MINERAL RESOURCE ESTIMATE TECHNICAL REPORT FOR THE PLYMOUTH MN-FE DEPOSIT WOODSTOCK PROPERTY NEW BRUNSWICK, CANADA

For
Buchans Minerals Corporation
And
Centrerock Mining Limited
(A Wholly-Owned Subsidiary of Minco plc)

Located at
603460mE
5113320mN
UTM NAD 83, Zone 19

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Effective Date: May 6th, 2013

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Summary

Buchans Minerals Corporation (“BMC”), through its subsidiary Canadian Manganese Corporation (“CMC”) is the registered owner of a 100 percent interest in Mineral Claim 5472, the “Woodstock Property” which covers the Plymouth Mn-Fe Deposit, located near Woodstock, New Brunswick, Canada. The Woodstock property consists of 215 map staked claims having a combined surface area of 5,875 ha. Centrerock Mining Limited is a wholly-owned subsidiary of Minco plc (here in referred to as “Minco”), an Irish exploration and development company listed on the Alternative Investment Market (“AIM”), that holds an option to earn a 50% interest in CMC.

This Technical Report describing a mineral resource estimate for the Plymouth Mn-Fe Deposit was prepared by Mercator on behalf of BMC and Minco (“BMC-Minco”) to meet reporting requirements of National Instrument 43-101 (“NI 43-101”) - Standards of Disclosure for Mineral Projects and conforms with resource estimation standards established by the Canadian Institute of Mining, Metallurgy and Petroleum, Definition Standards on Mineral Resources and Mineral Reserves (“CIM Standards”).

The history of exploration and mining on the property dates from the late 1840’s and in the 1848 through 1884 period approximately 70,000 tons (63,497 tonnes) of iron ore was mined from stratiform Mn-Fe deposits hosted by the Silurian Smyrna Mills Formation. This ore was locally smelted. BMC acquired the property in 2010, through a purchase agreement with a Fredericton-based private company, after reviewing results of earlier geological and metallurgical test work. BMC subsequently engaged Wardrop Engineering Ltd., a Tetra Tech Company (“Wardrop”), to complete an internal review of the historical data and update it to reflect up to date operating, capital and market data. Wardrop concluded that under 2010 market conditions, and given larger tonnage through-puts, development of the deposit would be economically viable. They also concluded that improved process recoveries and concentrate grades could be expected from additional metallurgical testing and that better recoveries would enhance project economics. Results of the Wardrop study were for internal working purposes and were not suitable for public disclosure, as they were not considered reliable, or compliant, under National Instrument 43-101. Wardrop’s review is succeeded by more comprehensive economic and hydrometallurgical reviews, undertaken for BMC by Thibault and Associates Inc. (“Thibault”), a process chemical engineering consulting firm specializing in the development and design of metallurgical and hydrometallurgical processes.. Key elements of Thibault’s work have been disclosed in BMC news releases and are further summarized in this report.

In 2011, BMC completed a 1,040 m (5 hole) diamond drilling program on the Plymouth deposit that was followed up in 2013 by a 4,082 m (15 hole) program by BMC and Minco (BMC-Minco). Composite samples for metallurgical testing were prepared from 2011 drilling program coarse reject material, to represent the general properties of the Plymouth Mn-Fe Deposit. Since

2011, Thibault has been contracted to conduct bench scale testing for development of a hydrometallurgical process to produce electrolytic manganese metal (EMM) from the deposit.

In the first phase of the metallurgical test program, process conditions were identified to obtain manganese extractions in the range of 87.0% to 94.1% from the 2011 bulk composite drill core sample using a sulphuric acid leach. In the second phase of testing, operating conditions for the leach were augmented to maintain a high recovery of manganese, while also optimizing on factors that impact on the economics of the leaching process, such as reagent consumption, pulp density, heating requirements and residence time. Bench scale testing of the sulphuric acid leach using the augmented process conditions from the second phase resulted in manganese extractions ranging from 85.7% to 88.2%.

Unit operations and process operating conditions for leach solution purification, using commercially proven technologies, for precipitation of iron as goethite and sulphide precipitation for trace heavy metal impurities, have also been defined to produce a purified manganese sulphate solution that meets target specifications for electrowinning of manganese, based on operating data from commercial EMM operations.

Bench scale test programs completed by Thibault to date have included testing of all major unit operations proposed for hydrometallurgical processing of the Plymouth Fe-Mn Deposit, with the exception of electrowinning. The process technology proposed by Thibault is considered technically viable. Positive results have also been obtained from preliminary pre-concentration studies that assessed a number of different pre-concentration techniques, including, High Gradient Magnetic Separation (HGMS), Flotation and Heavy Media Separation (HMS). HGMS has been identified as the most favourable pre-concentration method tested to date, which resulted in upgrading of feed material from 11.4% to 15.6% Mn at 86.7% recovery.

The mineral resource estimate described in this report is based on validated results of 2011 and 2013 drilling programs carried out by BMC and BMC-Minco plus validated results of 5 drill holes and 2 trenches completed by Maritime Resource Research Limited (MRR) in 1987. The deposit was modeled as a folded, stratiform Mn-Fe deposit occurring within a northeast striking, steeply dipping host sequence of red and grey siliciclastic sedimentary rocks using Gemcom – Surpac Ver. 6.4.1 deposit modeling software. Drilling defined mineralization within the resource estimate block model occurs along a 700 m strike length and reaches a maximum width of approximately 200 m in the central deposit area. Inverse distance squared (ID^2) interpolation methods and 3 m down hole assay composites were used to assign manganese, iron and specific gravity values within the block model, with block dimensions being 10 m (x) by 10 m (y) by 10 m (z). The predominant manganese compound in the deposit is manganese carbonate (MnCO3). Metal grade assignment was peripherally constrained by two separate wire-framed solid models based on sectional geological interpretations for the deposit and a minimum included grade of 5 % Mn over 12 metres in the respective down hole direction of each drill hole.

The main resource solid defines a folded geometry, with near vertical to steeply dipping eastern and western limbs and a broad interpreted closure zone. The eastern fold limb is recognizable for only 400 meters of block model strike length. The second resource solid was developed along the peripheral limits of the western limb of the main solid to constrain additional stratiform mineralization that shows less continuity and lower average manganese grade than that of the main solid. Results from 639 separate laboratory determinations of specific gravity were composited at a 3-meter down hole support length and were then used to develop the interpolated specific gravity model. The resource estimate and supporting block model were checked by comparison with geological and assay sections and also against results of grade interpolation, using Ordinary Kriging methods. Very good correlation exists between results of the two interpolation methods and results of section checking showed good model correlation to drill hole datasets.

The mineral resource estimate for the Plymouth Mn-Fe deposit prepared by Mercator reflects a 5% Mn cut-off value and has an effective date of May 6th, 2013. The resource estimate is highlighted in the tabulation below, which also illustrates sensitivity of total deposit tonnage and grade to increasing Mn% cut-off values. The resource statement is bolded and shaded in the tabulation. A separate tabulation of contained Mn metal is also provided below. Economic and mine planning studies have not yet been carried out for the deposit, but Mercator is of the opinion that the 5% Mn resource statement cut-off grade value defines a reasonable expectation of economic viability based on market conditions and potential for development using open pit mining methods.

Plymouth Mn-Fe Deposit Resource Estimate – May 6th, 2013*

Mn% Cut-off	Resource Category	Rounded Tonnes	Mn%	Fe%
5	**Inferred**	**43,710,000**	**9.98**	**14.29**
6	Inferred	41,610,000	10.20	14.55
7	Inferred	38,260,000	10.52	14.91
8	Inferred	33,800,000	10.92	15.36
9	Inferred	28,830,000	11.34	15.83
10	Inferred	22,460,000	11.86	16.42
11	Inferred	15,330,000	12.49	17.12
12	Inferred	9,100,000	13.19	17.93

**Notes:*

1. *Tonnages have been rounded to the nearest 10,000 tonnes.*
2. *The 5% Mn cut-off value for this resource statement is bolded above and reflects a reasonable expectation of economic viability for a deposit of this nature based on market conditions and 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.*

Total Contained Mn at the 5% Inferred Resource Statement Cut-off Value

Mn% Cut-off	Category	Rounded Tonnes	Mn%	lbs Mn (billions)
5	Inferred	43,710,000	9.98	9.62

Based on the current block model and associated mineral resource estimate, Mercator has concluded that the Plymouth Mn-Fe deposit, as currently defined by a 5% Mn cut-off value, remains open, both along strike and down dip, and that further core drilling to assess deposit extensions in these areas is warranted. Mercator has also concluded that infill drilling within current resource model limits, at a 50 metre intercept spacing, would be necessary to upgrade much of the currently defined Inferred mineral resource to the Indicated mineral resource category of confidence.

The current Inferred resource is considered to be of sufficient size and integrity to support a Preliminary Economic Assessment study. Completion of such a study comprises the recommended Phase I work program, which has an estimated total budget of $825,000. A recommended Phase II program is contingent on positive results and recommendations from the recommended Phase I program. Phase II consists of the completion of a Pre-Feasibility level economic assessment. Phase II has an estimated budget of $3.74 million and includes programs of resource infill drilling, to raise significant amounts of the Inferred Resource to Indicated confidence, advanced metallurgical flowsheet investigations, mine planning studies, market studies, environmental studies and economic analysis, all leading to completion of a Pre-Feasibility Study.

1 Introduction and Terms of Reference

This Technical Report was prepared by Mercator Geological Services Limited (Mercator) on behalf of Buchans Minerals Corporation (BMC) and Centrerock Mining Limited (Centrerock), a wholly-owned subsidiary of Minco plc (Minco), in accordance with requirements of National Instrument 43-101 and in compliance with the CIM Standards for mineral resource estimates. The purpose of the report is to provide an exploration update and mineral resource estimate for the Plymouth Mn-Fe Deposit, in support of regulatory filings by BMC and Minco. Terms of reference were established through discussions between BMC staff and Mercator and it was determined that the report would be based on historic exploration information, results of exploration programs completed by BMC in 2011 and BMC-Minco in 2013, and results of preliminary metallurgical investigations carried out by Thibault and Associates Inc. ("Thibault") in 2012-2013. The property was described in a previous Technical Report completed by Mercator (Webster et al., 2012) and new exploration program results presented here in are primarily associated with the 2011 and 2013 drilling programs and the preliminary metallurgical tests carried out by Thibault.

To a substantial degree, the material found in this report summarizes property assessment report information filed by BMC with the New Brunswick Department of Natural Resources and Energy (NBDNRE). Where applicable, various government assessment reports, filed by companies other than BMC, have also been consulted, along with pertinent academic publications, government reports, associated maps and the previous BMC technical report prepared by Mercator (Webster et al., 2012). These sources are cited as necessary throughout the report. Mercator recognizes the contribution of staff member Matthew Harrington (B. Sc., Hons.) to the resource modelling program, which was carried out under supervision of author Cullen.

Mr. Andrew Hilchey, P. Geo., of Mercator completed a site visit to the Woodstock area in March of 2013, which included review of Plymouth Mn-Fe deposit diamond drill core and hole locations for 2011 and 2013 drilling program holes, as well as collection of 15 independent check samples. Core from 1987 drilling on the property that is archived by the Government of New Brunswick in Sussex, New Brunswick was also reviewed for site visit purposes and samples of this were included in the Mercator check sample program.

The authors of this report are Qualified Persons as defined under NI 43-101 and the authors, Mercator and Thibault worked strictly on a fee for service basis. The BMC mineral resource estimation here in was one of numerous contracts under management by Mercator at the time of the preparation of this report. The authors have specific experience in the geology and mineralization types detailed in this report that reflects participation in exploration and development projects in Newfoundland and Labrador, New Brunswick and elsewhere.

1.1 Abbreviations and Units of Measure

The abbreviations, units of measure and conversion factors presented in Table 2.1 have been used throughout this report.

Table 1.1: Listing of Abbreviations and Conversions

AA	Atomic Absorption
Ag	Silver
Al	Aluminum
ALS	ALS Limited
As	Arsenic
amsl	above mean sea level
Atlantic Analytical	Atlantic Analytical Services Limited
Au	Gold
Ba	Barium
BIF	Banded Iron Formation
BMC	Buchans Minerals Corporation
C	Celsius
CDN	Canadian
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	centimetre
CMC	Canadian Manganese Company Inc.
CSA	Canadian Securities Administrators
Cu	Copper
Eastern Analytical	Eastern Analytical Limited
Eastern Geophysics	Eastern Geophysics Limited
EMM	Electrolytic manganese etal
Fe	Iron
g	gram (0.03215 troy oz)
Geotech	Geotech Limited
GSC	Geological Survey of Canada
ha	hectare
HLEM	Horizontal-Loop Electromagnetic
ICP	Inductively Coupled Plasma
ICP-OES	Inductively Coupled Plasma Optical Emission Spectroscopy
IP	Induced Polarisation
JV	Joint Venture
K	Potassium
kg	kilogram

km	kilometre
L	litre
lb	pound
Leitch	Leitch Mining Limited (Leitch)
m	metre
Ma	mega annum
MEC	Minerals Engineering Center
Mercator	Mercator Geological Services Limited
Minco	Minco plc
mm	millimetre
Mn	Manganese
MRR	Mineral Resource Research Limited
Na	Sodium
NBDNRE	New Brunswick Department of Natural Resources and Energy
NI-43-101	National Instrument 43-101
Noranda	Noranda Incorporated
Noranda Exploration	Noranda Exploration Limited (Noranda Exploration)
Noranda Mines	Noranda Mines Limited (Noranda Mines)
O	Oxygen
oz	troy ounce (31.04 g)
Oz/T to g/t	1oz/T = 34.28 g/t
Pb	Lead
PEA	Preliminary Economic Assessment
PR	Press Release
RPC	New Brunswick Research and Productivity Council
S	Sulphur
Sb	Antimony
SGS	SGS Lakefield Ltd.
Si	Silica
Stratmat	Stratmat Limited
t	tonne (1000 kg or 2,204.6 lb)
T	ton (2000 lb or 907.2 kg)
TDEM	Time-Domain Electromagnetic
Thibault	Thibault & Associates Inc.
Validated	Checked against supporting documentation
VLF-EM	Very Low Frequency Electromagnetic
Wardrop	Wardrop Engineering Limited – a Tetra Tech Company
Witteck	Witteck Development Inc.
XRAL	X-ray Assay Laboratories Limited

XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence
Zn	Zinc

2 Reliance on Other Experts

This current report was prepared by the author and Mercator staff for BMC and Minco, and the information and conclusions contained here in are based upon information available to Mercator at the time of report preparation. This includes data made available by both BMC and third party sources. Information contained in this report is believed to be reliable but the report is, in part, based upon information not within Mercator's control. Mercator has no reason to question the quality or validity of data used in this report. Comments and conclusions presented here in reflect Mercator's best judgment at the time of report preparation and are based upon information available at that time.

Mercator has relied on Thibault for the information contained in Section 12 of this report, "Mineral Processing and Metallurgical Testing", with the exception of section 12.1, and for recommendations arising from this work that appear in the Summary and in Sections 16.0 and 17.0.

This report also expresses opinions regarding exploration and development potential for the project and recommendations for further analysis. These opinions and recommendations are intended to serve as guidance for future development of the property, but should not be construed as a guarantee of success.

Mercator is not a Qualified Person with respect to comments on environmental matters, validity of surface rights, titles and other issues of land ownership in the province of New Brunswick and has relied upon information received from BMC in such cases. Mercator has also relied upon BMC with respect to description of its option agreement with Minco and assertions regarding encumbrances, if any, that may apply to the property.

3 Property Description and Location

3.1 Introduction

As title holder, BMC has the exclusive right to explore for minerals within the Woodstock property boundaries, being Mineral Claim 5472, and additionally is the owner of surface rights covering an area of 130 acres, over a portion of the Plymouth deposit. BMC has, as necessary, entered into agreements for land access with surface right holders for the purpose of mineral exploration on those areas where BMC does not already own the surface rights. Boundaries of the surface and mineral rights for the Woodstock property have not been legally surveyed.

To the knowledge of the authors, there are no environmental liabilities on any of the subject properties. In addition, BMC has acquired all exploration and drilling permits necessary to carry out exploration completed to date on the properties and the company has advised that it does not anticipate any difficulty in establishing access to the Plymouth Mn-Fe deposit area, of the Woodstock Property, for purposes of further exploration as recommended in this report. The authors are not aware of any other significant factors or risks that may affect access, title, or the right or ability to perform work on the Woodstock property.

3.2 Woodstock Property

The Woodstock property, which contains the Plymouth Mn-Fe deposit, is located in Carleton County, south western New Brunswick, Canada, approximately 5 km west of the town of Woodstock (Figure 3.1). The Plymouth Fe-Mn deposit is located in the south western area of the northernmost claim block, less than one km north of Highway 95 to Houlton, Maine, United States of America ("USA") and is accessed by Plymouth Road, which is located just west of the deposit. Approximate deposit co-ordinates are 0603460 mE 5113320 mN (UTM NAD 83 Zone 19) and the elevation of the properties is approximately 124 m above mean sea level (amsl).

The Woodstock property consists of 232 mineral claims that cover approximately 5,875 ha of surface area, which is held under Mineral Claim 5472. BMC acquired the mineral rights by purchasing the original claim block of 21 claim units covering the Plymouth Fe-Mn deposit and most of the Hartford Fe-Mn deposit on August 4, 2010 from Mineral Resource Research Ltd. (MRR), a private company based in Fredericton, New Brunswick. Upon completion of the purchase of the mineral rights, the claim units were transferred from MRR to BMC, which now holds a 100% interest in the mineral rights through its 100% owned subsidiary, Canadian Manganese Corporation (CMC) without any underlying royalties, or other conditions associated with the acquisition of the mineral rights.


600,000 mE
700,000 mE
800,000 mE
900,000 mE
5,400,000 mN
5,300,000 mN
5,200,000 mN
5,100,000 mN
5,000,000 mN
QUEBEC
N
Campbellton
Bathurst
Gulf of
St. Lawrence
Edmundston
NEW BRUNSWICK
Miramichi
P.E.I.
MAINE
(U.S.A.)
Woodstock
Property
Woodstock
Moncton
Fredericton
Saint John
Bay of Fundy
NOVA
SCOTIA
CANADA
NEW BRUNSWICK
BMC
Figure 3.1
Woodstock Property Location Map
NAD 83 UTM Zone 19N
NTS: 21J/04
Date: May 2013
mercator
0
50
100
Kilometres

After acquiring the initial MRR property, BMC staked additional mineral claim blocks in 2010 and 2011 to cover previously documented Fe-Mn occurrences in addition to the extensions of associated gravity and magnetic anomalies which extend for up to 20 km along strike in a southwest direction. The consolidated land package provides contiguous claim coverage over the 20 km long corridor of known historical deposits from the North Hartford deposit to the USA border (Figure 3.2).

Details of the Woodstock property mineral rights appear in Table 3.1.

Table 3.1: Summary of Woodstock Property Mineral Rights

Mineral Claim Number	Registered Owner	No. of Claims	No. of Hectares	NTS	Expiry Date	Expenditure Requirements
5472	Canadian Manganese Co.	232	5875	21J/04E	14-Nov-13	$109,650 work required; $297,718.58 is available in work credits.

3.3 Status of BMC Title

BMC advised Mercator that at the effective date of this report, Mineral Claim 5472 was in good standing, with respect to obligations for work program performance and filing of associated documentation with the Government of New Brunswick. The claim is held by Canadian Manganese Corporation (CMC), a wholly owned subsidiary of BMC. All claim units on the Woodstock Property that were previously held by BMC were formally transferred to CMC on July 15, 2011.

Mineral Claim 5472 has an expiry date of November 14th, 2013.

3.4 Encumbrances and Agreements

On July 26th, 2012 BMC announced that it had acquired, through its subsidiary CMC, the surface rights covering a portion of the Plymouth deposit. The acquired surface rights cover an area of 130 acres of forested land and were acquired from four vendors, for aggregate consideration of $380,000, plus an upfront bonus of $10,000 and 40,000 warrants. Each warrant is exercisable into one common share of the Company at a price of $0.10, for five years from the date of issuance. In addition, CMC granted to the vendors, collectively, a one percent gross sales royalty upon commencement of commercial production on the acquired surface rights. CMC retains certain rights to buyback half of the royalty.

On October 31st, 2012, BMC announced that an agreement had been signed with Minco to further explore the Woodstock Property. Under the terms of the option agreement Minco has the right to earn up to a 50% interest in CMC, being the owner of the Woodstock property. Pursuant to the terms of the agreement, Minco can earn a 10% interest in CMC by incurring $1.25 million of expenditures consisting primarily of diamond drilling work designed to allow for the completion of a resource estimation for the Plymouth Fe-Mn deposit within a period of 12 months from the date of signing.

After the completion of expenditures, Minco will have 30 days to elect to continue with a second phase of work totalling $750,000 over a period of six months in order to complete a preliminary economic assessment ("PEA") on the Plymouth Mn-Fe deposit to earn a further 10% interest in CMC. In the event that Minco elects not to proceed to the second phase of expenditures, BMC will have a 90 day option to buy back Minco's 10% interest in CMC for $1.250 million. Upon completion of the PEA, Minco will have an exclusive 3 month option to elect to earn a further 30% interest in CMC by completing a NI 43-101 compliant pre-feasibility study Technical Report on the Plymouth Mn-Fe deposit, within two years, with the budget to be determined at that time. BMC is the operator for all work programs performed under the option agreement.

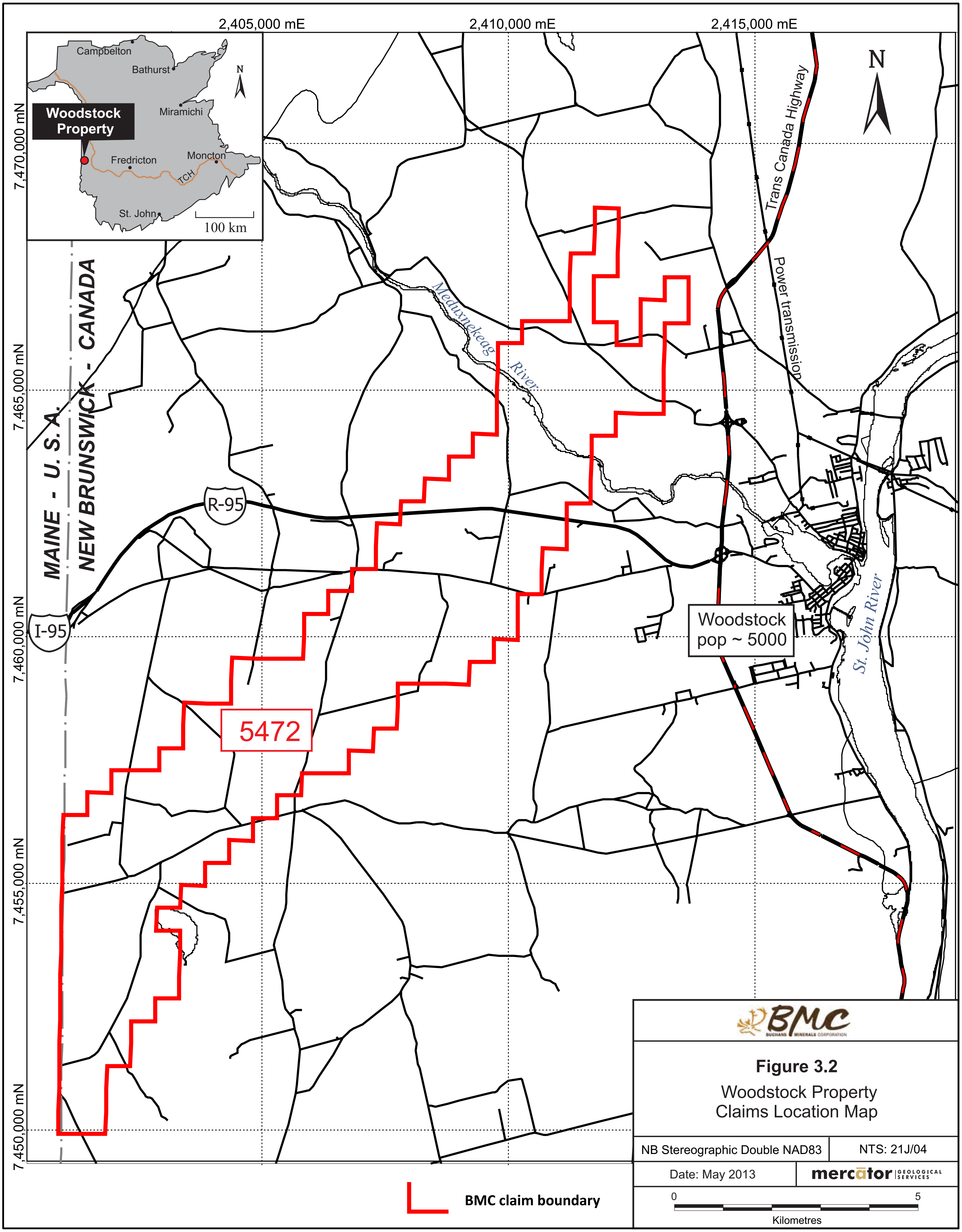


Figure 3.2
Woodstock Property
Claims Location Map

NB Stereographic Double NAD83	NTS: 21J/04
Date: May 2013	mercator geological services

0 — 5 Kilometres

3.5 Access to Lands For Future Exploration and Development Purposes

To date, BMC has accessed lands in the Woodstock area for the purpose of exploration activities, under terms of exploration permits issued by the Government of New Brunswick. BMC informed Mercator that it has permission from landowners to carry work with respect to drilling work program components discussed in this report.

Based upon its knowledge of the site and community, Mercator's opinion is that sufficient land exists in the deposit area to potentially accommodate a future open pit mine development and to establish the required milling infrastructure plus tailings impoundment and waste rock storage areas.

3.6 Environmental Liability for Historic Mining Operation Impacts

BMC advised Mercator that its liability, at the effective date of this report, was limited to activities carried out under their exploration permits issued by the Government of New Brunswick. These permits are for site activities related to diamond drilling and general site access but do not include impacts associated with historic site use. Development of a mining operation at Woodstock will require that the issue of site liabilities will be addressed in the related mining and environmental permitting process.

4 Accessibility, Climate, Local Resources, Infrastructure and Physiography

4.1 Accessibility

The Woodstock Property is easily accessible, with the Trans-Canada Highway being located approximately 4 km to the east and Highway 95, which extends westward in Canada, to the USA border, being located less than 1 km north of Plymouth Road which crosses the Woodstock Property.

4.2 Climate

The climate in North New Brunswick is characterised by relatively cool, northern Atlantic temperate conditions, with a short summer season lasting from July through early September and a long winter period, from November through late March to early April. Environment Canada records report the daily mean temperature during the winter months to be -5° C, ranging from 0° C to -11.5°C, and daily mean temperature from May to October is 10° C, range from 6.4° C to 19.3° C. Daily winter minimums can exceed -30° C and summer daily maximum values in the +25° C also occur. Average annual precipitation ranges from 77 cm to 107 cm with much of this occurring as snow.

Exploration activities can be carried out in all seasons in this area, assuming that appropriate measures are taken to accommodate for work in heavy snow conditions during winter months and thawing ground during Spring break-up. The latter period can present substantial challenges due to wet and soft ground conditions, which can make certain less developed roads temporarily impassable.

4.3 Physiography

For the most part, the terrain is gently rolling with wooded hills, covered by stands of predominantly mixed deciduous and evergreen trees being present. Low-lying and low relief areas are commonly cleared and used for farming. While most residential properties are limited to homesteads established prior to the mid-1900s, there are also local housing developments, consisting of modern suburban housing, particularly within the most northern portions of the property near the community of Hartford. Several rivers transect the properties and typically have incised gorges in the otherwise gently rolling topography; the largest of these is the Meduxnekeag River that flows east to the St. John River.

4.4 Local Resources

The property is well-positioned with respect to infrastructure. A railway line is accessible in Houlton, Maine, located 16 km to the west, and the existing electrical grid power is readily available within the property limits. The town of Woodstock is located approximately 5 km to the east and has a population of approximately 5,000 people. It offers basic amenities and is a regional hub of commerce. The city of Fredericton is located 105 km along the Trans-Canada Highway to the south, is a large centre with a population of 56,224 people, and could supply a skilled work force. Fredericton has a university, hospital, and all amenities and supplies necessary to support a potential mining operation.

5 History

5.1 Woodstock Property

The following description of Woodstock Property historical exploration is modified after original text prepared by BMC for an assessment report (Moore, 2011) filed with New Brunswick Department of Natural Resources and Energy ("NBDNRE") .

The history of exploration and mining at Woodstock is poorly recorded for the period prior to 1970, but historical operations at Iron Ore Hill and in the Woodstock area included development and production of approximately 70,000 tons (63,497 tonnes) of iron ore between 1848 and 1884. This ore was locally smelted. The Mn potential of these occurrences may not have been fully appreciated until 1936, when the Geological Survey of Canada published geological mapping for the area. This work highlighted several occurrences of iron formation including some of the main deposits in the Moody Hill and Iron Ore Hill areas. This work included chemical analyses of several of the iron formations and highlighted the high Mn content of the material, with reported ranges between 10.48% and 15.0 % Mn (Caley, 1936). In 1943, the ores were assessed by Noranda Mines Limited, (Noranda Mines), using flotation technology to produce a Mn and Fe concentrate. Also in that year, regional scale mapping was completed by White (1943) for the State of Maine and in 1947 the Maine Geological Survey published a review of the Mn deposits of Aroostook County (Miller, 1947).

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 (Anderson, 1954). 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 and work undertaken between 1952 and 1962 included metallurgical studies on mineralization from the Maple Mountain-Hovey Mountain deposits (Eilertsen, 1952; Conley, 1952; Lamb et al., 1953; MacMillan and Turner, 1956), description of ores from the Littleton Ridge Mn deposit (Pavlides, 1955), bulk sampling of the Dudley Mn deposit (Eilertsen and Earl, 1956), investigation of various Aroostook County occurrences (Eilertsen, 1958), and detailed geological investigation of the Maple and Hovey Mountain area deposits (Pavlides, 1962).

Between 1953 and 1960, the Hartford and Plymouth deposits were held by Strategic Manganese Corporation, a subsidiary of Stratmat Limited (Stratmat). While conducting a gravity survey southwest from the Iron Ore Hill area to the Maine border, Stratmat discovered the North and South Hartford deposits, as well as the Plymouth deposit (Sidwell, 1954). Over the period of 1953 to 1957, Stratmat completed various metallurgical investigations and geological and magnetic surveys, and 34,021 feet of drilling, including 17,388 feet on the Plymouth deposit (Sidwell, 1957). From this exploration, Stratmat produced a historical resource estimate for the Plymouth deposit of 51,000,000 tons of 13.3% Fe and 10.9% Mn (Sidwell, 1957; Monture, 1957). They also estimated the Woodstock deposits to a depth of 500 feet to contain 214 million tons of 13% Fe and 9% Mn (Monture, 1957). Mercator cautions that these estimates are historical in nature, are not compliant with NI 43-101, and should not be relied upon. A qualified person has not done sufficient work to classify the historical estimates as current mineral resources and BMC is not treating the historical estimate as current mineral resources.

Over the period 1965 to 1968, the Chemical Engineering Department of the University of New Brunswick undertook three investigations of the Mn ores. These investigations included examination of possible chemical processing techniques of the ore, that included chemical leaching with sulphuric acid, (Bien, 1965) and sulfidation (Sansom, 1968), as well as upgrading by agglomeration, as an alternative to flotation (Lalvani, 1965).

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 Fe-Mn prospects(Anderson, 1967). This report provides detailed descriptions of the main Woodstock Property deposits and documents the location of several Fe-Mn occurrences located southwest of the Plymouth Fe-Mn Deposit and extending south to the Maine border.

In the early 1970's, Mandate Refining Company held the claims and worked towards development of a method of roasting pyritic waste and Fe-Mn ore. This was unsuccessful and the claims were abandoned.

In 1972, the New Brunswick Department of Natural Resources published a geological report on the stratigraphy and structure of the area (Hamilton-Smith, 1972). This report included several geological maps showing locations of Fe-Mn occurrences throughout the area, including those covered by the current BMC mineral rights. .

In 1978 and 1979, one inch to quarter mile geology maps for the area were published by the New Brunswick Geological Survey (Venugopal, 1978).

Between 1976 and 1980, Minuvar Limited held the claims and undertook geological mapping and geochemical sampling of available trenched and outcropping bedrock exposures in 1976. It also subsequently conducted magnetometer and very low frequency electromagnetic (VLF-EM) ground geophysical surveys over the Plymouth deposit (Gilders, 1978).

In 1984, Mineral Resource Research Limited, (MRR), staked the Fe-Mn deposits and in 1985, completed detailed geological mapping and trenching over the Plymouth deposit and drilled one hole (DDH-85-1) to test the known deposit. This hole reportedly missed the zone, as it was drilled sub-parallel to strike (Roberts, 1985).

In the fall of 1985, the NBDNRE collected samples from the Plymouth deposit for submission to the New Brunswick Research and Productivity Council (RPC) for mineralogy studies and chemical analysis (Webb, 1986).

In 1986, a sampling program was completed over the Plymouth and Hartford deposits funded by the Canada-New Brunswick Mineral Development Agreement (Wilson and Bamwoya 1986). Work was completed by Atlantic Analytical Services (Atlantic Analytical) and the RPC. Five samples from Plymouth and three samples from South Hartford were collected for mineralogy and grade determinations, including five 200 kg samples collected from five trenches, excavated and sampled in January of 1986. The "original trench," previously sampled by the NBDNRE in 1985, was not sampled during this sampling campaign. This work was reportedly undertaken during a period of "heavy snow fall" that hindered the program. Results showed that all of the Plymouth samples were of inferior quality, assaying an average of only 5.13% Mn, and one of the samples assayed as low as 0.46% Mn and "contained substantial quantities of mud and soil". These same samples were used in a follow-up study, by the Process Studies Group of the Mineral Resources Branch of NBDNRE that included various leach tests. The reported head grade of the sample was 7.29% Mn and 11.3% Fe (O'Donnell, 1988).

In 1986, funded by the Canada-New Brunswick Mineral Development Agreement, Witteck Development Inc. ("Witteck"), was contracted by the Department of Supply and Services (Government of Canada) to undertake a detailed processing study, using the Atlantic Analytical samples collected from the Plymouth deposit (Newman and Bartlett, 1987). Witteck completed a detailed investigation that included metallurgical test work and an economic evaluation of selected processing options. Head assays for the Plymouth samples were determined to range from 6.27% to 8.41% Mn and averaged 7.2% Mn. Despite the low head grades, metallurgical test work by Witteck identified processes for which marginal economics might be achieved. Witteck evaluated ten processing techniques designed to produce electrolytic Mn metal, or high-purity Mn precipitate, of which they identified two that forecasted economically positive operating margins in 1987.

In 1987, MRR also completed a ground magnetometer and VLF-EM survey over the Plymouth Fe-Mn Deposit (Prince, 1987). The magnetometer survey was successful in outlining the Plymouth Fe-Mn deposit, with results obtained being comparable to those of earlier surveys (Gilders, 1976).

In 1988, MRR undertook a comprehensive technical program to evaluate the Plymouth Fe-Mn Deposit in an attempt to establish an accurate description of the deposit, including potential grade and tonnage aspects; (Roberts and Prince, 1988). This program included bulk sampling, trenching, core drilling and geochemical analyses. Highlights include excavation of two trenches across the deposit and drilling of two drill holes, beneath each trench, to allow interpretation of sections across the deposit at depth. A total of five holes (DDH-81-1 to DDH-81-5) were drilled, totalling 2,086 feet (636 m). Based on this work, MRR completed a resource estimate for part of the deposit that totaled 10,078,875 short tons (9.1 million tonnes) averaging 11.89% Mn (Roberts and Prince, 1988). Mercator cautions that these estimates are historical in nature, are not compliant with NI 43-101, and should not be relied upon. This work demonstrated trends of spatial and grade continuity within the deposit.

In 1991, Ikejiani et al., (1991) prepared an interim report on an investigation to evaluate the use of microwave-hydrochloric acid digestion processing of the Woodstock ores. In 1991, MMR contracted Industrial Research and Development Company Ltd. to evaluate the use of microwave-hydrochloric acid digestion processing of the Woodstock ores.

In 2007, a thesis study of the Woodstock deposits was initiated by Mr. Bryan Way, in pursuit of a Masters of Science degree in geology, at the University of New Brunswick, under the supervision of Dr. David Lentz. This research lead MRR to reacquire mineral claims over the Plymouth and Hartford deposits by staking in 2008 and MRR made various archived samples and drill cores available to Mr. Way for sampling and study.

In August, 2010, BMC acquired the Woodstock Property from MRR. For information regarding exploration and drilling by BMC, see Sections 8.0 and 9.0 of this report.

6 Geological Setting

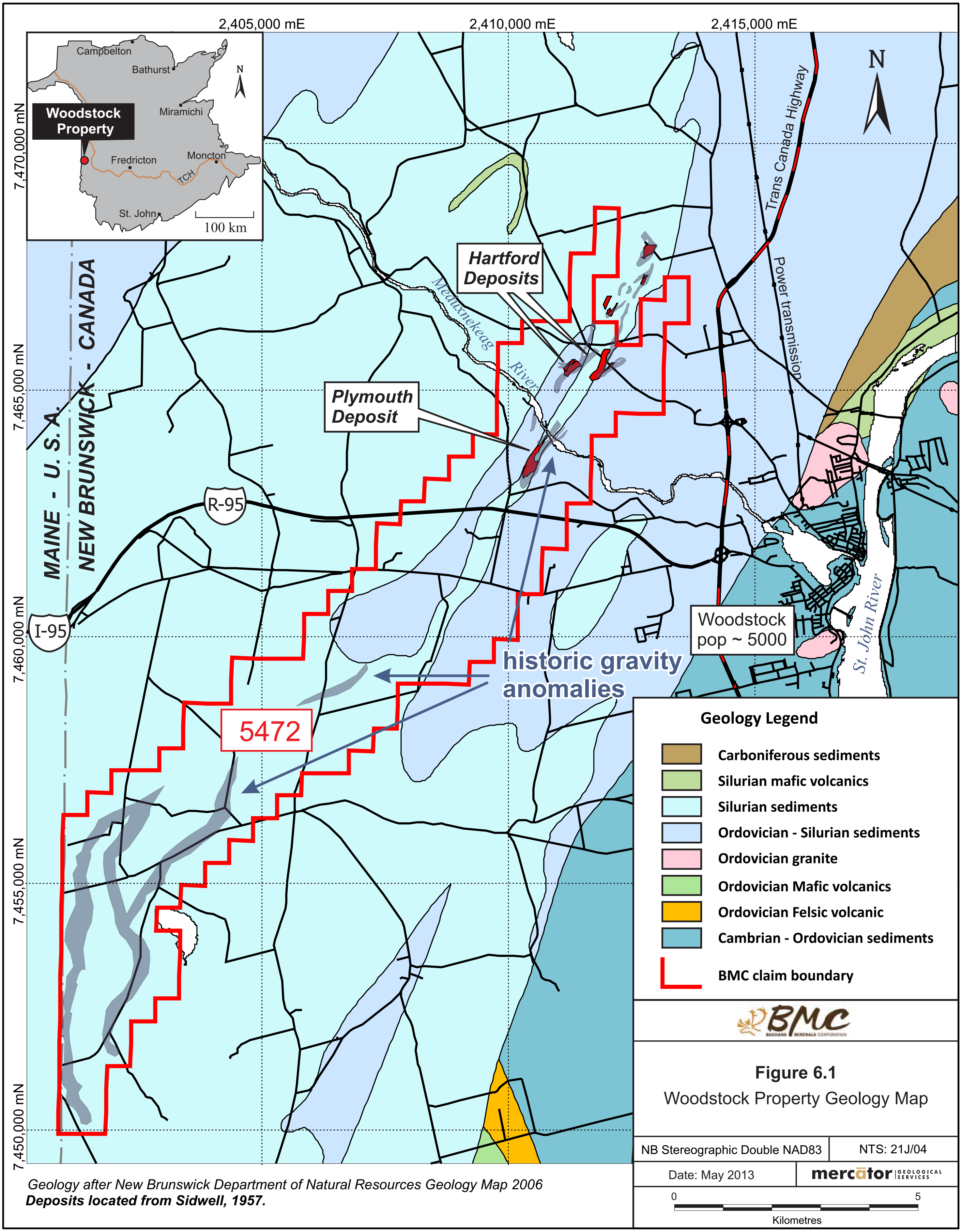
6.1 Woodstock Property Geology

The description of geology and mineralization presented below is summarized from a BMC assessment report (Moore, 2011) completed to meet NBDNR requirements.

Government mapping in the area of the Woodstock Property shows it to be underlain by a belt of Ordovician and Silurian siltstones and slates, collectively referred to as the Aroostook-Perce belt. Late Ordovician to Early Silurian sediments of the Matapedia Group's Whitehead Falls Formation are overlain by Early Silurian sediments of the Perham Group's Smyrna Falls Formation, which are laterally extensive over much of western and northwestern New Brunswick and Maine (Fyffe and Fricke, 1987; NBDNRE, 2000).

The Woodstock Fe-Mn deposits are interpreted to represent a series of Early Silurian manganiferous banded iron formations (BIFs). Six main Fe-Mn deposits were identified by gravimetric survey results from the mid-1950s and defined as being large, lenticular-shaped bodies within the Silurian Smyrna Mills Formation. These deposits are interpreted to have formed in a shallow marine basin during the Taconic Orogeny and are in sharp contact with units of red or green shale (Sidwell, 1957; Roberts and Prince, 1990; Force et al., 1991). Stratigraphic lensing and compositional variation of the manganiferous BIFs has been interpreted to indicate that the deposits are stratigraphically separated and not one continuous unit (e.g., Roberts and Prince, 1990). The current orientation of bedrock units is primarily a function of two folding generations (F1 and F2). F1 folds trend northeast, are slightly overturned south of the Plymouth deposit and have axial planes ranging from nearly vertical, to 85° northwest. Fold axes plunge shallowly (< 5 degrees) to the northeast and southwest. F2 folds overprint F1 structures and have axial planes trending northwest, (approximately 320°) and dipping steeply north at approximately 80° (Roberts and Prince, 1990). Both sets of folds were generated during the mid-Devonian Acadian Orogeny and were affected by associated regional sub-greenschist metamorphism (Way et al., 2009).

The White Head Formation consists of dark grey to bluish-grey fine-grained argillaceous limestone with inter bedded calcareous shale. The Smyrna Mills Formation is composed of dark grey coloured, non-calcareous, silty shale with minor layers of green and red mudstone, and associated ferro-manganiferous siltstone (Smith and Fyffe, 2006). There is great variation in shale and/or siltstone, in the Smyrna Mills Formation and this is interpreted to indicate highly variable, ocean redox conditions during deposition of the host sequence (Way et. al., 2009). .



Geology after New Brunswick Department of Natural Resources Geology Map 2006
Deposits located from Sidwell, 1957.

This is evidenced by the occurrences of BIFs at the Plymouth, Iron Ore Hill, South Hartford, and Green Road deposits that are commonly in sharp contact with units of red, or green shale, or a combination of the two (Sidwell, 1957).

The Plymouth Fe-Mn deposit has been described as an assemblage of Fe and Mn oxide and carbonate-silicate-oxide facies rocks that formed within a shallow marine basin; an interpretation supported by the presence of asymmetrical ripple marks within the surrounding strata (Roberts and Prince, 1990). Gross (1996) initially described the Plymouth BIF as a series of sedimentary-volcanic units, but alternative hypotheses suggest the Fe-Mn could have originated from a variety of sources including oceanic Fe-Mn hydroxides and/or the weathering of terrestrial bedrock (Way et al., 2009).

6.2 Mineralization

Historical interpretation of the mineralization of the Plymouth deposit indicated that the Fe-Mn mineralization can be subdivided into Fe-Mn oxide, silicate-carbonate-oxide, and carbonate facies (Sidwell, 1957; Gilders, 1976; Roberts and Prince, 1990). These stratiform deposits are analogous to the Type IIA deposits of bedded Mn oxides and carbonates described by Macharmer (1987). The Fe-Mn oxide facies present on the Woodstock Property is represented by red to maroon siltstone and red chert and is characterized by the mineral assemblage magnetite, hematite, braunite ($Mn^{+2}Mn^{+3}_6[O_8SiO_4]$) and bixbyite ($[Mn,Fe]_2O_3$) and ranges between 30% and 80% Fe-Mn oxides. Fe and Mn mineralization is also present in the form of rhodochrosite ($MnCO_3$) and minor sursassite ($Mn_2Al_3[(SiO_4)(Si_2O_7)(OH)_3]$) crosscuts syngenetic Fe-Mn mineralization in the Plymouth deposit (Sidwell, 1957). Layers of Fe-Mn mineralization are also locally observed to be crosscut by veins of quartz, quartz-carbonate, chlorite, and sulfide (Way et. al., 2009).

Following the work completed by BMC and Thibault on the Plymouth deposit since 2011, it has been found that the manganese mineralization in both the red and grey siltstones is dominated by manganese carbonate in the form of rhodochrosite. The iron mineralization in both the red and grey siltstones was found to be different, with the dominant iron minerals in the red siltstone found to be predominantly oxides, in the form of hematite, magnetite and ilmenite; whilst the dominant iron mineral in the grey siltstone was found to be predominantly carbonate, in the form of siderite. A more detailed description of the analysis of the mineralogy of the Plymouth deposit is found in Section 12.2 of this report.

7 Deposit Type

7.1 Woodstock Property

The manganese contained in the Plymouth deposit is predominantly in the form of a carbonate (rhodochrosite) whilst the iron exists in both oxide (hematite, magnetite and ilmenite) and carbonate minerals (predominantly siderite). The deposit type is sedimentary in origin and of the stratiform, banded Fe-Mn formation type (BIF). The host sequence consists of Silurian red and grey siliciclastic to calcareous siltstones and shales that have been metamorphosed under lower greenschist facies conditions. In addition to the main oxide, silicate and carbonate facies Fe-Mn concentrations, host rocks contain minor magnetite and traces of pyrite in grey siltstone and black shale intervals. The Mn rich iron formation deposits occur in stratiform bodies and represent spatially distinct intervals that accumulated contemporaneously with surrounding sedimentary strata.

Fe and Mn are considered to have been deposited from seawater in an oxidising environment and host strata have subsequently been structurally thickened through folding and faulting related to the Acadian Orogeny (Middle to early Late Devonian in age). Some subsequent remobilization of Mn has occurred and resulted in re-deposition of Mn oxides in fracture zones.

8 Exploration

8.1 Introduction

The following descriptions of exploration work carried out by BMC-Minco have been summarized from company assessments reports prepared for submission to provincial authorities.

8.2 Woodstock Property

In August, 2010, BMC acquired the Woodstock Property from MRR, a private, Fredericton-based company. The acquisition of the property was largely driven by the BMC's review of past metallurgical test work completed in 1987 by Witteck and funded by the Canada New Brunswick Mineral Development Agreement. Witteck evaluated 10 processing techniques designed to produce electrolytic Mn metal or high purity Mn precipitate, of which they identified two with positive operating margins that may have been potentially economic in 1987. The information was reviewed by BMC who, in August of 2010, engaged Wardrop to review and update the two processes with positive operating margins presented by Witteck, using current cost and market data. Following this evaluation, Wardrop concluded that, in 2010's market conditions and given larger tonnage through-puts, both Witteck flowsheets are potentially economic and that with newer and more robust flowsheet options, improved process recoveries and concentrate grades could be expected (Moore, 2011). Results of the Wardrop study were for internal working purposes and were not suitable for public disclosure, as they were not considered reliable or compliant under NI 43-101. Wardop's review is succeeded by more comprehensive economic and hydrometallurgical reviews undertaken by Thibault for BMC, and key elements of their work have been disclosed in BMC news releases and are further summarized in section 12 of this report.

BMC carried out a 5 hole (1,040 m) core drilling program on the property in 2011 and the details of this program are discussed in Section 9.0 of this report.

BMC engaged Thibault in 2011 to conduct bench scale hydrometallurgical tests to confirm and optimize the process for leaching Mn from typical Plymouth deposit material. Drill core samples and coarse reject material derived from BMC's 2011 drilling program were delivered to Thibault for this work, which included gravity concentration tests as well as a series of bench scale hydrometallurgical tests, to confirm and optimize a process of leaching the Mn from the host rock. In addition, tests were conducted towards a goal of producing a purified Mn leach solution that could provide the basis for producing end products such as electrolytic Mn metal (EMM) and Mn carbonate. Details of the metallurgical test work carried out by Thibault appear in Section 12 of this report.

In 2013 Minco and BMC completed 15 drill holes totalling 4,082 m to define 7 sections across the deposit as a basis for resource estimation of the Plymouth Deposit to the Inferred category. The program was planned by Mercator with input from BMC technical staff. Details of this program are discussed in Section 9.0 of this report.

9 Drilling

Details of the 2011 and 2013 diamond drilling programs on the Woodstock property carried out by BMC (2011) and BMC-Minco (2013) are summarized below.

9.1 2011 Plymouth Fe-Mn Deposit Drilling

BMC completed a 1,040 m diamond drilling program at the Plymouth deposit during 2011 consisting of five holes. These holes were designed to assess the historic Plymouth eposit, as identified by a magnetic survey carried out by MRR in 1987, and to confirm assay results reported by MRR in 1988. The program was managed by employees of BMC with logging and sampling conducted by a BMC geologists and technicians.

Collar coordinates and drill hole orientation data for the 2011 Woodstock program are presented in Table 9.1 and hole locations are presented in Figure 9.1.

Table 9.1: Plymouth Fe-Mn Deposit 2011 Drill Hole Locations

Hole No.	*Northing (m)	*Easting (m)	*Elevation (m)	Depth (m)	Dip (Deg.)	Az. (Deg.)
PL-11-006	5113442.78	603513.49	117.94	150	-45.1	128.2
PL-11-007	5113471.49	603471.29	117.69	176	-44	129.5
PL-11-008	5113498.20	603432.21	119.05	251	-43.2	125.1
PL-11-009	5113318.94	603511.00	127.91	200	-45.3	132.7
PL-11-010	5113357.60	603462.21	123.93	263	45.4	128.3

** UTM NAD 83 Zone 19 Coordination*

Assays from the initial three holes were released by BMC on September 7, 2011 and demonstrate grade and continuity over large widths. Significant intercepts include 11.41% Mn over 45.0 m in hole 11-006, 11.43% Mn over 89.0 m in hole PL-11-007, and 9.22% Mn over 63.0 m in hole PL-11-008. Additional drill results were released on September 17, 2011 and include results for two intersections in hole PL-11-009. The upper intercept from a depth of 10 m to 54 m returned 8.61% Mn over 44.0 m and the lower intercept from 69 m to 147 m returned 12.51% Mn over 78.0 m. Hole PL-11-010 also included two intersections with an upper intercept from 10 m to 111 m returning 11.27% Mn over 101.0 m and a lower intercept from 153 m to 231 m returning 11.67% Mn over 78.0 m.

Significant intercepts for the 2011 are summarized in Table 9.2.

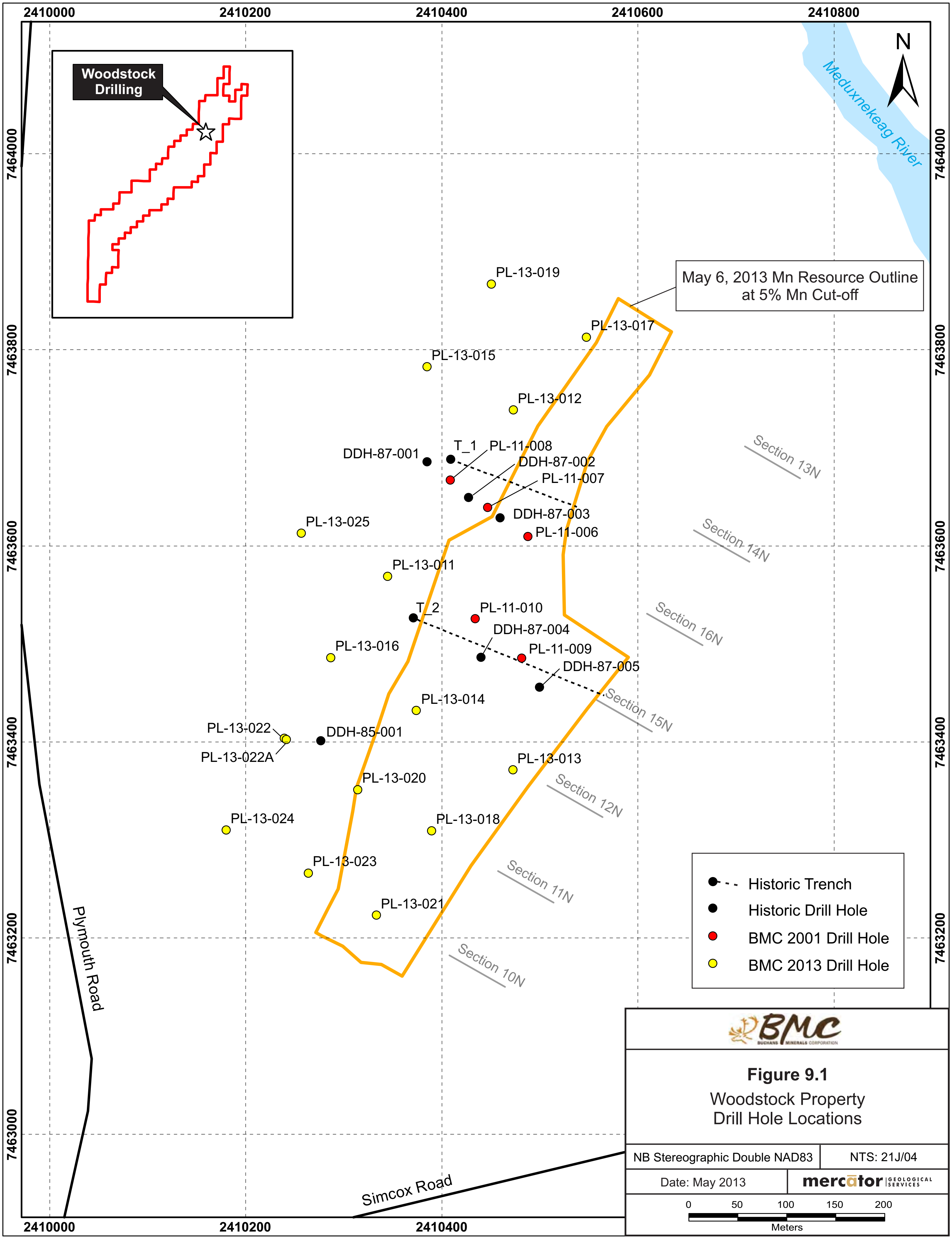

2410000
2410200
2410400
2410600
2410800
7464000
7463800
7463600
7463400
7463200
7463000
Woodstock Drilling
N
Meduxnekeag River
May 6, 2013 Mn Resource Outline at 5% Mn Cut-off
PL-13-019
PL-13-017
PL-13-015
PL-13-012
DDH-87-001
T_1
PL-11-008
DDH-87-002
PL-11-007
DDH-87-003
PL-11-006
PL-13-025
PL-13-011
T_2
PL-11-010
DDH-87-004
PL-11-009
DDH-87-005
PL-13-016
PL-13-014
PL-13-022
PL-13-022A
DDH-85-001
PL-13-013
PL-13-020
PL-13-024
PL-13-018
PL-13-023
PL-13-021
Section 13N
Section 14N
Section 16N
Section 15N
Section 12N
Section 11N
Section 10N
Plymouth Road
Simcox Road
Historic Trench
Historic Drill Hole
BMC 2001 Drill Hole
BMC 2013 Drill Hole
BMC
Figure 9.1
Woodstock Property
Drill Hole Locations
NB Stereographic Double NAD83
NTS: 21J/04
Date: May 2013
mercator
0
50
100
150
200
Meters

Table 9.2: Significant Intercepts from the 2011 Drill Program.

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
PL-11-006	5	50	45	11.41	13.14
PL-11-007	21	110	89	11.43	14.90
PL-11-008	80	143	63	9.22	12.75
PL-11-009	10	54	44	8.61	12.59
and	69	147	78	12.51	16.34
PL-11-010	10	111	101	11.27	16.01
and	153	231	78	11.67	16.57

True widths of the mineralized intercepts are estimated to be approximately 87% of the reported drill core lengths. Drilling was completed on two sections spaced approximately 100 m apart and was designed to confirm the deposit's grade and thickness and to collect fresh core samples for metallurgical testing.

9.2 2013 Plymouth Deposit Drilling

On January 21st, 2013 BMC and its partner Minco announced that under the terms of their October 31st, 2012 agreement drilling had begun on the Woodstock property located in New Brunswick, Canada. Overall,15 diamond drilling holes were completed totalling 4,082 m, along 7 sections transecting the mineralization, spaced at approximately 100 metre intervals, over the length of the deposit (i.e., sections 10 North to 16 North). This drilling was planned to provide drill hole information sufficient for the purposes of completing a NI 43-101 compliant resource estimate, being the subject of this report. Collar coordinates and drill hole orientation data for the 2013 drill program appear in Table 9.3 and hole locations are presented in previous Figure 9.1. The drilling was angled to cross cut the mineralisation and estimated true widths are generally based on the interpretation of geological cross sections and are typically 85% to 95% of the intercept width.

Table 9.3: Plymouth Deposit 2013 Drill Hole Locations

Hole No.	*Northing (m)	*Easting (m)	*Elevation (m)	Depth (m)	Dip (Deg.)	Az. (Deg.)
PL-13-011	5113397.72	603371.70	126.021	401	-45.2	121.5
PL-13-012	5113571.33	603494.39	108.54	200	-45	122.5
PL-13-013	5113204.72	603505.52	127.93	137	-45	118
PL-13-014	5113262.11	603405.28	128.96	275	-45.6	123.5
PL-13-015	5113612.54	603405.15	113.83	305	-45	132.5
PL-13-016	5113313.32	603316.27	127.28	415	-45	122.5
PL-13-017	5113647.98	603566.41	97.29	170	-45	113.5

Hole No.	*Northing (m)	*Easting (m)	*Elevation (m)	Depth (m)	Dip (Deg.)	Az. (Deg.)
PL-13-018	5113140.12	603424.52	130.01	92	-45	118
PL-13-019	5113699.05	603467.88	108.82	305	-44.7	120.5
PL-13-020	5113179.55	603347.85	131.62	227	-45	118
PL-13-021	5113052.14	603371.14	131.39	131	-45	118
PL-13-022	5113229.72	603271.35	135.69	119	-45	118
PL-13-023	5113092.99	603300.24	137.32	245	-45	118
PL-13-024	5113134.23	603215.20	139.16	245	-45	121.5
PL-13-022A	5113228.50	603273.66	135.75	356	-45	118.5

** UTM NAD 83 Zone 19 Coordination*

The first hole of the 2013 program, PL-13-011, was drilled at the northwest end of a line of previously drilled holes (Section 13 North) and completed a central section across the deposit (previous Figure 9.1). The hole returned assays averaging 11.25% Mn over 113.85 m core length (approximately 95 m true width). Interpretation of this section indicates mineralization is likely hosted by a folded sedimentary sequence, occurring as several lobes of mineralization, within a synclinal fold structure. Drilling also confirmed the near surface extent of the deposit at this location as being approximately 225 m wide and typically extending to depths of 100 m or more.

Three holes were drilled on Section 12 North where the deposit is interpreted to be approximately 190 m wide at surface and extending to depths of 230 m or more and 2 holes drilled on Section 15 North intersected mineralization projected to be 45 m wide at surface and extending to depths of 140 m or more (Figure 9.1). Highlights from the three holes on Section 12 North include hole PL-13-014, that intersected 11.08% Mn over 202.5 m core length (approximately 136 m true width); hole PL-13-016 that intersected 10.1% Mn over 99.0 m core length (approximately 78 m true width), as well as two deeper intercepts of 11.56% Mn over 30.0 m core length and 13.23% Mn over 39.0 m core length (23 m and 31 m approximate true widths respectively). The most easterly hole on this section, PL-13-013, intersected 11.43% Mn over 19.0 m core length (16 m approximate true width).

Highlights from the two holes on Section 15 North include hole PL-13-012 that returned assays averaging 10.82% Mn over 53.0 m core length, (45 m approximate true width) and hole PL-13-015, that returned an upper intercept averaging 10.01% Mn over 21.0 m core length, (17 m approximate true width) and a deeper intercept averaging 10.06% Mn over 36.0 m core length (30 m approximate true width).

Highlights from the three holes on Section 11 North include hole PL-13-022A that intersected 11.28% Mn over 217.4 m core length (180 m approximate true width); hole PL-13-020 that intersected 9.32% Mn over 202.0 m, (139 m approximate true width); including two sections of 10.21% Mn over 63.5 m core length and 10.52% Mn over 39.0 m core length, (44 m and 27 m approximate true widths respectively). The most easterly hole on this section, PL-13-018, intersected 7.41% Mn over 29.5 m core length, from 44.0 to 73.5 m, (20 m approximate true width), plus an upper section assaying 11.38% Mn over 3.1 m from 7.9 to 11.0 m (2 m true width).

Hole PL-13-025 (the westernmost hole drilled on Section 13 North), drilled in the deposit's central area, returned an intercept of 9.17% Mn over a core length of 82.8 m, (77 m approximate true width), which extends mineralization to depths of 100 to 150 m below surface. At the northern limit of the drill program, two holes drilled on Section 16 North extended the deposit along strike, since both holes intersected two lobes of mineralization. The larger lobe returned intercepts of 6.28% Mn over 58.3 m core length, (hole PL-13-017, 55 m approximate true width) and a deeper intercept of 5.25% Mn over 27.0 m core length was returned from hole PL-13-019 (26 m approximate true width). A second lobe, located immediately east of the larger lobe, also returned favourable assays, including 10.97% Mn over 6.0 m core length in hole P-13-017 and 6.14% Mn over 6.0 m core length, in hole PL-13-019, (true widths at approximately 85% of intercept). While these results demonstrate the deposit remains open to the north, it appears that the higher grade mineralized sections are thinner and are diluted by beds of less mineralized rock to the North.

Drilling on the southern end of the deposit along Section 10 North (i.e. 600 m south along strike of Section 16 North) confirmed mineralization in this area and shows that mineralization remains open to the south; however, increasing dilution is also apparent along this section. At this location, drilling intersected at least three mineralized lobes that extend from surface where the mineralization measures approximately 65 m in width, to a depth of at least 175 m (Figure 9.1). Highlights on this section include intercepts of 5.99% Mn over 20.5 m core length, (PL-13-023, 19 m approximate true width) and 8.59% Mn over 31.4 m core length (PL-13-023, 30 m approximate true width), as well as, 9.84% Mn over 29.0 m core length (PL-13-023, 27 m approximate true width). Drilling on this section also indicates the deposit remains open down dip.

Significant intercepts from the 2013 drill program are summarized in Table 9.4.

Table 9.4: Significant Intercepts from the 2013 Drill Program

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
PL-13-011	51.65	165.50	113.85	11.25	12.53
PL-13-012	56.00	109.00	53.00	10.82	12.94

Hole No.	From (m)	To (m)	Length (m)	Mn %	Fe %
PL-13-013	11.80	30.80	19.00	11.43	12.76
PL-13-014	3.50	206.00	202.50	11.08	15.79
PL-13-015	152.00	173.00	21.00	10.01	14.99
and	185.00	221.00	36.00	10.06	9.85
PL-13-016	89.00	188.00	99.00	10.11	13.12
and	215.00	245.00	30.00	11.56	14.20
and	302.00	341.00	39.00	13.23	17.41
PL-13-017	15.70	74.00	58.30	6.28	9.40
and	89.00	95.00	6.00	10.97	10.15
PL-13-018	7.90	11.00	3.10	11.38	18.92
and	44.00	73.50	29.50	7.41	10.70
PL-13-019	113.00	140.00	27.00	5.25	8.59
and	173.00	179.00	6.00	6.14	9.89
PL-13-020	12.00	214.00	202.00	9.32	13.91
PL-13-021	17.70	18.60	0.90	16.40	10.02
PL-13-023	41.00	61.50	20.50	5.99	10.98
and	90.60	122.00	31.40	8.59	13.09
and	152.00	181.00	29.00	9.84	12.81
PL-13-024	106.50	143.00	36.50	7.77	12.49
and	152.00	194.00	42.00	7.28	11.28
and	209.00	278.00	69.00	8.75	13.10
PL-13-025	152.00	234.80	82.80	9.17	13.95

9.2.1 Woodstock Drilling Logistics

Drilling during 2011 and 2013 was contracted to Maritime Diamond Drilling of Stewiacke, Nova Scotia, Canada and completed using a Longyear 38 drilling rig supported by a bulldozer and Timberjack equipment for drill moves and day to day support. NQ sized core (47.6 mm diameter) was recovered and drilling was carried out on a two shift per day basis. Site supervision, logging, sampling and project record keeping were the responsibility of BMC personnel in accordance with BMC field operations and Quality Assurance and Quality Control (QA/QC) protocols that are discussed in report section 10.0. Drill core was descriptively logged on site, aligned, marked for sampling and then longitudinally split in half using a diamond saw blade. Samples consisted of half NQ sized core. The remaining half of the core was preserved in core boxes for future reference. In accordance with BMC protocols, half core samples were placed in numbered plastic bags, along with a sample record tag, and were sealed. After insertion of QA/QC materials in the sample stream, bagged samples were shipped by commercial carrier to ALS's preparation laboratory in Sudbury, Ontario, Canada. Samples were typically collected using a nominal three metre core length, except where specific geologic parameters required lesser length samples be collected. Sample lengths were determined and marked by the logging geologist.

BMC staff were responsible for management and supervision of all aspects of the Woodstock drilling programs in both 2011 and 2013.

10 Sample Preparation, Analysis and Security

10.1 Introduction

Sample preparation, analysis and security aspects of historic, BMC (2011) and BMC-Minco (2012) drilling programs are presented below. Various levels of documentation were available for the historic programs, the most useful being sourced in the Government of New Brunswick assessment reporting Archives. Detailed information is not consistently present for work carried out prior to BMC's work (pre-2011), with respect to the reporting of drill logs, sample records, laboratory assay certificates, verifiable location data, sample preparation, analysis and security. Detailed support documentation for historic drilling during the 1950s is largely absent and only rudimentary information is available for the small programs carried out in 1985 and 1987. In contrast, BMC and BMC-Minco programs, carried out in 2011 and 2013 respectively, include good descriptions of procedures and associated protocols.

On the basis of poor support documentation, Mercator and BMC have not included results from 1950's era drilling programs in the project database used in the current resource estimate program. Only data from the MMR programs in 1985 and 1987, plus the programs by BMC and BMC-Minco in 2011 and 2013 respectively, are included in the resource estimate database, which is addressed below.

10.2 1985 MRR Program Summary

A single drill hole was completed during this program, but related reporting filed with the Government of New Brunswick does not include specific descriptions of project sample preparation, analysis and security procedures. BQ sized drill core was systematically logged and 14 samples were sent for analysis to Acme Analytical Laboratories Ltd. ("Acme") in Vancouver, BC. It is not specified whether these were half-core or full-core samples. Acme operated as an independent, commercial laboratory at that time, and at present is a fully accredited and ISO certified company. The lab provided Inductively Coupled Plasma Emission Spectroscopy (ICP-ES) 36 element analysis of submitted samples in 1985. Standard rock crushing and pulverising procedures were used to produce a 0.5 gram sub-sample for analysis which was digested in Aqua Regia at 95^{o} C for one hour prior to determination of elemental concentrations.

The hole (85-001) was abandoned due to poor ground conditions before the targeted mineralized zone could be reached. Mercator's review of the logging and sample record for this program concludes that the MRR (1985) records were complete and of acceptable detail. No comments with respect to sampling, logging or security protocols appear in the program report by Roberts (1985).

10.3 1987 MRR Program Summary

Four drill holes and two surface trenches were completed during 1987. The results were reported by Andersen and Prince (1988) in an assessment report submitted to the Government of New Brunswick. BQ-sized core was recovered and systematically logged during the drilling program. Half core samples were obtained by sawing the core after it had been logged. Each of the holes were sampled, from top to bottom. The half core samples were placed in labelled plastic bags prior to shipment to the laboratory. All samples were sent to the Research and Productivity Council of New Brunswick (RPC) in Fredericton for crushing to minus 1/8 inch mesh. A split for pulverization was cut from this material and all samples and splits were returned to MRR.

The trenching program produced chip samples of approximately 8 lb weight (3.6 kg) for routine laboratory analysis, with these corresponding to 20 ft. sections of the trenched zone. For each chip sample interval a 150 lb (68 kg) bulk sample was also collected. All samples were submitted to RPC for initial processing and then returned to MMR. Bulk samples were stored for future assessment and the core samples were organized for subsequent analysis.

The prepared core sample analytical splits were sent to X-Ray Assay Laboratories Ltd. (XRAL) in Don Mills, Ontario for pulverization to minus 200 mesh, using an agate mill and subsequent analysis of multiple elements. Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) methods were used for Co, Ga, Mo, In, Cs, La, Ce, Eu, Gd, Dy, Er, Lu, Hf, Ta, and W; Direct Current Plasma methods were used for Pb, Cd, Ag, Ge, Zn, Cu, Ni, Cr, V, B, and Be; Fire Assay Direct Current Plasma (FA-DCP) methods were used for Au; Atomic Absorption methods were used for Li, As, Se, and Sb; and, X-ray Fluorescence methods were used for S and Sn. No details of sample digestion, for methods requiring such, were included in program reporting. XRAL was an independent, commercial laboratory at that time, and at present, is a fully accredited and ISO certified company.

As was the case in 1985, no comments with respect to security protocols appear in the program report by Andersen and Prince (1988). All results and interpretations of the 1987 program by MRR were subsequently re-published by the New Brunswick Department of Natural Resources and Energy as Open File Report 90-4.

10.4 2011 BMC Program and 2013 BMC-Minco Program Summary

The following description of sample preparation and core handling protocols applies to the 2011 and 2013 drilling programs completed by BMC (2011) and Minco–BMC (2013). Program details were discussed with BMC staff during the site visits (December 2011 and March 2013) by Mercator.

In 2011 BMC completed five NQ drill holes and in 2013 BMC-Minco completed an additional 15 NQ holes. All core from both programs was logged and sampled by BMC staff at rented facilities located in Woodstock, NB. Core sample intervals were marked by the logging geologist and core was then cut by staff technicians to create half core splits. One split was retained in the wooden core box for archival purposes, with a sample tag affixed at each sample interval and the other was placed in a labelled plastic bag along with a corresponding sample number tag and placed in the shipment queue. Quality control samples were inserted at this time and sample batches were then shipped by commercial courier to the Sudbury preparation laboratory operated by ALS Limited (ALS). After preparation in Sudbury, sample pulps were analysed at the ALS laboratory in Vancouver, BC. ALS is an independent, commercial analytical firm with operations throughout the world. ALS is ISO 9001: 2008 and ISO/IEC 17025:2005 certified.

Each sample was crushed to ≥70% at 6 mm size, followed by a 250 g riffle split which was pulverized, such that ≥85% of the material passed through a 75 micron sieve. ALS inserted blanks (one per 20 samples) and certified standards (nominally one per 20 samples) for preparation and assay. In addition, BMC submitted blank samples, (nominally one per 20 samples) and certified reference standards (one per 20 samples) for preparation and assay in keeping with QA/QC protocols. The 2011 samples were analyzed by ALS in Vancouver using its ME-ICP06 analytical package, while sulphur and specific gravity determinations were carried out using the Leco (S-IR08) and pycnometer (OG-GRA08B) methods, respectively. ALS's ME-ICP06 analytical package employs the use of a lithium metaborate, or tetraborate, fusion followed by acid digestion and ICP-AES analysis. In addition to the ICP analyses, ALS also re-assayed all samples using the X-ray fluorescence (XRF – ALS code ME-XRF06) method as a check on the ICP method. The latter dataset reflects slightly higher extraction of both Mn and Fe from the sample matrix and was chosen for all future core analysis, as well as incorporation into the current resource estimation described here in.

The 2013 samples were logged, sampled and prepared in the same manner as those in 2011 but the XRF method (ALS code ME-XRF06) was the primary analytical method applied. Additionally, sulphur and specific gravity determinations were carried out using Leco (S-IR08) and pycnometer (OG-GRA08B) methods, respectively. An independent check sample pulp was prepared for every 20th sample and analysed at SGS Canada Inc. (SGS) using XRF methods (SGS XRF-76 code).

Security and quality control and assurance programs were integral to both the 2011 and 2013 drilling campaigns and details of these are presented below.

10.5 Security

10.5.1 MRR Programs – 1985 and 1987

No detailed comments with respect to sampling, logging or security protocols appear in the drilling program reports by MRR for 1985 (Roberts,1985) and 1987 (Andersen and Prince, 1987). However, review of logs and other reporting components has led Mercator to conclude that core logging, core sampling and project management activities were consistent with industry standards of the day. It is assumed that this level of attention was also extended to project security issues, but this cannot be verified.

10.5.2 2011 BMC Program and 2013 BMC-Minco Program

Security for core, samples and related documentation during both field programs was the responsibility of BMC site staff, under overall direction of Mr. Paul Moore, P. Geo., Vice President of Exploration for BMC. BMC staff were responsible for transport of core boxes by pick-up truck from drill sites to the company's secure logging facility located in Woodstock, where clean up, tag checking, logging and sampling were carried out. Complete photographic records of core from all drill holes were created prior to logging and half-core sampling, using diamond saws. Sampling was carried out after lithologic, geotechnical and magnetic susceptibility logging procedures were completed. Mineralized zones encountered in the 2011 and 2013 drilling were additionally assessed, in 2013, through collection of qualitative Mn and Fe values at 1.5 to 3.0 m intervals using a hand-held XRF unit (Niton XL3t-950 XRF Analyzer) to establish sampling intervals.

In addition to the standard logging procedures described above, BMC staff also quantitatively logged assayed intervals according to their colour with respect to percentage of red coloured mineralization compared to non-red mineralization, as it was deemed to have potential implications to future mineral processing. This was done by measuring the combined core length of preserved red coloured core and dividing by the combined length of total preserved core. This allowed calculation of a percentage of red per each assayed interval. The red percentage measurement was also recorded in the assay database used for resource estimation.

All logging data were recorded digitally in the project drill hole database, that was subject to scheduled off-site backup.

After insertion of quality control samples in the sample stream, the bagged samples were grouped in batches of six to 10 and placed in a plastic mesh bags for shipment to the ALS preparation laboratory in Sudbury, Ontario. All samples bagged for shipment remained in the locked, logging facility, until shipment by commercial carrier to ALS. Sample shipment forms were used to list all samples in each shipment and laboratory personnel cross-checked samples received against this list and reported any irregularities by fax, or email, to BMC. BMC advised Mercator that it did not encounter any issues with respect to sample processing, delivery or security for the 2011 and 2013 drilling programs.

Based on the above, Mercator is of the opinion that sample preparation, security and analytical procedures used by BMC and BMC-Minco in their respective 2011 and 2013 drilling programs are acceptable and consistent with industry standards.

10.6 Quality Control and Assurance Programs

10.6.1 MRR Programs – 1985 and 1987

Review of historic reporting for the 1985 drilling program and 1987 drilling and trenching programs on the property showed that no formal QA/QC programs were applied by the operators of the field programs. The commercial laboratories that provided analytical services would have, however, implemented routine, industry standard QA/QC protocols that included insertion of certified standards and blank samples, plus analysis of duplicate pulp split samples.

10.6.2 Summary of 2011 and 2013 BMC Programs

BMC applied an internal QA/QC program in 2011 that consisted of insertion of certified reference materials and blank samples. ALS was the primary laboratory used for the programs. A modified approach was used for the 2013 drilling program, which included addition of a ¼ core field duplicate and duplicate pulp split components, analysis of check samples at an independent, third party laboratory and modification of some sampling frequencies. SGS provided independent check sample analysis services in 2013. Duplicate splits, blanks, certified reference materials and in-house standard samples were routinely analyzed by both laboratories for their own internal QA/QC purposes. As noted previously, both ALS and SGS are independent, fully accredited, ISO registered firms that provide analytical services domestically and internationally.

The 2011 internal QA/QC by BMC for Woodstock drill core samples included the following components:

- Certified reference materials: 1 in every 20 samples
- Blanks samples: 1 in every 20 samples

The 2013 internal QA/QC by BMC-Minco for Woodstock drill core samples included the following components:

- Certified reference materials: One in every 20 samples
- Blanks samples: 1 in every 20 samples
- Field ¼ core duplicate: 1 in every 20 samples
- Pulp duplicate: 1 in every 20 samples
- Check Assay Pulp: 1 in every 20.

Results of the 2011 and 2013 QA/QC programs are separately presented below in report sections 10.6.3 and 10.6.4.

10.6.3 2011 BMC Program Results

10.6.3.1 Certified Reference Material Program

The NOD-P-1 certified reference material was obtained by BMC from the United States Geological Survey and used for the 2011 drilling program. Recommended values for this material are presented below in Table 10.1. NOD-P-1 was prepared from deep sea manganiferous nodule material collected from a depth of 4,300 m in the Pacific Ocean at Latitude 14°50' N and Longitude 124°28' W. Notably, the material is very sensitive to moisture and can absorb as much as 10% by weight of moisture over a 24 hour period. As such, it is not an optimal material for drilling program QA/QC applications. BMC selected this standard after searching, without success, for a more appropriate manganese standard.

Table 10.1: Certified reference material NOD-P-1 values

Oxide	**Wt %**	**± 1 SD**	**Oxide**	**Wt %**	**±1 SD**
SiO_2	13.9	0.034	MnO	37.6	0.1
Al_2O_3	4.8	0.092	Na_2O	2.2	0.006
Fe_2O_3 T	8.3	0.044	K_2O	1.2	0.014
CaO	3.1	0.016	TiO_2	0.5	0.003
MgO	3.3	0.014	P_2O_5	0.46	0.005
Element	**µg/g**	**±1 SD**	**Element**	**µg/g**	**±1 SD**
Ba	3350	28	Pb	560	6
Co	2240	11	Sr	680	3
Cu	11500	49	V	570	10
Mo	760	4	Zn	1600	6
Ni	13400	64			

A total of 15 analyses of this reference material were returned for the 2011 program and results for MnO and Fe_2O_3 are presented below in Figures 10.1 and 10.2. Project control limits for review of reference material data were set by Mercator, as the certified mean value, plus or minus 2 and 3 standard deviations. Figure 10.1 shows that 2011 MnO data for this material consistently falls below the mean minus 2 standard deviations level and that 8 samples fell below the mean minus 3 standard deviations level. Figure 10.2 shows that 2011 Fe_2O_3 data also consistently fall below the mean minus 2 standard deviations level and that 11 samples fell below the mean minus 3 standard deviations level. In combination, these define a low bias in the primary dataset for both Fe_2O_3 and MnO. BMC investigated these low bias trends through ALS and found that the primary meta-borate fusion and ME-ICP06 analytical package did not provide sufficient extraction of Mn and Fe to match reference material results that were based on XRF analysis.

Figure 10.1: NOD-P-1 Standard – 2011 Program MnO (N=15)

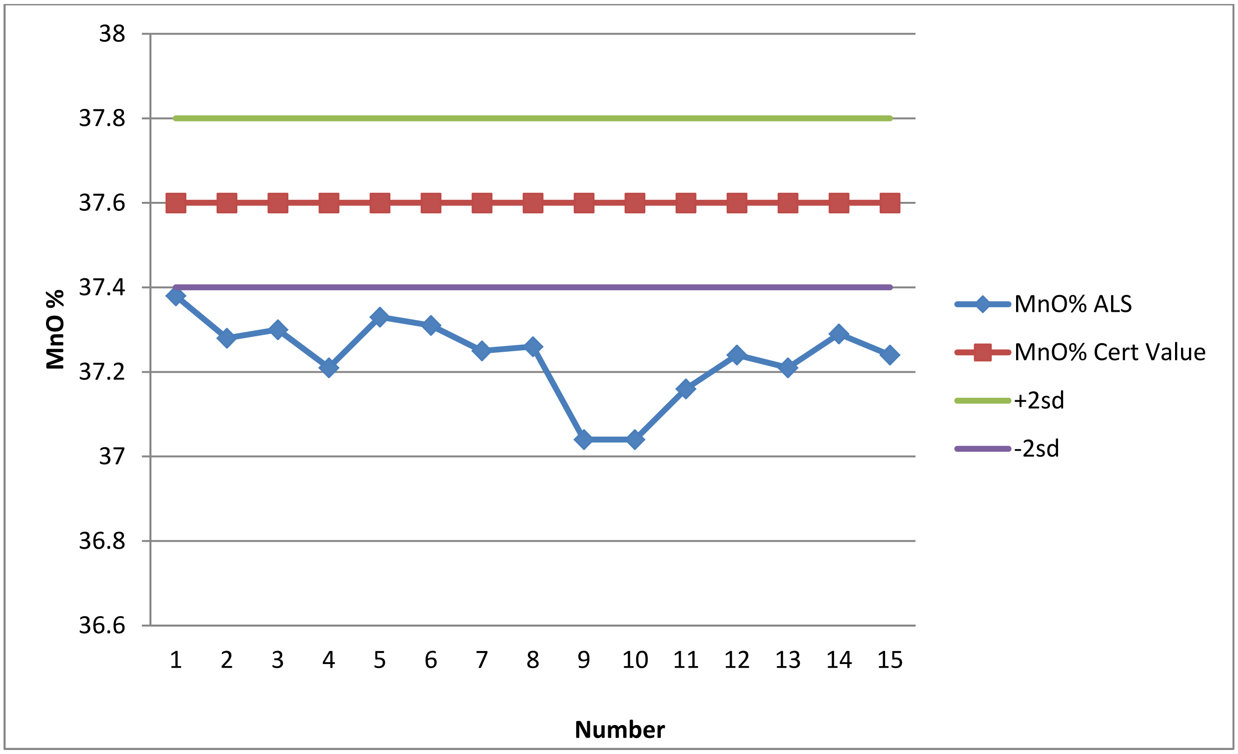
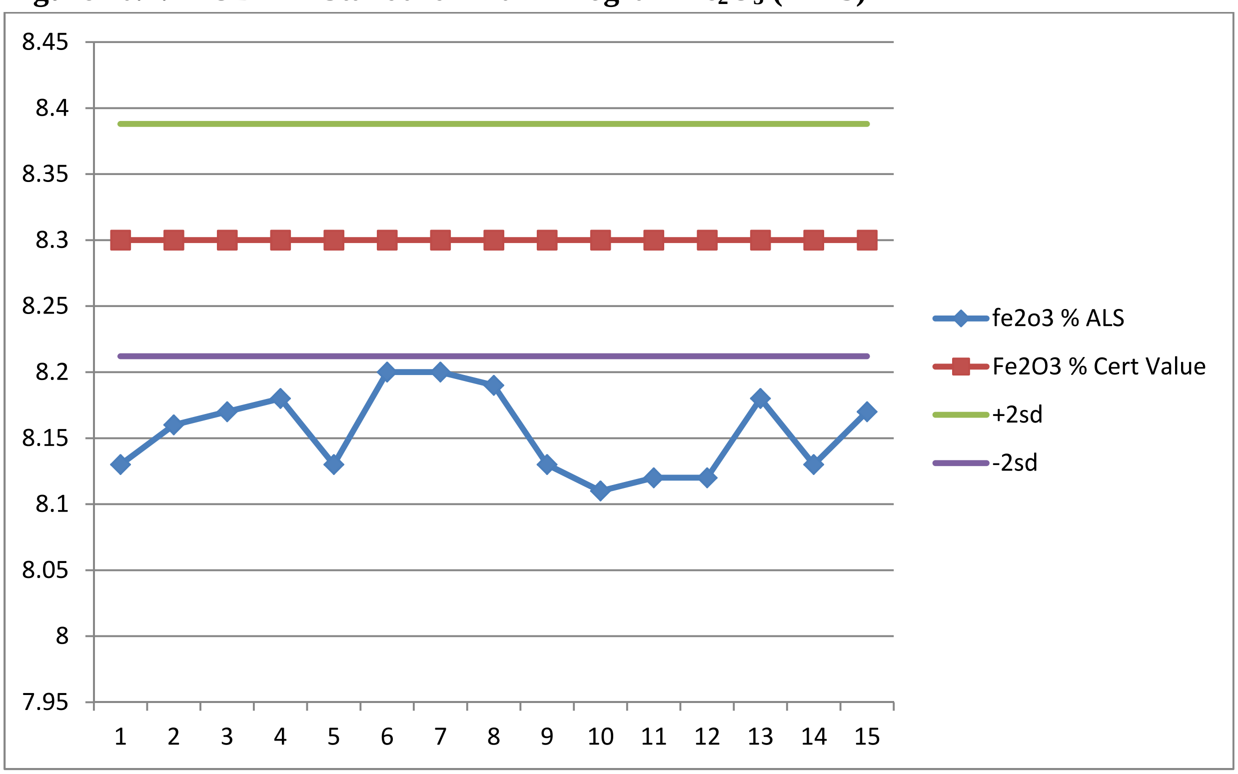


Figure 10.2: NOD-P-1 Standard – 2011 Program Fe_2O_3 (N=15)



Based on the initial ALS ME-ICP06 results, BMC elected to have all sample splits re-analyzed using the ALS ME-XRF06 protocol. The SARM-16 certified reference material was obtained by BMC from the South African Bureau of Standards in Pretoria, South Africa, and used for the re-analysis program. The sample material was sourced from the Wessels Mn deposit in the northern Cape Province, South Africa and has certified mean values of 49.17% Mn and 11.48% Fe. For report purposes, MnO and Fe_2O_3 values reported by ALS were converted to Mn and Fe values, respectively, using a factor of 0.774 for Mn % and a factor of 0.699 for Fe %. Certified reference values for the material appear in 10.2 and results of the 2011 program are presented in Figures 10.3 and 10.4.

Results for Mn range between 48.02% and 50.29% and only 1 value falls within the 95% confidence interval for the material. Data are distributed more or less evenly about the mean value. Those for Fe range between 11.21% and 11.81% and 11 of the 15 samples define a positive bias trend between 11.7% and 11.8% levels. Only one value falls within the 95% confidence interval.

Table 10.2: Certified reference material SARM-16 values

Metal	Wt %	95% Confidence Interval (Low)	95% Confidence Interval (High)
Mn	49.17	48.8	49.23
Fe	11.48	11.42	11.54
SiO_2	5.04	4.89	5.06
CaO	4.7	4.66	5.08
MgO	0.76	0.67	0.77
P	0.033	0.031	0.035
K_2O	0.02	0.01	0.02
BaO	0.6	0.59	0.68
S	0.017	0.16	0.19
Zn	364	336	370

Figure 10.3: SARM-16 Standard – 2011 Program (XRF) Mn (N=15)

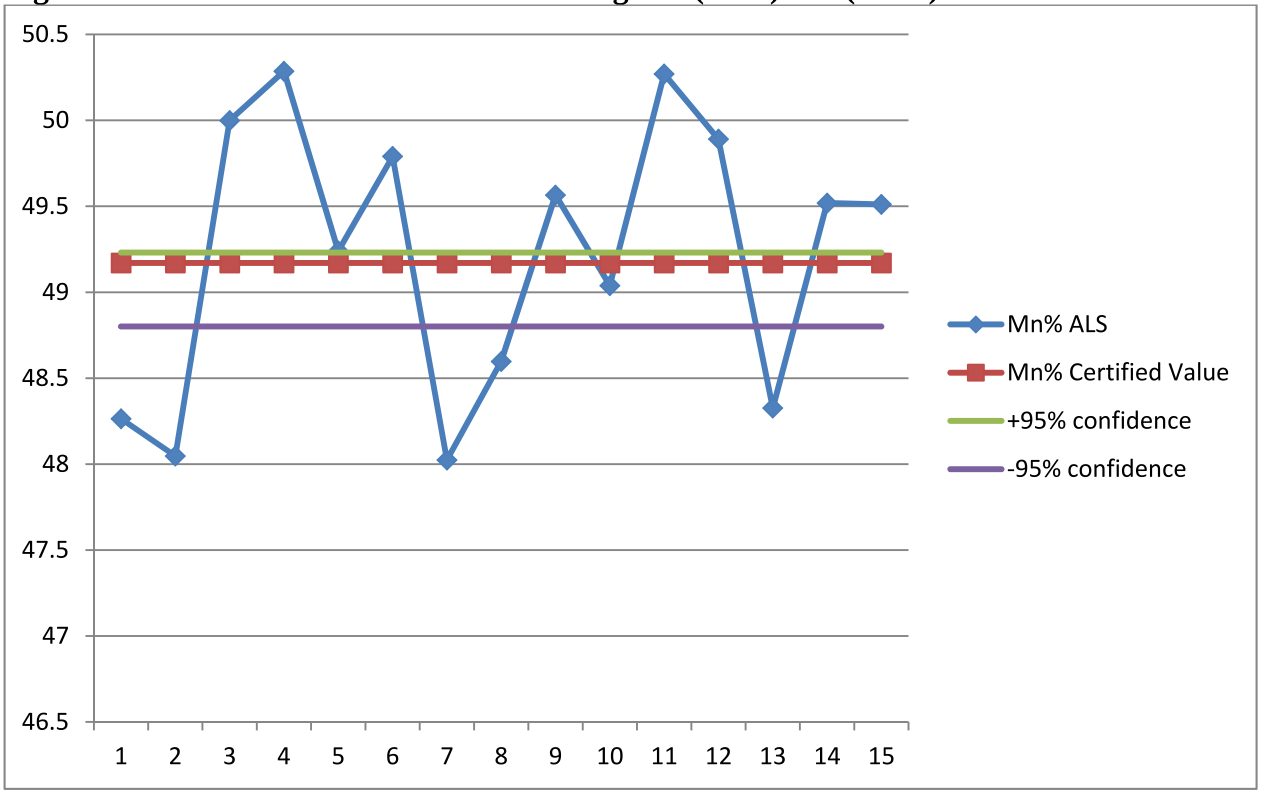
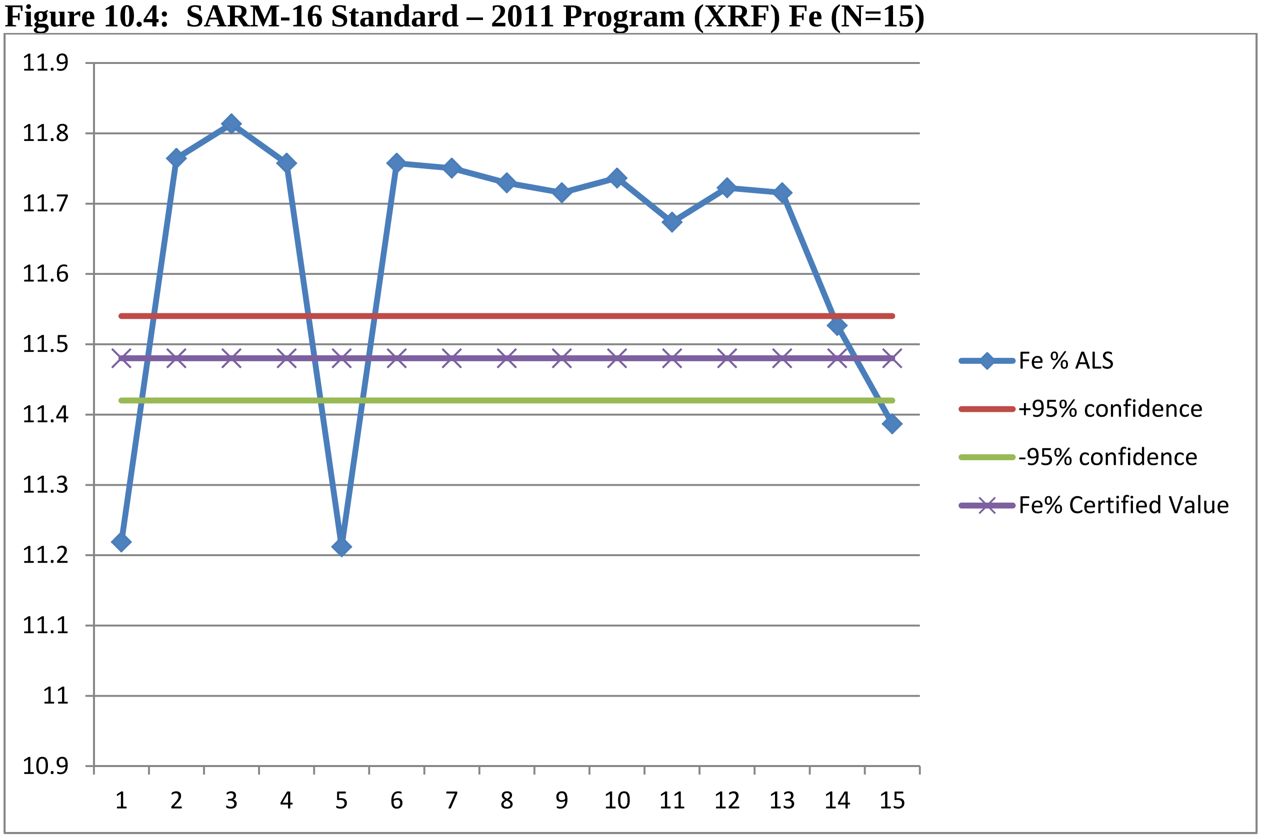


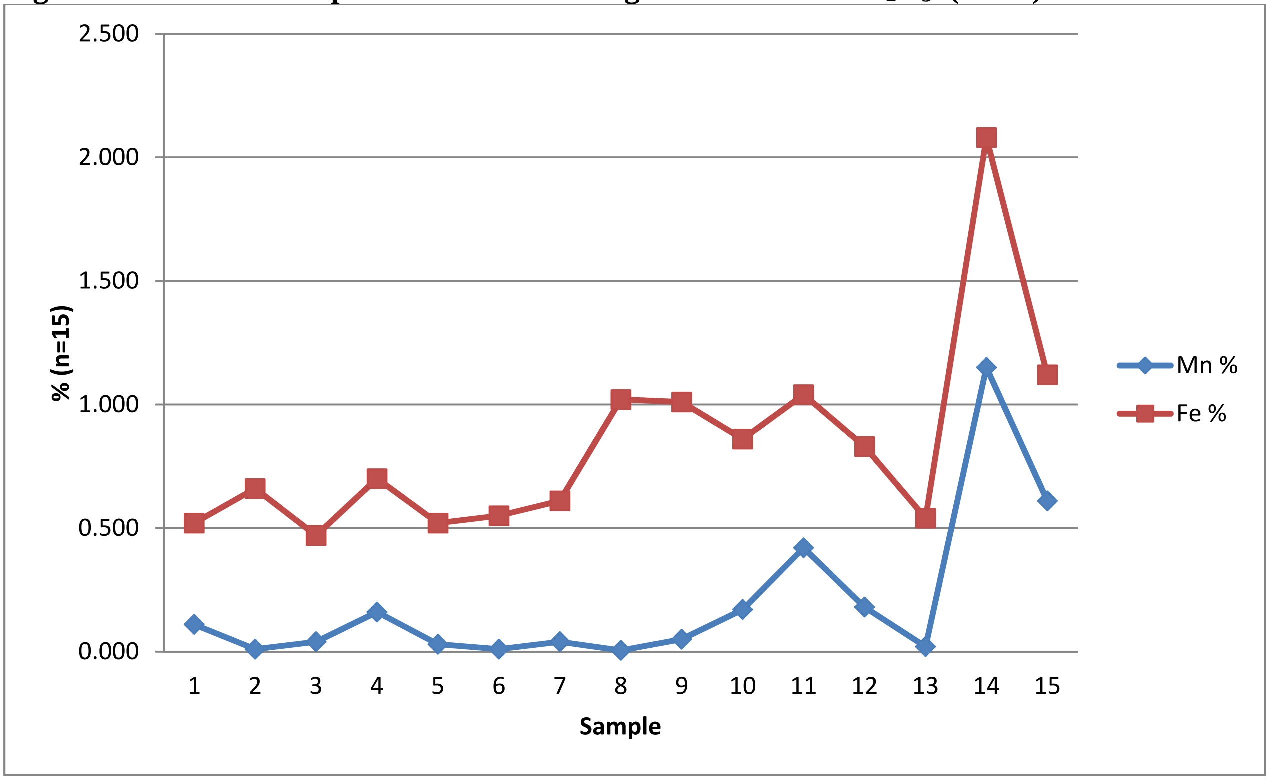
Figure 10.4: SARM-16 Standard – 2011 Program (XRF) Fe (N=15)



10.6.3.2 Blank Sample Program

A total of 15 analyses of blank sample material were returned for the 2011 program and results for Mn and Fe are presented below in Figure 10.5. The blank material consisted of nepheline syenite sand blasting sand obtained by BMC from Bell and Mackenzie Co. Ltd. of Hamilton, Ontario, Canada. Figure 10.5 shows that 2011 MnO results average 0.20% for this material and range between 0.005% and 1.15%. FE_2O_3 values (Figure 10.5) average 0.84% and range between 0.47% and 2.08%. A single sample spike in both datasets is present and defined by respective dataset values. The source of this spike is unclear, but the preceding sample in the preparation stream contained high levels of both MnO and Fe_2O_3. This suggests that preparation stage cross contamination may have occurred in this instance. However, the following blank sample also shows elevated metal levels and, in combination with the spike sample, may represent a change in the blank material composition itself, possibly due to non-homogeneity of the sample splits. Dataset core values associated with the intervals of these two blank samples do not suggest systematic cross-contamination.

Figure 10.5: Blank sample results – 2011 Program MnO and FE_2O_3 (N=15)



10.6.4 2013 BMC-Minco Program

10.6.4.1 Certified Reference Material Program

The SARM-16 certified reference material used for the 2011 re-analysis program by BMC was the only standard used by BMC-Minco for the 2013 drilling program.

A total of 47 analyses of this material were returned for the 2013 program and results for Mn and Fe are presented below in Figures 10.6 and 10.7. As for 2011 data, MnO and Fe_2O_3 values reported by ALS have been converted to Mn and Fe values, respectively, using a factor of 0.774 for Mn % and a factor of 0.699 for Fe %. Mn values for the SARM-16 dataset have a mean of 49.08% and all but 2 fall within the 95% confidence limits for the material. Two exceptions fall within .04% and .01 % of the lower 95% confidence interval limit. The SARM-16 Fe dataset has a mean value of 11.62% with minimum and maximum values of 11.43% and 12.01% respectively. No samples reported below the lower 95% confidence interval level, but 26 of the 47 samples exceeded the upper 95% confidence interval limit.

Figure 10.6: SARM-16 Standard – 2013 Program Mn (N=47)

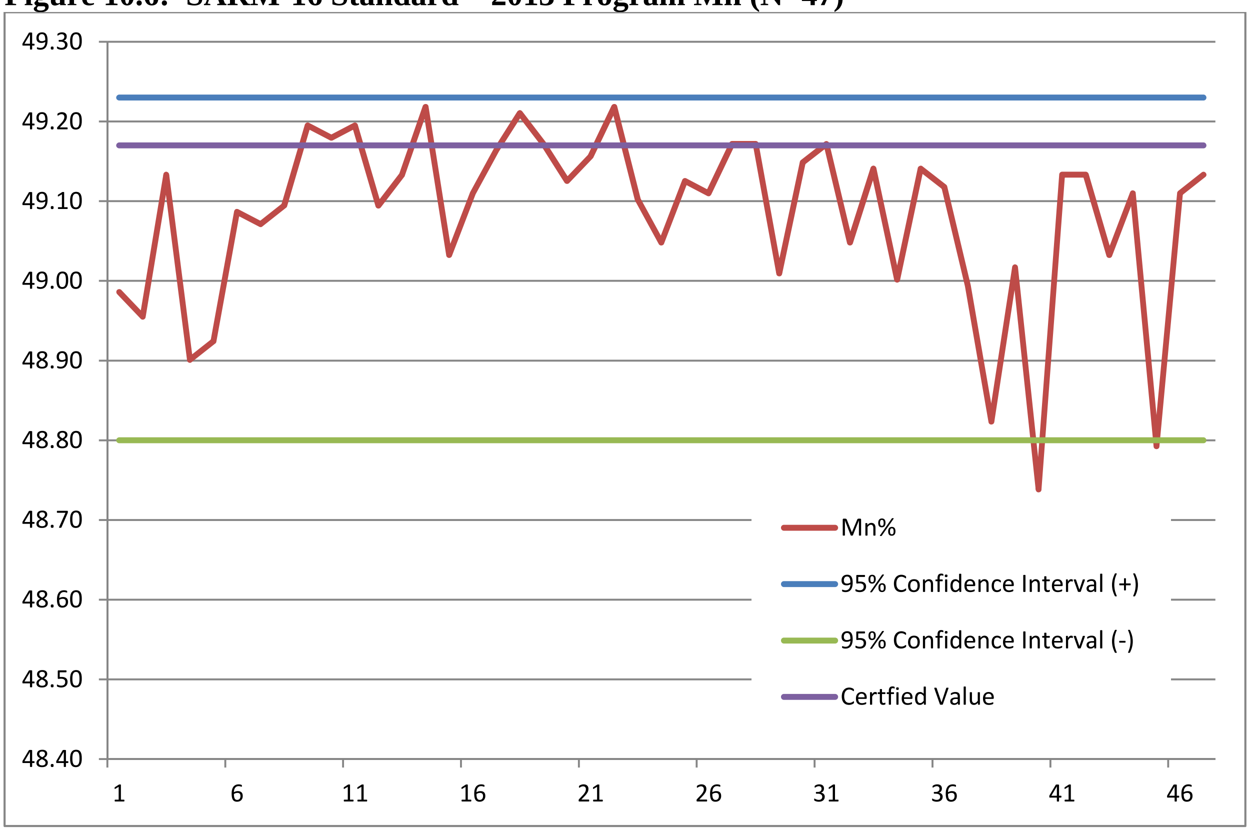
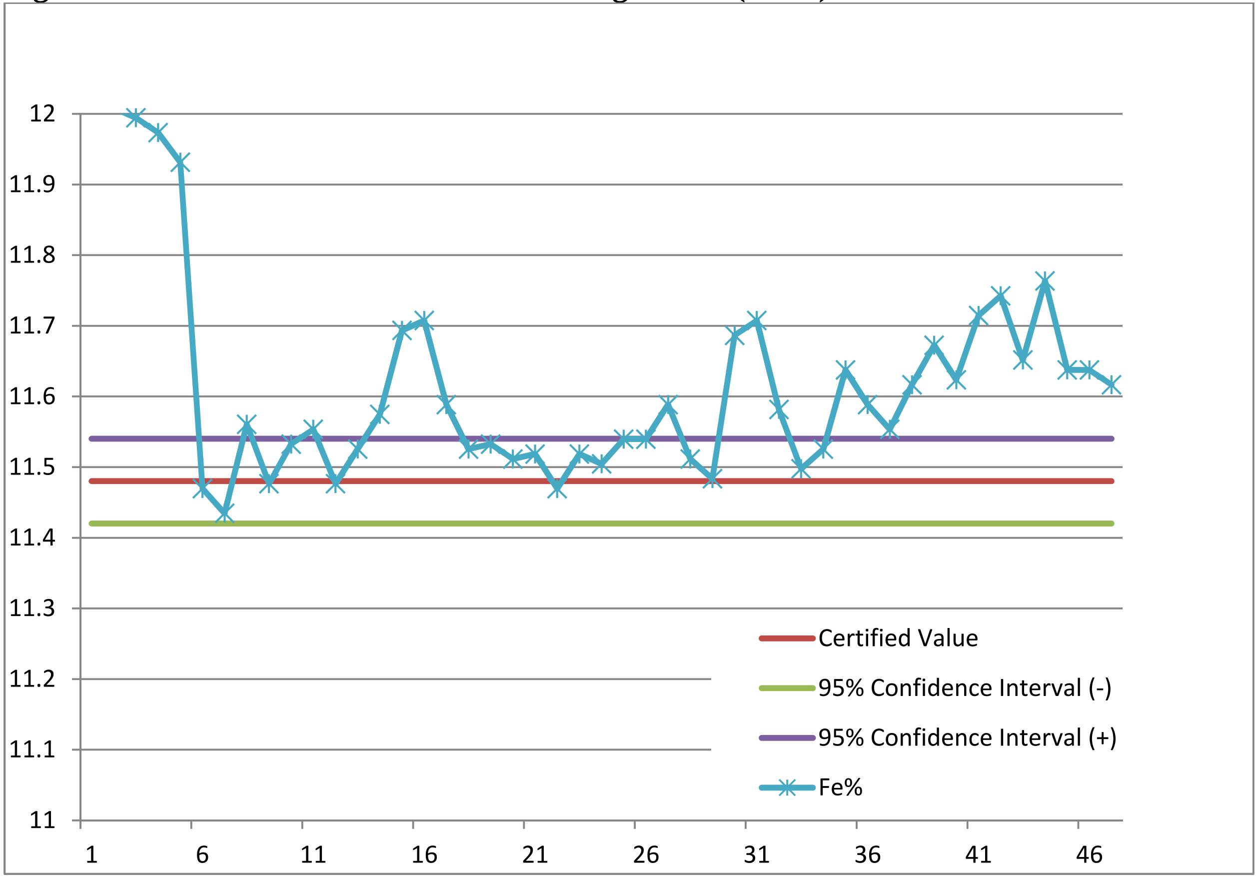


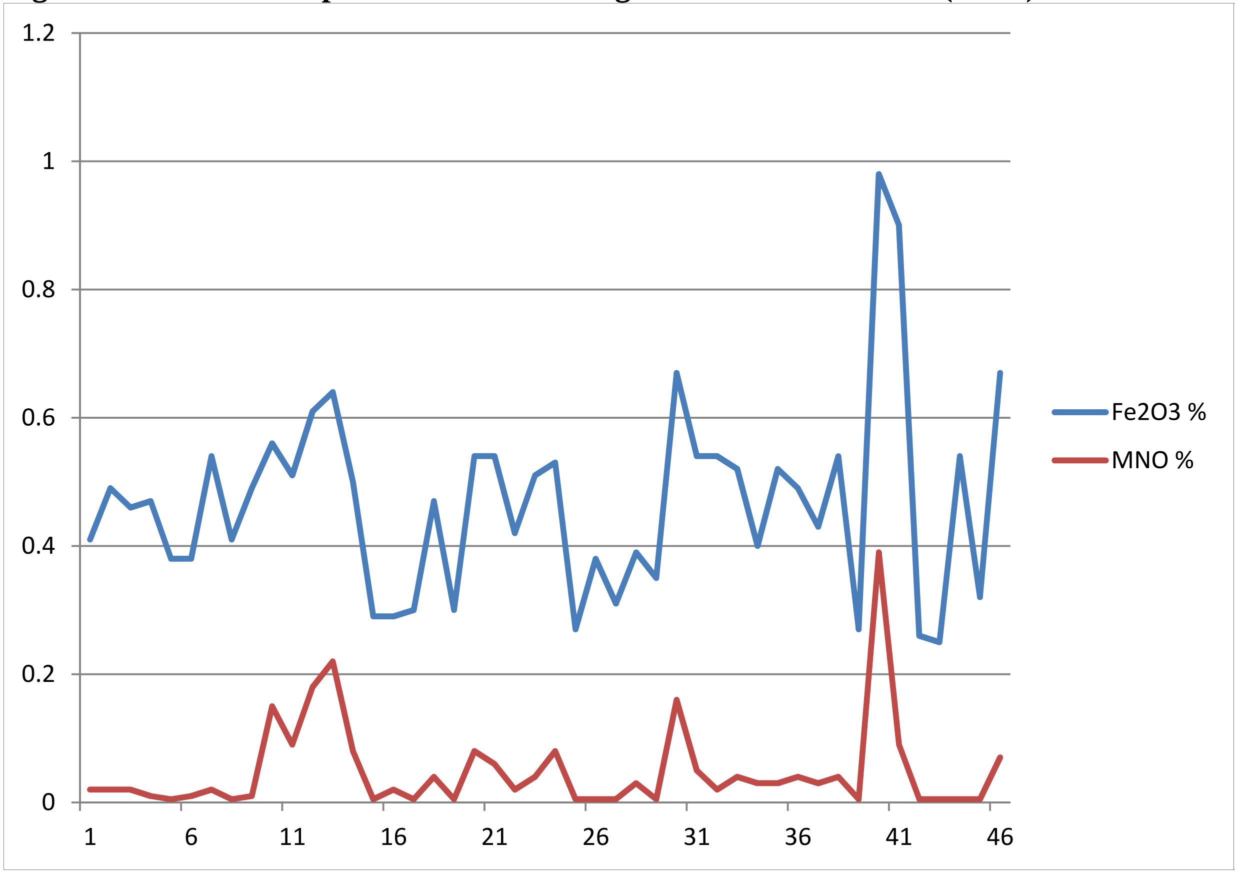
Figure 10.7: SARM-16 Standard – 2013 Program Fe (N=47)



10.6.4.2 Blank Sample Program

A total of 46 analyses of blank sample material were returned for the 2013 program and results for MnO and Fe_2O_3 are presented below in Figure 10.8. The blank material consisted of crushed high-purity quartzite having an average top size of ½ inch that was obtained from Atlantic Silica Inc., of Poodiac, New Brunswick. Figure 10.8 shows that all 2013 MnO results fall below the 0.4% level and that Fe_2O_3 values all fall below 1%. The average MnO value is 0.049% for this material and values range between 0.005% and 0.39%. Fe_2O_3 values average 0.47% and range between 0.25% and 0.98%. A single sample spike in both datasets is present and is associated with the maximum dataset values. The source of this spike is not apparent.

Figure 10.8: Blank sample results – 2013 Program MnO and FE2O3 (N=46)



10.6.4.3 2013 Duplicate Pulp Split Program

Duplicate sample pulp splits were prepared by ALS at a nominal 1 in 20 rate during the 2013 program, with an additional pulp split from each of the samples being prepared for submission as a third party check sample. MnO and Fe_2O_3 results for a total of 36 duplicate pulp splits were reviewed by Mercator and are presented below in Figures 10.9 and 10.10. Duplicate split pairs correlate well along a 1:1 trend, with Fe_2O_3 having an R^2 value of 0.999 and MnO having an R^2 value of 0.998. These results and associated trends are interpreted as indicating that the pulp splits are homogenous and that associated analyses reflect acceptable precision.

Figure 10.9: 2013 ALS pulp duplicate split results - Fe_2O_3 (N= 36)

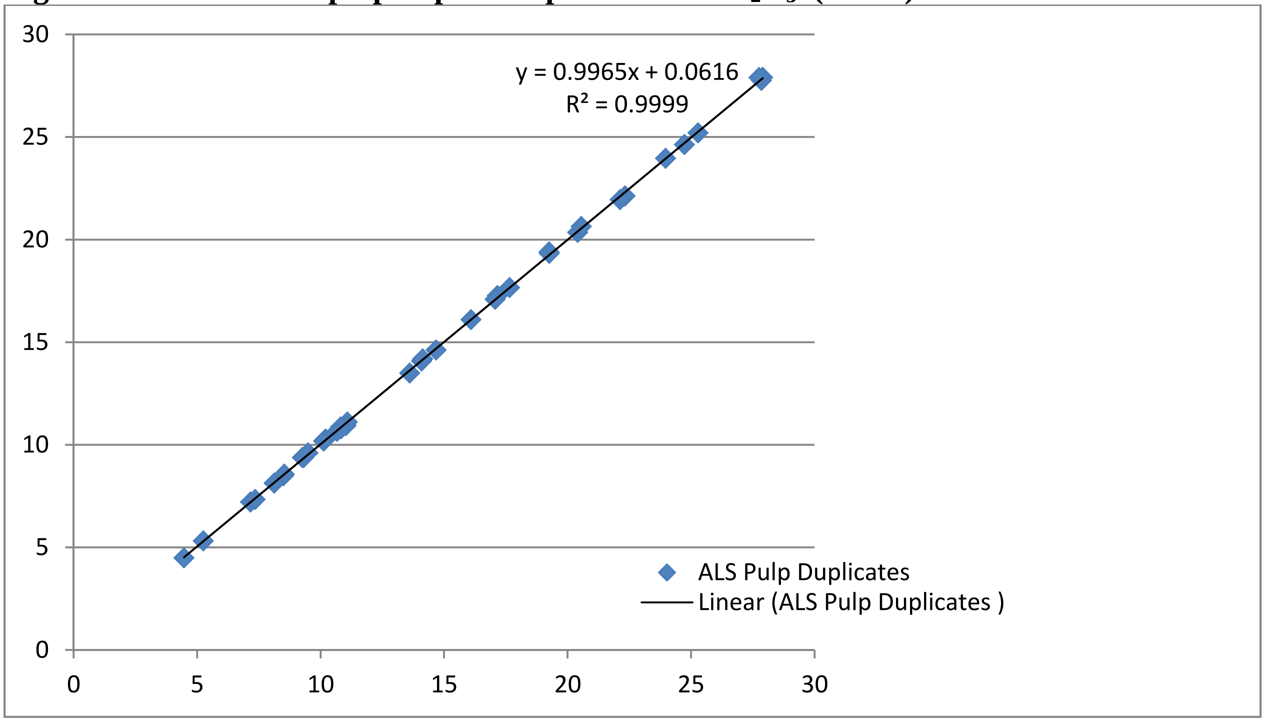
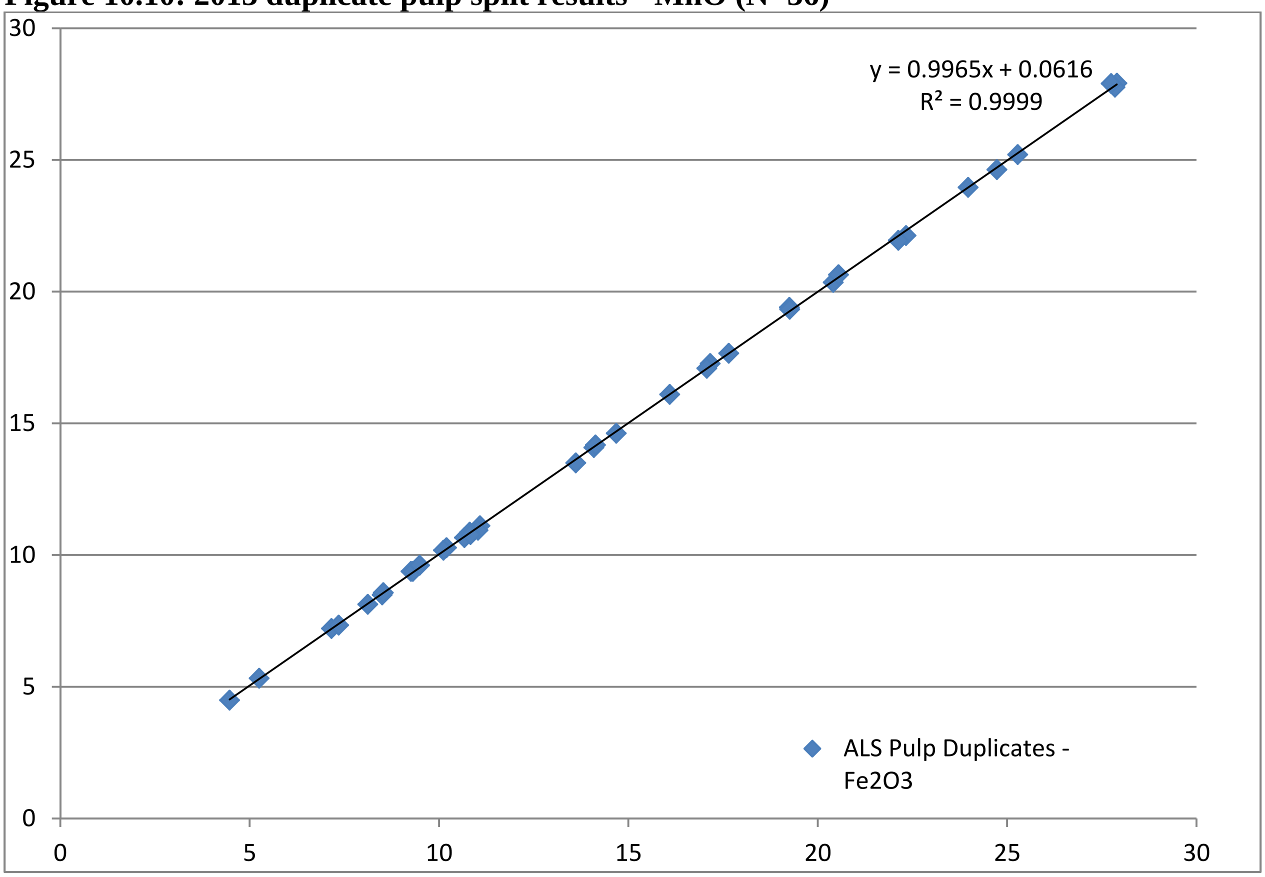


Figure 10.10: 2013 duplicate pulp split results - MnO (N=36)



10.6.4.4 2013 Field Duplicate ¼ Core Program

BMC prepared ¼ core field duplicate samples at a nominal 1 in 20 frequency. For these samples, the primary core sample was also a ¼ core sample to allow a full half core to remain in the archive for possible future use in metallurgical studies. Both samples were prepared by ALS and analysed according to the project protocol.

A total of 47 ¼ core field duplicate samples were submitted for analysis in 2013 and comparisons of MnO and Fe_2O_3 results for corresponding ¼ core splits are presented in Figures l0.11 and 10.12. The sample pairs correlate well along a 1:1 trend, with Fe_2O_3 having an R^2 value of 0.975 and MnO having an R^2 value of 0.998. This indicates that substantial homogeneity exists within the core samples at the level of the ¼ core sub-sample. Good correlation is anticipated in such sedimentary deposits.

Figure 10.11: Field duplicate results – 2013 program Fe_2O_3 (N= 47)

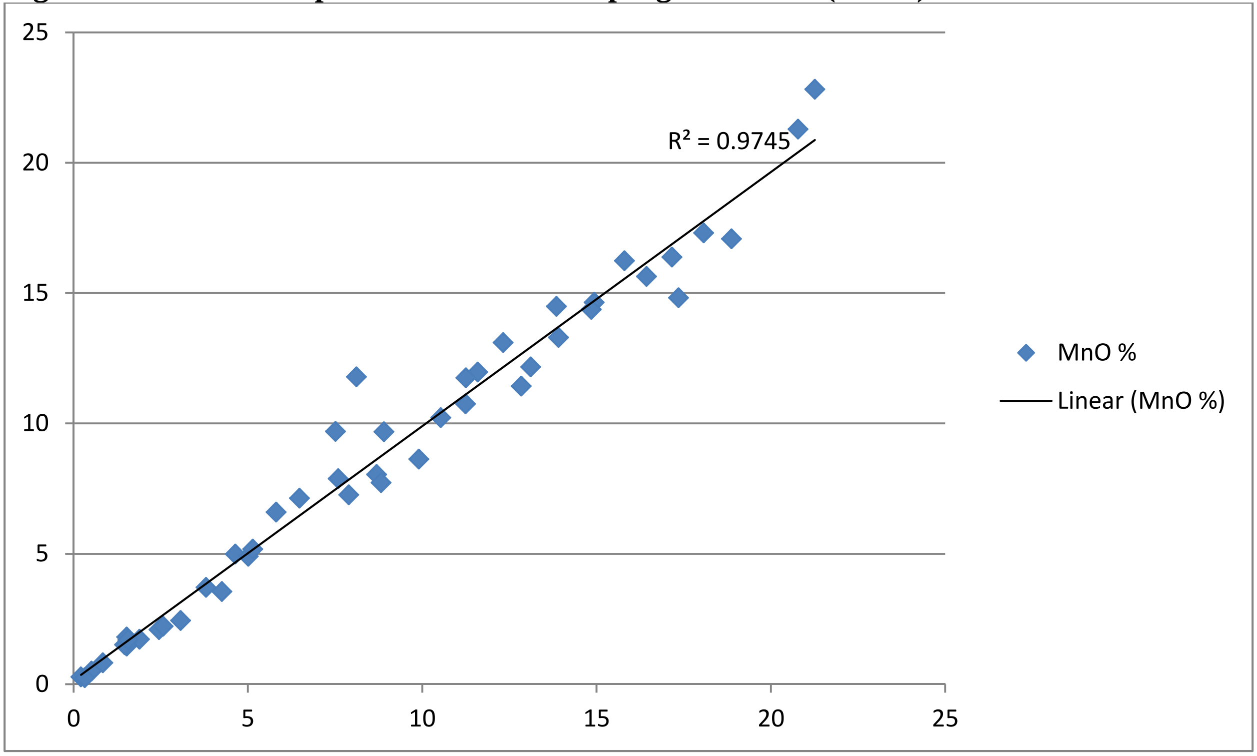
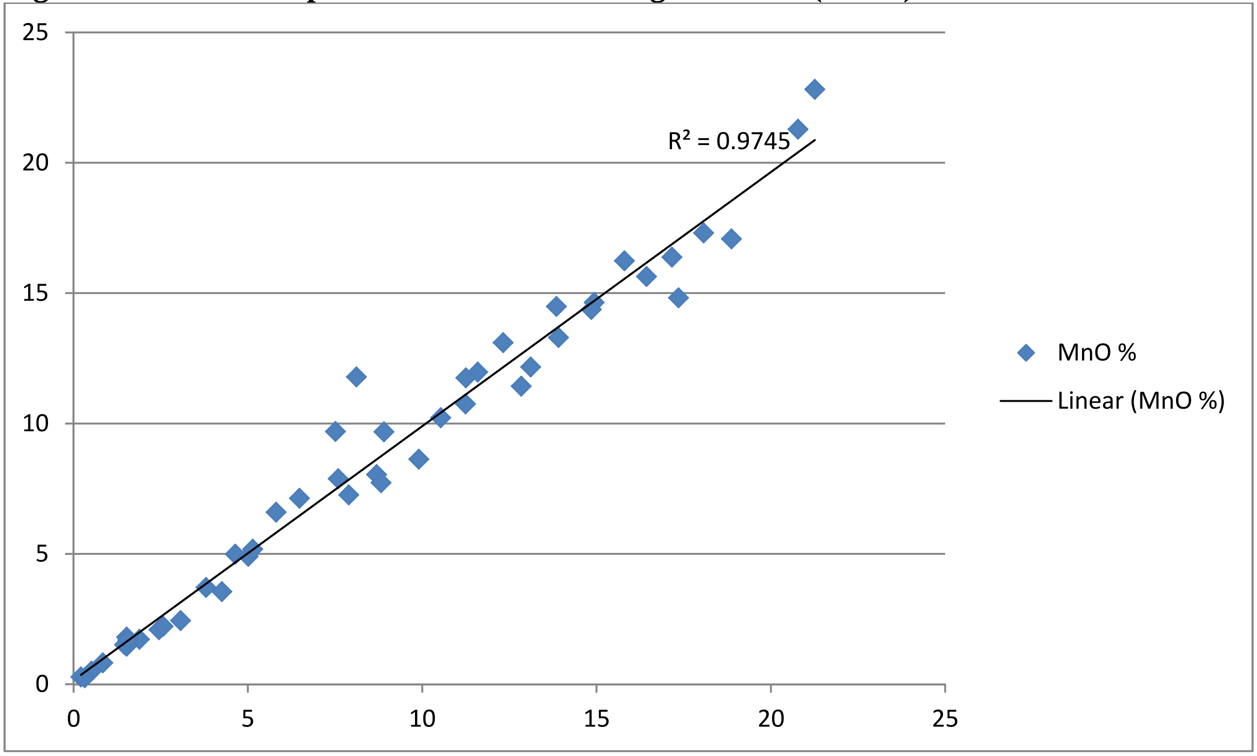


Figure 10.12: Field duplicate results – 2013 Program MnO (N= 47)



10.6.4.5 2013 Third Party Check Sample Program

Check sample pulps were prepared by ALS from core samples used to prepare the duplicate split pulps discussed above. These pulps were sent to SGS for analysis using XRF methods (SGS XRF-76 code) and reflect a nominal 1 in 20 rate within the core sample submission stream. As noted earlier, SGS is a fully accredited, independent analytical firm having ISO registration and an international scope of operations.

Results for a total of 37 check sample pulps were reviewed by Mercator and are presented in Figures l0.13 and 10.14. Check sample duplicate pairs correlate well along a 1:1 trend, with Fe_2O_3 having an R^2 value of 0.999 and MnO having an R^2 value of 0.998. Results from the two laboratories correlate very well and no issues arising from the check sample program were identified with the project dataset.

Figure 10.13: Check sample results – 2013 Program Fe_2O_3 (N= 37)

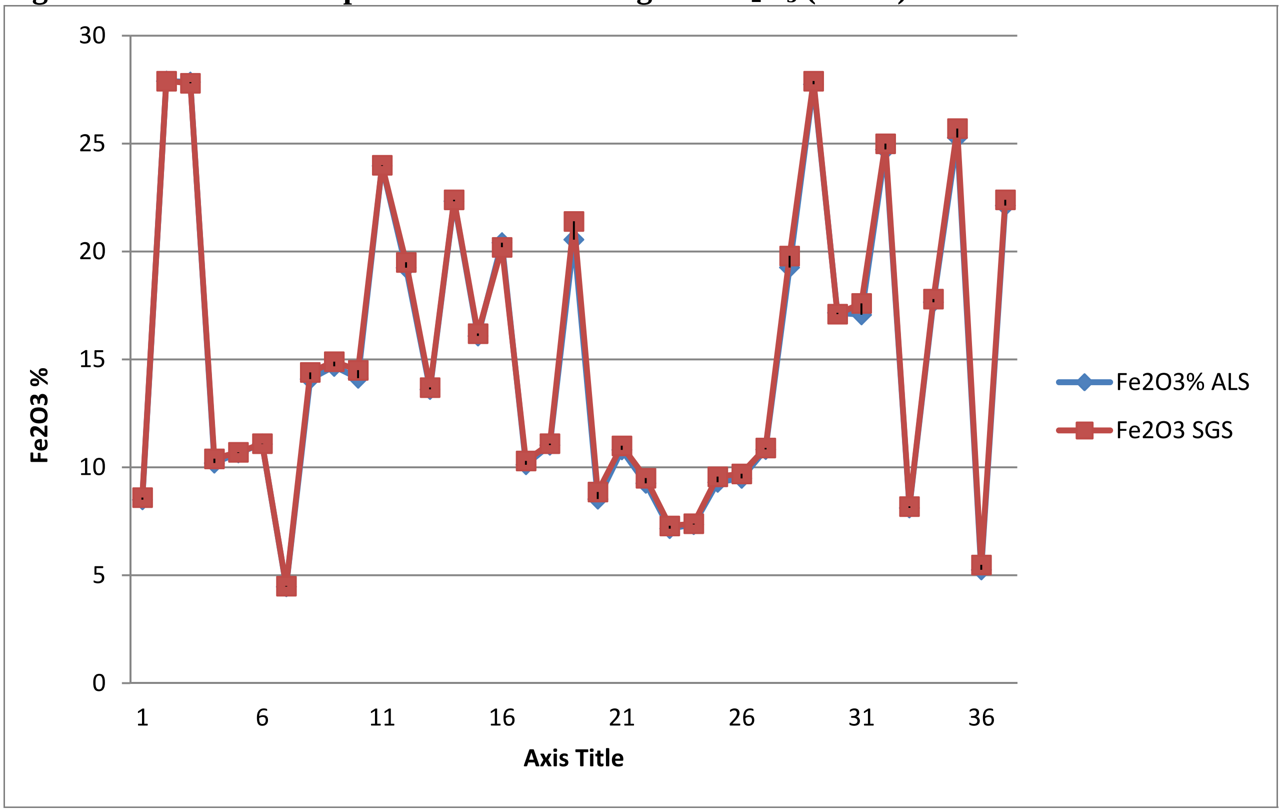
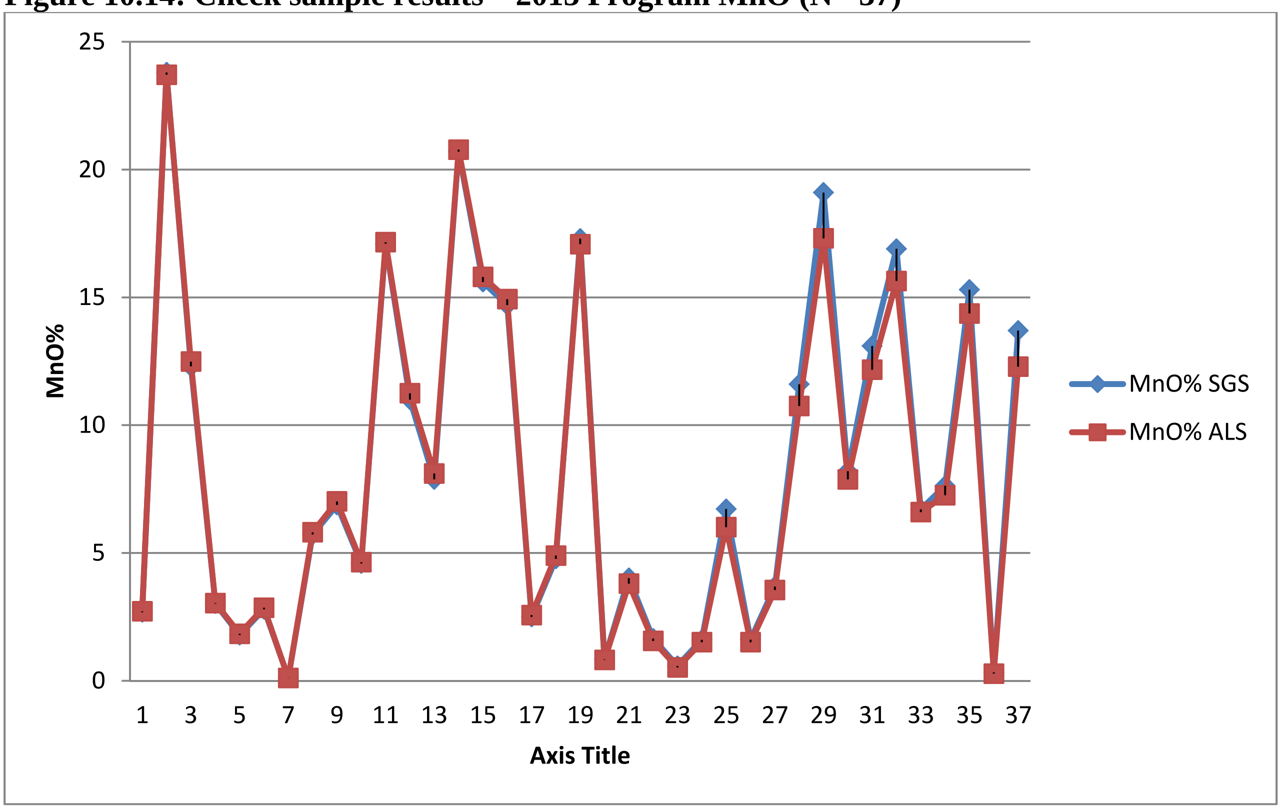


Figure 10.14: Check sample results – 2013 Program MnO (N= 37)



10.6.5 Comment on 2012 QA/QC Program Results

Mercator is of the opinion that sample preparation, analysis and security methodologies employed during the 2011 and 2013 drilling programs by BMC and BMC-Minco, respectively, are consistent with current industry standards and sufficient for this project.

Review of QA/QC program results for the 2011 and 2013 programs showed that the NOD-P-1 certified reference material used in 2011 was not well matched to the borate fusion-ICP-ES analytical method originally used and produced results that systematically show low bias. This was in part addressed by BMC having all of the 2011 ICP assayed samples re-analysed by ALS using their XRF method; that being the same method employed for the 2013 analyses. Subsequent use of the SARM-16 produced better results, but in part included a slight, high bias trend. Notwithstanding these issues, accuracy of the associated datasets is considered to be adequate for current resource estimation purposes. No substantive indications of sample cross-contamination are apparent in the blank sample data sets and good correlation between duplicate pulp split analyses indicates acceptable precision. Sample homogeneity at the ¼ core scale is indicated by results of the field ¼ core duplicate program. Independent laboratory check sample program results show that the XRF analytical methods used by ALS and SGS produce highly comparable results.

Based on the above, Mercator considers the 2011 and 2013 drilling dataset to be of acceptable quality for use in resource estimation programs and recommends that consideration be given to development of at least three project-specific internal certified reference materials for use in future drilling or sampling programs. These should reflect the low, mid and high levels of the deposit's grade spectrum and be prepared by an accredited independent laboratory or analytical services firm.

11 Data Verification

11.1 Site Visit by Mercator

Mercator completed a site visit to the Woodstock property between March 26th and 27th, 2013. Andrew Hilchey, P.Geo, and Tamara Moss, MIT, were accompanied on the site visit by BMC's geologists, Melissa Lambert and Bryan Way. On March 28th, 2013, Hilchey and Moss also examined and sampled two holes (87-002 and 87-004) from historic drilling on the Woodstock Property. This core is currently stored at the New Brunswick Department of Minerals and Petroleum core storage facility in Sussex, New Brunswick. One previous site visit by Mercator was conducted from December 15th and 18th, 2011, which is described in Webster et al. (2012).

During the BMC core facility visit, Mercator confirmed presence of mineralization in drill core at depths specified in BMC logs and also verified various lithological descriptions in logs, against corresponding core intervals. A total of 15 check samples were collected by Mercator from Woodstock drill core from 1987, 2011, and 2013 drilling. Mercator supervised all aspects of core marking, cutting and bagging, with respect to the check samples and these were securely held by Mercator, until delivered to the offices of AGAT Laboratories Ltd. (AGAT) in Dartmouth, NS, for shipment by courier to that firm's Mississauga facility for preparation and subsequent analysis using XRF methods. Specific gravity determinations were also carried out. AGAT 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_2O_3 and MnO results for the Mercator check sampling program are presented in Figures 11.1 and 11.2 below and show that good correlation exists between the check analysis values and the corresponding project database values.

In addition to check sampling, Mercator also completed a field check on drill collar coordinates. This was done by recording field locations for nine drill holes using a Garmin GPS Map60 Cx hand-held GPS unit and comparing their UTM coordinates with their corresponding drilling database entries. Table 11.1 presents results of the check and shows that acceptable correlation exists between the two sets of data. The drill collar surveying was carried out by a registered land surveying firm using Differential GPS technology that would be expected to have greater accuracy than the hand-held derived data.

Figure 11.1: Check sample results – 2013 Program Fe2O3 (N= 15)

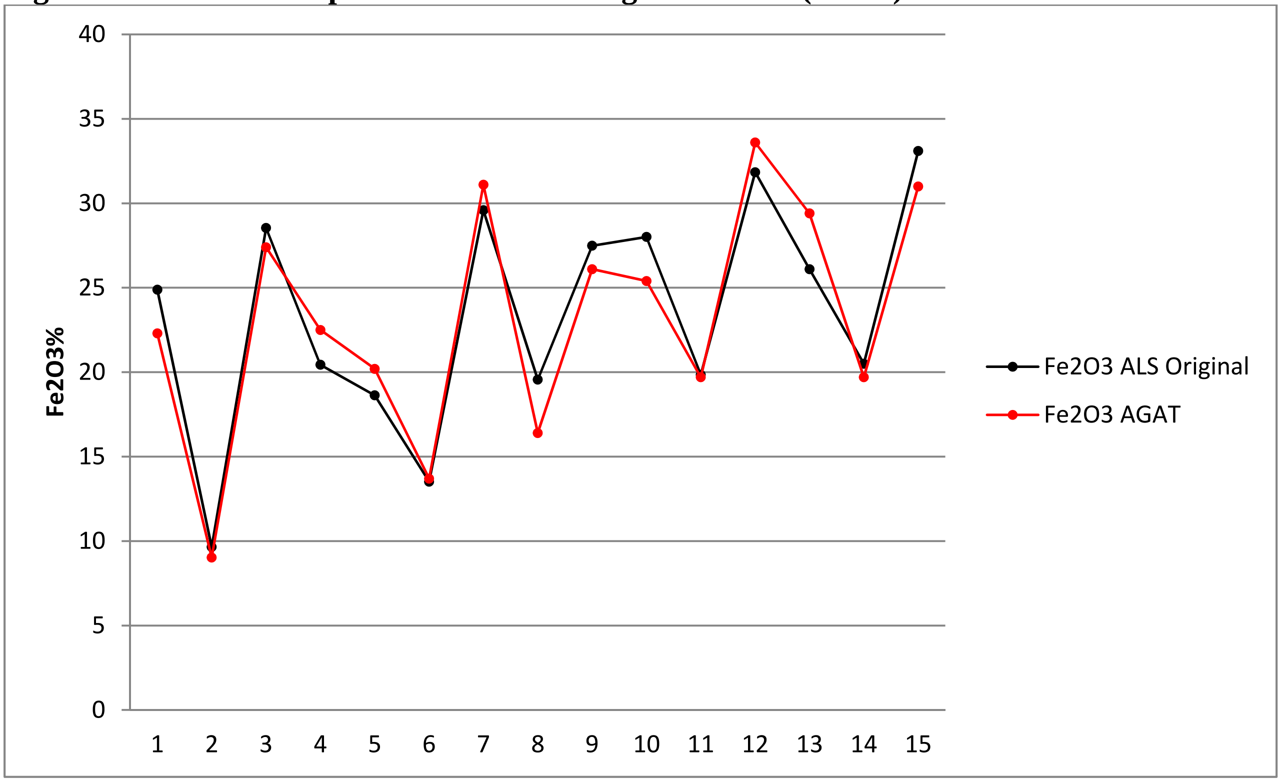


Figure 11.2: Check sample results – 2013 Program MnO (N= 15)

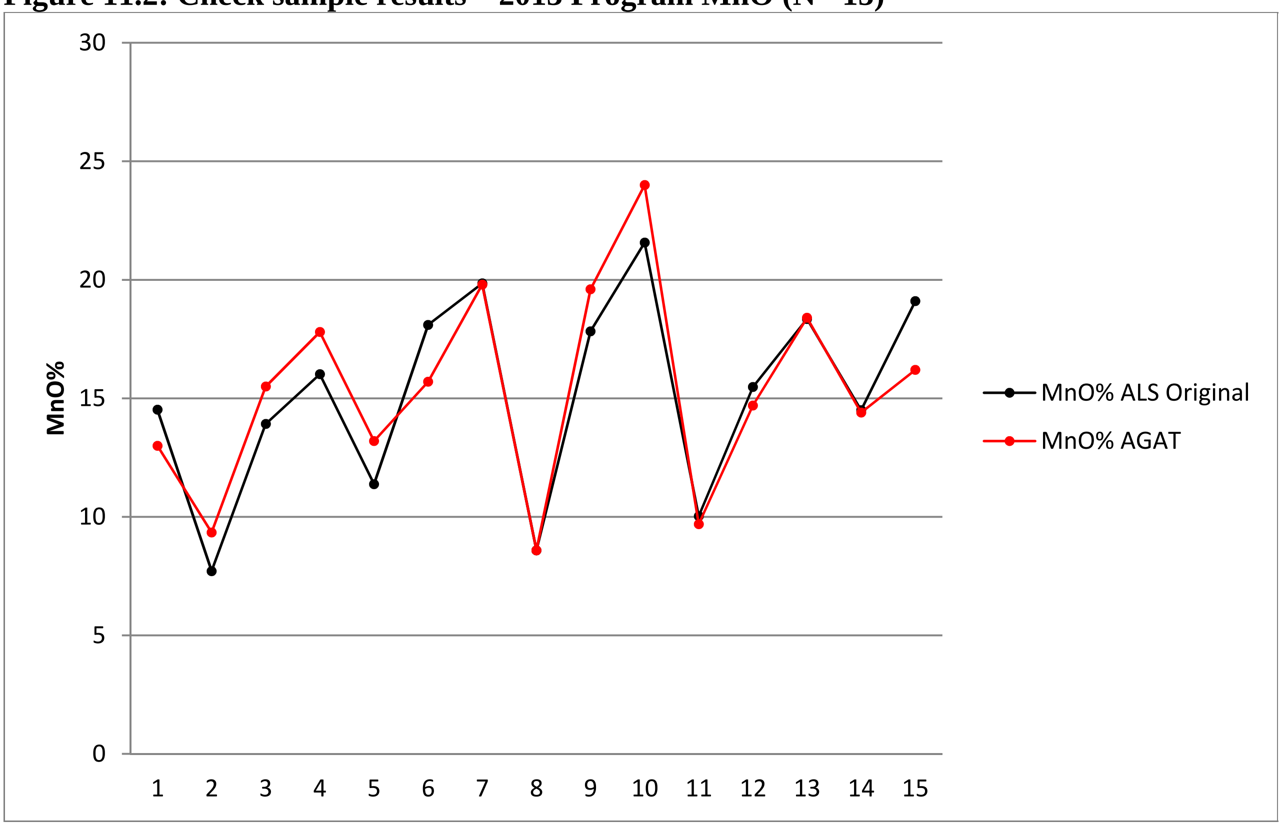


Table 11.1: Comparison of drill collar coordinates

Hole ID	UTM East (m)	UTM North (m)	Elev. ASL (m)	BMC East (m)	BMC North (m)	BMC Elev. (Asl-m)	East Var. (m)	North Var. (m)	Elev. Var. (m)
PL-13-024	603209	5113126	137	603215.21	5113134.23	139.16	-6.21	-8.23	-2.16
PL-13-018	603422	5113144	127	603424.53	5113140.13	130.01	-2.53	3.87	-3.01
PL-13-014	603406	5113260	128	603405.28	5113262.11	128.96	0.72	-2.11	-0.96
PL-13-016	603316	5113319	125	603316.28	5113313.32	127.28	-0.28	5.68	-2.28
PL-13-011	603370	5113402	124	603371.71	5113397.73	126.02	-1.71	4.27	-2.02
PL-11-008	603430	5113502	113	603432.22	5113498.21	119.05	-2.22	3.79	-6.05
DDH-87-002	603451	5113482	118	603451.78	5113480.94	119.45	-0.78	1.06	-1.45
DDH-87-003	603484	5113467	123	603484.27	5113460.94	117.46	-0.27	6.06	5.54
PL-11-006	603511	5113443	124	603513.5	5113442.78	117.95	-2.5	0.22	6.05

Note: All coordinates reflect UTM NAD 83 Zone19

11.2 Database Checking

Mercator validated project database entries for 1985, 1987, 2011 and 2013 drilling campaigns to support the current resource estimation program. This included systematic checking of database entries against source documents, with correction of deficiencies where necessary. Checking of database content by Mercator staff 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. In addition to these manually coordinated checks, routine digital assessment of 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. No substantive issues were identified from checking activities.

11.3 Comment by Mercator on Data Verification

Mercator considers results of the data verification program described above to be acceptable and that the associated drilling program digital database to be acceptable for resource estimation use.

12 Mineral Processing and Metallurgical Testing

12.1 Introduction

Thibault & Associates Inc., with expertise in process metallurgical assessment, was retained by BMC to carry out initial metallurgical testing on core samples derived from the company's 2011 Woodstock Property drilling program on the Plymouth deposit. Samples were chosen and supplied by BMC. Thibault cannot vouch for the nature of the samples as being representative of the mineralization being assessed. BMC indicated all samples were selected from drill cores drilled during the summer of 2011 as a test of the Plymouth Fe-Mn Deposit. BMC further indicated that assays results and other information pertinent to the samples were disclosed fully in their press releases dated September 7 and 26, 2011, including the Company's implementation of QAQC protocols.

The following description of the metallurgical program was provided by Stephanie M. Goodine, P. Eng., of Thibault.

12.2 Mineralogy

Crushed drill core samples for all five of the 2011 drill holes (PL-11-006, PL-11-007, PL-11-008, PL-11-009, PL-11-010) were delivered to Thibault in bags containing approximately 3 m of core each. To represent the general properties of the deposit, a weighted average bulk composite sample of all five drill holes, containing a total of seven mineralized intersections as defined by BMC, was split from these samples and blended accordingly.

The Plymouth Fe-Mn Deposit is hosted within bands of brick-red siltstone and green-grey siltstone, which imparts a distinct color characteristic to the drill core samples. Based on the results of historic metallurgical testing, it was suggested that the brick-red siltstone and green-grey siltstone hosted samples may differ in mineralogy, with respect to the types of manganese and iron minerals present. Therefore, drill core samples within the mineralized intersections were categorized by BMC according to this color characteristic and two additional weighted average composite samples were split and blended to generate a brick-red siltstone hosted composite sample, referred to as the "red" composite sample and a green-grey siltstone hosted composite sample, referred to as the "grey" composite sample. It is anticipated that the brick-red samples may contain a higher proportion of manganese and iron oxide-based minerals and that the green-grey siltstone hosted samples may contain a higher proportion of manganese and iron carbonate-type minerals. Along with the bulk composite sample, the "red" and "grey" composite samples were tested to distinguish the different properties for these sections of the deposit.

Weighted average composite samples of the mineralized intersections were also blended for each individual drill hole. No testing has been completed to date using the individual drill hole composite samples.

Thibault sub-contracted SGS Lakefield Ltd. (SGS) in Lakefield, Ontario to perform Semi-Quantitative X-Ray Diffraction (XRD) analysis on the 2011 drill core samples. The work was conducted to determine the major and minor mineral phases that occur in the deposit and, furthermore, to quantitatively determine relative amount of manganese and iron present in the deposit in their respective mineral forms (i.e. carbonate, oxide and silicate forms) since this impacts directly on the development of a process flowsheet for the deposit.

On October 13, 2011, Thibault sent a 100 g composite sample of the 2011 drill core material for XRD analysis to SGS. Along with the bulk composite sample, 100 g of both the red and grey composite samples were sent for XRD analysis.

According to the results of the XRD scan, quartz, rhodochrosite, chlorite, plagioclase, and hematite were present in moderate amounts (i.e. 10-30 wt%) in the bulk composite sample. Rhodochrosite ($MnCO_3$) was the only manganese mineral detected by the scan, and was present at a grade of 20.5 wt% $MnCO_3$ (9.8 wt% Mn) in the bulk composite sample. It is possible that trace amounts of other manganese species (i.e. manganese oxides) were not detected in the XRD scan because they are either not crystalline or are present as solid solutions. The manganese assayed as $MnCO_3$ by XRD represents approximately 90% of the manganese content determined by the Inductively Coupled Plasma – Optical Emissions Spectroscopy (ICP-OES) method.

Iron was also reported as having a strong presence in the bulk composite sample and was found to be present in both oxide form (hematite, magnetite, ilmenite) and as a carbonate (siderite). Oxide forms of iron minerals were generally dominant in the "red" composite sample, which contained 16.4 wt% hematite while the "grey" composite sample contained only 3.6 wt% hematite. Siderite, on the other hand, was determined to be the dominant iron species in the "grey" composite sample at 9.5 wt% siderite versus 2.3 wt% siderite in the "red" composite sample. The bulk composite sample contained 10.4 wt% hematite and 6.0 wt% siderite.

The most prominent mineral species in the "grey" composite sample were reported as quartz, rhodochrosite, chlorite, and plagioclase. Again, rhodochrosite was the only manganese species detected at 22.3 wt% $MnCO_3$ (10.7 wt% Mn).

Quartz, rhodochrosite, plagioclase, and hematite were all found to be present in moderate amounts in the "red" composite sample. Rhodochrosite was found to be present at 19.3 wt% $MnCO_3$ (9.2 wt% Mn).

Overall, the XRD results indicated that the deposit consists largely of silica based compounds, quartz and mica, rhodochrosite, and iron.

12.3 Hydrometallurgical Testing (Fall 2011-Spring 2012)

A scoping-level bench scale test program was initiated in October of 2011 to explore options for hydrometallurgical extraction (leaching) of manganese from the samples and to quantify a preliminary leach extraction efficiency for manganese from the 2011 drill core composite samples. Approximately 65 leach tests were completed under varying conditions of reagent type, reagent addition rate, leach time, leach temperature, slurry density and solid particle size.

The Mineral Engineering Center (MEC) at Dalhousie University performed the majority of the analytical work on the hydrometallurgical solutions and solids using ICP-OES analytical methods. A standardized manganese ore sample (Brammer Standard DH 4303) was scanned with each solid sample set to support the accuracy of the results. Quality assurance and confidence in MEC assay results for head grade analysis of the bulk, "red" and "grey" composite samples were verified by ALS Canada Limited (ALS), whom performed the analysis of drill core samples from the 2011 drill program, using both ICP-OES and X-Ray Fluorescence (XRF) analytical methods.

Sulphuric acid (H_2SO_4) at various concentrations was initially tested for leaching of manganese from the samples. At an acid concentration of 50 g/L, at 10 wt% pulp density and leach temperature of 85^{o}C, the extraction of manganese was found to be 89.2 wt%, allowing a four hour leach residence time, for the bulk composite sample. Under the same conditions, the extraction of manganese from the "grey" composite sample was 97.7 wt% at 50 g/L H_2SO_4, whereas the extraction of manganese from the "red" sample was 89.2 wt%. Manganese extraction from all samples was observed to reach a plateau at approximately 50 g/L H_2SO_4, while the extraction of iron continued to increase linearly, with increasing acid concentration. The results of this series of leach tests provided indication that a reducing acid leach may not be required for the extraction of manganese from the Plymouth Fe-Mn Deposit samples and that an atmospheric sulphuric acid leach may provide sufficient extraction of manganese from the mineralized material.

Kinetic leach tests were performed at initial acid concentrations of 50 g/L and 100 g/L. At the higher initial acid concentration, manganese extraction efficiency was found to plateau after approximately two hours, and at the lower initial acid concentration the same effect was observed after approximately three to four hours of residence time, indicating that acid concentration has a significant effect on the leach kinetics. Moreover, a preliminary review of the leach test results reported to date indicates that acid concentration is the most significant factor affecting the hydrometallurgical extraction of manganese from the drill core samples.

Subsequent leaches were performed at a controlled pH of 1.0 by addition of sulphuric acid to the slurry, on a semi-continuous basis, throughout the duration of the test. The semi-continuous addition of sulphuric acid to the leach over time was thought to be more representative of a continuous leach process, as it would normally be conducted in a full-scale hydrometallurgical plant setting. At a controlled pH of 1.0, under the same leach conditions described above, the extraction of manganese was calculated as 94.1 wt% for the bulk composite sample and 99.1 wt% and 98.0 wt% respectively for the “grey” and “red” composite samples.

Further testing was performed on the bulk composite sample under controlled conditions, such that the pH was maintained throughout the tests at pH 3.0, 4.0, 5.0, and 6.0 by semi-continuous addition of sulphuric acid. Manganese extraction after six hours residence time reached a maximum of 56.1 wt% at a pH of 3.0 and extraction was observed to decrease with increasing slurry pH, with negligible extraction of manganese being observed at pH 6.0. Co-extraction of iron was also found to decrease with increasing pH, with no co-extraction of iron being observed at slurry pH greater than 4.0. Further testing to determine if extending the leach residence time beyond six hours could improve on manganese extraction at elevated pH was conducted; however, the leach extraction was found to reach a plateau after approximately eight hours in all tests.

Due to the fact that the majority of the manganese present in the ore was determined by XRD analysis to be present in the form of a carbonate, it was expected that sulphuric acid alone may be capable of producing high manganese extraction rates, by the following leach reaction mechanism:

$$MnCO_3 + H_2SO_4 \rightarrow MnSO_4 + H_2O + CO_2$$

In the event that manganese was predominantly present in the samples as an oxide, rather than a carbonate mineral, it would have to first be reduced from the Mn(IV) valance state to the Mn(II) state by addition of a reducing agent, such as sulfur dioxide (SO_2) to the leaching stage. The following leaching mechanisms would take place if manganese were largely present as an oxide:

$$MnO_2 + SO_2 \rightarrow MnSO_4$$

$$Mn_2O_3 + H_2SO_4 + SO_2 \rightarrow 2MnSO_4 + H_2O$$

$$Mn_3O_4 + 2H_2SO_4 + SO_2 \rightarrow 3MnSO_4 + 2H_2O$$

Based on this knowledge, a test program was performed using various dosages of sodium metabisulphite ($Na_2S_2O_5$), being an alternative to the use of SO_2 gas, in order to determine if manganese extraction would be significantly impacted by the addition of a reducing agent to the leach reaction. Under acidic conditions (pH controlled at 1.0 using H_2SO_4) the $Na_2S_2O_5$ will form SO_2 by the following reaction:

$$Na_2S_2O_5 + H_2SO_4 \rightarrow Na_2SO_4 + 2SO_2 + H_2O$$

Upon the addition of $Na_2S_2O_5$ to the leach, the extraction of manganese was not materially changed, indicating that the addition of a reducing agent will likely not be required for optimum extraction of manganese and that significant extraction of manganese can be attained with an atmospheric sulphuric acid leach.

Acid leaching tests were also performed at varying temperatures and leach reaction times, using an initial acid concentration of 100 g/L H_2SO_4. At the conditions tested, only a small increase in manganese extraction was observed between 60°C and 85°C and both reactions reached a plateau for manganese extraction within two hours. Leach reactions performed at ambient temperature demonstrated a significant reduction in manganese extraction, relative to those performed at 60°C and above.

The leachability of varying crushed ore particle size fractions was evaluated, in order to determine the significance of grinding prior to the leach stage. A manganese extraction of 92.6 wt% was observed for the finest particle size fraction (- 75µm), with leach extraction decreasing to 73.1 wt% for the largest particle size fraction tested (+1.0 mm/-2.0 mm), indicating that grinding of the ore will be required prior to leaching.

12.4 Pre-concentration Testing (Fall 2012 – Spring 2013)

In the Fall of 2012, scoping-level bench scale test programs were completed to assess the amenability of the 2011 drill core samples to pre-concentration, or upgrading, by means of high gradient magnetic separation (HGMS), heavy media separation (HMS) and flotation. The objectives for pre-concentration were threefold:

- to upgrade the manganese content of the run-of-mine mineralized material, prior to hydrometallurgical treatment to produce EMM;
- to selectively reject acid-consuming gangue minerals to reduce the consumption of sulphuric acid in the leaching section of the hydrometallurgical process for production of EMM, and;
- to reject bulk gangue minerals to reduce the tonnage of solids to be processed through the hydrometallurgical circuit.

The results of preliminary bench scale testing for pre-concentration of the 2011 drill core composite samples are discussed in the sections below.

12.4.1 High Gradient Magnetic Separation (HGMS) Testing

Initial testing of HGMS was completed by SGS on a 5 kg sub-sample of the 2011 drill core bulk composite sample, ground to a P_{80} of 84 micron (particle size distribution determined by SGS using a Malvern Mastersizer 2000). XRF whole rock analysis, using lithium borate fusion digestion of the sample by SGS, resulted in an average head grade of manganese and iron in the sample of 11.2% and 15.5%, respectively, which correlated well to the previous head grade assays of the bulk composite 2011 drill core sample. As a precursor to the completion of the HGMS tests, the head sample was subjected to three stages of low intensity magnetic separation (LIMS) in order to reject ferromagnetic iron minerals which may interfere with HGMS testing using an Eriez Wet Drum Magnetic Separator set to a field intensity of 1,000 Gauss.

The first pass LIMS tailings (non-magnetics) contained 97.6% of the total manganese and 93.3% of the total iron in 96.8% of the original sample weight. The LIMS tails were dried and 100 g sub-samples were riffled out for use as feed to the HGMS test unit.

The results of the initial HGMS tests showed a strong correlation between recovery of manganese and recovery of iron, with manganese slightly more strongly recovered to the HGMS concentrates than iron. An analysis of the separation factor for manganese and iron showed that the best separation of manganese from iron occurred at low magnetic intensity, (5,000 Gauss) and high slurry velocity (75 mm/sec). This test resulted in a manganese grade of 15.8% and an iron grade of 17.8% in the magnetic concentrate; however, the recovery of manganese was low, at a reported value of 33.6%.

The range of slurry velocity that was achievable using the HGMS test unit at SGS was limited due to the size of the slurry feed and discharge tubing relative to the sample size, and follow-up bench scale HGMS testing was completed at Metso Minerals Process Engineering Laboratory in Sweden (Metso).

As a result of low separation factors for manganese and iron, and the low recoveries of manganese observed in the HGMS testing completed at SGS, a finer particle size distribution was selected for the feed sample for HGMS testing to be conducted at Metso. A 5 kg sub-sample of the ground 2011 drill core bulk composite sample (original P_{80} of 62 micron as determined by Malvern Instruments Master Particle Sizer M3.1), was wet screened to generate a 2 kg, minus 20 micron sub-sample to serve as feed to the Metso HGMS test program. The particle size distribution of the resulting feed sample was analyzed by Metso using a Malvern Mastersizer, which returned a P_{80} of 22 micron. Elemental analysis of the Metso magnetic separation test program samples was completed by MEC by near total acid digestion followed by ICP-OES for elemental analysis. A standardized manganese ore sample (Brammer Standard DH 4303) was scanned with each solid sample set to support the accuracy of the results.

The feed sample was run through a single stage low intensity magnetic separator operated at 1,000 Gauss to remove ferro-magnetic minerals from the feed samples to the HGMS unit. The LIMS tailings contained 98.9% of the total manganese and 91.2% of the total iron in 97.4% of the original sample weight. The LIMS tails were dried and split into six 45.5 g sub-samples and six 76.0 g sub-samples to serve as feed for twelve individual HGMS tests.

The HGMS test unit was a Metso Minerals HGMS 10-15-20, used in conjunction with a type XF (fine) matrix. The field intensity was varied from 4,500 to 16,300 Gauss while the slurry velocity and matrix loading were varied from 95 to 193 mm/sec and from 0.3 to 0.5 g/cm^3, respectively. Once again, the results showed a strong relationship between the recovery of manganese and the recovery of iron, with recoveries ranging from 62.6% to 93.8% for manganese and from 45.5% to 90.6% for iron, depending on the test parameters. On average, approximately 11.0% of the total iron was rejected relative to manganese recovery (i.e. 11.0% difference on average between manganese and iron recovery to HGMS magnetics) and selectivity for manganese over iron was found to improve at higher slurry velocities in each test.

Trends for aluminum, magnesium and silica were also followed to serve as an indicator of the behavior of acid-consuming gangue minerals when subjected to HGMS. Recovery of aluminum, magnesium and silica to the magnetic fraction was highly variable and generally increased with increasing field intensity and decreased with increasing slurry velocity through the matrix and increasing matrix loading. Selectivity for manganese over aluminum, magnesium and silica improved at higher slurry velocities through the HGMS matrix.

By employing a combination of LIMS and HGMS as a means of pre-concentration, it was concluded that the manganese content of the bulk composite sample could be upgraded by selectively rejecting gangue minerals. The optimum test conditions were selected as 10,500 Gauss HGMS magnetic field intensity and 193 mm/sec slurry velocity with matrix loadings of between 0.3 and 0.5 g/cm^3, which corresponds to the test parameters used in Metso test numbers HGMS-07 and HGMS-08. The average results of these two tests are summarized as follows:

- Manganese grade of 15.6% achieved at 86.7% recovery;
- Overall mass rejection of 34.0% achieved relative to HGMS test feed;
- Iron rejection of 25.8% achieved relative to HGMS test feed;
- Aluminum rejection of 49.6% achieved relative to HGMS test feed;
- Magnesium rejection of 33.4% achieved relative to HGMS feed;
- Silica rejection of 48.2% achieved relative to HGMS feed;

When considering all factors, including the degree of manganese upgrading achieved, recovery of manganese and rejection of gangue minerals, high gradient magnetic separation was identified as the most favorable pre-concentration method for upgrading of mineralized material from the Plymouth manganese deposit. Further test work is, therefore, recommended to assess the impact of pre-concentration of the feed mineralization, by HGMS, on the performance of hydrometallurgical unit operations.

12.4.2 Heavy Media Separation Testing

Scoping level bench scale heavy media separation (HMS) testing was conducted at Minerals Engineering Center ("MEC") on the crushed (70% minus 6 mm) bulk composite, "red" composite and "grey" composite 2011 drill core samples. Approximately 5.0 kg of 70% minus 6 mm crushed material was split from each of the bulk, "red" and "grey" composite 2011 drill core samples and classified using a 1 mm screen. The minus 1 mm material was screened out prior to heavy media test work, as this is near the practical lower particle size limit for commercial operation of a heavy media circuit. The plus 1 mm material was used for bench scale heavy media testing at specific gravities of 2.65, 2.75, 2.85, and 2.96 using tetrabromoethane ($C_2H_2Br_4$) diluted with acetone ($(CH_3)_2CO$) as the heavy media. Testing at higher specific gravities was conducted using diiodomethane (CH_2I_2) diluted with acetone. Elemental analysis of HMS head and product samples was completed by MEC by near total acid digestion of the solids followed by elemental analysis by ICP-OES. A standardized manganese reference material sample (Brammer Standard DH 4303) was scanned with each solid sample set to support the accuracy of the results.

For all three composite 2011 drill core samples, a high proportion of the crushed material reported to the minus 1 mm fraction (in the range of 40% to 45%) as the 2011 drill core samples had been pre-crushed to 70% minus 6 mm for assaying purposes by ALS.. Due to the relatively high proportion of fines that were present in the pulp rejects from the 2011 drill core samples, limited upgrading was observed by HMS, once the fines were re-combined with the upgraded coarse (plus 1 mm) material and the results discussed here in are reported relative to the plus 1 mm fraction that was used as feed for the upgrading tests.

The viability of HMS is, therefore, limited by the crush particle size distribution and further work to assess grade-recovery relationships, relative to an optimum crush size as feed to the HMS circuit, would be required to provide a definitive conclusion regarding the technical viability of HMS for upgrading of the Woodstock manganese deposits. Overall, the results of heavy media testing on the plus 1 mm fractions of the bulk, "red" and "grey" composite 2011 drill core samples indicated that, at the relatively coarse particle sizes required for heavy media separation, the manganese and iron minerals are not sufficiently liberated from each other or from the gangue, to allow for a high degree of pre-concentration of manganese or rejection of iron by this method.

A summary of the results for the heavy media test conducted at a specific gravity of 2.96 (considered to represent the optimum operating point for HMS based on bench scale testing completed to date) for each sample is given below. The results reported below consider only the results for the plus 1 mm size fraction (the fraction of total feed material subjected to heavy media testing not including recombination of the upgraded material with the minus 1 mm fines fraction).

Bulk Composite Sample:

- Manganese grade of 15.2% achieved at 89.5% recovery;
- Overall mass rejection of 32.1% achieved relative to HMS test feed;
- Iron rejection of 16.0% achieved relative to HMS test feed;
- Aluminum rejection of 55.4% achieved relative to HMS test feed;
- Magnesium rejection of 39.5% achieved relative to HMS feed;

"Red" Composite Sample:

- Manganese grade of 16.0% at 88.8% recovery;
- Overall mass rejection of 34.3% achieved relative to HMS test feed;
- Iron rejection of 11.9% achieved relative to HMS test feed;
- Aluminum rejection of 64.2% achieved relative to HMS test feed;
- Magnesium rejection of 51.8% achieved relative to HMS feed;

"Grey" Composite Sample:

- Manganese grade of 15.0% at 91.6% recovery;
- Overall mass rejection of 15.2% achieved relative to HMS test feed;
- Iron rejection of 15.6% achieved relative to HMS test feed;
- Aluminum rejection of 45.8% achieved relative to HMS test feed;
- Magnesium rejection of 30.4% achieved relative to HMS feed;

12.4.3 Flotation Testing

Ten bench scale rougher flotation tests were completed by Thibault on a sub-sample of the bulk composite 2011 drill core sample ground to various particle sizes ranging from a P_{80} of 75 micron to a P_{80} of 41 micron (as determined by wet screening). Four of the rougher float tests were subsequently followed up with rougher-scavenger and cleaner open circuit flotation tests. Analysis of the head and product samples from the flotation test program was completed by Accurassay Laboratories ("Accurassay") in Thunder Bay, Ontario by means of whole rock analysis using a lithium borate fusion method with elemental analysis by XRF.

Flotation of rhodochrosite is not commonly practiced in industry, therefore, optimum conditions for flotation were largely unknown and extensive development of the reagent scheme and operating parameters for flotation was not completed. In general it is noted that the reagent scheme should consist of a fatty acid collector, a pH modifier and a slime / gangue dispersant.

All rougher flotation tests employed high intensity conditioning (“HIC”) prior to flotation to remove slime particles from the surface of the valuable particles and to promote effective conditioning with flotation reagents. Heating of the slurry to approximately 45°C was also completed throughout the HIC and flotation stages to improve on the solubility of the fatty acid collectors.

Of the two collector-dispersant reagent schemes tested, Aero 704 (Cytec Industries) and sodium silicate were found to provide a better flotation response than FS-100 (Clariant Mining Solutions) and carboxymethyl cellulose. In most cases, a separate frother was not required, as the collectors used in the test program provide sufficient froth. A reduction in the flotation feed particle size negatively impacted the recovery of manganese and the presence of excessive slimes as a result of the high chlorite and clay content of the ore is believed to be at least partly responsible for low manganese recoveries observed throughout the test program. Furthermore, the similarity of the chemical composition of valuable (rhodochrosite) and gangue (siderite, hematite, chlorites, clays) minerals makes the selective flotation of manganese from the Woodstock manganese deposits particularly challenging.

The recovery of manganese was found to be limited throughout the rougher, scavenger and cleaner stages of flotation and additional collector added to the rougher-scavenger and cleaner stages generated only a marginal improvement in the recovery of manganese. Due to the low recovery, manganese grades in both the rougher and cleaner concentrates were also limited. The results of the scoping-level flotation tests indicate that higher recoveries would not be obtained in a closed circuit at the conditions tested and further development of the reagent scheme and other operating parameters such as conditioning time, pH, and pulp density would be required to produce an acceptable manganese recovery. Low recoveries of manganese combined with the high technical risk for development of an unconventional flotation circuit resulted in the suspension of further flotation testing.

The results of the most favourable rougher flotation test (BFL-01) are summarized as follows:

- Manganese grade of 17.4% at 68.6% recovery;
- Overall mass rejection of 53.4% achieved relative to flotation feed;
- Iron rejection of 56.2% achieved relative to flotation feed;
- Aluminum rejection of 69.3% achieved relative to flotation feed;
- Magnesium rejection of 59.5% achieved relative to flotation feed;
  Silica rejection of 66.0% achieved relative to flotation feed;

12.4.4 Hydrometallurgical Testing (Fall 2012-Spring 2013)

In the Fall 2012 – Spring 2013 bench scale hydrometallurgical test program, a new layer of complexity was added relative to the Fall 2011 – Spring 2012 leach test program by simulating the recycle of spent electrolyte solution to the leach, which is commonly practiced in most leach-electrowinning circuits.

In a conventional EMM plant, a portion of the acid required for leaching of fresh ore or concentrate is provided by recycling the spent electrolyte solution from the electrowinning cell. All hydrometallurgical testing conducted as part of the Fall 2012 – Spring 2013 test program was completed using a 20 kg riffled sub-sample of the bulk composite 2011 drill core sample ground to a P_{80} of 67 micron (as determined by Malvern Instruments Master Particle Sizer M3.1) and included the use of a synthetic spent electrolyte solution having the following composition:

- Manganese concentration = 15 g/L as Mn (present in solution as $MnSO_4$)
- Ammonium sulphate concentration = 140 g/L as $(NH_4)_2SO_4$
- Sulphuric acid concentration = 50 g/L as H_2SO_4

MEC performed the majority of the analytical work on the hydrometallurgical solutions and solids by ICP-OES. A standardized manganese reference material sample (Brammer Standard DH 4303) was scanned with each solid sample set to support the accuracy of the results.

Initial leach tests using the synthetic spent electrolyte solution were conducted as stand-alone leaches, (leach residue is filtered from the pregnant leach solution prior to entering solution purification unit operations), at leach pulp densities ranging from 10% to 30% solids. These tests demonstrated slow filtration rates and precipitation of ammonium-based double sulphate salts was observed upon cooling of the solution during and after filtering.

In order to overcome these issues, the solid-liquid separation step between the leach and the initial stage of solution purification (iron precipitation) was eliminated. A total of thirteen combined leach-primary iron precipitation tests were completed at different acidities, temperatures, pulp densities and batch reaction times for both unit operations. From the results of these tests, the optimum process conditions for operation of the combined leach-primary iron precipitation step were selected by giving consideration to both technical and economic factors, including: reagent consumption, manganese extraction, process heating loads and residence times versus equipment sizing. The selected operating conditions are listed as follows:

- Leach pH controlled at 1.5;
- 20% leach pulp density;
- Batch residence time of 8 hours in leach;
- Leach temperature controlled at 60^{o}C;
- Primary iron precipitation reaction pH controlled in the range of 4.0 to 4.5;

- Pulverized high calcium limestone to be used for leach solution neutralization and pH adjustment in primary iron precipitation reaction;
- Batch residence time of 8 hours in primary iron precipitation reaction;
- Primary iron precipitation reaction temperature controlled at 60°C;
- Combined leach-primary iron precipitation residue subject to a minimum of two displacement washes on vacuum filter;
- Re-pulp wash completed on combined leach-primary iron precipitation residue at approximately 50% solids for batch residence time of 1 hour with temperature maintained at 60°C and pH maintained at 3.5.

Applying the above process operating conditions, the average recovery of manganese in the combined leach-primary iron precipitation unit operations was reported as 87.0% (range of 85.7% to 88.2%). It should be noted that, although the manganese extraction in the leach at the selected operating conditions is less than that reported for the Fall 2011 – Spring 2012 hydrometallurgical test program, the current results were obtained for a higher leach pulp density at a higher operating pH (lower acid concentration in the leach) and lower reaction temperature. All of these factors contribute to the overall technical and economic viability of the hydrometallurgical flowsheet and the results of economic trade-off assessments, completed to date, have indicated that accepting a lower recovery of manganese, at a reduced operating cost, is advantageous.

The residual iron and aluminum concentrations in the pregnant leach solution following the primary iron precipitation step ranged from 2.0 to 3.0 g/L for iron and from 10.0 to 25.0 mg/L for aluminum. Residual iron and aluminum, as well as copper and zinc, are further removed in the secondary iron precipitation step, which is operated at a pH of 5.5 to 6.0, for a batch residence time of 3.5 hours at 60°C. Following the secondary iron precipitation step, the residual iron and aluminum concentrations were observed to fall to a range of 0.2 to 3.5 mg/L for iron and 0.4 to 0.6 mg/L for aluminum. Typical concentrations of copper and zinc following the secondary iron precipitation reaction are in the range of 0.3 to 0.8 mg/L for copper and 0.7 to 6.8 mg/L for zinc.

Operating conditions for a sulphide precipitation step using ammonium sulphide for tertiary solution purification have also been identified and the ability to remove cobalt, nickel and zinc to very low levels in the feed solution to the EMM electrowinning unit operation has been confirmed. Manganese concentrations in the final purified leach solution ranged from 30.0 to 35.0 g/L as Mn and typical concentrations of trace impurities in the final purified leach solution were reported as:

- <0.1 mg/L cobalt, nickel, cadmium, copper, titanium and vanadium;
- <0.5 mg/L antimony and tin;
- <0.5 mg/L aluminum;
- 1.0 mg/L arsenic;
- 0.3 mg/L chromium;

- 1.0 mg/L for iron;
- 3.0 mg/L lead;
- 0.5 mg/L molybdenum;
- 10.2 mg/L selenium, and;
- 0.3 mg/L zinc.

The concentrations of aluminum, cobalt, copper, iron, molybdenum, nickel, and zinc all meet the maximum tolerable impurity concentrations defined as target specifications for electrowinning of manganese based on operating data from commercial EMM operations.

Target specifications for trace heavy metals such as selenium and lead, as well as alkali and alkaline earth metals such as calcium, potassium, magnesium and sodium, have not been defined and further bench and/or pilot scale testing of the electrolysis unit operation, under various sets of operating conditions, will be required as an integral part of future process development test programs. The results of bench and pilot scale EMM electrowinning tests will then be used to form the basis for site and process specific target specifications for manganese sulphate electrolyte purity.

An electrochemical model (Evans Diagram) was developed to assess the predicted EMM product quality, relative to the final purified leach solution composition. Based on Evans Diagram model predictions, using the purified manganese sulphate solution composition given above, the theoretical grade of EMM that would be expected to be produced is in excess of the typical market specification of 99.7%. Thibault notes that the Evans Diagram predictions are based on detailed thermodynamic calculation of the actual electrochemical potentials of the components in the process solution at the relevant operating conditions for the cell, giving consideration to electrochemical reaction kinetics and electrowinning cell design parameters. The Evans Diagram model does not provide sufficient detail to predict the impact of auto-catalytic reactions and synergistic effects of impurities in the solution and the results of the Evans Diagram model should be confirmed by bench and pilot scale testing of electrowinning operations.

13 Mineral Resource Estimate

13.1 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). Assumptions, metal threshold parameters and deposit modeling methodologies associated with the current Plymouth deposit resource estimate are discussed below in report sections 13.2 through 13.4.

13.2 Geological Interpretation Used In Resource Estimation

The banded iron formation Plymouth Mn-Fe 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 Fe 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.

13.3 Methodology of Resource Estimation

13.3.1 Overview of Estimation Procedure

The mineral resource estimate completed by Mercator is based on validated results of 27 diamond drill holes (5,973 m), including 15 drill holes (4,093 m) completed in 2013 by BMC-Minco and five holes (1040 m) completed by BMC in 2011. Two trenches completed in 1988 were represented as horizontal drill holes and, along with five drill holes by MRR completed in 1987. also contributed to the resource estimate. Modelling was performed using Gemcom Surpac® 6.4.1 modeling software with manganese percent, iron percent and specific gravity values for the block model estimated using inverse distance squared (ID^2) interpolation methodology from 3 m down hole assay composites. The resource block model was set up with a block size of 10 m (x) by 10 m (y) by 10 m (z). The predominant manganese compound in the deposit is manganese carbonate (MnCO3).

Metal grade assignment was peripherally constrained by two separate wire-framed solid models based on sectional geological interpretations for the Plymouth Fe-Mn Deposit and a minimum included grade of 5 % Mn over 12 meters, down-hole. The main resource solid measures approximately 700 m along strike (southwest-northeast), averages approximately 100 m in width (northwest-southeast), and extends to a maximum depth of 300 m below surface. The domain has a folded geometry with near vertical, to steeply dipping eastern and western limbs, with the eastern limb demonstrating continuity only for 400 m of strike length from the southwest to the northeast. A second separate resource solid was developed along the peripheral limits of the western limb of the main solid, constraining mineralization within the defined minimum parameters that demonstrates less continuity, consistency and average grade than the main resource solid. The west resource solid measures approximately 675 m along strike (southwest-northeast), averages approximately 40 m in thickness (northwest-southeast), and extends to a maximum depth of 200 m below surface. Both resource solid models are constrained by a digital terrain model of the surface of bedrock.

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 20° and 30°, with no plunge. The semi-major axes occurs 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. Major, semi-major, and minor axis ranges of 150 m, 125 m, and 25 m, respectively, were used for all interpolation. At least 3, and a total of 6, contributing assay composites, with no more than 3 composites allowed from a single drill hole, were required to interpolate a valid block grade. Results from 639 separate laboratory determinations of specific gravity were composited at a 3 meter down-hole support length and used to develop an interpolated specific gravity model using ID^2 methodology specified above.

13.4 Data Validation

The estimate is based on validated results of 27 diamond drill holes totalling 5,973 m of drilling. This includes 840 m from 6 historic surface diamond drill holes completed in 1985 and 1987 by MRR, 1,040 m from five surface diamond drill holes completed in 2011 by BMC, and 4,093 m from 15 surface diamond drill holes completed in 2013 by Minco and BMC. In addition, two trenches competed in 1987 by MRR were compiled and represented as horizontal drill holes.

Drill hole coordinates are located in UTM NAD83 Zone 19 coordination. BMC staff compiled and logged drill hole results in Gemcom Logger software and provided Mercator with an Access database output. Mercator staff subsequently supplemented the database with results for the two 1988 trenches, T-1 and T-2, and historic drill hole DDH-85-001. A total of 1,263 core samples and 969 specific gravity determinations are compiled on the deposit and a total of 879 core samples and 639 specific gravity determinations occur within the limits of the peripheral resource solids.

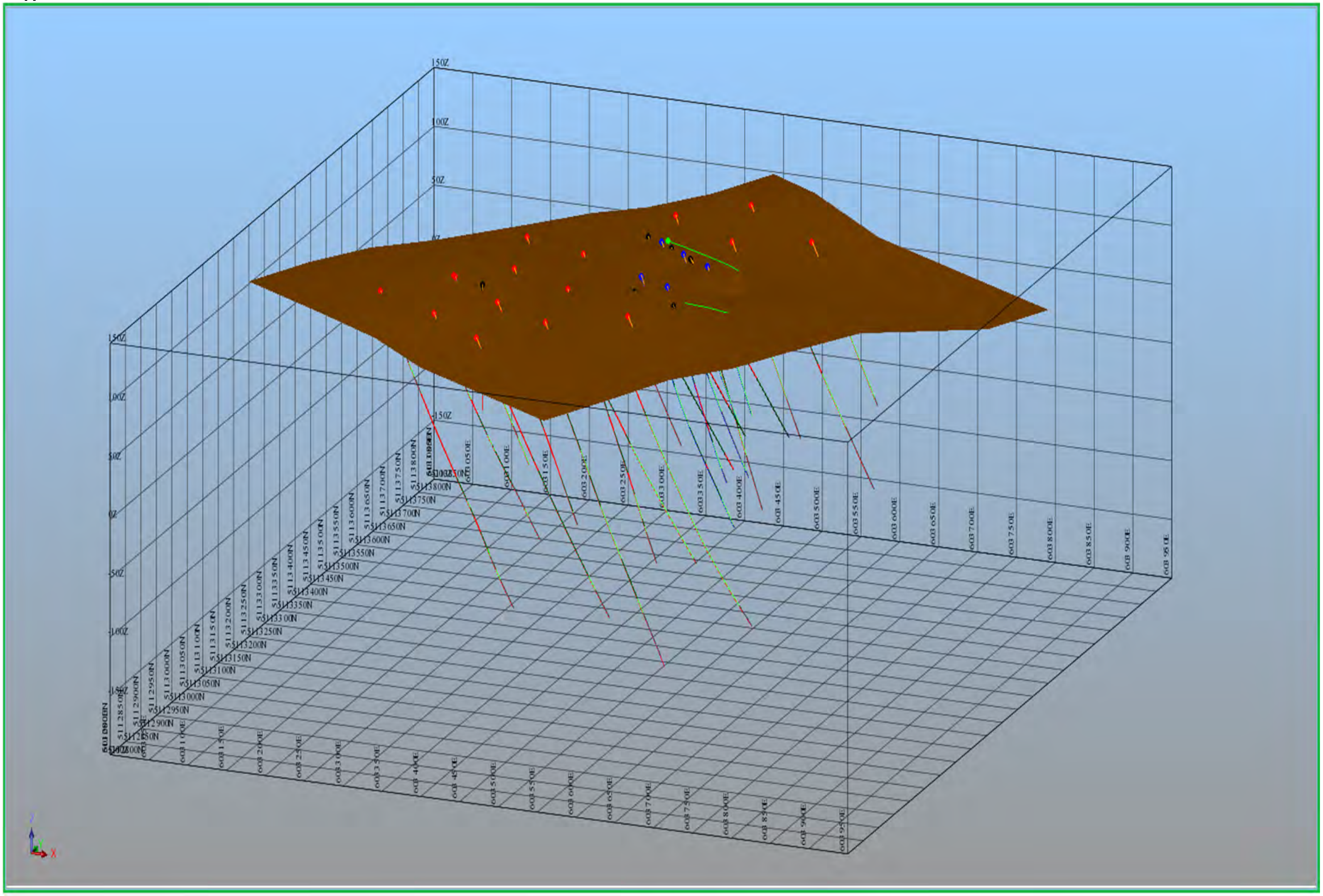
Validation checks on overlapping intervals, inconsistent drill hole identifiers, improper lithological assignment, unreasonable assay value assignment, and missing interval data were performed. Checking of database analytical entries was also carried out against laboratory records supplied by BMC.

13.5 Data Domains and Solid Modelling

13.5.1 Surface of Bedrock

A digital terrain model (DTM) of the surface of bedrock was developed by Mercator from sectional interpretations of drill hole lithological data. The surface of bedrock DTM functions as the top constraining surface for both peripheral solid models in the resource estimate (Figure 13.1).

Figure 13.1: Isometric view towards NW of the surface of bedrock DTM



13.5.2 Domain Modeling

The Plymouth Mn-Fe deposit is an assemblage of manganese carbonate and manganese carbonate-silicate-oxide sedimentary units. Four main stratigraphic classifications are commonly associated with the deposit strata, these being numbered as Units 1 through 4, with iron and manganese minerals and oxides most commonly associated with Units 3 and 4. Unit 3 is composed of laminated non-calcareous green-grey siltstone with associated iron and manganese carbonate siltstone. Unit 4 is composed of laminated dark-red shale and iron-manganese oxide-carbonate siltstone. Mineralization is predominantly associated with high amounts of hematite and rhodochrosite with minor amounts of magnetite and manganese-silicate minerals.

BMC logged each drill hole within the context of the 4 stratigraphic units and subsequently assessed the percentage of red rock, Unit 4, to each down-hole sample interval. Correlation and continuity of each unit is variable and subjective at the current 100 meter drill hole spacing. This is largely attributed to the effect of regional upright folding associated with the Acadian Orogeny during the Middle Devonian time period. Lithological and mineralogical characteristics of each unit significantly impact grade distribution and metallurgical results, and further detailing of a stratigraphic model that accommodates distribution of reduced and oxidised host stratigraphy within the deposit, are required.

To best assess manganese and iron mineralization of the Plymouth Fe-Mn Deposit, peripheral constraint solid models were developed using a minimum threshold of 5 % Mn over 12 m lengths down hole, from down-hole analytical results displayed on vertical northwest-southeast geological sections. The limits of the resource solids extend 50 m along dip or strike from the last drill hole, (approximately half the section spacing of 100 m), except where the last drill hole lies outside the defined grade requirements. In those instances, the midpoint between holes was used to define the limit of mineralization.

Two separate wire-framed solid models were developed (Figure 13.2). The main resource solid measures approximately 700 m along strike (southwest-northeast), averages approximately 100 m in width (northwest-southeast) and extends to a maximum depth of 300 m below surface (Figure 13.3). The domain has a folded geometry, with near vertical to steeply dipping eastern and western limbs, with the eastern limb demonstrating continuity for only 400 m of strike length from the southwest to the northeast. A second, completely separate, resource solid was developed along the peripheral limits of the western limb of the main solid, constraining mineralization within the defined minimum parameters, which demonstrate less continuity, consistency and average grade than the main resource solid. The west resource solid measures approximately 675 m along strike (southwest-northeast), averages approximately 40 m in thickness (northwest-southeast), and extends to a maximum depth of 200 m below surface Figure 13.4). Both resource solid models are constrained by a digital terrain model of the surface of bedrock.

Figure 13.2: Isometric view towards NW (left) and SW (right) of the 2 resource solid models

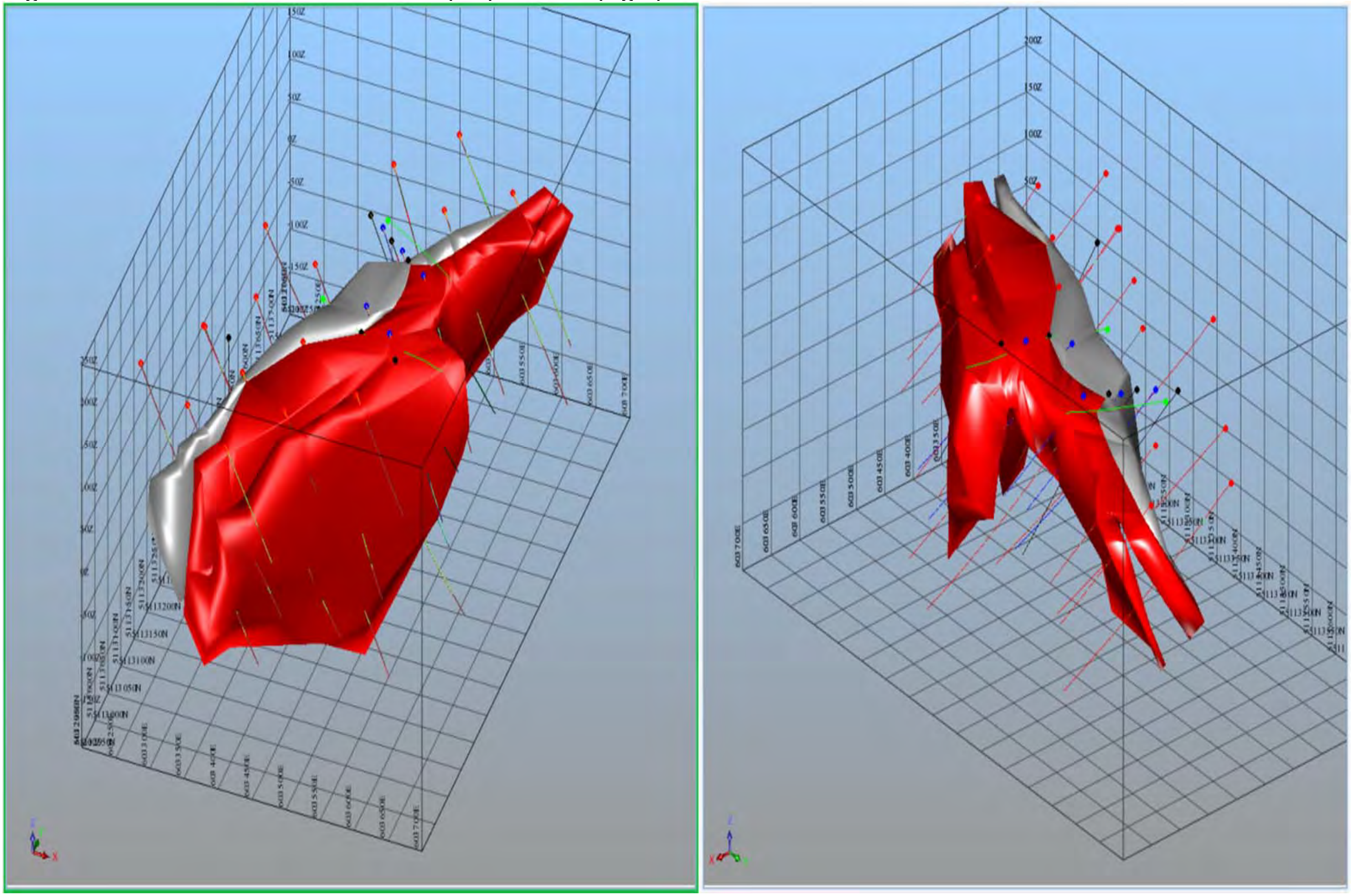


Figure 13.3: Isometric view towards NW (left) and SW (right) of the main solid model

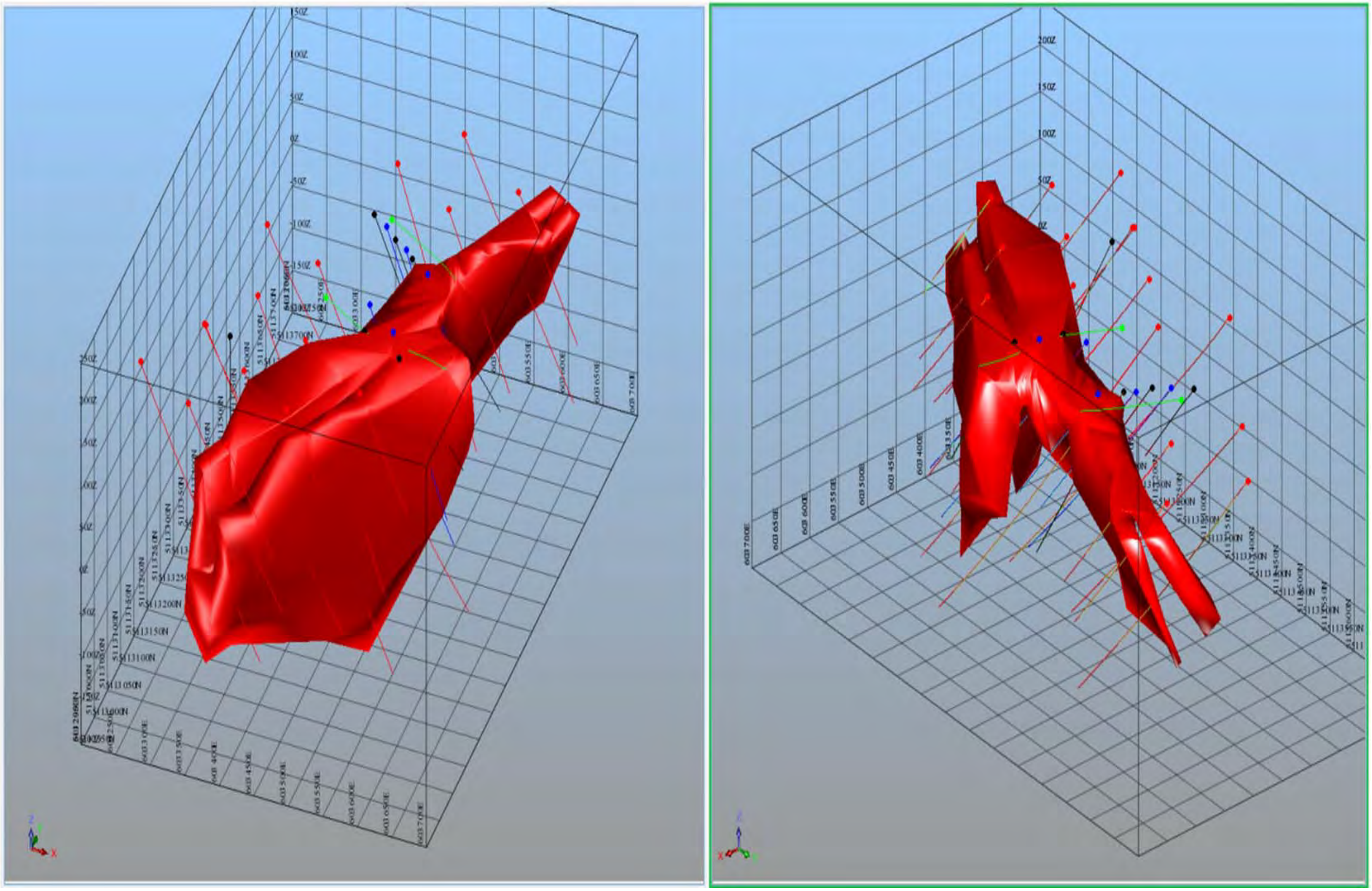
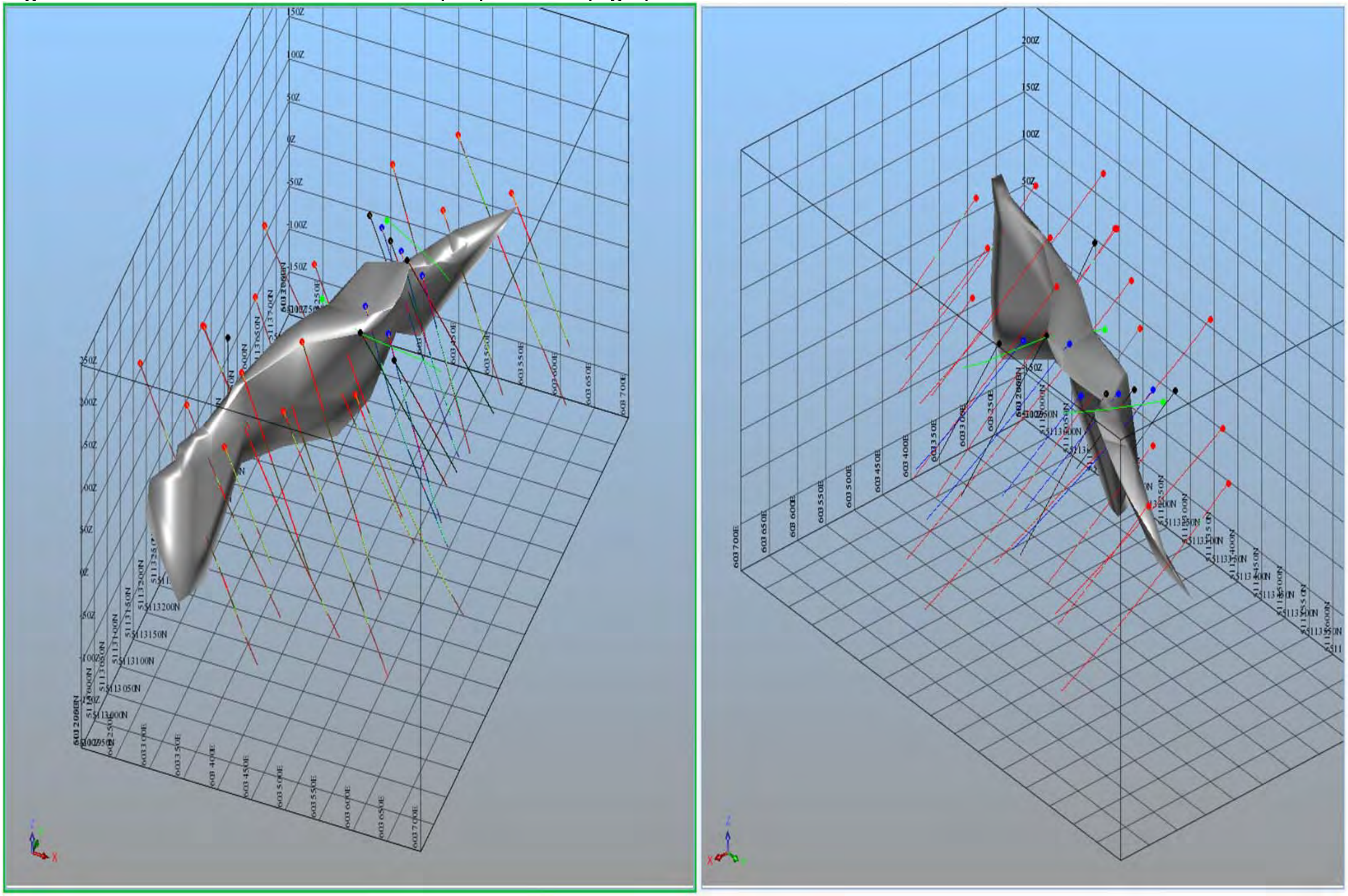


Figure 13.4: Isometric view towards NW (left) and SW (right) of the west solid model



13.5.3 Drill Core Assay Composites and Statistics

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

The drill core analytical data set used in the resource estimate contains 879 core sample records occurring within the peripheral solid models. Sample lengths range between 0.6 m and 22.26 m and have an average length of 3.21 m. Over 90 % of samples measure 3.0 m in length. The majority of samples measuring larger than 3 m in length are associated with the two trenches. Based on these results, down-hole assay composites over 3.0 m intervals were developed for Mn % and Fe %.

Compositing was constrained based of the drill hole intersections with the peripheral solid models. Descriptive statistics were calculated for both Mn % and Fe % from the 3.0 m composite datasets within each domain and for the global composite population and are presented in Table 13.1, 13.2, 13.3 respectively. Distribution histograms, cumulative frequency plots and probability plots for the 3.0 m composites are included in Appendix I.

Table 13.1: **Main Plymouth Domain: Mn and Fe Statistics for 3.0 Meter Composites**

Parameter	**Manganese**	**Iron**
Mean Grade	10.80%	15.50%
Maximum Grade	18.36%	33.01%
Minimum Grade	0.67%	5.02%
Variance	11.18	17.99
Standard Deviation	3.34	4.24
Coefficient of Variation	0.31	0.27
Number of Composites	807	807

Table 13.2: West Plymouth Domain: Mn and Fe Statistics for 3.0 Meter Composites

Parameter	**Manganese**	**Iron**
Mean Grade	7.36%	10.96%
Maximum Grade	18.02%	26.55%
Minimum Grade	0.51%	5.39%
Variance	10.37	15.00
Standard Deviation	3.22	3.87
Coefficient of Variation	0.44	0.35
Number of Composites	157	157

Table 13.3: Plymouth Deposit: Combined Mn and Fe Statistics for 3.0 Meter Composites

Parameter	Manganese	Iron
Mean Grade	10.24%	14.76%
Maximum Grade	18.36%	14.43%
Minimum Grade	0.51%	5.02%
Variance	12.66	20.31
Standard Deviation	3.56	4.51
Coefficient of Variation	0.35	0.31
Number of Composites	964	964

13.5.4 High Grade Capping Of Assay Composite Values

No high-grade capping factors were applied to drill core sample analytical results. Through analysis of metal grade distribution, it was concluded that high values that occur in the dataset lay within zones where drill log descriptions of lithology and mineralogy support presence of spatially correlative higher grade material. Maximum metal levels present are also considered to be consistent with the mineralization styles present.

13.5.5 Variography and Interpolation Ellipsoids

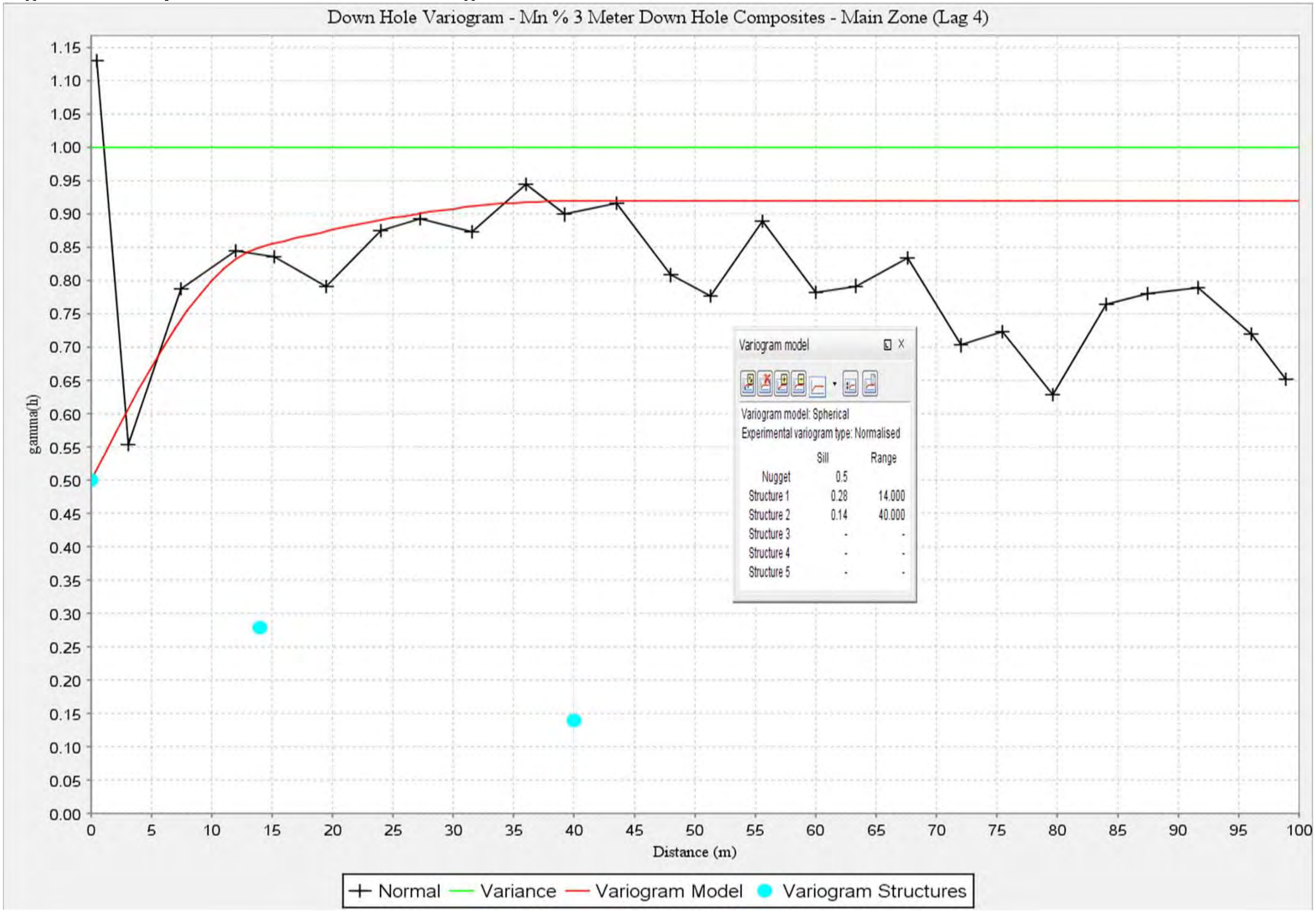
To assess spatial aspects of grade distribution within the Plymouth Fe-Mn Deposit down-hole and directional variograms were developed for Mn % based on the 3.0 m down hole composite dataset defined by the peripheral solid models. Good spherical model results were obtained for experimental down hole variograms, thereby providing assessment of global nugget values and minor axis ranges (Figure 13.5).

Best experimental directional variogram results were developed for the Plymouth Fe-Mn Deposit within a plane dipping 75° towards an azimuth of 295° using a spread of 40° and increments of 20°. The major axis of continuity orientation conformed along strike at 5° azimuth with a 50° plunge (Figure 13.6). The semi-major axis of continuity occurs perpendicular to the major axis trend with a 185° azimuth and 40° plunge (Figure 13.7).

Interpolation ellipsoid ranges and orientations were developed through the consideration of the variogram assessment in combination with geological interpretations and drill hole spacing. Three orientation domains were created within the peripheral solid models to best accommodate the geometry of the deposit (Figure 13.8), these being: (1) Southwest (2) Middle (3) Northeast. Ellipsoid orientations for each interpolation domain are presented in Table 13.4 according to Surpac rotation type ZXY LRL.

Major axes orientations are between 20° to 30° azimuth along the strike direction of the deposit. The semi-major axes occur perpendicular to the major axes in the dip direction, which ranges from near-vertical in the southwest to a 55° westerly dip in the northeast. Minor axes are oriented at a high angle to stratigraphy in the down-hole direction. Major, semi-major, and minor axis ranges of 150 m, 125 m, and 25 m, respectively, were determined from the variogram assessment.

Figure 13.5: Experimental Down Hole Variograms for Mn



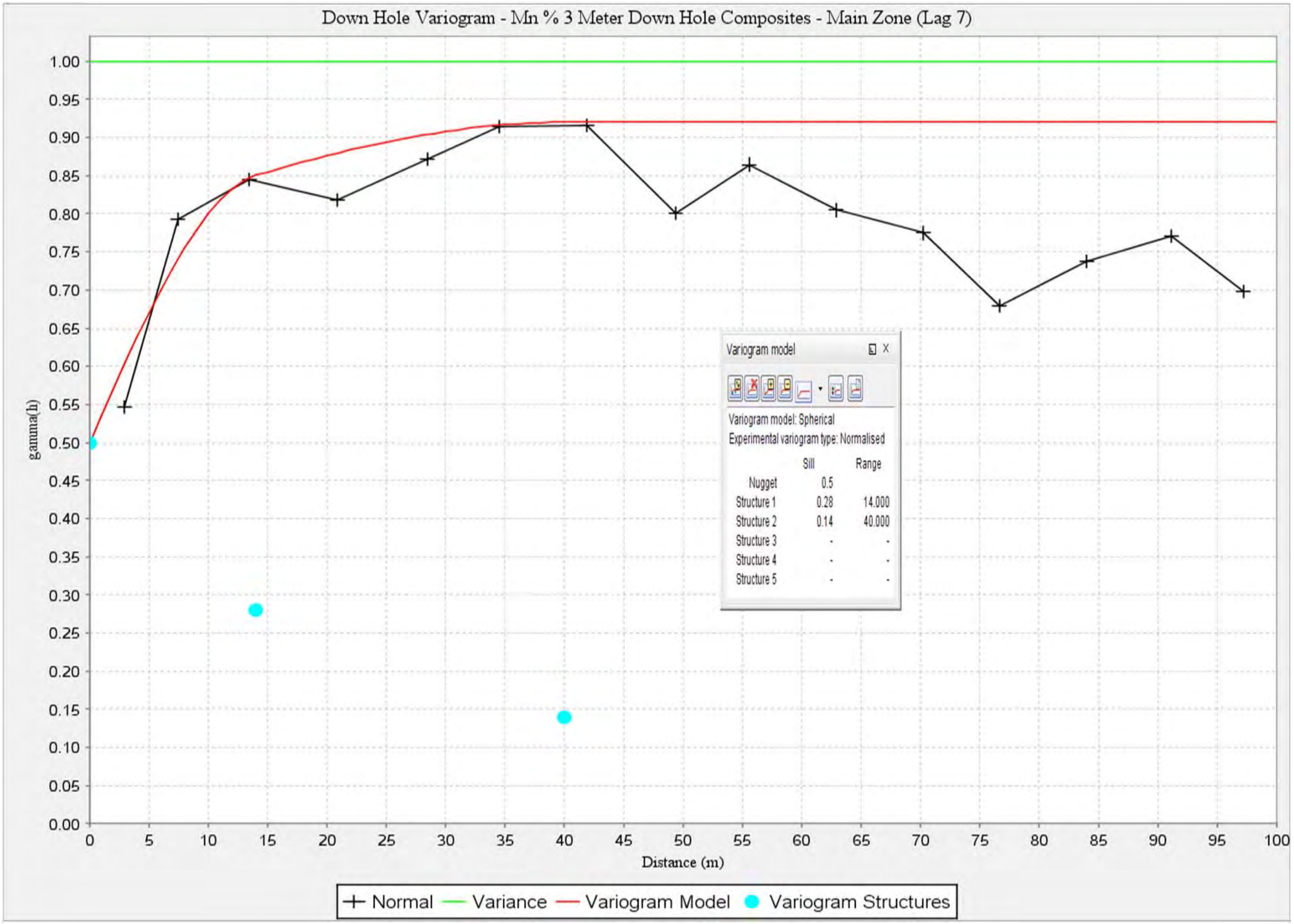
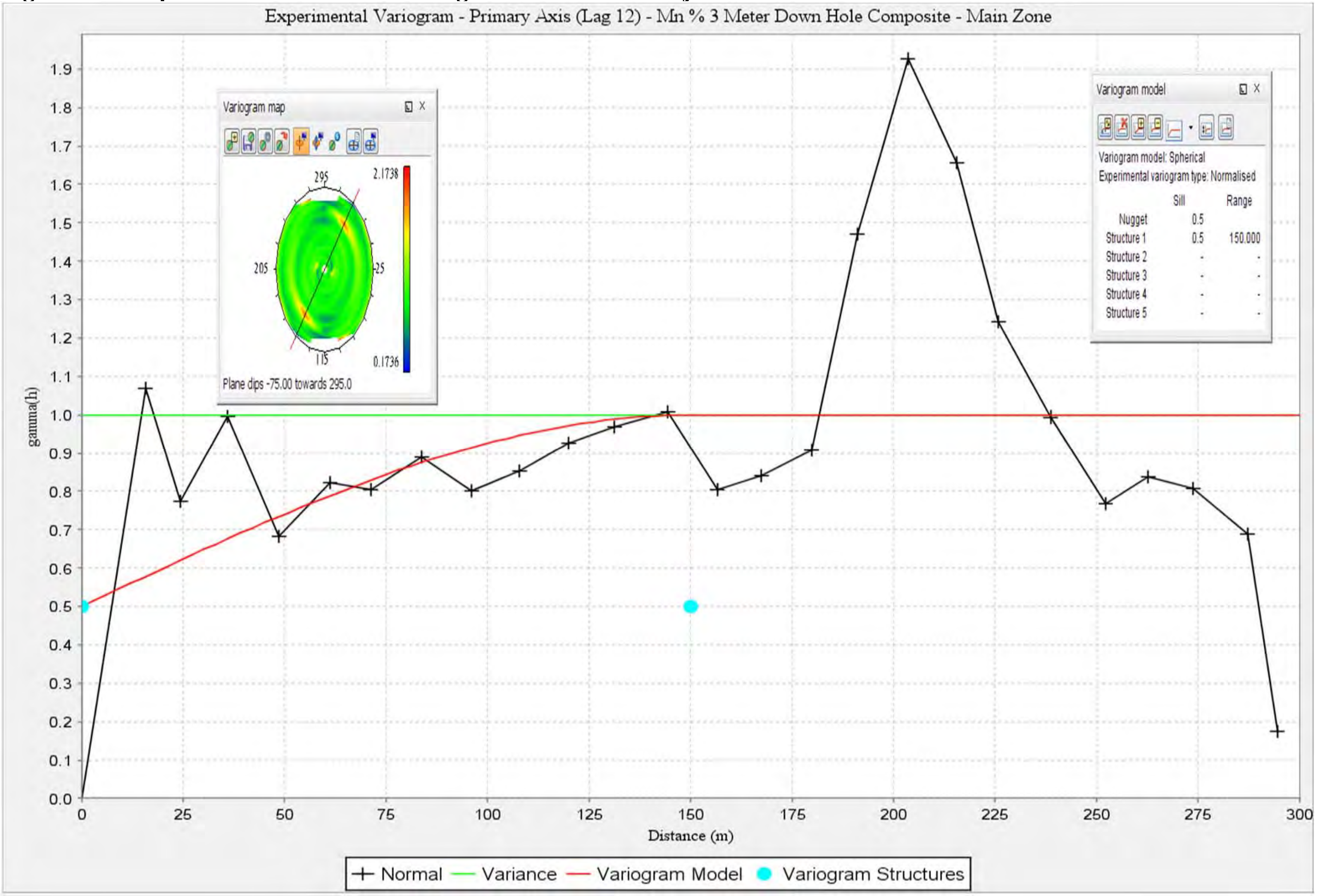

Down Hole Variogram - Mn % 3 Meter Down Hole Composites - Main Zone (Lag 7)
gamma(h)
Distance (m)
Variogram model
Variogram model: Spherical
Experimental variogram type: Normalised
Sill
Range
Nugget 0.5
Structure 1 0.28 14.000
Structure 2 0.14 40.000
Structure 3
Structure 4
Structure 5
Normal
Variance
Variogram Model
Variogram Structures

Figure 13.6: Experimental Directional Variograms for Mn % - Major Axis



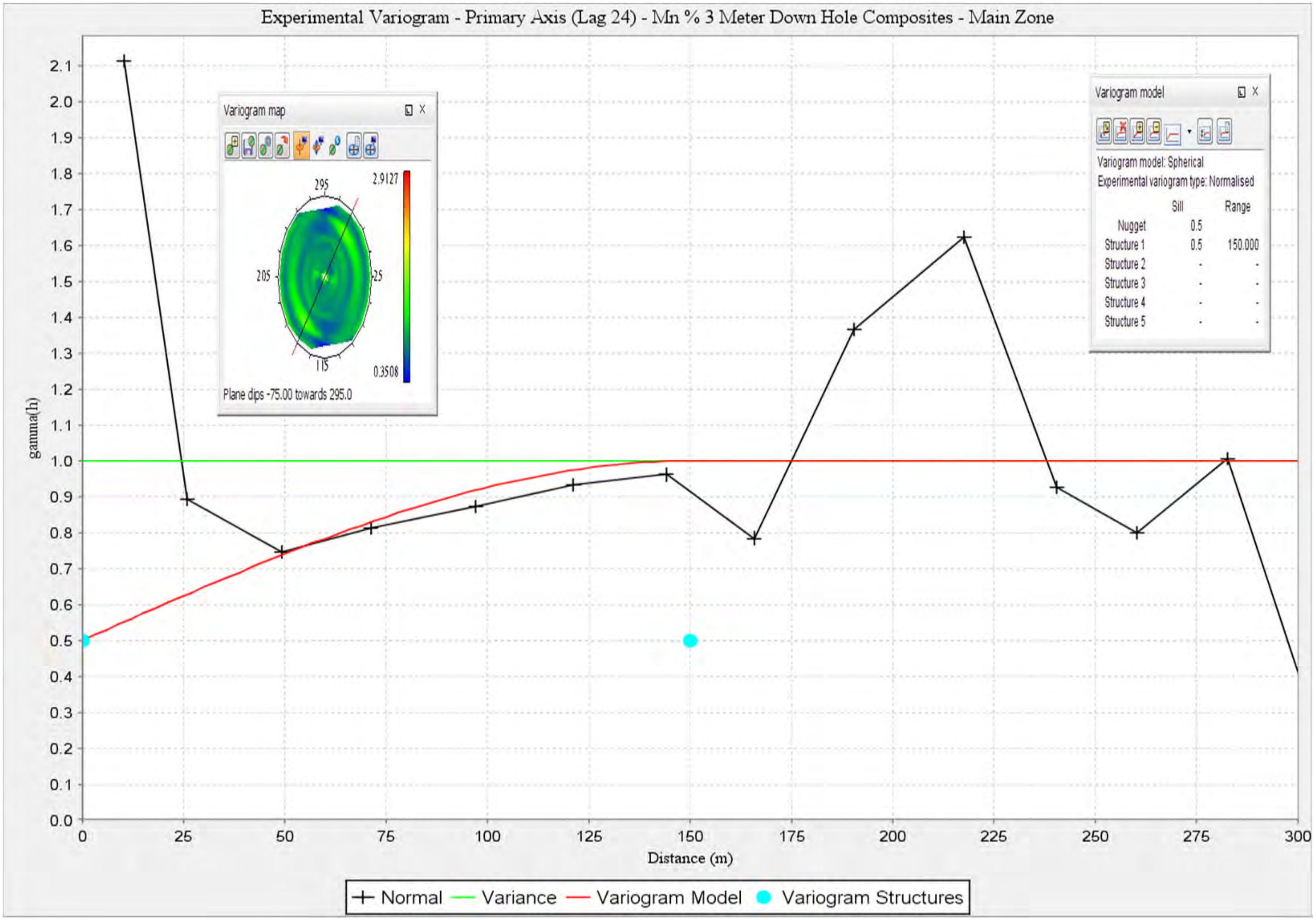
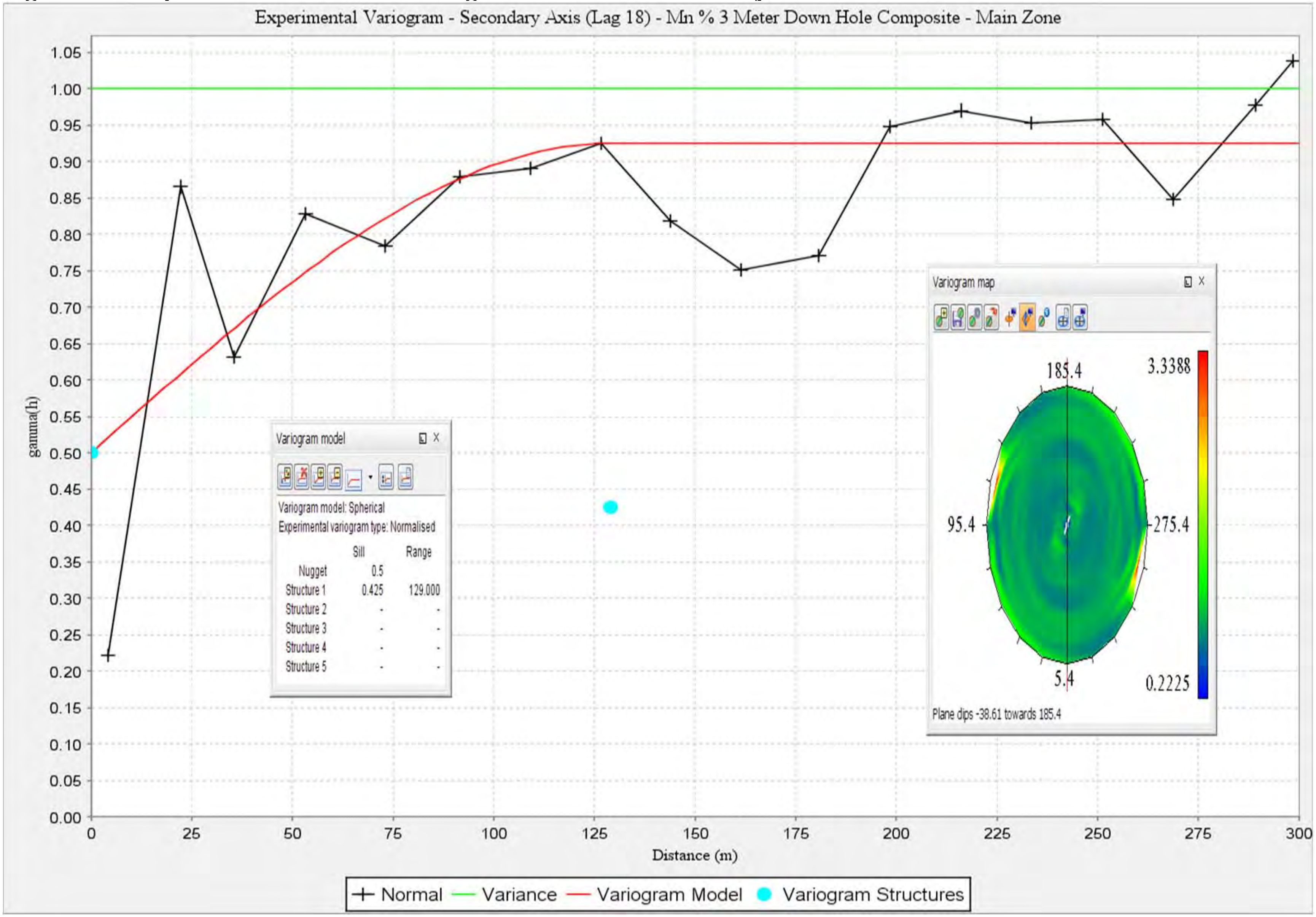

Experimental Variogram - Primary Axis (Lag 24) - Mn % 3 Meter Down Hole Composites - Main Zone
gamma(h)
Distance (m)
Variogram map
295
205
25
115
2.9127
0.3508
Plane dips -75.00 towards 295.0
Variogram model
Variogram model: Spherical
Experimental variogram type: Normalised
Sill
Range
Nugget 0.5
Structure 1 0.5 150.000
Structure 2 - -
Structure 3 - -
Structure 4 - -
Structure 5 - -
Normal
Variance
Variogram Model
Variogram Structures

Figure 13.7: Experimental Directional Variograms for Mn % - Semi-Major Axis



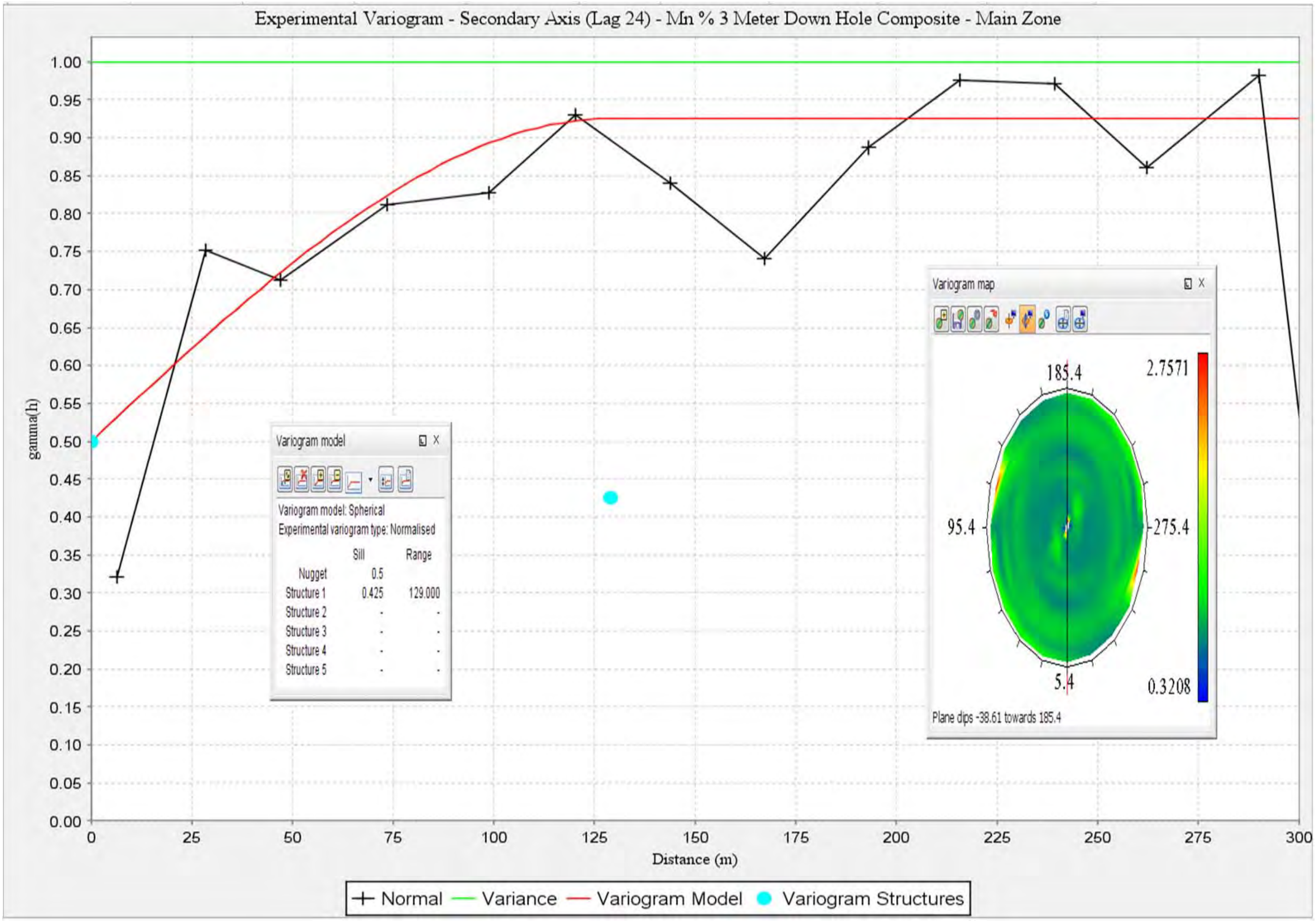

Experimental Variogram - Secondary Axis (Lag 24) - Mn % 3 Meter Down Hole Composite - Main Zone
gamma(h)
Distance (m)
Variogram model
Variogram model: Spherical
Experimental variogram type: Normalised
Sill Range
Nugget 0.5
Structure 1 0.425 129.000
Structure 2
Structure 3
Structure 4
Structure 5
Variogram map
185.4
95.4
275.4
5.4
2.7571
0.3208
Plane dips -38.61 towards 185.4
Normal Variance Variogram Model Variogram Structures

Figure 13.8: Block Model Interpolation Domains viewed to NW

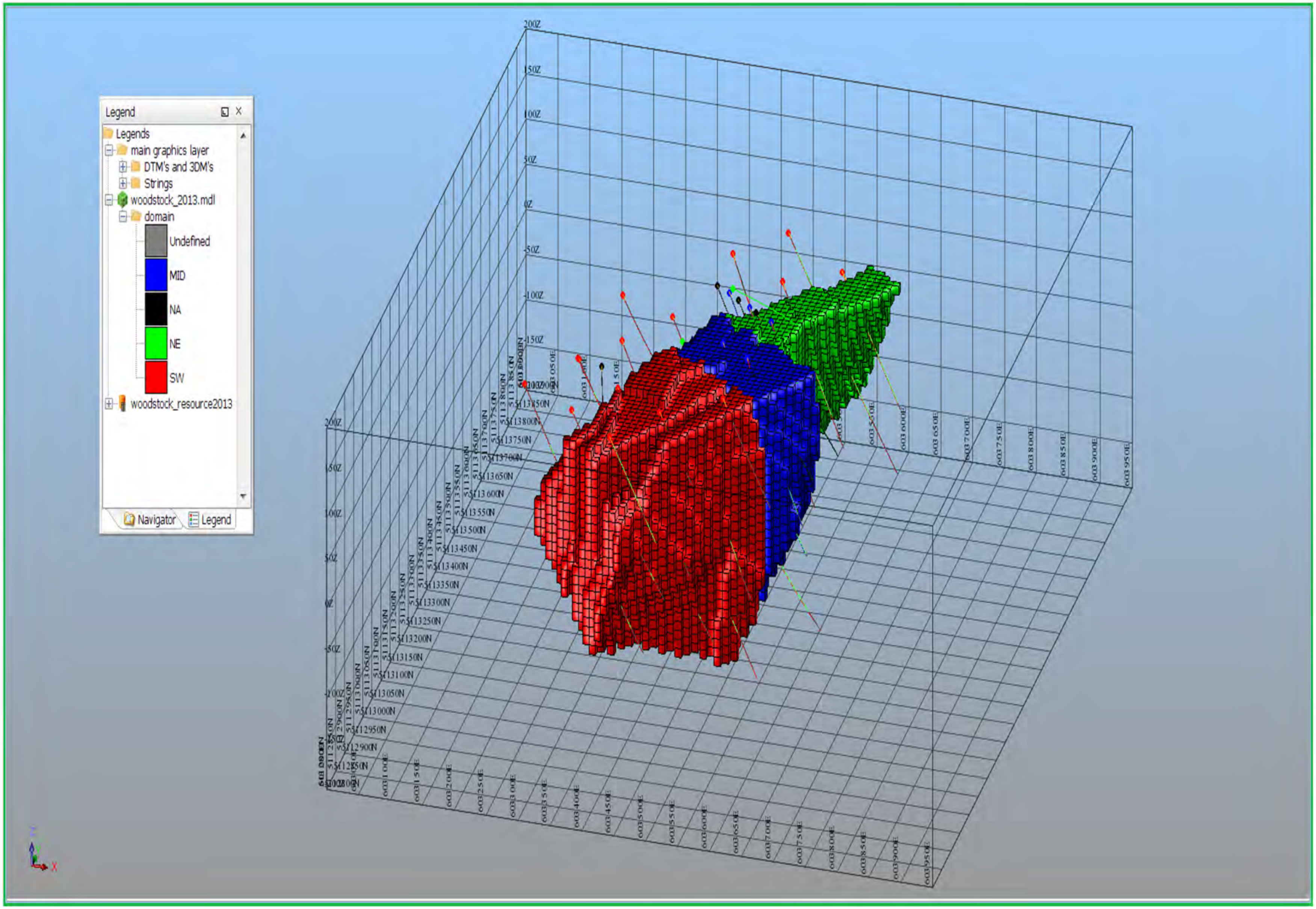


Table 13.4: Ellipsoid Orientations for each Interpolation Domain - Surpac Format

Peripheral Domain	Orientation Domain	Orientation	Plunge	Dip
Main	Southwest	27	0	-90
	Middle	25	0	-75
	Northeast	20	0	-55
West	Southwest	22	0	-90
	Middle	25	0	-80
	Northeast	30	0	-75

13.5.6 Setup of Three Dimensional Block Model

The block model extents are presented below in Table 13.5 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 10 m x 10 m x 10 m (X, Y, Z) with no units of sub-blocking allowed.

Table 13.5: Summary of Deposit Block Model Parameters

Type	Y (Northing m)	X (Easting m)	Z (Elevation m)
Minimum Coordinates	5,112,830	603,055	-160
Maximum Coordinates	5,113,840	603,905	190
User Block Size	10	10	10
Min. Block Size	10	10	10
Rotation	0	0	0

13.5.7 Resource Estimation

Inverse distance squared (ID^2) grade interpolation was used to assign block grades within the Plymouth block model. As reviewed earlier, interpolation ellipsoid orientation and range values used in the estimation reflect trends determined from variography, plus sectional interpretations of geology and grade distributions for the deposit. These parameters were previously described in detail in report section 13.3.7.

The main and west peripheral domains set hard boundaries for grade interpolation, with only the intersecting blocks and 3.0 meter down hole composites for each domain accepted for block model grade interpolation. Composites occurring outside each respective domain were not considered in the grade interpolation, for blocks intersecting that domain. The interpolation ellipsoid orientations used for block grade assignment, within the 2 peripheral domains, was defined by the intersecting orientation domain as shown in Figure 13.8 and specified in Table 13.4. A minimum of 3 and a maximum of 6 contributing assay composites, with no more than 3 composites allowed from a single drill hole, were required to interpolate a valid block grade. Block Discretization was set at 2Y x 2X x 2Z.

13.5.8 Density

Density information used in the resource estimate is based on drill core data collected in the 2011 and 2013 drill programs. Results from 639 separate density determinations by ALS (pycnometer method - ALS OA-GRA08b code) were used to create the density model. These results were composited at 3.0 m down-hole support length and a total of 639 composites within the limits of the peripheral domain were used, to develop an interpolated specific gravity model, using the ID^2 methodology described for block grade interpolation. Descriptive statistics for specific gravity composites for both the peripheral domains and the global composite population are presented in Table 13.6, 13.7, and 13.8. Descriptive statistics for block interpolated values of specific gravity are presented in Table 13.9. Mean average density shows an acceptable correlation between the global 3.0 m composite population and blocks values.

Table 13.6: Plymouth Main Domain: Density Statistics for 3.0 m Composites

Parameter	Density
Mean	3.19 g/cm^3
Maximum	3.81 g/cm^3
Minimum	2.72 g/cm^3
Variance	0.04
Standard Deviation	0.20
Coefficient of Variation	0.06
Number of Composites	524

Table 13.7: Plymouth West Domain: Density Statistics for 3.0 m Composites

Parameter	Density
Mean	3.08 g/cm^3
Maximum	4.07 g/cm^3
Minimum	2.70 g/cm^3
Variance	0.04
Standard Deviation	0.19
Coefficient of Variation	0.06
Number of Composites	115

Table 13.8: Plymouth Fe-Mn Deposit: Density Statistics for 3.0 m Composites

Parameter	Density
Mean	3.17 g/cm^3
Maximum	4.07 g/cm^3
Minimum	2.70 g/cm^3
Variance	0.04
Standard Deviation	0.20
Coefficient of Variation	0.06
Number of Composites	639

Table 13.9: Density Statistics for Interpolated Block Values

Parameter	Density
Mean	3.16 g/cm^3
Maximum	3.68 g/cm^3
Minimum	2.77 g/cm^3
Variance	0.02
Standard Deviation	0.14
Coefficient of Variation	0.04
Number of blocks	14,176

13.5.9 Resource Category Definitions

Definitions of mineral resources and associated mineral resource categories used in this report are those recognized under National Instrument 43-101 (NI 43-101) and set out in the Canadian Institute of Mining, Metallurgy and Petroleum Standards On Mineral Resources and Mineral Reserves, Definitions and Guidelines (the CIM Standards).

13.5.10 Resource Category Parameters Used in Current Estimate

Mineral resources presented in the current estimate have been assigned to Inferred. Several factors were considered in defining resources in the Inferred category, including drill hole spacing, geological interpretations, number and range of informing composites. Specific definition parameters for each resource category applied in the current estimate are set out below.

Measured Resource: There are no interpolated resource blocks with the certainty of definition suitable for classification in this category present in the current estimate.

Indicated Resources: There are no interpolated resource blocks with the certainty of definition suitable for classification in this category present in the current estimate.

Inferred Resources: Inferred resources are defined as all interpolated blocks with a minimum of 3 contributing composites inside the peripheral constraint solids.

13.5.11 Statement of Mineral Resource Estimate

Block grade, block density and block volume parameters for the Plymouth Fe-Mn 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 statement presented in Table 13.10. Results are reported in accordance with Canadian Institute of Mining, Metallurgy and Petroleum Standards on Mineral Resources and Reserves: Definitions and Guidelines (the CIM Standards) as well as disclosure requirements of National Instrument 43-101. The Plymouth Fe-Mn Deposit resource sensitivity tabulation at a variety of cut-off values is presented in Table 13.11.

The 5% Mn cut-off represents a natural break in the Plymouth Fe-Mn Deposit down hole analytical results and identifies the bulk of the body of mineralization with average grades of economic potential that are amenable to beneficiation based on preliminary metallurgical results. Mercator considers this cut-off to reflect a reasonable expectation of economic viability for a deposit of this nature based on market conditions and open pit mining methods.

Table 13.10: Plymouth Mn-Fe Deposit Resource Estimate – May 3rd, 2013*

Mn% Cut-off	Resource Category	Rounded Tonnes	Mn%	Fe%
5	**Inferred**	**43,710,000**	**9.98**	**14.29**
6	Inferred	41,610,000	10.20	14.55
7	Inferred	38,260,000	10.52	14.91
8	Inferred	33,800,000	10.92	15.36
9	Inferred	28,830,000	11.34	15.83
10	Inferred	22,460,000	11.86	16.42
11	Inferred	15,330,000	12.49	17.12
12	Inferred	9,100,000	13.19	17.93

**Notes:*

1. *Tonnages have been rounded to the nearest 10,000 tonnes.*
2. *The 5% Mn cut-off value for this resource statement is bolded above and reflects a reasonable expectation of economic viability for a deposit of this nature based on market conditions and 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.*

Table 13.11: Total Contained Mn at the 5% Inferred Resource Statement Cut-off Value

Mn% Cut-off	Category	Rounded Tonnes	Mn%	lbs Mn (billions)
5	Inferred	43,710,000	9.98	9.62

13.6 Model Validation

Results of block modeling were reviewed in three dimensions and compared on a section by section basis with corresponding manually interpreted sections prepared prior to model development. Block grade distribution was shown to have acceptable correlation with the grade distribution of the underlying drill hole data (Figures 13.10 to 13.18).

Descriptive statistics were also 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 13.12). The mean weighted average drill hole composite grades for the Plymouth Fe-Mn Deposit (Table 13.13) compare well with tabulated block grade mean values.

Table 13.12: Plymouth Deposit: Mn and Fe statistics for Individual Blocks

Parameter	Manganese	Iron
Mean Grade	9.77%	14.05%
Maximum Grade	16.44%	23.50%
Minimum Grade	2.29%	5.91%
Variance	6.18	10.75
Standard Deviation	2.49	3.28
Coefficient of Variation	0.25	0.23
Number of Composites	14,172	14,172

Table 13.13: Plymouth Deposit: Combined Mn and Fe Statistics for 3.0 Meter Composites

Parameter	Manganese	Iron
Mean Grade	10.24%	14.76%
Maximum Grade	18.36%	14.43%
Minimum Grade	0.51%	5.02%
Variance	12.66	20.31
Standard Deviation	3.56	4.51
Coefficient of Variation	0.35	0.31
Number of Composites	964	964

The ID^2 resource model for the Plymouth Fe-Mn Deposit was checked using ordinary kriging (OK) interpolation methodology. Interpolation parameters, ellipsoid range and orientation were maintained from the ID^2 method. Variogram assessment determined a nugget and sill of 0.50. A comparison of the ordinary kriging check model results with those of the ID^2 model are presented in Figure 13.9. Global tonnage and metal grades compare acceptably between the two models for both manganese and iron. Results of the two methods are considered sufficiently consistent to provide an acceptable check on the preferred ID^2 methodology.

Figure 13.9: Grade Tonnage and Average Grade Comparison of ID^2 and OK Methods

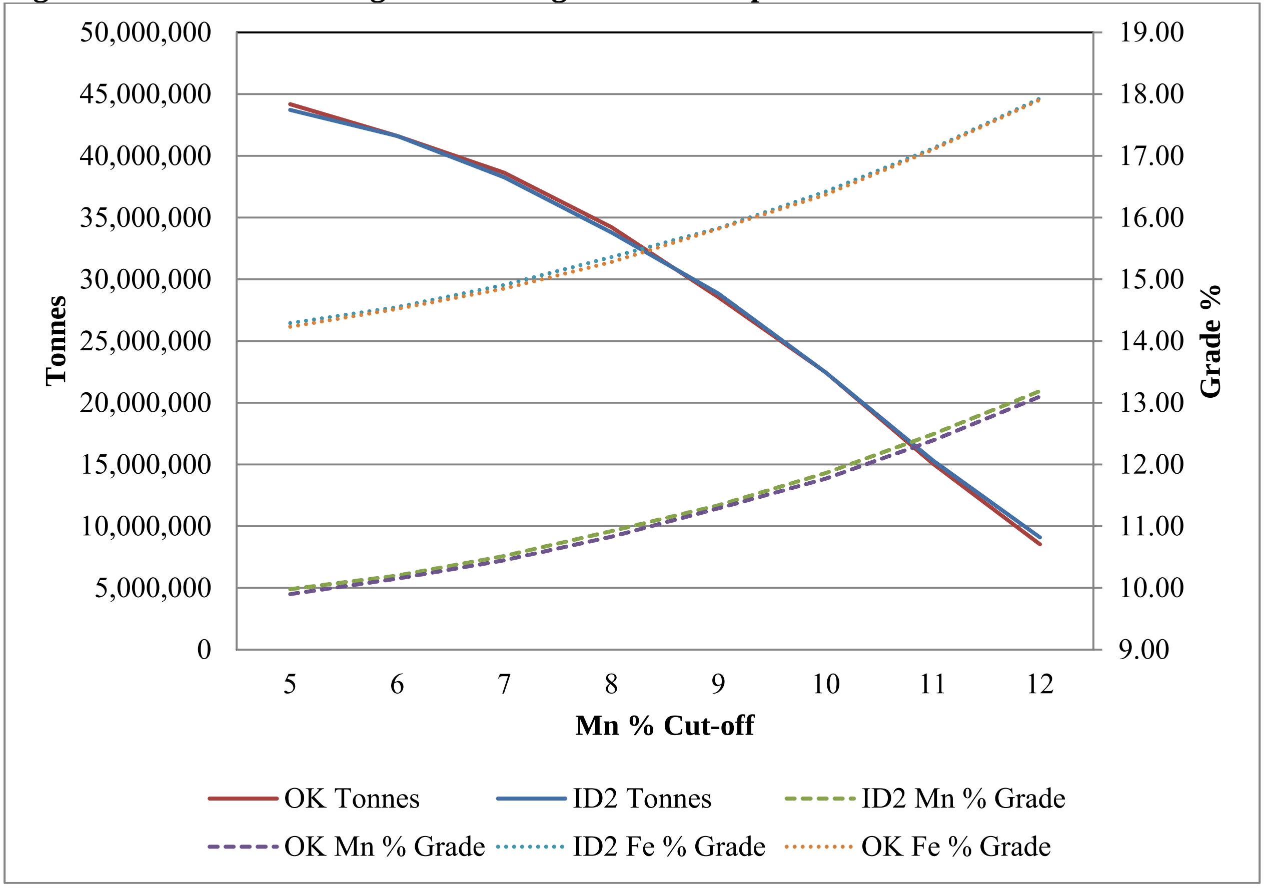


Figure 13.10: Historic Section Line 10N – Looking NE – Mn % Block Values

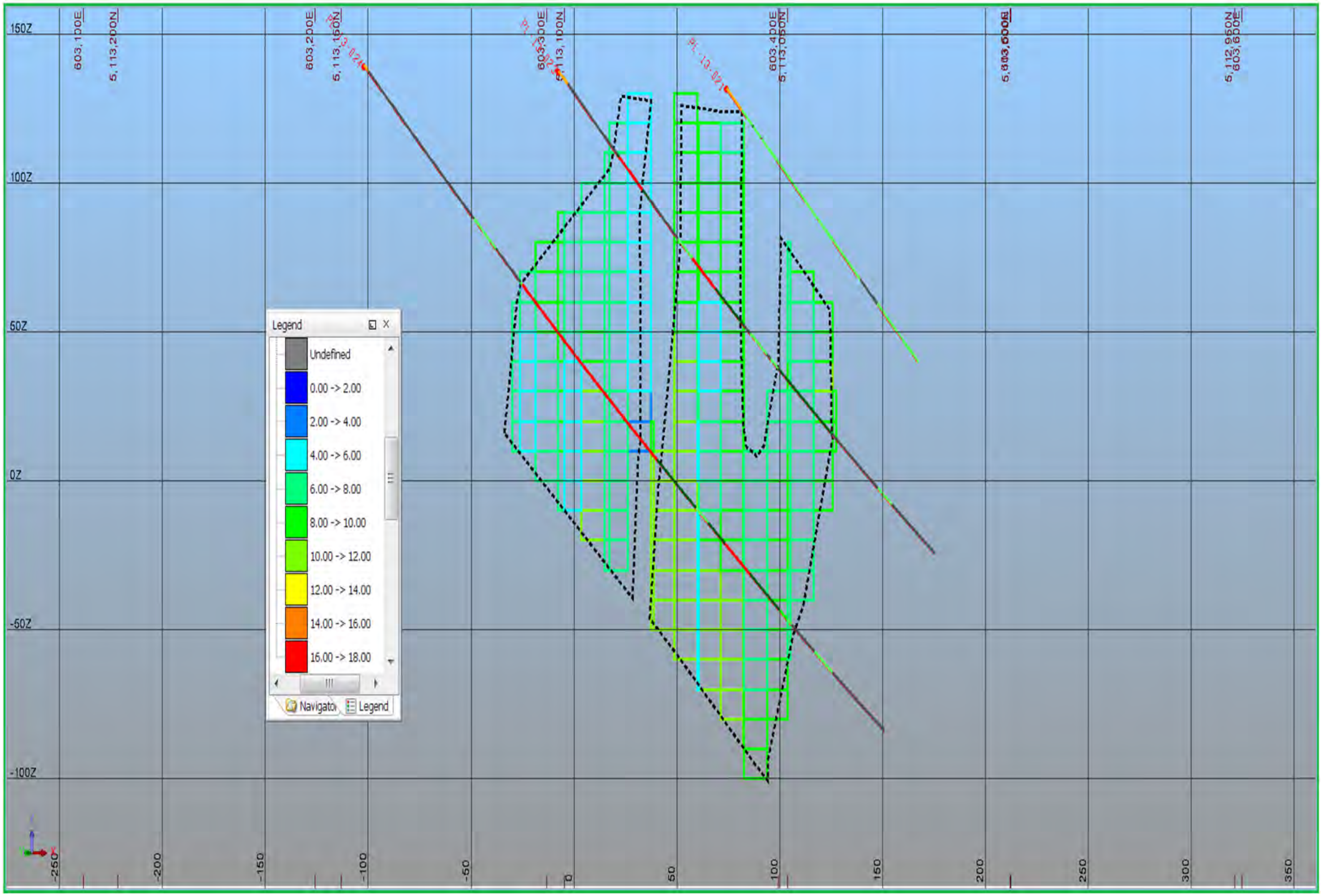


Figure 13.11: Historic Section Line 11N – Looking NE – Mn % Block Values

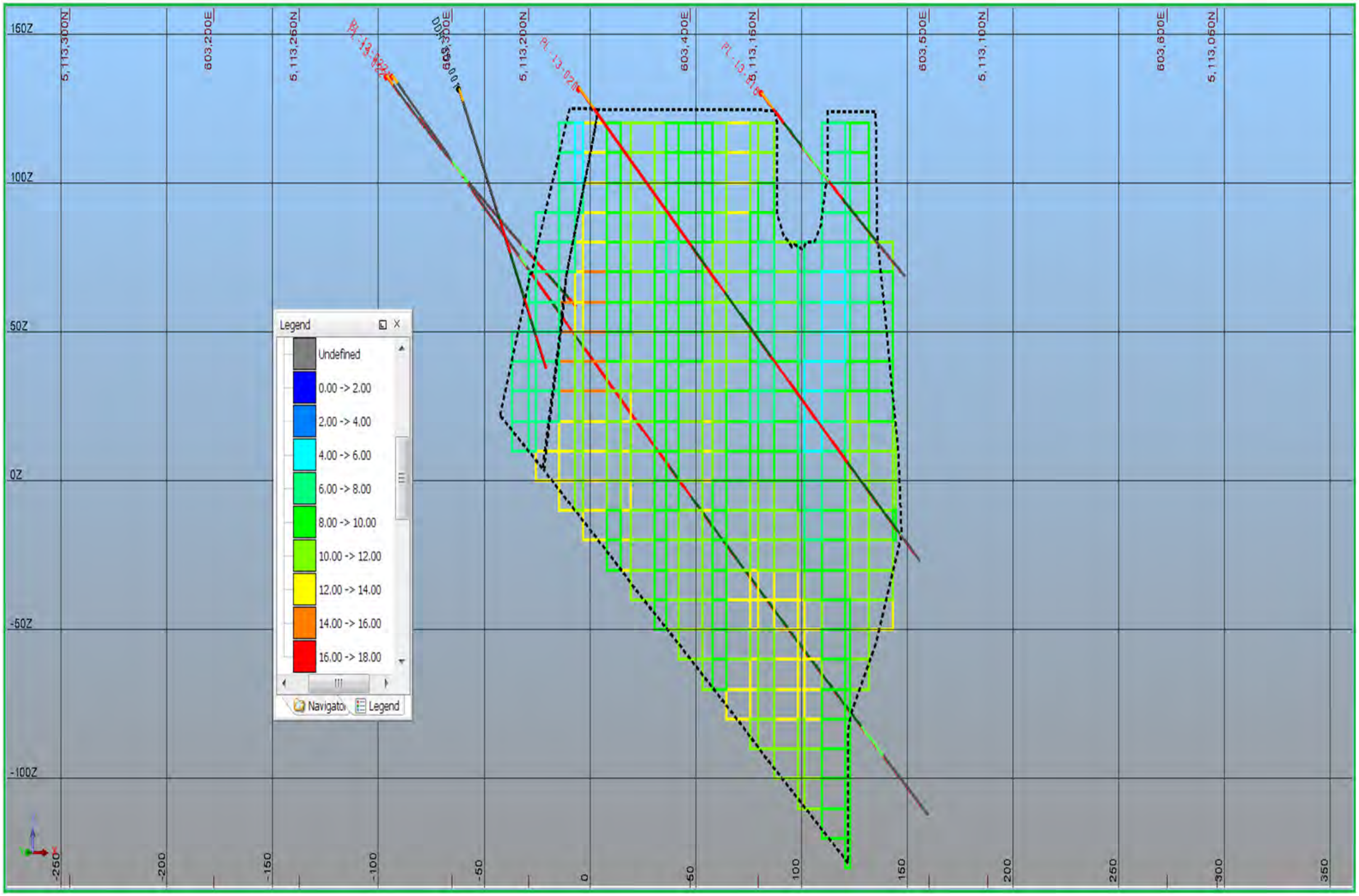


Figure 13.12: Historic Section Line 12N – Looking NE – Mn % Block Values

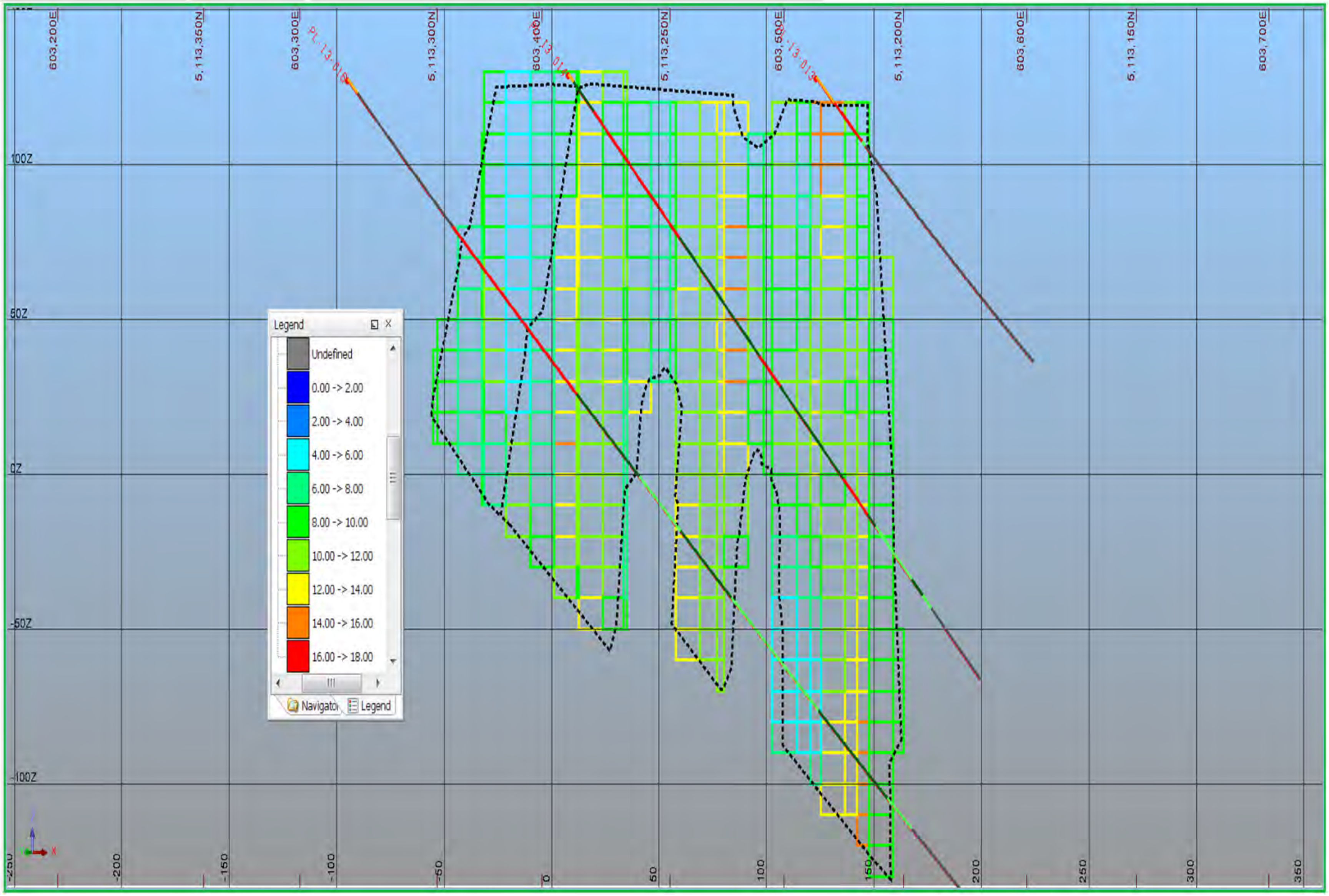


Figure 13.13: Historic Section Line 13N – Looking NE – Mn % Block Values

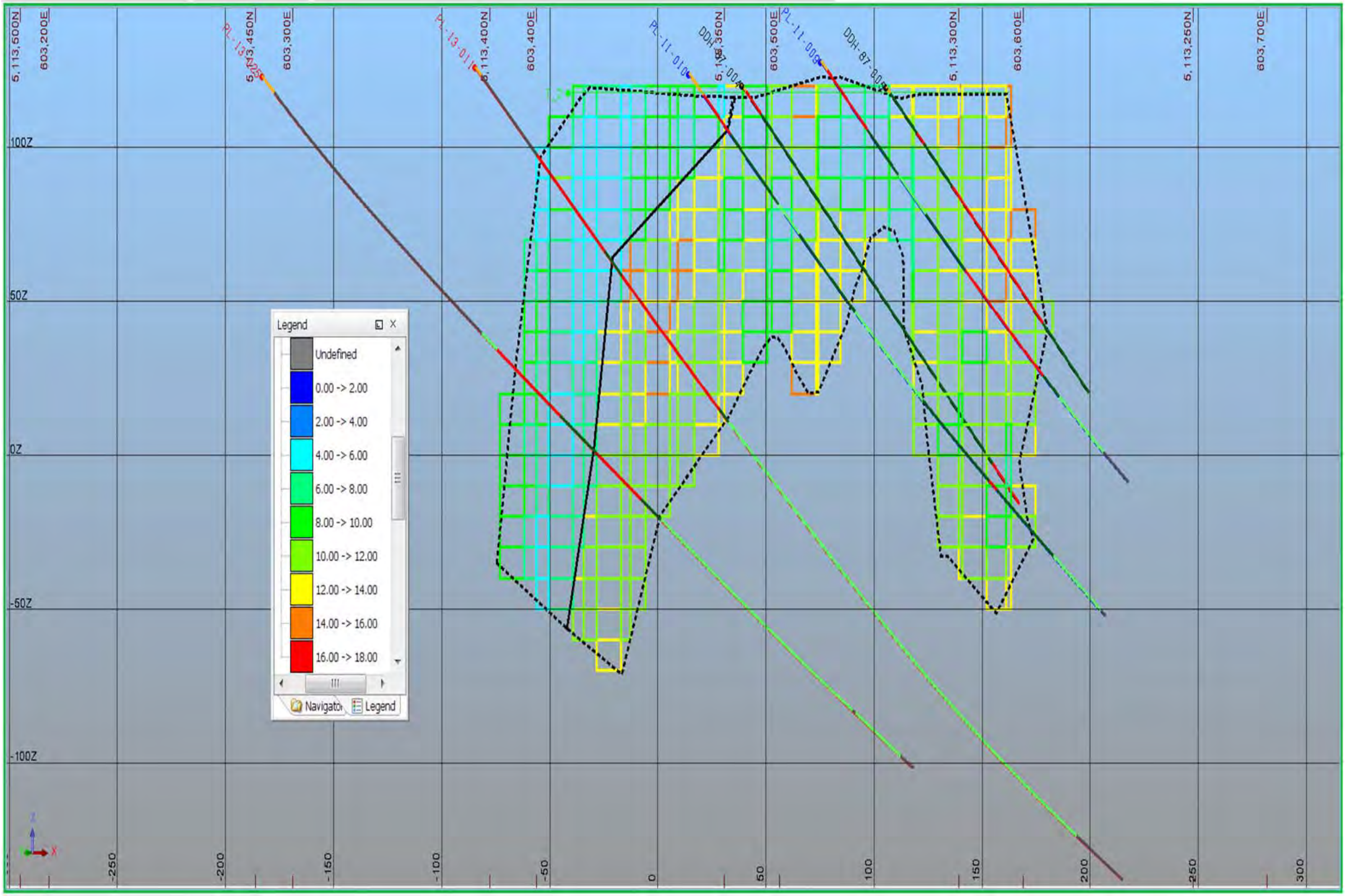


Figure 13.14: Historic Section Line 14N – Looking NE – Mn % Block Values

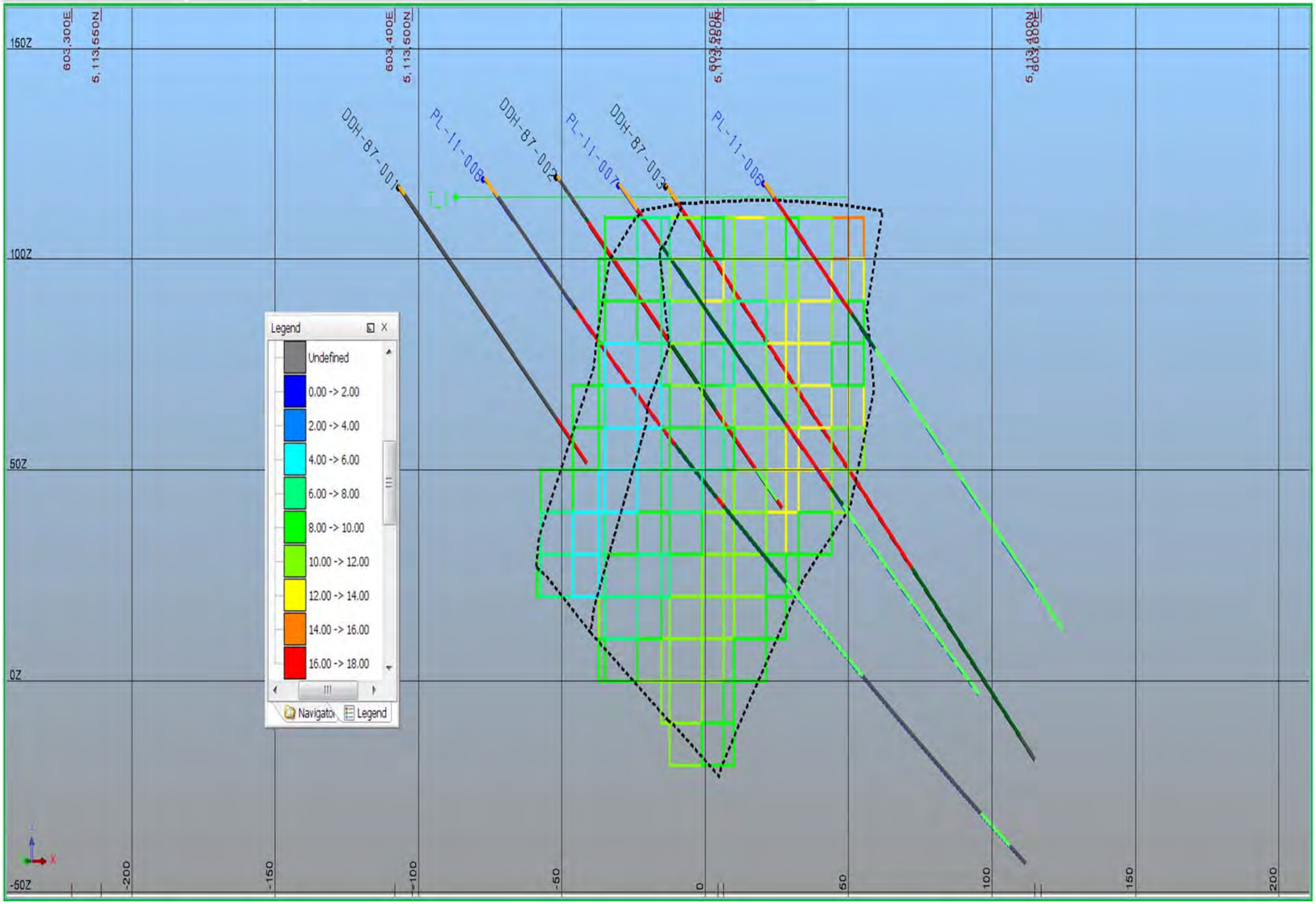


Figure 13.15: Historic Section Line 15N – Looking NE – Mn % Block Values

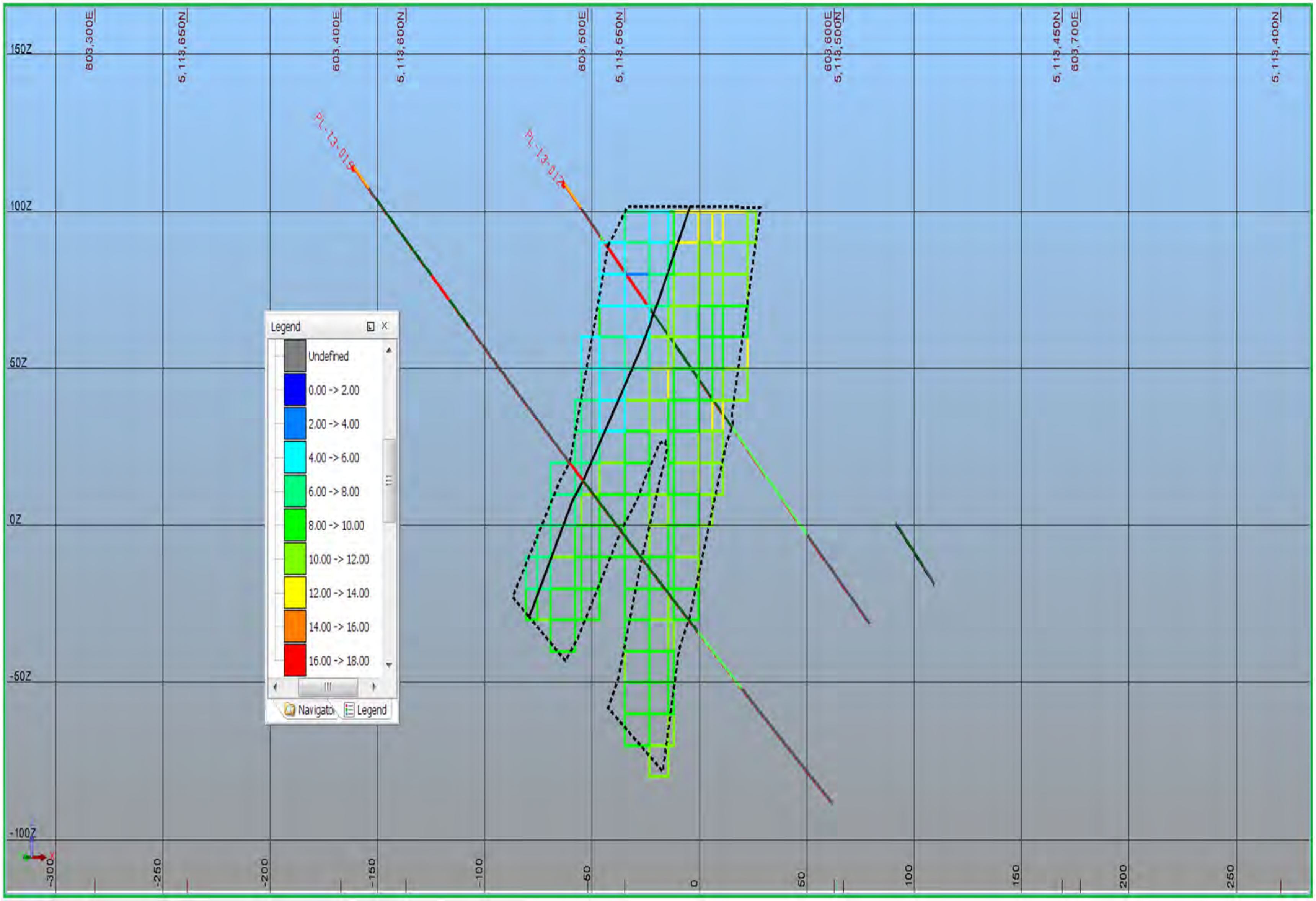


Figure 13.16: Historic Section Line 16N – Looking NE – Mn % Block Values

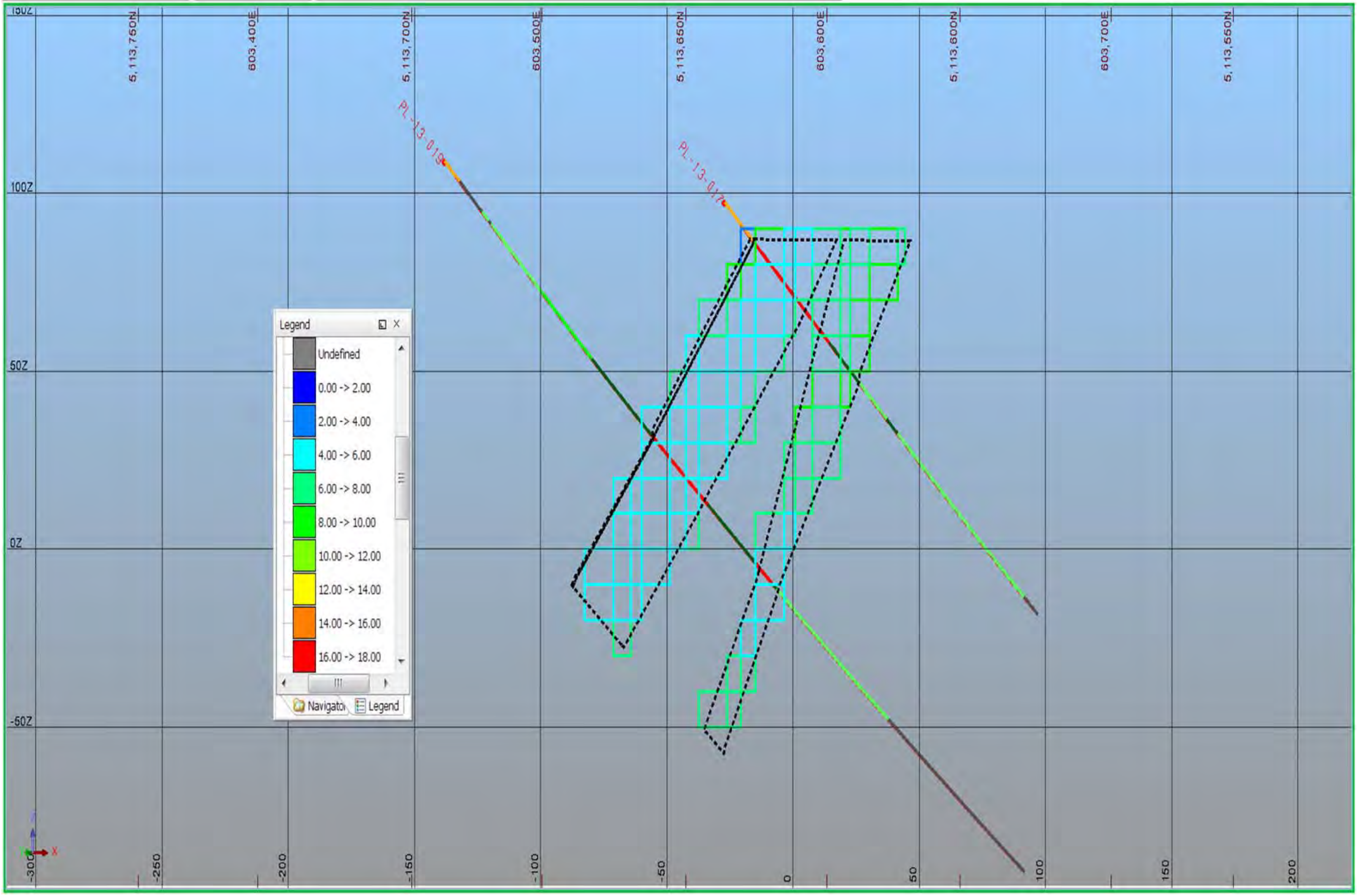


Figure 13.17: BM 5% Mn Cut-off: Mn % Block Values Looking NW (Left) and SW (Right)

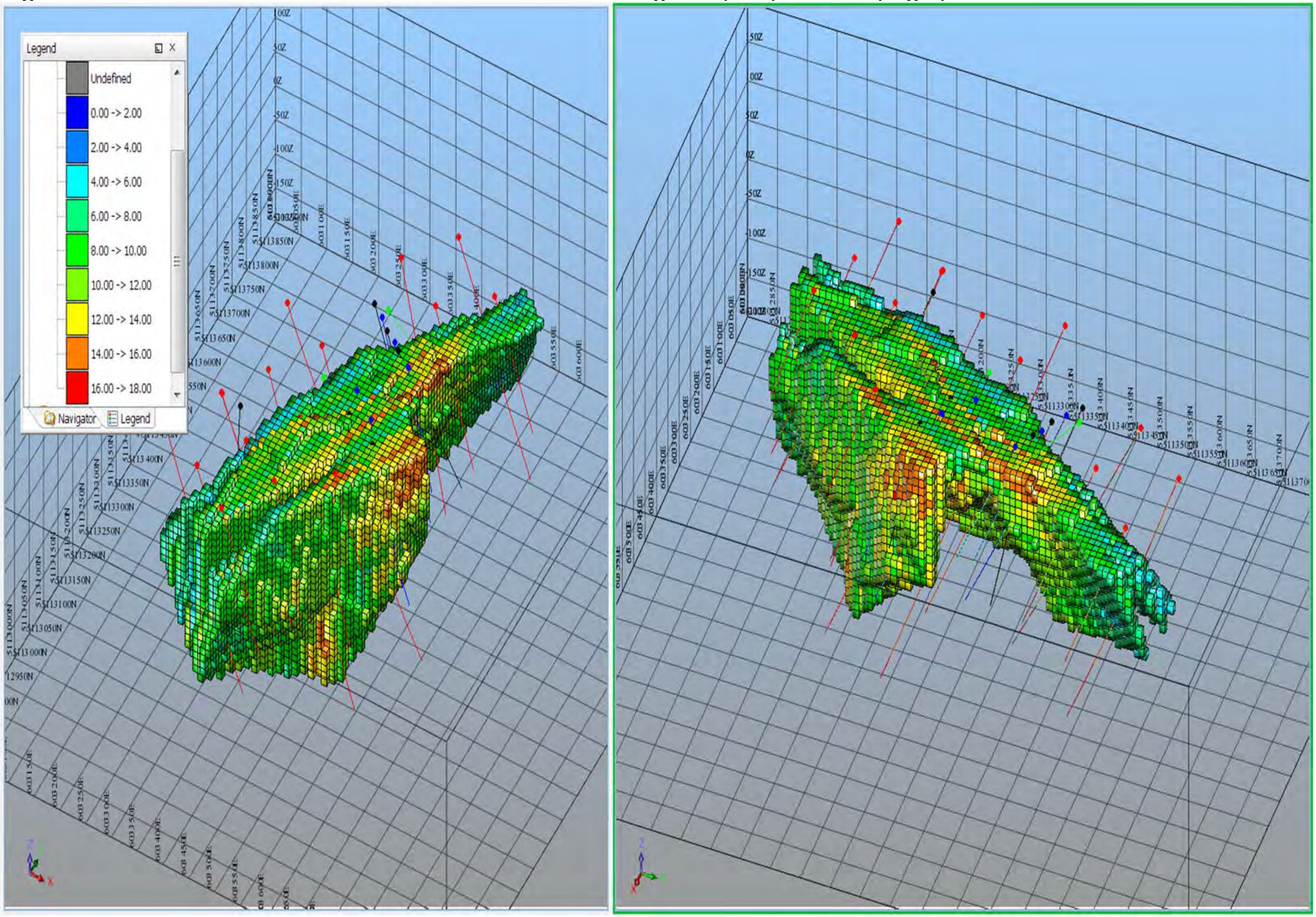
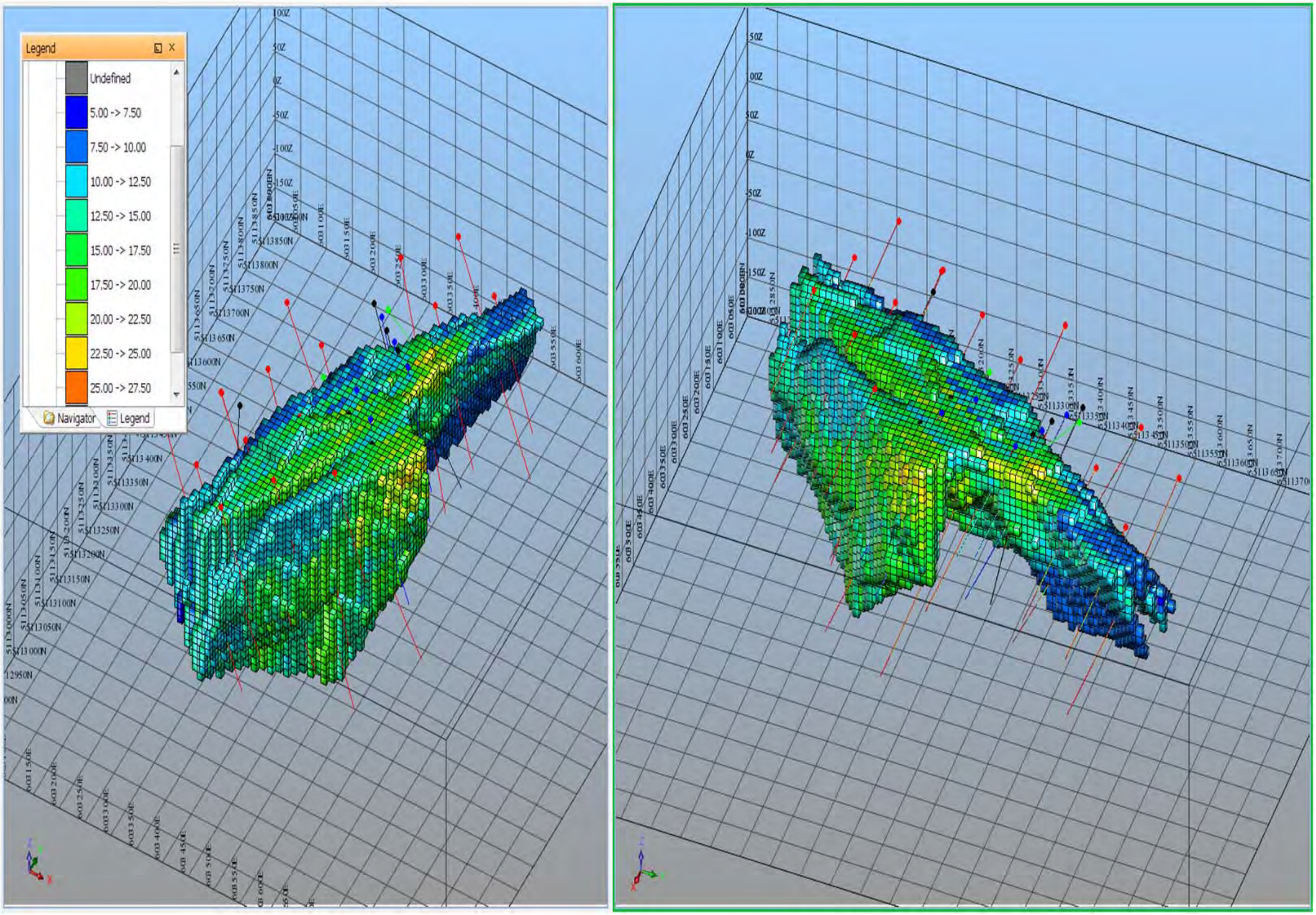


Figure 13.18: BM 5% Mn Cut-off: Fe % Block Values Looking NW (Left) and SW (Right)



13.7 Comment on Previous Resource Estimates

No previous NI 43-101 compliant resource estimates have been evaluated for the Plymouth Fe-Mn Deposit. A historic non-compliant resource estimate was evaluated by Strategic Manganese Corporation in 1957, which resulted in an uncategorized resource estimate of 46.5 million tonnes averaging 10.90% Mn and 13.30% Fe. Drill records contributing to that resource estimate were not available for consideration for the current resource estimate. Subsequent drilling and trenching by MRR in 1987 supported the Strategic Manganese Corporation assessment of the deposit, with their analytical results averaging 12.0% Mn. The current estimate includes a slightly higher Fe grade and slightly lower Mn grade than the 1957 program, but direct comparison of inputs for the two estimates is not possible due to lack of historic support documentation.

14 Adjacent Properties

There are no adjacent properties, as defined under NI 43-101, that are pertinent to this report.

15 Other Relevant Data and Information

No other relevant data or information that should be included in this report has been identified by Mercator

16 Interpretation and Conclusions

This Technical Report describing a mineral resource estimate for the Plymouth Mn-Fe deposit was prepared by Mercator on behalf of BMC and Minco to meet reporting requirements of National Instrument 43-101 (NI 43-101) - Standards of Disclosure for Mineral Projects and conforms with resource estimation standards established by the Canadian Institute of Mining, Metallurgy and Petroleum, Definition Standards on Mineral Resources and Mineral Reserves (CIM Standards). For reporting purposes, the deposit is considered to occur within the "Woodstock Property" that consists of Mineral Claim 5472, which has an expiry date of November 14th, 2013. Mercator understands that exploration title to this property was in good standing at the May 6th effective date of the mineral resource estimate described in this report.

The history of exploration and mining on the property dates from the late 1840's and in the 1848 through 1884 period approximately 70,000 tons (63,497 tonnes) of iron ore was mined from stratiform Fe-Mn deposits hosted by the Silurian Smyrna Mills Formation. This ore was locally smelted. BMC acquired the property in 2010 through purchase from a private, Fredericton-based company after reviewing results of earlier geological and metallurgical test work. BMC subsequently engaged Wardrop to apply up to date cost and market data to an internal model developed for the evaluation of project and to complete an internal evaluation of the historic positive operating margin flowsheets. Wardrop concluded that under 2010 market conditions, and given larger tonnage through-puts, development of the deposit would be economically viable. Wardrop also concluded that improved process recoveries and concentrate grades could be expected from additional metallurgical testing and that better recoveries would enhance project economics.

BMC completed a 1,040 m (5 hole) diamond drilling program in 2011 on the deposit that was followed up in 2013 by a 4,082 m (15 hole) program by Minco-BMC. Composite samples for metallurgical testing were prepared from 2011 drilling program coarse reject material to represent the general properties of the Plymouth Mn-Fe Deposit. Thibault was contracted to conduct bench scale testing on the 2011 "bulk composite" sample, for development of a hydrometallurgical process, to produce EMM from the deposit. In the first phase of the test program, process conditions were identified to obtain manganese extractions in the range of 87.0% to 94.1% from the "bulk composite" 2011 drill core sample using a sulphuric acid leach.
In the second phase of bench scale testing, operating conditions for the leach were augmented to maintain a high recovery of manganese, while simultaneously optimizing on factors that impact on the economics of the leaching process, such as reagent consumption, pulp density, heating requirements and residence time. Bench scale testing for operation of the sulphuric acid leach, at the augmented process conditions, resulted in manganese extractions ranging from 85.7% to 88.2%.

Unit operations and process operating conditions for leach solution purification, using commercially proven technologies for precipitation of iron as goethite and sulphide precipitation of trace heavy metal impurities, have also been identified to produce a purified manganese sulphate solution that meets target specifications for electrowinning of manganese, based on operating data from commercial EMM operations.

Bench scale test programs completed to date have included testing of all major unit operations proposed for hydrometallurgical processing of the Plymouth Fe-Mn Deposit, with the exception of electrowinning, and the process technology is considered technically viable by Thibault. Furthermore, the bench scale test program data compiled to date is considered to be sufficient to enable completion of a preliminary economic assessment of the deposit. Based on the results of metallurgical testing completed to date, Thibault has recommended that the next phase of process testing be based on the operation of small scale, continuous, (or semi-continuous), pilot test equipment, to include operation of an electrowinning cell for production of EMM, to confirm product grade and current efficiency, relative to hydrometallurgical process operating conditions, solution purity and cell operating parameters.

Positive results have also been obtained from preliminary pre-concentration studies that assessed HGMS, Flotation and HMS methods as a means of upgrading the run-of-mine mineralized material, prior to feeding to a hydrometallurgical process. HGMS has been identified as the most favourable pre-concentration method tested to date, and resulted in upgrading of the feed material from 11.4% to 15.6% Mn at 86.7% recovery. In addition to small scale continuous pilot testing of the hydrometallurgical process proposed above, it is further recommended that satellite bench scale studies be conducted to assess hydrometallurgical processing of mineralized material that has been pre-concentrated by HGMS.

The mineral resource estimate completed by Mercator is based on validated results of 5,881 m of diamond drilling in 26 diamond drill holes. Of these, 15 drill holes totalling 4,093 m were completed in 2013 by Minco and BMC, five holes totalling 1,040 m were completed in 2011 by BMC, and five historic holes totalling 747.7 m were completed by MRR in 1987. Results for two trenches completed in 1987 by MRR were also incorporated in the resource database as horizontal drill holes having a bedrock surface elevation. Modelling was performed using Gemcom Surpac® 6.4.1 modeling software with manganese percent, iron percent and specific gravity values estimated using inverse distance squared (ID^2) interpolation methodology from 3 m down hole assay composites. The resource block model was set up with a block size of 10m (x) by 10m (y) by 10m (z). Down hole analytical results for manganese oxide percent (MnO%) and iron oxide percent ($Fe_2O_{3\%}$) were converted to manganese percent (Mn%) and iron percent (Fe%) respectively. Metal grade assignment was peripherally constrained by two separate wire-framed solid models based on sectional geological interpretations for the deposit and a minimum included grade of 5 % Mn over 12 meters down hole length.

The main resource solid trends northeast and measures approximately 700 m in strike length. It averages approximately 100 meters in width and extends to a maximum depth of 300 meters below surface. This domain has a folded geometry with near vertical to steeply dipping eastern and western limbs and a broad interpreted closure zone. The eastern fold limb is recognizable for only 400 meters of block model strike length. A second distinct resource solid was developed along the peripheral limits of the western limb of the main solid to constrain additional stratiform mineralization that shows less continuity and lower average Mn grade than the main resource solid. This solid measures approximately 675 meters in length and 40 meters in width and extends to a maximum depth of 200 meters below surface. Both resource solid models are constrained by a digital terrain model of the surface of bedrock. Results from 639 separate laboratory determination of specific gravity were composited at a 3 meter down hole support length and used to develop an interpolated specific gravity model using ID^2 methodology. The resource estimate and supporting block model were checked by comparison with geological and assay sections and also against results of grade interpolation using Ordinary Kriging methods. Very good correlation exists between results of the two interpolation methods and section checks were also acceptable.

The mineral resource estimate prepared by Mercator is presented below in Table 16.1 and has an effective date of May 6th, 2013. Economic and mine planning studies have not yet been carried out for the deposit, but Mercator is of the opinion that the 5% Mn resource statement cut-off grade value defines a reasonable expectation of economic viability based on market conditions and potential for development using open pit mining methods. Table 16.2 illustrates the effect of cut-off grade on total deposit tonnage and average metal grade.

Table 16.1: Plymouth Mn-Fe Deposit Resource Estimate – May 6th , 2013*

Mn% Cut-off	Resource Category	Rounded Tonnes	Mn%	Fe%
5	**Inferred**	**43,710,000**	**9.98**	**14.29**
6	Inferred	41,610,000	10.20	14.55
7	Inferred	38,260,000	10.52	14.91
8	Inferred	33,800,000	10.92	15.36
9	Inferred	28,830,000	11.34	15.83
10	Inferred	22,460,000	11.86	16.42
11	Inferred	15,330,000	12.49	17.12
12	Inferred	9,100,000	13.19	17.93

**Notes:*
1. *Tonnages have been rounded to the nearest 10,000 tonnes.*
2. *The 5% Mn cut-off value for this resource statement is bolded above and reflects a reasonable expectation of economic viability for a deposit of this nature based on market conditions and 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.*

Table 16.2: Total Contained Mn at the 5% Inferred Resource Statement Cut-off Value

Mn% Cut-off	Category	Rounded Tonnes	Mn%	lbs Mn (billions)
5	Inferred	43,710,000	9.98	9.62

Based on the current block model and associated mineral resource estimate, Mercator has concluded that the Plymouth Mn-Fe deposit, as currently defined by a 5% Mn cut-off value, remains open both along strike and down dip, and that further core drilling to assess deposit extensions in these areas is warranted. Mercator has also concluded that infill drilling within current resource model limits at a 50 m intercept spacing would be necessary to upgrade much of the currently defined Inferred mineral resource to Indicate mineral resource status. In combination with positive metallurgical processing results reported by Thibault, the current Inferred resource is considered to be of sufficient size and integrity to support a Preliminary Economic Assessment study.

Thibault has concluded that bench scale metallurgical test programs completed to date have provided sufficient information for the preliminary selection of process equipment and conceptual design of a metallurgical flowsheet for processing of the Plymouth Fe-Mn Deposit mineralized material. The development of the hydrometallurgical process has been based on the 2011 drill core bulk composite sample, which is comprised of a blend of mineralized material, and is considered to be representative of the metallurgical performance for a preliminary technical and economic assessment.

The development of technologies for both pre-concentration by magnetic separation and hydrometallurgical processing for the production of a market grade EMM product is considered to be technically viable and the next stage of metallurgical testing would be for optimization of a flowsheet for a pre-feasibility assessment. Optimization of the flowsheet using a bulk sample of run-of-mine mineralized material as defined by the mine plan is recommended, and would include small scale pilot testing (mini-pilot test program) of a fully integrated flowsheet, including recycle streams, under continuous flow conditions to simulate the metallurgical performance of the flowsheet.

17 Recommendations and Proposed Budget

17.1 Introduction

The following recommendations with respect to further evaluation of the Plymouth Mn-Fe deposit are based on work completed to date by Mercator and Thibault. Expenditure estimates for completion of recommended future work programs are present below in report section 17.4.

17.2 Mercator Recommendations

1. No further deposit extension drilling should be carried out at this time, since sufficient near-surface Inferred mineral resources have been delineated to date to support completion of a Preliminary Economic Assessment (PEA) study;

2. Infill drilling at a 50 m section spacing should be carried out to upgrade Inferred mineral resources to Indicated status, but this work should be deferred until results of a PEA study are available. Delineation of a sufficient quantity of Indicated resources to support Pre-Feasibility and Feasibility studies will ultimately be required. Conclusions of a PEA will provide clear definition of this resource requirement and allow spatial and grade range optimization of subsequent infill drilling efforts.

3. A PEA study should be prepared based on the current Inferred mineral resource, the updated metallurgical flow sheet parameters developed by Thibault and appropriate mine planning, environmental and market study inputs.

4. If a positive economic assessment is determined by the PEA study, an infill drilling program designed to upgrade Inferred resources to Indicated status should be completed after a decision has been taken to move the project forward to the Pre-Feasibility study level. At least 5,000 m of infill drilling will be required to upgrade resources and a new resource estimate should be prepared after completion of that drilling program.

17.3 Thibault Recommendations:

1. The results of bench scale testing for development of a hydrometallurgical process for the production of a market grade EMM product from the Plymouth Fe-Mn deposits indicate that the process is technically viable and test program data compiled to date is considered to be sufficient to support the completion of a PEA. It is, therefore, recommended that a PEA be completed to assess the economic viability of the proposed hydrometallurgical process.

2. It is recommended that future process development test programs move towards continuous simulation of the hydrometallurgical flowsheet, including electrowinning and incorporation of all proposed recycle streams, using small scale pilot test equipment to simulate the metallurgical performance of the integrated flowsheet. Furthermore, optimization of the hydrometallurgical process during the pilot testing phase should be based on the use of a bulk sample containing an appropriate blend of "red" and "grey" mineralization types as defined by a suitable mine plan..

3. In addition to small scale continuous pilot testing of the hydrometallurgical process for processing of the run-of-mine Plymouth Fe-Mn mineralized material, it is further recommended that optimization of an integrated flowsheet for pre-concentration of the "run of mine" mineralized material by HGMS be completed and that satellite bench scale studies be conducted to assess hydrometallurgical processing of the upgraded HGMS feed material for the hydrometallurgical process.

17.4 Proposed Budget

Implementation of the above recommendations should proceed as a two phase program. Phase I consists of completion of a PEA study and Phase II consists of completion of infill drilling required to upgrade Inferred mineral resources used in the PEA to Indicated mineral resource status to support a subsequent Pre-Feasibility Study. Commitment to Phase II expenditures is contingent on substantively positive results arising from Phase I. Estimated expenditures for Phase I and II programs appear, respectively, in Table 17.1 and 17.2.

Table 17.1: Estimated Budget for Recommended Phase I and Phase II Programs

Item	Program Phase	Program Component	Estimated Cost ($ Cdn)
1	Phase I	Geological, geotechnical, environmental, land access and mine planning studies to support preparation of a Preliminary Economic Assessment (PEA)	$200,000
2	Phase 1	Metallurgical studies required to a provide a preliminary optimized flowsheet to support preparation of a PEA	$150,000
3	Phase 1	Preparation of a PEA report based on the Inferred mineral resource estimate presented in this report, with appropriately detailed inputs from items 1 and 2 above	$400,000
	Subtotal		$750,000
		Contingency	$75,000
	Total		**$825,000**

Table 17.2: Estimated Budget for Recommended Phase II Programs

Item	Program Phase	Program Component	Estimated Cost ($ Cdn)
1	Phase II	Infill core drilling to upgrade Inferred mineral resources to Indicates status, including support and reporting costs	$2,000,000
2	Phase II	Metallurgical studies required to provide a preliminary optimized flowsheet to support Pre-Feasibility and Feasibility studies	$650,000
3	Phase II	Preparation of a Pre-Feasibility report based on an updated mineral resource estimate and optimized metallurgical and mine planning studies	$750,000
	Subtotal		$3,400,000
		Contingency	$340,000
	Total		**$3,740,000**

18 Certificates of Qualification

CERTIFICATE OF AUTHOR

I, Michael P. Cullen, P. Geo., do hereby certify that:

1. I reside at 2071 Poplar St. in Halifax, Nova Scotia, Canada
2. I am currently employed as Chief Geologist with:

   Mercator Geological Services Limited
   65 Queen St Dartmouth,
   Nova Scotia, Canada B2Y 1G4
3. I received a Masters Degree in Science (Geology) from Dalhousie University in 1984 and a Bachelor of Science Degree (Honours, Geology) in 1980 from Mount Allison University.
4. I am a registered member in good standing of the Association of Professional Geoscientists of Nova Scotia (Registration Number 064), Newfoundland and Labrador Professional Engineers and Geoscientists (Member Number 05058) and Association of Professional Engineers and Geoscientists of New Brunswick, (Registration Number L4333).
5. I have worked as a geologist in Canada and internationally since graduation and have been employed by Mercator Geological Services Limited since 2001.
6. I do not have prior involvement with the Woodstock property that is the subject of the Technical Report (as hereinafter defined).
7. 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.
8. I am one of the qualified persons responsible for preparation of the technical report titled (Technical Report):

   MINERAL RESOURCE ESTIMATE
   TECHNICAL REPORT
   FOR THE PLYMOUTH MN-FE DEPOSIT
   WOODSTOCK PROPERTY
   NEW BRUNSWICK
   CANADA
   Effective Date: May 6th, 2013

   I supervised work on, and am responsible for, all sections of the Technical Report with the exception of section 11.2 and sections 12.2 through 12.4.

9. I have not visited the property that is the subject of the Technical Report.
10. I am independent of Buchans Minerals Corporation, applying all of the tests in section 1.5 of NI 43-101.
11. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared in compliance with that instrument.
12. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, all sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 22nd day of May, 2013

(Original signed and sealed by)

Michael P. Cullen, M. Sc., P. Geo.
Chief Geologist
Mercator Geological Services Limited

CERTIFICATE OF AUTHOR

I, Andrew C. Hilchey, P. Geo., do hereby certify that:

1. I reside in Halifax, Nova Scotia, Canada

2. I am currently employed as a Resource Geologist with:
   Mercator Geological Services Limited
   65 Queen St
   Dartmouth, Nova Scotia, Canada
   B2Y 1GA

3. I received a Bachelor of Science (Hons. Geol.) degree from Dalhousie University in Halifax, Nova Scotia, Canada in 2004.

4. I am a registered member in good standing of the Association of Professional Engineers and Geoscientists of New Brunswick, registration number L4863.

5. I have worked as a geologist in Canada for over 7 years since graduation from university and have been employed by Mercator Geological Services Limited (Mercator) since 2007.

6. I do not have prior involvement with the Woodstock property that is the subject of the Technical Report (as hereinafter defined).

7. 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.

8. I am one of the qualified persons responsible for preparation of the technical report titled (Technical Report):

MINERAL RESOURCE ESTIMATE
TECHNICAL REPORT
FOR THE PLYMOUTH MN-FE DEPOSIT
WOODSTOCK PROPERTY
NEW BRUNSWICK
CANADA
Effective Date: May 6th, 2013

I am responsible for section 11.2 of this Technical Report and have contributed to other sections.

9. I visited the property that is the subject of this report most recently on March 26th, 2013 at which time I viewed mineralized 2013 program drill core at Buchans Minerals Corporation's core logging facility, carried out a quarter core check sampling program and carried out field checking of drill collar coordinates. I also viewed Plymouth Deposit drill core and collected check samples at the New Brunswick government core library in Sussex, NB on March 27th, 2013.

10. I am independent of Buchans Minerals Corporation, applying all of the tests in section 1.5 of NI 43-101.

11. I have read NI 43-101 and the section of the Technical Report for which I am responsible has been prepared in compliance with that instrument.

12. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, section 11.2 of the Technical Report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 22nd day of May, 2013

[Original signed by]

____

Andrew Hilchey, P.Geo
Resource Geologist
Mercator Geological Services Limited

CERTIFICATE OF AUTHOR

I, Stephanie M. Goodine, P.Eng., do hereby certify that:

1. I reside at 39 Declaration Drive, Killarney Road, New Brunswick, Canada
2. I am currently employed as Lead Plant Design / Process Chemical Engineer with:

   Thibault & Associates Inc.
   330 Alison Blvd., Fredericton
   New Brunswick, Canada E3C 0A9
3. I received a Bachelor's Degree in Engineering (Chemical) from the University of New Brunswick in 2002.
4. I am a registered member in good standing of the Association of Professional Engineers and Geoscientists of New Brunswick (APEGNB), registration number M6565.
5. I have practiced in my profession as a process chemical engineer continuously for a total of 11 years since graduation. I have a wide variety of experience in development and design of metallurgical and hydrometallurgical processes for production of industrial metals and minerals such as copper, gold, zinc, tin, indium, tungsten, molybdenum, iron and manganese. I have previously completed Mineral Processing and Metallurgical Testing sections for NI 43-101 compliant Technical Reports.
6. I have relevant work experience and have authored reports summarizing the results of various metallurgical and hydrometallurgical bench and pilot scale test programs including copper/gold flotation, gold cyanide leaching, iron ore upgrading by gravity and magnetic separation, and indium/zinc leaching and recovery processes.
7. In addition to the bench scale test programs for development of a hydrometallurgical process for manganese and the test programs for pre-concentration of the 2011 drill core composite samples, since 2011, I have been involved in the development of a conceptual economic model, management of an internal market assessment study for various manganese end products, and the preparation of a preliminary review of environmental and regulatory requirements for the Woodstock manganese property.
8. 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.
9. I am one of the qualified persons responsible for preparation of the Technical Report titled:

MINERAL RESOURCE ESTIMATE
TECHNICAL REPORT
FOR THE PLYMOUTH MN-FE DEPOSIT
WOODSTOCK PROPERTY
NEW BRUNSWICK
CANADA
Effective Date: May 6th, 2013

I supervised work on, and am responsible for Section 12 of the Technical Report, with the exception of section 12.1, and have contributed to other sections of the report.

10. I have not visited the property that is the subject of this report.
11. I am independent of Buchan Minerals Corporation, applying all of the tests in section 1.5 of NI43-101.
12. I have read NI43-101and the sections of the Technical Report for which I am responsible have been prepared in compliance with that instrument.
13. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, all sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make this Technical Report not misleading.

Dated this 22nd day of May, 2013

(Original signed and sealed by)

____

Stephanie M. Goodine, P. Eng.
Lead Plant Design / Process Chemical Engineer
Thibault & Associates Inc.

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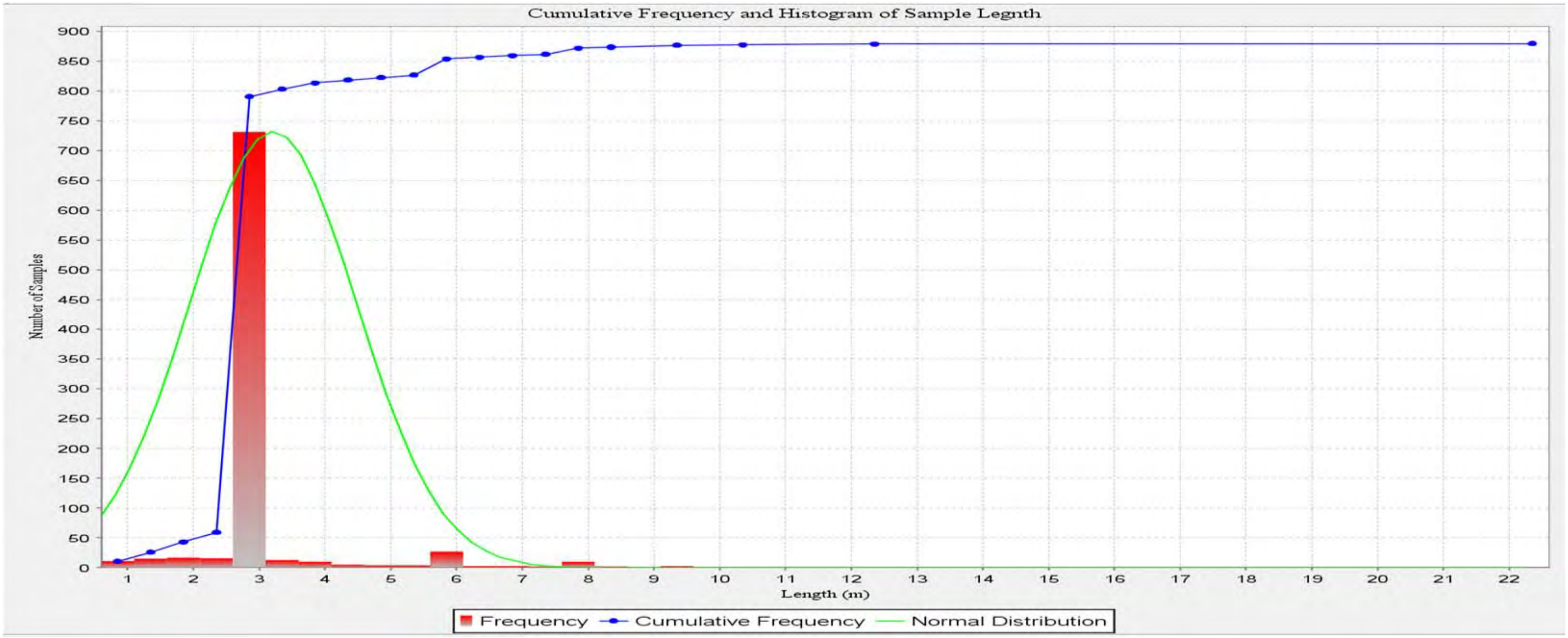
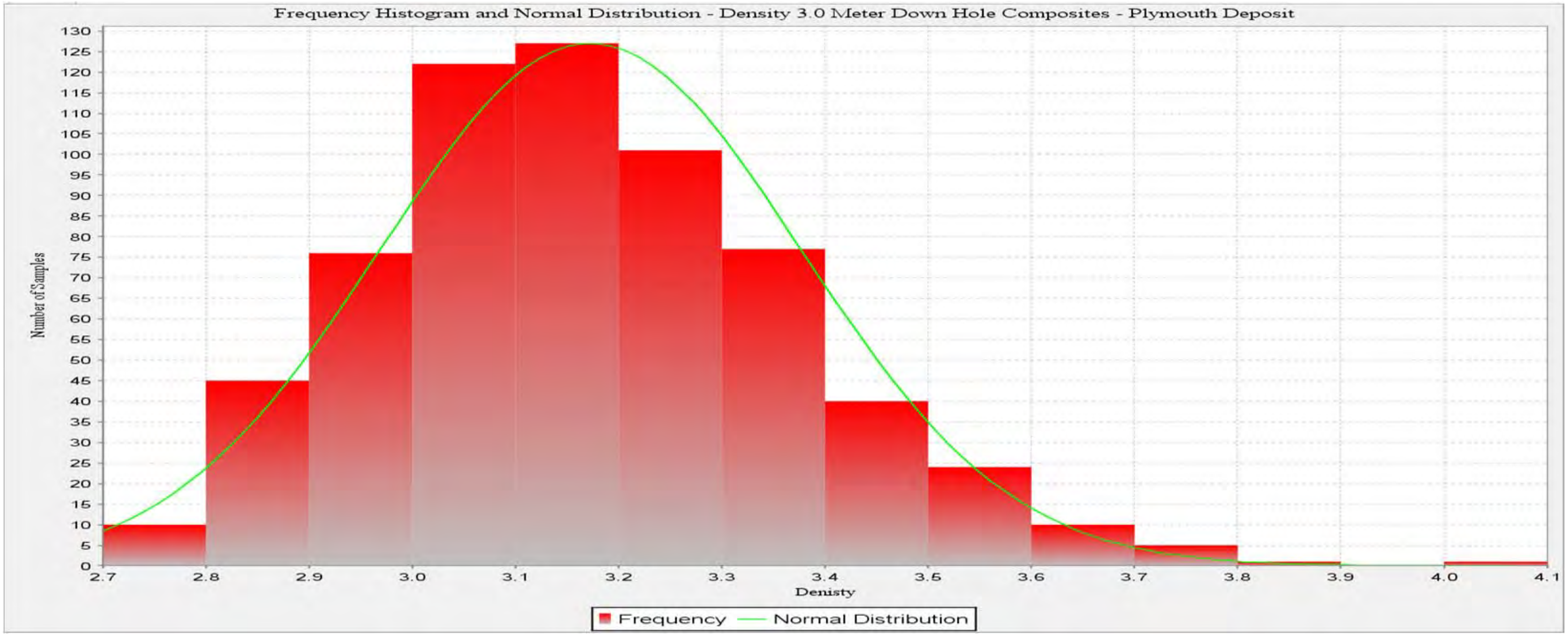
Press Releases

BMC Press Release, January 21, 2013
BMC Press Release, September 26, 2011
BMC Press Release, September 7, 2011

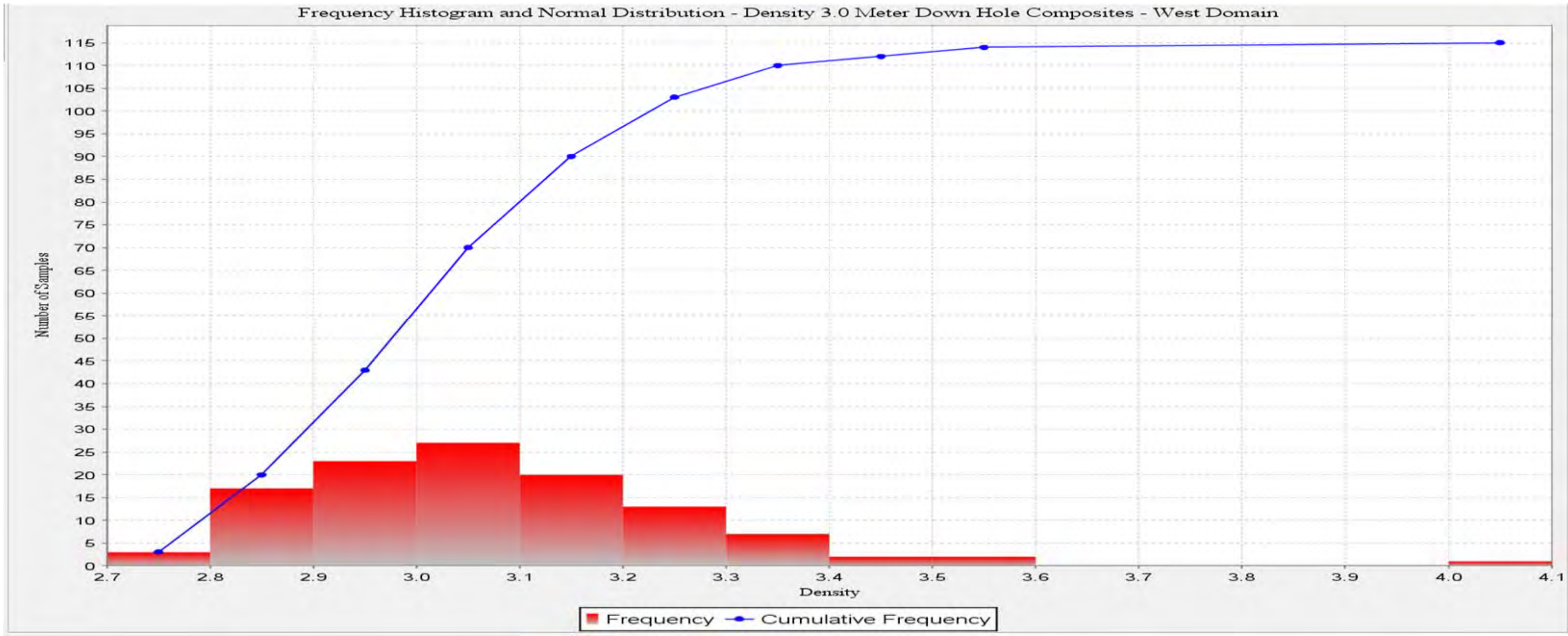
Appendix I

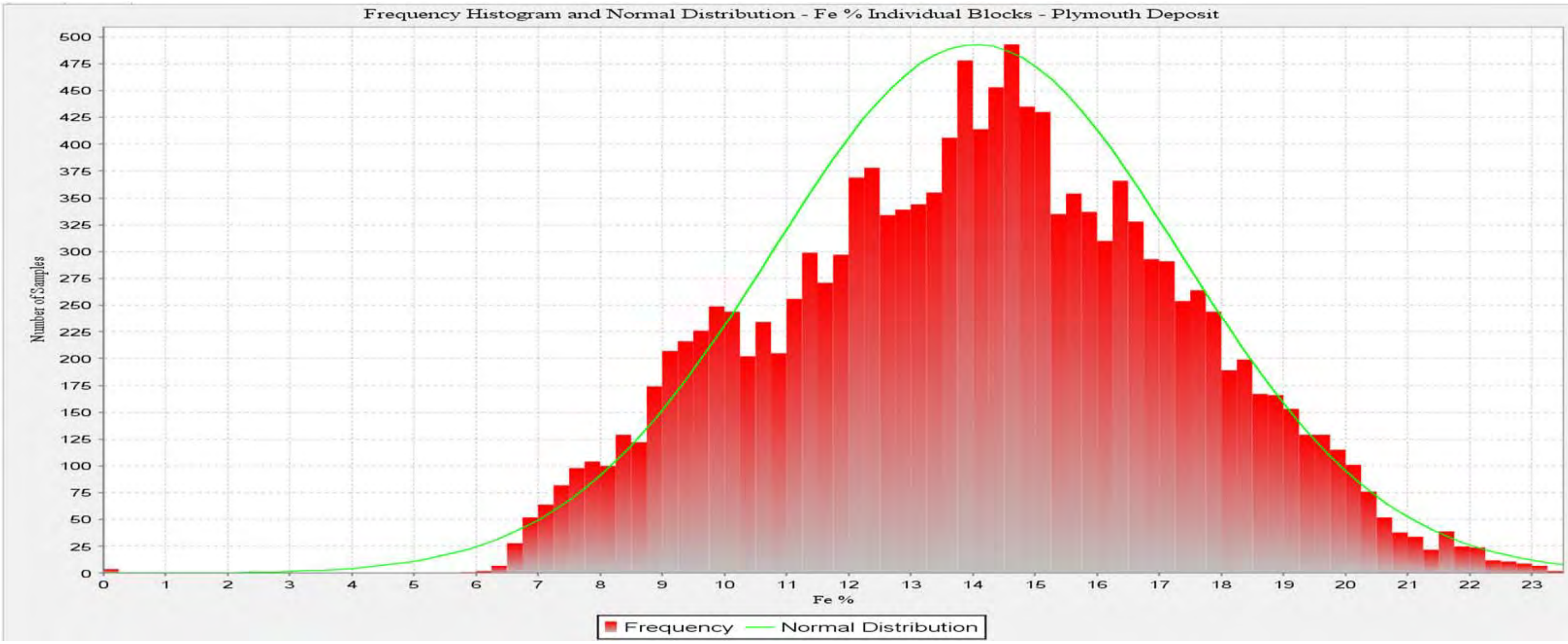
Support Documents

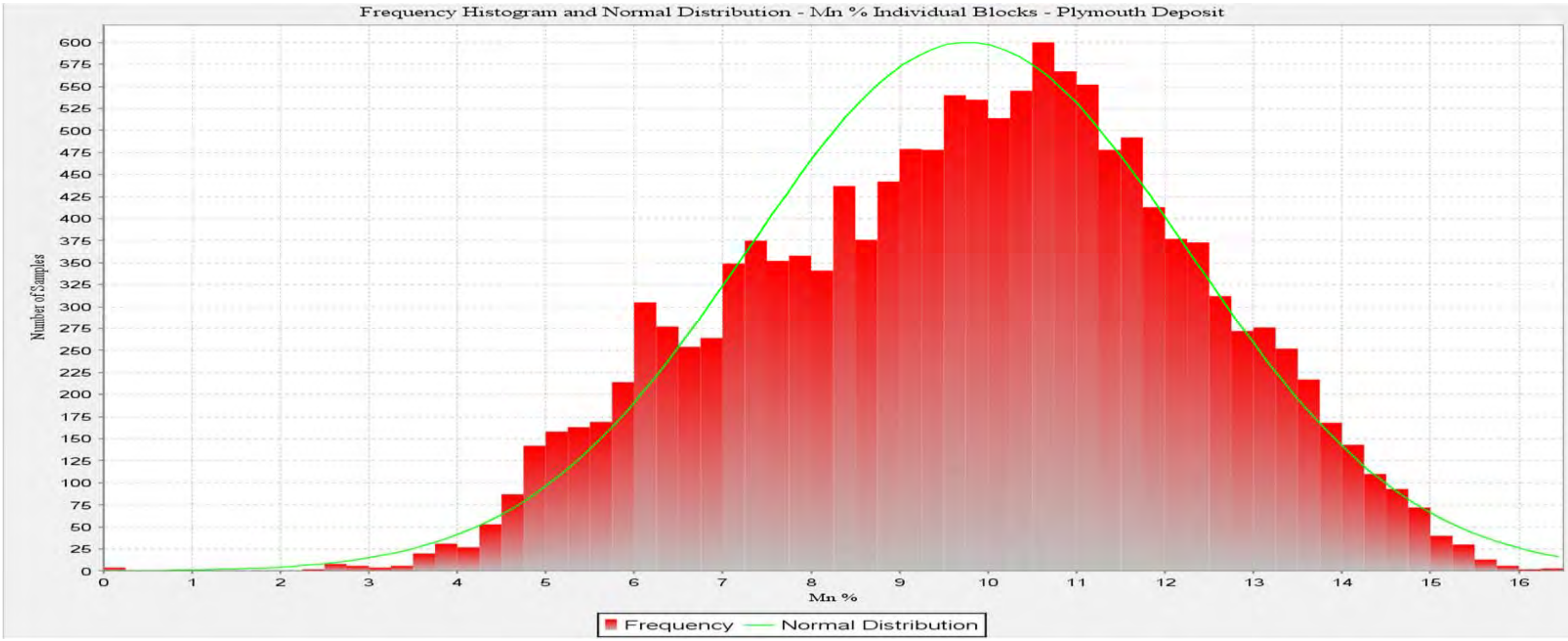

Cumulative Frequency and Histogram of Sample Legnth
Number of Samples
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Length (m)
Frequency
Cumulative Frequency
Normal Distribution

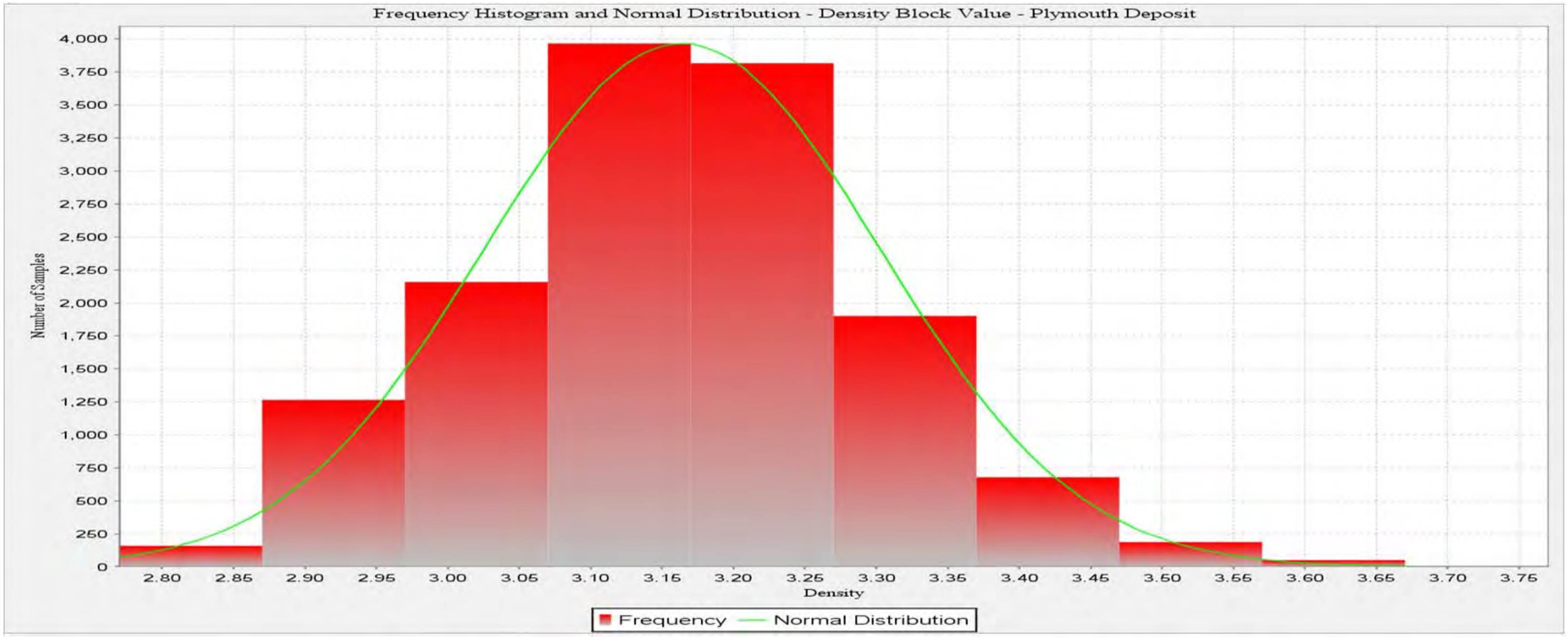

Frequency Histogram and Normal Distribution - Density 3.0 Meter Down Hole Composites - Plymouth Deposit
Number of Samples
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
Denisty
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Density 3.0 Meter Down Hole Composites - Main Domain
Number of Samples
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2.75 2.80 2.85 2.90 2.95 3.00 3.05 3.10 3.15 3.20 3.25 3.30 3.35 3.40 3.45 3.50 3.55 3.60 3.65 3.70 3.75 3.80
Density
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Density 3.0 Meter Down Hole Composites - West Domain
Number of Samples
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
Density
Frequency
Cumulative Frequency


Frequency Histogram and Normal Distribution - Fe % Individual Blocks - Plymouth Deposit
Number of Samples
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Fe %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Mn % Individual Blocks - Plymouth Deposit
Number of Samples
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
500
525
550
575
600
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Mn %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Density Block Value - Plymouth Deposit
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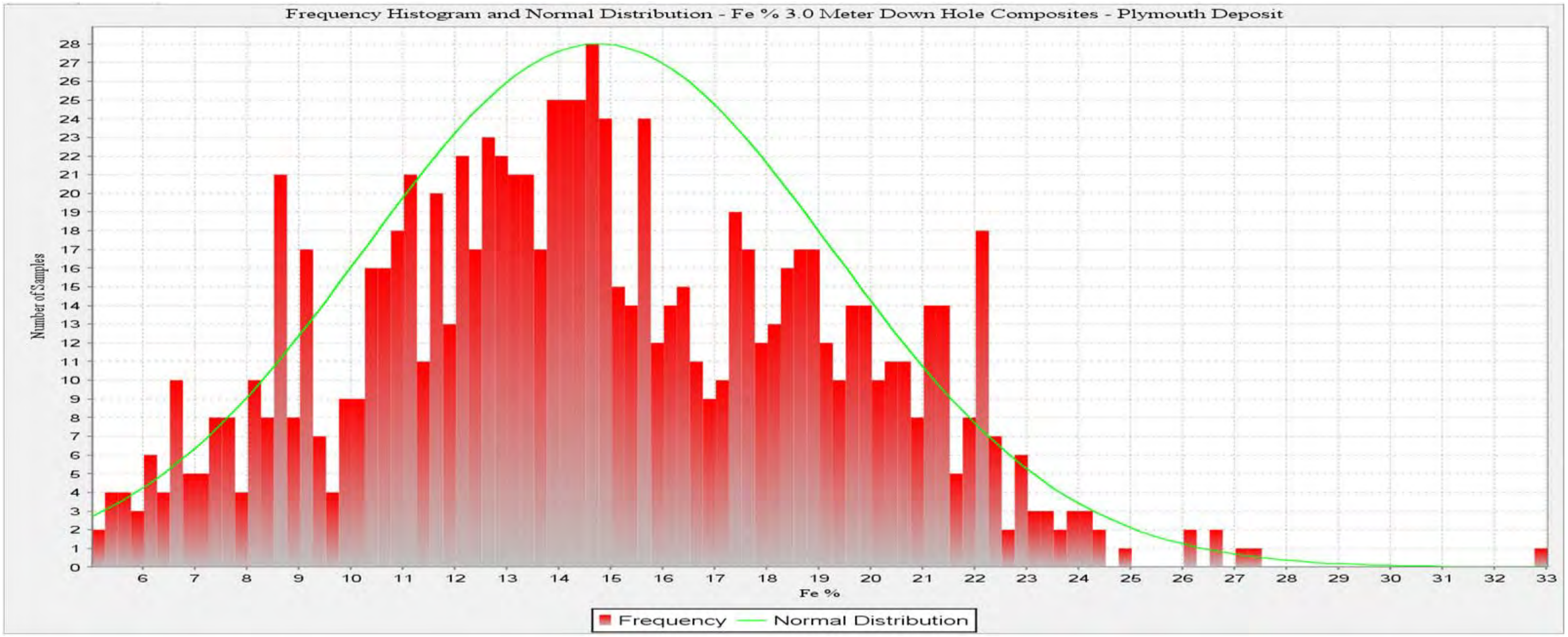
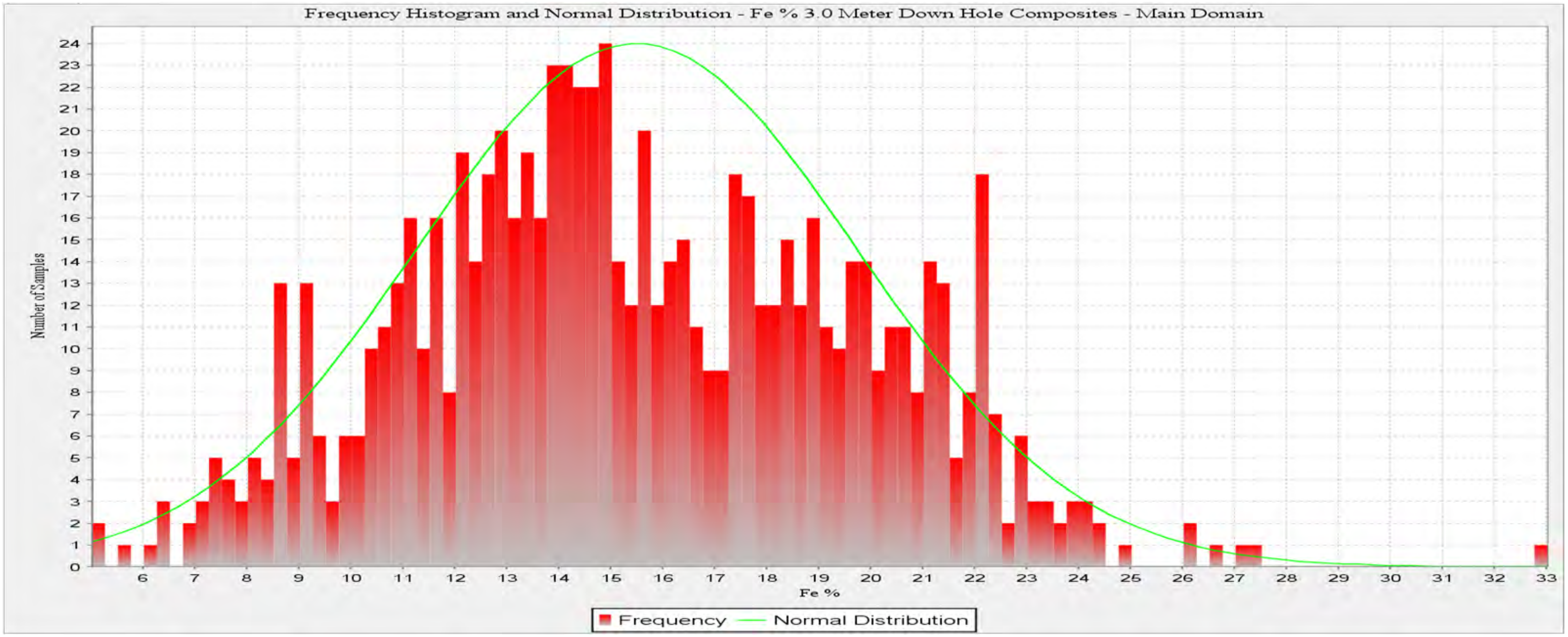
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
2.80
2.85
2.90
2.95
3.00
3.05
3.10
3.15
3.20
3.25
3.30
3.35
3.40
3.45
3.50
3.55
3.60
3.65
3.70
3.75
Density
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Fe % 3.0 Meter Down Hole Composites - Plymouth Deposit
Number of Samples
Fe %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Fe % 3.0 Meter Down Hole Composites - Main Domain
Number of Samples
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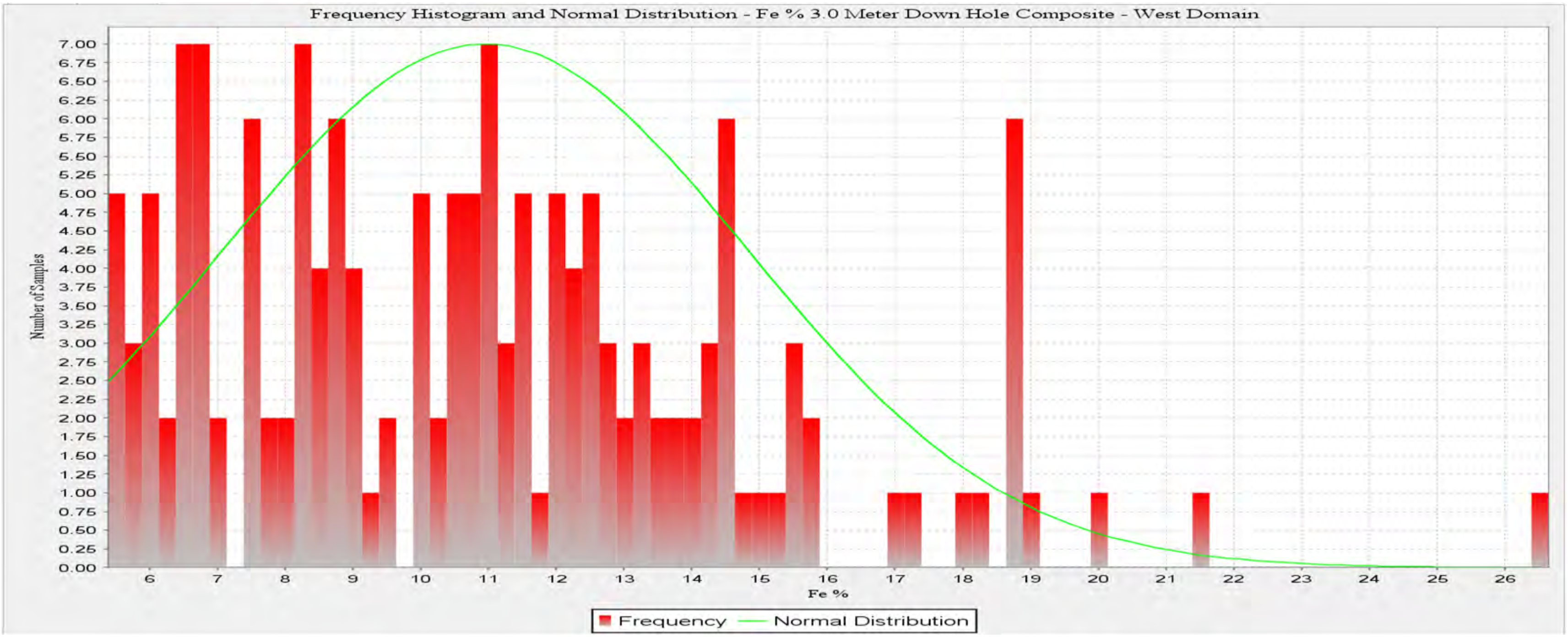
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
Fe %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Fe % 3.0 Meter Down Hole Composite - West Domain
Number of Samples
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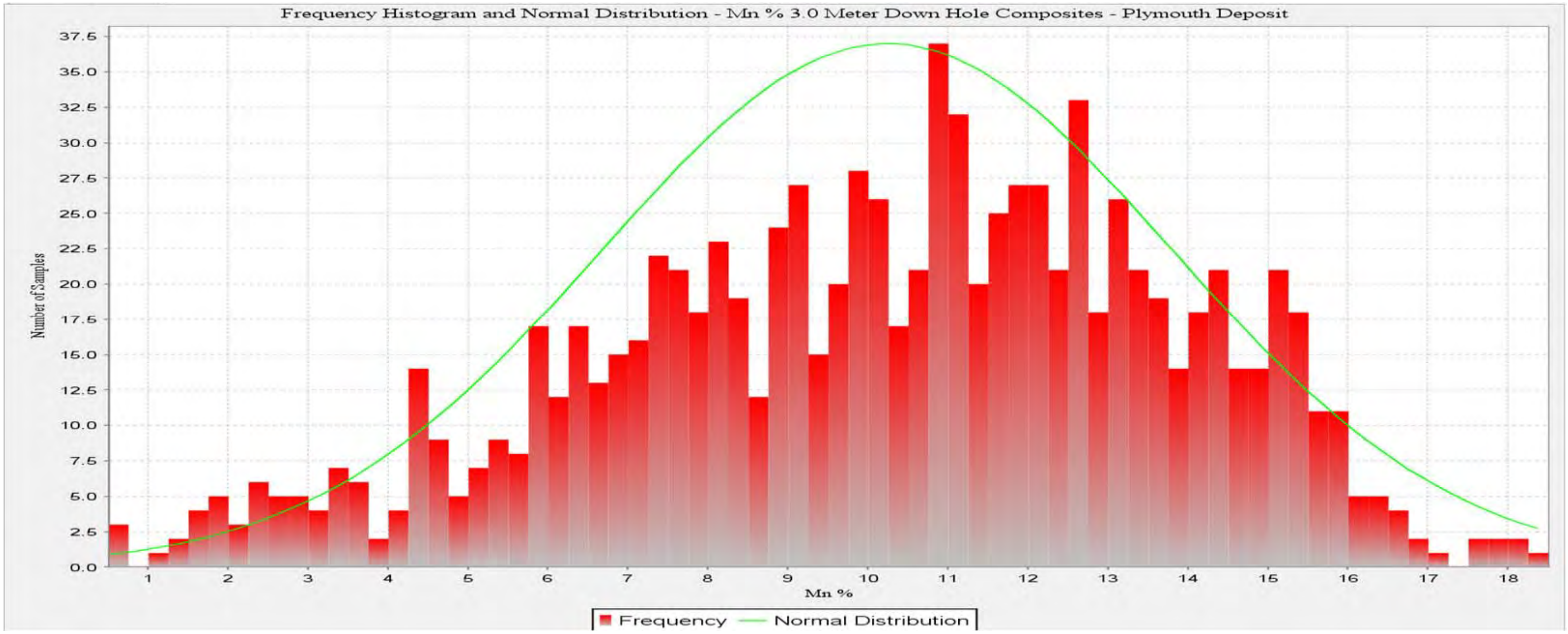
6.75
6.50
6.25
6.00
5.75
5.50
5.25
5.00
4.75
4.50
4.25
4.00
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Fe %
Frequency
Normal Distribution



Frequency Histogram and Normal Distribution - Mn % 3.0 Meter Down Hole Composites - Plymouth Deposit
Number of Samples
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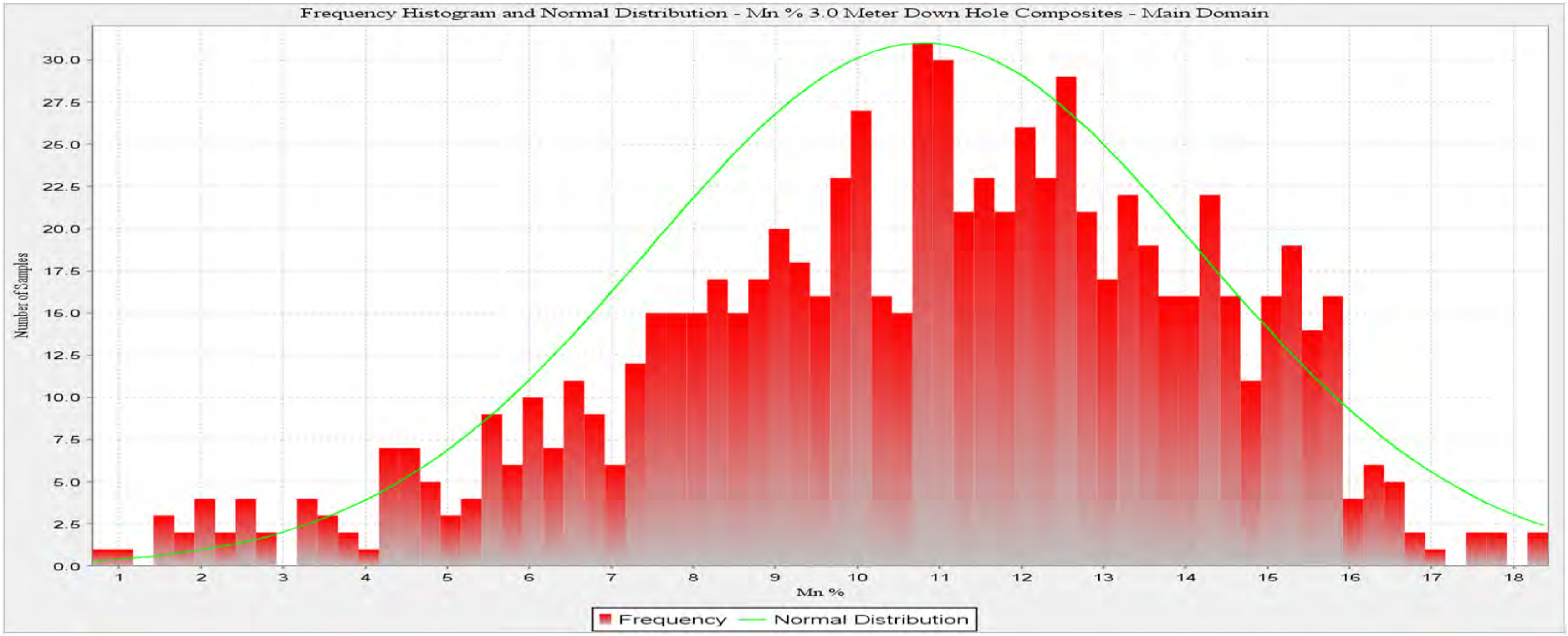
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0
32.5
35.0
37.5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Mn %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Mn % 3.0 Meter Down Hole Composites - Main Domain
Number of Samples
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0
1
2
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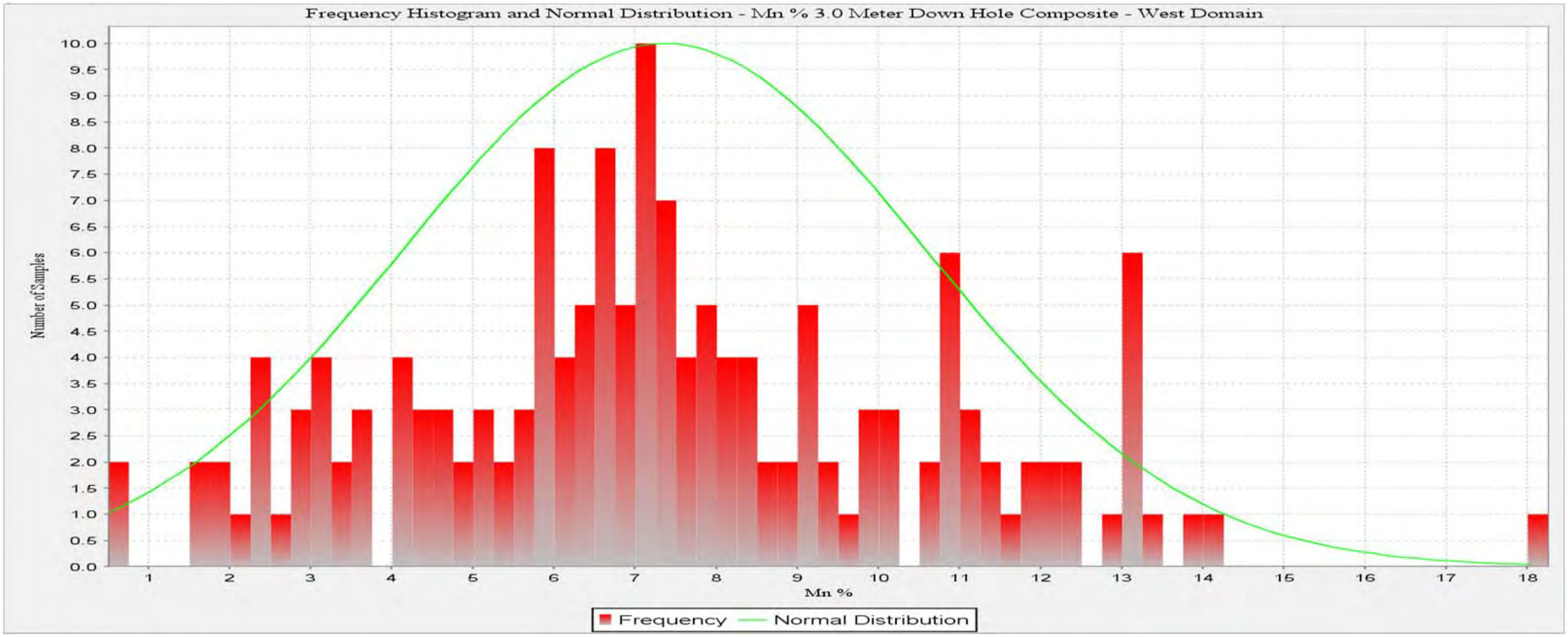
8
9
10
11
12
13
14
15
16
17
18
Mn %
Frequency
Normal Distribution


Frequency Histogram and Normal Distribution - Mn % 3.0 Meter Down Hole Composite - West Domain
Number of Samples
Mn %
Frequency
Normal Distribution