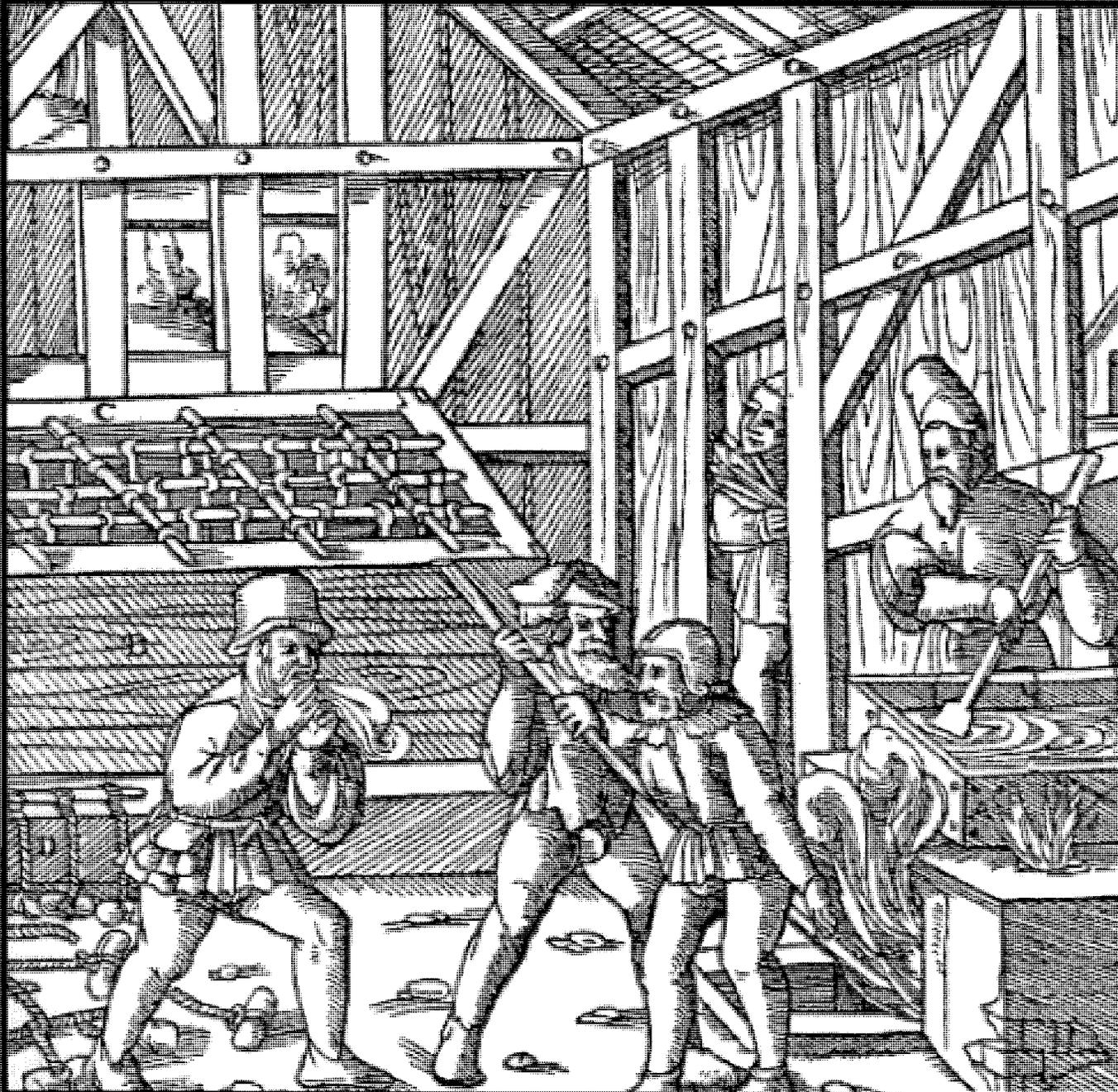




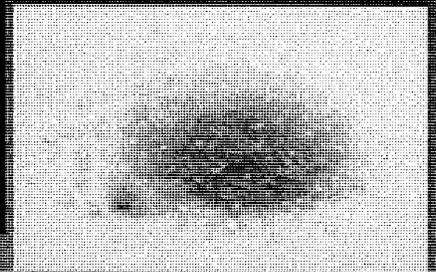
Copperas Production

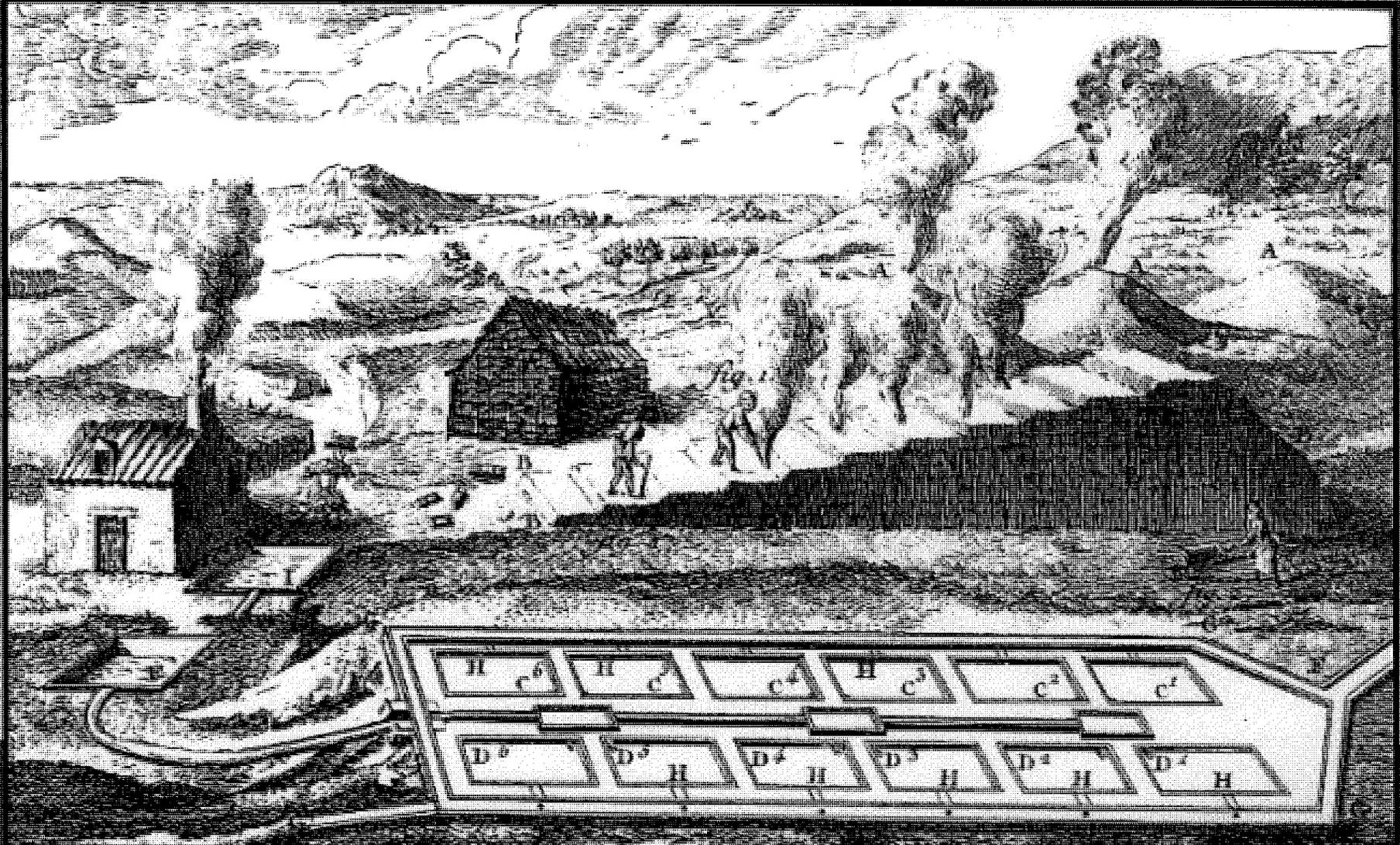
1556 Georgius Agricola, *De Re
Metallica*





1556 Georgius Agricola
De Re Metallica





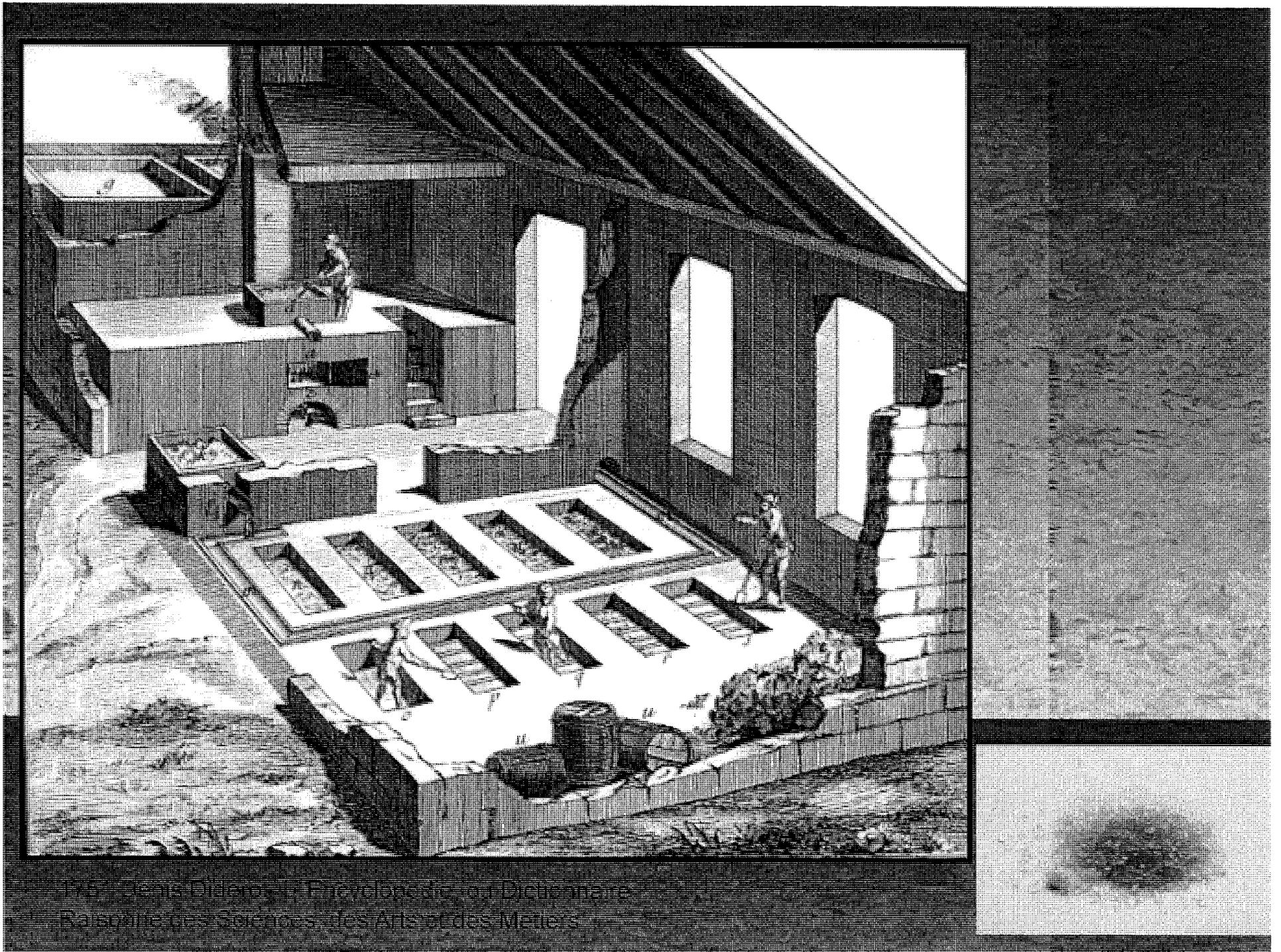
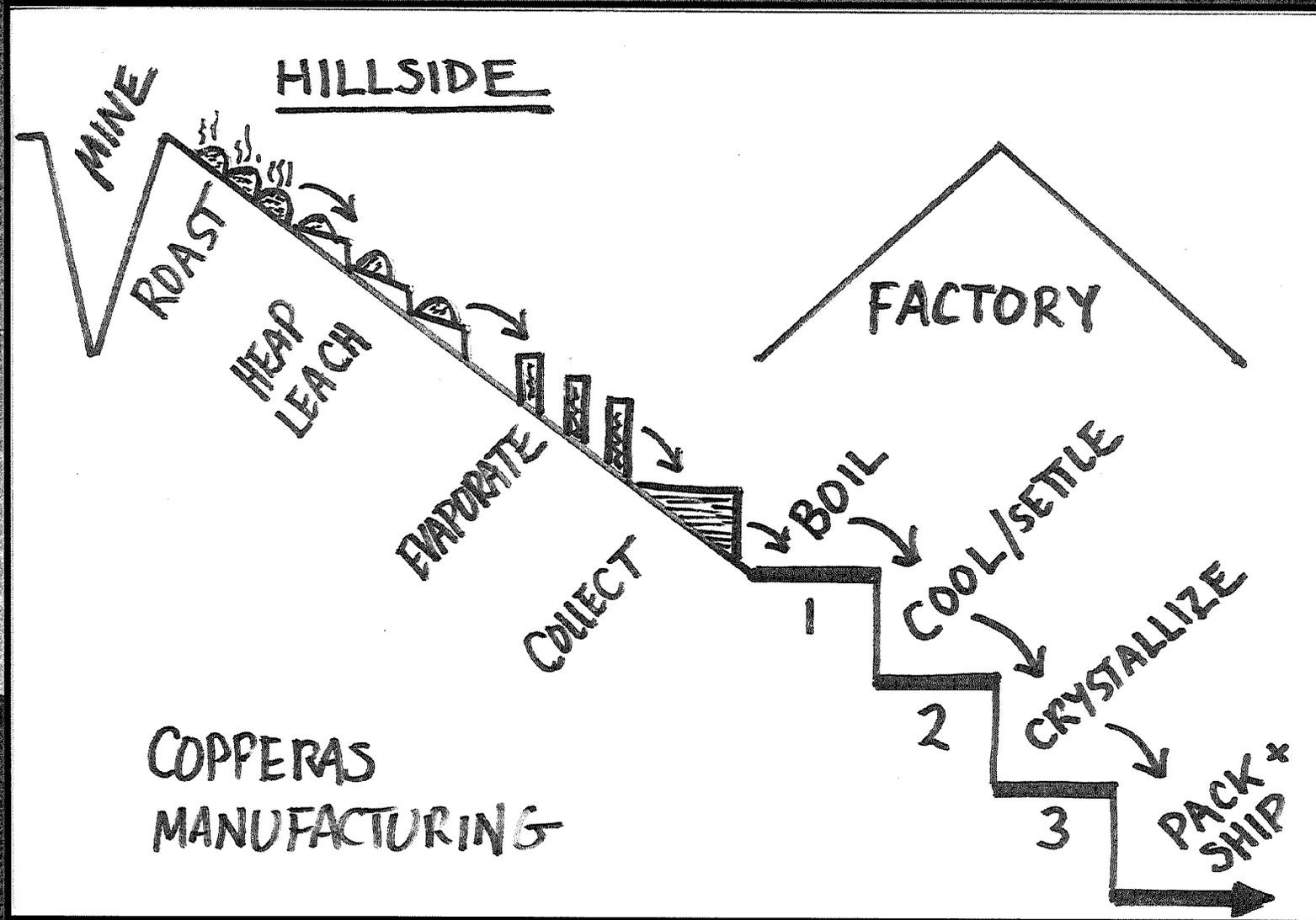
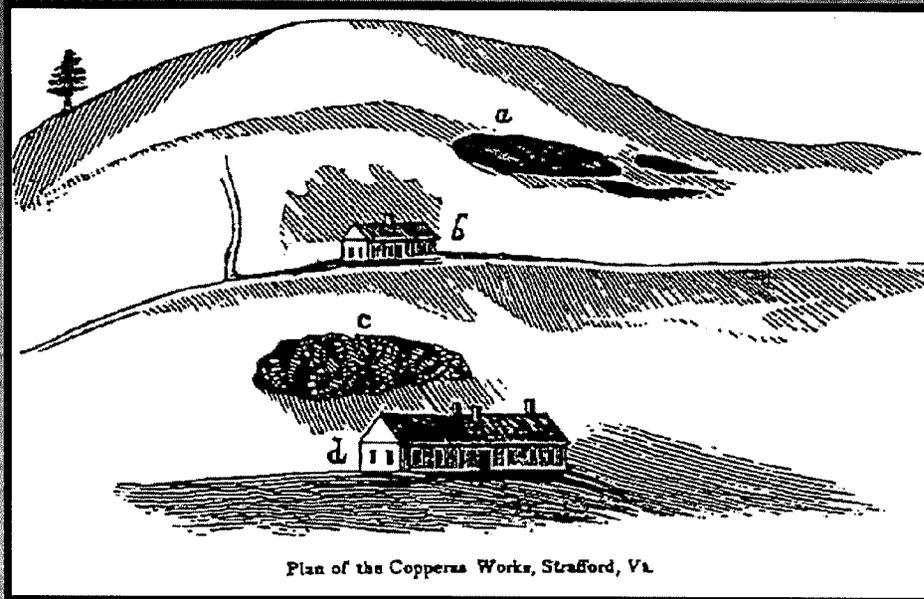


Fig. 15. Diagramme Évolutionnaire du Dictionnaire
Rassemble des Sciences, des Arts et des Métiers

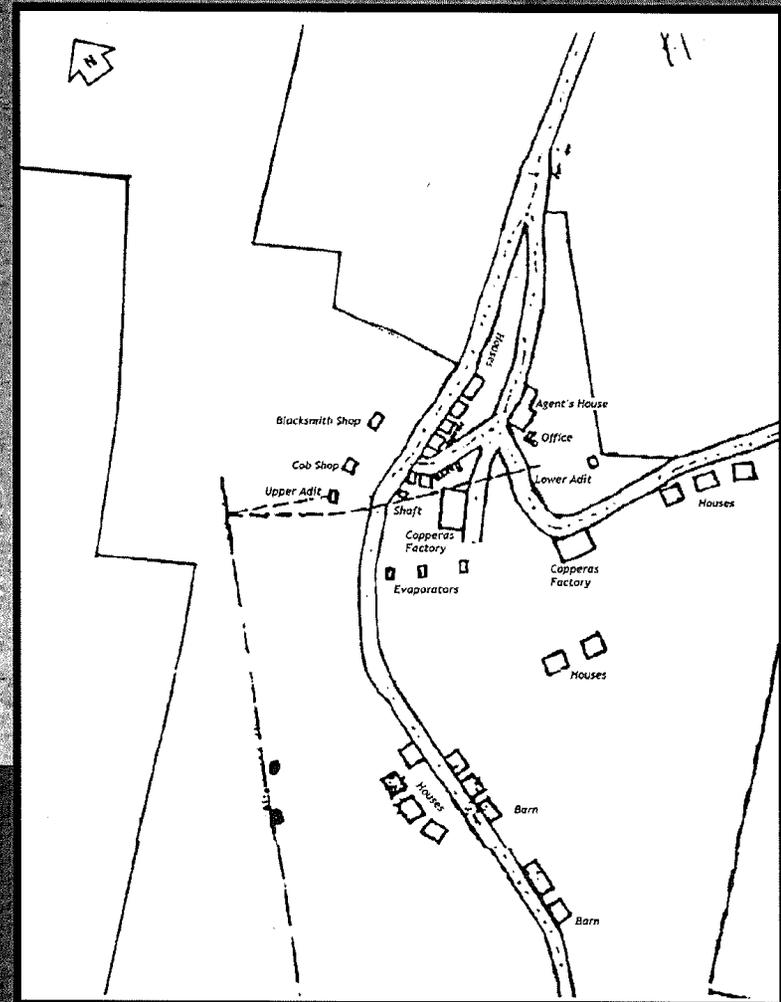
The Process



Historical Accounts & Placing the Process on the Landscape

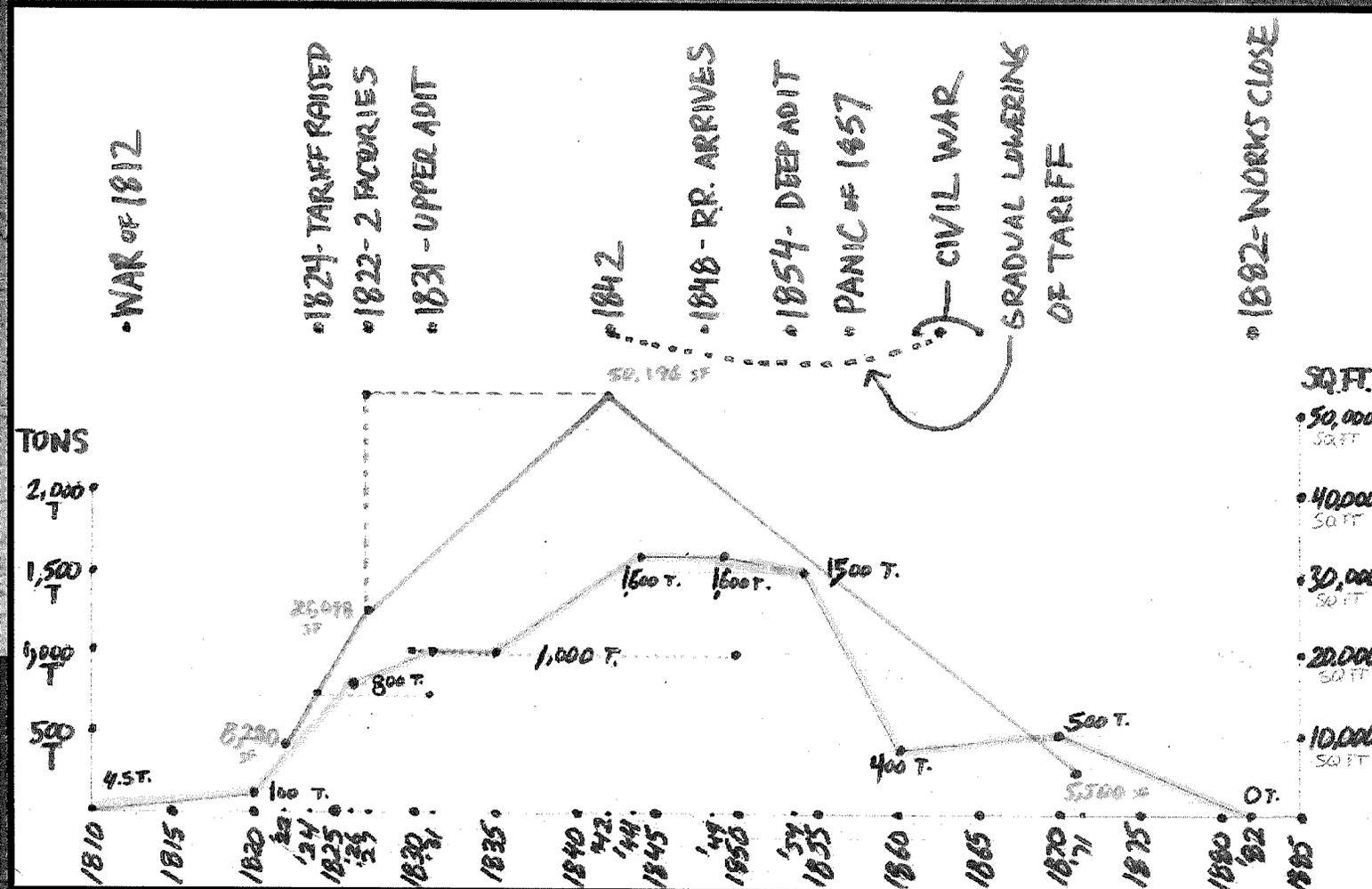


Above: Sketch of Copperas Works, Final Report on Geology and mineralogy of the State of New Hampshire, 1844.

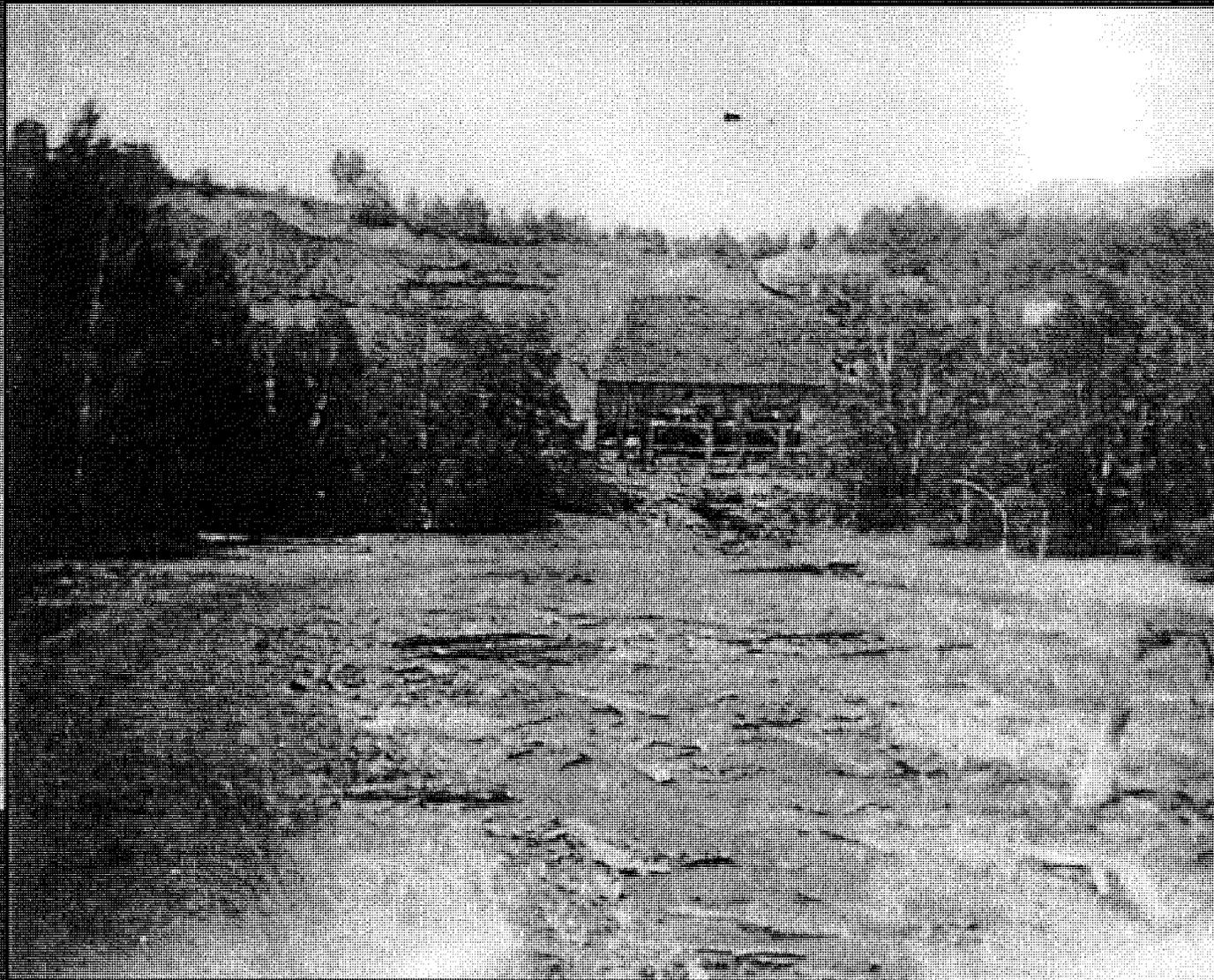


Right: Detail Showing Copperas Works Plan of Property of the Vermont Copperas Co., 1874.

The Elizabeth Mine Copperas Production Timeline



Surviving Photo of the Copperas Works



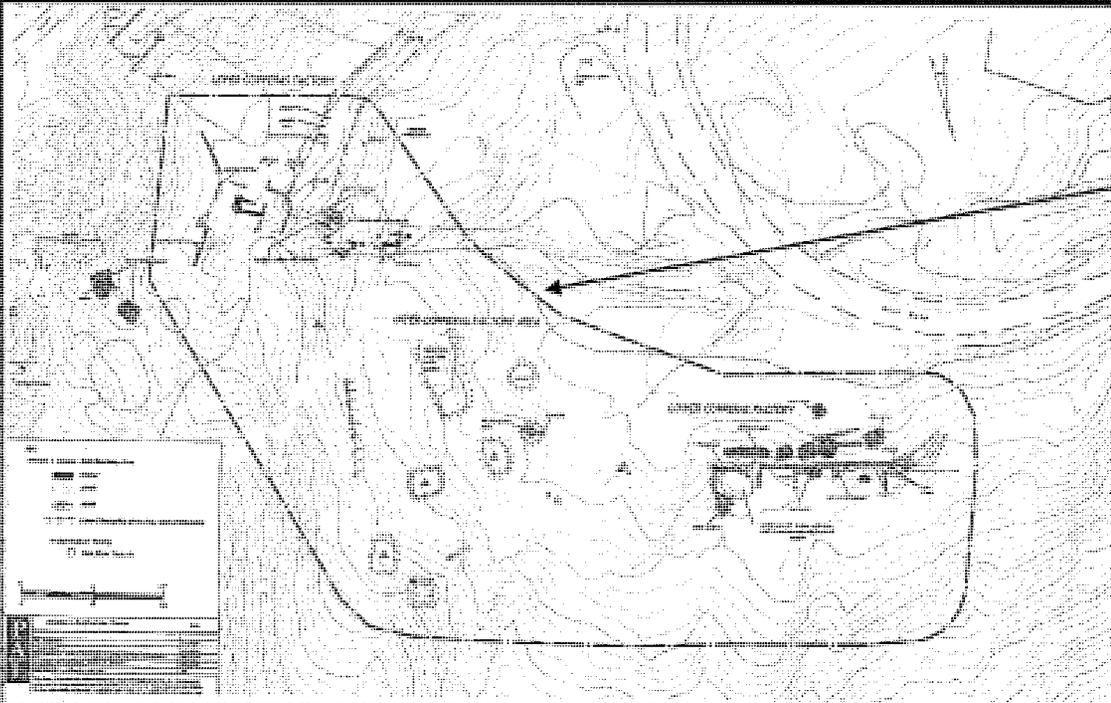
Photograph of Upper Copperas Factory looking west. Gate unknown.
Courtesy: Stafford Historical Society - Stafford, Vermont.



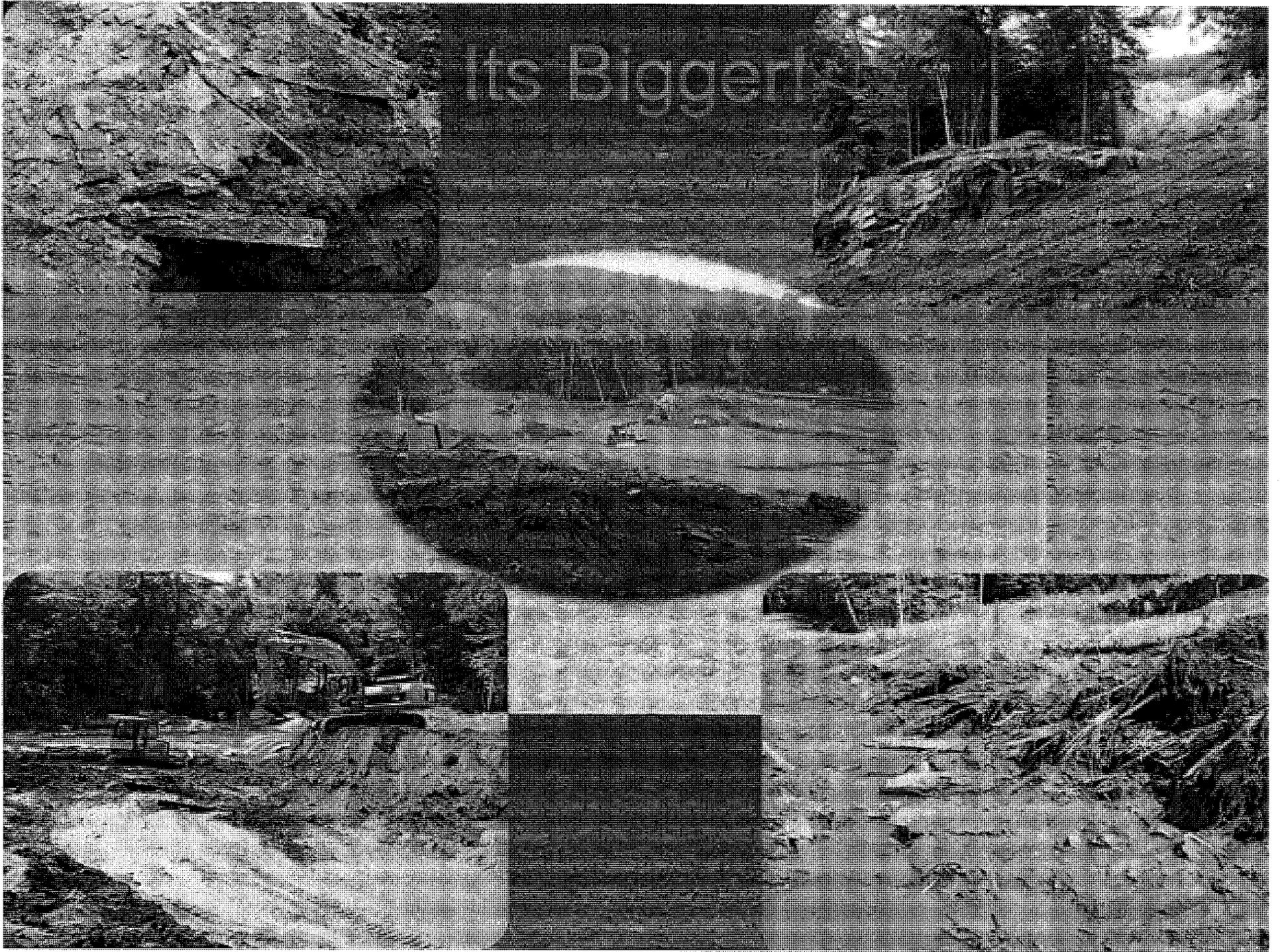
Archaeology



Project Area

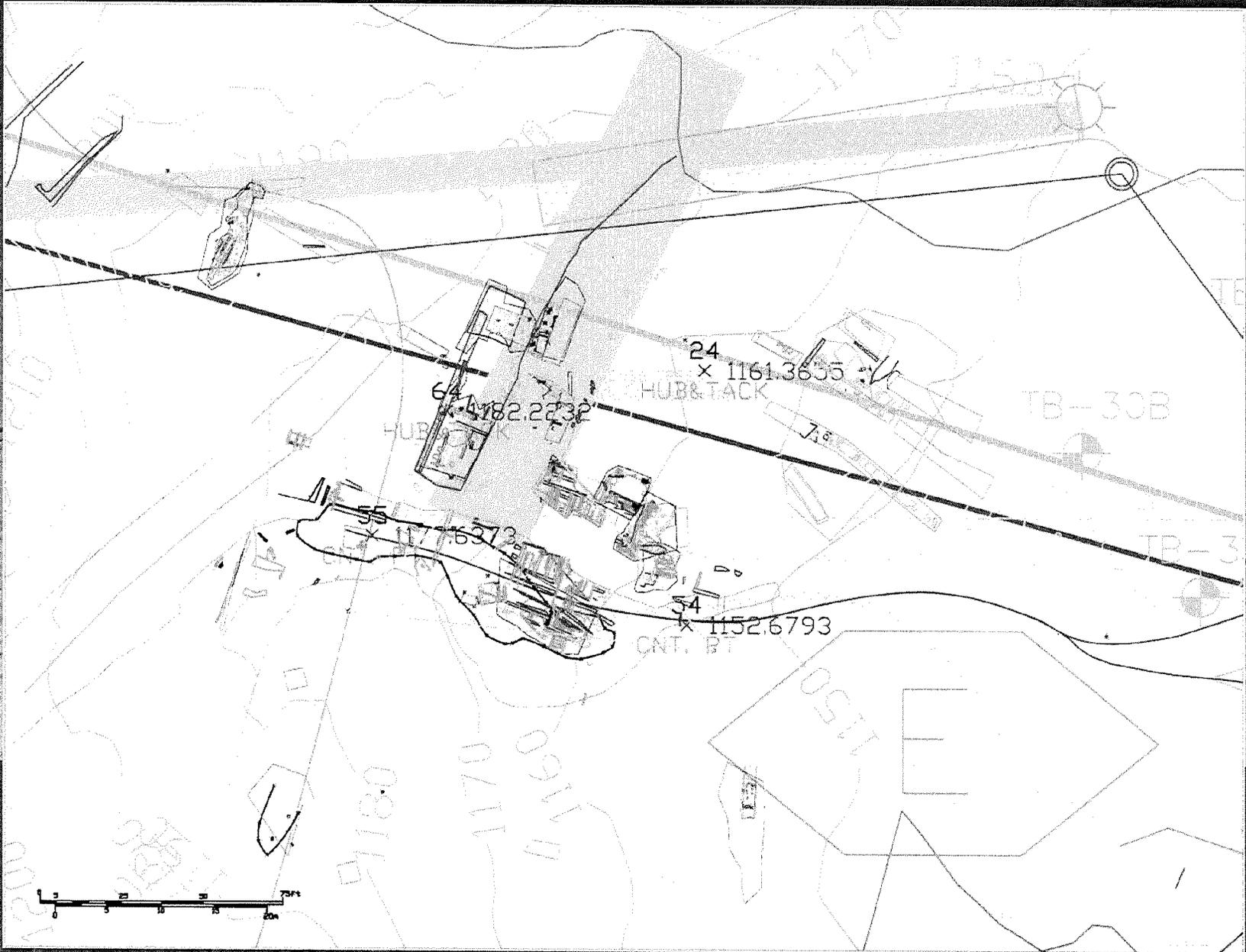


Its Bigger!

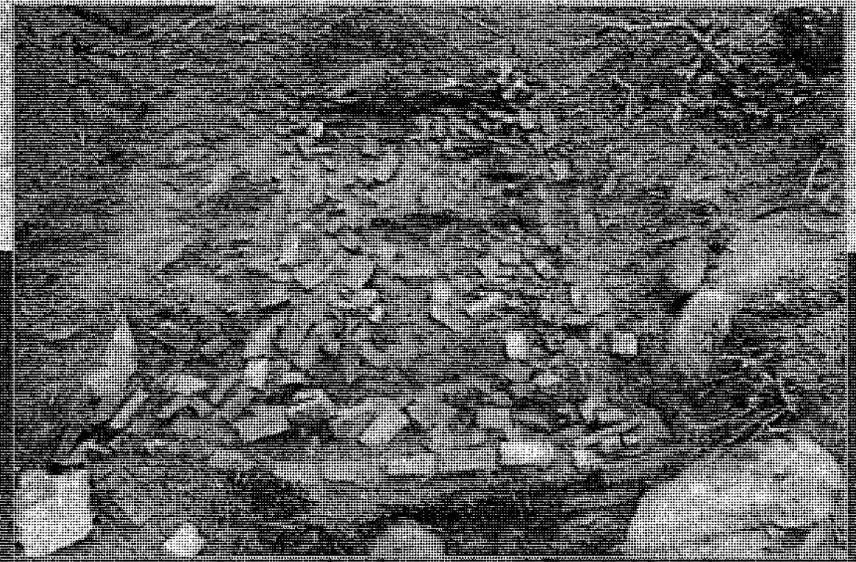


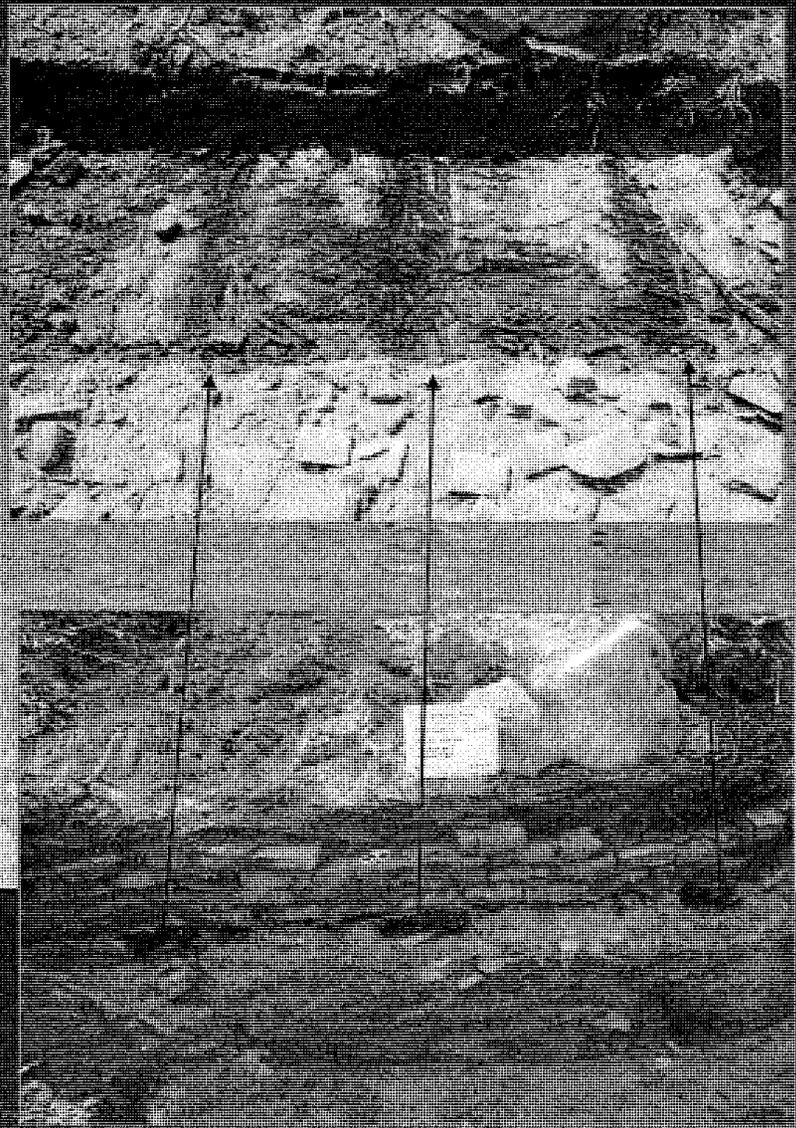
Site Conditions Prior to Data Recovery





Finding Crystallizers





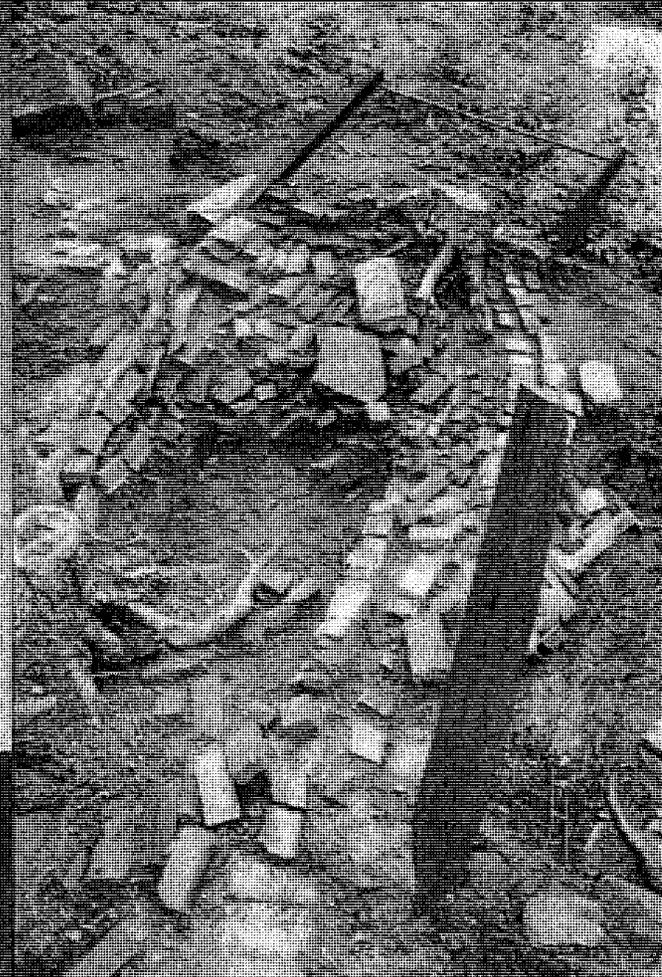
Elizabeth Mine 2009 Archaeological Data Recovery

Digging Deeper



Elizabeth Mine 2009 Archaeological Data Recovery

Comparing Features



Elizabeth Mine 2009 Archaeological Data Recovery

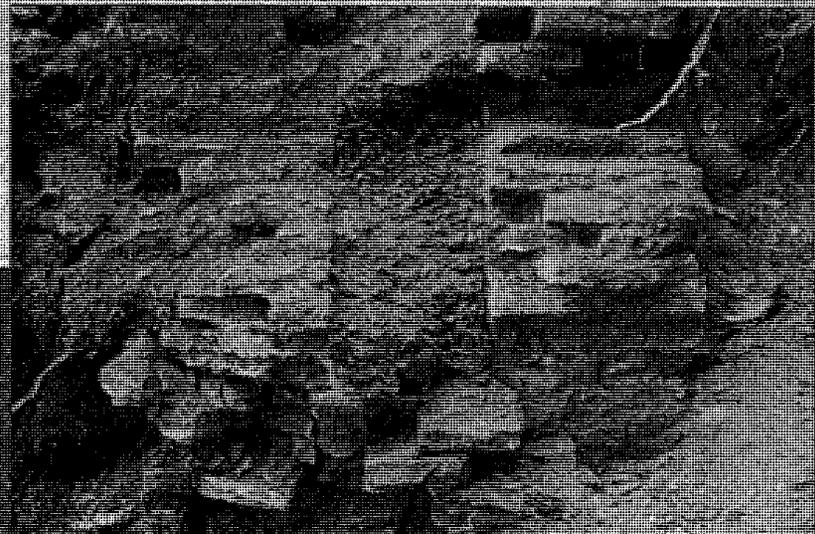


North Barn



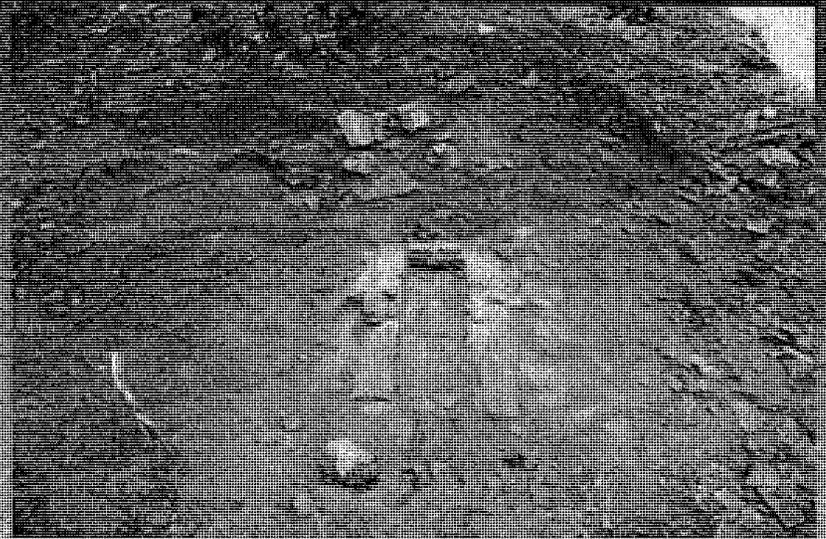
South Barn

North Berm 2009 Data Recovery and Removal



Elizabeth Mine 2009 Archaeological Data Recovery

ARCHAEOLOGICAL DATA RECOVERY



Elizabeth Mine 2009 Archaeological Data Recovery

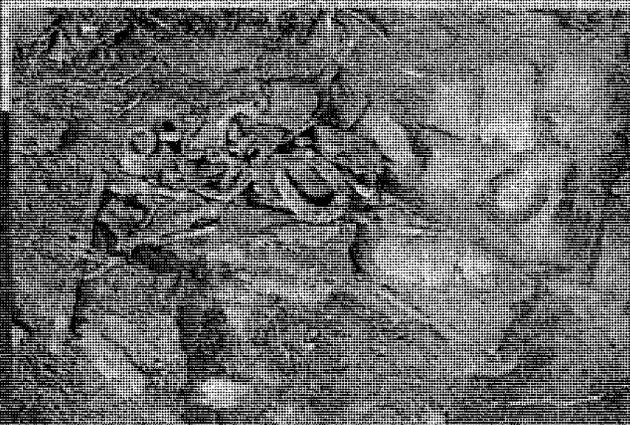
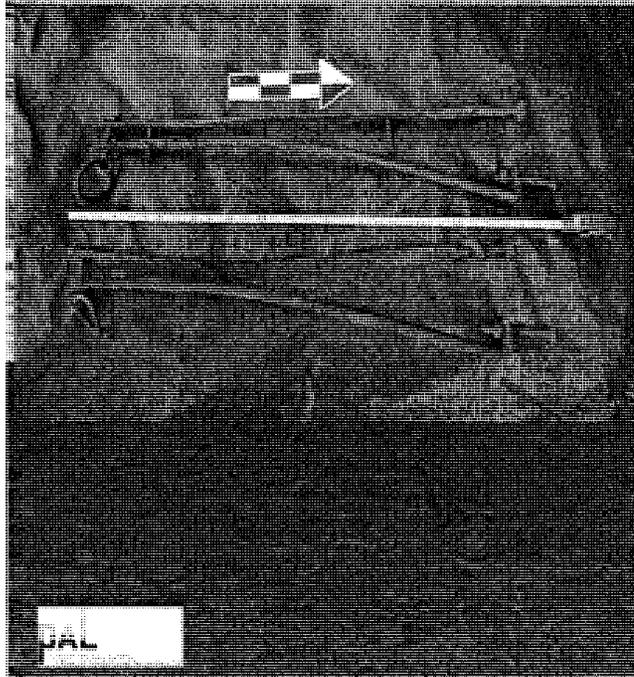
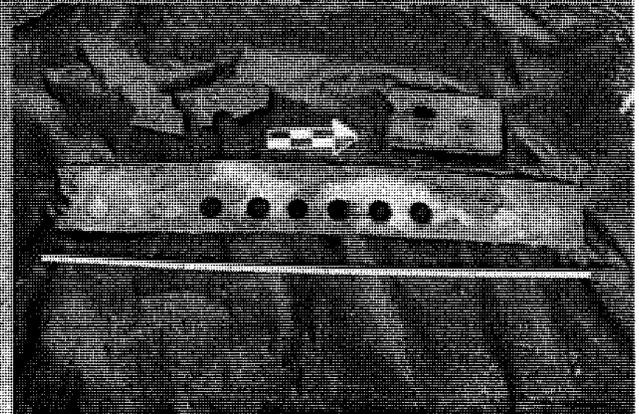
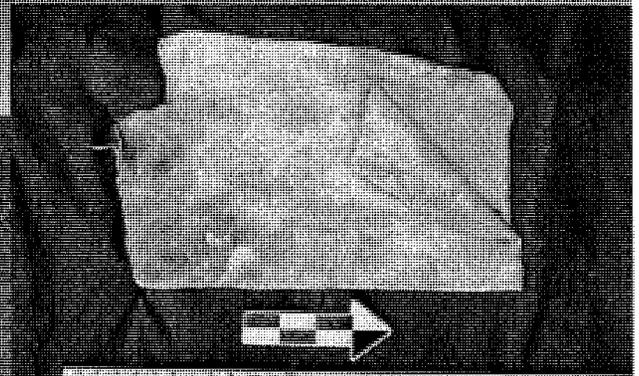
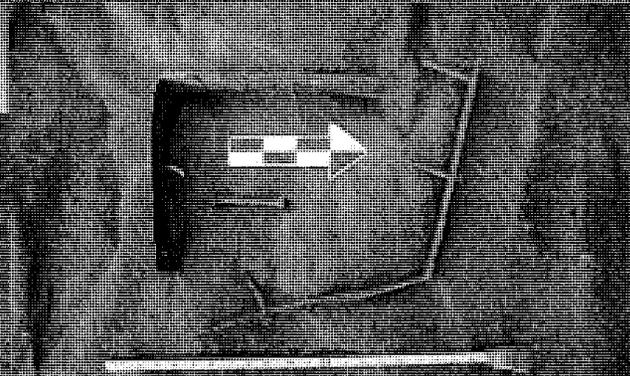
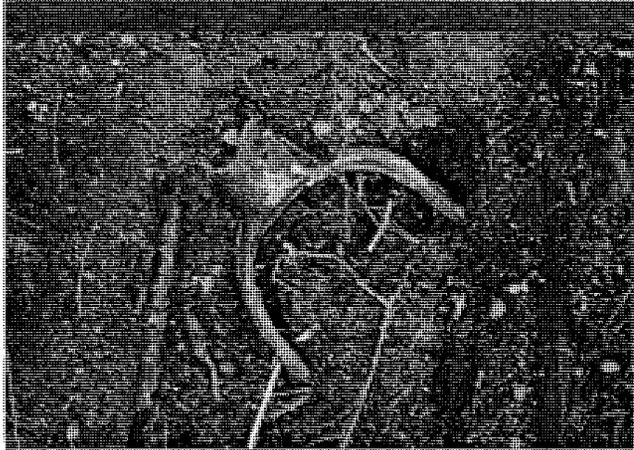


Brick Features



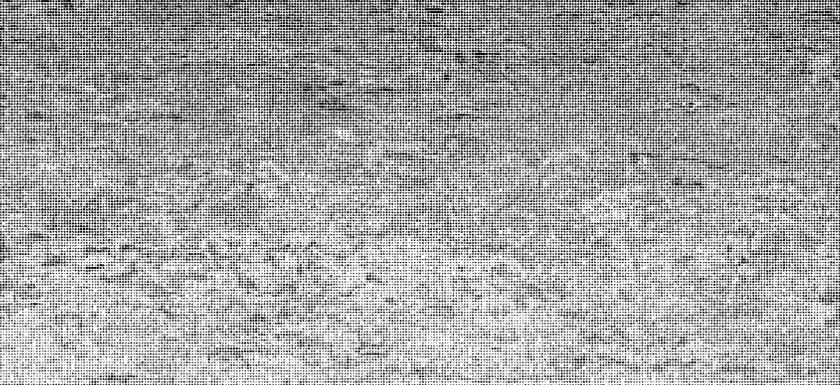
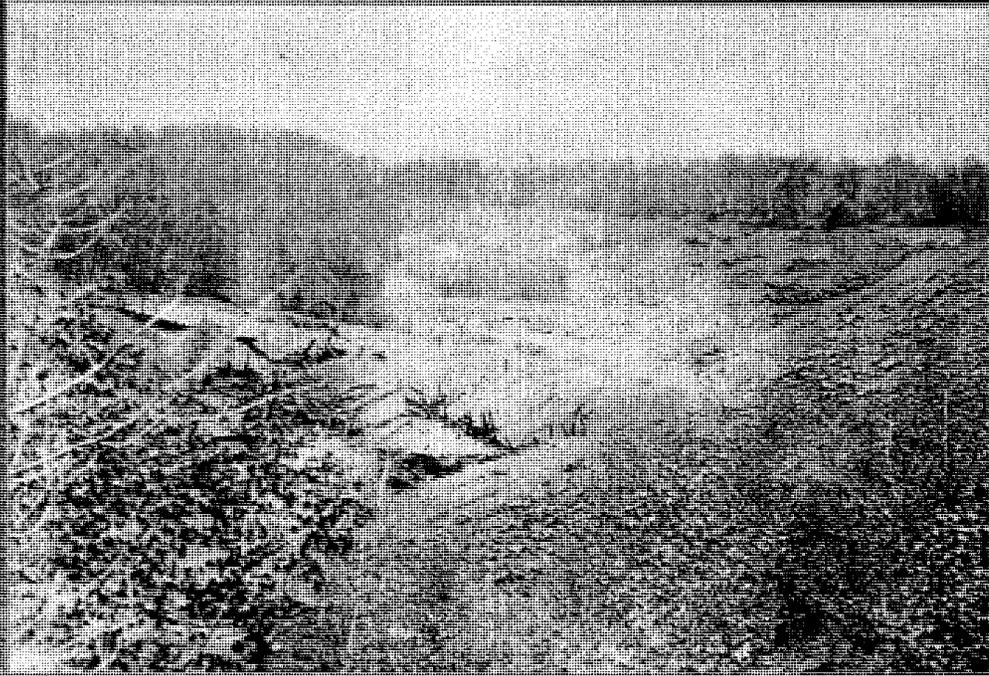
Elizabeth Mine Archaeological Data Recovery

2009 Artifacts



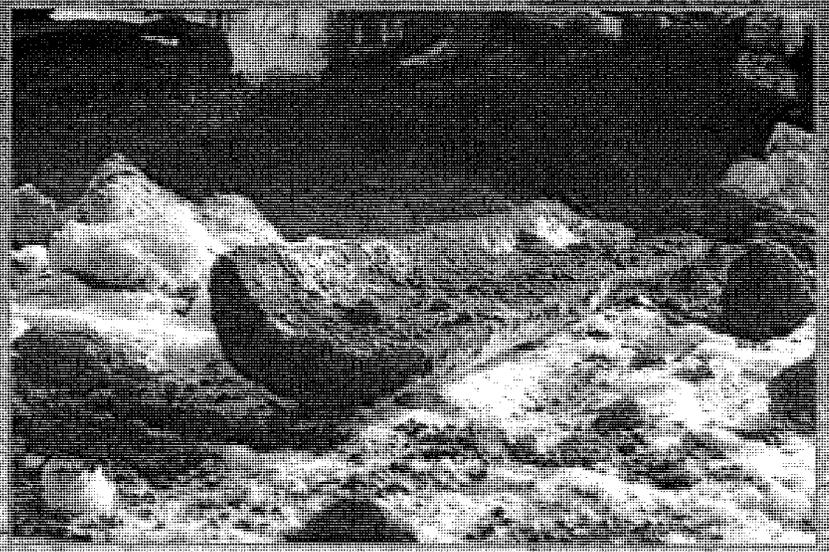
LAL

TP-3 Monitoring and Removal





TP-3 Monitoring and Removal



Elizabeth Mine 2010 Archaeological Data Recovery



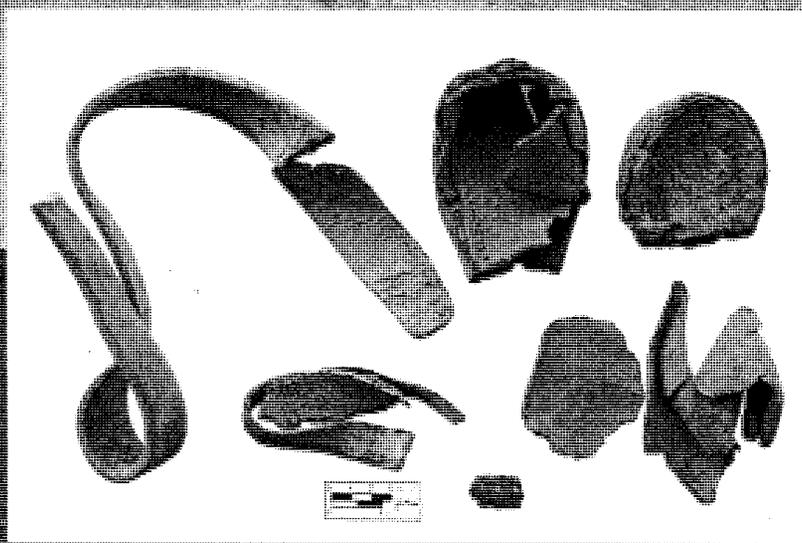
Elizabeth Mine 2010
Archaeological Data Recovery



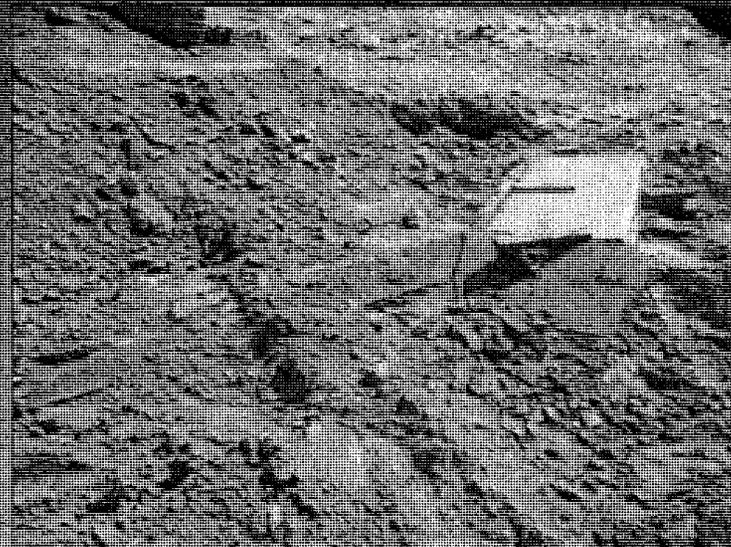
Elizabeth Mine 2010 Archaeological Data Recovery

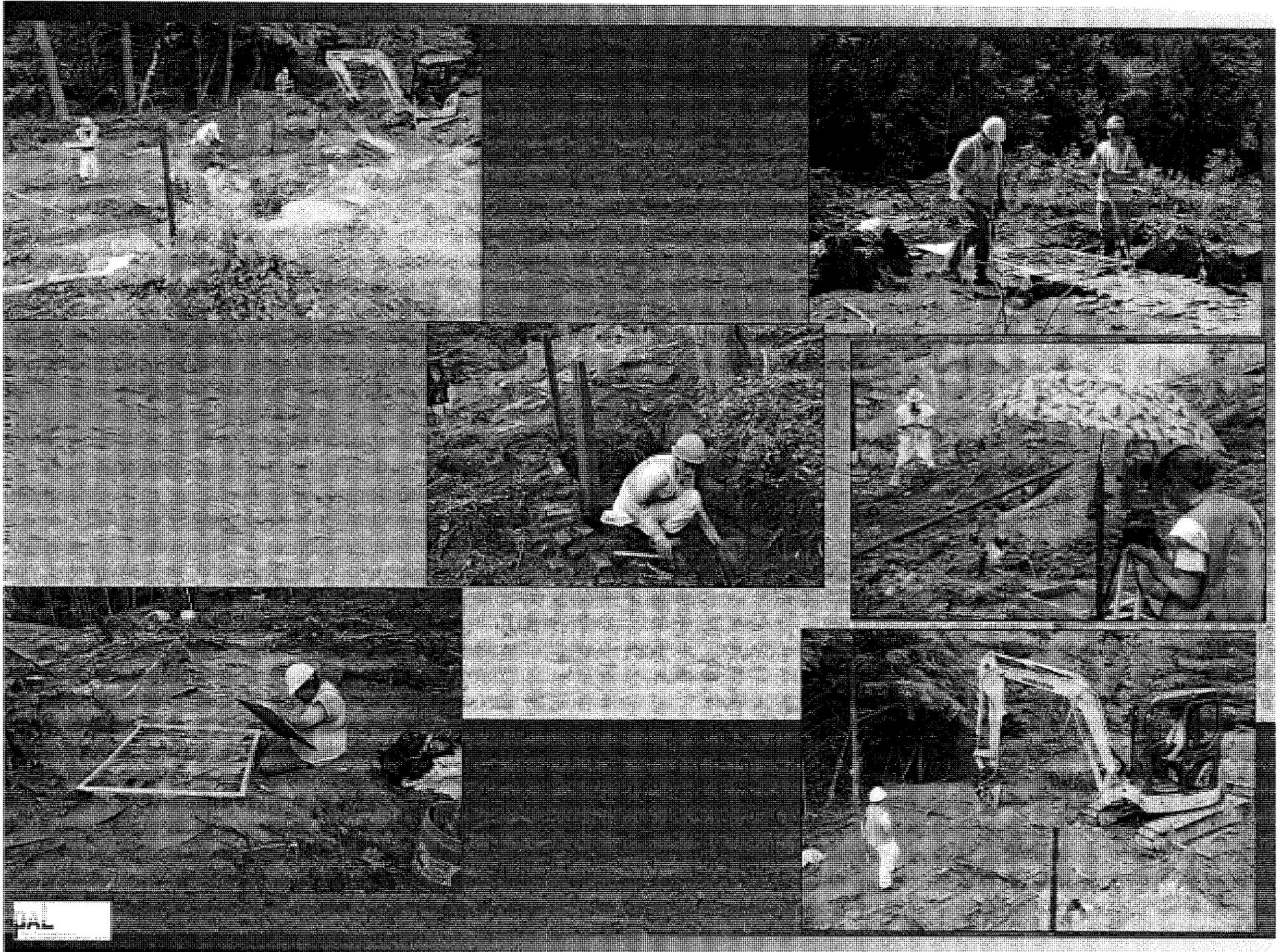


Pine Grove



Elizabeth Mine 2010 Monitoring the Brook Corridor



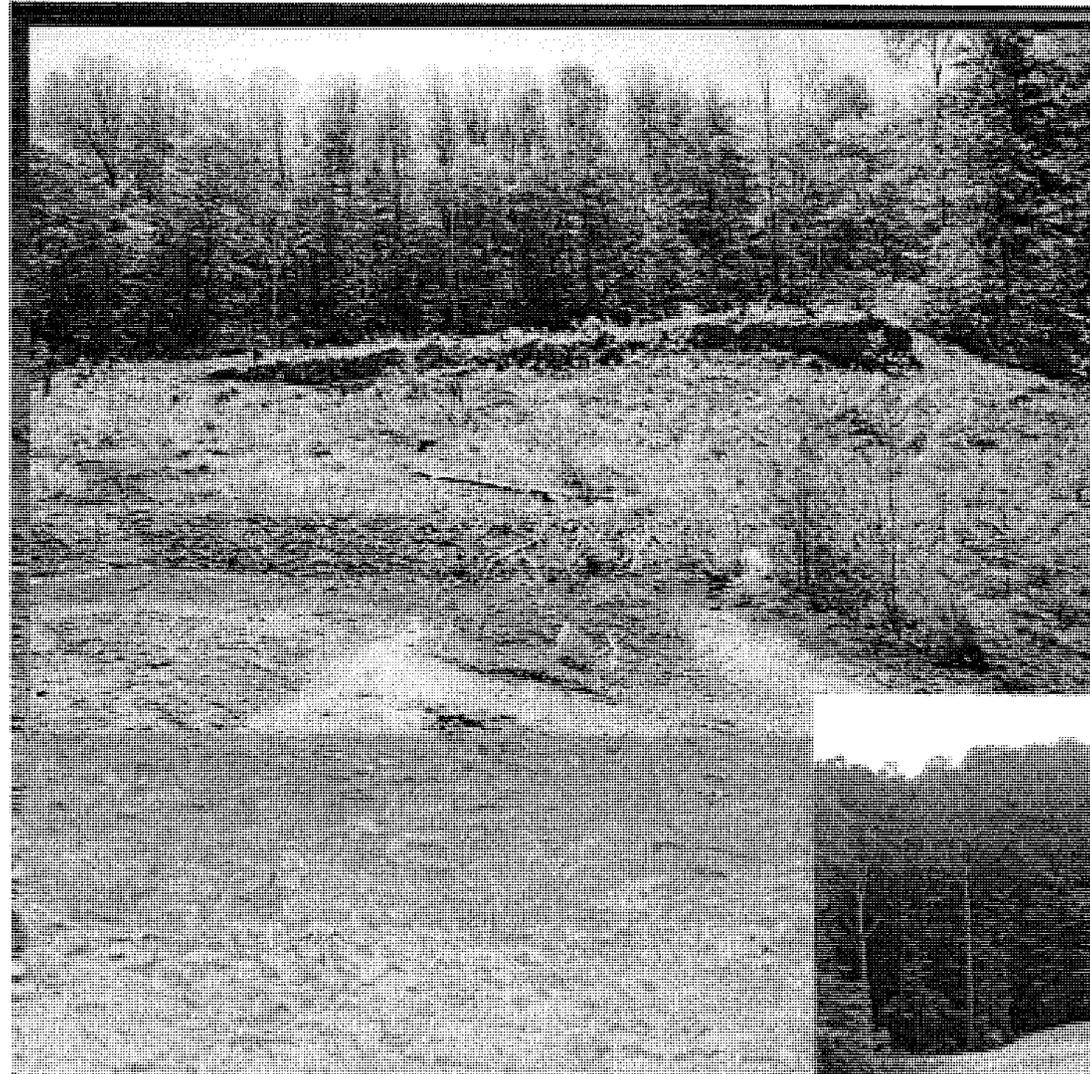


Site Significance

- One of Two Copperas Works Archaeological Excavated in the World
- Early Chemical Works
- One of the Largest Copperas Works in the U.S. (others at Cuttingsville & Shrewbury, VT smaller, short-lived; Hubbardston, MA 18th century.)
- Surviving Site Visited by President James Monroe as Part of the Tour of Internal Improvements
- Early and Large Scale Application of Outdoor Heap Leaching
- Wide Variety of Features and Artifacts Relating to the Process
- Features and Artifacts Correlate to the Historical Record (with a few surprises)
- Integrity, Correlation, and Relationships Allow us to Associate Features with Steps in the Copperas Making Process and Place them on the Landscape

Lower Copperas Factory

Before



After





Thank You

APPENDIX E

**PAL ARCHAEOLOGICAL MONITORING OF WESTON SOLUTIONS, INC.,
GEOTECHNICAL TEST PITS, TAILINGS PILE 3 AT ELIZABETH MINE, 2006**

SUMMARY REPORT

**ARCHAEOLOGICAL MONITORING
OF GEOTECHNICAL TEST PITS
TAILINGS PILE 3 AT ELIZABETH MINE
South Strafford, Vermont**

**CONTRACT NO. DACW33-03-D-0002
TASK ORDER NO. 0011**

Principal Investigator:
Suzanne Cherau

Industrial Historian:
Matthew Kierstead

Submitted to:
U.S. Army Corps of Engineers, New England District
696 Virginia Road
Concord, Massachusetts 01742

Submitted by:
PAL
210 Lonsdale Avenue
Pawtucket, Rhode Island 02860

Section 1. Scope and Authority

This summary report presents the results of archaeological monitoring at Tailings Pile 3 (TP3) at the Elizabeth Mine Superfund Site in South Strafford, Vermont (Figure 1). The archaeological monitoring of the geotechnical test pits was conducted to identify the extent and appearance of iron sulfide ore roasting and heap leaching associated soils and structures at the Copperas Works site on the east flank of Copperas Hill. For this project, significant potential archaeological deposits consisted of 1) deposits of roasted and/or leached iron-copper sulfide ore; 2) plank decks and timber support structures associated with heap leaching the roasted ore for copperas liquor production; and 3) copperas liquor collection features excavated in or built on the underlying bedrock. PAL conducted the investigations under contract with the U.S. Army Corps of Engineers, New England District (NAE).

The monitoring was authorized by EPA New England to comply with Section 106 of the NHPA of 1966 (16 USC 470f), as amended (1976, 1980, 1992, 1999), and implementing regulations of the Advisory Council on Historic Preservation (36 CFR 800). The archaeological monitoring was conducted on November 8, 2006. The monitoring was conducted at Test Pits WS-101 through WS-017 in the TP3 area (Figure 2). PAL staff involved in the project included Deborah C. Cox (project manager); Suzanne G. Cherau (principal investigator and project safety manager); and Matt Kierstead (industrial historian and on-site monitor). The PAL monitor was accompanied by David Andrews of URS Corporation (URS), the Corps and EPA's contractor.

All monitoring information (field forms, photographs, maps) is currently on file at PAL, 210 Lonsdale Avenue, Pawtucket, Rhode Island. While no artifacts were recovered, PAL serves as a temporary curation facility for the paper materials until such time as the U.S. Government designates a permanent repository that meets the requirements under 36 CFR 79.

Section 2. Site History

TP3 was the location of an important early copperas (iron sulfate) works. Iron sulfate was an important nineteenth-century chemical with a multitude of applications including use as a wood preservative, domestic animal disinfectant, dye and dye mordant, astringent, ink, etc. The New England felt hat industry was a major consumer of the South Strafford copperas. The South Strafford copperas works was in operation by 1809, and thrived during the War of 1812. The works were included in President James Monroe's 1917 tour of domestic industrial improvements. By the 1830s the works was supplying 75 percent of U.S. copperas production, and by the 1850s was shipping copperas to Boston, Baltimore, Charleston, Hartford, Richmond, and Troy. It ceased operations about 1882, when it was eclipsed by mining for the copper content in the sulfide ore.

The first step in the manufacturing process consisted of excavating the pyrrhotite (iron sulfide) ore from the North Open Cut near the top of the east flank of Copperas Hill. The entire hillside below the cut was reconfigured into a series of platforms for roasting and leaching the ore. Workers piled the ore in heaps, covered it with earth, and set fire to it, so that the smoldering combustion of the sulfur in the ore increased its porosity. Then the ore was placed on wood plank deck platforms supported by timber cribbing, where water was percolated over the heaps to form a dilute sulfuric acid. Channels lined with clay or brick were made in the bedrock to funnel the dilute acid to a large holding reservoir at the bottom of the hill. The liquor was concentrated through natural evaporation and boiling in lead-lined pans to form bright green copperas crystals that were packed in wood casks for shipment. The TP3 Copperas Works site is significant for its association with early internal improvements and the early U.S. chemical industry, and was a major U.S. copperas producer. It is an unusual surviving early-nineteenth-century chemical manufacturing site, and a very early U.S. example of the heap-leaching process.

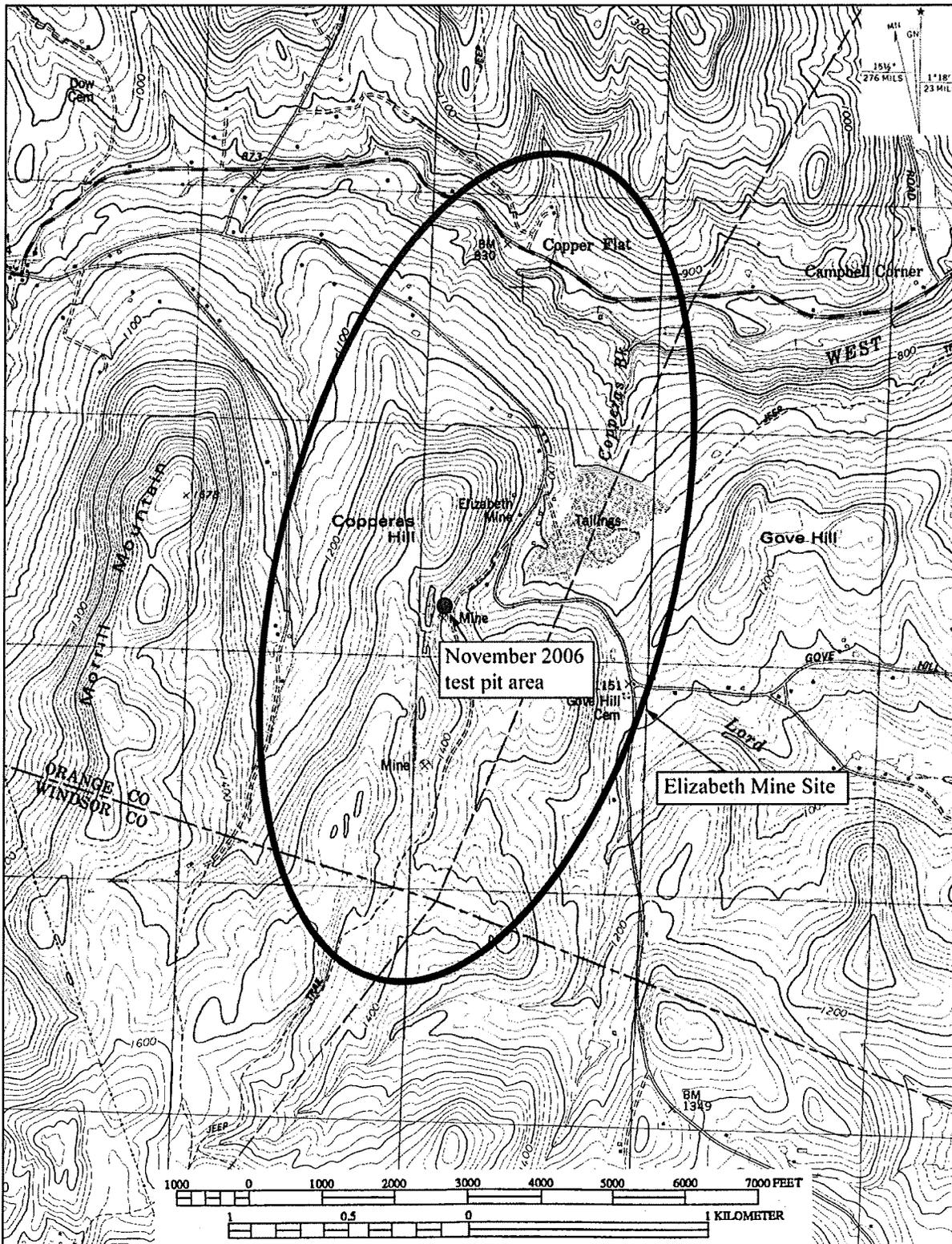


Figure 1. Location of the November 2006 test pit area within the Elizabeth Mine Site of the South Strafford, Vermont USGS topographic quadrangle, 7.5 minute series.

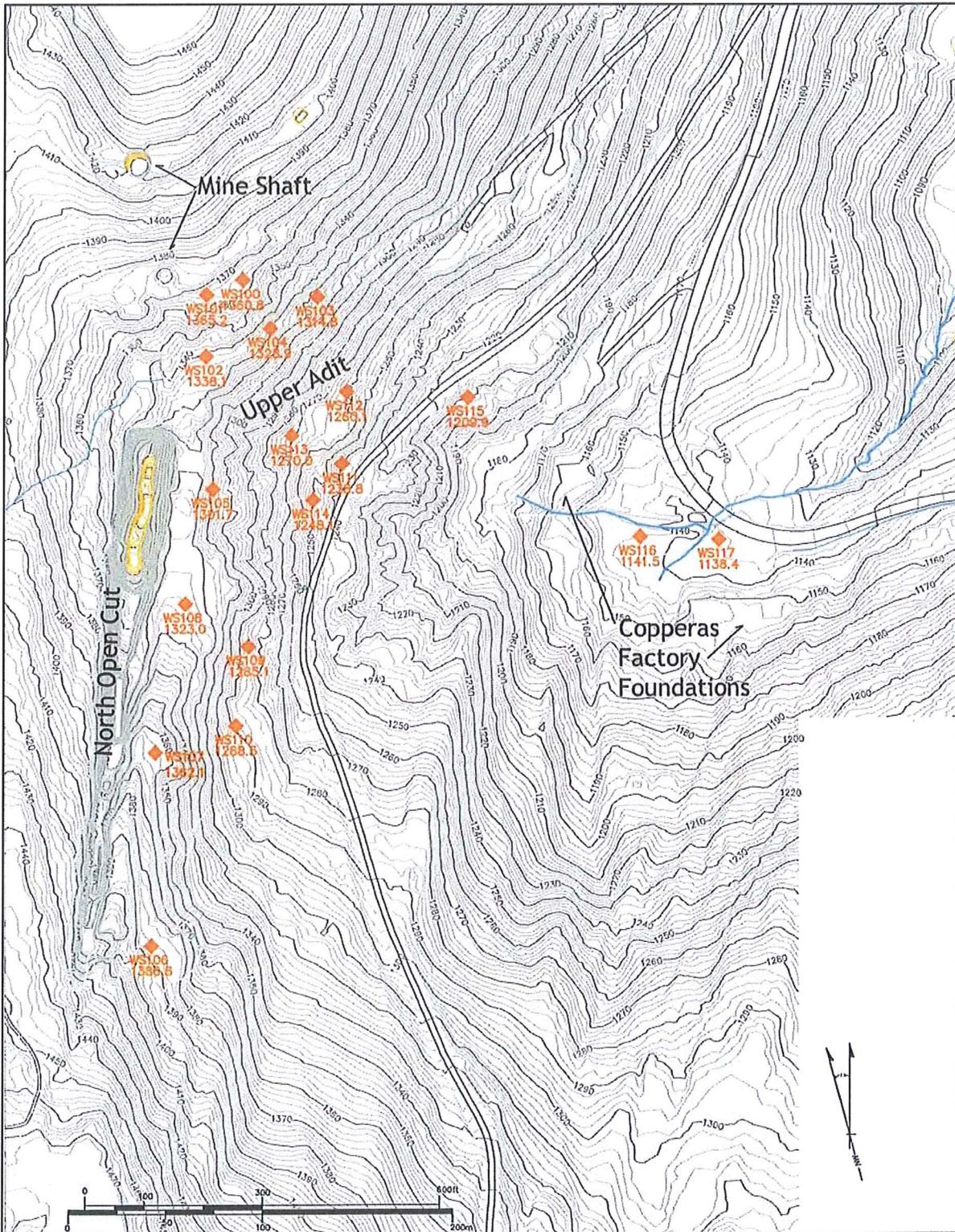


Figure 2. Locations of TP-3 November test pits (source: URS).

After copperas operations ceased about 1882, TP3 was the scene of sporadic underground and surface mining for chalcopyrite (copper sulfide) ore until the 1950s. The waste materials from those operations and subsequent weathering and movement of mine wastes have partially obscured the characteristic red soil associated with the decomposition of the piles of roasted ore, and the timber structures associated with the heap leaching.

Section 3. Methodology

The archaeological monitoring at TP3 was coordinated with URS Corporation, the Corps and EPA's contractor, and was tailored to the excavation methods used. The purpose of the archaeological monitoring was to determine the presence of historic copperas works roasting and leaching activity on the hillside, through location of buried characteristic red roast bed soils, associated timber plank heap leaching structures, and possible bedrock or masonry copperas liquor drainage features, to determine if copperas manufacturing activity had taken place in a wider area than that indicated by the surface evidence. The test pits were dug with a large Kobelco backhoe with a toothed bucket. During the excavations the PAL monitor observed the tailings material excavation in progress, scanning the tailings for characteristic red roast bed soils, and timber and masonry structural remains. Digital photographs of the test pit walls containing roast bed evidence were taken where safe (see Appendix A). Test pit logs were completed by David Andrews of URS and provided to PAL for interpretive purposes (see Appendix B).

Section 4. Results

The test pit excavations involved the removal of mine waste material including non-sulfidic development rock, weathered cobbed pyrrhotite/chalcopyrite ore, roasted and heap leached pyrrhotite, and a variety of unidentified mine waste weathering products to reach bedrock. This information will be used by URS to determine the consistency and volume of materials that may need to be capped or excavated as part of the ongoing remediation of TP 3.

The only test pits that contained the diagnostic red roast bed soils and structural materials were WS-105, WS-107, and WS-109, all located due east of the North Open Cut, which was the historic source of the pyrrhotite. This soil was not visible at the surface at these locations, although it does crop out in the vicinity. All three of these pits exhibited colorful roast bed stratigraphy (see Appendix A) including, from top to bottom, layers of yellow ocher topsoil, decomposed red roasted and leached pyrrhotite, thin layers of whitish, brown, and ocher soil (unknown materials), a black burned charcoal or till layer, and brown clay till above the bedrock. WS-107 had unstable walls and was too deep to photograph, but contained a layer of wood plank. WS-109 contained a round horizontal wood timber at approximately the level where the till began (see Appendix A-2 and A-3), consistent with other round timbers exposed in known roast bed material elsewhere on the hillside.

Section 5. Conclusions and Recommendations

The presence and location of buried roast bed materials and heap leach pad support structures in areas where the diagnostic red roast bed material does not crop out at the surface indicates that the extent of the roasting and heap leaching activity is greater across the side of Copperas Hill than indicated by the visible evidence. The roast ore piles and the thermally altered till below them have been subjected to historic heap leaching, erosion, alluvial redeposition, and chemical action including acid leaching and/or spontaneous combustion in oxygenated and anoxic conditions, leaving a unique, unusual stratigraphy, the associated chemical processes and composition of which remain unknown.

Additional archaeological monitoring of cleanup activities in areas of potential historic copperas ore roasting and heap leaching beds would add to our understanding of the physical extent of that activity on the hillside. However, it would not add to our understanding of the process itself or associated structures. For this reason, additional archaeological monitoring in areas of potential historic copperas ore roasting and heap leaching beds where other activities were not known to have taken place is not recommended.

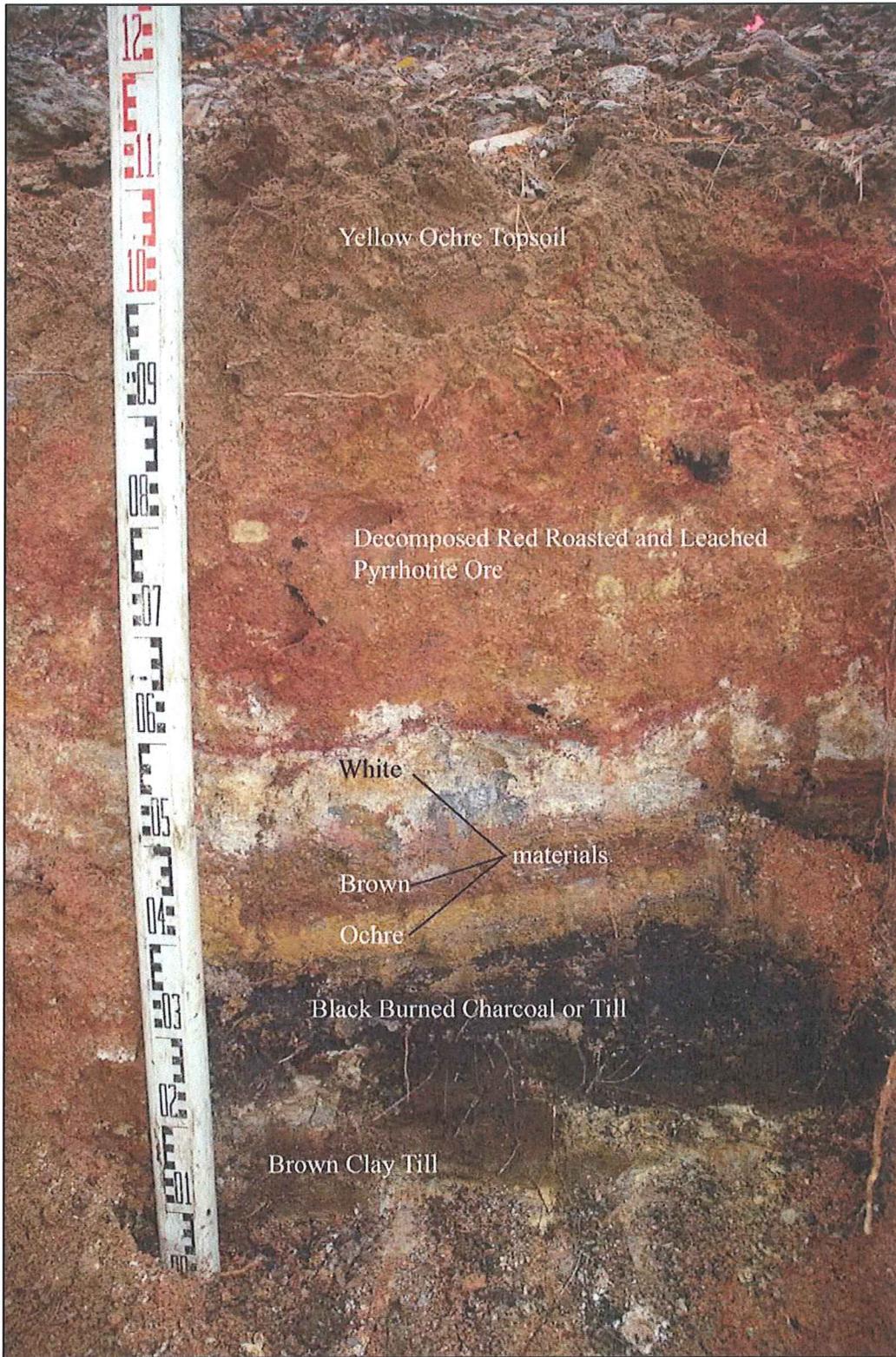
In areas where other activities are known to have occurred and/or were mapped by PAL during the 2003 survey, archaeological monitoring may be warranted because these resources may have the potential to yield additional information about industrial activities that took place at the Elizabeth Mine Site. These areas include the 1880s Tyson Shaft in the upper north part of TP 3, the blacksmith shop/adit site immediately west of Copperas Hill Road, and the terraced stone foundations immediately opposite on the east side of the road.

APPENDIX A

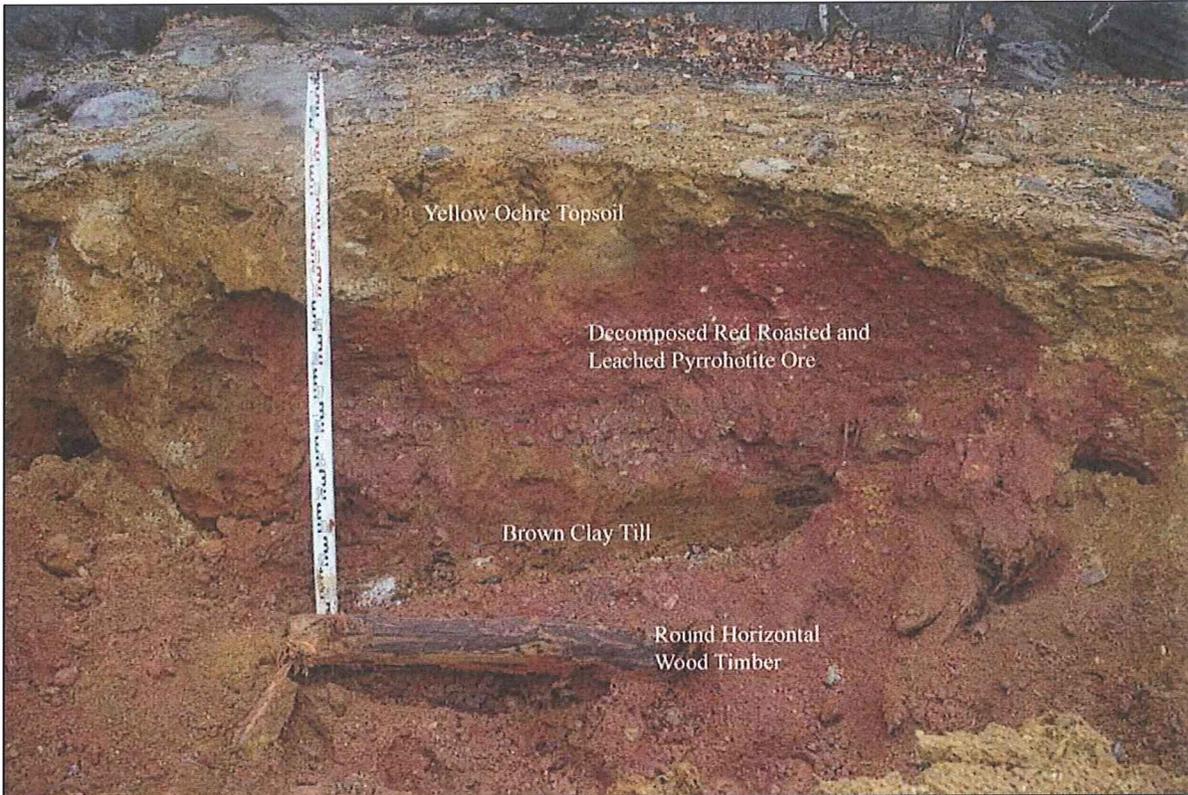
**DIGITAL PHOTOGRAPHS OF TEST PITS CONTAINING DIAGNOSTIC RED ROAST BED
SOIL AND MATERIALS**



Appendix A-1. TP-3 landscape and project excavator.



Appendix A-2. West wall profile of test pit WS-105.



Appendix A-3. West wall profile of test pit WS-109.



Appendix A-4. Detail of round leach pad deck support timber view facing east of test pit WS-109.

APPENDIX B
URS TEST PIT LOGS

Project: Elizabeth Mine
Project Location: S. Strafford, Vermont
Project Number: 39459945.03550

DRAFT Log of Test Pit WS-100
 Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	9
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Reddish brown SILTY SAND, little gravel and cobbles (dry) (loose) [WASTE ROCK]	
5		SM		Brown SILTY SAND, little gravel (dry) (dense) [GLACIAL TILL]	
10				Bottom of Exploration 8.5'	Bedrock encountered at 8.5'
15					
20					
25					
30					

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-101
 Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	13
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Reddish brown COBBLE, little sand (dry) (loose) [WASTE ROCK]	
5		SM		Brown SILTY SAND, little gravel (dry) (dense) [GLACIAL TILL]	
13				Bottom of Exploration 13'	Bedrock encountered at 13'
15					
20					
25					
30					

Report: ELIZABETH TEST PIT LOGS. File: ENVR EXAMPLE.GPJ; 12/15/2006 WS-101

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-102

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	6
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Reddish brown to tan SILTY SAND (moist) (loose) [WASTE ROCK]	
5		SM		Brown SILTY SAND, little gravel (dry) (dense) [GLACIAL TILL]	
6				Bottom of Exploration 6'	Bedrock encountered at 6'
10					
15					
20					
25					
30					

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-103

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	10
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

DEPTH (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Brown to tan SILTY SAND and GRAVEL, some cobble (moist) (loose) [WASTE ROCK]	
5	SM		Gray SILTY SAND, little gravel, trace cobbles (moist) (dense) [GLACIAL TILL]	
10			Bottom of Exploration 10'	Bedrock encountered at 10'
15				
20				
25				
30				

Report: ELIZABETH TEST PIT LOGS; File: ENVR EXAMPLE.GPJ; 12/15/2006 WS-103

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-104

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	9
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0			Reddish brown/gray/tan SILTY SAND and GRAVEL (wet) [WASTE ROCK]	
			Black SILTY SAND (moist) [CHEMICALLY ALTERED TOPSOIL]	
5			Reddish brown SILTY SAND with iron precipitate cementation, very hard [CHEMICALLY ALTERED GLACIAL TILL]	Difficult to dig
	SM		Brown SILTY SAND, little gravel (moist) (dense) [GLACIAL TILL]	
10			Bottom of Exploration 9'	
15				
20				
25				
30				

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-104

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-105
 Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	4
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Layered red gray black SILTY SAND (moist to wet) (loose) "roast bed" [WASTE ROCK]	
3.5		SM		Brown SILTY SAND, trace gravel (moist) (medium dense) [GLACIAL TILL]	
5				Bottom of Exploration 3.5'	
10					
15					
20					
25					
30					

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-105

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-106

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	5
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Cobbles and boulders up to 3' diameter (dry) (loose) [WASTE ROCK]	
			Topsoil	
5			Bottom of Exploration 4.5'	Bedrock encountered at 4.5'
10				
15				
20				
25				
30				

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-107

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	13
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Yellowish brown SAND, little cobble and gravel (dry) (loose) [WASTE ROCK]	
5				
			Wood deck and planking	
			Reddish brown cemented SILTY SAND (dry) (very hard) [WASTE ROCK]	Very difficult digging, possible roast beds
10				
			Bottom of Exploration 13'	Seepage at 13'
15				
20				
25				
30				

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-107

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-108

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kebelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	6
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Yellowish brown SAND to SILTY SAND, little cobble (dry) (loose) [WASTE ROCK]	
5				Bottom of Exploration 6'	Bedrock encountered at 6'
10					
15					
20					
25					
30					

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-109

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	6
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Reddish brown SILTY SAND (moist) (loose) "roast bed" [WASTE ROCK]	
5	SM		Wood deck / logs, black altered topsoil (moist) Gray SILTY SAND, little gravel (moist) (dense) [GLACIAL TILL]	
6			Bottom of Exploration 6'	Bedrock encountered at 6'
10				
15				
20				
25				
30				

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-109

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-110
 Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	6
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Duffy, silty topsoil	
	SM		Reddish brown SILTY SAND (moist) (dense) [GLACIAL TILL]	
	SM		Gray SILTY SAND (moist) (dense) [GLACIAL TILL]	
5			Bottom of Exploration 6'	Bedrock encountered at 6'
10				
15				
20				
25				
30				

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-111

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	3
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

DEPTH (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Yellowish brown SILTY SAND/GRAVEL cobbles (dry) (loose) [WASTE TILL]	
				Black altered sandy topsoil	
		SM		Brown SILTY SAND, cemented (very hard) [GLACIAL TILL]	
				Bottom of Exploration 3'	
5					
10					
15					
20					
25					
30					

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-112

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	7
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Brown SILTY SAND, gravel and cobbles (moist) (loose) [WASTE ROCK]	
~1			Black altered topsoil (moist)	
~1.5	SM		Brown SILTY SAND, some cobbles, cemented (very hard)	Difficult digging
5				
7			Bottom of Exploration 7'	
10				
15				
20				
25				
30				

Report: ELIZABETH TEST PIT LOGS; File: ENVR EXAMPLE.GPJ; 12/15/2006 WS-112

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-113

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	1
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

DEPTH (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0		X	Brown cemented [WASTE ROCK]	
			Bottom of Exploration 1'	Encountered bedrock at 1'
5				
10				
15				
20				
25				
30				

Project: Elizabeth Mine
Project Location: S. Strafford, Vermont
Project Number: 39459945.03550

DRAFT Log of Test Pit WS-114
 Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	3
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

Depth (ft)	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Reddish brown SILTY SAND (moist) (loose) [WASTE ROCK]	
3				Bottom of Exploration 3'	Encountered bedrock at 3'
5					
10					
15					
20					
25					
30					

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-114

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-115

Sheet 1 of 1

Date(s) Installed	11/08/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	3
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments					

DEPTH (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0	SM	[Pattern]	Brown duffy SILTY SAND (moist) (loose) [TOPSOIL]	
	SM	[Pattern]	Gray SILTY SAND (moist) (medium dense) [GLACIAL TILL]	
5			Bottom of Exploration 3'	
10				
15				
20				
25				
30				

Project: Elizabeth Mine
 Project Location: S. Strafford, Vermont
 Project Number: 39459945.03550

DRAFT Log of Test Pit WS-116

Sheet 1 of 1

Date(s) Installed	11/09/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	13
Contractor	Northwoods Excavating	Foreman	T. Ulman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments	Copperas Brook 20' from Test Pit				

DEPTH (ft)	SAMPLES		MATERIAL DESCRIPTION	FIELD NOTES
	USCS Code	Graphic Log		
0			Light brown medium grained SAND, little silt (wet) (loose) [ALLUVIUM - WASTE ROCK]	
5			Black SAND, little silt, organics (wet) (loose) [ALLUVIUM - WASTE ROCK]	Seepage
5			Brown SAND, little silt (wet) (loose) [ALLUVIUM], possibly reworked [WASTE ROCK]	
10				Caving
13			Bottom of Exploration 13'	Cobbles, hard digging
15				
20				
25				
30				

Project: Elizabeth Mine Project Location: S. Strafford, Vermont Project Number: 39459945.03550	DRAFT Log of Test Pit WS-117 Sheet 1 of 1
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Date(s) Installed	11/09/2006	Logged By	D. Andrews	Checked By	K. Savage
Equipment Type	Kobelco Excavator	Sampler Type	Grab	Total Depth of Test Pit (ft)	6
Contractor	Northwoods Excavating	Foreman	T. Uiman	Depth to Water Table (ft)	Not Encountered
Notes	' = Feet				
Comments	Copperas Brook 25' from Test Pit				

	SAMPLES	USCS Code	Graphic Log	MATERIAL DESCRIPTION	FIELD NOTES
0				Brown medium grained SAND, little silt (wet) (loose) [ALLUVIUM - WASTE ROCK]	
5				Wood plank at 3', reddish brown medium SAND (wet) (loose) [WASTE ROCK]	Caving, Seepage
10				Bottom of Exploration 6'	Rapidly caving
15					Test pit terminated as caving hole would have damaged adjacent Mine Road
20					
25					
30					

Report: ELIZABETH TEST PIT LOGS; File: ENVR_EXAMPLE.GPJ; 12/15/2006 WS-117

APPENDIX F

**MINE WASTE REMOVAL MONITORING 2009-2010 FIELD NOTES (TYSON SHAFT,
1831 ADIT/COB SHOP/BLACKSMITH SHOP AND ORE ROASTING AND LEACHING
AREA) AND PHOTOGRAPHS (ALL AREAS)**

Elizabeth Mine TP-3 Monitoring
WO 12/7/09
Matt Kierstead

12/8/09: Monitoring was conducted in two areas.

1. Vertical plank feature, treeline east of Tyson Shaft (survey point taken by Northwoods). Feature was previously identified by Weston/Northwoods and set aside for PAL monitoring. Guided machine excavation through mine waste uncovered a rectangular feature approximately 5 or 6 ft wide consisting of vertical planks and small timbers driven down into till. The feature held water at a level above the surrounding water table. One distinctive piece of wood measured approximately 4 ft long and had one semicircular side, one straight side, and two beveled ends. No artifacts were found or recovered. The feature does not appear on any historic maps. The function of the feature is unknown; it may have been a well or cistern.

2. 1831 Adit, immediately west of the Cob Shop/Blacksmith Shop plateau west of Copperas Road (survey point taken by Northwoods). Adit is indicated on 1874 map of Copperas Works. Guided machine excavation immediately broke through the roof of the buried timber and plank approach tunnel where it meets the bedrock tunnel. Combined machine and hand excavation further cleared the remaining timber and plank portal structure at the soil/bedrock tunnel interface. Continued machine excavation broke through a ferricrete dam in the tunnel mouth, releasing several thousand gallons of water. Once the flow subsided, photos of the timber portal structure and tunnel interior were taken. The arched tunnel ceiling and walls are encrusted with hematite/goetheite stalactites. The floor of the tunnel has been raised approximately two feet by an accumulation of silt and ferricrete.

Elizabeth Mine TP-3 Monitoring
Week of 12/21/2009
Erin Timms

Monitoring was conducted north and east of the Cob Shop/Blacksmith Shop and in the area of the Blacksmith/ Cob shop on the plateau west of Copperas Road adjacent to the 1831 Adit.

Removal of waste rock to the north and east of the Blacksmith/Cobb shop revealed little evidence of other cultural material. During the intensive Phase I survey a concentration of blue-gray clay soil was identified in this general area. Building materials, hardware, planks, and cribbing were absent in this area. Waste rock was removed down to glacial till.

Large timbers were identified adjacent to the east temporary loading station in RU-2. Large timbers were found southwest of the loading station. Iron banding was found adjacent to the timbers. Planks, wooden timbers, and stone building material were identified during the removal of the northwest section of the blacksmith shop. Red vitrified soils and roasted ore were identified in the Blacksmith/Cob shop area.

Elizabeth Mine TP-3 Monitoring
Week of 12/28/09
Matt Kierstead

Monitoring was conducted at the Cob Shop/Blacksmith Shop plateau west of Copperas Road and at the adjacent 1831 Adit.

Monitoring at the Cob Shop/Blacksmith Shop plateau consisted of observing south-to-north passes of a Caterpillar D7 bulldozer and photographing the swath and disturbed materials. The area immediately east of the 1831 Adit contained numerous flat schist stones. A north-south oriented section of timber, apparently a building sill, was found resting on a wall of split schist blocks. Additional square and round wood posts and flat planks of various sizes were uncovered in the area close to the east retaining wall at the east lip of the plateau. A concentration of dark soil in the north section was removed and a large concentration of broken ore was removed in the south section. Several loose sections of eroded mine car rail were removed and stockpiled across Copperas Road at the south end of the "Big Yellow" pile of waste rock for later retrieval. No other artifacts were found.

Monitoring at the 1831 Adit consisted of observing backhoe removal of soil, ferricrete and loose rock from the areas next to and above the adit. The wood portal structure at the soil/bedrock interface was photographed and carefully dismantled using the backhoe claw. Several square timbers and round yellow birch logs that held up the plank roof tunnel were set aside and photographed. Once the soil, loose rock and wood were removed, the bedrock opening and tunnel interior were photographed.

Erin Timms
Elizabeth Mine Monitoring
WO 1-4-2010

Tailings removal continued with TP-3 with excavations starting in the RU-3 area approximately 100 feet south of Adit #2. Red clayey soils associated with roasting were found in this area followed by a layer of wood or wood staining that was preceded by mottled clayey soils. Excavation continued down to ledge rock. Monitoring activities focused on eastern portion of RU-3. A concentration of large timbers beams and posts were found in this area. Below the wood layer similar to the roasting bed (WO 1/11/2010) was a gelatinous heavily mottled clay. In some areas planks were found at the interface between the red vitrified clayey soils and the heavily mottled gelatinous soils. Below the wood layer excavation became difficult as equipment began to sink in the heavily mottled gelatinous soils. Bricks were found in this area but none were found in situ. The area was excavated using a combination of northeast passes using a D7 CAT bulldozer and a CAT 342D excavator.

Elizabeth Mine Monitoring
WO 1-18-2010
Erin Timms

1-20-2010

PAL archaeologist arrived at Elizabeth Mine around 11 a.m. Monitoring began with what remained of the exposed timber roasting bed structure due south of the boiler feature in RU-3. Excavation of this area began the day before and was stopped due to the large amount of timbers and planks were reportedly removed without PAL presence. An approximate 3 foot by 50 foot section earthen berm and exposed timbers were left along the hillside with a 40 x 60 foot section aligning the road. Roasted ores were present in these areas. Two beams were encountered running a general north-south direction with planks above running a northeast-southwest direction. The heaps were heterogeneous with stratified layers of roasted ores. Soils above the wood layer consisted of a red silty clay (roasted tailings) followed by a yellow silty sand (possible leached tailings). Below the wood layer the strata consisted of a black ashy organic layer with possible sintered ore inclusions. The layer is similar to what was found across the center of TP-3 found above a heavily mottled wet layer of tailings followed by bedrock.

1-21-2010

Monitoring continued the following day along the east bank of the north open cut. The removal of the temporary road and tailings along the cut revealed a concentration of timbers and iron pipes and mine car rails. Several planks were found in situ including a platform structure with planks running a general north-south orientation with round support timbers below. One plank was found running east-west from the north open cut just north of one of the large roasting beds. The plank was vertical with horizontal planks running in north-south direction off the east-west plank. Square beams with an east-west orientation were found underneath the north-south wood planking. One upright post was encountered at the north-east side of the top of the conical roasting bed.

Elizabeth Mine Monitoring
WO 1-25-2010
Erin Timms
1-25-2010- rainy day

1-26-2010 & 1-27-2010

After a rain delay, excavation continued south along the north open cut. Excavations revealed a series of upright posts (6-8) at the top of the conical roasting bed. The posts were at a 30 to 45 degree angle following the slope of the roasting mound. Irregular large pieces of ore averaging 6 inches and larger were found at the top of the mound intermixed with a light yellowish brown tailings. The stratum that followed was yellow compacted tailings with ore ranging from 2-3 inches in diameter. The next stratum was red roasted tailings with minimal chunks of ore. Some smaller piles of mostly black roasted ore were also located around and the roasting bed. A monitoring well for the EPA cleanup was removed with some historic pipes that may have been used to water the roasting beds. The pipes may have run from the dam on the west side of the North Cut radiating out to the roasting beds on the east side of the North Open Cut. Pieces of mine car rail and a tangle of iron or steel cable were removed from the east side of the roasting bed. Both were found within the same area at the east side of the roasting bed. The rails appeared to be running in a east-west direction to a cut notch on the west side of the north open cut (possible adit) within the bed rock.

Elizabeth Mine Monitoring
WO 2-1-10
Erin Timms

2-2-10 to 2-5-10

A combined machine excavation with a D6 bulldozer and a 345C excavator began removing the tailings pile referred to as big yellow in RU-5. The tailings pile is east of Copperas Brook and the Upper Copperas factory. The tailings pile is adjacent to a ravine to the south with many exposed broken timbers. At the surface the pile consisted of yellow tailings. Excavation into the tailings pile revealed red roasted soils and timbers associated with roasting activities. Two beams were identified at the interface between the red and yellow tailings along the southern profile. The beams seemed to be placed at an angle following the conical shape of the roast bed. During excavation large amounts of blue copperas salts were encountered. One large iron artifact was encountered approx. 2 feet below grade at the interface between the red roasted soils and the yellow tailings. Earlier work at Elizabeth Mine has suspected that the yellow tailings may have been from one of the later Tyson era mining periods. The tailings pile and ravine were littered with artifacts from what appears to be a 20th century dump site. Radiator hoses and machine made bottles were found within the yellow tailings. Excavation continued exposing multiple levels of wood planking along the west profile. Large pieces of ore and smaller black roasted ores were encountered, as well as, the residual red, purple and white clayey soils found in these roast beds. The piles seem to be stratified with a fair consistency with wood plank layers separating the various stages of ore decomposition. On the last day of excavation, a wood trough was found in situ running north-south from the south side of the tailings pile into the wood lined ravine. The trough is approx. 20 feet northeast of one of the brick evaporators.

Elizabeth Mine Monitoring
WO 2-8-10
Erin Timms

2-8-10 to 2-9-10

A combined machine excavation with a D6 bulldozer and a 345C excavator began removing the tailings pile south of the wood lined ravine in RU-4. At the surface the tailings pile consisted of dark reddish brown to black sintered ore. East of the black sintered ore pile was a yellowish-brown pile that was removed at the same time. Excavation had already begun by the time PAL personnel arrived on site. Excavation revealed a large amount of metal and glass artifacts throughout the tailings that had not been encountered in other roasting beds. The many of the artifacts encountered appear to be a part of the 20th century dump site. A leaf spring for a truck, radiator hoses, and a rubber tire tube as well as machine made bottles was encountered near the top of the pile. Some of the metal artifacts were found at greater depths within the stratified roasted ores. One specialized brick was encountered, large amounts of iron/steel cable, various spikes and terracotta pipe, and iron piping were found at various depths with in the roast bed. Wood planks and beams were encountered that were consistent with the other roast beds. Excavation continued down through various levels of wood and ore until reaching bedrock.

Monitoring continued in RU-5 in between domestic foundations northwest of the upper factory. Excavation within this area revealed very few features. Two round timbers were found in the bank approximately 2 feet below grade on the south-west side off of Copperas Road. One square beam was also encountered southwest along the slope. Approx. 2-3 feet of yellowish-brown tailings and soil were removed down to till. The absence of mining features in this area would indicate minimal use other than possible domestic. No domestic artifacts were encountered in the tailings removal. Excavations ceased at the southwest foundation to northeast and the ravine to southwest.

Elizabeth Mine Monitoring
WO 2-22-10
Erin Timms

2-22-10

PAL staff arrived on site Monday morning. Excavation of RU-5 continued with Copperas Road Removal. A stratified roasting bed was being removed. Excavation into the pile revealed large timbers in the southwest corner. Plank decking was found in this area as well as slated planks/horizontal laths that were supported by upright square posts. Three large beams were found in the southwest profile staged at different elevations following the shape of the roasting pile. Excavation continued down to bedrock. Excavation ceased 20 feet before the bend in the temporary haul road and Copperas Road.

2-23-10

PAL monitored the excavation of one roasting bed with exposed timbers and a ridge suspected to be roasted ores in RU-4. The roasting bed was excavated in a circular pattern bisecting the northwest side of the ridge nose of the roasting bed. The bed was located adjacent to two streams north and west and east of the pile assumed to be apart of the conveyance for copperas liquor. Guided excavation with a smaller Ascera 140SR backhoe pulled back roasted ores trying to maintain a fairly level surface. The excavation of the top of the pile revealed disarticulated wood members removed with the frozen top layer. As ore and timbers were removed a wood wheel spoke like pattern became evident. Wood timbers radiated out of the center towards the brook. Another possible wooden ring was identified approx. 15 feet from the center of the pile. Upright timber posts supported the slatted planks or horizontal laths that divided the pile into wedges. Excavation ceased to the west and northwest due to raising water table. Clayey heavily mottled soils were encountered in this area. To the north excavations ceased at bedrock. The roasting bed was not as tall as other roasting beds encountered in RU-4 and RU-5. Only two distinct soil strata occurred within the roasting bed with one black organic layer separating the two. The roasting bed was the furthest eastern bed in RU-4.

Excavation of a suspected roast bed proved to be a natural stone ridge with predominately natural soils. Stone outcrops appeared high along the northwestern side of the ridge nose. One excavation trench was placed to the south. The trenching showed a thin layer of roasted soils on the western side of the ridge followed by a brown silty loam similar to soils identified in the inter-copperas area followed by till. Excavation continued at the top of the ridge with natural soils at the top followed by bedrock. The backhoe operator confirmed that when a trench was placed along the crest the week prior rich brown natural soils were encountered followed by shallow bedrock.

Excavations continued around the possible bank barn foundations. At the request of Weston contractors monitoring was to remove more tailings around the foundations trimming back the bank. Excavations began northeast of the foundations. Large boulders for a possible floor and a heavy concentration of artifacts were encountered. Excavation ceased due to the large amount of cultural material. Excavations continued on the northeast bank. One trench was placed along the island away from the foundation. No material was found. This area will be removed once the drainage areas around the foundation can be stabilized. Excavations continued on the southwest bank. Yellow tailings and large pieces of ore were removed from the southwest bank. A few timbers were encountered in the southwest corner of the pile. The timbers were at a 20-25 degree angle and were consistent with supports found in other roasting beds.

Elizabeth Mine TP-3 Monitoring
Week of 4-12-10
Matt Kierstead

Monitoring was conducted at the Tyson Shaft #1 Site at the north edge of TP-3, north of the North Open Cut. The PAL Senior Industrial Historian arrived at 12 noon on 4-14-10 and monitored until 5:00 p.m. Monitoring resumed at 7:00 a.m. on 4-15-10 and ended at 12:00 noon. Monitoring consisted of observing a Caterpillar 3300L with a 60 ft long arm and straight-edged bucket remove a section of a steeply-sloping pile of weathered waste rock in an oval area east of the suspected collapsed shaft, a shallow pit with decayed large horizontal timbers extending east from its west edge. Excavation in the upper portion of the pile yielded an occasional loose piece of broken wood, none of which appeared to be in situ. As work moved from south to north, the excavator eventually encountered a hard resistive horizontal black layer that only yielded to prying from the edge. At PAL's direction the operator cleared as much of the area as possible at once to determine its extent. The surface was level and consisted of a hard, approximately 1 ft thick layer of roughly fist sized pieces of ore cemented with black pyrrhotite ore fines. Two, 4" square red oak timbers were embedded in the floor, one oriented in an E-W direction and another N-S. The floor appeared to have a distinct east edge. Only approximately 15 ft by 10 ft could be exposed. Excavation could not proceed west as it was outside the reach of the excavator. It could not proceed north as it would have required removal of a larger birch tree with a survey spike in it (once the purpose of this spike is determined by Northwoods, it may be able to be removed allowing further waste rock removal and determination of the extent or footprint of the floor). A wrought iron strap approximately 2 inches wide with a triangular hole in it protrudes from the ground between the excavation limit and the tree. Working south of the floor area, immediately east of the suspected collapsed shaft, the excavator extracted several E-W oriented, horizontally placed round timbers opposite the in-situ exposed decayed timbers protruding from the opposite side of the pit. Excavation at this level also yielded other round timbers, pieces of 4" square timber, 1" thick plank, and several flat rectangular pieces of un-weathered schist.

The floor area corresponds with the shed east of the enclosed headframe in the 1880s photo of the Tyson Shaft. Sorted piles of rock and a waste disposal trestle in this area in the photo suggest that this was the ore cobbing house. The hard black layer of ore pieces and fines appears to be the working floor of the cobbing shop.

Elizabeth Mine TP-3 Monitoring
Week of 5-3-10 (Thursday, May 6)
Matt Kierstead

Monitoring was completed on the east side of the Tyson Shaft #1 Site at the north edge of TP-3, north of the North Open Cut. The PAL Senior Industrial Historian arrived at 9:00 a.m. and monitored until noon. Monitoring consisted of observing a Caterpillar 3300L with a 60 ft long arm and straight-edged bucket remove the remains of the section of waste rock east of the Tyson Shaft monitored during the week of 4-12-10. Excavation yielded one loose piece of broken wood, not in situ. The excavator again encountered the hard resistive horizontal black layer of ore cemented with black pyrrhotite ore fines. Only approximately 15 ft by 10 ft was exposed. Excavation could not proceed west as it was outside the reach of the excavator. It proceeded north to the large birch tree with a survey spike in it. The wrought iron strap approximately 2 inches wide with a triangular hole in it protruding from the ground was removed and photographed. The area between the previous northern excavation limit and the birch tree contained many large round granite boulders. It also contained a shallow-buried row of three flat rectangular split schist blocks on top of a one-foot thick layer of waste rock on till. The area corresponds with the shed east of the enclosed headframe in the 1880s photo of the Tyson Shaft. Sorted piles of rock and a waste disposal trestle in this area in the photo suggest that this was the ore cobbing house. The hard black layer of ore pieces and fines appears to be the working floor of the cobbing shop. The row of split schist blocks appears to have been a simple foundation support for a timber sill of the north wall of the cobbing house.

On the west side of the shaft pit, an approximately 2 ft high, 1" diameter, threaded iron machinery mounting pin was identified at the southwest edge of the collapsed pit, in the area of the Tyson's boiler/steam engine/shaft hoist house. The pin was flagged with striped flagging tape.

Two industrial waste piles were identified southwest of the shaft pit; a pile of bituminous coal ash and boiler grate clinker, and a pile of bituminous coal ash and coke several feet west. The possibly correspond to the Tyson's boiler/steam engine/shaft hoist house and blacksmith shop, respectively.

Elizabeth Mine TP-3 Monitoring
Week of 5-10-10
Matt Kierstead

Monitoring was resumed at the Tyson Shaft #1 Site at the north edge of TP-3, north of the North Open Cut. Waste rock removal was in the area of archaeological concern west of the shaft, where the Tyson's 1880s blacksmith shop and boiler/steam engine/shaft hoist house were located west of the shaft pit. The PAL Senior Industrial Historian arrived at 12 noon on 5-11-10 and monitored until 5:00 p.m. Monitoring resumed at 7:00 a.m. on 5-12-10 and ended at 5:00 p.m. Monitoring consisted of observing a Caterpillar 3300L with a 60 ft long arm and straight-edged bucket remove a section of a deep, steeply-sloping pile of weathered waste rock in an oval area west of the suspected collapsed shaft. The bucket reach extended to a point approximately 10 ft west of the threaded iron machinery mounting pin flagged earlier in the monitoring campaign in this area. Documentation consisted of digital photography.

A limited number of haul trucks using a long access route allowed for slower, more careful use of the excavator in this area between truck loading episodes. The excavator was used to take long, shallow, east-to-west passes down to gray undisturbed till. The remains of two buildings were found. Excavation in the area at the eastern extent of the excavator immediately uncovered a shallow-buried, approximately 1 ft square, large horizontal wood timber extending east and apparently attached to the flagged threaded machinery pin. Approximately 10 ft north of the timber, excavation revealed layered masonry construction consisting of a single layer of hand-struck red brick that may be a floor surface, above a layer of increasingly large flat rounded boulders and tabular schist slabs.

Several feet west of the above feature, excavation uncovered portions of a small, square, crude stone foundation consisting of east-west and north-south rows of flat rounded boulders and squared off schist slabs. The interior contained a scatter of wrought iron artifacts including large and small angle iron brackets, spikes, straps, two horseshoes, a hook, a short length of pipe, and two cast iron fragments of what appear to be furnace door frames. A deposit of bituminous coal was found in the area immediately north of the foundation.

The excavated area corresponds with area of the shed and building west of the enclosed headframe shown in the 1880s photo of the Tyson Shaft. The area where the iron artifacts and coal pile were found appears to be the location of the blacksmith shop, likely the small free-standing shed in the photograph. The large horizontal east-west timber, stone foundations and brick floor that uncovered to the east appear to correspond with the west end of the boiler/steam engine/shaft hoist house. Excavation of this area to the east will be conducted once clearance is obtained to place excavation equipment in the current exclusion zone over the mine workings.

PAL was also asked to briefly monitor waste rock removal in a small area at the south end of the east edge of the North Open cut where excavation had been stopped earlier in the week when several parallel, east-west-oriented wood planks and timbers were encountered by an excavator. The wood was located in waste rock fill in a notch cut into the east edge of the North Open Cut

that may have been a large historic crosscut, possibly for WW II-/1950s-era truck haulage. Careful removal of the wood revealed that it was a stacked pile of oak planks of various dimensions and lengths, birch poles, several timbers with regularly-spaced, shallow notches, and a few short lengths of 2-inch diameter iron pipe. The materials were loosely stacked and did not appear to be connected or part of a structure. It appears they were piled in the notch area for storage and subsequently covered with a mound of mine waste possibly placed to block entrance to the notch for safety.

Elizabeth Mine TP-3 Monitoring
Week of 6-7-10
Matt Kierstead

Monitoring was resumed at the Tyson Shaft #1 Site at the north edge of TP-3, north of the North Open Cut. Waste rock removal continued in the area of archaeological concern west of the shaft, where the Tyson's 1880s blacksmith shop and boiler/steam engine/shaft hoist house were located west of the shaft pit. The PAL Senior Industrial Historian arrived at 7:30 a.m. and monitored until 12:00 p.m. Monitoring consisted of observing a Caterpillar 3300L with a 60 ft long arm and toothed bucket remove the remainder of the waste rock in the area immediately west of the suspected collapsed shaft. The machine exclusion zone was narrowed, allowing excavation into the area of the collapsed shaft pit. Documentation consisted of digital photography.

The use of only one haul truck using a long access route allowed for slower use of the excavator in this area between truck loading episodes, however, use of the toothed bucket (the straight edged grading bucket used previously was broken) made for greater disturbance. The excavator continued taking take long, shallow, east-to-west passes down to gray undisturbed till. Excavation uncovered the full extent of the two large east-west oriented wood timbers that had their east ends partially exposed at the west lip of the shaft pit. These two timbers were tree trunks approximately two feet in diameter that has been sawn flat on two opposing sides. The remains of several wrought iron pins with larger square retaining washers were observed in the timbers. The area surrounding these timbers contained a scatter of metal artifacts including wrought iron threaded pins, straps, brackets, spikes, bolts and hardware. The area also included several lengths of 1" to 2" diameter iron pipe, one with a bronze faucet at one end. Artifacts also included a broken pickaxe head, and a metal loop with a worn bottom suggesting wear from a rope, cable, chain, etc. A particularly unusual artifact was an approximately 8" diameter cast iron ball with a flat bottom and a broken loop at the top, interpreted as a possible hoist counterweight or piece of rock breaking machinery.

The excavated area corresponds with area of the building west of the enclosed headframe shown in the 1880s photo of the Tyson Shaft. The area where the iron artifacts were found appears to be the location of the boiler room/steam engine hoist house in the photograph. The large horizontal east-west timbers appear to be the sills of the heavy timber headframe that held the hoist cable sheave wheel(s) over the shaft mouth. The lack of expected heavy masonry pads, piers, floor, etc. suggests that these structures were dismantled and possibly recycled elsewhere.

Excavation in pursuit of locating the shaft cap could not be conducted as the excavator could not reach the required area. The machine was slated to be moved to the east side of the shaft to continue excavations.

Elizabeth Mine TP-3 Monitoring
Week of 6-14-10
Matt Kierstead

Monitoring was resumed at the Tyson Shaft #1 Site at the north edge of TP-3, north of the North Open Cut. Waste rock removal continued in and on the east side of the shaft collapse pit, where some sort of shaft cap structure was anticipated. The PAL Senior Industrial Historian was participating in site mapping at the Copperas Brook Corridor and monitored briefly mid-day when wood was encountered at the bottom of an approximately 15 ft deep pit excavated by the Caterpillar 3300L with a 60 ft long arm and toothed bucket. Documentation consisted of digital photography.

Excavation uncovered a flat circular cluster of parallel large east-west oriented square timbers. The timbers deflected downward easily under the gentle pressure of the excavator bucket, indicating a void beneath them. The structure was roughly centered where the bottom of the removed collapse pit had been, in line with the two parallel heavy shaft headframe sill timbers encountered previously. The sides of the cap were delineated by the excavator, but excavation beyond the top surface was not possible because of the depth of the hole and steepness and instability of the pit walls.

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