

Amendment



Mining Permit Application Amendment

Copperwood

Volume II

Environmental Impact Assessment Amendment

Project I.D.: 17C050

Copperwood Resources, Inc.
Gogebic County, Michigan

March 2018





Green Bay Location

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March 21, 2018

Mr. Tom Repaal
Copperwood Resources, Inc.
310 East US Highway 2
Wakefield, MI 49968

Dear Mr. Repaal:

RE: Copperwood – Environmental Impact Assessment Amendment

Enclosed for your distribution is the *Environmental Impact Assessment Amendment (Amendment EIA)* for mining the Copperwood mineral resource. This *Amendment EIA* has been prepared in accordance with the requirements of Part 632 of the Michigan Natural Resources and Environmental Protection Act and Michigan Administrative Rules codified under R 425.206.

Sincerely,

Foth Infrastructure & Environment, LLC

A handwritten signature in black ink, appearing to read "Kris Baran".

Kris Baran
Project Director/Associate

A handwritten signature in black ink, appearing to read "Mark Ciardelli".

Mark Ciardelli
Lead Environmental Scientist

A handwritten signature in black ink, appearing to read "Stephen V. Donohue".

Stephen V. Donohue, PH
Vice President - Mining

Environmental Impact Assessment Amendment
Copperwood

Distribution

<u>No. of Copies</u>	<u>Sent To</u>
2	Mr. Joe Maki District Geologist Michigan Department of Environmental Quality Oil, Gas, and Minerals Division 1504 West Washington Street Marquette, MI 49855
1	Mr. Tom Repaal Copperwood Resources, Inc. 310 East US Highway 2 Wakefield, MI 49968

Environmental Impact Assessment Amendment Copperwood

Project ID: 17C050

Prepared for
Copperwood Resources, Inc.
Gogebic County, Michigan

Prepared by
Foth Infrastructure & Environment, LLC

March 2018

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Environmental Impact Assessment Amendment Copperwood

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List of Abbreviations, Acronyms, and Symbols

<i>Amendment</i>	<i>Mining Permit Application Amendment</i>
<i>Amendment EIA</i>	<i>Environmental Impact Assessment Amendment</i>
Copperwood	Copperwood Resources, Inc.
EIA	Environmental Impact Assessment
Foth	Foth Infrastructure & Environment, LLC
GMining	G Mining Services Inc.
KBIC	Keweenaw Bay Indian Community
km	kilometer
LVD	Lac Vieux Desert Band of Lake Superior Chippewa
MCL	Michigan Compiled Laws
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MEDC	Michigan Economic Development Corporation
MPA	Mine Permit Application
MPSC	Michigan Public Service Commission
NREPA	Natural Resources and Environmental Protection Act
ORUSC	Orvana Resources US Corp.
PMWSP	Porcupine Mountain Wilderness State Park
Project	Copperwood Project
PTI	Permit to Install
TDF	tailings disposal facility

1 Introduction

Copperwood Resources, Inc. (Copperwood), formerly known as Orvana Resources US Corp. (ORUSC), is proposing the development of the Copperwood mineral resource in Ironwood and Wakefield Townships, Gogebic County, Michigan. The Copperwood Project (Project) location is shown on Figure 1-1. Copperwood is applying for an amendment to its Mining Permit (MP 01 2012) in accordance with Part 632 of the Michigan Natural Resources and Environmental Protection Act (NREPA) (Michigan Compiled Law [MCL] §324.63207) and rules promulgated under R 425.206 of the Michigan Administrative Code to allow for a revised Project site layout, and modified mining methods. The location of Project components to be permitted as part of this amendment are shown on Figure 1-2. This volume (Volume II) of the *Mining Permit Application Amendment (Amendment)* contains the *Environmental Impact Assessment (Amendment EIA)* for the Project. This *Amendment EIA* has been prepared based on engineering and other environmental studies as they relate to the design, construction, operation, closure, reclamation, and post-closure care of the Project.

1.1 Professional Qualifications

This *Amendment EIA* was prepared by Foth Infrastructure & Environment, LLC (Foth) under contract to Copperwood. This document incorporates information prepared by qualified professionals working under contract to Copperwood. Table 1-1 is a summary of the organizations and individuals who have contributed to the preparation of this *Amendment EIA* for the Project.

1.2 Environmental Impact Assessment Methodologies and Sources of Information

Updated baseline studies conducted in support of the revised Project site layout and modified mining methods were completed using widely recognized industry standards and practices, and methodologies consistent with those utilized during the original Environmental Impact Assessment (EIA) provided in the Mine Permit Application (MPA) (Orvana, 2011) associated with Mining Permit (MP 01 2012). Documentation of standards and sources of information used in the preparation of this *Amendment EIA* are provided within the individual reports appended to or referenced in this *Amendment EIA*.

1.3 Public Input

In addition to extensive public outreach and public input completed as part of the MPA, Copperwood has continued to gather public input to the Project. Copperwood conducted extensive public outreach efforts beginning in the spring of 2017 and continuing through the winter of 2018 to obtain public input. These efforts consisted of job and career fairs, local press releases, website information, participation in local community events and festivals, site visits for public officials, meetings with local, state and federally elected officials, and attendance at local governmental meetings and other community organizations.

Copperwood has met with the entities listed below on several occasions since the beginning of 2017 and they have endorsed the project.

- ♦ City of Ironwood
- ♦ City of Bessemer
- ♦ City of Wakefield
- ♦ Village of Ontonagon
- ♦ Ironwood Township
- ♦ Wakefield Township
- ♦ Bessemer Township
- ♦ Marenisco Township
- ♦ Gogebic County Board of Commissioners
- ♦ Ontonagon County Board of Commissioners
- ♦ Gogebic County Road Commission
- ♦ Western UP Planning and Development Region

In October of 2017, meetings were held with federally recognized tribal entities to provide information, to listen, and to consider their concerns with mining in the Upper Peninsula of Michigan. These tribes included:

- ♦ Keweenaw Bay Indian Community (KBIC)
- ♦ Lac Vieux Desert Band of Lake Superior Chippewa (LVD)

Communications and presentations were made over the course of 2017 to the following agencies to share project details and progress, discuss monitoring efforts and preliminary findings, and identify concerns.

- ♦ Michigan Department of Environmental Quality (MDEQ)
- ♦ Michigan Department of Natural Resources (MDNR)
- ♦ Michigan Department of Transportation (MDOT)
- ♦ Porcupine Mountain Wilderness State Park (PMWSP)
- ♦ Michigan Economic Development Corporation (MEDC)
- ♦ Michigan Public Service Commission (MPSC)

2 Summary of Proposed Action

Copperwood is proposing the development of the Copperwood mineral resource in Ironwood and Wakefield Townships, Gogebic County, Michigan. The location of the Project is shown on Figure 1-1. The closest communities to the Project are Wakefield and Bessemer, located along US Highway 2, approximately 20 kilometers (km) to the south of the site. A Mining Permit (MP 01 2012) was obtained for the Project in 2012 and was amended 2013.

Copperwood is proposing to slightly modify the Project site layout and mining methods. The revised Project site layout to be permitted as part of this *Amendment* is shown on Figure 1-2. Mining will be conducted underground using drill-and-blast, mechanized room-and-pillar mining methods. Ore will be transported to the surface primarily by a conveyor system. At the surface, ore will either be routed directly to the process plant or to the ore stockpile for temporary storage prior to processing. Concentrate produced in the process plant will be loaded into trucks and shipped off site to a yet-to-be determined smelter for further refinement.

Detailed descriptions of the proposed action, including modifications to the Project site layout and mining methods are provided in Volume I of this *Amendment*. These modifications include revisions to the following project components:

- ♦ Process plant layout and location resulting in slight expansion of the mining area
- ♦ Beneficiation processes
- ♦ Ventilation raise pads
- ♦ Ore handling and storage processes
- ♦ Tailings management
- ♦ Site utilities
- ♦ Storm water management
- ♦ Water treatment and discharge

3 Environmental Impact Assessment

This section describes the scope of this *EIA Amendment* and the additional potential environmental impacts anticipated for the proposed action described in Section 2.

3.1 Scope of Environmental Impact Assessment

The environmental resources in the vicinity of the Project were studied per the requirements of Part 632 during the original assessment conducted for the permitting of the Project (Orvana, 2011), referred to as the EIA. The scope of this *Amendment EIA* is to update the EIA for any additional potential environmental impacts anticipated from the proposed action.

3.2 Topography and Drainage

Identification of existing topography and drainage baseline conditions described within the EIA remains valid. Potential impacts to topography and drainage from the proposed action will remain similar to the impacts described in the EIA, with the exception of impacts due to subsidence. As with the first mine permit amendment received in 2013, the current underground design described in Volume I of this *Amendment* was designed to minimize surface subsidence. As discussed in the *Amendment*, the anticipated surface subsidence as a result of mining will be on the order of 0 to 3 centimeters. Therefore, the EIA assessment of topography and drainage impacts provide a conservative estimate of impacts, as anticipated surface subsidence will significantly be reduced with the proposed action.

3.3 Soils

The proposed action described in Section 2 and associated potential environmental impacts to soils remain similar to what was described in the EIA. Impacts to soils will include disturbances to site soil conditions resulting from the construction of mine-related structures and infrastructure. A summary of the impacted soil areas resulting from site grading and construction is provided in Table 3-1 for the proposed action site layout.

3.4 Geology

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on geology, and the assessment provided in the EIA remains valid.

3.5 Hydrology

The proposed action described in Section 2 and associated potential environmental impacts to hydrology remain similar to what was described in the EIA, with a few exceptions. The process plant design was optimized and this necessitated moving the process plant area to the opposite side of the east branch of Unnamed Creek. An alternatives analysis for the relocation of the process plant is provided in Section 5.2 of this *Amendment EIA*. The proposed action also includes a new ore stockpile facility. The ore stockpile is designed with a composite liner system consisting of a compacted clay till base and geomembrane liner, and an associated drainage system. Precipitation contacting the ore will be captured within the drainage system

and will be treated as contact water. An alternatives analysis for the new ore stockpile is provided in Section 5.3.

These changes will not have any additional impacts on groundwater and surface water. The assessment in the EIA remains valid.

3.6 Water Supply and Part 201 Facilities

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on water supply and Part 201 facilities, and the assessment provided in the EIA remains valid.

3.7 Floodplains, Shorelines, and Wetlands

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on floodplains and shorelines.

The potential impacts to wetlands from the proposed action will remain similar to the wetland impacts described within the EIA. However, the type and amount of wetlands impacted will be different due to the revised Project site layout. Copperwood is currently in the process of preparing a Part 301 Inland Lakes and Streams and Part 303 Wetlands Protection Permit application for the proposed action. A detailed analysis of wetland impacts resulting from the proposed action will be provided in the Part 301 and Part 303 application. The location of wetlands relative to Project components are shown on Figure 3-1. A summary of the preliminary impacted wetland areas resulting from site grading and construction is provided in Table 3-2 for the proposed action site layout.

Preliminary analysis indicates there will be a small net increase in wetland impacts from those of the originally proposed process plant site (2.56 acres) compared to the revised process plant location plus ore stockpile area preliminary impact (2.69 acres). Impacts associated with the ore stockpile area account for 1.78 acres of this combined total. Preliminary plans indicate approximately 0.29 acres of wetland impact will occur from the addition of the ventilation raises. Overall the preliminary analysis indicates there will be a total of 58.34 acres of impacts resulting from the proposed action site layout, which is a net increase of 0.39% (0.23 acres).

3.8 Terrestrial Biology – Upland Habitat, Ecosystems, and Wildlife

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on upland habitat, ecosystems, and wildlife; and the assessment provided in the EIA remains valid.

3.9 Threatened and Endangered and Special Concern Species

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional

impacts on threatened, endangered, and special concern species; and the assessment provided in the EIA remains valid.

3.10 Invasive Species

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on invasive species, and the assessment provided in the EIA remains valid.

3.11 Natural and Wild and Scenic Rivers

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on natural and wild and scenic rivers, and the assessment provided in the EIA remains valid.

3.12 Public Roads, Pipelines, and Powerlines

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will generally have the same potential impacts to public roads, pipeline, and powerlines as was described in the EIA. Electrical demand for the proposed action will no longer be provided by an offsite power line to the site. Instead, a natural gas power plant will be constructed onsite to generate electricity. Copperwood is currently working with utility providers to determine viable options for supplying natural gas to the Project.

Potential impacts to public roads will largely remain the same as the assessment provided in the EIA. However, there may be a slight increase in the amount of concentrate haul traffic leaving the site. As described Volume I of this *Amendment*, the number of trucks will be dependent on the size of truck utilized for transport. If 39.9-tonne (44 short ton) trucks are utilized, there will be approximately 12 trucks leaving the site per day, which is consistent with the number of trucks described in the EIA. The number of trucks per day would increase to 26 trucks if 18.1-tonne (20 short ton) trucks are utilized.

3.13 State and Federal Wilderness, Research, and Recreational Areas

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on state and federal wilderness, research, and recreational areas; and the assessment provided in the EIA remains valid.

3.14 Land Use

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on land use, and the assessment provided in the EIA remains valid.

3.15 Aquatic Resources

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on aquatic resources, such as aquatic biota, fish, macroinvertebrates, and habitat; and the assessment provided in the EIA remains valid.

3.16 Cultural, Historical, and Archaeological Resources

The proposed action described in Section 2 is similar to the original proposed action described in the EIA, with one exception: several components of the revised Project site layout are located within areas that previously were not assessed for cultural, historical, and archaeological resources within the EIA. A Phase I archeological survey was previously conducted along the source water pipeline for Gogebic Range Water Authority and is included as Appendix A-1. A desktop study consisting of a literature and archives research review has been completed for areas not assessed as part of the EIA or during the Phase I survey of the pipeline location. This study is provided as Appendix A-2. Cultural, historical, and archaeological resources were not identified during either study. Therefore, it is anticipated the proposed action in this *Amendment EIA* will not have any additional impacts on cultural, historical, and archaeological resources. Follow-up field surveys will be completed in the spring, and the results of the field surveys will be provided to the MDEQ with an updated assessment on potential cultural, historical, and archaeological resources resulting from the proposed action described in Section 2.

3.17 Air Quality and Climatology

Potential air quality impacts have been thoroughly evaluated in the Michigan Air Use Permit – Permit to Install (PTI) (Foth, 2018). Significant emissions sources for the project include a power plant comprised of four operating and one back up natural gas generator, emergency power generators comprised of three diesel generators, material handling and storage emissions, and roadway emissions. Estimated point source emissions for the facility criteria pollutants are less than 100 tons per year (90.7 tonnes per year), therefore the Project will not be categorized as a major source under Title V or Prevention of Significant Deterioration. Further, the facility's Hazardous Air Pollutant emissions are less than 10 short tons per year (9.1 tonnes per year) individually and all combinations of those pollutants are less than 25 tons per year (22.7 tonnes per year). Modeling has demonstrated that applicable state and federal air quality standards will be maintained at the highest emissions levels anticipated for the Project.

To mitigate impacts from these emission sources, certain engineering controls will be employed during various steps in the mining process. These controls include use of building enclosures, geomembrane covers on storage areas, partial cover systems on the ore stockpiles, installation of dust collection or suppression systems on processes and following prescribed preventive maintenance procedures for processing and control equipment at the facility. These practices and compliance criteria will be addressed in the anticipated PTI issued by MDEQ. A summary of the significant emissions are as follows:

- ♦ The natural gas power plant will be equipped with a Selective Catalytic Reactor and Oxidation catalyst system to reduce nitrous oxides, carbon monoxide, volatile organic carbon, and particulate matter emissions.
- ♦ The diesel generators will operate less than 500 hours per year and have no additional pollution controls.
- ♦ Fugitive dust sources from disturbance of soils, development of soil stockpiles, and vehicle traffic could impact ambient air quality. To mitigate this potential impact, a fugitive dust plan will be implemented. Newly exposed areas will be temporarily re-vegetated and/or covered to minimize the potential for windblown dust and/or erosion. After final grading of embankment slopes, permanent vegetation will be planted for soil stabilization and to reduce windblown dust. Vegetated areas will also incorporate a protective mat to keep vegetation in place and to ensure dust is not mobilized. Once areas are re-vegetated and storage piles covered, these areas will be closely monitored. To the extent necessary, roadways established during the construction phase will be kept wet during dry periods of the year. This will be accomplished through use of a watering program over identified traffic areas. Potential dust issues will likely be greater during the summer and lesser during the winter. Particulate matter in the 10 micron or less size range values are generally lower in winter when snowfall and frozen conditions reduce the potential for mobilization of windblown dust.

3.18 Aesthetic Resources

The proposed action described in Section 2 is similar to the original proposed action described in the EIA. Therefore, the proposed action in this *Amendment EIA* will not have any additional impacts on aesthetic resources, such as, visual, noise, light, and seismicity; and the assessment provided in the EIA remains valid.

4 Cumulative Impacts

Cumulative impacts were previously defined in the EIA as environmental impacts resulting from the proposed mining activities when added to other past, present, and reasonably foreseeable future activities. The proposed action in this *Amendment EIA* is similar to the original proposed action. Therefore, the assessment of cumulative impacts provided in the EIA remains valid.

Additive impacts were previously defined in the EIA as those impacts which combine together to create a more significant impact together than they would have individually. Deposition modeling was completed for the EIA and based on the proposed action in this *Amendment EIA*, additional additive impacts are not anticipated. If requested, the depositional assessment can be completed on the proposed action and submitted to the MDEQ prior to construction.

5 Alternatives Analysis

In accordance with R 425.202(1)(c), an alternative analysis for mine permit amendment changes is provided in this section.

5.1 Background

In May 2017 Highland engaged the services of G Mining Services Inc. (GMining) to review the Project, as it was defined in the MPA associated with Mining Permit (MP 01 2012), and develop an updated Project. The proposed action described in Section 2 was developed through the evaluation of various Project tradeoffs. The primary Project changes and improvements associated with this proposed action are as follows:

- ♦ Process plant relocation to the west of the previous site.
- ♦ Addition of an outdoor ore stockpile.
- ♦ Modification of the mine ventilation plan.
- ♦ Addition of on-site power generation using natural gas fuel.

5.2 Process Plant Relocation

GMining's assessment of the process plant arrangement in the MPA identified site safety and environmental concerns that could be addressed by relocating the process plant to the west of the previous site. In the MPA layout, all traffic into the plant site, except when directed only to the administration building and laboratory, entered an active mining area where all surface water was managed as a contact water area by passing underneath the overhead conveyor carrying ore to storage and traveled near the top of the mine box cut entrance ramp. This included all deliveries of bulk materials and supply stores for use in site-wide operation and maintenance activities.

Relocating the plant site allows for traffic to the on-site power plant, supply stores warehouse and employee parking to be designated as non-contact surface water travel areas reducing the volume of contact runoff water to be managed and the requirement for wheel washing of vehicles leaving the contact areas of the plant site. Also eliminated is the potential safety hazard of vehicle and personnel traffic passing underneath the ore conveyor.

The impact tradeoff for the process plant relocation is the addition of two stream crossing culverts as there is a small creek between the new location and the mine box cut ramp and ore stockpile facility. Preliminary wetland determinations; indicate a small net increase in wetland impacts from those of the originally proposed process plant site (2.56 acres) compared to the revised process plant location plus ore stockpile area preliminary impact (2.68 acres).

Based on the improved operational safety and the net reduction in environmental impacts (by reduced public interaction with contact water areas), this change is viewed as a better environmental and operational alternative.

5.3 Ore Stockpile

The MPA specified an ore storage facility capable of holding 24 hours of ore. If the mine production rate exceeded this holding capacity, the ore would have to be left at the production faces in the mine and effectively shut down the mine as there was no planned surge capacity for ore storage between the mine and the mill. The MPA plan for pre-production ore produced before the process plant was able to begin operations was anticipated to be less than 75,000 tonnes and be stored in the tailings disposal facility (TDF). The review of this plan identified short comings requiring correction in their updated design proposals.

An outdoor stockpile and associated reclaim system is now proposed with a capacity for 620,000 tons of ore to accumulate during the Project construction and development period. This stockpile of ore will serve to support continuous process plant operation during the ramp up of underground mine production to its planned capacity of 6,000 tonnes per day. After the initial Project ramp-up period, the ore stockpile will serve as surge capacity between the mine and the process plant to facilitate continuous underground mine operation when ore production temporarily exceeds the process plant capacity.

The ore stockpile is being designed with a compacted clay till base and geomembrane liner system with the clay till coming from excavation of the mine box cut opening just to the north of the stockpile site. Precipitation runoff from the stockpile will be captured in a lined ditch system and will be pumped to the site-wide contact water management system. As discussed in Section 5.2, the stockpile area will impact a small amount of wetlands, however, this updated design presents a better alternative from the MPA proposed facility from both an operational and environmental perspective as noted in Section 5.2.

5.4 Mine Ventilation Plan

The MPA mine ventilation design used four portal openings at the base of the mine box cut ramp for both exhaust and fresh air intake openings. The ventilation exhaust was through twin fans at the base of the box cut into a 4.6-meter diameter duct and vertical stack extending to 10.7 meters above ground surface. The height and diameter of the exhaust stack were determined by dispersion modeling to be the minimum dimensions required to meet air quality and stack velocity requirements.

GMining reviewed the existing ventilation plan and determined that it could more effectively and efficiently assure adequate ventilation to meet health and safety requirements with a different ventilation design. The proposed action updated design will use a remote intake raise to deliver fresh air to the mine with two exhaust raises and the mine portal serving as discharge points for the ventilation system. Air dispersion modeling for the proposed action exhaust raises has demonstrated that 3-meter diameter by 8-meter-tall stacks will be sufficient to meet air quality requirements.

Locations of the ventilation raises and access routes were planned to avoid wetland and stream impacts as much as feasibly possible; however, preliminary plans indicate approximately 0.29 acres of wetland impact will occur. This additional impact is 0.49% of the total proposed action wetland impacts. This alternative design presents a better alternative from the MPA

proposed ventilation plan from both an operational and health and safety perspective for the Project.

5.5 On-site Power Generation

The MPA planned for delivery of high voltage power by a regulated utility company to the mine site via overhead transmission line from a substation in Ironwood, MI to a substation owned by the Project; a distance of 40 km. The transmission line was being planned to follow existing right of ways as much as possible to reach the mine site. The previous owner, ORUSC, reviewed options for on-site power generation, but dismissed this option due to the estimated load requirement of 20 megawatts.

GMining's tradeoff studies for power supply as part of the Project update concluded that on-site power generation with natural gas fueled engine-generator sets has become a feasible alternative for the Project. The economics of natural gas fuel are more favorable now than previously. The environmental impacts of burning natural gas in new reciprocating engine units, with selective catalytic reduction and oxidation catalyst control devices, are significantly less than a typical utility mix of power generation sources. The power generation approach for the proposed action presents a better alternative from an economic perspective.

6 References

Foth Infrastructure & Environment, LLC, 2018. *Michigan Air Use Permit – Permit to Install*.
March 21, 2018.

Orvana Resources US Corp, 2011. *Copperwood Mine – Mine Permit Application*.
September 2011.

Tables

Table 1-1
List of Qualified Professionals

Organization	Individuals	Qualifications
Copperwood Resources, Inc.	Sylvain Collard	General Manager
310 East US Highway 2	Thomas Repaal	Senior Environmental Engineer
Wakefield, MI 49968	Brandon Stimac	Environmental Engineer
Foth Infrastructure & Environment, LLC	Stephen V. Donohue, P.H.	Vice President - Mining
2121 Innovation Court, Suite 300	Kris Baran	Project Director/Associate
De Pere, WI 54115	Mark Ciardelli	Lead Environmental Scientist/Geochemist
	Curtis Dungey, CHMM, CIH	Technical Advisor
	Andrea Martin, P.E.	Lead Environmental Engineer
	Mitch Vanderydt, P.E.	Project Geotechnical Engineer
Coleman Engineering Company	Michael Foley, P.E.	Project Manager
200 E. Ayer Street		
Ironwood, MI 49938		
G Mining Services Inc.	Carl Michaud	Underground Engineering Manager
7900 Tacherau Boulevard, Building D,	Paul Murphy	Engineering Manager
Suite 200		
Brossard, QC J4X 1C2		

Notes:

CHMM = Certified Hazardous Materials Manager

CIH = Certified Industrial Hygienist

P.E. = Professional Engineer

P.H. = Professional Hydrologist

Prepared by: JEF1

Checked by: MCC2

Table 3-1
Soil Disturbances

Infrastructure	Area (US Acres)
Exhaust/Intake and Road	7.5
East Stream Relocation	9.0
Explosives Plant/Magazine and Road	5.2
Fire Suppression Tanks and Road	0.6
Main Access Road	26.7
Mitigation and Access Road	26.6
Ore Stockpile and Road	16.2
Process Plant	32.5
Sewage Lagoon and Road	10.0
Tailings Disposal Facility	347.9
Topsoil Stockpile	3.8
Water Intake Road and Pump House	6.8
West Stream Relocation	18.3
Total	511.1

Notes:

The areas have been rounded to the nearest 10th of an acre.

Source: Copperwood Resources, Inc.

Prepared by: MCC2

Checked by: JEF1

Table 3-2
Preliminary Wetland Disturbances

Infrastructure	Dredge Area (US Acres)	Fill Area (US Acres)
Exhaust/Intake and Road	0.29	0.00
East Stream Relocation	0.36	0.00
Explosives Plant/Magazine and Road	0.00	0.00
Fire Water Tank and Road	0.00	0.00
Main Access Road	1.37	0.00
Mitigation and Access Road	0.61	0.00
Ore Stockpile and Road	1.78	0.00
Process Plant	0.90	0.00
Sewage Lagoon and Road	0.00	0.00
Tailings Disposal Facility	51.24	0.00
Topsoil Stockpile	0.00	0.00
Water Intake Road and Pump House	0.13	0.00
West Stream Relocation	0.80	0.85
Total	57.48	0.85

Note:

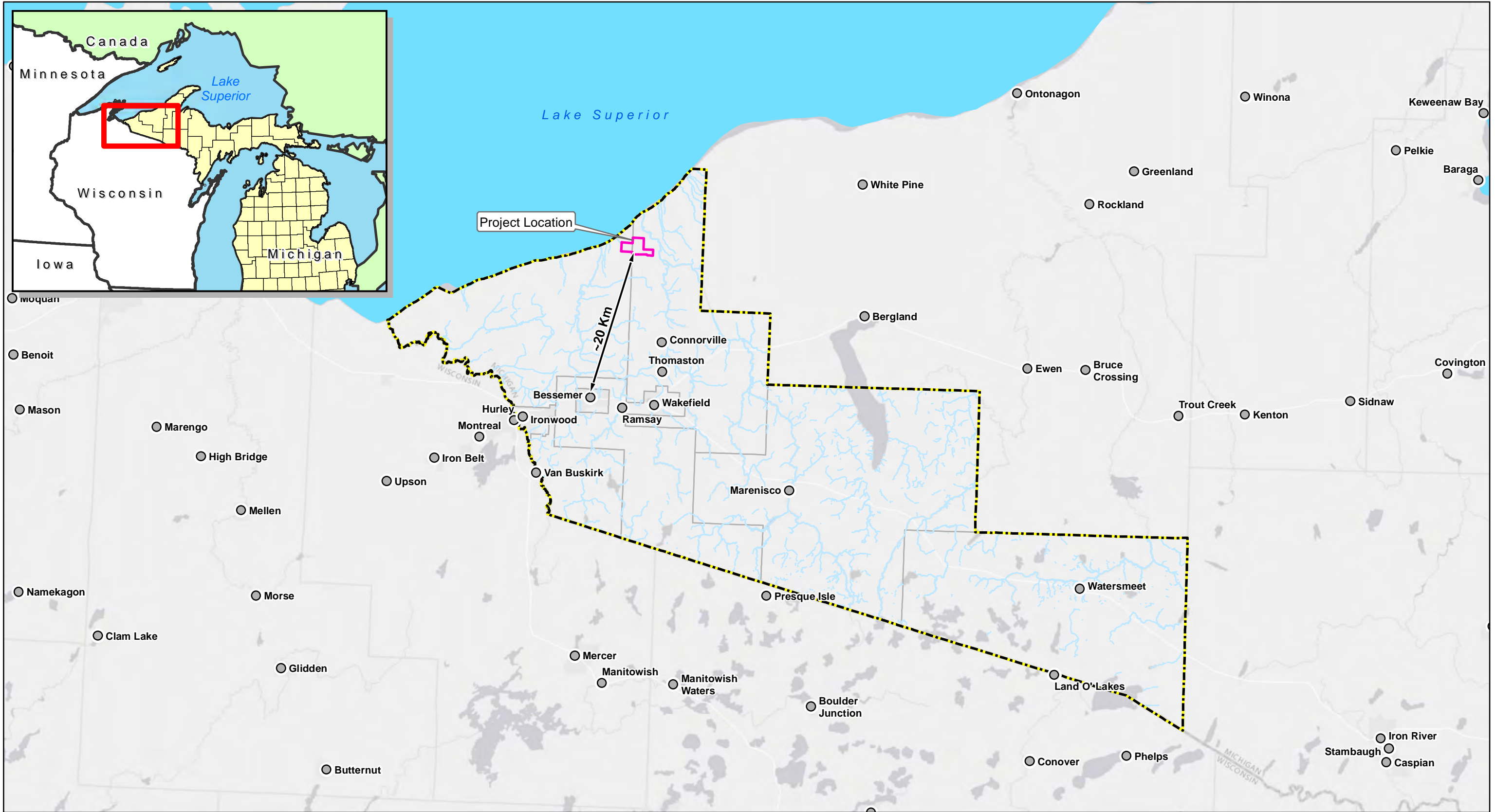
The areas have been rounded to the nearest 10th of an acre.

Source: Coleman Engineering Company

Prepared by: MCC2

Checked by: MJV2

Figures



NOTES:
1. Coordinate System: NAD 1983 UTM Zone 16N

- LEGEND**
- Place Name
 - Major Roads
 - Gogebic County
 - Property Boundary

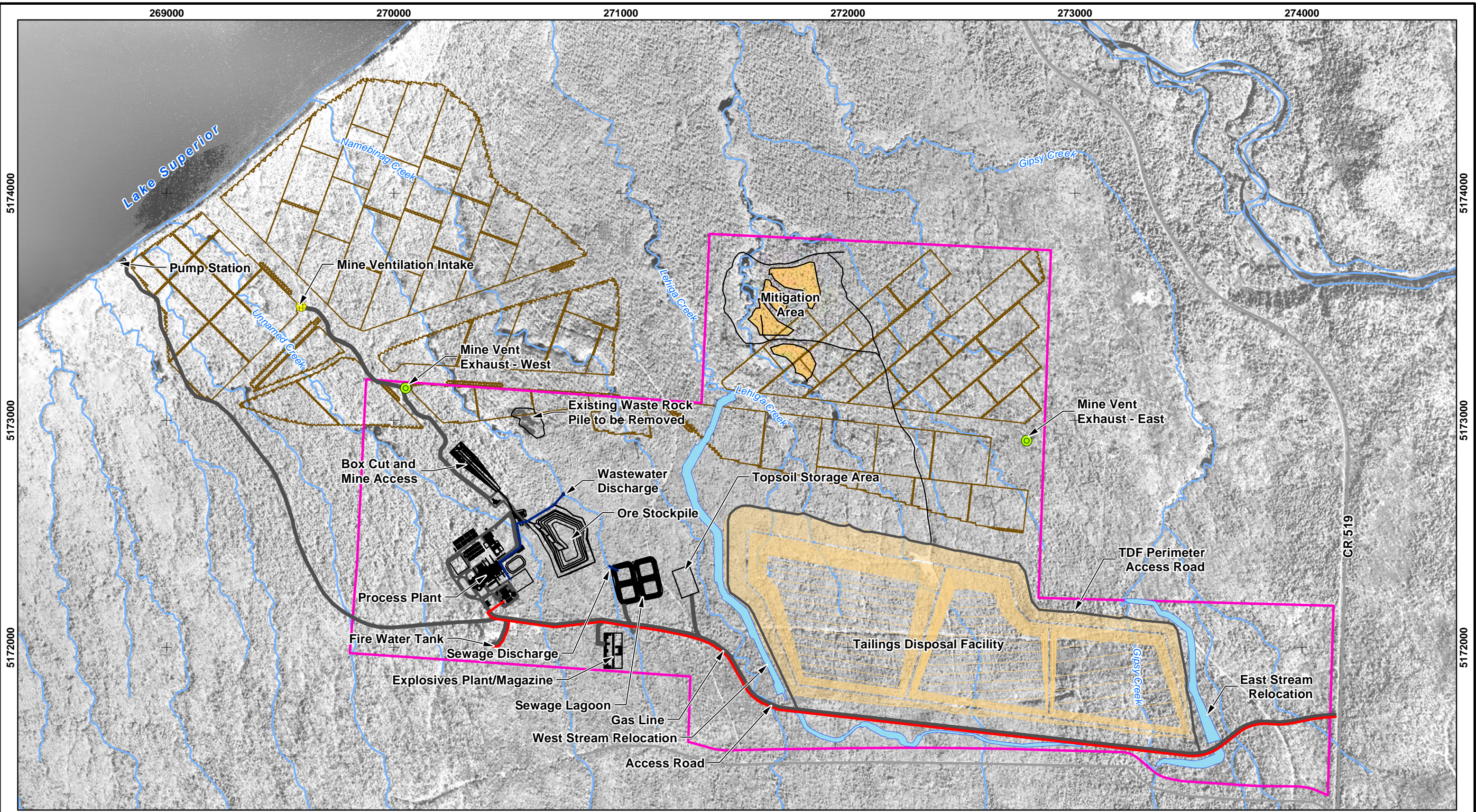


Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION
PREPARED BY: MCC2		DATE: MAR. '18	
REVIEWED BY: MJV2		DATE: MAR. '18	
APPROVED BY: KKB		DATE: MAR. '18	

COPPERWOOD RESOURCES, INC.

FIGURE 1-1
ENVIROMENTAL IMPACT ASSESSMENT
PROJECT AREA LOCATION
GOGEBIC COUNTY, MICHIGAN

Scale: 0 5 10 Kilometers
Date: MARCH 2018
Drafted by: DAT
Project: 17C050



NOTES:
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Facility layout supplied by G Mining Services Inc.
3. Aerial Imagery downloaded from USDA Geospatial Data Gateway.

- LEGEND**
- | | |
|---------------------------|-------------------|
| Wastewater Discharge Pipe | Stream Relocation |
| Natural Gas Pipeline | Mine Panels |
| Roads | Property Boundary |
| Plant and Facility | |
| Tailing Disposal Facility | |
| Access Road | |
| River and Streams | |



Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION
PREPARED BY: MCC2		DATE: MAR. '18	
REVIEWED BY: MJV2		DATE: MAR. '18	
APPROVED BY: KKB		DATE: MAR. '18	

COPPERWOOD RESOURCES, INC.

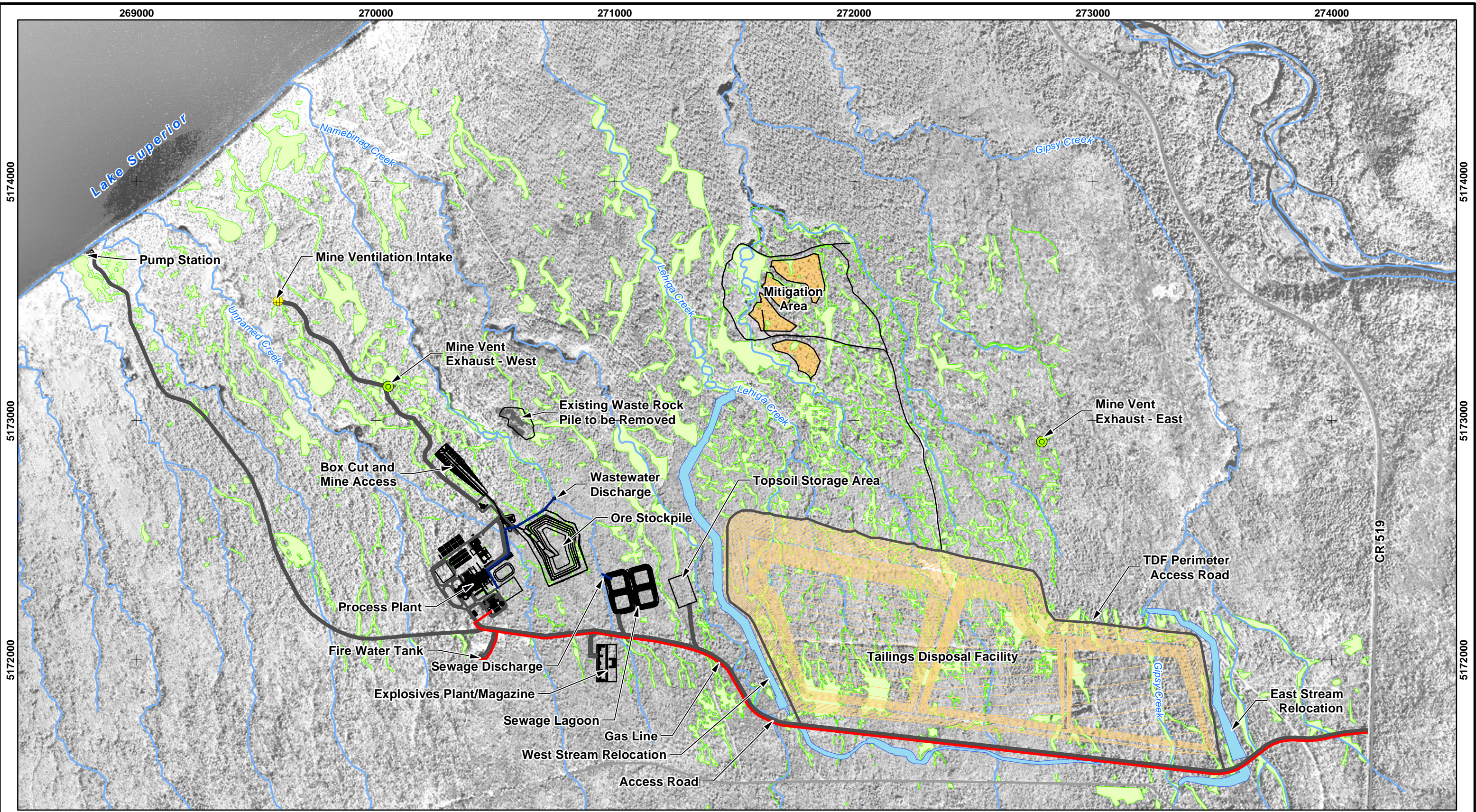
FIGURE 1-2
ENVIRONMENTAL IMPACT ASSESSMENT
SITE LAYOUT
GOGEBIC COUNTY, MICHIGAN

Scale: 0 150 300 Meters

Date: MARCH 2018

Drafted by: DAT

Project: 17C050



- NOTES:**
1. Coordinate System: NAD 1983 UTM Zone 16N
 2. Facility layout supplied by G Mining Services Inc.
 3. Aerial Imagery downloaded from USDA Geospatial Data Gateway.
 4. Wetlands supplied by Copperwood Resources Inc.

- LEGEND**
- | | |
|---------------------------|-------------------|
| Wastewater Discharge Pipe | River and Streams |
| Natural Gas Pipeline | Stream Relocation |
| Roads | Wetlands |
| Plant and Facility | |
| Tailing Disposal Facility | |
| Access Road | |



Foth Infrastructure & Environment, LLC				
REVISED	DATE	BY	DESCRIPTION	
PREPARED BY: MCC2			DATE: MAR. '18	
REVIEWED BY: MJV2			DATE: MAR. '18	
APPROVED BY: KKB			DATE: MAR. '18	

COPPERWOOD RESOURCES, INC.

FIGURE 3-1
ENVIRONMENTAL IMPACT ASSESSMENT
PROJECT SITE WETLAND
GOGEBIC COUNTY, MICHIGAN

Scale: 0 150 300 Meters

Date: MARCH 2018

Drafted by: DAT

Project: 17C050

Appendix A

Archaeological Surveys

A-1

Phase I Archaeological Survey for the Gogebic Range Water Authority



Archaeological Services, Inc.

October 24, 2012

Kristen Farrell, P.E.
C2AE
1211 Ludington Street
Escanaba, MI 49829

Re: *A Phase I Archaeological Survey For the Gogebic Range Water Authority For the Copperwood Water Supply, Gogebic County, Michigan.*

Dear Ms. Farrell:

AVD Archaeological Services, Inc. (AVD) is pleased to submit this letter report of additional Phase I Archaeological Survey at the Copperwood project. This letter describes the results of the most recent archaeological survey we conducted at this project location. The following background is provided so that anyone viewing only this letter report will know that there has been more work and that more of the archaeological background is explained in the original report (Van Dyke 2010a).

BACKGROUND

Earlier in 2009, AVD, Inc., conducted an archaeological survey of about 60 spur roads that were to be built for drill rigs that would work in the project area. The results of that survey were reported in *A Phase I Archaeological Survey of Access Roads for Core Drilling at the Copperwood Project In Gogebic County, Michigan: 2009* (Van Dyke 2010a). That report is a full account of the relevant history, prehistory, and archaeological work near the project area, the physical setting of the project area, a discussion of the literature and archives research, and the findings. Following that, we surveyed 40 acres for the proposed plant site. That survey was reported in a letter (Van Dyke 2010b), and accompanying map; the map and letter constitute an addendum to the first report. Additional archaeological surveys were conducted on 640 acres in 2010 (October 5 to October 18) and 1,140 acres in 2011 (May 2 to June 16). The same archaeological field techniques described in the original report of the 60 spur roads (Van Dyke 2010a) were used for the 40 acre plant site (Van Dyke 2010b), and the 2010 and 2011 surveys (Van Dyke 2011). Those descriptions are not repeated in any of the following survey reports. This present letter report is the latest account of archaeological activity for the Copperwood Project.

FIELDWORK

This project took place in sections 2, 11, and 12 of T49N, R46W, Ironwood Township, Gogebic County, Michigan (Map 1). Archaeological survey fieldwork took place on September 10-14, 2012.

For much of its length, the water line route is a 100 foot wide corridor (50' on either side of centerline of existing road) that follows old logging roads. Four additional areas of survey were: 1) at the very northwestern end of the Project Area (PA) is a 200'-x-300' rectangle for a water inlet from lake superior; 2) parallel to the one just described, an alternate route 100' wide and 1,100' long with a 200'-x-300' rectangle for a water intake; 3) at the central part of the PA is a new road spur with a 100' wide corridor and approximately 1,300' long corridor; and 4) at the east end of the PA, a 200'-x-300' rectangular area for a water tank (the latter not on map, communicated to us from the mine office staff).

The entire area was forested in northern hardwoods - birch, oak, with white pine - with areas of marsh or wetland, and with small creeks that crossed the PA in several areas.

The survey began at the eastern end of the PA. The entire area was shovel tested at a 15 meter interval. The first area shovel tested was the proposed water tank location. It had been disturbed by logging road construction and maintenance (4 transects of 13 shovel tests each (52 shovel tests) were dug in this area. Shovel testing proceeded northwest along the logging road with one transect on each side of the road, keeping well off the disturbed roadside, but still within the PA. The near-road area contained push piles from road construction and maintenance. Most of the shovel tests along this route were dug with only occasional interruption from wetland/marsh or tributary streams. Soil profiles were relatively consistent showing an A horizon of brown clayey silt, 15-20 cm thick, over a reddish silty clay. (See Map 2 for the locations described in this and following paragraphs as well as Map 1).

The next area was one of the 200'-x-300' rectangular areas for a water intake; four transects of six shovel tests each were dug (24 shovel tests). The area was marshy with wet soil and marsh grass and ferns throughout. Shovel tests revealed eroded soils with either no A horizon, or a very shallow (<5 cm) brown clayey silt over reddish silty clay with gravel. Shovel testing continued south along the existing logging road with a transect dug on each side of the road. Again, areas were disturbed by logging road construction-grading and push piles. There were also more wetland and/or marsh areas. Soil profiles showed a very shallow A horizon, approximately 5-10 cm thick.

At the northern end of the PA, along the alternate route for the road, within the 200'-x-300' rectangular area for water outlet, the ground was wet with marsh grass and ferns throughout. Four transects of six shovel tests each (24 total shovel tests) were dug within this area. Shovel tests showed eroded soils either lacking an A horizon, or with a very shallow (<5 cm) brown clayey silt over reddish silty clay with gravel. Shovel testing south along the proposed logging road alternate route, three transects were dug; one along the centerline and one 15 meters either side. This segment was comprised of areas of wet

soil, marsh or wetland as well. Soil profiles showed an A horizon of brown clayey silt (5-10 cm thick) over a reddish silty clay with gravel.

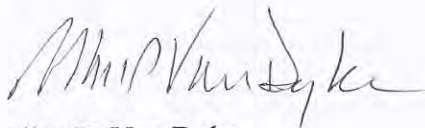
Continuing south along the existing logging road, one transect of shovel tests was dug on each side of the road. Soil profiles showed the typical A horizon of brown clayey silt (15-20 cm thick) over a reddish silty clay. Several wetland or marshy stretches were found as well as some areas of disturbance (scraped and push piles) caused by grading for road construction and maintenance.

Following completion of the main stem of the route, the alternate spur in the center of the PA (100'-x-1,300') was shovel tested. Three transects were dug; one along the centerline of the route and one on each side of the centerline. In the southern and northern portions of the alternate, soil profiles showed the now familiar A horizon of brown clayey silt (15-20 cm thick), over reddish silty clay. The center of the spur was crossed by a large creek ravine with instances of marsh or wetland. At this point, the lath and flagging that had marked most of the route was missing so we determined the remainder of the route with topographic map and compass.

CONCLUSION AND RECOMMENDATION

A total of approximately three miles of 100' corridor (with three wider spots of various length) were shovel tested with approximately 300 shovel tests dug throughout. Not one artifact was found. The archaeological survey, using the techniques described above, found no archaeological sites or artifacts. Therefore, we believe it is unlikely that construction in this area will disturb an archaeological site. If you have any questions about the survey, please contact me.

Sincerely,



Allen P. Van Dyke

AVD/rlk

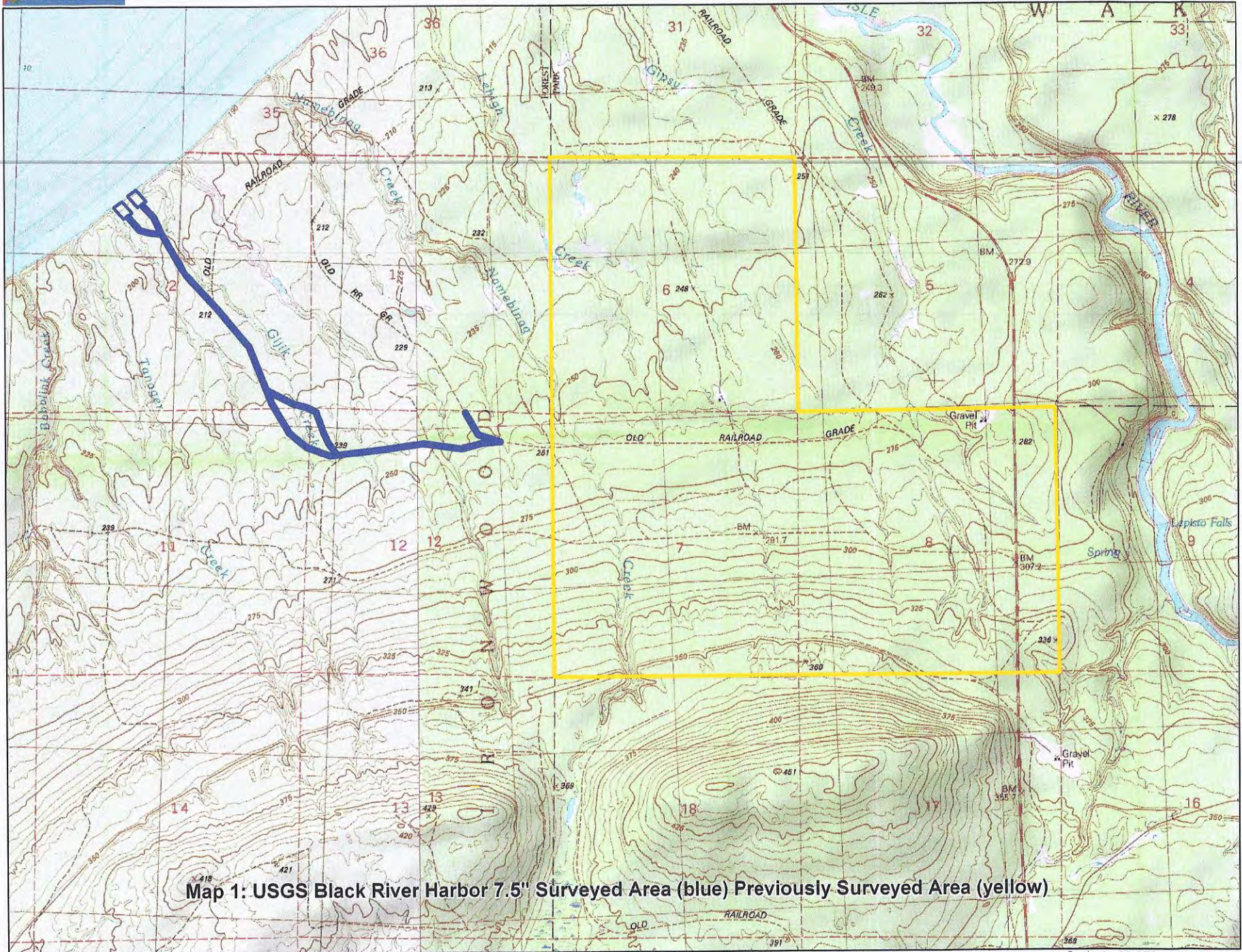
Attachments 2 maps

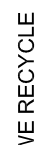
The results of this survey are based on professional interpretation of available information. AVD has assumed that the information provided is complete and correct. The techniques used in this survey are only appropriate for locating archaeological sites that are near the surface or on exposed ground surfaces. It is possible that deeply buried sites or unmarked graves might exist.

If archaeological artifacts are discovered during ground disturbing activities, immediate consultation can be obtained by contacting the Michigan Office of the State Archaeologist at **517-373-6416 or 517-373-1618**. Ground disturbing activity in the area of the discovery should be stopped until the appropriate office has been contacted.

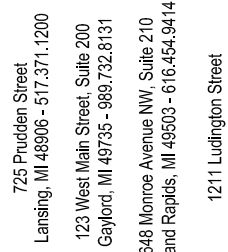
Van Dyke, A.P.

- 2010a *Phase I Archaeological Survey of Access Roads For Core Drilling at the Copperwood Project in Gogebic County, Michigan: 2009.* AVD Report of Investigations No. 110560.
- 2010b *Phase I Archaeological Survey of 40 Acres for Orvana Minerals Corporation Copperwood Project in Gogebic County, Michigan.* AVD Report of Investigations No. 110.
- 2011 *Phase I Archaeological Survey of 6401 Acres and 1140 Acres for Orvanna Resources US Corporation Copperwood Project, Gogebic County, Michigan.* AVD Report of Investigations No. 110





DESIGNED BY: -	APPROVED BY: -
CHECKED BY: -	DWG'S MOD BY: -



GOGEBIC RANGE WATER AUTHORITY / ORVANA RESOURCES US

ARCHAEOLOGISTS REVIEW LOCATIONS

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SCALE:	1' = 400'
PROJ. #:	120118
DATE:	AUGUST 2012
SHEET	1

PRELIMINARY

A-2

Literature and Archives Research for New Site Locations



Archaeological Services, Inc.

March 14, 2018

Brandon Stimac
Environmental Engineer
Highland Copper Company, Inc.
310 US 2
Wakefield, MI 49968

RE: Literature and Archives Research for the Highland Copper Company Copperwood Mine Location in Gogebic County, Michigan.

Dear Mr. Stimac:

AVD Archaeological Services, Inc. (AVD) is pleased to submit this letter report of literature and archives research for the Highland Copper Company Copperwood Mine Location in Gogebic County, Michigan. This research was done per your request and for the reasons below.

Highland Copper Company Inc. (HCC), through its wholly owned subsidiary Copperwood Resources Inc. proposes to establish a new underground copper mine in the western Upper Peninsula of Michigan. HCC retained Foth Infrastructure and Environment, LLC to amend the Environmental Impact Assessment for inclusion in a Mine Permit Application under Michigan's Nonferrous Metallic Mining Regulations (Part 632 of P.A. 451, 1994 as amended). Part 632 of Michigan's Non-Ferrous Metallic Mining regulation clearly outlines the studies necessary for amine permit application and requires, among other things, consideration of cultural, historical, or archaeological resources. HCC is requesting an amendment to its Part 632 Mining Permit (MP 01 2012) to allow for a revised site layout. As part of the amendment application, revisions to the original EIA are required for environmental resources that may be impacted by proposed changes. This scope of work presents an analysis of cultural, historical, or archaeological resources for disturbance areas that are new to the Project and were therefore not assessed previously.

AVD conducted a similar research effort in 2009 prior to conducting extensive fieldwork for the Copperwood Project. This work was followed by three seasons of field survey all of which were reported to the Michigan State Historic Preservation Office

Earlier in 2009, AVD archaeologists conducted an archaeological survey of about 60 spur roads for drill rigs to work in the project area. The results of that survey were reported in *A Phase I Archaeological Survey of Access Roads for Core Drilling at the Copperwood Project In Gogebic County*,

Brandon Stimac

March 14, 2018

Page 2

Michigan: 2009 (Van Dyke 2010a). That report included a full account of the literature and archives research and the Phase I survey and its results. Following that was a survey of 40 acres for the proposed plant site (Van Dyke 2010b). In 2010 AVD Archaeologists surveyed 640 acres for the proposed tailings site. There was no separate report for that work; it is covered in a later report.

From October 5 to October 18, 2010, and from May 2 to June 16, 2011, AVD archaeologists surveyed an additional 1,140 acres. This survey and the 2010 640 acres survey are described in the June 28, 2011 report. In all, the two surveys encompassed approximately 1,780 acres.

The only items of historical interest noted in all of the surveys were: an old railroad grade that serves as the main road bisecting the project area, and a cabin in the project area known to us only as the deer camp cabin, the only standing structure in the project area at the time

Archaeological literature and archives research was conducted at the Michigan Bureau of History prior to the original field work (Van Dyke 2010a). Phase I Archaeological Survey was conducted within the limits of the approximate 1,780 acres of sections 6, 7 and 8. That fieldwork effort dug approximately 19,366 shovel tests in the project area at 15 meter intervals. The estimated number of shovel tests is about 68 percent of all possible shovel tests in 1,780 acres. A number of acres were in ravines, gullies and their slopes, and in standing water; therefore, the 68% coverage. No artifacts were found.

Per your request, we conducted additional literature and archives research at the office of the Michigan State Archaeologist on Tuesday March 13, 2018. There have been no additional archaeological surveys conducted in that area; thus there are no new archaeological sites to report. Maps 1 and 2 are copies of the OSA maps showing surveyed areas. Map 3 is your map of the area that you requested that we survey this spring.

If you need any additional information, I can be reached by email at allenvandyke@gmail.com or by phone at 262-878-9960.

Sincerely,



Allen P. Van Dyke

President

AVD Archaeological Services, Inc.

Brandon Stimac

March 14, 2018

Page 3

REFERENCES CITED

Van Dyke, A.P.

2010a *A Phase I Archaeological Survey of Access Roads for Core Drilling at the Copperwood Project In Gogebic County, Michigan*: 2009. AVD Archaeological Services, Inc. ROI#110560

2010 b *Phase I Archaeological Survey of 640 Acres for Orvana Resources US Corporation Copperwood Site, Gogebic County, Michigan*.

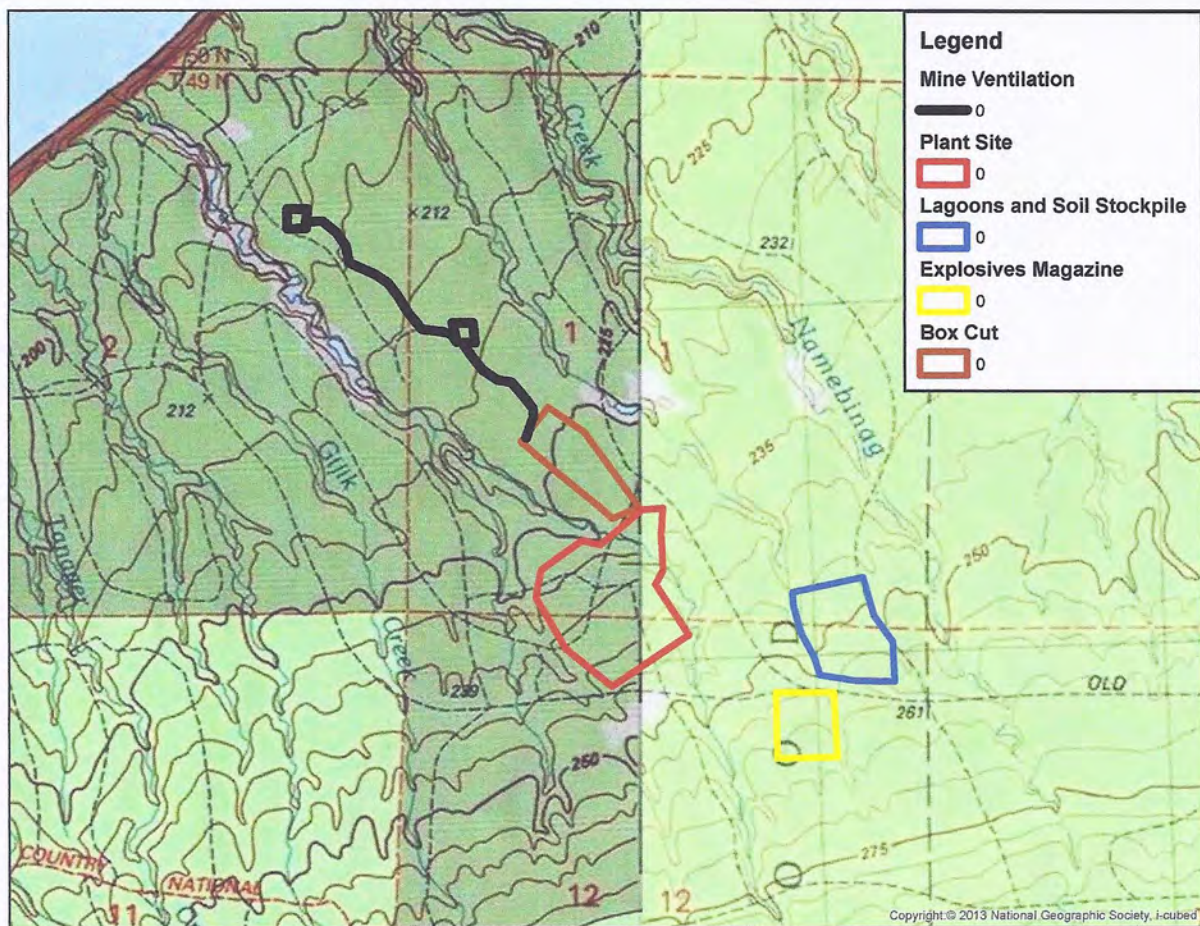
2011 *Phase I Archaeological Survey of 640 Acres and 1140 Acres for Orvana Resources US Corporation Copperwood Project, Gogebic County, Michigan*.



Map 2: Part of USGS Tiebel Creek – Surveyed areas in red. Source: Office of the State Archaeologist.



Map 1: Part of USGS Black River Harbor – Surveyed areas in red. Source: Office of the State Archaeologist.



Map 3: Planned survey areas. Source: Highland Copper Co.