North Star Manganese Inc
NI 43-101 Technical Report

"Resource Estimate on the Emily Property, Minnesota USA"

Effective Date of Resource Estimate: June 12, 2020
Signature Date: December 5th, 2022
Brad M. Dunn, CPG

Emily Project Structures and Mineralized Core

Barr Engineering Company

Revision History

Revision #	Date	Prepared by	Description
Draft	June 19th 2020	Brad Dunn	For Client Review
1	April 19th 2022	Marcelo Filipov	For first review of the client
1	April 29th 2022	Marcelo Filipov	For first issue of the client
2	May 02nd 2022	Marcelo Filipov	Pictures and report review from the Client
4	May 09th 2022	Brad Dunn	Final DRAFT to Client
5	May 22nd 2022	Rick Sandri	Draft reviewed by the client
6	May 28th 2022	Ian Pringle	Draft reviewed by the client
7	June 02nd 2022	Marcelo Filipov, Brad Dunn	Report, and figures review from client
8	June 03rd 2022	Marcelo Filipov, Rick Sandri, Brad Dunn	Finalize report
9	December 5th 2022	Rick Sandri, Brad Dunn	Updated report

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1 Summary

1.1 Introduction

This Mineral Resource Report (the “Report”) on the Emily Manganese Project (the “Project”) has been prepared in accordance with Form 43-101 and National Instrument 43-101. The principal metal of interest for the Emily Project is manganese (Mn). This Report describes the results of a mineral resource estimate of the Project, which is owned and managed 100% by North Star Manganese Inc (NSM), a Minnesota, USA based corporation. NSM is a 90.5% subsidiary of Nevada Silver Corporation, a Canadian publicly traded corporation (TSXV: NSC) (OTCQB: NVDSF).

The underlying manganese mineral assets assessed in this Report are owned by Cooperative Mineral Resources LLC (CMR), a Minnesota, USA limited liability corporation. A contract mining and sales arrangement between NSM and CMR provides NSM the exclusive right to mine and purchase the manganese ore and separate property lease and a manganese processing agreement between NSM, CMR and People’s Security Company, Inc. (PSC) which provides NSM exclusive rights to the properties and extend certain downstream processing arrangements between the parties. This Report is based on historical reports and the work of others as stated in this Report. Barr Engineering Co. (Barr) assumes such reports and data are correct except for discrepancies or variations indicated in this Report.

This Report relies on earlier reports, namely Pahlman 1996, Marston 2008, and Barr 2011 and 2012. All references to resource evaluation are based on currently available data including the most recent drilling results from 2012. Reference herein to historical information from these earlier accounts are relied on in this Report.

This updated NI 43-101 Technical Report is prepared as an update to the Barr NI 43-101 Technical Report issued in 2020, and principally addresses the addition of important and significant mineral rights to the Project. Since the change is in the addition of mineral rights, it does not change the Resource Estimate prepared in 2020.

1.2 Property Description and Ownership

The Project is located near the center of the State of Minnesota, United States of America. The Project is in the northern portion of Minnesota’s Cuyuna Iron Range in Crow Wing County, approximately 2 miles north, northwest of the city of Emily, Minnesota. Figure 1-1 shows the location of the Project in the State of Minnesota, Figure 1-2 shows the bedrock geology of the Cuyuna Range, and Figure 1-3 shows the Project in the Emily District of the Cuyuna Iron Range.

Figure 1-1 Project location in Minnesota

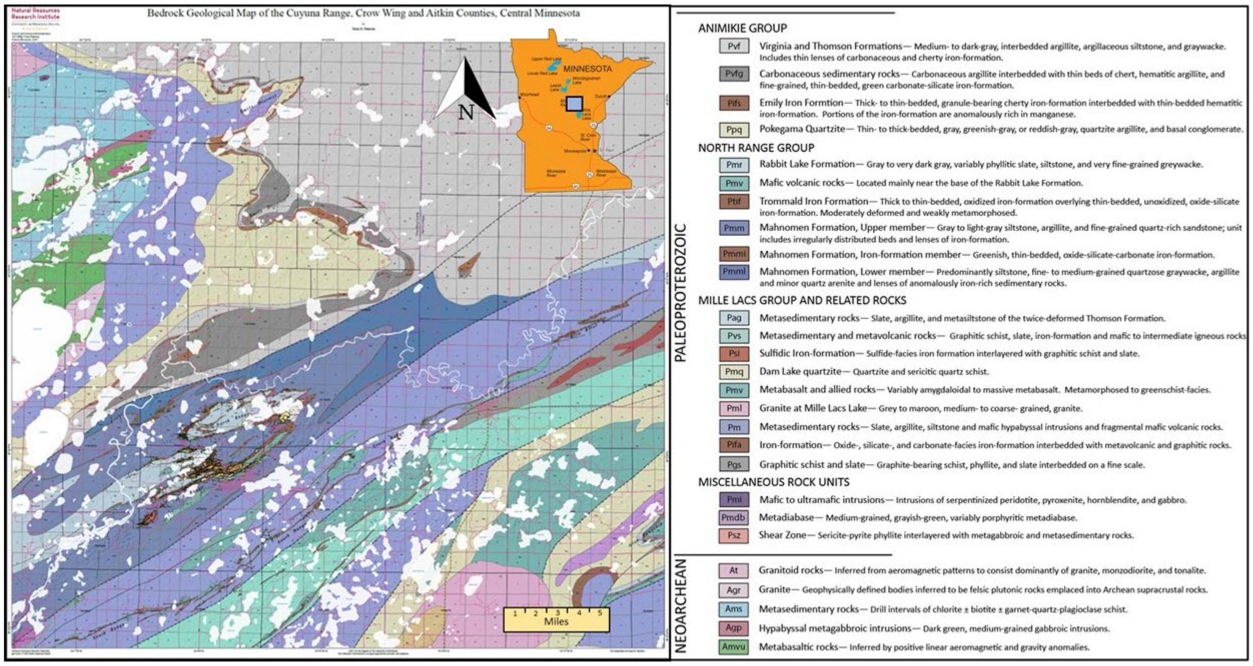


Figure 1-2 Bedrock Geology Map of the Cuyuna Range and location in Minnesota

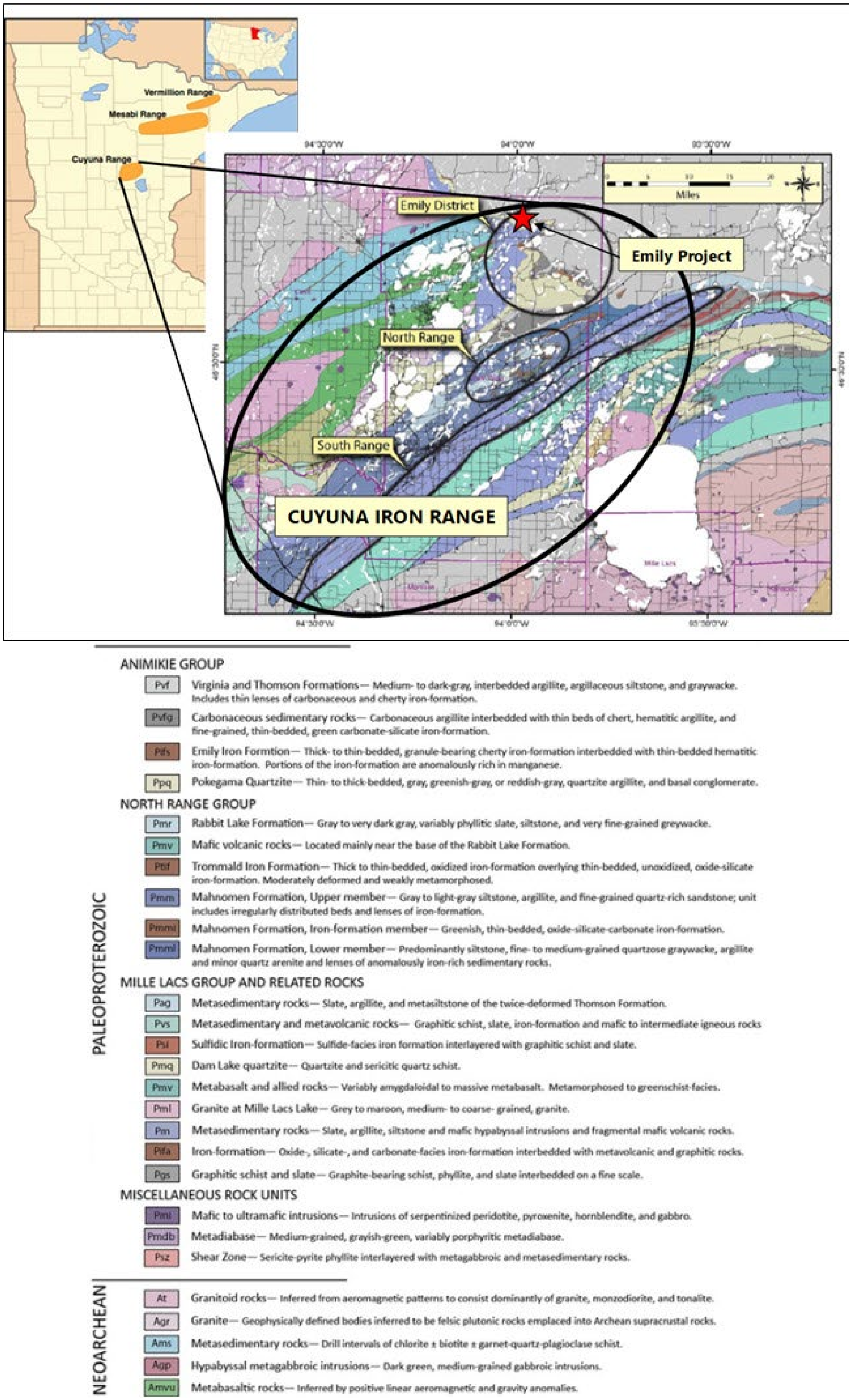


Figure 1-3 Project location in the Emily District of the Cuyuna Iron Range

The Project's land and mineral assets consist of surface rights, covering 75.75 acres, and mineral rights, covering 167.92 acres, owned by CMR, located in Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota, subject to a State of Minnesota reservation for coal and iron ore on 92.17 acres. The Project also includes surface and mineral rights, covering 123.38 acres, owned by People's Security Company, Inc. (PSC), located in Section 20, Township 138 North, Range 26 West, Crow Wing County, Minnesota. Both CMR and PSC are 100% wholly owned subsidiaries of Crow Wing Cooperative Power & Light Company. The Project has an Area of Interest (AOI) arrangement between NSM, CMR and PSC, covering Sections 20 and 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota (roughly 2 square miles) which extends certain downstream processing arrangements for additional mineral properties that are acquired or leased within the AOI.

The principal metal of interest for the Project is manganese.

The Project consists of the mining and processing of manganese ores. NSM has entered into a series of agreements with CMR and PSC that establish two general arrangements relating to the use of the CMR and PSC lands:

1) a contract mining and sales arrangement between NSM and CMR for the extraction of manganese ores from the CMR property whereby NSM has the exclusive right to mine and purchase the manganese ore; and

2) separate property leases and a manganese processing agreement between NSM, CMR and PSC, where CMR and PSC, will receive as rent for their properties a portion of NSM's net distributed profits from downstream sale of processed advanced materials from any ores mined by NSM from the AOI.

Figure 1-4 shows legal ownership of the Project and surrounding area. The majority of the mineral lands not owned by CMR in Section 20 and 21 are owned or controlled by the State of Minnesota.

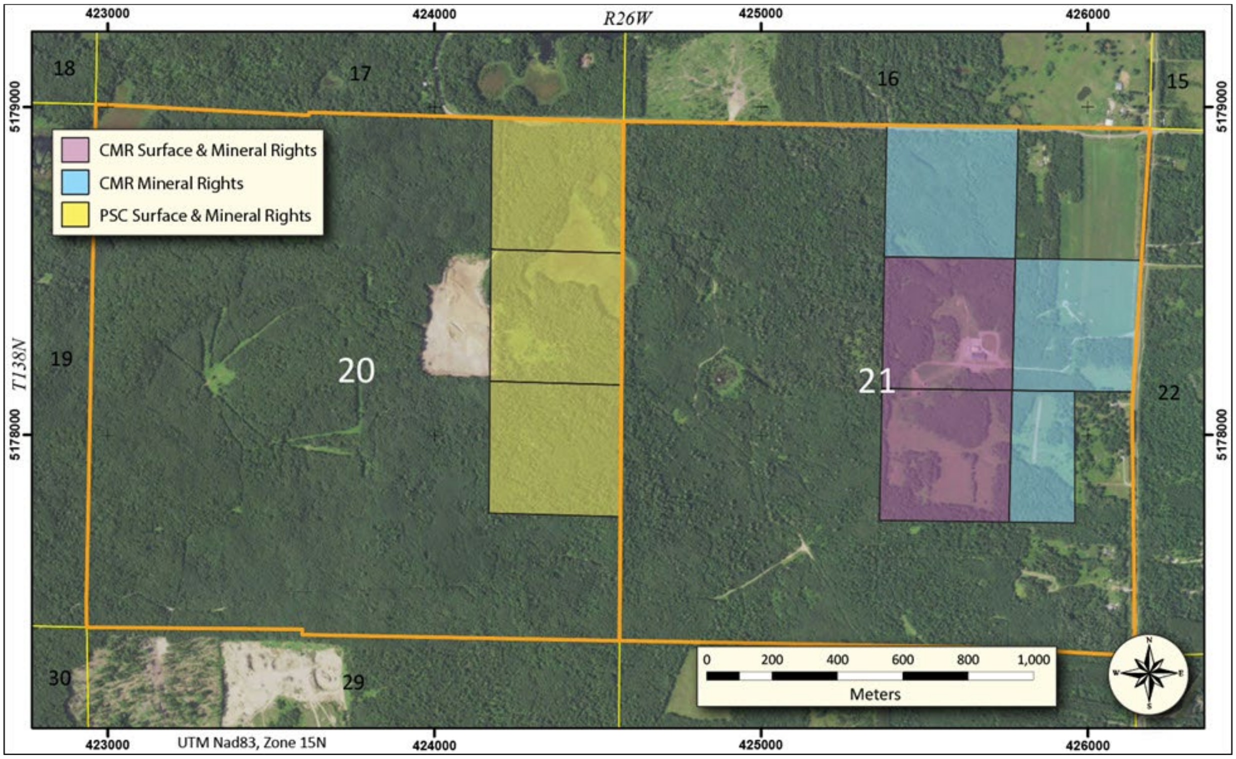


Figure 1-4 Legal ownership of the Project and surrounding area

NSM will have one hundred percent (100%) ownership and management of the Project. NSM has initial fifty (50) year contracts with CMR and PSC as described above, with two (2) additional fifty (50) year renewals at the same terms.

CMR has represented and warranted to NSM that CMR's mineral rights associated with the Project consist of a one hundred percent (100%) ownership interest in the mineral properties, subject to a State of Minnesota reservation for coal and iron ore on 92.17 acres,[1] shown on Figure 1-4. CMR has conveyed to NSM these CMR mineral rights to extract and sell its ores under the contract mining and sales agreement referenced above.

CMR also has represented to NSM that CMR has paid all outstanding amounts owed to acquire the above mineral rights except a residual U.S. two million dollars ($2,000,000) non-interest bearing obligation owed to the prior owners of the mineral rights, to be paid within thirty (30) days after production of mining from the CMR mineral lands has commenced. CMR also is responsible for certain royalty payments to those prior owners for the minerals extracted from the CMR lands, and to the State of Minnesota for any coal and/or iron ore produced and sold from the reserved acres. NSM has no contractual or payment obligations to these prior owners. Before the initiation of mining from the CMR mineral lands, NSM will pay U.S. three million dollars ($3,000,000) to CMR, which in turn is obligated under its agreements with

[1] The State of Minnesota mineral reservation requires CMR to pay mineral royalties for any coal and/or iron ore produced and sold from the reserved acres. As of the date of this report, NSM has a number of State mineral lease applications pending for non-ferrous and ferrous mineral leases in Sections 20 and 21, which include the 92.17 acres with the State of Minnesota reservation for coal and iron ore.

NSM to immediately use U.S. two million dollars ($2,000,000) of the payment from NSM to pay CMR's outstanding obligation to the prior mineral owners.

For the Project, NSM will mine CMR's mineral property as a contractor to CMR, under a cost plus fifteen percent fee (15%) contract.

NSM has the exclusive right to purchase the mined manganese ore from the CMR property for the higher of the following:

- the net sales (market) price of the ore - described as the gross sales price of the ore purchased by NSM (gross sales (market) price of the manganese ore mined, adjusted for grade, shipping, and insurance, per Fastmarkets Metal Bulletin published benchmark prices) less all costs associated with that ore, including acquisition, exploration, development and permitting, capital, sustaining and closing costs, financing and interest, direct and indirect operating costs, taxes and fees, and all other applicable costs and fees that are common to the mining and processing industry; or
- a fixed minimum price equal to the greater of (a) four percent (4%) of the gross sales (market) price of the manganese ore purchased by NSM, adjusted for grade, shipping, and insurance, per Fastmarkets Metal Bulletin published benchmark prices, as described above or (b) the royalty rate charged by the State of Minnesota for equivalent manganese ore mined from leased properties by the State.

Title to the mined manganese ore from CMR mineral property transfers to NSM upon NSM's payment to CMR for the ore purchased.

There is no mineral royalty to be paid by NSM for the extraction and sale of ores from the CMR mineral properties.

NSM also has surface leases with CMR and PSC. Title to the surface rights associated with the Project are one hundred percent (100%) owned by CMR and PSC, respectively.

Under the lease arrangements, NSM is required to keep the CMR and PSC properties in good standing relative to taxes and fees. Other than the annual payments to keep the properties in good standing, currently estimated at U.S. one hundred and twenty thousand dollars ($120,000) per year, NSM has no payment commitments to CMR and/or PSC under the leases except to make the rental payments described below; in particular, NSM has no specified work requirements to be undertaken on the Project.

NSM will pay lease (base rent) payments to CMR and PSC, collectively, for rent of their lands totaling five percent (5%) of the net distributable profits from the sale of NSM processed advanced materials from the AOI lands. An additional rent payment equaling five percent (5%) of the net distributed profits from the sale of NSM downstream processed advanced materials will be paid to CMR from ores mined exclusively from CMR's mineral property, until such time that U.S. thirteen million, five hundred thousand dollars ($13,500,000) have been paid to CMR; at which time the additional rent payment will terminate.

As part of the NSM arrangement, NSM has operational rights to the structures and facilities located in the SW ¼ of the NE ¼ of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota, as shown on 5.

Figure 1-5 Aerial view of the existing Project structures

NSM also has an option to purchase all of CMR's and PSC's mineral and surface assets, including all rights and obligations, for U.S. thirty million, two hundred and fifty thousand dollars ($30,250,000), less any net distributable profits paid by NSM, at any time until the mine and downstream processing facilities have achieved commercial start-up, defined as at least equal to eighty percent (80%), on average, of the design of the system utilizing ore from the AOI lands for a continuous period of six (6) months.

1.3 Geology and Mineralization

Manganese at the Project occurs within zones of massive manganese-oxide replacement in an early Proterozoic sequence of quartz arenite, an intermediate iron-formation (containing lenses of massive manganese) with intervening black shale and a feldspar-rich greywacke-shale. The manganese rich rock is generally more granular than low-grade manganese rock and contains abundant ovoid-shaped structures. The richest manganese layers are composed of massive, black, metallic manganite (manganese oxide-hydroxide (MnO(OH) containing up to 87% Mn).

Morey et al. (1991) hypothesizes that the depositional environment for the manganese enriched zones was one of gradual change over time from sedimentation in shallow water, through a period of chemical precipitation of silica and iron, to a second period of sedimentation in deeper water.

The Emily Manganese Deposit is dominated by manganese oxides (mostly the mineral manganite) and iron oxides (mostly hematite) with silica. Analyses of manganese-rich drill core samples tested seldom contain more than 0.05% sulphur showing that the mineralization is sulphide-free. As such, future development of the Emily Manganese Deposit is unlikely to generate sulphate and acidic waste, although appropriate testing, which is mandatory for all mining operations in Minnesota, will be required.

1.4 Exploration and Development

Drill hole spacing was approximately 350 feet on a staggered grid. Drilling has been concentrated in a central zone with more recent drilling further north (down dip) and east (along strike). The historical drilling has mostly been EX and AX-size diamond coring, with HQ-size diamond core used for the most recent drilling.

This Report has relied upon a comprehensive Quality Assurance/Quality Control program involving the use of blanks, standards and field duplicates that was instigated by Barr. This process included the insertion of blanks into the sample stream along with field duplicates, and high-grade and low-grade standards provided by Coleraine Minerals Research Laboratory (CMRL) in Coleraine, Minnesota.

1.5 Current Mineral Resource

The current resource estimate by Barr incorporates reported drilling results from two separate drilling programs from 2011 and 2012 for a total of 7 diamond core holes. This Barr resource estimate was carried out for manganese and iron by inverse distance squared method. The results of this resource estimate are tabulated below, using 5, 10, 15, and 20% manganese weight percentage cut-offs. While all four resource estimates represent viable manganese weight percentage cut-off cases, Barr recommends the use of the 10% manganese mineral resource estimate cut-off case as the base case for future project assessment until future drilling and studies are undertaken by NSM.

Table 1-1 Inverse Distance Squared Interpolated Current Mineral Resource Estimate

Category and Geology Unit	Mn Cut-off %	Avg Mn %	Avg Fe %	Tons
Indicated – Total	5	14.31	23.66	9,719,425
Inferred - Total	5	17.33	21.44	1,176,006
Indicated – Total	10	19.20	23.02	5,685,310
Inferred - Total	10	22.48	22.15	777,777
Indicated – Total	15	23.71	21.12	3,448,357
Inferred - Total	15	24.51	21.55	644,216
Indicated – Total	20	27.63	19.12	2,108,731
Inferred - Total	20	26.90	20.36	481,695

While a significant manganese resource exists at the Emily deposit, the resource defined by Barr Engineering represents only a small portion of a much larger area of manganese-iron deposition along strike and down-dip that was previously drilled by Pickands Mather and U.S. Steel in the 1940s and 1950s, and which adds significant upside potential to the planned NSM extensional drill program. (See Item 23.2 Former Proposed Mining Properties.)

1.6 Conclusions

Conclusions include the following items:

- The potential to increase resources at the Project is very prospective.
- The main manganese bearing minerals are manganese oxides.
- Manganese mineralization is open down dip and along strike of the deposit.
- Drilling to date has established significant tonnages of Indicated Resources and Inferred Resources.
- There is excellent potential to significantly increase resources to the west and north of the current Project.
- Metallurgical testing has resulted in technical feasibility at both bench scale and pilot scale for producing pure electrolytic manganese metal (EMM) and pure electrolytic manganese dioxide (EMD) from the Project deposit.

- Metallurgical testing has also shown that standard chemical leaching of the manganese oxides could produce EMM and EMD products.

1.7 Recommendations

Recommendations include the following items:

- Securing additional mineral and surface rights for potential expansion of mineral resource and project area.
- Undertaking additional exploration related activities, including data collection and review and drilling (twinning, step-out and in-fill).
- Additional metallurgical testing to optimize downstream processing.
- Initiating environmental baseline work and discussions with the State of Minnesota.
- Upon the completion of the above activities, undertaking a Preliminary Economic Assessment (PEA) followed by a Prefeasibility Study (PFS) for the Project.
- The drilling program expansion should include step-out drilling to expand the resource as well as re-drilling (twinning) of old drill holes which were dismissed, because the quality assurance/quality control of the historic data could not be validated. It is recommended that the drilling program be undertaken in three phases, as outlined in the following sections.

1.7.1 Phase 1

The Phase 1 resource expansion exploration program includes drilling twin boreholes adjacent to the historic drill holes 201, 16, 39 and 42, as well as a set of new drill holes to the west, that would serve to reduce any uncertainty about the deposit extension. This first phase will include additional metallurgical test work to better characterize the ore. The cost estimate for Phase 1 of the recommended program is U.S. one million, two hundred and fifty thousand dollars ($1,250,000).

1.7.2 Phase 2

The Phase 2 program will aim to expand the deposit to the west and north in the vicinity of the most recent drilling. This phase is intended to include metallurgical test work for ore characterization and the Company envisages that it will also more closely delineate the extension of the high-grade manganese horizons and increase the resource. The cost estimate for Phase 2 is U.S. one million dollars ($1,000,000).

1.7.3 Phase 3

The Phase 3 program will aim to define extensions to the deposit to the north and east, in the vicinity of the most recent drilling program. This phase will include advanced metallurgical test work for ore characterization and the Company envisages that it will define further extensions of the high-grade manganese horizons, increase deposit size and upgrade resource categories. The cost estimate for Phase 3 is U.S. two million, two hundred and fifty thousand dollars ($2,550,000).

2 Introduction

This Technical Report has been prepared for North Star Manganese Inc (NSM). The purpose of this Technical Report is to provide a resource estimate for the Emily Manganese Project (Project). It was prepared at the request of NSM. The Report is to update information that was prepared in the June 12, 2020 "Resource Estimate on the Emily Property, Minnesota USA" (the "2020 Resource Estimate Report"), prepared by Barr. This Report adds critical land related information to the 2020 Resource Estimate Report. This Resource Estimate Report was based on the drilling results available as of June 12, 2020 and includes results from diamond core drilling programs in 2011 and 2012. No changes have been made to the drilling information or resource results of the 2020 Resource Estimate Report. Information, conclusions, and recommendations contained herein are based on a study of relevant and available data, and discussions with NSM and CMR and their consultants. Personal inspection of the site was performed by Brad Dunn, Senior Mining Geologist, on January 3rd, 2020. It is Barr's opinion that no material change has occurred since the time of this personal inspection.

2.1 Terms of Reference

This Technical Report is based on the following:

- Historic independent technical reports
- Diamond core drilling programs in 2011 and 2012
- Interpretation of independent metallurgical test work in 2013
- Information gathered during the site Inspection by the Qualified Person in 2020

This Technical Report was completed by Barr at the request of NSM and is in compliance with NI 43-101. Persons contributing are:

- **Brad Dunn, BSc CPG** Senior Mining Geologist with Barr Engineering Company. He is responsible for reporting all Items of this Technical Report. Mr. Dunn resides in Utah and is a member of the AIPG. He received his BSc from the University of Otago in New Zealand.
- **Brian Anderson, BSc PE** Former Senior Mining Engineer with Barr Engineering Company. He collaborated with Mr. Dunn on Item 14.0 of this Technical Report. Mr. Anderson resides in Minnesota. He received his BSc from the University of Missouri – Rolla.
- **Dan Palo, PhD PE** Senior Process Engineer and Vice President with Barr Engineering Company. He collaborated with Mr. Dunn on Item 13.0 of this Technical Report. Dr. Palo resides in California. He received his BSc from the University of Minnesota – Duluth, and his PhD from the University of Connecticut.
- **Henry Sandri, PhD** Professional Mineral Economist and Chief Executive Officer with North Star Manganese Inc. Dr. Sandri resides in Minnesota. He received his BSc from the Georgetown University, his MA from The American University and his PhD from the Colorado School of Mines.

- **Philip Solseng, BSc PE** Senior Geotechnical Engineer and Vice President with Barr Engineering Company. Mr. Solseng resides in Minnesota. He received his BSc from North Dakota State University.

- **Marcelo Filipov, MSc** Senior Mining Geologist with Barr Engineering Company. Mr. Filipov resides in Utah. He received his BSc and MSc from the University of Sao Paulo in Brazil.

Table 2-1 Glossary of Terms

Term	Abbreviation
American Institute of Professional Geologists	AIPG
Approximately	~
Bachelor of Science	BSc
Barr Engineering Company	Barr
By	x
Center for Advanced Mineral and Metallurgical Processing	CAMP
Canadian Institute of Mining, Metallurgy and Petroleum	CIM
Certified Professional Geologist	CPG
Chemical Manganese Dioxide	CMD
Coleraine Mineral Research Laboratory	CMRL
Cooperative Mineral Resources	CMR
Degrees	°
Doctor of Philosophy	PhD
Dollar (U.S. Dollar)	$
East	E
Editors	eds
Electrolytic Manganese Dioxide	EMD
Electrolytic Manganese Metal	EMM
et alibi	Et al.
Fahrenheit	F
Feet	ft
Formation	Fm
Gram	g
Greater Than	>
Incorporated	Inc
Iron	Fe
Kilowatt Hour	kWh
Less Than	<
Limited Liability Company	LLC
Manganese	Mn
Master of Science	MSc
Meter	m
Millimeter	mm
Million Years	Ma

Term	Abbreviation
Million Tons	Mt
Mineral Liberation Analysis	MLA
Minnesota	MN
National Instrument 43-101	NI 43-101
National Topographic System	NTS
North	N
North Star Manganese	NSM
Oxygen	O
Page	p
Percent	%
People's Security Company	PSC
Plates	pls
Pound	lb
Professional Geoscientist	P.Geo.
Professional Geoscientists of Ontario	PGO
Range	R
Silica	Si
Society for Mining, Metallurgy & Mining	SME
South	S
Ton (Short Ton)	t
Township	T
United States	US
Volume	Vo
West	W
Wisconsin	WI

2.2 Qualified Person

As stated in the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources & Mineral Reserves, prepared by the CIM Standing Committee on Reserve Definitions, adopted by the CIM Council on May 19, 2014:

"Mineral Resource and Mineral Reserve estimates and any supporting technical reports must be prepared by or under the direction of a Qualified Person, as that term is defined in NI 43-101.

The Qualified Person(s) should be clearly satisfied that they could face their peers and demonstrate competence and relevant experience in the commodity, type of deposit and situation under consideration. If doubt exists, the person must either seek or obtain opinions from other colleagues or demonstrate that he or she has obtained assistance from experts in areas where he or she lacked the necessary expertise.

Determination of what constitutes relevant experience can be a difficult area and common sense has to be exercised. For example, in estimating Mineral Resources for vein gold mineralization, experience in a high-nugget, vein-type mineralization such as tin, uranium etc. Should be relevant whereas experience in massive *base metal deposits may not be. As a second example, for a person to qualify as a Qualified Person in the estimation of Mineral Reserves for alluvial gold deposits, he or she would need to have relevant experience in the evaluation and extraction of such deposits. Experience with placer deposits containing minerals other than gold, may not necessarily provide appropriate relevant experience for gold.*

In addition to experience in the style of mineralization, a Qualified Person preparing or taking responsibility for Mineral Resource estimates must have sufficient experience in the sampling, assaying, or other property testing techniques that are relevant to the deposit under consideration in order to be aware of problems that could affect the reliability of the data. Some appreciation of extraction and processing techniques applicable to that deposit type might also be important.

Estimation of Mineral Resources is often a team effort, for example, involving one person or team collecting the data and another person or team preparing the mineral resource estimate. Within this team, geologists usually occupy the pivotal role. Estimation of Mineral Reserves is almost always a team effort involving a number of technical disciplines, and within this team mining engineers have an important role. Documentation for a Mineral Resource and mineral reserve estimate must be compiled by, or under the supervision of, a Qualified Person(s), whether a geologist, mining engineer or member of another discipline. It is recommended that, where there is a clear division of responsibilities within a team, each Qualified Person should accept responsibility for his or her particular contribution. For example, one Qualified Person could accept responsibility for the collection of Mineral Resource data, another for the Mineral Reserve estimation process, another for the mining study, and the project leader could accept responsibility for the overall document. It is important that the Qualified Person accepting overall responsibility for a Mineral Resource and/or Mineral Reserve estimate and supporting documentation, which has been prepared in whole or in part by others, is satisfied that the other contributors are Qualified Persons with respect to the work for which they are taking responsibility and that such persons are provided adequate documentation."

The Qualified Person for this NI 43-101 Technical Report is:

- Brad Dunn, CPG

Mr. Dunn visited the site on January 3rd, 2020.

Mr. Dunn is responsible for the preparation and supervision of the Technical Report.

Mr. Dunn is responsible for each Item in the Technical Report as The Qualified Person.

3 Reliance on Other Experts

Exploration work, drilling of holes, sampling, and assaying on the Project was undertaken under the supervision of the Qualified Person. Examination and verification of mineralization in core samples at the site was undertaken during the site visit. The authors of this report have exercised all reasonable diligence in checking, confirming, and testing data on the Property presented by CMR and NSM.

The QP has reviewed and analyzed the data and reports provided by the client, together with public available data, and has followed standard professional procedures in preparing the content of this resource estimation report. Data used in this report has been verified where possible and this report is based upon information believed to be accurate at the time of completion. However, not all data and reports of others is verified or attested to in this report.

The QP has relied on several sources of information on the property, including technical reports by consultants to CMR and NSM, digital geological, assay and survey data collected by others, and geological interpretation by others. In issuing this report, Barr relies on the truth and accuracy as presented in sources listed in Item 27-References section of this report.

4 Property Description and Location

The Project is located near the center of the State of Minnesota, United States of America. Minnesota is situated in the Upper Midwest, Great Lakes, and northern regions of the United States. Minnesota shares its northern border with Ontario and Manitoba, Canada, its eastern border with Wisconsin and Michigan, its southern border with Iowa, and its western border with North Dakota and South Dakota.

The Project is in northern Crow Wing County and is on the northern portion of the Emily District, of Minnesota's Cuyuna Iron Range, approximately 2 miles north, northwest of the City of Emily, Minnesota, and west of State Highway 6, as shown on Figure 4-1.

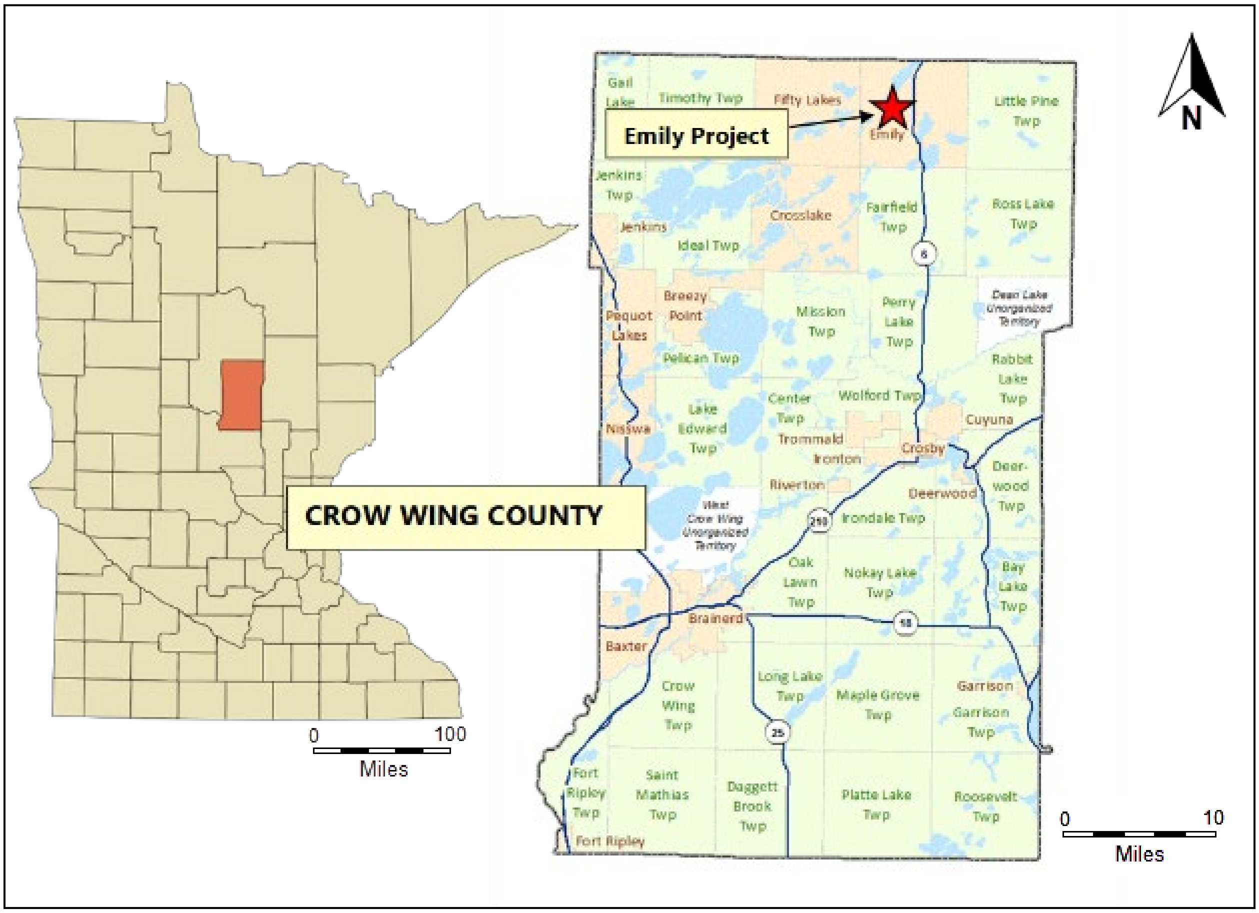


Figure 4-1　Location of the Emily Project in Crow Wing County, Minnesota

The Project is in the Emily District of the northern portion of the historic Cuyuna Iron Range in Minnesota, as shown on Figure 4-2, below, and Figure 4-3 shows the position of the Project in the northern portion of the Emily District.

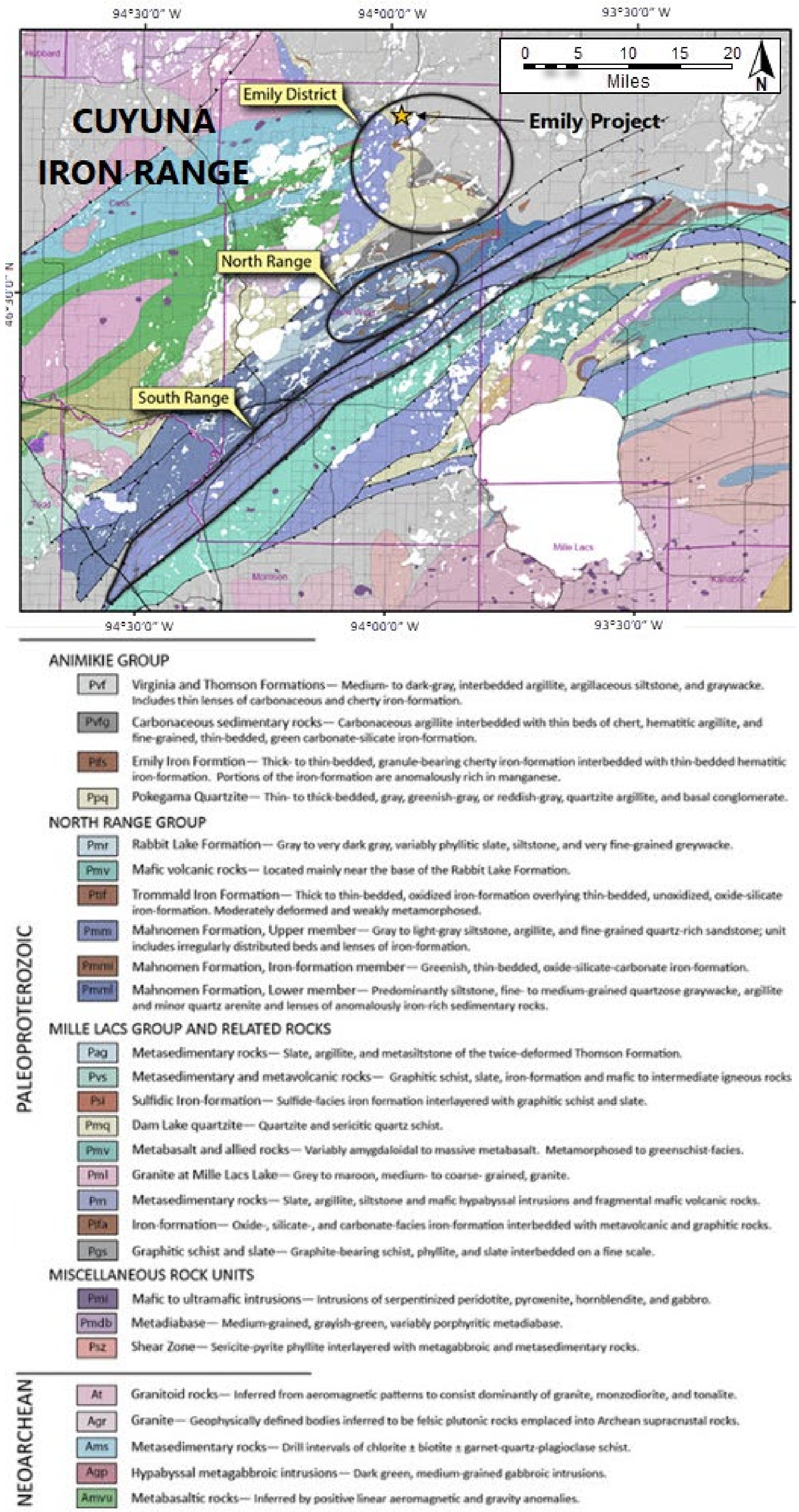
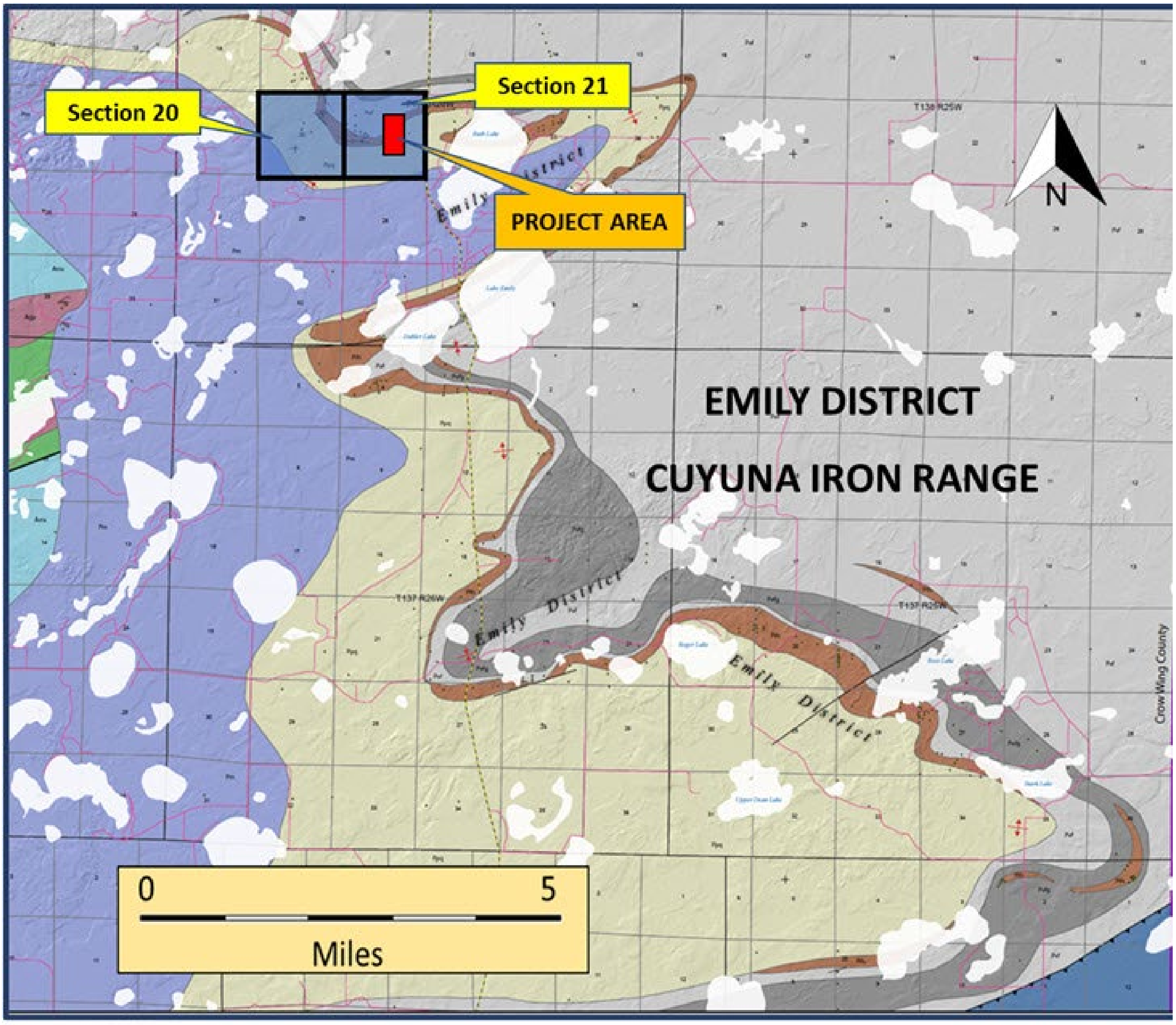


Figure 4-2 Location of the Project within the Cuyuna Iron Range



ANIMIKIE GROUP

- Pvf — Virginia and Thomson Formations— Medium- to dark-gray, interbedded argillite, argillaceous siltstone, and graywacke. Includes thin lenses of carbonaceous and cherty iron-formation.
- Pvfg — Carbonaceous sedimentary rocks — Carbonaceous argillite interbedded with thin beds of chert, hematitic argillite, and fine-grained, thin-bedded, green carbonate-silicate iron-formation.
- Pifs — Emily Iron Formtion— Thick- to thin-bedded, granule-bearing cherty iron-formation interbedded with thin-bedded hematitic iron-formation. Portions of the iron-formation are anomalously rich in manganese.
- Ppq — Pokegama Quartzite— Thin- to thick-bedded, gray, greenish-gray, or reddish-gray, quartzite argillite, and basal conglomerate.

NORTH RANGE GROUP

- Pmr — Rabbit Lake Formation— Gray to very dark gray, variably phyllitic slate, siltstone, and very fine-grained greywacke.
- Pmv — Mafic volcanic rocks— Located mainly near the base of the Rabbit Lake Formation.
- Ptif — Trommald Iron Formation— Thick to thin-bedded, oxidized iron-formation overlying thin-bedded, unoxidized, oxide-silicate iron-formation. Moderately deformed and weakly metamorphosed.
- Pmm — Mahnomen Formation, Upper member— Gray to light-gray siltstone, argillite, and fine-grained quartz-rich sandstone; unit includes irregularly distributed beds and lenses of iron-formation.
- Pmmi — Mahnomen Formation, Iron-formation member— Greenish, thin-bedded, oxide-silicate-carbonate iron-formation.
- Pmml — Mahnomen Formation, Lower member— Predominantly siltstone, fine- to medium-grained quartzose graywacke, argillite and minor quartz arenite and lenses of anomalously iron-rich sedimentary rocks.

Figure 4-3 Location of the Project within the northern portion of the Emily District

Mines in the Cuyuna Iron Range produced and sold iron ore and manganese from 1907 to 1982. The Project is also located south of the western end of Mesabi Iron Range, which hosts the largest iron ore mining and processing operations in the United States and North America. The location offers nearby services, equipment suppliers and labor associated with the iron mining and processing industry.

Regionally, the Project site benefits from proximity to medium to large cities and regional industrial centers (iron mining and processing), with major domestic and international transportation linkages, as shown in Table 4-1.

Table 4-1 Regional Cities and Transportation Linkages

Regional City	Distance from the Project Site	Rail Connections	Shipping Connections	Airport Connections
Brainerd, MN	38 miles / 61 km southwest	One Class -1 Railroad		Brainerd Lakes (Regional)
Grand Rapids, MN	47 miles / 76 km northeast	One Class -1 Railroad		Iron Range (Regional)
Duluth, MN / Superior, WI	109 miles / 175 km east	Two Class -1 Railroads	Great Lakes and Ocean shipping	Duluth (International)
Minneapolis, MN	149 miles / 240 km south	Three Class -1 Railroads		Minneapolis/St. Paul (International)
St. Paul, MN (State Capital)	154 miles / 248 km south	Three Class -1 Railroads	Mississippi River barge shipping	Minneapolis/St. Paul (International)

The CMR's Project mineral assets include 167.93 acres in five land parcels and 75.75 surface acres in two parcels in which NSM has contracted rights from CMR as described in Items 1.0 and 6.0. These land parcels are located in the southwest quarter of the northeast quarter and the northwest quarter of the southeast quarter of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota. Table 4-2 below lists these parcels.

Table 4-2 CMR Project Land Parcels

Parcel	Location	Title	Surface Rights	Mineral Rights	Acres	PIN
NW ¼ NE ¼	S21 T138 N R26 W	CMR	-	X *	37.86	21210541
SW ¼ NE ¼	S21 T138 N R26 W	CMR	X	X	37.60	21210540
NW ¼ SE ¼	S21 T138 N R26 W	CMR	X	X	38.16	21210510
SE ¼ NE ¼	S21 T138 N R26 W	CMR	-	X *	35.36	21210539
W ½ NE ¼ SE ¼	S21 T138 N R26 W	CMR	-	X *	18.95	21210511
Total Area			75.75	167.93	167.93	

* In these land parcels, CMR mineral rights include manganese and all other non-coal and non-iron ore resources (coal and iron ore are reserved by the State).

Figure 4-4 shows these land parcels with respect to the Project site.

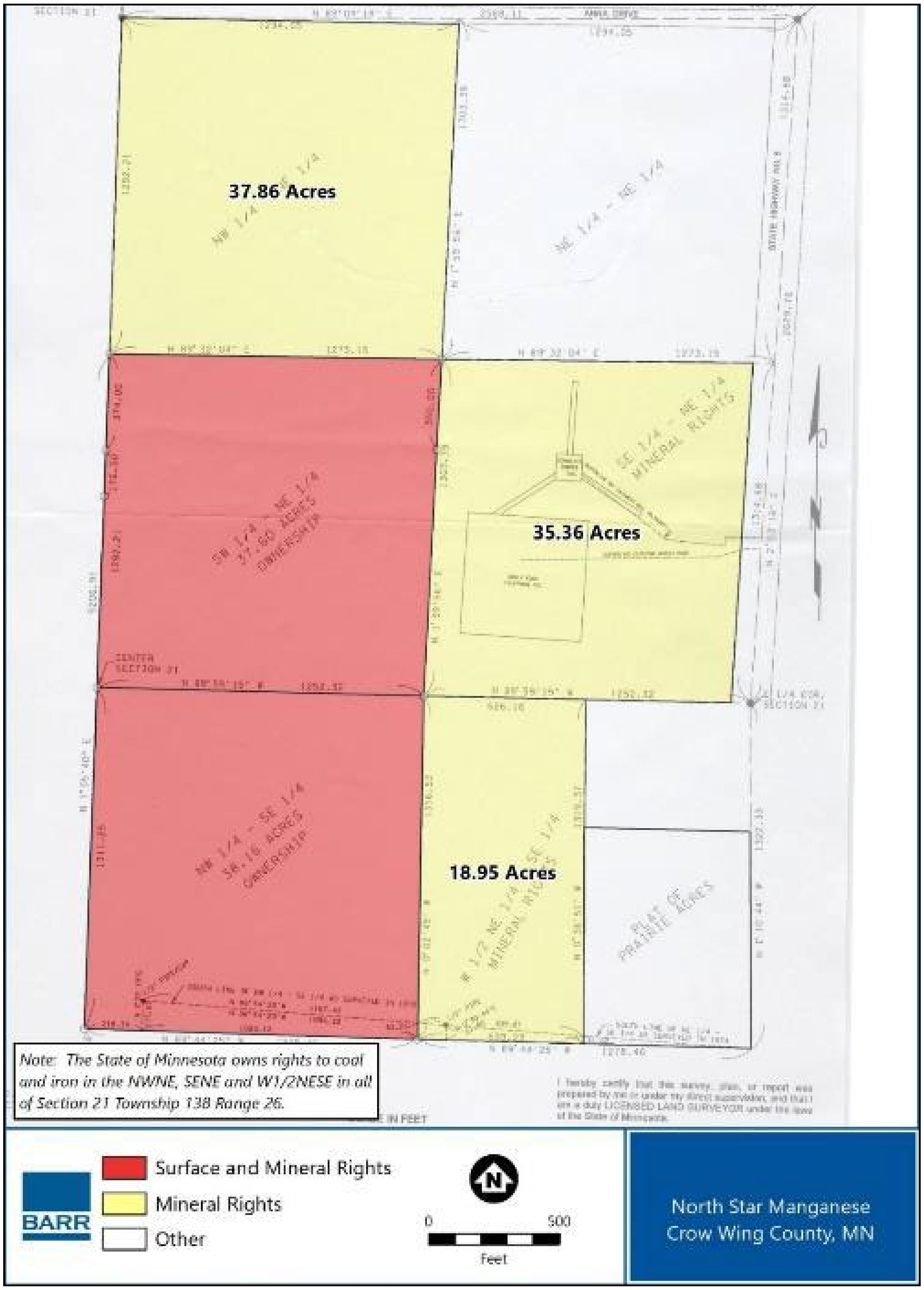


Figure 4-4 Project land parcels owned by CMR

The CMR land parcels have been surveyed, and a copy of the certificate of survey is shown on Figure 4-5.

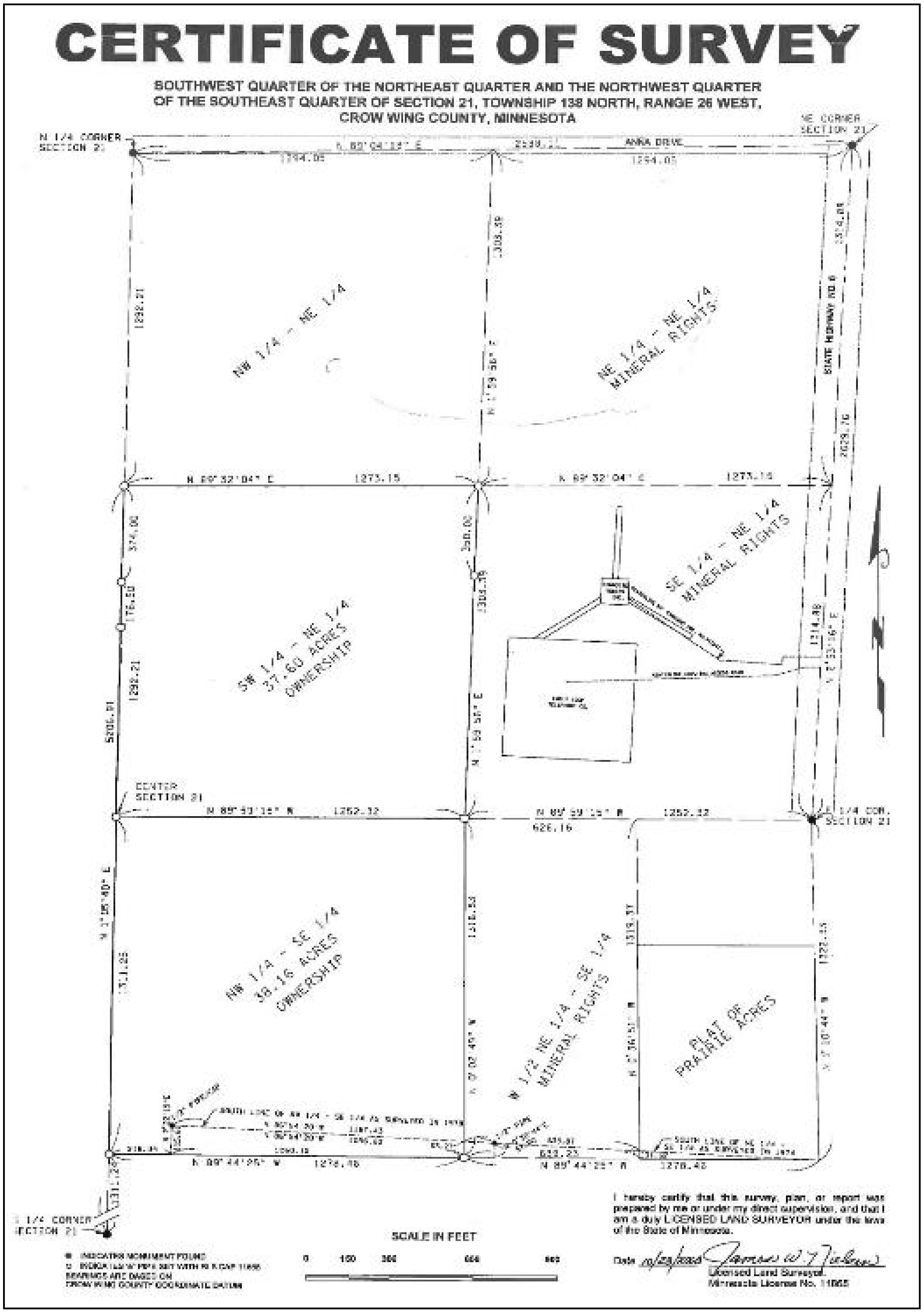


Figure 4-5 Project certificate of survey of land owned by CMR

The Project also includes the leasing of PSC surface and mineral rights covering 123.38 acres in three parcels, located in Section 20, Township 138 North, Range 26 West, Crow Wing County, Minnesota. Table 4-3 below lists these parcels.

Table 4-3 PSC Project Land Parcels

Parcel	Location	Title	Surface Rights	Mineral Rights	Acres	PIN
NE ¼ NE ¼	S20 T138 N R26 W	PSC	X	X	41.02	21200517
SE ¼ NE ¼	S20 T138 N R26 W	PSC	X	X	41.06	21200514
NE ¼ SE ¼	S20 T138 N R26 W	PSC	X	X	41.30	21200503
Total Area			123.38	123.38	123.38	

The PSC parcels have been surveyed, and a copy of the certificate of survey is shown on Figure 4-6.

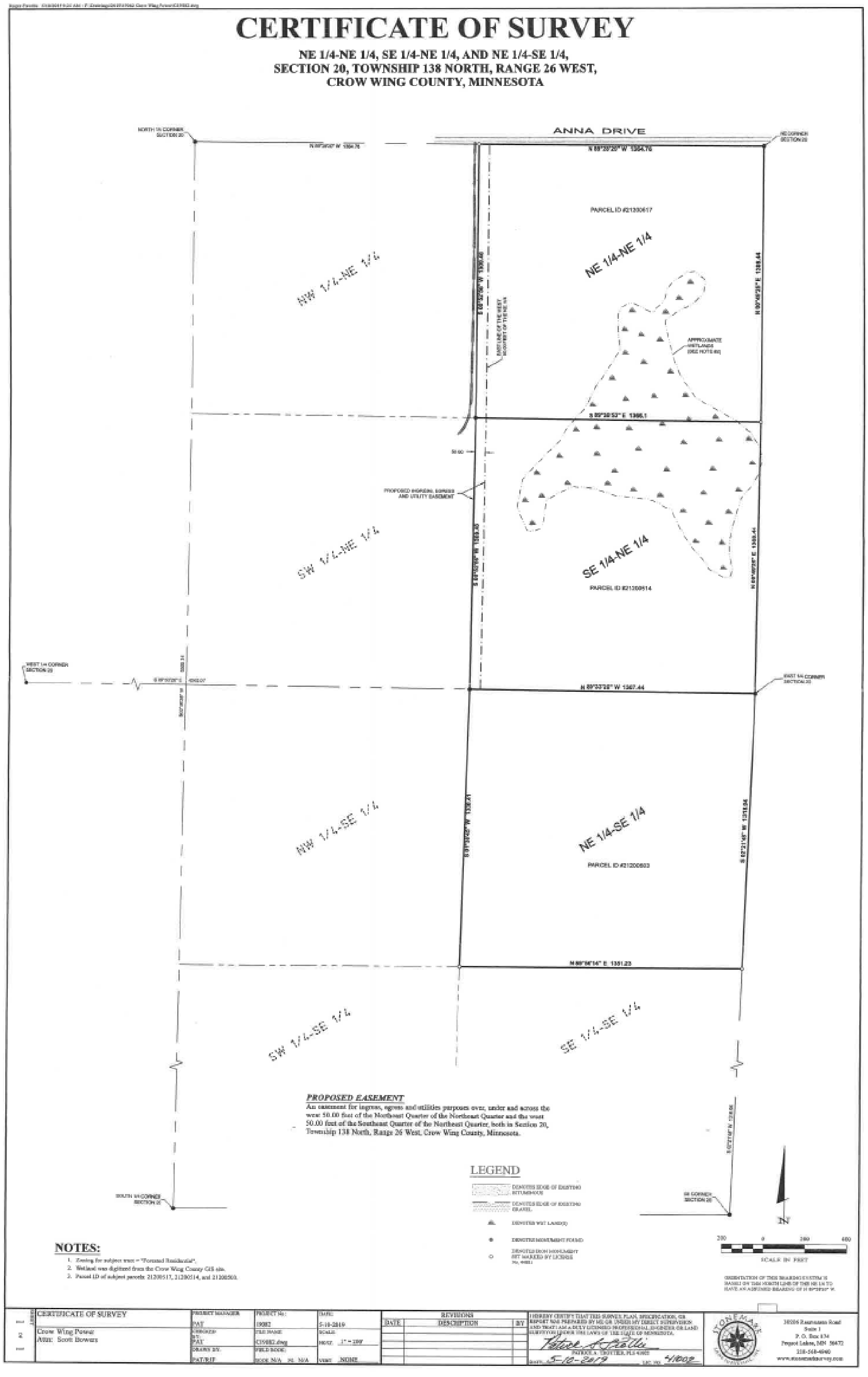


**Figure 4-6	Project certificate of survey of land owned by PSC**

All surface and mineral parcels, represented above, are owned by either CMR or PSC as described in Items 1.0 and 6.0.

Figure 4-7 shows the CMR and PSC parcels with respect to the Project site (the Project site is highlighted in purple).

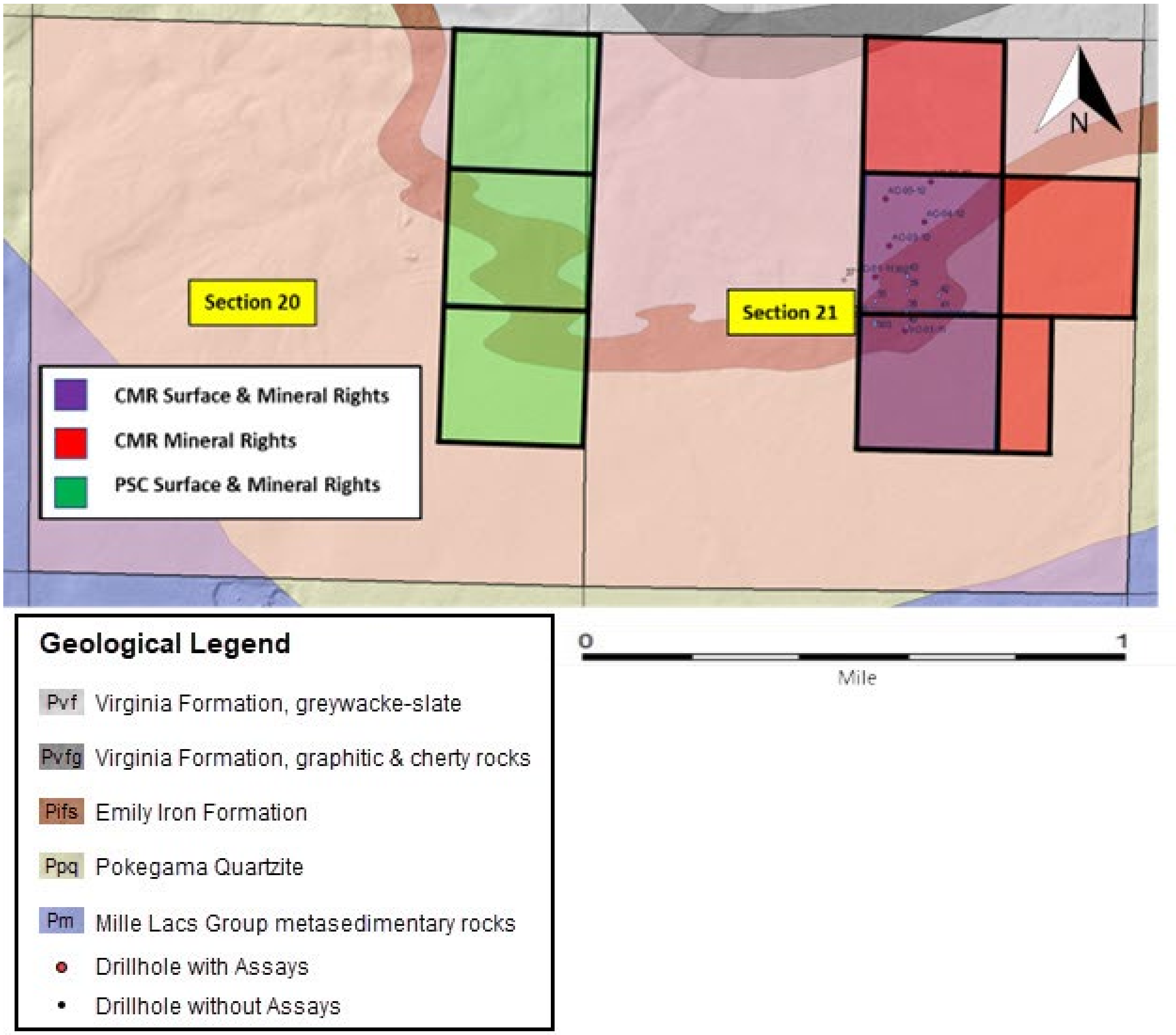


Figure 4-7 Project land parcels owned by CMR and PSC with respect to the Project site

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Project is located approximately 2 miles north of the City of Emily, Minnesota, and is accessed by Minnesota State Highway 6, which runs adjacent to the Project site. The nearest airport is the Brainerd Lakes Regional Airport situated approximately 34 miles southwest of the Project. The nearest Class -1 Railroad terminals are via the Burlington Northern Santa Fe line with a terminal and service yard in Brainerd, approximately 38 miles southwest of the Project, and a terminal in Grand Rapids, approximately 47 miles northeast of the Project.

5.2 Climate

The climate at Emily will vary seasonally from daytime high temperatures in the summer of up to 81 degrees Fahrenheit and -5 degrees Fahrenheit in winter. Average precipitation is 27 inches per year and the annual average snowfall is 45 inches.

5.3 Local Resources and Infrastructure

Local infrastructure and resources are very well established in the Emily area. Historical iron ore mining on the Cuyuna Iron Range has left a permanent mark on the landscape and infrastructure through an excellent network of roads, rail, and utilities. However, there is no current iron ore mining activity in the Cuyuna Iron Range, only sand, gravel, and aggregate operations.

The significant portion of the iron ore mined in the US over the past one hundred years has come from the Mesabi Iron Range, located from Grand Rapids Minnesota in the west to Babbitt Minnesota in the east, 125 miles of historic and current mining operations. Grand Rapids is approximately 47 miles to the northeast of the Project. Currently, there are six mining-processing operations on the Mesabi Iron Range, and these operations supply more than 90% of domestic U.S. iron ore production in the form of taconite (mined ore) and taconite pellets (manufactured iron pellets). Mining and processing infrastructure and services are readily available in the district.

The area is serviced by State and Federal roads and highways, regional and international air transport, and local, national and international rail connections, via the Burlington Northern Santa Fe Railroad, and are linked to the domestic and international lake- seaports of Duluth Minnesota and Superior Wisconsin. Duluth is located on the north shore of Lake Superior at the westernmost point of the Great Lakes. Superior Wisconsin is immediately adjacent, and to the east of Duluth. The ports of Duluth and Superior are accessible to oceangoing vessels from the Atlantic Ocean 2,300 miles (3,700 km) via the Great Lakes Waterway and the Saint Lawrence Seaway. Duluth and Superior are major transportation centers for the transshipment of bulk commodities (coal, taconite pellets), agricultural products, steel, limestone, and cement), as well as manufactured goods, shown on Figure 5-1.

Figure 5-1 **Emily Project in proximity to Great Lakes Shipping**

5.4 Physiography

The Project area is in the Mississippi River Watershed, with an eventual flow into the Gulf of Mexico, as shown on Figure 5.2.

Figure 5-2 Emily Project location relative to the Mississippi River Watershed

The Project properties range from 1280 – 1325 feet above sea level. The local topography is relatively low and flat, as shown on Figure 5-3. There are no bedrock outcrop exposures at the Project site, due to approximately 100 to 200 feet of glacial outwash and till surface cover.

Figure 5-3 Emily Project lands

Regionally, there are some localized areas of rugged relief due to numerous natural glacial lakes and a limited number of man-made lakes. The latter are the remains of historical iron ore mining operations. Hills and ridges frequently occur beside lakes, especially the post-mining lakes. The landscape includes lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, and wide, poorly drained peat lands. Vegetation in the area is common of Laurentian mixed forest regions, consisting of areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps. Drainage from the area follows the Upper Mississippi River Basin.

6 History

The following history is reported to Barr. In general, these items have not been verified by the QP.

6.1 Ownership History

- Land that comprises Minnesota were acquired by the United States through a series of international and native treaties, cross-border agreements, international acquisitions and lands ceded from future states from 1789 through 1842.
- The Minnesota Territory was established on March 3, 1849.
- Crow Wing County was established in 1857.
- Minnesota became the 32nd State in the United States on May 11, 1858.
- Iron ore was first discovered in Minnesota in 1866 in the Vermillion Iron Range and the Mesabi Iron Range in 1890, beginning a long running history of iron mining in Minnesota.
- In the early 1880s, federal surveys noted magnetic anomalies near what would become the Cuyuna Iron Range. No visible outcrops of iron ore were present at the surface, and iron ore from drilling was identified in 1902. In June 1907, the Rogers–Brown Ore Company opened the Kennedy Mine, the first active iron mine on the Cuyuna Iron Range.
- In 1913, two holes were drilled by Osterburg & Johnson in the greater Emily Project area.
- Demand for iron ore in the United States surged during World War I. Over thirty iron mines were operating in the Cuyuna Iron Range at that time; most were underground operations. After the war, many of these mines closed. The few new mines of the 1920s were open pits that used large earth-moving equipment rather than shafts and tunnels to reach the ore.
- Demand for iron ore fell during Depression but rose again throughout World War II and the Korean War. In 1953, production on the Cuyuna Iron Range reached its highest point, at a little over three-and-a-half million tons per annum.
- In the early 1960s a rapid decline in iron ore production from the Cuyuna Iron Range was due to a closure of seventeen mines between 1961 and 1965. The passing of the Minnesota Taconite Amendment in 1964 incentivized production from other Minnesota iron ranges. By 1967, the last operating Cuyuna Iron Range underground mine in Minnesota, the Armor #2 Mine near Crosby, was closed. In 1982, the last reported shipment of iron ore ended a 75-year period of active mine operations in the Cuyuna Iron Range.
- The Cuyuna iron ores also contained manganese. Manganese-rich iron ores were important for making hard steels and mines in the Cuyuna Iron Range supplied manganese to domestic operations and as exports from the 1920s through the late 1950s. The Manganese Chemical Corporation, Riverton Minnesota, developed and patented new methods to turn manganese ore into products for modern batteries. The patents filed for this process continue to be cited by

major battery companies in the twenty-first century. The Cuyuna Iron Range held, and continues to hold, the largest U.S. domestic supply of manganese ore.

- Following the closure of most of the Cuyuna iron mines in the 1960s, the United States became a net importer of manganese, and by the mid-1970s the United States became 100% dependent on imported manganese. The Manganese Chemical Corporation moved from Riverton to Baltimore, Maryland, in 1962.

- In the 1940's Pickands Mather Mining Company (today, part of Cleveland-Cliffs Corporation), while exploring for iron ore during a search for a geologic connection between the north-west section of the Cuyuna Iron Range and the western end of the Mesabi Iron Range, discovered the Emily District, including the Emily manganese deposit (the Project area).

- The Oliver Mining Company (a historic U.S. Steel company) operated in the Cuyuna Iron Range to 1969, and specifically in the Emily District from 1951 to 1960. Lands adjacent to the Project area, owned or leased by Oliver Mining from private owners and the State of Minnesota, were explored. Upon completion of the exploration, including extensive geophysical work and drilling, U.S. Steel (Oliver Mining) designed an open pit mine for the West Ruth Lake area, which includes the Project property (Strong 1959). By the early-1960s U.S. Steel decided not to proceed with the West Ruth Lake and nearby proposed mines and proceeded to move its mining operations to the Mesabi Iron Range.

- In the 1960s, Pickands Mather Chief Mining Engineer, Delno W. Carlton, converted a lease containing manganese-rich iron ores held since the 1950s and purchased five (5) mineral parcels and two (2) surface parcels from Pickands Mather Mining Company.

- The following information has been provided to NSM by Cooperative Minerals Resources, LLC and People's Security Corporation, Inc. and/or CMR's and PSC's attorney.[2]

    - Hunt Enterprises, LLC., a wholly owned subsidiary of Cooperative Holding Company, a wholly owned subsidiary of Crow Wing Power, signed an Agreement for Purchase of Land and Mineral Rights, dated November 20, 2008, with respect to certain lands in Crow Wing County, Minnesota. The sellers executing this Agreement were Cammilla C. Carlton, Steven C. and Katherine D. Carlton, and Raymond Culp (sellers). The sellers reserved certain royalty interests in the mineral parcels in this Purchase Agreement and an additional royalty agreement between Hunt Enterprises, LLC and sellers. Deeds for the lands were conveyed to Hunt Enterprises, LLC on December 16, 2008. The deeds are applicable to the following:

[2] The surface and mineral parcels associated with the Project are owned by CMR and/or PSC, respectively. In the agreements in which CMR and PSC each conveyed leasehold and other rights and interests to NSM, CMR and PSC provided to NSM various warranties concerning title and ownership with respect to their respective parcels and with certain permitted exceptions as specially described in the agreements, the absence of any encumbrances to such title and ownership.

    - Two (2) surface parcels in Crow Wing County, Minnesota:
        - the SW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West, and
        - the NW ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West.
    - Five (5) mineral parcels in Crow Wing County, Minnesota:
        - the NW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West,
        - the SW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West,
        - the NW ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West
        - the SE ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West, and
        - the W ½ of the NE ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West.
- Hunt Enterprises has a residual obligation of U.S. two million dollars ($2,000,000) to be paid to the sellers within thirty (30) days following the receipt of all necessary governmental permits for full operation of a mine and after full production of the mine has commenced.
- Crow Wing Power, on January 12, 2009, formed Greener Acres LLC. as a wholly owned subsidiary to manage the manganese property owned by Hunt Enterprises, LLC.
- Hunt Enterprises, LLC. conveyed its above-referenced surface and mineral rights to Greener Acres LLC. on February 19, 2009.
- Greener Acres LLC. changed its name to Cooperative Mineral Resources, LLC in September 2009.
- On May 15, 2019, People's Security Company, Inc., a wholly owned subsidiary of Crow Wing Power, purchased certain lands in Crow Wing County, Minnesota: The deeds are applicable to the following:
    - Three (3) surface and mineral parcels in Crow Wing County, Minnesota:
        - the NE ¼ of the NE ¼ of Section 20 / Township 138 North / Range 26 West,

    - the SE ¼ of the NE ¼ of Section 20 / Township 138 North / Range 26 West, and

    - the NE ¼ of the SE ¼ of Section 20 / Township 138 North / Range 26 West.

- On April 22, 2020, CMR and PSC signed a series of agreements with NSM on the mining and processing of manganese ores that established two general arrangements (described in Item 1.0 of this Report):

    - a contract mining and sales arrangement between NSM and CMR for the extraction of manganese ores from the property whereby NSM has the exclusive right to mine and purchase the manganese ore; and

    - separate property leases and a manganese processing agreement between NSM, CMR and PSC, where CMR and PSC, collectively, will receive as rent for their properties a portion of NSM's distributed profits from downstream sale of processed advanced materials from any ores mined by NSM from the AOI.

6.2 Work History

- Exploration work by the Pickands Mather Company from 1945 to 1962 defined the "Carlton Reserve" at the Project site.

- In 1951, Oliver Mining Company leased lands in the area and conducted extensive geophysical work detailed exploration through 1959.

- Extensive studies of the Emily deposit were conducted in the 1990s by the United States Bureau of Mines, the University of Minnesota, and the Minnesota Geological Survey.

- The United States Bureau of Mines undertook exploration work in 1995.

- John E. Pahlman completed a resource estimation of the Emily deposit in 1996 following the 1995 exploration work and this was reported in a United States Bureau of Mines document.

- In 2008 with the acquisition of the Project property to the present, CMR has spent more than U.S. $23 million on technical studies, exploratory drilling, process development and bench-level pilot processing to extract, upgrade and process manganese carbonate ($MnCO_3$), Electrolytic Manganese Metal (EMM) and Electrolytic Manganese Dioxide (EMD). Significant activities undertaken by CMR included:

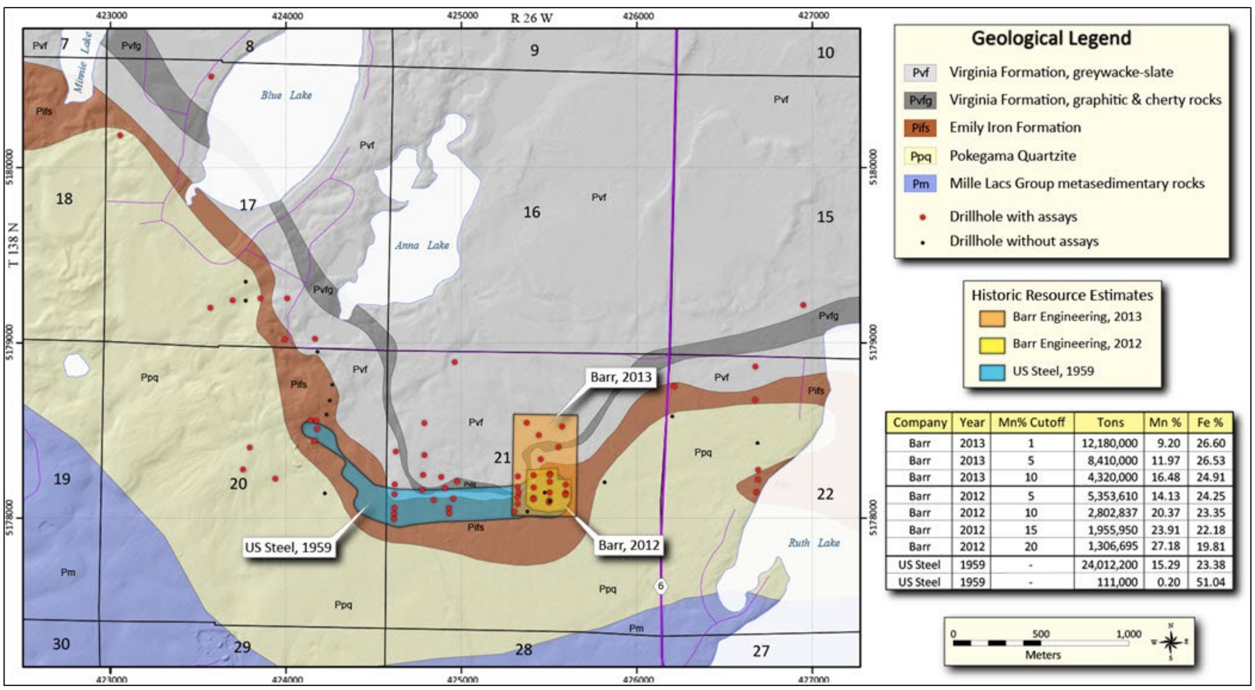
    - Michael Ward of Marston & Marston Inc. completed a resource estimation of the Emily deposit as part of a due diligence study on the property, in 2008.

    - CMR initiated a pilot test involving a borehole mining tool in 2009 to assess the effectiveness of extracting manganese enriched zones to the surface for commercial mining using this technique. Rice Lake Construction was contracted to undertake this pilot test.

- o Barr Engineering performed a geotechnical and hydrogeological investigation in conjunction with the borehole mining pilot test being undertaken in 2009.
- o Rice Lake Construction completed the borehole mining pilot test in the fall of 2011.
- o Barr Engineering undertook and completed a resource drilling program in the fall of 2011. Part of this program included a geotechnical analysis of the manganese enriched zone.
- o Barr Engineering undertook and completed a resource drilling program in the fall and winter of 2012.

6.3 Historical Mineral Resource Estimates

- In 1950, A. D. Chisholm (Pickens Mather Company) estimated 2,142,500 tons of ore grading at 20.82% manganese at the Emily deposit. No cut-off grade was stipulated with this estimation.
- In 1950s U.S. Steel (Oliver Mining) undertook additional drilling, and in 1959 designed the West Ruth Lake Mine, targeting 24,012,200 tons of ore @ 15.29% Mn and 23.38% Fe (Strong 1959). The West Ruth Lake Mine included the Pickens Mather "Carlton Reserve" as part of the total reserve of the proposed mine. A representation of the location of the proposed U.S. Steel West Ruth Lake Mine is shown below on Figure 6-1 and discussed in Item 23 of this Report.



Company	Year	Mn% Cutoff	Tons	Mn %	Fe %
Barr	2013	1	12,180,000	9.20	26.60
Barr	2013	5	8,410,000	11.97	26.53
Barr	2013	10	4,320,000	16.48	24.91
Barr	2012	5	5,353,610	14.13	24.25
Barr	2012	10	2,802,837	20.37	23.35
Barr	2012	15	1,955,950	23.91	22.18
Barr	2012	20	1,306,695	27.18	19.81
US Steel	1959	-	24,012,200	15.29	23.38
US Steel	1959	-	111,000	0.20	51.04

Figure 6-1 Location of the U.S. Steel proposed West Ruth Lake Mine in 1959

- In 1996, John E. Pahlman (United States Bureau of Mines) estimated 500,000 tons of manganese contained in 7.2 acres of ore containing a Mn>10% cut-off grade at the Emily deposit. No ore grade was stipulated with this estimation.

- In 2008, Michael Ward (Marston & Marston Inc.) estimated 2,102,000 tons of ore grading at 19.8% manganese with a Mn>10% cut-off grade at the Emily deposit.
- In 2012, Barr estimated 2,802,837 tons of mineralized rock grading at 20.37% manganese with a Mn>10% cut-off grade at the Emily deposit.
- Big Rock Exploration, LLC (BRE) was contracted by North Star Manganese (NSMn) in October 2021 to perform basic modeling of the manganese (Mn) resource on their Emily Property in northcentral Minnesota. The work undertaken was for internal analysis and future drill targeting, and included:
    - An updated basic geological model for the Emily Manganese Deposit area of interest (AOI),
    - An internal resource model and grade-tonnage estimate (non – NI43-101 Compliant) for the Emily Manganese Deposit AOI for future drill targeting purposes.

The mineral resources noted in this section are now considered “historical” in nature. The first references to estimating reserves in Emily District dated from 1950, and these historical works do not comply with the modern industry standards in terms of quality control and quality assurance of the information provided by drilling, sampling and laboratory analysis. It is not possible to track an effective control or work replication for this historical data which do not comply with current NI 43-101 or similar industry standards. For these reasons item “14. Mineral Resources Estimates” of this report supersedes all previous estimations.

The QP has not validated the numbers provided by the previous resources estimates due the lack of reliable information and does not consider the historical estimates as valid or able to be added to the current technical report. The QP understands that none of these historical resource estimates are compliant with Canadian National Instrument 43-101 or similar standards.

7 Geological Setting and Mineralization

7.1 Setting

7.1.1 Bedrock

The Emily Manganese Project is situated within a region of Precambrian bedrock referred to as the Cuyuna Iron Range. The region includes an early Proterozoic sequence of a lower quartz arenite (Pokegama Quartzite), an intermediate iron-formation with intervening black shale (Biwabik Iron Formation) and an upper feldspar-rich greywacke-shale (Virginia Formation). The age of the geologic formation is estimated at 1.9-1.7 billion years old. Figure 7-1 depicts bedrock geology of the Cuyuna Range and Figure 7-2 depicts the Precambrian bedrock of the Project area.

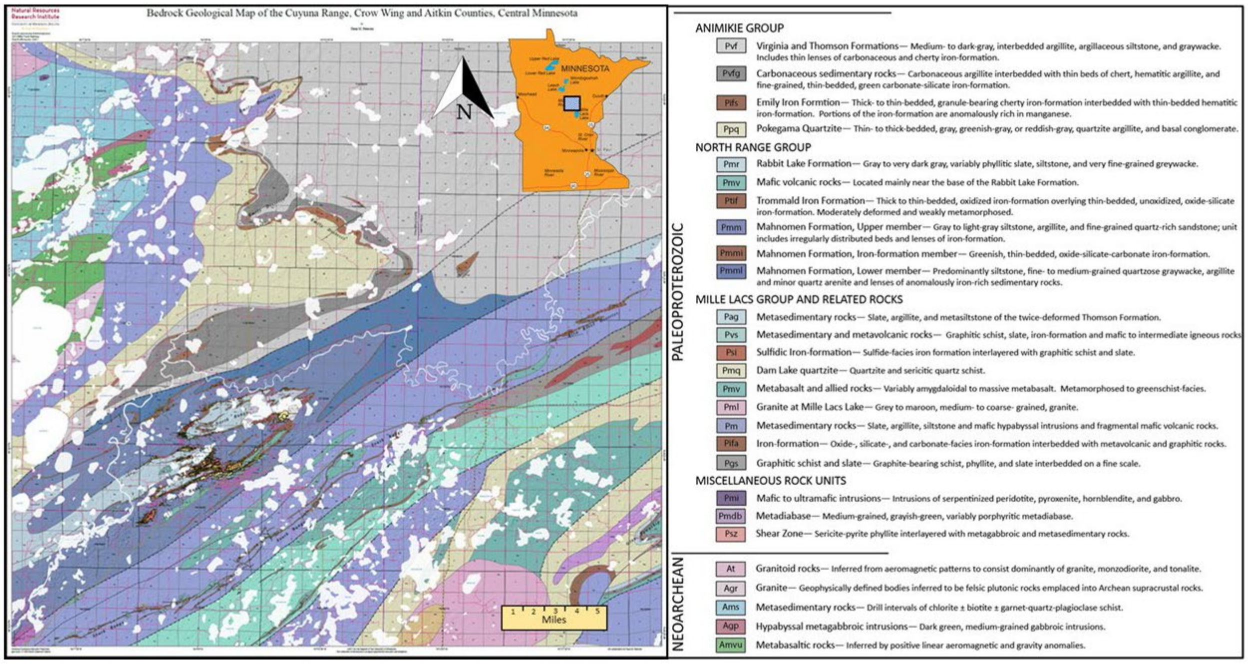


Figure 7-1 Bedrock Geological Map of the Cuyuna Range

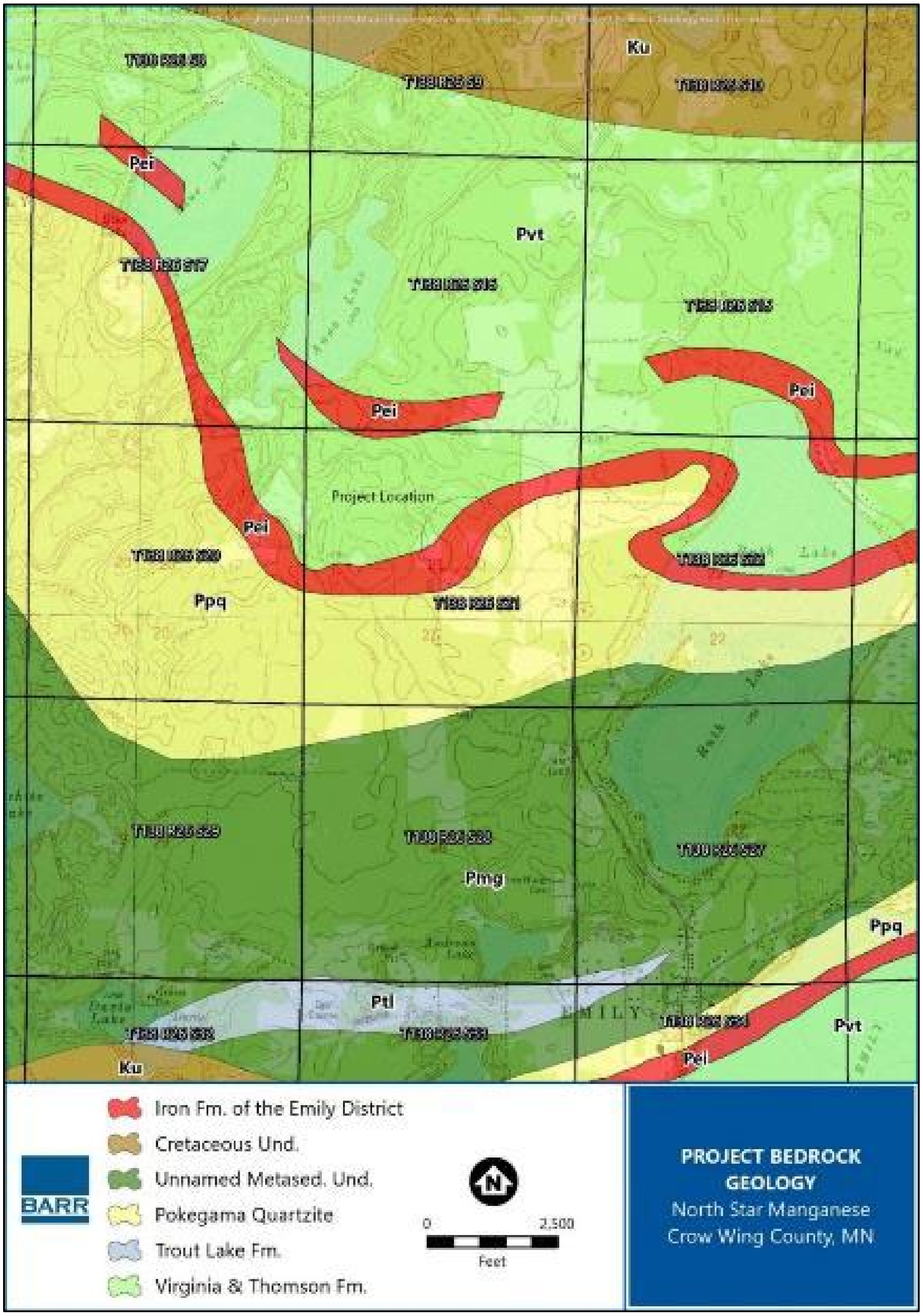


Figure 7-2 Project bedrock geology (2012)

Figure 7-3 shows more recent mapping of the bedrock geology in and around the Project area updated in 2019 by the Natural Resources Research Institute, as well as the historic and current drill holes by various parties (Peterson 2019).

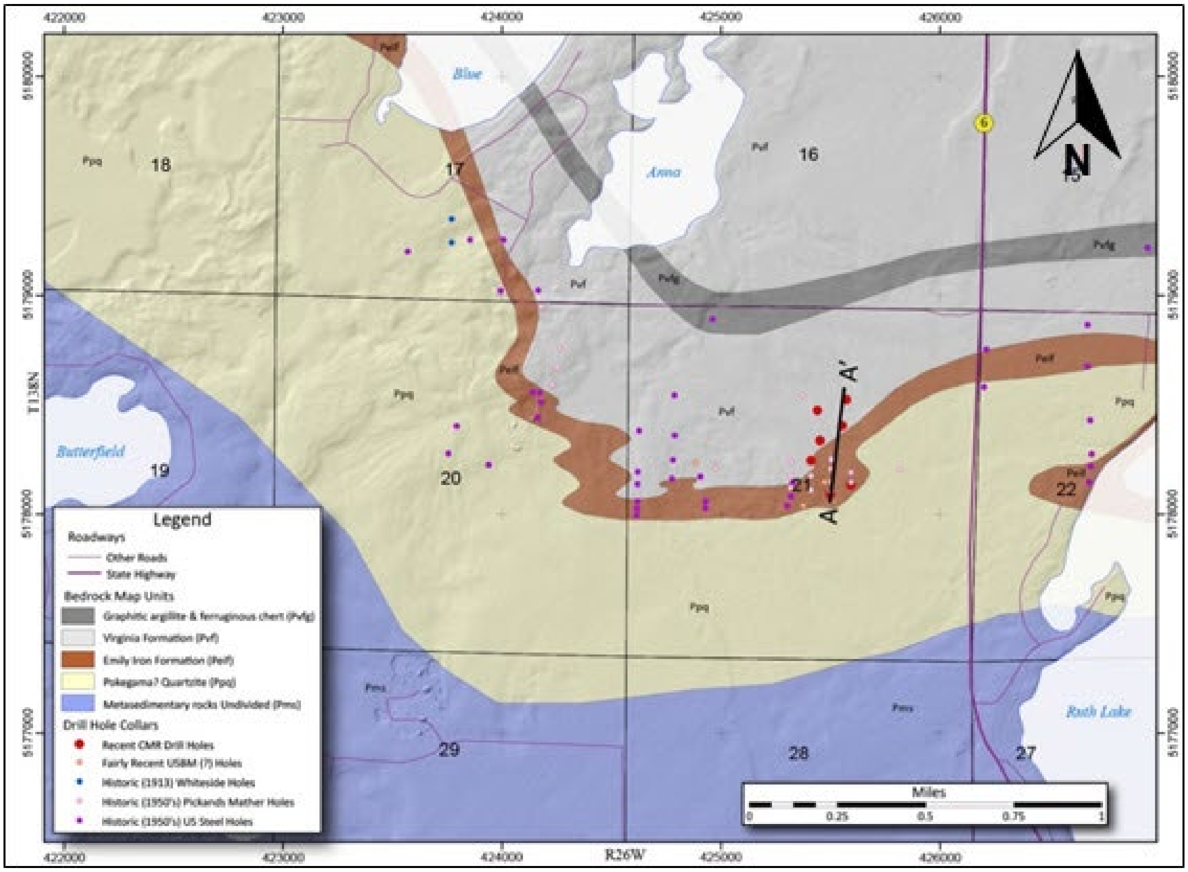


Figure 7-3 Upgraded Project bedrock geology with historic and current drilling

Figure 7-4 shows Cross Section A – A′, (location shown on Figure 7-3) (Peterson 2019).

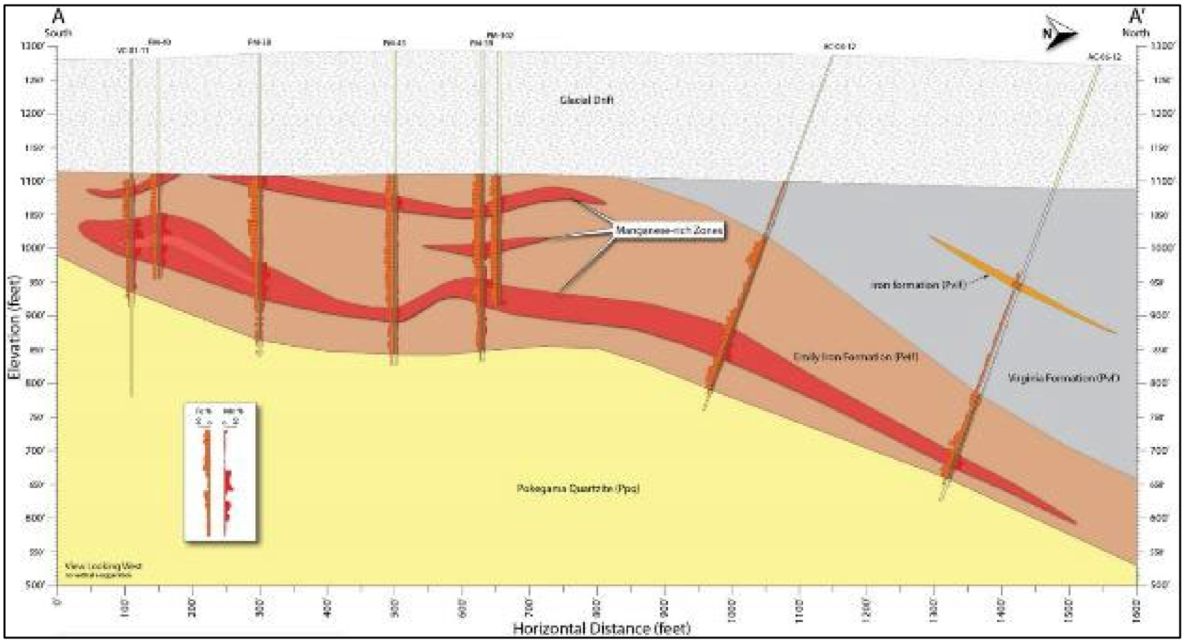


Figure 7-4 Cross Section A – A′, through the Project area

7.1.2 Stratigraphy

The iron formation is divided into three districts: North, South and Emily (Marsden, 1972). The project site is situated in the Emily District which extends from the Mississippi River, northward through the town of Emily and into Cass County. The Biwabik Iron-Formation in the Emily District is occupied by three units of iron-formation: Unit A, Unit B and Unit C separated by intervening sequences of black shale. This information is based on Drill Hole E-1, drilled in 1990 by the University of Minnesota and the U.S. Bureau of Mines. Drill Hole E-1 is located approximately one-half mile west of the Project property (see Figure 7-7). Morey et al., (1991) adopts the stratigraphic correlation of Southwick et al. (1988) that suggests the three iron-formation lenses in the Emily District together occupy the same approximate stratigraphic position as that of the Biwabik Iron-Formation on the Mesabi Iron-Range. Figure 7-5 depicts the stratigraphic correlation of bedrock units between the Mesabi Iron-Range and the Emily District.

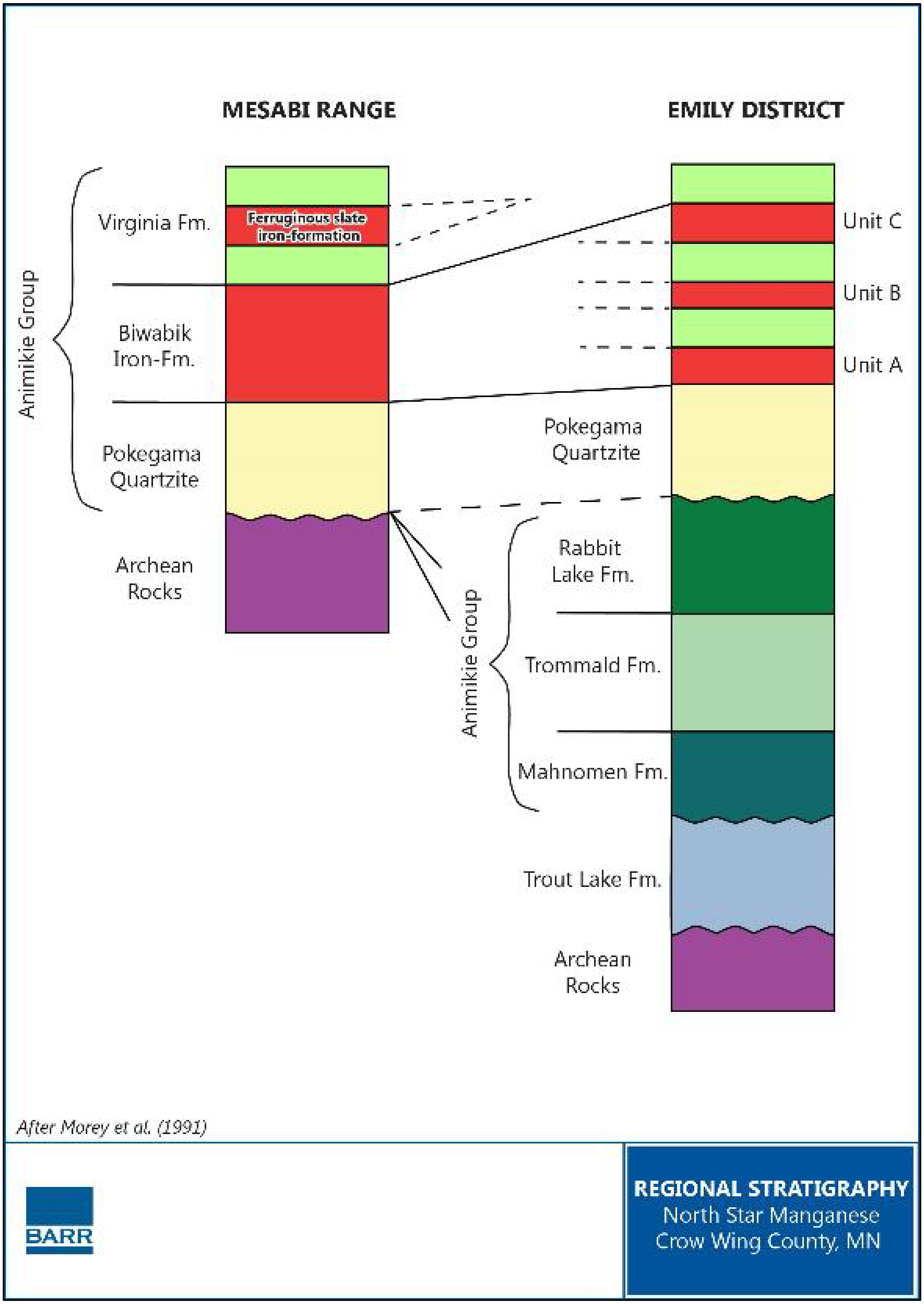


Figure 7-5 Regional stratigraphy

The iron-formations and associated rocks of the Emily District have been pervasively oxidized and leached. Oxidation and leaching are variable, with more oxidation associated with fracture zones along fold hinges (Morey et al., 1991).

The Project area is located in what Morey et al. (1991) describes as the “Ruth Lake Area”. In this area, the iron-formation strikes to the east and dips 15° to 40° to the north. Morey et al. (1991) interprets the site to lie along the north limb of an east-northeast plunging anticline that flattens to the north. The iron-formation is broken by a conjugate set of north-northeast and west-northwest-striking faults with displacements on the order of meters to tens of meters (Figure 7-6).

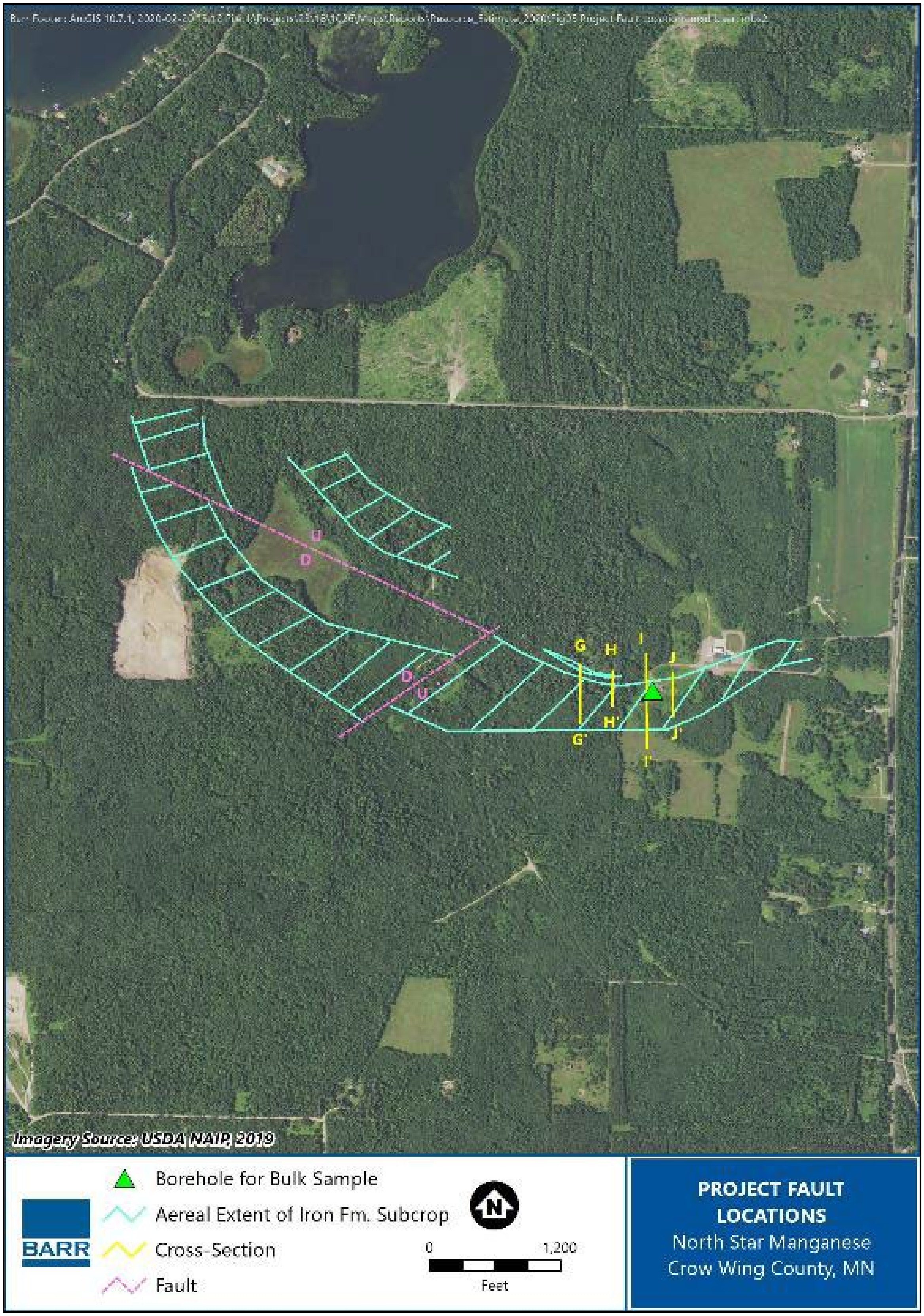


Figure 7-6 **Project fault locations**

The bedrock in the area is overlain by extensive deposits of sand-and-gravel outwash. The sand and gravel were deposited by meltwater from the receding Rainy lobe of the Laurentide Ice Sheet which covered much of northern North America about 75,000 years ago (Setterholm 2004). Surficial peat deposits are present in some locations between Anna Lake and Ruth Lake but the surficial deposits in this area are predominantly highly permeable sand and gravel with little or no silt and clay.

7.2 Mineralization

Unit A iron-formation of the Ruth Lake Area in the Emily District is a sequence of chemically derived sediments that consist of three main units: an upper hematitic chert, a manganiferous iron-formation, and a basal manganiferous, jaspery, oolitic to sandy chert.

Dahl et al., (1994) developed a stratigraphic and petrographic description of Unit A based on the analysis of a core drilled through Unit A in the fall of 1990 (Drill Hole E-1) by the University of Minnesota and the U.S. Bureau of Mines (Figure 7-5). Drill Hole E-1 is located approximately one-half mile west of the Project property. Note, Drill Hole E-1 is west of the Emily resource area described in Unit 14 of this Report and the stratigraphic mineralized units in the Project area are different than those described in Drill Hole E-1.

It is important to note that the Resource estimate for this Technical Report is broken into two distinct zones of mineralization – Upper and Lower Manganese Zones. These zones are interpreted to be within Unit A as described by Morey et al. (1991) but may or may not align with the below descriptions within Drill Hole E-1. Further exploration and geological interpretation will be required to determine any alignment with these zones.

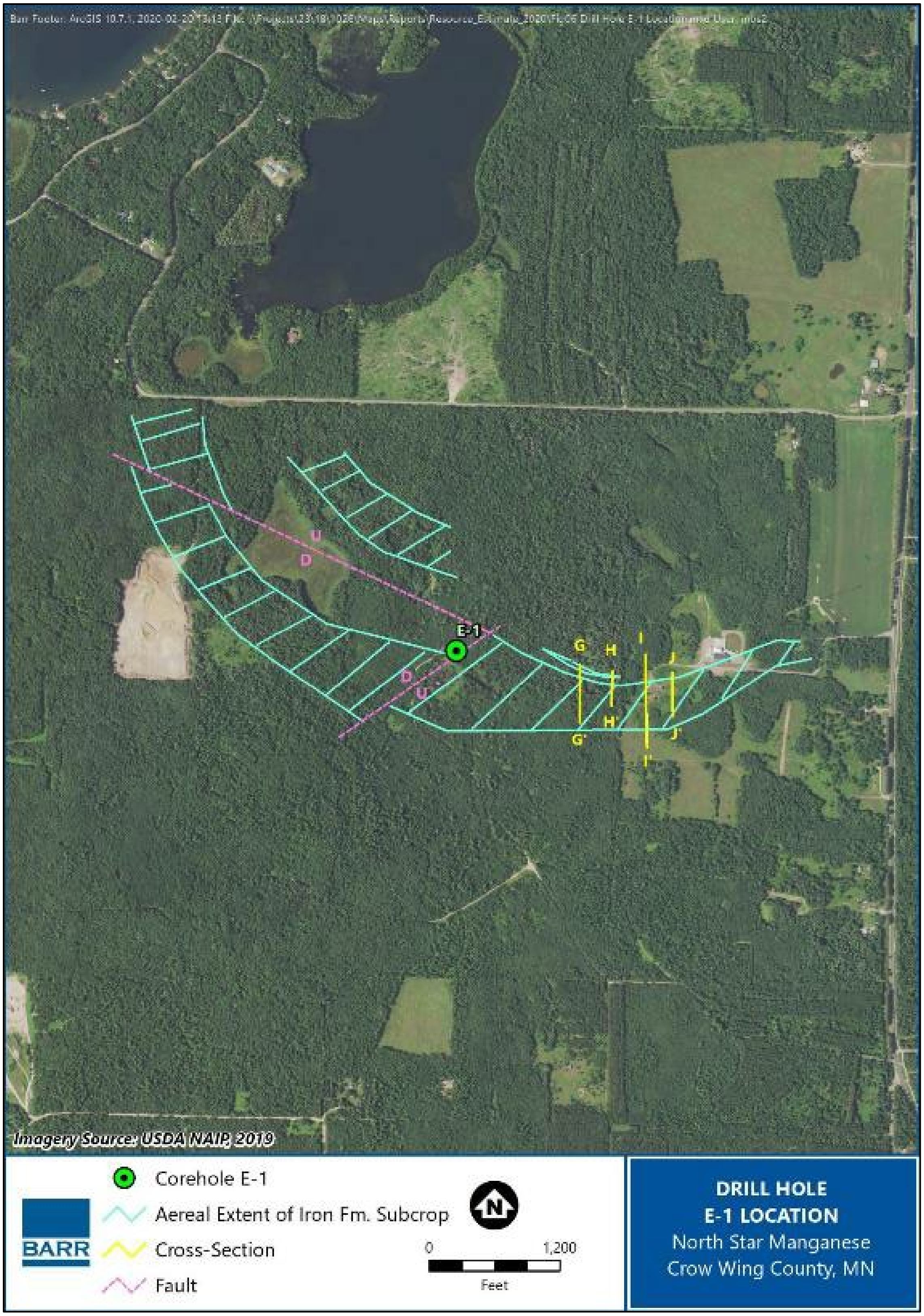


Figure 7-7 Drill hole E-1 location

7.2.1 Upper Unit A, as defined by Drill Hole E1 (Dahl)

Analysis by Dahl et al. (1994) describes the upper 116 feet as finely laminated chert, grading downward to massive, oolitic to granular chert. Minor interbeds of hematite (Fe_2O_3)-chert iron-formation are also present. The lower part of this unit averages 42.6% Fe_2O_3; 53.05% SiO_2, and 0.32% MnO.

7.2.2 Middle Unit A, as defined by Drill Hole E1 (Dahl)

Dahl et al., (1994) describes the middle 297 feet of Unit A as a fine-grained and well-bedded manganiferous iron-formation. Laminated beds consist of fine laths of specular hematite in a chert matrix. More granular layers contain variable amounts of disseminated octahedral hematite, rounded quartz grains, and oolites in a chert matrix. The oolitic structures are composed of alternating rims of chert and hematite in a chert matrix. More granular layers contain variable amounts of disseminated octahedral hematite, rounded quartz grains, and oolites in a chert matrix. The oolitic structures are composed of alternating rims of chert, hematite, and manganese-oxides coating quartz sand or chert. Jaspery, oolitic chert beds 2 to 6 cm thick are interbedded throughout this middle unit. The primary mineralogy and structure of the iron-formation is overprinted by partial to total replacement by hematite, goethite, and manganese-oxides. Manganese enrichment ranges from 0.3% to as high as 45.3% Mn in zones of massive manganese-oxide replacement. The manganese-rich rock (>20% Mn) is more granular than lower grade rocks and contain abundant ovoid-shaped manganese-rich oolites structures. The highest-grade manganese layers are composed of massive, black, metallic manganite.

7.2.3 Lower Unit A, as defined by Drill Hole E1 (Dahl)

Dahl et al., (1994) describes the lower 27 feet of Unit A iron-formation as manganiferous, jaspery, oolitic to sandy chert. The chert consists of terrigenous quartz sand grains, hematite granules, and a variety of oolite types (some of which have manganese-oxide rims). The granular components are cemented by a chert matrix. This unit averages about 10% manganese.

7.2.4 Whole-Rock Chemistry

Dahl et al. (1994) reported whole-rock analyses of samples from core E-1 which show silica, iron-oxide and manganese-oxide as the dominant constituents in Unit A. Total sulphur analyses were performed on both low-grade and high-grade manganese samples from core (Boart-95) by the Natural Resources Research Institute, Coleraine Minerals Research laboratory, University of Minnesota using a Leco sulphur and carbon analysis instrument. Both samples showed 0.015% total sulphur concentrations. There is almost no sulphur in the iron-formation.

X-ray diffraction detected only one manganese-oxide (manganite) throughout Unit A iron-formation (Dahl et al., 1994). Morey et al., (1991) analyzed a variety of samples and found cryptomelane ($K(Mn^{4+}{}_7Mn^{3+})O_{16}$), hollandite ($Ba(Mn^{4+}{}_6Mn^{3+}{}_2)O_{16}$), braunite ($Mn^{2+}Mn^{3+}{}_6[O_8SiO_4]$), and lithiophorite ($(Al,Li)MnO_2(OH)_2$) in addition to manganite. Photomicrograph scans by Hazen (2013) showed that the iron oxide in the Emily mineralization is mostly hematite, often finely intergrown with magnetite.

Morey et al. (1991) notes that magnetite and other ferrous iron components are minor or lacking in the Ruth Lake deposits. This is believed to be the result of (1) accumulation of silica and iron from both anoxic weathering and volcanic sources; (2) upwelling of water rich in silica and iron onto shallow-water shelf environments; and (3) loss of carbon dioxide, triggering the precipitation of siderite. The loss of carbon dioxide resulted in limited magnetite precipitation. Manganese is most highly concentrated in two zones within the iron-formation that, in general, correspond to oolitic-pisolitic lithotopes (Morey et al., 1991). Manganese minerals in both of these zones are chiefly manganite, psilomelane ($(Ba(Mn^{2+})(Mn^{4+})_8O_{16}(OH)_4$ or as $(Ba,H_2O)_2Mn_5O_{10}$) up to 70 to 80% Mn), and cryptomelane. Higher than average concentrations of barium and lower amounts of silica are associated with the two manganese enriched zones. Morey et al., (1991) hypothesized a reflux model whereby manganese and barium were carried to their final depositional sites by anaerobic water systems, and both precipitated as uncemented iron-formation on the seafloor when the anaerobic water met and mixed with aerated water. In this environment, sulphate anion could neither form nor remain to any significant extent, thus explaining the absence of sulphur and sulphur-bearing minerals.

Because the Emily Manganese Deposit is dominated by manganese oxides (mostly the mineral manganite) and iron oxides (mostly hematite) with silica, analyses of manganese-rich drill core samples show an absence of sulphur and sulphur-bearing minerals, seldom containing more than 0.05% sulphur. Based on the testing to date, the mineralization is characterized as sulphide-free. This indicates that future mine development of the Emily Manganese Deposit is unlikely to generate sulphate and acidic waste. Testing to confirm the absence of outflow of acidic water from future process options will be required to meet mandatory mine standards, though testing will still be required since it is mandatory for mining operations in Minnesota.

8 Deposit Type

Deposition of Unit A in the Ruth Lake Area of the Cuyuna Iron Range was interpreted by Morey et al., (1991) to have gradually changed over time from epiclastic sedimentation in shallow water, through a period of chemical precipitation of silica and iron, to a period of epiclastic sedimentation in deeper water. The rock layers within Unit A range from thin-bedded and finely laminated to thick-bedded and granular. According to Morey et al., (1991) these intercalated granular and slaty beds of iron-formation indicate a strandline or a platform-shelf sedimentary environment.

Dahl et al., (1994) interpreted Unit A to have been deposited in a shallow sedimentary basin above the Pokegama Quartzite – an argillized siltstone-slate that grades down-section (to the south) into a white, medium-grained sandstone-quartzite. Manganese is present in the Unit A in the vicinity of the Project area.

The Unit A iron-formation sequence grades into the overlying Virginia Formation through interval bedding. The Virginia Formation is described by Dahl et al., (1994) as a light gray to pale-orange, feldspar-rich, greywacke-shale sequence containing mud rip-up clasts. The unit likely formed in a deep-water turbidite environment. Morey et al. (1991) described this unit as a black argillite or “shale”.

9 Exploration

Exploration has been conducted at the Property since 1943, when Pickens Mather geologist C. C. Carlton and Bethlehem Steel's chief geologist George Adair were involved in the initial discovery of manganese mineralization.

From 1951 through 1959, U.S. Steel (Oliver Mining) undertook extensive geophysical work and exploration, drilling 259 drill holes in the Emily District under contract by the Atkins-Walker Company and E. J. Longyear Inc. None of the U.S Steel drill holes are on the Property, but 3 drill holes are located close to the south-western boundary of the Project property (Strong 1959). The drilling led to a mine design for the West Ruth Lake area (and the nearby East Ruth Lake and Lake Mary mines). The mineralized portion of the Project area was included in the U.S. Steel West Ruth Lake Mine plan.

This early work was followed by an exploration program that lasted until 1962 and Pickens Mather geologist J. V. Everett logged most of the drill core.

The early Pickens Mather drill holes were drilled by S. E. Atkins Company, using a steam powered drill with a rod extraction tripod, and E. J. Longyear Inc. using a gasoline powered drill. Recovery was reported as similar for the two drilling contractors.

In 1995, a rotasonic exploration drill hole was completed by Ray Huff and Associates using a Boart Longyear Rota-Sonic drill rig. The US Bureau of Mines undertook chemical analysis at ALS Chemex for the samples taken from this hole.

In 2008 CMR acquired the property and initiated its exploration and test mining of the Project. In 2009, Barr was hired to undertake a geotechnical drilling program. This was followed by Rice Lake Construction Drilling Program 2009-2011 for the borehole mining test.

In 2011, CMR hired Barr to manage the exploration activities. Three diamond core drill holes and one rotasonic drill hole were completed by Barr as part of a resource delineation program. Samples were collected and logged by Barr geologists B. Dunn (QP) and L. Johnson and sawn half-core was logged and sampled under the direct supervision of B. Dunn. Samples were selected and recorded by B. Dunn at CMRL in Coleraine, Minnesota and then analyzed by AcmeLabs in Vancouver, Canada.

In 2012, four diamond drill holes were completed by Barr as part of an extended resource delineation program. Samples were collected and logged by Barr geologists B. Dunn, L. Johnson, E. Considine and K. Hashimoto. The core was cut in half under the direct supervision of B. Dunn at CMRL in Coleraine, Minnesota. Assay samples were selected and recorded by B. Dunn at Coleraine, Minnesota and then analyzed by AcmeLabs in Vancouver, Canada.

The current Technical Report Resource Estimate uses only data from 2011 and 2012 work programs, and subsequent Barr reports.

10 Drilling

A total of eight drilling programs have been performed at or adjacent the Project since 1945, and are summarized below:

- Pickens Mather Exploration Drilling Program 1945-1950
  - Two drilling contractors (S.E. Atkins and E. J. Longyear) were used over a period of five years to explore manganese mineralization
  - Small diameter EX and AX diamond core was used
  - 13 drill holes were completed within the area of interest
  - Assaying of drill samples was undertaken by the Lerch Brothers laboratory in Hibbing, Minnesota
- U.S. Steel Exploration Drilling Program 1951 - 1959
  - Two drilling contractors (Atkins-Walker Company and E. J. Longyear) worked over a period of eight years to explore iron and manganese mineralization
  - Multiple diameter AX, BX and NX (conventional and wireline) diamond core was used
  - 3 drill holes were completed adjacent to the Project area, and 35 additional drill holes were completed in the expanded area of Sections 15, 17, 20, 21 and 22
  - Assaying of drill samples was undertaken by the U.S. Steel laboratory in Coleraine, Minnesota
- Ray Huff & Associates Exploration Drilling Program 1995
  - Boart Longyear were contracted as the drilling company to confirm manganese mineralization
  - A large diameter rotasonic drill hole was used
  - 1 drill hole was completed within the area of interest
  - ALS Chemex laboratories performed the drill sample analyses
- Barr Engineering Hydrogeological Drilling Program 2009
  - Lambert drilling was contracted as the drilling company to install groundwater monitoring wells to assist with subsidence study associated with the upcoming borehole mining pilot test
  - Large diameter mud rotary holes were used

    - 8 drill holes were completed within the area of interest
    - No assay samples were collected
- Barr Engineering Geotechnical Drilling Program 2009
    - IDEA drilling was contracted as the drilling company to assist with subsidence study associated with the upcoming borehole mining pilot test
    - HQ diameter triple tube diamond core was used
    - 1 drill hole was completed within the area of interest
    - No assay samples were collected
- Rice Lake Construction Borehole Mining Collection Drilling Program 2009-2011
    - Lambert drilling was contracted as the drilling company to install borehole mining tool
    - A large diameter mud rotary hole was used
    - 1 drill hole was completed within the area of interest
    - No assay samples were collected
- Barr Engineering Exploration Drilling Program 2011
    - Boart Longyear was contracted as the drilling company to confirm and explore manganese mineralization
    - A large diameter rotasonic hole and HQ diameter triple tube diamond core was used
    - 4 drill holes were completed within the area of interest (1 rotasonic and 3 diamond core)
    - AcmeLabs laboratory in Vancouver, Canada undertook assaying of drill samples
- Barr Engineering Exploration Drilling Program 2012
    - Major Drilling was contracted as the drilling company to confirm and explore manganese mineralization
    - 4 drill holes were completed within the area of interest (all diamond core)
    - Drill samples were collected for assay and AcmeLabs laboratory in Vancouver, Canada performed the analyses

In total, 35 drill holes have been completed within or adjacent to the Emily manganese deposit since 1945 using a variety of drilling and sampling techniques as listed above.

From these 35 drill holes, 25 were sampled for resource estimation, and 12 were drilled for either geotechnical, hydrogeological, or pilot borehole mining investigations.

From the 25 sampled drill holes, Barr used assay data for the 2013 resource estimate from 20 drill holes (13 Pickens Mather exploration drill holes from the 1945 to 1950 program, three Barr exploration drill holes from the 2011 program, and four Barr exploration drill holes from the 2012 program). The remaining five drill holes (3-US Steel drill holes adjacent to the Project, 1-Ray Huff & Associates exploration drill hole from the 1995 program, and 1-Barr exploration drill hole from the 2011 program) were not considered for assay data inclusion because they had samples collected from unseen core and rotasonic drill holes were deemed inappropriate because of insufficient evidence of core recovery, unclear sample intervals and sampling irregularities of the rotasonic drilling method.

The Pickens Mather exploration drill hole assay results were confirmed and deemed appropriate to use for resource estimation by Barr through twinned drill holes during the 2011 exploration program (drill holes VC-01-11 and 40).

Table 10-1 summarizes project drill holes with assay data completed between 1945 and 2012.

Table 10-1 Project Drill Holes with Assay Data Completed Between 1945 and 2012

Start/Finish Dates	Company	Hole Number	Grid East	Grid North	Elevation	Azimuth	Dip	Hole Length (ft)
October 4, 1945- July 7, 1949	Pickens Mather	16	2693198	967232	1292.1	0	-90	485
September 27, 1947- November 20, 1947	Pickens Mather	35	2693198	967432	1299.9	0	-90	368
*	Pickens Mather	36	2692898	967432	*	0	-90	315
*	Pickens Mather	37	2692898	967632	*	0	-90	365
April 2, 1948- June 1, 1948	Pickens Mather	38	2693498	967342	1289.4	0	-90	450
June 7, 1948- August 2, 1948	Pickens Mather	39	2693498	967542	1293.7	0	-90	460
August 9, 1948- September 12, 1948	Pickens Mather	40	2693498	967192	1281.2	0	-90	327
September 24, 1948- October 19, 1948	Pickens Mather	41	2693798	967342	1297.1	0	-90	315
October 22, 1948- November 29, 1948	Pickens Mather	42	2693798	967492	1298.2	0	-90	340
December 2, 1948-February 17, 1949	Pickens Mather	43	2693498	967692	1293.9	0	-90	465
November 11, 1949- June 2, 1950	Pickens Mather	301	2692898	967245	*	0	-90	550

Start/Finish Dates	Company	Hole Number	Grid East	Grid North	Elevation	Azimuth	Dip	Hole Length (ft)
February 2, 1950- March 16, 1950	Pickens Mather	302	2693498	967672	*	0	-90	376
March 20, 1950- April 26, 1950	Pickens Mather	303	2693198	967212	*	0	-90	360
September 14, 2011- September 24, 2011	Barr	VC-01-11	2693490	967158.5	1281.5	0	-90	500
September 20, 2011- October 5, 2011	Barr	AC-01-11	2693195	967661.8	1301.4	180	-70	585
October 4, 2011- October 8, 2011	Barr	AC-02-11	2693794	967301	1296.2	180	-70	330
September 17, 2012- October 8, 2012	Barr	AC-03-12	2693324	967960.9	1294.8	180	-70	644
October 15, 2012- October 20, 2012	Barr	AC-04-12	2693652	968194	1286.2	180	-70	561
October 23, 2012- November 15, 2012	Barr	AC-05-12	2693279	968410.6	1288	180	-70	678.5
November 17, 2012- November 27, 2012	Barr	AC-06-12	2693711	968580.7	1272.2	180	-70	687

*data not available

Figure 10-1 and Figure 10-2 illustrate typical samples from the Barr Drilling during 2011.

Figure 10-1 Example of Manganese Mineralization. Drill cutting sample from rotasonic drill hole VS-01-11

Figure 10-2 Example of Manganese Mineralization – core from diamond drill hole VC-01-11

Figure 10-3 shows the locations of the drill holes used in the 2020 Resource Estimate

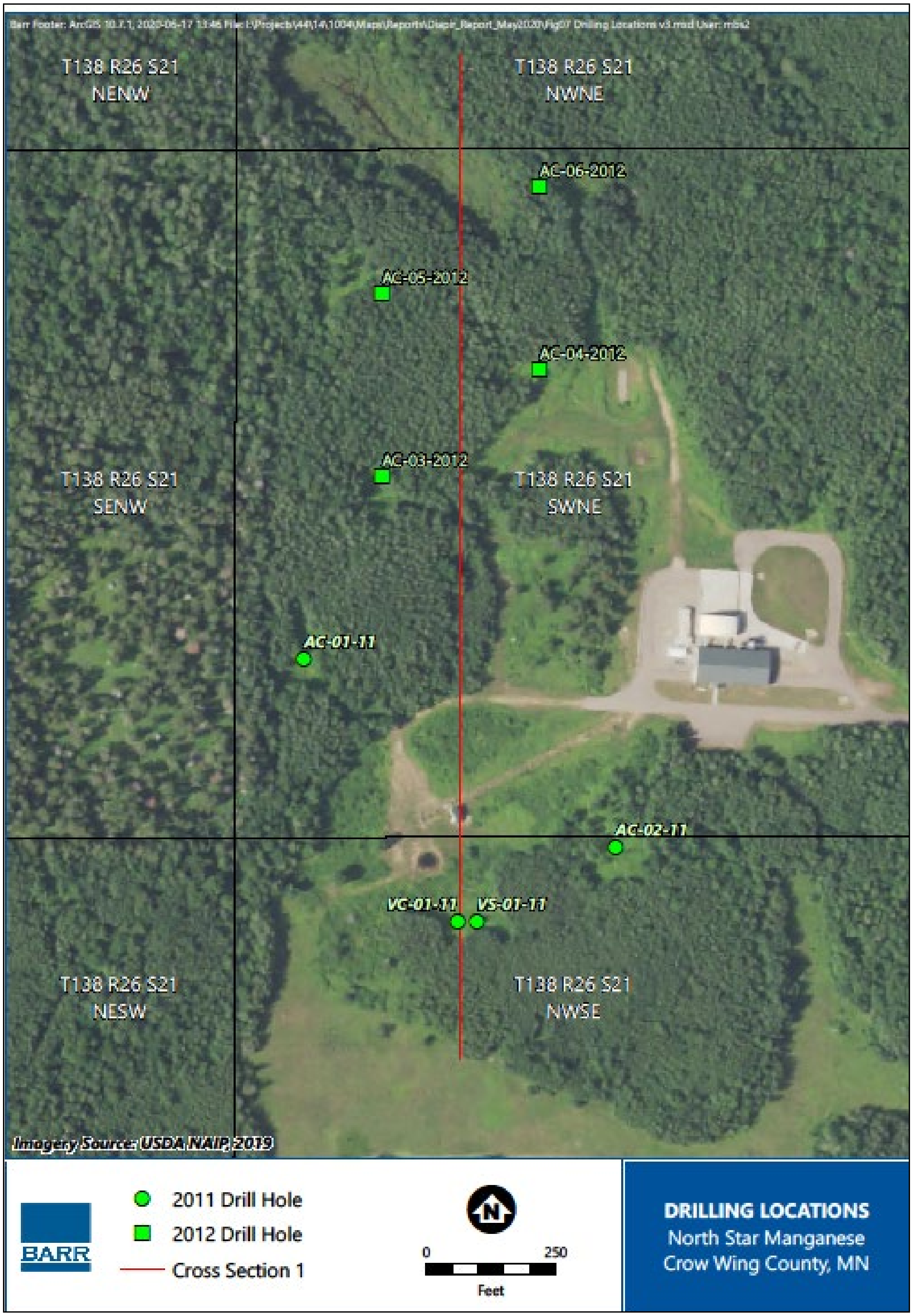


Figure 10-3 Drill hole locations used in the 2020 Resource Estimate

Cross Section 1 shown on Figure 10-3 is discussed in Item 14.1.2 and displayed on Figure 14-2.

The drillhole information used in the current technical report depend on the dip of the drillhole, and the angle the hole intersected the manganese mineralized layers. True thickness of mineralization can range was 90% to 99% of the sample length.

Table 10.2 shows the mineralized intervals with the apparent and true length intervals.

Table 10-2 Drilling with the True and Apparent Length Intervals

Start/Finish Dates	Company	Hole Number	From (ft)	To (ft)	Interval (ft)	Drillhole Dip (degrees)	Layer Dip (degrees)
September 20, 2011-October 5, 2011	Barr	AC-01-11	340.50	360.50	20.00	71.2	19.3
	Barr	AC-01-11	480.00	508.00	28.00	71.2	19.3
	Barr	AC-01-11	559.00	564.00	5.00	71.2	19.3
October 4, 2011-October 8, 2011	Barr	AC-02-11	244.00	273.00	29.00	71.3	17.7
October 15, 2012-October 20, 2012	Barr	AC-04-12	456.50	479.50	23.00	72.9	17.2
November 17, 2012-November 27, 2012	Barr	AC-06-12	616.50	636.50	20.00	71.8	20.7
September 17, 2012-October 8, 2012	Barr	AC-3B-12	409.00	417.50	8.50	66.5	18.7
	Barr	AC-3B-12	453.50	474.50	21.00	66.5	18.7
	Barr	AC-3B-12	528.00	533.00	5.00	66.5	18.7
	Barr	AC-3B-12	533.00	536.00	3.00	66.5	18.7
	Barr	AC-3B-12	536.00	541.00	5.00	66.5	18.7
September 14, 2011-September 24, 2011	Barr	VC-01-11	237.00	270.50	33.50	90.0	17.7
	Barr	VC-01-11	281.00	300.00	19.00	90.0	17.7
	Barr	VC-01-11	336.00	342.00	6.00	90.0	17.7

Note, hole AC-05-12, while drilled during the 2012 program, did not intercept any significant manganese mineralization above the minimum cut-off grade of 5.0%.

Table 10-3 shows the mineralized intervals in the drillholes used for the estimation in the current technical report, at a 10% cut-off of Mn.

Table 10-3 Drilling Results used in the Resource Estimate (2020)

Start/Finish Dates	Company	Hole Number	From (ft)	To (ft)	Interval (ft)	Mn%
September 20, 2011-October 5, 2011	Barr	AC-01-11	340.5	360.5	20	22.77
	Barr	AC-01-11	480	508	28	24.74
October 4, 2011-October 8, 2011	Barr	AC-02-11	559	564	34	29.94
October 15, 2012-October 20, 2012	Barr	AC-04-12	456.5	479.5	23	18.69
November 17, 2012-November 27, 2012	Barr	AC-06-12	616.5	636.5	20	16.23
September 17, 2012-October 8, 2012	Barr	AC-3B-12	409	417.5	8.5	16.85
	Barr	AC-3B-12	453.5	474.5	21	14.19
	Barr	AC-3B-12	528	541	13	14.40
September 14, 2011-September 24, 2011	Barr	VC-01-11	237	270.5	33.5	29.81
	Barr	VC-01-11	281	300	19.0	21.60
	Barr	VC-01-11	336	342	6	12.58

11 Sample Preparation, Analyses and Security

11.1 Sample Selection

Samples from the exploration drilling program exhibiting mineralization or alteration were selected by Barr from diamond core at CMRL at Coleraine. The sample lengths were required to be no longer than five feet and no shorter than one foot, except in exceptional circumstances, and Barr used best judgment to make this decision. The samples were marked by stapling a duplicate Tyvek sample tag on each core box (Figure 11-1).

Figure 11-1 Drill core sample boxes with tags

Barr sampled continuously through the mineralized zone from hanging-wall to footwall. At least three feet of hanging-wall lithology and three feet of foot-wall lithology were required to be sampled in order to define assay boundaries of the mineralized zone. Areas of barren rock within the zone were required to be sampled to identify internal dilution.

Figure 11-2 Sample bags

Sample tags were placed in the polyethylene bag with the core, in the corresponding core box at the beginning of the sample interval, and in a sample book for future reference. The polyethylene bag was then sealed with a plastic tie, placed in a plastic bucket (Figure 11-3) and then sealed with a lid.

Figure 11-3 Sample buckets

The residual half of the core remained in the core box. The sample tag number, drill hole number, interval, and location were recorded in a sample tag book.

Blank samples were supplied by CMRL and were carefully selected so as to bear similar traits to the core recovered at the Project. CMRL regularly works with banded iron formation samples with very low manganese content, and core resembling the exploration drilling program core was abundantly sourced.

Field duplicates were collected by taking two quarters of the selected sample interval and placing each in a polyethylene bag with sample tags that were sequential with the other samples in that group. The remaining half of core was placed back in the core box.

Manganese standard samples were supplied by CMRL. A manganese standard sample was diluted using a hematite standard to produce a complete range of manganese standards in a hematite matrix to closely simulate the Emily manganese grades in their hematite matrix.

For every group of thirty samples, a blank sample was placed as the fourth sample, every seventeenth sample was a field duplicate, and every twenty ninth sample was a standard. Continuous numbering was used for each group.

The sample buckets were labeled, wrapped in cling film (Figure 11-4) and then shipped from Coleraine, Minnesota via FedEx to Blaine, Washington and then via truck across the Canadian border to the analysis lab in Vancouver, British Columbia. Sample rejects were requested to be returned to CMR for storage and future reference.

This sampling protocol was undertaken by one geologist in order to maintain consistency and quality.

Figure 11-4 Samples prepared for shipment

11.2 Sample Preparation, Analysis and Security

Sample analysis of the exploration drilling program was performed by AcmeLabs in Vancouver, Canada.

Sample preparation consisted of rock and drill core crushed to 80% passing 10 mesh (2mm), homogenized, riffle split to 250g and then pulverized to 85% passing 200 mesh (75 microns). The crusher and pulverizer were routinely cleaned by brush and compressed air between samples. A granite/quartz wash scoured equipment after high grade samples, between changes in rock color, and at the end of each file. Granite/quartz was crushed and pulverized as the first sample in sequence and then carried through to analysis.

Each analysis was a whole rock reading by X-Ray spectrometer. A predetermined amount of sample was roasted to determine the loss on ignition. The roasted sample was then fused in a platinum-gold crucible with a commercial lithium tetraborate flux. The molten material was then cast in a platinum mold.

Fused discs were analyzed by X-Ray spectrometer. Total carbon and sulphur were determined by the Leco method.

The samples arrived via truck over the Canadian border from the AcmeLabs depot in Blaine, Washington. The shipment was inspected for completeness as documented in the sample submission sheets filled out by Barr.

The samples were sorted and inspected for quality of use (quantity and condition). Pulp samples were inspected for homogeneity and fineness.

11.3 QP's Opinion

It is the QP's opinion that the sample preparation and analytical procedures put in place by CMR meet acceptable industry standards and that the information can be used for geological and resource modeling.

While the sample preparation and analytical procedures used prior to CMR involvement did meet the acceptable industry standards of the time, and the information can be used for geological interpretation, it does not comply with current NI 43-101 or similar industry standards.

12 Data Verification

A database was put together as part of the modeling effort for the Project. Data verification consisted of gathering and organizing all of the drilling, assay, and geological data deemed appropriate to be used for the resource estimation by Barr, followed by statistical and geostatistical analysis.

12.1 Data Set

Barr created the Project data in a number of different formats, including:

- Drill hole database

  Data initially stored as .CSV files and then imported into a mine planning software propriety database

- Project data sets

  These hold the drilling information in Microsoft Excel in text format .CSV files

12.2 Database Organization

The information was organized in Microsoft Excel tables including:

- Collar table: this stores the local coordinates, total length, azimuth, and dip of the drill hole, and various other items related to the Project
- Survey table: this carries the down hole survey data including the depth, azimuth and dip
- Assay table: this contains the from-to interval, and individual assay items
- Lithology table: this contains the from-to interval, with lithology abbreviations
- Dictionary table: this contains the definitions of the geological zones, descriptions, and codes

Original data, such as handwritten logs and grade element data are considered to be the most reliable data source.

12.3 Data Set Verification

All of the data from the .CSV text files were compiled, verified, and stored in the database. This methodology helped to check the from-to computer record level for every item defined from the sources described above. Data sorting was performed when loading the original text files into the database to ensure that the data was within acceptable limits. Any suspicious data missing or out of range was flagged. The database was also subjected to a validation routine provided by mine planning software that checks for obvious errors such as inconsistent drill hole lengths, zero length intervals, out of sequence intervals, and missing intervals.

12.4 QP's Opinion

The QP believes the sampling practices adopted by CMR meets current industry standards. The QP also believes that the sample database provided by CMR and validated by the QP is suitable to support the resource estimation.

13 Mineral Processing and Metallurgical Testing

13.1 United States Bureau of Mines Test Work

The United States Bureau of Mines Twin Cities Research Center in Minneapolis, Minnesota undertook extensive research into the extraction of manganese from enriched zones in Minnesota in the early 1990s. A paper describing the Emily deposit is included in the Society of Mining, Metallurgy, and Exploration (SME) 1992 Transactions, Volume 294. This paper discusses an *in situ* mining research program. The Bureau conducted site characterization studies on the Emily deposit, including regional stratigraphic relationships from existing geologic databases, ore body geometry, geologic structure, hydrologic conditions, accessibility of ore minerals to a leach field, surface subsidence potential and data collected from laboratory leaching experiments. This information was used to evaluate the technical, environmental, and economic feasibility of *in situ* mining of manganese at the Emily deposit. In 1996, the Bureau published three reports based upon findings from a chemical analysis of 47 intervals of core drilled at the Project. These reports discuss correlations between main oxides found within the ore and also provide estimations of contained manganese (see Item 6 History).

13.2 Coleraine Minerals Research Laboratory Test Work

The CMRL in Coleraine, Minnesota has had possession of manganese ore from the Project since 1995 when a sonic drill hole was completed, and from a borehole mining pilot test that took place from 2009 to 2011. This totaled approximately 600 tons of material. Most of the material was used for testing, and residual material from CMRL, following the completion of the program, was shipped to Midland Research, Nashwauk, Minnesota.

13.2.1 Manganese Ore Analysis

CMR requested CMRL to evaluate manganese ore samples taken in 1995, 2009 and 2011. The ore samples consisted of manganiferous iron ore containing manganese minerals in the form of pyrolusite (63% Mn), manganite, and psilomelane (70-80% manganous oxide). Drill core samples from 2009 were logged and mineral identification conducted on core footage sections taken. Drill core material from 1995 was used for process upgrading experimental work. Manganese ore from the Emily demonstration plant delivered to CMRL in 2011 was dried and loaded into 55-gallon drums. Additional truckloads of the CMR Emily manganese ore were stored at Midland Research, Nashwauk, Minnesota.

Working with the 1995 core samples initially, experimental work indicated that the upper level (200-300 ft) of lower grade ore (average 8.7% MnO_2) was difficult to process using standard mineral processing physical separation methods due to the large fraction of very fine (minus 500-Mesh; 25 micron) material and the association of the manganese grains with iron and silica even at this very fine grind. Additional experimental work indicated that the lower level (300-400 ft) of higher-grade ore (average 23.6% MnO_2) could be physically upgraded using gravity concentration methods and high intensity magnetic separation to a grade of 33.7% MnO_2 and further upgraded to 43% MnO_2 using additional chemical flotation techniques. Because of the overall poor upgrading ability and recovery of the manganiferous Emily ore using a combination of gravity and high intensity magnetic separation techniques followed by chemical flotation, it was highly recommended that SO_2 leaching be the focus of further test work for efficiently extracting manganese from the manganiferous iron ore. Many world class manganese mining operations utilize SO_2 leaching because of the low cost and high manganese extraction efficiency of the process which is carried out at ambient temperature and atmospheric pressure in open leaching tanks. Once manganese is selectively brought into solution with SO_2, it can then be oxidized to form chemical manganese dioxide (CMD) which is one of the more valuable forms of manganese in high demand throughout the world. The CMD can then be converted to lithium battery grade manganese dioxide for use in the rechargeable electric car battery industry and other lithium battery applications.

13.3 Barr Mineralogy Test Work

Barr performed a combination of mineralogical analysis, process test work, process flowsheet development, and preliminary cost estimation for CMR in 2013. This resulted in demonstration of technical feasibility of producing purified electrolytic manganese metal (EMM) and purified manganese dioxide (EMD), and it provided insights into the future work that is needed to develop the Project.

13.3.1 Mineralogical Analysis

Based on the 2011-2012 drill cores, the mineralogy of the Project was quantified through mineral liberation analysis (MLA), confirming the Mn and Fe measurements previous conducted via whole rock analysis and indicating that the Fe is primarily in the form of hematite and the Mn is primarily in the form of manganese oxides (approximated as MnO_2). The bulk of the material consists of iron oxides, manganese oxides, and silica with other minor constituents present in varying amounts, depending on the drill core measured. In fact, the Project material was found to be quite variable among the multiple drill cores, indicating a deposit that requires a careful mine plan for efficient production.

Previous beneficiation work conducted by CMRL on material from the Project had proved to be very difficult. The MLA analysis indicated fine dissemination of quartz, hematite, and manganese oxide, further confirming that physical beneficiation is not sufficient to upgrade the Mn to a saleable product. MLA seemed to indicate that a large amount of the silica gangue (perhaps up to 50%) could be liberated from the matrix, but full upgrading to EMM or EMD products would require chemical leaching of the material.

13.3.1.1 Process Test Work

Based on the results of the MLA, conceptual process schemes were developed. The steps of these conceptual processes indicated which process test work would be required for this initial investigation. This included comminution, gravity and magnetic separation for pre-concentration, and chemical leaching. A representative bulk sample was assembled from the available 2011-2012 exploration drill cores and used to conduct the necessary test work to clarify and quantify the conceptual process flows.

Comminution

Regardless of the process option chosen, some sort of comminution will be required. The type of process utilized determines the extent to which crushing and grinding must be conducted. It is typical to conduct grindability testing on the subject material to provide work index information for design of crushing and grinding equipment after the extent of comminution has been decided. Comminution work conducted at Hazen Research, Inc. (Hazen) yielded Bond rod mill and Bond ball mill work indexes of 14.4kWh/mt and 15.8 kWh/mt, respectively, indicating relatively hard rock similar to material mined on the Mesabi Iron Range.

Gravity Separation

One method of pre-concentration that was identified was gravity separation. Barr enlisted the services of Hazen to test the gravity pre-concentration of the material using both spiral separators and shaking tables. Initial diagnostic tests using heavy liquid separation indicated the potential to remove up to 50% of the quartz while rejecting only 2-5% of the Mn and Fe. Spiral and shaking table experiments, however, proved difficult, and very little gangue material could be removed efficiently from the feed.

Magnetic Separation

The second method of pre-concentration investigated involved high-intensity magnetic separation, namely the SLon technology distributed by Outotec. Barr provided Outotec with both ROM feed and gravity pre-concentrate to evaluate the suitability of the SLon to reject quartz while maintaining high recovery of Fe and Mn. Outotec investigated several operational variables and found an optimum setting for operation. However, the ability to reject relatively pure quartz and maintain high Fe and Mn recoveries remained elusive.

Leaching

Regardless of whether or not pre-concentration is used, chemical leaching was deemed necessary for the full upgrading of Mn for the Project. Barr contracted with Kemetco Research, Inc. (Kemetco), which conducted parametric leach tests on both ROM and gravity pre-concentrate feed streams to provide an initial determination of the optimal leaching conditions and the ultimate Mn recovery that could be expected from the process. SO_2-based leaching was selected because it is the most common approach used in commercial upgrading of Mn. Using an SO_2-based leaching protocol, Kemetco demonstrated that >80% of the Mn could be recovered from the feed without the need for pre-concentration. Kemetco also performed a larger batch leach and fed the purified leach solution to a laboratory-scale electrowinning setup to produce both EMM and EMD products.

13.3.1.2 Process Development

Barr used the results of the process test work to prepare initial conceptual process flow schemes into preliminary process flow diagrams.

13.3.1.3 Path Forward

Additional work is recommended, including the refinement and optimization of the comminution and leaching circuits (interdependent), investigation into recovery of an iron concentrate from the leach tailings, and additional testing related to tailings management. In the future, a pilot-scale demonstration of the refined process is recommended to further refine the flowsheet and generate appropriate capital and operating cost estimates.

14 Mineral Resource Estimates

14.1 Mineral Resource Estimation Procedure

14.1.1 Drill Hole Database

A drill hole database was compiled from the 2011 and 2012 drilling program. Appendix 1 show this database which contains drillhole ID, elevations, eastings, northings, depth, sample intervals, assay results, and lithology interpretations used for the 2020 Resource Estimate.

14.1.2 Geological Interpretation

Based on analysis of historical drill hole data and cross-sections, geological reports of the deposit, and the 2011 and 2012 drilling results, Barr created a geologic block model for the deposit. The lithology is based largely on the assay results, where the high-manganese zones are clearly evident as separate units. Table 14-1 shows the lithology codes used in the block model creation

Table 14-1 Lithologic Codes

Lithocode	Description
OB	Glacial Overburden
IF1	Upper iron formation unit
UM_MN	Upper member of high-grade manganese
IF2	Middle iron formation unit
LM_MN	Lower member of high-grade manganese
IF3	Lowest iron formation unit
FW	Footwall of the deposit, quartzite unit

Once the lithological units were determined, a 3D geology model of the deposit was created. The modeling process involves creating a series of cross-sections, using the drill hole data as a guide. 3D surfaces of each lithology were created using Maptek Vulcan™ Integrated Stratigraphic Modelling routine. Several modeling algorithms were reviewed, and a best fit was observed by using the Inverse Distance Squared method, applying a Trend Order of 1, and a Smoothing Factor of 9. The maximum search distance was set to 5,000 feet so that the top and bottom of the lithology surfaces would be extrapolated past the block model extents. The surfaces generated in the geology model revealed that the general geometry of the deposit is consistent with historical representations. In general, the deposit dips northward between 15 – 25 degrees. The deposit is part of a large-scale northwesterly plunging syncline with a northeasterly strike. Figure 14-1 displays Barr's graphic representation of the 3D geology model. The upper member of the high-grade manganese zone is colored orange, and the lower member of the high-grade manganese zone is colored purple.

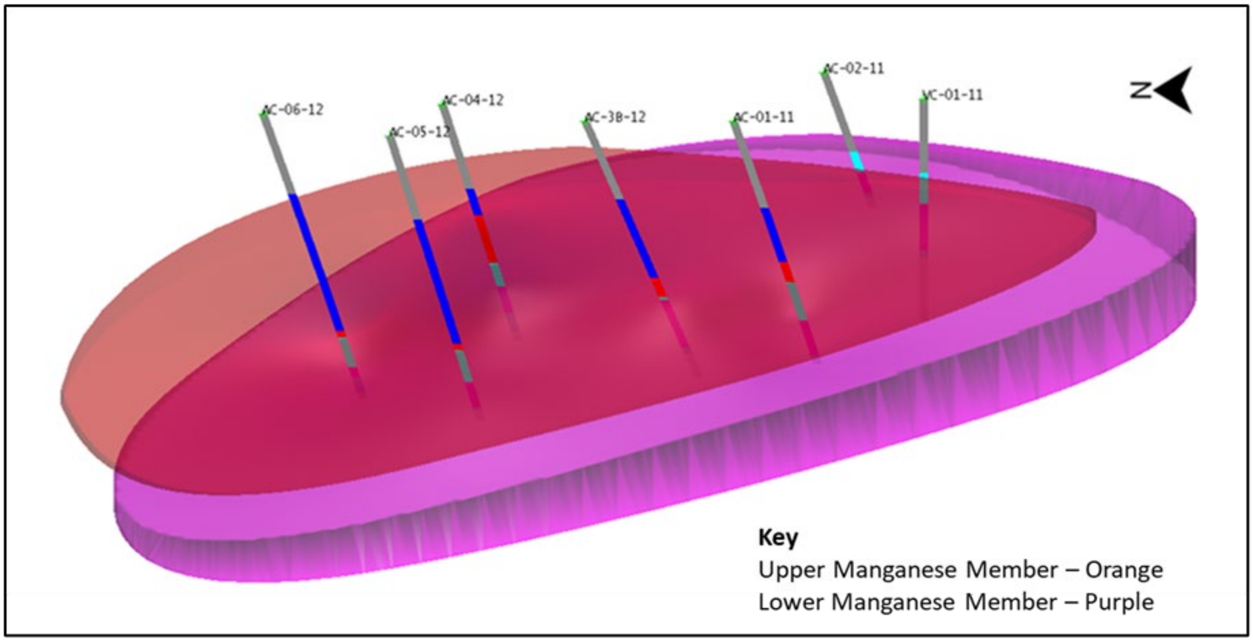


Figure 14-1 Graphic representation of 3D geology model

The high-grade manganese zones are interpreted to reach a surface contact with the glacial overburden within 1000 feet of the southernmost drill holes. These zones also appear to thin out in the northern portion of the drilled property. Figure 14-2 displays a cross section of the model. The upper member of the high-grade manganese zone in Figure 14-2 is shown in orange hash and the lower member of the high-grade manganese zone is the purple hash.

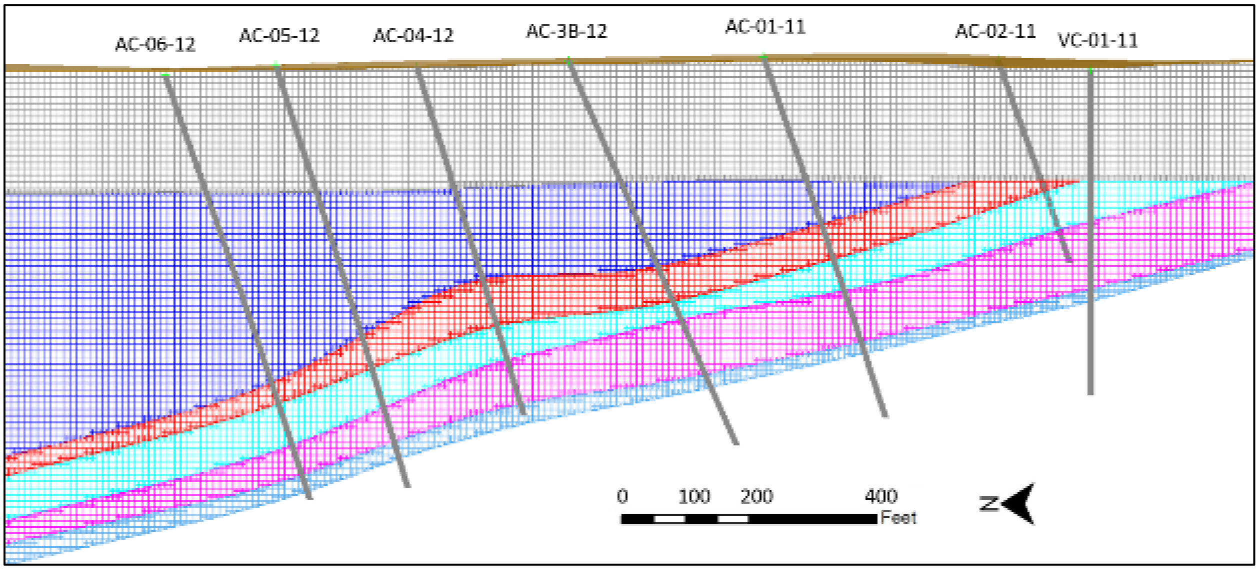


Figure 14-2 Cross section 1 of 3D geology model

The surface location of Cross Section 1 is shown on Figure 10-3.

14.1.3 Descriptive Statistics

General statistics were used to establish the variability of the deposit and used as an additional check to determine any errors. For example, Table 14-2 and Table 14-3 show overall statistical summaries from the upper and lower manganese zones from drill hole assays, the composite database, and the block model. Figure 14-3 and Figure 14-4 show histograms for the manganese within the Upper and Lower Manganese Zones. No cut-off grades are applied to these tables or figures.

Table 14-2 Statistical Summary of Upper Manganese Zone

	Assay Database				Composite Database				Block Model (500x1500x200 search)			
Mineral	Min	Max	Avg	Median	Min	Max	Avg	Median	Min	Max	Avg	Median
Mn	0.02	29.42	5.37	2.53	0.02	27.11	4.54	1.79	0.02	26.85	5.08	2.94
Fe	0.85	53.88	25.76	26.69	1.64	53.68	25.30	27.02	4.68	49.44	25.02	25.80
Si	3.51	42.83	22.71	21.39	3.52	42.69	23.43	21.72	6.07	42.69	23.68	23.43

Table 14-3 Statistical Summary of Lower Manganese Zone

	Assay Database				Composite Database				Block Model (500x1500x200 search)			
Unit	Min	Max	Avg	Median	Min	Max	Avg	Median	Min	Max	Avg	Median
Mn	0.02	50.13	11.40	7.12	0.02	46.54	11.82	8.41	0.03	46.02	13.44	9.14
Fe	6.13	51.14	23.42	22.69	7.78	51.14	23.26	22.49	8.37	50.80	22.81	21.62
Si	0.33	36.42	19.17	20.34	0.42	33.48	18.97	20.26	0.50	33.10	18.10	17.54

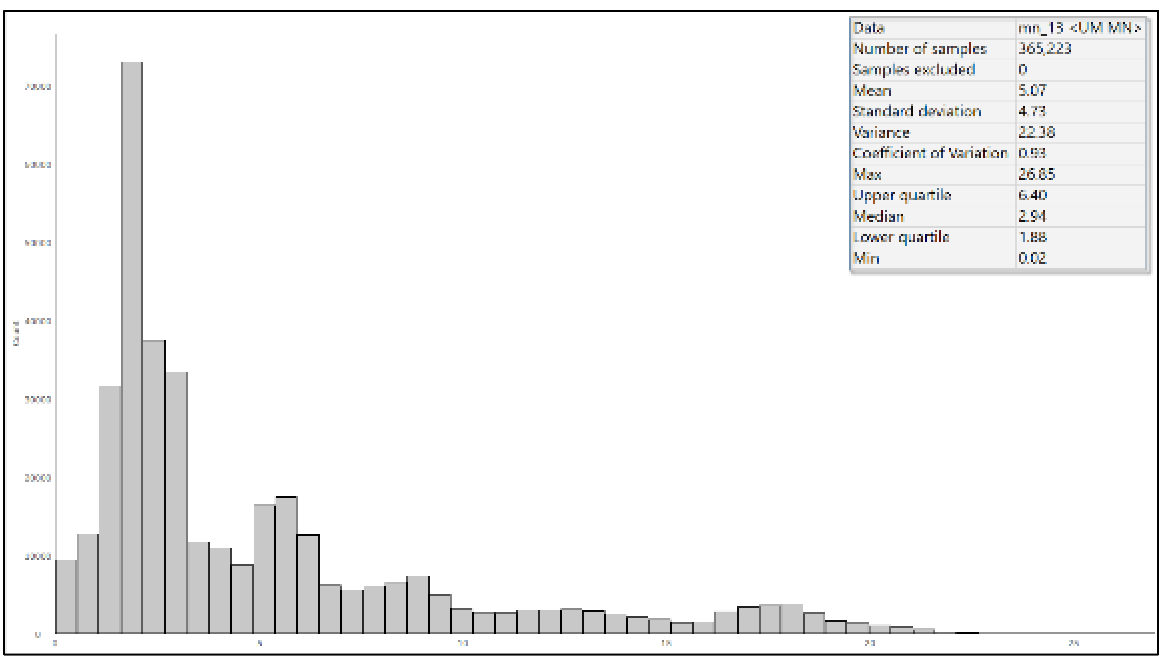


Figure 14-3 Upper Manganese Zone: block model distribution of Mn comb%

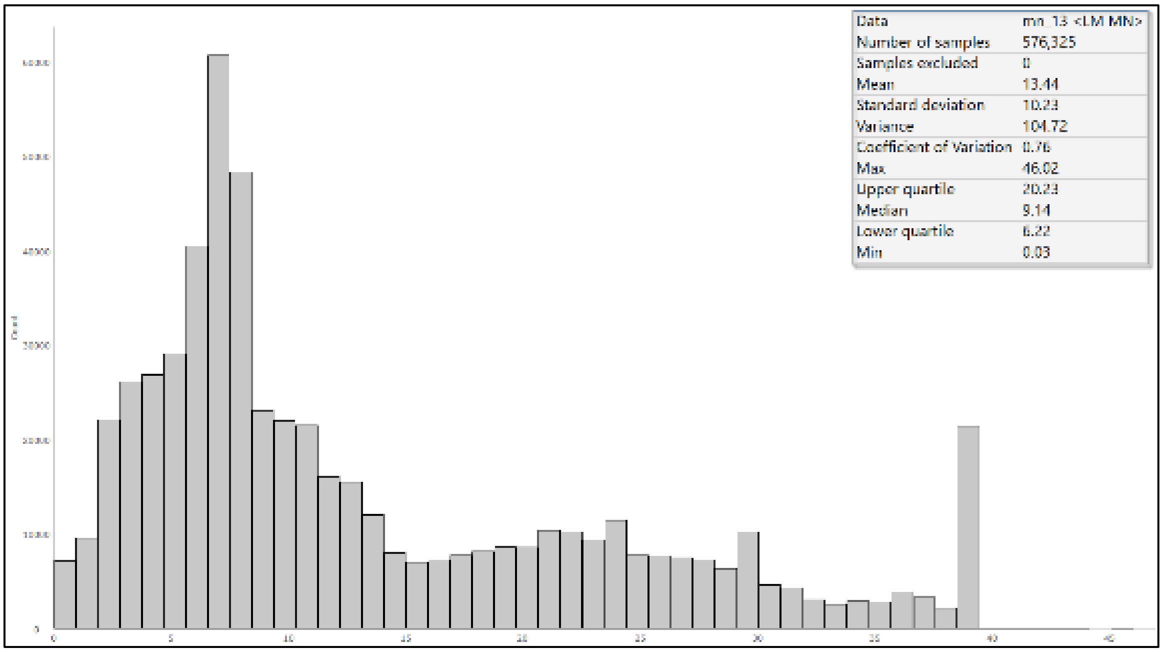


Figure 14-4 Lower Manganese Zone: block model distribution of Mn comb%

14.1.4 Geostatistics

In order to better understand the manganese deposit, sample data was geostatistically evaluated by constructing experimental variograms using Earth Volumetric Studio (EVS) software developed by C Tech Corporation. Although a complete explanation of variography is beyond the scope of this report, in general, experimental variograms depict the similarity in sample concentration over distance. The similarity is expressed as semivariance along the Y axis and the distance between samples is identified as the lag distance along the X axis. Variogram settings can be modified to adjust for anisotropy, with the goal of producing an experimental variogram that best fits one of several established variogram models. The variogram model is defined by the model type, and the sill, range, and nugget. The sill represents the maximum variance before samples become uncorrelated, whereas the range represents the distance (in input units) at which samples become uncorrelated. EVS allows for the use of three dimensional (3D) variograms where variance between 3D geospatial samples can be evaluated. In 3D, the variogram can be visualized as a sphere, which can be modified to an ellipsoid and rotated as necessary to find correlation between samples. Producing an experimental variogram is a combination of the underlying objective variogram functions, as well as subjective interpretation of the results. Typically, knowledge of the dataset and its limitations is necessary to produce acceptable results.

Manganese sample data from all stratigraphic units (not only the lower and upper manganese layers) were input to EVS software and the Edit Variogram tool was used to evaluate the data. Data was evaluated with and without logarithmic (log) transformation. Log transformed data provided the better of the two initial experimental variograms. Transformation can be necessary as variograms require normally distributed data, which can be generated by transforming the data in some manner. The initial variogram and variogram model can be seen below on Figure 14-5.

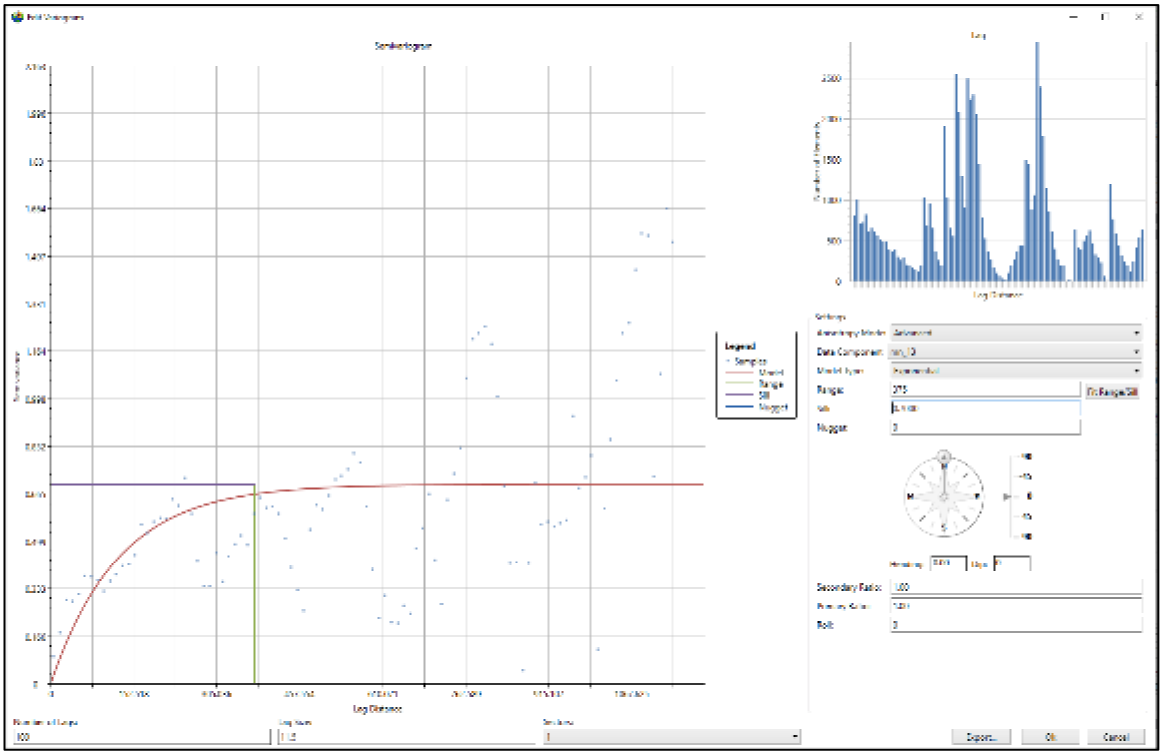


Figure 14-5 Initial Variogram and Variogram model

No variogram settings were modified and the best fit variogram model is as such:

- Sill: 0.7
- Range: 375 feet
- Nugget: 0

After modifying variogram settings in order to achieve a better fit variogram model, the below variogram shown on Figure 14-6 was constructed.

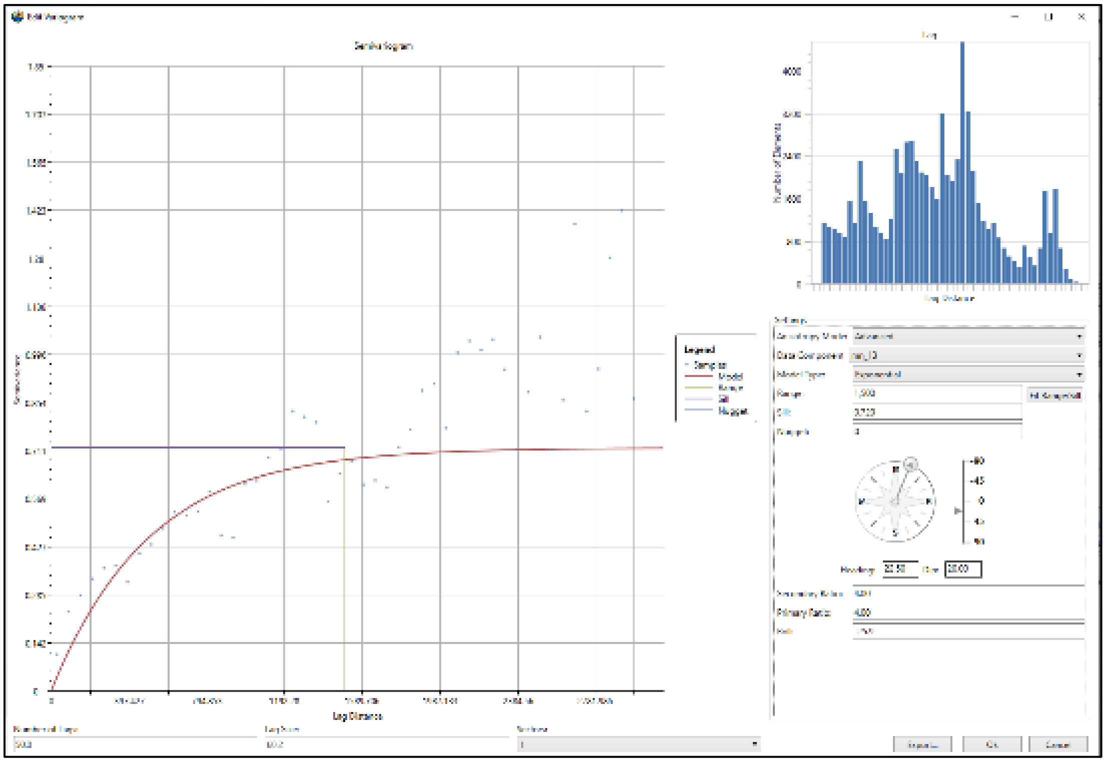


Figure 14-6 Modified Variogram and Variogram model

Modified settings include:

- Heading: 22.5° east of north
- Dip: 20° along heading
- Roll: -25.9°, negative indicates left roll (perpendicular of heading)
- Primary ratio: 4
- Secondary ratio: 4
  - Ratios modify the weight the sample distances depending on the orientation of the samples to the defined variogram plane (set by the heading, dip, and roll).
  - The combination of ratios results in increased weight along the primary axis of the variogram (which follows the set heading and dip).

The modified experimental variogram results in a variogram model as follows:

- Sill: 0.72
- Range: 1500 feet
- Nugget: 0

Due to the use of variogram ratios, the range (distance at which samples become uncorrelated) now varies spatially from minimum to maximum across the relative distances set by the variogram ellipsoid. In the modified variogram above, the maximum range is along the primary axis and shown as the reported range, and the minimum range is along the Z axis of the variogram which remains at 1. Therefore, the minimum range is 375 feet (1500 feet divided by 4). This is also confirmed in the unmodified variogram model, where the range using 1:1 ratios is also 375 feet.

Based on the variogram models, 375 feet is the minimum 3D distance at which manganese samples are no longer correlated.

14.1.5 Compositing

The composite database is used to populate a block model. Using the data from the drill hole database, the composite database assigns x/y/z coordinates and an average grade to each assay interval in order have a representative point in three-dimensional space. It is from these points that a block model is constructed and populated.

The composite database was created using the historical assay from-to intervals as the principal method for creating a data point. Composites were created using a run length of 5 feet and split at lithological boundaries. The composite length of 5 feet was established by using the greatest metal accumulation method (Mineral Deposit Evaluation: A practical approach, 1991). This compositing method identifies which sample lengths contain the largest percent of mineralized material (Table 14-4). The composites were then verified by displaying them on screen, reviewing each section, comparing general statistics, and visually comparing the composite intervals against the geology surfaces.

Table 14-4 Composite Details

Sample Length (Ft)		Number of Samples	Average Mn%	Total Length	Mn% X Total Length	Percent of Total
From	To					
0	1	1	6.63	0.5	3	0%
1	2	14	11.84	17.5	207	3%
2	3	19	5.61	43.5	244	3%
3	4	51	9.79	164.5	1,610	22%
4	5	114	9.68	534.5	5,176	71%

14.1.6 Bulk Density

A bulk density of 179.21 pounds per cubic foot was used for the resource estimate calculations. This was from the average of 13 rock samples collected during the 2011 drilling program.

14.1.7 Block Model Definition

Barr used a 10.0 x 5.0 x 1.0 feet block size. The spatial extents of the deposit are not significantly large, so this block size was used in an attempt to better represent the sampling intervals. The block size was also selected to enable the model to more accurately delineate the high- and low-grade manganese zones. Table 14-5 displays the block dimensions.

Table 14-5 Block Model Dimensions

	Minimum (ft)*	Maximum (ft)	Offset (ft)	Parent Block Size (ft)	Sub-block Size (ft)
Easting	2,692,900	2,694,540	1,640	10	5
Northing	965,885	968,815	2,930	10	5
Elevation	0	1500	1,500	10	1

*Origin coordinates are Minnesota State Plane (Central) Feet, NAD 1983

Block variables established during the model development are listed in Table 14.6.

Table 14-6 Block Model Variables

Block Model Variable	Description
geology	geology code
mn_13	Mn % from only modern holes
fe_13	Fe % from only modern holes
si_13	Si % from only modern holes
sample_nearest	Minimum distance to sample
sample_holes	Number of holes used for estimation
samples	Total number of samples used for estimation
density	Bulk density value

The 3D surfaces created from the drill hole cross-sections were used to populate the block models with appropriate geology codes. Cross-section displays were visually checked to confirm that the geology block model was accurate.

14.1.8 Variography

Basic variograms were created for the Barr resource estimate within the deposit. These variograms indicated a model range of at least 900 feet. This variography helped inform Barr's conservative cut-off distances of 450 feet (half of the range) and 375 feet (as described in 14.1.4 Geostatistics) used for the resource classification. Review of the geology and drillhole spacing further informed distances used for Inferred and Indicated Categories for the Resource estimate (as described in 14.1.10 Mineral Resource Classification).

Ordinary kriging could be evaluated as a grade estimation method in future resource estimates when more drill holes and assays are completed. This will allow confidence intervals to be computed within the block model.

14.1.9 Grade Estimation

Grade element interpolation was done using an inverse distance squared method. This is sufficient because the deposit is relatively homogenous and the sample points are widely spaced. Each element variable was estimated based upon lithological constraints. This ensured that high-grade manganese values (or vice versa) were not diluted by low-grade manganese values. Each block was estimated using a minimum of one sample location and maximum of ten samples. A maximum of four samples per drill hole were also used for each block estimation.

A search ellipsoid was aligned with the general dip and dip direction of the deposit. Grade estimations were computed within each of the modeled geologic units, samples during the grade estimation process were restricted to that of the geologic unit being estimated. The parameters used for the search ellipsoid are provided in Table 14-7.

Table 14-7 Search Ellipsoid Parameters

Search Parameter	Parameter Value
Major Axis	500 ft
Semi-Major Axis	1,500 ft
Minor Axis	200 ft
Bearing (Z)	270 degrees
Plunge (Y)	-10 degrees
Dip (X)	-15 degrees

14.1.10 Mineral Resource Classification

Several factors have been considered in the definition of a resource classification:

- Canadian National Instrument 43-101 requirements.
- Canadian Institute of Mining, Metallurgy and Petroleum guidelines;
- Authors' experience with banded-iron formation deposits;
- Spatial continuity of the assays within the drillholes;
- Borehole spacing and estimate runs required to estimate the grades in a block;
- The confidence with the dataset based on the results of the validation;
- The number of samples and boreholes used in each of the block estimations;
- Inspection of current workings; and
- The continuity of the geology and mineralized system.

No environmental, permitting, legal, title, taxation, socio-economic, marketing, or other relevant issues are known to the authors that may affect the estimate of mineral resources. Mineral reserves can only be estimated on the basis of an economic evaluation that is used in a preliminary feasibility study or feasibility study of a mineral project; thus, no reserves have been estimated. As per NI 43-101 definitions, mineral resources, which are not mineral reserves, do not have to demonstrate economic viability.

During the grade estimation process, individual blocks were populated with a block variable called *sample-nearest* which represents the nearest sample used for estimating that block. This attribute was used for classifying the Mineral Resource.

A maximum distance of 450 feet was used for the Inferred Resource category and was derived by using half the maximum drillhole spacing observed for the Project. A maximum distance of 375 feet was used for the Indicated Category. This was informed by the variography as described in 14.1.4 and 14.1.8. Blocks located outside of the Property boundary were not classified or reported as part of the Resource Estimate.

14.1.11 Block Model Validation

Visual inspection of the interpolation was done on the north-south cross sections. The cross sections were checked in conjunction with the block grade versus the composite drill hole database. The high-grade manganese values were visually checked to determine if they followed the same geometry as the geology model.

Resource classification for the Project uses distance to the nearest sample together with number of drill holes and number of sample composites within a drill hole. All of the samples considered within an interpolation search are within the Project site.

14.2 Mineral Resource Statement

14.2.1 Mineral Resource Definition

As stated in the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources & Mineral Reserves, prepared by the CIM Standing Committee on Reserve Definitions, adopted by the CIM Council on May 19, 2014:

"Mineral Resources are sub-divided, in order of increasing geological confidence, into inferred, indicated and measured categories. An Inferred Mineral Resource has a lower level of confidence than that applied to an Indicated Mineral Resource. An Indicated Mineral Resource has a higher level of confidence than an Inferred Mineral Resource but has a lower level of confidence than a Measured Mineral Resource.

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.

The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.

Material of economic interest refers to diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, coal, and industrial minerals.

The term Mineral Resource covers mineralization and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of Modifying Factors. The phrase 'reasonable prospects for eventual economic extraction' implies a judgment by the Qualified Person in respect of the technical and economic factors likely to influence the prospect of economic extraction. The Qualified Person should consider and clearly state the basis for determining that the material has reasonable prospects for eventual economic extraction. Assumptions should include estimates of cut-off grade and geological continuity at the selected cut-off, metallurgical recovery, smelter payments, commodity price or product value, mining and processing method and mining, processing and general and administrative costs. The Qualified Person should state if the assessment is based on any direct evidence and testing.

Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. For example, for some coal, iron, potash deposits and other bulk minerals or commodities, it may be reasonable to envisage 'eventual economic extraction' as covering time periods in excess of 50 years. However, for many gold deposits, application of the concept would normally be restricted to perhaps 10 to 15 years, and frequently to much shorter periods of time.

An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.

Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.

An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Pre-Feasibility Study which can serve as the basis for major development decisions.

An Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.

An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

An Inferred Mineral Resource is based on limited information and sampling gathered through appropriate sampling techniques from locations such as outcrops, trenches, pits, workings and drill holes. Inferred Mineral Resources must not be included in the economic analysis, production schedules, or estimated mine life in publicly disclosed pre- feasibility or feasibility studies, or in the life of mine plans and cash flow models of developed mines. Inferred Mineral Resources can only be used in economic studies as provided under NI 43-101.

There may be circumstances, where appropriate sampling, testing, and other measurements are sufficient to demonstrate data integrity, geological and grade/quality continuity of a measured or Indicated Mineral Resource, however, quality assurance and quality control, or other information may not meet all industry norms for the disclosure of an indicated or Measured Mineral Resource. Under these circumstances, it may be reasonable for the Qualified Person to report an Inferred Mineral Resource if the Qualified Person has taken steps to verify the information meets the requirements of an Inferred Mineral Resource."

While a significant manganese resource exists at the Emily deposit, the mineral resource estimate defined by Barr represents only a small portion of a much larger area of manganese-iron deposition along strike and down-dip previously drilled by Pickands Mather and U.S. Steel in the 1940s and 1950s, pointing to significant upside potential from the planned NSM extensional drill program.

The Barr resource estimate was carried out for manganese and iron using the inverse distance squared method. The results of the resource estimates are tabulated below, using 5, 10, 15, and 20% manganese weight percentage cut-offs. While all four resources estimates represent viable manganese weight percentage cut-off cases, Barr recommends the use of the 10% manganese mineral resource estimate cut-off case as the base case for future project assessment until future drilling and studies are undertaken by NSM. Further, it is important to note that all four resource estimates in this Technical Report are broken into two distinct zones of mineralization – Upper and Lower Manganese Zones.

14.2.2 Mineral Resource Estimate

Category and Geology Unit	Mn Cut-off %	Avg Mn %	Avg Fe %	Tons
Indicated – Upper Manganese Zone (um_mn)	5	10.31	29.89	1,658,265
Indicated – Lower Manganese Zone (lm_mn)	5	15.13	22.38	8,061,160
Indicated – Total	**5**	**14.31**	**23.66**	**9,719,425**
Inferred – Upper Manganese Zone (um_mn)	5	12.07	28.74	170,133
Inferred – Lower Manganese Zone (lm_mn)	5	18.22	20.21	1,005,873
Inferred – Total	**5**	**17.33**	**21.44**	**1,176,006**
Indicated – Upper Manganese Zone (um_mn)	10	14.52	31.03	729,887
Indicated – Lower Manganese Zone (lm_mn)	10	19.89	21.84	4,955,422
Indicated – Total	**10**	**19.20**	**23.02**	**5,685,310**
Inferred – Upper Manganese Zone (um_mn)	10	15.19	30.50	101,475
Inferred – Lower Manganese Zone (lm_mn)	10	23.57	20.90	676,302
Inferred – Total	**10**	**22.48**	**22.15**	**777,777**
Indicated – Upper Manganese Zone (um_mn)	15	18.05	30.92	277,508
Indicated – Lower Manganese Zone (lm_mn)	15	24.20	20.26	3,170,849
Indicated – Total	**15**	**23.71**	**21.12**	**3,448,357**
Inferred – Upper Manganese Zone (um_mn)	15	17.21	31.10	51,682
Inferred – Lower Manganese Zone (lm_mn)	15	25.15	20.71	592,534
Inferred – Total	**15**	**24.51**	**21.55**	**644,216**
Indicated – Upper Manganese Zone (um_mn)	20	20.81	30.19	45,537
Indicated – Lower Manganese Zone (lm_mn)	20	27.78	18.87	2,063,194
Indicated – Total	**20**	**27.63**	**19.12**	**2,108,731**
Inferred – Upper Manganese Zone (um_mn)	20	0	0	0
Inferred – Lower Manganese Zone (lm_mn)	20	26.90	20.36	481,695
Inferred – Total	**20**	**26.90**	**20.36**	**481,695**

15 Mineral Reserve Estimates

Not applicable.

16 Mining Methods

Not applicable.

17 Recovery Methods

Not applicable.

18 Project Infrastructure

18.1 Project Structures

As part of the CMR surface leases, NSM has the rights to use the structures and facilities located in the SW ¼ of the NE ¼ of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota.

Figure 18-1 through Figure 18-9 show the various structures and facilities associated with the Project.

Figure 18-1 Aerial view of the Project structures and facilities

18.1.1 Process Building

- Fixed steel building with concrete floor housing the mineral sorting and dewatering equipment.
- Dimension of the structure is 66'w x 140'l x 20'h.
- Square footage of 9,240 ft.

Figure 18-2 Ground view of the primary plant structures

18.1.2 Process Equipment

- Dual washing and gravity sorting stations.
- Internal water pumping (original slurry delivery system) and multiple conveying systems.
- Two dewatering tanks.
- Office and storage area.
- Core and material storage area.

Figure 18-3 Washing and gravity sorting equipment, including conveyors

Figure 18-4 Dewatering tanks

Figure 18-5 Core storage and work area

18.1.3 Pump Building

- Two (2) portable structure housing high-pressure injection pumps.
- 3-ton crane.
- Dimension of the structures are 16’5”w x 52’11 1/2”l x 11’5 3/16”h and 15’w x 27’5”l x 11”5 3/16”h.
- Square footage is 1,280 feet.

Figure 18-6 Pump building equipment

18.1.4 Clarifier Tank

- Process water clarifier tank.
- Dimension of the structure is 23'6"h x 12'6" inside diameter.
- Square footage of the horizontal projected clarification area is 2,346 ft.

Figure 18-7 Clarifier tank

18.1.5 Material Storage Facility

- Fabric tension enclosure for storage of the bulk sample material prior to shipment.
- Dimension of the structure is 36'w x 72'l x 39'10"h.
- Square footage is 2,556 ft.

Figure 18-8 Material storage facility

18.1.6 Electrical Utility Plant

- MCC electrical building/2500 KVA transformers
- A 1,000 kVA 3-phase 480 volt transformer and a 1,500 kVA 480 volt transformer.

Figure 18-9 Electrical utility plant and transformers

19 Market Studies and Contracts

Not applicable.

20 Environmental Studies, Permitting and Social or Community Impact

20.1 Environmental Permitting

All activities associated with exploration, mining, mineral processing, product production and facility closing will be required to meet the County and State requirements, and Federal conditions where applicable, as appropriate for the type of operation being proposed and operated.

There are currently no environmental liabilities pending on the project site, and there are no ongoing activities at the Project site, except the maintenance of the facilities which are covered by an Interim Use Permit. As of the date of this Report, there are no active permits for exploration, development or operations.

20.2 Current Permits

The City of Emily issued an Interim Use Permit (IUP) for the structures and facilities located in the SW ¼ of the NE ¼ of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota. This is a renewable 5-year permit with the next renewable date of March 2, 2026.

20.3 Historical Plans and Permits

Since 2008, the Project area has been subject two sets of operational plans and permits associated with the borehole test mining and exploration drilling.

All activities associated with the previous borehole test mining and exploration drilling have expired and the sites have been reclaimed.

20.3.1 Borehole Mining Pilot Test

As outlined in Item 10, Rice Lake Construction performed a borehole mining pilot test from 2009 to 2011 at the Project site. During this pilot, the following environmental studies and permits were completed:

- Minnesota Pollution Control Agency State Disposal System Permit (SDS)
- Minnesota Department of Transportation Stormwater Pollution Prevention Plan (SWPPP)
- Minnesota Department of Natural Resources Water Appropriations Permit
- Minnesota Environmental Quality Board Environmental Assessment Worksheet (EAW)
- United States Environmental Protection Agency Underground Injection Control Permit (UIC)

20.3.2 Exploration Drilling

As outlined in Item 10, Barr performed exploration drilling programs in 2011 and 2012 at the Project site. During these programs, the following reports were completed:

- Minnesota Health Department Exploratory Boring Sealing Reports
- Minnesota Department of Natural Resources Exploration Plans

21 Capital and Operating Costs

Not applicable.

22 Economic Analysis

Not applicable.

23 Adjacent Properties

23.1 Existing Mining Properties

As detailed in Item 6 of the current Technical Report, the Emily District has been explored and evaluated since the 1940s by a number of companies. The exploration and mining activity described in this Item 23.1 describes current and recent activity on in the immediate area and adjacent properties.

There are two existing mining operations in the immediate area, a sand & gravel, and aggregate operation run by Anderson Brothers Construction Company of Brainerd, Minnesota, located in Section 20, Township 138 North, Range 26 West, Crow Wing County, Minnesota, and a sand & gravel operation run by Amber & Bryce Butcher, located in Section 29, Township 138 North, Range 26 West, Crow Wing County, Minnesota. Both the Anderson Brothers and Emily Sand & Gravel have interim conditional use permits with City of Emily to supply material in the local area when it is required. Both companies have surface rights only for the removal of sand, gravel and aggregate. The location of the two operations are shown on Figure 23-1.

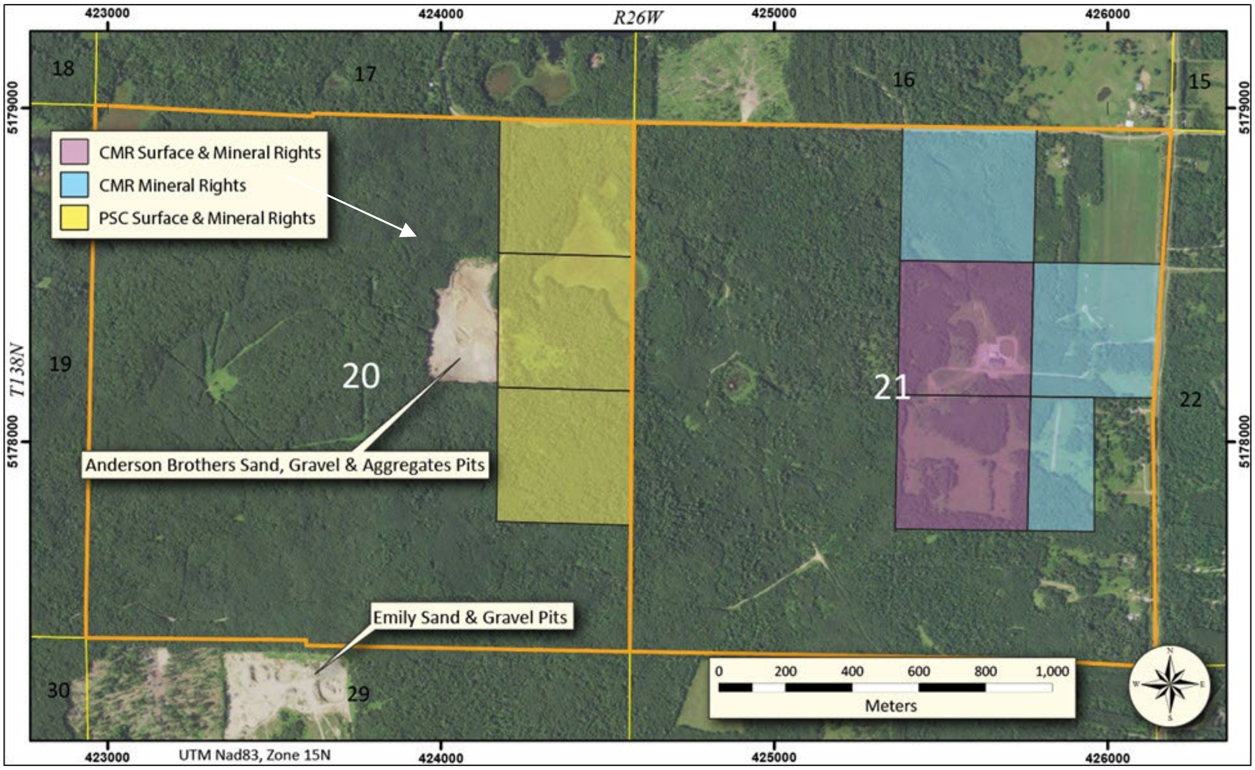


Figure 23-1 Anderson Brothers Sand & Gravel and Aggregate Pits and Emily Sand & Gravel Pits relative to the Project area

23.2 Former Proposed Mining Properties

Three iron ore/manganese mines were designed by U.S. Steel Corporation in 1959, and these were located within or near to the Project (Strong 1959). The three proposed mines, the West Ruth Lake Mine, East Ruth Lake Mine and Mary Lake Mine, are all located in the Emily District of the Cuyuna Iron Range.

The location of the three proposed mines is shown on Figure 23-2.

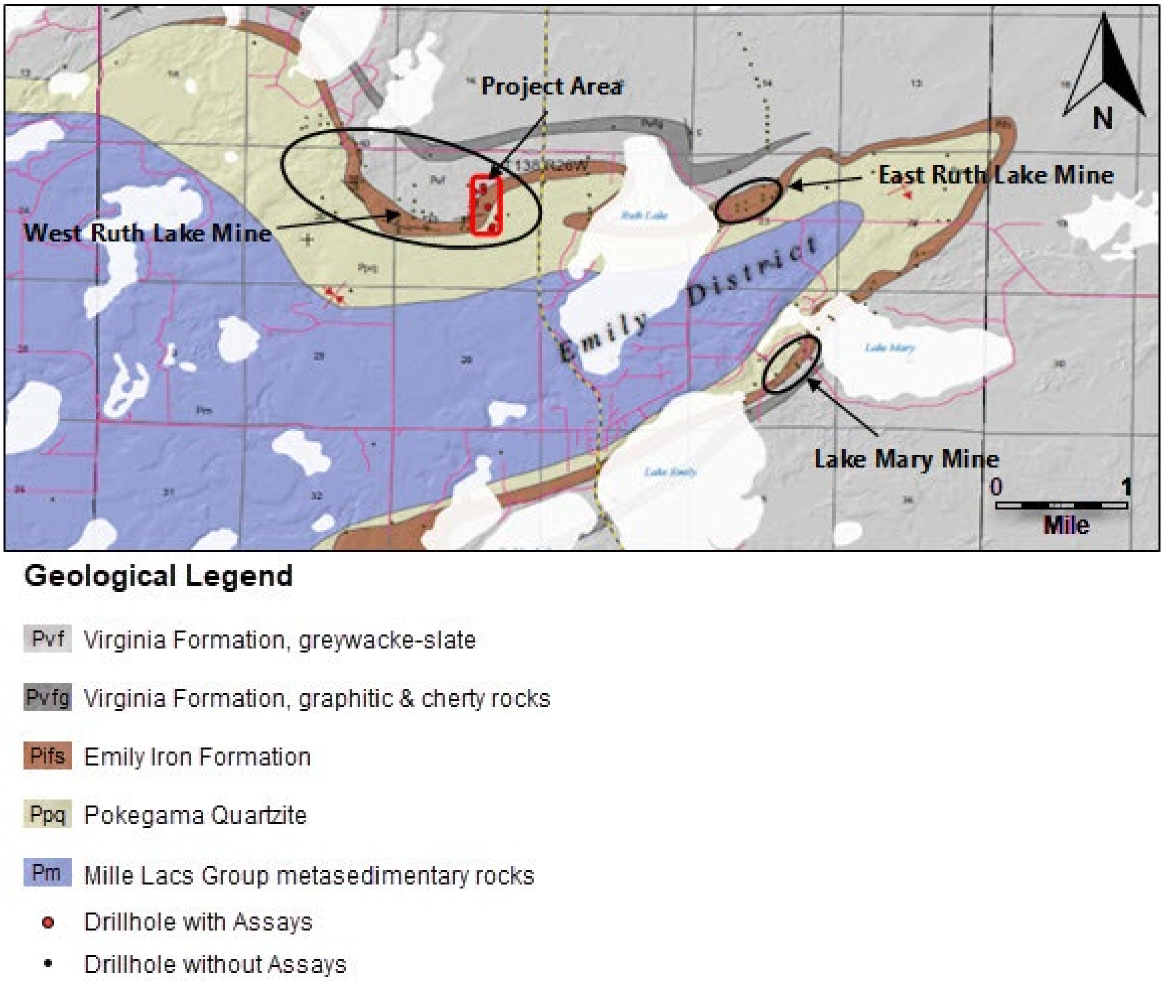


Figure 23-2 Location of the proposed U.S. Steel iron and manganese mines in 1959

All three mines are important since they were designed to produce both iron ore and manganese. Grades and tons calculated by U.S. Steel for each of the mines are presented in Table 23-1.

Table 23-1 Historic Resources for the Three Proposed U.S. Steel Mines

Property	Avg Fe %	Avg Mn %	Tons
West Ruth Lake Mine	23.38	15.28	24,012,200
East Ruth Lake Mine	36.35	7.25	5,161,300
Mary Lake Mine	30.17	8.21	8,390,000

All three proposed mines were planned for iron ore and manganese production by U.S. Steel Corporation.

The proposed West Ruth Lake Mine included the mineralization within the Project area in its overall mine plan, which contained higher grades of manganese bearing rock, compared with the proposed East Ruth Lake and Lake Mary mines.

Extensive exploration and mineral testing was undertaken on the proposed West Ruth Lake Mine project, including mine planning and metallurgical processing. A selected example of the planning work undertaken by U.S. Steel is presented on Figures 23-3 and 23-4 (Strong 1960): note, U.S. Steel Cross Section 26E is within the Project Area. A selected example of the manganese grades from U.S. Steel drilling is presented in Figure 25-5 (Peterson 2019).

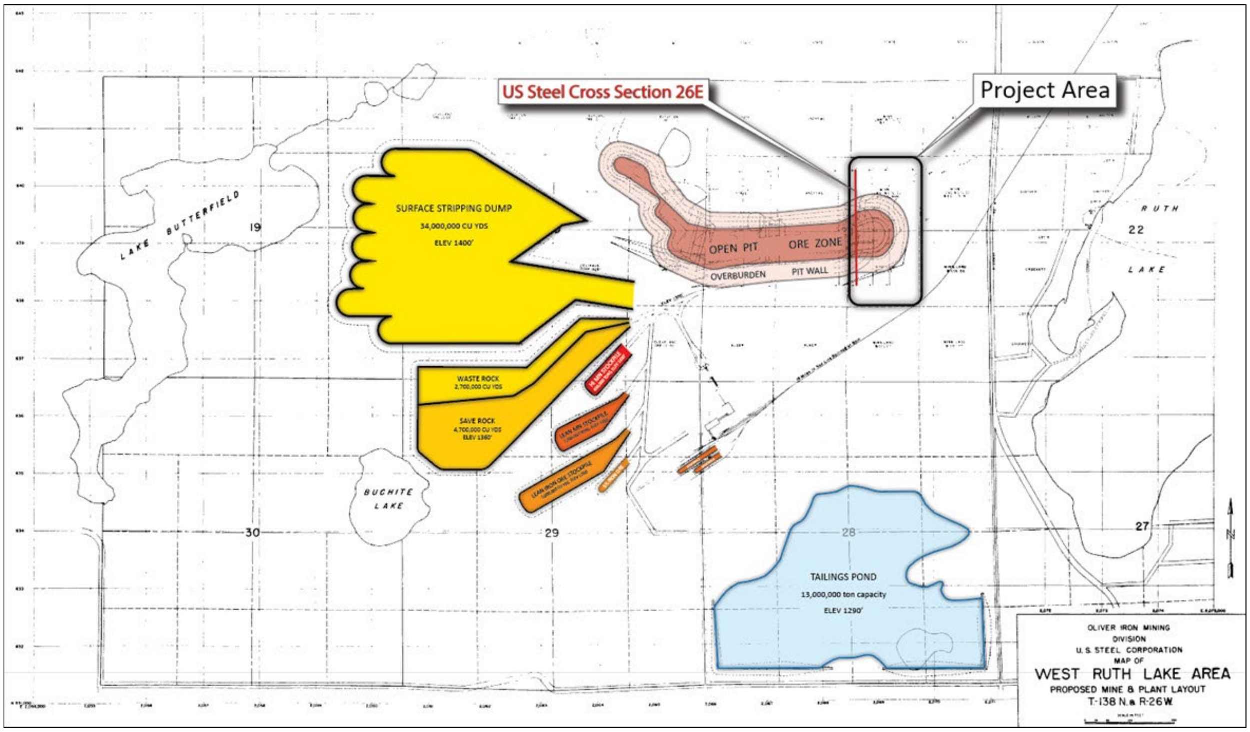


Figure 23-3 Mine and facilities plan for the proposed U.S. Steel West Ruth Lake Mine

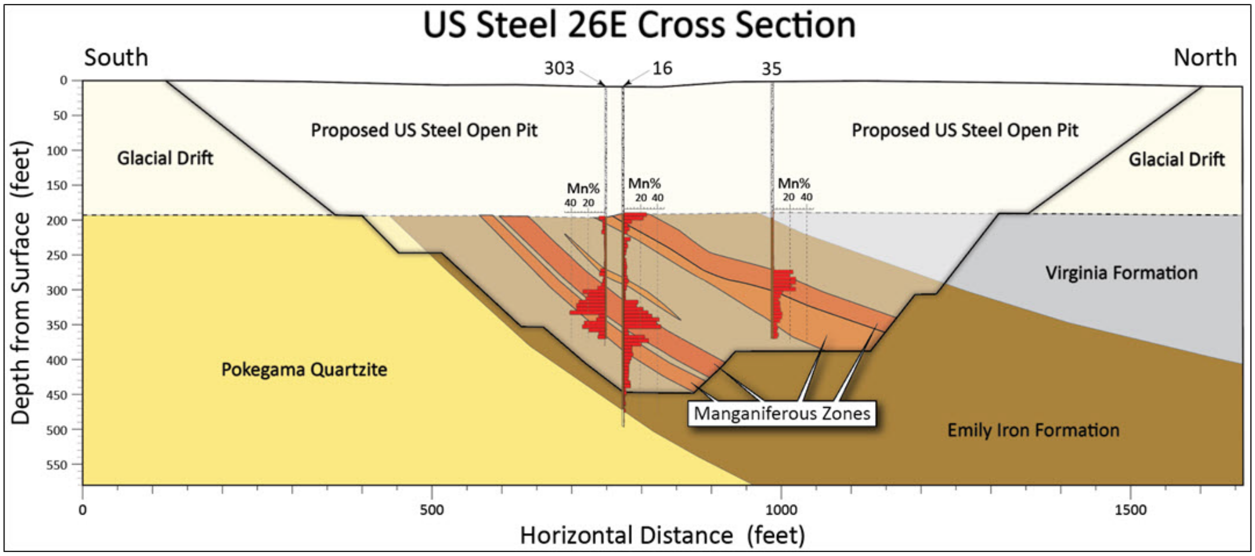


Figure 23-4 A section diagram from the proposed U.S. Steel West Ruth Lake Mine plan

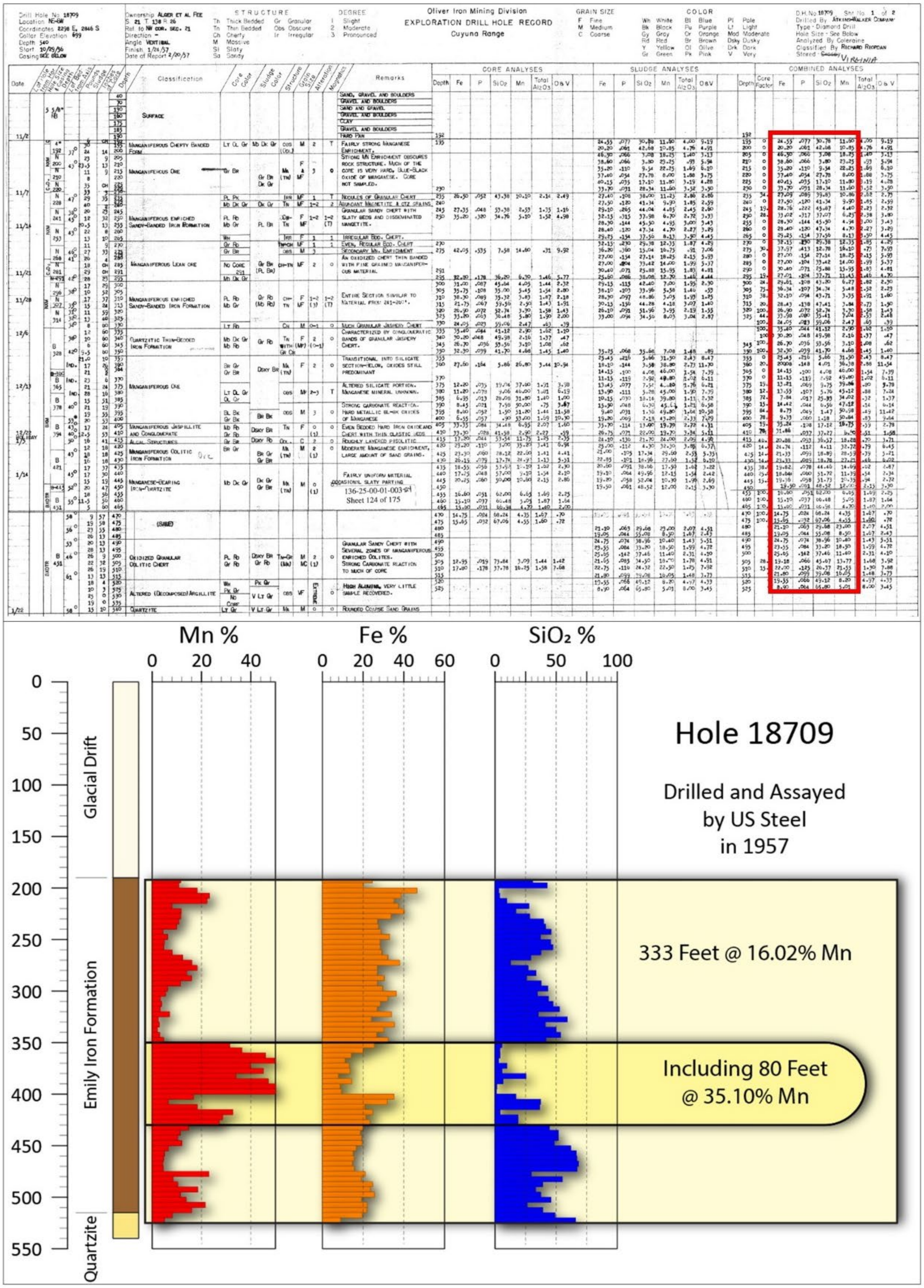
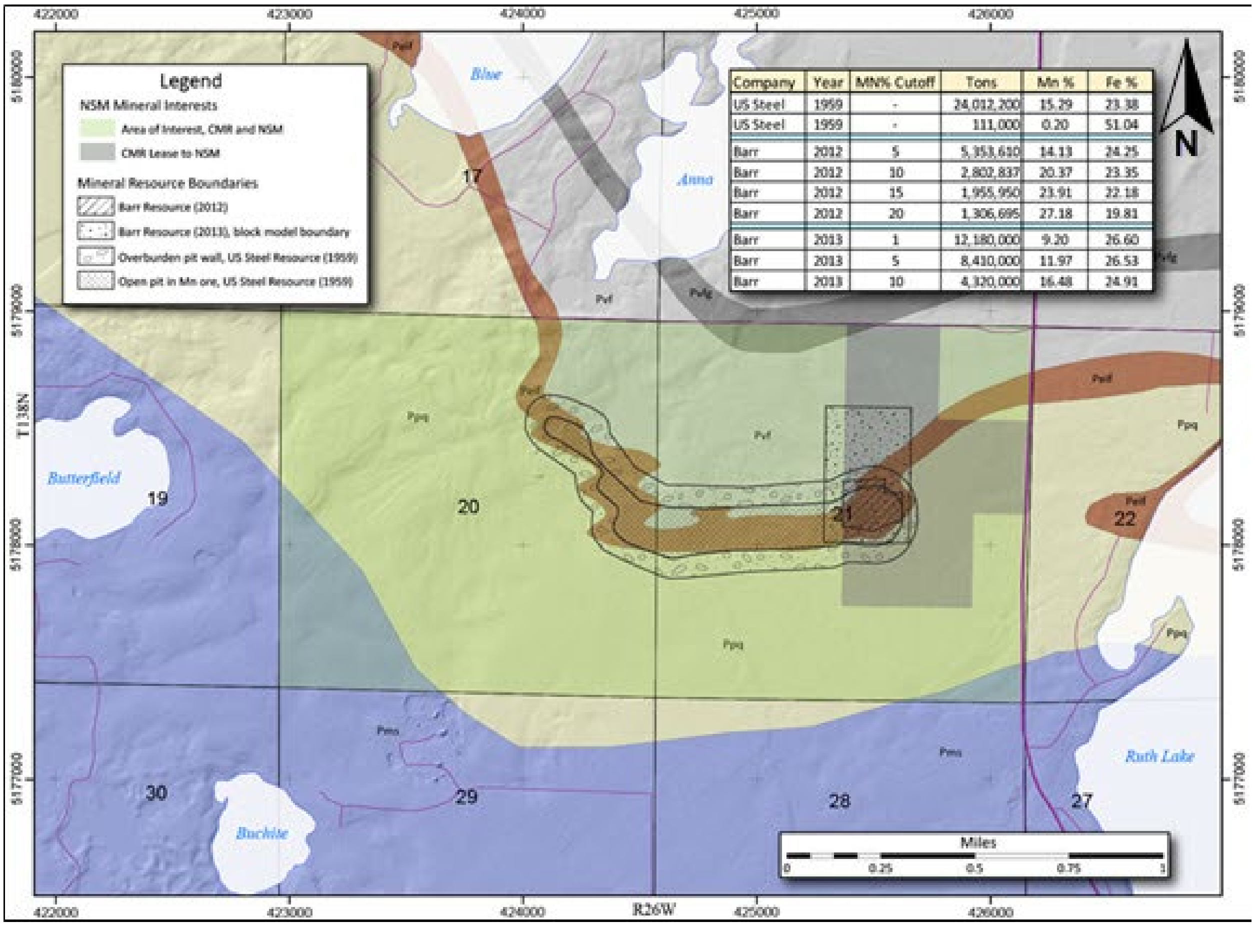


Figure 23-5 **U.S. Steel drillhole 18709 demonstrating high grade manganese**

Figure 23-6 shows the proposed West Ruth Lake Mine outline together with the early Barr 2012 and current Barr 2013 Resource Estimate for the Project area which is located in the eastern portion of the historic proposed West Ruth Lake Mine.

The proposed West Ruth Lake Mine was planned to operate for 29.4 years to produce both iron ore and manganese, but it was not developed because of the changes of U.S. iron and steel production from iron ore to taconite iron pellets mined from the Mesabi Iron Range and other locations. This coincided with the closing of the Cuyuna Iron Range iron ore mines.



Company	Year	MN% Cutoff	Tons	Mn %	Fe %
US Steel	1959	-	24,012,200	15.29	23.38
US Steel	1959	-	111,000	0.20	51.04
Barr	2012	5	5,353,610	14.13	24.25
Barr	2012	10	2,802,837	20.37	23.35
Barr	2012	15	1,955,950	23.91	22.18
Barr	2012	20	1,306,695	27.18	19.81
Barr	2013	1	12,180,000	9.20	26.60
Barr	2013	5	8,410,000	11.97	26.53
Barr	2013	10	4,320,000	16.48	24.91

Geological Legend

Pvf Virginia Formation, greywacke-slate

Pvfg Virginia Formation, graphitic & cherty rocks

Pifs Emily Iron Formation

Ppq Pokegama Quartzite

Pm Mille Lacs Group metasedimentary rocks

Figure 23-6 U.S. Steel's proposed West Ruth Lake Mine plan of 1959 with U.S. Steel's historic Resource Estimate and Barr's 2012 & 2013 Resource Estimates

The QP has reviewed the U.S. Steel Report (Strong 1959) but has not been able to verify the data on the former proposed mining properties. The U.S. Steel information specific to the Property is not necessarily indicative of the mineralization on the Property but it did provide sufficient information that led U.S. Steel to develop a mine plan in 1959 and to proceed with other related engineering and metallurgical work. The U.S. Steel data has not been used in the determination of resources that are the subject of the current Technical Report.

The QP has not validated the numbers provided by the previous resources estimates due the lack of reliable information about the methods of calculation, and as such, the historic estimates are not possible to be add to the current technical report estimates. The QP understands that none of these historical resource estimates are compliant with Canadian National Instrument 43-101 or similar standards.

24 Other Relevant Data and Information

Not applicable.

25 Interpretation and Conclusions

25.1 Current Mineral Resource Interpretation

Table 25.1 presents the current mineral resource estimate based on all available and relevant geologic and drilling information and using lower cut-off manganese grades of 5%, 10%, 15% and 20%, with the 10% manganese mineral resource estimate cut-off case representing the best case. This estimate was calculated using an inverse distance squared grade interpolation scheme.

Table 25-1 Inverse Distance Squared Resource Summary

Category and Geology Unit	Mn Cut-off %	Avg Mn %	Avg Fe %	Tons
Indicated – Total	**5**	**14.31**	**23.66**	**9,719,425**
Inferred - Total	**5**	**17.33**	**21.44**	**1,176,006**
Indicated – Total	**10**	**19.20**	**23.02**	**5,685,310**
Inferred - Total	**10**	**22.48**	**22.15**	**777,777**
Indicated – Total	**15**	**23.71**	**21.12**	**3,448,357**
Inferred - Total	**15**	**24.51**	**21.55**	**644,216**
Indicated – Total	**20**	**27.63**	**19.12**	**2,108,731**
Inferred - Total	**20**	**26.90**	**20.36**	**481,695**

25.2 Project Conclusions

Conclusions that have been drawn from all available and relevant technical data on the Project are summarized as follows:

- The potential to increase resources (tons) of similar Mn and Fe grades at the Project is very high.
- The potential to increase Mn and Fe grades at the Project is very prospective.
- The main manganese bearing minerals are manganese oxides.
- Manganese mineralization at the Project is open down dip and along strike of the deposit.
- There is excellent potential to increase resources to the west and north of the current Project.

- Metallurgical testing has resulted in technical feasibility at both bench and pilot scale for producing pure electrolytic manganese metal (EMM) and pure electrolytic manganese dioxide (EMD) from the Project deposit.
- Metallurgical testing has also shown that standard chemical leaching of the manganese oxides could be used to produce EMM and EMD products.
- Technical feasibility has been proven for producing pure electrolytic manganese metal (EMM) and pure electrolytic manganese dioxide (EMD) from the Project deposit.
- EMM and EMD products could require chemical leaching of the manganese oxides from the Project deposit.

26 Recommendations

26.1 General Recommendations

Based on the positive results of the resource estimation and successful metallurgical work, Barr recommends that NSM pursue the advancement of the Emily Project. The following items are recommended for the Phase I exploration and assessment program for 2022.

26.1.1 Land Management

Barr recommends securing:

- The remaining surface rights overlaying the current CMR mineral rights, via lease or acquisition.
- Rights to additional properties surrounding the current Project to add to the potential resource and provide a buffer.
- The mineral and surface rights on the AOI lands, the majority of which is controlled by the State of Minnesota.

26.1.2 Investigation & Research

For a more comprehensive review of the manganese potential in central Minnesota, Barr recommends expanding research outside of the Project area:

- Review and tabulate historic manganese exploration and production in the Cuyuna Iron Range and surrounding area.
- Identify Phase II expansion target opportunities beyond the current Project Mineral Resource.

26.1.3 Exploration & Drilling

For a more comprehensive data set, Barr recommends additional exploration assessment and drilling to include:

- More detailed geophysics (magnetics) of the Project area and adjacent lands.
- Drill adjacent to the historical Pickens Mather drill holes (twinning). This will increase the confidence in historical drill data.
- Drill further west along the known strike of manganese mineralization guided by historic Pickens Mather drilling results and magnetic signature of the regional iron formation. This will help to increase the *Indicated* and *Inferred* categories of the Project Resource.
- Drill further north of historic Pickens Mather cross sections 138E and 438E. This will assist in upgrading the Resource towards the *Measured* category in these areas.
- Drill between current grid set (infilling). This will prove useful in upgrading portions of the Resource to the *Probable and Proven Mineral Reserve* category for these areas.

26.1.4 Metallurgical Testing

Barr recommendations are to:

- Use new drill samples and update the metallurgical testwork to produce intermediary products, EMM and EMD.
- Assess the removal and viability of residual iron as a by-product.
- Undertake first level optimization of the processing approach.

26.1.5 Environmental & Government Activities

Barr recommendations are to:

- Initiate preliminary studies on the requirements for an eventual mine and processing facility, including the collection of baseline data.
- Initiate environmental discussions with the State and local communities.
- Continue outreach programs with citizen groups, local communities, cities and counties, the State, tribal nations, and professional organizations.

26.2 Engineering Design

Upon the completion of additional drilling and other required work, Barr recommends that a preliminary economic assessment (PEA) followed by a prefeasibility level study (PFS) be instigated for the Project:

- Concept designs for extraction of the Project deposit, including:
    - Mining approach and mining plan for the extraction of the manganese ore
    - Layout of extraction technologies at the Project site
    - Estimation of production rates
    - Estimation of costs
- Concept designs for processing of the Project deposit, including:
    - Identify potential technologies
    - Estimation of costs
- A plan for the full development of the Project deposit
- Identification of major issues, including
    - Environmental requirements

- Permitting requirements
- Transportation requirements
- Market opportunities

26.3 Proposed Budget

Tables 26-1 to 26-3 present the budgets recommended by Barr to undertake and complete three sequential phases of drilling-dominated activities as various portions of prospective extensions to the manganese mineralization become accessible for exploration and assessment.

Table 26-1 Phase 1 Budget*

Activity	Estimate
Land Management	US$150,000
Cuyuna Range Data Review & Analysis	US$50,000
Geophysics	US$50,000
Exploration Activities (including drilling)	US$600,000
Metallurgical Testing	US$100,000
Environmental & Government Activities	US$100,000
Administrative, Legal & Other	US$200,000
Total Phase 1 Budget	**US$1,250,000**

Table 26-2 Phase 2 Budget**

Activity	Estimate
Geophysics	US$50,000
Exploration Activities (including drilling)	US$750,000
Metallurgical Testing	US$100,000
Administrative, Legal & Other	US$100,000
Total Phase 1 Budget	**US$ 1,000,000**

Table 26-3 Phase 3 Budget***

Activity	Estimate
Geophysics	US$ 100,000
Exploration Activities (including drilling)	US$ 2050,000
Metallurgical Testing	US$300,000
Administrative, Legal & Other	US$100,000
Total Phase 1 Budget	**US$ 2,550,000**

* ** *** The Budget does not include an estimate for a PEA or PFS, which would only be initiated, as appropriate, after the Phase I (or 2 or 3) activities are completed.

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Date and Signature Page

Brad M. Dunn, CPG

Signing Date: December 5th, 2022

Certificate

As an author of this Report entitled "NI43-101 Technical Report, Resource Estimate on the Emily Property, Minnesota, USA", with an effective date June 12, 2020 (the "Technical Report"), I Brad M. Dunn, CPG, do hereby certify that:

1. I am employed by, and carried out this assignment for:

   Barr Engineering Company Limited
   4300 MarketPointe Drive
   Minneapolis, MN 55435
   United States of America
   Tel. (952) 832 2600 fax (952) 832 2601

2. I hold the following academic qualifications:

   B.Sc. Geology, The University of Otago, New Zealand, 2000

3. I am a Certified Professional Geologist (CPG) registered with the American Institute of Professional Geologists (AIPG), Membership number: CPG-11505.
4. I have practiced my profession continuously since 2000. I have over twenty years of experience in exploration, mining operations and resource estimation, including iron formation hosted mineralization, such as is present at the Project.
5. I do, by reason of education, experience and professional registration, fulfill the requirements of a Qualified Person as defined in NI 43-101.
6. I most recently visited the Project property on January 3, 2020.
7. I am responsible for the preparation and supervision of all Items of this Technical Report.
8. I am independent of NSM and CMR., as defined in Section 1.5 of NI 43-101.
9. I have read NI 43-101, and this Report, for which I am responsible, has been prepared in compliance with the instrument.
10. As of the date of this certificate, to the best of my knowledge, information and belief, the sections of this Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make this report not misleading.

Dated this day of December 5th, 2022

Brad M. Dunn, CPG
Senior Mining Geologist, Barr Engineering Company