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NI 43-101 TECHNICAL REPORT

BATTERY HILL PROJECT
MINERAL RESOURCE ESTIMATE
WOODSTOCK AREA
NEW BRUNSWICK, CANADA

Prepared For:

Manganese X Energy Corp.

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1.0 SUMMARY

1.1 Overview

Manganese X Energy Corp. ("Manganese X" or the "Company") retained Mercator Geological Services Limited ("Mercator") with respect to completing a Mineral Resource Estimate ("MRE") for the Battery Hill Manganese Project ("Battery Hill Project" or the "Project") located in New Brunswick, Canada. This Technical Report documents the MRE, which was prepared in accordance with the CIM Definition Standards for Mineral Resources and Reserves as amended in 2014 (CIM Standards 2014). The Technical Report was prepared in accordance with National Instrument 43-101 ("NI 43-101"). Manganese X is a publicly-traded mineral exploration company based in Quebec, Canada and listed on the TSX Venture Exchange under the "MN" stock ticker. Its head office is located at 145 Rue Graveline, Saint-Laurent, Quebec, Canada. The purpose of this Technical Report is to provide technical disclosure in support of a maiden MRE for the Battery Hill Project.

The Battery Hill Project includes Mineral Claim 5816, that is comprised of 55 mineral claim units (1,228 hectares) located near Jacksonville, New Brunswick, and Mineral Claim 5745, that is comprised of 8 mineral claim units (179 hectares) located 10 km to the southwest. Both titles are also 100% owned by Manganese X.

This Technical Report summarizes historical drilling and recent diamond drilling work completed on the Project by Manganese X that forms the basis of the MRE and makes recommendations for further exploration and development work on the Project.

Report authors Paul Ténière and Matthew Harrington are Professional Geologist's (P. Geo.) and Qualified Persons registered in the Provinces of Nova Scotia and/or New Brunswick and/or Ontario and are employees of Mercator, which has its head office in Dartmouth, Nova Scotia, Canada. Report author Doug Warkentin, P. Eng., is a Professional Engineer (P. Eng.) and Qualified Person registered in the province of British Columbia and employed by Kemetco Research Inc., which has its head office at 150 13260 Delf Place, Richmond, British Columbia, Canada. Report author Lawrence Elgert is a Professional Engineer (P. Eng.) and Qualified Person registered in the province of British Columbia and employed by AGP Mining Consultants Inc., which has its head office at Suite 246-132K Commerce Park Dr., Barrie, Ontario.

The report authors have prepared this Technical Report after reviewing historical exploration work and technical reports and completing metallurgical testing and a mineral resource estimate for the Battery Hill Project. In addition, author Ténière completed a personal inspection (site visit) of the Battery Hill Project on February 24, 2021.

1.2 Property Description and Ownership

The Battery Hill Project is comprised of Mineral Claim 5816 and Mineral Claim 5745 (63 claim units in total) that cover approximately 1,407 hectares of surface area. Both Mineral Claims are 100% owned by Manganese X and are located in Carleton County, New Brunswick, approximately 6 km west-northwest of the Town of Woodstock (population ~5,200). The Project is centred at map coordinates 605,639 m Easting and 5,119,588 m Northing (UTM NAD83 Zone 19N) within NTS Map Sheet 21J/04. It is approximately 16 km east of the town of Houlton, Maine, USA and approximately 105 km north of the City of Fredericton. The closest international airport is the Greater Moncton Roméo LeBlanc International Airport (YQM) located approximately 270 km southeast of the Project. Regional airline service (Air Canada and Porter Airlines) is available from Saint John Airport (YSJ) and Fredericton Airport (YFC). At the effective date of this report, scheduled passenger service at Saint John and Fredericton airports had been cancelled due to Covid 19 pandemic travel restrictions.

The region can be accessed via the Trans Canada highway or Route 95 which joins the I-95 Interstate highway at the USA border. Mineral Claim 5816 can easily be accessed via Route 560 from which the claims are transected in an east-west direction by Lockhart Mill Road, Iron Ore Hill Road, Burtt Road, Hopkins Road and Kirk Road, all just west of the village of Jacksonville. For Mineral Claim 5745, access is from Route 95, approximately 10 kilometers west of Woodstock. The closest town is Woodstock, which includes full-service accommodations, gas stations, grocery stores and restaurants, tool rentals, hardware stores, plus hospital, police, and fire services.

Agriculture is the predominant land use in the Battery Hill Project area.

1.3 Geology and Mineralization

The sedimentary units that host the iron-manganese mineralization in the Project area occur within the Smyrna Mills Formation of the Silurian Perham Group. These sedimentary units are in contact with the Carboniferous Mabou Group strata several kilometers to the east, and with argillaceous limestone and calcareous shale units of the Late Ordovician to Silurian White Head Formation in the immediate area to the east (Smith and Fyffe, 2006).

Development of upright, tight, local folds that trend generally northeast in the Project area is attributed to the mid-Devonian Acadian Orogeny. A weaker, subsequent system of cross folds is present in the southeastern part of the area and may be attributed to later stages of the same orogeny. These folds have affected strata of economic interest and resulted in substantial thickening of mineralized units in fold hinge zones. This locally produced broad zones of near-surface mineralization that may be particularly amenable to open pit development. Faulting has also contributed to structural thickening of the mineralized beds with folding and faulting together locally creating widths in excess of 200 metres.

The iron-manganese mineralization in this district is stratiform and sedimentary in origin and related to redox condition fluctuations in the offshore zone of a Silurian continental shelf environment developed adjacent to a stable cratonic margin. The constituent folded deposits are all classified for present purposes as being of the stratiform, manganiferous subset of the banded iron-formation (BIF) deposit type.

The majority of the manganese-iron mineralization occurs near the base of the Smyrna Mills Formation. This formation is comprised of dark grey, non-calcareous silty shale and associated ferro-manganiferous siltstone, red to brown ferro-manganiferous siltsone, and dark grey calcareous shale interbedded with medium grey calcareous quartzose sandstone. It also includes green calcareous sandstone, light grey, crystalline limestone, green nodular limestone, grey polymictic conglomerate, and minor non-manganiferous red shale and dark grey laminated, graptolitic siltstone. The underlying Whitehead Formation is Silurian to Ordovician in age and forms part of the Matapedia Group consisting of dark grey to bluish grey, massive to abundantly laminated, very fine-grained argillaceous limestone interbedded with calcareous shale" (Smith and Fyffe, 2006).

Based on previous drilling on the Iron Ore Hill occurrence, the main intervals of manganese-iron interest within the Smyrna Mills Formation consist of brick red and maroon hematite rich siltstones and weakly magnetic green siltstones. The highest manganese results are encountered in the brick red to maroon, hematite bearing units containing the manganese carbonate mineral rhodocrosite. Iron oxides such as magnetite and ilmenite are also present at lower levels. The slightly magnetic, altered green siltstones commonly include the iron carbonate mineral siderite. Non-magnetic green and black siltstone beds present in the stratigraphic section do not carry iron and manganese grades of economic interest. Manganese occurs predominantly in the form of the carbonate mineral rhodochrosite and iron occurs in both oxide (hematite, magnetite, and ilmenite) and carbonate minerals (predominantly siderite).

1.4 Exploration and Drilling

Manganese X acquired the Battery Hill Project in XXXXX and since that time has completed gravity and magnetometer ground geophysical surveys, three programs of core drilling that total 53 holes (9697m) plus a robust program of metallurgical investigation.

In 2016, Eastern Geophysics Ltd. ("Eastern Geophysics") completed ground gravity and magnetometer surveys that covered all of Mineral Claim 5816 on behalf of Manganese X. The surveys were planned over the same area as a 2011 Globex magnetometer survey with the purpose of providing follow up testing and enhancement of the data collected during 2011. The 2016 gravity survey consisted of 164 stations along 4 km of lines at 100 m line separation. Gravity survey highs closely coincide with positive anomalies identified by the earlier magnetometer survey but provide better definition of potential drilling targets.

The gravity survey was followed in 2016 by a 124-line km ground magnetometer survey and results were merged with those of the earlier survey. The survey provided better definition of anomalies and AusieCan Geoscience Inc. ("AusieCan") was contracted to merge, process and model the 2011 and 2016 survey data. The AusieCan interpretation identified Iron Ore Hill as containing five of the six best targets on the grid, with weakly anomalous areas occurring throughout the Sharpe Farm and Moody Hill areas.

In 2016, Manganese X completed a diamond drill program consisting of 16 drill holes for a total of 3,589 m of NQ-sized core. Drilling activities focused on the southern area of Mineral Claim 5816 where the strongest anomalies of the 2016 magnetometer survey occur. In 2017, Manganese X completed 9 diamond drill holes totaling 1,599 m of NQ-sized core on the Sharpe Farm and Moody Hill target areas. The program was designed to further delineate, expand, and improve the structural understanding of the significant manganese mineralization identified during the 2016 drilling program. In 2020, Manganese X completed 28 additional diamond drill holes totaling 4,509 m of NQ-sized core on the Moody Hill target areas. The drilling program was designed to further delineate, expand, and improve the structural understanding of the iron-manganese mineralization on the property, and had the specific purpose of providing a sufficient technical basis to support a mineral resource estimation program in accordance with the CIM Standards (2014) for Battery Hill Project. It confirmed significant widths of continuous mineralization from surface to a maximum vertical depth of approximately 150 m over a strike length of 500 m.

1.5 Mineral Processing and Metallurgical Testing

The mineralogical and metallurgical studies undertaken to date on Battery Hill Project mineralization for Manganese X used composite samples of Red and Grey mineralization, and a Mixed composite in some cases. The primary (master) composite samples were prepared from assay sample reject material from exploration drill-holes SF-16-6, -8 and -9 drilled on the Moody Hill section and holes SF-16-2, -4 and -5, drilled on the Sharpe Farm section of the Battery Hill deposit.

The first metallurgical programs consisted of diagnostic leach testing carried out by Kemetco and KPM to determine the achievable manganese extraction, investigate the leach kinetics of the major leachable elements and to measure the acid consumption for the main types of mineralization on the property (Red, Grey and Mixed). The test results were encouraging, with the best manganese extraction results exceeding 95%.

Kemetco subsequently carried out a program of purification testing and initial results showed that two stages of purification, which involved neutralization with lime and precipitation of Ca and Mg with fluoride, were very effective at removing Fe and Al contamination, and also removed most of the Ca and Mg. A third purification step, involving manganese carbonate precipitation and redissolution, was added to remove the residual reagent and additional Mg, resulting in a clean solution feeding the evaporation and crystallization stage. Crystal washing steps allowed further purification of the crystals, and the resulting crystal purities were above 99.9%. It was projected that even lower levels of impurity could be achieved in the final product, if needed, through additional washing steps.

A follow-up program by Kemetco was carried out to define principal unit operations of a flowsheet for the production of high purity $MnSO_4$ (HPMSM) from the Battery Hill mineralization. This included investigation of leaching methods and the effects of principal leaching parameters, solid-liquid separation methodology, and primary and secondary purification processes. Results from bench-scale leach tests showed the importance of maintaining high acidity, either through a lower pH set point or by limiting solids loading through lower pulp density. There was a lesser but significant temperature effect, but the most significant impact on recovery was from reduced particle size, with recovery increasing above 85% with a moderate grind. Addition of a reducing agent (SMBS) to a leach with ground mineralization resulted in a further improvement in recovery but had a more significant unwanted effect on iron and magnesium extraction. Process development work at Kemetco was on-going at the time of this Technical Report, with continuing testing designed to establish a fully integrated process flowsheet and to prepare mass balance data around each chosen unit operation. A single small-scale vat leach test was also completed on an agglomerated sample of as-received Red composite material and gave significantly lower recoveries. It demonstrated an alternate approach to leaching that could have economic advantages if successfully optimized.

Manganese X also contracted NRC to investigate the potential for mineralization upgrading processes to remove acid consuming minerals and thereby reduce the acid requirements for leaching, and to test the fluoride precipitation process for removing alkali metals in order to generate a final HPMS product. Testing results showed that gravity methods produced limited separation. Magnetic methods demonstrated some selectivity and produced an upgrading factor of 1.26. Two flotation reagent schemes based on fatty acid and hydroxamic acid collectors were also investigated and best results were achieved when a full rougher concentrate was cleaned three times. The combined 1st cleaner and scavenger concentrates, grading 17.3% Mn, recovered 64.1% of the manganese in 43.7% of the mass. Further cleaning resulted in further upgrading, with the third cleaner concentrate grading 19.5% Mn with 51.3% recovery in 31.1% of the mass.

In 2017, Manganese X initiated preliminary studies by Steinert US and ST Equipment and Technology LLC to test two additional upgrading technologies, these being sensor-based ore-sorting (Steinert) and 'Tribo-Electrostatic' separation (ST). The sorter was shown to be effective in upgrading the mineralization under a range of sensitivity settings, with the best product grading 14.72% Mn. The tribo-electrostatic separation preliminary testing did not lead to a significant separation or upgrading of the manganese under normal test conditions. A single small-scale vat leach test was also completed on an agglomerated sample of as-received Red composite material and gave significantly lower recoveries. It demonstrated an alternate approach to leaching that could have economic advantages if successfully optimized.

1.6 Mineral Resource Estimates

The mineral resource estimate for the Battery Hill Deposit supported by this Technical Report appears below in Table 1.1 and is based on validated results of 55 diamond drill holes totalling 10,056 m of drilling. The majority of this drilling was carried out by Manganese X between 2016 and 2020

The "reasonable prospects for eventual economic extraction" requirement for the mineral resource estimate was assessed by means of developing an optimized open pit shell to constrain mineral resources. The pit shell was based on the mineral deposit block model and developed by AGP for Mercator using Hexagon Mine Plan 3D version 15.4, MineSight® Economic Planner version 4.00. Pit optimization parameters include metal pricing of US$1500 per tonne for HPMSM, an exchange rate of CDN$1.30 to US$1.00, mining at CDN $6.50 per tonne, combined processing and G&A at CDN $86.22 per tonne processed, and a milling recovery to HPMSM of 65%. Although iron content was also estimated and is currently reported for the deposit, only manganese content was used in the pit optimization process. Potential for by-product production of specific iron products has been identified and requires further study through completion of additional metallurgical testing. The optimized pit shell supports a 3.7:1 strip ratio with pit slopes of 20° in overburden and 45° in bedrock.

Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization and is considered to define reasonable prospects for eventual economic extraction by open pit mining methods. Table 1.2 illustrates the effect of cut-off grade on total deposit tonnage, average metal grades and contained Mn metal.

Measured, Indicated, and Inferred mineral resources are defined as all blocks with interpolated manganese grades from the first, second or third interpolation pass, respectively, that meet the specified pit-constrained cut-off grade and demonstrate reasonable continuity. Orphan blocks and discontinuous zones of mineral resource categorization were refined through application of categorization solid models.

Table 1.1: Battery Hill Project Mineral Resource Estimate – Effective Date: June 18, 2021*

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	Measured	11,260,000	6.75	10.96
	Indicated	23,600,000	6.26	10.53
	Measured and Indicated	34,860,000	6.42	10.67
	Inferred	25,910,000	6.66	10.92

Mineral Resource Estimate Notes:

1) Mineral resources were prepared in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves (MRMR) (2014) and CIM MRMR Best Practice Guidelines (2019).
2) Mineral resources are defined within an optimized pit shell with average pit slope angles of 45º and a 3.7:1 strip ratio (waste : mineralized material).
3) Pit optimization parameters include: pricing of US$1500/t for High Purity Manganese Sulphate Monohydrate - 32% Mn (HPMSM), exchange rate of CDN $1.30 to US$ 1.00, mining at CDN $6.50/t, combined processing and G&A (1000 tpd) at CDN $86.22/t processed and a process recovery of Mn to HPMSM of 65%. Fe content was not included in the pit optimization.
4) Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization to define reasonable prospects for eventual economic extraction by open pit mining methods.
5) Mineral resources were estimated using Ordinary Kriging methods applied to 3 m downhole assay composites. No grade capping was applied. Model block size is 5 m (x) by 5 m (y) by 5 m (z)
6) Bulk density was applied using a regression curve based on Mn % and Fe % block grades.
7) Mineral resources may be materially affected by environmental, permitting, legal, title, taxation, sociopolitical, marketing, or other relevant issues.
8) Mineral resources are not mineral reserves and do not have demonstrated economic viability.
9) Mineral resource tonnages are rounded to the nearest 10,000.

Table 1.2: Battery Hill Project Cut-off Grade Sensitivity Analysis Within Mineral Resources

Cut-off Grade (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	**Measured**	**11,260,000**	**6.75**	**10.96**
	Indicated	**23,600,000**	**6.26**	**10.53**
	Inferred	**25,910,000**	**6.66**	**10.92**
5	Measured	8,680,000	7.52	11.73
	Indicated	15,930,000	7.26	11.65
	Inferred	18,630,000	7.71	11.92
6	Measured	6,250,000	8.32	12.44
	Indicated	11,680,000	7.91	12.35
	Inferred	14,130,000	8.41	12.64
7	Measured	4,460,000	9.06	13.11
	Indicated	7,790,000	8.61	12.95
	Inferred	10,610,000	9.05	13.30

Notes:
This table shows sensitivity of the June 18, 2021 mineral resource estimate to cut-off grade. The base case at a cut-off value of 2.5 % Mn is bolded for reference.

1.7 Project Risks and Uncertainties

All mineral projects are subject to risks arising from various sources. These include, but are not limited to, the following:

(1) Political instability of the host country or region;
(2) Site environnemental conditions that affect deposit access;
(3) Issues associated with legal access to sufficient land areas to support development and mining;
(4) Lack of certainty with respect to mineral tenure and development regulatory regimes;
(5) Lack of social licence for project development;
(6) Unforeseen negative market pricing trends;
(7) Inadequacy of deposit modelling and grade estimation programs with respect to actual metal grades and tonnages contained within the deposit;
(8) Metallurgical recoveries that fall within economically acceptable ranges cannot be attained.

At this time, the report authors do not foresee any significant risks and uncertainties that could reasonably be expected to affect the reliability or confidence in the drilling information, mineral resource estimate and metallurgical study conclusions disclosed in this technical report.

1.8 Interpretation and Conclusions

The Battery Hill Project covers the northern portion of a belt of stratiform manganese-iron mineralization. Mineralization occurs in three main host lithologies, these being brick-red to maroon-coloured siltstones, green-grey to black siltstones, and mixed red and grey siltstones. These three types of mineralized siltstones have been termed Red, Grey and Mixed for current purposes and are directly comparable to similar mineralized sequences that have been described in detail with respect to the Plymouth Manganese-Iron Deposit located approximately 5 km south of Battery Hill on the adjacent exploration property held by Canadian Manganese Company Inc. Historical and recent testing programs have shown that the brick-red siltstones and green-grey to black siltstones had differing minerology, resulting in significant differences in acid consumption and leachable metal content between the these lithologies.

Since acquiring the Battery Hill Project in 2015, Manganese X completed a 3,589 m (16 hole) diamond drilling program in 2016 on the deposit that was followed in 2017 by a 1,599 m (9 hole) program, and a 4,509 m (28 hole) program in 2020. Beginning in 2017, Manganese X Energy contracted Kemetco to carry out a series of mineralogical and metallurgical studies on Battery Hill Deposit mineralization to support preparation of a future Mineral Resource Estimate for the deposit. The primary focus of the metallurgical studies was development of processes and related flow sheet components to produce HPMSM from the manganese carbonate mineralization that predominates. Kemetco was successful in developing such processes and estimated processing costs developed by that company were applied by Mercator in addressing the “reasonable prospects of eventual economic extraction” assessment for the current mineral resource estimate as set out under the CIM Standards (2014).

The mineral resource estimate for the Battery Hill Project supported by this Technical Report appears above in section 1.6 and defines a large resource inventory. In combination with processing approaches developed by Kemetco, this inventory has potential for cost-effective future production of HPMSM as well as other manganese products for domestic and international sale. The forecasted expanding future market for HPMSM in production of electric vehicle (EV) batteries underwrites Manganese X's strategy with respect to the project.

The large inventory of Measured and Indicated category mineral resources defined to date for the Battery Hill Project is sufficient to form the basis of a Preliminary Economic Assessment (PEA), a Pre-feasibility study (PFS) or a Feasibility Study (FS). However, a substantial body of additional engineering, metallurgical testing, processing flowsheet development work and market analysis is required to support the PFS and FS options. The report authors are of the opinion that initiation of a PEA based on the current mineral resource estimate and Kemetco's most recent processing study results is the best approach for Manganese X to take with respect to timely and systematic evaluation of the Battery Hill Projects' economic viability. A positive PEA result should form the basis of any subsequent decision by Manganese X to move the project forward to the PFS or FS level of economic and technical evaluation. Any future PFS or FS level evaluation would benefit from conversion of certain existing Inferred category mineral resources to Indicated status, particularly in the Sharp Farm area of the deposit. This upgrading will require a modest infill core drilling and is warranted.

In addition to economic evaluation of the main Battery Hill deposit, it is appropriate to carry out a basic assessment of Manganese X's other holding in the area, Mineral Claim 5745, that hosts historically described manganese mineralization of the same style as that comprising the Battery Hill area deposits. A small core drilling assessment designed to test the ground magnetometer anomalies that define the mineralized stratigraphy trend in this area is warranted.

1.9 Recommendations

The following recommendations with respect to further evaluation of the Battery Hill Project are based on work completed to date by Mercator, AGP and Kemetco. A two Phase approach is presented, with commitment to Phase II being contingent on receipt of sufficiently positive results from Phase I.

1.9.1 Phase I Program

To expedite economic evaluation of the Battery Hill Project, it is recommended that a PEA based on the June 18th, 2021 mineral resource estimate and Kemetco's latest metallurgical processing flowsheet be initiated as soon as possible.

It is also recommended that two small drilling programs be undertaken in Phase I. The first, totalling 1500 m of infill drilling, should be directed toward mineral resource category upgrading in the Sharp Farm area. The second, totaling 400 m of drilling should be undertaken on Manganese X's Mineral Claim 5745, located 10 kilometers south of Battery Hill. The purpose of this program would be to meet government assessment work requirements and to also provide initial characterization of manganese and iron mineralization known to be present in that area.

1.9.2 Phase II Program

Preparation of a PFS for the Battery Hill Project comprises the entirety of the Phase II recommended work program. Commitment to this evaluation is contingent upon receipt of a sufficiently positive economic evaluation from the Phase I PEA. A PFS will require detailed contributions across a broad range of professional and technical fields that include geotechnical, mining, metallurgical and civil engineering as well as completion of advanced geological, mineral resource estimation, environmental, marketing and economic analysis studies. These advanced project components were not addressed in detail for current report purposes. However, a general cost estimate based on comparable size projects was developed for budget purposes and appears below in Section 1.9.2.

1.9.3 Work Program Budget Estimates

Budget estimates for the recommended Phase I and Phase II work programs appear in Table 1.3.

Table 1.3: Phase I and Phase II Recommended Budgets

Phase 1	Task	Estimated Cost CDN$
	Preparation of a PEA based on the June 18, 2021 mineral resource estimate and updated Kemetco processing flow sheet	150,000
	Sharp Farm area infill drilling (1,500 meters) including reporting and analyses	300,000
	Mineral Claim 5745 exploration drilling (400 meters) including reporting and analyses	80,000
	Sub-total	530,000
	Administration and support	53,000
	Total	**583,000**
Phase II	Preparation of a PFS contingent upon positive results of the Phase I PEA	2,000,000
	Administration and support (~15%)	300,000
	Total	**2,300,000**

2.0 INTRODUCTION

2.1 Scope of Reporting

Manganese X Energy Corp. ("Manganese X" or the "Company") retained Mercator Geological Services Limited ("Mercator") with respect to completing a Mineral Resource Estimate ("MRE") for the Battery Hill Manganese Project ("Battery Hill Project" or the "Project") located in New Brunswick, Canada. This Technical Report documents the MRE, which was prepared in accordance with the CIM Definition Standards for Mineral Resources and Reserves as amended in 2014 (CIM Standards 2014). The Technical Report was prepared in accordance with National Instrument 43-101 ("NI 43-101"). Manganese X is a publicly-traded mineral exploration company based in Quebec, Canada and listed on the TSX Venture Exchange under the "MN" stock ticker. Its head office is located at 145 Rue Graveline, Saint-Laurent, Quebec, Canada. The purpose of this Technical Report is to provide technical disclosure in support of the MRE for the Battery Hill Project.

The Battery Hill Project includes Mineral Claim 5816 that comprises 55 mineral claim units (1,228 hectares) located near Jacksonville, New Brunswick and is 100% owned by Manganese X (Figure 2.1). The Battery Hill Project also includes Mineral Claim 5745 that comprises 8 claim units (179 hectares) located 10 km southwest of Mineral Claim 5816 and is also 100% owned by Manganese X.

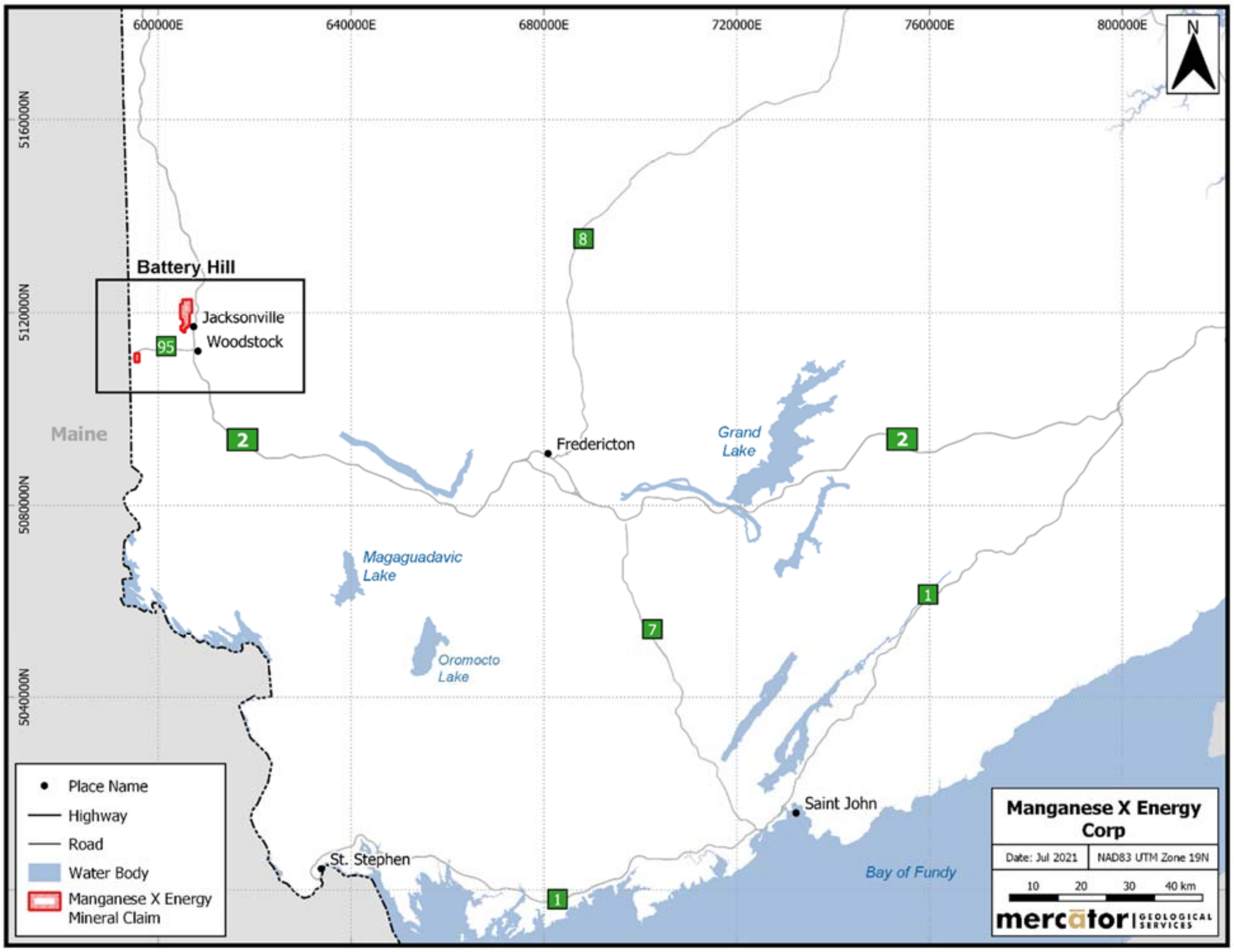
This technical report also summarizes historical drilling and recent diamond drilling work completed on the Project by Manganese X that forms the basis of the MRE and makes recommendations for further exploration and development work on the Project.

2.2 Qualified Persons

Report authors Paul Ténière and Matthew Harrington are Professional Geologist's (P. Geo.) and Qualified Persons registered in the Provinces of Nova Scotia and/or New Brunswick and/or Ontario and are employees of Mercator, which has its head office in Dartmouth, Nova Scotia, Canada. Report author Doug Warkentin, P. Eng., is a Professional Engineer (P. Eng.) and Qualified Person registered in the province of British Columbia and employed by Kemetco Research Inc. (Kemetco) which has its head office at 150 13260 Delf Place, Richmond, British Columbia, Canada. Report author Lawrence Elgert is a Professional Engineer (P. Eng.) and Qualified Person registered in the province of British Columbia and employed by AGP Mining Consultants Inc. (AGP), which has its head office at Suite 246-132K Commerce Park Dr., Barrie, Ontario.

The report authors are independent Qualified Persons (QP) as defined by NI 43-101 and are responsible for all sections of this report as summarized in each Certificate of Qualified Person that appears in section 27. Neither Mercator, nor the authors of this report, have any material present or contingent interest in the outcome of this report, nor do they have any financial or other interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. This technical report has been prepared in return for professional fees based upon agreed commercial rates and the

Figure 2.1: Location Map for Battery Hill Project



payment of these fees is in no way contingent on the results of this report. The report authors are not a director, officer or other direct employee of Manganese X and do not have shareholdings in this company.

2.3 Personal Inspection (Site Visit) and Data Verification

Report author Paul Ténière completed a personal inspection (site visit) of the Battery Hill Project on February 24, 2021. This site visit was completed for the purposes of site inspection, ground truthing, collecting core samples for independent witness (IW) sampling and to satisfy NI 43-101 "personal inspection" and data verification requirements. During his personal inspection, Mr. Ténière visited Mineral Claim 5816 that covers the Battery Hill Project mineral resource estimate area and verified the geology, mineralization, local infrastructure, and accessibility into the project area for future exploration and development activities by Manganese X. Mr. Ténière collected a total of 3 quarter core samples from the 2020 Manganese X drill program on the Battery Hill Project (Moody Hill target) for independent witness (IW) sampling and check assay analyses.

In addition, on December 17, 2020, Mr. Ténière visited the New Brunswick Department of Natural Resources and Energy Development ("NBDNR") core storage facility in Sussex, NB to review and sample the Battery Hill drill core collected during the 2016 and 2017 Manganese X drilling programs. Mr. Ténière collected a total of 11 quarter core samples for IW sampling and check assay analyses (Moody Hill and Sharpe Farm targets). A summary of the results from the IW sampling and check assay program are discussed in Section 12 of this technical report (Data Verification).

During the site visits Mr. Ténière completed the following tasks and inspections:

- Review and inspection of the Manganese X core storage facility in Woodstock, including select core intervals from the 2016, 2017 and 2020 drilling programs and visually comparing the core to original drill logs and sampled intervals;
- Independent witness sampling of 14 core sample intervals from the 2016, 2017, and 2020 drilling programs for data verification purposes, comparison to the original assay results, and to rectify any errors in the assay database provided by Manganese X (see Section 12 for details);
- Reviewed the data collection and quality assurance/quality control (QAQC) procedures for the Battery Hill drilling and sampling programs completed by Manganese X; and
- Completed a field inspection in the northern part of the Battery Hill Project area including the northern part of the Moody Hill target with a Manganese X employee on February 24, 2021 (Figure 2.1). The inspection was completed on the road and drill sites were not accessible due to deep snow conditions (winter conditions).

The personal inspection completed by Mr. Ténière on December 17, 2020 and February 24, 2021 (Battery Hill Project site visit) confirmed the following:

- The Manganese X core facility at the Battery Hill Project was well organized and there was evidence of proper QAQC procedures in place for core logging and sampling (Figure 2.2);
- Manganese mineralization was evident in the core samples reviewed and sample intervals were properly documented in core boxes and in the core logging database;
- Access to the Project area is excellent through secondary roads and well-maintained trails owned by private landowners with agreements in place. Exploration and drilling activities can be carried out easily without material obstacle.

In addition, based on a review of available drilling, rock sampling, geophysical surveying results, QA/QC procedure results, and other exploration program activities recently completed by Manganese X, the report author is satisfied that this meets the data verification requirements under NI 43-101. The Manganese X field programs were designed according to CIM Mineral Exploration Best Practice Guidelines, and no issues or fatal flaws were detected during the personal inspection.

2.4 Information Sources

Sources of information, data and reports reviewed as part of this technical report can be found in Section 27 (References). The report authors take responsibility for the content of this report and believe the data review to be accurate and complete in all material aspects. Exploration claims information, historical assessment and technical reports, and exploration and drilling data were either acquired by Mercator or supplied by Manganese X. Historical and recent drilling data was loaded into a Surpac database and validated by report author Matthew Harrington prior to evaluation use in the mineral resource estimate.

2.5 Abbreviations Used in Report

Abbreviations used in this report appear in Table2.1,

Table 2.1: Table of Abbreviations

Abbreviation	Meaning		
3D	three-dimensional		
AA	atomic adsorption		
Actlabs	Activation Laboratories Ltd.		
ALS	ALS Minerals Ltd.		
AusieCan	AusieCan Geoscience Inc.		
CALA	Canadian Association for Laboratory Accreditation		
CDN	Canadian		
CIM	Canadian Institute of Mining and Metallurgy		
DEM	digital elevation model		
DGPS	differential global positioning satellite		
EL	exploration licence		
EM	electromagnetic		
FA-AA	fire assay-atomic absorption		
GMR	gross metal royalty		
GPS	global positioning satellite		
GSC	Geological Survey of Canada		
g/t	grams per tonne		
ICP-OES	Inductively Coupled Plasma Optical Emission Spectrometry		
IP	Induced Polarization		
LiDAR	light detection and ranging		
Manganese X	Manganese X Energy Corp.		
Mercator	Mercator Geological Services Ltd.		
Mt	millions of tonnes		
NI 43-101	National Instrument 43-101		
NBDNRED	New Brunswick Department of Natural Resources and Energy Development		
NSR	net smelter return (royalty)		
oz	ounce		
P. Geo.	Professional Geologist		
P. Eng.	Professional Engineer		
ppb	parts per billion		
ppm	parts per million		
QAQC	quality assurance and quality control		
QP	Qualified Person		
RC	reverse circulation		
UTM	Universal Transverse Mercator		
VLF-EM	very low frequency electromagnetic		
k	thousand	°	degree symbol

Abbreviation	Meaning		
Ma	million	%	percent
Ga	billion	Ba	Barium
ca	circa	PGE	Platinum Group Elements
et al.	and others	REE	Rare Earth Elements
C	Celsius	Pb	Lead
ha	hectare	Pd	Palladium
kg	kilogram	Au	Gold
km	kilometre	Ag	Silver
lbs	pounds	As	Arsenic
ft	foot	Cu	Copper
"	inch	Ni	Nickel
µm	micrometre	Zn	Zinc
m	metre	Fe	Iron
mm	millimetre	Mn	Manganese
cm	centimetre	K	Potassium
ml	millilitre	Th	Thorium
/	per	Co	Cobalt
g	gram (0.03215 troy oz)	Pb	Lead
oz	troy ounce (31.04 g)	Bi	Bismuth
Oz/T to g/t	1 oz/T = 34.28 g/t	Ca	Calcium
Sn	tin	In	Indium
st	short ton (2000 lb or 907.2 kg)	ppm	parts per million
ppb	parts per billion	t	tonne (1000 kg or 2204.6 lb)

3.0 RELIANCE ON OTHER EXPERTS

The QP and Mercator are relying upon information provided by Manganese X concerning any legal, political, environmental, or any option, joint venture or royalty matters relating to the Battery Hill Project. The QP and Mercator acquired mineral titles information on the mineral claims that are the subject of this technical report from the New Brunswick Department of Energy and Resource Development electronic database of mineral titles (known as “NB e-CLAIMS”). This information showed the subject Mineral Claims to be in good standing at the effective date of this report and at the report date. However, the QP and Mercator have not independently verified the status of, nor legal titles relating to, the Mineral Claims and associated claim units.

No warranty or guarantee, be it express or implied, is made by the QP or Mercator with respect to the completeness or accuracy of the mineral titles comprising the Battery Hill Project.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location and Description

The Battery Hill Project is comprised of non-contiguous Mineral Claim 5816 and Mineral Claim 5745 (63 claim units in total - Table 4.1) and measures approximately 1,407 hectares in surface area. The two Mineral Claims are located in Carleton County, New Brunswick, approximately 6 km west-northwest of the Town of Woodstock. The Project is centred at map coordinates 605639 m Easting and 5119588 m Northing (UTM NAD83 Zone 19N) within NTS Map Sheet 21J/04 (Figure 4.1).

Table 4.1: Mineral Claims Table for Battery Hill Project

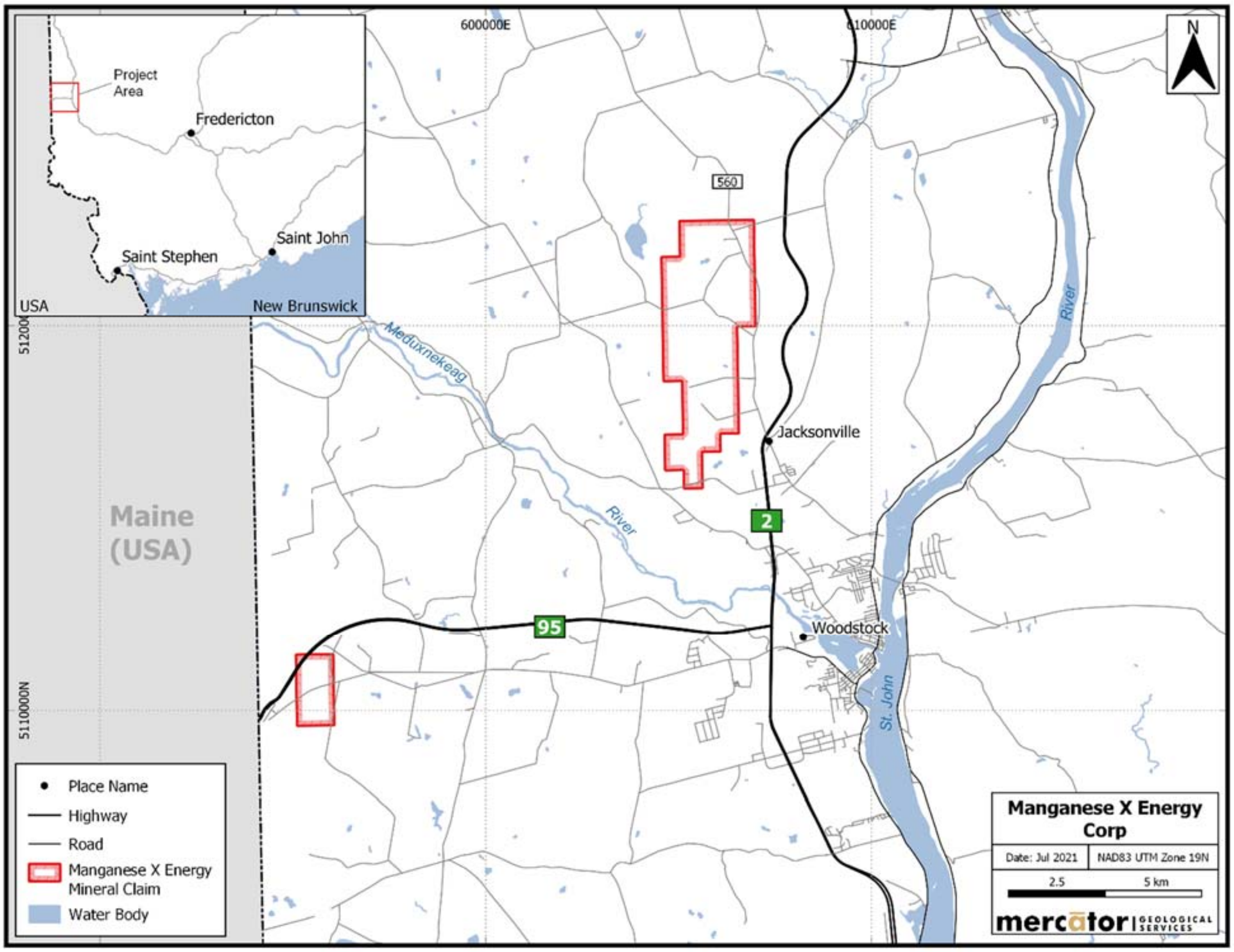
Mineral Claim Number	Claim Group Name	Beneficial Owner	Number of Claim Units	Issue Date	Expiry Date	Area (Ha)
5816	Jacksonville	Manganese X Energy Corp. (100%)	55	2010-07-21	2022-07-21	1,228
5745	Irish Settlement	Manganese X Energy Corp. (100%)	8	2010-03-25	2022-03-25	179
			63			**1,407**

The New Brunswick Department of Energy and Resource Development electronic database of mineral titles known as “NB e-CLAIMS” (http://nbeclaims.gnb.ca/nbeclaims) confirms that all mineral claims comprising the Battery Hill Project as described above in Table 4.1 were, at the effective date and report date, in good standing , and that no legal encumbrances were registered with New Brunswick Department of Energy and Resource Development against these mineral claims. The QP confirms that payment of claim acquisition fees associated with the claims identified in Table 4.1 have been documented in NB e-CLAIMS. The QP makes no further assertion concerning the legal status of the properties. None of the properties have been legally surveyed to date and there is no requirement to do so at this time.

4.2 Option Agreements and Royalties

On December 4, 2018, Manganese X announced that it had acquired a 100% interest in the Battery Hill Project by making cash payments of $200,000, issuing 4.0 million common shares and spending $1.0 million on exploration over a two-year period. The Project is still subject to a 3% Gross Metal Royalty (“GMR”) on production payable to Globex Mining Enterprises Inc. (“Globex”). On July 13, 2020, Globex sold 2% of the GMR to Electric Royalties Ltd. Under the terms of the original option agreement with Globex, if the Project is not in commercial production by the 6th anniversary of the effective date of the agreement (December 4, 2024), Manganese X will pay Globex an advance royalty payment of $20,000 annually. The agreement includes all claim units in Mineral Claim 5816 and Mineral Claim 5745.

Figure 4.1: Location Map for Battery Hill Project



4.3 Surface Rights and Permitting

As defined under the New Brunswick Mining Act ("*Mining Act*"), minerals are generally owned by the Crown, however, some land grants reserved only specific minerals to the Crown and therefore other minerals were, in fact, transferred to the grantee. Prior to 1810, it was common for gold and silver, and a few other minerals to be reserved to the Crown. The *Mining Act* defines a mineral as any natural, solid, inorganic, or fossilized organic substance, and such other substances as are prescribed by regulation to be minerals, but does not include:

- Sand, gravel, ordinary stone, clay or soil unless it is to be used for its chemical or special physical properties, or both, or where it is taken for contained minerals;
- Ordinary stone used for building or construction;
- Peat or peat moss;
- Bituminous shale, oil shale, albertite, or intimately associated substances or products derived therefrom;
- Oil or natural gas; or

- Such other substances as are prescribed by regulation not to be minerals.

Crown-owned minerals are property separate from the soil; that is, a landowner owns the surface rights but does not own mineral rights, unless some minerals were granted with the land and each conveyance since the granting has preserved the ownership of those minerals. By means of the *Mining Act*, the province makes Crown-owned minerals available for exploration and development. Prospectors (persons or companies that hold prospecting licences), holders of claims, and holders of mining leases have the right to prospect, explore, mine, and produce those minerals, whether they are on Crown-owned or privately-owned lands. They also have the right of access to the minerals; however, they are liable for any damage they cause.

All Crown-owned minerals are available for prospecting and staking except in:

- Lands withdrawn from staking for all or certain minerals, e.g., coal and potash are currently withdrawn from prospecting and staking;
- Lands already staked or leased;
- First Nations reserves. Minerals in First Nations reserves are administered through the Indian Act of Canada; and
- National and Provincial Parks, Protected Natural Areas, and Military Lands.

Mineral Claim acquisition in New Brunswick is an online process (NB e-CLAIMS) and can be completed by selecting claim units from an interactive map or by inputting claim unit numbers in the application. For acquisition, the minimum size of a Mineral Claim is 1 mineral claim unit and the maximum number of units in a Mineral Claim should not exceed 256 contiguous available mineral claim units. To fully benefit from all the options available via NB e-CLAIMS, holders of earlier ground staked Mineral Claims should convert their titles to the current map staked system of mineral claim units and Mineral Claims. Conversion of ground staked Mineral Claims to map staked Mineral Claims is to be voluntarily completed until such time as the Recorder's office will control any outstanding conversions.

Mineral claim unit renewal fees and yearly work requirements are summarized in Table 4.2 below.

Table 4.2: Amount of Assessment Work Required Per Mineral Claim Unit (*Mining Act*)

Service Type	Description	Fee/Charge ($)
Renewal Fees	1 to 5	10
	6 to 10	20
	11 to 15	30
	16 and more	50
Other Fees	Grouping ≥2 contiguous Mineral Claims into 1 group (per resulting group)	20
	Transfer (all or part per Mineral Claim Unit)	10
	Notice of dispute (per Mineral Claim)	20
	Payment in lieu of required work in the first year of a Mineral Claim Unit (per Mineral Claim Unit)	20
Mineral Claim Work Expenditure Requirement (per Mineral Claim Unit and per year)	Year 1	100
	Year 2	150
	Year 3	200
	Year 4	250
	Year 5 to 10	300
	Year 11 to 15	500
	Year 16 to 25	600
	Year 26 and over	800

Land access permission is required from surface rights holders in New Brunswick before mineral exploration activities can be undertaken. Surface titles to lands covered by the Battery Hill Project are held by various private landowners or the Province of New Brunswick (the “Crown”). For both Crown land and private land, mineral exploration licence holders must come to an agreement with the landholder in order to gain the right to access and be able to conduct exploration work on the land.

For work on Crown Land it is necessary to submit a Notice of Planned Work on Crown Land – Form 18.1 to the Recorder (New Brunswick Regulation 86-99 under the Mining Act, s.20.1). The Recorder will review the submitted form and, in most cases, will grant permission on behalf of the Department of Natural Resources and Energy Development. In some cases, the Recorder will advise the claim holder that a reclamation plan and security are required before work can commence. If work is to be conducted on a Crown Land Lease, the claim holder needs to obtain permission from the Lessee (Mining Act, 1985 s.110).

For private land, a claim holder needs to contact the landowner as soon as possible after staking and advise of such. A Notice of Planned Work on Private Land - Form 18 (New Brunswick Regulation 86-99 under the Mining Act, 1985 s.20) must be delivered to the landowner if intrusive work of any kind is planned. A copy of the completed Form 18 must also be submitted to the Recorder indicating how and when the landowner was notified. The claim holder must attempt to reach an agreement with the landowner regarding any surface disturbance such as damage and/or interference with use and enjoyment of the land, including plans for reclamation. If the claim holder is unable to contact the landowner, it is necessary to notify the Recorder that a reasonable effort to do so has been made. If the claim holder is unable to reach an agreement with a landowner within 60 days of contact, work may be done after a security is deposited with the Recorder. The claim holder is required to notify landowners prior to each year of work (Mining Act, 1985 s.110).

Special permission from a landowner or appropriate authority is required prior to causing actual damage to, or interference with the use and enjoyment of the following lands: lands in cities, town and villages, lands occupied by railway stations and switching yards and railway rights of way, lands within the boundaries of a public highway, lands occupied by a building or a public highway, lands occupied by a building or curtilage thereof, gardens and cultivated lands and other lands that are prescribed by regulation

Reference:
https://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/minerals/content/Minerals_exploration/LandAccessAndUse.html

4.4 Permits or Agreements Required for Exploration Activities

The Battery Hill Project is located on private lands. Manganese X has executed land access agreements with private landowners to complete the recent exploration work on its mineral claims (diamond drilling) and reported in this technical report. Amendments to these land access agreements would be required to conduct prospecting, geochemical surveys, ground geophysical surveys requiring line cutting, trenching, and all drilling activities. These land access agreements would cover any land disturbance or other damage associated with the intended exploration work and need to be renewed on a regular basis.

4.5 Other Liability and Risk Factors

The QP is not aware of any environmental liabilities on the property. As noted above, Manganese X will require permits to conduct recommended future exploration work on the property. The Moody Hill, Maple Hill and Iron Ore Hill historical mine workings contain open trenches, pits, and possibly one inclined shaft at Iron Ore Hill. It is the QP’s opinion that any liabilities for these workings would lie with the current landowners or the Government of New Brunswick if located on Crown land.

The QP is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the recommended work program on the property.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The Battery Hill Project is located in western New Brunswick, Canada, approximately 6 km northwest of the Town of Woodstock (pop. 5,200), approximately 16 km east of the town of Houlton, Maine, USA (pop. 6,123), and approximately 105 km north of the City of Fredericton (pop. 58,220) see previous Figure 4.1). The closest international airport is the Greater Moncton Roméo LeBlanc International Airport (YQM) located approximately 270 km southeast of the Project. Regional airline service (Air Canada and Porter Airlines) is also available from Saint John Airport (YSJ) and Fredericton Airport (YFC) with daily direct flights from Montréal and Toronto. At the effective date of this report, scheduled passenger service at Saint John and Fredericton airports had been cancelled due to Covid 19 pandemic travel restrictions.

The region can be accessed via the Trans Canada highway or Route 95 which joins the I-95 Interstate highway at the USA border. Mineral Claim 5816 can easily be accessed via Route 560 from which the claim units are transected in an east-west direction by Lockhart Mill Road, Iron Ore Hill Road, Burtt Road, Hopkins Road and Kirk Road, all just west of the village of Jacksonville. For Mineral Claim 5745, access is from Route 95, approximately 10 kilometers west of Woodstock.

5.2 Climate and Physiography

The Project is in the temperate zone of North America, and although the property is within 157 km of the ocean (Bay of Fundy), climatic conditions are more humid continental, governed by the eastward flow of continental weather patterns. The average annual temperature is approximately 10˚C, with an average summer maximum of 30˚C and an average winter minimum of -30˚C. Winter conditions are prevalent at the site from late November until early April. Frost depth is approximately 2.0 m. Annual precipitation is approximately 1,000 mm with 60% of this occurring as rain and the remainder as snow. Mineral exploration field programs can efficiently be undertaken from May through to late November in all areas. Programs such as drilling and geophysical surveys can also be implemented year-round but delays due to poor winter weather conditions such as heavy snow fall should be expected.

The Project is located within the Saint John River watershed and is primarily agricultural land with forested sections. Overburden thickness typically ranges between 0 and 10 metres in depth. Topographic elevations on the Mineral Claims range between 120 and 180 metres above sea level. Surface drainage systems consist of abundant small lakes, rivers, and streams.

5.3 Local Resources and Infrastructure

The Project is well positioned with respect to infrastructure. The town of Woodstock (population ~5200), which includes full-service accommodations, gas stations, grocery stores and restaurants, tool rentals and hardware stores, plus hospital, police and fire services. Agriculture is the predominant land use in the Project area. Railway transportation is accessible in Houlton, Maine, approximately 15 km west of the Project and also in McAdam, New Brunswick, approximately 75 km to the south. Access to the provincial electrical grid system is readily available.

The surface drainage systems present in the Saint John River watershed provide readily accessible potential water sources for incidental exploration use such as diamond drilling. They also provide good potential as higher volume sources of water such as those potentially required for future mining and milling operations.

Exploration staff and consultants, as well as forestry, heavy equipment and drilling contractors can be sourced from within New Brunswick and surrounding provinces such as Nova Scotia and Quebec. The agriculture and forestry sectors are the major employers in the region, with J.D. Irving Ltd. being dominant in western New Brunswick. The local, rural and urban communities of the region provide a large base of skilled trades, professional, and service sector support that can be accessed for exploration and resource development purposes.

6.0 HISTORY

6.1 Historical Assessment Work

Past exploration work on the Battery Hill Project consists of surface exploration activities such as ground geophysics, drilling, and geological mapping. The historical work in the Project area has mainly focused on Mineral Claim 5816 which contains the Moody Hill, Iron Ore Hill, Maple Hill, Wakefield, and Sharpe Farm iron-manganese mineral occurrences.

The iron-manganese occurrences in the Woodstock area were first discovered by Dr. C.T. Jackson in conjunction with a geological study of the State of Maine in 1836. Initial development interests were focused on the recovery of iron. In 1848, the Woodstock Charcoal and Iron Co. was formed, and two small blast furnaces operated between then and the early 1860’s. Most of the mining activity during this time was primarily in the Iron Ore Hill area. No further work was undertaken after the close of the mine in the 1860’s until Strategic Materials Corporation (“Stratmat”) commenced exploration efforts in the area in the early 1950’s.

Between 1953 and 1960, Stratmat conducted various metallurgical investigations and field work consisting of ground geophysical exploration followed by diamond drilling (Sidwell, 1957). Reconnaissance gravity surveys were conducted southwest from the Iron Ore Hill area to the Maine border. During this time Stratmat completed a total of 34,021 feet (10,370 metres) of drilling, of which 17,388 feet (5,300 metres) was completed on the Plymouth Deposit, located several kilometers southwest of Mineral Claim 5816. This deposit is not held by Manganese X. Historical drill logs from this program are no longer available, but drilling results are reported in Sidwell (1957). As a result of this work, Stratmat identified the South Hartford, North Hartford, Plymouth, Moody Hill, and Sharpe Farm “deposits”. Sidwell (1957) reported approximate tonnages and grades for each of these, but the estimates are considered historical in nature and do not comply with 2014 CIM Definition Standards on Mineral Resources and Mineral Reserves. In 1986, Mineral Resource Research Limited (MRSL), on behalf of the New Brunswick Department of Natural Resources, completed limited drilling, minor bulk sampling, and a magnetometer survey on the Plymouth Deposit (Prince and Roberts, 1990).

In 2010, Globex Mining Enterprises Inc. (“Globex”) took ownership of the Project and commenced exploration activities by collecting rock samples near the Iron Ore Hill historical workings. A total of 7 rock samples were tested and confirmed the presence of higher grades of manganese than had been reported in the historical testing, as well as abundant quantities of lower grade material (MacKinnon, 2011). As a result of this initial sampling, a follow up sampling program was completed and consisted of 59 rock samples taken along intermittent outcrops in a ditch adjacent to the historical workings. The results of this program returned manganese values from 1% to 26.15% MnO (26.15% MnO contains 20.25 weight percent elemental Mn). Higher grade results were obtained from black, sub-metallic layers in the mixed, predominantly brick red and maroon alternating bands within the mineralized horizon. Maroon layers provided the next highest grades (MacKinnon, 2011).

In 2011, Globex completed a diamond drilling program and a 64-kilometre magnetometer survey over Mineral Claim 5816. The magnetometer readings were taken at 12.5-metre intervals and lines were at 100 metre spacing oriented in an east-west direction using a GPS for control. A 1:10,000 scale contoured map of the survey was produced, showing better defined, sharper results in the south part of the survey as compared to the north. The 2011 drilling program consisted of a single diamond drill hole on Mineral Claim 5745, and 2 drill holes on Mineral Claim 5816. The holes drilled on Mineral Claim 5816 were drilled to intersect mineralization in the area of the historical workings at the Iron Ore Hill mineral occurrence. The highest assay values occurred in drill hole GNB-11-2, which intercepted 13.9% Fe and 9.79% Mn over 48.3 metres (MacKinnon, 2012). The highest-grade manganese mineralization was observed in both the maroon and green siltstone units.

6.2 Regional and Government Survey Work

In 1952, the New Brunswick Resources Development Board completed a review of New Brunswick Mn occurrences (Sidwell, 1952), and in 1954 the Geological Survey of Canada (GSC) completed a preliminary review of the Woodstock area Mn occurrences. The United States Bureau of Mines and Maine Geological Survey also initiated studies of similar Mn deposits, across the US border in Aroostook County, Maine in 1952.

In 1968, the Geological Survey of Canada published a Memoir on the Woodstock area that included a regional geological map showing locations of the various manganese-iron prospects (Anderson, 1968). This report provided detailed descriptions of the main Woodstock area manganese deposits and also documented the location of several manganese-iron occurrences located southwest of the Plymouth Deposit and extending south to the Maine border.

6.3 Historical Mineral Resource Estimates and Past Production

To date no mineral resource or mineral reserve estimates prepared in accordance with the CIM Standards (2014 or earlier) have been completed for the Battery Hill Project. As noted above, various estimates are described in pre-NI 43-101 historical reporting for the area, but these are historical in nature and should not be relied upon. Manganese X is not considering any of them to be current and is not relying upon these estimates.

Small-scale production from the Woodstock area iron-manganese occurrences occurred shortly after their discovery in 1848 with a reported 70,000 tons (63,502 tonnes) mined from the Iron Ore Hill occurrence with a lesser amount from the Moody Hill occurrence (Sidwell, 1957). Gross (1967) reported that the iron-manganese produced from the Woodstock area during this period was found to have exceptionally good physical qualities and was shipped to England for use by the Royal Navy for armour plating gunboats.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

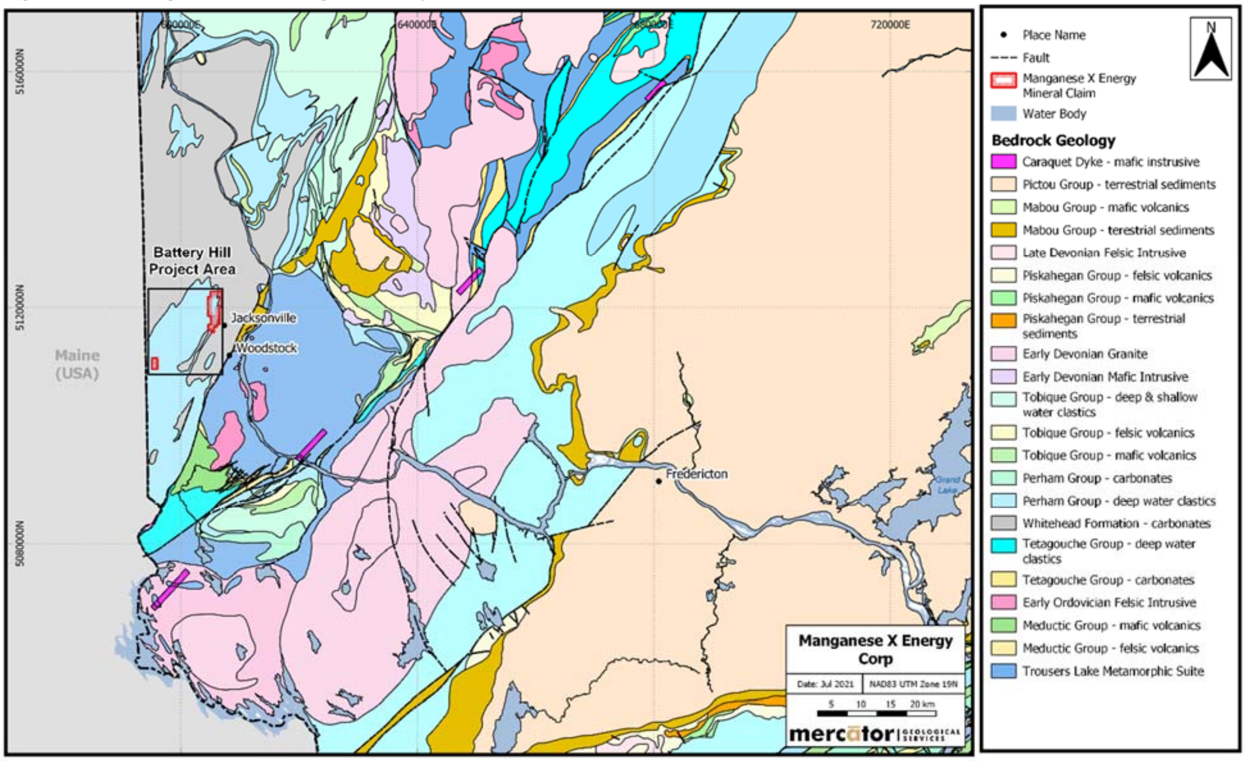
The sedimentary units that host the iron-manganese mineralization in the Woodstock area occur within the Smyrna Mills Formation of the Silurian Perham Group (Figure 7.1). These sedimentary units are in contact with the Carboniferous Mabou Group several kilometers to the east, and the argillaceous limestone and calcareous shale units of the Late Ordovician to Silurian White Head Formation immediately to the east (Smith and Fyffe, 2006).

Hamilton-Smith (1972) reported a large syncline passing through the area of the Project, but Potter (1983) described an anticline through the same area. From drill sections it appears the latter would be accurate. This folding event is attributed to the Acadian Orogeny. A weaker, later system of cross folds occurring in the southeastern area of the mineralized strata may be attributed to the later stages of the same orogeny but do not appear to have significantly affected the structure in the Project area. Large and small scale faulting has also been described in geological studies of the area (Hamilton-Smith, 1972 and Potter, 1983) with northeast-southwest orientations similar to the main axis of folding noted.

Caley (1936) proposed the Woodstock iron-manganese mineralization deposition environment as one of offshore hydrothermal conditions resulting in a chemical precipitate accompanied by volcanic activity. Miller (1947) suggested similar deposits in Maine were derived from subaerial weathering and erosion of volcanic rocks. Sidwell (1957) concurred with the latter explanation and stated that the second stage of remobilization and mineralization was likely hydrothermal and restricted to those occurrences of the iron-manganese assemblage in zones of intense structural deformation.

More recent work from investigations resulting from a Masters thesis by Way (2012) indicates the mineral bearing strata were initially derived from hydrogenous-detrital sources without any indication of an hydrothermal input as a source of Fe-Mn. This conclusion was based on the observation that Na/Mg ratios, chondrite normalized REE patterns, and mineralogical evidence of rapid changes in ocean redox conditions suggest the mineralized lithofacies were formed in an offshore zone of a continental shelf on a stable cratonic margin.

Figure 7.1: Regional Geological Map of Woodstock area

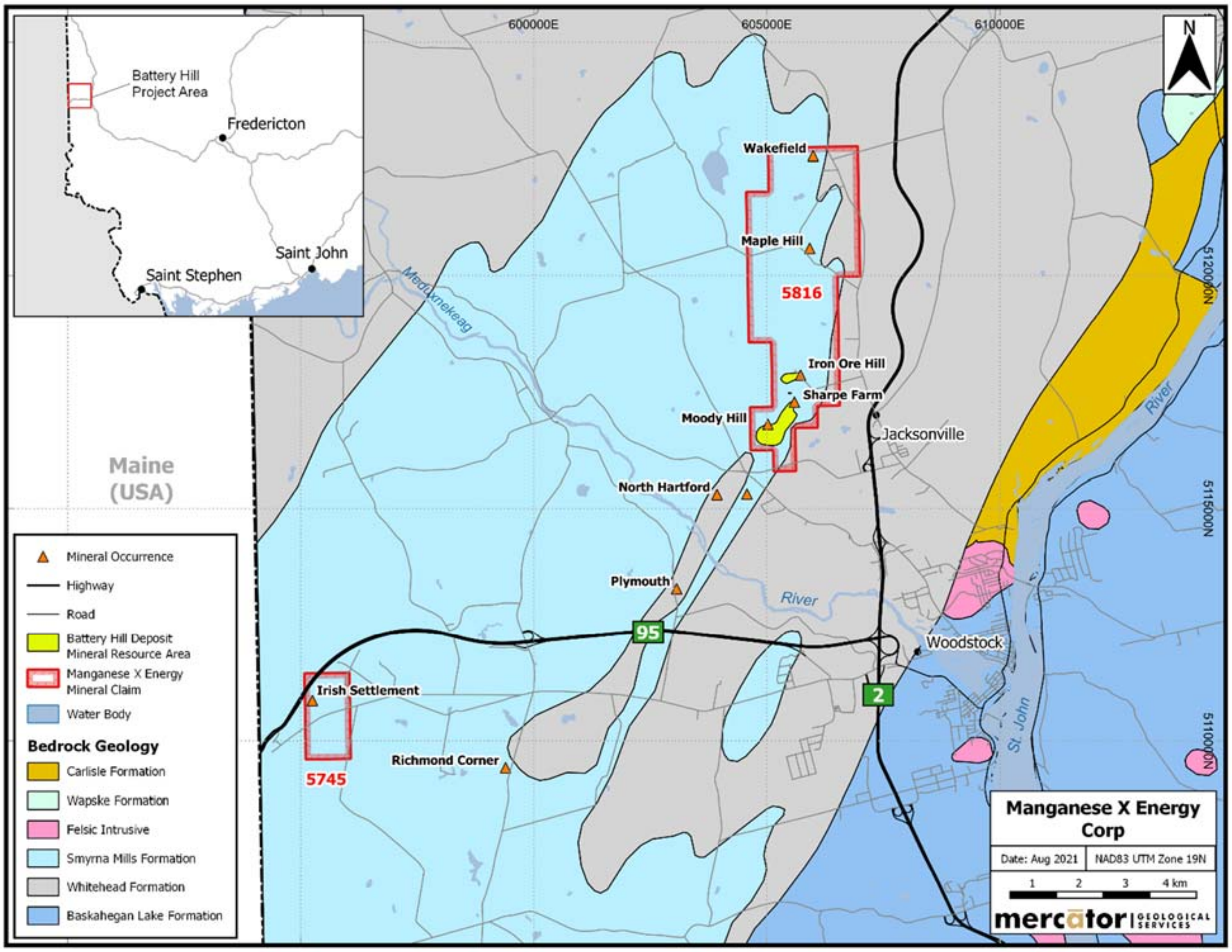


7.2 Property Geology

The sedimentary units that host the iron-manganese mineralization in the Woodstock area occur near the base of the Smyrna Mills Formation of the Silurian Perham Group (Figure 7.2). Smith and Fyffe (2006) describe the Smyrna Mills Formation as comprised of dark grey, non-calcareous silty shale and associated ferro-manganiferous siltstone, and dark grey calcareous shale interbedded with medium grey calcareous quartzose sandstone. It also includes green calcareous sandstone, light grey, crystalline limestone, green nodular limestone, grey polymictic conglomerate, and minor red shale and dark grey laminated, graptolitic siltstone. The underlying Whitehead Formation is Silurian to Ordovician in age and forms part of the Matapedia Group. It consists of dark grey to bluish grey, massive to abundantly laminated, very fine-grained argillaceous limestone interbedded with calcareous shale.

Based on previous drilling on the Iron Ore Hill occurrence, the main intervals of manganese-iron interest within the Smyrna Mills Formation consist of brick red and maroon hematite-rich siltstones and weakly magnetic green siltstones. The highest manganese results are encountered in the brick red to maroon, hematite-bearing units containing the manganese carbonate mineral rhodocrosite. Iron oxides such as magnetite and ilmenite are also present at lower levels. The slightly magnetic, altered green siltstones commonly include the iron carbonate mineral siderite. Non-magnetic green and black siltstone beds present in the stratigraphic section do not carry iron and manganese grades of economic interest.
The manganese and iron mineralization of economic interest within the Battery Hill Project is bedded and stratiform in nature and is recognized as being of primary sedimentary origin. Manganese occurs

Figure 7.2: Geology of the Battery Hill Manganese Project



predominantly in the form of the carbonate mineral rhodochrosite and iron occurs in both oxide (hematite, magnetite, and ilmenite) and carbonate minerals (predominantly siderite).

Manganese X drill sections show that an anticlinal structure showing upright, tight folding style trends northeast across the Project area. As noted above, the related folding event is attributed to the mid-Devonian Acadian Orogeny and a weaker, set of cross folds present in the southeastern part of the Project area is similarly assigned. These folds have not significantly affected strata of economic interest in the Project area. Folding has resulted in substantial thickening of mineralized units in fold hinge zones and this locally produced broad zones of near-surface mineralization that may be particularly amenable to open pit development. Faulting has also contributed to structural thickening of the mineralized beds with folding and faulting together locally creating widths in excess of 200 metres.

Large and small scale northeast-southwest trending faults have been mapped in the area and are broadly similar in orientation to the axial surface trends of the dominant fold set that affects the manganese-iron mineralization (Hamilton-Smith, 1972). An east-west trending, sinistral fault offsets the main mineralized sequence by approximately 650 m north of the area hosting the North and South Hartford occurrences, near the southern end of Mineral Claim 5816.

Other than in the areas of historical excavation such as at Moody Hill, very few bedrock outcrops occur in the Project area. However, it is reported that poor exposures can locally be viewed in some of the cultivated fields prior to planting or after harvest season. The average depth of overburden ranges from two to four metres.

7.3 Manganese-Iron Mineralization and Mineral Occurrences

The manganese-iron mineralization encountered in the Battery Hill project area tends to be lenticular, stratiform and generally steeply dipping in form, having been shaped and thickened by tight folding and possible faulting. In the Iron Ore Hill area, tight folds with steep northwest plunges have been noted. In the Moody Hill historical open-cut workings, several folds showing shallow southerly plunges are present. Further detailed structural mapping is required to improve the structural interpretation of the area.

To date, five main areas of mineralization (mineral occurrences) have been defined within the Project area, these being Wakefield, Maple Hill, Iron Ore Hill, Sharpe Farm and Moody Hill. Brief descriptions of these are presented below under separate headings. Previous Figure 7.2 presents occurrence locations within the Manganese X holding.

7.3.1 Wakefield Occurrence

The Wakefield mineral occurrence occurs on the far northern extent of Mineral Claim 5816. This occurrence was one the of the original discoveries identified by C.T. Jackson during an 1836 geological mapping program (MacKinnon, 2020). The New Brunswick Department of Lands and Mines sampled a 4.6 m section of the occurrence that returned values of 20.5% iron and 8.86% manganese (Anderson, 1968). Detailed work has not been completed for this mineral occurrence to date by Manganese X because it is located in a cultivated area near residential homes.

7.3.2 Maple Hill Occurrence

The Maple Hill mineral occurrence is located 2 km south-southwest of the Wakefield occurrence in a wooded patch that measures approximately 175-200 m^2 in area. Historical trenching on this occurrence exhibited less iron-manganese mineralization than seen at the Moody Hill or Iron Ore Hill occurrences, though higher grade material has been reported (MacKinnon, 2011). In comparing the known location of the occurrence to the geophysical response of the 2011 Globex magnetometer survey, the deposit is located on the extreme western edge of the magnetic field anomaly where response is weak to moderate compared to much of the rest of the anomaly. The large area of strongest response located on the eastern edge of the survey in the Maple Hill area has not yet been ground checked by Manganese X. Sampling in 1968 by the New Brunswick Department of Lands and Mines returned values of 13.88% iron and 6.97% manganese over 2.13m (Anderson, 1968).

7.3.3 Iron Ore Hill Occurrence

The Iron Ore Hill historical workings are located approximately 3 km south of the Maple Hill occurrence. In the early 1950's, Stratmat identified a strong gravity anomaly measuring approximately 2,500 feet (762 m) in strike length. Globex's 2011 magnetometer survey confirmed a similar sized anomaly centered on the Iron Ore Hill area. The historical workings are still visible at the site which produced approximately 70,000 tons (63,502 tonnes) of iron (MacKinnon, 2020).

Sampling on and near the historical workings by Globex in 2010 confirmed the presence of higher grades of manganese than had been reported in previous testing, and also identified an abundance of lower grade material. As a result of this sampling, an additional 59 samples were collected, mainly along intermittent outcroppings in a ditch adjacent to the historical workings. This program returned manganese results ranging between 1% and 26.15% MnO (20.25 weight percent elemental Mn) (MacKinnon, 2011). Higher grade results were obtained from black, sub-metallic layers in the mixed, predominantly brick red and maroon alternating beds within the mineralized horizon. Maroon layers provided the next highest manganese grades.

7.3.4 Sharpe Farm Occurrence

The Sharpe Farm occurrence is located southwest of the Iron Ore Hill occurrence. Sidwell (1957) described it as coinciding with a 2,600 foot (792 m) long gravity anomaly that is substantially weaker than the anomaly associated with the Iron Ore Hill occurrence. Two holes drilled at that time were reported to have intersected silicified slates showing an average width of 150 feet (45.7 meters) with an average grade of 9% Mn.

The 2011 Globex magnetometer survey identified a moderate to strong circular anomaly with two smaller responses extending in a semi-continuous manner northeastward toward the Iron Ore Hill occurrence. This anomaly is the second strongest in the survey, after the Iron Ore Hill occurrence, and is over 400 m in diameter. Including the area between this and the Iron Ore Hill occurrence, the total length of the northeast-southwest trending anomaly is 700 m. Ground checking by Manganese X resulted in the discovery of a few historical trenches as the only evidence of historical workings (MacKinnon, 2012).

7.3.5 Moody Hill Occurrence

Sidwell (1957) describes the Moody Hill occurrence as a 1,700 foot (518 m) weak to moderate magnetometer survey anomaly compared to the Iron Ore Hill occurrence, with historical drilling results indicating a width of 825 feet (251 m). Ground checking of the occurrence by Manganese X revealed several 1 to 5 m deep and up to 30 m long trenches. No samples collected at that time were analyzed but many of the rocks viewed appeared to be similar to units present at the Iron Ore Hill occurrence (MacKinnon, 2011).

Recent diamond drilling by Manganese X on the Moody Hill occurrence served to define the spatial aspects of this significant manganese-iron deposit. Significant grades and widths of mineralization were routinely intercepted, as exemplified by drill hole SF-16-8 that returned 9.38% Mn and 12.84% Fe over 75.5 m (core width) beginning at a downhole depth of 61 meters. Similarly, drill hole SF-17-18 intersected 74.0 m grading 9.39% Mn and 14.72% Fe beginning at 40 meters downhole. Estimated true widths range between 70 and 80% of the reported core length. Further details of the Manganese X drilling programs are discussed in Section 10 of this Technical Report.

8.0 DEPOSIT TYPES

New Brunswick's iron-manganese occurrences have been divided into two broad types according to whether manganese mineralization is primary or secondary (Webb, 2008). The two divisions are further categorized on the basis of regional and localized geological setting. The Battery Hill Project deposits are considered to be of primary, sedimentary origin.

Manganese mineralization in primary manganese deposits develops syngenetically with deposition of the host rocks. Significant deposits of this type in New Brunswick occur in two geological settings:

- Silurian sedimentary rocks: manganese and iron mineralization resulted from oxidization of manganese and iron in ambient seawater during the deposition of sediments in marine basins.
- Ordovician volcanogenic–sedimentary rocks: manganese and iron mineralization was derived largely from hydrothermal fluids associated with submarine volcanism.

New Brunswick's largest and most extensive known manganese deposits occur within the Silurian sedimentary sequence near Woodstock, which hosts the Battery Hill Project as well as the adjacent Plymouth deposit owned by Canadian Manganese Company Inc. (Kesavanathan et al., 2014). These stratified iron-manganese deposits are associated with red and grey, siliciclastic to calcareous siltstone and shale of the Smyrna Mills Formation (Perham Group). Manganese content in the rocks is interpreted to have been deposited from seawater in an oxygen-rich environment. Following deposition and lithification, the manganese-bearing horizons underwent structural thickening due to repeated folding and faulting.

Manganese is predominantly present at the Battery Hill Project in the form of the carbonate mineral rhodochrosite and iron occurs in both oxide (hematite, magnetite, and ilmenite) and carbonate minerals (predominantly siderite). The mineralization comprising the current mineral resource estimate is classified as being of the stratiform, manganiferous subset of the banded iron-formation (BIF) deposit type.

9.0 EXPLORATION

9.1 Overview

Exploration work completed by Manganese X on the Battery Hill Project properties prior to the current mineral resource estimate includes ground gravity and magnetometer surveys, three programs of core drilling, and a preliminary deposit modelling program designed to facilitate drill program planning. An extensive program of metallurgical testwork focused on production of manganese sulphate monohydrate (MSM) and high purity manganese sulphate monohydrate (HPMSM) from Battery Hill Project mineralization was also successfully carried out. The geophysical and drilling programs are described below, and details of the metallurgical program appear in section 13 of this Technical Report.

9.2 Ground Gravity and Magnetometer Surveys

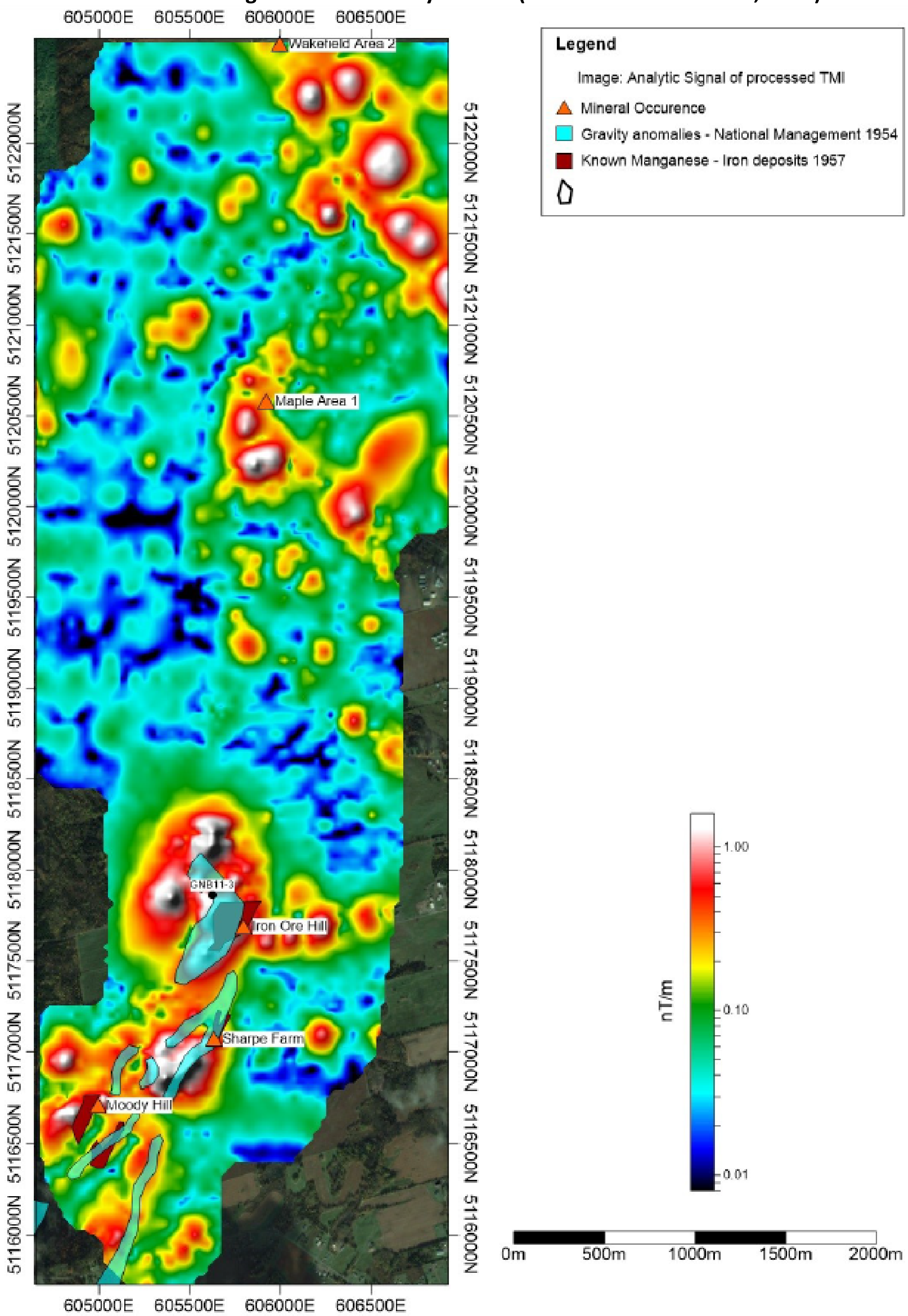
In 2016, Eastern Geophysics completed ground gravity and magnetometer surveys that covered all of Mineral Claim 5816. The surveys were planned over the same area as the 2011 Globex magnetometer survey with the purpose of providing follow up testing and enhancement of the data collected by Mangnese X during an earlier exploration program completed in 2011. The 2016 ground gravity survey consisted of 164 stations along 4 km lines at 100 m line separation. The anomalous gravity survey results closely coincide with the 2011 Globex magnetometer survey positive anomalies and provide better definition of potential drilling target areas.

The gravity survey was followed later in 2016 by a 124 line km ground magnetometer survey (Figure 9.1). This survey was planned with a 50-metre offset north-south from the 2011 Globex survey to provide an effective line spacing. Data for both the 2011 and 2016 surveys were collected using GEM GSM-19W (Overhauser Effect) magnetometers. One was deployed as a base station and the other as the rover. For the 2016 survey, data was acquired in continuous acquisition mode using a sample rate of one reading per second. The 2016 survey provided better definition of anomalies with a sample interval of 1 m compared to the 2011 survey which had a line sample interval of approximately 12.5 m.

AusieCan Geoscience Inc. (“AusieCan”) was contracted by Manganese X to process the 2016 ground magnetic data and merge the data with the data collected during the 2011 Globex magnetometer survey. Several modelling methods were employed and a 3D magnetic susceptibility model was developed. AusieCan observed that the 3D model is in reasonable agreement with the geological model of the area in that it depicts steeply dipping and tightly folded structures. In overlaying the 1950’s historical gravity results with the 2016 gravity and magnetometer results, AusieCan noted reasonable correlation, with some exceptions.

The 2016 magnetometer survey expanded on the existing coverage area mainly in the northern regions of the grid and doubled the coverage density of the older survey by surveying between the older survey lines. In addition, permission was received to survey a small, but important, area near Iron Ore Hill occurrence that was not covered in the 2011 Geodex survey. The 2011 Geodex survey identified well-defined anomalies from Iron Ore Hill, southwest to Moody Hill and off Mineral Claim 5816 to the south.

Figure 9.1: 2016 Ground Magnetometer Survey Results (taken from MacKinnon, 2020)



The strongest anomaly in the north coincides with a line of houses along Route 560 in the north of Jacksonville, which may reflect cultural influence. Several smaller anomalies west of this area appear to be away from any cultural effects but are smaller compared to the Moody Hill and Iron Ore Hill anomalies (see previous Figure 9.1).

The AusieCan interpretation of the 2016 geophysical survey identified Iron Ore Hill as containing five of the six best targets on the grid, with weakly anomalous areas occurring throughout the Sharpe Farm and Moody Hill areas. The Sharpe Farm and Iron Ore Hill anomalies are interpreted to be connected, as the magnetometer results show some separation between the individual occurrences, possibly due to faulting or as a result of an interference folding pattern (see previous Figure 9.1). AusieCan cautioned that in areas of tight folding, results and therefore the interpretation may be misleading, as there can be cancelling magnetic effects due to close repeating of magnetic horizons leading to apparent magnetic lows where in fact strongly magnetic material may be present.

9.3 Preliminary Deposit Modelling to Support Drill Planning

In 2017, Manganese X contracted Mercator to complete preliminary solid models and a grade and tonnage block model assessment to facilitate further internal drill program planning and also to support a future mineral resource estimate. The work completed focused on the three main mineralized zones on Mineral Claim 5816 (Moody Hill, Sharpe Farm, and Iron Ore Hill) and examined results from the confirmation drilling programs carried out by Manganese X that consisted of 25 holes totalling 5,188 metres completed in 2016 and 2017. Mercator received digital project data from Manganese X, including drill logs, drill core assay results, drill hole collar and downhole survey results, core specific gravity measurements, core photos and associated reports. A project drill hole database was created by Mercator and imported into Surpac GEOVIA ver. 6.8 modelling software. A full data review and validation of the database was not completed by Mercator during this study.

Results of the block modeling were reviewed in three dimensions on a section by section basis and it was determined that block grade distributions had acceptable correlation with grade distribution of the underlying drill hole data. Block volume estimates for each area were also shown to have acceptable correlation with the supporting solid model volume reports. Average grade values for each area compared favorably with the average grade values of the underlying assay composite dataset. The 2017 program by Mercator was subsequently expanded upon through completion of additional core drilling in 2020 but formed an important initial aspect of the modelling program completed in support of the mineral resource estimate described in this Technical Report.

10.0 DRILLING

This section describes the diamond drilling programs completed by Manganese X in 2016, 2017, and 2020 on the Battery Hill Project, specifically on the Moody Hill, Sharpe Farm, and Iron Ore Hill target areas. Details of the first two programs are reported in MacKinnon (2017) and Dahn (2018). The 2020 diamond drilling program was completed in November of 2020 and highlights were disclosed in a Manganese X news release dated February 16, 2021. Drill hole locations for the 2016, 2017 and 2020 drilling programs are shown in Figure 10.1. Manganese X provided Mercator with all supporting data and reports associated with these drilling programs, including a digital drilling database and complete certified records of laboratory analysis.

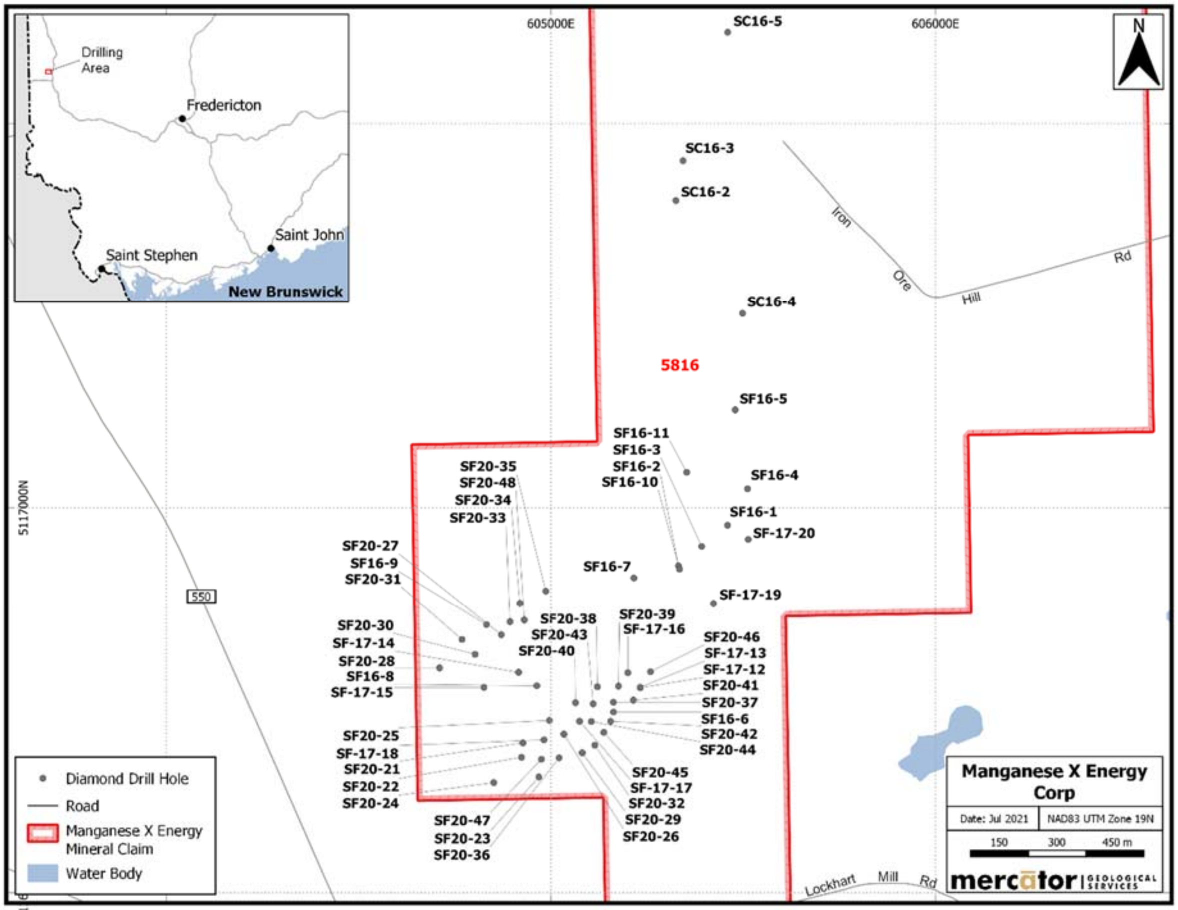
10.1 2016 Drilling Program

In 2016, Manganese X completed a diamond drill program consisting of 16 drill holes for a total of 3,589 m of NQ-sized core. Diamond drilling was completed by Maritime Diamond Drilling Ltd. (“Maritime Drilling”) of Brookfield, Nova Scotia using an EF-50 drill rig and Lantech Drilling Services Inc. (“Lantech”) of Dieppe, New Brunswick using a Longyear 38 drilling rig. Drilling activities focused on the southern area of Mineral Claim 5816 (Jacksonville) where the strongest anomalies occurred in the 2016 magnetometer survey. Five holes totaling 1,051 m were drilled on the Iron Ore Hill area of the claims, while the remaining 2,538 m was drilled on the Moody Hill and Sharpe Farm areas. All permits required for drilling were obtained, including access permission from the private landowner. A total of 1,041 samples were selected for laboratory testing using XRF whole rock analysis methods.

The core was logged and marked for sampling by consulting geologist, Perry MacKinnon, P. Geo., and details of lithologies, structure, alteration, and mineralization were recored in a digital spreadsheet template. Prior to sampling, all drill core was photographed using a standardized format and digital camera to provide a permanent pre-sampling record for each hole. Core selected for sampling was cut in half using a diamond saw and a sample tag was stapled in the core boxes at the beginning of each sample interval. Excessive core loss was not encountered.

The average strike of the rocks in the Iron Ore Hill area is 020 azimuth and the tight folding plunges steeply to the northwest. Drilling on the site was carried out along sections oriented at 110 azimuth. All 16 holes were drilled with a -45 degree dip. Down hole survey measurements were taken at an average of 50 m intervals with a Reflex down hole tool. Many of the drill holes had trouble securing the casing, which often vibrated loose and additional casing had to be added. This was due to soft and fractured rock present near surface, which resulted in poor recovery for the first few metres. Below this point, the core recovery improved with approximately 100% recovery, except for a few areas where cavities were intersected. Quality Control and Quality Assurance (QAQC) samples including blanks and certified reference standards were inserted into the sample stream at regular intervals for laboratory analyses along with blind duplicates. Results of the QAQC program are reported below in report Section 11.

Figure 10.1: Drill Hole Locations for the 2016, 2017, and 2020 Manganese X Drilling Programs



Specific gravity (SG) measurements for all holes except SC16-1 and SC16-2 were recorded when the geological unit in the hole changed. The Archimedes method was employed and two digital weight scales were used to take required measurements. A dry representative portion of the unit was first weighed in air on one of the scales. The same sample portion was then placed in a container of water located on the second scale and weighed to determine the sample weight in water. The SG value was calculated by dividing the dry measurement by the difference between the dry and wet measurements. The general equation for this calculation is: **Specific Gravity = Weight *(air)* / (Weight *(air)* – Weight *(water)).***

Non mineralized material returned SG values of approximately 2.78, while the mineralized material returned a maximum SG value of 3.75.

Drill core from the 2016 drilling program is currently stored at the New Brunswick Department of Natural Resources core storage facility in Sussex, NB, parts of which were reviewed by report author, Paul Ténière, on December 17, 2020, as part of a check sampling program for data verification purposes (refer to Section 12).

10.1.1 Iron Ore Hill Target

Five diamond drill holes (SC16-1, SC16-2, SC16-3, SC16-4, and SC16-5) totaling 1,051 m were drilled at the Iron Ore Hill target area. This drill hole program was designed to target mineralization in the historical Iron Ore Hill workings area and to test for extension of manganese mineralization along the high magnetic anomalies identified in the 2016 magnetometer survey completed for Manganese X. Drilling revealed that bedrock sequences are predominately comprised of black, grey, green, and various shades of red fine-grained siltstones. Calcareous siltstone and minor tuffaceous beds were also present. The highest manganese value returned was 16.66% Mn over 12 metres and correlates with an interval of grey green siltstone. True widths are estimated to range between 70 and 85% of sample lengths. A summary of the Iron Ore Hill drill holes is shown in Table 10.1 and significant intercepts are shown in Table 10.2.

Table 10.1: Summary of Iron Ore Hill 2016 Diamond Drill Holes

Hole No.	Easting (m) (NAD 83 Zone19)	Northing (m) (NAD 83 Zone19)	Elevation (m)	Azimuth (deg)	Dip (deg)	Total Depth (m)
SC16-1	605500.308	5117825.887	185.4	135	-45	173
SC16-2	605325.135	5117799.574	177.5	135	-45	284
SC16-3	605343.733	5117903.276	175.8	135	-45	149
SC16-4	605498.412	5117505.747	187.7	135	-45	242
SC16-5	605459.941	5118237.181	179.5	135	-45	242

Table 10.2: Significant Intercepts for the Iron Ore Hill 2016 Drilling Program

Hole No.	From (m)	To (m)	*Length (m)	Mn (%)	Fe (%)
SC16-1	52	74	22	8.16	11.38
Incl.	64	74	10	9.11	11.87
SC16-1	142.6	149.7	7.1	4.12	9.92
SC16-2	41.6	66	24.4	7.31	10.29
Incl.	41.6	58	16.4	8.55	11.79
Incl.	50.7	58	7.3	11.19	13.9
SC16-2	80	95.4	15.4	4.22	8.33
SC16-2	101	109	8	9.52	13.15
SC16-2	157	163	6	9.92	14.18
SC16-2	187	195	8	6.83	11.56
SC16-2	203	229	26	11.03	17
Incl.	215	227	12	16.66	23.32
SC16-3	135	143	8	9.74	16.99
SC16-4	11	17	6	7.81	14.99
SC16-4	47	59	12	9.39	13.07
SC16-5	47.6	49.6	2	11.72	14.35

**True widths are estimated to range between 70 and 85% of sample lengths.*

10.1.2 Sharpe Farm and Moody Hill Targets

Eleven diamond drill holes totaling 2,538 m were drilled at the Sharpe Farm and Moody Hill target areas. Several surface measurements on bedrock trends in these areas indicate the strike of the rock units to be approximately AZ. 040 to 050 degrees, which agrees with the alignment of the linear high magnetic anomalies. The drilling program was designed to test for an extension of manganese mineralization along the high magnetic anomalies identified in the 2016 magnetometer survey completed for Manganese X. Drilling intercepted bedrock sequences comprised of fine-grained siltstones varying in shades of black, grey, green, buff and shades of red. Calcareous siltstone was also present. The highest manganese value returned was 12.96% Mn over 32.85 m beginning at 103.85 m downhole. Manganese mineralization in the Sharpe Farm target area is dominantly hosted by fine grained, dark grey to black siltstones with some green to grey or buff-colored sequences. Little to no “red or mixed” types occur within the Sharpe Farm drill holes. A summary of the Sharpe Farm and Moody Hill drill holes completed in 2016 is shown in Table 10.3 and significant intercepts are shown in Table 10.4. True widths are estimated to range between 70 and 85% of sample lengths.

Table 10.3: Summary of Sharpe Farm and Moody Hill 2016 Diamond Drill Holes

Hole No.	Easting (m) (NAD 83 Zone19)	Northing (m) (NAD 83 Zone19)	Elevation (m)	Azimuth (deg)	Dip (Deg.)	Total Depth (m)
SF16-1	605459.483	5116954.59	191.3	135	-45	276
SF16-2	605331.853	5116849.145	184.8	135	-45	246
SF16-3	605392.091	5116899.633	189.2	135	-45	211
SF16-4	605511.562	5117049.46	199.9	135	-45	170
SF16-5	605479.2	5117254.576	203.2	135	-45	152
SF16-6	605162.901	5116468.521	167.9	135	-45	207
SF16-7	605215.983	5116817.312	179.9	135	-45	304
SF16-8	604963.58	5116536.725	158.3	135	-45	303
SF16-9	604832.737	5116695.649	139.5	135	-45	198
SF16-10	605334.696	5116840.58	183.8	135	-45	170
SF16-11	605353.195	5117092.313	211.3	135	-45	302

Table 10.4: Significant Intercepts for the Sharpe Farm and Moody Hill 2016 Drilling Program

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
SF16-1	4	91.7	87.7	9.35	16.54
Incl.	4	32.8	28.8	11.03	19.97
Incl.	40.8	50.25	9.45	10.42	14.35
Incl.	50.2	63.1	10.9	10.36	15.46
Incl.	72.15	91.7	19.55	11.03	17.53
SF16-2	8.5	21	12.5	6.82	10.78
SF16-2	35.1	112	78.9	8.89	13.41
Incl.	56	96	40	10.76	15.81
SF16-2	126	131.5	5.5	6.58	8.94
SF16-2	179	182	3	10.46	20.26
SF16-3	11.7	52	40.3	8.24	13.15
Incl.	26.65	41	14.35	12.1	16.88
SF16-3	76.5	87.15	10.65	7.06	10.44
SF16-3	118.5	132	13.5	10.53	16.06
SF16-3	145.15	152.85	7.7	8.65	11.14
SF16-4	19.4	24.5	5.1	7.49	8.55
SF16-4	31.5	55.6	24.1	6.5	10.71
Incl.	46.3	54	7.7	9.65	14.63
SF16-4	74.5	160	85.5	9.31	14.52
Incl.	74.5	114	39.5	10.51	16.07
Incl.	127	160	33	9.9	14.45
SF16-5	38.4	91	52.6	10.75	16.75
SF16-6	49	90	41	10.4	14.49
SF16-6	116	128	12	8.59	17.2
SF16-7	14	47	33	8.06	11.76
SF16-7	59.4	64.4	5	11.59	14.69
SF16-7	72.4	81.4	9	8.06	11.76
SF16-7	88.2	104	15.8	9.05	15.98
SF16-8	5.3	24	18.7	8.59	7.31
SF16-8	61.1	136.6	75.5	9.38	12.84
Incl.	103.75	136.6	32.85	12.96	14.99
SF16-9	33	64.5	31.5	8.1	13.4
SF16-9	80	117.8	37.8	7.65	14.54
Incl.	95	116.6	21.6	8.97	16.96
SF16-9	153.4	173	19.6	8.76	13.01
SF16-9	186.7	192	5.3	9.74	13.94
SF16-10	5	18	13	6.66	11.01
SF16-10	113.5	118.5	5	6.23	10.82
SF16-11	27	39.4	12.4	6.62	10.01
SF16-11	71	86	15	9.55	14.12

**True widths are estimated to range between 70 and 85% of sample lengths.*

10.2 2017 Drilling Program

Manganese X completed 9 drill holes totaling 1,599 m of NQ-sized core on the Sharpe Farm and Moody Hill target areas between May 17, 2017, and June 8, 2017. The drilling program was completed by Maritime using an EF-50 drill rig. This program was designed to further delineate, expand, and improve the structural understanding of the significant manganese mineralization identified during the 2016 drilling program on the Battery Hill Project (MacKinnon, 2017).

The core was logged and marked for sampling by consulting geologist Perry MacKinnon, P. Geo., noting lithologies, structure, alteration, and mineralization. A spreadsheet template was used to enter logging and sampling information. Prior to sampling, all drill core was photographed using a standardized format and digital camera to provide a permanent pre-sampling record for each hole. Core selected for sampling was cut in half using a diamond rock saw, and a sample tag was stapled in the core boxes at the beginning of each sample interval. Excessive core loss was not encountered. QAQC samples including blanks and certified standards were also inserted into the sample stream at regular intervals and blind duplicates included for laboratory analyses. Details are presented below in Section 11.

SG determinations were carried out at the time of core logging using the same procedures applied in 2016 and described above. Non-mineralized material generally returned an SG value of approximately 2.78 whereas the Mn-Fe mineralized material had a maximum value measured at 3.88.

Drill core from the 2017 drilling program is stored at the New Brunswick Department of Natural Resources core storage facility in Sussex, NB, parts of which were reviewed by report author, Paul Ténière on December 17, 2020, as part of a check sampling program for data verification purposes (refer to Section 12).

10.2.1 Moody Hill Target

The 2017 diamond drilling program in the Moody Hill area consisted of 7 diamond drill holes totaling 1,319 m. In order to answer key structural questions and to improve the overall structural understanding of the area, three holes (SF-17-17, SF-17-19 and SF-17-20) were completed to “scissor” cut specific 2016 drilling intersections. The Moody Hill area drilling results define three main mineralized trends that are named from west to east: Moody West, Moody Central and Moody East. Moody West has only been intersected by one drill hole (SF-16-9). Moody Central has been intersected by six drill holes (SF-16-8, SF-17-12, SF-17-15, SF-17-16, SF-17-17, and SF-17-18) over an approximate 300 m strike length to a maximum vertical depth of approximately 150 m (SF-17-15). Moody East has been intersected by two drill holes (SF-16-6 and SF-17-13) located approximately 100 m grid north of drill hole SF-16-6. The majority of the mineralization consists of “mixed” and “red” lithotypes with significant, but lesser, amounts of “grey” hosted mineralization. Each of these mineralized zones remains open for further resource expansion drilling. Highlighting the 2017 drill program results was hole SF-17-18 that intersected 74.0 m grading 9.39% Mn and 14.72% Fe. A summary of the Moody Hill drill hole data for the 2017 program is shown in Table 10.5 and significant intercepts are shown in Table 10.6. True widths are estimated to range between 70 and 85% of sample lengths.

Table 10.5: Summary of Sharpe Farm and Moody Hill 2017 Diamond Drill Holes

Hole No.	Easting (NAD 83 Zone19)	Northing (NAD 83 Zone19)	Elevation (m)	Azimuth (deg)	Dip (deg)	Total Depth (m)
SF-17-12	605232.37	5116531.623	171.8	315	-45	215
SF-17-13	605232.37	5116532.623	171.8	135	-45	146
SF-17-14	604916.068	5116571.584	151.8	315	-80	110
SF-17-15	604826.331	5116532.549	137.6	135	-45	269
SF-17-16	605200.371	5116570.373	170.5	315	-45	170
SF-17-17	605074.758	5116444.563	166.2	315	-45	224
SF-17-18	604982.052	5116396.19	158.4	315	-45	182
SF-17-19	605422.949	5116750.674	173.6	315	-45	170
SF-17-20	605513.303	5116917.78	187.1	315	-45	113

10.2.2 Sharpe Farm Target

Two drill holes totaling 283 m were completed on the Sharpe Farm target to improve on the structural understanding of this area. Drill holes SF-17-19 and SF-17-20 were drilled in a westerly direction to “scissor” SF-16-2 and SF-16-1, respectively.

Drill hole SF-17-19 collared in grey, highly calcareous Whitehead Formation before intersecting the host Mn-rich siltstone assemblage. From 60 to 123 m, the average grade returned was 7.4% Mn and 12.6% Fe over 63.0 m. Within this wide zone, a 32.8 m higher-grade interval beginning at a downhole depth of 77 m returned a grade of 9.17% Mn and 14.43% Fe. This drill hole interpretation indicates that the overall dip of the mineralization and stratigraphy is approximately 70 to 75 degrees to the southeast in this area.

Hole SF-17-20 also collared in the calcareous Whitehead Formation and continued in it until a depth of 14.9 m. Significant mineralization intersected included 7.94% Mn and 12.22% Fe over 44.6 m, beginning at a downhole depth of 32.4 m, including 7.5 m of 12.11% Mn. Similar to drill hole SF-17-19, SF-17-20 confirmed a southeastern dip to the mineralization and stratigraphy in the Sharpe Farm target area. True widths are estimated to range between 70 and 85% of sample lengths.

Based on the drilling completed to date on the Sharpe Farm target, it appears that stratigraphy along the eastern side of the magnetic feature dips to the southeast, and on the western side of the magnetic feature dips are sub-vertical to northwest dipping. This magnetic feature suggests either a domal anticlinal or synclinal structure with apparent closure at both ends.

Table 10.6: Significant Intercepts for the Sharpe Farm and Moody Hill 2017 Drilling Program

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
SF-17-12	92.7	118	25.3	8.83	11.99
Incl.	92.7	107	14.3	11.25	13.53
SF-17-13	31	37	6	6.18	10.58
SF-17-13	64.7	69.6	4.9	6.94	10
SF-17-13	117.4	124	6.6	6.28	10.26
SF-17-15	177.1	192	14.9	6.78	8.68
SF-17-15	208	214	6	9.47	11.48
SF-17-16	32.4	77	44.6	10.21	13.4
Incl.	32.4	56	23.6	13.45	15.87
SF-17-17	17	30	13	8.35	16.93
SF-17-17	66.5	125.3	58.8	8.39	11.84
Incl.	66.5	100	33.5	10.22	13.12
Incl.	83	93	10	14.25	16.16
SF-17-17	130.5	144.5	14	5.5	9.7
SF-17-17	206	211	5.6	7.66	11.68
SF-17-18	40	114	74	9.39	14.72
Incl.	40	94	54	10.56	16.45
Incl.	60.5	92	31.5	12.33	18.99
SF-17-19	29.3	42.1	12.8	5.63	10.29
SF-17-19	60	123	63	7.4	12.6
SF-17-19	77	109.8	32.8	9.17	14.43
SF-17-19	84.5	108	23.5	10.35	14.59
SF-17-20	37.5	81.5	44	7.94	12.22
Incl.	37.5	70	32.5	8.42	12.95
Incl.	55.8	64	8.2	12.11	18.07

**True widths are estimated to range between 70 and 85% of sample lengths.*

10.3 2020 Drilling Program

Manganese X completed a total of 28 drill holes totaling 4,509 m of NQ-sized core on the Moody Hill target areas between October 1, 2020, and November 29, 2020 (Table 10.7). The drilling program was completed by Lantech and Maritime using a Morooka track-mounted drilling rig and a skid-mounted EF50 drilling rig, respectively. This program was designed to further delineate, expand, and improve the structural understanding of the iron-manganese mineralization identified during the 2016 and 2017 drilling programs and to provide additional drilling data required to support preparation of a mineral resource estimate for the Project.

The core was logged, photographed and sampling by consulting geologist Perry MacKinnon, P. Geo., noting lithologies, structure, alteration, and mineralization. All logging, processing and QAQC protocols were the same as those described above for the 2017 program. Excessive core loss was not encountered. Further details of the sampling, analysis and QAQC results appear in Section 11.

Table 10.7: Summary of 2020 Moody Hill Diamond Drill Holes

Hole No.	Easting (NAD83 Zone19)	Northing (NAD83 Zone19)	Elevation (m)	Azimuth (deg)	Dip (deg)	Total Depth (m)	Target Area
SF20-21	604927.4	5116388.3	144.7	315	-45	108	Moody Central
SF20-22	604923.8	5116351.1	142.2	315	-50	149	Moody Central
SF20-23	604968.8	5116299.9	139.7	335	-51	218	Moody Central
SF20-24	604851.8	5116285.4	129.9	315	-46.5	134	Moody Central
SF20-25	604996.5	5116446.6	159.6	315	-46	137	Moody Central
SF20-26	605033.9	5116410.9	159.4	315	-45	209	Moody Central
SF20-27	604871.3	5116669.1	143.1	135	-45	140	Moody West
SF20-28	604710.8	5116583.0	125.9	135	-45	134	Moody West
SF20-29	605081.6	5116362.8	153.8	315	-47	230	Moody Central
SF20-30	604803.2	5116618.2	136.1	135	-45	122	Moody West
SF20-31	604769.2	5116656.8	136.3	135	-45	188	Moody West
SF20-32	605114.3	5116382.4	157.8	135	-45	166	Moody East
SF20-33	604893.9	5116703.2	144.5	135	-45	161	Moody West
SF20-34	604919.6	5116751.1	147.9	135	-45	191	Moody West
SF20-35	604987.0	5116783.0	156.7	135	-45	128	Moody West
SF20-36	605021.5	5116349.7	149.2	315	-45	191	Moody Central
SF20-37	605162.6	5116493.9	170.3	315	-48	161	Moody Central
SF20-38	605121.1	5116534.2	169.7	315	-45	98	Moody Central
SF20-39	605176.0	5116535.7	170.8	315	-45	128	Moody Central
SF20-40	605064.1	5116492.5	168.4	315	-45	134	Moody Central
SF20-41	605214.7	5116499.4	171.7	313	-50	203	Moody Central
SF20-42	605155.4	5116444.4	165.1	315	-48	233	Moody Central
SF20-43	605110.2	5116489.7	169.1	315	-46	155	Moody Central
SF20-44	605105.2	5116443.8	163.7	315	-48	221	Moody Central
SF20-45	605137.8	5116415.8	161.6	315	-52	196	Moody Central
SF20-46	605259.2	5116573.1	171.0	315	-45	118	Moody Central
SF20-47	604975.6	5116346.1	146.2	319	-47	179	Moody Central
SF20-48	604931.2	5116707.6	150.3	135	-45	77	Moody West

SG determinations were carried out on representative core samples using the Archimedes method described above in Section 10.1. Non-mineralized material generally returned an SG value of approximately 2.78 whereas the Mn-Fe mineralized material had a maximum value measured at 3.88.

Drill core from the 2020 drilling program is currently stored at a core storage facility located in the Project area and select drill holes were reviewed by report author Paul Ténière on February 24, 2021, as part of a check sampling program and personal inspection (site visit) of the Project.

The 2020 diamond drilling program was designed to increase drill sole density within the extents of the Moody Hill deposit, that includes the Moody Hill Central, Moody Hill East, and Moody Hill West target areas, to support preparation of a mineral resource estimate for the deposit and to provide a better understanding of the geology and structure. The 2020 drilling program at Moody Hill consisted of predominantly 50 m spaced holes, which consistently confirmed significant widths of mineralization from surface to a maximum vertical depth of approximately 150 meters, over a strike length of approximately 500 meters (previous Figure 10.1).

A summary of the significant drill hole intercepts in the Moody Hill target area is shown below in Table 10.8 (Moody Hill Central) and Table 10.9 (Moody Hill West and Moody Hill East).

Table 10.8: Significant Intercepts for the 2020 Moody Hill Central Diamond Drilling Program

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
SF20-21	7.0	45.8	38.8	7.14	9.02
	7.0	21.7	14.7	9.68	9.53
SF20-22	37.6	57.3	19.7	7.01	10.17
Incl.	37.6	47.3	9.7	8.02	9.20
and	54.6	57.3	2.7	13.46	12.82
SF20-23	148.5	151.0	2.5	12.84	17.37
SF20-24	31.8	51.0	19.2	11.72	14.30
SF20-25	8.5	58.5	50.0	7.92	12.47
Incl.	15.6	36.0	20.4	9.82	14.72
SF20-26	72.6	123.0	50.4	9.00	13.36
Incl.	72.6	86.0	13.4	12.88	15.05
and	108.0	123.0	15.0	10.92	15.02
SF20-29	147.0	201.0	54.0	9.18	14.13
Incl.	147.0	183.0	36.0	10.16	14.84
SF20-36	108.9	136.1	27.2	9.87	11.01
Incl.	146.0	160.0	14.0	7.16	9.65
SF20-37	90.0	132.0	42.0	8.15	12.37
Incl.	90.0	110.0	20.0	10.24	14.26
SF20-38	30.0	52.0	22.0	9.09	14.92
Incl.	34.0	48.0	14.0	11.00	17.23
And	68.0	80.0	12.0	7.52	12.39
SF20-39	66.0	100.0	34.0	9.00	13.88
Incl.	66.0	84.0	18.0	11.42	16.76
SF20-40	36.0	70.0	34.0	8.76	12.78
Incl.	42.0	52.0	10.0	13.43	15.74
and	80.0	102.0	22.0	6.04	10.99
SF20-41	44.0	48.0	4.0	7.33	6.96
Incl.	60.0	66.0	6.0	7.10	6.91
and	120.0	140.0	20.0	10.56	14.20
SF20-42	120.0	164.0	44.0	8.51	12.82
Incl.	120.0	140.0	20.0	11.12	14.93
SF20-43	16.5	22.5	6.0	8.04	11.87
	28.6	34.6	6.0	8.84	12.03
	57.7	109.0	51.3	9.99	14.67
Incl.	61.5	88.0	26.5	12.77	17.36
	120.0	128.0	8.0	7.02	11.61
SF20-44	88.0	138.0	50.0	9.16	13.27
Incl.	88.0	120.0	32.0	10.32	13.70
	140.0	148.0	8.0	7.19	11.52
	154.0	168.0	14.0	7.68	12.24

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
SF20-45	104.0	112.0	8.0	11.65	8.26
	132.0	168.0	36.0	8.69	12.72
Incl.	132.0	154.0	22.0	10.27	13.71
SF20-46	2.5	19.5	17.0	8.00	11.33
	39.0	82.2	43.2	6.98	11.76
Incl.	39.0	60.0	21.0	8.18	13.21
	73.0	80.2	7.2	8.07	11.34
SF20-47	103.0	144.0	41.0	6.60	11.54
Incl.	103.0	122.8	19.8	7.60	12.09

**True widths are estimated to range between 70 and 85% of sample lengths.*

Table 10.9: Significant Intercepts for the 2020 Moody Hill West and Moody Hill East Diamond Drilling Program

Moody Hill West Zone Results									
Hole No.	**Azimuth**	**Dip**	**Easting**	**Northing**	**From (m)**	**To (m)**	**Length (m)**	**Mn %**	**Fe %**
SF20-27	135°	-45	604871	5116669	14.0	33.5	19.5	9.08	16.68
				including	22.0	30.0	8.0	11.57	17.91
SF20-28	135°	-45	604711	5116583	No Significant Values				
SF20-30	135°	-45	604803	5116618	No Significant Values				
					59.0	63.0	4.0	9.46	13.56
SF20-31	135°	-45	604769	5116657	26.0	46.3	20.3	8.48	11.83
					57.5	67.5	10.0	7.56	12.68
					73.6	89.2	15.6	8.52	15.03
				including	75.6	85.6	10.0	9.82	12.52
SF20-33	135°	-45	604894	5116703	49.0	67.0	18.0	9.06	16.50
				including	49.0	63.0	14.0	10.17	17.60
SF20-34	135°	-45	604920	5116751	7.5	10.5	3.0	8.16	11.75
					68.0	100.0	32.0	9.15	14.19
				including	68.0	92.0	24.0	10.31	14.93
				or	82.0	92.0	10.0	13.17	18.46
					144.0	150.0	6.0	8.75	17.62
SF20-35	135°	-45	604987	5116783	55.1	61.0	5.9	8.86	9.79
SF20-48	135°	-45	604931	5116708	3.5	16.8	13.3	9.13	16.77
Moody Hill East Zone Results									
Hole No.	**Azimuth**	**Dip**	**Easting**	**Northing**	**From (m)**	**To (m)**	**Length (m)**	**Mn %**	**Fe %**
SF20-32	135°	-45	605114	5116382	82.0	88.0	6.0	9.52	9.97
				and	108.0	116.0	8.0	9.58	11.99

**True widths are estimated to range between 70 and 85% of sample lengths.*

11.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 Sample Preparation and Analyses

During the 2016 Manganese X diamond drilling program, the core was taken from the core tube at the drill by the drill crew and placed in core boxes. Once full, individual core trays were lidded and secured using sturdy rubber bands or fibre tape. Core was then delivered by the drilling company or Manganese X staff to the Manganese X core shed, a large, secure, multi-purpose garage near Woodstock.

The core was logged by professional geologists Perry MacKinnon, P. Geo., and Rob Richard, P. Geo., marked for splitting with a red crayon, photographed then cut longitudinally with one of two Husqvarna overhead, water cooled, diamond blade core saws. The core saws were operated by local workers and Manganese X staff trained in standard core cutting procedures and QAQC protocols. Once the core was cut, one half was returned in place in the core box (archive) and the other half placed in a heavy duty, clear poly bag labeled with the sample number, along with a tag bearing the sample number. A second, duplicate sample tag was placed under the split core near the start of the sample in the core box. Red crayon was also used to mark the beginning and end of each sample in the box.

The sample tag number was written in indelible marker on the outside of the poly bag for easy identification at the laboratory. The sample bag was zip tied and placed in a larger fiber bag for shipping to the lab. The fiber bag (holding 4 to 7 samples) was also zip tied and the range of numbers for the samples contained within were marked with indelible marker on the outside.

When a sufficient number of full fiber bags had accumulated, they were itemized on a submission form which listed the samples included in the shipment, then loaded on a truck and driven by Manganese X staff directly to the Activation Laboratory Ltd. (“Actlabs”) preparation laboratory in Fredericton, NB or shipped to their main laboratory located in Ancaster, Ontario.

During the 2017 diamond drilling program, consultant Perry MacKinnon, P. Geo., and staff logged and sampled all of the drill core. The core recovery (CR) and rock quality designation (RQD) were calculated, and core samples sent to Actlabs for preparation and analysis using the same techniques as those used in the 2016 drilling program.

During the 2020 diamond drilling program, consultant MacKinnon and staff similarly logged and sampled all of the drill core. The core recovery (CR) and rock quality designation (RQD) parameters were calculated, and core samples sent to Actlabs for preparation and analysis using the same techniques as those used in the 2016 and 2017 drilling program. Samples averaged 2 m in width and true widths of the intercepts were not determined at the time, but the structure is near vertical and the average core angle in the mineralization is 50°, from which it can be concluded that the average true width of intercepts is approximately 75 % of the sampled length. All bagged half-core samples were taken by Manganese X personnel to the Actlabs preparation facility in Fredericton, NB where they were typically prepped and the pulps forwarded to Actlabs in Ancaster, Ontario for analysis.

Actlabs preparation procedures included drying and crushing the entire sample (up to 5 kg) to 80%-10 mesh, riffle splitting and pulverizing a 350 gram subsample (500 gram bowl) to 95% passing 150 mesh. A clean sand was processed in the pulveriser between core samples to avoid cross-contamination. Crushing and pulverizing equipment typically used include TM Engineering Terminator and TM MAX 2 units operating under a dust control system. One in forty samples had a second pulp prepared from the reject as a QC check. Pulp duplicates were also routinely prepared at a nominal frequency of 1 in 20. Quality of the rejects and pulps are routinely monitored to ensure proper preparation procedures are performed.

The analytical method chosen for the 2016, 2017, and 2020 drilling programs was XRF-Fusion (Actlabs Code 4C) in which samples are initially fused with lithium metaborate/ tetraborate in platinum crucibles using automated fluxers at 1150 degrees Celsius. The molten mixture is poured into heated platinum molds and allowed to cool. The glass disc formed is then analyzed with Panalytical Axios Advanced or PW2400 wavelength dispersive XRF instrumentation. Analytical results were received in digital spreadsheet (.xls format) and laboratory certificate (pdf format) forms by email from Actlabs. Actlabs is an international, COLA accredited, analytical services firm registered to the ISO 17025 ISO 9001:2008 standards. Actlabs is fully independent of Manganese X and Mercator.

Half core samples were collected during the 2016 and 2017 drilling programs and the sample stream included QAQC program blanks, duplicates, and certified reference materials (standards). A total of 1,691 half core and quarter core duplicate samples were collected during the 2020 drilling program and the Company used the same certified reference materials and blank material as used in the 2016 and 2017 drilling programs (see Section 11.2).

11.2 QAQC Protocol and Results

The Manganese X QAQC protocol applied in all drilling programs includes insertion in the sample stream of certified reference material (CRM) samples, blank samples consisting of silica sand, duplicate pulp split samples and quarter core duplicate samples. The CRM samples were inserted after every 20 to 25th sample, nominally, and quarter core duplicate sampling was completed at approximately every 20th sample. In addition, six check samples of pulp material were prepared for use as third party check samples in 2016.

The CRM used was either OREAS 171 or OREAS 700, both obtained from Ore Research and Exploration Pty Ltd. of Bayswater North, Victoria, Australia. The CRM's consisted of supergene manganese mineralization ore from Lower Cretaceous sediments of the Northern Territory of Australia (OREAS 171) and tungsten-magnetite skarn (OREAS 700) from New South Wales, Australia. Table 11.1 presents CRM details.

The six check samples of 2016 drill program assay pulps were sent to SGS Canada Ltd. for check analysis and results in comparison with original sample results are shown in Table 11.2. A single sample of each of the CRM samples was also tested as part of the 2016 program. No check sampling was completed during the 2017 and 2020 drilling programs, other than independent witness samples as discussed in Section 12 of this Technical Report.

Table 11.1: Certified Reference Materials details

Certified Reference Material		Certified Value (%)	95% Confidence Low	95% Confidence High
OREAS 171				
Mn Ore	Mn %	35.1	34.84	35.36
	Fe %	3.66	34.84	35.36
OREAS 700				
W-magnetite Skarn	Mn %	0.321	0.315	0.327
	Fe %	16.06	15.95	16.16

Table 11.2: 2016 Check Sample Results

Independent Laboratory Results		Actlabs	SGS	Actlabs	SGS
		Fe_2O_3 **%**	Fe_2O_3 %	MnO %	MnO %
Sample # Original	Sample # Check	Value Original	Value Check	Value Original	Value Check
1400332	319401	23.35	23.2	14.9	15
1400342	319402	16.71	16.1	20.53	20.4
319148	319403	22.9	23.5	16.2	16.31
319155	319404	24.88	25.1	20.54	20.2
319165	319405	19.83	19.7	9.651	9.77
319175	319406	14.15	13.6	8.091	8.3
CRM 700	319407	22.96	22.8	0.415	0.42
CRM171	319408	5.233	5.14	45.32	44.9

11.2.1 QAQC Results

Two CRM samples (OREAS 171 and OREAS 700) were submitted blindly with drill core samples for the 2016, 2017 and 2020 drilling programs. The blind CRMs were inserted into the sample stream at intervals that varied from approximately every 10 to 30 samples. In total, 99 CRMs were submitted during the 2016-2017 drilling programs and 89 CRMs were submitted during the 2020 drilling program. Certified iron and manganese values for the CRMS are given in Table 11.3.

Table 11.3: Certified Reference Material Mean Total Fe % and Mn % Values Determined by Lithium Borate Fusion and X-ray Fluorescence Analysis

Reference Material	Certified Mean Total Fe +/- 2 SD %	Certified Mean Total Mn +/- 2 SD %	Number Submitted	
			2016-17	**2020**
OREAS 171	3.66 +/- 0.068	35.10 +/- 0.334	51	47
OREAS 700	16.06 ± 0.35	0.328 +/- 0.008	48	47

Blank material consisted of silica sand and was inserted into the sample stream in similar irregular intervals as the CRMs. In total, 57 blank samples were submitted during the 2016 and 2017 drilling program and 95 blank samples were submitted during the 2020 drilling program.

Mercator reviewed QAQC results for the 2016-2017 and 2020 drilling programs. There were five instances found where an incorrect QAQC sample number was reported for a CRM or blank. Each instance was investigated by Mercator and corrected within the QAQC database. In each instance, the sample number entered was one sample number off from the true CRM or blank sample number. Three such instances were corrected in the 2016-17 QAQC dataset and two were corrected in the 2020 QAQC dataset.

The 2016-2017 Fe (%) and Mn (%) results for the OREAS 171 standards are plotted in Figures 11.1 and 11.2, respectively. Both Fe (%) and Mn (%) are consistently lower than the certified values. The mean Fe value returned for OREAS 171 is 3.50 +/- 0.11 %, approximately 0.1% below the certified value, and for Mn is 34.00 +/- 0.35 %, approximately 1.1 % below the certified value. The majority of analyses fall within two standard deviations of the respective means and only one Fe and one Mn analysis exceeds three standard deviations.

The 2016-2017 Fe (%) and Mn (%) results for the OREAS 700 standards are plotted in Figures 11.3 and 11.4, respectively. The majority of returned Fe (%) values and all Mn (%) fall within two standard deviations of the certified mean values. The mean OREAS 700 returned value for Fe is 16.24 +/- 0.13 %, 1.14 % above the certified mean value. The mean returned value for Mn is 0.323 +/- 0.004 %, 0.005 % below the certified mean value. Of the 48 CRM analyses, three Fe (%) values fall between two and three standard deviations of the mean value and no values exceed the mean plus +/- three standard deviations level.

The 2020 Fe (%) and Mn (%) results for the OREAS 171 standards are plotted in Figures 11.5 and 11.6, respectively. Similar to the 2016 and 2017 programs, both Fe (%) and Mn (%) are consistently slightly lower than the certified values. The mean OREAS 171 returned value for Fe is 3.37 +/- 0.06 %, 0.29 % below the certified mean value. The mean returned value for Mn is 33.57 +/- 0.42 %, 1.53 % below the certified value. All returned Fe (%) and Mn (%) values fall below two standard deviations of the mean returned values.

The 2020 Fe (%) and Mn (%) results for the OREAS 700 standards are plotted in Figures 11.7 and 11.8, respectively. The mean OREAS 700 returned value for Fe is 16.19 +/- 0.28 %, 0.13 % above the certified mean value. The mean returned value for Mn is 0.343 +/- 0.015 %, 0.15 % above the certified value. These results are consistent with the values returned during the 2016-17 drilling program, though the variance is higher during the 2020 program. One sample returned 14.61 % Fe, well below the two standard deviations level of the certified mean Fe value, and nine spikes of Mn exceed the mean plus two standard deviations level of the certified mean value.

Neither standard is an ideal fit for the Mn grades observed at Battery Hill, but it is recognized that there is a limited number of CRMs available to select from. The discrepancy between the certified and returned values for the high-grade OREAS 171 CRM is of particular note and should be investigated further. The more consistent results for the low-grade OREAS 700 CRM and the consistency between check samples and original assays from two different laboratories (see Section 12.2 below) suggest that the issue lies with the OREAS 171 CRM material used at the site rather than with the sampling and analytical procedures. Mercator also reviewed the results of interval QAQC CRMs analyzed by Actlabs as reported

Figure 11.1: 2016-2017 Drilling Programs CRM OREAS 171 results for Fe (N= 51)

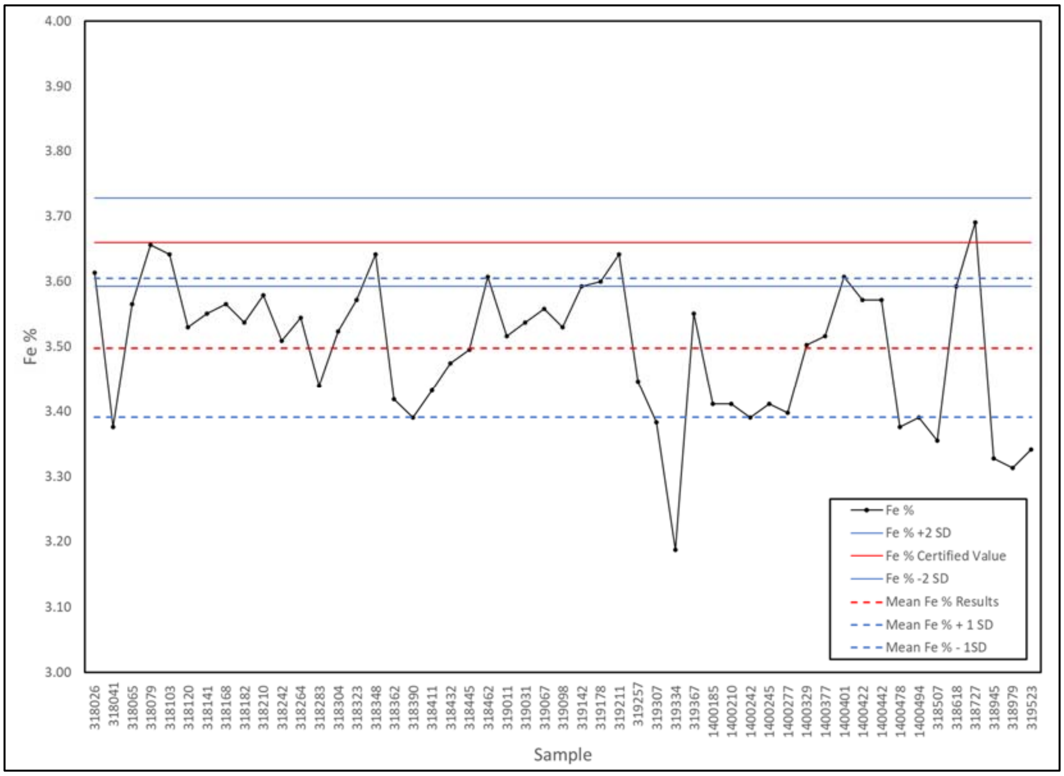


Figure 11.2: 2016-2017 Drilling Programs CRM OREAS 171 Results for Mn (N= 51)

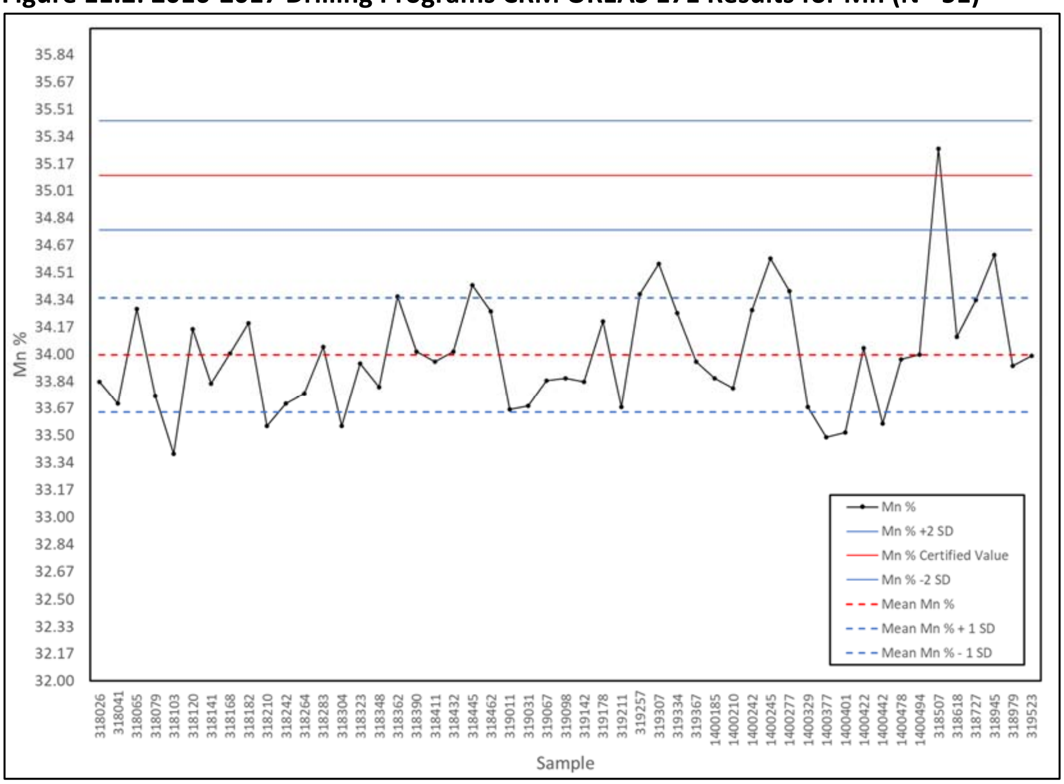


Figure 11.3: 2016-17 Drilling Programs CRM OREAS 700 Results for Fe (N= 48)

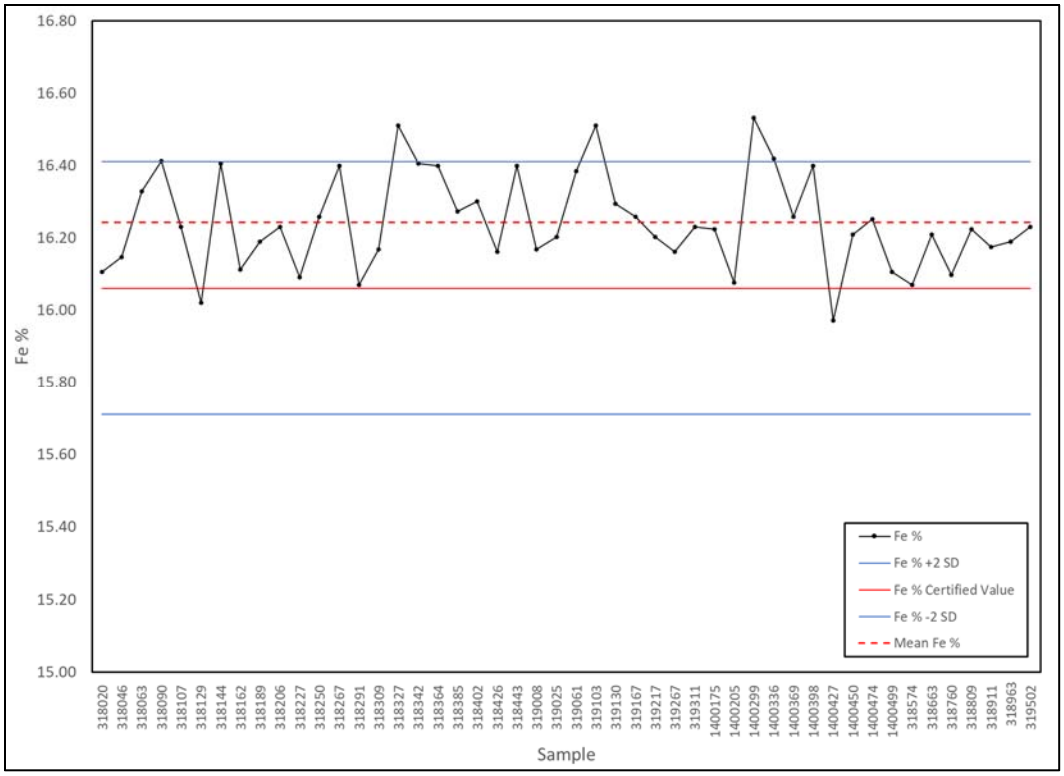


Figure 11.4: 2016-2017 Drilling Programs CRM OREAS 700 Results for Mn (N= 48)

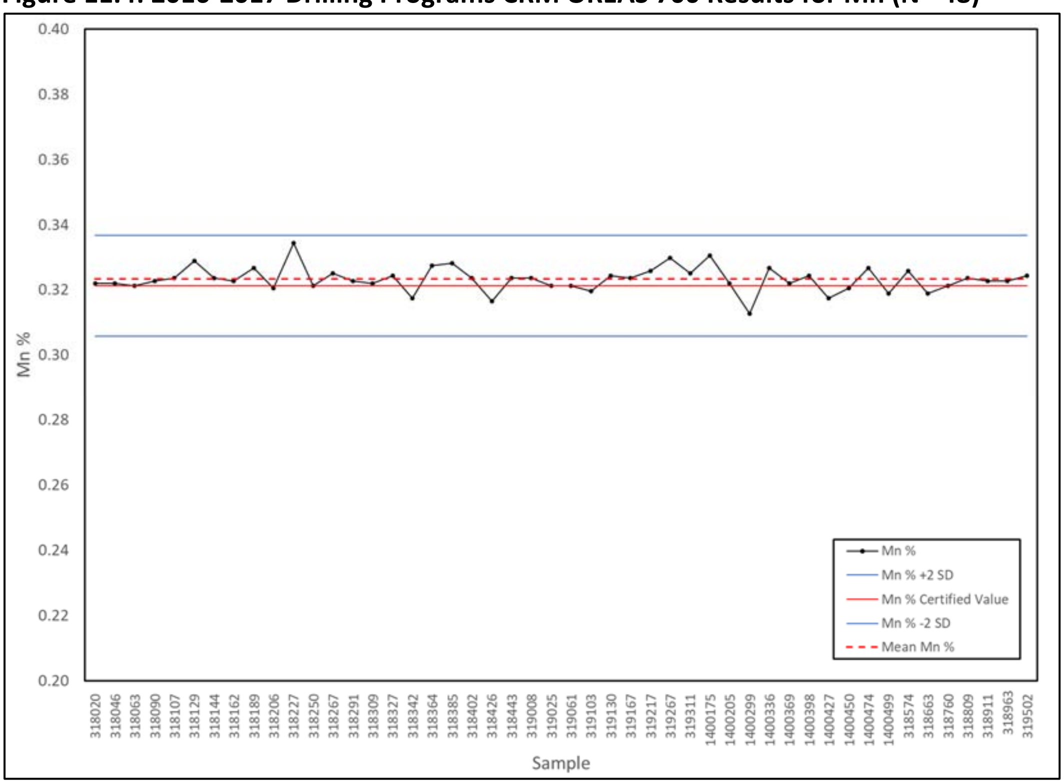


Figure 11.5: 2020 Drilling Program CRM OREAS 171 Results for Fe (N= 47)

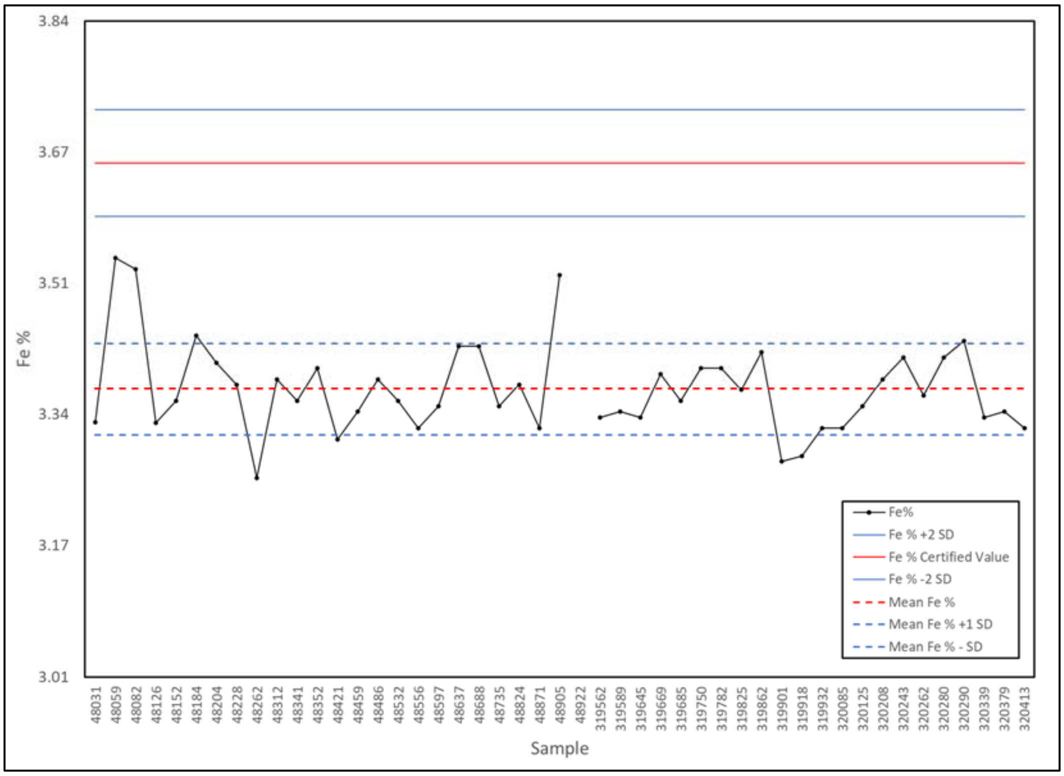


Figure 11.6: 2020 Drilling Program CRM OREAS 171 Results for Mn (N= 47)

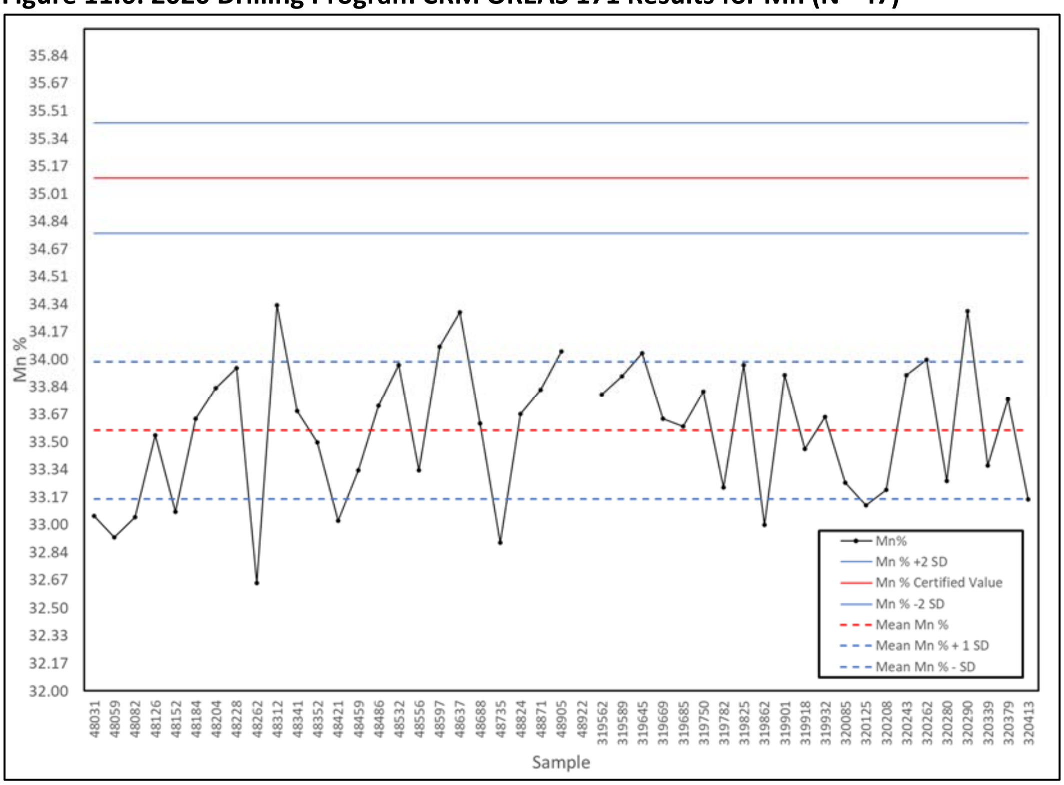


Figure 11.7: 2020 Drilling Program CRM OREAS 700 Results for Fe (N= 47)

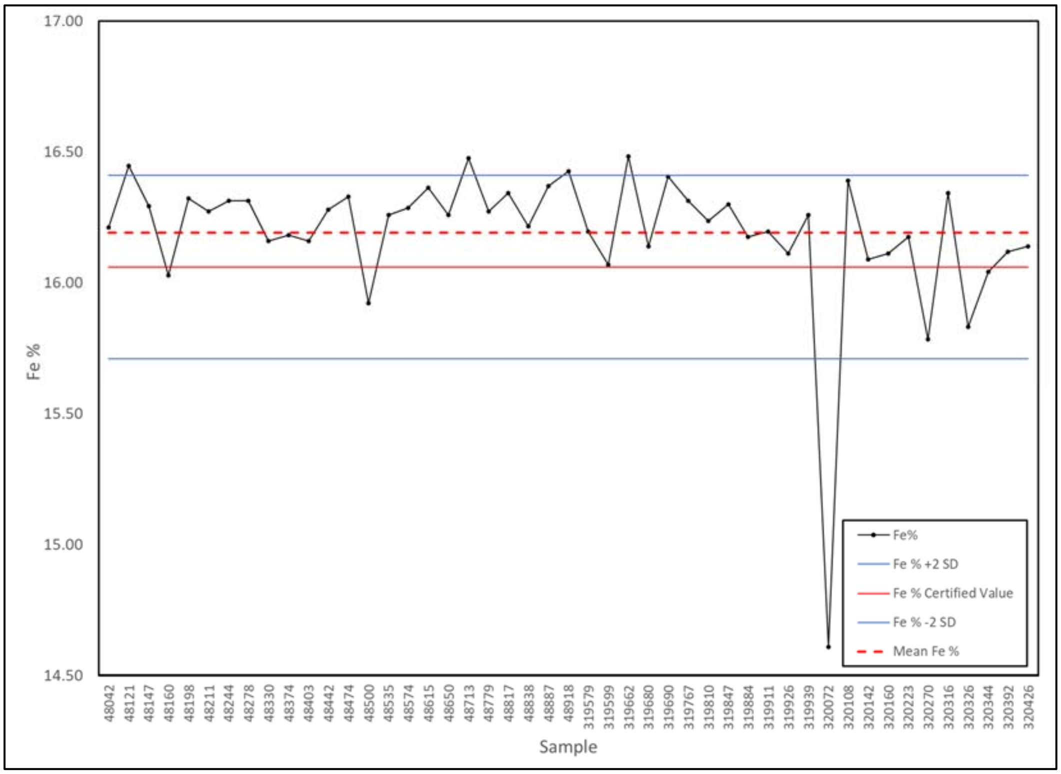
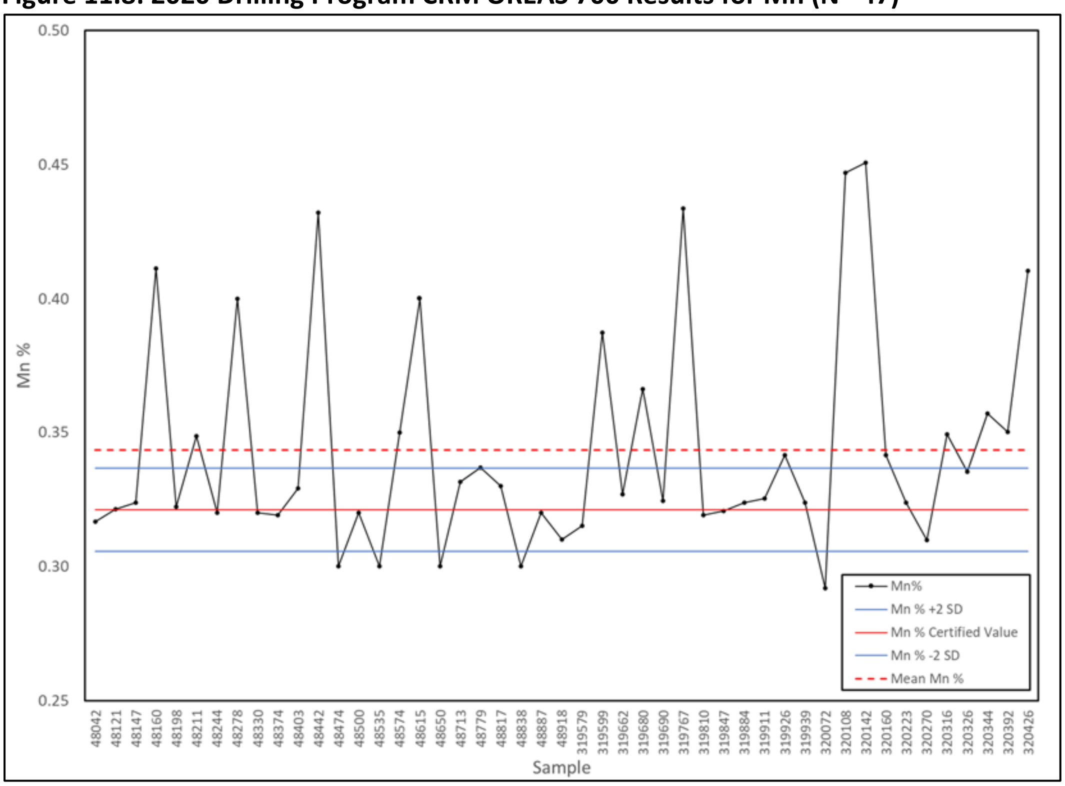


Figure 11.8: 2020 Drilling Program CRM OREAS 700 Results for Mn (N= 47)



in respective laboratory certificates and did not find any discrepancies, which further supports the conclusion that an issue existed with the OREAS 171 CRM material used at the site.

The 2016/2017 Fe (%) and Mn (%) results for the blank material are plotted in Figures 11.9 and 11.10, respectively. The mean returned value for Fe is 0.406 +/- 0.135 % with the highest value not exceeding 0.95 %; and for Mn is 0.015 +/- 0.022 %, with the highest value not exceeding 0.13 %.

The 2020 Fe (%) and Mn (%) results for the blank material are plotted in Figures 11.11 and 11.12, respectively. Two different background levels of Fe (%) and Mn (%) are observed in the blank material and these reflect a change in the blank material used later in the program. For the 48034 to 48928 series, the mean returned value for Fe is 1.370 +/- 0.298 % with the highest value not exceeding 2.231 and for Mn is 0.054 +/- 0.030 %, with the highest value not exceeding 0.170 %. For the 319567 to 320482 series, the mean returned value for Fe is 1.00 +/- 0.60 with only one value exceeding 1.24 %; and for Mn is 0.44 +/- 0.03 % with the highest value not exceeding 0.57 %. The one Fe value that exceeds 1.24 % is 4.91 %.

Figure 11.9: 2016-17 Drilling Program blank Results for Fe (N= 57)

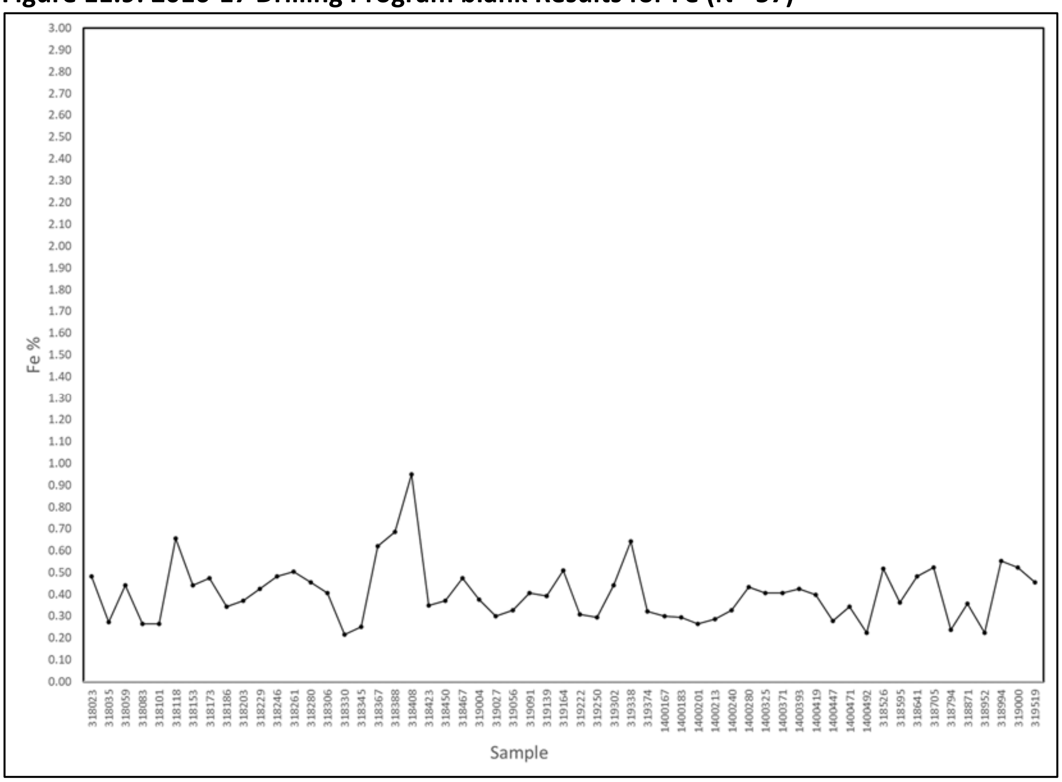


Figure 11.10: 2016-17 Drilling Program Blank Results for Mn (N= 57)

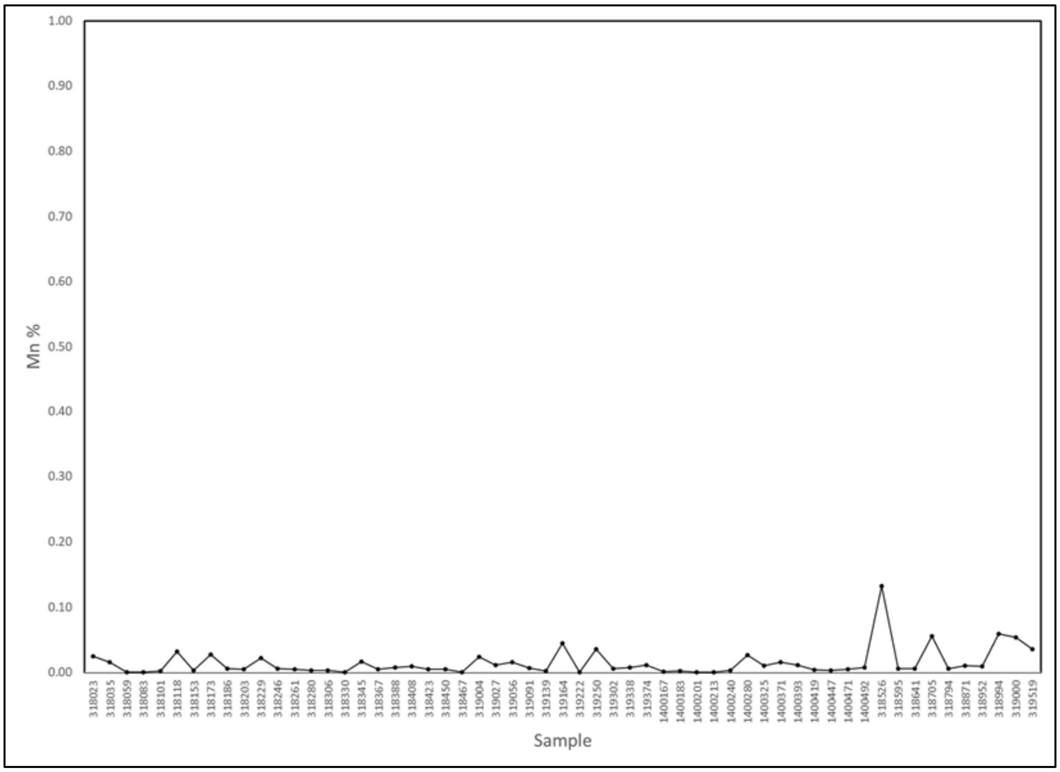


Figure 11.11: 2020 Drilling Program Blank Results for Fe (N= 95)

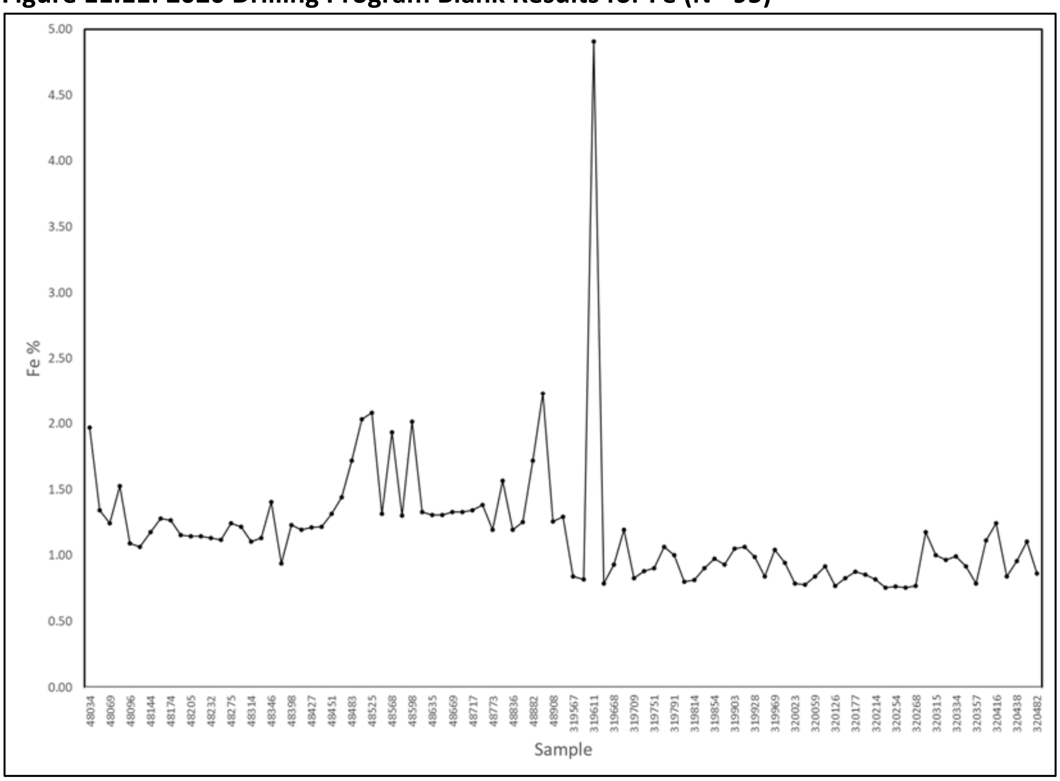
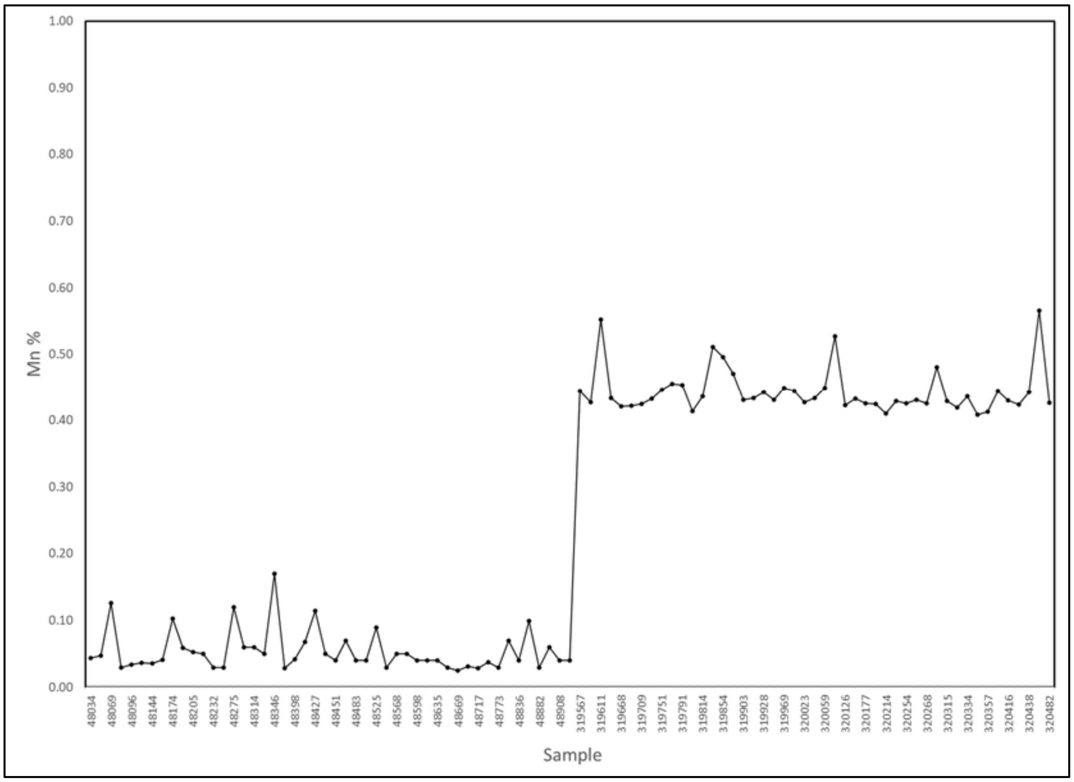


Figure 11.12: 2020 Drilling Program Blank Results for Mn (N= 95)



Manganese X also carried out a quarter core duplicate sampling program to check on sample variability during the 2016, 2017 and 2020 diamond drilling programs. During the 2016 and 17 drilling program, a total of 58 core duplicates were analyzed. Duplicate ¼ core split samples were included in the laboratory sample shipment sequence in intervals that ranged from every 15 to 70 samples. Total Fe and Mn results for duplicate – original pairs are presented in Figure 11.13 and 11.14, respectively. The correlation coefficient (R^2) between pairs for Fe and Mn is 0.95 in both cases and results group closely along respective 1:1 equality lines.

During the 2020 drilling program, a total of 93 ¼ core duplicates samples were analyzed. These were inserted into the laboratory sample shipment sequence in intervals that range between 6 and 50 samples. Total Fe and Mn results for sample pairs are presented in Figure 11.15 and 11.16. The correlation coefficient (R^2) between sample pairs for Fe and Mn is 0.97 in both cases and results group closely along respective 1:1 equality lines.

Figure 11.13: 2016-17 Duplicate ¼ Core Sample Results for Fe (N = 58)

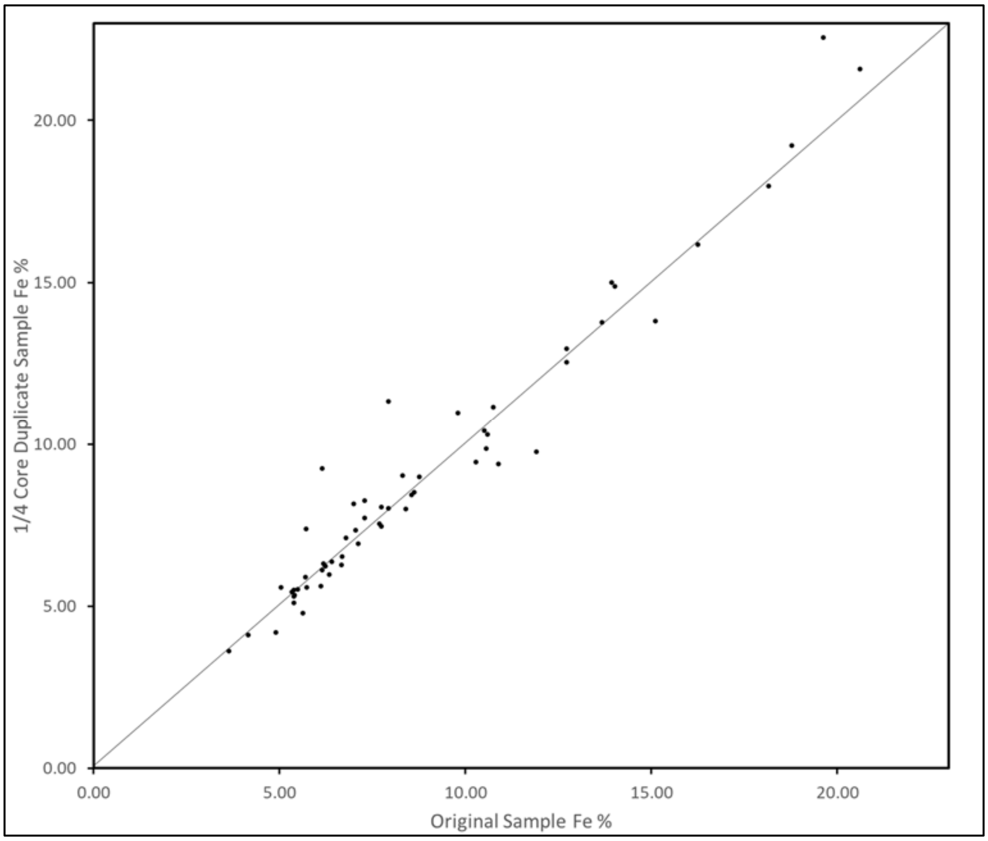


Figure 11.14: 2016-17 Duplicate ¼ Core Sample Results for Mn (N = 58)

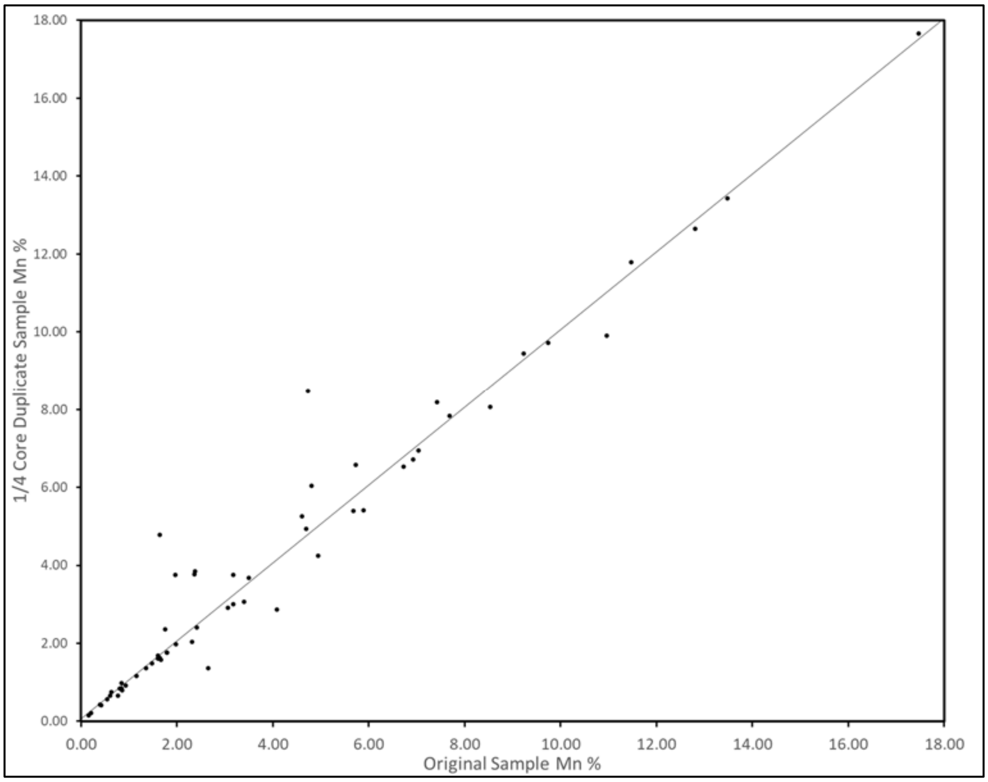


Figure 11.15: 2020 Duplicate ¼ Core Sample Results for Fe (N = 93)

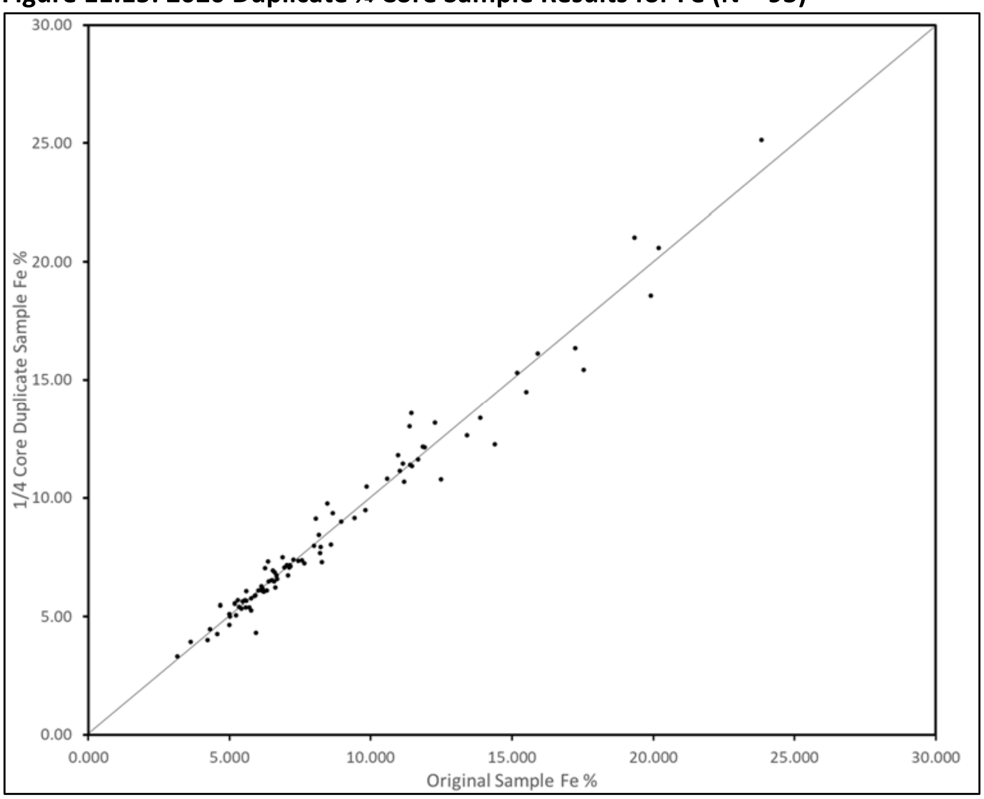
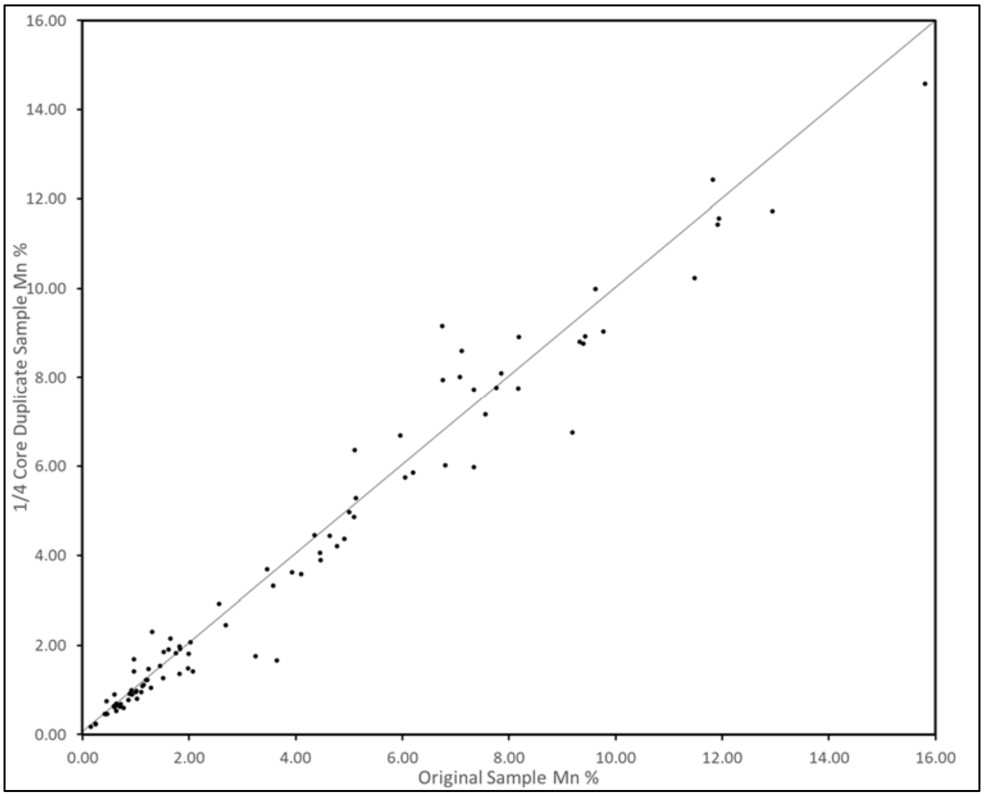


Figure 11.16: 2020 Duplicate ¼ Core Sample Results for Mn (N = 93)



11.3 Summary of QAQC Program Results

Review of associated datasets has shown that CRM samples chosen for the three referenced drilling programs did not perform consistently when compared to separate laboratory CRM results and results of third party check sampling analysis carried out by Manganese X. Low-level under reporting of Mn levels occurred in all programs and in results for both CRMs. CRM 700 results are also sometimes positively spiked in the 2020 data set, and this stands out from the other years. In general, the CRM's performed better in the 2016-2017 programs than in 2020 and it is possible that bulk CRM materials used for the program were degraded during the intervening storage period.

Blank sample results for all programs do not indicate presence of any systematic trends of preparation-stage cross contamination. Results of the quarter core duplicate split program show good correlation between sample pairs. Similarly, results of a 2016 third party check sampling program show very good correlation between the two commercial laboratories involved (ActLabs and SGS).

11.4 QP Opinion on Sample Preparation, QAQC Protocols, and Analytical Methods

The QP is of the opinion that the quality of the analytical results from the 2016, 2017 and 2020 diamond drilling programs are sufficiently reliable to support their use in the mineral resource estimate for the Battery Hill Manganese Project. Sample preparation, analysis, security procedures, and QAQC procedures undertaken by Manganese X staff were performed in accordance with CIM exploration best practices and mining industry standards. It is recommended that custom CRM samples be developed by a commercial laboratory for use in any future Manganese X drilling programs, based on mineralization samples from the Project.

12.0 DATA VERIFICATION

12.1 Overview

Data verification procedures carried out by the report authors for the Battery Hill Project consisted of two main components:

(1) Review of public record and internal source documents cited by previous operators and Manganese X with respect to key geological interpretations, previously identified geochemical or geophysical anomalies, and historical and current exploration and drilling results that support the current mineral resource estimate for the Battery Hill Project; and

(2) Completion of a site visit to the Battery Hill Project on February 24, 2021 by report author, Paul Ténière, which included visual inspection of the Battery Hill Project from the roadside and independent witness (IW) check sampling of quarter core samples from the 2016, 2017 and 2020 Manganese X drilling programs. IW check sampling of 2016 and 2017 drill core was completed on December 17, 2020 in the Sussex core library, and for the 2020 drill core at the Manganese X core facility onsite (Jacksonville, NB) on February 24, 2021. Details of the site visit and check sampling activities carried out by Mr. Ténière are presented in Section 2.3 of this report. No issues were identified that negatively impact the findings and conclusions of this report.

Mercator staff were responsible for assisting with data compilation, designing, and implementing the Battery Hill drilling programs and interpreting data sets for future exploration targeting using mining industry standards and CIM Mineral Exploration Best Practice Guidelines. Mercator staff completed data verification procedures throughout the entire process including review of QAQC procedures and results.

12.2 Site Visit (Personal Inspection) and Check Sampling Program

Report author Paul Ténière completed a site visit to the Battery Hill Project on February 24, 2021. Mr. Ténière completed a personal inspection of the Battery Hill Project via roadside observations on Iron Ore Hill Road, near Jacksonville, NB which transects the northern part of the Moody Hill area and is the main access into the northern part of the deposit. Drill hole collars were not observed due to winter conditions and thick snow cover. Mr. Ténière noted no obstacles to complete further drilling and bulk sampling of the project for future mining studies. As part of the personal inspection, Mr. Ténière also examined and sampled a total of 14 quarter core IW samples from 8 drill holes (SF16-02, SF16-06, SF16-08, SF17-15, SF17-20, SF20-32, SF20-34, and SF20-37) at the Manganese X core storage facility (2020 drill holes) and NBDNRED core storage facility in Sussex, NB (2016 and 2017 drill holes).

During the December 17, 2020 and February 24, 2021 core storage facility visits, Mr. Ténière confirmed the presence of Mn-Fe mineralization in drill core at depths specified in Manganese X drill logs and also verified various lithological descriptions in logs, against corresponding core intervals. A total of 14 check samples were collected from the 2016, 2017, 2020 drilling programs and were submitted for laboratory analysis along with one blank sample and one CRM included in the sample stream. Mr. Ténière supervised all aspects of core marking, cutting and bagging with respect to the check samples and these were securely held by Mr. Ténière until delivered in person to the ALS Lab (ALS) office in Moncton, NB for preparation and subsequent analysis using XRF methods. ALS is an independent commercial analytical firm that is accredited by the Canadian Association for Laboratory Accreditation (CALA) and also holds ISO 9001 and ISO/IEC 17025 registrations.

Fe % and Mn % results for the check sampling program are presented in Table 12.1 and Figures 12.1 and 12.2 below. These show that good correlation exists between the check analysis values and the corresponding project database values from the original assay results. A numbering error occurred with respect to sample 3051 and it does not represent the sample interval assessed by sample 319257. This accounts for the discrepancy of corresponding sample pair results in Figure 12.1.

Table 12.1: Mercator Check Sample Results (2016, 2017, and 2020 Drilling Programs)

Check Sample ID	Chart ID	Hole ID	From (m)	To (m)	Thick (m)	Fe% check	Mn% check	Comments	Original Sample ID	Fe% original	Mn% original
3051	1	SF16-06	112	115	3	4.82	1.74	Not a standard, sample ID error	319257	3.45	34.40
3052	2	SF16-06	118	120	2	11.88	6.77	red	319260	10.79	6.55
3053	3	SF16-06	126	128	2	10.32	9.56	red green mixed	319265	11.49	10.79
3054	4	SF16-02	88	90	2	23.91	14.95	red green mixed	1400349	23.43	14.59
3055	5	SF16-02	96	98	2	14.90	9.72	red green mixed	319003	14.19	8.93
3056	6	SF16-08	121.8	123.8	2	7.43	16.90	green	318410	7.53	15.50
3057	7	SF16-08	132.25	133.25	1	6.75	15.80	green	318418	7.68	14.30
3058	8	SF17-15	230	232	2	13.00	12.45	red-brown	318707	11.71	11.69
3059	9	SF17-15	247.5	249.3	1.8	8.20	5.31	green	318715	9.08	6.52
3060	10	SF17-20	55.8	58	2.2	16.18	10.70	green	319513	15.46	10.22
3061	11	SF17-20	66	68	2	14.20	10.40	green	319518	13.31	8.32
3064	12	SF20-32	74	76	2	14.58	4.89	avg green	320219	13.55	7.26
3065	13	SF20-34	90	92	2	20.45	14.50	hg mixed	320455	19.49	14.75
3066	14	SF20-37	102	104	2	15.60	9.64	avg mixed	48176	15.93	9.21
3062						16.02	0.324	CRM OREAS700 (acceptable result)			
3063						1.27	0.054	blank silica sand (acceptable result)			
						16.06	*0.321*	CRM OREAS700 (acceptable result)			

Figure 12.1: Mn % Check Sample Results 2016, 2017, and 2020 Drilling Programs

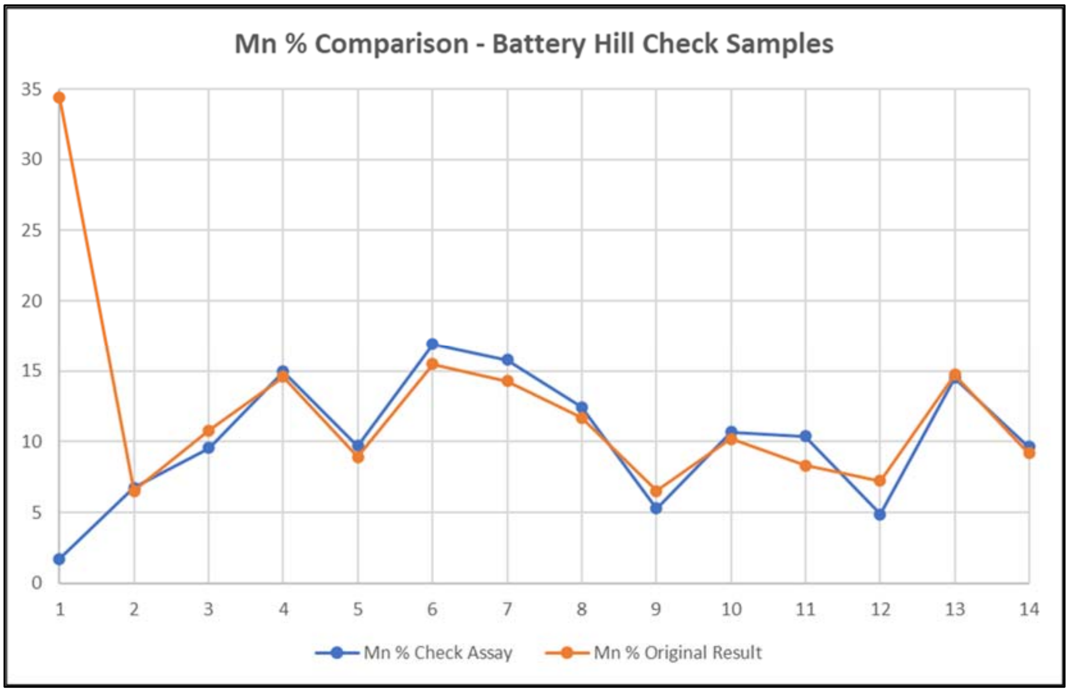
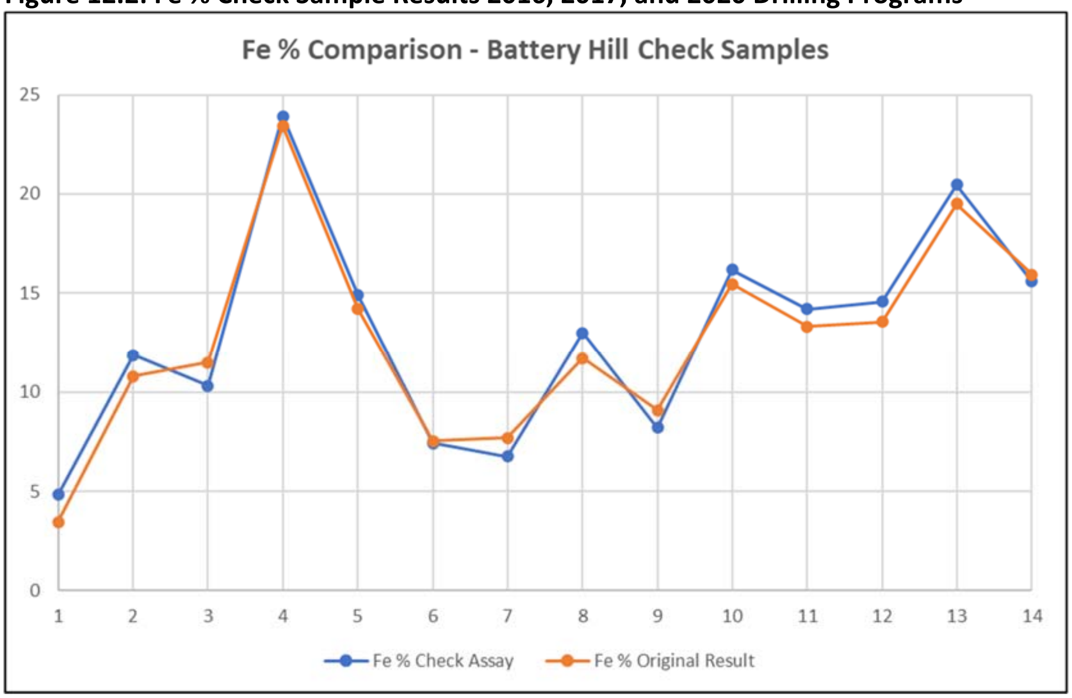


Figure 12.2: Fe % Check Sample Results 2016, 2017, and 2020 Drilling Programs



12.3 Review of Supporting Documents and Previous Technical Reports

As mentioned above, the report authors also obtained copies of relevant historical assessment work reports as part of the data validation procedures. Additional documents such as the previous NI 43-101 technical report (MacKinnon, 2020) that summarises drilling program results were also reviewed. Key aspects of this historical reporting are in part referenced in this technical report and were obtained through online searching of historical assessment reports available through the provincial government online report database and previous technical reporting. Results of the reference documentation checking program showed that in all instances considered, digital and hard copy records accurately reflect content of referenced source documents.

The report authors also validated project database entries for 2016, 2017, and 2020 diamond drilling programs to support the current resource estimate. This included systematic checking of database entries against source documents, with correction of deficiencies where necessary. Checking of database content consisted of collar coordination checks for all drill holes against source records, spot checks of core sample record entries and checking of assay results entries against source laboratory reports and certificates (including the check assay program described above). In addition to these manually coordinated checks, routine digital assessment of the drill hole datasets for issues such as end of hole errors, conflicting sample records, survey record errors, etc., were carried out using scripts run within the Gemcom-Surpac modeling software. Minor discrepancies were addressed as required and noted in the database meta-data. No substantive issues were identified.

12.4 QP's Opinion on Data Verification

The QP is of the opinion that results from the data validation program components discussed above indicate that industry standard levels of technical documentation and detail are evident in the recent 2016, 2017, and 2020 diamond drilling results for the Battery Hill Project. In addition, the QP is of the opinion that the associated drilling digital database is acceptable for mineral resource estimation use.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Historical Metallurgical Testing

Ores from iron-manganese deposits in the Woodstock New Brunswick area were reportedly smelted to produce iron as early as the 1840's, with operations continuing until 1884. After that, the earliest information regarding metallurgical work on manganese-bearing materials from these formations comes from a 1940's report to the Canadian National Railway by K.M. Ralston, a mining engineer. This report states that Noranda Mines did a series of metallurgical tests on this material and determined that the minerals "are too intimately associated to be separated by flotation. Some encouragement was given by a process that involved leaching of the manganese by electrolysis". Gravity and magnetic methods were also reportedly investigated as part of this work. Details of this testwork are not available.

Between 1953 and 1957, Stratmat carried out extensive work in the area, primarily on the Plymouth deposit, which lies to the south of the Battery Hill property but is in the same formation and shows similar grades and mineralogy. The work included float-sink testing, which was stated as giving considerable upgrading with "a reasonable recovery of manganese" (no grades given). Stratmat also extracted bulk samples from the Plymouth deposit for pyrometallurgical treatment at a facility owned by the company in Niagara Falls. A multistage pyrometallurgical process was successful in producing iron and ferromanganese, but the cost of heating the ore rendered the process uneconomic.

In 1969, an area of claims that includes the current Battery Hill project was acquired by Mandate Refining Company. This company developed a patented processing flowsheet that included an initial roasting stage with the ore blended with high-pyrite tailings obtained from a base metal mining operation in Bathurst, New Brunswick. The pyrite provided the sulfur source to generate sulfuric acid and sulfur dioxide in the roasting stage, converting manganese to $MnSO_4$ and leaving much of the iron from the pyrite as an oxide. The manganese sulfate was extracted with a water leach, and the resulting sulfate solution was purified and treated electrolytically to recover manganese metal. Although considerable development work was conducted, the process was not implemented.

No further testwork is reported on mineralization from the current Battery Hill property until about 2010 when Globex Mining had a single sample tested for extraction with a nitric acid process. The results showed greater than 90% Mn extraction, along with high rates of extraction of other components in the ore.

In the 1980's, the portion of this mineral belt immediately to the south of the Manganese X property was acquired by Mineral Resource Research Ltd. (MRR). Based on public information from the current owner of that property, MRR had at least two separate metallurgical studies done as part of its development work. In 1986, Witteck Development Inc. carried out metallurgical testing and economic evaluations of processes tested, and in 1991, Industrial Research and Development Co. Ltd. evaluated the use of a microwave-hydrochloric acid digestion process. Completed reports from these studies are not currently available.

After Canadian Manganese Company (CMC) acquired the southern part of the belt from MRR in 2010, a series of bench-scale test programs were completed by Thibault and Associates beginning in 2011, using drill core from a 2011 drill program at the Plymouth deposit on CMC's claims. The initial hydrometallurgical study determined that an atmospheric sulfuric acid leach was sufficient to provide high levels of manganese extraction, achieving 94% extraction from a bulk composite of mineralization and up to 99% with individual mineralization types. Continued work the following year focused on preconcentration of the mineralization, evaluating high-gradient magnetic separation (HGMS), heavy media separation, and multiple approaches to flotation. All three methods showed potential for upgrading, with the best flotation result giving 69% Mn recovery with 53% mass rejection, while HGMS recovered 86% of manganese from a fine sized sample, with 36% mass rejection. Heavy media separation showed similar upgrading of coarse fractions, but finer fractions could not be upgraded. Additional hydrometallurgical testing carried out at this time used a simulated spent electrolyte solution as leachate and incorporated a primary iron removal step. In these tests, the average resulting Mn extraction was 88%.

In 2014, an additional test program was completed that consisted of bulk leaching and purification to produce electrolyte for testing of Electrolytic Manganese Metal (EMM) production. These tests resulted in EMM flake products grading above 99.7% Mn. This work was conducted in relation to the preparation of a PEA report on the CMC property in 2014. That report, prepared by Tetra Tech, was based on a flowsheet that included crushing, grinding, preconcentration using HGMS, leaching of the resulting concentrate with sulfuric acid, leach solution purification and electrowinning to produce EMM. Overall manganese recovery was projected to be 77.1%, resulting from an 85.7% recovery in the preconcentration step and 90% recovery from the concentrate leach.

Please Note: The above-reported testing and analyses were undertaken by companies external to Manganese X and were conducted principally using samples sourced from outside the Manganese X property boundaries. Although cursory examinations show there are similarities between the material tested and the mineralized zones located on The Manganese X claims, there can be no assurance that the same hydrometallurgical processes will be applicable to the mineralization that exists on the Manganese X claims.

13.2 Current Mineral Processing and Metallurgical Testing—Sample Selection

Beginning in 2017, Manganese X initiated a series of mineralogical and metallurgical related studies, as described in the following sections.

The Battery Hill property covers the northern portion of a belt of sediment-hosted manganese-iron formations which include three principal types of manganese mineralization. These are brick-red to maroon-coloured siltstones, green-grey to black siltstones, and a banded mix of the red and grey siltstones. These three types of mineralized siltstones have been termed Red, Grey and Mixed, respectively, for simplicity of sample descriptions. These mineralization types appear to be directly analogous to separate rock types tested in the recent metallurgical programs conducted by CMC on their adjacent property. That material came from drill core obtained from the Plymouth deposit, located approximately 5 km south of the Battery Hill property. In that work, it was determined that the brick-red siltstones and green-grey to black siltstones had differing minerology, resulting in significant differences in acid consumption and leachable iron content between the two materials.

The mineralogical and metallurgical studies undertaken to date by MANGANESE X have primarily used two composite samples, one of Red and the other of Grey mineralization, with a separate Mixed composite also used in some cases. The primary (master) composite samples for this testwork were prepared from assay sample reject material from exploration drill-holes SF-16-6, -8 and -9 drilled on the Moody Hill section and holes SF-16-2, -4 and -5, drilled on the Sharpe Farm section of the Battery Hill deposit. The composite samples of Red and Grey mineralization totaled 98.8 and 251.8 kilograms, respectively. Sampling and compositing were completed at the core logging facility in March 2017 by company representatives Roger Dahn and Perry MacKinnon. The weights of rejects from each assay sample added to a given composite were recorded to allow the calculation of a composite head assay, based on the weighted average of the assays of the individual sample intervals. Details of the Red and Grey composite samples are presented in Table 13.1.

Table 13.1: Red and Grey Mineralization Master Composite Samples

COMPOSITE SAMPLES OF 2016 DRILL PROGRAM "REJECT SAMPLE MATERIAL" FOR ASSORTED METALUGICAL TESTWORK				
RED ORE COMPOSITE		98.84 KG's of Rejects with a weighted average grade of 9.12 % Mn and 11.95 % Fe Red composite was formed by combining 100% of reject material from 19 samples from holes SF-6, SF-8 and SF-9. The weight (Kgs) and grade of the drill intervals used are listed below.		
		% Mn	% Fe	Weight (Kg)
100% of rejects	SF-6 (Moody)	9.33	17.65	18.55
100% of rejects	SF-8 (Moody)	9.39	7.63	37.03
100% of rejects	SF-9 (Moody)	8.80	13.20	43.25
GREY (NON-RED) ORE COMPOSITE		251.84 KG's of Rejects with a weighted average grade of 10.34 % Mn and 15.01 % Fe "Grey" composite was formed by combining 50% of reject material from 69 samples from holes SF-2, SF-4 and SF-5; and 100% of reject material from 23 samples from holes SF-8 and SF-9. The weight (Kgs) and grade of the drill intervals used are listed below.		
		% Mn	% Fe	Weight (Kg)
50% of rejects	SF-16-2 (Sharpe)	10.88	15.99	44.41
50% of rejects	SF-16-4 (Sharpe)	9.87	15.50	49.11
50% of rejects	SF-16-5 (Sharpe)	10.70	16.71	58.62
100% of rejects	SF-16-8 (Moody)	13.57	10.55	26.78
100% of rejects	SF-16-9 (Moody)	8.67	14.46	58.98
100% of rejects	SF-16-9 (Moody)	9.74	13.94	13.92

Composite samples were delivered to RPC Science and Engineering (RPC) in Fredericton, New Brunswick for homogenization and preparation of sub-samples. The two Master Composite samples (designated J2035 Red and J2035 Grey) were securely stored at RPC and representative sub-samples have been shipped to contractor facilities for mineralogical and metallurgical testwork as needed.

13.3 Mineralogical Testing—QEMSCAN

Four composite samples from the property were submitted to the Mineral Services group of SGS Canada for chemical analysis and mineralogical characterization by X-ray diffraction and QEMSCAN analysis. Two of the samples (A-Red and B-Grey) were from Globex Mining drill holes GNB-11-2 and -3, drilled on the Iron Ore Hill occurrence in 2011. The other two samples were splits from the two master composites J2035 Red and J2035 Grey, which were from MANGANESE X drill holes on the Sharpe Farm and Moody Hill sections, as described in Section 13.2. The additional samples were included in the study to determine if the 'Red' and 'Grey' sediments from different parts of the property showed similar mineralogy, manganese distribution and mineral grain liberation. The following summary is derived from the SGS Canada Inc. report titled "The Mineralogical Characteristics of two Manganese Composite Samples from the Battery Hill Property – Report 16134-002 Final Report", dated May 10, 2017.

The X-ray diffraction and QEMSCAN analyses detected several manganese bearing minerals. The analysis showed that the manganese phases have highly variable manganese concentrations. The QEMSCAN results include the modal mineralogy and various sets of deportment data illustrating the minerals by composition. Tables 13.2 and 13.3 present the overall mineral distributions, while comparing the two Red samples and the two Grey samples, respectively. Tables 13.4 and 13.5 show the distribution of manganese in these same samples, based on the overall mineral distributions obtained from the QEMSCAN analysis.

The mineralogy of these samples may be summarized as follows:

- Sample A (Red), from the Iron Ore Hill area, was high in manganese silicates, and particularly Mn-Fe silicates, in total accounting for over 35% of the mass, with Mn-bearing carbonates accounting for less than 10% of the mass, and an additional 5% made up of Mn-bearing clays. A further 12% of the mass occurred as Fe oxides and silicates, and the remainder of the material was mainly made up of a mixture of quartz, plagioclase, feldspar, micas, apatite (Ca-phosphates), with minor amounts of clay and other alteration minerals.

- The results for the corresponding sample material of Red composite (J2035 Red), from Moody Hill/Sharpe Farm areas, showed a much lower content of Mn-Fe silicates, with only marginally higher amounts of other Mn silicates (total Mn-silicates 18%). The total mass of Mn-bearing carbonate minerals was, however, significantly higher than Sample A (13.4%). While the content of other iron minerals was similar to Sample A (11.5%), there were less oxides and more silicates. Remaining gangue minerals were similar between the two samples, but with proportionately higher quartz and mica in the composite sample (31% of the mass) along with more chlorite (11%).

- Sample B (Grey), from the Iron Ore Hill, also showed a large part of the mass (28.7%) to be made up of Mn-bearing silicate minerals, but Mn-containing carbonate minerals also represented a larger fraction than seen in the red samples (19.4%). Iron oxides were less than 1% in this sample, but Mn-free iron-bearing silicates still represented about 9% of the mass. Dominant gangue minerals were quartz and chlorite, but minor gangue minerals seen in the Red material were also present in similar amounts. This sample had the highest sulfide mineral content (2%), likely representing additional iron content in the form of iron sulphide minerals.

- The Grey composite sample, from Moody Hill/Sharpe Farm (J2035 Grey), showed much less variation from the Iron Ore Hill Grey sample (Sample B) than seen with the Red samples. Total

Mn-bearing silicates were a little less (25.2%), while the Mn-containing carbonate content was almost the same for both samples (20%). Iron-bearing minerals in the gangue were again primarily present as silicates rather than oxide minerals. Other gangue minerals were similar between samples, but with chlorite making up a more significant fraction relative to quartz and other silicates (14.9%).

Table 13.2: QEMSCAN Mineral Identification and Classification. Modal Distributions (mass %) for each Red Sample, with Variance Between Samples Highlighted

LIMS # Sample Name Deposit Name	MI5022-FEB17 Sample A(Red) Houston Woodstock	MI5028-MAR17 J2035 Red Ore Battery Hill	Difference
Mn-Silicate	1.65	2.02	-0.37
Mn-Ca-Silicate	2.84	4.53	-1.68
Mn-Ca-Al Silicate	2.48	1.63	0.85
Mn-Fe Silicate (+/- Al, Ca & Mg)	29.80	9.76	20.03
Mn Mica/Clays	4.83	3.32	1.51
Ca-Mn-Fe Carbonate	1.96	1.13	0.83
Mn-Ca Carbonate	7.30	7.54	-0.25
Mn-Fe Carbonate	0.33	0.32	0.02
Mn-Carbonate	0.09	4.39	-4.30
Mn Others	0.00	0.03	-0.03
Quartz	4.96	12.61	-7.65
Plagioclase	5.72	3.83	1.90
K-Feldspar	1.14	2.25	-1.12
Sericite/Muscovite	6.51	9.50	-2.98
Biotite	3.17	8.65	-5.48
Chlorite	2.45	11.05	-8.60
Clays	4.26	1.85	2.42
Fe-Al Silicate	1.74	4.44	-2.70
Other Silicates	0.06	0.12	-0.06
Rutile	0.48	0.72	-0.24
Siderite	1.52	0.74	0.78
Fe-Oxides	9.10	6.22	2.89
Other Oxides	0.03	0.12	-0.09
Carbonates	0.02	0.12	-0.11
Ca-Phosphate (Low Impurites)	6.23	2.78	3.45
Barite	0.11	0.18	-0.07
Sulphides	1.16	0.04	1.11
Other	0.05	0.11	-0.06

Table 13.2 shows the difference in Mn-silicate mineral content between the two Red samples collected from different parts of the property. While the general mineral make-up is similar, there are important differences in the manganese-bearing minerals present. The composite shows much less of the manganese mineralization in silicates and significantly more in carbonates. This may have important

implications for leach performance and reagent consumption. Of note was the lack of non-Mn carbonates in both of these samples, supporting previous findings of lower acid consumption with this rock type.

Table 13.3 shows the mineral distribution for the Grey samples from Iron Ore Hill (Sample B) and Moody Hill/Sharpe Farm (composite – J2035). In this case, the samples show much less variation that for the Red samples. Both show relatively high proportions of both silicate and carbonate host minerals for manganese. As with the Red samples, the gangue shows a wide distribution of quartz and silicate minerals typical of sedimentary formations. The Grey mineralization is much lower in iron oxides, which likely accounts for the colour difference. The Grey mineralization also contains a small amount of non-Mn bearing carbonates, higher sulfide content and more chlorite.

Based on SEM-EDS analysis of the mineral phases present, the manganese content of each phase was calculated to determine the manganese distribution through the Mn-bearing minerals. These results are presented in Table 13.4 for the two Red samples, and Table 13.5 for the Grey samples. As with the mineral distributions, the variations between the Iron Ore Hill sample and the Moody Hill/Sharpe Farm composite are also included in these tables. For the Red samples, this analysis indicates the relative importance of the carbonate minerals when compared with the mineral distributions, indicating a higher average manganese grade in the carbonate minerals than the Mn-bearing silicate minerals.

This analysis also shows more clearly the significance of the differences between the manganese mineral distribution between Sample A and the drill core composite. While in Sample A, all carbonates account for approximately 35% of the manganese present, this increases to over 60% for the composite. In particular, pure manganese carbonate (Rhodochrosite) accounts for nearly 25% of the Mn in the composite, but is essentially absent from Sample A.

As noted, Table 13.5 shows the calculated manganese distribution in each sample, based on average Mn content determined by SEM-EDS. Again, this analysis shows the relative importance of the carbonates as a source of manganese, which in this case is much more consistent between the two samples. The main difference between these samples was a relatively small variation in the relative importance of different mixed carbonate minerals. For the Moody Hill/Sharpe Farm composites (J2035 Red and Grey), the distribution of the manganese to carbonate minerals was consistent between the Red and Grey samples, at approximately 60%. Based on these results the majority of the manganese in the carbonates occurred as mixed Mn-Ca carbonates, which could indicate potential challenges for rejecting alkalinity in any pre-concentration processes.

Table 13.3: QEMSCAN Mineral Identification and Classification. Modal Distributions (mass %) for Each Grey Sample, with Variance Between Samples Highlighted

LIMS # Sample Name Deposit Name	MI5022-FEB17 Sample B (Grey) Houston Woodstock	MI5028-MAR17 J2035 Grey Ore Battery Hill	Difference
Mn-Silicate	0.85	0.61	0.24
Mn-Ca-Silicate	0.74	0.88	-0.14
Mn-Ca-Al Silicate	1.54	0.83	0.72
Mn-Fe Silicate (+/- Al, Ca & Mg)	24.56	21.39	3.17
Mn Mica/Clays	1.20	1.52	-0.32
Ca-Mn-Fe Carbonate	7.73	4.82	2.91
Mn-Ca Carbonate	6.43	8.14	-1.70
Mn-Fe Carbonate	2.47	4.24	-1.77
Mn-Carbonate	2.76	2.82	-0.06
Mn Others	0.00	0.01	-0.01
Quartz	12.49	8.36	4.13
Plagioclase	0.39	2.16	-1.77
K-Feldspar	1.12	1.20	-0.08
Sericite/Muscovite	3.94	5.76	-1.82
Biotite	1.95	2.29	-0.34
Chlorite	11.08	14.92	-3.84
Clays	1.74	1.41	0.33
Fe-Al Silicate	4.93	7.54	-2.61
Other Silicates	0.05	1.35	-1.30
Rutile	0.62	0.61	0.01
Siderite	4.05	0.65	3.40
Fe-Oxides	0.64	1.10	-0.47
Other Oxides	0.16	0.24	-0.08
Carbonates	0.34	0.27	0.07
Ca-Phosphate (Low Impurites)	6.08	5.13	0.95
Barite	0.00	0.00	0.00
Sulphides	2.06	1.58	0.49
Other	0.07	0.17	-0.10

Table 13.4: Manganese Distribution (normalized mass %) for Each Red Sample, with Variance Between Samples Highlighted.

Minerals	Sample A(Red):	J2035 Red Ore:	Difference
Mn-Silicate	5.92	7.26	1.34
Mn-Ca-Silicate	2.80	5.04	2.23
Mn-Ca-Al Silicate	2.45	1.87	-0.58
Mn-Fe Silicate (+/- Al, Ca & Mg)	44.08	16.39	-27.68
Mn Mica/Clays	3.22	2.78	-0.43
Ca-Mn-Fe Carbonate	6.16	3.91	-2.25
Mn-Ca Carbonate	27.35	32.54	5.19
Mn-Fe Carbonate	0.92	0.95	0.04
Mn-Carbonate	0.40	23.31	22.91
Mn Others	0.00	0.19	0.18
Chlorite	0.56	2.63	2.07
Other Silicates	0.01	0.00	-0.01
Other Oxides	0.00	0.01	0.01
Ca-Phosphate (Low Impurities)	6.14	3.12	-3.02
Sulphides	0.00	0.00	0.00
Other	0.00	0.00	0.00

Table 13.5: Manganese Distribution (normalized mass %) for Each Grey Sample, with Variance Between Samples Highlighted.

Minerals	Sample B (Grey):	J2035 Grey Ore:	Difference
Mn-Silicate	2.41	1.82	-0.59
Mn-Ca-Silicate	0.61	0.76	0.15
Mn-Ca-Al Silicate	1.28	0.70	-0.58
Mn-Fe Silicate (+/- Al, Ca & Mg)	30.49	27.35	-3.14
Mn Mica/Clays	0.85	0.85	-0.01
Ca-Mn-Fe Carbonate	20.35	13.16	-7.19
Mn-Ca Carbonate	20.24	26.33	6.09
Mn-Fe Carbonate	5.69	10.22	4.53
Mn-Carbonate	10.91	11.37	0.46
Mn Others	0.01	0.06	0.05
Chlorite	2.11	2.96	0.85
Other Silicates	0.01	0.00	0.00
Other Oxides	0.01	0.02	0.01
Ca-Phosphate (Low Impurities)	5.03	4.40	-0.63
Sulphides	0.00	0.00	0.00
Other	0.00	0.00	0.00

13.4 Diagnostic Leach and Purification Testing

Manganese X's first metallurgical programs for Battery Hill material consisted of diagnostic leach testing, carried out by two separate firms, Kemetco Research Inc. (Kemetco) in Richmond, BC and Kingston Process Metallurgy (KPM) in Kingston, Ontario. Both programs were carried out using sub-samples from the two master composite Red and Grey samples (J2035 Red and J2035 Grey) prepared from Sharpe Farm and Moody Hill drill core. In addition, KPM completed testwork on a composite sample of Mixed mineralization from the Moody Hill Central zone. The Mixed composite sample was prepared from drill core sample rejects from 2017 drill holes SF-17-16, SF-17-17, and SF17-18. The weighted average head grade of this composite was calculated as 12.9% Mn and 17.5% Fe. A second sample of Moody Hill mixed material, grading 11.7% Mn and 15.8% Fe, was tested using the same procedures at a later date.

The laboratory bench-scale sulfuric acid leach tests were conducted to determine the achievable manganese extraction, investigate the leach kinetics of the major leachable elements and to measure the acid consumption for the main types of mineralization on the property (Red, Grey and Mixed).

The test results were encouraging, with the best manganese extraction results exceeding 95%. Test results from KPM and Kemetco showed a similar leach response and sample characteristics, as summarized below:

- Both mineralization types (Red and Grey) showed high Mn extraction, exceeding 95% under the best conditions, using an elevated temperature sulfuric acid leach, indicating that the manganese occurred primarily in readily extractible mineral forms.

- The presence of high free acid levels (50 g/l) had a minor effect on Mn leach extraction, but a much more pronounced effect on the amount of impurities (Fe, Mg) reporting to the leachate (Figure 13.1).

- The manganese extraction was rapid (less than two hours) for the Red composite, but slower for the Grey material (Figure 13.2 and 13.3).

- Iron extraction varied significantly between the two mineralization types, with the Grey showing much higher leachable iron. This is likely to lead to process differences between the two materials, with lower process costs associated with iron and manganese removal for the Red mineralization.

- The mixed material showed intermediate kinetics, with slightly lower Mn extraction than the other two samples. The Fe extraction was also intermediate between the other two types of mineralization, while the Mg extraction was the lowest of all the materials tested (Figure 13.1).

- Overall, Mn extraction varied from 84 to 96%, depending on the feed material type and the test conditions.

Figure 13.1: Comparison of Leach Results for all Samples with 10 g/l and 50 g/l Free H_2SO_4 in Leach (KPM Testing)

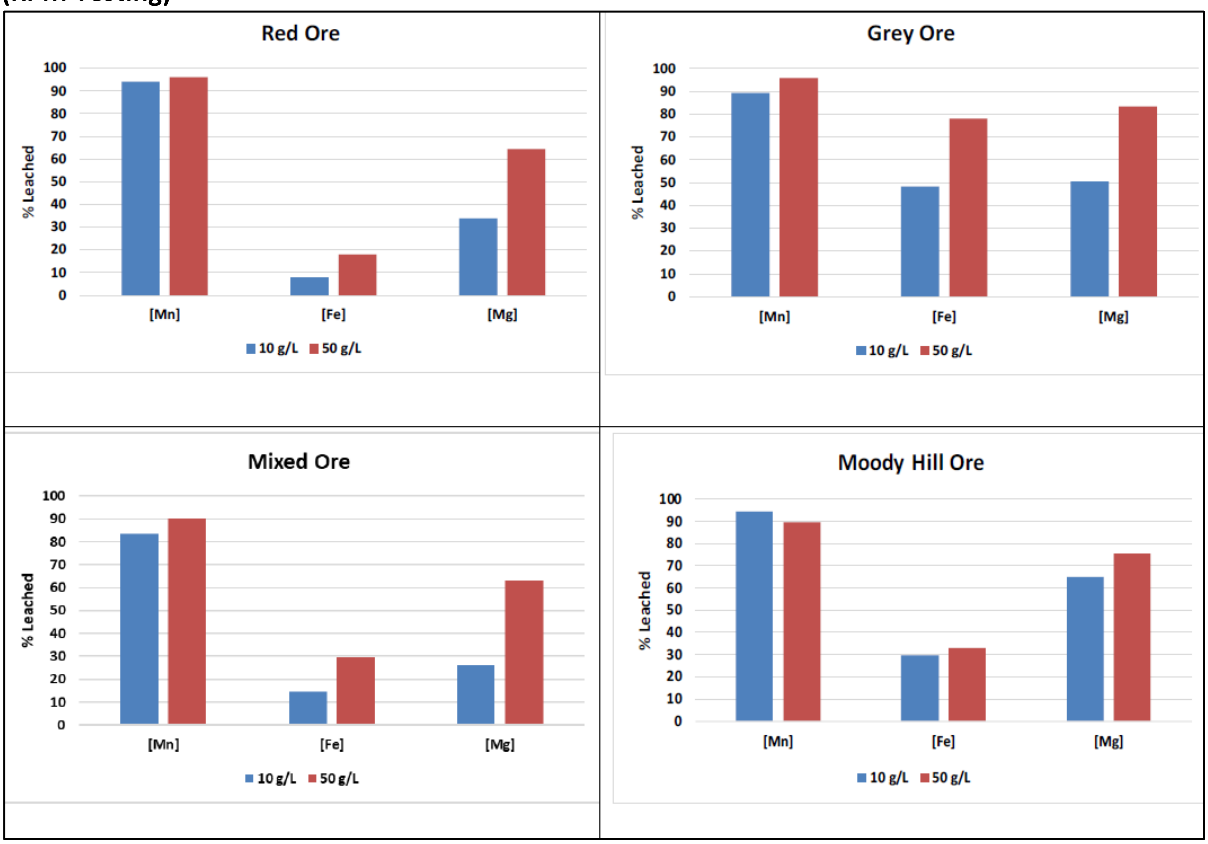


Figure 13.2: Kinetic Extraction Profile for Red Material – Mn and Fe (Kemetco Testing)

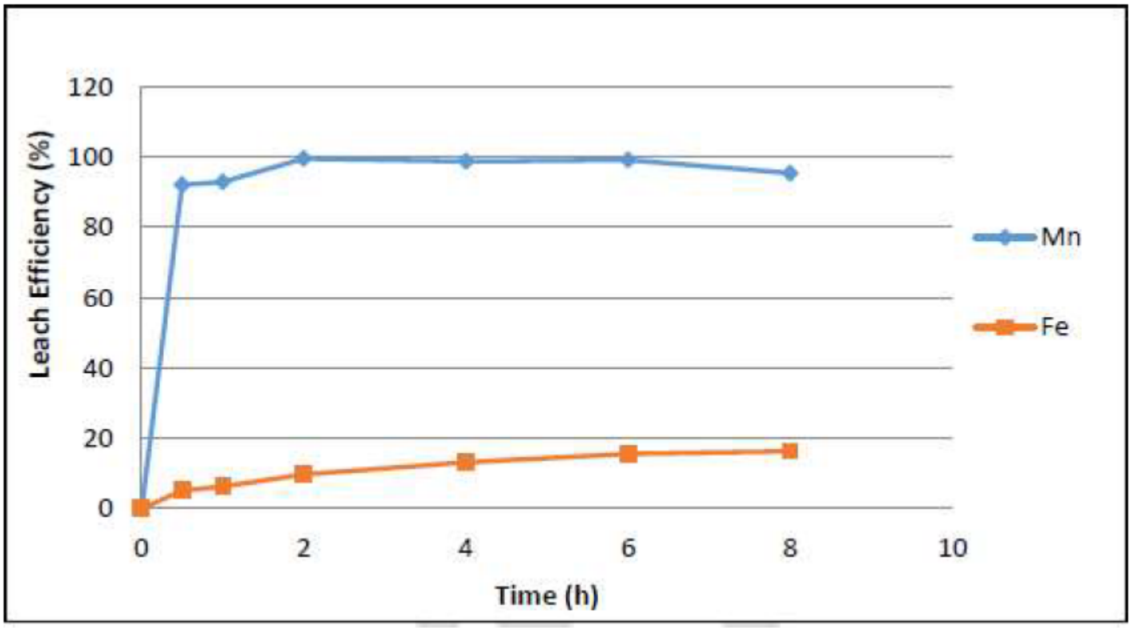
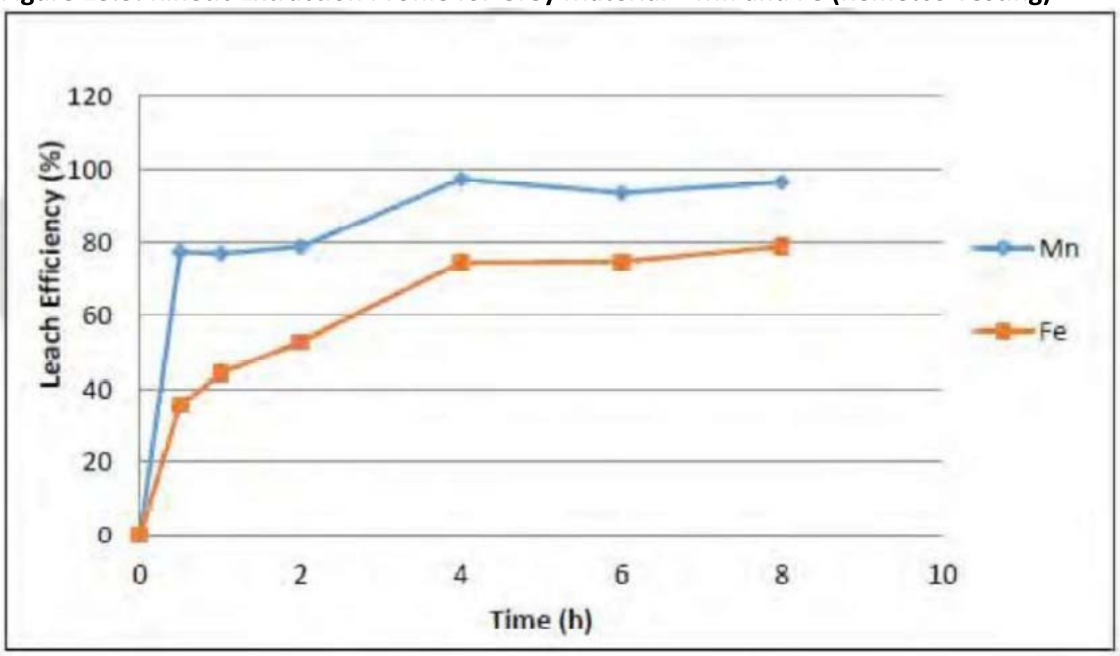


Figure 13.3: Kinetic Extraction Profile for Grey Material – Mn and Fe (Kemetco Testing)



Diagnostic leach testing results are reported in detail in "Manganese Diagnostic Leach Project – Project ID: K1005" by Kemetco Research Inc., June 22, 2017 and "Sulfuric Acid Leach of Battery Hill Ore" by Parisa Ebrahimi, Kingston Process Metallurgy Inc., June 22, 2017 (updated 171010 and 181126).

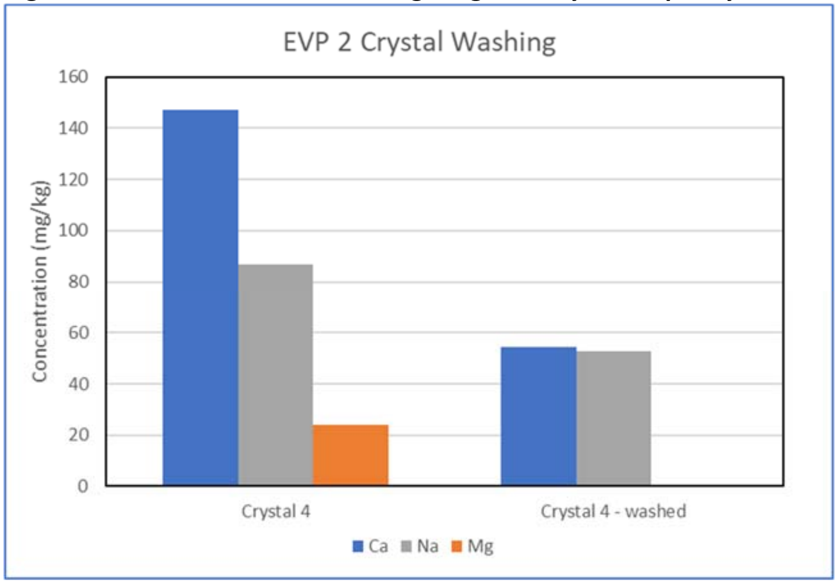
As a follow-up to the diagnostic leach testing, Manganese X enlisted Kemetco to complete a program of $MnSO_4$ purification and crystallization testing using samples of Battery Hill mineralization. The work was conducted using the red composite, which was subjected to a sulfuric acid leach. The leach slurry was pressure filtered to produce a clear leachate for purification, evaporation and crystallization, with the objective of producing a high purity manganese sulfate product suitable for use in battery manufacturing or other high-tech applications. The leach solution was subjected to two stages of impurity removal, the first stage primarily to remove iron and aluminum and the second to precipitate calcium and magnesium.

Table 13.6: Final Manganese Crystal Products after 3-stage Purification – ICP Analysis and Back-Calculated Total Impurity Levels

Element	Crystal 1	Crystal 1 - washed
	mg/kg	mg/kg
Ag Silver	<2.5	<2.5
Al Aluminium	<10.	<10.
As Arsenic	<10.	<10.
B Boron	<25.	<25.
Ba Barium	<0.5	<0.5
Be Beryllium	<0.5	<0.5
Bi Bismuth	<12.5	<12.5
Ca Calcium	147	54.3
Cd Cadmium	<0.5	<0.5
Co Cobalt	4.58	<2.5
Cr Chromium	<2.5	<2.5
Cu Copper	<5.	<5.
Fe Iron	<5.	<5.
K Potassium	<25.	29.0
Li Lithium	6.03	5.67
Mg Magnesium	23.8	<5.
Mn Manganese	308746	316184
Mo Molybdenum	<5.	<5.
Na Sodium	86.6	52.8
Ni Nickel	<2.5	<2.5
P Phosphorus	<15.	<15.
Pb Lead	<10.	<10.
S Sulfur	179515	180705
Sb Antimony	<10.	<10.
Se Selenium	<10.	<10.
Si Silicon	14.7	23.5
Sn Tin	<10.	<10.
Sr Strontium	0.78	0.68
Ti Titanium	<5.	<5.
Tl Thallium	<10.	<10.
U Uranium	<25.	<25.
V Vanadium	<5.	<5.
Zn Zinc	<2.5	<2.5
Calc. Impurity (%)	**0.10**	**0.05**
Total % Mn ppt	**23.59**	**27.06**

Initial results showed that the two stages of purification, which involved neutralization with lime and precipitation of Ca and Mg with fluoride, were very effective at removing Fe and Al contamination, and also removed most of the Ca and Mg, but residual reagents remained in solution, which reduced the grade of the final crystals. A third purification step, involving manganese carbonate precipitation and redissolution, was added to remove the residual reagent, resulting in a clean solution feeding the evaporation and crystallization stage. Crystal washing steps allowed further purification of the crystals, and the resulting crystal purities were above 99.9% (Figure 13.4). Based on these results, it could be projected that even lower levels of impurity could be achieved in the final product, if needed, through additional washing steps. Determining the degree of additional impurity removal that can be achieved was limited by the available analytical methods. While many of the target impurities were below the analytical detection limits, the he high manganese content of the final $MnSO_4$ product limited the lower detection levels that could be measured, which added uncertainty to very low level impurity calculations.

Figure 13.4: Effect of One Washing Stage on Crystal Impurity Levels



Following demonstration of the level of $MnSO_4$ purity that could be obtained, additional process solution was treated in the same manner to provide a high-purity sample product to Manganese X for outside testing and evaluation, as needed. This scoping-level test program demonstrated that the use of bulk purification techniques was capable of producing a high purity manganese sulfate (HPMS) product to a purity of 99.95%, with low levels of targeted contaminants. While the product was not tested directly for high tech applications, the measured contaminant levels appeared to be consistent with use as a component in the production of Electric Vehicle (EV) and storage batteries. These results led to recommendations for follow-up process development work to develop a complete process flowsheet, evaluate the effects of lower cost process steps, and to develop mass balance and recovery data for the process. Additional work initiated in this regard is described in Section 13.7, below.

13.5 NRC—Manganese Upgrading and Purification Testing

As recommended by Thibault and Associates and KPM for CMC's Plymouth deposit to the south, in 2018, Manganese X contracted NRC to investigate the potential for mineralization upgrading processes to remove acid consuming minerals to reduce the acid requirements for leaching, and potentially reduce the alkali metals in the leachate. Manganese X sent a total of 70 kg of crushed composite material, including

66 kg sent to NRC's Montreal Road campus and 4 kg sent to SGS's Lakefield lab for testing. The following results were reported:

- Gravity separation using a laboratory shaking table with sized sample fractions demonstrated limited separation.
- Magnetic separation demonstrated some selectivity. The combined magnetics, grading 15.0% Mn, recovered 77.9% of the manganese in 61.8% of the mass, giving an upgrading factor of 1.26.
- Two flotation reagent schemes based on fatty acid and hydroxamic acid collectors were investigated, with the best result giving a 17.3% Mn concentrate with 64.1% recovery.

Rougher and cleaner flotation testing using 2 kg charges were conducted. The best results were achieved when a 2 kg charge was ground for 40 minutes and floated with a ten-minute rougher stage using a fatty acid collector. The full rougher concentrate was cleaned three times using the fatty acid collector FA1. The combined 1st cleaner and scavenger concentrates, grading 17.3% Mn, recovered 64.1% of the manganese in 43.7% of the mass. Further cleaning resulted in further upgrading, with the third cleaner concentrate grading 19.5% Mn with 51.3% recovery in 31.1% of the mass.

Additional flotation testwork was recommended to identify collectors for manganese silicates and to evaluate the effects of primary grinding levels and concentrate regrind. An alternative flowsheet configuration was also recommended where an initial primary rougher concentrate would be collected directly as a final concentrate, while the secondary rougher and scavenger concentrates would be reground and cleaned.

13.6 Preliminary Pre-concentration Research-Ore Sorting and Tribo-Electrostatic Separation Testing

The average grade range of mineralization on the Battery Hill property is projected to be in the 8 to 10.5% Mn range. The Company recognized that upgrading technologies could be a key to improving the economics of a potential mining and processing operation. During 2017, the Company initiated preliminary studies of two upgrading technologies, sensor-based ore-sorting and 'Tribo-Electrostatic' separation

13.6.1 Ore Sorting Testwork

The objective of this preliminary program was to determine whether there was potential for an ore sorting technology to significantly upgrade the 'ore' through the rejection of gangue minerals and/or lower grade manganese-bearing material. To provide significant improvements to project economics, a level of upgrading to provide an average 15% Mn in the process feed was targeted. The preliminary test results from Steinert US were encouraging, with product grades of 14.7% Mn being achieved, although recovery rates were somewhat lower than anticipated. Further ore sorting testwork was recommended by Steinert.

The sample material for the ore sorting testwork was ½ cut NQ drill core from hole SF-17-18, located in the Moody Central zone of the Battery Hill deposit. The sample material was collected in July 2017 by Manganese X representative Roger Dahn, and as with other metallurgical samples, was sent to RPC

Science and Engineering in Fredericton for preparation. The material was crushed to produce a 1” by ½” sized sample for shipment to the Steinert US facility in Walton, Kentucky, where the testing was conducted in August 2017. The 74-meter core interval sampled totaled 88 kg and had an average grade of 9.39% Mn and 14.72% Fe, based on the original core assays. The interval included all three mineralization types (Grey, Red and Mixed), as well as lower grade (<3% Mn) material (Table 13.7) and was therefore felt to represent a good broad composite sample for an initial ore sorting scoping test program.

Table 13.7: Hole SF-17-18 Ore Sorting Composite Sample Details (40.0 to 114.0 m depth).

Mineralization Type	Width (m)	Percentage	% Mn	% Fe
Grey	22.5	30.4	8.13	12.49
Red + Mixed	44.3	59.9	11.29	17.45
Low Grade (< 3%)	7.2	9.7	1.69	4.89
Combined Total	**74.00**	**100.00**	**9.39**	**14.72**

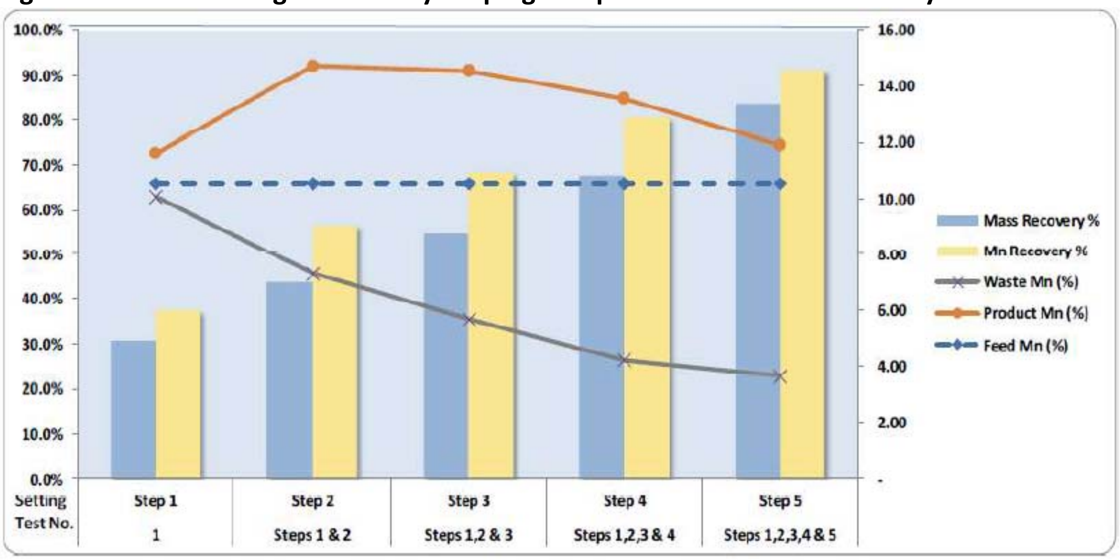
In addition to preliminary scoping of the applicability of ore sorting to this material, the work included identifying a suitable sensor or sensor combination for maximizing sorting efficiency for this material. The testwork used the Steinert Combi-Sensor KSS 100 XT FLI sorter. This sorter utilized a combination of sensor types, including dual-energy X-ray transmission (XT), Colour camera (F), 3-D Laser (L) and Induction (I). XRT sorting is the preferred technology for mining applications, since the detection is based on X-ray absorption, which determines the atomic density of the entire particle. The advantage is that the particles do not need to be cleaned/washed, which would be necessary for surface detection sensors such as colour camera and laser. XRT can therefore provide a dry beneficiation process.

The grade of the feed sample was established to be 10.54% Mn. The highest Mn grade achieved (14.72% Mn) was at the ‘Step 2’ sensitivity setting, which combined the products of the red hematite/iron oxide material (colour sensor) and the densest fraction determined by the X-ray transmission sensor. At that stage, the Mn recovery was 56.6%. By Step 3, the Mn was still upgraded from 10.54% to 14.55%, and recovery was 68.4%, with a mass pull to the product of 54.7% (the grade of the 45.3% of mass rejected was 5.68% Mn). The cumulative results for five steps of sorting are presented in Table 13.8, and the grade-recovery response is illustrated in Figure 13.5.

Table 13.8: Ore Sorting – Steps 1-5: Mn Grade/Recovery Results

Opportunity No.:			9044			Lab: 507				
Customer:			Manganese X			-50 +12mm				
Date:					9/21/2017					
Test No.	MD Setting	Setting	Total Sample kg	Feed Mn (%)	Product kg	Mass Recovery %	Product Mn (%)	Mn Recovery %	Waste kg	Waste Mn (%)
1	Step 1	Color	85.00	10.54	26.00	30.6%	11.60	37.3%	59.00	10.07
Steps 1 & 2	Step 2	XRT/Laser	85.00	10.54	37.00	43.5%	14.72	56.6%	48.00	7.31
Steps 1,2 & 3	Step 3	XRT/Laser	85.00	10.54	46.50	54.7%	14.55	68.4%	38.50	5.68
Steps 1,2,3 & 4	Step 4	XRT/Laser	85.00	10.54	57.50	67.6%	13.56	80.6%	27.50	4.21
Steps 1,2,3,4 & 5	Step 5	XRT/Laser	85.00	10.54	71.00	83.5%	11.89	91.1%	14.00	3.65

Figure 13.5: Ore Sorting Preliminary Scoping: Step 1 to 5 Mn Grade-Recovery



In their report on this preliminary test program with the Manganese X sample, Steinert US made the following conclusions.

- The sorter was shown to be effective in upgrading the sample under a range of sensitivity settings.
- With each step in the sensitivity setting, the Mn and Fe recovery are increased, with lowering product grades.
- Manganese and iron show good correlation.
- Step 2 on the sensitivity scale tested provided the highest grade Mn product, with a grade of 14.72% Mn.
- Further bulk testing was recommended.

The full ore sorting report by Steinert US is titled ‘XRT Test Work Report – Manganese X Energy Corp. Waste Rock Sorting Test Work’ document TRE-9044-XRT-507 dated November 2, 2017.

13.6.2 Tribo-Electrostatic Separation Test

In July 2017, the tribo-electrostatic separation potential was evaluated through an initial test study on a 3 kg sample of the Grey mineralization (composite sample J2035 Grey). The electrostatic separation test was performed by ST Equipment & Technology LLC located in Needham, Massachusetts.

Preliminary testing did not lead to a significant separation or upgrading of the manganese under normal test conditions, likely due to the intimate association of manganese-bearing carbonate and silicate species with gangue silicate minerals. Further testwork was not recommended and a report was not completed.

13.7 Flowsheet Development Testing

Following the successful preliminary $MnSO_4$ crystallization and purification testing conducted by Kemetco Research, a follow-up program was initiated in May 2020, aimed at defining the principal unit operations of a flowsheet for the production of high purity $MnSO_4$ from the Battery Hill mineralization. This work was conducted using the Red composite material previously shipped to Kemetco (J2035 Red), due to its lower acid consumption and high manganese extraction rates determined from previous testwork. The work program included investigation of leaching methods and the effects of principal leaching parameters, solid-liquid separation methodology, and primary and secondary purification processes.

13.7.1 Bulk Leaching and Leach Parameter Testing

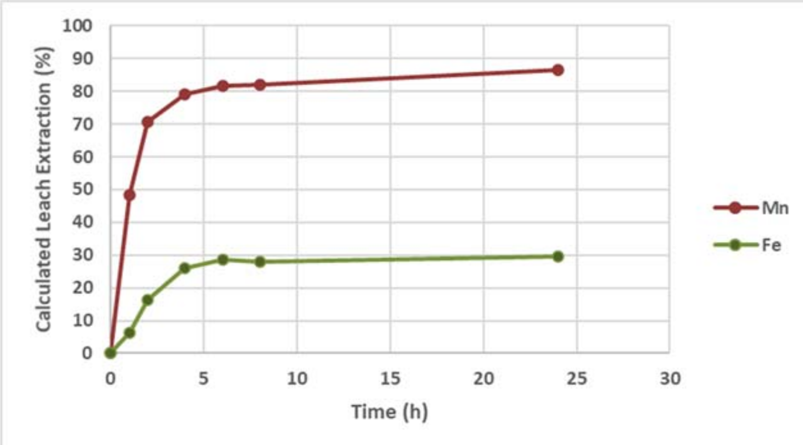
The bulk leach testing involved a single 6-hour sulfuric acid leach controlled at pH 1.5 and 60°C, with the slurry then allowed to cool overnight while mixing. The test feed was crushed assay reject, as received without grinding, giving a feed P_{80} of approximately 2 mm. Table 13.9 shows a summary of the overall mass balance for the bulk leach after neutralization and solid-liquid separation, with close to 75% Mn extraction, while leaching 25% of the Fe. Free acid in solution was maintained at a high level (approximately 25 g/L) and the overall acid consumption was 570 kg/t. Kinetic sampling (Figure 13.6) showed that most of the leaching occurred within the first four hours, with Fe leveling off after that, while Mn extraction continued to increase at a low rate. The higher calculated Mn extraction in the leach shown in

Figure 13.6 reflected solution assays prior to losses in the neutralization and solid-liquid separation stages, which are not yet optimized.

Table 13.9: Bulk Leach Summary after Neutralization

Product	Wt (kg)	Assay (% or g/L)		Distribution (%)	
		Mn	Fe	Mn	Fe
Feed Ore	15.45	12.7 %	16.5 %	100	100
Leachate	43.1	32.2 g/L	9.76 g/L	74.4	24.5
Residue	15.25	3.3 %	12.6 %	25.6	75.5

Figure 13.6: Bulk Leach Test – Kinetic Extraction Curves for Mn and Fe



Following the bulk leach, a series of bench-scale sulfuric acid leach tests were conducted to identify the most significant of the principal test parameters. These tests started from the baseline conditions used in the bulk leach and tested a series of parameters that included temperature, free acid addition, pulp density, particle size and solution reducing potential. All test conditions are summarized in Table 13.10. These tests also incorporated a post-leach neutralization stage to allow solid-liquid separation, which is described below.

Results from all bench-scale leach tests are summarized in Table 13.11, including the vat leach test described in Section 13.7.2. The results showed the importance of maintaining high acidity, either through a lower pH set point or by limiting solids loading with lower pulp density. There was a lesser but significant temperature effect, but the most significant impact on recovery was from reduced particle size, with recovery increased to 85% using a moderate grind. Addition of a reducing agent (SMBS) to a leach with ground ore resulted in a further improvement in recovery but had a more significant unwanted effect on iron and magnesium extraction. This confirmed that refractory oxidized manganese minerals are not a major component of the manganese present in this material. Acid consumption was lower in these tests than in the bulk leach. The baseline test had a consumption of 320 kg/t, and other tests ranged from about 200 to 400 kg/t, with a general correlation between acid consumption and Mn extraction.

Table 13.10: Summary of Test Conditions - Leach Parameter Testing

Test	Pulp Density (%)	pH	Temp (°C)	Grind	Feed Wt. (kg)	Acid Cons. (g/kg)	Final Leach pH	Max Temp. (°C)	Neutr. pH	Lime Added (g/kg)	Solid Residue (kg)	Notes
1	30	1.5	60	As Received	0.55	339	1.42	61.7	5.08	30.9	0.44	Baseline Leach
2	30	1.5	40	As Received	0.56	278	1.40	46.0	4.27	17.3	0.42	Low Temperature
3	30	1.5	80	As Received	0.56	340	1.62	83.2	4.98	34.3	0.47	High Temperature
4	30	2.5	60	As Received	0.52	207	2.60	62.5	4.94	8.1	0.40	Low Acid Addition
5	20	1.5	60	As Received	0.35	413	1.60	64.1	4.63	51.6	0.31	Low Pulp Density
6	40	1.5	60	As Received	0.69	244	1.84	67.9	4.58	17.9	0.58	High Pulp Density
7	30	1.5	60	P_{80}=231 um	0.55	369	1.58	69.0	4.71	26.5	0.43	Reduced Particle Size
8	30	1.5	60	P_{80}=231 um	0.56	470	1.52	63.4	4.87	48.6	0.45	Reducing Leach - 30 grams SMBS added to leach

Table 13.11: Summary of Test Performance - Leach Parameter Testing

Test	Mn Extract. (%)	Mn in Leach (g/l)	Fe in Leach (g/l)	Mn in Residue (%)	Treated Solution Assay (g/L)					Mn:Mg ratio	Max. Setl. Rate	Init. Filt. Rate
					Mn	Fe	Mg	Ca	Al		cm/min	mL/min
0 (vat)	41.5	49.3	11.36	8.34	32.1	6.95	2.14	0.62	1.87	15.0	-	-
1	73.5	42.4	9.79	3.86	32.3	5.90	1.23	0.49	0.05	26.3	0.20	170
2	70.2	38.4	5.69	4.58	29.7	3.03	1.38	0.49	0.08	21.5	1.17	200
3	76.1	37.1	9.76	3.38	30.4	6.18	1.96	0.47	0.02	15.5	1.57	100
4	55.1	25.7	2.86	6.43	22.2	1.90	0.93	0.47	0.06	23.9	0.66	90
5	77.1	26.6	8.15	3.15	20.0	4.60	1.57	0.46	0.02	12.8	2.58	316
6	53.6	51.6	8.84	6.56	37.6	5.33	1.91	0.47	0.11	19.7	0.09	120
7	86.3	45.9	9.62	2.05	34.3	6.30	2.09	0.48	0.11	16.4	0.23	100
8	91.0	43.2	15.28	1.35	29.7	8.90	2.56	0.47	0.03	11.6	0.20	80

13.7.2 Vat Leach Testing

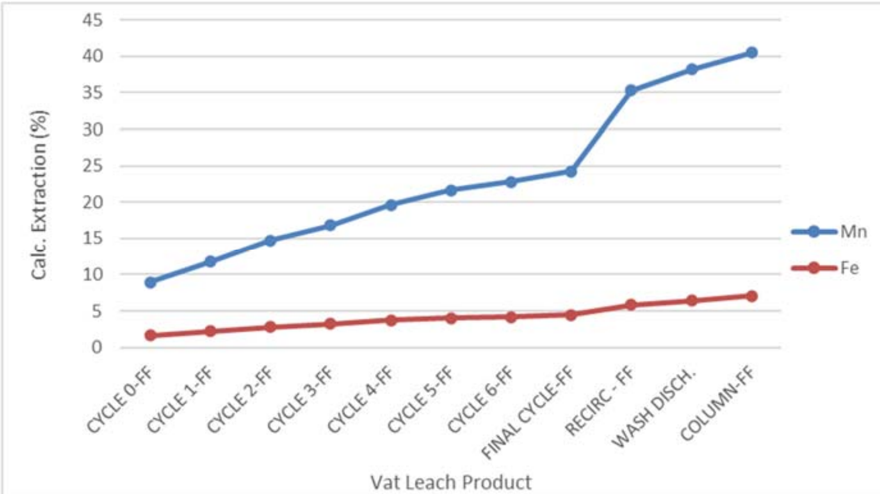
A single small-scale vat leach test was completed on an agglomerated sample of as-received Red composite material. This test incorporated multiple fill-drain cycles at elevated temperature with acid make-up between cycles. This was a preliminary screening test, which gave significantly lower recoveries, but also successfully demonstrated an alternate approach to leaching that could have economic advantages if successfully optimized. The vat leach also proved to be a potential method of handling fine solids, as drained leach solutions were low in suspended solids and could be filtered without neutralization. Acid consumption was relatively low, at 156 g/kg, but this was likely a reflection of the low manganese recovery (Table 13.12). Significant additional optimization work would be needed to determine if this could be used as a viable alternative to grinding and tank leaching as the primary extraction process.

Table 13.12: Vat Leach Summary

Product	Wt (kg)	Assay (% or g/L)		Distribution (%)	
		Mn	Fe	Mn	Fe
Feed Ore	1.70	12.3 %	15.6 %	100	100
Leachate	4.50	18.4 g/L	3.91 g/L	41.5	10.3
Residue	1.46	8.34 %	16.3 %	58.5	89.7

Figure 13.7 shows extraction of Mn and Fe through each cycle including final wash stages. Continuing increases in Mn extraction in the later cycles, including a final solution recirculation stage, suggest that higher extraction levels could be achieved with optimized leach conditions. These preliminary results also pointed to the potential for increased selectivity for manganese in the leach, as iron extraction was lower than in tank leach tests.

Figure 13.7: Vat Leach Test – Kinetic Extraction Curves for Mn and Fe



13.7.3 Neutralization and Solid-Liquid Separation Testing

The earlier leaching testwork had shown that solid-liquid separation after tank leaching this material was very challenging, with long filtration times and manganese losses due to poor washing efficiency. For the bulk leach, therefore, the leached slurry was divided into four equal test lots to evaluate solid-liquid separation after partial neutralization, using a range of temperature and pH conditions for the neutralization step. Table 13.13 summarizes the neutralization test conditions and their effect on both settling and filtration. The results showed a dramatic improvement in the solid-liquid separation response, with the best result from neutralizing to pH 5 at 50°C. This method of handling the leach slurry had the additional potential benefit of eliminating one solid-liquid separation stage by allowing the leaching and first purification stages to run sequentially on the whole slurry. Effective solid-liquid separation also allowed for the inclusion of normal cake washing or potential CCD configurations that would minimize manganese losses to the resulting solid residue.

Table 13.13: Summary of Neutralization Tests with Dewatering Rates

Test	Air (L/min)	pH	Temp	$Ca(OH)_2$ Addition	$Ca(OH)_2$ (g/Kg-sl)	Solution Assay (g/L)			Max. Setl. Rate	Init. Filt. Rate
						Mn	Fe	Al	cm/min	mL/min
Leachate	-	1.0	-		-	48.3	20.4	6.3	-	-
1	0	3.5	20	Dry	18.8	46.9	17.9	3.8	0.07	3.5
2	0	3.5	50	Dry	26.2	50.3	16.8	2.3	0.04	12.1
3	1	5	50	Dry	43.5	40.8	7.7	<0.01	0.59	68.5
4	1	5	50	Slurry	25.9	41.6	13.5	0.01	1.36	58.0

Following each of the bench-scale leach optimization tests, the acidic leach slurry was neutralized following the procedures developed from the bulk leach neutralization testing, with settling and filtration data were collected for the resulting neutralized slurries. These neutralizations used lime slurry addition to reach pH 5, with aeration, over a 2–4 hour period with an additional one hour of aeration after the pH was stabilized. Comparative settling and filtration data for each test are included in Table 13.11.

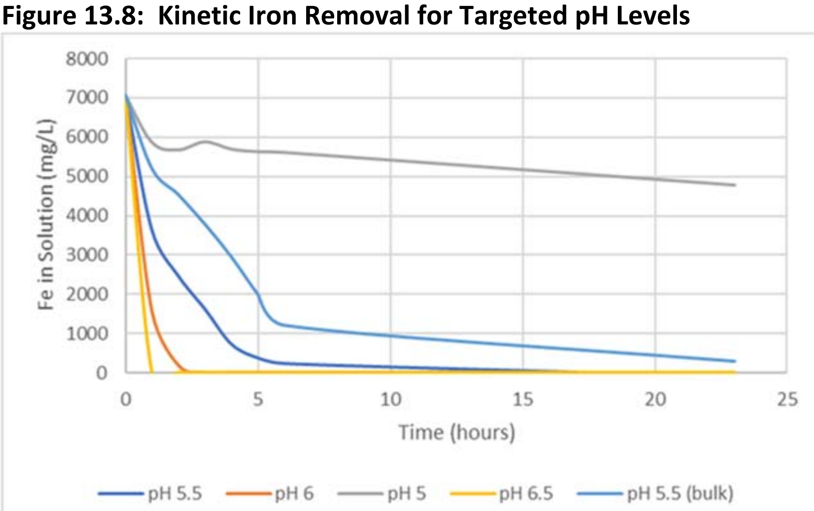
13.7.4 Leach Solution Purification

Results from iron and aluminum removal testing are summarized in Table 13.14. Aluminum was removed through hydroxide precipitation as the pH increased and was complete for all tests. Iron removal also occurred through hydroxide precipitation but required oxidation of any ferrous iron to the ferric state for complete precipitation. Iron removal was successful for all tests with a pH target of 5.5 or higher. Higher pH levels also increased manganese oxidation, leading to losses from solution. At the highest pH tested (6.5), iron removal was rapid, but manganese losses also became significant. At a pH of 5.5 manganese losses were minimized, but iron removal was significantly slower, as indicated in Figure 13.8.

Table 13.14: Summary of Results for Iron/Aluminum Removal Testing

Test #	Target pH	Feed Sol'n (kg)	pH @ 6 hr	Final pH (24 hrs)	$Ca(OH)_2$ Added (g/kg)	Fe <0.1 g/L (hrs)	Fe (g/L)	Fe Rem. (%)	Mn Loss (%)
1	5.5	1.12	5.49	6.00	11.99	17	<0.005	99	3.1
2	6.0	1.12	7.19	7.10	15.49	3	<0.005	100	11.1
3	5.0	1.15	4.83	5.10	5.41	-	4.78	39	1.8
4	6.5	1.15	7.18	6.95	16.70	<1	<0.005	100	18.3
5 (bulk)	5.5	11.07	5.20	5.98	10.51	-	0.29	96	4.7

Figure 13.8: Kinetic Iron Removal for Targeted pH Levels

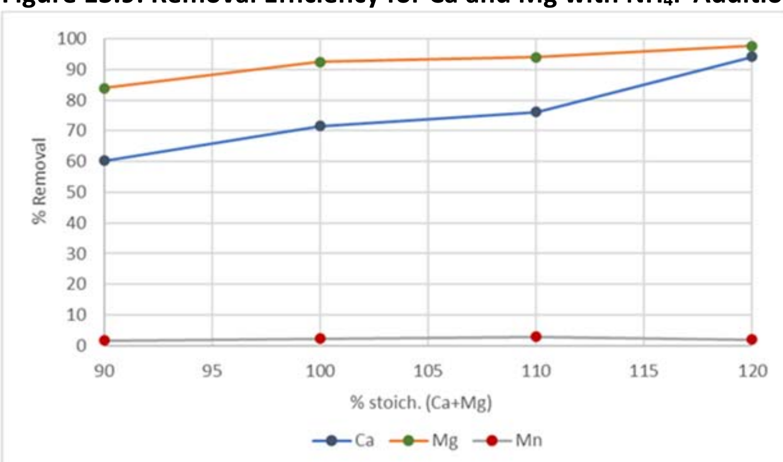


In the second stage of purification, prior to final $MnSO_4$ crystallization, calcium and magnesium levels were lowered through precipitation as insoluble fluoride compounds by adding NH_4F to the leachate after iron and aluminum removal. Addition of NH_4F needed to be kept close to stoichiometric levels to prevent manganese losses and minimize buildup of excess fluoride ions. The objective was to minimize Ca, and especially Mg relative to Mn, allowing high purity $MnSO_4$ to be crystallized from evaporated solutions. A series of tests were conducted to better define the NH_4F additions required to maximize Ca and Mg removal while minimizing manganese losses. Table 13.15 gives results for this series of four tests, indicating that additions up to 20% above calculated stoichiometric levels resulted in increased Ca and Mg removal without incurring significant Mn precipitation. Figure 13.9 shows the relative removal of Ca and Mg with increasing fluoride addition. A 100% stoichiometric addition resulted in greater than 90% Mg removal, but Ca removal lagged in tests below 120% stoichiometric addition. With 120% addition both Ca and Mg were reduced to below 100 mg/L in solution.

Table 13.15: Results for Stoichiometric NH_4F Additions

Test #	NH_4F Added	Mg	Ca	Mn	Mg Rem.	Ca Rem.	Mn Rem.
	(% Stoich.)	(g/L)	(g/L)	(g/L)	(%)	(%)	(%)
head	0	3041	488	29302	0	0	0
1	90	500	166	29692	83.9	60.3	1.7
2	100	288	98	29134	92.4	71.5	2.3
3	110	147	53	29108	94.0	76.1	2.9
4	120	71	28	28664	97.6	94.1	2.0

Figure 13.9: Removal Efficiency for Ca and Mg with NH_4F Addition Relative to Mn Loss



Additional process development work at Kemetco was in progress at the time of preparation of this Technical Report, with continuing testing aimed at establishing a fully integrated process flowsheet and to prepare mass balance data around each selected unit operation.

14.0 MINERAL RESOURCE ESTIMATES

14.1 General

The definition of mineral resource and associated mineral resource categories used in this report are those recognized under National Instrument 43-101 and set out in the Canadian Institute of Mining, Metallurgy and Petroleum Standards on Mineral Resources and Reserves Definitions and Guidelines (the CIM Standards – May 2014). Assumptions, metal threshold parameters and deposit modeling methodologies associated with the current Battery Hill Project resource estimate are discussed below in report sections 14.2 through 14.4.

The mineral resource estimate for the Battery Hill Project was prepared by Mr. Matthew Harrington, P. Geo., Mr. David Murray, P. Geo. and Mr. Michael Cullen, P. Geo., of Mercator. Mr. Harrington is responsible for the Battery Hill Project mineral resource estimate with an effective date of June 18, 2021.

A tabulation of the Mineral Resources for the Battery Hill Project is presented in Table 14.1. Mineral resources were defined within optimized pit shells developed using Hexagon Mine Plan 3D version 15.4, MineSight® Economic Planner version 4.00-11. Pit optimization parameters include metal pricing of US$1500 per tonne for High Purity Manganese Sulphate Monohydrate - 32% Mn (HPMSM – 32 %), an exchange rate of CDN$1.30 to US$ 1.00, mining at CDN $6.50 per tonne, combined processing and G&A at CDN $86.22 per tonne processed, and a milling recovery to HPMSM of 65%. Iron is not included in the pit optimization but it is reasonable to conclude that iron contained in the deposit may have future economic value and this requires further technical and economic assessment. Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization and is considered to define reasonable prospects for eventual economic extraction by open pit mining methods.

Table 14.1: Battery Hill Project Mineral Resource Estimate – Effective Date: June 18, 2021*

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	Measured	11,260,000	6.75	10.96
	Indicated	23,600,000	6.26	10.53
	Measured and Indicated	34,860,000	6.42	10.67
	Inferred	25,910,000	6.66	10.92

* See detailed notes on mineral resources in Table 14.5 of Section 14.3.12

14.2 Geological Interpretation Used In Resource Estimation

The banded iron formation Battery Hill manganese-iron deposit is interpreted as a stratiform deposit of sedimentary origin that is comprised of an assemblage of manganese carbonate and manganese carbonate-silicate-oxide mixed with iron oxide minerals, occurring within a steeply dipping, folded sedimentary sequence of Silurian age. Mineralized units show substantial drill section to drill section continuity and have been modeled as laterally continuous bedded deposits.

14.3 Methodology of Resource Estimation

14.3.1 Overview of Estimation Procedure

The mineral resource estimate is based on validated results of 55 diamond drill holes (10,056 m), including 16 drill holes (3,572 m) completed in 2016, 9 drill holes (1,598 m) completed in 2017, and 28 drill holes (4,509 m) completed in 2020 by Manganese X. Two drill holes completed in 2011 (377 m) by Globex also contributed to the resource estimate. Solid modelling was performed using GEOVIA Surpac™ 2021 (Surpac) and Seequent Leapfrog™ Geo 6 (Leapfrog) modeling software. Block model volume, grade, and density modeling was performed using Surpac with manganese percent and iron percent values for the block model estimated using ordinary kriging (OK) interpolation methodology from 3 m down hole assay composites. Block specific gravity values were assigned using a regression curve based on the cumulative block manganese and iron percent. The resource block model was set up with a block size of 5 m (x) by 5 m (y) by 5 m (z). The predominant manganese compound in the deposit is manganese carbonate ($MnCO_3$).

Metal grade assignment was peripherally constrained by solid models based on sectional geological interpretations for the Battery Hill Project and a minimum included grade of 2.5 % manganese over 6 meters down-hole. A total of 24 separate solid models were developed for the three deposit areas of the Battery Hill Project, these being Moody Hill (10 solids), Sharpe Farm (7 solids) and Iron Ore Hill (7 solids). The three deposit areas trend along strike southwest-northeast for approximately 1850 m, range in width from 100 to 500 m, and are defined to a maximum vertical depth of approximately 250 m. They are separated by discontinuity in the mineralization trends along strike that could potentially be related to cross-cutting faults. The deposit has a folded geometry with near vertical, to steeply dipping eastern and western limbs, and the solid models reflect tabular stacked horizons of above cut-off mineralization. The Moody Hill and Sharpe Farm areas are interpreted to predominantly occur on the eastern limb, supporting near-vertical to steeply eastern dips, and the Iron Ore Hill area is interpreted to predominantly occur on the western limb, supporting near-vertical to steeply western dips. To assess the distribution of reduced and oxidized host stratigraphy blocks were assigned a colour code of “grey”, “red”, or “mixed” using solid models developed from logged Manganese X colour intervals.

Interpolation ellipsoid ranges and orientations were developed through assessment of variography, combined with geological interpretations and drill hole spacing. Major axis orientations conform to the strike direction, between an azimuth 036° and 073°, with no plunge. The semi-major axes occur in the dip direction and perpendicular to the major axes, while minor axes are oriented at a high angle to stratigraphy in the down hole direction. Manganese and iron grade interpolation was completed independently and constrained to block volumes using a three interpolation pass approach. Interpolation passes, implemented sequentially from pass one to pass three progress from being restrictive to more inclusive in respect to ellipsoid ranges, composites available, and the number of composites required to assign block grades. Grade domain boundaries were set as hard boundaries for grade estimation. Grade interpolation was restricted to the 3 m assay composites associated with the drill hole intercepts assigned to each deposit area solid.

The "reasonable prospects for eventual economic extraction" requirement was assessed for the Battery Hill Project by means of developing an optimized open pit shell to constrain mineral resources. This shell was based on the mineral deposit block model and developed by AGP Mining Consultants Inc. (AGP) through application of operating and recovery parameters deemed appropriate for the style of mineralization present. Pit optimization parameters include metal pricing of US$1500 per tonne for High Purity Manganese Sulphate Monohydrate - 32% Mn (HPMSM – 32 %), an exchange rate of CDN$1.30 to US$ 1.00, mining at CDN $6.50 per tonne, combined processing and G&A at CDN $86.22 per tonne processed, and a milling recovery to HPMSM of 65%. Although iron content has also been estimated and is currently reported for the deposit, only manganese content was used in the pit optimization process. No value for the deposit's iron content was assigned for optimization purposes but potential for by-product production of specific iron products has been identified and requires further study through completion of additional metallurgical testing. The optimized pit shell supports a 3.7:1 strip ratio with average pit slopes of 20° in overburden and 45° in bedrock.

Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization and is considered to define reasonable prospects for eventual economic extraction by open pit mining methods.

Measured, Indicated, and Inferred mineral resources are defined as all blocks with interpolated manganese grades from the first, second or third interpolation pass, respectively, that meet the specified pit-constrained cut-off grade and demonstrate reasonable continuity. Orphan blocks and discontinuous zones of mineral resource categorization were refined through application of categorization solid models.

14.3.2 Data Validation

The mineral resource estimate is based on validated results of 55 diamond drill holes totalling 10,056 m of drilling. This includes 377 m from 2 historical surface diamond drill holes completed in 2011 Globex, 3,572 m from 16 surface diamond drill holes completed in 2016 by Manganese X, 1,598 m from 9 surface diamond drill holes completed in 2017 by Manganese X, and 4,509 m from 28 surface diamond drill holes completed in 2020 by Manganese X.

Drill hole coordinates are located in UTM NAD83 Zone 19 coordination. Manganese X staff logged drill hole results in Microsoft Excel software and provided Mercator drill hole database results as a Microsoft Excel output. Mercator compiled a Microsoft Access database of the project drill hole data and subsequently completed a 30 % validation to acceptable results. A total of 3,332 core samples and 1,468 specific gravity determinations are compiled on the deposit and a total of 2,169 core samples and 948 specific gravity determinations occur within the limits of the peripheral resource solids.

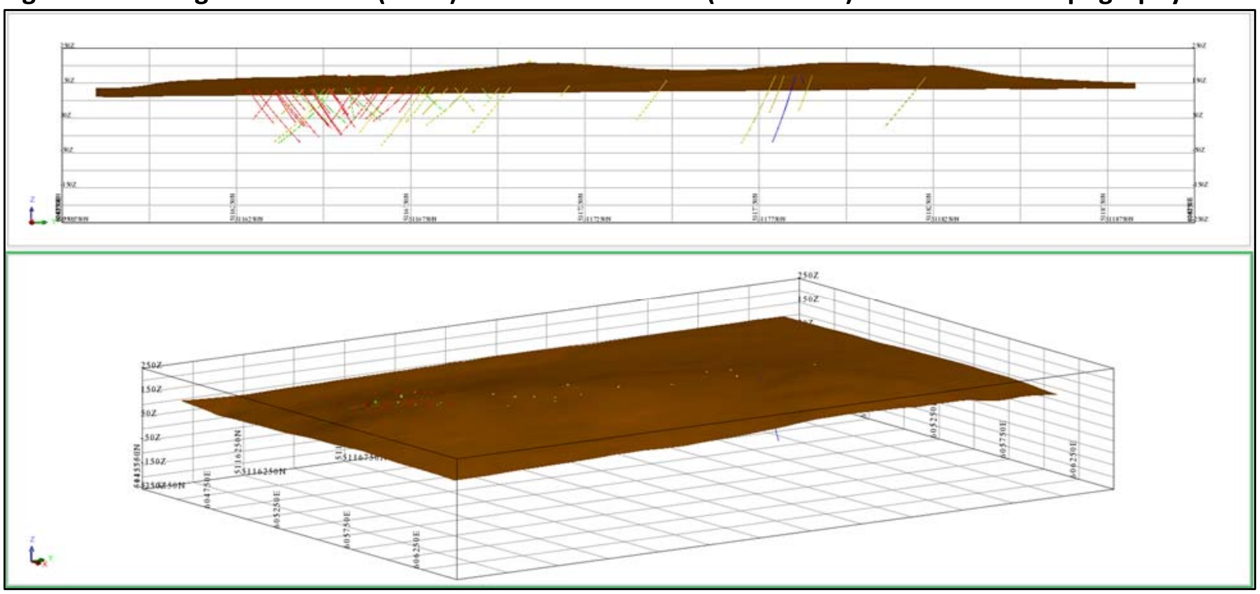
Validation checks on overlapping intervals, inconsistent drill hole identifiers, improper lithological assignment, unreasonable assay value assignment, and missing interval data were performed. Checking of database analytical entries was also carried out against laboratory records supplied by Manganese X.

14.3.3 Modelling: Topography, Lithology, and Grade

14.3.3.1 Topography Surface

A digital terrain model (DTM) point dataset for the Battery Hill project area was acquired by the QP from the New Brunswick GeoNB geographic information platform. The elevation dataset supports a spacing of approximately 70 m and the absolute vertical accuracy of a single point is approximately 2.5 m. The GeoNB elevation point dataset and project drill collar elevation dataset were merged and a DTM of topography was developed in Leapfrog using an adaptive resolution of 100 m. Lateral extents measure approximately 2,000 m E-W and 3,000 m N-S over the deposit area. The QP reviewed drill collar position in respect to the surface and an acceptable agreement is present. Figure 14.1 presents longitudinal and isometric views of the DTM of topography.

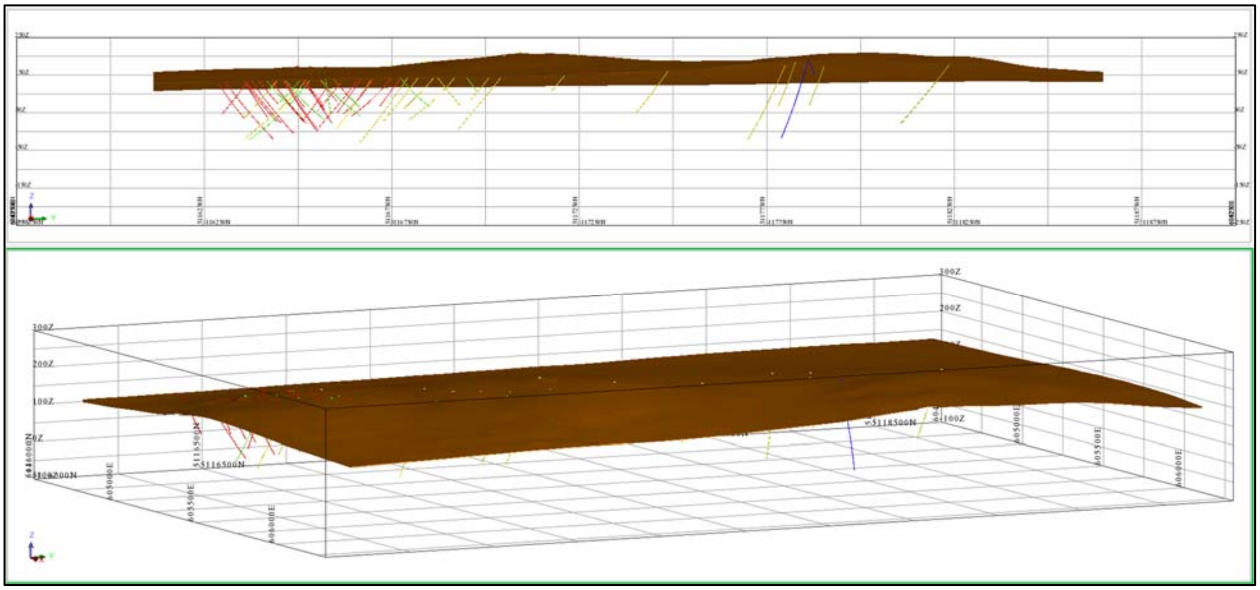
Figure 14.1: Longitudinal View (West) and Isometric View (Northwest) of the DTM of Topography



14.3.3.2 Overburden Solid Model

An overburden solid model was developed in Leapfrog at a resolution of 2.5 m from drill hole litho-codes and the topography surface. The topography surface and/or overburden solid model were used to constrain the surface projections of the grade domain and lithological solid models. Overburden thickness averages approximately 3 m, with maximum thicknesses of approximately 10 m, in the deposit area. Figure 14.2 presents longitudinal and isometric views of the overburden solid model.

Figure 14.2: Longitudinal View (West) and Isometric View (Northwest) of the Overburden Solid Model



14.3.3.3 Grade Domain Solid Models

To best assess manganese and iron mineralization of the Battery Hill Project, grade based peripheral constraint solid models were developed using a minimum threshold of 2.5 % manganese over 6 m down hole lengths, from down-hole analytical results displayed on vertical northwest-southeast geological sections. Adjacent intercepts at the 2.5 % over 6 m down-hole threshold were merged if the included dilution was less than 6 m meters and the maximum hanging wall and footwall contacts of mineralization demonstrated continuity with similar intervals of mineralization along strike and dip. The 2.5 % manganese grade domain solid models were first developed in Leapfrog at a 2.5 m resolution and subsequently imported into Surpac and validated for volumization and intercept snapping. Solid models were snapped to the respective intercepts and extended half the distance to a constraining drill hole or 50 m where constraining drill hole data was not present. Solid models defined by more than one drill hole were projected to surface if the vertical distance was less than 100 m.

A total of 24 separate solid models were developed for the three areas of the Battery Hill Project, Moody Hill (10 solids), Sharpe Farm (7 solids) and Iron Ore Hill (7 solids). The three deposit areas trend along strike southwest-northeast for approximately 1850 m, range in width from 100 to 500 m, and are defined to a maximum vertical depth of approximately 250 m. They are separated by discontinuity in the mineralization trends along strike that could potentially be related to cross-cutting faults. The deposit has a folded geometry with near vertical, to steeply dipping eastern and western limbs, and the solid models reflect tabular stacked horizons of above cut-off mineralization. The Moody Hill and Sharpe Farm areas interpreted to predominantly occur on the eastern limb, supporting near-vertical to steeply eastern dips, and the Iron Ore Hill area is interpreted to predominantly occur on the western limb, supporting near-vertical to steeply western dips. Figures 14.3 through 14.5 present isometric views of the grade domain solid models.

Figure 14.3: Isometric View (Southeast) of the Grade Domain Solid Models

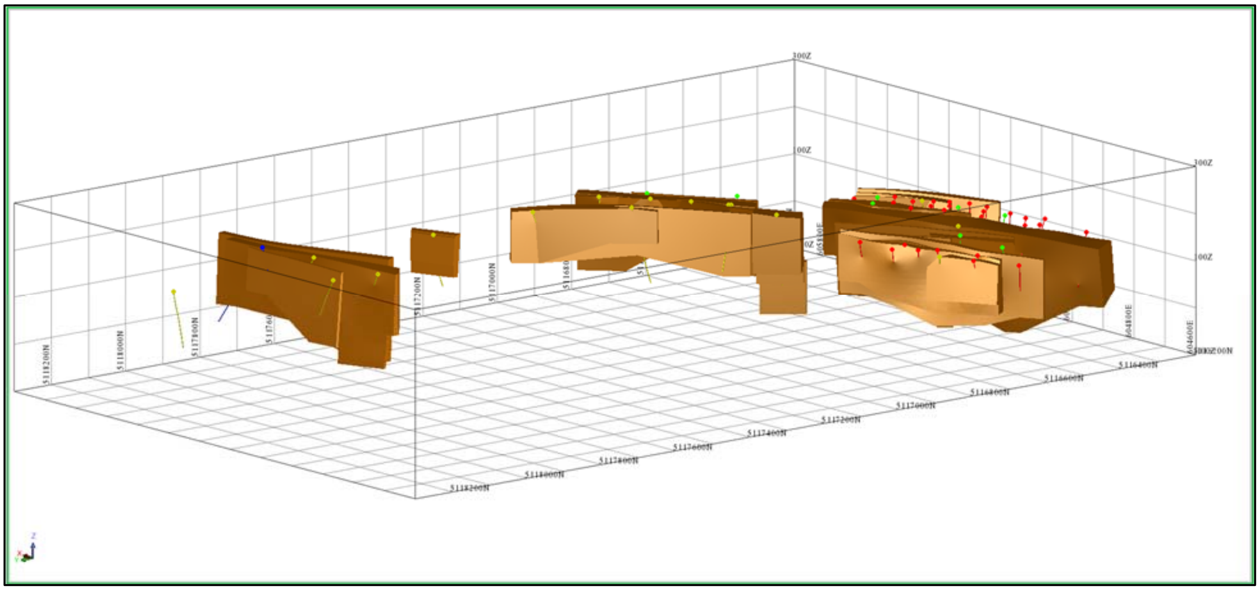


Figure 14.4: Isometric View (Northwest) of the Grade Domain Solid Models

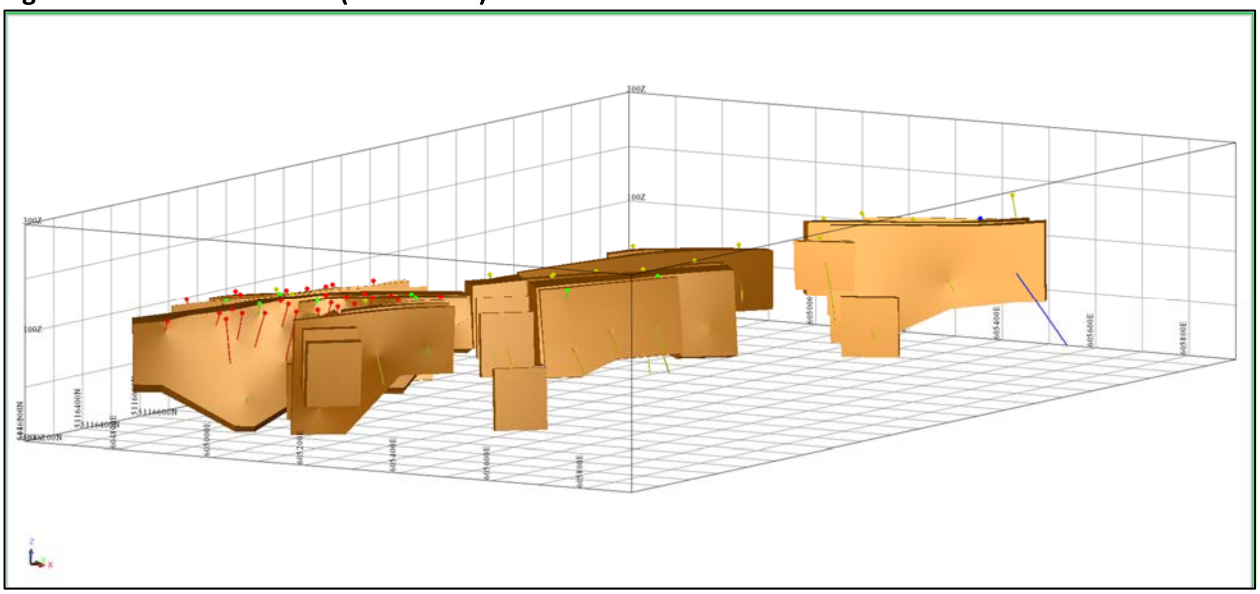
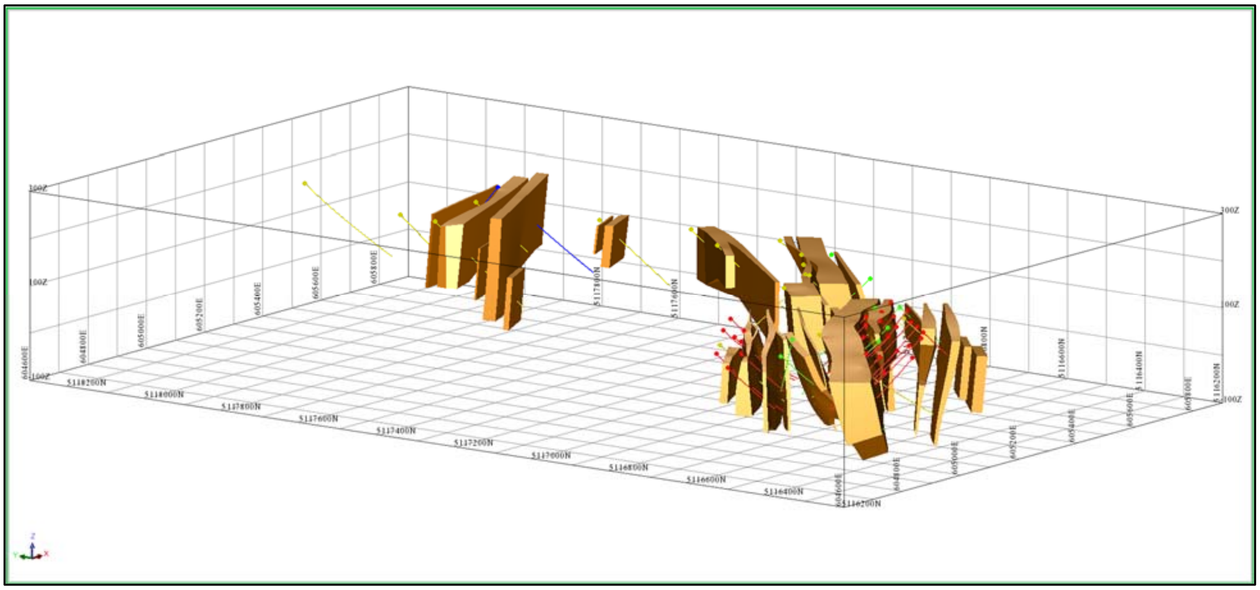


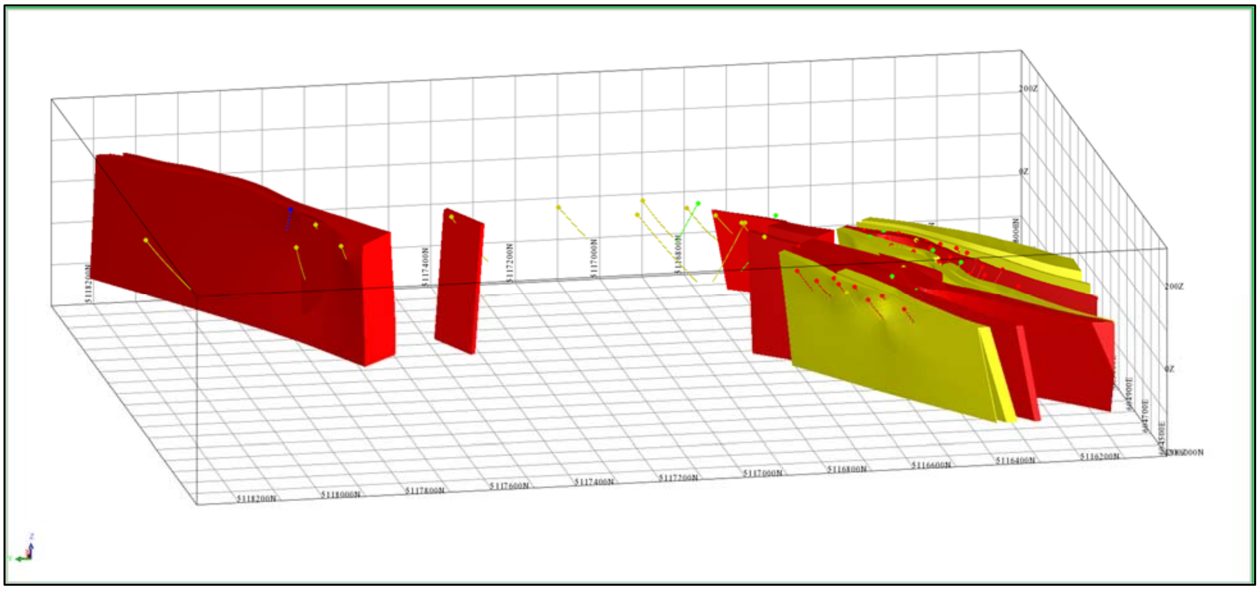
Figure 14.5: Isometric View (Northeast) of the Grade Domain Solid Models



14.3.3.4 Colour Solid Models (Reduced and Oxidized Stratigraphy)

To best assess the distribution of reduced and oxidized host stratigraphy the QP developed solids models of rock colour to assign rock colour block values. Manganese X staff logged the host stratigraphy with either a red, grey, or xmas (mixed) colour code. Intervals assigned with the xmas colour code are typically described as dark red siltstone with varying amounts of green siltstone and whitish iron-carbonate. Colour code distribution was evaluated in Leapfrog and grouped to define continuous zones of the respective colour. Colour solid models were developed in Leapfrog for the red and xmas grouped units at a 5 m resolution and were used to code a red or xmas colour assignment to intersecting blocks. All blocks occurring outside of the red and xmas solid models were assigned a colour of grey. Figure 14.6 presents an isometric view of the red and xmas colour solid models.

Figure 14.6: Isometric View (East) of the Red and Xmas Colour Solid Models (Red: Red, Yellow: Xmas)



14.3.4 Assay Sample Assessment and Down Hole Composites

The predominant manganese compound in the deposit is manganese carbonate ($MnCO_3$). The laboratory reports manganese oxide percentage (MnO%) and iron oxide percentage (Fe_2O_3%) to achieve a balance of all elements as compounds. Respective oxide values were converted to manganese percentage (Mn%) and iron percentage (Fe%) respectively, using a factor of 0.774 for Mn% and a factor of 0.699 for Fe%.

The drill core analytical dataset used in the mineral resource estimate contains 3,332 sample records. Manganese percent results are present for all sample records and iron percent results, which are missing for the Globex 2011 drill holes, are present for 3,126 sample records. A total of 2,169 sample records occur within the peripheral solid models. Sample length statistics for the solid constrained sample records define a sample length range of 0.16 m to 4.4 m and an average sample length of 2 m, with 80 % of samples measuring 2 meters or less and 90 % of sample measuring 3 m or less.

Down-hole assay composites over 3 m intervals were developed for manganese percent and iron percent using the Surpac 'best fit" option set to a 3 m target value. Assay composites generated outside of a 25% tolerance interval of the nominal length were either manually re-generated or merged with adjacent composites to meet the selection conditions. Compositing was constrained based on the drillhole intersections with the peripheral solid models. The Globex 2011 drill holes missing iron pecent values are located in the Iron Hill area and were exluded from compositing for the iron percent assay compostes. All other intervals missing assay values for manganese and/or iron percent were set to a null value, zero percent, prior to compositing.

Descriptive statistics were calculated for both manganese percentage and iron percentage from the 3 m composite datasets within each deposit area and for the global composite population and are presented in Table 14.2.

Table 14.2: Battery Hill Project Mn % and Fe % Statistics for the 3 m Assay Composites

Area/Deposit	Moody Hill		Sharpe Farm		Iron Ore Hill		Battery Hill	
Value	**Mn %**	**Fe %**	**Mn %**	**Fe %**	**Mn %**	**Fe %**	**Mn %**	**Fe %**
Number of samples	981	981	305	305	127	73	1,413	1,359
Minimum value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum value	19.20	23.86	15.87	23.95	19.06	27.15	19.20	27.15
Mean	6.22	10.44	6.98	11.57	5.95	9.90	6.36	10.66
Variance	12.77	15.67	11.96	17.11	16.08	25.64	13.01	16.78
Standard Deviation	3.57	3.96	3.46	4.14	4.01	5.06	3.61	4.10
Coefficient of variation	0.58	0.38	0.50	0.36	0.67	0.51	0.57	0.38

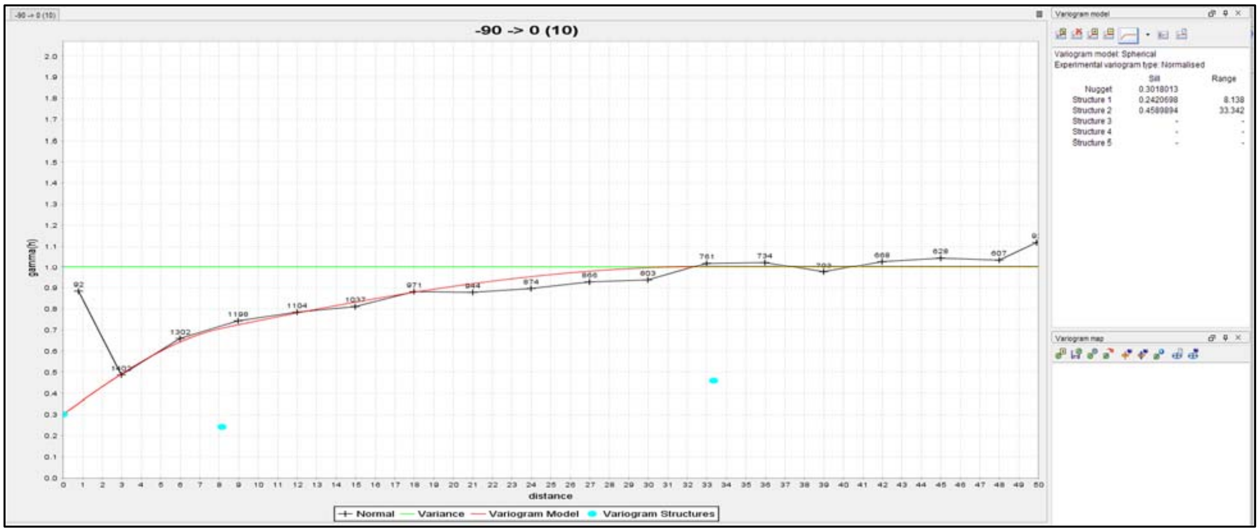
No high-grade capping factors were applied to the 3 m assay down-hole composites or the contributing drill core sample analytical results. Through analysis of metal grade distribution, by means of frequency histogram, cumulative frequency plots, probability plots, rank/percentile, and decile analysis, it was concluded that maximum grades values that occur in the dataset are consistent with the mineralization styles present and do not represent high grade outliers. Higher-grade values lay within zones where drill log descriptions of lithology and mineralogy support presence of spatially correlative higher-grade material.

14.3.5 Variography and Interpolation Ellipsoids

Manually derived models of geology and grade distribution provided definition of the primary southwest-northeast and sub-vertical trend associated with the folded host stratigraphy. To assess spatial aspects of grade distribution within the Battery Hill manganese-iron deposit, down-hole and directional variograms were developed for manganese percentage based on the 3.0 m down hole composite dataset defined by the peripheral solid models.

Down-hole variograms provided definition of a normalized nugget of 0.30 (Figure 14.7) and spherical model results with two structures. The first structure supported a normalized sill of 0.24 and a range of 8m and the second structure supported a normalized sill of 0.46 and a range of 33 m. The down-hole variogram provide guidance and definition of nugget values and minor axis ranges for the directional variogram assessment.

Figure 14.7: Downhole Manganese Variogram for the Battery Hill Project



Best directional experimental variogram results were developed within a plane trending towards an azimuth of 140⁰ and a plunge of 70⁰ using a spread angel of 15⁰ and a spread limit of 20⁰. The plane orientation corresponds to the down-dip trend of the Moody Hill area and assesses grade continuity along strike and in the down-dip direction. Application of spherical models provided definition of an anisotropy ellipsoid along an azimuth of 233° with a plunge of 9° and a dip of 80° using Surpac's ZXY LRL axes of rotation convention. Two structures were modelled for the primary axis trend supporting a normalized sill of 0.33 and a range of 45 m for the first structure and a normalized sill of 0.37 and a range of 150 m for the second structure. Maximum ranges of continuity of 88 m for the secondary axis trend and 25 m for the third axis trend were defined. Figure 14.8 presents results of the primary variogram assessment, Figure 14.9 presents results of the secondary variogram assessment, and Figure 14.10 presents variogram results along all axes.

Figure 14.8: Manganese Variogram Model for the Major Axis of Continuity for the Battery Hill Project

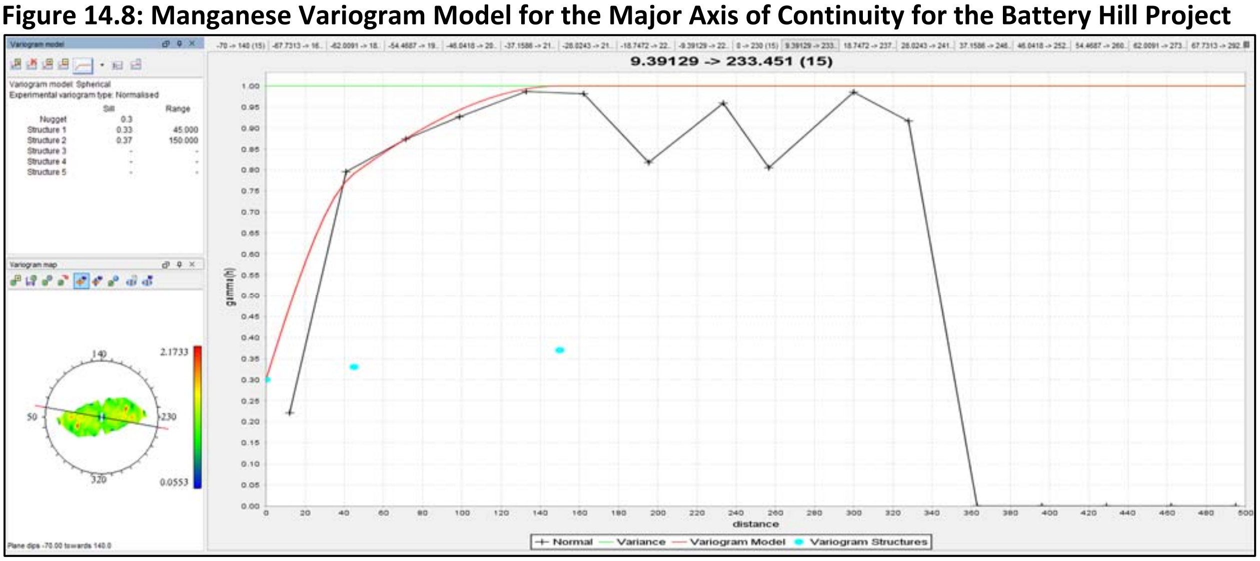


Figure 14.9: Manganese Variogram Model for the Semi-Major Axis of Continuity for the Battery Hill Project

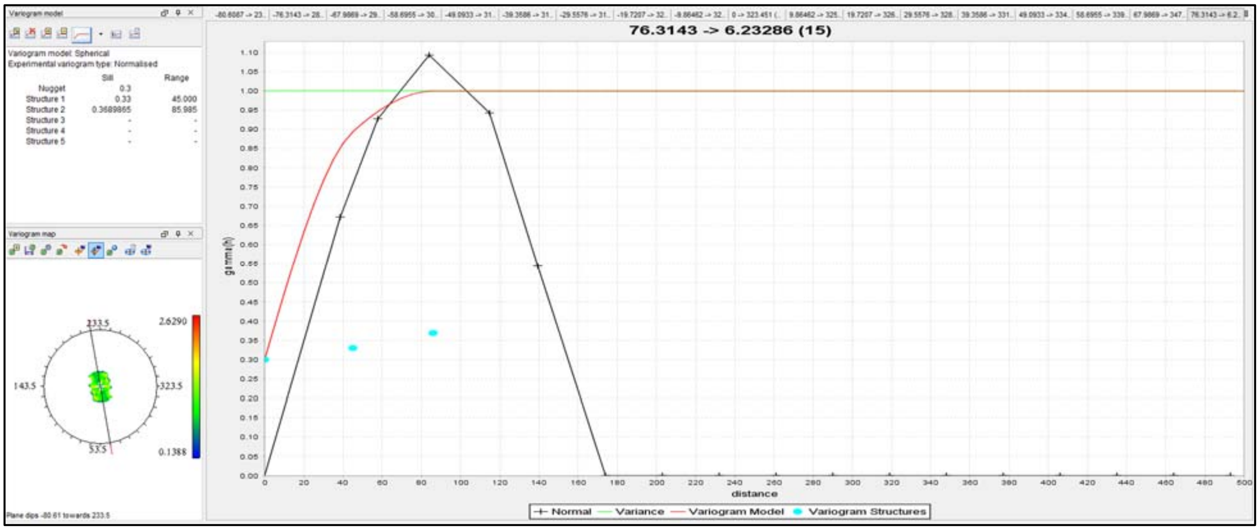
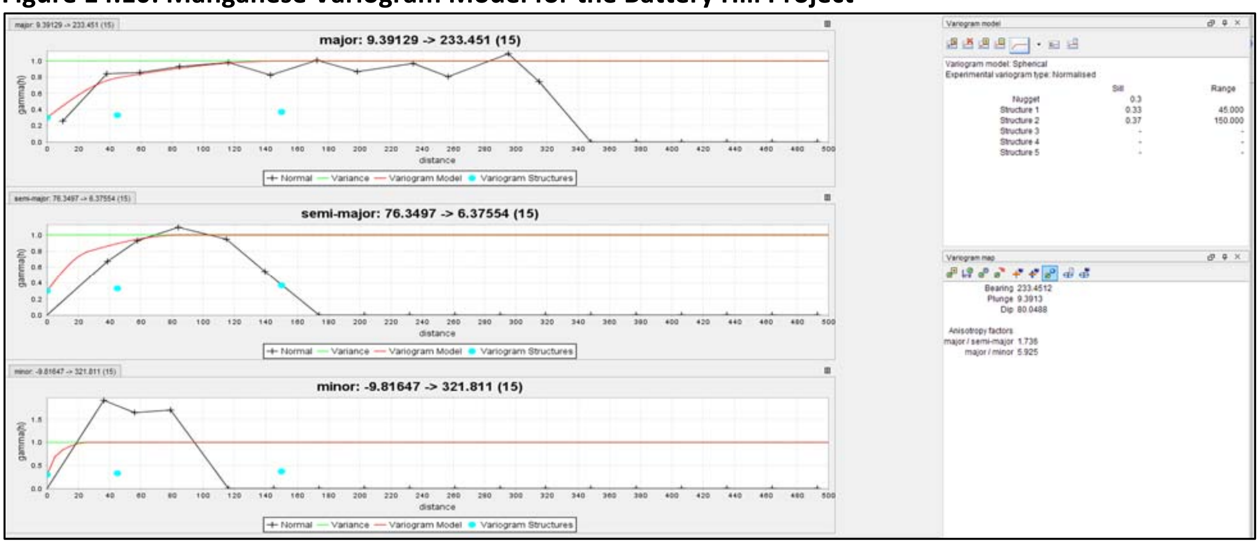


Figure 14.10: Manganese Variogram Model for the Battery Hill Project



Interpolation ellipsoid ranges and orientations were developed through the consideration of the variogram assessment in combination with geological interpretations and drill hole spacing. A total of 31 interpolation domains were developed for the 24 grade domains solid models. Interpolation domains were created to accommodate local variations in deposit geometry and to independently assess more restricted occurrences of mineralization. Major axis orientations conform to the strike direction, between an azimuth 036° and 073°, with no plunge. The semi-major axes occur in the dip direction, ranging from near vertical to 70^{o} and perpendicular to the major axes, while minor axes are oriented at a high angle to stratigraphy in the down hole direction. Ranges of 150 m, 90 m, and 30 m were derived for the major, semi-major and minor axes, respectively, from the variogram assessment.

14.3.6 Setup of the Three-Dimensional Block Model

The block model extents are presented below in Table 14.3 and were defined using UTM NAD83 (Zone 19) coordination and elevation relative to sea level. No rotation was applied to the block model. Standard block size for the model is 5 m by 5 m by 5 m (X, Y, Z) with no units of sub-blocking allowed.

Table 14.3: Summary of Battery Hill Project Block Model Parameters

Type	Y (Northing m)	X (Easting m)	Z (Elevation m)
Minimum Coordinates	5,116,150	604,650	-150
Maximum Coordinates	5,118,100	605,950	250
User Block Size	5	5	5
Minimum Block Size	5	5	5
Rotation	0	0	0

* UTM NAD83 Zone 19 coordination and sea level datum

14.3.7 Mineral Resource Estimate

Battery Hill Project block model volumes were estimated from the project solid models. Blocks were assigned a deposit code of air, overburden, grey, red, or mixed based on their spatial relationship with the DTM of topography, overburden solid model, and colour solid models. Blocks assigned with a deposit code of grey, red, or mixed were accepted as eligible for grade domain volumization. Eligible blocks intersecting the grade domain solids were accepted for manganese and iron block grade interpolation and coded with the respective solid model identifier to correspond with the appropriate 3m assay composite dataset and interpolation parameters.

Ordinary kriging (OK) grade interpolation was used to assign block manganese and iron grades within the Battery Hill Deposit block model from the 3 m assay composite datasets. Interpolation ellipsoid orientation and range values used in the estimation reflect a combination of trends determined from the manganese variography assessment and interpretations of geology and grade distribution for the deposit. Manganese and iron grade interpolation was completed independently, with the parameters derived from assessment of manganese also applied to the iron grade interpolation. A 3 interpolation pass approach was applied, implemented sequentially from pass 1 to pass 3, that progresses from being restrictive to more inclusive in respect to ellipsoid ranges, composites available, and number composites required to assign block grades. Interpolation pass ranges reflect 50 %, 100 %, and 150 % of the ranges defined from variogram assessment for the first pass, second pass, and third pass, respectively. A total of 31 interpolation domains, each with unique interpolation ellipsoid orientation, were applied. Grade domain boundaries were set as hard boundaries for grade estimation purposes. Block discretization was set at 2 (Y) x 2 (X) x 2 (Z). Interpolation parameters for the Battery Hill Deposits are summarized in Table 14.4.

Table 14.4: Summary of Battery Hill Project Interpolation Parameters

Interpolation Pass	Range			Contributing Composites		
	Major (m)	Semi-Major (m)	Minor (m)	Minimum	Maximum	Maximum Per Drill Hole
1	75	45	15	7	12	3
2	150	90	30	4	9	3
3	225	135	45	1	4	4

14.3.8 Density

A total of 1,468 specific gravity determinations are available for the project drill hole database, including 1,454 water immersion determinations completed by Manganese X during the 2016, 2017, and 2020 drill programs. From the total dataset, 1,292 determinations can be correlated with an associated manganese percent and iron percent grade and 948 determinations occur within the mineralized area. The specific gravity determinations are accepted to represent a density determination of the rock measured.

Complete coverage of density determinations over the deposit area is not available. On this basis, a regression curve and equation was developed relating the 1,292 determinations with results for manganese and iron with those values. The regression curve was developed by averaging density values in grade bin intervals of 5 % manganese and iron. Average density values range from 2.79 g/cm^3 in the less than 5 % manganese and iron bin to 3.37 g/cm^3 in the greater that 35 % manganese and iron bin. The following regression equation was developed:

*specific gravity (density) = 0.18 *(Mn % + Fe %) + 2.70*

The regression curve was applied to all blocks with an accepted interpolated manganese percent and iron percent value.

14.3.9 Metal Pricing

Metal pricing data and market forecasts for HPMSM were assembled in May 2021 on behalf of Manganese X by NOK Associates Limited (NOK) and this information was made available to the QP. NOK was specifically tasked with providing a pricing and forecast framework for HPMSM that could be used in support of the pit optimization process for the current mineral resource estimate. NOK is based in Mississauga, Ontario, Canada and specializes in providing professional metallurgical services to mineral development and mining projects. The QP also carried out an independent review of public record manganese market information and assessed results from both sources to establish a pricing approach for cut-off grade application and to assess current and projected market potential for HPMSM products that could be sourced from future mining of the Battery Hill Project.

The three-year trailing average market prices to March 1, 2021 provided by NOK for HPMSM landed at a European or North American port is US$1282/t and NOK estimated the May 2021 price to be approximately US$1440/t. That company's forecast shows continued increase in HPMSM price to a level of US$1500/t for 2023, US$ 1550/t for 2025 and US$ 1700/t for 2030. In associated reporting, NOK recommended that a long-term HPMSM price of $1500/t to US$1559/t be used for mineral resource estimation purposes over the next three to five year period.

After review of NOK's 3 year trailing average data for HPMSM of US$1,282/t, which registers the negative impact of the Covid pandemic in 2020, NOK's three year forecast average through 2024 of $1498/t and its 2021 through 2030 forecast average of US$1,604/t, the average of these was found to be US$1443.7/t. This average of this value and the $1,559/t high range value recommended by NOK for mineral resource estimate use is US$1501.40 and was rounded down to US$1,500/t for use in the current mineral resource pit optimization.

14.3.10 Future Markets

Based on its analysis of current world supply and demand trends for battery metals, NOK concluded that opportunities for new producers of HPMSM in will continue to rise through 2030. This particularly reflects impact of present and forecasted EV industry battery requirements on supply of HPMSM. An assessment of the degree to which market share for a new producer can be obtained requires completion of a detailed market study addressing this point and will be necessary to define the specific scope of future market opportunities that may actually be available for the Battery Hill Project. However, based on general cost comparisons with world-dominant Chinese production and NOK's assessment of metal pricing trends, the Battery Hill Project shows good potential to produce competitively in the future within the international market place.

The QP is of the opinion that, based on the pricing and market analysis information provided by NOK, Kemetco and Manganese X, the Battery Hill Project's large tonnage, manganese carbonate mineralogy, potential competitive future production cost and the broadly anticipated future manganese market expansions in the battery metal sector combine to indicate that reasonable market prospects exist for sale of high purity manganese products sourced in future production from the Battery Hill Project.

14.3.11 Mineral Resource Cut-off Grade and Pit Optimization

The "reasonable prospects for eventual economic extraction" requirement was assessed for the Battery Hill Deposit by means of developing an optimized open pit shell to constrain mineral resources. This shell was based on the mineral deposit block model and developed by AGP Mining Consultants Inc. (AGP) through application of operating and recovery parameters deemed appropriate for the style of mineralization present. Hexagon Mine Plan 3D version 15.4, MineSight® Economic Planner version 4.00-11 was used to carry out the program. The QP and AGP had determined after initial review of the deposit model that good potential was present for future development using open pit mining methods.

To define mineralization within the block model that has reasonable prospects for eventual economic extraction by open pit mining, AGP provided current mining and transportation cost estimates and applied these in combination with average manganese pricing developed by the QP and Manganese X through consultation with NOK Associates Limited Mining and Metallurgy ("NOK"), plus processing cost and recovery estimates developed by Kemetco. The reader is cautioned that the results from the pit optimization are used solely for the purpose of addressing reasonable prospects for eventual economic extraction by an open pit and do not represent an attempt to estimate mineral reserves. The results are used as a guide to assist in the preparation of a mineral resource statement and to select an appropriate mineral resource reporting cut-off grade. Mineral resource cut-off grade parameters are summarized in Table 14.5. Results of pit optimization are presented in Figure 14.11 and 14.12.

Table 14.5: Summary of Battery Hill Project Pit Optimization Parameters

Parameter	Units	Value
Mining Cost – Rock	Cdn$ /t	6.5
Mining Cost – Overburden	Cdn$/t	6.5
Processing Rate	Tonnes /day	1,000
Processing Recovery	%	65
Processing Plus General and Administrative (G&A)	Cdn$/t processed	86.22
Transportation	Cdn$/lb	0.09
Metal Price	US$/tonne HPMSM (32%)	1,500
Exchange Rate	Cdn$ to US$	1.30:1.00
Pit Slope Angle (Overburden)	Degrees	20
Pit Slope Angle (Rock)	Degrees	45

Figure 14.11: Oblique View Looking Northwest of the Battery Hill Project Optimized Pit Shell (Mn % Block Values: Blue 2.5 – 5 %; Green 5 – 7.5 %, Yellow 7.5 – 10 %, Red 10 – 15 %, Pink > 15 %)

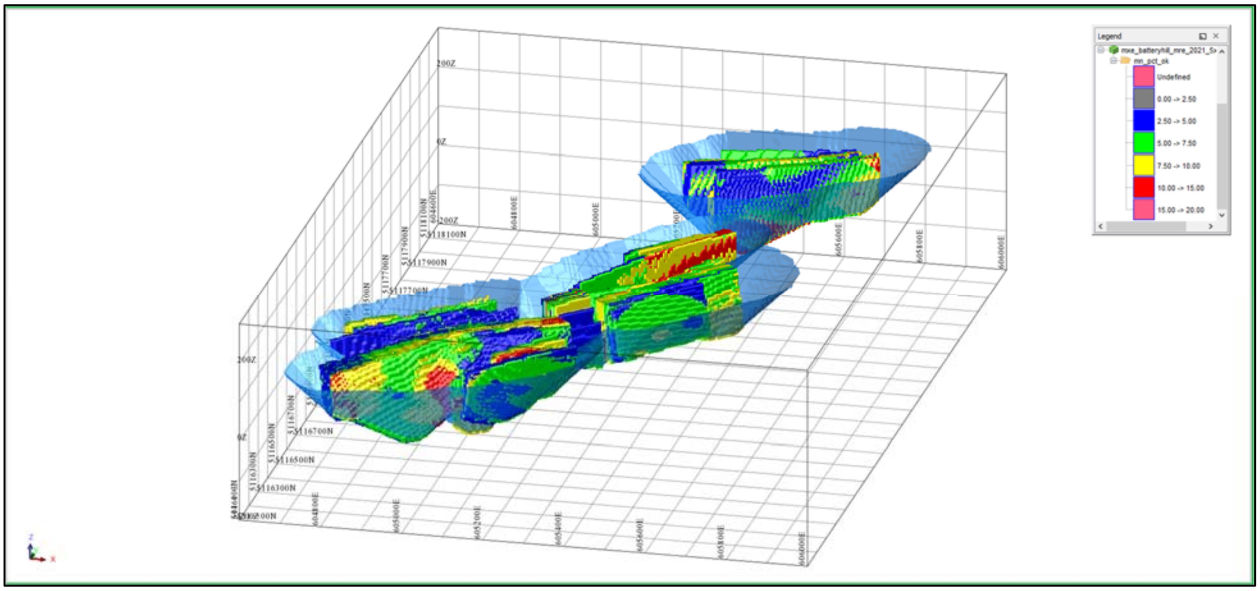
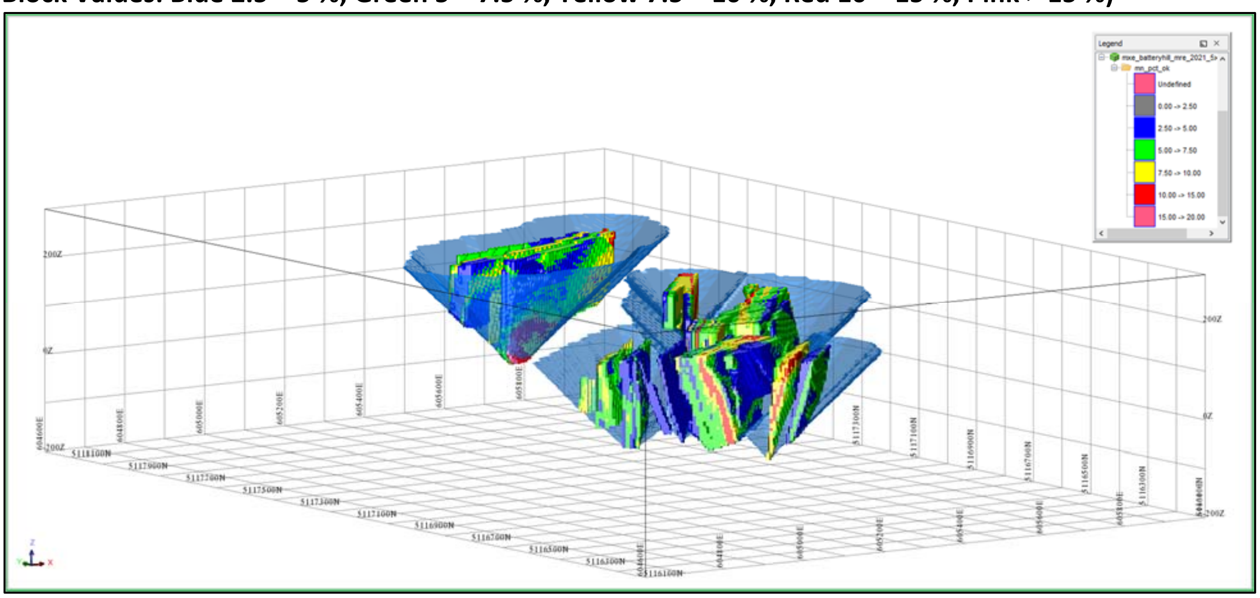


Figure 14.12: Sectional View Looking Northeast of the Battery Hill Project Optimized Pit Shell (Mn % Block Values: Blue 2.5 – 5 %; Green 5 – 7.5 %, Yellow 7.5 – 10 %, Red 10 – 15 %, Pink > 15 %)



The mineral resource estimate break-even cut-off grade was calculated as follows:

(Total cost/tonne processed)/(net value/tonne processed) = 2.5 % Mn

No value for the deposit's iron content was assigned for optimization purposes but potential for by-product production of specific iron products has been identified and requires further study through completion of additional metallurgical testing.

14.3.12 Reasonable Prospects for Eventual Economic Extraction

The QP is of the opinion that the open pit operating scenario, associated general cost assumptions, metal pricing and market assessment information presented above in this report section combine to meet the requirement of "reasonable prospects for eventual economic extraction" referenced in the CIM Standards (2014) as it applies to the current Battery Hill Project mineral resource estimate.

14.3.13 Resource Category Parameters Used in Current Mineral Resource Estimate

Definitions of mineral resources and associated mineral resource categories used in this report are those set out in the CIM Standards (2014) as referenced in NI 43-101. Measured, Indicated, and Inferred categories have been assigned to the Battery Hill Deposit.

Several factors were considered in defining resource categories, including drill hole spacing, geological interpretations and number of informing assay composites and average distance of assay composites to block centroids. Specific definition parameters for each resource category applied in the current estimate are set out below.

<u>Measured Resource:</u> Measured mineral resources are defined as all blocks with interpolated manganese grades from the first interpolation passes that meet the specified pit-constrained cut-off grade.

<u>Indicated Resource:</u> Indicated mineral resources are defined as all blocks with interpolated manganese grades from the first and second interpolation passes that were not previously assigned to the Measured category and meet the specified pit constrained cut-off grade.

<u>Inferred Resources:</u> Inferred mineral resources are defined as all blocks with interpolated manganese grades from the first, second, and third interpolation passes that were not previously assigned to the Measured or Indicated category and meet the specified pit constrained cut-off grade.

Application of the selected Mineral Resource categorization parameters specified above defined distribution of Measured, Indicated and Inferred mineral resource estimate blocks within the block model. To eliminate isolated and irregular category assignment artifacts, the peripheral limits of blocks in close proximity to each other that share the same category designation and demonstrate reasonable continuity were wireframed and developed into discrete solid models. All blocks within these "category" solid models were re-classified to match that model's designation. This process resulted in more continuous zones of each mineral resource estimate category and limited occurrences of orphaned blocks of one category as imbedded patches in other category domains.

14.3.14 Statement of Mineral Resource Estimate

Block grade, block density and block volume parameters for the Battery Hill Deposit were estimated using methods described in preceding sections of this report. Subsequent application of resource category parameters set out above resulted in the mineral resource estimate presented in Table 14.5. Mineral resources are defined at a manganese cut-off grade of 2.5 %. Results are reported in accordance with CIM Standards (2014). Mineral resources allocated to each deposit area are presented in Table 14.6. A cut-off grade sensitivity tabulation is presented in Table 14.7 for comparative purposes but does not constitute part of the mineral resource statement. Figure 14.13 illustrates the relationship of cut-off grade to mineral resource tonnage within the optimized pit shell. The 2.5 % manganese cut-off grade is based on the parameters discussed in section 14.3.11 above and reflect "reasonable prospects for eventual economic extraction" using conventional open pit mining methods.

Table 14.6: Battery Hill Project Mineral Resource Estimate – Effective Date: June 18, 2021*

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	Measured	11,260,000	6.75	10.96
	Indicated	23,600,000	6.26	10.53
	Measured and Indicated	34,860,000	6.42	10.67
	Inferred	25,910,000	6.66	10.92

Mineral Resource Estimate Notes:

1) Mineral resources were prepared in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves (MRMR) (2014) and CIM MRMR Best Practice Guidelines (2019).
2) Mineral resources are defined within an optimized pit shell with average pit slope angles of 45° and a 3.7:1 strip ratio (waste: mineralized material).
3) Pit optimization parameters include: pricing of US$1500/tonne for High Purity Manganese Sulphate Monohydrate - 32% Mn (HPMSM – 32 %), exchange rate of CDN $1.30 to US$ 1.00, mining at CDN $6.50/t, combined processing and G&A (1000 tpd) at CDN $86.22/t processed and a process recovery of Mn to HPMSM of 65%. Fe content was not included in the pit optimization.
4) Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization to define reasonable prospects for eventual economic extraction by open pit mining methods.
5) Mineral resources were estimated using Ordinary Kriging methods applied to 3 m downhole assay composites. No grade capping was applied. Model block size is 5 m (x) by 5 m (y) by 5 m (z)
6) Bulk density was applied using a regression curve based on Mn % and Fe % block grades.
7) Mineral resources may be materially affected by environmental, permitting, legal, title, taxation, sociopolitical, marketing, or other relevant issues.
8) Mineral resources are not mineral reserves and do not have demonstrated economic viability.
9) Mineral resource tonnages are rounded to the nearest 10,000.

Table 14.7: Battery Hill Project Mineral Resource Estimate for Each Deposit Area– Effective Date: June 18, 2021*

Deposit Area	Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
Moody Hill	2.5	Measured	11,260,000	6.75	10.96
		Indicated	15,230,000	5.88	9.96
		Measured and Indicated	26,490,000	6.25	10.39
		Inferred	7,580,000	6.29	10.51
Sharpe Farm	2.5	Measured			
		Indicated	8,370,000	6.96	11.56
		Measured and Indicated	8,370,000	6.96	11.56
		Inferred	9,460,000	7.63	12.54
Iron Ore Hill	2.5	Measured			
		Indicated			
		Measured and Indicated			
		Inferred	8,870,000	5.93	9.54

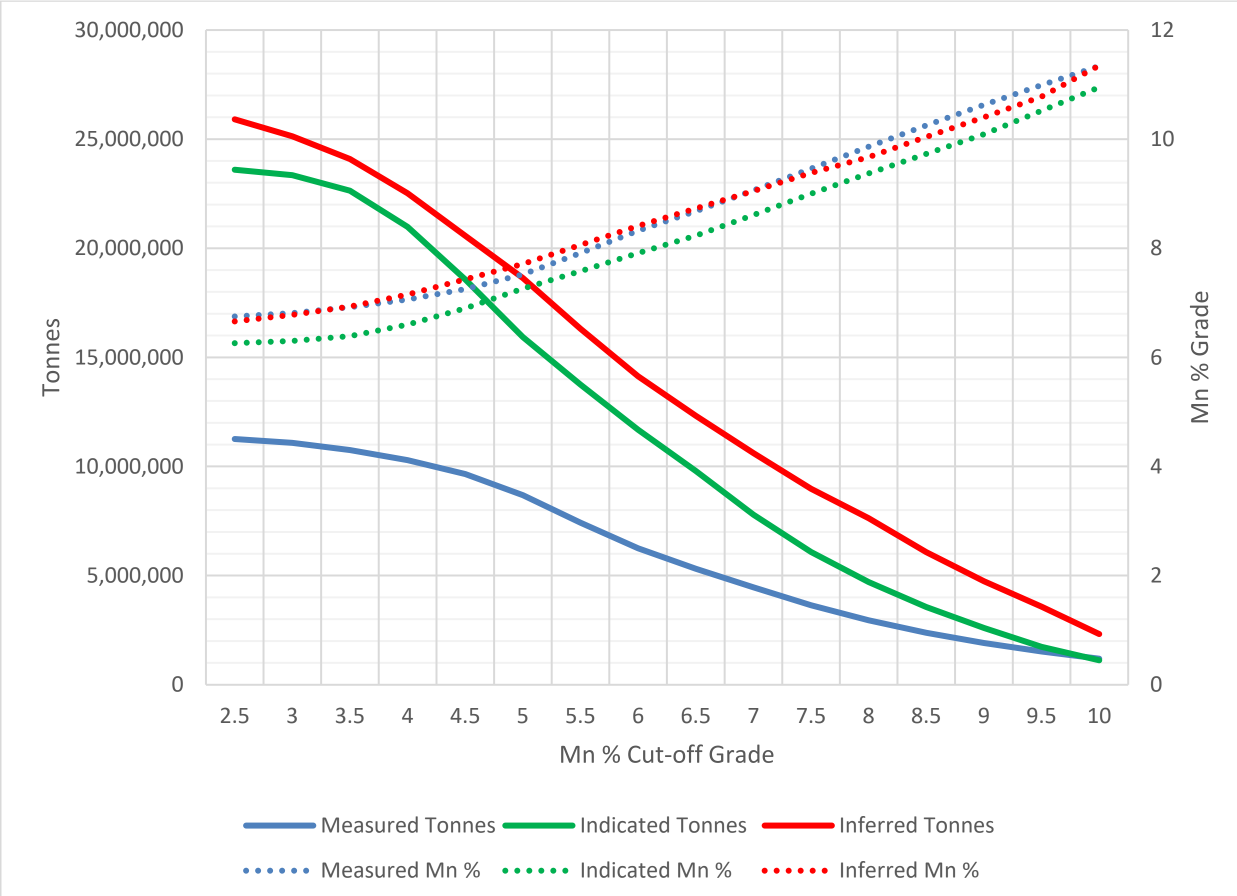
* See detailed notes on mineral resources in Table 14.5 of Section 14.3.12

Table 14.8: Battery Hill Project Cut-off Grade Sensitivity Analysis Within Mineral Resources

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	**Measured**	**11,260,000**	**6.75**	**10.96**
	Indicated	**23,600,000**	**6.26**	**10.53**
	Inferred	**25,910,000**	**6.66**	**10.92**
5	Measured	8,680,000	7.52	11.73
	Indicated	15,930,000	7.26	11.65
	Inferred	18,630,000	7.71	11.92
6	Measured	6,250,000	8.32	12.44
	Indicated	11,680,000	7.91	12.35
	Inferred	14,130,000	8.41	12.64
7	Measured	4,460,000	9.06	13.11
	Indicated	7,790,000	8.61	12.95
	Inferred	10,610,000	9.05	13.30

Notes:
This table shows sensitivity of the June 18, 2021, mineral resource estimate to cut-off grade. The base case at a cut-off value of 20.00% Mn is bolded for reference. See detailed notes on mineral resources in Table 14.5 of Section 14.3.12.

Figure 14.13: Battery Hill Project Tonnage/Grade Relationship Within Mineral Resources



14.3.15 Model Validation

Block volume estimates for each mineral resource solid were compared with corresponding solid model volume reports generated in Surpac and results show good correlation, indicating consistency in volume capture and block volume reporting. Results of block modeling were reviewed in three dimensions and compared with deposit interpretations for geology and grade distribution. Block grade distribution was shown to have acceptable correlation with the grade distribution of the underlying drill hole data (Figures 14.14 to 14.16). Mineral resource category distribution demonstrates continuous zones of each category designation (Figures 14.17 to 14.18). Measured and Indicated mineral resources are restricted to the Moody Hill and Sharpe Farm areas that are supported by a higher density of core drilling.

Figure 14.14: Oblique View Looking Northeast of the Battery Project Mn % Values Above a 2.5 % Mn Cut-off with Pit Shell in Grey (Mn % Block Values: Blue 2.5 – 5 %; Green 5 – 7.5 %, Yellow 7.5 – 10 %, Red 10 – 15 %, Pink > 15 %)

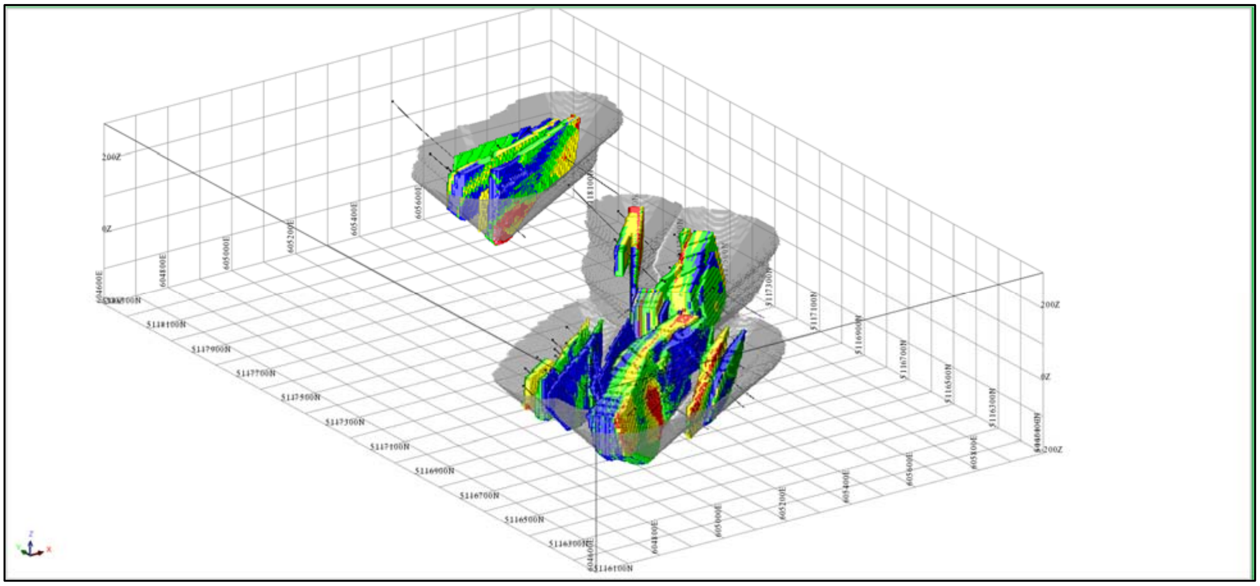


Figure 14.15: Oblique View Looking Northeast of the Battery Hill Project Mn % Values Above a 5 % Mn Cut-off with Pit Shell in Grey (Mn % Block Values: Blue 2.5 – 5 %; Green 5 – 7.5 %, Yellow 7.5 – 10 %, Red 10 – 15 %, Pink > 15 %)

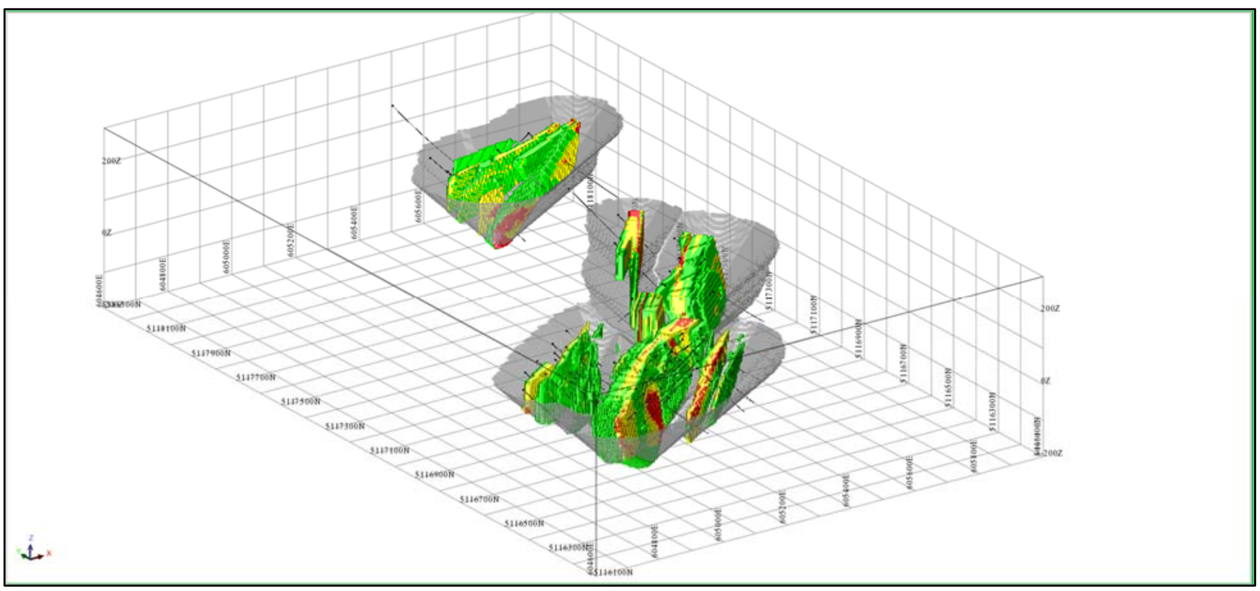


Figure 14.16: Oblique View Looking Northeast of the Battery Hill Project Mn % Values Above a 7.5 % Mn Cut-off with Pit Shell in Grey (Mn % Block Values: Blue 2.5 – 5 %; Green 5 – 7.5 %, Yellow 7.5 – 10 %, Red 10 – 15 %, Pink > 15 %)

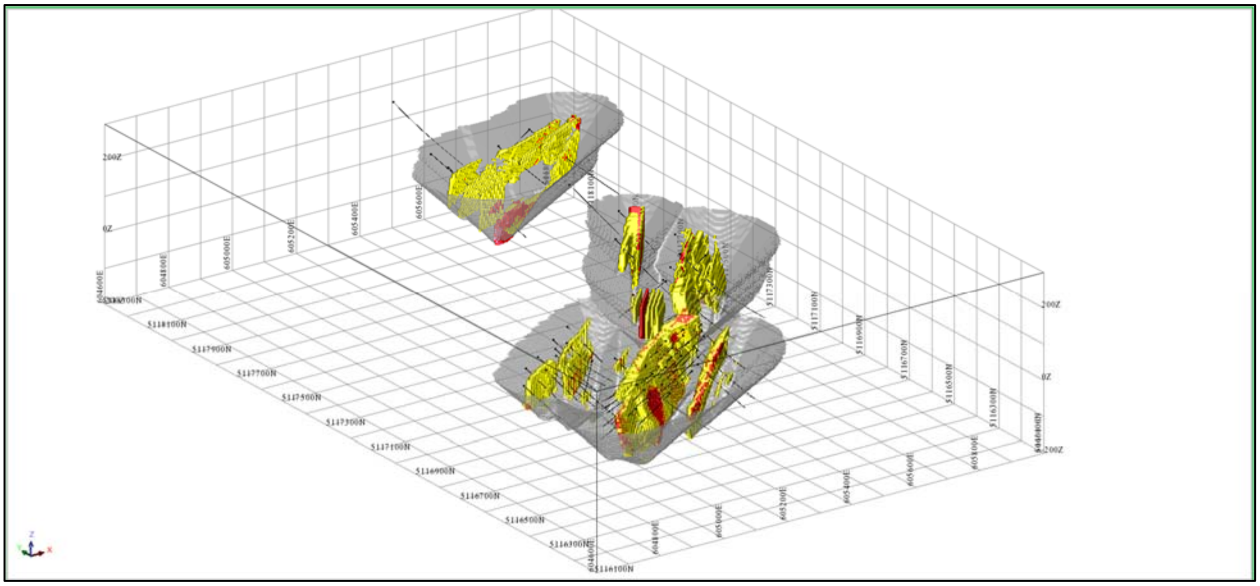


Figure 14.17: Oblique View Looking Northeast of Battery Hill Project Mineral Resource Categorization with Pit Shell in Grey (Category: Blue - Inferred, Yellow – Indicated, Red - Measured)

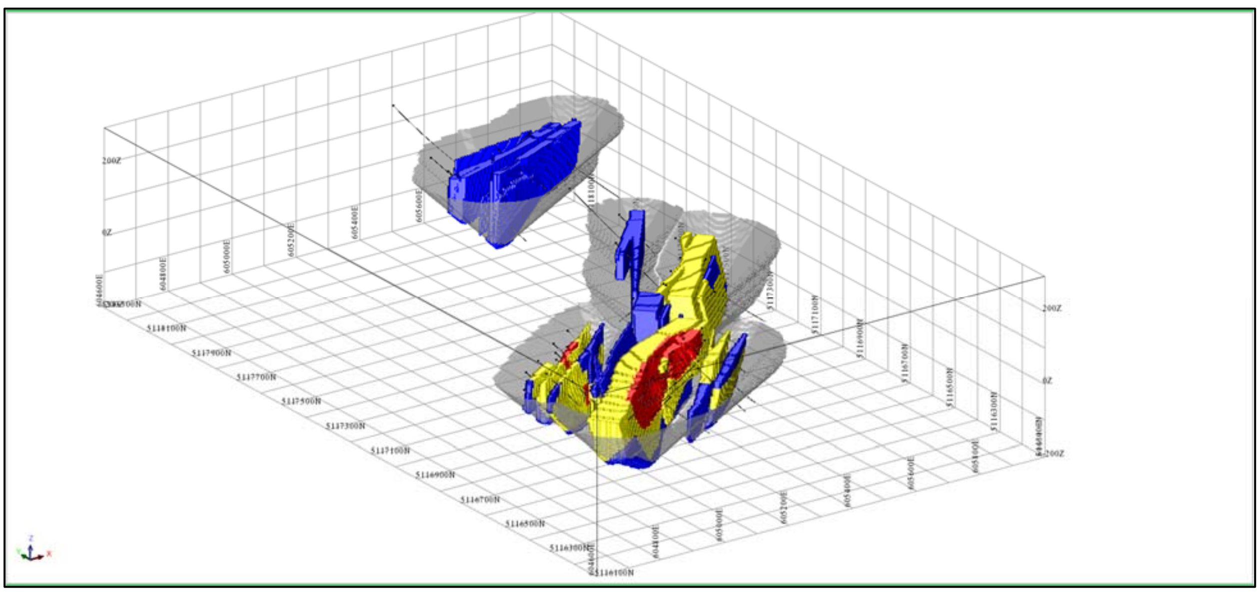


Figure 14.18: Oblique View Looking Northeast of the Battery Hill Project Indicated Mineral Resource with Pit Shell in Grey (Category: Blue - Inferred, Yellow – Indicated, Red - Measured)

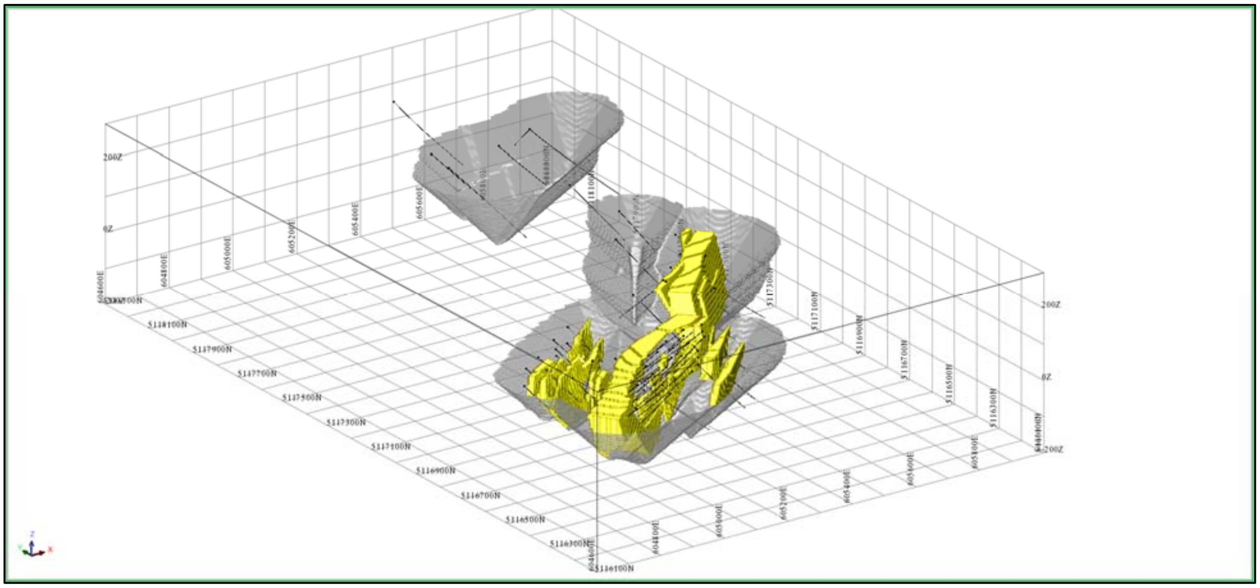
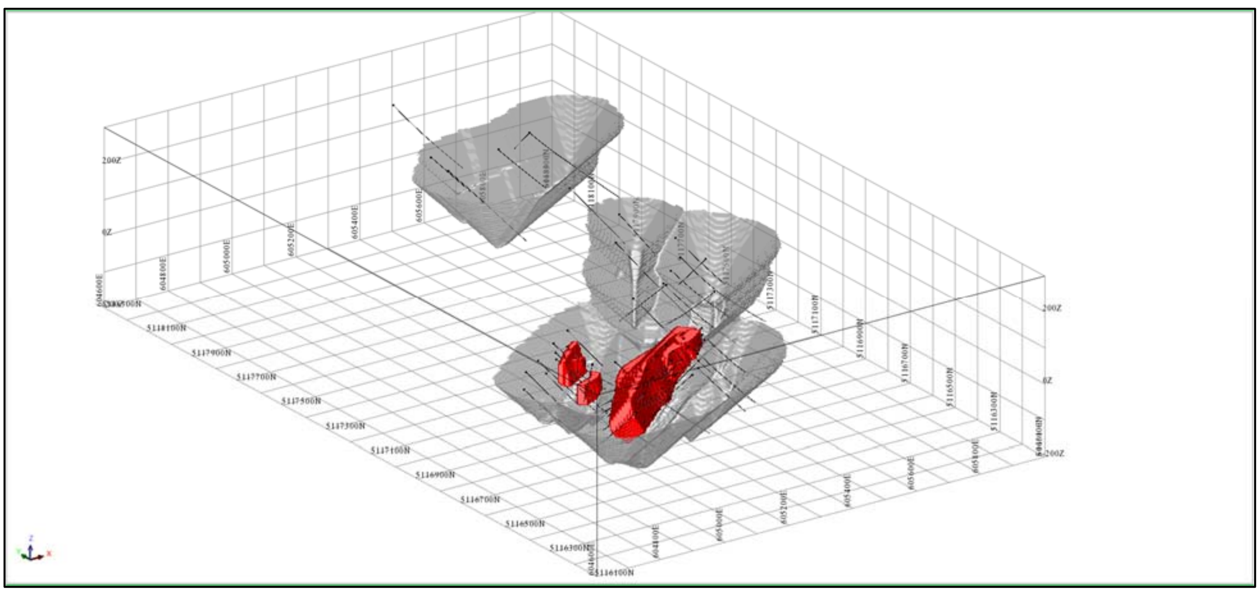


Figure 14.19: Oblique View Looking Northeast of the Battery Hill Project Measured Mineral Resource with Pit Shell in Grey (Category: Blue - Inferred, Yellow – Indicated, Red - Measured)



Descriptive statistics were calculated for the drill hole composite values used in block model grade interpolations and these were compared to values calculated for the individual blocks (Table 14.8 to 14.10). The mean weighted average drill hole composite grades for the Battery Hill deposit areas compare well with the respective block values.

Table 14.8: Battery Hill Project - Moody Hill Area Mn and Fe Statistics for Block Values and 3 Meter Composites

Type	Blocks		Composites	
Value	**Mn %**	**Fe %**	**Mn %**	**Fe %**
Number of samples	97,958	97,958	981	981
Minimum value	0.67	1.11	0.00	0.00
Maximum value	15.26	19.18	19.20	23.86
Mean	6.02	10.17	6.22	10.44
Variance	5.09	6.09	12.77	15.67
Standard Deviation	2.26	2.47	3.57	3.96
Coefficient of variation	0.37	0.24	0.58	0.38

Table 14.9: Battery Hill Project - Sharpe Farm Area Mn and Fe Statistics for Block Values and 3 Meter Composites

Type	Blocks		Composites	
Value	**Mn %**	**Fe %**	**Mn %**	**Fe %**
Number of samples	49,901	49,901	305	305
Minimum value	1.07	2.79	0.00	0.00
Maximum value	14.04	21.21	15.87	23.95
Mean	7.15	11.86	6.98	11.57
Variance	5.05	7.50	11.96	17.11
Standard Deviation	2.25	2.74	3.46	4.14
Coefficient of variation	0.31	0.23	0.50	0.36

Table 14.9: Battery Hill Project - Iron Hill Area Mn and Fe Statistics for Block Values and 3 Meter Composites

Type	Blocks		Composites	
Value	**Mn %**	**Fe %**	**Mn %**	**Fe %**
Number of samples	29,073	29,073	127	73
Minimum value	0.76	0.00	0.00	0.00
Maximum value	18.92	27.13	19.06	27.15
Mean	5.58	9.32	5.95	9.9
Variance	6.23	11.94	16.08	25.64
Standard Deviation	2.50	3.46	4.01	5.06
Coefficient of variation	0.45	0.37	0.67	0.51

Mercator created swath plots in the easting, northing, and vertical directions comparing average composite grades and global volume weighted block grades for each deposit area (Figures 14.20 to 14.28). Swath plots of the Battery Hill deposit and shows an acceptable correlation between the two grade populations. Areas of higher variance between composite grades and block grades is typically related to low composite density and/or low tonnages.

Figure 14.20: Moody Hill Area South-North Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

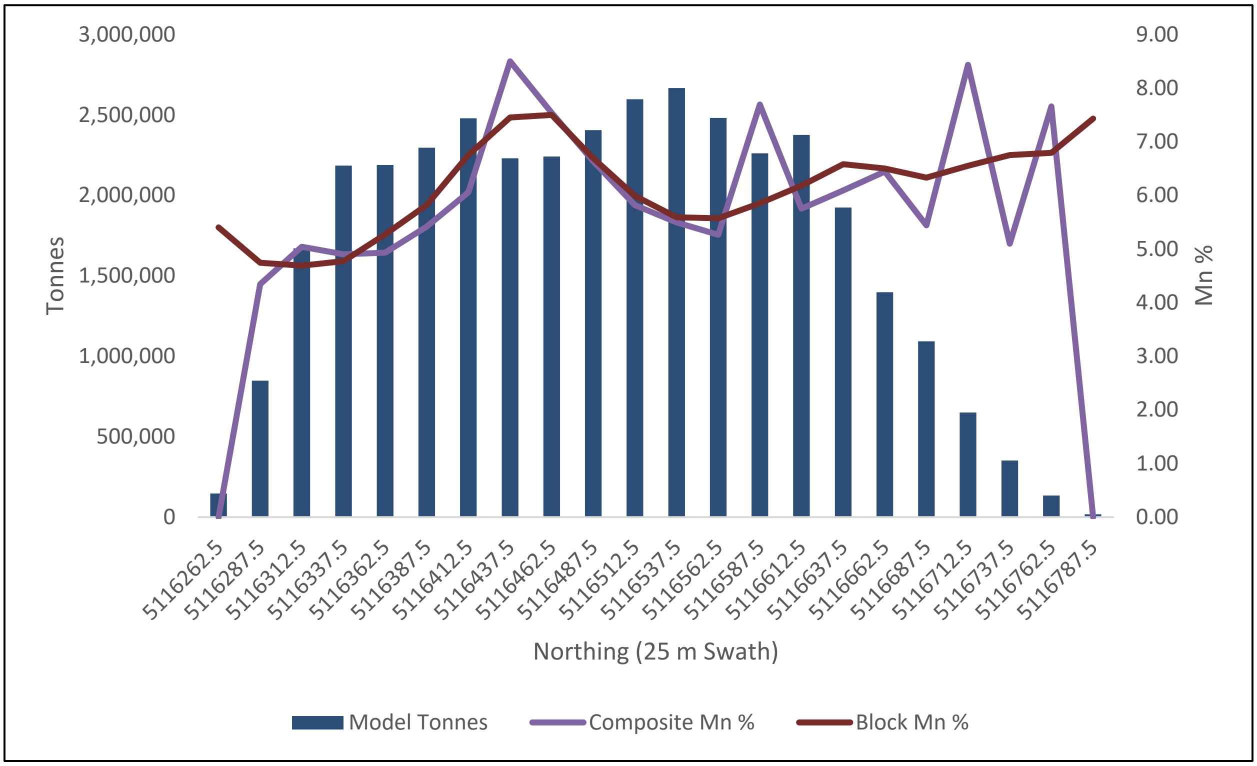


Figure 14.21: Moody Hill Area West-East Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

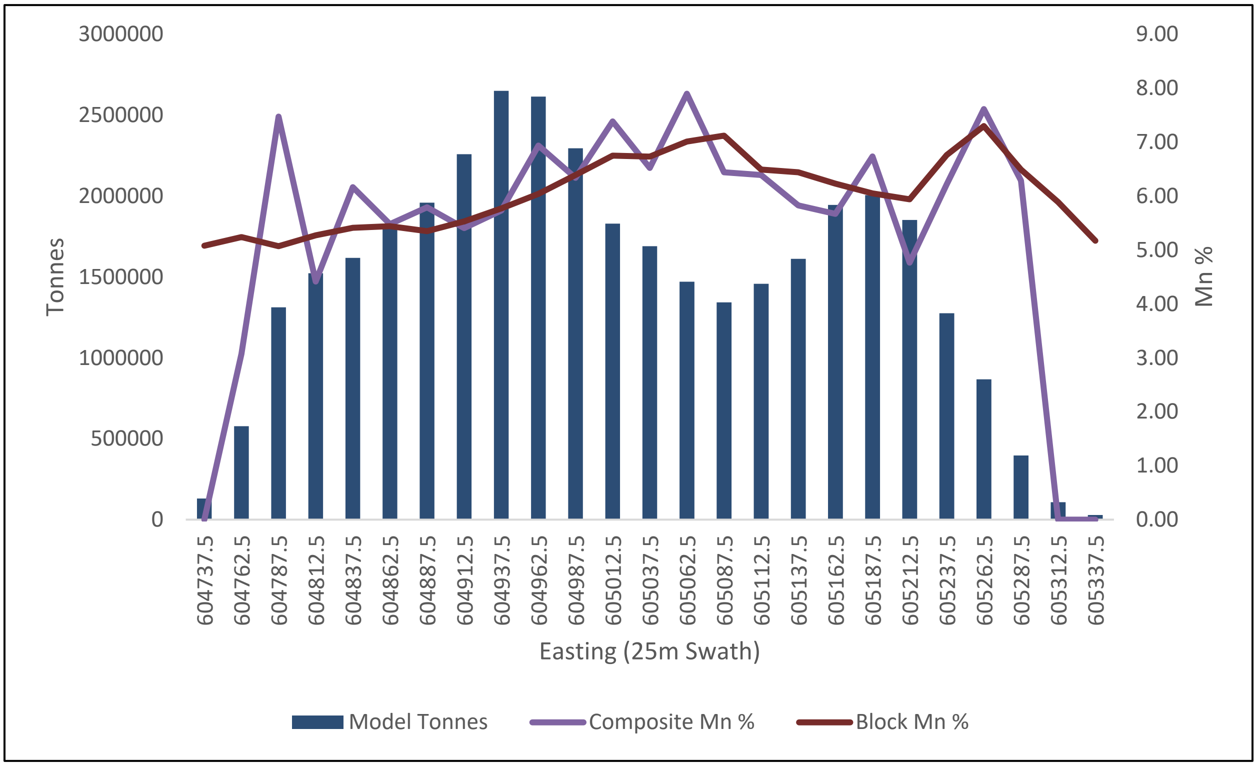


Figure 14.22: Moody Hill Area Elevation Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

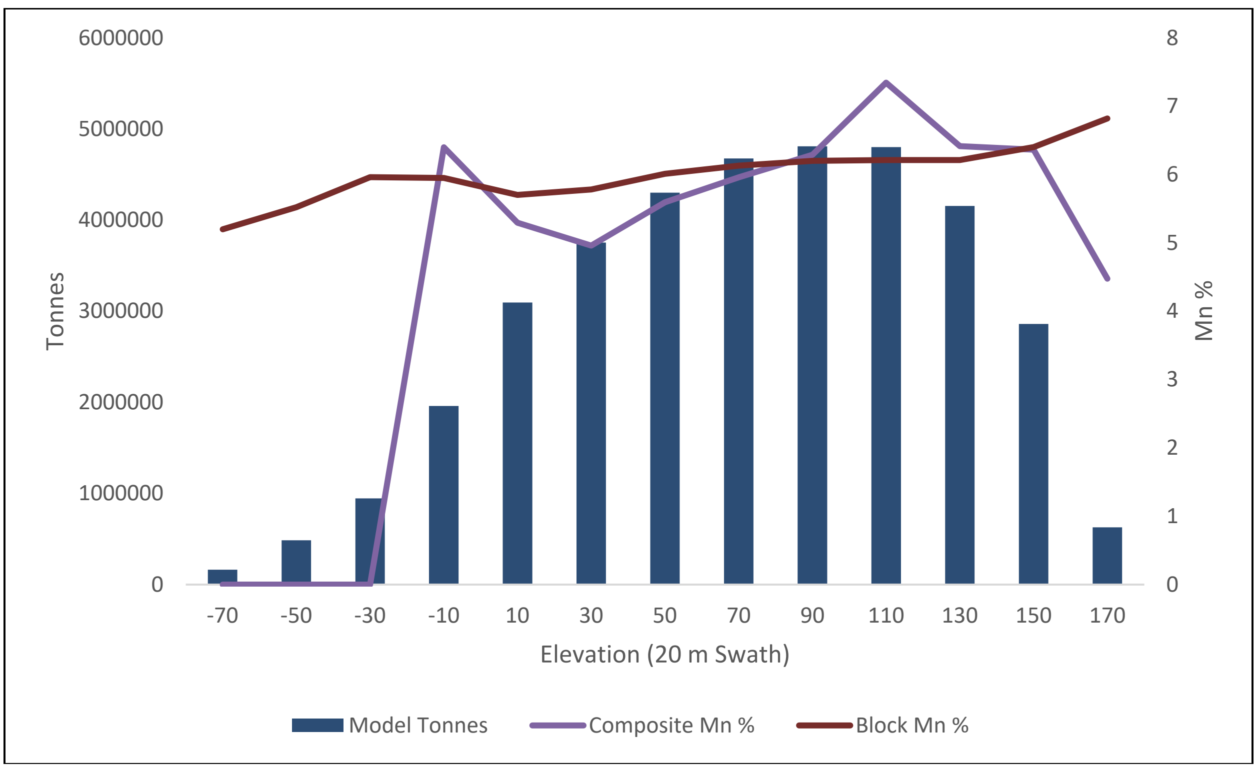


Figure 14.23: Sharpe Farm Area South-North Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

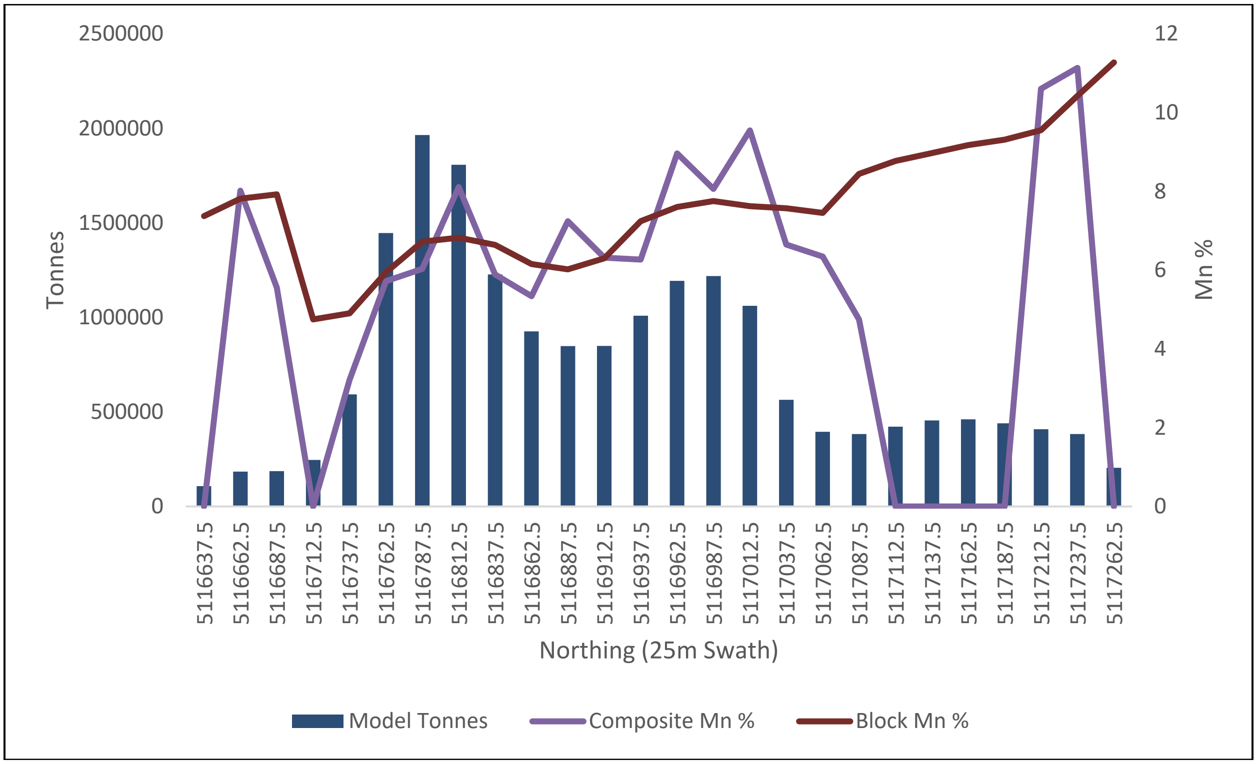


Figure 14.24: Sharpe Farm Area West-East Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

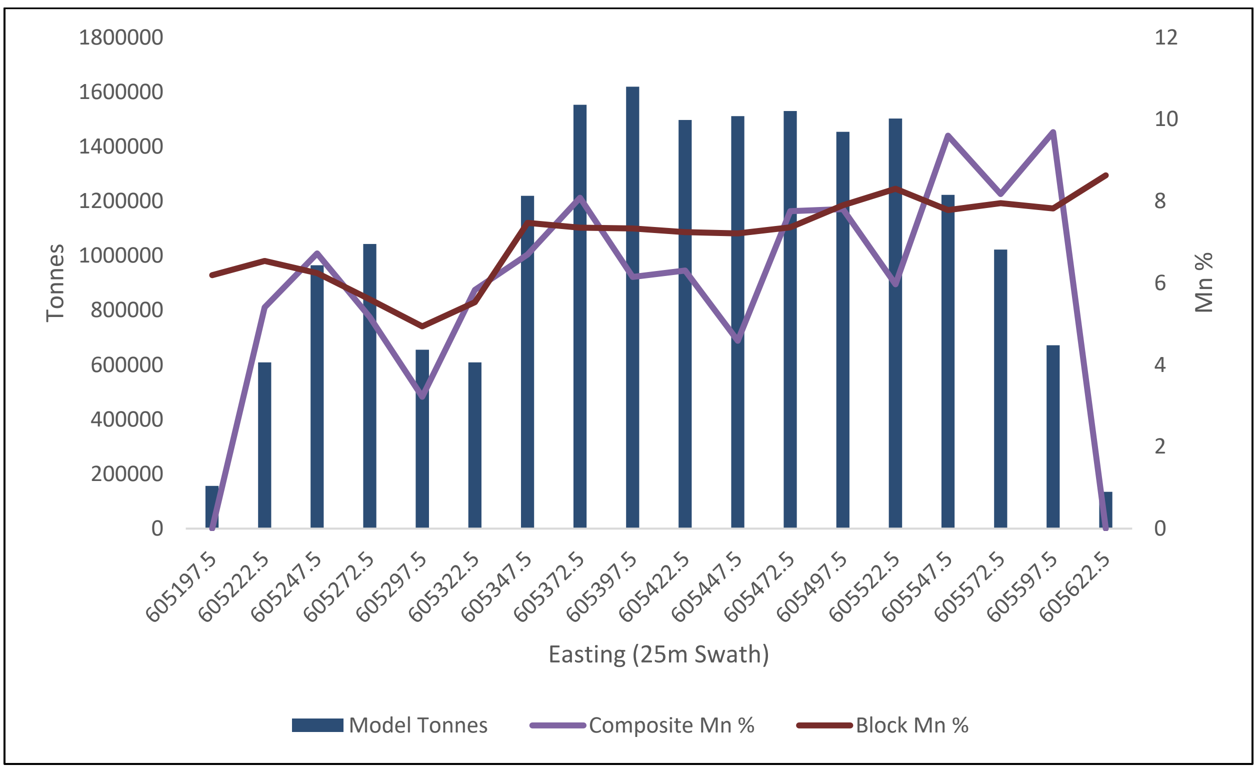


Figure 14.25: Sharpe Farm Area Elevation Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

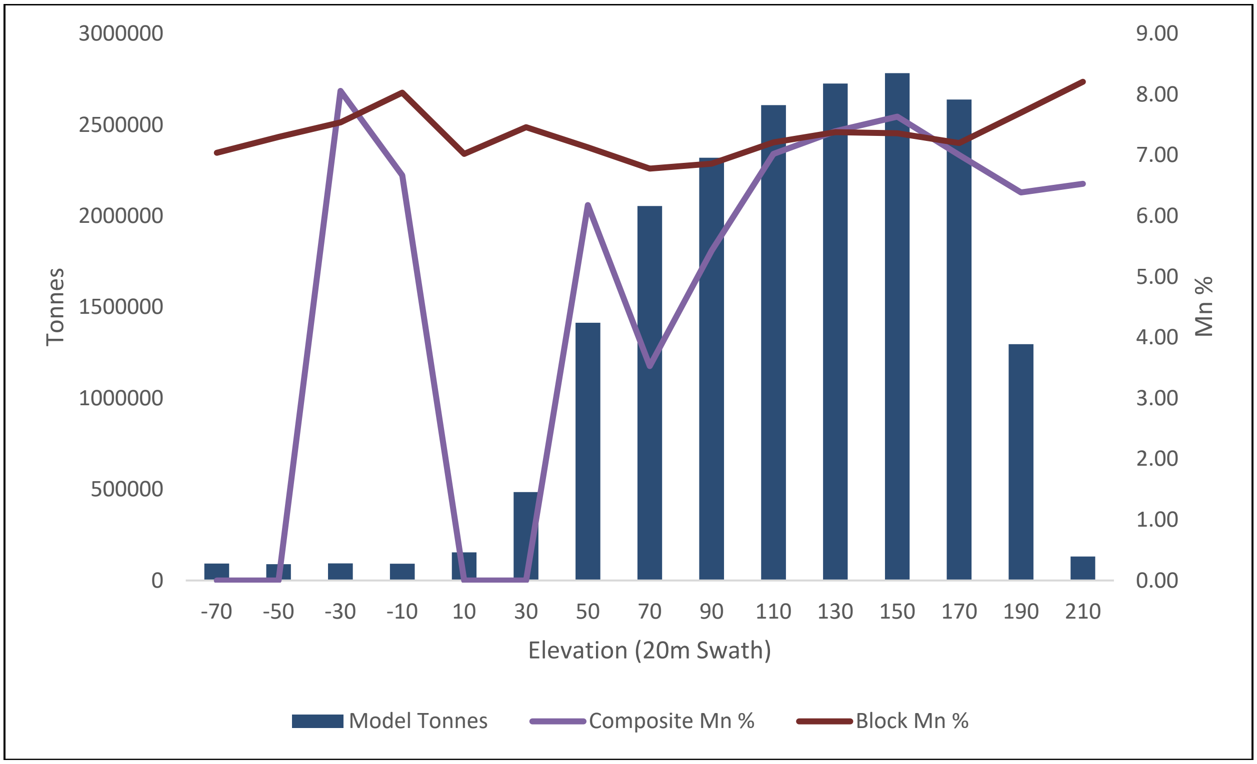


Figure 14.26: Iron Hill Area South-North Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

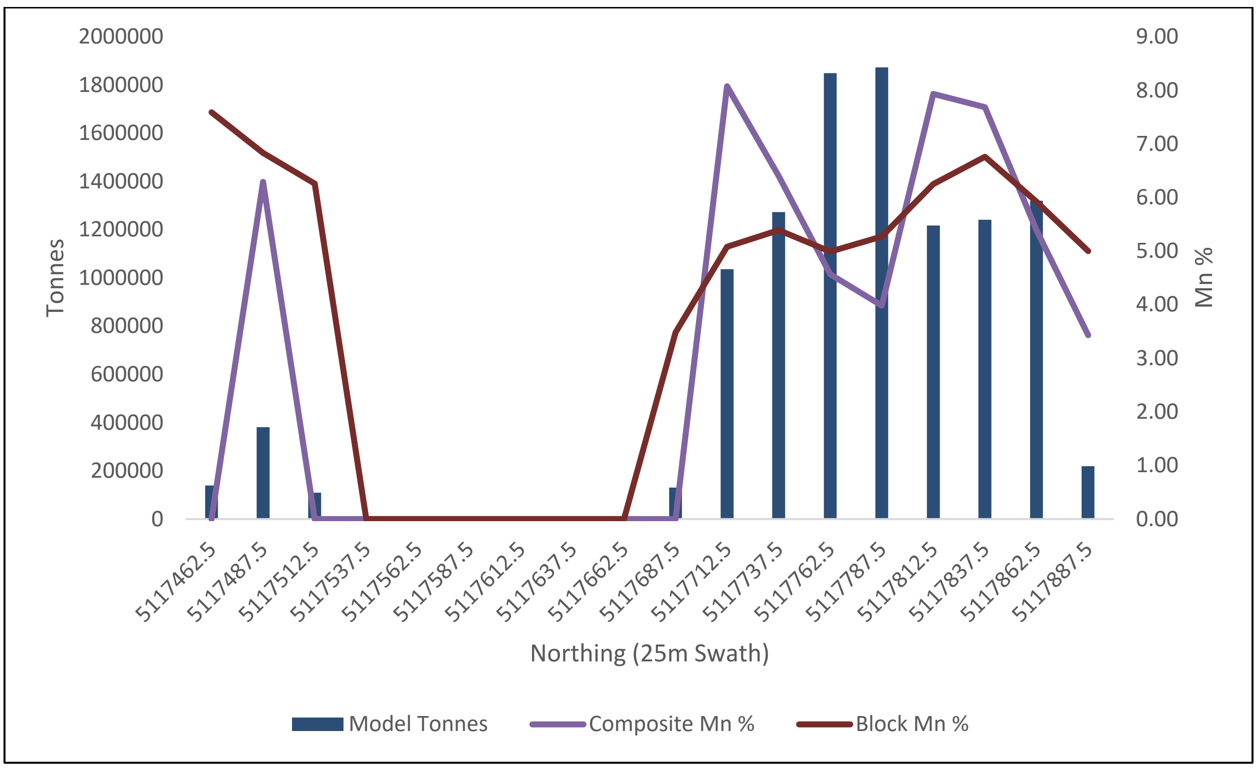


Figure 14.27: Iron Hill Area West-East Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades

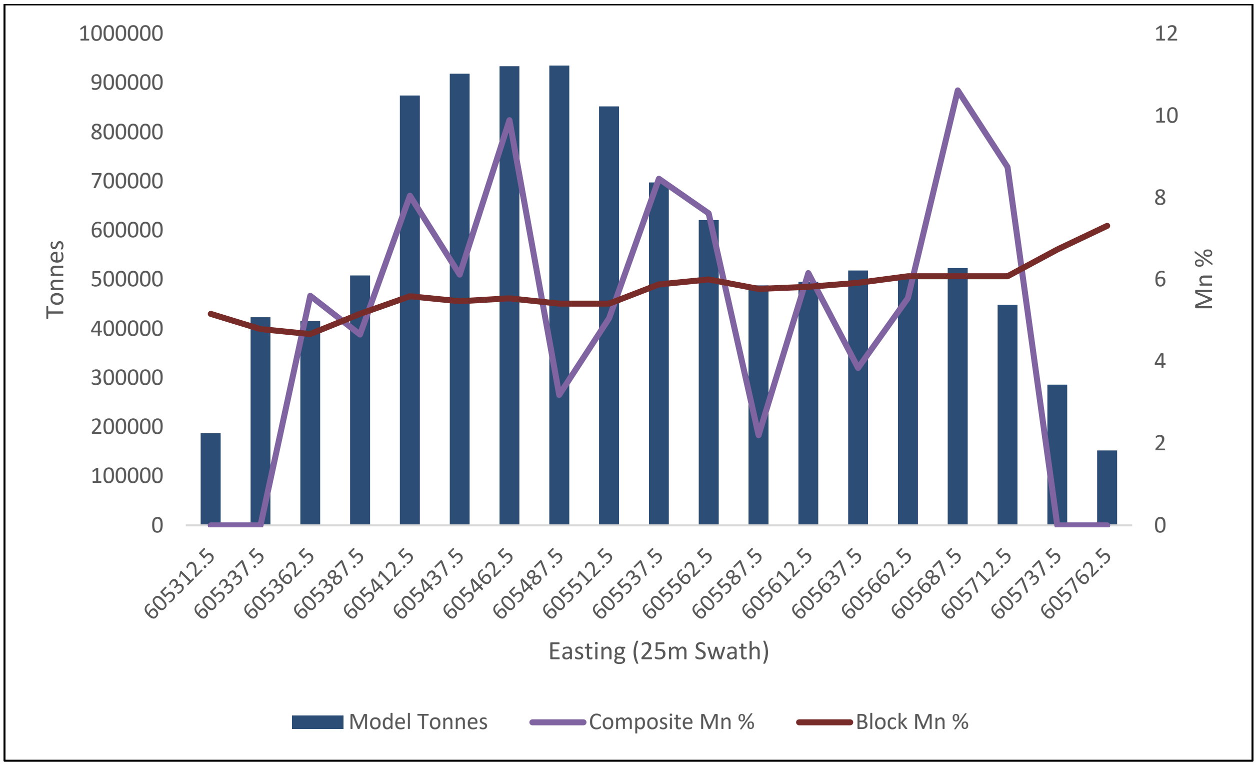
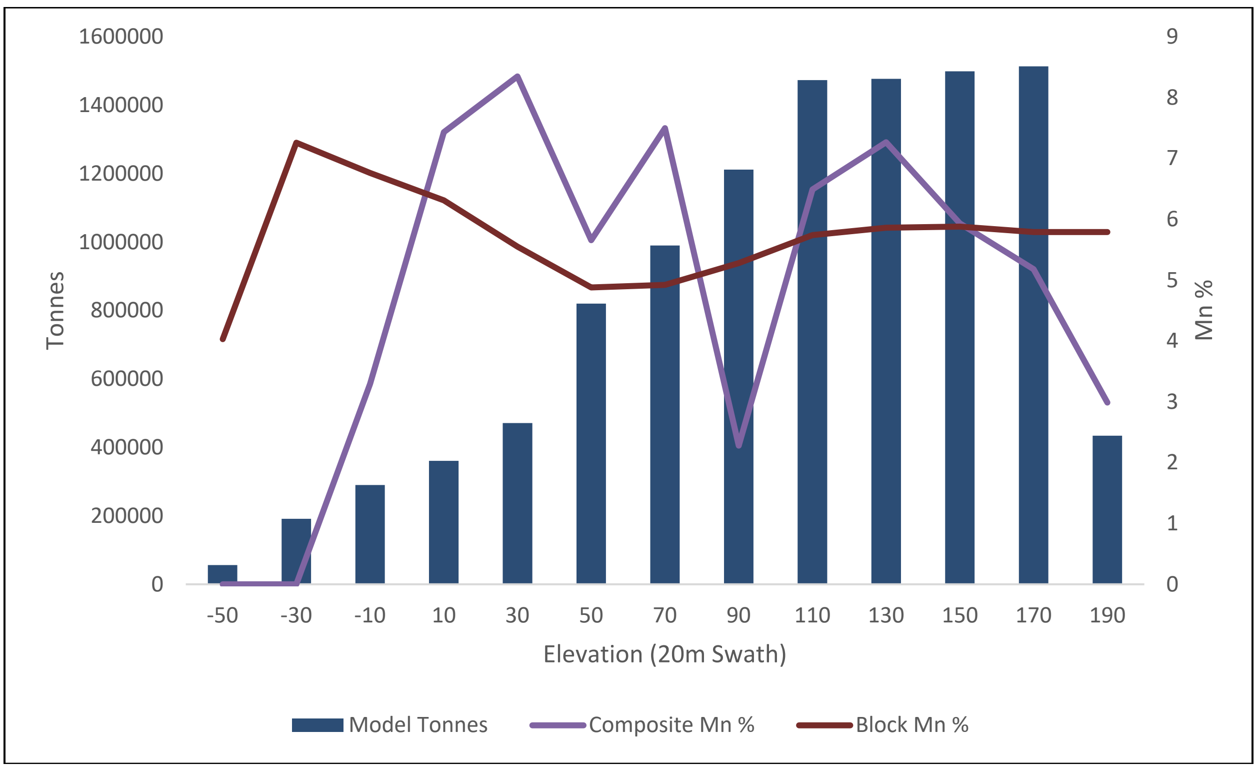


Figure 14.28: Iron Hill Area Elevation Swath Plot of Mineral Resource and 3.0 Meter Composite Mn % Grades



Mercator completed a comparative interpolation model for manganese percent using inverse distance (ID2) methods and the 3.0 meter composite population as a check against the OK interpolation results. Tonnage and grade results of the ID2 model was compared with the Battery Hill mineral resource estimate OK model at the 2.5 % Mn cut-off grade. Results are presented in Table 14.10 and the models are considered acceptably comparable.

Table 14.10: Comparison between Ordinary Kriging (OK) and Inverse Distance Squared (ID2) Interpolation Methodologies

		MRE OK Model*		**Check ID2 Model**	
Cut-off (Mn %)	**Category**	**Rounded Tonnes**	**Mn %**	**Rounded Tonnes**	**Mn %**
2.5	**Measured**	**11,260,000**	**6.75**	**11,210,000**	**6.75**
	Indicated	**23,600,000**	**6.26**	**23,360,000**	**6.36**
	Inferred	**25,910,000**	**6.66**	**25,570,000**	**6.80**

*MRE OK Model = Mineral resource estimate block model interpolated with ordinary kriging interpolation methodology. See detailed notes on mineral resources in Table 14.6 of Section 14.3.14

14.3.16 Project Risks that Pertain to the Mineral Resource Estimate

All mineral projects are subject to risks arising from various sources. These include, but are not limited to, the following:

(1) Political instability of the host country or region;
(2) Site environmental conditions that affect deposit access;
(3) Issues associated with legal access to sufficient land areas to support development and mining;
(4) Lack of certainty with respect to mineral tenure and development regulatory regimes;
(5) Lack of social licence for project development;
(6) Unforeseen negative market pricing trends;
(7) Inadequacy of deposit modelling and grade estimation programs with respect to actual metal grades and tonnages contained within the deposit;
(8) Metallurgical recoveries that fall within economically acceptable ranges cannot be attained.

At this time, the report authors do not foresee any significant risks and uncertainties that could reasonably be expected to affect the reliability or confidence in the drilling information, mineral resource estimate and metallurgical study conclusions disclosed in this technical report.

14.3.17 Comparison with Previous Mineral Resource Estimates

The June 18, 2021 mineral resource estimate is the maiden estimate for the Battery Hill Deposit. There are no previous mineral resource estimates.

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23.0 ADJACENT PROPERTIES

The Battery Hill Project is located adjacent to the Woodstock Project - Plymouth Mn-Fe deposit currently held by Canadian Manganese Company Inc. ("CMC"). The Woodstock Project is located 4 kilometres south of the southern end of claim group 5816, near the town of Woodstock and comprises Mineral Claim 5472.

Please note: the adjacent properties discussed in this section contain broadly similar geology and structure to the Battery Hill Project. However, the report authors have not independently verified the technical information for these adjacent properties and information related to the adjacent properties is not necessarily indicative of the mineralization potential at the Battery Hill properties discussed in this technical report. Furthermore, any mineral resource estimates completed by the owners of these adjacent properties and disclosed below have not been verified by the report author and are not necessarily indicative of the mineralization potential of the Battery Hill Project. As per Section 2.4(a) of NI 43-101, the source and date of these historical estimates and their associated technical reports have been disclosed below and in Section 27.

23.1 Woodstock Manganese – Iron Project of Canadian Manganese Company Inc.

Buchans Minerals Corporation (BMC) is 100% owner of CMC, who acquired the claims of the Plymouth Manganese-Iron deposit in 2010 from a private, Fredericton based company. CMC now owns 100% of associated Mineral Claim 5472.

Work completed on the property in by CMC included a a five hole (1,040 m) diamond drilling program In 2013, a 15-hole (4,082) diamond drilling program in 2013, and a 2013 mineral resource estimate by Mercator (Cullen et. al., 2013). During this time, Thibault and Associated Inc. was also retained to do bench scale metallurgical testing focused primarily on production of electrolytic manganese metal (EMM) and MSM from the Plymouth mineralization.

Table 23.1 presents the 2013 mineral resource estimate for the Woodstock Project at a Mn cut-off of 5%. This table is taken from the Technical Report prepared by Michael Cullen, P. Geo., Andrew Hilchey, P. Geo. of Mercator and Stephanie Goodine, P.Eng., Thibault and Associates Inc. entitled "Mineral Resource Estimate Technical Report for the Plymouth Mn-Fe Deposit, Woodstock Property, New Brunswick, Canada for Buchans Minerals Corporation (BMC) and Centrerock Mining Limited (a Wholly Owned Subsidiary of Minco plc.)". This report has an effective date of May 6, 2013 and was filed by CMC on SEDAR on May 23, 2013.

Table 23.1: Mineral Resource Estimate for the Plymouth Mn-Fe Deposit, Woodstock Property – Effective Date May 6, 2013 (Cullen et. al., 2013)

Mn% Cut-off	Resource Category	Rounded Tonnes	Mn%	Fe%
5	Inferred	43,710,000	9.98	14.29

Notes:

1) *Tonnages have been rounded to the nearest 10,000 tonnes.*
2) *The 5% Mn cut-off value for this resource statement reflects the reasonable prospects for eventual economic extraction for a deposit of this nature based on market conditions and using open pit mining methods.*
3) *Mineral resources that are not mineral reserves do not have demonstrated economic viability.*

4) *This estimate of mineral resources may be materially affected by environmental permitting, legal, title, taxation, sociopolitical, marketing, or other relevant issues.*

Bench scale testing by Thibault and Associates Inc. identified that the deposit mineralization occurs in two distinct forms, both containing the manganese carbonate rhodochrosite as the main manganese mineral, and easily identified by colour. The red material contains the iron oxides hematite, magnetite, and ilmenite as the primary iron minerals, whereas the grey material has the iron carbonate mineral siderite, as the main iron mineral.

In December 2013, CMC retained Tetra Tech to complete a preliminary economic assessment (PEA) for the Woodstock Project with an effective date of July 10, 2014 (Kesavanathan et. al., 2014). Tetra Tech examined two mining operation scenarios for the Woodstock Project based on the 2013 mineral resource estimate completed by Mercator with these supporting two mill throughput rates: 3,000 t/d and 1,500 t/d. The 3,000 t/d mill throughput rate was utilized as the base case operational scenario for the PEA study. Tetra Tech prioritized the net smelter return (NSR) contribution of red and grey mineralized blocks for preparation of an open pit mine plan that would maximize the project economics by preferentially extracting and processing higher value mineralization. The 2013 mineral resource estimate was updated for the PEA by application of a 3.5% Mn cut-off value defined during the PEA for in-pit resources. This produced a slight increase in resource tonnage and slight decrease Mn grade relative to the 2013 estimate.

Tetra Tech concluded that the Woodstock Project (Plymouth deposit) had good potential to become a future mining and processing operation. It recommended that CMC complete further diamond drilling to improve confidence in the mineral resource classification, complete bulk sampling and further metallurgical testing, and advance the Woodstock Project to a prefeasibility level mining study (PFS).

24.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is required to make this technical report understandable and not misleading.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Overview

This Technical Report describing a Mineral Resource Estimate for the Battery Hill Project was prepared by Mercator on behalf of Manganese X to meet reporting requirements of NI 43-101 and conforms with mineral resource estimation standards set out in the CIM Definition Standards (2014). The report incorporates important professional contributions from Kemetco with respect to metallurgical studies and from AGP with respect to pit optimization work completed to constrain mineral resources.

The Battery Hill Project covers the northern portion of a belt of Silurian, stratiform manganese-iron mineralization hosted by the Smyrna Mills Formation, as well as a small portion of the belt's southern extent. Three principal host rocks characterise the mineralization, these being brick-red to maroon-coloured siltstones, green-grey to black siltstones, and a banded mix of the red and grey siltstones. These three types of mineralized siltstones have been termed Red, Grey and Mixed for current purposes and are directly comparable to similar mineralized sequences that have been described in detail with respect to the Plymouth Manganese-Iron Deposit, located approximately 5 km south of the Battery Hill Deposit on the adjacent exploration property held by Canadian Manganese Company Inc.

Metallurgical testing programs carried out by Kemetco for Manganese X have shown that the brick-red siltstones and green-grey to black siltstones have differing minerology, resulting in significant differences in acid consumption and leachable metal content between these lithologies. Kemetco studies have also resulted in development of a process flow sheet that produces HPMSM suitable in purity for use in the steadily expanding electric vehicle (EV) battery market, in particular. The processing methods developed by Kemetco to produce HPMSM are currently the subject of patent applications by Kemetco on behalf of Manganese X.

The mineral resource estimate for the Battery Hill Project supported by this Technical Report appears below in Section 25-2 and defines a large resource inventory. In combination with the processing approaches developed by Kemetco, this inventory has potential to cost-effectively support future production of HPMSM as well as other manganese products for domestic and international sale. The forecasted expanding future market for HPMSM for production of EV batteries substantially underwrites Manganese X's strategy with respect to potential future development and production from the Battey Hill Project.

The large inventory of Measured and Indicated category mineral resources defined to date for the Battery Hill Project is sufficient to form the basis of a Preliminary Economic Assessment (PEA), a Pre-feasibility study (PFS) or a Feasibility Study (FS). However, a substantial body of additional metallurgical testing and processing flowsheet development work is required to support the PFS and FS options. The report authors are of the opinion that initiation of a PEA based on the current mineral resource estimate and Kemetco's most recent processing study results is the best approach for Manganese X to take with respect to timely and systematic evaluation of the Battery Hill Projects' economic viability. A positive PEA result should form the basis of any subsequent decision by Manganese X to move the project forward to the PFS or FS level of economic and technical evaluation. Any future PFS or FS level evaluation would benefit from conversion of certain existing Inferred category mineral resources to Indicated status, particularly in the Sharp Farm area of the deposit. This upgrading will require a modest infill core drilling and is warranted.

In addition to economic evaluation of the main Battery Hill Project, it is appropriate to carry out a basic geological assessment of Manganese X's other holding in the area, Mineral Claim 5745, that hosts historically described manganese mineralization of the same style in the current mineral resource area. A small core drilling assessment designed to test the ground magnetometer anomalies that define the mineralized stratigraphy trend in this area is warranted.

25.2 Mineral Resource Estimate

The mineral resource estimate for the Battery Hill Deposit supported by this Technical Report appears below in Table 25-1 and is based on validated results of 55 diamond drill holes totalling 10,056 m of drilling. The majority of this drilling was carried out by Manganese X between 2016 and 2020

The "reasonable prospects for eventual economic extraction" requirement for the mineral resource estimate was assessed by means of developing an optimized open pit shell to constrain mineral resources. The pit shell was based on the mineral deposit block model and developed by AGP for Mercator using Hexagon Mine Plan 3D version 15.4, MineSight® Economic Planner version 4.00. Pit optimization parameters include metal pricing of US$1,500 per tonne for HPMSM, an exchange rate of CDN$1.30 to US$ 1.00, mining at CDN $6.50 per tonne, combined processing and G&A at CDN $86.22 per tonne processed, and a milling recovery to HPMSM of 65%. Although iron content was also estimated and is currently reported for the deposit, only manganese content was used in the pit optimization process. The optimized pit shell supports a 3.7:1 strip ratio with average pit slopes of 20° in overburden and 45° in bedrock.

Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization and is considered to define reasonable prospects for eventual economic extraction by open pit mining methods. Table 25-2 illustrates the effect of cut-off grade on total deposit tonnage, average metal grades and contained Mn metal.

Measured, Indicated, and Inferred mineral resources are defined as all blocks with interpolated manganese grades from the first, second or third interpolation pass, respectively, that meet the specified pit-constrained cut-off grade and demonstrate reasonable continuity. Orphan blocks and discontinuous zones of mineral resource categorization were refined through application of categorization solid models.

Table 25-1: Battery Hill Project Mineral Resource Estimate – Effective Date: June 18, 2021*

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	Measured	11,260,000	6.75	10.96
	Indicated	23,600,000	6.26	10.53
	Measured and Indicated	34,860,000	6.42	10.67
	Inferred	25,910,000	6.66	10.92

Mineral Resource Estimate Notes:

1) Mineral resources were prepared in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves (MRMR) (2014) and CIM MRMR Best Practice Guidelines (2019).
2) Mineral resources are defined within an optimized pit shell with average pit slope angles of 45º and a 3.7:1 strip ratio (waste : mineralized material).
3) Pit optimization parameters include: pricing of US$1500/tonne for High Purity Manganese Sulphate Monohydrate - 32% Mn (HPMSM), exchange rate of CDN $1.30 to US$ 1.00, mining at CDN $6.50/t, combined processing and G&A (1000 tpd) at CDN $86.22/t processed and a process recovery of Mn to HPMSM of 65%. Fe content was not included in the pit optimization.
4) Mineral resources are reported at a cut-off grade of 2.50 % Mn within the optimized pit shell. This cut-off grade reflects total operating costs used in pit optimization to define reasonable prospects for eventual economic extraction by open pit mining methods.
5) Mineral resources were estimated using Ordinary Kriging methods applied to 3 m downhole assay composites. No grade capping was applied. Model block size is 5 m (x) by 5 m (y) by 5 m (z)
6) Bulk density was applied using a regression curve based on Mn % and Fe % block grades.
7) Mineral resources may be materially affected by environmental, permitting, legal, title, taxation, sociopolitical, marketing, or other relevant issues.
8) Mineral resources are not mineral reserves and do not have demonstrated economic viability.
9) Mineral resource tonnages are rounded to the nearest 10,000.

Table 25.2: Battery Hill Project Cut-off Grade Sensitivity Analysis Within Mineral Resources

Cut-off (Mn %)	Category	Rounded Tonnes	Mn %	Fe %
2.5	**Measured**	**11,260,000**	**6.75**	**10.96**
	Indicated	**23,600,000**	**6.26**	**10.53**
	Inferred	**25,910,000**	**6.66**	**10.92**
5	Measured	8,680,000	7.52	11.73
	Indicated	15,930,000	7.26	11.65
	Inferred	18,630,000	7.71	11.92
6	Measured	6,250,000	8.32	12.44
	Indicated	11,680,000	7.91	12.35
	Inferred	14,130,000	8.41	12.64
7	Measured	4,460,000	9.06	13.11
	Indicated	7,790,000	8.61	12.95
	Inferred	10,610,000	9.05	13.30

Notes:
This table shows sensitivity of the June 18, 2021 mineral resource estimate to cut-off grade. The base case at a cut-off value of 2.5 % Mn is bolded for reference.

25.3 Metallurgical Studies

The mineralogical and metallurgical studies undertaken to date on Battery Hill mineralization for Manganese X used separate composite samples of Red and Grey mineralization, and a Mixed composite in some cases. The primary (master) composite samples were prepared from assay sample reject material from exploration drill-holes SF-16-6, -8 and -9 drilled on the Moody Hill section and holes SF-16-2, -4 and -5, drilled on the Sharpe Farm section of the Battery Hill deposit.

The first metallurgical programs consisted of diagnostic leach testing carried out by Kemetco and KPM to determine the achievable manganese extraction, investigate the leach kinetics of the major leachable elements and to measure the acid consumption for the main types of mineralization on the property (Red, Grey and Mixed). The test results were encouraging, with the best manganese extraction results exceeding 95%.

Kemetco subsequently carried out a program of purification testing and initial results showed that two stages of purification, which involved neutralization with lime and precipitation of Ca and Mg with fluoride, were very effective at removing Fe and Al contamination, and significantly reduced the Ca and Mg. A third purification step, involving manganese carbonate precipitation and redissolution, was added to further reduce Ca and Mg, and to remove residual process reagents, resulting in a clean solution feeding the evaporation and crystallization stage. Crystal washing steps allowed further purification of the crystals, and the resulting crystal purities were above 99.9%. It was projected that even lower levels of impurity could be achieved in the final product, if needed, through additional washing steps.

A follow-up program by Kemetco was carried out to define principal unit operations of a flowsheet for the production of high purity $MnSO_4$ (HPMSM) from the Battery Hill mineralization. This included investigation of leaching methods and the effects of principal leaching parameters, solid-liquid separation methodology, and primary and secondary purification processes. Results from bench-scale leach tests showed the importance of maintaining sufficient acidity in the leach, either by maintaining a low pH set point or by limiting solids loading through lower pulp density. There was also a lesser but significant benefit from high temperature leaching, but the most significant impact on recovery was from reduced feed particle size, with recovery increasing above 85% using a moderate grind. Addition of a reducing agent (SMBS) to a leach with ground mineralization resulted in further improvement in manganese recovery but had a more significant impact on iron and magnesium extraction, resulting in high acid consumption and high impurity concentrations. A single small-scale vat leach test was also completed on an agglomerated sample of as-received Red composite material and gave significantly lower recoveries. It did, however, demonstrated an alternate approach to leaching that may have economic advantages if it can be successfully optimized.

Process development work at Kemetco was on-going at the time of this technical report, with continuing testing designed to establish a fully integrated process flowsheet and to prepare mass balance data around each chosen unit operation.

Manganese X also contracted NRC to investigate the potential for mineralization upgrading processes to remove acid consuming minerals to reduce the acid requirements for leaching. Testing results showed that gravity methods produced limited separation. Magnetic methods demonstrated some selectivity and produced an upgrading factor of 1.26. Two flotation reagent schemes based on fatty acid and hydroxamic acid collectors were also investigated and best results were achieved when a full rougher concentrate was cleaned three times. The combined 1st cleaner and scavenger concentrates, grading 17.3% Mn, recovered 64.1% of the manganese in 43.7% of the mass. Further cleaning resulted in further upgrading, with the third cleaner concentrate grading 19.5% Mn with 51.3% recovery in 31.1% of the mass.

In 2017, Manganese X initiated a preliminary study by Steinert US of sensor-based ore-sorting separation. The sorter was shown to be effective in upgrading the mineralization under a range of sensitivity settings, with the best product grading 14.72% Mn. Separate preliminary testing of 'tribo-electrostatic' separation did not show a significant separation or upgrading of the manganese under normal test conditions.

25.4 Project Risks and Uncertainties

All mineral projects are subject to risks arising from various sources. These include, but are not limited to, the following:

(1) Political instability of the host country or region;
(2) Site environmental conditions that affect deposit access;
(3) Issues associated with legal access to sufficient land areas to support development and mining;
(4) Lack of certainty with respect to mineral tenure and development regulatory regimes;
(5) Lack of social licence for project development;
(6) Unforeseen negative market pricing trends;
(7) Inadequacy of deposit modelling and grade estimation programs with respect to actual metal grades and tonnages contained within the deposit;
(8) Metallurgical recoveries that fall within economically acceptable ranges cannot be attained.

At this time, the report authors do not foresee any significant risks and uncertainties that could reasonably be expected to affect the reliability or confidence in the drilling information, mineral resource estimate and metallurgical study conclusions disclosed in this technical report.

26.0 RECOMMENDATIONS

The following recommendations with respect to further evaluation of the Battery Hill Project are based on work completed to date by Mercator, AGP and Kemetco. A two Phase approach is presented, with commitment to Phase II being contingent on receipt of sufficiently positive results from Phase I.

26.1 Phase I Program

To expedite economic evaluation of the Battery Hill Project, it is recommended that a PEA based on the June 18th, 2021 mineral resource estimate and Kemetco's latest metallurgical processing flowsheet be initiated as soon as possible.

Due to the importance of the metallurgical processing costs, production rates and product values to the overall project economics, significant additional testwork is recommended to confirm and refine the proposed process flowsheet, including:

- Testing of multiple composite samples derived from principal areas of mineralization included in the resource estimate.
- Comminution testing to determine crushing and grinding work index values.
- Grind-recovery testing based on sulphuric acid tank leaching.
- Leach optimization testing with a focus in minimizing acid consumption and leaching of impurities to reduce downstream purification costs.
- Purification and crystallization optimization testing aimed at confirming the overall process flowsheet, achievable product qualities, recovery rates, recycle and by-product streams, and a preliminary overall mass balance for the process.

It is also recommended that two small drilling programs be undertaken in Phase I. The first, totalling 1,500 m of infill drilling, should be directed toward mineral resource category upgrading in the Sharp Farm area. The second, totaling 400 m of drilling should be undertaken on Manganese X's Mineral Claim 5745, located 10 kilometers south of Battery Hill. The purpose of this program would be to meet government assessment work requirements and to also provide initial characterization of manganese and iron mineralization known to be present in that area.

26.2 Phase II Program

Preparation of a PFS for the Battery Hill Project comprises the entirety of the Phase II recommended work program. Commitment to this evaluation is contingent upon receipt of a sufficiently positive economic evaluation from the Phase I PEA. A PFS will require detailed contributions across a broad range of professional and technical fields that include geotechnical, mining, metallurgical and civil engineering as well as completion of advanced geological, mineral resource estimation, environmental, marketing and economic analysis studies. Details of these advanced project components were not addressed for current report purposes. However, a general cost estimate based on comparable size projects was developed for budget purposes and appears below in Section 26.3.

26.3 Work Program Budget Estimates

Budget estimates for the recommended Phase I and Phase II work programs appear in Table 26.1.

Table 26.1: Phase I and Phase II: Recommended Budgets

Phase 1	Task	Estimated Cost CDN$
	Preparation of a PEA based on the June 18, 2021 mineral resource estimate and updated Kemetco processing flow sheet	150,000
	Sharp Farm area infill drilling (1,500 meters) including reporting and analyses	300,000
	Mineral Claim 5745 exploration drilling (400 meters) including reporting and analyses	80,000
	Sub-total	530,000
	Administration and support	53,000
	Total	**583,000**
Phase II	Preparation of a PFS contingent upon positive results of the Phase I PEA	2,000,000
	Administration and support (~15%)	300,000
	Total	**2,300,000**

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28.0 AUTHOR CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

I, Paul J. Ténière, M.Sc., P.Geo., do hereby certify that:

1. I am currently employed as a Senior Geologist with:
   Mercator Geological Services Limited
   65 Queen Street, Dartmouth, NS B2Y 1GA Canada
2. The Technical Report to which this certificate applies is titled "NI 43-101 Technical, Battery Hill Project Mineral Resource Estimate, Woodstock Area, New Brunswick, Canada" with an effective date of June 18th, 2021.
3. I hold a M.Sc. in Geology from Acadia University (2002) and a B.Sc. (Honours) degree in Earth Sciences (1998) from Dalhousie University. I have worked as a geologist in Canada, USA, and internationally since my graduation over 20 years ago. My relevant experience with respect to this project includes extensive professional experience with respect to geology, mineral deposit styles, and exploration activities in the Northern Appalachians including the Silurian sedimentary succession that is the focus of this Technical Report.
4. I am a member in good standing with the Association of Professional Geoscientists of Ontario (Registration Number: 2493) and the Association of Professional Engineers and Geoscientists of New Brunswick (Registration Number: M8502).
5. I have read the definition of a "Qualified Person" as set out in National Instrument 43-101 ("NI 43-101"), and certify that by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
6. I completed a personal inspection of the Battery Hill Project on February 24th, 2021.
7. I am responsible for all sections of this Technical Report except sections 13 and 14 and I have no prior involvement with the Battery Hill Project that is the subject of this Technical Report.
8. I am independent of Manganese X Energy Corp. as described in Section 1.5 of NI 43-101.
9. I have read NI 43-101 and this Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make this Technical Report not misleading.

Signed, sealed and dated this 19th day of August, 2020.

(Original signed and sealed by Paul Ténière)

Paul Ténière, M.Sc., P.Geo.
Senior Geologist, Mercator Geological Services Limited

CERTIFICATE OF QUALIFIED PERSON

I, Matthew D. Harrington, P. Geo., do hereby certify that:

1. I am currently employed as Senior Resource Geologist with:
   Mercator Geological Services Limited
   65 Queen Street, Dartmouth, NS
   B2Y 1GA, Canada

2. The Technical Report to which this certificate applies is titled "NI 43-101 Technical Report, Battery Hill Project Mineral Resource Estimate, Woodstock Area, New Brunswick, Canada" with an effective date of June 18th, 2021

3. I hold a Bachelor of Science degree (Honours, Geology) in 2004 from Dalhousie University and I have worked as a geologist in Canada and internationally since my graduation. My relevant experience with respect to this Project includes extensive professional experience with respect to geology, mineral deposits and exploration activities in the Northern Appalachians and elsewhere. I have specific experience in assessment of Mn-Fe deposits in the Woodstock area and contributed to the 2014 PEA and 2013 mineral resource estimate prepared for the nearby Plymouth deposit on behalf of Canadian Manganese Company Inc. I also contributed to the June 2021 mineral resource estimate prepared for the iron-manganese deposit located on the adjacent property held by Manganese X Energy Corp.

4. I am a member in good standing of the Association of Professional Geoscientists of Nova Scotia (Registration Number 0254) and the Association of Professional Engineers and Geoscientists of Newfoundland and Labrador (Member Number 09541).

5. I have read the definition of "Qualified Person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I have not visited the Woodstock Project.

7. I am responsible for Section 14 (except 14.3.11) of this Technical Report. I also have previous involvement with the Battery Hill Project through participation in drill program planning and deposit modelling studies, beginning in 2017.

8. I am independent of Manganese X Energy Corp. as described in Section 1.5 of NI 43-101.

9. I have read NI 43-101 and this Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.

10. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make this Technical Report not misleading.

Signed, sealed and dated this 19th day of August, 2021.

(*Original signed and sealed by Matthew Harrington****)***

____

Matthew Harrington, P. Geo.

CERTIFICATE OF QUALIFIED PERSON

I, Lawrence Elgert, B.S., P. Eng., do hereby certify that:

1. I am currently employed as Principal Mining Engineer with:
   AGP Mining Consultants Inc.
   Suite 246-132K Commerce Park Dr.
   Barrie, ON
   L4N 0Z7, Canada
2. The Technical Report to which this certificate applies is titled “NI 43-101 Technical Report, Battery Hill Project Mineral Resource Estimate, Woodstock Area, New Brunswick, Canada” with an effective date of June 18th, 2021.
3. I am a graduate of the Montana College of Mineral Science and Technology with a B.S. in Mining Engineering in 1989. I have practiced my profession in the mining industry continuously since graduation. My relevant experience includes over 30 years where I have been directly involved in mine planning and design, ore control, geomechanics, production forecasting and management, slope stability monitoring and operations, mainly for open-pit precious and base metal and coal mines. I have previous experience with respect to pit optimization studies related to the sedimentary succession that is the focus of this Technical Report.
4. I am a member in good standing of Engineers and Geoscientists BC (Registration Number: 29807).
5. I have read the definition of “Qualified Person” set out in National Instrument 43-101 (“NI 43-101”) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
6. I have not visited the Battery Hill Project and I have no previous involvement with the Battery Hill Project the subject of this Technical Report.
7. I am responsible for Section 14.3.11 of the Technical Report.
8. I am independent of Manganese X Energy Corp. as described in Section 1.5 of NI 43-101.
9. I have read NI 43-101 and this Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make this Technical Report not misleading.

Signed, sealed and dated this 19th day of August, 2021.

(Original signed and sealed by Lawrence Elgert)

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Lawrence Elgert, P. Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Douglas Warkentin, P. Eng., do hereby certify that:

1. I am currently employed as Senior Metallurgist with:
   Kemetco Research Inc.
   13260 Delf Place #150
   Richmond, BC
   V6V 2A2, Canada
2. The Technical Report to which this certificate applies is titled "NI 43-101 Technical Report, Battery Hill Project Mineral Resource Estimate, Woodstock Area, New Brunswick, Canada" with an effective date of June 18th, 2021
3. I received a Bachelor of Applied Science degree (Mining and Mineral Process Engineering) in 1988 from the University of British Columbia, and have worked as a Mineral Process Engineer and Extractive Metallurgist in Canada and internationally since my graduation. My relevant experience with respect to this Project includes extensive professional experience with respect to process development for mineral properties, incorporating aspects of ore preparation, physical upgrading, hydrometallurgical treatment of ores and concentrates and selective recovery of metal products from process solutions. This experience covers laboratory development programs, pilot testing and commercial operations.
4. I am a member in good standing of Engineers and Geoscientists BC (Registration Number: 19059).
5. I have read the definition of "Qualified Person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I have not visited the Battery Hill Project but have worked on the Project for Manganese X Energy Corp. since 2018.
7. I am responsible for section 13 of this Technical Report.
8. I am independent of Manganese X Energy Corp. as described in Section 1.5 of NI 43-101.
9. I have read NI 43-101 and this Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make this Technical Report not misleading.

Signed, sealed and dated this 16th day of July 2021.

(Original signed and sealed by Douglas Warkentin)

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Douglas Warkentin, P. Eng.