

**NI 43-101 TECHNICAL PRE-FEASIBILITY STUDY REPORT FOR  
THE MATAWINIE GRAPHITE PROJECT**



**FINAL REPORT**

**Prepared for  
Nouveau Monde Graphite Inc.**

**Prepared by**

**QPs**

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**Effective Date : July 28<sup>th</sup>, 2017**

**Issue Date : December 8<sup>th</sup>, 2017**

### **IMPORTANT NOTICE**

This Report, following National Instrument 43-101 rules and guidelines, was prepared for Nouveau Monde Graphite Inc. (“**NMG**”) by Met-Chem, a division of DRA Americas Inc. (“**MC-DRA**”). The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in MC-DRA’s services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this Report. This Report can be filed as a Technical Report with Canadian Securities Regulatory Authorities pursuant to National Instrument 43-101, Standards of Disclosure for Mineral Projects. Except for the purposes legislated under Canadian securities laws, any other uses of this Report by any third party are at that party’s sole risk.

**DATE AND SIGNATURE PAGE – CERTIFICATES**

Effective Date: July 28<sup>th</sup>, 2017

Issue Date: December 8<sup>th</sup>, 2017

## CERTIFICATE OF AUTHOR

To accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Bernard-Olivier Martel, P. Geo, do hereby certify that:

- 1) I am consulting geologist with B.O Martel Inc., with an office at 5500 Chemin Chambly, office 1, St-Hubert, Canada;
- 2) I am a graduate from *Université du Québec à Montréal* with in the bachelor’s degree program in geology in 1999;
- 3) I am a registered member of “*Ordre des géologue du Québec*” (492);
- 4) I have worked as a geologist continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and am responsible for the Sections 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 23.0 and also part of the Sections 1, 25 and 26;
- 7) I have visited the project from 24 July to 16 August 2015, from 5 September to 27 September 2015, from 22 October to 2 December 2015, from 6 July to 28 July 2016 and form 25 May to 15 June 2017.
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this Report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the technical report in compliance with NI 43-101 and Form 43-101F1; and have prepared the report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

This 8<sup>th</sup> day of December 2017.

***Bernard-Olivier Martel (Signed)***

---

Bernard-Olivier Martel, Géo # 492,  
Consulting geologist  
B.O Martel Inc.



## Certificate of Qualified Person

Yann Camus, P.Eng.

yann.camus@sgs.com

I, Yann Camus, P. Eng. of Blainville, Quebec, do hereby certify:

- a) I am a Mineral Resource Engineer for SGS Canada Inc. - Geostat with an office at 10 Boul. de la Seigneurie East, Suite 203, Blainville, Quebec, Canada, J7C 3V5.
- b) This certificate applies to the Technical Report entitled "NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project" prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.
- c) I am a graduate of the École Polytechnique de Montréal (B.Sc. Geological Engineer, in 2000). I am a member of good standing, No. 125443, of the l'Ordre des Ingénieurs du Québec (Order of Engineers of Quebec). My relevant experience includes continuous mineral resource estimation since my graduation from University (17 years). I am a "Qualified Person" for purposes of National Instrument 43-101 (the "Instrument").
- d) I have visited the site on November 9<sup>th</sup>, 2016 for one day.
- e) I am responsible for the Sections 1.7, 12 and 14 of the Technical Report.
- f) I am independent of Nouveau Monde Graphite Inc or its subsidiaries, as defined by section 1.5 of the Instrument.
- g) My prior involvement with the property is the preparation of updated mineral resources presented in the press release "Nouveau Monde Updates Mineral Resource Estimate for its West Zone Deposit, Matawinie Graphite Property" dated March 2<sup>nd</sup>, 2017.
- h) I have read the Instrument and the sections of the Technical Report that I am responsible for have been prepared along the guidelines of the Instrument.
- i) As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the Technical Report, or part that as a qualified person I'm responsible for, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Signed and dated this 8<sup>th</sup> day of December, 2017 at Blainville, Quebec, Canada.

*Yann Camus (signed and sealed)*

Yann Camus, P.Eng.

Mineral Resource Engineer

SGS Canada Inc. - Geostat

### Geostat

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Membre du Groupe SGS (SGS SA)

## CERTIFICATE OF AUTHOR

To Accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Oliver Peters, do hereby certify that:

- 1) I am President and Principal Metallurgist with Metpro Management Inc. with an office at 102 Milroy Drive, Peterborough, Ontario, Canada;
- 2) I am a graduate from RWTH Aachen with a M.Sc. in Mineral Processing in 1998 and an MBA from Athabasca University in 2007;
- 3) I am a registered member the Professional Engineers of Ontario (100078050);
- 4) I have worked as a Mineral Processing Engineer and Project Manager continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) *I have participated in the preparation of this technical report and part of the sections 1.6, 13.0 and parts of Sections 25.0, 26.0, and 27.0;*
- 7) I have not visited the project site;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the technical report in compliance with NI 43-101 and Form 43-101F1; and have prepared the report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

This 8<sup>th</sup> day of December 2017.



Oliver Peters, P.Eng, M.Sc., MBA  
President & Principal Metallurgist  
Metpro Management Inc.



## CERTIFICATE OF AUTHOR

To accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Martine Paradis, Eng. M.Sc. PMP, do hereby certify that:

- 1) I am Environmental Mining Senior Engineer at SNC-Lavalin, with an office at 5500 boulevard des Galeries, Ville de Québec, Québec, Canada, G2K 2E2;
- 2) I am a graduate from Laval University with B.Eng. in geological engineering in 2001 and from Laval University with M.Sc. in Earth Sciences in 2004 respectively;
- 3) I am a registered member of “Ordre des Ingénieurs du Québec” (126444);
- 4) I have worked as a Mining Environmental Engineer or Project Manager continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience in environmental mining operations and studies, government agency and consulting practice related to mine closure, environmental assessment and relations with Local (municipality) and Natives People, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and am responsible for Sections 1.13, 20.0 and 26.3;
- 7) I have visited the Project site on November 26<sup>th</sup>, 2017;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this Report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

This 8<sup>th</sup> day of December 2017.



Martine PARADIS, Eng. M.Sc PMP,  
Environmental Mining Senior Engineer  
Sustaining Capital, Mining & Metallurgy  
SNC-Lavalin Inc



## **CERTIFICATE OF AUTHOR**

To Accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Nicolas Sciadas, P.Eng., do hereby certify that:

- 1) I am Project Manager with Journeaux Associates, a division of Lab Journeaux Inc. With an office at 801 Bancroft, Pointe-Claire, Quebec, Canada, H9R 4L6;
- 2) I graduated from McGill University with a Bachelor’s degree in Civil Engineering in 1977 and a Master’s degree in Civil Engineering in 1982;
- 3) I am a registered member of “Ordre des Ingénieurs du Québec” (117881);
- 4) I have worked as a Civil Engineer or project Manager continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and part of the section 18.9;
- 7) I have not visited the Project site;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

This 8<sup>th</sup> day of December 2017.



---

Nicolas Sciadas, P.Eng. M. Eng.,  
Senior Project Manager  
Journeaux Assoc., a division of Lab Journeaux Inc.

## CERTIFICATE OF AUTHOR

To accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Patrick Pérez, P.Eng., do hereby certify that:

- 1) I am Senior Mining Engineer with Met-Chem, a division of DRA Americas Inc, with an office at 555 René-Lévesque Blvd. West, 6<sup>th</sup> Floor, Montréal, Canada;
- 2) I am a graduate from “*Ecole Nationale Supérieure de Géologie de Nancy*”, in France, with a M.Sc. in Geological Engineering in 2003;
- 3) I am a registered member of APEGS (Association of Professional Engineers and Geoscientists of Saskatchewan), membership #16131;
- 4) I have worked as a Mining Engineer or Project Manager continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and am responsible for Sections 15.0 and 16.0 and part of the sections 1.0, 21.0, 25.0 and 26.0;
- 7) I have visited the project site on May 8<sup>th</sup>, 2017;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this Report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

This 8<sup>th</sup> day of December 2017.

*Patrick Perez (signed and sealed)*

---

Patrick Pérez, P.Eng. M.Sc,  
Manager Mining Engineering  
Met-Chem, a division of DRA Americas Inc.

## CERTIFICATE OF AUTHOR

To accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Richard Bonici, ing., do hereby certify that:

- 1) I am Mining Engineer with Met-Chem, a division of DRA Americas Inc, with an office at 555 René-Lévesque Blvd. West, 6<sup>th</sup> Floor, Montréal, Canada;
- 2) I am a graduate of “McGill University” (located in Montreal, Canada) with a bachelor of engineering - Mining in 2008;
- 3) I am a registered member of the *Ordre des Ingénieurs du Québec*, membership #5019495;
- 4) I have worked as a Mining Engineer since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and part of the sections 1.0, 15.0, 16.0, 21.0, 25.0 and 26.0;
- 7) I have visited the project site on May 8<sup>th</sup>, 2017;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this Report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

This 8<sup>th</sup> day of December 2017.

*Richard Bonici (signed)*

---

Richard Bonici, ing,  
Mining Engineer  
Met-Chem, a division of DRA Americas Inc.

## CERTIFICATE OF AUTHOR

To accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Ewald Pengel, P. Eng., do hereby certify that:

- 1) I am a Senior Process Engineer with Met-Chem, a division of DRA Americas Inc, with an office at 555 René-Lévesque Blvd. West, 6<sup>th</sup> Floor, Montréal, Canada;
- 2) I am a graduate from Queen’s University, Kingston, Ontario with a B. Sc. In Metallurgical Engineering in 1982 and the University of Pittsburgh, Pittsburgh, Pennsylvania (USA) with a M.Sc. in Mining Engineering in 1985;
- 3) I am a registered member of Professional Engineers Ontario (90520297) and I am a member of the Canadian Institute of Mining Metallurgy and Petroleum;
- 4) I have worked for 30 years in the mineral industry since graduation;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and am responsible for the Sections part of the sections 1.10, 17, 21, 25 and 26;
- 7) I have not visited the potential project site;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this Report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

This 8<sup>th</sup> day of December 2017.

*Ewald A. Pengel (signed and sealed)*

---

Ewald Pengel, P. Eng., M.Sc.  
Senior Process Engineer  
Met-Chem, a division of DRA Americas Inc.

## CERTIFICATE OF AUTHOR

To Accompany the Report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of July 28<sup>th</sup>, 2017, issued on December 8<sup>th</sup>, 2017.

I, Céline M. Charbonneau, Eng., do hereby certify that:

- 1) I am Project Manager with Met-Chem, a division of DRA Americas Inc, with an office at 555 René-Lévesque Blvd. West, 6<sup>th</sup> Floor, Montréal, Canada;
- 2) I am a graduate from École Polytechnique de Montréal with B.Eng. in Geological Engineering in 1985;
- 3) I am a registered member of “*Ordre des Ingénieurs du Québec*” (41764);
- 4) I have worked as a Geological Engineer or Project Manager continuously since my graduation from university;
- 5) I have read the definition of “qualified person” set out in the National Instrument 43-101 and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be an independent qualified person for the purposes of NI 43-101;
- 6) I have participated in the preparation of this Technical Report and am responsible for Sections 1.0, 2.0, 3.0, 18.0, 21.0, 22.0 and 24.0 and part of the Sections 25.0 and 26.0;
- 7) I have visited the Project site on May 8<sup>th</sup>, 2017;
- 8) I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this report;
- 9) Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Nouveau Monde Graphite Inc., or any associated or affiliated entities;
- 10) Neither I, nor any affiliated entity of mine, own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Nouveau Monde Graphite Inc., or any associated or affiliated companies;
- 11) Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three (3) years from Nouveau Monde Graphite Inc., or any associated or affiliated companies;

- 12) I have read NI 43-101 and Form 43-101F1 and have prepared the Technical Report in compliance with NI 43-101 and Form 43-101F1; and have prepared the Report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

This 8<sup>th</sup> day of December 2017.

*Céline M. Charbonneau (signed and sealed)*

---

Céline M. CHARBONNEAU, Eng. M.Sc,  
Senior Project Manager  
Met-Chem, a division of DRA Americas Inc.

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**Table 0.1 – List of Abbreviations**

Abbreviation	Description	Abbreviation	Description
µg/m <sup>3</sup>	Microgram per Cubic Metre	AWG	American Wire Gauge
µm	Microns, Micrometre	az	Azimuth
'	Feet		
"	Inch	Ba	Barium
\$	Dollar Sign	bank	Bank Cubic Metre (Volume of material in situ)
\$/m <sup>2</sup>	Dollar per Square Metre	BAPE	<i>Bureau d'Audience Publique sur l'Environnement</i>
\$/m <sup>3</sup>	Dollar per Cubic Metre	Be	Beryllium
\$/t	Dollar per Metric Tonne	BFA	Bench Face Angle
%	Percent Sign	BIF	Banded Iron Formation
% w/w	Percent Solid by Weight	BOF	Basic Oxygen Furnace
¢/kWh	Cent per Kilowatt hour	BQ	Drill Core Size (3.65 cm diameter)
°	Degree	BSG	Bulk Specify Gravity
°C	Degree Celsius	BTU	British Thermal Unit
2D	Two Dimensions	BVSM	Saint-Maurice Watershed
3D	Three Dimensions	BWi	Bond Ball Mill Work Index
AARQ	<i>Atlas des amphibiens et des reptiles du Québec</i>	C <sub>10</sub> C <sub>50</sub>	Petroleum Hydrocarbons
ABA	Acid-Base Accounting	C(g)	Carbon Graphite
Ag	Silver	C(t)	Total Carbon
Ai	Abrasion Index	Ca	Calcium
ALS	ALS Minerals Laboratories	CA	Certificate of Authorization
AMSL	Above Mean Sea Level	CAD	Canadian Dollar
AP	Acid Potential	CAGR	Compound Annual Growth Rate
ARD	Acid Rock Drainage	CAPEX	Capital Expenditures
As	Arsenic	CCME	Canadian Council of Ministers of the Environment
ASL	Above Sea Level		
ATV	All-Terrain Vehicle	Cd	Cadmium
Au	Gold		

Abbreviation	Description	Abbreviation	Description
CDC	<i>Claim désigné sur carte</i>	COV	Coefficient of Variation
CDE	Canadian Development Expenses	Cr III	Chromium Oxide
CDP	Closure and Decommissioning Plan	Cr VI	Hexavalent Chromium
CDPNQ	<i>Centre de données sur le patrimoine naturel du Québec</i>	CREL	Lanaudière Environmental Regional Council
CEEAQ	<i>Centre d'expertise en analyse environnementale du Québec</i>	CRM	Certified Reference Materials
Ce	Cesium	Cu	Copper
CEAA	Canadian Environmental Assessment Agency	CuSO <sub>4</sub>	Copper Sulphate
CEE	Canadian Exploration Expenses	CWi	Crusher Work Index
CEPA	Canadian Environmental Protection Act		
cfm	Cubic Feet per Minute	d	Day
CFR	Cost and Freight	d/w	Days per Week
CFU	Colony-Forming Unit	d/y	Days per Year
CIF	Cost Insurance and Freight	D2	Second Generation of Deformation
CIL	Carbon in Leach	D3	Third Generation of Deformation
CIM	Canadian Institute of Mining, Metallurgy and Petroleum	D4	Fourth Generation of Deformation
CIP	Carbon in Pulp	dB	Decibel
CIS	Commonwealth Independent States	dBA	Decibel with an A Filter
Cl	Clay	DDH	Diamond Drill Hole
CL	Concentrate Leach	deg	Angular Degree
cm	Centimetre	DFO	Department of Fisheries and Oceans
Co	Cobalt	DGPS	Differential Global Positioning System
CofA	Certificate of Authorization	DMS	Dense Media Separator
COG	Cut Off Grade	DRI	Direct Reduced Iron
COPH	<i>Coalition des opposants à un projet minier en Haute-Matawanie</i>	DT	Davis Tube
		DWI	Drop Weight Index
		DWT	Drop Weight Test
		DXF	Drawing Interchange Format

Abbreviation	Description	Abbreviation	Description
E	East	g/l	Grams per Litre
EA	Environmental Assessment	g/t	Grams per Tonne
EAB	Environmental Assessment Board	gal	Gallons
EAF	Electric Arc Furnace	GDP	Gross Domestic Product
EBS	Environmental Baseline Study	GEMS	Global Earth-System Monitoring Using Space
EHS	Environment Health and Safety	GPS	Global Positioning System
EIA	Environmental and Social Impact Assessment	GQ	Government of Quebec
EIS	Environmental Impact Statement	Gr	Granular
EMP	Environmental Management Plan	GCW	Gross Combined Weight
EOH	End of Hole	GOH	Gross Operating Hours
EP	Environmental Permit		
EPA	Environmental Protection Agency	H	Horizontal
EPCM	Engineering, Procurement and Construction Management	h	Hour
EPS	Expandable Polystyrene	h/d	Hours per Day
EQA	Environmental Quality Act	h/y	Hour per Year
ER	Electrical Room	H <sub>2</sub>	Hydrogen
ESBS	Environmental and Social Baseline Study	ha	Hectare
ESIA	Environmental and Social Impact Assessment	HBI	Hot Briquetted Iron
		HCO <sub>3</sub>	Bicarbonate
FAG	Fully Autogenous Grinding	HCT	Humidity Cell Test
FDS	Fused Disconnect Switch	HDPE	High Density Polyethylene
Fe	Iron	HF	Hydrofluoric Acid
FOB	Free on Board	HFO	Heavy Fuel Oil
ft	Feet	Hg	Mercury
FVNR	Full Voltage Non-Reversible	HG	High Grade
		HL	Heavy Liquid
g	Grams	HmFe	Hematitic Iron
G&A	General and Administration	hp	Horse Power
		HPEV	Hybrid Plug-in Electric Vehicle
		HQ	Drill Core Size (6.4 cm Diameter)

Abbreviation	Description	Abbreviation	Description
HVAC	Heating Ventilation and Air Conditioning	kt	Kilotonne
		kV	Kilovolt
		kVA	Kilovolt Ampere
I/O	Input / Output	kW	Kilowatt
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy	kWh	Kilowatt-hour
ICP-MS	Inductively Coupled Plasma – Mass Spectroscopy	kWh/t	Kilowatt-hour per Metric Tonne
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectroscopy	Hz	Hertz
ID	Identification		
IDW	Inverse Distance Method	L	Line
IDW2	Inverse Distance Squared Method	l	Litre
In	Inches	l/h	Litre per hour
IRA	Inter-Ramp Angle	lbs	Pounds
IRR	Internal Rate of Return	LCT	Locked Cycle Tests
IT	Information Technology	LFO	Light Fuel Oil
		LG	Low Grade
		LG-3D	Lerchs-Grossman – 3D Algorithm
J/g	Joule per grams	Li	Lithium
		LIMS	Low Intensity Magnetic Separator
KE	Kriging Efficiency	LOI	Loss on Ignition
kg	Kilogram	LOM	Life of Mine
kg/l	Kilogram per Litre	LV	Low Voltage
kg/m <sup>2</sup> /h	Kilogram per Square Metre per Hour		
Kg/t	Kilogram per Metric Tonne	m	Metre
kl	Kilolitre	m/h	Metre per Hour
km	Kilometre	m/s	Metre per Second
km <sup>2</sup>	Square Kilometre	m <sup>2</sup>	Square Metre
km/h	Kilometre per Hour	m <sup>3</sup>	Cubic Metre
kPa	Kilopascal	m <sup>3</sup> /d	Cubic Metre per Day
KSR	Kriging Slope Regression	m <sup>3</sup> /h	Cubic Metre per Hour
		m <sup>3</sup> /y	Cubic Metre per Year
		mA	MilliAmpère

Abbreviation	Description
Mag	Magnetic
MagFe	Magnetic Iron
Mm <sup>3</sup>	Million Cubic Metres
MCC	Motor Control Center
MDDELCC	<i>Ministère du Développement durable, de l'environnement et de la Lutte contre les changements climatiques</i>
MDDEP	<i>Ministère du Développement Durable, Environnement, Faune et Parcs</i>
MENA	Middle East and North Africa
MEND	Mining Environment Neutral Drainage Program
MERN	<i>Ministère de l'Énergie et des Ressources naturelles</i>
MFFP	<i>Ministère des Forêts, de la Faune et des Parcs</i>
Mg	Magnesium
mg/L	Milligram per Litre
MI	Mineralized Intervals
MIBC	Methyl Isobutyl Carbinol
MIBK	Methyl Isobutyl Ketone
min	Minute
min/h	Minute per Hour
Min/shift	Minute per Shift
ml	Millilitre
ML	Metal Leaching
mm	Millimetre
mm/d	Millimetre per Day
Mm <sup>3</sup>	Million Cubic Metres
MMER	Metal Mining Effluent Regulation
MMU	Mobile Manufacturing Units

Abbreviation	Description
Mn	Manganese
MNDM	Ministry of Northern Development and Mines
MNRW	Ministry of Natural Resources and Wildlife
MOE	Ministry of Environment
MOU	Memorandum of Understanding
MRC	<i>Municipalité régionale de comté</i>
MRN	<i>Ministère des Ressources Naturelles</i>
MSDEP	Ministry of Sustainable Development, Environment and Parks
Mt	Million Metric Tonnes
Mt/y	Millions of Metric Tonnes per year
MV	Medium Voltage
MVA	Mega Volt-Ampere
MW	Megawatts
MWh/d	Megawatt Hour per Day
My	Million Years
N	North
N/A	Not Available
NAG	Non-Acid Generating
Nb	Number
NE	Northeast
NFPA	National Fire Protection Association
NGR	Neutral Grounding Resistor
NI	National Instrument
Nm <sup>3</sup> /h	Normal Cubic Metre per Hour

Abbreviation	Description	Abbreviation	Description
NMG	Nouveau Monde Graphite Inc.	PFS	Pre-Feasibility Study
NP	Neutralization Potential	PGGS	Permit for Geological and Geophysical Survey
NPV	Net Present Value	ph	Phase (electrical)
NQ	Drill Core Size (4.8 cm diameter)	pH	Potential Hydrogen
NRCAN	Natural Resources Canada	PIR	Primary Impurity Removal
NSR	Net Smelter Return	PLC	Programmable Logic Controllers
NTP	Normal Temperature and Pressure	PP	Preproduction
NTS	National Topographic System	ppb	Part per Billion
NW	North West	ppm	Part per Million
		psi	Pounds per Square Inch
O/F	Overflow	PVC	Polyvinyl Chloride
OB	Overburden		
OK	Ordinary Kriging	QA/QC	Quality Assurance / Quality Control
OEM	Original Equipment Manufacturer	QKNA	Quantitative Kriging Neighbourhood Analysis
OPEX	Operating Expenditures	QP	Qualified Person
ORF	Ontario Research Foundation		
oz	Ounce (troy)	RCM	Regional County Municipality
oz/t	Ounce per Short Ton	RCMS	Remote Control and Monitoring System
		RER	Rare Earth Magnetic Separator
P&ID	Piping and Instrumentation Diagram	RMR	Rock Mass Rating
Pa	Pascal	ROM	Run of Mine
PAG	Potentially Acid Rock Drainage Generating	rpm	Revolutions per Minute
PAH	Polycyclic Aromatic Hydrocarbons	RQD	Rock Quality Designation
PAX	Potassium Amyl Xanthate	RWI	Bond Rod Mill Work Index
Pb	Lead		
PEA	Preliminary Economic Assessment	S	South
PEV	Plug-in Electric Vehicle	S	Sulfur
PF	Power Factor	S/R	Stripping Ratio

Abbreviation	Description	Abbreviation	Description
SAG	Semi-Autogenous Grinding	t/d	Metric Tonne per Day
Sb	Antimony	t/h	Metric Tonne per Hour
SCC	Standards Council of Canada	t/h/m	Metric Tonne per Hour per Metre
scfm	Standard Cubic Feet per Minute	t/h/m <sup>2</sup>	Metric Tonne per Hour per Square Metre
SCIM	Squirrel Cage Induction Motors	t/m	Metric Tonne per Month
SCSE	SAG Circuit Specific Energy	t/m <sup>2</sup>	Metric Tonne per Square Metre
SE	South East	t/m <sup>3</sup>	Metric Tonne per Cubic Metre
sec	Second	t/y	Metric Tonne per Year
Set/y/unit	Set per Year per Unit	Ta	Tantalum
SFP	State Forest Permit	TCLP	Toxicity Characteristic Leaching Procedure
SG	Specific Gravity	TDEM	Time Domain Electromagnetic
SGS Geostat	SGS Canada Inc. – Geostat office in Blainville, Quebec, Canada	Ti	Titanium
SGS Lakefield	SGS Lakefield Research Limited of Canada	TIN	Triangulated Irregular Network
SHC	Self-Heating Capacities	Tl	Thallium
SIR	Secondary Impurity Removal	TMF	Tailings Management Facilities
SLO	Social Licence to Operate	ton	Short Ton
SMC	SAG Mill Comminution	tonne	Metric Tonne
SNRC	<i>Système National de Référence Cartographique</i>	TOR	Terms of Reference
SO <sub>4</sub>	Sulfate	TotFe	Total Iron
SolFe	Sulfate Ferrous	TSS	Total Suspended Solids
SPI	SAG Power Index		
SPLP	Synthetic Precipitation Leaching Procedure	U	Uranium
SPT	Standard Penetration Tests	U/F	Under Flow
SR	Stripping Ratio	UGAF	Furbearer Management Units
SW	South West	ULC	Underwriters Laboratories of Canada
SW	Switchgear	USA	United States of America
		USD	United States Dollar
		USGPM	Us Gallons per Minute
t	Metric Tonne		

Abbreviation	Description
UTM	Universal Transverse Mercator
V	Vanadium
V	Vertical
V	Volt
VAC	Ventilation and Air Conditioning
VFD	Variable Frequency Drive
VLF	Very Low Frequency
W	Watt
W	West
WHIMS	Wet High Intensity Magnetic Separation
WHO	World Health Organization
WRA	Whole Rock Analysis Method
WSD	World Steel Dynamics
wt	Wet Metric Tonne
X	X Coordinate (E-W)
XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence
y	Year
Y	Y coordinate (N-S)
Z	Z coordinate (depth or elevation)
ZEC	<i>Zone d'exploitation contrôlée</i>
Zn	Zinc
Zr	Zirconium

## 1.0 EXECUTIVE SUMMARY

### 1.1 Introduction

Nouveau Monde Graphite Inc. (“**NMG**”) is a listed company trading on the Toronto Stock Exchange under the symbol NOU. NMG owns the Matawinie graphite Property (“**Property**”) The Property consists of 250 map-designated claims forming nine (9) main claim blocks. This Pre-feasibility Study (“**PFS**”) focuses on the Tony Block consisting of 145 contiguous map-designated claims. The Tony Claim Block center is located approximately six (6) km South West of the community of Saint-Michel-des-Saints, 120 km, as the crow flies, North of the city of Montréal.

NMG has mandated Met-Chem, a division of DRA Americas Inc. (“**MC-DRA**”) to complete this Technical Report, following National Instruments 43-101 (“**NI 43-101**”) rules and guidelines, regarding the Tony Block in order to advance the Project.

The capital and operating costs estimates, schedule and financial reviews have been completed as per the industry standards.

### 1.2 Property Description, Location and Ownership

The Matawinie Property consists of 250 map-designated cells forming nine (9) main claim blocks totalling 13,694 hectares. The property is fully owned by NMG and is spread over an area of approximately 75 km by 45 km. Since the main focus of this PFS is to present an assessment on the Tony Claim Block, only that claim block will be described in this Report. The Tony Block currently consists of 145 contiguous map-designated cells (or claims) totalling 7,543.86 ha.

The centre of the Tony Claim Block is located approximately six (6) km to the South-West of the community of Saint-Michel-des-Saints in the National Topographic System (“**NTS**”) map sheets 31J/09 and 31I/12. Much of the Tony Block lies within the municipality of Saint-Michel-des-Saints, Lanaudière Administrative Region, Province of Québec, Canada. The centre of the Tony Block is positioned approximately 120 km North, as the crow flies, of the city of Montreal, more or less at latitude 46.63° and longitude -73.96°.

A large part of the Tony Claim Block is subject to a 2 % Net Smelter Return (“**NSR**”) which can be bought back by NMG from 3457265 Canada Inc. and Éric Desaulniers by a total of two (2) lump sum payments of \$ 1,000,000 (one payment for each tranche of 1 %). The portion of the claim block subject to the NSR is located over the main mineralized zones, one (1) of which, the West Zone, contains the Mineral Reserves identified in this PFS.

### 1.3 Geological Setting and Mineralization

The Matawinie Property, including the Tony Claim Block, lies in the southwestern portion of the Grenville geological province, and more specifically in the Morin Terrane. The area is host to a variety of rock types, mainly composed of deformed metamorphosed sediments, including paragneiss and calc-silicates. Granitic and pegmatitic intrusions are also present and are observed locally on the Property. The graphite mineralization identified in the Tony Block is hosted in paragneiss horizons and appears as disseminated graphite flakes.

### 1.4 Exploration

Exploration work on the Tony Block was initiated in late 2013, when a detailed airborne geophysical survey was performed in the area. The 2013 survey was executed following positive results from a regional survey by 3457265 Canada Inc., pursuant to the instructions provided by NMG's technical staff, covering over 2,100 km<sup>2</sup> (confidential internal documents).

NMG's field exploration programs on the Tony Block focused on graphite exploration consisting of:

- Airborne TDEM surveys (2013 and 2015);
- Ground prospecting of conductive targets identified by the airborne surveys (2014-2015);
- Ground geophysical surveying using a portable TDEM system (2014-2017);
- Trenching and channel sampling of the main conductors (2014-2016);
- Drilling of the main mineralized zones (2015-2016);
- Metallurgical testing on surface and drill core samples (2014-2017).

From 2014 to 2017, ground PhiSpy TDEM surveys totalling 110 line-kilometres using 100 m line spacing in the targeted areas and 25 m line spacing over the more promising South-East, South-West and West Zones, was performed. The PhiSpy results provided a detailed outline of the conductive areas and thus possible mineralized zones, which were used as a basis for planning the trenching and drilling programs.

Trenching on the Tony Block from 2014 to 2016 confirmed the extent of the graphite mineralization in the property. The trenching work targeted wide conductors on each of the main conductive zones outlined by the 2015-2016 ground PhiSpy surveys. A total of 511 channel samples were collected from the Tony Block. The results from trench TO-14/16-

TR-03, TO-16-TR-10 and TO-16-TR-11 were used in the mineral Resource Estimate for the West Zone (West Zone Deposit).

## 1.5 Drilling

Drilling on the Tony Block targeted wide conductors on each of the main conductive areas outlined by the 2015 and 2016 ground PhiSpy surveys. A total of 112 drill holes, numbered TO-15-05 to TO-15-74 and TO-16-75 to TO-16-116, were drilled in the Tony Block for a total of 17,601.10 m.

Drilling in the West Zone (or the “West Deposit”) consisted of 69 holes totaling 11,668.5 m.

Mineralization was intercepted 224 times by drilling in the West Zone resulting in the interpretation of a mineralized envelope of 100 m to about 150 m thick from which 17 graphitic horizons, or volumes, were interpreted. These horizons can be followed, sometimes sporadically, from sections W-0200 to W+2200 (a distance of 2,400 m). An additional feature of the West Zone is that some of the horizons separate and coalesce to form wider mineralized volumes. The longest intersection along drill core returned a graphite content of 4.76 % C(g) over 133.7 m although this intersection is considered as being down-dip. Mineralization is open to the North, to the south and at depths greater than 150 m from surface.

The drilling in the South-East Zone of the South deposit consisted of nine (9) holes for a total of 1,552 m drilled. Mineralization was intercepted 13 times by drilling resulting in the interpretation that the South-East Zone is composed of two (2) main mineralized horizons (S1 and S2). The highlight of the South-East Zone is the large width of the mineralized horizons. From section S2600 to section S2900 (300 m length), the mineralized horizon ranges from 117 to 160 m true width, with grade varying from 3.19 % to 3.62 % C(g).

The drilling in the South-West Zone of the South deposit consisted of 22 holes for a total of 2,616.6 m drilled. Mineralization was intercepted 57 times by drilling resulting in the interpretation that the South-West Zone is composed of two (2) main mineralized horizons (S1 and S2). The highlight of South-West Zone is a first graphitic horizon (S1) about 30 m thick, followed by a mostly barren interval between 25 and 63 m thick, and finally, a second graphitic horizon (S2) around 40 to 50 m thick, with both graphitic horizons varying from 2.79 % to 5.29 % C(g).

A total of 12 other exploration holes totalling 1,764 m were drilled in other mineralized zones on the Property. Although most of these holes intercepted graphite mineralization, the potential for the presence of an economic deposit was lower than that for the West, South-East and South-West Zones, due to thinner mineralized intercepts and/or lower graphite grades.

Quality control samples, including blanks, duplicates and graphite standards, were included in the drill core sample stream. Out of the 6,365 drill core samples from the Tony Block sent for graphic carbon [“C(g)”] analysis in 2015 and 2016, 682 were sent as quality control samples. Quality control sample results returned within acceptable limits. No bias was introduced in the sampling procedures.

## 1.6 Mineral Processing and Metallurgical Testing

The process component of the PFS is based on the results of six (6) metallurgical programs that were carried out on numerous composites from the Matawinie graphite Project. All test work was completed by SGS Minerals in Lakefield, Ontario. The test work included laboratory scale testing and one (1) bulk sample processing campaign on a pilot scale.

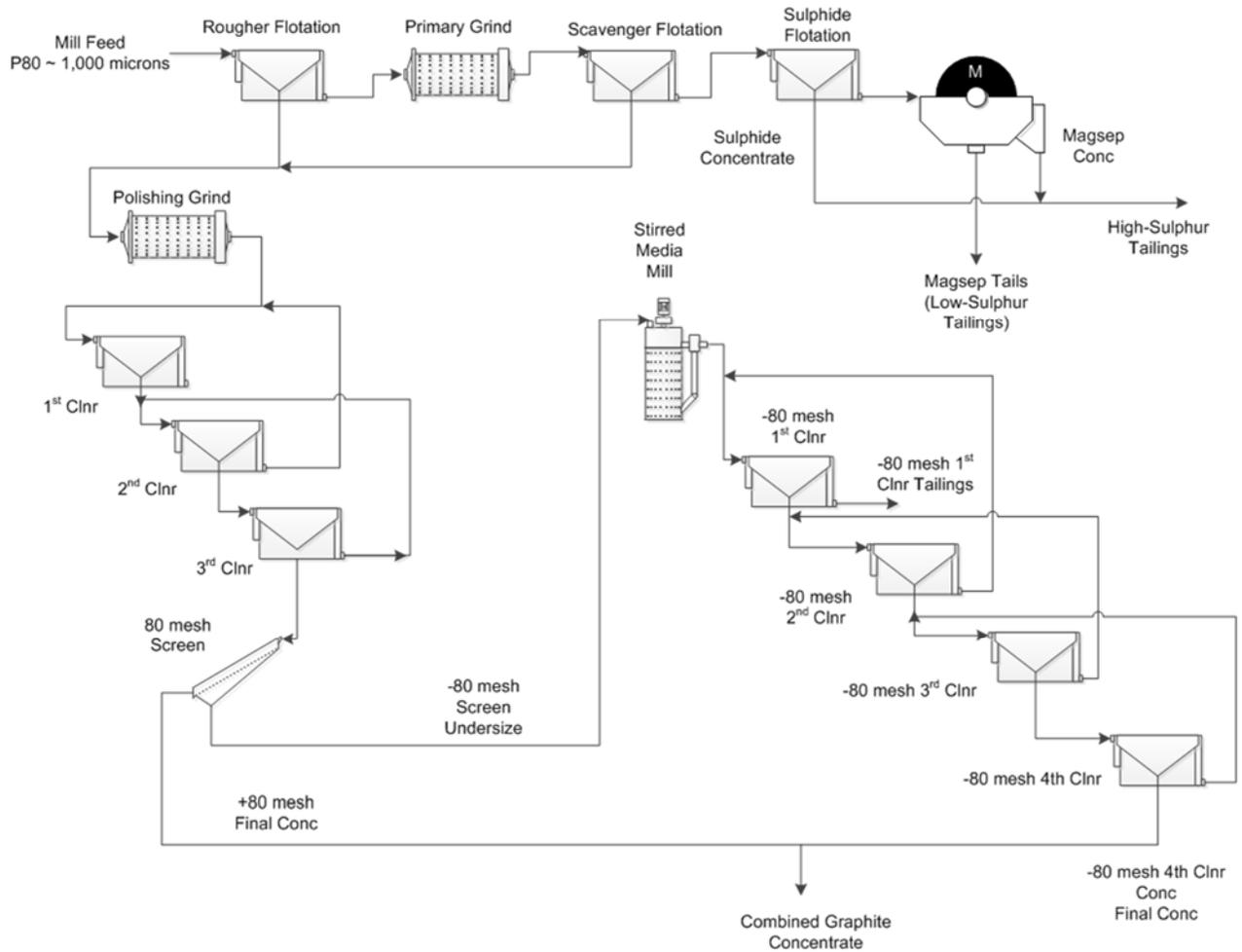
The process development and optimization programs culminated in the flotation flow sheet that is depicted in Figure 1.1. The flow sheet consists of graphite rougher/scavenger flotation followed by cleaning of the intermediate graphite concentrate. The graphite tailings are subjected to a desulphurization stage to produce a low-mass high-sulphide tailings stream and a low-mass desulphurization tailings stream.

Closed circuit flotation testing on the West Zone Master composite produced a combined concentrate grade of 97.3 % C(t) at 97 % graphite recovery. A more conservative graphite recovery of 94 % was chosen for the process design criteria.

The results of the size fraction analysis using the final graphite concentrate of the locked cycle flotation test are presented in Table 1.1. Total carbon grades of at least 97.1% C(t) were obtained for all size fraction larger than 400 mesh.

Open circuit variability flotation testing on eight (8) composites representing different areas of the West Zone mineralization produced a robust metallurgical response with relative standard deviations for the graphite concentrate and recovery of 1.1 % and 1.2 %, respectively.

Figure 1.1 – Matawinie Flotation Flow Sheet



**Table 1.1 – Flotation Concentrate Size Fraction Analysis**

Product	Optimization Program	
	Mass (%)	Grade % C(t)
+48 mesh	16.5	97.1
+65 mesh	20.4	97.1
+80 mesh	11.2	96.4
+100 mesh	11.6	96.9
+150 mesh	15.2	98.2
+200 mesh	9.1	98.1
+325 mesh	7.2	97.6
+400 mesh	3.0	97.3
-400 mesh	5.8	96.2
<b>Total</b>	<b>100</b>	<b>97.3</b>

### 1.7 Mineral Resources Estimates

The block model, used to generate the Current Resource of the West Zone, is based on a total of 68 core drill holes which produced 3,693 samples as well as 207 samples collected from channeling work in three (3) trenches. This does not include the quality control samples which comprise of 172 duplicates, 171 blanks and 82 standard samples, all of which returned within acceptable limits. In all, 17 mineralized horizons encased in paragneiss units were interpreted and modelled from this data.

The Current Resource block model for the West Zone was prepared by Yann Camus, P. Eng., of SGS Canada Inc. – Geostat office in Blainville, Québec, Canada (“**SGS Geostat**”), using the Genesis© mining software. Interpolation was performed using inverse square distance (“**ID<sup>2</sup>**”) as well as different search ellipsoids which were adapted for the geology of the deposit. The block model was then fed to GEOVIA’s Whittle software to provide an optimized pit. The optimized pit containing the Current Resource was limited to the Tony Block property boundary to the South of the West Zone Deposit. The resource was further constrained by an elevation of 390 m above sea level to better approximate the parameters used for the PEA. The details for the PEA resources are available in the report: “Preliminary Economic Assessment Report for the Matawinie Graphite Project” by Norda Stelo dated August 5<sup>th</sup>, 2016. Details of the PEA Resources can be found in the report available on NMG web site and on SEDAR.

**Table 1.2 – Resource Estimate for the West Zone**

Mineral Resource Category <sup>2</sup>	Current Resource (March 2, 2017) <sup>17</sup>		
	Tonnage (Mt) <sup>5,6</sup>	Grade [% C(g)] <sup>3</sup>	C(g) (Mt)
Indicated	32.9	4.50	1.48
Inferred <sup>4</sup>	0.2	4.84	0.01

<sup>1</sup> The Mineral Resources provided in this table were estimated using current Canadian Institute of Mining, Metallurgy and Petroleum (“CIM”) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

<sup>2</sup> Mineral resources that are not mineral reserves have not demonstrated economic viability. Additional trenching and/or drilling will be required to convert Inferred and Indicated Mineral Resources to Measured Mineral Resources. There is no certainty that any part of a mineral resource will ever be converted into reserves.

<sup>3</sup> All analyses used for the Resource Estimates were performed by ALS Minerals Laboratories and delivered as graphitic carbon [% C(g)], internal analytical code C-IR18.

<sup>4</sup> Inferred Mineral Resources represent material that is considered too speculative to be included in economic evaluations. Additional trenching and/or drilling will be required to convert Inferred Mineral Resources to Indicated or Measured Mineral Resources. It cannot be assumed that all or any part of the inferred resources will ever be upgraded to a higher resource category.

<sup>5</sup> Current Resource effective March 2<sup>nd</sup>, 2017.

<sup>6</sup> Mineral Resources are stated at a cut-off grade of 2.28 % C(g).

<sup>7</sup> The Current Resource was constrained at an elevation above 390 m above sea level (“ASL”).

## 1.8 Mineral Reserve Estimates

The Mineral Reserves for the West Zone Deposit were prepared by MC-DRA using best practices in accordance with CIM guidelines and following National Instrument 43-101 rules and guidelines. The Mineral Reserves are the Measured and Indicated Mineral Resources that have been identified as being economically extractable and which incorporate mining losses and the addition of waste dilution.

The first step in the Mineral Reserve estimate was to carry out a pit optimization analysis. The pit optimization analysis used economic criteria to determine the cut-off grade and to what extent the deposit can be mined profitably. The pit optimization analysis was done using the MS-Economic Planner module of MineSight<sup>®</sup>. The optimizer uses the 3D Lerchs-Grossmann algorithm to determine the economic pit limits based on input of mining and processing costs and revenue per block.

The pit optimization analysis shows that the open pit design should be based on the pit shell that was generated with a revenue factor of 0.7. This pit shell contains 33.6 Mt of Indicated Mineral Resources. Mining additional resources with an open pit beyond the limits of this pit shell increases the strip ratio but does not increase the NPV of the Project. The cut-off grade for the open pit was calculated to be  $\geq 2.32$  % C(g).

An open pit was designed with an overall pit slope of 55° based on similar projects. The overall pit slope criteria was validated with a geotechnical study that was completed by Journeaux Assoc. in parallel with the PFS. The pit design considers five (5) m high mining benches (10 m double bench) and the access ramp is 20 m wide with a maximum grade of

10 %. The ultimate pit is approximately 2,200 m long and 330 m wide at surface with a maximum pit depth from surface of 186 m.

The open pit design includes 33.0 Mt of Probable Mineral Reserves at a grade of 4.39 % C(g) (diluted grade). In order to access these reserves, 9.8 Mt of overburden and 24.6 Mt of waste rock will need to be removed. This results in a stripping ratio of 1.04 to 1. Table 1.3 presents the open pit Mineral Reserves for the West Zone Deposit of the Matawinie Property.

**Table 1.3 – Open Pit Mineral Reserves**

Category	Tonnage (Mt)	C(g) Grade* (%)
Proven	0	0
Probable	33.0	4.39
Proven & Probable	33.0	4.39

\* 5 % Dilution was considered for C(g) grade.

## 1.9 Mining Methods

The mining method selected for the Project is a conventional open pit, truck and shovel, drill and blast operation. Vegetation, topsoil and overburden will be stripped and stockpiled for future reclamation use. The ore and waste rock will be mined with five (5) m high benches, drilled, blasted and loaded into rigid frame haul trucks with hydraulic excavators.

The primary overburden stockpile has been designed on the South West side of the open pit, out of site of the neighboring community of Saint-Michel des Saints. Material that will be placed in this stockpile will be used for future reclamation along with a topsoil stockpile located West of the proposed primary crusher location. A secondary overburden stockpile has been designed South East of the pit on top of the waste stockpile to reduce the Project footprint and promote reclamation. The waste rock will be built in five (5) m high lifts and compacted by a dozer. Backfilling of waste material into the pit has been considered, and is planned to start in Year 9.

A mine plan was developed which supplies the required amount of ore to produce 52,000 tonnes of concentrate per year for the 27-year life of the open pit. Mining will begin in the Phase 1 starter pit which will supply the majority of the run of mine ore for the first seven (7) years of the operation. The purpose of Phase 1 is to minimize the haulage distance to the primary crusher and supply a consistent feed grade in the early years of production. The total material mined per year during the 27-year life of the open pit ranges from 2 Mt

in Year 1 to a maximum of 5 Mt in Year 16. The average annual grade varies from 4.04 % to 4.97 % C(g) during the mine life.

The mining operations will be carried out by a contractor who will operate the mine, five (5) days per week, twelve (12) hours per day. Since the concentrator is designed to operate year-round both on the day and night shift, an ore stockpile was designed in order to maintain the run of mine ore feed to the plant during nights, weekends and when the mine is shutdown.

### 1.10 Recovery Methods

The Matawinie concentrator is located near the open pit mine. The concentrator is designed to produce a nominal 52,000 tonnes of high grade graphite concentrate per year.

The Run of Mine (“ROM”) mineralized material will be transported to the primary jaw crusher. The crushed mineralized material is ground in a SAG mill. The SAG mill discharge is screened and the screen oversize is returned back in the SAG mill. The SAG screen undersize is pumped to coarse flotation. The removal of graphite flakes at the earliest stage is to maintain graphite flake integrity. The coarse flotation tailings are ground in a ball mill in closed circuit with a sizing screen. The screen undersize is pumped to rougher flotation. The rougher tailings are pumped to the final tailings treatment plant via the concentrator tailings.

The combined coarse and rougher concentrate are dewatered to obtain the proper pulp density and polished in a polishing mill using ceramic media. The polishing mill scrubs the surface of the graphite flakes and thus removes the gangue minerals that were stuck to the flakes. The primary cleaner concentrate is screened over a 0.3 mm screen. The screen oversize is final product and is transported to the thickener. The screen undersize undergoes the same process with slightly harsher polishing. The fine polishing mill discharge is re-floated. The column tailings go to cleaner scavenger flotation cells. The concentrate from the cleaner scavenger cells is recycled, while the tailings go to the concentrator tailings thickener. The secondary fine cleaner concentrate and the secondary coarse concentrate are both pumped to the graphite concentrate thickener.

The final graphite concentrate at 97.3 % C(t) is filtered and dried to 0.1 % moisture. After drying the product is dry screened and bagged in super sacks for transport to costumers.

The flotation reagents are fuel oil and Methyl Isobutyl Carbinol (“MIBC”). Almost all of the flotation reagents will be absorbed by the graphite.

The concentrator tailings are desulphurized in the tailings treatment plant. The concentrator tailings are diluted for sulphide flotation. The sulphide flotation tailings undergo magnetic separation to produce clean Non-Acid Generating (“NAG”) tailings. The NAG tailings and the sulphide concentrate are filtered and stored separately in dry stacks.

### 1.11 Project Infrastructure

The Project infrastructure includes the 34.5 kV electrical power line, the main access road and site roads, general site works, site electrical distribution and communication, site fire protection, fresh water, potable water and sewage treatment, auxiliary buildings, fuel storage, tailings and water management facilities.

### 1.12 Market Studies and Contracts

Graphite is a material with unique chemical, electrical, mechanical and thermal properties, which allows it to find demand from a very wide array of applications, from pencil lids and refractory bricks, to battery active anode. Natural Graphite is one of the commercial types of this material, and is available in an array of commercial grades with different purity, particle size and morphology. Among the traditional applications, the refractory industry is the most relevant, and looking into future trends, anode material for lithium-ion batteries is the most promising. China is the largest producer, followed by Brazil and India. The graphite concentrate sales price used for the PFS was established at USD 1,429 /tonne. The selling price was determined using pricing information, averaged during a period of 60 months (from January 2011 to December, 2016) and calculated from Benchmark Mineral Intelligence (“**Benchmark**”) Flake Graphite Price Index. Benchmark is an independent marketing source who compiles international graphite prices for various commercial size fractions and concentrate purities. No contracts relevant to the PFS have been established by NMG. The company has not hedged, nor committed any of its production pursuant to an off-take agreement.

### 1.13 Environmental Studies, Permitting and Social or Community Impact

Several environmental baseline studies have been completed since 2015 to set environmental reference values and to identify any major environmental issues. In parallel, several stakeholder and public engagement activities were set forth since 2015 to obtain an overview of potential socioeconomic issues and to propose adequate measures to foster the social acceptability of the Project and its harmonious insertion at the local level. Field work to describe the receiving environment started in June 2016 and continued in 2017, and focused on the following components: soil characterization; sediment characterization; geochemistry, hydrogeology; surface water quality; groundwater quality; noise environment; vegetation, wetlands and special status plant species; aquatic fauna and fish fauna; small mammals; amphibians and reptiles; bats; and birds. Some results on soil characterization, geochemistry, hydrogeology, and groundwater quality are still to come as these studies are in progress. Additional studies will need to be carried out to support a feasibility study to better understand the Project’ impacts and proposed relevant mitigation measures (noise, air emission...). Baseline studies on other environmental components were completed using existing data. According to the results of the current baseline studies, no major environmental issues likely to have an impact on resource extraction were

identified in the study area. However, specific mitigation measures will be required to minimize the Project impacts. In addition, stakeholders and the public have raised issues that relate to noise, air quality, transportation and safety, loss of property value and physical and psychosocial health, among others. A stakeholder committee has been formed to follow up on the Project's advancement and to collaboratively design adequate mitigation measures. The Atikamekw First Nation of Manawan and the Council of the Atikamekw First Nation is also involved in this process and in discussions aiming to lead to a pre-development agreement. NMG is planning to prepare an Environmental and Social Impact Assessment ("ESIA") report based on the directive issued by the Ministry responsible for Environment ("MDDELCC") in order to get a Decree. If and once the Certificate of Authorization is issued, NMG will have to get all other environmental permits requested by the law. In the same time, the Project needs to undertake the environmental monitoring activities as described in the ESIA report and/or requested by the government authorities.

## 1.14 Capital and Operating Costs

### 1.14.1 Capital Cost Estimate

The Project scope covered in this Study is based on the construction of a green field mining and processing facility with an average mill feed capacity of 1.22 million tonnes per year of ore and producing 52,000 tonnes per year of graphite concentrate.

The capital and operating cost estimates related to the mine, the concentrator, and all required facilities and infrastructure have been developed by MC DRA or consolidated from external sources.

The capital cost estimate consists of direct and indirect capital costs as well as contingency. Provision for sustaining capital is also included, mainly for tailings storage expansion. Amounts for closure and rehabilitation of the site have been estimated as well.

The Capex includes the material, equipment, labour and freight required for the mine pre-development, processing facilities, tailings storage and management, as well as all infrastructure and services necessary to support the operation.

The Capex prepared for this PFS is based on a Class 3 type estimate as per the Association for the Advancement of Cost Engineering Recommended Practice 47R-11 with a target accuracy of  $\pm 25\%$ .

Table 1.4 presents a summary of the pre-production initial capital and the sustaining capital costs for the Project.

**Table 1.4 – Summary of Capital Cost Estimate**

<b>Description</b>	<b>Initial Costs (CAD)</b>	<b>Sustaining Costs (CAD)</b>	<b>LoM Costs (CAD)</b>
Direct Costs			
Mining*	4,778,000	3,381,000	8,159,000
Processing Plant	73,986,000		73,986,000
Infrastructure	3,933,000		3,933,000
Tailings and Water Management	29,135,000	18,182,000	47,317,000
Main Electrical Distribution and Communication	6,339,000		6,339,000
<b>Sub-Total Direct Costs</b>	<b>118,171,000</b>	<b>21,564,000</b>	<b>139,734,000</b>
Indirect and Owner's Costs			
Project Development Costs	4,550,000		4,550,000
EPCM Costs	14,221,000		14,221,000
Owner's Costs	18,133,000		18,133,000
<b>Sub-Total Indirect Costs</b>	<b>36,904,000</b>		<b>36,904,000</b>
Contingency	22,150,000	3,235,000	25,385,000
Closure Costs	1,582,000	1,582,000	3,164,000
NSR Buyout	2,000,000		2,000,000
<b>TOTAL Costs</b>	<b>180,807,000</b>	<b>26,380,000</b>	<b>207,187,000</b>

\* The mine development will be done under a mining contract. The cost is costed as a value per tonne of material moved and included in the operating costs.  
 The totals may not add up due to rounding.

### 1.14.2 Operating Costs Estimate

The estimated operating costs of the Matawinie Project cover the mining, processing, general administration and site services. Table 1.5 presents the operating costs summary.

The sources of information used to develop the operating costs include in-house databases and outside sources, particularly for materials, services and consumables.

**Table 1.5 – Operating Costs Summary**

Description	Cost per Year (CAD)	Cost /tonne of concentrate (CAD/t concentrate)	% of Total Costs (%)
Mining (Average over life)	8,710,320	167.51	31.1
Tailings Manutention and Transport (Average over life)	1,935,499	37.22	6.9
Ore and Tailings Processing	14,407,299	277.06	51.4
Site Services	1,036,245	19.93	3.7
General and Administration	1,915,210	36.83	6.8
<b>TOTAL Opex</b>	<b>28,004,573</b>	<b>538.55</b>	<b>100.0</b>

### 1.15 Economic Analysis

An economic analysis based on the production and cost parameters of the Project was prepared and the results are shown in Table 1.6. In the analysis, an average FOB-mine graphite concentrate selling price of USD 1,429 per tonne and a USD/CAD exchange rate of 0.7519 (1.33 CAD/USD) was assumed.

**Table 1.6 – Summary of the Life of Project Production, Revenues and Costs**

Description	Units	Value
Production - Mineralization	M tonnes	33.0
Production – Concentrate @ 97.0 % C(t)	k tonnes	1,401.7
Revenue	M CAD	2,667.7
Initial Capital Costs (excludes Working Capital)	M CAD	177.2
Sustaining Capital Costs	M CAD	24.8
Operating Costs	M CAD	751.2
Closure Costs	M CAD	3.2
Total Pre-Tax Cash Flow	M CAD	1,709.4
Total After-Tax Cash Flow	M CAD	1,060.6

The financial indicators associated with the economic analysis are summarized in Table 1.7.

Figure 1.2 and Figure 1.3 show the sensitivity of the after-tax NPV and IRR, respectively, to variations in Capex, Opex, Selling Price and the USD/CAD Exchange Rate.

The PFS was compiled according to widely accepted industry standards. However, there is no certainty that the conclusions reached in this PFS will be realized.

**Table 1.7 – Summary of Financial Indicators**

Description	Units	Value
<b>Pre-Tax</b>		
Payback Period*	Years	2.3
NPV at 6 %	M CAD	661.0
NPV at 8 %	M CAD	498.7
NPV at 10 %	M CAD	380.7
IRR	%	32.4
<b>After-Tax</b>		
Payback Period*	Years	2.6
NPV at 6 %	M CAD	400.4
NPV at 8 %	M CAD	297.2
NPV at 10 %	M CAD	221.8
After-tax IRR	%	25.9

\* Measured from the start of commercial production

Figure 1.2 – Sensitivity of Project NPV @ 8 % (After-Tax)

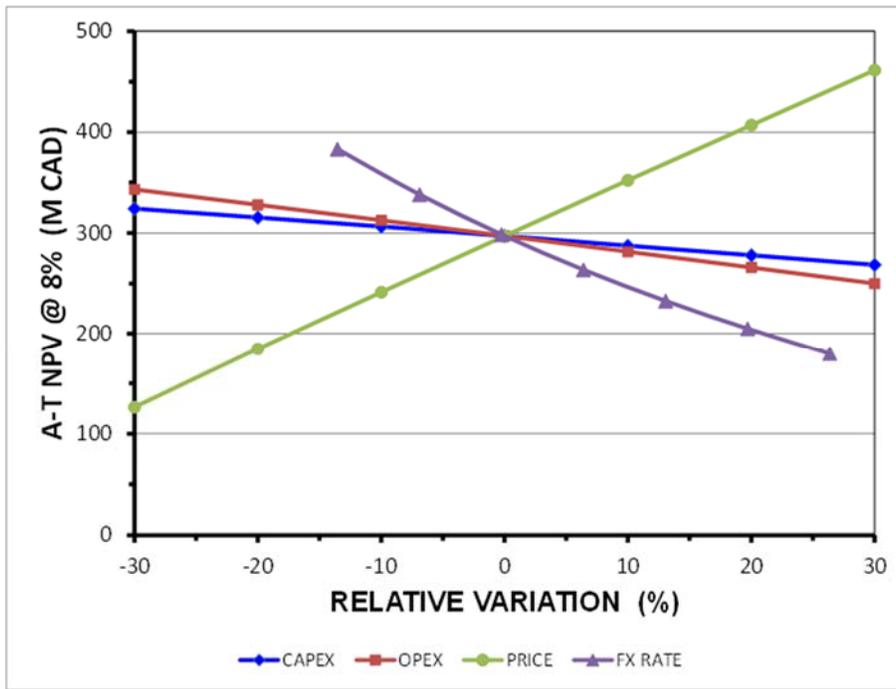
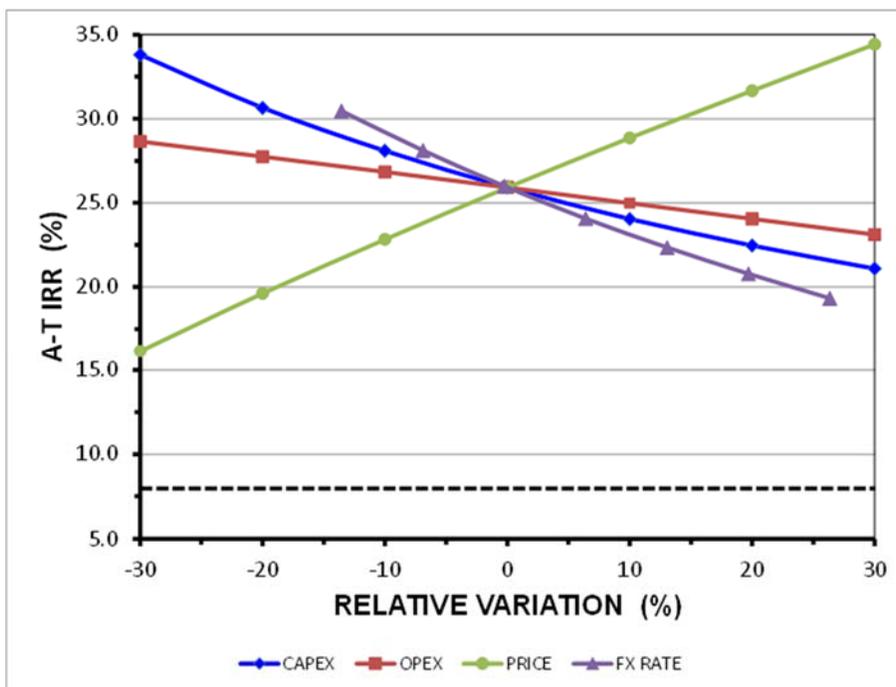


Figure 1.3 – Sensitivity of Project IRR (After-Tax)



## 1.16 Interpretation and Conclusions

### 1.16.1 Exploration Activities

Exploration work on the Project targeted graphite mineralization and consists to date of airborne geophysics (Mag and TDEM), prospecting, ground TDEM surveying, trenching/channel sampling and core drilling. Surface and core samples were also collected for metallurgical tests including representative master composite of the West Zone. Exploration work by NMG was initiated on the Tony Claim Block in summer of 2014 which resulted in the discovery of seven (7) mineralized zones. These zones are named the Far West, West, North, North-East, East, South-East and South-West Zones. No other known mineral occurrences were identified on the Project area prior to the exploration work performed by NMG.

Exploration activities by NMG have culminated in the identification of a Probable Mineral Reserve for the West Zone as well as a Mineral Resource Estimate combining the South-East and South-West mineralization present on NMG's Tony Claim Block. The Probable Mineral Reserve of the West Zone is based on 3,693 assay intervals collected from core drilling and three (3) surface trenches providing 207 channel samples. Proper quality control measures were used throughout the exploration programs leading to the Probable Mineral Reserves detailed in this Report.

### 1.16.2 Mineral Processing and Testing

The processing plant is designed to process 3,349 t/d of run of mine to produce approximately 52,000 tonnes per year of graphite concentrate grading at about 97 % C(t) based on a concentrate recovery of 94 %. A suitable process flow sheet includes crushing, grinding, flotation, regrind, and concentrate thickening, filtering and drying. The dried concentrate is then classified into various sized products as required by customers.

The concentrator tailings are desulphurized in the tailings treatment plant. The NAG tailings and the sulphide concentrate are stored separately in dry stacks.

### 1.16.3 Market

NMG is developing a natural graphite Project which will have competitive advantages due to its privileged location, cost structure and experienced team. A demonstration plant (see Press Release dated April 19<sup>th</sup>, 2017) should allow NMG to have an earlier debut in the market and de-risk the first years of sales. One of the goals of this demonstration plant is to secure medium to long term supply agreements with different customers.

#### 1.16.4 Economic Analysis

The Pre-feasibility Study showed that Matawinie Graphite Project is technically feasible as well as economically viable.

Based on 27-year cash flow and assuming 100 % equity, the IRR is 32.4 % before taxes and 25.9 % after taxes.

The authors of this Technical Report consider that the Matawinie graphite Project to be sufficiently robust to warrant moving it to the feasibility phase.

#### 1.16.5 Risk Evaluation

The following process uncertainties have been identified at the end of the pre-feasibility program:

- The crushing and grinding circuit has been designed based on limited comminution data. Significant variations in hardness throughout the life of mine resource could cause a throughput limitation in the comminution circuit;
- Variability flotation tests completed to-date have revealed a consistent metallurgical response of composites representing large areas within the resource. However, the risk of increased variation for smaller areas within the deposit still exists. Any significant variation in the metallurgical response of the mill feed during the first few months and years of operation can have a significant impact on the economics of the Project;
- The addition of xanthate in the sulphide circuit may lead to residual xanthate in the process water that is cycled back to the front end of the graphite circuit. The xanthate could result in elevated sulphur recovery into the graphite cleaning circuit and possibly the final graphite concentrate;
- Limited mineralogical data is presently available for the West Zone mineralization. While this is not an immediate risk, a better understanding of the host rock mineralogy may assist in the final optimization of the graphite and sulphide circuits and may provide an opportunity for generating a saleable by-product; and
- Final graphite concentrate grades and recoveries are based on limited closed-circuit flotation tests. Metallurgical data from additional locked cycle tests will provide more confidence in the expected metallurgical performance and will further validate the robustness of the flow sheet.

## 1.17 Recommendations

### 1.17.1 Next Phase Estimated Costs

Table 1.8 presents the estimated costs for the next phase and the Section below described the work to be done.

**Table 1.8 – Next Phase Estimated Costs**

<b>Activity</b>	<b>Estimated Costs (\$)</b>
Definition Drilling Program	100,000
Geotechnical and Hydrogeology Studies	360,000
Metallurgical Studies and Tests Works	250,000
Environmental Studies	1,340,000
Feasibility Studies	2,500,000
<b>Estimated Total Costs</b>	<b>4,550,000</b>

### 1.17.2 Mining and Geology

#### a) Definition Drilling Program

It is proposed to proceed with a 750 m drilling program in the West Zone aimed at providing more detailed geological data for sections W+0000 to W+0400. These sections only contain two (2) drill holes, one (1) additional drill hole in each of the 100 m spaced section (total of 5 drill holes) would provide a more complete and robust geological model concerning the West Zone Deposit.

#### b) Geotechnical Program Targeting Overburden

A geotechnical program aimed at characterizing the overburden of the area is a necessary step for the project to go forward. The pit angles could be optimised further once geotechnical and hydrogeological assessments of the mine site are completed. The work program is aiming to enhance the understanding of the geotechnical conditions onsite and to characterize materials in support of the design of the open pit, tailings locations as well as the crushing and concentrator plant site. The work program includes consultant support to perform geo-mechanical mapping, drilling, trenching and a laboratory program. Additional drilling and testing is recommended in the open pit area to get detailed geotechnical information of the overburden.

c) Hydrogeology Program

Further hydrogeology investigations are recommended for a better understanding and management of the groundwater. The program is designed to obtain the fundamental hydrogeology characteristics and conditions for mine dewatering, open pit wall stability as well as to properly delineate a wellhead (source water) protection area.

- Data will be collected through a series of pumping test using large diameter (15 cm) drill holes.
- Numerical modelling will be performed to simulate the groundwater regime and effects from the mining activities, including potential drawdown of groundwater in private wells.
- Surface water control in hilly terrain is particularly important to allow efficient mining operations. A detailed surface water plan is also part of this program and need to be addressed prior to any mine development and long-term mining outlook.
- The use of existing and future exploration drill holes could help in lowering the proposed budget for the hydrogeology program.

### 1.17.3 Process

The following characterization and test program is recommended for the definite feasibility study:

- Full chemical and mineralogical characterization of LOM composite;
- Basic chemical and mineralogical characterization of 6-8 variability composites;
- Comprehensive comminution tests including unconfined compressive strength test, low energy impact tests, bond ball mill grindability test, Bond abrasion index tests, JKDropweight and SMS tests, and JKSimMet modelling. This will allow to assess ore variability and its impact on crushing and grinding design;
- Rougher/scavenger optimization to confirm consistency of composite and to optimize/simplify the sulphide rejection circuit;
- Cleaner validation for a 96-97 % C(t) target grade;
- Process water ageing tests to assess the impact of residual xanthate in the process water on rougher and scavenger flotation;
- Cleaner benchmarking tests to determine impact of freeze/thaw cycles of core on metallurgy;

- Variability flotation testing to confirm consistent metallurgical response of the material that will serve as mill feed in the first few months and years of the Project; and
- Locked cycle flotation tests to confirm closed circuit metallurgical performance.
- Demo plant to validate the design flowsheet. The demo plant should include both graphite beneficiation and sulphide rejection circuits. In addition, ability to produce a coarser graphite concentrate should be studied.
- Settling and filtration test work: Testing using the demo plant concentrate and tailings material should be arranged to validate equipment selection.

In addition, the following trade off studies are recommended:

- Cyclones versus screening: To assess the metallurgical, infrastructural and financial impact of using cyclones or screens in the secondary grinding circuit.
- Concentrate filtration: To evaluate impact of various pressure filtering technologies on flake size.
- Dryer flake degradation: To study impact of drying technology on flake integrity.
- Cleaner flotation performance in mechanical flotation cells versus flotation columns in the demo plant.

#### 1.17.4 Environment

- Undertake the geochemistry phase II tests as well as hydrogeology modeling to better define disposition concepts that will minimize the Project' impacts;
- Undertake air emission, noise and landscape modeling during the feasibility study when the layout will be more definitive;
- Complete the EIA report following the directive that will be issued by the MDDELCC;
- Continue the collaborative work with the Stakeholder Committee;
- Make sure that the information on Project advancement is readily available to all and offer the possibility to raise other concerns as applicable;
- Ensure that all stakeholders and members of the public are engaged for the purpose of the upcoming EIA;

- Undertake the Environmental and Social Impact Assessment in the coming months, in parallel with the Feasibility Study, and according to the directive that will be issued by the Ministry responsible for the Environment (MDDELCC);
- Continue to undertake public consultations in order to properly inform the local community and stakeholders regarding the Project;
- Continue the engagement with the Atikamekw First Nation of Manawan and the Council of the Atikamekw First Nation in order to reach a pre-development agreement;
- Pursue the proactive acquisition process.

#### 1.17.5 Opportunities

The location of NMG's Project is a key competitive advantage to supply natural graphite to the North American market. NMG's planned demonstration plant (see press release dated April 19<sup>th</sup>, 2017) could supply enough quantities of each material group to support an adequate market approach.

## 2.0 INTRODUCTION

### 2.1 Terms of Reference - Scope of Study

Nouveau Monde Graphite Inc. (“**NMG**”) is a listed company trading on the Toronto Stock Exchange under the symbol NOU. NMG owns the Matawinie graphite Property (“**Property**”). The Property consists of 250 map-designated claims forming nine (9) main claim blocks. This Pre-feasibility Study (“**PFS**”) focuses on the Tony Block consisting of 145 contiguous map-designated claims. The Tony Claim Block center is located approximately six (6) km South West of the community of Saint-Michel-des-Saints, 120 km, as the crow flies, North of the city of Montréal.

NMG has mandated Met Chem, a division of DRA Americas Inc. (“**MC-DRA**”) to complete this Technical Report, following National Instrument 43 101 (“**NI 43 101**”) rules and guidelines, regarding the Tony Block in order to advance the Project.

The capital and operating costs estimates, schedule and financial reviews have been completed as per the industry standards.

### 2.2 Source of Information

Much of the historical and geological information was gathered from Québec government databases and NMG internal documents.

When applicable, the document code given for historical assessment reports made available by the *Ministère de l'Énergie et des Ressources Naturelles* (“**MERN**”) in the form of GM XXXXX (and others in the form of DV XXX, RG XXX or MM XX-XX etc...) was used for reference purposes in this Report. These reports can be viewed free of charge on the MERN website ([http://sigeom.mines.gouv.qc.ca/signet/classes/I1102\\_indexAccueil?l=a](http://sigeom.mines.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a)) using the SIGEOM or EXAMINE applications. Such reports usually contain technical information on geological, geochemical or/and geophysical work conducted by mineral exploration companies. Government compilations of geoscientific work, historical drilling, geophysical surveys and other aspects of mineral exploration are also available on the SIGEOM and EXAMINE systems.

Information about land tenure or claims was gathered from the MERN's online GESTIM system (<https://gestim.mines.gouv.qc.ca>) on October 23<sup>rd</sup>, 2017. This system provides a downloadable claim database in various GIS formats, as well as an online viewer.

Some land tenure information was provided by NMG, as well as the underlying agreements and technical information not in the public domain. All of this information appears to be of sound quality.

In addition to public information, reports and information supplied by NMG, MC-DRA used the information contained in relevant reports by SGS Geostat and by Metpro Management Inc., in the preparation of the present Report.

Other sources of information used in this Report are listed in the references or elsewhere in the text of the Report.

### 2.2.1 Contributing Authors

This Report was completed with the efforts of five (5) companies and individual: SGS Geostat, Metpro Management Inc, Journeaux Assoc., SLI, MC-DRA, Bernard-Olivier Martel P. Geo.

### 2.2.2 Qualified Persons

The main Qualified Persons (“QPs”) responsible for the development of this Report are Yann Camus P. Eng. from SGS Geostat, Oliver Peters P. Eng., M. Sc., MBA from Metpro Management Inc., Martine Paradis, Eng., M. Sc. from SLC-Lavalin, Nicolas Sciadas P.Eng, M. Eng. from Journeaux Assoc, Patrick Perez P. Eng. M. Sc., Richard Bonici Eng., Ewald Pengel P. Eng. M. Sc. and Celine M. Charbonneau Eng. M. Sc. all with MC-DRA, Bernard-Olivier Martel P. Geo., B. Sc.

Table 2.1 provides a list of QPs and their respective sections of responsibility. The QP’s certificates can be found at the beginning of the Report under Date and Signature – Certificates.

**Table 2.1 – Qualified Persons and their Respective Sections of Responsibilities**

Section	Title of Section	Qualified Persons
1.0	Summary	Céline M. Charbonneau and related QPs
2.0	Introduction	Céline M. Charbonneau and related QPs
3.0	Reliance on Other Experts	Céline M. Charbonneau and related QPs
4.0	Property Description and Location	Bernard-Olivier Martel
5.0	Accessibility, Climate, Local Resources, Infrastructure and Physiography	Bernard-Olivier Martel
6.0	History	Bernard-Olivier Martel
7.0	Geological Setting and Mineralization	Bernard-Olivier Martel
8.0	Deposit Types	Bernard-Olivier Martel
9.0	Exploration	Bernard-Olivier Martel

Section	Title of Section	Qualified Persons
10.0	Drilling	Bernard-Olivier Martel
11.0	Sample Preparation, Analysis and Security	Bernard-Olivier Martel
12.0	Data Verification	Yann Camus, SGS Geostat
13.0	Mineral Processing and Metallurgical Testing	Oliver Peters, Metpro Management Inc.
14.0	Mineral Resources Estimates	Yann Camus, SGS Geostat
15.0	Mineral Reserve Estimates	Patrick Perez and Richard Bonici, MC-DRA
16.0	Mining Methods	Patrick Perez and Richard Bonici, MC-DRA
17.0	Recovery Methods	Ewald Pengel, MC-DRA
18.0	Project Infrastructure	Nicolas Sciadas, Journeaux Assoc. Céline M. Charbonneau, MC-DRA
19.0	Market Studies and Contracts	Céline M. Charbonneau, MC-DRA
20.0	Environmental Studies, Permitting and Social or Community Impact	Martine Paradis, SNC-Lavalin
21.0	Capital and Operating Costs	Céline M. Charbonneau and related QPs
22.0	Economic Analysis	Céline M. Charbonneau, MC-DRA
23.0	Adjacent Properties	Bernard-Olivier Martel
24.0	Other Relevant Data and Information	Céline M. Charbonneau, MC-DRA
25.0	Interpretation and Conclusions	Céline Charbonneau and related QPs
26.0	Recommendations	Céline Charbonneau and related QPs
27.0	References	

### 2.3 Effective Date and Declaration

This Report is issued in support of the NMG press release, dated October 25<sup>th</sup>, 2017, entitled “Nouveau Monde Announces Robust Pre-feasibility Study with Pre-Tax NPV of \$ 498.7 Million and IRR of 32.4 % Concerning its Tony Claim Block, Matawinie Graphite Property”. The effective date of this NI 43-101 Technical Report is July 28<sup>th</sup>, 2017 and the issue date is December 8<sup>th</sup>, 2017.

This Report provides an independent Technical Report for the Pre-feasibility Study of the graphite mineralization of the West Zone Deposit, in conformance with the standards required by NI 43-101 rules and guidelines and Form 43-101F1. The estimate of mineral resources contained in this Report conforms to the CIM Mineral Resources and Mineral definitions.

The information, conclusions, opinions, and estimates contained herein are based on information available at the effective date of this Report, assumptions, conditions, and qualifications as set forth in this Report, and data, reports, and opinions supplied by NMG and other third-party sources.

It should be understood that the mineral resources which are not mineral reserves do not have demonstrated economic viability. The mineral resources presented in this Technical Report are estimates based on available sampling and on assumptions and parameters available.

## 2.4 Site Visit

M. Bernard-Olivier Martel, P. Geo. (Québec), B. Sc a qualified person under the terms of NI 43 101, conducted a site visit to the Property from July 24<sup>th</sup> to August 16<sup>th</sup>, 2015, from September 5<sup>th</sup> to September 27<sup>th</sup>, 2015, from October 22<sup>nd</sup> to December 2<sup>nd</sup>, 2015, from July 6<sup>th</sup> to July 28<sup>th</sup>, 2016 and May 25<sup>th</sup>, to June 15<sup>th</sup>, 2017.

Mr. Yann Camus, P. Eng., a qualified person under the terms of NI 43 101, conducted a site visit to the Property on November 9<sup>th</sup>, 2016.

Patrick Perez, P. Eng., M. Sc., a qualified person under the terms of NI 43-101, conducted a site visit to the Property on May 8<sup>th</sup>, 2017.

Richard Bonici, Eng, a qualified person under the terms of NI 43-101, conducted a site visit to the Property on May 8<sup>th</sup>, 2017.

Nicolas Sciadas P.Eng, M. Eng., did not visit the site; however the information required for his work was obtained by Sherif Kamel, P. Eng., PhD, of Journeaux Assoc., who conducted a site visit to the Property on May 8<sup>th</sup>, 2017.

Martine Paradis, Eng., M. Sc., a qualified person under the terms of NI 43 101, conducted a site visit to the Property on November 26<sup>th</sup>, 2017. The information required for her work was obtained by SNC team members following sites visits (see Section 20.1 for details).

Ms. Céline Charbonneau, Eng. M.Sc., a qualified person under the terms of NI 43-101, conducted a site visit to the Property on May 8<sup>th</sup>, 2017.

## 2.5 Units and Currency

In this Report, all currency amounts are Canadian Dollars (“CAD” or “\$”) unless otherwise stated, with commodity prices typically expresses in US Dollars (“USD”). Quantities are generally stated in *Système international d’unités* (“SI”) metric units, the standard Canadian and international practices, including metric tons (“tonnes”, “t”) for weight, and

kilometres (“**km**”) or metres (“**m**”) for distance. Abbreviations used in this Report are listed in Table 0.1.

### 3.0 RELIANCE ON OTHER EXPERTS

MC-DRA prepared this Report using reports and documents as noted in Section 27.0 – References. The authors wish to make clear that they are qualified persons only in respect to the areas in this Report identified in their “Certificates of Qualified Persons”, submitted with this Report to the Canadian Securities Administrators.

The authors wish to state that an independent verification of land title and tenure was not performed, nor has MC-DRA verified the legality of any underlying agreement (s) that may exist concerning the licenses or other agreement (s) between third parties, but has relied on NMG to have conducted the proper legal due diligence.

A draft copy of the report has been reviewed by NMG. Any changes made as a result of these reviews did not involve any alteration to the conclusions made. Hence, the statement and opinions expressed in this document are given in good faith and in the belief that such statements and opinions are neither false nor misleading at the date of this Report.

Mr. Armando Farhate has contributed to this PFS Technical Report. He supplied and elaborated the basis for the Section 19.0 – Market Studies and Contracts. He is a mechanical engineer graduated from UNIP – São Paulo, SP, Brazil in 1987. He obtains a post graduate in Business Administration (MBA) from Mauá – São Paulo, SP, Brazil in 1998. He has worked as a C-Level executive in graphite mining companies in Brazil and Canada for six (6) years.

For information that is outside of the area of MC-DRA technical expertise:

- MC-DRA has not checked the legal aspects of the NSR buyout due by NMG. This information was provided by NMG, see Section 4.3.

## 4.0 PROPERTY DESCRIPTION AND LOCATION

The Matawinie Property presently consists of 250 map-designated cells forming nine (9) main claim blocks totaling 13,694 ha. The property is spread over an area of approximately 75 km by 45 km. Since the focus of this report is to detail a Pre-feasibility Study on the Mineral Reserves identified in the Tony Block, only that claim block will be described in the present document. It is important to note that the Tony Block was formally known as claim block “H” or “Hotel” and that a name change occurred in 2015 (see June 17, 2015 press release). The Tony Block now consists of 145 contiguous map-designated cells (or claims) totaling 7,543.86 ha.

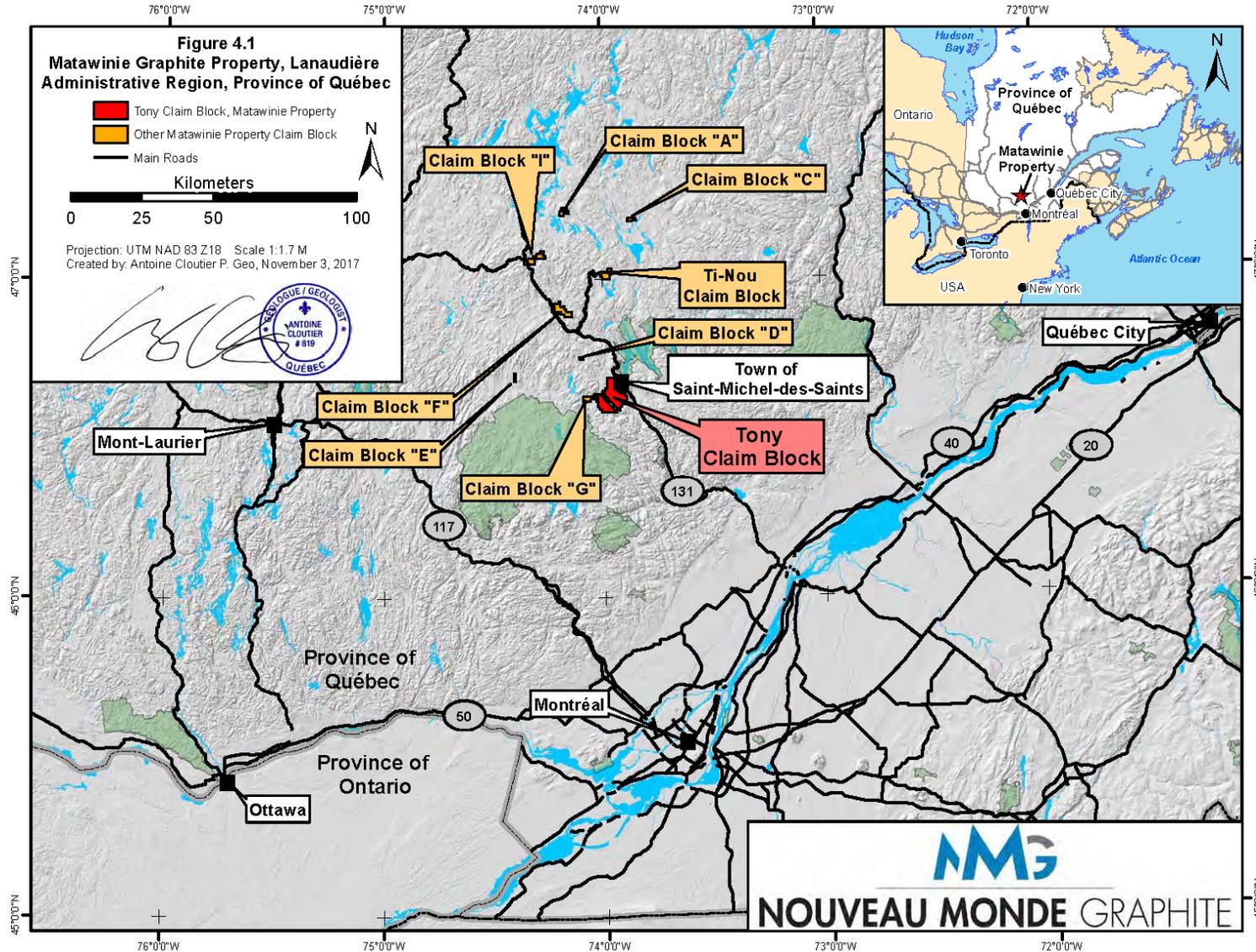
### 4.1 Location and Access

The centre of the Tony Block is located approximately six (6) km to the South-West of the community of Saint-Michel-des-Saints. The claim block overlaps the National Topographic System (or “NTS”) map sheets 31J/09 and 31I/12. Most of the Tony Block lies within the municipality of Saint-Michel-des-Saints, Lanaudière Administrative Region, Province of Québec, Canada. A total of 18 claims on the southwestern portion are completely or partly located within the Unorganized Territory of Saint-Guillaume-Nord, Matawinie Regional County Municipality (or “MRC” for *Municipalité Régionale de Comté* in French), also located in the Lanaudière Administrative Region. The centre of the Tony Block is positioned approximately 120 km North, as the crow flies, of the city of Montréal, more or less at latitude 46.63° and longitude -73.96° (See Figure 4.1 and Figure 4.2).

### 4.2 Type of Mineral Tenure

In the Province of Quebec, claims are now referred to as map-designated cells (or “CDC”). These predetermined cells each measure 30” longitude by 30” latitude. Cells can be acquired for a fee using an online form on the GESTIM website (<https://gestim.mines.gouv.qc.ca>). Claims are valid for a period of two (2) years, after which a certain amount of accumulated work credits on the claims is required for renewal as well as a renewal fee. All 145 claims composing the Tony claim Block are 100 % owned by NMG. A sufficient amount of credits has been obtained to satisfy statutory work obligations needed to renew the entire Tony Block claims until at least January of 2018. An amount of \$ 8,791.93 will be required to renew all claims forming the Tony claim Block for an additional two (2) years following their present expiry date.

Figure 4.1 – Matawinie Property Location





The information, downloaded from the GESTIM website on October 23<sup>rd</sup>, 2017, concerning the claims of the Tony Block, such as work credits required for renewal, credits accumulated from recent work, claim size and expiry date, is presented in Appendix A. Please note that work credits accumulated since April 1<sup>st</sup>, 2016 have not yet been declared to the Ministry of Energy and Natural Resources (or “**MERN**”), this includes the 2016 drilling campaign as well as work pertaining to the present Report.

#### 4.3 Agreements and Royalties Obligations

Of the 145 claims currently comprising the Tony Block, 108 claims totaling 5,695.94 ha were optioned from 3457265 Canada Inc. (“**3457265**”). See Figure 4.2. Under the terms of the agreement, 3457265 performed a regional airborne survey over a total surface area of approximately 2,100 km<sup>2</sup>, pursuant to the instructions provided by NMG's technical staff. Based on the results of this survey, 3457265 acquired four (4) blocks of claims comprising the Matawinie Property Blocks “F”, “G”, “I” and part of the Tony Block, previously referred to as Block “H” or “Hotel” (Figure 4.1).

In consideration of the technical support, 3457265 granted NMG an exclusive and irrevocable option to acquire a 100 % interest in the mineral claims forming the four (4) blocks mentioned above. The following summarizes the agreement mentioned above dated February 28<sup>th</sup>, 2014 and an amendment to that agreement dated January 28<sup>th</sup>, 2016:

- Reimbursement of the airborne survey costs and costs related to claim acquisition (\$ 317,700) by the issuance of shares at a set price of \$ 0.25 per share, subject to approval of the option agreement by the TSX Venture Exchange (the “**Exchange**”);
- The completion of a total of \$ 300,000 in exploration work over a period of 24 months, \$ 100,000 of which must be provided in the first 12 months and \$ 200,000 in the following 12 months;
- Should NMG proceed with the filing of a positive Preliminary Economic Assessment (“**PEA**”), NMG undertook, within a period of five (5) days following such filing, to either issue 1,000,000 common shares of its share capital, to be divided between 3457265 (900,000 shares) and Éric Desaulniers (100,000 shares), or to pay a sum of \$ 1,000,000 which will be divided between 3457265 (\$ 900,000) and Éric Desaulniers (\$ 100,000), at NMG's sole discretion.
- Should NMG proceed with the filing of a positive Feasibility Study (“**FS**”), NMG undertook, within a period of five (5) days following such filing, to either issue 1,000,000 common shares of its share capital, to be divided between 3457265 (900,000 shares) and Éric Desaulniers (100,000 shares), or to pay a sum of \$ 1,000,000 which will be divided between 3457265 (\$ 900,000) and Éric Desaulniers (\$ 100,000), at NMG's sole discretion.

- On successful completion of the terms of the agreement, NMG will assume a 100 % interest in the mineral claims subject to a two percent (2 %) Net Smelter Return (“NSR”) royalty held by 3457265 (1.8 %) and Éric Desaulniers (0.2 %). NMG can buy back the NSR Royalty for the sum of \$ 1,000,000 for each 1 % at any time to be shared on a prorata basis between 3457265 and Éric Desaulniers.

It is important to note that since the execution of that agreement and subsequent amendment, the first three (3) terms mentioned above have been successfully met, and thus all claims comprising the Matawinie Property, including those originally designated by 3457265 (Blocks “F”, “G”, “H”, and “I”), are now fully owned by NMG. Furthermore, as per the fourth (4) term mentioned above, NMG issued a total of 1,000,000 common shares (900,000 shares to 3457265 and 100,000 shares to Éric Desaulniers) of its share capital in August of 2016 following the filing of the positive PEA (see Press Release dated August 10<sup>th</sup>, 2016).

The author has relied on information provided by NMG regarding land tenure, underlying agreements and technical information, and all those sources appear to be of sound quality. The author has not sought a formal legal opinion about the ownership status of the claims comprising the property, and has relied on materials presented on the GESTIM website (<https://gestim.mines.gouv.qc.ca>) and from NMG for all aspects of tenure.

#### 4.4 Permits and Environmental Liabilities

To the best of NMG’s and the author’s knowledge, NMG is not responsible for any environmental or physical hazards or liabilities within the Tony Block. Subsequent to the field programs carried-out since 2014, all trenches were either backfilled or properly graded to prevent possible injuries to land users including local wildlife. NMG has not encountered, nor has it been responsible for any spills or the spread of contaminants during the course of its Project.

Permits needed for the work completed to date consists of tree clearing permits, provided by the Ministry of Forests, Wildlife and Parks (or “**MFPP**” from the French “*Ministère des Forêts, de la Faune et des Parcs*”). In order to obtain the tree clearing permits, a Certificate of Conformity from the Municipality of Saint-Michel-des-Saints is required. Table 4.1 below lists the permits and authorizations obtained to date for work completed on the Tony claim Block.

**Table 4.1 – Permits and Authorizations Acquired for Work on the Tony Block to Date**

Permit Type	Activity	Authority*	Permit #	Effective Date	Deadline
Certificate of Conformity	Drilling	SMDS	N/A	15/04/23	N/A
Site access construction authorization	Drilling	MERN	68216200000	15/06/12	16/06/12
Intervention permit for mining activities (tree clearing)	Drilling	MFFP	3017317	15/06/15	16/03/31
Certificate of Conformity	Drilling	SMDS	N/A	15/07/13	N/A
Site access construction authorization	Drilling	MERN	68219100000	15/08/10	16/08/10
Intervention permit for mining activities (tree clearing)	Drilling	MFFP	3017760	15/08/21	16/03/31
Certificate of Conformity	Drilling & Trenching	SMDS	N/A	16/06/10	N/A
Intervention permit for mining activities (tree clearing)	Drilling & Trenching	MFFP	3019212	16/06/28	17/03/31
Certificate of Conformity	Drilling	SMDS	N/A	17/05/09	N/A
Intervention permit for mining activities (tree clearing)	Drilling	MFFP	3020919	17/05/19	18/03/31
Certificate of Conformity	Drilling	SMDS	N/A	17/07/07	N/A
Intervention permit for mining activities (tree clearing)	Drilling	MFFP	3021342	17/07/17	18/03/31

\* SMDS: Municipality of Saint-Michel-des-Saints  
 \* MERN: Ministry of Energy and Natural Resources  
 \* MFFP: Ministry of Forests, Wildlife and Parks

The permits needed to conduct the work proposed for the Property, listed in Section 26.0, consists of additional tree clearing permits which are provided by the MFFP. The expected delay for these types of permits is usually about three (3) weeks following the submission of the tree clearing request form.

#### 4.5 Significant Factors, Risks, and Other Relevant Information

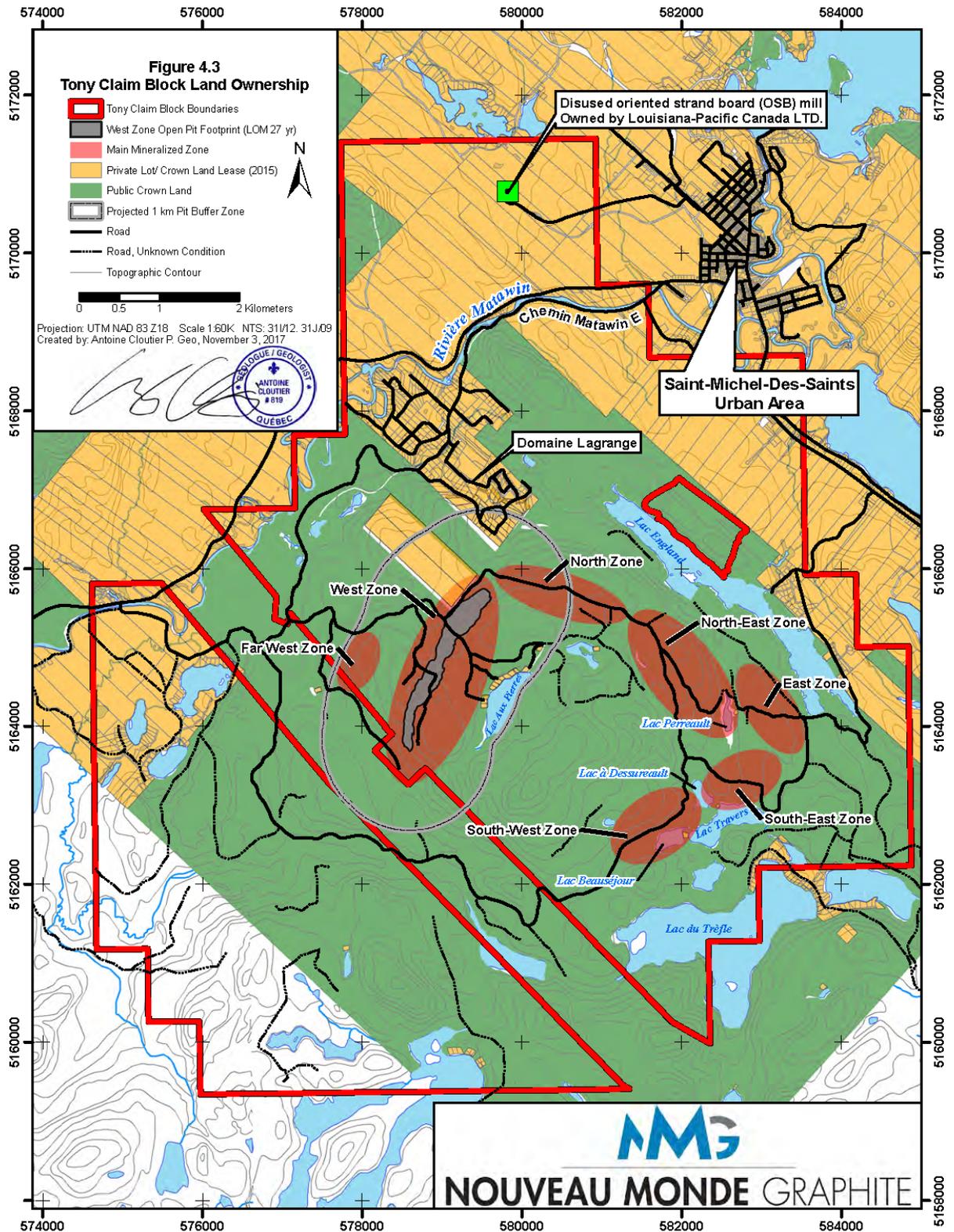
Certain areas of the province are defined as “restricted zones” where it is either not permitted to “stake” a claim, or claims (or parts of claims) are subject to specific laws and regulations. These zones are available for viewing on the GESTIM system. Specific information relative to the restrictions is also available on the GESTIM online viewer and is illustrated in Figure 4.3. Such zones usually refer to native reserves, biological reserves,

parks and urban areas. The Tony Block is truncated in the middle by a restricted zone where the designation of claims is temporarily suspended due to the future addition of transmission lines by Hydro-Québec, a government-owned Public Utility Company. Since claim parcels within the Tony Block extrude from this zone, the portions within the restricted zone will automatically be allocated to NMG if and when the temporary suspension is lifted.

Information provided by the municipality cadaster database from late 2015 reveals that the mineralized zones covers crown land. The Tony Block also covers private properties, although these are located some distance from the targeted mineralization (Figure 4.3).

For more details on social, environmental and permitting issues, see Section 20.0.

Figure 4.3 – Tony Block Main Mineralized Zones and Land Use



## 5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

### 5.1 Accessibility

All mineralized zones located on the Tony Block are within four (4) km, as the crow flies, from the centre of the Tony block and 11 km to 18 km driving distance from the community of Saint-Michel-des-Saints using the current road system. The town itself is accessible from Montréal using the Province of Quebec's paved Route 131, the trip represents a distance of approximately 160 km. The main mineralized zones are all accessible using logging roads of varying grades, these however, are not maintained by any organization nor are they cleared during the winter months. The use of an All-Terrain Vehicles ("ATV") or Four-Wheel-Drive ("4X4") vehicle is strongly recommended to access the mineralized zones, especially in wet and slippery conditions, although the West Zone is easily accessible using high clearance two-wheel-drive vehicles in dry weather conditions.

### 5.2 Physiography

The topography of the Project area and surrounding region is typical of the Laurentian Highlands, characterized by a series of rounded elongated hills and valleys carved by the passage of the Laurentide Ice Sheet during the Quaternary Period. Summits usually reach 100 m to 150 m above the bottom of adjacent valleys. The valleys themselves vary considerably in width and are often occupied by marshes and small streams. The lakes in the Project area are formed by larger basins, most of which are probably structurally controlled. Elevation on the Property varies between 360 m to 625 m above sea level.

Studies of Pleistocene and recent quaternary deposits, as well as the author's observations, indicate that hilltops and elevated areas are generally covered by a thin veneer of undifferentiated glacial till, usually about one (1) m to five (5) m thick although sometimes exceeding 25 m as demonstrated by drilling in the northern portion of the West Zone.

Adjacent valleys generally include considerable accumulated organic matter, more or less decomposed and derived from sphagnum, mosses, and forest litter. Fluvioglacial and fluvial deposits are also present within the area; they can be distinguished by their mostly homogeneous grain size, the lack of clay and silt size particles and the presence of rounded cobbles and boulders. These deposits seem to dominate the valley host to the Matawin River. Most of the mineralized zones seem to be covered by till, with the exception of the South-East Zone, where fluvioglacial material was encountered during a trenching program.

The area is located in the maple-yellow birch bioclimatic domain. The potential vegetation on mesic sites is maple-yellow birch stands (mid-slope) and balsam fir-yellow birch stands (top of slope). Well-drained sites are colonized by the potential vegetation of black spruce,

lichen-American green alder stands. Balsam fir-red spruce stands are located on less well-drained benches. The growing season is of moderate length, varying from 160 to 170 days (Robitaille and Saucier 1997). More specifically, the Study area is dominated by deciduous stands, which consist mainly of yellow birch, maple and poplar. Mixed stands come second and are composed of the same deciduous and coniferous species such as fir, tamarack or cedar. Coniferous stands are less extensive and consist mainly of fir, tamarack, cedar and pine.

### 5.3 Climate

The Project area is under the influence of a temperate continental climate, and receives a moderate amount of precipitation. There are no climate related obstacles preventing a year-round mining operation.

The mean annual temperature is 3.1 °C based on data recorded at Environment Canada's station No. 7077570, which is located in Saint-Michel-des-Saints (Environment Canada, 2015). According to the 1981-2010 statistics (station No. 7077570), July is the warmest month with an average maximum temperature of 24.2 °C, whereas January is the coldest month with an average minimum temperature of -20.4 °C. These statistics also show that the average annual rainfall is 731.21 mm with quantities culminating in June and July, and the average annual snowfall is 208.5 cm with significant precipitations in December, January and March. Snowfall occurs typically from October until April. Few snowfall events are possible in September and May. On average, a snow cover of 20 cm or more is present 98.1 days/year in the study area (Environment Canada, 2015). The permanent snow cover period varies from year to year but usually occurs around mid-November until mid to end of April. Non-maintained secondary and logging roads can typically be accessed by snowmobile between mid-December and early April.

### 5.4 Local Resources and Infrastructures

The Tony Block mineralization is located within a few kilometers of major infrastructure. Electrical power and lumber supply stores are available in the town of Saint-Michel-des-Saints as well as other common amenities such as running water, maintained public road system, lodging, restaurants and grocery stores. Communication towers provide partial cellular communication coverage to most of the main mineralized zones. According to the 2016 federal census, the population center of Saint-Michel-des-Saints reaches 1,131 and the Saint-Michel-des-Saint municipality counts a population of 2,359.

The nearest hospital or CSSS (from the French "*Centre de santé et de services sociaux*") is located in the town of Saint-Michel-des-Saints and a larger facility is located some 100 km south in the town of Joliette. A 735 kV power line passes thru the Project area with an additional 735 kV power line presently in construction scheduled to be fully operational by the end of 2019.

Local resources on the Tony Block consist of an abundance of fresh water and mixed deciduous and coniferous trees. Sand and gravel have also been observed on the Tony Block during field work, although the available volume and quality of the material is unknown. Geotechnical tests are presently being conducted on the till covering the deposit to validate its usefulness for the construction of infrastructure. The general area has excellent road coverage, with many logging roads leading far into the hills.

All nearby communities suffer from under-employment, a situation aggravated recently by the closure of wood-related industries. There is an abundant unemployed skilled workforce, such as forestry workers, mechanics and heavy equipment operators. It is important to note that NMG is planning to lease part of a large disused manufacturing plant near the community of Saint-Michel-des-Saints in order to host a demonstration plant. Additional information about this demonstration plant is detailed in a Press Release from NMG dated April 19<sup>th</sup>, 2017.

## 5.5 Surface Rights

The main mineralized zones, including the West Zone, are all located on public crown land although some private land and crown land leaseholders are located nearby. The West Zone open pit boundary borders two (2) vacant private lots (Figure 4.3). Although none of the infrastructure on the proposed mine site is located on private or leased land, some of the infrastructure, such as the mill, is located in close proximity (about 100 m) of government land leases on which cottages are built on the shores of *Lac aux Pierres* (Figure 18.1). Further details about the possible acquisition of these land leases and nearby private lots are available in Section 20.0

## 6.0 HISTORY

The Tony Block is located in an area that has mostly been ignored in terms of its mineral potential. No mention of work in the Tony Block by other mineral exploration companies has been found in the literature. At a more regional scale, the SIGEOM mineral occurrence database indicates a few mineralized showings in the general area, including an old mica mine and closed quartz (silica) quarries (Figure 6.1). The MERN and the Geological Survey of Canada (“GSC”) completed geological mapping in the area in the 1960s (Figure 6.2). The provincial government also carried out lake bottom and stream sediment sampling, although according to the SIGEOM database, no significant anomalies were present on the Tony Block area.

### 6.1 Regional Government Surveys

The historical information used for the preparation of this section was obtained from the SIGEOM and EXAMINE systems, both managed by the MERN<sup>1</sup>, and from Natural Resources Canada (“NRCAN”)<sup>2</sup>. The only relevant historical work performed on the Tony Block, other than that done by NMG and 3457265 Canada Inc., consists of geological mapping by both the provincial and federal government. A list of reports describing this geoscientific work is available in Table 6.1.

**Table 6.1 – Historical Geoscientific Reports Concerning the Tony Block**

Report ID	Year of Publication	Type of Report and Comments
RP 552 <sup>1</sup>	1966	Geological mapping at the 1:63,360 scale of the Saint-Michel-des-Saints region (western part) as well as the Joliette, Berthier and the Maskinongé County.
*108485 <sup>2</sup>	1966	Geological mapping at the 1:253,440 scale of the Mont Laurier and Kempt Lake Map Areas (NTS sheet 31J and 31O)
CGSIGEOM31I <sup>1</sup>	2010	Geological map compilation at the 1:50,000 scale covering NTS sheet 31I
CGSIGEOM31J <sup>1</sup>	2010	Geological map compilation at the 1:50,000 scale covering NTS sheet 31J

### 6.2 Mineral Exploration Work

No mention of work in the Tony Block by mineral exploration companies, other than NMG, has been found in the literature.

<sup>1</sup> available on the following website: [http://sigeom.mines.gouv.qc.ca/signet/classes/I1102\\_indexAccueil?l=a](http://sigeom.mines.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a)

<sup>2</sup> available on the following website: [http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan\\_e.web](http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web)

Figure 6.1 – Tony Block Regional Geology

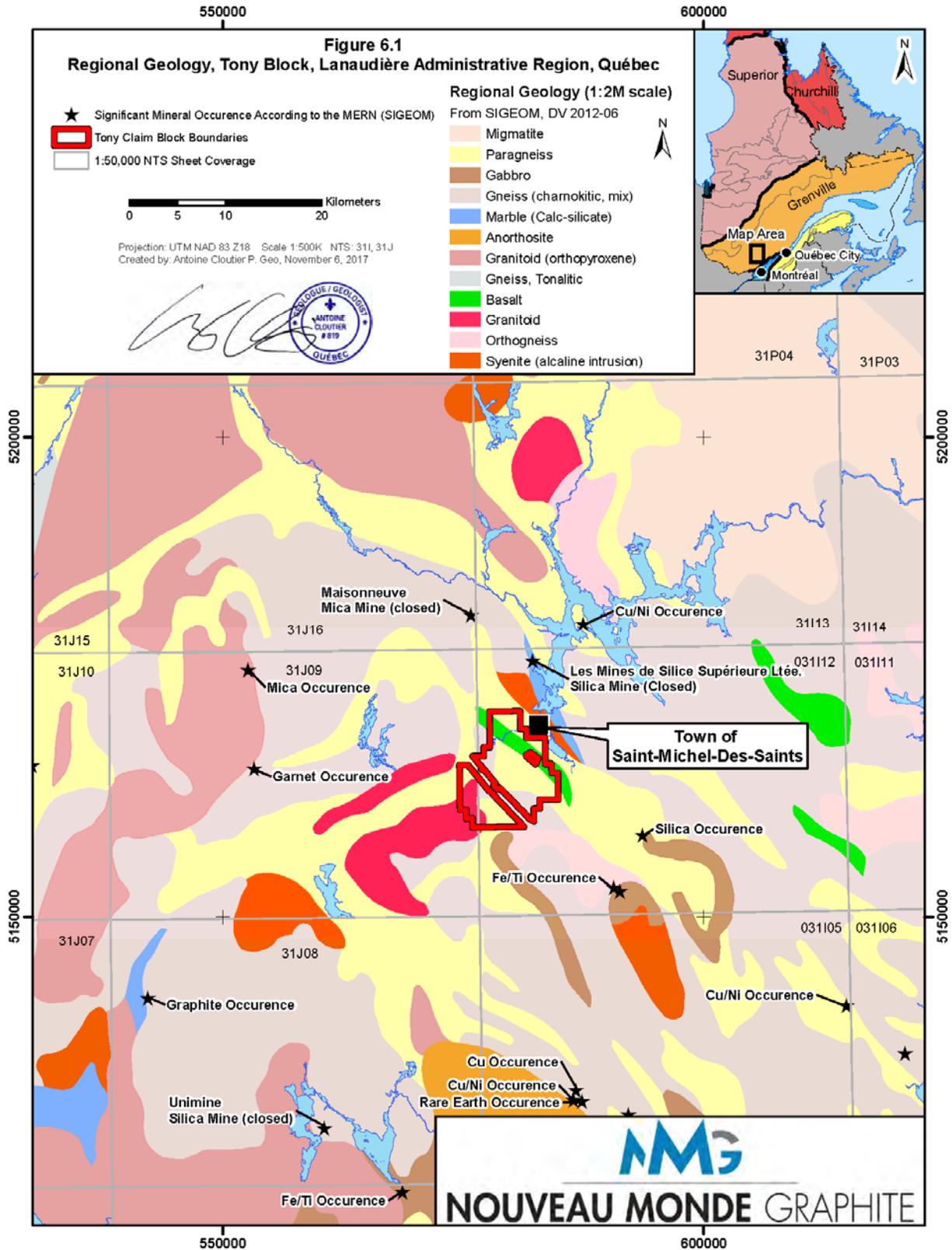
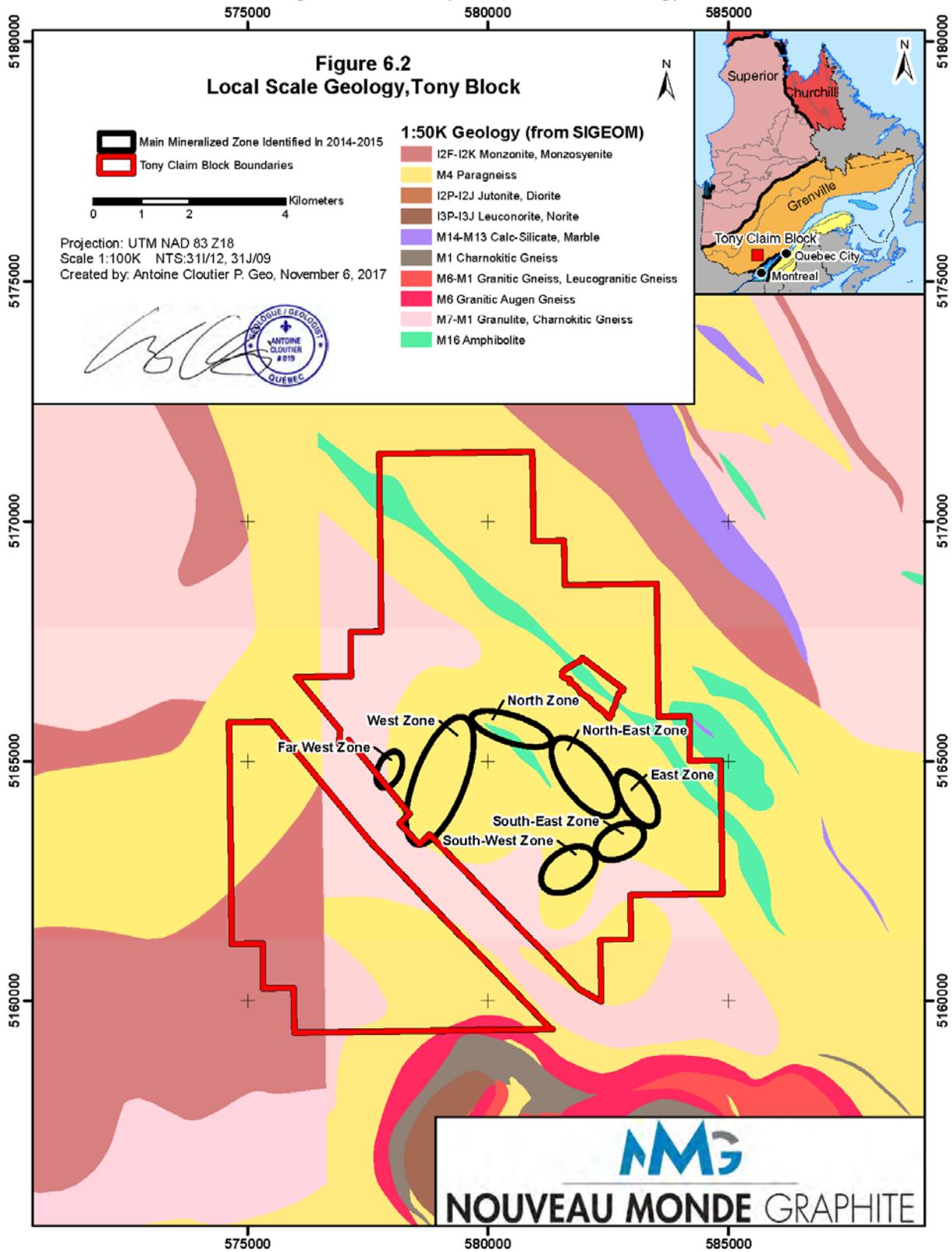


Figure 6.2 – Tony Block Local Geology

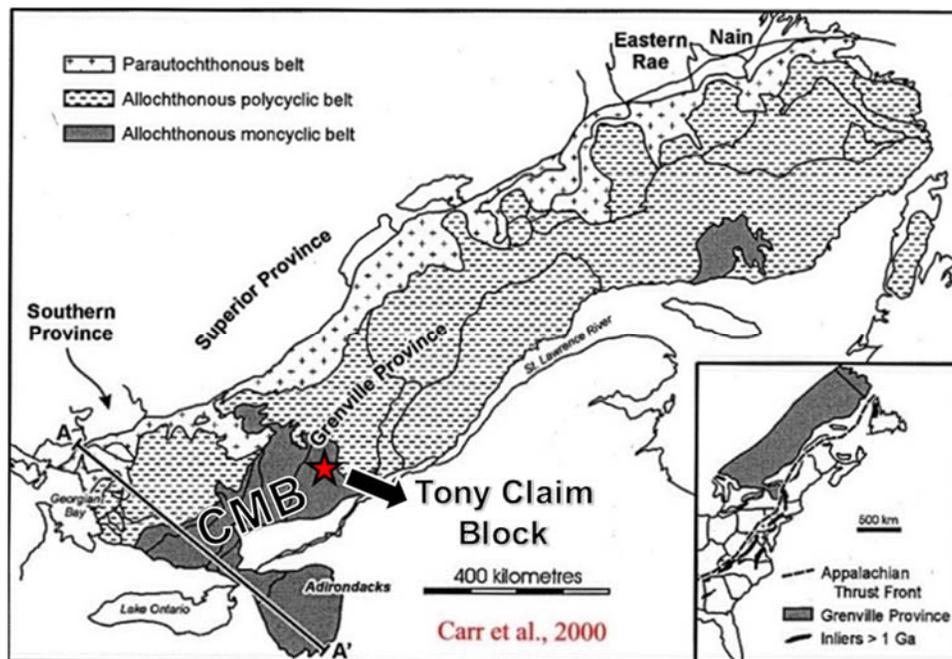


## 7.0 GEOLOGICAL SETTING AND MINERALIZATION

### 7.1 Regional Geology

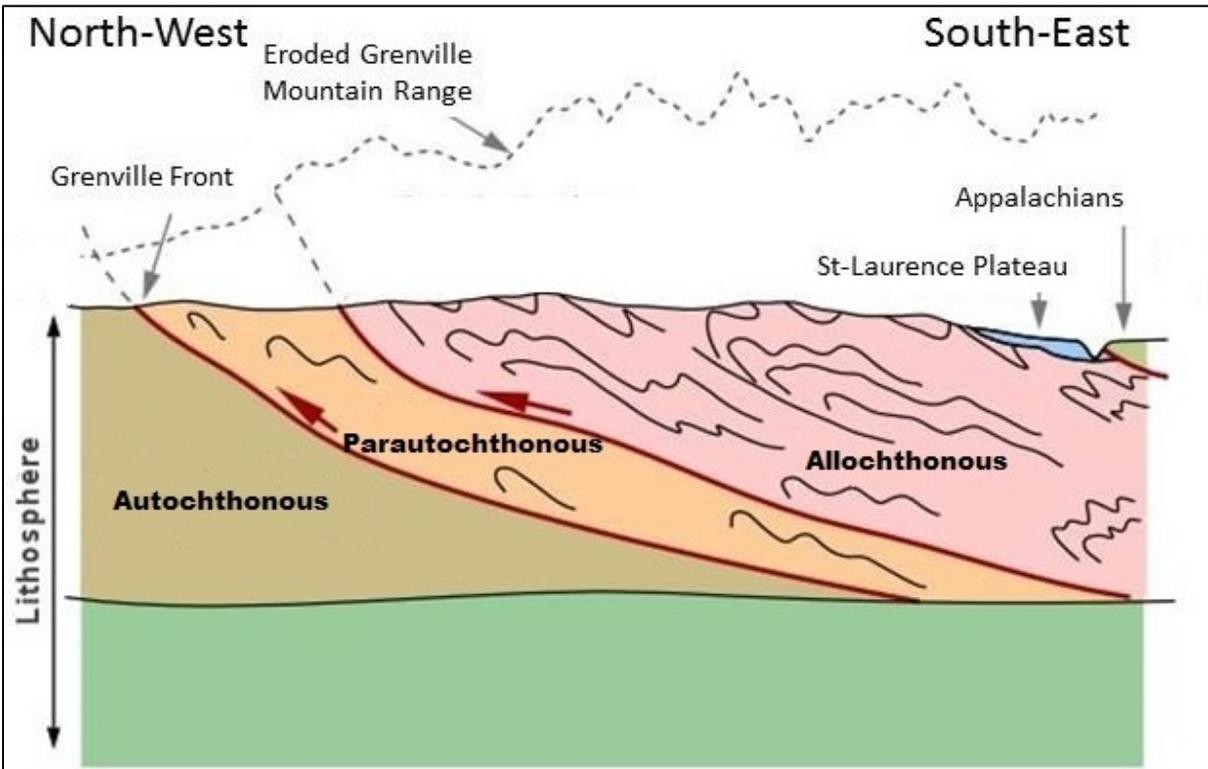
The Tony Block is located in the southwestern portion of the Grenville geological Province. The Grenville Province is composed of imbricated terranes, or large crustal blocks, each one dipping eastward below successively younger ones due to the pushing and adding of new terranes during distinct phases of orogenic activity. These terranes, or fault bounded crustal blocks, are exposed over a 300 to 500 km wide belt that extends from southwestern Ontario and northern New York State to Labrador (Figure 7.1). Rivers *et al.* (1989) divided the Grenville into the Autochthonous, Parautochthonous and Allochthonous tectonic belts. Intense ductile deformation occurred during the Grenvillian orogenic cycle (1160-970 Ma; Rivers et al., 1989). During this cycle, the different terranes were thrust up and over each other (Figure 7.2).

**Figure 7.1 – Tectonic Subdivisions of the Grenville Province**



Modified from Carr et al., 2000 and according to Rivers et al. 1989.

Figure 7.2 – Grenville Orogeny Thrusting

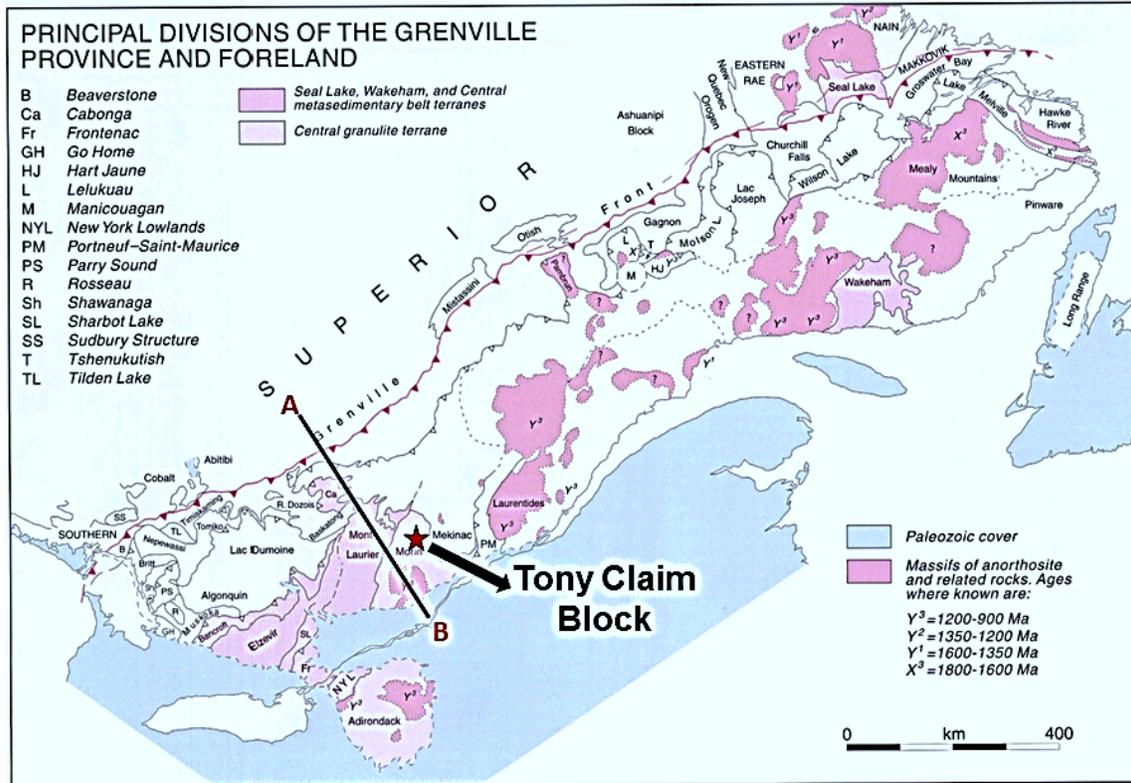


From [http://www2.ggl.ulaval.ca/personnel/bourque/intro.pt/planete\\_terre.html](http://www2.ggl.ulaval.ca/personnel/bourque/intro.pt/planete_terre.html) [modified from Hocq et al. 1994 (MM 94-01)].

The Tony Block is more specifically located within the Morin Terrane (“**MT**”), part of the deformed and transported Allochthonous monocyclic belt of the Grenville geological Province (Figure 7.1 and Figure 7.3). It should be noted that the Allochthonous monocyclic belt present in the western part of the Grenville Province has long been referred to as the Central Metasedimentary Belt (“**CMB**”). The CMB overlaps several regions in Québec, Ontario and northern New York State. It is composed of lithologies belonging to the Grenville Supergroup (marble, metasediments, metavolcanics, quartzite, etc.) metamorphosed from the Greenschist Facies through the Amphibolite Facies to the Granulite Facies, depending upon the region.

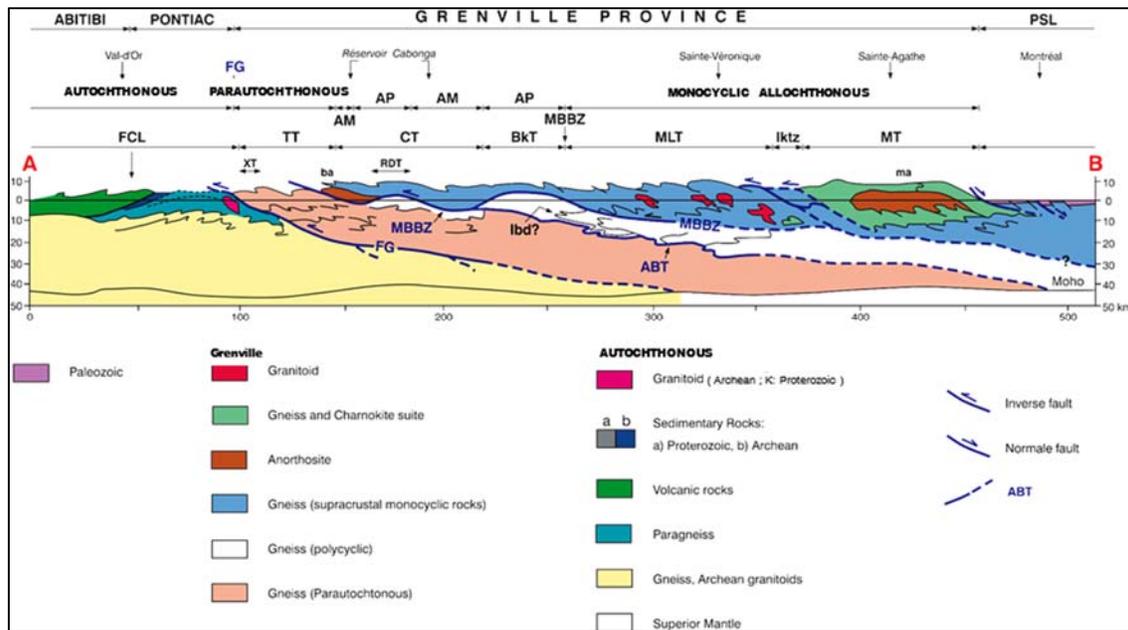
The volcano-sedimentary Morin Terrane is bounded to the West by the Mont-Laurier Terrane (“**MLT**”), which is also part of the Allochthonous monocyclic belt. Both terranes are separated by a large inverse fault known as the Labelle-Kinongé Shear Zone (“**LKTZ**”) (Figure 7.4 and Figure 7.5). The MT is mostly metamorphosed at the Granulite Facies, while the MLT displays mostly Amphibolite Facies metamorphism (Hocq *et al*, 1994, MM-94-01). The MT straddles the Mékinac-Taureau Domaine, part of the Allochthonous polycyclic belt. This domain bounds the MT to the east (Figure 7.5). A normal fault separates the MT and the Paleozoic sedimentary rocks to the south. The northern boundary of the MT is still imprecise and has not yet been properly mapped.

Figure 7.3 – Principal Divisions of the Grenville Province and Location of the Tony Block



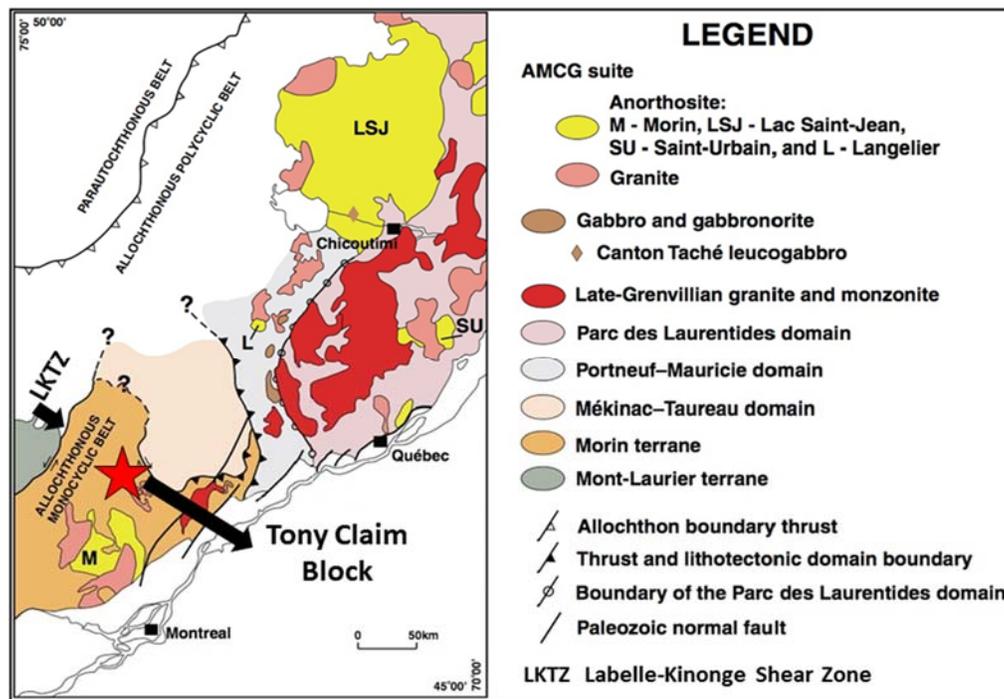
Modified from Davidson et al. 1998.

Figure 7.4 – Cross Section of the Grenville Province Centered Over the Morin Terrane



Modified from Hocq et al. 1994 (MM 94-01).

Figure 7.5 – Terranes Adjacent to the Tony Block



The MT is centered over a large anorthosite body dated at about 1,160 Ma. It is also composed of paragneiss, amphibolite and orthogneiss cut by charnockite intrusions associated with the Grenville Orogeny. The region displays numerous deformation events made evident by the polyphased foliation observed locally within the paragneiss sequences (Marcil, GM 60206). According to calcite-graphite thermometry work performed by Peck, W. H *et al* (2005), marbles within the MT yield metamorphic temperatures of  $755 \pm 38$  °C. Peck, W. H *et al* concludes that the peak metamorphic conditions and cooling paths in the MT are similar to the 1.07 Ga Ottawa orogeny.

The regional geology, as characterized by the geological map compilation at a 1: 2,000,000 scale in the MERN EXAMINE document DV 2012-06, is illustrated in Figure 6.1. More detailed geological maps, based on work from Wynn-Edwards (1966) and Schryver, K., (1966, RP 552), are also available in the literature, and are illustrated in Figure 6.2. It is important to note that the lithological data available from SIGEOM and EXAMINE has not been mapped at a property scale and that due to the complexity of the Grenville geology, other lithologies may be present on the Tony Block, and lithological boundaries are approximate.

The MERN database suggests that a large portion of the Tony Block, especially the eastern section, is composed of paragneiss. This was confirmed during prospecting activities in 2014 and 2015. A few large slivers of amphibolite units were mapped in the central part of the Property, and a charnockite orthogneiss unit wraps around the northwestern and southeastern portion of the main mineralized zones. The late 2013 and early 2015

geophysical airborne surveys suggest a large circular conductor located in the central part of the Tony Block, as well as weaker conductors scattered within the Tony Block (Figure 9.1). The main circular conductor, which has proven to display graphite mineralization, was the focus of ground exploration work by NMG since 2014.

## 7.2 Property Geology

The majority of the lithologies present on the Tony Block are the typical metasedimentary rocks, which were assigned to being part of the “Grenville Series” of Logan (1863). The term Grenville Series was redefined as the “Grenville Supergroup” by Wynne-Edwards (1972). The principal lithologies diagnostic of the Grenville Supergroup are; aluminous paragneisses (garnet, sillimanite, biotite, graphite), marble (crystalline limestone), quartzite, amphibolite, and related rocks. All these lithologies occupy a large area in Quebec, Ontario, and northern New York State, which is referred to as the Central Metasedimentary Belt; Mont-Laurier Basin; Monocyclic Belt, etc. Thus, the Tony Block lies within this Central Metasedimentary Belt (“CMB”) (Figure 7.1). The following paragraphs summarize the various lithologies encountered during work performed by NMG on the Tony Block.

### 7.2.1 Paragneisses – Migmatites – Mobilizate

The aluminous paragneiss is the most abundant rock type encountered in the area and is also host to the graphite mineralization observed on the Tony Claim Block. These paragneisses are derived from the metamorphism and deformation of the original pelitic sedimentary rocks that took place during the Grenville Orogeny. Paragneisses are visually identified by the alternating centimetre to decimetre scale light to dark banding as well as their mineral assemblages. The leucocratic minerals comprising the paragneisses located on the Tony Claim Block are mostly quartz, plagioclase and potassic feldspar (orthoclase, microcline). The most common mafic mineral found in the paragneisses is biotite. The other common minerals observed in the paragneisses are; graphite, sillimanite, garnet, cordierite, sulphides (pyrrhotite, pyrite) and magnetite. The accessory minerals observed in thin sections include apatite, zircon and monazite.

The paragneisses enriched in graphite usually contain a comparable but lower amount of disseminated sulphides (pyrrhotite and/or pyrite) as provided by comparing the analysis results of graphitic carbon and sulfur content which returns approximately a one (1) to 0.75 ratio. The surficial alteration of the sulphides imparts a rusty colouration commonly observed in the paragneiss outcrops. Garnet-rich paragneisses in the area usually contain less than one (1) % graphite. They are also more leucocratic in appearance and only display slight surface alteration in outcrops.

Petrographic studies have helped to determine the chronology of the development and growth of the different minerals observed in the paragneisses of the Tony Block:

- Biotite and graphite show intimate growths;
- Sillimanite may contain inclusions of both biotite and graphite;
- Cordierite may contain inclusions of biotite, graphite and sillimanite;
- Garnet may contain inclusions of sillimanite, biotite, and/or graphite.

The mineralogical assemblage observed in these paragneisses, and particularly the development of sillimanite, indicates that these rocks were subjected to a very high grade of metamorphism of the upper amphibolite facies. In addition, the textural and structural relationships of the minerals present indicate that these rocks are the product of very strong syntectonic deformation. This is made further evident by the strong foliation and tectonic banding shown by the preferred orientation of the biotite, graphite, sillimanite, elongate quartz lenses and ribbons present in the rock.

During such a high grade of metamorphism, the paragneisses start to undergo partial melting (anatexis) to different degrees, resulting in the formation of migmatites. The migmatites, in which the product of partial melting and segregation is present in the form of lit-par-lit layers and bands parallel to the foliation in the paragneiss, are designated as metatexites.

During anatexis, the migration and subsequent crystallization of a melt within the source rock produces in-source leucosomes, also called mobilizate. This material is leucocratic, generally white to very pale pink in colour, and granitic in composition. It can form centimetre to metric-size units. The presence of garnet in the mobilizate distinguishes it from common granite and/or pegmatite intrusions.

### 7.2.2 Marble and Calc-Silicate Rocks

The calc-silicate rocks, containing a larger proportion of carbonate minerals, accompanied by a smaller proportion of calc-silicate minerals, in fact represent somewhat impure crystalline limestone (marble) in the CMB. The recrystallization of carbonate minerals and the development of calc-silicate minerals took place during the deformation and metamorphism event of the Grenville Orogeny.

The presence of calc-silicate units with thickness ranging from centimetre to metric scale was observed and recorded during drill core logging. Some of these units are also useful as key horizons that can be correlated in different drill holes, especially for the South Zones. These units can be identified by an effervescent reaction to diluted hydrochloric (HCl) acid. They are usually pale in color with green specks or light green with white specks and display a gradational contact into paragneiss units.

The calc-silicate rocks are generally medium to coarse grained where the granoblastic carbonate minerals predominate. In addition, there is common development of diopside and scapolite, in large and small grains, well distributed in the rock. The rock may contain very minor grains of sphene observed in thin sections. In some cases, the presence of tourmaline, blue-green in colour, has also been noted.

### 7.2.3 Metagabbro

Thin units of metagabbro were also observed during drill core logging. Some of these units can be correlated in the drill holes. The metagabbros represent small mafic intrusions in the form of either sills or dykes that have been transposed parallel to the general structure of the surrounding metasedimentary rocks. They are visually identified by their dark green color and mineral assemblage. They also offer a sharp contact which is usually biotite rich.

Metagabbros represent a deformed and metamorphosed gabbro, which has undergone a large degree of recrystallization but still preserved some primary textures, and primary mineral assemblages. The primary preserved minerals include; large plagioclase grains that commonly show good zoning, and large clinopyroxene and orthopyroxene grains.

The effects of deformation and accompanying recrystallization are: smaller broken and recrystallized plagioclase, clinopyroxene, orthopyroxene grains, development of large and small reddish biotite flakes showing good preferred orientation. This rock can also contain large and small garnet porphyroblasts. The accessory minerals observed in thin section include apatite, magnetite, sulphide and zircon.

### 7.2.4 Charnockite Granite

Several large and small outcrops of a charnockite granite were observed in the central part of the Tony Block and drill hole intersections are noted mostly in the North-West area of the West Zone. The rock varies in grain size from coarse-grained to medium grained. The rock generally shows a foliation, which in some outcrops is very intense and even mylonitic.

The distinguishing feature of this granitic rock is a good greenish to pink colour in fresh surfaces, and a brownish colour on weathered surfaces which is very characteristic of the charnockite group rocks.

### 7.2.5 Graphite

It is quite common to observe the presence of flakes of graphite disseminated in the marbles and rusty biotite paragneisses of the Grenville Supergroup in the Central Metasedimentary Belt, in Quebec and in Ontario. These two (2) rock types are considered favourable for the large economic concentrations of graphite.

The observations of the graphite bearing biotite paragneisses, in the field, in drill core, and in thin-sections, clearly indicate that the graphite flakes and the associated biotite flakes are strongly lepidoblastic, and define the strong foliation. In thin-section, biotite and graphite show an intimate relationship, indicating that their development took place quite early, followed by the development of sillimanite and garnet, respectively. The presence of sillimanite in the paragneisses, and the common evidence of partial melting of the paragneisses indicate that the development and growth of graphite and all the associated minerals is syntectonic, and under the metamorphic conditions which are equivalent to the upper amphibolite facies.

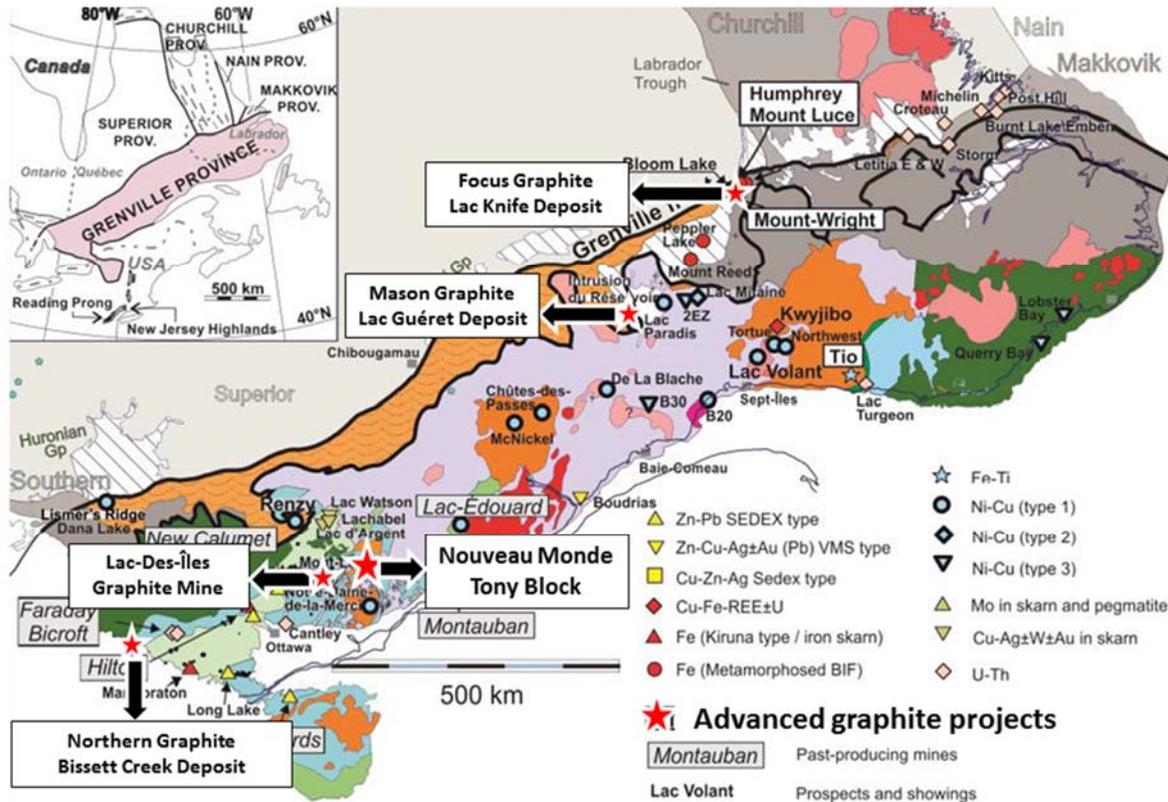
### 7.3 Mineralization

#### 7.3.1 Regional Mineralization

The Grenville geological province is well known for its extensive anorthosite intrusives quarried for dimensional stone, its industrial minerals, and its iron and titanium deposits. The province also includes numerous Ni-Cu, Mo, Zn-Pb, Zn-Cu-Ag, REE and U-Th deposits, as illustrated in Figure 7.6. More information concerning the mineral deposits and mineralization found in the Grenville Province can be obtained from Avramtchev and Piché, 1981 (DPV 809), as well as in Avramtchev and LeBel-Drolet, 1981 (DVP 744). The Grenville Province is also host to the only presently active crystalline flake graphite mine in North America, the Lac-Des-Îles mine, owned by Imerys Graphite and Carbon S.A., a French multinational company. It is located near the community of Lac-Des-Îles, Province of Quebec (Figure 7.6).

The more immediate area outside of the Tony Block includes a few mineralized occurrences (Figure 6.1). Some, like mica and garnet, may not be of much interest now, but at one time, extensive effort was devoted to finding and extracting these minerals. Molybdenite, rare earth elements, uranium-thorium minerals, base metals and other minerals have been sought in the general area in the past and remain the subject of limited interest here.

Figure 7.6 – Geology and Major Mineral Deposits of the Grenville Province



Modified from Corriveau et al., 2007.

### 7.3.2 Tony Block Graphite Mineralization

Crystalline flake graphite mineralization was first discovered on the Tony Block in mid-2014. Prospecting work, performed as a follow-up to the late 2013 airborne survey (Dubé, 2014, GM 69067), resulted in the collection of nine (9) grab samples that returned values in excess of 5 % C(g) (Cloutier, 2015, GM 69069). Subsequent to this discovery, a short ground TDEM survey was conducted over four (4) areas where the 2013 airborne survey displayed strong conductors. Trenching was then performed in each of these areas, resulting in the discovery of graphitic paragneiss horizons displaying thicknesses of over 20 metres. The best intersections were provided by trenches TO-14-TR-2 and TO-14-TR-4, which returned 5.7 % C(g) over 22 m and 5.1 % C(g) over 25.8 m, respectively.

Thrilled by these results, NMG proceeded with another TDEM airborne survey in early 2015, thus completing coverage of the main conductors in the area. Drill programs were then devised to test the significant conductors, now totaling over 12 km in strike length and separated into seven (7) zones: Far-West, West, North, North-East, East, South-East and South-West (Figure 9.1).

The drilling and trenching of all the mineralized zones located on the Tony Block, including the West Zone, revealed that the mineralized graphitic paragneiss units vary from a few centimetres to tens of metres in thickness. Overall, a stacking of these beds, or horizons, has shown to provide fairly homogeneous and continuous mineralization. The foliation, or gneissosity, of graphitic paragneiss horizons seems to be dipping mostly outwards from the main circular conductive anomaly seen in Figure 9.1 with the exception of the West Zone, whose mineralized horizons dip at about 60 to 70 degrees towards the South-East (or the interior of the anomaly) at the northern extremity and incrementally dips steeper going South where it becomes sub-vertical at the southern extremity. Overall, the dip of the other mineralized horizons varies from 30 degrees to sub vertical. The main graphitic horizons pinch and swell from four (4) m to around 80 m in width along strike, and drilling suggests that they are mostly open at depths greater than 150 m from surface. The thickness and extent of the mineralization found to date on the Tony Block is illustrated and further discussed in Section 10.0 of this Report.

The graphitic horizons are interbedded with garnet paragneiss units displaying low graphite content and ranging from a few centimetres to tens of metres in width. Both the graphitic and the garnet paragneiss horizons can contain very little to high percentages of leucocratic mobilizate, thought to be the product of partial melting. The paragneiss is given the name of metatexite when the mobilizate layers of varying thickness are common, and are distributed in a lit-par-lit manner parallel to the foliation. These units are usually sub-parallel to the main foliation and often border the mineralized zones. All mineralized zones, with the exception of the West Zone, are limited by unmineralized to poorly mineralized paragneiss and sometimes metatexite. The Mineralization of the West Zone is usually bounded to the West by metatexite or charnockite and to the East by unmineralized paragneiss and further outside of the mineralization (usually less than 100 m), by charnockite.

The crystalline graphite flakes are mostly aligned parallel to the main foliation and they are disseminated fairly homogeneously within the mineralized horizons. Graphite mineralization is often found in the presence of sulphides, or in the case of the Tony Block, mainly pyrrhotite. This is made further evident by the correlation between the mineralized intersections and a strong magnetic field measured using a magnetic susceptibility meter (MPP probe by Instrumentation GDD Inc.) over the drill core.

## 8.0 DEPOSIT TYPES

Crystalline flake graphite mineralization has been the focus of exploration by NMG on its Matawinie Property, including the Tony Block.

The deposit type described in this Section is used as an indication of what could be found on the Tony Block, which contains similar geological environments and settings. The reader should also note that resources of this deposit type may not reflect the mineralization and/or results that might occur on the Tony Block.

### 8.1 Crystalline Flake Graphite Deposit Type

Crystalline flake graphite deposits are usually sedimentary in origin. They occur when carbon-rich organic content accumulated during sedimentation is transformed into graphitic carbon crystals, or flakes, during metamorphism. They are commonly stratabound and hosted by porphyroblastic and granoblastic paragneiss, marbles, and quartzites (Harben and Kuzvart, 1996). Alumina-rich paragneiss and marble units in upper amphibolite or granulite grade metamorphic terranes are the most favourable host rocks. When present, flake graphite usually occurs in thin, centimetre to metre wide bands. In favourable conditions, wider coalescing bands in fold crests can provide sufficient volume needed for an economic deposit.

Economically significant deposits are several metres to tens of metres thick and hundreds of metres in strike length. The economic quantifiers in flake graphite deposits are mostly graphite flake size, quantity and purity. According to Simandl, G.J. and Kenan, W.M. (1997), “Grade and tonnage of producing mines and developed prospects varies substantially. The median grade and size is 9.0 % C(g) and 2.4 M tonnes respectively (Bliss and Sutphin, 1992). Depending on market conditions, large deposits containing high proportions of coarse flakes, which can be easily liberated, may be economic with grades as low as 4 %.”

The Lac-Des-Îles mine, owned by Imerys Graphite and Carbon and located near the town of Lac-Des-Îles, Québec, is the only presently active crystalline flake graphite producer in Québec and is an archetypal example of this type of deposit. This deposit is located some 125 km to the WSW of the Tony Block. Focus Graphite’s Lac Knife deposit and Mason Graphite’s Lac Guéret deposit, both located in Northern Quebec, as well as Northern Graphite’s Bissett Creek deposit in Ontario, are three (3) other known significant crystalline graphite flake deposits found in eastern Canada and within the Grenville geological Province (Figure 7.6).

## 8.2 Exploration Methods

Graphite is a very conductive mineral and electromagnetic detection methods can therefore be successfully used to explore for high-grade crystalline flake graphite deposits. Such methods include Time Domain Electromagnetic (“**TDEM**”), Frequency Domain Electromagnetic (“**FDEM**”), Induced Polarization (“**IP**”), self-potential and other types of Electromagnetic (“**EM**”) surveys.

In a report detailing the 2012-2013 exploration work on the Matawinie Property (Cloutier, 2015, GM 68856), Cloutier proposes the following exploration steps for crystalline flake graphite exploration in Canada:

- Identification of an area with known organic-bearing metasediments in amphibolite to granulite terrane;
- Conducting of a regional airborne TDEM survey at a one (1) km spacing to discriminate large-scale conductive targets. These can then be flown in more detail at a 100-m spacing to provide better resolution;
- Ground follow-up of targets can be performed using a portable conductor detector such as the Beep Mat from GDD Instrumentations (according to the manufacturer, it can detect conductive material at a maximum depth of three (3) m, although field tests indicate a useful scanning depth of one (1) m for graphite exploration). Visual observation is also very effective; graphite is easily identifiable by its silver metallic sheen, softness and dark-grey to black streak. The goal of the follow-up is to identify mineralization with values in excess of 5 % C(g) with a potential for being over five (5) m thick and hundreds of metres long;
- Mineralization showing potential economic grade and volume should be sampled and processed to test its crystalline flake size distribution and carbon purity. Trenching could be performed to confirm the potential size of the mineralization. Trench location can be optimized by using a portable ground TDEM system such as the PhiSpy, which detects conductors to a depth of 10 to 15 m in real time;
- Subject to favourable metallurgical results, and potential for adequate volume, further assessment of a showing can be performed by additional ground EM surveying, trenching and ultimately, core drilling.

## 9.0 EXPLORATION

Exploration work on the Tony Block was first initiated by 3457265 Canada Inc., in late 2013, when a detailed airborne geophysical survey was performed in the area. The 2013 survey was executed following positive results from a regional survey by 3457265 Canada Inc. that covered over 2,100 km<sup>2</sup> pursuant to the instructions provided by NMG's technical staff (confidential internal documents). Subsequent work was then conducted by NMG and includes ground follow-up prospecting, ground geophysics, trenching, scoping level metallurgical testing and core drilling.

Section 9.1 below summarizes the reports pertaining to the historical work mentioned above and Section 9.2 summarizes the main exploration methods and protocols used by NMG during the course of its exploration programs.

### 9.1 Exploration History

A list of reports describing the relevant exploration work performed by NMG on the Tony Block is presented in Table 9.1. The exploration reports are listed in chronological order, starting with the earliest reports. In addition to the reports available on the EXAMINE system, a technical report detailing a Preliminary Economic Assessment concerning the Tony Block, prepared by Norda Stello, (Pierre H., Terreault et al., 2016) and completed in accordance with National Instrument (“NI”) 43-101 guidelines, was published on SEDAR (<http://www.sedar.com>) on August 5<sup>th</sup>, 2016.

**Table 9.1 – Previous Exploration Reports for Work Performed on the Tony Block**

Report ID	Type of Report and Comments
GM 69067	Late 2013 Heliported Magnetic and TDEM surveys totalling 1,006 line-km over four (4) blocks composing the Matawinie graphite Property. The survey covers part of the Tony Claim Block.
GM 69069	2014 Prospecting and trenching on the Matawinie Property by NMG.
GM 69560	2015 Heliported Magnetic and TDEM surveys on the southern and western part of the Tony Block totalling 299 line-km.
GM 69561	2014-2015 Ground TDEM PhiSpy Surveys on the Tony Block totalling 100.6 line-km.
SEDAR*	Technical Report detailing the Mineral Resource Estimate of the South-East and South-West Zones on the Tony Block. (this report was superseded by the updated report below)
GM 69562 + SEDAR*	Technical Report detailing the updated Mineral Resource Estimate of the South-East, South-West and West Zones on the Tony Block (this report was superseded by the updated report below).
SEDAR*	Preliminary Economic Assessment Report detailing the Mineral Resource Estimate of the West Zone

\* Currently available on SEDAR

## 9.2 Exploration Methodology and Results

NMG’s field programs on the Tony Block focused on graphite exploration consisting of:

- Airborne TDEM surveys (2013 and 2015);
- Ground prospecting of conductive targets identified by the airborne surveys (2014-2015);
- Ground geophysical surveying using a portable TDEM system (2014-2017);
- Trenching and channel sampling of the main conductors (2014 to 2016);
- Drilling of the main mineralized zones (2015-2016) (further discussed in Section 10.0);
- Metallurgical testing on surface and drill core samples (further discussed in Section 13.0).

An overview of the significant 2013 to 2017 exploration results are summarized in Figure 9.3 with the exception of the metallurgical test results, which are discussed in Section 13.0.

Figure 9.1 – 2013 and 2015 Airborne TDEM Survey Results

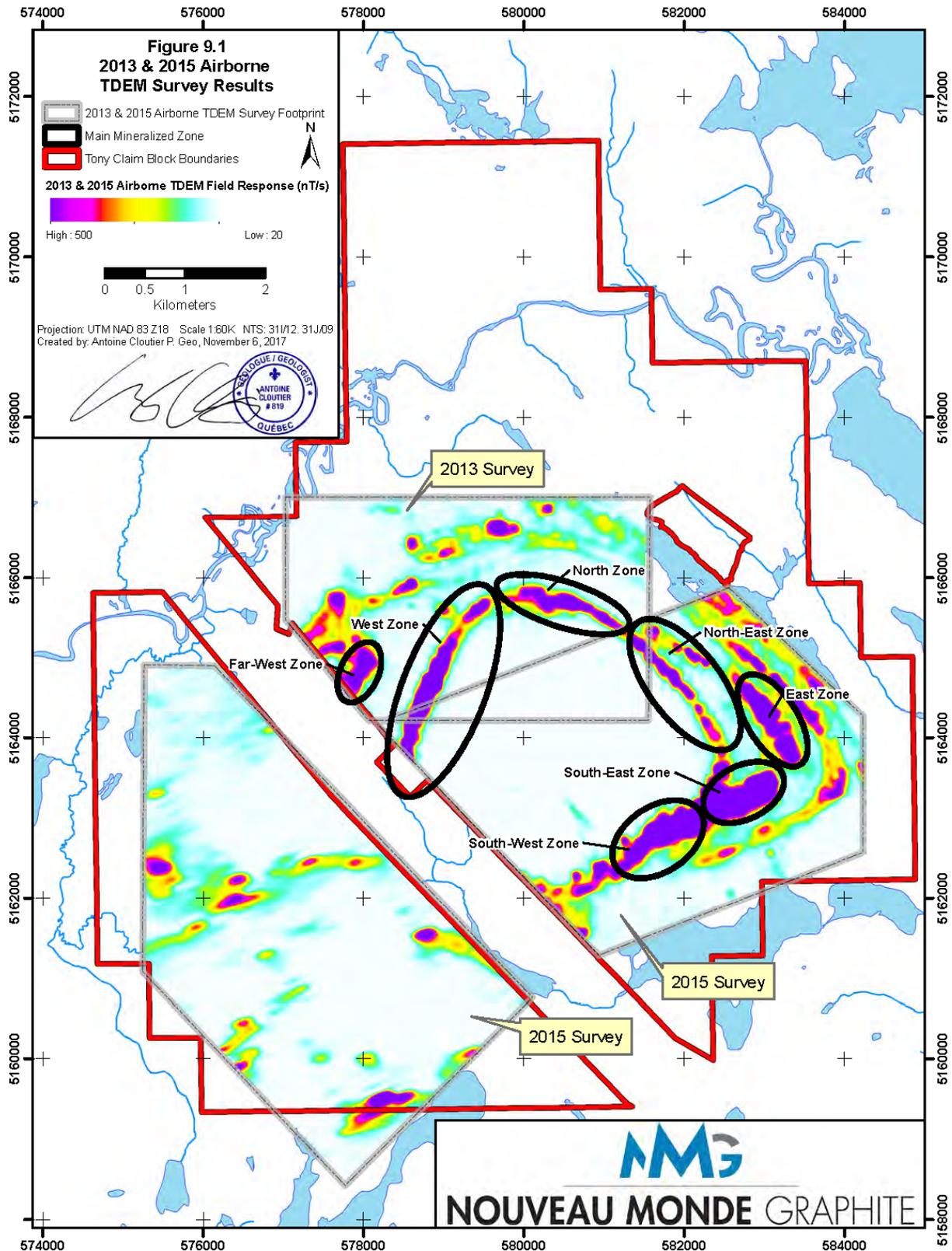


Figure 9.2 – 2014-2017 PhiSpy Survey Results

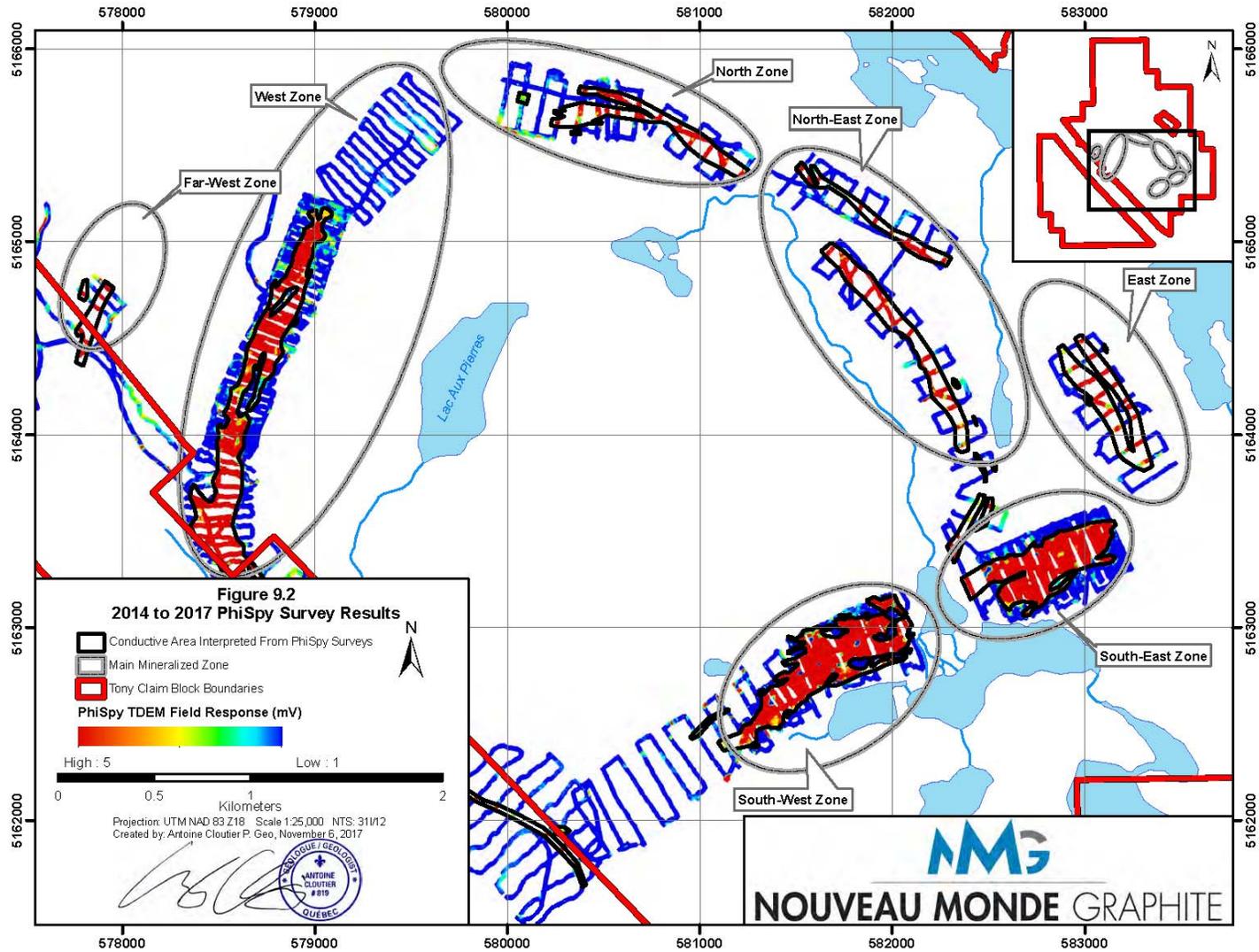
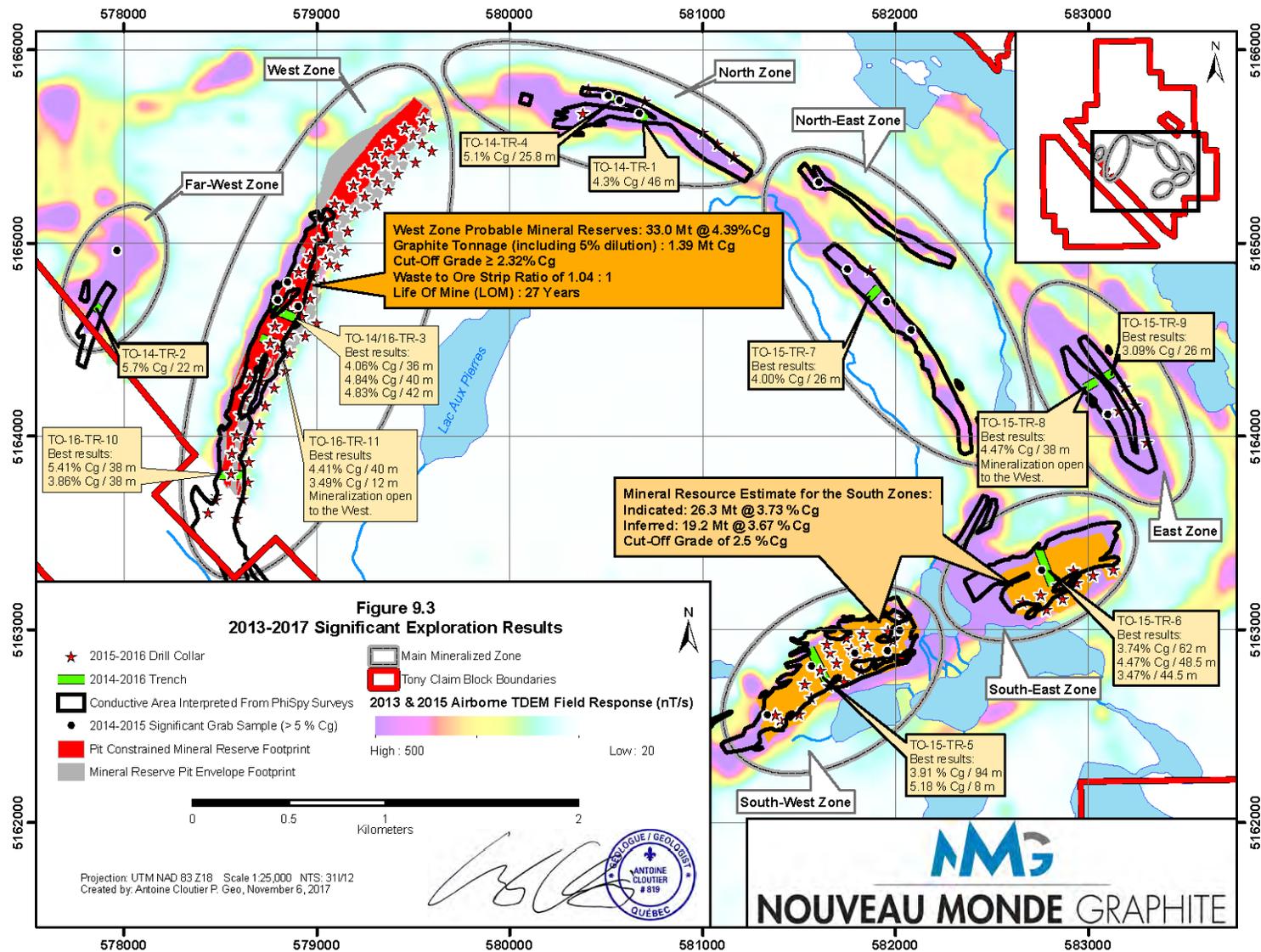


Figure 9.3 – Significant 2013-2017 Exploration Results



### 9.2.1 Airborne Geophysical Surveying

Graphitic mineralization is conductive whether it is in amorphous or crystalline form. This physical property enables the detection of graphite using remote electromagnetic surveying methods. Its detection is enhanced by proper connectivity between grains and quantity or volume of graphite present. The regional survey performed by 3457265 Canada Inc. aimed to detect graphite mineralization in the area and used a time domain electromagnetic sensor to do so.

A heliborne regional geophysical survey was first completed in the area, under the guidance of NMG consultants. This survey, covering 2,100 km<sup>2</sup>, was flown by Prospectair Inc. (based in Gatineau, Québec) using one (1) km line spacing and detected large conductors, including part of the main circular conductor present over the Tony Claim Block. Two (2) detailed heliborne surveys were then performed, one (1) in late 2013 and a second in early 2015, to provide better accuracy and to delineate the extent of the conductors (Figure 9.1).

These detailed surveys were flown at 100-m spacing and delivered targets for ground follow-up prospecting. A magnetometer was also used during the heliborne TDEM surveys to provide additional geophysical measurements. Results indicated that the circular conductive anomaly also demonstrated a positive magnetic contrast compared to the regional average. Samples from future ground work (prospecting, trenching and drilling), established that the graphite mineralization is associated with a sufficient amount of magnetic pyrrhotite to provide positive magnetic anomalies. It is important to note that due to the interference caused by the presence of high voltage power lines in the middle of the Tony Claim Block, the airborne TDEM surveys did not cover that area.

### 9.2.2 Prospecting

The 2014 and 2015 prospecting programs targeted strong conductors identified earlier by the airborne TDEM surveys. Outcrops in the conductive areas were visually inspected and sampled where graphite mineralization was observed. The use of a Beep Mat, a portable device capable of detecting conductors to depth of up one (1) m, was instrumental during prospecting to scan for soil-covered shallow conductors. Generally, a grab sample, about one (1) to three (3) kg in size, was collected if the outcrop displayed above-background conductivity using the Beep Mat (readings usually over 100 in the High Frequency or HFR channel). Most conductors identified using the Beep Mat were covered by a thin till veneer (< 1 m) that had to be cleared manually using a hand shovel. Significant grab sample results are defined as those greater than five (5) % C(g). The collection of 19 samples grading above five (5) % C(g) confirmed the potential for the 12 linear kilometres of continuous TDEM anomalies, displaying a circular geometry surrounding *Lac aux Pierres*, to host sizeable mineralization. Significant grab sample locations from the 2014 and 2015 prospecting programs are illustrated in Figure 9.3.

Grab samples were initially described in the field. Information such as rock type, mineralization and coordinates (UTM) were recorded. Samples were hand cleaned using stream water and placed in individual plastic bags. These were bundled and sent in 20 L plastic pails by courier to the ALS Minerals facilities in Val-d'Or, Quebec, for processing, weighing, crushing and pulverizing. The resulting powders were then sent to ALS Minerals' North Vancouver facilities for analysis. Analytical packages were chosen to test for graphite ["C(g)", package C-IR18], total carbon ["C(t)", package C-IR07] and sulphur ("S", package S-IR08).

No quality control samples were inserted by NMG during the course of these prospecting programs. Additional information on the analytical packages is available on the ALS Minerals website (<http://www.alsglobal.com/en/Our-Services/Minerals/Geochemistry>).

### 9.2.3 PhiSpy Surveying

Ground PhiSpy TDEM surveys were carried-out by Dynamic Discovery Geoscience Inc., based in Ottawa, Ontario. These surveys, now totalling about 110 line-kilometres, were mostly performed perpendicular to the main circular airborne anomaly following encouraging grab sample results. Surveys used a grid of cut lines covering the main airborne anomaly with spacing varying from 25 m to 100 m to enable remote mapping of the mineralization (Figure 9.2). The survey results were used to plan for trenching and diamond drilling operations. The PhiSpy apparatus, carried by a two (2) man team, has demonstrated a capacity to detect conductors to a depth of approximately ten (10) to 15 m. The lack of conductors identified by the PhiSpy over the northern portion of the West Zone is explained by the presence of thick overburden (> 15 m).

### 9.2.4 Trenching and Channel Sampling Program

The 2014 to 2017 ground TDEM surveys delineated wide conductive areas over each of the targeted mineralized zones. A trenching program was initiated on the widest part of the conductive areas identified over these zones. As a result, four (4) trenches were excavated in 2014, five (5) in 2015 and three (3) in 2016. Antoine Cloutier, P. Geo., supervised all trenching and channel sampling operations to date on the Tony Block. Trenches were oriented roughly perpendicular to the foliation of the paragneiss units and mineralized horizons when possible. Table 9.2 displays trench coordinates, as well as other useful information regarding the trenching programs.

**Table 9.2 – Trench Location and Relevant Information**

Trench ID	Mineralized* Zone	Grid Line	Trench Start **		Trench End **		GPS** Length (m)	Measured Length (m)	Azimuth (deg)	Total Samples
			Easting	Northing	Easting	Northing				
TO-14-TR-1	North	NA	580673	5165671	580704	5165642	42.4	48	133	23
TO-14-TR-2	Far-West	NA	577856	5164670	577871	5164656	20.5	22	133	11
TO-14/16-TR-3	West	W+0875	578903	5164603	578757	5164665	158.7	158.55	293	77
TO-14-TR-4	North	N-1000	580525	5165764	580524	5165739	25	25.8	182	14
TO-15-TR-5	South-West	S-1500	581558	5162903	581640	5162733	189	193	154	73
TO-15-TR-6	South-East	S-2800	582813	5163230	582740	5163424	207	198	339	84
TO-15-TR-7	North-East	N-2700	581857	5164711	581910	5164765	76	77	45	35
TO-15-TR-8	East	E-2200	582981	5164250	583041	5164284	69	68	60	33
TO-15-TR-9	East	E-2200	583071	5164297	583126	5164327	63	62	61	31
TO-16-TR-10	West	W+0025	578631	5163800	578496	5163800	135.15	138	270	69
TO-16-TR-11	West	W+0700	578822	5164466	578711	5164511	119.3	120	292	61

\* The West Zone is the main subject of this Report as it contains the only Mineral Reserves identified as the Report effective date on the Property.

\*\* Trench coordinates and length was measured using a Garmin GPS model 76 CSX providing about five (5) m of precision with the exception of trenches completed in 2016 which were professionally surveyed and have a precision of 0.05 m.

A summary of significant channel sample results is available in Table 9.3, below, and trench locations are illustrated in Figure 9.3.

**Table 9.3 – Significant 2014 to 2016 Trench Channel Sample Results**

Trench ID	Mineralized Zone*	From (m)	To (m)	Grade [% C(g)]**
TO-14-TR-1	North	0	46	46 m @ 4.32% C(g)
TO-14-TR-2	Far-West	0	22	22 m @ 5.72% C(g)
TO-14/16-TR-3	West	14	50	36 m @ 4.06% C(g)
		63	103	40 m @ 4.84% C(g)
		111	153	42 m @ 4.83% C(g)
TO-14-TR-4	North	0	25.8	25.8 m @ 5.11% C(g)
TO-15-TR-5	South-West	61	155	94 m @ 3.91% C(g)
		185	193	8 m @ 5.18% C(g)
TO-15-TR-6	South-East	0	62	62 m @ 3.74% C(g)
		69.5	118	48.5 m @ 4.47% C(g)
		147.5	192	44.5 m @ 3.47% C(g)
TO-15-TR-7	North-East	30	56	26 m @ 4.00% C(g)
TO-15-TR-8	East	0	38	38 m @ 4.47% C(g)
TO-15-TR-9	East	20	46	26 m @ 3.09% C(g)
TO-16-TR-10	West	6	42	36 m @ 3.86% C(g)
		90	128	38 m @ 5.41% C(g)
TO-16-TR-11	West	16	28	12 m @ 3.49% C(g)
		80	120	40 m @ 4.41% C(g)

\* The West Zone is the main subject of this Report as it contains the only Mineral Reserves identified as the Report effective date on the Property.  
 \*\* Interval length does not represent true width. All analyses were performed by ALS Minerals Laboratories and delivered as graphitic carbon [C(g)], internal analytical code C-IR18.

Trench locations were mostly chosen based on the results of ground PhiSpy surveys. In 2014, the trenching program aimed at sampling only mineralized material along the trenches in order to determine the potential of the mineralization while in 2015 and 2016, channel sampling usually started two (2) or four (4) m [one (1) to two (2) sample lengths] outside the visible mineralized area and were collected in a continuous manner as to prevent any sample bias. In some instances, large boulders, the accumulation of water and prohibitive depth prevented the excavation and/or sampling of portions of the planned trenches.

In 2016, trench TO-14/16-TR-03 was extended to the East and to the West to properly expose the conductive area. Mineralization remains open to the East side of trench TO-14/16-TR-3, on the northern side of trench TO-14-TR-4, the South side of trench TO-15-TR-5, on the South side of trench TO-15-TR-6 on the West side of trench TO-15-TR-8 and on the West side of trench TO-16-TR-11.

Trenching was carried out using a small excavator. Trenches were mostly positioned over cut lines used for the ground TDEM surveys. Trenches were approximately 1.5 m in width and varied from 0 m to four (4) m in depth.

A hand shovel and gas-powered broom were used to clean the outcrop once excavation was completed. Sample lengths were marked and cut perpendicular to the trench alongside a 30-m long measuring tape. Aluminum tags, numbered according to the samples, were placed in cut marks, usually at the beginning of every sample.

Channel samples were cut with a gas-powered rock saw; most samples were approximately two (2) m in length, four (4) cm in width and ten (10) cm in depth, and weighed between ten (10) kg and 20 kg. Once cut, the channel samples were chiselled out and placed in individual plastic bags. Bags were identified with a sample number and a numbered tag was also inserted into the bag. Trench positions were measured using a handheld Garmin GPSMAP 76CSX unit providing an accuracy of about five (5) metres. The error inherent to the GPS could explain the difference compared to the trench lengths obtained with a measuring tape, shown in Table 9.2. The latter can also be inaccurate, especially in uneven terrain. All Individual West Zone trench sample start and end points were surveyed by a surveying company (Corriveau J. L. & Assoc. Inc, Surveying, Val d'Or, Qc.). This was necessary as these sample results were to be used for the preparation of an updated Mineral Resource Estimate concerning the West Zone which required greater accuracy than was provided by a commercial handheld GPS.

Channel samples were thoroughly cleaned using a pressure washer. The top weathered crust, usually about one (1) cm thick, was removed to the extent possible using a rock hammer. Samples were then bagged using their original sample number. Samples were placed in locked storage facilities. When a sufficient number of samples were ready for shipping, they were placed in large containers on a flatbed trailer and sent directly to the ALS Minerals' facilities in Val-d'Or, Québec, for processing, weighing, crushing and pulverizing. The resulting powders were then sent to ALS Minerals' North Vancouver facilities for analysis.

In 2014 and 2016, all samples were analysed for their graphite, total carbon and sulfur content using the C-IR18, C-IR07 and S-IR08 ALS analytical packages. In 2015, all samples underwent the C-IR18 package and one (1) in every five (5) sample was also tested using package S-IR08. Information on the analytical packages is available in Section 11.0

and on the ALS Minerals website (<http://www.alsglobal.com/en/Our-Services/Minerals/Geochemistry>).

The protocols concerning the insertion of quality control samples in 2014 included the insertion of one (1) duplicate sample per trench. In 2015 and 2016, depending on the terrain and ease of sampling, duplicates were collected at roughly every sample number ending in even tens, while a blank sample was added at every odd tens. In 2016, one (1) graphite standard was inserted per trench at every sample ending in “50”. The blank material used for quality control purposes was the same as the one used during the drilling program. No bias was introduced during the trenching and channel sampling operations and all quality control samples inserted within the channel sample stream returned within acceptable limits.

One notable field observation is that graphitic mineralization tends to give the water used during the cutting operation a silver sheen. Silver coloured pools and residue in the trenches should not be mistaken for a chemical or oil/fuel spill, as they are rather caused by graphite particles in suspension from the channelling work. The silver residue washes away after a few days of rain.

Trenches completed in 2014 and 2015 were all backfilled with only a few shallow windows left uncovered for posterity. The deeper portions of the 2016 samples were backfilled and trench flanks were graded to a 3-to-1 ratio (horizontal to vertical lengths) when applicable to prevent injuries to curious land users and wandering wildlife.

**Figure 9.4 – Trench TO-16-TR-11, Looking to the East**



## 10.0 DRILLING

NMG initiated an extensive drilling program in 2015 following repeated discoveries of high-grade graphite showings coincident with multi-kilometric conductive anomalies on the Tony Block. The objective of the work was to generate a Mineral Resource Estimate using current CIM, Standards on Mineral Resources and Reserves, Definitions and Guidelines. Additional drilling was performed from July to November of 2016 in the West mineralized Zone which has proven to display good economic potential as demonstrated by the results of a PEA (See News Release dated June 22<sup>nd</sup>, 2016). The 2016 drilling aimed at extending and upgrading the Mineral Resources of the West Zone in order to provide the necessary information needed for the PFS detailed in this Report.

The following table (Table 10.1) lists exploration and definition drill hole information per mineralized zone.

**Table 10.1 – Tony Block Exploration and Definition Drilling Summary**

Mineralized Zone	Total Drill Holes	Metres Drilled	Amount of Samples and Type of Analysis**						
			C-IR18	C-IR07	S-IR08	ME-MS41	AU-AA23	OA-GRA08	OA-GRA08b
West*	69	11,668.50	3,693	2,295	2,565	460	23	518	97
South-West	22	2,616.60	937	15	205	15	15	0	28
South-East	9	1,552.00	598	8	106	7	8	0	28
East	4	641.7	209	3	49	3	3	0	0
North-East	2	210.3	34	1	9	1	1	0	7
North	6	912	212	6	33	6	6	0	0
<b>Total</b>	<b>112</b>	<b>17,601.10</b>	<b>5,683</b>	<b>2,328</b>	<b>2,967</b>	<b>492</b>	<b>56</b>	<b>518</b>	<b>160</b>

\* The West Zone is the main subject of this Report as it contains the only Mineral Reserves identified as the Report effective date on the Property.

\*\* All analyses were performed by ALS Minerals Laboratories. See below for a description of each type of analytical package.

C-IR18 [Graphitic carbon or "C(g)" by LECO]

S-IR08 (Sulphur or "S" by LECO)

ME-MS41 (Multi-Element analysis of 51 elements by *Aqua Regia* extraction followed by Mass Spectroscopy)

AU-AA23 (Gold "Au" analysis by fire assay followed by Atomic absorption)

OA-GRA08 (specific gravity by measuring the weight of a core sample in air and in water)

OA-GRA08b (specific gravity by measuring the weight of a displaced solvent by adding three (3) g of a powdered sample)

In 2015, drilling and core sampling operations were supervised by Yvan Bussi eres, P. Eng., assisted by Bernard-Olivier Martel, P. Geo. In 2016, the drilling and sampling program was solely supervised by Bernard-Olivier Martel, P. Geo. All drill hole locations are illustrated in Figure 10.1 to Figure 10.3.

In 2017, ten (10) drill holes, not mentioned above, were completed on the West Zone as part of a geotechnical investigation program. These 200 m long holes, drilled at a dip of 45°, were not sampled for C(g). The results of this investigation are mentioned in Section 16.1.2.

## 10.1 Drilling Program Overview

From September to December 2015, NMG drilled 27 holes on the West Zone. These holes are numbered TO-15-36 to TO-15-40 and TO-15-53 to TO-15-74, for a total of 4,546 m. An additional 42 holes were drilled in the West Zone in 2016. These were numbered from TO-16-75 to TO-16-116 bringing the total metres drilled in the West Zone for graphite sampling purposes to 11,668.5 m (Figure 10.1).

From June to October 2015, NMG drilled 31 holes on the South-East and South-West Zones. These holes are numbered TO-15-05 to TO-15-07, TO-15-09 to TO-15-33 and TO-15-41 to TO-15-43, for a total of 4,168.6 m (Figure 10.2). The reader should note that the five (5) drill holes (TO-16-97, 98, 99, 115 and 116) located in the southern part of the West Zone were at the time located outside of the Property limits and thus the mineralization intercepted in these holes was not considered in the Mineral Resource Estimate published March 2<sup>nd</sup>, 2017 neither is it considered in the present Report. The Property boundary has since been expanded to contain these drill holes which could be included in future Mineral Resource Estimates.

In October 2015, NMG drilled 12 holes on other graphitic zones consisting of the North, North-East and East Zones. These holes are numbered TO-15-08, TO-15-34 to TO-15-35 and TO-15-44 to TO-15-52, for a total of 1,764 m (Figure 10.3).

The drilling program was initiated on the basis of positive results of the 2014 exploration work as well as the detailed airborne Time Domain Electromagnetic (“**TDEM**”) and Magnetic (“**Mag**”) surveys performed in the area. The initial planning of the drilling program consisted of one (1) hole per section at 100 m spacing over the most favorable targets. Within the first few drill holes, NMG intercepted graphitic horizons many tens of metres thick indicating potential to delineate good tonnage. The follow-up drilling was planned at more or less 50 m to 80 m spacing between holes on the same section. Due to the good continuity displayed by the graphitic horizons, illustrated by the ground TDEM surveys at 25 m line spacing, drilling on sections spaced at 100 m was considered adequate to delineate the graphite resources.

Figure 10.1 – 2015-2017 Trenching and Drilling Program, West Zone

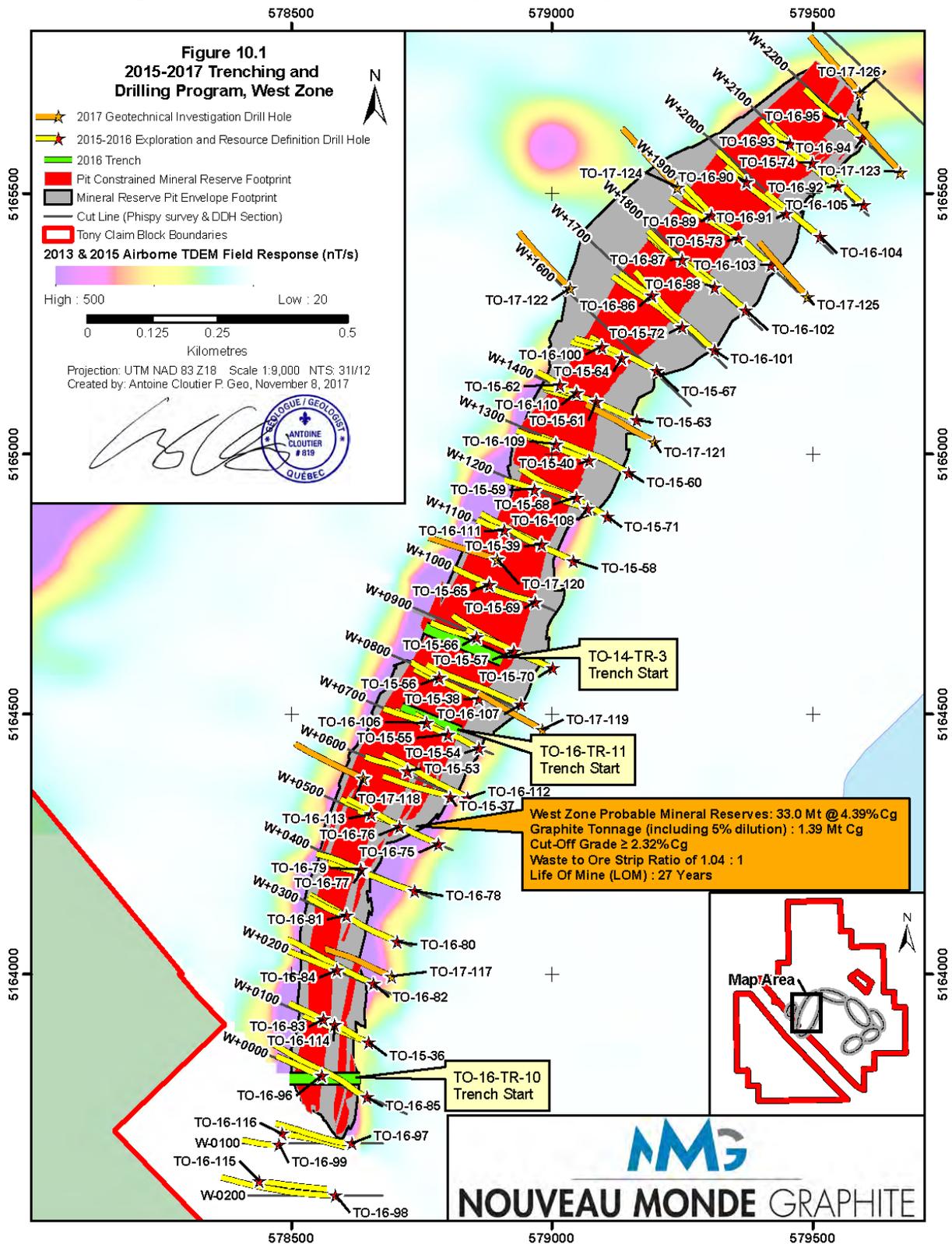


Figure 10.2 – 2015 Trenching and Drilling Program, South-East and South-West Zones

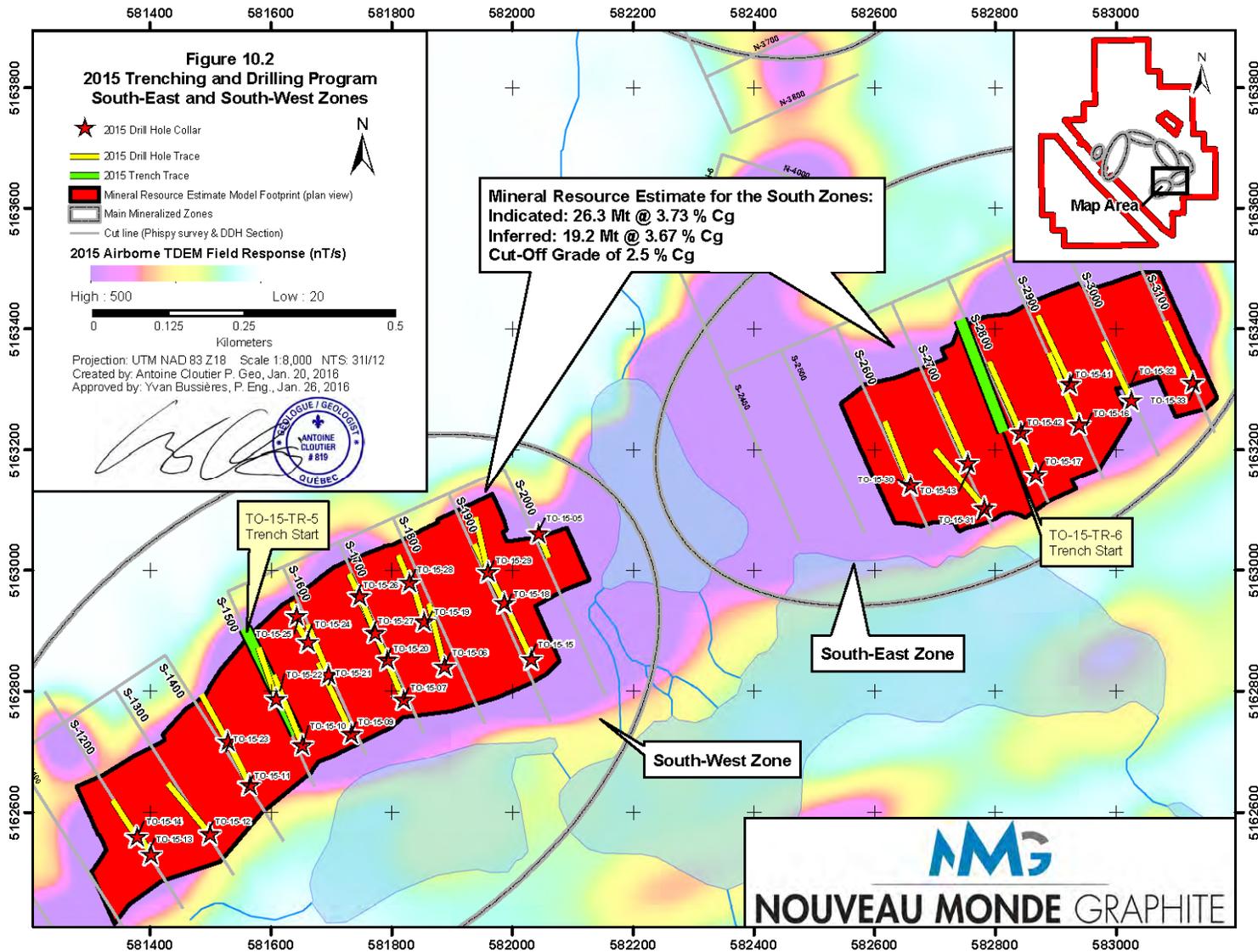
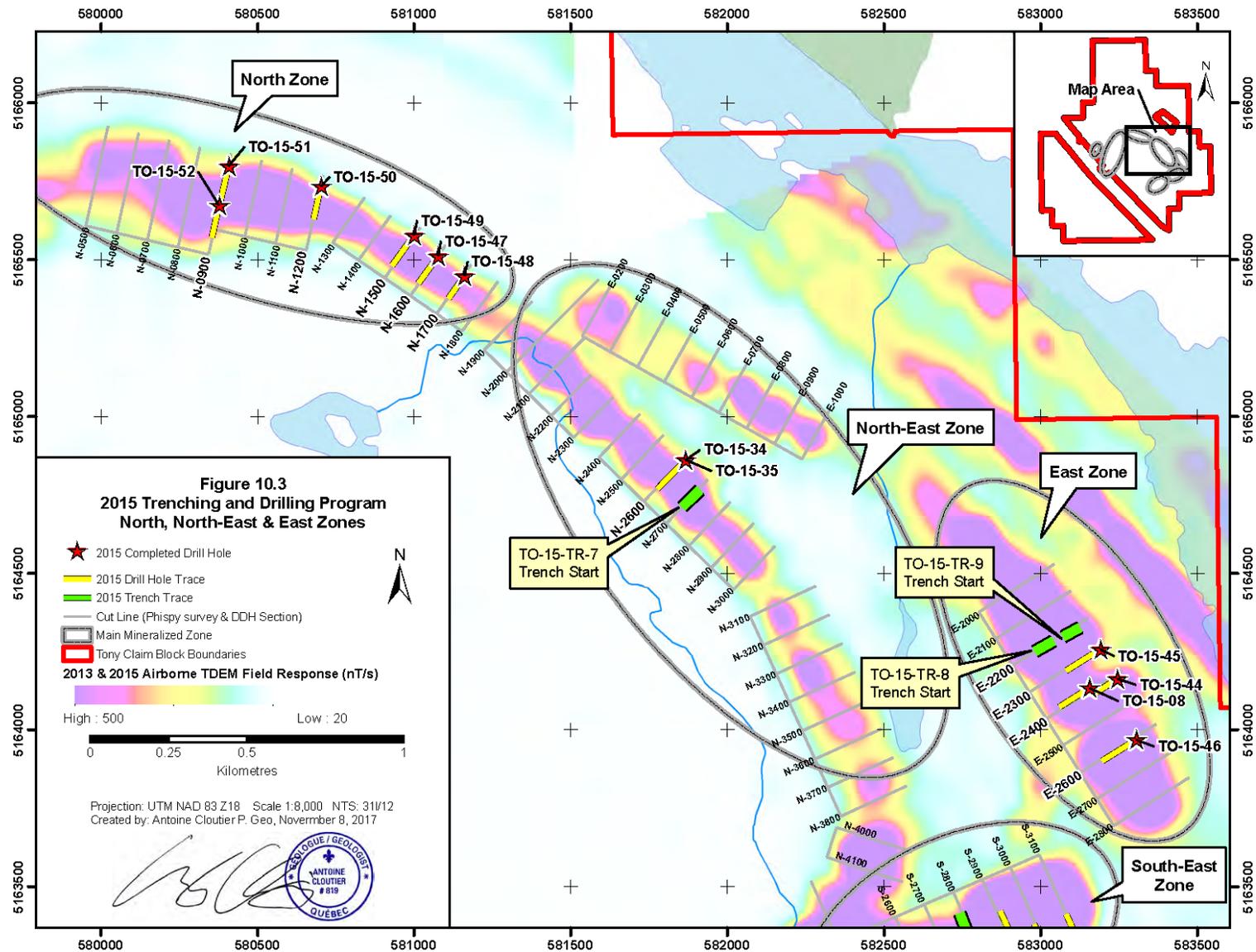


Figure 10.3 – 2015 Trenching and Drilling Program, North, North-East, and East Zones



## 10.2 Drilling Protocols and Procedures

NMG applied the following drilling operation procedures;

### 10.2.1 Drill Hole Location

Drill hole location was based on:

- The ground TDEM survey (PhiSpy) results, which mapped the potential location of graphitic horizons under an overburden thickness of less than 15 metres. Drill holes were collared at approximately ten (10) m to 30 m behind the interpreted contact to enable the sampling of non-mineralized rock before intersecting the graphitic horizon as well as to provide information at depth;
- The geological information available;
- The trench and channel sample results;
- The interpretation of the geology of the drill hole section;
- Maximization of the graphitic horizon to be intercepted by the drilling;
- Minimization of the number of metres drilled to properly define the mineralized horizons.

Drill sites were located using a handheld GPS and oriented using a handheld compass. In 2015, drilling used mostly BTW size tubing providing a core diameter of 42 mm although some drilling over the West Zone used NQ size tubing providing a core diameter of 47.6 mm. All drilling in 2016 used NQ size tubing with the exception of holes TO-16-77, TO-16-79, TO-16-81, TO-16-83 and TO-16-99 which used BQ size tubing. Drilling aimed at identifying the extent of mineralization to a depth of at least 150 m from the surface for the West Zone and to a depth of at least 100 m from surface for the other mineralized zones.

### 10.2.2 Drilling Supervision

During drilling operations:

- The geologist visited the drill rig at least once per hole to verify its correct position and designation number;
- The drill operator collected one (1) deviation reading for each 50 m of drilling using tools such as the Reflex Easyshot and the Ranger;

- The drill operator carried the full core boxes at the designated secure site (protected by a locked gate and video surveillance) at 480 Rue des Aulnaie, Saint-Michel-des-Saints, at the end of each shift;
- Before completing the drill hole, the geologist determined whether the target has been reached, and if not, the geologist requested that drilling continues.

Once the drill hole was completed:

- The casing was left in place for surveying purposes;
- In 2015, a wooden log was inserted in the casing and a flag was attached to the log. An aluminum tag identified with the number, azimuth, dip and length of the hole was attached to the flag. In 2016, metal caps and flags identifying the hole number were bolted on the casings;
- Casing locations were professionally surveyed with a precision of 0.05 m. Surveyors Gilles Dupont, based in Repentigny (Qc), Corriveau J. L. & Assoc. Inc of, Val d'or (Qc) and Martin Larocque, based in Laval (Qc), performed surveys at various times on the Tony Block to properly locate the top centre of each casing. The casing dip reading was noted by a geologist or technician. This information was added to Geotic Log, a drill database management software.

### 10.2.3 Core Handling

Upon reception of the core boxes:

- A technician verified the continuity of the core depth markers in the core box;
- A technician measured and noted the core depth at the end of each core box;
- The technician stapled an aluminum tag on each core box on which the hole number, box number and core depth measurement were identified;
- The technician noted the magnetic susceptibility and conductivity readings provided by an MPP probe (sold by Instrumentation GDD Inc.) at every 0.5 m along the drill core. These readings have been useful for identifying the graphitic horizons. These are more magnetic than the barren or weakly mineralized units since they correlate with magnetic pyrrhotite and magnetite;
- The geologist logged (described) the drill core;
- The technician took a picture of the core boxes once the description and samples were marked in order to show the sample intervals marked by the tags.

#### 10.2.4 Core Sampling

The drill core sample was split into two (2) core quarters and one (1) core half using a rock saw. One (1) of the quarter-core was then bagged and sent for analysis, and the remaining quarter as well as the remaining half was kept as a reference and for possible metallurgical testing. Figure 11.1 shows that a quarter of the drill core is a sufficient amount to be considered representative of the graphitic mineralization.

#### 10.2.5 Sample Quality Assurance and Quality Control Measures

NMG established an extensive quality assurance and quality control (“QA/QC”) protocol to ensure the accuracy of assays. The protocol consisted of inserting duplicates, blanks and graphite standards. The QA/QC protocol is detailed under Section 11.0.

### 10.3 Drilling Results

The excellent core recovery (mostly 100 %), consistent quality control sample results and visual observation of the graphite mineralization confirms the accuracy and reliability of core sample results from the drilling performed on the Tony Bloc to date.

#### 10.3.1 Drilling Results for the West Zone

Drilling in the West Zone (or the “West Deposit”) consisted of 69 holes totaling 11,668.5 m. The West Zone is the main subject of this Report as it contains the only Mineral Reserves identified at the Report effective date on the Property.

Drill hole TO-16-77 was abandoned at 33 m in overburden due to the drill’s lack of power, all other drill holes in the West Zone were completed as planned.

Mineralization was intercepted 224 times by drilling in the West Zone resulting in the interpretation of a mineralized envelope of 100 m to about 150 m thick from which 17 graphitic horizons, or volumes, were interpreted. These horizons can be followed, sometimes sporadically, from sections W-0200 to W+2200 (a distance of 2,400 m). An additional feature of the West Zone is that some of the horizons separate and coalesce to form wider mineralized volumes. The longest intersection along drill core returned a graphite content of 4.76 % C(g) over 133.7 m although this intersection is considered as being down-dip. Table 10.3 summarizes the 17 mineralized horizons provided by drilling in the West Zone as well as the longest mineralized drill intercepts. Section 14.0 details the mineralized horizon, also referred to as mineralized volumes, interpreted from the drill core assay results.

**Table 10.2 – West Zone Mineralized Volumes and Longest Mineralized Interval**

Mineralized Volume	Longest Mineralized Core Interval*	Section	Drill Hole
W0	44.4 m @ 5.96 % C(g)	W+1700	TO-16-101
W0A	5.8 m @ 2.88 % C(g)	W+1300	TO-15-40
W1A	50.53 m @ 3.62 % C(g)	W+1200	TO-15-59
W1B_1_subs_NEG	98.8 m @ 4.72 % C(g)	W+0000	TO-16-85
W1B_2	70.1 m @ 4.17 % C(g)	W-0100	TO-16-97
W1B_3	7.1 m @ 3.32 % C(g)	W-0100	TO-16-97
W1B_4	133.7 m @ 4.76 % C(g)	W-0200	TO-16-98
W1C	40 m @ 5.69 % C(g)	W+1900	TO-16-103
W1D	43.5 m @ 4.25 % C(g)	W-0200	TO-16-98
W2	40.45 m @ 4.86 % C(g)	W+1700	TO-16-101
W2A	23.0 m @ 4.76 % C(g)	W+0600	TO-16-112
W3_1	34.52 m @ 4.14 % C(g)	W+0900	TO-15-70
W3_2	12.0 m @ 3.75 % C(g)	W+2000	TO-16-104
W3B	18.99 m @ 4.14 % C(g)	W+0800	TO-15-38
W4_1	31.1 m @ 3.36 % C(g)	W-0100	TO-16-97
W4_2	10.0 m @ 2.38 % C(g)	W+2000	TO-16-104
W5	3.8 m @ 4.06 % C(g)	W+2100	TO-16-105

\*Core interval does not represent true width.

The mineralized horizons of the West Zone dip around  $70^{\circ} \pm 10^{\circ}$  towards the South East at the norther portion of the West Zone and remains fairly stable heading South to section W+0500. From section W+0400 to section W+0100, the mineralized horizons dips gradually steeper and seem to become sub vertical at section W+0100. The dip of the mineralized horizons also rotates towards the East-South-East when heading South along strike following the large circular conductive anomaly. Continuing South, the dipping trend seems to continue and dipping shifts to the West at a steep angle at section W-0200. Mineralization on the West Zone is open to the North, to the South and at depths greater than 150 m.

Figure 10.4 – West Zone Drill Hole Section W+0500

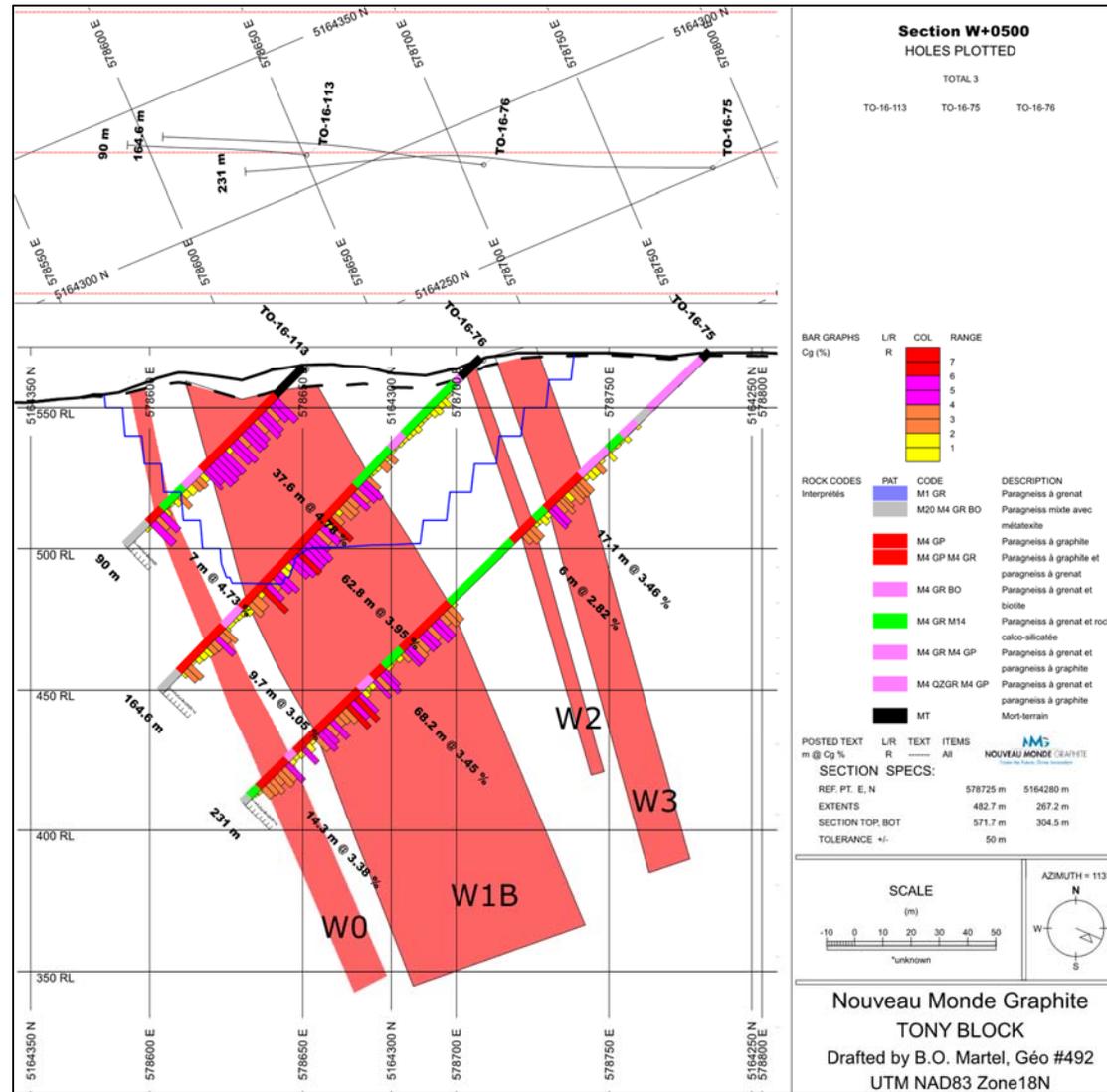


Figure 10.5 – West Zone Drill Hole Section W+1400

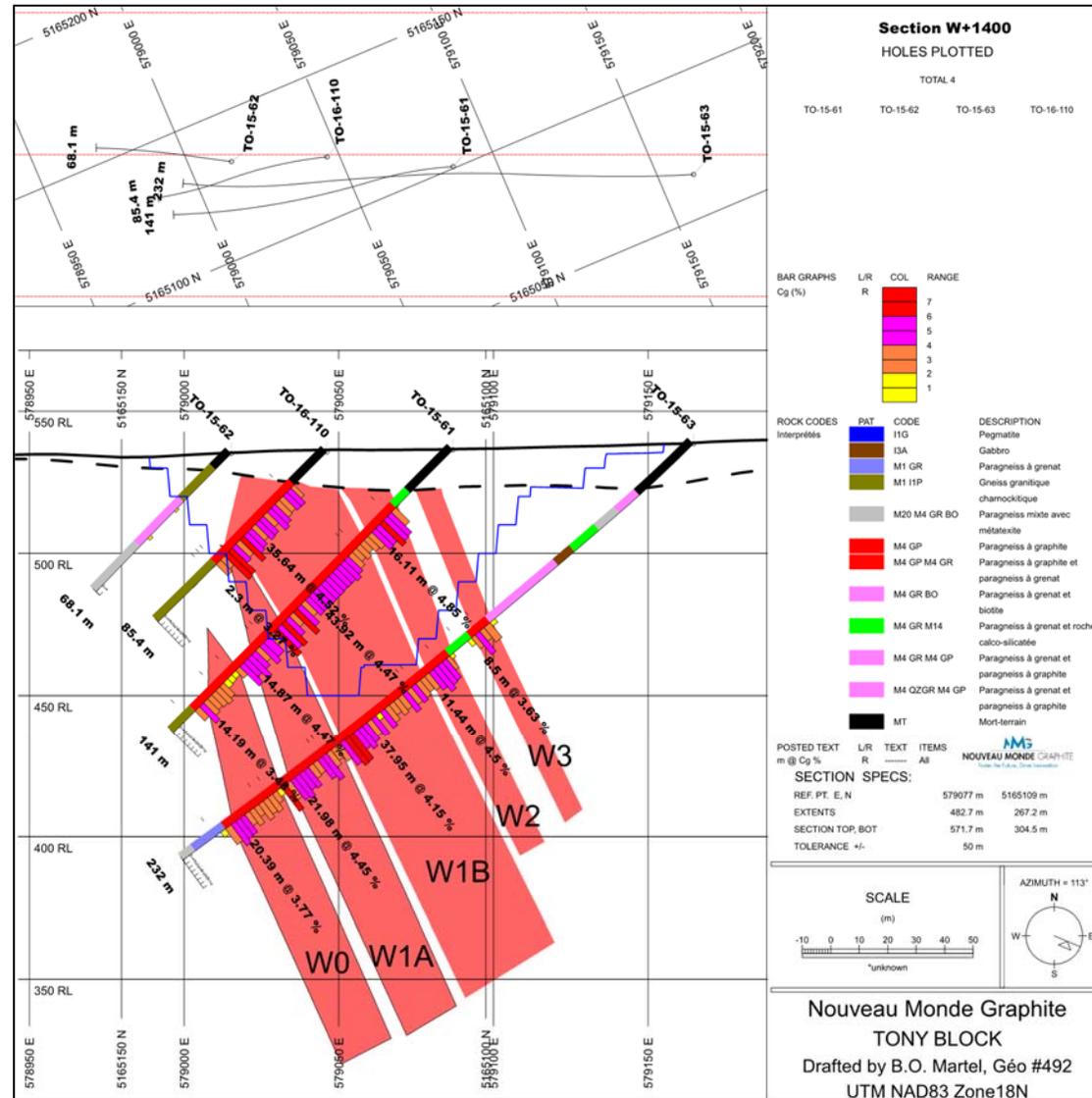
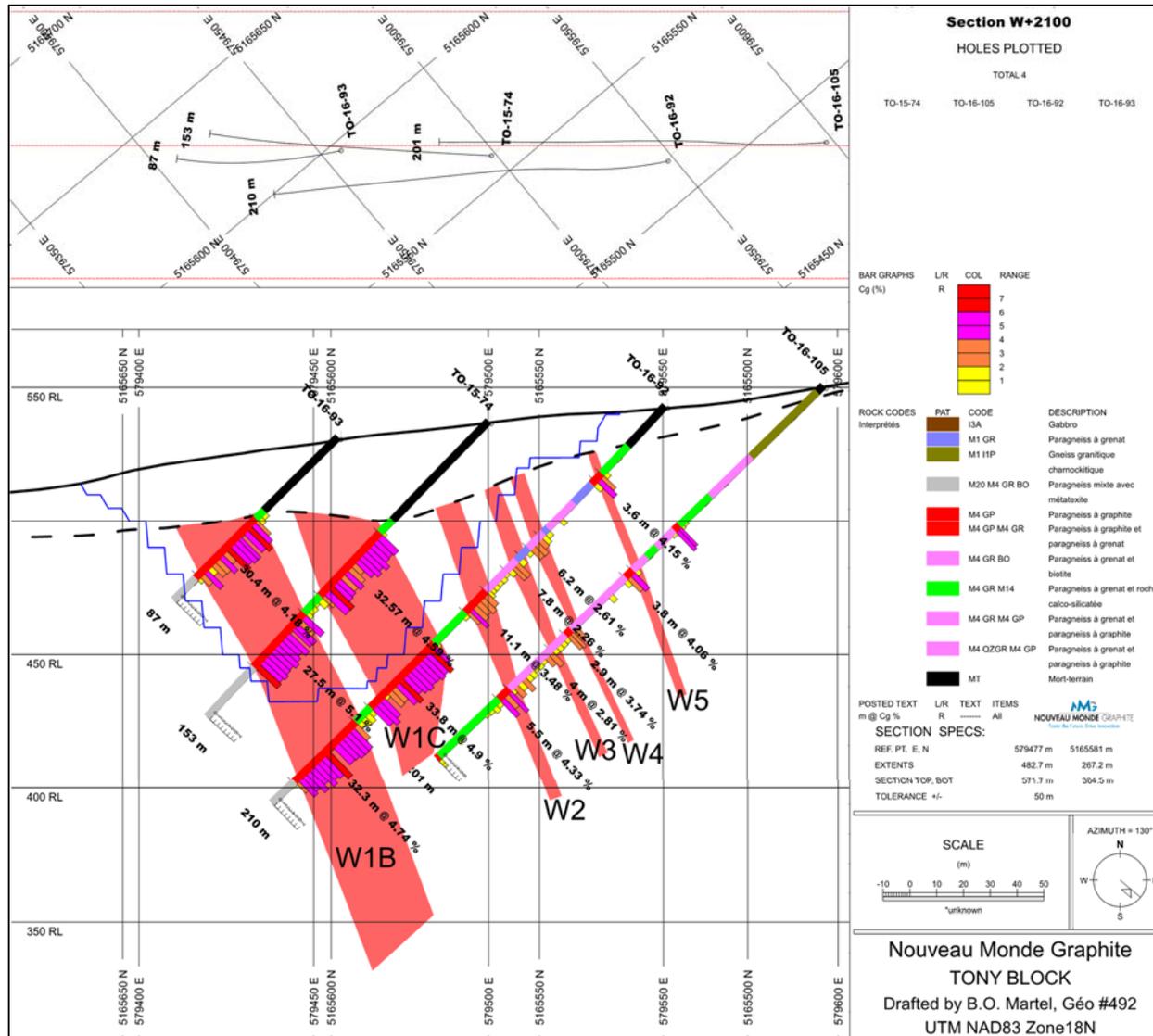


Figure 10.6 – West Zone Drill Hole Section W+2100



### 10.3.2 Drilling Results for the South-East Zone

The 2015 drilling program on the South-East Zone consisted of nine (9) holes for a total of 1,552 m drilled. Mineralization was intercepted by drilling 13 times here resulting in the interpretation that the zone is composed of two (2) main mineralized horizons (S1 and S2). The longest mineralized intercept is interpreted as being 160.1 m at 3.19 % C(g) true width and the smallest mineralized intercept at 8.6 m at 4.65 % C(g) true width.

The highlight of the South-East Zone is the large width of the mineralized horizons. From section S2600 to section S2900 (300 m length), the mineralized horizon ranges from 117 to 160 m true width, with a grade varying from 3.19 % to 3.62 % C(g). As seen on section shown in Figure 10.7 (Section S2900), the drill holes intercepted a wide graphitic horizon (S1 + S2) at least 160 m thick. This horizon dips around 45° to the South and strikes at 066°. The drill results suggest that the S1 + S2 horizon narrows to the East between sections S3000 and S3100.

### 10.3.3 Drilling Results for the South-West Zone

NMG's 2015 drill campaign on the South-West Zone consisted of 22 holes for a total of 2,617 m drilled. Mineralization was intercepted 57 times by drilling in this zone resulting in the interpretation that the zone is composed of two (2) main mineralized horizons (S1 and S2). The longest mineralized intercept is interpreted as being 61.8 m at 3.36 % C(g) true width and the smallest mineralized intercept at 3.3 m at 4.58 % C(g) true width.

The highlight of South-West Zone is a first graphitic horizon (S1) about 30 m thick, followed by a mostly barren interval between 25 and 63 m thick, and finally, a second graphitic horizon (S2) around 40 to 50 m thick, with both graphitic horizons varying from 2.79 % to 5.29 % C(g). As seen on the section in Figure 10.8 (Section S1500), the graphitic horizons dip from 45° to 55° South and strike 066°. The drill results indicate that Zones S1 and S2 merge and narrow to the West between sections S1200 and S1400, while PhiSpy ground geophysics indicates that Zones S1 and S2 disappear to the East between sections S1900 and S2000.

### 10.3.4 Drilling Results on the North, North-East, and East Zones

NMG's 2015 drill campaign on the North, North-East and East Zones consisted of 12 holes for a total of 1,764 m drilled. Mineralization was intercepted 29 times by drilling in these zones (see Table 10.3).

The four (4) holes (TO-15-08, 44, 45 and 46) and two (2) trenches (TO-15-TR-8 and 9) were completed on the East Zone. These intercepted graphitic horizons measuring 10.2 m to 49.4 m wide but often returning a low grade of around 2.5 % C(g). On section E2400

the graphitic horizons plunging sub-vertically on the East side and folding upwards at depth to the West resulting in the horizon dipping around 45° to the East on the West side.

The six (6) holes (TO-15-47 to 52) completed on the North Zone intercepted graphitic horizons generally measuring 10 to 30 m wide returning respectable grades of three (3) to five (5) % C(g). Section N0900 is typical of the North Zone. The graphitic horizons here are plunging steeply South at the West end, changing to a sub-vertical dip in the middle (section N1500) and steeply plunging North in the eastern portion of this zone (section N1700).

Hole TO-15-35 and trench TO-15-TR-7, completed on the North-East Zone, intercepted graphitic horizons measuring 10 to 26 m wide with grades varying from 2.5 to 4.5 % C(g). On section N2600, which is typical of this area, the graphitic horizons plunge sub-vertically.

Although drilling over the North, North-East and East Zones intercepted decent graphite mineralization, these are considered a lower priority for NMG since they display less potential than the West, South-West and South-East Zones. Thus, NMG opted to forego the preparation of a Mineral Resource Estimate over these zones for the time being.

**Table 10.3 - List of Mineralized Intercepts of the North, North-East, and East Zones**

Section	Drill Hole	Mineralized Horizon	From (m)	To (m)	Width (m)	True Width (m)	Grade [% C(g)]
E2200	TO-15-TR-8	EAST	0	42	42	29.7	42 m @ 4.28 %
	TO-15-TR-9	EAST	20	54	34	34	34 m @ 2.81 %
E2300	TO-15-45	EAST	10.9	58.9	48	33.9	48 m @ 1.74 %
		EAST	91	102.5	11.5	10.4	11.5 m @ 2.41 %
E2400	TO-15-08	EAST	4.6	54	49.4	49.4	49.4 m @ 2.73 %
		EAST	97	108.5	11.5	11.5	11.5 m @ 2.49 %
		EAST	143.5	157	13.5	13.5	13.5 m @ 3.49 %
	TO-15-44	EAST	10.5	49.7	39.2	27.7	39.2 m @ 2.38 %
		EAST	79.3	93.1	13.8	13.8	13.8 m @ 2.65 %
E2600	TO-15-46	EAST	6	26.2	20.2	18.3	20.2 m @ 2.68 %
		EAST	46.5	79	32.5	31.4	32.5 m @ 3.39 %
		EAST	90.8	101	10.2	9.9	10.2 m @ 3.37 %
		EAST	164	177.83	13.8	13.3	13.8 m @ 3.77 %
N0900	TO-15-51	NORTH	9.1	32.36	23.3	13.4	23.3 m @ 4.05 %
		NORTH	159.53	174	14.5	8.3	14.5 m @ 4.24 %
	TO-15-52	NORTH	20.2	36	15.8	9.1	15.8 m @ 2.15 %
		NORTH	45	51	6	3.4	6 m @ 3.42 %
N1200	TO-15-50	NORTH	23.54	81.85	58.3	33.4	58.3 m @ 5.11 %
		NORTH	125	144	19	10.9	19 m @ 3.42 %
N1500	TO-15-49	NORTH	39.35	59.7	20.4	16.7	20.4 m @ 5.18 %
		NORTH	71	88.45	17.5	14.3	17.5 m @ 4.61 %
		NORTH	106.34	135.95	29.6	24.2	29.6 m @ 2.89 %
N1600	TO-15-47	NORTH	35.5	59.13	23.6	20.4	23.6 m @ 4.67 %
		NORTH	90.38	108.3	17.9	15.5	17.9 m @ 3.44 %
N1700	TO-15-48	NORTH	16.7	22.75	6.1	5	6.1 m @ 4.13 %
		NORTH	36	51.5	15.5	12.7	15.5 m @ 4.79 %
		NORTH	72.1	88	15.9	13	15.9 m @ 3.05 %
N2600	TO-15-35	NORTH-EAST	53.16	66.59	13.4	10.3	13.4 m @ 4.59 %
		NORTH-EAST	82.3	117	34.7	26.6	34.7 m @ 2.55 %
N2700	TO-15-TR-7	NORTH-EAST	26	44	18	13.8	18 m @ 4.22 %





## 11.0 SAMPLE PREPARATION, ANALYSIS AND SECURITY

The drill program geologists, Yvan Bussières (2015) and Bernard-Olivier Martel (2015-2016) determined the sample intervals and supervised the core sampling operations. These were all performed in a secure storage facility located at 480 Rue des Aulnaies in Saint-Michel-des-Saints. The main purpose of the core sampling is to determine the grade of the graphitic horizons which is used to determine the graphite resources.

Samples were sent to the ALS Minerals facilities located in Val d'Or, Québec, for crushing and pulverizing. The resulting pulps were sent to the ALS Minerals facilities in North Vancouver, British Columbia, for analysis. Blanks, standards and duplicate samples were added to the sample stream by NMG as part of quality control procedures. Some duplicate samples were also sent to Actlabs in Ancaster (On) to validate graphite content results measured by ALS Minerals. The author is of the opinion that there was no sample bias and that the results are representative of the mineralized zones located on the Tony Claim Block.

### 11.1 Sample Procedure and Sample Security

Drill core sampling was done as follows:

- Drill core samples were selected when the geologist observed above an estimated 1 % C(g) content;
- The geologists choose an additional sample before and after the graphitic interval. These samples confirm the limits of the graphitic horizon, which help to connect the graphitic horizons between holes during the construction of the resource model;
- The typical sample length used for the Project is two (2) metres, however, sample length was adjusted to the lithological contact or when graphite content varies greatly (samples were no longer than 3.95 m and no smaller than 0.1 m during the 2015-2016 drilling programs);
- The geologist marked the beginning and end of each sample on the core using a wax pencil;
- The geologist added two (2) water-resistant tags bearing the sample number in the core box. One (1) tag was placed in the sample bag once the core splitting was completed and the other was stapled in the core box at the end of each sample run;
- The drill core sample was split into two (2) core quarters and one (1) core half by a technician using a water-cooled rock saw equipped with a diamond blade. One (1) of the quarter-core was bagged and sent for analysis and the remaining quarter, as

well as the remaining half, was kept as reference and for possible metallurgical testing. Figure 11.1 compares graphite content of 19 samples using quarter-core and its half-core duplicate. This illustrates adequate reproducibility of using quarter-core samples to determine graphite content for the Tony Block mineralization.

Figure 11.1 – Comparison between Quarter Core and Half Core C(g) Results

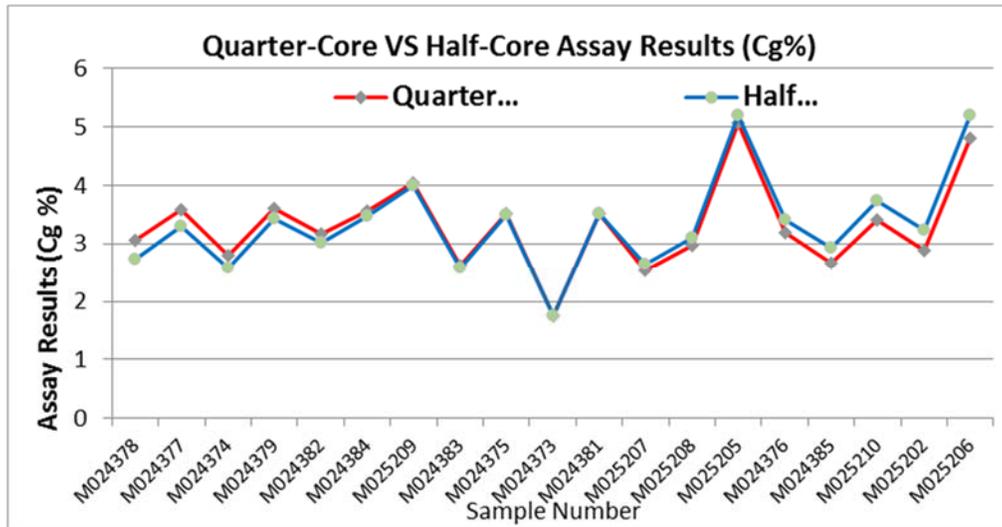


Figure 11.2 – Core Box Picture after Core Splitting and Sampling



## 11.2 Sample Preparation and Analysis

Samples were sent to ALS Minerals laboratories (“ALS”). At the ALS facilities in Val d’Or, Quebec, samples were entirely crushed to less than two (2) mm, and a 250 gram representative portion of the sample was crushed to less than 75 microns. The resulting

pulps were sent for analysis to the ALS facilities in Vancouver, British Columbia. A detailed description of the following analysis methods can be found through this link: <http://www.alsglobal.com/en/Our-Services/Minerals/Geochemistry/Service-Schedule>.

ALS's Val D'Or and Vancouver geochemistry laboratories conforms with requirements of CAN-P-1579, CAN-P-4E (ISO/IEC 17025:2005)) and as such, are regularly audited by the Standard Council of Canada.

All of the 2015-2016 drill core samples underwent graphitic carbon [C(g)] analysis by LECO analyzer using ALS's C-IR18 package.

In 2015, approximately one (1) sample per drill section was also analyzed using ALS's C-IR07, ME-MS41 and Au-AA23 packages and one (1) in every five (5) samples was analyzed using the S-IR08 package.

In 2016, all samples underwent ALS's C-IR-18, C-IR07 and S-IR08 analysis packages and approximately two (2) samples per mineralized interval was analyzed using the ME-MS41 package, this type of analysis was also performed at each major lithological change along each drill hole.

The number of samples sent for each types of analysis per mineralized zone is presented in Table 10.1.

The C-IR18 package consists of digesting one (1) gram of prepared sample in acid followed by a roasting phase and then by burning in a combustion furnace. The purpose of this method is to remove the carbon associated with carbonate minerals, like calcite, by acid digestion, followed by roasting to eliminate any organic carbon undigested by the acid, and finally, by burning the remaining carbon in the combustion furnace to measure what is considered as graphitic carbon.

The C-IR07 package determines the C(t) content using a LECO analyzer. The difference between the C(t) and the C(g) indicates the amount of carbonated mineral (s). The purpose of this method is to measure the total carbon (organic carbon, carbon within carbonate mineral and graphitic carbon) within the sample.

The S-IR08 package determines the total sulphur content ("S %") using a LECO analyzer. The S-IR08 method consists of burning one (1) gram of prepared sample in a combustion furnace.

The ME-MS41 package determines the content of 51 elements in the sample. This was performed in order to determine whether graphitic horizons contained any economic grades of other types of metals and/or minerals as well as elements which could be considered as potential contaminants. To increase the probability of obtaining a greater amount of contaminants, the selected sample was generally one (1) visually displaying higher

sulphide content. The ME-MS41 method consists of digesting 0.5 gram of a prepared sample by Aqua Regia extraction followed by an ICP-MS finish.

The Au-AA23 package determines the gold content. This method consists of taking 30 grams of pulverized rock to be treated by the method of lead fusion followed by cupellation and a digestion of the metallic bead in an Aqua Regia solution, followed by an analysis using inductively coupled plasma mass spectrometry (ICP-AES).

Due to the nature of the mineralization, the graphite easily creates a greasy substance that attaches itself to the jaws of the crushers as well as the ring and puck of the pulverizers during sample preparation at the laboratory. Furthermore, the graphite dust also sticks to the jaws, ring and puck, and the standard procedure of using compressed air cleaning between samples is sometimes insufficient to properly clean the equipment. In order to minimize contamination in the laboratory sample preparation process, NMG added ALS methods WSH-21 and WSH-22 to the samples shipped after October 2015. These methods consist of cleaning the crushers with barren material (WSH-21) after every sample and cleaning the pulverizers with barren material (WSH-22) after every sample.

### 11.3 Quality Assurance and Quality Control Procedure

NMG established an extensive quality assurance and quality control (“QA/QC”) program to ensure a high level of quality control for its exploration work. Table 11.1 summarizes the quality control samples used during the 2015-2016 drilling campaigns. These assay controls were:

1. Insertion of graphite standards in order to control laboratory precision and accuracy in reporting C(g) content;
2. Insertion of blank samples to verify for possible laboratory contamination;
3. Insertion of field duplicate samples to verify result reproducibility;
4. Analysis of duplicates at a different laboratory to validate the ALS results.

A total of 6,365 samples were assayed from the 112 drill holes sampled during the 2015 and 2016 drilling programs including quality control samples. A total of 682 control samples were used and therefore represent 11 % of the samples analyzed for the Project.

**Table 11.1 – 2015-2016 Drill Core Quality Control Samples**

Mineralized Zone	Total Samples	Samples Excluding QA/QC	Quality Control Samples Analyzed for C(g) Content							
			Blank	Duplicate	Standard					
					STC	STF	STH	STM	STH-2	CDN-GR-3
West*	4,096	3,693	161	163	7	8	4	12	22	26
South-West	1,067	937	42	73			6	9		
South-East	694	598	22	61			5	8		
East	234	209	10	11			2	2		
North-East	38	34	1	2				1		
North	236	212	11	10			2	1		
<b>Total</b>	<b>6,365</b>	<b>5,683</b>	<b>247</b>	<b>320</b>	<b>7</b>	<b>8</b>	<b>19</b>	<b>33</b>	<b>22</b>	<b>26</b>

\* The West Zone is the main subject of this Report as it contains the only Mineral Reserves identified as the Report effective date on the Property.

#### 11.4 Analysis Standards

During the 2015-2016 drilling programs, NMG added six (6) different quality control standard samples, each representing different grades, to its sample stream in order to verify the accuracy of C(g) results. Five (5) of these were produced using mineralized rock from NMG's Matawinie Property. Each of these five (5) in-house standard samples was sent to the ALS laboratory to be crushed, homogenized and analyzed ten (10) times for its graphite content. In 2016, one (1) in-house standard was used (STH-2) as well as a graphite standard [reference CDN-GR-3, certified value of 2.39 % C(g) ± 0.11] bought from CDN Resource Laboratories Ltd. (ISO-9001:2015), from Langley (B-C). Table 11.2 provides the mean and standard deviation of these ten (10) tests performed on the in-house standards as well as the results of the inserted standard samples in the drill core sample stream. As part of the QA/QC program, one (1) standard sample was inserted for every 50 samples sent to the laboratory.

**Table 11.2 - Summary of Standard Sample Results**

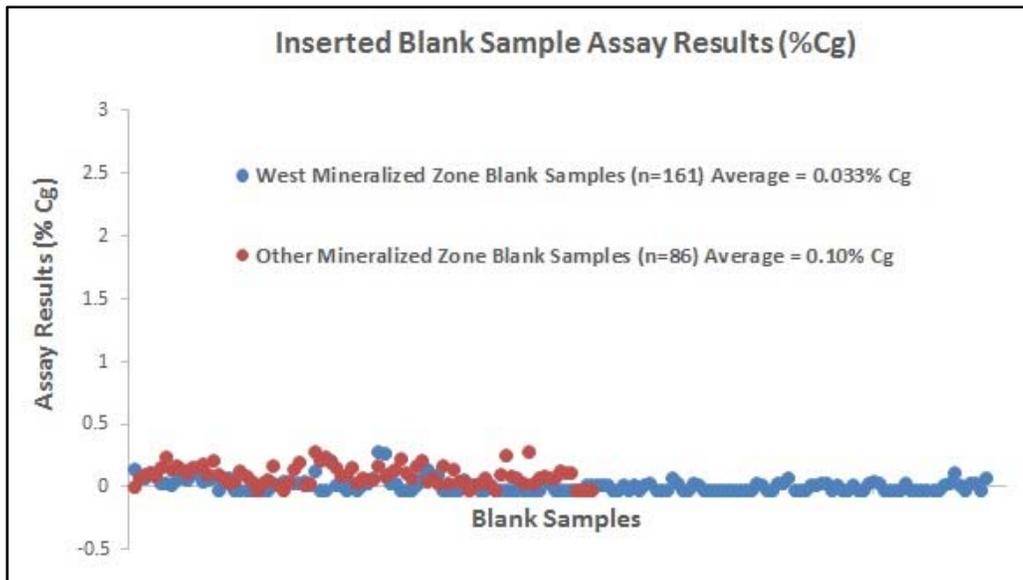
Standard Samples Statistics	In-House Standards % C(g) Results from ALS (C-IR18)				
	STC	STF	STH	STM	STH-2
Mean based on 10 rounds of analysis	4.48	5.04	18.29	6.11	5.84
Mean from inserted samples	4.59	5.04	18.06	6.12	5.82
Standard Deviation based on 10 rounds of analysis	0.11	0.07	0.22	0.05	0.06
Standard Deviation from inserted samples	0.12	0.13	0.3	0.22	0.17

The 26 CDN-GR-3 standard samples inserted in the sample stream returned a mean of 2.44 % C(g) and a standard deviation of 0.05. Two (2) of these samples returned values slightly above the certified value of 2.39 % C(g) ± 0.11, samples K437600 and P186100 returned 2.54 and 2.52 % C(g) respectively. The author is of the opinion that the standard sample results are within acceptable limits.

### 11.5 Analysis Blanks

The blank samples used for QA/QC purposes during the 2015 drilling campaign consisted of approximately one (1) kg of white gravel (bag from Canadian Tire). In 2016, blank sample material (quartz) was acquired from IOS Service Geoscientifique of Chicoutimi (Qc) following the recommendations from the PEA report of using a more reliable blank standard. A total of 247 blank samples (161 for the West Zone and 86 for the other mineralized zones), representing a population of 3.8 % of the drill program samples, were inserted within the sample stream in 2015-2016. Samples were generally inserted at sample numbers ending in odd tens. The 2016 blank standard, with an average content of 0.02 % C(g) has proven more suitable as a quality control material than the 2015 material, with an average content of 0.08 % C(g) since test results closer to the laboratory's detection limit of 0.02 % C(g). Figure 11.3 below shows the C(g) content for the inserted blank samples during the 2015-2016 drilling campaigns. The author is of the opinion that the blank sample results are within acceptable limits.

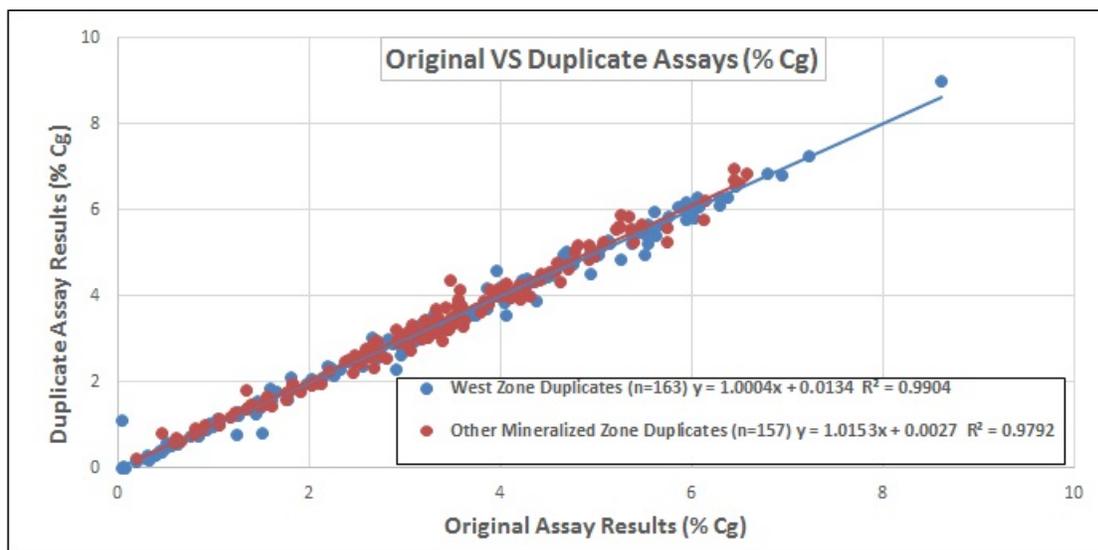
**Figure 11.3 – Inserted Blank Sample C(g) Assay Results**



**11.6 Core Duplicates**

During the 2015-2016 drilling programs, NMG added duplicate samples to its sample stream to verify assay reproducibility. Samples were generally inserted at sample numbers ending in even tens. In all, 320 drill core samples (163 from the West Zone and 157 for the other mineralized zones) were duplicated representing a population of 5 % of the drill program samples (this includes duplicate samples sent to other laboratories for validation). Figure 11.4 below shows the very high reproducibility of C(g) results provided by the duplicate samples inserted into the 2015 and 2016 core sample stream.

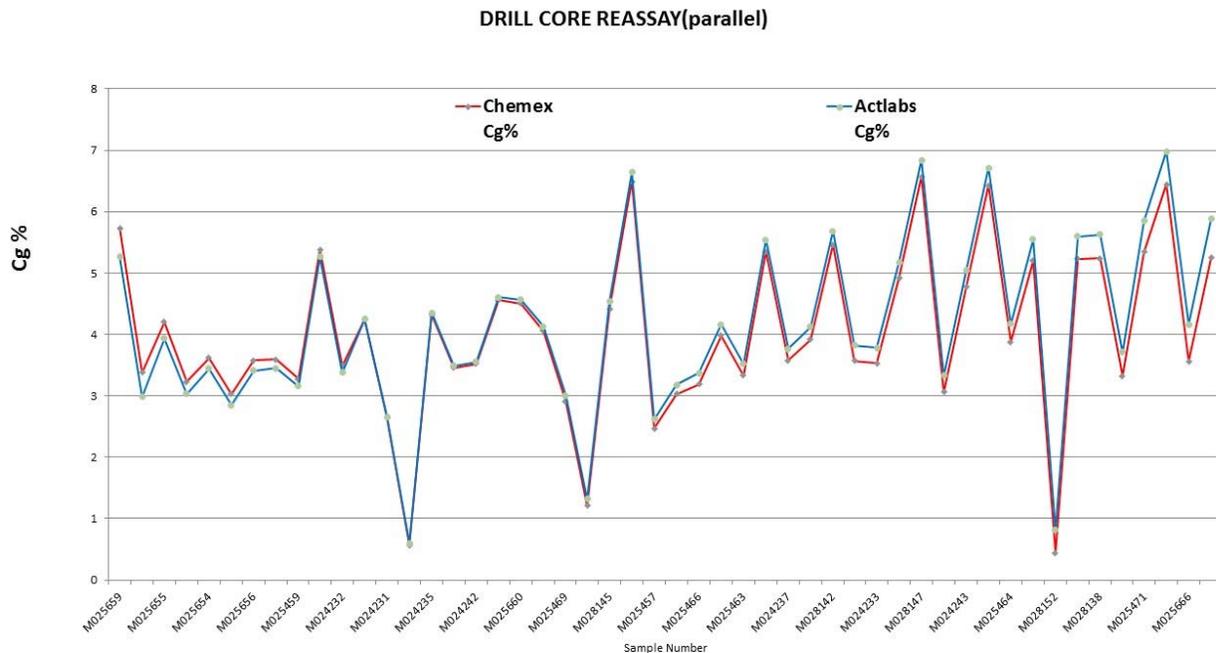
**Figure 11.4 – Reproducibility of Duplicate Samples**



At the end of the 2015 drilling program, as part of due diligence and quality control, 50 samples were selected and sent to Actlabs Laboratories, located in Ancaster, Ontario, to see whether it could duplicate the results obtained by ALS. Actlabs’ Quality System is accredited to international quality standards through the International Organization for Standardization /International Electrotechnical Commission (ISO/IEC) 17025 (ISO/IEC 17025 includes ISO 9001 and ISO 9002 specifications) with CAN-P-1579 (Mineral Analysis) for specific registered tests by the Standards Council of Canada (“SCC”). The accreditation program includes ongoing audits which verify the QA/QC system and all applicable registered test methods. Figure 11.5 illustrates a good reproducibility of graphite values between laboratories. The sample re-assays therefore confirmed that:

- The graphite values for ALS can be compared to those of another laboratory;
- The reproducibility of sample values demonstrates that assay value for the quarter-core sample is representative of the graphite content;
- There was no particular bias noted in the verification process.

**Figure 11.5 – Drill Core C(g) Assay Comparison Using ALS and Actlabs**



### 11.7 Specific Gravity

In 2015, for each drill section spaced at 100 m, different rock types [usually five (5) to seven (7) samples] were measured using ALS’s OA-GRA08b package to determine the

specific gravity of the rock types used for the resource calculation. The OA-GRA08b method consists of the following steps:

- A prepared sample (3.0 g) is weighed into an empty pycnometer;
- The pycnometer is filled with a solvent (either methanol or acetone) and then weighed;
- From the weight of the sample and the weight of the solvent displaced by the sample, the specific gravity is calculated.

$$\text{Specific Gravity} = \frac{\text{Weight of sample (g)}}{\text{Weight of solvent displaced (g)}} \times \text{Specific Gravity of Solvent}$$

In 2016, the specific gravity of one (1) out of every six (6) mineralized samples was measured using ALS's OA-GRA08 method and one (1) sample was also measured for each lithologies along the core. Specific gravity measurements were performed on a 30-cm piece of ½ core, representative of its 2-m, ¼ core sample twin. The 30-cm sample was weighed dry on a balance then it was weighed while suspended in water. From the data, the specific gravity is calculated.

$$\text{Specific Gravity} = \frac{\text{Weight of sample (g)}}{\text{Weight in air (g) - Weight in water (g)}}$$

Both specific gravity measurement methods have a lower and upper reporting limit of 0.01 and 20 respectively.

A total of 678 samples from the 2015 and 2016 drilling campaign were measured for their specific gravity of which 518 are from the West mineralized Zone.

## 11.8 Quality Control Program Conclusions

In summary, based on the study of the results of the QA/QC program, the author concludes that:

- The sampling of a quarter of core is representative of the Tony Block graphite mineralization and can be repeated with an acceptable confidence level;
- Duplicate samples demonstrated good assay reproducibility;
- Although blank samples are considered within acceptable limits, C(g) content in 2015 were higher than expected, this was corrected by using different blank material in 2016.

- The in-house 2015 C(g) standards returned overall acceptable results although their standard deviation was considered higher than intended. The 2016 standards from CDN Resource Laboratories Ltd. returned acceptable results.

Overall, the author considers that the sample preparation, security and analytical procedures as well as quality control results are adequate and representative of the graphite mineralization on NMG's Tony Claim Block.

## 12.0 DATA VERIFICATION

The author did the following to ascertain that the database supporting the estimation of resources is sound and reliable:

- Site visit;
- Independent sampling;
- Multiple database verifications.

SGS Geostat was hired by NMG to update the mineral resources for the Matawinie Property. Mr. Yann Camus, P.Eng. oversaw this mandate for SGS Geostat.

### 12.1 Site Visit

SGS Geostat visited the Matawinie graphite Property on November 9<sup>th</sup>, of 2016.

Mr. Yann Camus met with M. Antoine Cloutier (NMG chief geologist) who led the visit during the entire day.

The author met with Bernard-Olivier Martel (consulting geologist), Andy Rochette (technician for Explo-Logik Inc.) and René Lelièvre (prospector and technician for Explo-Logik Inc.) at the core shack. It was decided by SGS Geostat in consultation with M. Antoine Cloutier to prepare independent duplicate samples on a total of 51 samples.

The visit started by visiting the core storage area and core shack. Both are together at a self-storage facility right in the community of Saint-Michel-des-Saints at about 12 km driving distance from the Project. Because looking at the witness core and independent sampling of it was an important part of the visit, most of the day was spent there. The author acknowledged the procedures for verifying, orienting, collecting RQD measurements, logging, identifying samples, measuring magnetic susceptibility and conductivity, taking photos and finally cutting and sampling the core.

At mid-afternoon, the author quickly visited a house used by NMG to host employees, show multimedia presentations to visitors and store equipment. This house is located between Saint-Michel-des-Saints and the Project area. Then it was time to go on the actual ground of the Tony West Zone Deposit towards hole TO-15-64. The author used a handheld GPS and compass to verify the position, azimuth and dip of TO-15-54, TO-15-55, TO-15-64, TO-16-85 and TO-16-96. The comparison between the database information and the field readings reveals no problem. There is a difference of 19 metres in elevation for a collar GPS reading but this is within acceptable range for elevation differences.

Many subjects were discussed including but not limited to:

- Structural geology;
- Known mineralized structures and available data;
- Preparation of the drilling campaigns;
- Procedures to put in place for drilling, logging, sampling, QA/QC, etc.;
- Potential extensions;
- Availability of material for independent sampling by SGS Geostat.

During the author's visit at the West Zone Project site, the following actions were taken:

- Independent sampling of 51 witness core samples from two (2) holes (see details in the Verification Re-Assays - Independent Sampling by SGS Geostat section);
- Visit and field observation of some trenches and drill hole collars;
- Visit of the drill rig during the drilling of TO-16-106 by Forage Val D'Or Inc.;
- Witness and measurement of position, azimuth and dip for five (5) collars taken at random. The verification of collar locations by GPS readings was with the WAAS on at all times. Also, the author witnessed three (3) trenches. All drill holes can be found in the field and most are well identified with a proper marker. Table 12.1 shows the list of the five (5) collars and three (3) trenches with position and orientation. The comparisons with the database matched very well.

**Figure 12.1 – Typical Drill Hole Casing (Left)  
– Mr. Cloutier, Mr. Martel and Mr. Lelièvre in the Cutting Room (Right)**



**Table 12.1 – List of Independently Measured Collar Locations and Validation**

Hole Name	NMG Database					Measurement by SGS Geostat					Difference			
	Easting	Northing	Elev.	Azimuth	Dip	Easting	Northing	Elev.	Azimuth	Dip	Easting	Northing	Elev.	Angle
TO-15-55	578,799	5,164,461	569	293	-45	578,801	5,164,460	568	NA	NA	-2	1	1	NA
TO-15-54	578,859	5,164,434	571	295	-45	578,859	5,164,435	569	298	-44	0	0	3	0
TO-16-96	578,557	5,163,806	526	288	-45	578,557	5,163,806	530	288	-44	0	0	-3	2
TO-16-85	578,645	5,163,764	537	289	-45	578,646	5,163,767	539	293	-44	-1	-2	-1	3
TO-15-64	579,134	5,165,184	535	293	-46	579,132	5,165,193	516	288	-44	2	-9	19	6
TO-TR-03	These three (3) trenches were witnessed and #10 and #11 were walked. The incline of the ground was fitting with the shape of the trenches and topography used for the modelling.													
TO-TR-10														
TO-TR-11														

## 12.2 Witness Samples Found at the Core Storage Site

The witness samples that are present at the core storage site in Saint-Michel-des-Saints are mainly of four (4) types:

- Quarter, half and full core of diamond drill holes that are well preserved in core boxes in metal racks (See Figure 12.2);
- Core to be cut, and;
- Samples to be transported to the laboratory (See Figure 12.3).

All types of samples are well organised. Most of the core is of NQ size (47.6 mm) and some is also BTW (42 mm). Typically, only a quarter of the core was sampled for the geochemical analysis and therefore a half and a quarter remain in each box. The  $\frac{3}{4}$  of the core is kept by NMG for check sampling and metallurgical tests.

**Figure 12.2 - Core Boxes from Diamond Drill Holes (Left and Right)**



**Figure 12.3 – Core to be Cut with the Core Saw and Samples to be Transported to the Laboratory**



**Figure 12.4 - Core to be Cut with the Core Saw and Samples to be Transported to the Laboratory**



### 12.3 Verification Re-Assays – Independent Sampling by SGS Geostat

The half cores are well identified and the author reviewed the core for drill holes TO-16-79, TO-16-84, TO-16-96 and TO-16-98.

For the validation of the data used for this resource estimation, the author looked for two (2) important intervals covering well the deposit. These intervals are hole identifiable witness samples whilst on site in West Zone. A total of 51 witness samples were selected to be re-sampled. All 51 samples are from the 2016 drilling program. Since  $\frac{3}{4}$  of the core was remaining in the boxes, it was decided to take  $\frac{1}{4}$  for the independent sample and leave  $\frac{1}{2}$  for future use. SGS Geostat supervised the collection of the witness samples (See Figure 12.5 for pictures of the bags before final packing for the transfer to Corem laboratory in Québec city).

The list of the re-sampled intervals can be found in Table 12.2. The differences in graphitic carbon, sulfur and total carbon are highlighted in pink when Corem is higher and blue when lower than ALS. In general, the differences are very small between the two (2) laboratories, especially since the samples are duplicates on the core which inherently more variable than a coarse reject duplicate or pulp duplicate. The Table 12.3 shows that the graphitic carbon from Corem is 3.1 % under the ALS average, and the total carbon from Corem is 1.6 % under the ALS average. The two (2) biases are confirmed by the sign test and Student T-test. These differences are acceptable for the current Study. Having differences for this kind of assay is also frequent between laboratories. At the time of the writing of the Report, there is no way of deciding if Corem or ALS is more accurate. No bias is identified for the sulfur. These observations show that the assays are sufficiently replicable and accurate.

The variability is very low for this kind of duplicates with respective coefficient of variations of 6.1 %, 5.8 % and 5.2 % for graphitic carbon, sulfur and total carbon. This observation shows that the assay data is sufficiently precise.

**Figure 12.5 – Pictures of the Independently Re-Assayed Samples**

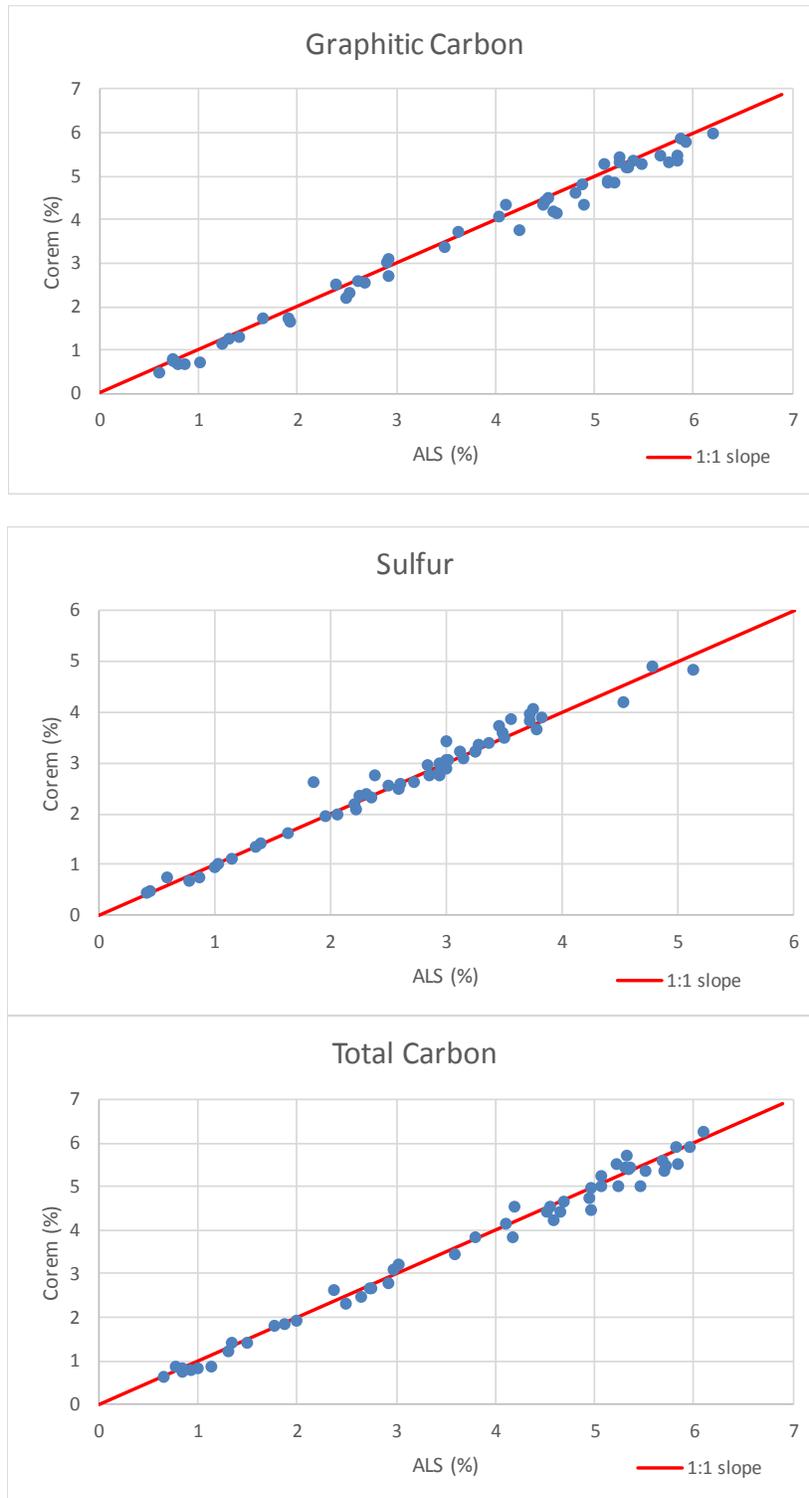


**Table 12.2 – Results for the 51 Independently Re-Assayed Samples  
 – Database Graphitic Carbon, Sulfur and Total Carbon (% - ALS)  
 vs Independent Values (% - Corem)**

Hole Name	From	To	Length	ALS			Corem			Difference		
				C(g) (%)	S (%)	C(t) (%)	C(g) (%)	S (%)	C (t) (%)	C(g) (%)	S (%)	C(t) (%)
TO-16-96	10	12	2	4.04	2.84	4.11	4.1	2.97	4.13	0.06	0.13	0.02
TO-16-96	12	14.3	2.25	2.39	2.38	2.37	2.54	2.74	2.63	0.15	0.36	0.26
TO-16-96	14.25	16	1.75	1.65	1.64	1.77	1.76	1.6	1.82	0.11	-0.04	0.05
TO-16-96	16	18	2	0.74	0.6	0.77	0.81	0.76	0.88	0.07	0.16	0.11
TO-16-96	18	20	2	0.78	0.79	0.93	0.72	0.68	0.78	-0.06	-0.11	-0.15
TO-16-96	20	22.3	2.25	1.24	1.03	1.31	1.15	1.01	1.22	-0.09	-0.02	-0.09
TO-16-96	22.25	24	1.75	2.92	3	3.02	3.13	3.43	3.23	0.21	0.43	0.21
TO-16-96	24	26	2	4.11	3.76	4.19	4.38	4.05	4.54	0.27	0.29	0.35
TO-16-96	26	28	2	5.66	2.86	5.68	5.51	2.76	5.59	-0.15	-0.10	-0.09
TO-16-96	28	30	2	5.34	3.29	5.31	5.23	3.34	5.42	-0.11	0.05	0.11
TO-16-96	32	34	2	4.48	3.02	4.52	4.37	3.07	4.44	-0.11	0.05	-0.08
TO-16-96	34	36	2	2.9	1.86	2.98	3.05	2.63	3.08	0.15	0.77	0.10
TO-16-96	36	38	2	5.39	2.35	5.36	5.38	2.32	5.44	-0.01	-0.03	0.08
TO-16-96	38	40	2	5.87	2.72	5.96	5.89	2.61	5.89	0.02	-0.11	-0.07
TO-16-96	40	42	2	5.25	3	5.22	5.47	3.07	5.5	0.22	0.07	0.28
TO-16-96	42	44	2	5.84	2.93	5.84	5.48	2.79	5.5	-0.36	-0.14	-0.34
TO-16-96	46	48	2	4.62	3.72	4.59	4.17	3.95	4.24	-0.45	0.23	-0.35
TO-16-96	48	50	2	2.93	2.31	2.92	2.72	2.38	2.80	-0.21	0.07	-0.12
TO-16-96	50	52	2	3.48	2.21	3.59	3.40	2.19	3.44	-0.08	-0.02	-0.15
TO-16-96	52	54.2	2.2	4.50	2.61	4.55	4.45	2.59	4.53	-0.05	-0.02	-0.02
TO-16-96	54.2	56	1.8	0.86	0.44	0.85	0.70	0.48	0.74	-0.16	0.04	-0.11
TO-16-79	30.3	32	1.7	2.62	2.07	2.74	2.59	1.98	2.67	-0.03	-0.09	-0.07
TO-16-79	32	34	2	1.91	2.25	2.00	1.76	2.35	1.93	-0.15	0.10	-0.07
TO-16-79	34	36	2	4.25	3.78	4.17	3.77	3.64	3.85	-0.48	-0.14	-0.32
TO-16-79	36	37.8	1.8	5.75	4.53	5.70	5.32	4.19	5.36	-0.43	-0.34	-0.34
TO-16-79	37.8	40.4	2.55	0.80	1.01	1.00	0.70	0.94	0.85	-0.10	-0.07	-0.15

Hole Name	From	To	Length	ALS			Corem			Difference		
				C(g) (%)	S (%)	C(t) (%)	C(g) (%)	S (%)	C (t) (%)	C(g) (%)	S (%)	C(t) (%)
TO-16-79	40.35	42	1.65	4.53	3.49	4.69	4.52	3.60	4.65	-0.01	0.11	-0.04
TO-16-79	42	44	2	5.14	3.82	5.06	4.92	3.89	4.99	-0.22	0.07	-0.07
TO-16-79	44	46	2	4.87	4.78	4.96	4.83	4.89	4.97	-0.04	0.11	0.01
TO-16-79	46	48	2	5.21	5.14	5.24	4.87	4.82	5.01	-0.34	-0.32	-0.23
TO-16-79	50.8	53	2.2	2.68	1.96	2.75	2.58	1.96	2.66	-0.10	0.00	-0.09
TO-16-79	53	55	2	3.63	2.95	3.79	3.73	2.99	3.82	0.10	0.04	0.03
TO-16-79	55	57	2	5.48	3.57	5.32	5.30	3.87	5.70	-0.18	0.30	0.38
TO-16-79	57	59	2	5.25	3.72	5.34	5.33	3.81	5.41	0.08	0.09	0.07
TO-16-79	59	61	2	4.81	3.37	4.94	4.62	3.40	4.72	-0.19	0.03	-0.22
TO-16-79	61	63	2	5.10	3.12	5.07	5.30	3.21	5.24	0.20	0.09	0.17
TO-16-79	63	65	2	6.20	3.51	6.09	6.02	3.48	6.27	-0.18	-0.03	0.18
TO-16-79	65	67	2	5.92	3.46	5.82	5.79	3.71	5.90	-0.13	0.25	0.08
TO-16-79	67	69	2	5.13	3.25	5.46	4.89	3.21	5.00	-0.24	-0.04	-0.46
TO-16-79	69	71	2	5.32	3.15	5.51	5.24	3.08	5.35	-0.08	-0.07	-0.16
TO-16-79	71	73	2	4.59	3.00	4.65	4.21	2.88	4.43	-0.38	-0.12	-0.22
TO-16-79	73	75	2	5.83	3.25	5.71	5.36	3.21	5.49	-0.47	-0.04	-0.22
TO-16-79	75	77.5	2.45	4.90	2.59	4.97	4.37	2.47	4.46	-0.53	-0.12	-0.51
TO-16-79	77.45	79.2	1.75	0.60	0.42	0.66	0.49	0.43	0.62	-0.11	0.01	-0.04
TO-16-79	79.2	82.1	2.9	1.01	2.51	1.14	0.75	2.54	0.88	-0.26	0.03	-0.26
TO-16-79	82.1	84	1.9	2.53	0.87	2.64	2.32	0.73	2.46	-0.21	-0.14	-0.18
TO-16-79	84	86	2	1.42	1.36	1.49	1.31	1.34	1.41	-0.11	-0.02	-0.08
TO-16-79	88	90	2	0.75	1.15	0.85	0.76	1.13	0.84	0.01	-0.02	-0.01
TO-16-79	90	91.4	1.4	1.31	1.40	1.35	1.28	1.40	1.40	-0.03	0.00	0.05
TO-16-79	91.4	93	1.6	1.92	2.23	1.88	1.66	2.09	1.86	-0.26	-0.14	-0.02
TO-16-79	93	95	2	2.49	2.94	2.49	2.20	2.74	2.32	-0.29	-0.20	-0.17

Figure 12.6 – Scatterplots of the 51 Independently Re-Assayed Samples for Graphitic Carbon, Sulfur and Total Carbon



**Table 12.3 – Statistics on the Independent Duplicates**

	<b>C(g)</b>	<b>S</b>	<b>C</b>
Mean C(g) ALS	3.67	2.63	3.71
Mean C(g) Corem	3.55	2.65	3.65
Difference	-3.1 %	1.0 %	-1.6 %
Duplicates Coefficient of Variation	6.1 %	5.8 %	5.2 %
Count Corem > ALS	13	24	18
Count Corem = ALS	0	2	0
Count Corem < ALS	38	25	33
Odds Sign Test	0.001	1.000	0.049
Sign Test Conclusion	99.9 % chance to have a bias according to the sign test	Not conclusive	95 % chance to have a bias according to the sign test
Odds T-test	0.0001	0.2966	0.0355
Odds log T-test	0.0002	0.4936	0.0126
T-test Conclusion	Bias according to the Student paired T-test	Not conclusive	Bias according to the Student paired T-test

#### 12.4 Database Verification

Standard verifications were carried out: extreme values, data going beyond hole depth, check of gaps in the information, search of collars inconsistencies. Only minor details needed any changes and all was fine for the resource modeling and estimation.

#### 12.5 Conclusion

The verification of the NMG database is satisfactory for the preparation of the resource estimation. The site visit allowed multiple verifications. Everything corresponded well to the information provided by NMG. The independent sampling of 51 witness samples confirmed the database information. While the average graphitic carbon from independent samples sent to Corem matches the expected grade found in the database by ALS, it is worth mentioning that a small bias of about 3 % was identified. The assay data for graphitic carbon, sulfur and total carbon are sufficiently replicable, accurate and precise.

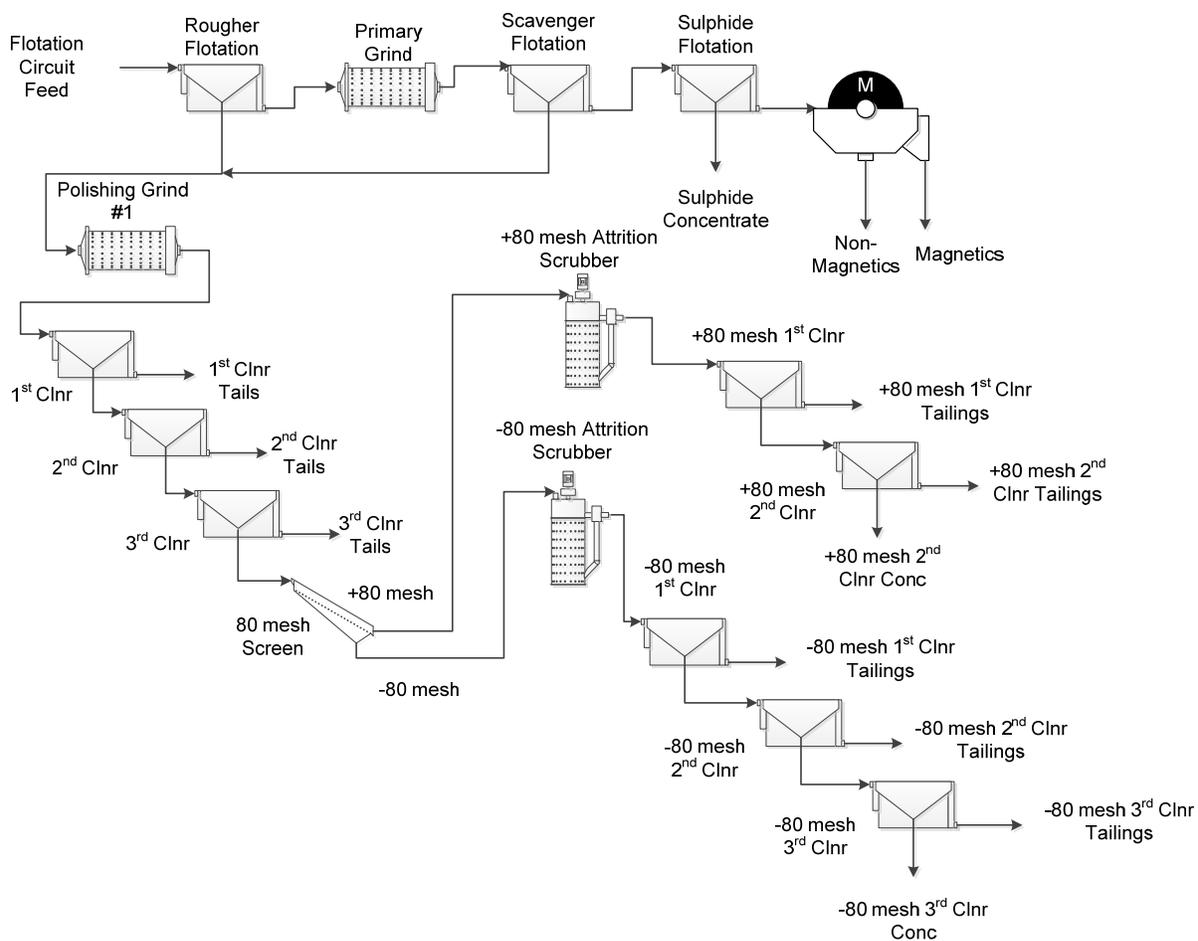
The standard database verifications run by SGS Geostat indicates a sound database, reliable for the estimation of resources.

### 13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

#### 13.1 Historic Metallurgical Results

A total of five (5) metallurgical tests programs were completed prior to the commencement of the most recent flotation optimization program that was carried out to support the development of the engineering data for the PFS. The metallurgical programs started with initial scoping level flotation tests on grab and trench samples and culminated in a flow sheet development program that produced the process flow sheet that is depicted in Figure 13.1.

**Figure 13.1 – Matawinie Process Flow Sheet**



The robustness of the flow sheet was confirmed in a small variability flotation program, that tested seven (7) different composites from the West and South Zones using the flow sheet and flotation conditions established during the flow sheet development program. The concentrate grades ranged between 94.4 % C(t) and 99.5 % C(t) with open

circuit total carbon recoveries of 81.5 % to 88.5 %. No closed-circuit flotation tests were carried out as part of the flow sheet development program.

The reagent regime comprised of frother methyl isobutyl carbinol (“MIBC”), collector diesel, pH modifier lime, sulphide activator copper sulphate (“CuSO<sub>4</sub>”), and sulphide collector potassium amyl xanthate (“PAX”).

Although both zones responded well to the process flow sheet and conditions, the metallurgical response was slightly superior for the West Zone mineralization. It is also important to note that the West Zone material’s head grade is approximately 10 % higher. The higher head grade should have a positive impact on operating costs as 10 % less ore has to be processed to produce the same amount of concentrate.

A bulk concentrate production pilot plant campaign on 12 tonnes of mineralized South Zone material demonstrated the scalability of the proposed process flow sheet and conditions.

The open circuit test results were analysed and compared with similar projects that had both open and closed-circuit flotation test data available. The overall graphite recovery was projected at 89.5 % at a combined concentrate grade of 97.3 % C(t). The results of the size fraction analysis of the graphite flotation concentrate are presented in Table 13.1. These metallurgical results were used in the Preliminary Economic Assessment (“PEA”) study that was completed in 2016 prior to the start of the flow sheet optimization program at in 2017.

**Table 13.1 – Mass and Grade Distribution of Concentrate of Flow Sheet Development Program**

<b>Product</b>	<b>Mass (%)</b>	<b>Grade % C(t)</b>
+48 mesh	16.1	97.5
+65 mesh	19.8	97.7
+80 mesh	10.0	97.4
+100 mesh	11.1	97.4
+150 mesh	18.8	96.4
+200 mesh	9.8	96.1
+325 mesh	7.6	96.4
+400 mesh	2.1	97.1
-400 mesh	4.6	98.5
Total	100.0	97.3

### 13.2 Sample Collection

The West Zone Master composite that was used in the 2017 process optimization program conducted at SGS Minerals Services in Lakefield, Ontario was generated by combining a total of 125 drill core intervals. The drill core intervals were chosen to duplicate the grade profile in the West Zone mineralization and provide a full spatial representation of the West Zone. This compositing approach ensures that the West Zone Master composite was representative of the average life-of-mine mill feed.

The eight (8) variability composites were generated by combining 362 drill hole intervals from different locations within the specific sampling zone. The drill hole intervals were selected to ensure a spatial distribution and a combined head grade that was representative for the specific zone.

### 13.3 Sample Characterization

The West Zone Master composite was subjected to chemical characterization. The results of the carbon speciation and sulphur analysis are presented in Table 13.2 and the whole rock analysis data is presented in Table 13.3.

The graphitic carbon content of the West Zone Master composite was 4.31 % C(g) and the carbonate content yielded 0.27 % CO<sub>3</sub>. The carbonate content is critical for designing the desulphurisation circuit (i.e. to produce a high-mass desulphurized tailings stream that is not acid generating). The sulphur head grade of the composite was 3.49 % S. The non-sulphide gangue minerals consisted primarily of silica, aluminium oxides, and iron oxides. Note that the results of the whole rock analysis are expressed as the major oxide of an element, but it does not mean that these elements actually occurred as those minerals. The results of an ICP-OES scan, presented in Table 13.4, showed low levels of deleterious elements.

**Table 13.2 – West Zone Master Composite Carbon Speciation and Sulphur Head Grades**

Assays (%)			
C(t)	C(g)	CO <sub>3</sub>	S
4.84	4.31	0.27	3.49

**Table 13.3 – Whole Rock Analysis Results**

Assays (%)						
SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	MgO %	CaO %	NaO %	K <sub>2</sub> O %
66.6	9.63	8.22	1.42	1.75	0.87	2.35
TiO <sub>2</sub> %	P <sub>2</sub> O <sub>5</sub> %	MnO %	Cr <sub>2</sub> O <sub>3</sub> %	V <sub>2</sub> O <sub>5</sub> %	Lol %	Sum %
0.61	0.44	0.03	0.03	0.07	6.86	98.8

**Table 13.4 – ICP-OES Scan Results**

Assays (g/t)										
Ag	As	Ba	Be	Bi	Cd	Co	Li	Mo	Na	Ni
< 2	< 30	499	1.34	< 20	< 2	35	11.00	32	6,450	162
Pb	Sb	Se	Sn	Sr	Ti	Tl	U	Y	Zn	
< 30	< 10	< 30	< 20	66.3	3,960	< 30	< 20	20.8	220	

Eight (8) variability samples were submitted for graphitic and total carbon analysis and the results are presented in Table 13.5. The total carbon head grades ranged from 3.79 % C(t) for the Top South composite to 4.95 % C(t) for the Top North composite. The corresponding graphitic carbon values were 3.52 % C(g) for the Top South composite and 4.58 % C(g) for the Top North composite.

**Table 13.5 – Total and Graphitic Carbon Analysis of Variability Composites**

Composite	C(t) (%)	C(g) (%)
Top South Center	4.04	3.78
Top North	4.95	4.58
Bottom South	4.92	4.58
Bottom North	4.91	4.83
Top North Center	4.02	3.77
Top South	3.79	3.52
Bottom North Center	4.12	4.12
Bottom South Center	4.45	4.09

### 13.4 Comminution Testing

A series of comminution tests were carried out on the West Master composite and the Trench sample material. These comminution tests were completed to determine the crushing and grinding energy requirements for the comminution circuit and to quantify the expected wear rates of liners, lifters, and grinding media.

The full test program was completed on the Trench sample and only the SAG Mill Comminution (“SMC”), Bond rod mill and ball mill grindability tests, and the Bond Abrasion tests were carried out on the West Zone Master composite due to insufficient size of the drill core. A summary of the results is presented in Table 13.6.

**Table 13.6 – Summary of Comminution Tests**

Sample Name	Relative Density	JK Parameters				Work Indices (kWh/t)			Ai (g)
		A x b <sup>1</sup>	A x b <sup>2</sup>	t <sub>a</sub>	SCSE	CWi	RWi	BWi	
West Zone Trench Sample	2.68	93.2	78.4	0.49	7.0	8.3	6.7	7.9	0.240
West Zone Master Composite	2.73	-	84.1	0.80	7.3	-	9.0	10.0	0.472

A x b<sup>1</sup>: From JKDropWeight Test  
 A x b<sup>2</sup>: From SMC Test

The JKDropWeight and SMC tests produced the semi-autogenous (“SAG”)/autogenous mill (“FAG”) parameters that facilitates the sizing of a SAG or FAG mill. The A×b, t<sub>a</sub>, and SCSE values of the JKDropWeight test on the Trench sample placed the Matawinie West mineralization into the very soft category. The A×b value of the Trench sample yielded 93.2 and only 13.6 % of the 4,607 ore types in the JKTech database produced higher A×b values i.e. were harder from a SAG/FAG grinding point of view. The SCSE value for the Trench sample was 7.00 kWh/t and only 12.4 % of the sample in the JK Tech database produced a lower SCSE value. The Trench sample yielded a t<sub>a</sub> of 0.49 and 44.2 % of the 4,649 ore types in the JKTech generated higher t<sub>a</sub> values.

JKTech noted that while almost all JKDropWeight test results show an increase in particle hardness with decreasing particle size, the Trench sample showed an increase in hardness with decreasing particle size from -63+53 mm down to -31.5+26.5 mm, and a reduction in hardness as the particle size continued to decrease down to -16+13.2 mm. The decreased hardness of these smaller particle sizes resulted in the overall JKDropWeight A×b for the Trench sample to be higher than expected, and is the reason for the difference between this result and the SMC value.

The two (2)  $A \times b$  values of 78.4 for the Trench sample and 84.1 for the West Zone Master composite as determined by the SMC tests suggest that the West Zone Master composite was slightly softer with regards to resistance to impact breakage.

With regards to the resistance to abrasion breakage, the  $t_a$  values between 0.49 for the Trench sample in the JKDropWeight test and 0.80 for the West Zone Master composite placed the Matawinie mineralization into the 20-40<sup>th</sup> percentile of hardness compared to all samples in the JKTech database.

The Low Energy Impact test produced a Crusher Work Index (“**CWi**”) of 8.3 kWh/t for the Trench sample. This is slightly lower compared to the average value of 9.8 kWh/t of over 800 samples in the SGS Lakefield CWi database.

Both the Bond rod mill and ball mill comminution results placed the Matawinie West mineralization into the very soft category. In the case of the Rod mill Work Index (“**RWi**”) results less than 10% of more than 2,600 samples that were tested at SGS Lakefield produced lower RWi. The Ball mill Work Indices (“**BWi**”) of 7.9 kWh/t and 10.0 kWh/t also fall within the 10<sup>th</sup> percentile of the softest material out of the more than 6,100 samples tested at SGS Lakefield.

The bond Abrasion work Indices (“**Ai**”) of 0.240 g and 0.472 g place the Matawinie mineralization into the medium to medium-high abrasive material category.

Overall the comminution results for the Matawinie West Zone material are favourable in terms of grinding energy requirements. However, the higher abrasion index will result in elevated liner, lifter, and media wear.

The Trench sample produced comminution results that indicate lower crushing and grinding energy requirements as well as lower abrasiveness. It is postulated that these results may have been driven by the fact that the Trench sample originated close from surface and has been exposed to a certain degree of oxidation. Hence, the comminution results for the West Zone Master composite are to be considered more representative of the average mill feed. The JKDropWeight test and SMC data for Trench sample can be used to calibrate the model, which will increase the accuracy of the SAG mill grinding energy requirements for drill core samples to be tested during the next phase of metallurgical testing.

### 13.5 Flow Sheet Optimization Program

The flow sheet optimization program built upon the results of the PEA metallurgical program, is summarized under historic metallurgical programs. While the overall flow sheet was maintained, the various unit operations were optimized to achieve maximum graphite recovery while maintaining a minimum concentrate grade of 96 % C(t) and

minimizing flake degradation. In the previous test programs, the primary objective was to maximize the final concentrate grade.

### 13.5.1 Rougher Kinetics Tests

A total of five (5) rougher kinetics tests were carried out to determine the relationship between secondary grind size and graphite recovery into the combined rougher and scavenger concentrate. Further, the effectiveness of the sulphide rejection circuit was evaluated as a function of the secondary grind size.

The mass recovery of the five (5) rougher tests into the various size fractions is depicted in Figure 13.2. The data confirms that a finer secondary grind target size will result in a decreased mass recovery into the jumbo flake size category. As the secondary grind target size was reduced from  $P_{80} = 518$  microns to  $P_{80} = 179$  microns, the mass recovery into the + 48 mesh size fraction decreased from 30.2 % to only 8.3 %. It should be noted that a reduced mass recovery into the + 48 mesh size fraction for the finer secondary grind size does not necessarily translate into higher losses of jumbo sized graphite flakes. The scavenger concentrate grade is relatively low in the medium and coarse grind sizes and characterized by middlings of graphite flakes and gangue minerals.

The total carbon grades of the various size fractions of the scavenger concentrates are depicted in Figure 13.3. The finer secondary grind size appeared to have a small beneficial impact on the total carbon grades of the coarsest flakes size of + 48 mesh. The total carbon grade of the + 48 mesh yielded 85.4 % C(t) for the finest secondary grind size of  $P_{80} = 179$  microns, compared to 62.3 % C(t) or less for the coarser secondary grind sizes. However, the benefit was less clear for the smaller flake sizes, especially since the coarsest secondary grind size of  $P_{80} = 518$  microns produced total carbon grades in the smaller size fractions that exceeded the ones of the finest secondary grind size.

Figure 13.2 – Mass Recovery into Size Fractions of Scavenger Concentrates (F1 to F5)

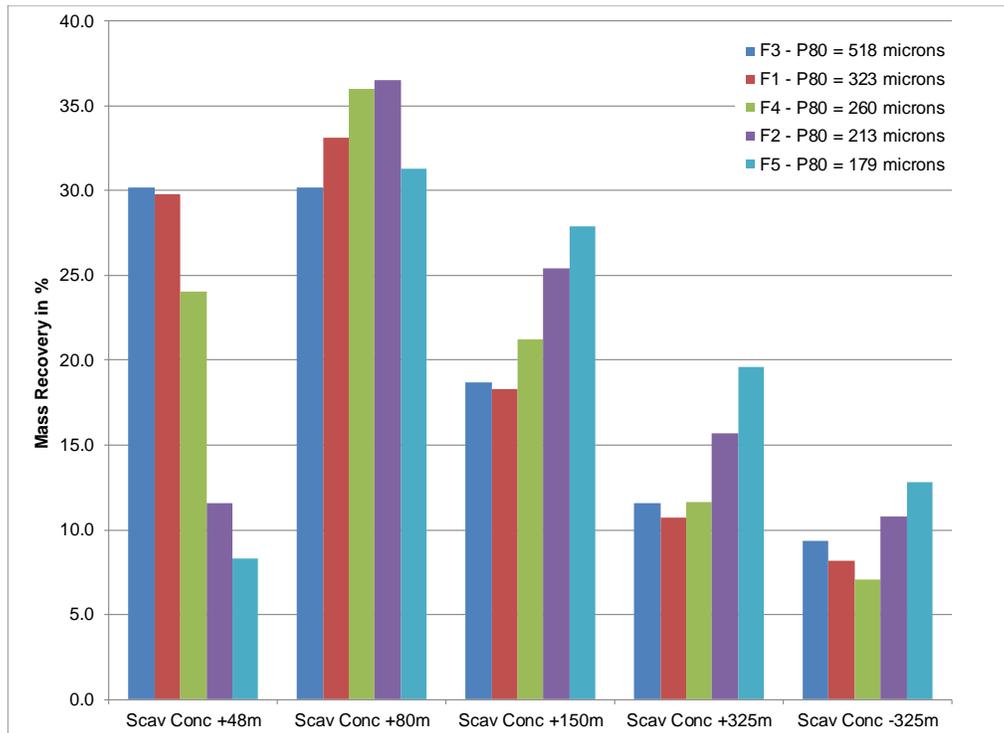
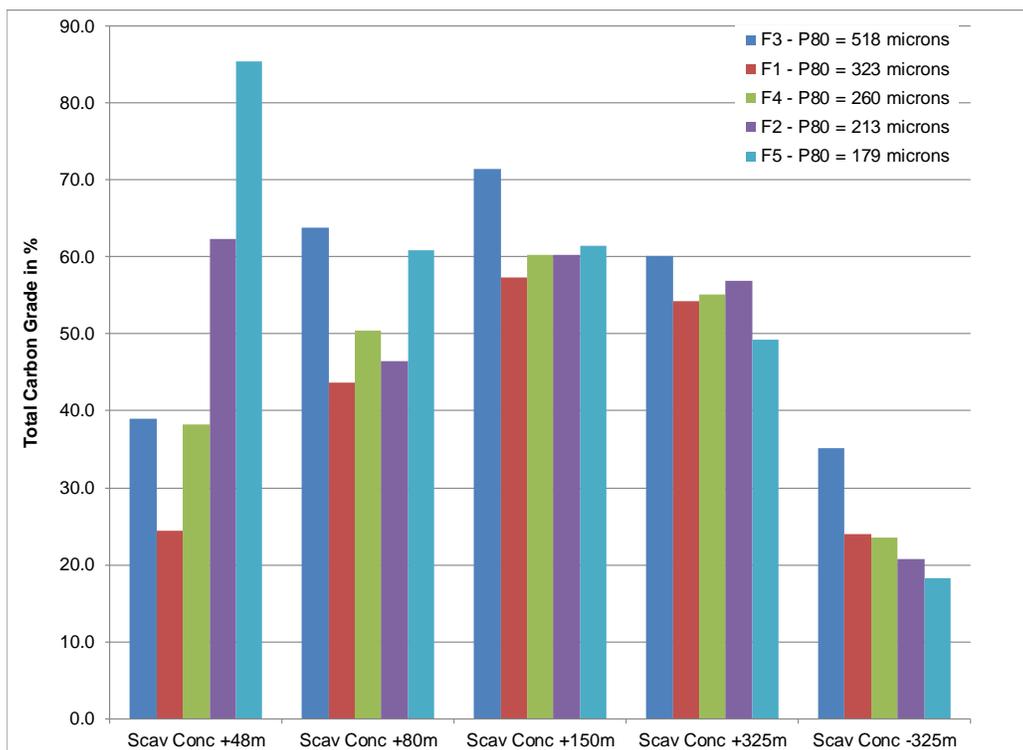


Figure 13.3 – Total Carbon Grades of Size Fractions of Scavenger Concentrates (F1 to F5)

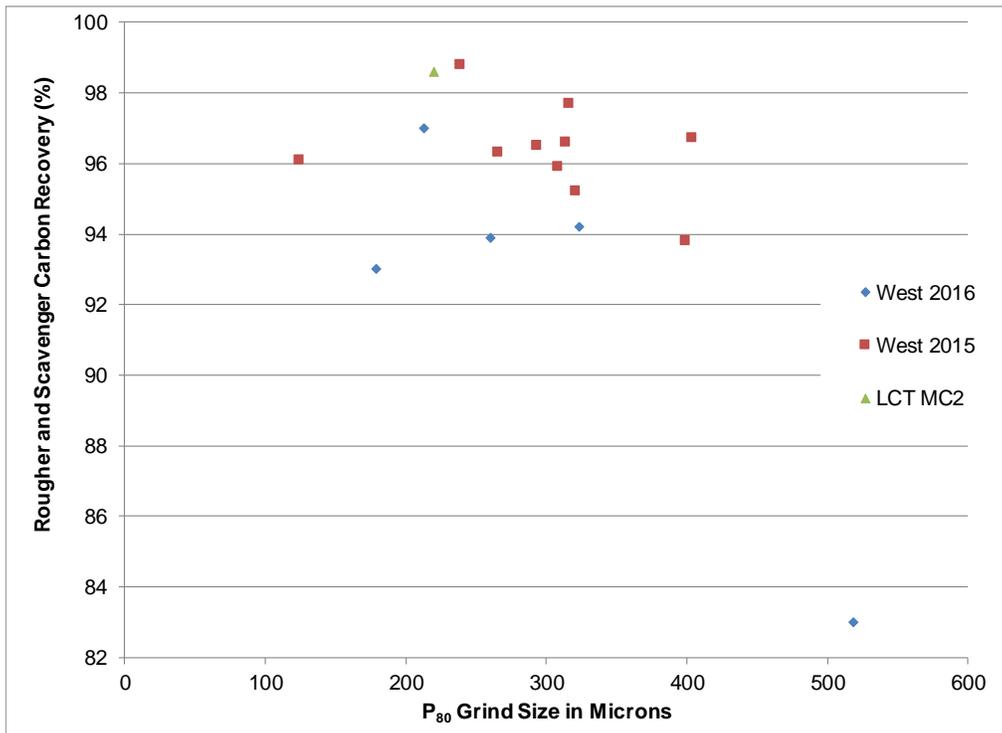


The combined rougher and scavenger total carbon recovery is plotted against the secondary grind size in Figure 13.4. The chart depicts the scavenger recovery for the rougher kinetics tests of both the 2016 and 2017 metallurgical programs. The presented data does not reveal a correlation between secondary grind size and combined rougher and scavenger recovery within the evaluated size range.

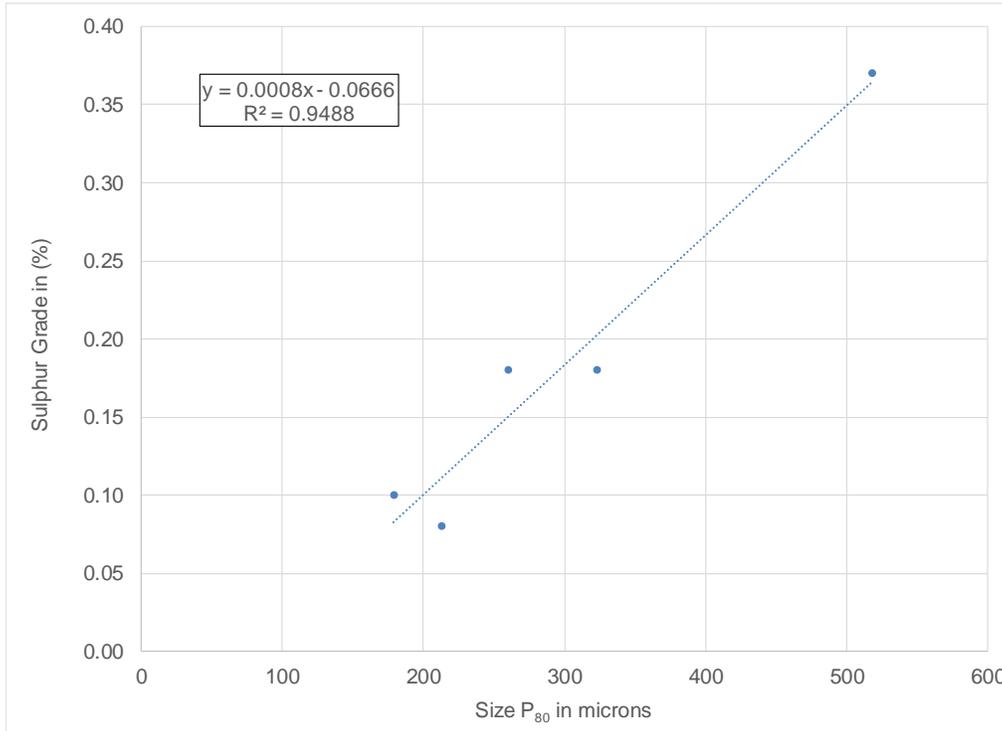
A third factor that impacts the selected secondary grind size is the ability to produce a low-sulphur tailings stream that consists of non-acid generating tailings. The sulphur grade as a function of the secondary grind size is depicted in Figure 13.5. The trendline equation provides a good fit with a  $R^2$  of 0.949. Although a firm threshold value has not been established for the Matawinie West Zone mineralization, the absence of significant quantities of carbonates suggests that a tailings grade of approximately 0.10 % S may be required to render the low-sulphide tailings non-acid generating.

Considering the three (3) factors that impacted the grind size selection, a secondary grind size of  $P_{80} \sim 210$  microns as obtained in test F2 was selected for the remaining tests.

**Figure 13.4 – Combined Rougher and Scavenger Graphite Recovery as Function of Head Grade**



**Figure 13.5 – Sulphur Grade as Function of Secondary Grind Size**



### 13.5.2 Desulphurization Tests

Eight (8) additional rougher flotation tests were completed to generate combined rougher and scavenger concentrate for primary cleaner optimization testing and to evaluate the impact of different sulphide activator and collector dosages on the sulphide grade of the low-sulphide tailings stream.

A summary of the test conditions for the sulphide rejection stage is provided in Table 13.7. The dosages of the sulphide activator copper sulphate (CuSO<sub>4</sub>) were varied between 0 g/t and 200 g/t. The dosages of the sulphide collector PAX varied between 75 g/t and 300 g/t. The rougher flotation time of eight (8) minutes was kept the same in all eight (8) tests.

**Table 13.7 – Copper Sulphate and Potassium Amyl Dosages in Sulphide Rejection Circuit**

Criteria	F6	F7	F8	F9	F10	F11	F12	F13
CuSO <sub>4</sub> Dosage	0	0	0	100	50	100	200	200
PAX Dosage	150	75	225	225	75	100	200	300

The results of the eight (8) sulphide rejection tests are presented in Table 13.8. The sulphide recovery into the sulphide rougher concentrate ranged between 76.9% in test F8 with 0 g/t CuSO<sub>4</sub> and 225 g/t PAX and 93.1 % in test F13 with 200 g/t CuSO<sub>4</sub> and 300 g/t PAX. Without the addition of copper sulphate, the sulphide recovery decreased with increasing PAX dosage. The addition of both reagents did improve the overall sulphide recovery into the sulphide rougher concentrate by approximately eight (8) % for the highest dosages.

**Table 13.8 – Sulphide Rejection Performance**

Test	Product	Mass	% S Grade	% S Rec
F6 0 g/t CuSO <sub>4</sub> 150 g/t PAX	Sulphide Conc 1+2	11.5	23.0	81.5
	Magsep Conc	9.2	5.44	15.6
	Magsep Tails	79.3	0.12	2.9
F7 0 g/t CuSO <sub>4</sub> 75 g/t PAX	Sulphide Conc 1+2	12.2	22.1	84.8
	Magsep Conc	9.4	4.27	12.7
	Magsep Tails	78.4	0.10	2.5
F8 0 g/t CuSO <sub>4</sub> 225 g/t PAX	Sulphide Conc 1+2	10.4	22.9	76.9
	Magsep Conc	10.1	5.91	19.3
	Magsep Tails	79.4	0.15	3.8
F9 100 g/t CuSO <sub>4</sub> 225 g/t PAX	Sulphide Conc 1+2	13.9	21.2	89.7
	Magsep Conc	8.9	3.20	8.6
	Magsep Tails	77.2	0.07	1.6
F10 50 g/t CuSO <sub>4</sub> 75 g/t PAX	Sulphide Conc 1+2	12.7	21.2	86.0
	Magsep Conc	9.2	3.90	11.4
	Magsep Tails	78.2	0.10	2.5
F11 100 g/t CuSO <sub>4</sub> 100 g/t PAX	Sulphide Conc 1+2	12.3	23.3	87.6
	Magsep Conc	9.5	3.60	10.4
	Magsep Tails	78.2	0.08	1.9
F12 200 g/t CuSO <sub>4</sub> 200 g/t PAX	Sulphide Conc 1+2	14.3	20.4	90.4
	Magsep Conc	8.0	3.08	7.7
	Magsep Tails	77.7	0.08	1.9
F13 200 g/t CuSO <sub>4</sub> 300 g/t PAX	Sulphide Conc 1+2	14.8	20.3	93.1
	Magsep Conc	8.3	2.04	5.2
	Magsep Tails	76.9	0.07	1.7

The magnetic separation stage recovered between 8.2 % and 19.3 % of the sulphides. The higher recoveries coincide with the tests that produced the lower sulphur recovery into the flotation concentrate.

The magnetic separation tailings contained between 1.7 % and 3.8 % of the sulphur at grades between 0.07 % S and 0.15 % S. Test F7 with a PAX dosage of 75 g/t and 0 g/t CuSO<sub>4</sub> graded 0.10 % S, which was only marginally higher than the best results. Given the significant operating cost reduction due to the reduced reagent dosage, the conditions of test F7 with a slightly higher PAX dosage of 100 g/t were chosen for the design.

### 13.5.3 Primary Cleaner Tests

Eight (8) cleaner flotation tests were carried out to determine suitable conditions for the primary cleaning circuit. The tests evaluated different grinding technologies including conventional polishing grinding, attrition scrubbing, and stirred media grinding. A summary of the conditions that were chosen for the eight (8) tests is provided in Table 13.9.

**Table 13.9 – Grinding Conditions for Primary Cleaner Optimization**

Test	Conditions
F14	15 min polishing mill with ceramic media
F15	20 min polishing mill with ceramic media
F16	25 min polishing mill with ceramic media
F17	15 min attrition scrubbing with ceramic media
F18	10 min stirred media grinding with steel media
F19	15 min stirred media grinding with steel media
F20	10 min stirred media grinding with ceramic media
F21	15 min stirred media grinding with ceramic media

The mill discharge was upgraded in four (4) stages of cleaner flotation and the 4<sup>th</sup> cleaner concentrate was submitted for a size fraction analysis. The mass recovery and the total carbon grades of the various size fractions are depicted in Figure 13.6 and Figure 13.7, respectively.

The mass recovery into the large and jumbo flake categories of + 80 mesh was significantly improved for the three (3) tests that employed polishing grinding. Approximately 44 % of the concentrate mass was recovered into this product for all three (3) tests compared to only 14.6 to 34.6 % in the other five (5) tests using alternative grinding technologies. While attrition scrubbing produced an intermediate concentrate with 34.6 % of the mass in the + 80 mesh size fractions, the mass recovery into the same product decreased from 14.6 to

21.1 % in the stirred media mill tests. The test that employed ceramic media in the stirred media mill produced a slightly better mass recovery into the + 80 mesh size fractions, but the improvements were marginal at 1.5 to 2.5 %.

The combined concentrate grades of the eight (8) tests fell within a narrow range of 96.4 % C(t) to 97.8 % C(t). Since high concentrate grades were obtained for all tests, it suggests that most of the impurities were attached to the surface of the flakes and, therefore, a high-shear environment is not required to achieve high-grade concentrates for this intermediate graphite product.

Comparing the different grinding technologies, the attrition scrubber produced the lowest grades in the + 65 mesh size fractions, but then fell in line with stirred media tests for the smaller size fractions. The stirred media tests using the ceramic media produced the best grades overall at 97.6 % and 97.8 % C(t). The four (4) stirred media tests produced the highest grades in the + 80 mesh size fractions with 97.7 to 98.4 % C(t), while the attrition scrubber matched and in some cases exceeded the total carbon grades for the smaller size fractions. The total carbon grades of the size fractions of the three (3) tests using the polishing mill fell generally below the best results of the attrition scrubber and stirred media mill, but the differences were relatively small at less than 1.5 % for most size fractions.

Given that the mass recovery into the large and jumbo flake categories was 10-20 % higher for the polishing mill compared to the alternative grinding technologies, a decision was made to select the polishing mill for the primary grinding circuit. The mass recovery into the + 80 mesh size fractions was not noticeably affected by the polishing grind time, but a slight grade improvement was noted for the longer grind times. Hence, a polishing grind time of 22 minutes was chosen for the primary cleaning circuit.

Figure 13.6 – Mass Recovery into Size Fractions – F14 to F21

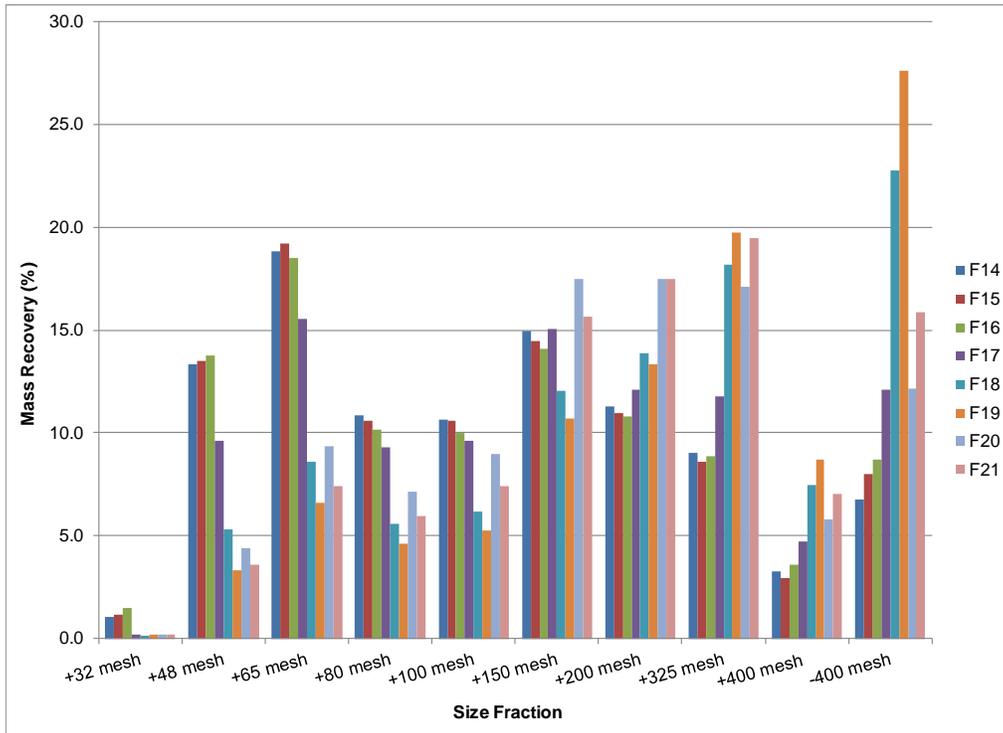
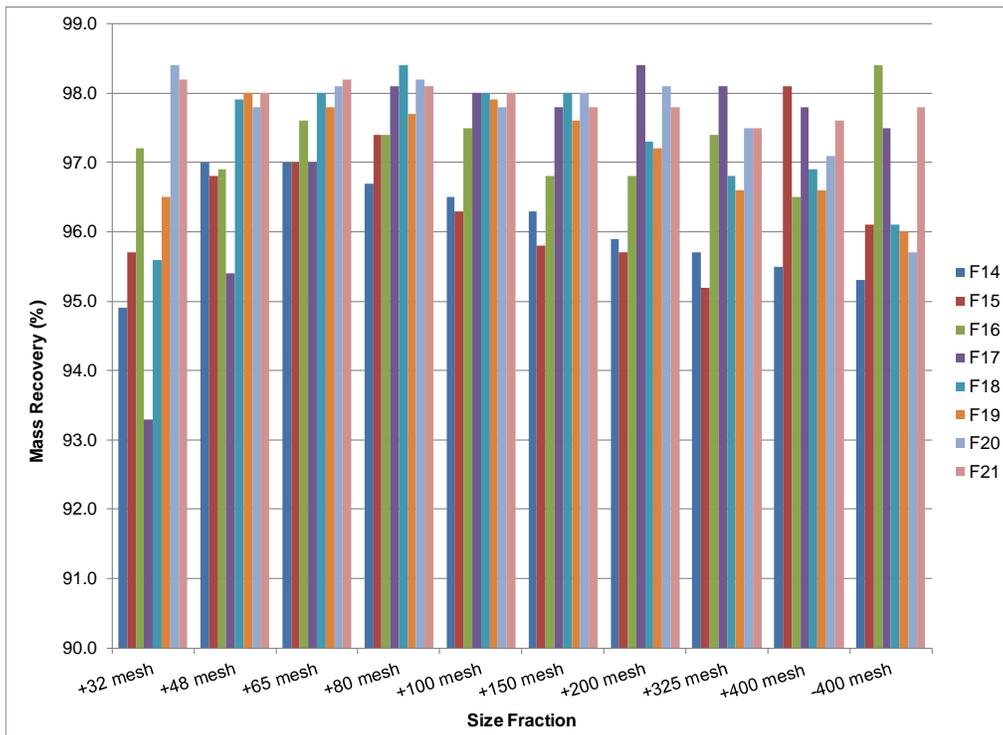


Figure 13.7 – Total Carbon Grades of Size Fractions – F14 to F21



#### 13.5.4 Intermediate Concentrate Production

In order to generate feed samples for the secondary cleaning circuit optimization tests, a bulk intermediate concentrate was generated and then split into equal test charges. This approach was chosen to eliminate test-to-variance to produce the feed for the secondary cleaning circuit.

One (1) test charge was submitted for a size fraction analysis, and the results are presented in Table 13.10. A total of 45.8 % of the concentrate reported to the + 80 mesh size fractions and 16.2 % of that mass into the + 48 mesh size fraction. The combined concentrate grade of the intermediate concentrate was 95.4 % and the size fractions in the large and jumbo sizes graded 96.2 % to 98.4 % C(t), respectively. Hence, the + 80 mesh portion of the concentrate met the minimum grade target of 96 % C(t) without the need of a secondary cleaning circuit.

A primary objective of the flow sheet optimization program was to determine the maximum concentrate grade that can be achieved for the West Zone mineralization and to identify the best grinding technology to accomplish this objective while minimizing flake degradation. While the primary cleaning circuit was able to achieve the current graphite concentrate target, a higher-grade target that may be established in the future will require a secondary cleaning circuit.

**Table 13.10 – Size Fraction Analysis of Feed Sample for Secondary Cleaner Optimization**

Size		Weight (g)	%	Retained	% Passing Cumulative	% C(t)
Mesh	µm		Individual	Cumulative		
32	500	0.8	1.6	1.6	98.4	96.2
48	300	7.3	14.6	16.2	83.8	97.1
65	212	9.8	19.6	35.8	64.2	98.4
80	180	5.0	10.0	45.8	54.2	97.0
100	150	5.4	10.8	56.6	43.4	96.4
150	106	7.1	14.2	70.8	29.2	96.0
200	75	5.3	10.6	81.4	18.6	95.2
325	45	4.1	8.2	89.6	10.4	93.6
400	38	1.2	2.4	92.0	8.0	89.7
Pan	-38	4.0	8.0	100.0	0.0	83.9
<b>Total</b>	-	<b>50.0</b>	<b>100.0</b>	-	-	<b>95.4</b>
K <sub>80</sub>	282					

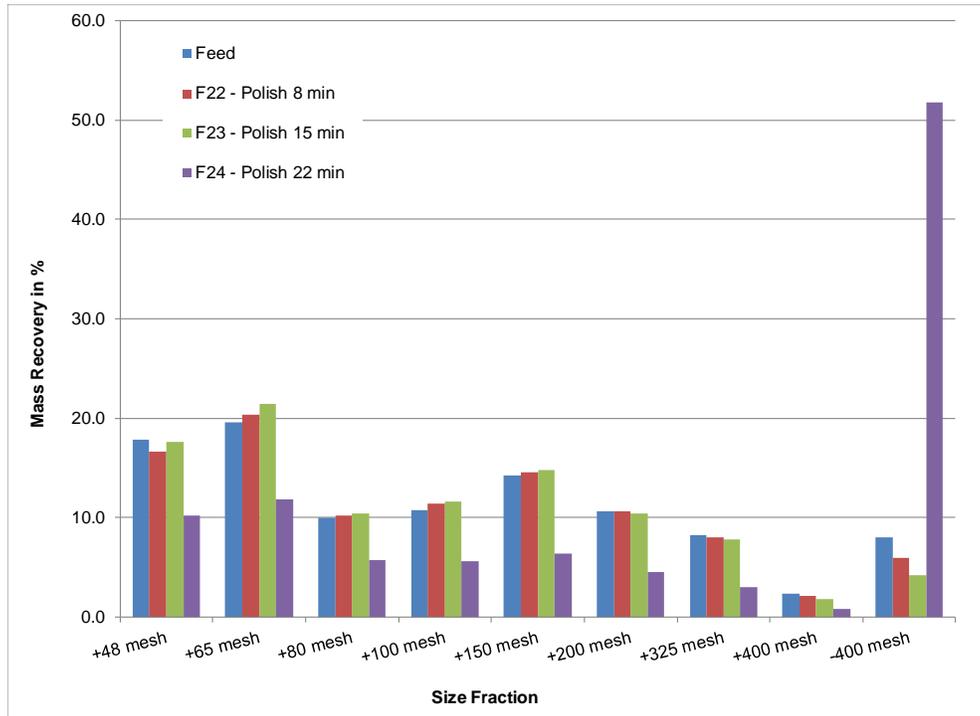
### 13.5.5 Secondary Cleaner Optimization

The secondary cleaner optimization included 19 flotation tests that evaluated different classification sizes, grinding technologies, and grinding media.

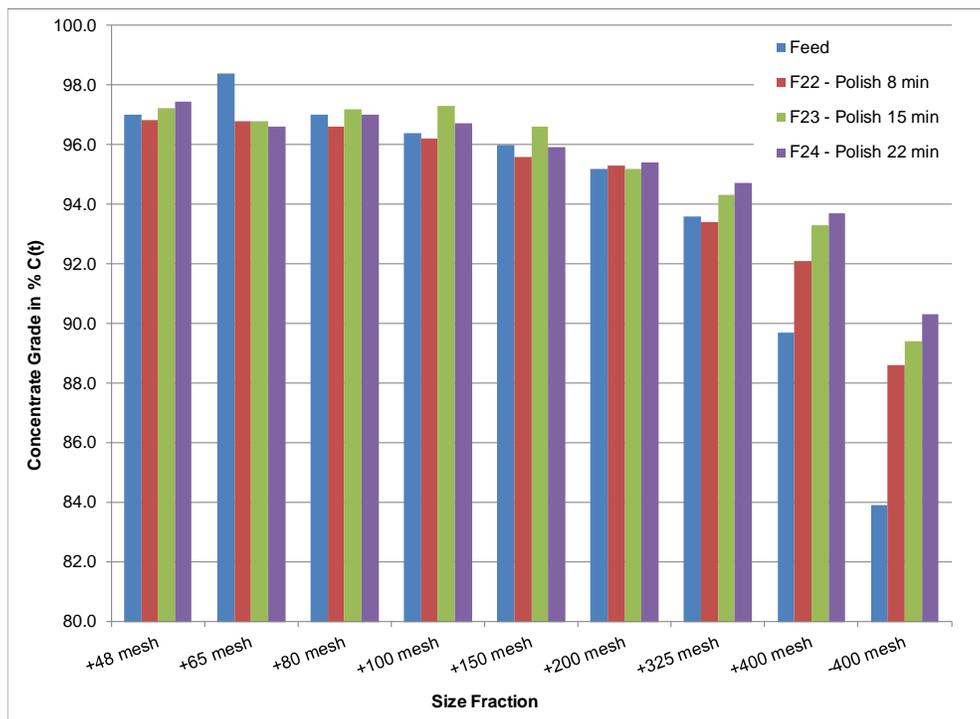
Three (3) tests were carried out using a polishing mill with ceramic media after the feed was screened at 80 mesh and 200 mesh. The polishing grind times for each size fraction were varied between eight (8) minutes and 22 minutes. The mill discharges were then upgraded in three (3) stages of cleaner flotation.

The three (3) concentrates of each test were combined in the proper weight ratio and submitted for a size fraction analysis. The mass recovery into the various size fractions and their corresponding total carbon grades of the three (3) tests using the polishing mill are presented in Figure 13.8 and Figure 13.9, respectively. The significantly different size distribution for test F24 was the result of a bucking room error during the screen analysis rather than the true size distribution of the final concentrate. It is postulated that the results should be similar to the other two (2) tests as increasing the polishing grind time from eight (8) minutes to 15 minutes had little effect on the flake size distribution of the final concentrate.

**Figure 13.8 – Mass Recovery into Concentrate Size Fractions  
 Polishing Grind**



**Figure 13.9 - Total Carbon Grades of Concentrate Size Fractions  
 Polishing Grind**



The total carbon grades of the various size fractions did not improve for flake sizes of 200 mesh and larger since the small grade variations fell within the range of analytical measurement uncertainties. Only the three (3) smallest flake sizes yielded an improvement from polishing and longer polishing times resulting in increased grade improvements. However, the grades of the two (2) smallest size fractions were still below 94 % C(t). Based on these results, polish grinding proved ineffective in the secondary cleaning circuit tests.

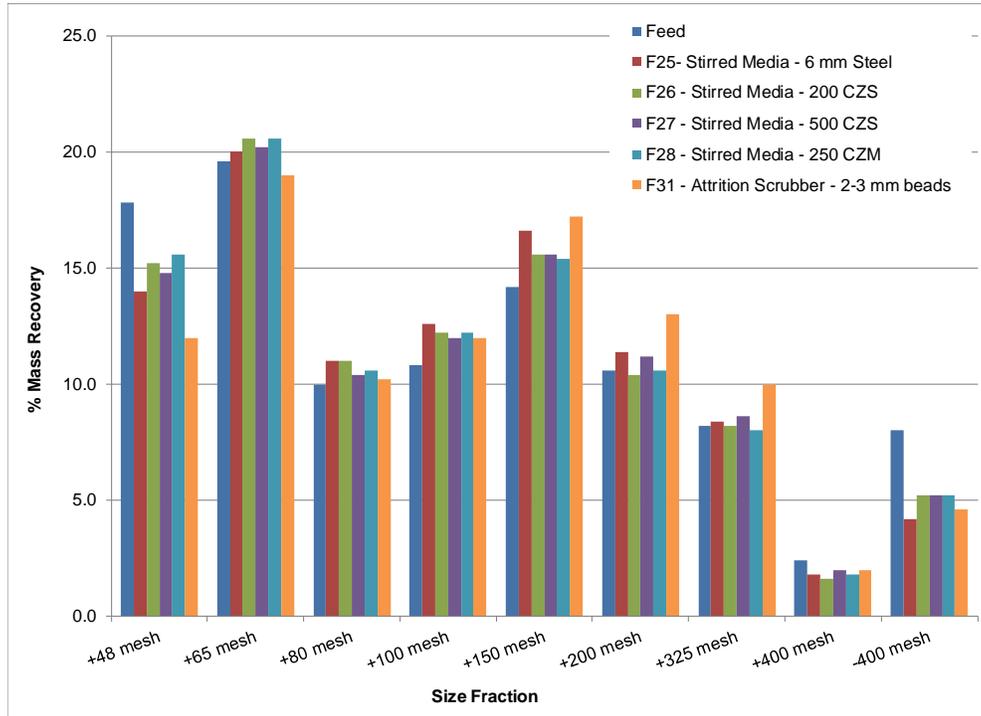
The second block of tests evaluated the impact of different media types in the stirred media mill and the use of an attrition scrubber. The grind times were kept identical at five (5) min in each grinding application.

The results of the size fraction analyses that were performed on the final concentrates of the five (5) tests are shown in Figure 13.10 and Figure 13.11 in form of mass recovery and total carbon grades charts, respectively.

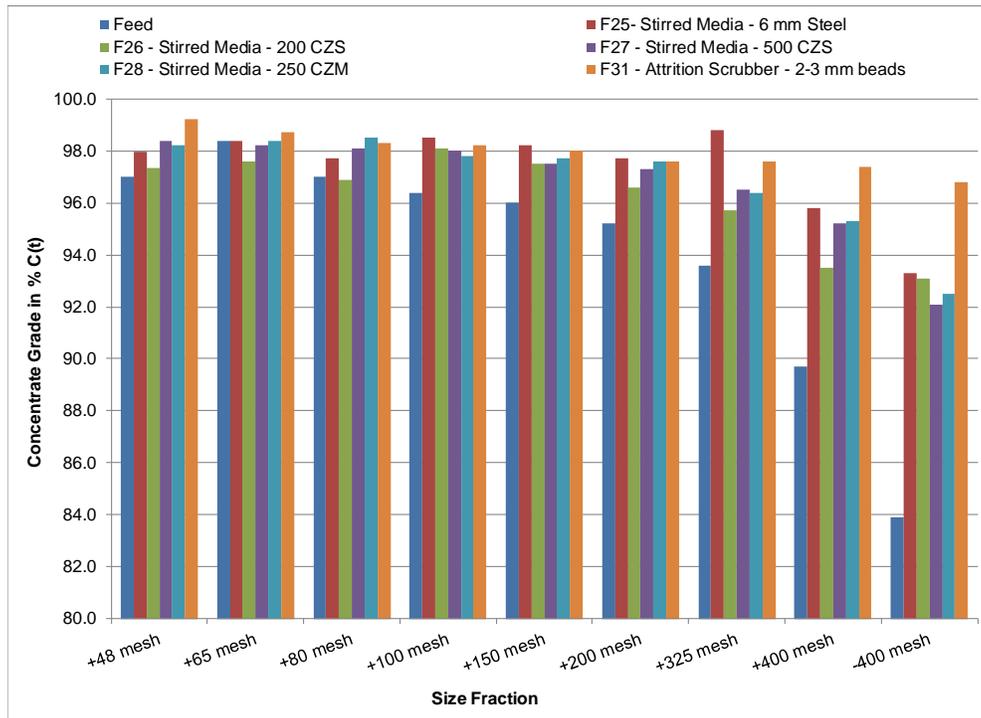
With regards to mass recovery into the various size fractions, the four (4) tests using the stirred media mill produced comparable results that differed only marginally. The test with the six (6) mm steel balls yielded a slightly lower mass recovery into the + 48 mesh and + 65 mesh size fractions. Further, the 200 CZS and 250 CZM media produced the lowest flake degradation in the same two (2) size fractions. The attrition scrubber test resulted in the finest concentrate product with significantly lower mass recovery into the + 65 mesh and + 48 mesh size fractions.

The attrition mill test produced the highest combined concentrate grade of 97.8 % C(t). However, the grade advantages were obtained primarily in the three (3) finest size fractions. In the + 200 mesh size fractions, the five (5) tests generated comparable results with marginal grade differences. The 200 CZS media produced slightly lower grades in the various size fractions compared to the other stirred mill grinding media. Given that the 250 CZM media caused the least amount of flake degradation in the two (2) coarsest size fractions, a decision was made to proceed with media in the following set of tests.

**Figure 13.10 – Mass Recovery into Concentrate Size Fractions  
 Stirred Media & Attrition Scrubber**



**Figure 13.11 – Total Carbon Grades of Concentrate Size Fractions  
 Stirred Media & Attrition Scrubber**

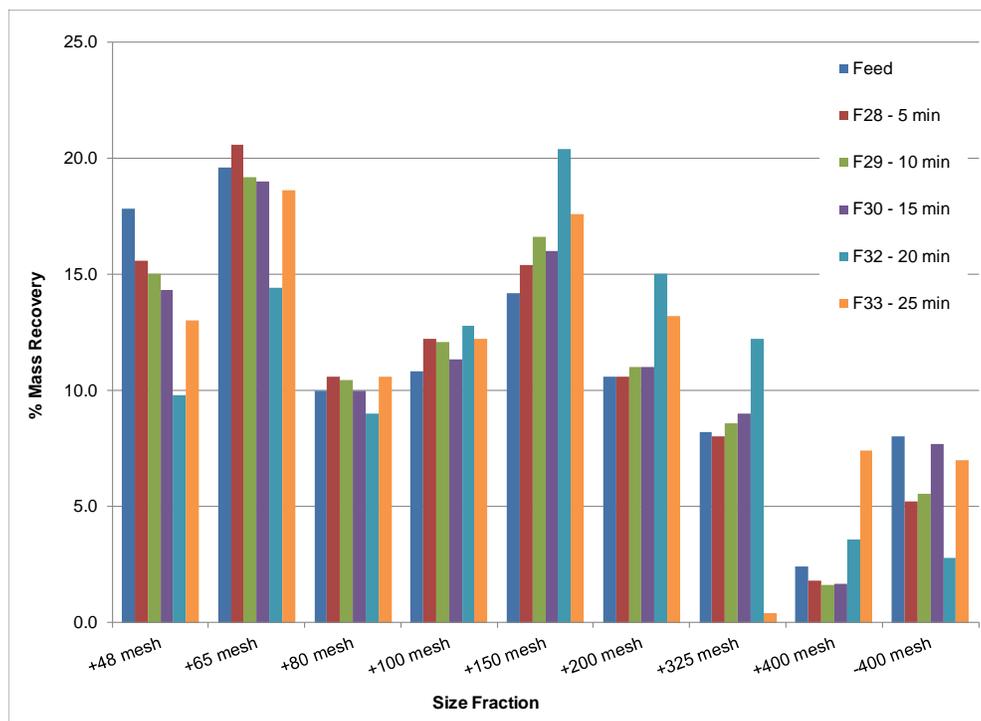


Four (4) additional tests were completed with the 250 CZM media in the stirred media mill. The grind times were increased from five (5) minutes in the previous block of tests to 10, 15, 20, and 25 in the test series.

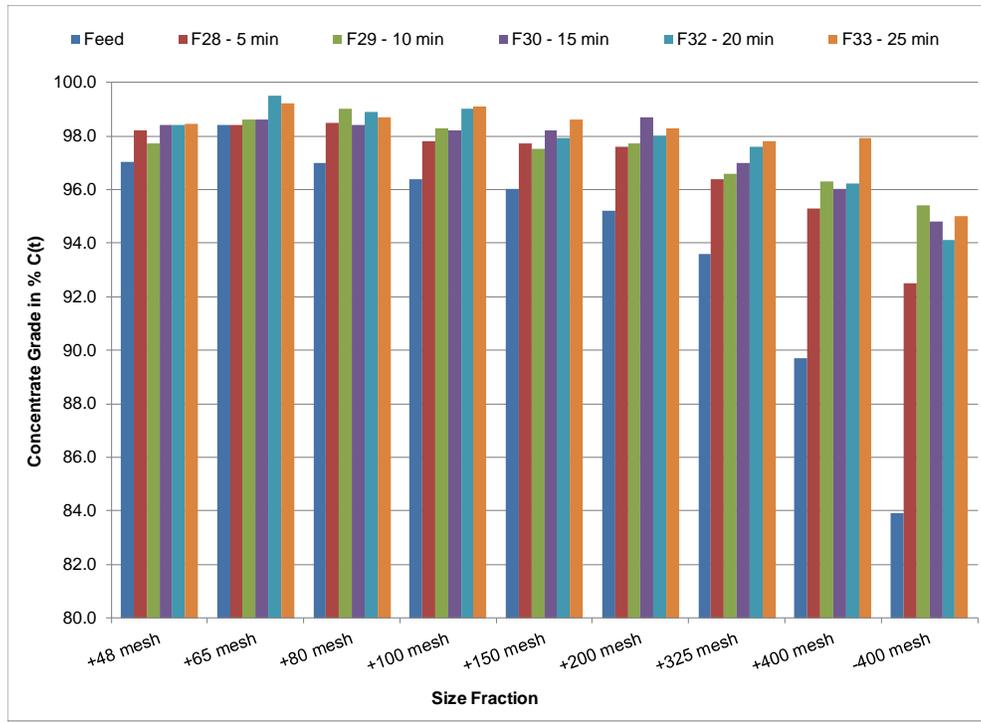
The mass recovery into the various size fractions and their corresponding total carbon grades are presented in Figure 13.12 and Figure 13.13, respectively. As expected, the mass recovery into the + 48 mesh size fraction gradually decreased with increasing grind times. Although some degradation of the + 48 mesh size fraction was observed, the absolute amount was moderate. At a grind time of five (5) minutes a total of 15.6 % of the mass reported to the + 48 mesh size fraction. This number decreased marginally to 13 % for the longest grind time of 25 min. The sizing results for test F32 are questionable since it does not follow the normal pattern. It is postulated that the mass that was collected from the – 80 / + 200 mesh concentrate was higher than it should have been, thus biasing the overall size distribution.

As the grind time was increased, the combined concentrate grade increased as well. While there is some variation in the size-by-size analysis, the combined concentrate grade as a function of the stirred media grind time, which is displayed in Figure 13.14, shows a strong and linear correlation. As the grind time is increased from five (5) minutes to 25 minutes, the combined concentrate improved from 97.6 % to 98.4 % C(t).

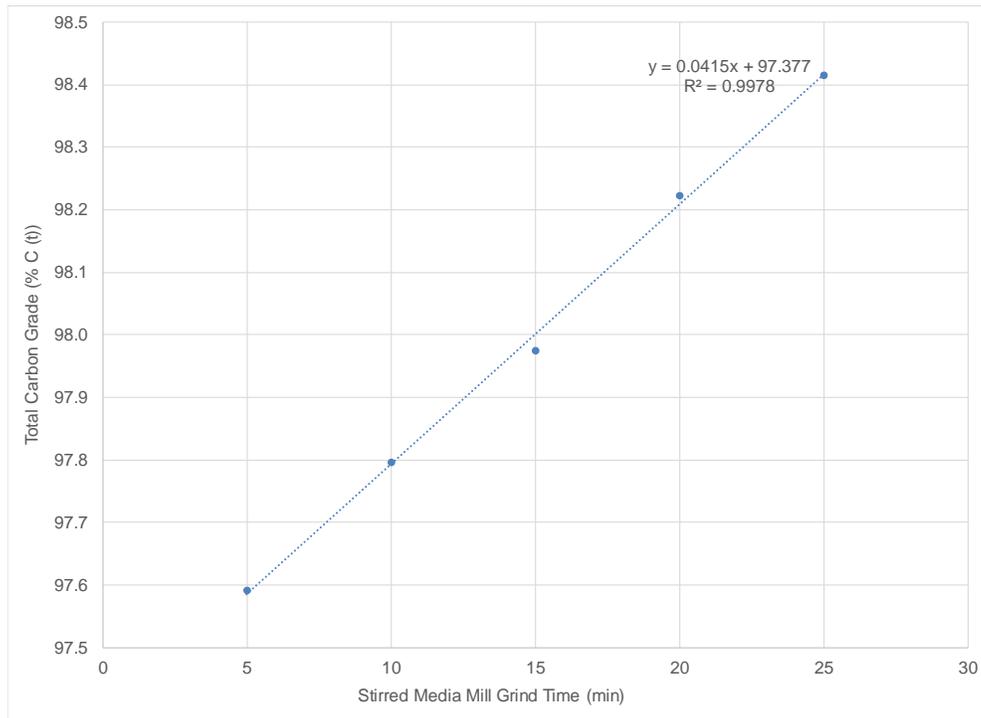
**Figure 13.12 – Mass Recovery into Concentrate Size Fractions – Stirred Media Grind Time**



**Figure 13.13 – Total Carbon Grades of Concentrate Size Fractions Stirred Media Grind Time**



**Figure 13.14 – Total Carbon Grade versus Stirred Media Mill Grind Time**



In the previous tests, the stirred media mill was operated at the standard speed of 30 Hz (approximately 350 rpm). In order to assess the impact of higher and lower speeds on mineral liberation and flake degradation, one (1) test was carried out at a slower speed setting of 220 rpm and one (1) test at a higher speed setting of 480 rpm.

The mass recovery and total carbon grades of the various size fractions are presented in Figure 13.15 and Figure 13.16, respectively. While the degree of flake degradation was comparable for the low and medium stirred media mill speed, it increased noticeably at the highest speed of 480 rpm.

While the highest mill speed produced the best concentrate grades for 66 % of the size fractions, the grade advantages were 1.0 % C(t) or less with the exception of the - 400 mesh size fraction.

**Figure 13.15 – Mass Recovery into Concentrate Size Fractions – Stirred Media Speed**

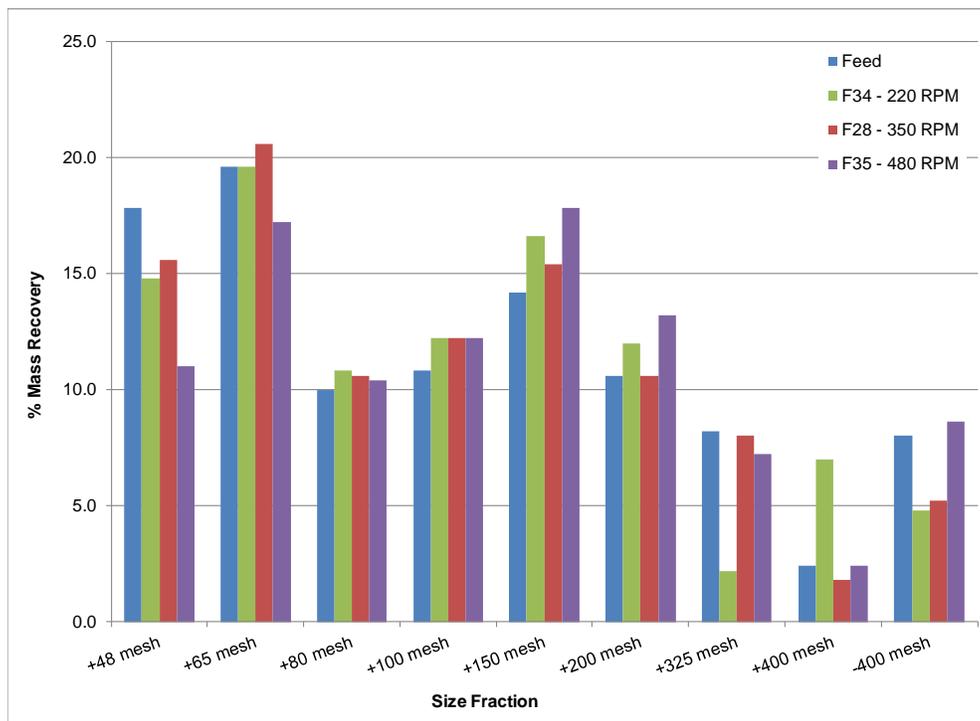
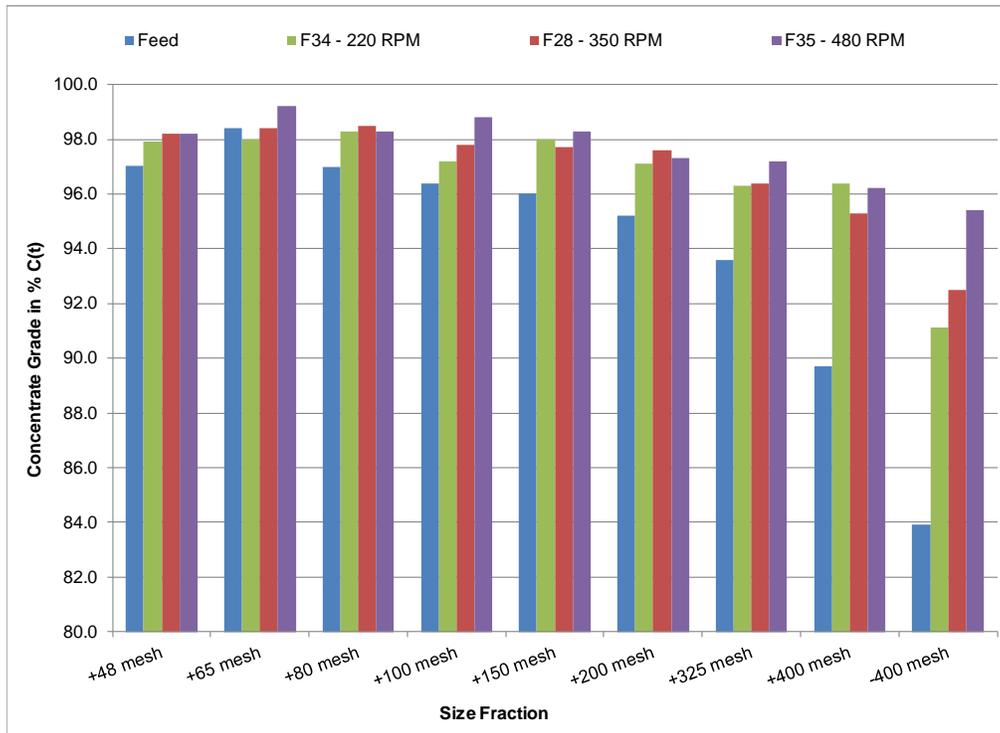


Figure 13.16 – Total Carbon Grades of Concentrate Size Fractions – Stirred Media Speed



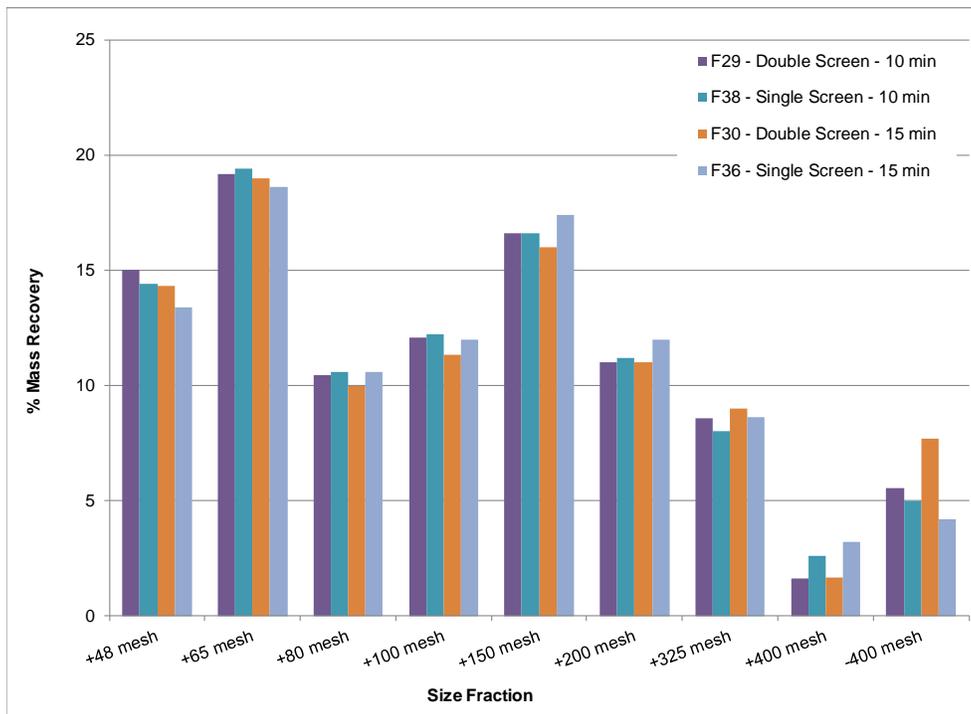
Three (3) tests were completed to assess the impact of a single screening stage at 80 mesh rather than two (2) stages at 80 mesh and 200 mesh. This approach simplifies the circuit and eliminates a challenging wet screening application at 200 mesh. The mass recovery into the various size fractions is depicted in Figure 13.17 and does not display significant differences within the same size fraction that would suggest that two (2) secondary cleaning circuits instead of three (3) leads to an increased flake degradation for the West Zone graphite mineralization.

The total carbon analysis results for the size fractions, which are presented in Figure 13.18, indicate that using a single screen benefits the total carbon grades of the size fraction range of – 65 / + 325 mesh as both tests with just a single screen size yielded noticeably better concentrate grades. However, the grades of the + 400 mesh and - 400 mesh size fractions were up to 1.1 % higher in the tests with the two (2) screening stages.

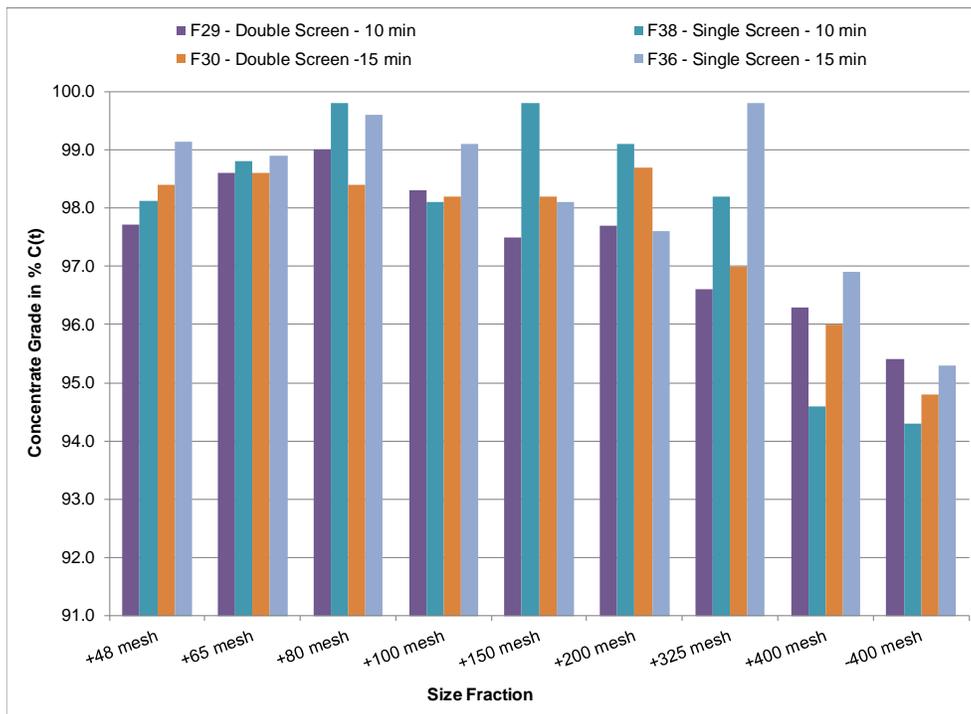
The test using the five (5) min grind times in the secondary cleaner circuits was excluded from the analysis as an incorrect screen analysis prevented the analysis of the data.

Based on the results obtained in the four (4) tests, a single screening stage at 80 mesh produced a comparable flake size distribution and slightly better concentrate grades in the medium size flakes, thus warranting a decision to maintain a simple flow sheet with only two (2) secondary cleaning circuits.

**Figure 13.17 – Mass Recovery into Concentrate Size Fractions – Single versus Double Screen**



**Figure 13.18 – Total Carbon Grades of Concentrate Size Fractions – Single versus Double Screen**



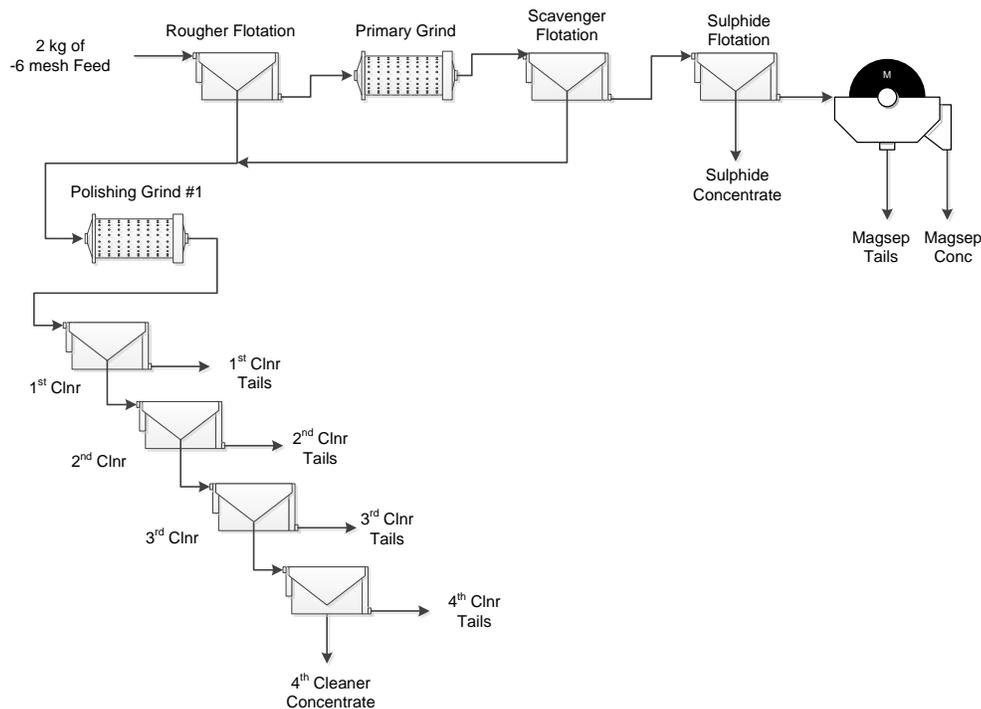
The last two (2) tests F39 and F40 evaluated the use of coarse sand as grinding media in the attrition scrubber. The mass recovery into the various size fraction was slightly superior for both tests compared to the baseline test F36 with 15 minutes of stirred media milling with 250 CZM. However, the total carbon grades of the various size fractions were inferior by up to 4 % compared to the baseline tests. Further, the recovery of coarse sand in a commercial process would be more challenging.

### 13.5.6 Variability Flotation Testing

The robustness of the proposed flow sheet and conditions for a range of different samples was evaluated with variability flotation tests. A total of eight (8) composites representing different areas and depths of the West Zone mineralization and the West Zone Master composite were subjected to the flow sheet that is depicted in Figure 13.19.

This simplified flow sheet was chosen since the grade target at the time of variability flotation testing was only 95 % C(t), but was raised subsequently to 96.0 % C(t) at the end of the optimization program.

**Figure 13.19 – Variability Flotation Test Flow Sheet**



The combined total carbon grade and recovery into the 4<sup>th</sup> cleaner concentrate for the eight (8) tests is presented in Table 13.11 together with a basic statistical analysis.

The average total carbon grade and recovery were 96.2 % C(t) and 94.5 %, respectively. The concentrate grades ranged between 95.2 % C(t) for the Top South composite and

97.6 % C(t) for the Bottom North Center composite. The relative standard deviation was only 1.1 %.

The open circuit total carbon recovery into the 4<sup>th</sup> cleaner concentrate ranged between 92.4 % for the Bottom North composite and 96.0 % for the Bottom South Center composite. The average total carbon recovery was 96.0 % with a 1.2 % relative standard deviation.

**Table 13.11 – Statistical Analysis of Variability Flotation Test Results**

Test	Composite	ID	Grade (%) C(t)	Rec (%) C(t)
Var 1	Top South	TS	95.2	94.6
Var 2	Bottom South	BS	96.8	95.1
Var 3	Top South Center	TSC	95.3	95.0
Var 4	Bottom South Center	BSC	96.7	96.0
Var 5	Top North Center	TNC	95.4	95.1
Var 6	Bottom North Center	BNC	97.6	94.9
Var 7	Top North Center	TNC	95.1	93.1
Var 8	Bottom North	BN	97.3	92.4
Average			96.2	94.5
Min			95.1	92.4
Max			97.6	96.0
StdDev			1.0	1.2
Rel StdDev			1.1	1.2

The 4<sup>th</sup> cleaner concentrates of the eight (8) variability flotation tests were subjected to a size fraction analysis. The mass recovery into the ten (10) size fractions and the associated total carbon grades are presented in Figure 13.20 and Figure 13.21, respectively.

As expected, small differences in the mass recoveries into the various size fractions were noted, but the range was relatively small in most size fractions. The Top-South-Center composite produced the worst results with only 42.1 % of the concentrate mass reporting to the jumbo and large flake categories. The Top-North-Center and Bottom-North composites produced the coarsest graphite concentrate with 52.9 % and 53.5 % of the mass reporting to the jumbo and large flake categories, respectively. The average mass recovery into the + 80 mesh size fractions for all eight (8) variability tests was 48.4 %.

The total carbon grades of the size fractions displayed slightly more variation. However, the variation was still within a narrow range given that the variability samples originated from entirely different areas within the West Zone mineralization.

**Figure 13.20 – Mass Recovery into Concentrate Size Fractions – Variability Testing**

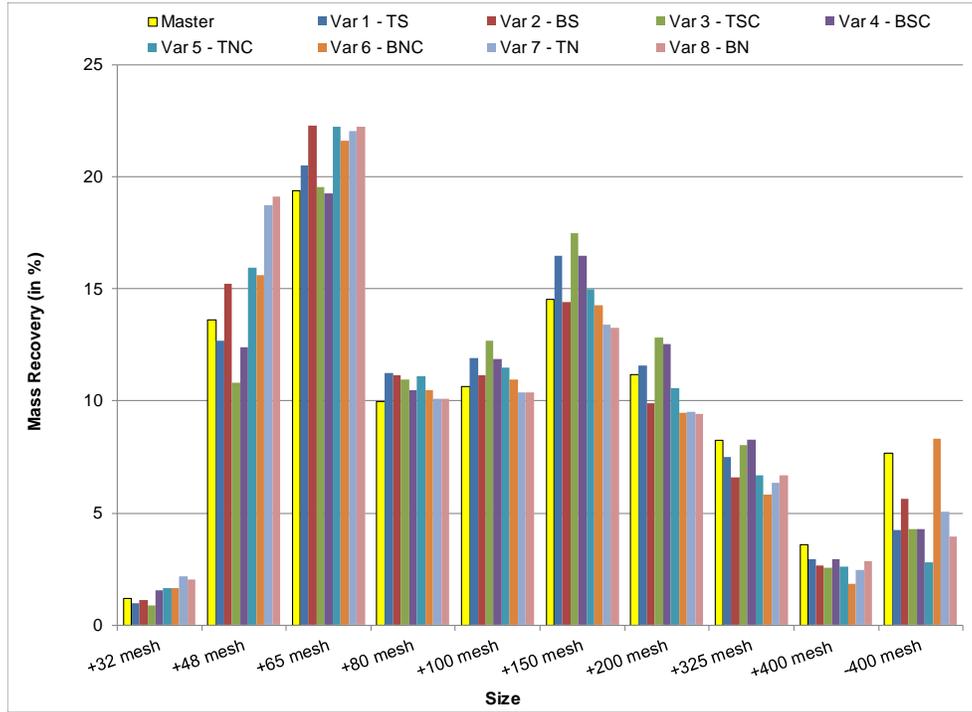
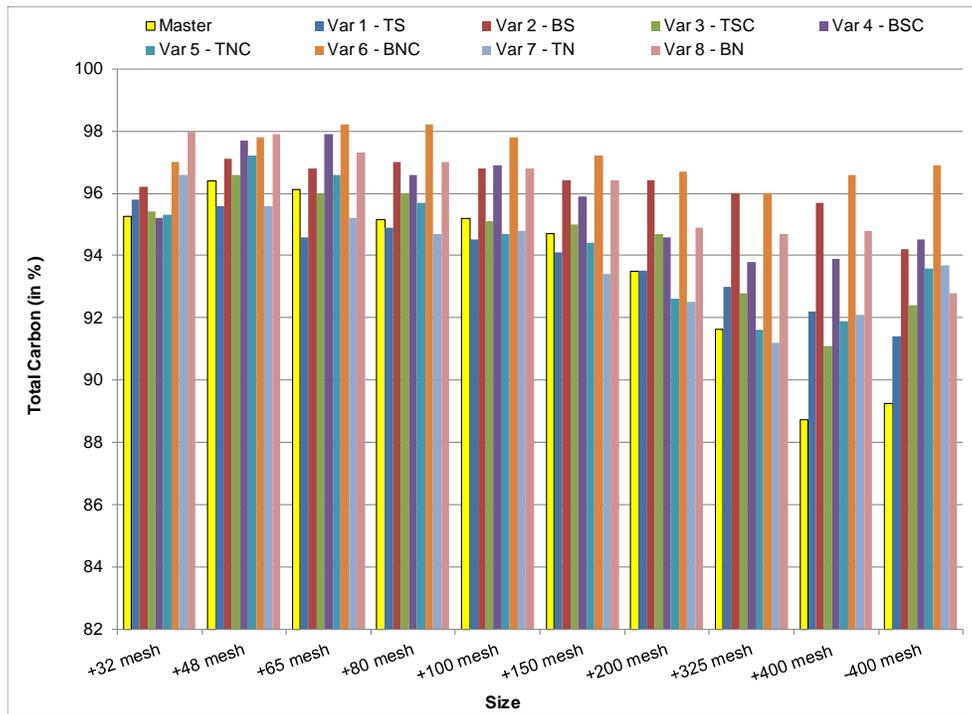


Figure 13.21 – Total Carbon Grades of Concentrate Size Fractions – Variability Testing



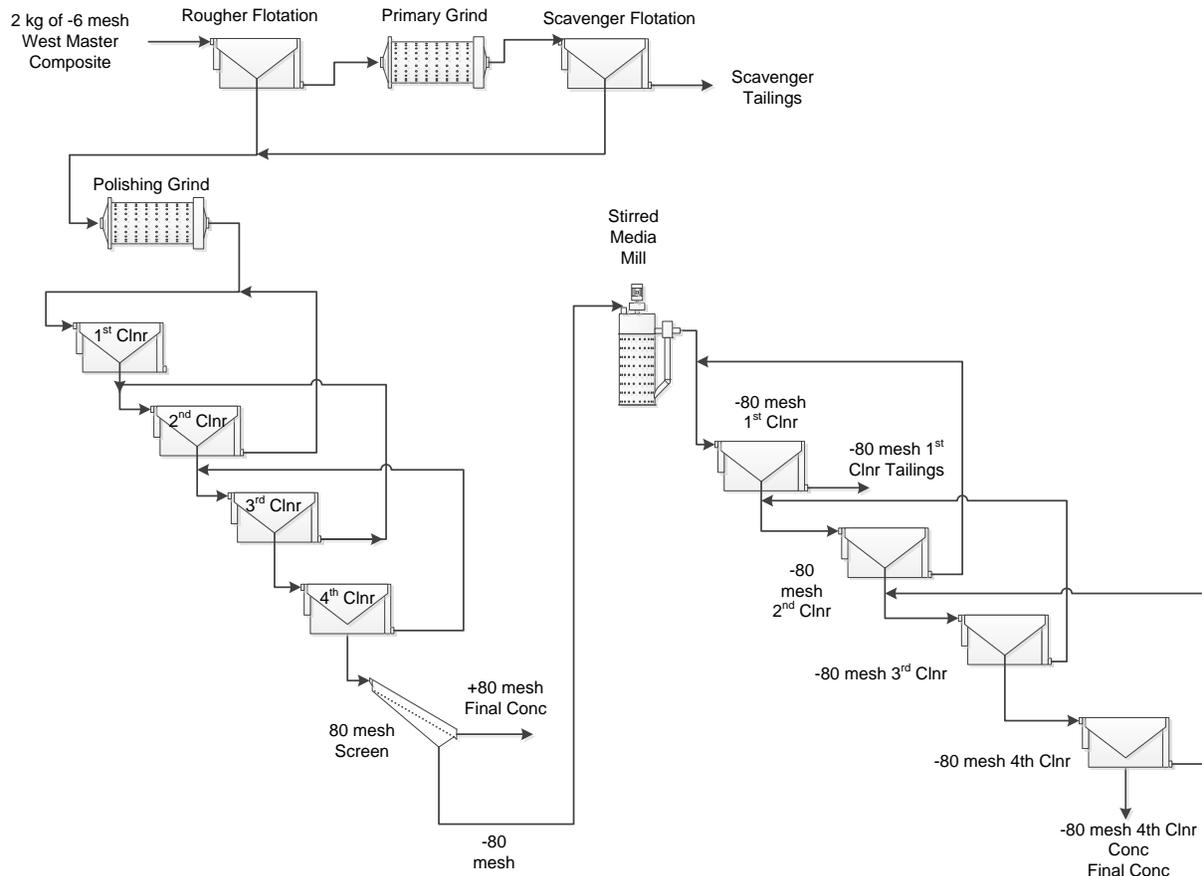
The eight (8) variability flotation tests produced a robust metallurgical response using a simplified West Zone process flow sheet and conditions. It may be possible that the variation is reduced further with the integration of the secondary cleaning circuit, which has been incorporated into the proposed West Zone process flow sheet.

It should be noted that the variability composites were generated to represent a significant resource area to identify potentially problematic metallurgical challenges on a macroscopic level. More significant variations in the metallurgical response may be observed with composites that represent smaller tonnages of the West Zone mineralization.

### 13.5.7 Locked Cycle Testing

Two (2) locked cycle flotation tests (“LCT”) were carried out as part of the optimization program. The first test LCT-MC replicated the conditions of the variability flotation tests, while the second test LCT-MC2 included a secondary cleaning circuit for the – 80 mesh product after the 4<sup>th</sup> cleaner concentrate was classified on 80 mesh. The flow sheet for LCT-MC2 is depicted in Figure 13.22.

Figure 13.22 – Locked Cycle Test LCT-MC2 Flow Sheet



A summary of the mass balances for the two (2) LCTs is provided in Table 13.12. Both tests focused on maximizing graphite recovery into the combined concentrate by employing more aggressive froth removal. Test LCT-MC achieved 98 % total carbon recovery into the 4<sup>th</sup> cleaner concentrate, but the final concentrate grade was only 94.3 % C(t), which was slightly below the 95 % C(t) grade target that was established at the time of testing.

The second LCT, which was carried out approximately one (1) month later after the slightly higher concentrate grade target of 96% C(t) was established, included the secondary cleaning circuit for the 80 mesh screen undersize to increase the final concentrate grade. The total carbon recovery into the graphite flotation concentrate decreased marginally by 0.6 % to 97.4 %, but the concentrate grade of 97 % C(t) met the 96 % C(t) target.

The size fraction analysis results of the graphite concentrate from LCT-MC2 is presented in Table 13.13. A total of 16.5 % of the mass reported to the jumbo flake category of > 48 mesh and an additional 31.6 % reported to the large flake category of – 48 / + 80 mesh.

The combined mass recovery of 48.1 % into the large and jumbo flake size categories are in good agreement with the open circuit flotation test results.

**Table 13.12 – Summary of Locked Cycle Test Results**

Test	Sample ID	Weight (%)	Assays (%) C(t)	% Distr. C(t)
LCT MC	4th Clnr Conc	4.55	94.3	98.0
	1st Clnr Tails	4.45	0.48	0.5
	Sulphide Conc	14.0	0.20	0.7
	Magsep Tails	77.0	0.05	0.9
	Head (calc)	100	4.37	100
LCT MC2	<b>Combined Conc</b>	4.44	97.0	97.4
	-80 mesh 1st Clnr Tails	0.09	16.1	0.3
	1st Clnr Tails	3.64	1.02	0.8
	Scav Tails	91.8	0.07	1.4
	Head (calc)	100.0	4.42	100.0

**Table 13.13 – Size Fraction Analysis of LCT-MC2 Graphite Concentrate**

<b>Size Fraction</b>	<b>Weight (%)</b>	<b>Assays % C(t)</b>	<b>Distribution % C(t)</b>
+ 32 mesh	1.6	96.5	1.6
+ 48 mesh	14.9	97.2	14.9
+ 65 mesh	20.4	97.1	20.4
+ 80 mesh	11.2	96.4	11.1
+ 100 mesh	11.6	96.9	11.6
+ 150 mesh	15.2	98.2	15.3
+ 200 mesh	9.1	98.1	9.2
+ 325 mesh	7.2	97.6	7.2
+ 400 mesh	3.0	97.3	3.0
- 400 mesh	5.8	96.2	5.7
<b>Final Concentrate (SA)</b>	<b>100.0</b>	<b>97.3</b>	<b>100.0</b>

### 13.5.8 Bulk Flotation Tests

In June and July 2017, a total of 11 x 10-kg bulk flotation tests were carried out to generate high-sulphur and desulphurized tailings for various characterization tests including self-heating, geochemical, geotechnical, and solid-liquid separation testing.

### 13.6 Product Characterization

Samples of the graphite flotation concentrate, high-sulphur tailings, and desulphurized tailings were submitted for product characterization tests to generate technical data required for the development of the process design criteria and to develop suitable tailings disposal strategies.

#### 13.6.1 Solids Liquid Separation Tests

Graphite concentrate, high-sulphur tailings, and desulphurized tailings were shipped to Outotec in Sudbury, Ontario for solid-liquid separation evaluation. The test program included flocculant scoping, static settling, vacuum filtration, and pressure filtration testing. The two (2) tailings products were generated in the bulk flotation tests using the West Zone Master composite. Since insufficient graphite concentrate sample mass was available from the recent test program on the West Zone Master composite, remaining concentrate from the South Zone 12 tonne concentrate production campaign was used instead.

A summary of the most favourable thickening test results is presented in Table 13.14. The high-sulphide and desulphurized tailings streams produced underflow densities of 72 % w/w and 65 % w/w, respectively. The graphite concentrate underflow density of 35 % w/w is in line with other graphite projects. The two (2) tailings streams produced good solids loading rates of 1.0-1.2 tph/m<sup>2</sup>. The number of flocculants were limited to SNF 913 and SNF 923 and the overflow clarity was good for all three (3) product and tailings streams.

**Table 13.14 – Thickening Results Summary**

Sample	Solids Loading Rate (t/h/m <sup>2</sup> )	Flocculant Type	Flocculant Dosage (g/t)	Underflow Density [% (w/w)]	Overflow Clarity (ppm)	Yield Stress (Pa)
Graphite Concentrate	0.4	SNF 923 VHM	30	35	< 100	47
High-Sulphur Tailings	1.0	SNF 923 VHM	20	65	< 100	90
Desulphurized Tailings	1.2	SNF 913 VHM	25	72	< 100	322

The results of the best vacuum and pressure filtration tests are presented in Table 13.15. Due to insufficient high-sulphur tailings sample mass, pressure filtration tests were only carried out on the graphite concentrate and the desulphurized tailings.

The moisture content of the filter cakes from vacuum filtration ranged between 9.3 % w/w for the high-sulphur tailings and 21.9 % w/w for the graphite concentrate. Pressure filtration reduced the moisture content to 15.5 % w/w for the graphite concentrate and 7.9 % w/w for the desulphurized tailings. Reducing the moisture content to a minimum is critical for graphite concentrate as it is more cost effective to remove the water by means of filtration than in the subsequent drying stage.

**Table 13.15 – Filtration Comparison**

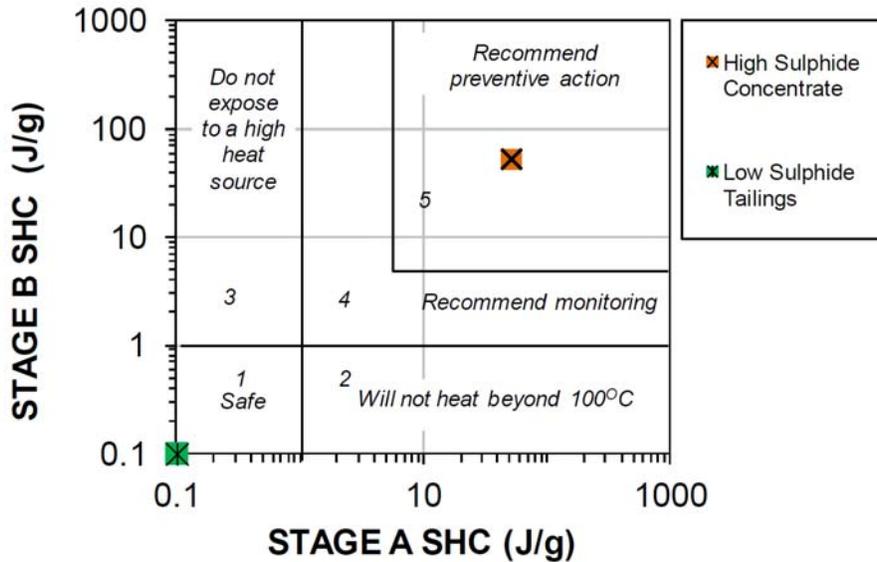
Parameters	Units	Graphite Concentrate		Desulphurized Tailings		High-Sulphur Tailings
		Pressure Filtration	Buchner Filtration	Pressure Filtration	Buchner Filtration	Buchner Filtration
Feed Density	% (w/w)	40	40	60	60	70
Chamber Size	mm	45	N/A	50	N/A	N/A
Filtration Rate	kg/m <sup>2</sup> h	196	183	159	704	958
Cake Moisture	% (w/w)	15.5	21.9	7.9	16.8	9.3
Cake Thickness	mm	34	22	47	20.2	18.8
Cycle Time	min	15	5.1	13.5	2.6	1.8

### 13.6.2 Self-Heating Tests

The high-sulphur and desulphurized tailings were submitted to NesseTech Consulting Services Inc. for self-heating tests to quantify the Self-Heating Capacities (“SHC”) of the two (2) tailings streams. Both samples were adjusted to the standard testing moisture content of six (6) % w/w to determine the Stage A and B SHC values.

The two (2) samples displayed significantly different self-heating behaviour. In the case of the desulphurized tailings, both the Stage A and Stage B, SHC values were 0 J/g, which places the product into risk region 1, which is considered safe. The Stage A and B, SHC values of 51.8 J/g and 52.8 J/g place the high-sulphur tailings into the Risk Region 5, which suggests that preventative action to avoid self-heating of the tailings samples is recommended. The results for the high-sulphur tailings sample were somewhat expected given the calculated pyrrhotite content of 50-55 % based on a sulphur grade of approximately 20 % S. The results of the self-heating tests on the two (2) tailings samples are illustrated in Figure 13.23 in form of a risk assessment chart.

**Figure 13.23 – Self Heating Risk Assessment for Desulphurized and High Sulphide Tailings Samples**



### 13.6.3 Geochemical and Geotechnical Characterization

The high-sulphur and desulphurized tailings from LCT-MC were submitted for single addition static net acid generation and modified Acid Base Accounting (“**ABA**”) tests to quantify the acid generation potential of the two (2) tailings streams. The results of the net acid generation and ABA tests are presented in Table 13.16 and Table 13.17, respectively.

The modified ABA results suggest that the desulphurized tailings are non-acid generating based on the neutralization potential ratio and uncertain based on the net neutralizing potential. The net acid generation results classify the low-sulphur tailings as non-acid forming.

Both the modified ABA and net acid generation tests result classify the high-sulphur tailings as potentially acid generating.

**Table 13.16 – Net Acid Generation Test Results**

Parameter	Unit	Low-Sulphur Tails	High-Sulphur Tails
Vol H <sub>2</sub> O <sub>2</sub>	mL	150	150
Final pH		7.41	2.30
NaOH	Normality	0.1	0.1
Vol NaOH to pH 4.5	mL	0	16.9
Vol NaOH to pH 7.0	mL	0	39.4
NAG (pH 4.5)	kg H <sub>2</sub> SO <sub>4</sub> /tonne	0	53
NAG (pH 7.0)	kg H <sub>2</sub> SO <sub>4</sub> /tonne	0	123

**Table 13.17 – Modified Acid Base Accounting Test Results**

Parameter	Unit	Low-Sulphur Tails	High-Sulphur Tails
Paste pH		9.27	6.93
Fizz Rate	---	1	1
Sample Weight	g	2.03	2.09
HCl_add	mL	20.00	24.00
HCl	Normality	0.10	0.10
NaOH	Normality	0.10	0.10
Vol NaOH to pH=8.3	mL	13.21	18.36
Final pH	no unit	1.28	1.69
NP	t CaCO <sub>3</sub> /1,000 t	17.0	14.0
AP	t CaCO <sub>3</sub> /1,000 t	1.88	483
Net NP	t CaCO <sub>3</sub> /1,000 t	14.8	-469.31
NP/AP	ratio	8.91	0.03
S	%	0.101	19.7
Acid Leachable SO <sub>4</sub> -S	%	0.04	4.27
Sulphide	%	0.06	15.4
C	%	0.099	0.418
CO <sub>3</sub>	% as CO <sub>3</sub>	0.380	0.639

Parameter	Unit	Low-Sulphur Tails	High-Sulphur Tails
C(g)	%	< 0.05	0.28
CO <sub>3</sub> NP	t CaCO <sub>3</sub> /1,000 t	6.3	10.6
CO <sub>3</sub> Net NP	t CaCO <sub>3</sub> /1,000 t	4.4	-472
CO <sub>3</sub> NP/AP	ratio	3.36	0.02
NP related to CO <sub>3</sub>	%	37.1	75.8

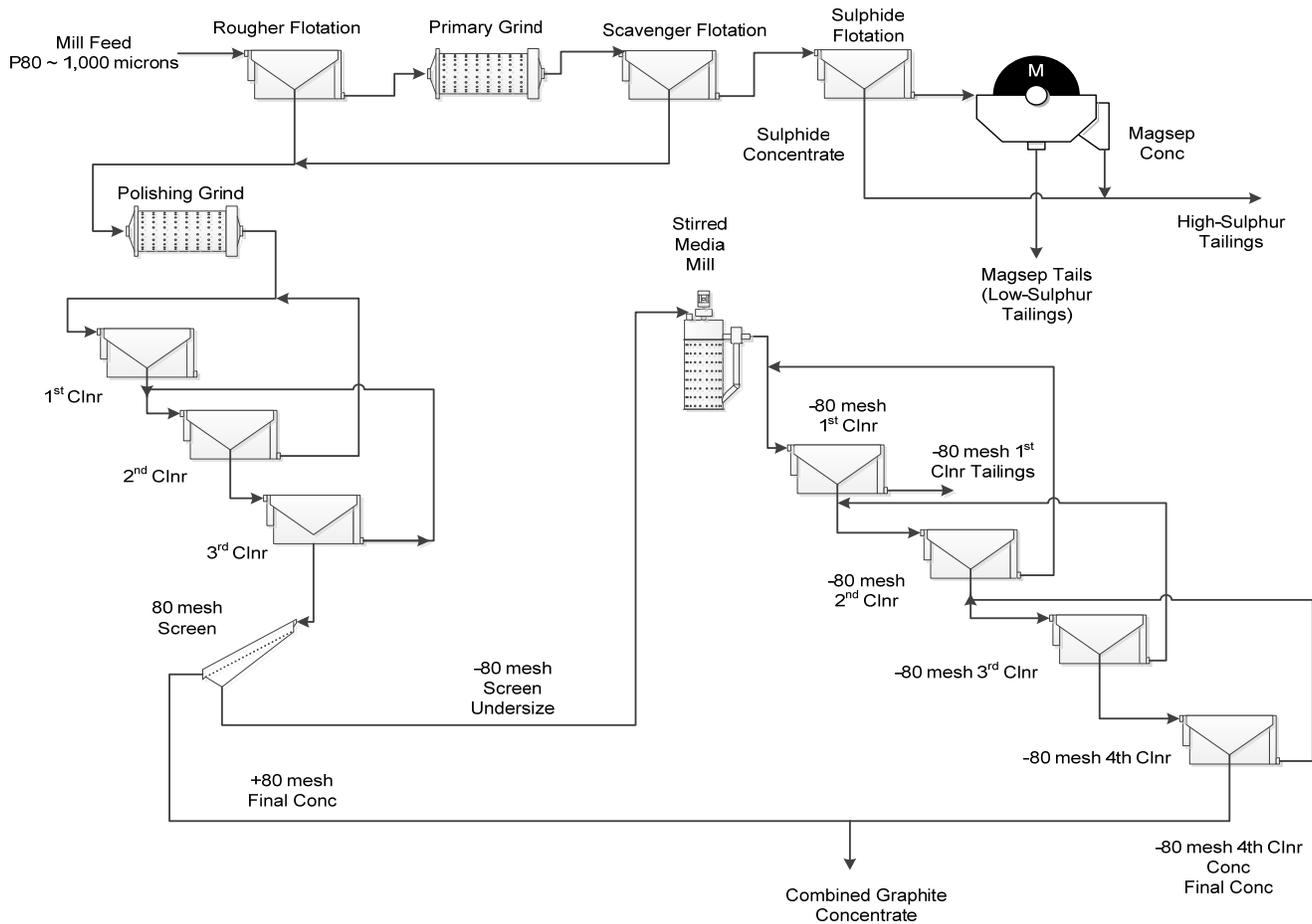
### 13.7 Test Work Interpretation

The flow sheet optimization program resulted in a simplified flow sheet that does not require two (2) separate secondary cleaning circuits to produce final graphite concentrate grading over 97 % C(t) with total carbon grades of > 96 % C(t) in all size fractions including the - 400 mesh product.

Considering all results of the flow sheet optimization program, the flow sheet presented in Figure 13.24 represents the optimized process and takes into account all of the following primary Project objectives:

- Minimum concentrate grade of 96 % C(t);
- Minimize flake size degradation;
- Maximize graphite recovery;
- Generate separate tailings streams to produce a high-mass, desulphurized non-acid generating product and a low-mass, high-sulphur tailings stream that contains most of the sulphide; and
- Minimize capital and operating costs of the process.

Figure 13.24 – Optimized West Zone Process Flow Sheet



The slightly improved metallurgical results were achieved with a simplified process flow sheet with reduced capital and operating costs. A comparison of the final graphite flotation concentrate from the flow sheet development and optimization programs is provided in Table 13.18. The combined concentrate grade of 97.3 % C(t) was identical in both tests, but the optimized conditions produced a slightly higher mass recovery into the + 80 mesh size fractions of 48.1 % compared to 45.9 % in the flow sheet development program.

**Table 13.18 – Comparison of Concentrates from Flow Sheet Development and Optimization Programs**

Product	Development Program		Optimization Program	
	Mass (%)	Grade % C(t)	Mass (%)	Grade % C(t)
+ 48 mesh	16.1	97.5	16.5	97.1
+ 65 mesh	19.8	97.7	20.4	97.1
+ 80 mesh	10.0	97.4	11.2	96.4
+ 100 mesh	11.1	97.4	11.6	96.9
+ 150 mesh	18.8	96.4	15.2	98.2
+ 200 mesh	9.8	96.1	9.1	98.1
+ 325 mesh	7.6	96.4	7.2	97.6
+ 400 mesh	2.1	97.1	3.0	97.3
- 400 mesh	4.6	98.5	5.8	96.2
<b>Total</b>	100	97.3	100	97.3

In an attempt to reduce operating costs, the reagent dosages were optimized in the current program. A comparison of the original and optimized reagent dosages is provided in Table 13.19. Note that despite the significant reduction in PAX and the elimination of copper sulphate, net acid generation and modified ABA test results suggest that the low-sulphide tailings remain non-acid generating.

**Table 13.19 – Original and Optimized Reagent Dosages**

Reagent	Original (g/t)	Optimized (g/t)
Diesel	140	120
MIBC	140	130
Lime	110	-
PAX	300	100
CuSO <sub>4</sub>	150	-

The mass split into graphite concentrate, low-sulphur tailings, and high-sulphur tailings based on the locked cycle test was 4.6 %, 77.0 %, and 18.5 %, respectively.

## 14.0 MINERAL RESOURCE ESTIMATES

Resource estimates on the West Zone Deposit were estimated with an effective date of March 2nd, 2017. These numbers have been publicly disclosed March 2nd, 2017 in the press release: “Nouveau Monde Updates Mineral Resources Estimate for its West Zone Deposit, Matawinie Graphite Property”. This report explains additional details about this updated resource estimation. This report also presents resources for the South Zones that namely separates into the South-East and South-West Zones.

### 14.1 Drill Hole Database

NMG provided SGS Geostat with the electronic version of the 2015-2016 drilling campaign data. The data was imported into a Geobase format emphasizing on the collar identifications, deviations, lithologies and assay results (see Table 14.1).

**Table 14.1 – Summary of Database Entries Used for the Estimates**

<b>Field</b>	<b>Number of Entries</b>	<b>Length (m)</b>
Collars Drill holes (DDH)	68	11,601.63
Sampled trenches	3	418.43
Deviations	617	
Lithologies	981	
Assays (trenches samples excluded)	3693	7,275.63
Assays (trenches samples)	207	418.43

A total of 68 diamond-drill holes are included in the database, along with 3 trenches. (see Table 14.2). Drilling used for the resource estimate totals 11601.63 m. Holes were surveyed using a Reflex or a Ranger downhole orientation instrument and appear to be sampled consistently every 50m or less down the hole. Trench samples were surveyed at approximately every 2m. Drill holes and trenches are surveyed using the UTM projection, NAD83 CSRS Zone 18.

**Table 14.2 – Summary of Database Entries by Hole Type**

Hole Type	Number of Drill Holes	Sum of Length (m)	Number of Assays	Sum of Assayed Length (m)*
DDH	68	11,601.63	3,693	7,275.63
Trenches	3	418.55	207	418.43
<b>Total</b>	<b>71</b>	<b>12,020.18</b>	<b>3,900</b>	<b>7,694.06</b>

The database contains 3900 assay results for graphitic carbon, sulfur and total carbon. A total of 3693 assays are from diamond drill rigs and represent 7275.63 metres and 207 assays come from Trenches and represent 418.43 trenched metres (Table 14.2).

Assays were made into mineralized intervals (MI). A modeling cut-off grade of 2.0% C(g) was used to delineate mineralized volumes. There are 260 MIs. The total length for the MIs is of 5737.74 m. The shortest MI created is of 2.02 m. The longest MI created is of 133.7 m and is in the W1B\_4 mineralized zone.

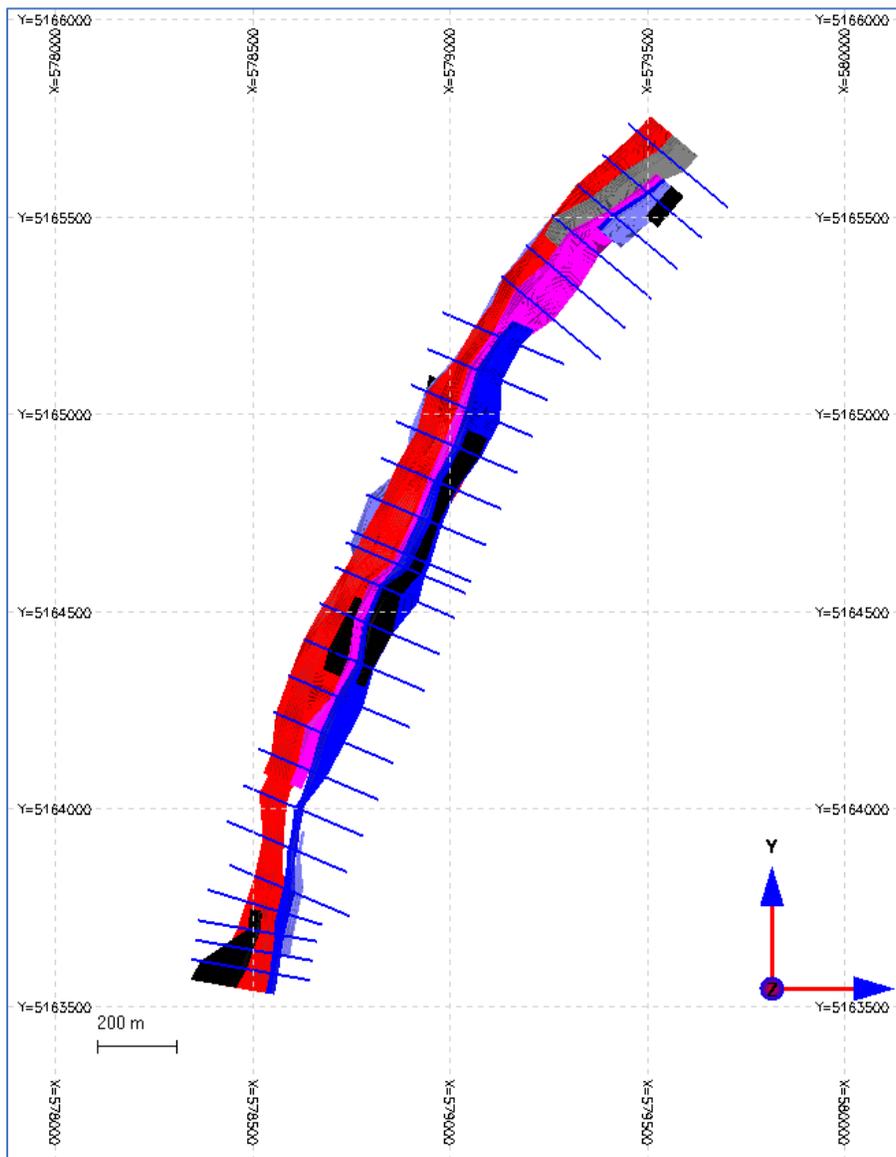
## 14.2 Mineralized Volumes

The mineralized volumes were prepared using the Genesis© mining software. Some mineralized volumes were modeled over the MIs. The process involved the creation of closed polygons on section views. The sections are not always on a regular grid as the drilling is not always on a standard azimuth and the drill holes spacing is not perfectly even. There are 155 polygons that were interpreted on 27 sections. There are currently 17 mineralized volumes in the West Zone. Out of these 17 volumes, 4 of them are a continuity of each other: W1B\_1\_sub\_NEG, W1B\_2, W1B\_3 and W1B\_4. Therefore, there are 14 separate volumes modelled. The volumes under topography are listed in Table 14.3 along with the number of mineralized intervals that pierce these volumes.

**Table 14.3 – List of the Mineralized Volumes and the Count of Mineralized Intervals**

<b>Mineralized Volumes</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Mineralized Intervals</b>
W0	3,648,750	23
W0A	68,375	3
W1A	5,634,000	38
W1B_1_subs_NEG	17,948,900	72
W1B_2	787,000	2
W1B_3	151,250	2
W1B_4	1,551,750	2
W1C	1,368,000	6
W1D	443,125	6
W2	3,327,250	34
W2A	465,375	7
W3_1	4,326,380	35
W3_2	177,125	4
W3B	434,000	12
W4_1	543,125	7
W4_2	152,000	4
W5	32,250	2

Figure 14.1 - Sections (blue) and Mineralized Volumes (multiple colors)



### 14.3 Composite Data

To prepare a reliable estimation, it is important to use data that has comparable weight. Therefore, we need to produce some composites using a chosen methodology. In the case of the West Zone Deposit, the assays are already very even in length. SGS Geostat has chosen to use the original assay as composites. Composites have been created inside mineralized intervals (MI). Because the limits of the mineralized volumes do not always cut exactly where the assays finish, there were a few small composites created. Out of the 2,877 composites, 2,286 (79%) are between 1.9 and 2.1 m in length. Also 2,783 (97%) are between 1.0 and 3.0 m in length. The smallest composite is 0.01 m and the longest is 3.58

m long. After verifications for possible outliers, all composites were kept. The resulting 2,877 composites have a length between 0.01 m and 3.58 m.

There are 2,877 composites in total. The composites were prepared in the Genesis software. Composites were divided into 12 separate sets to prepare the estimation for the 17 volumes. Table 14.4 and Table 14.5 show the composite statistics by zone. The attribution of the 12 separate sets that correspond to the 17 mineralized volumes are presented in Table 14.6.

**Table 14.4 – Statistics on the Composites [C(g)%] for the West Zone**

<b>Statistics on the Composites [C(g) %]</b>	
<b>West Zone</b>	
Count	2,877
Min	0.02
Max	14.4
Mean	4.17
Median	4.28
Standard Deviation	1.49

**Table 14.5 – Statistics on the Composites [C(g)%] for Each Mineralized Volume**

	<b>W0</b>	<b>W0A</b>	<b>W1A</b>	<b>W1B</b>	<b>W1C</b>	<b>W1D</b>	<b>W2</b>	<b>W2A</b>	<b>W3</b>	<b>W3B</b>	<b>W4</b>	<b>W5</b>	<b>All</b>
Count	225	9	418	1404	104	37	225	46	292	53	60	4	2877
Mean % C(g)	3.94	2.85	3.92	4.38	4.74	4.02	4.21	4.44	3.74	3.67	3.43	4.06	4.17
Max % C(g)	7.18	3.67	8.61	14.4	7.60	6.21	9.26	6.05	7.27	6.13	5.84	4.67	14.4
Min % C(g)	0.02	2.19	0.23	0.03	0.06	0.02	0.07	0.57	0.38	0.55	1.09	3.51	0.02
StdDev % C(g)	1.69	0.48	1.41	1.46	1.61	1.41	1.52	1.10	1.38	1.28	1.20	0.55	1.49

**Table 14.6 – List of Volumes and Corresponding Composite Sets**

Volume		Composite Set	
Number	Name	Number	Name
1	W0	1	W0
2	W0A	2	W0A
3	W1A	3	W1A
4	W1B_1_subs_NEG	4	W1B
5	W1B_2	4	W1B
6	W1B_3	4	W1B
7	W1B_4	4	W1B
8	W1C	5	W1C
9	W1D	6	W1D
10	W2	7	W2
11	W2A	8	W2A
12	W3_1	9	W3
13	W3_2	9	W3
14	W3B	10	W3B
15	W4_1	11	W4_1
16	W4_2	11	W4_2
17	W5	12	W5

#### 14.4 Capping

A capping study was done and the conclusion is that capping is not required. Any reasonable capping of graphitic carbon high grade would have almost no impact on the big picture. For example, a capping at a grade of 7% C(g) would reduce the global graphitic carbon by less than 0.2%.

#### 14.5 Density

A density of 2.76 t/m<sup>3</sup> was set to the whole West Zone Deposit.

This density average comes from the density database prepared by NMG. This database consists of a total of 159 density measurements. These measurements are from 2015 (71) and from 2016 (88). The statistical T-test on populations cannot confirm that any of the

better-informed zones have significantly different densities (W0, W1A, W1B, W2, W3 and W4). From this observation, it was decided to use a single density for the whole resource estimation. Also, the coefficient of variation for the complete density database is of 4% which is low. The statistics for the density is in details in Table 14.7 by zone and in total.

**Table 14.7 - Density Statistics for the 12 Composite Sets**

	Count	Min	Mean	Median	Max	SD	CoefOVar
W1B	55	2.61	2.76	2.74	3.25	0.12	4 %
W1A	25	2.64	2.75	2.74	2.97	0.08	3 %
W3	24	2.66	2.79	2.75	3.35	0.14	5 %
W2	21	2.67	2.81	2.74	3.15	0.14	5 %
W0	17	2.67	2.75	2.73	3.01	0.08	3 %
W4	5	2.73	2.77	2.75	2.84	0.05	2 %
W2A	4	2.74	2.86	2.83	3.04	0.13	5 %
W3B	2	2.88	3.00	3.00	3.11	0.16	5 %
W1C	2	2.74	2.87	2.87	2.99	0.18	6 %
W1D	2	2.78	2.81	2.81	2.83	0.04	1 %
W0A	1	2.80	2.80	2.80	2.80	NA	NA
W5	1	2.69	2.69	2.69	2.69	NA	NA
<b>Total</b>	<b>159</b>	<b>2.61</b>	<b>2.77</b>	<b>2.74</b>	<b>3.35</b>	<b>0.12</b>	<b>4 %</b>

#### 14.6 Resource Block Modelling

The resource was estimated using a block model. The block model was prepared, estimated and classified in the Genesis© mining software. The block model origin is (x, y, z) → (578,900 – 5,162,650 – 597.5) with block size of 5 m × 5 m × 5 m. The number of indices is of (x, y, z) → (740, 300, 74). These coordinates are the centers of the blocks. There is also a rotation to the block model of -67 degrees (counterclockwise rotation). Full blocks were used that means that if the center of the block falls inside the volume, it is counted at 100%, if the center of the block falls outside the volume, it is counted at 0%. One large block model was created using those parameters inside of 17 mineralized volumes, and each volume was tagged in the block model and estimated separately.

**Table 14.8 – Block Model Settings – Origin and Size**

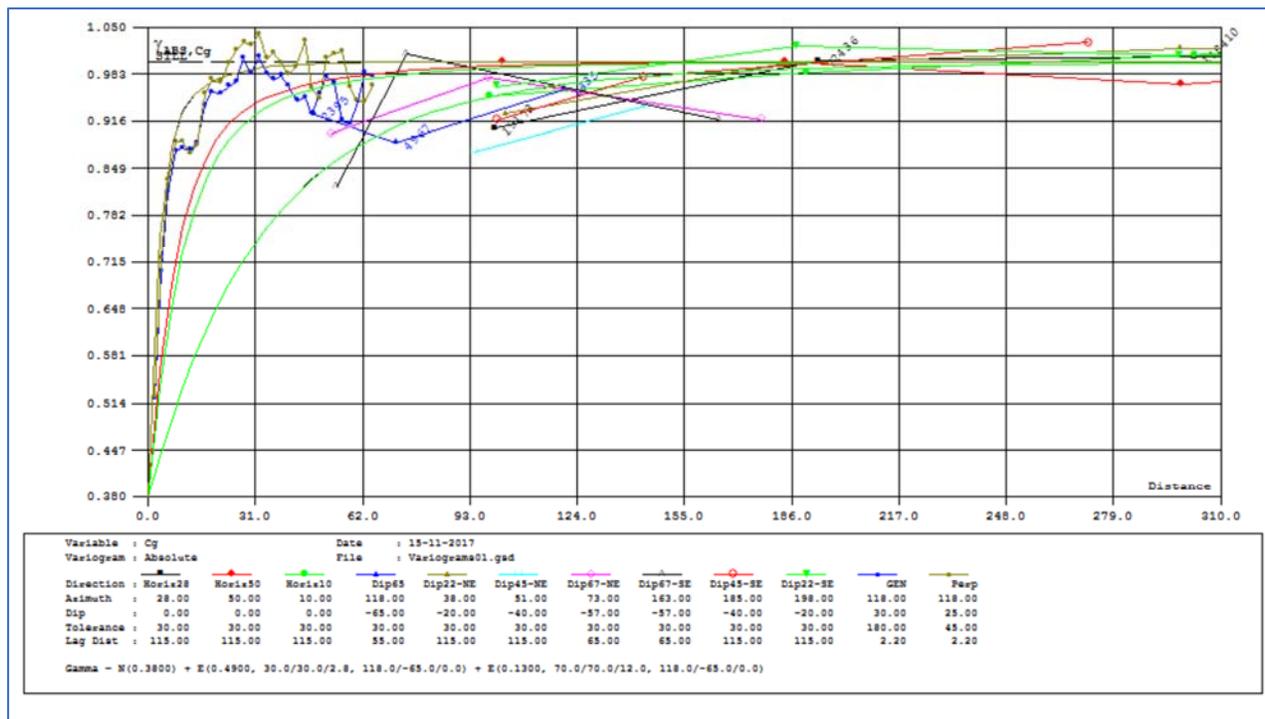
Grid	X	Y	Z
Origin (Center of Block)	578,900	5,162,650	597.5
Size	5	5	-5
Discretization	2	2	2
Starting Coordinate	578,900	5,162,650	597.5
Starting Block Index	1	1	1
Ending Block Index	740	300	74

14.6.1 Variography

Some variography has been done but has not been used for the actual estimation.

The variograms were done in October 2016 with the available composites at that time. SGS Geostat calculated a correlogram (normalized variogram type) with 2305 composites or roughly 80% of the data used for the estimation presented here. It is presented in Table 14.2. The long range variogram is not bad given the number of composites. SGS Geostat tried to manipulate the composites in several ways to improve the calculated variograms (like rotations and unfolding) but nothing was found helpful.

**Figure 14.2 – Variogram Model**



**Table 14.9 – Summary of Variogram Model**

Component			Ranges (m)			Orientation (degrees)		
Number	Type	C (%)	Short	Medium	Long	Azim	Dip	Spin
3	Exponential	13 %	70	70	12	118	-65	0
2	Exponential	49 %	30	30	2.8	118	-65	0
1	Nugget	38 %	NA	NA	NA	NA	NA	NA

#### 14.6.2 Grade Interpolation Methodology

To interpolate graphitic carbon grade, the Inverse Distance Squared (IDS) method was used, with ellipsoid influenced distances in the calculation and the composite selection. Block discretization was set to 2×2×2 for the estimation of block to composite distance. Blocks were created within all the mineralized volumes. Three passes were used with a small ellipsoid for the first pass, larger ellipsoid for the second pass and larger again ellipsoid for the third pass. The small ellipsoid has radiuses of 50 m x 50 m x 15 m, the medium ellipsoid has radiuses of 100 m x 100 m x 30 m, and the large ellipsoid have radiuses of 200 m x 200 m x 60 m. The algorithm used for the estimation has “variable orientation” for the ellipsoids. Each block has a local orientation for the search ellipsoid to be used for the estimation of that block. The resulting estimation fits better the orientation of the layers and has better looking results than some other algorithms.

The first pass of the estimation used a minimum of 5 and a maximum of 11 composites, with the additional limit of 3 composites per drill hole. The second pass of the estimation used a minimum of 5 and a maximum of 11 composites, with the additional limit of 3 composites per drill hole. The third pass of the estimation used a minimum of 4 and a maximum of 11 composites, with the additional limit of 3 composites per drill hole. There are exceptions: for the volumes W0 and W1D, the third pass of the estimation used a minimum of 3 and a maximum of 11 composites, with the additional limit of 3 composites per drill hole to estimate the full volumes.

All blocks inside the mineralized volumes were estimated.

#### 14.7 Classification

##### 14.7.1 Definitions

The following definitions are selected parts from the Canadian institute of Mining, Metallurgy and Petroleum (CIM). The full definition is available from: [http://www.cim.org/~media/Files/PDF/Subsites/CIM\\_DEFINITION\\_STANDARDS\\_20142](http://www.cim.org/~media/Files/PDF/Subsites/CIM_DEFINITION_STANDARDS_20142).

### Mineral Resource

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

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

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

### Inferred Mineral Resource

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

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

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

### Indicated Mineral Resource

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

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

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

### Measured Mineral Resource

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

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

*A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.*

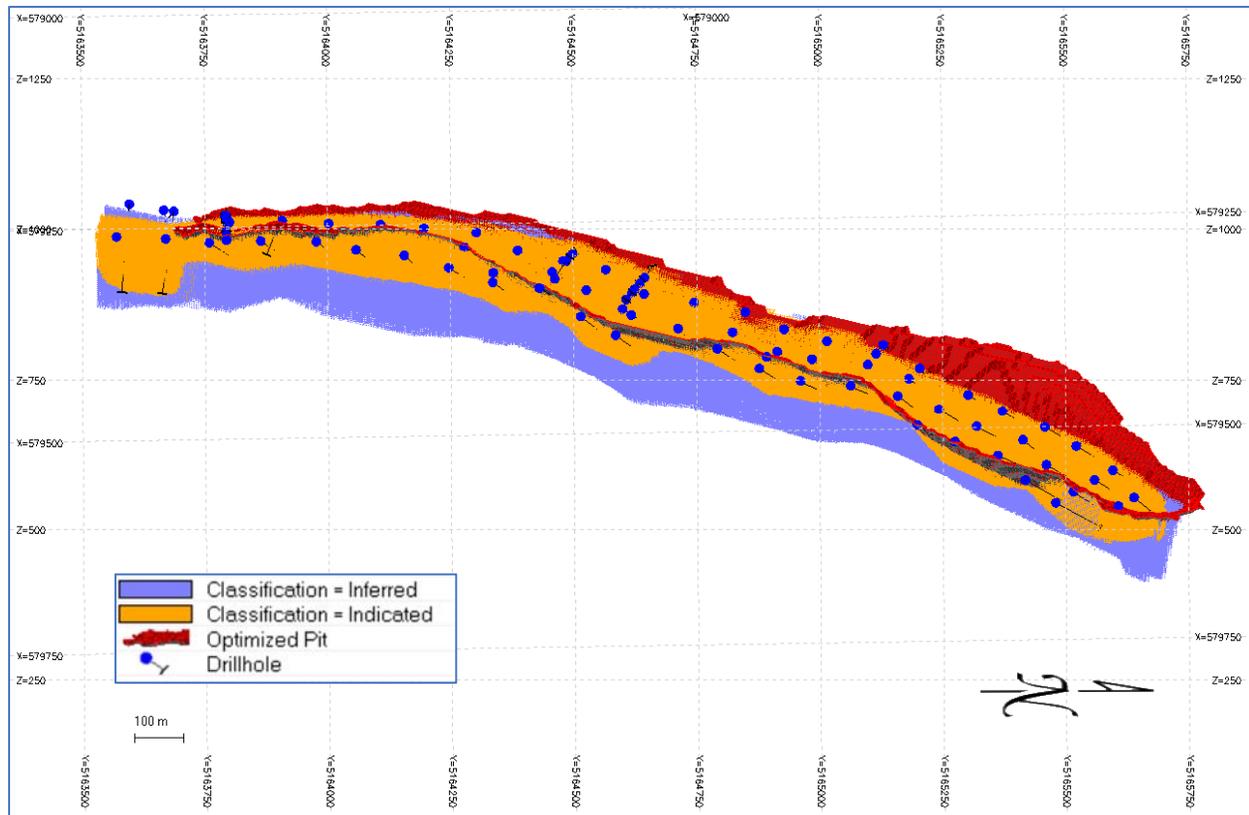
#### 14.7.2 Classification Method

The category indicated has been given to blocks by drawing outlines manually on a longitudinal view. The volumes named W0A, W1D and W5 were forced to keep the inferred category because they have more uncertainty in their interpretations. No measured resources are present in the project. The extents of the outlines for indicated resources are based on the distance between drill holes. The full thicknesses of the mineralized volumes have the same category.

The indicated resource is a continuous area 2.4 km long by about 150 m wide. The drill holes are typically spaced every 100 m or less section to section and spaced every 75 m or less on the sections.

All resources outside of this perimeter are given the default inferred category.

**Figure 14.3 – Block Model Colored by Classification with Optimized Pit and Drill Hole Traces**



#### 14.8 Optimized Open Pits and Cut-off Grade Used to Constrain the Resource

The method of exploitation chosen for this project is by open pit. Therefore, the resource was constrained by an optimized open pit. The block model was fed to GEOVIA’s Whittle software to provide an optimized pit. Some pit optimizations have been run and the assumptions of concentrate price, costs and technical mining factors used for the open pits suggest an economical COG lower than the 2.28 %C(g) used for the resource estimation. The open pit used to constrain the resource presented here are shells with no designs of ramps.

Whittle software was used to create pit shells based on the resource model and the topographic surface and overburden bottom surfaces. The concentrate price, mining and

processing costs and slope angle used for this optimization are shown in Table 14.10. The final open pit has been selected with a general factor smaller than 1 for the concentrate price to be comparable to the PEA report. The pit is therefore conservative.

Figure 14.4, Figure 14.5 and Figure 14.6 illustrate some interpretations of the mineralization with drill holes, assay results, topographic and overburden bottom surfaces, block model and the optimized open pit selected to constrain the resource.

**Table 14.10 – Assumptions Used for the Optimization of the Open Pits**

Parameters	Values	
Currency	CAD	
Block size	5m x 5m x 5m	
Specific Gravity	2.76 t/m <sup>3</sup>	
Overall slope angle	rock	50°
	overburden	25°
Pit selection method	Cash Flow	
Mining cost	rock	6.50 \$/t
	overburden	5.20 \$/t
Mining dilution	5%	
Mining recovery	95.2%	
Rehabilitation Cost	0.61 \$/t	
Processing Cost	15.84 \$/t	
Processing Recovery	89.50%	
G&A	4.16 \$/t	
Selling Price of concentrate	1430 \$/t	
Concentration of C(g) in the concentrate	97.3%	
Initial Capex	110 M\$	
Discount Rate	8%	
Target Processing Rate/yr.	1.212 Mt	

Figure 14.4 – West Zone Section 700

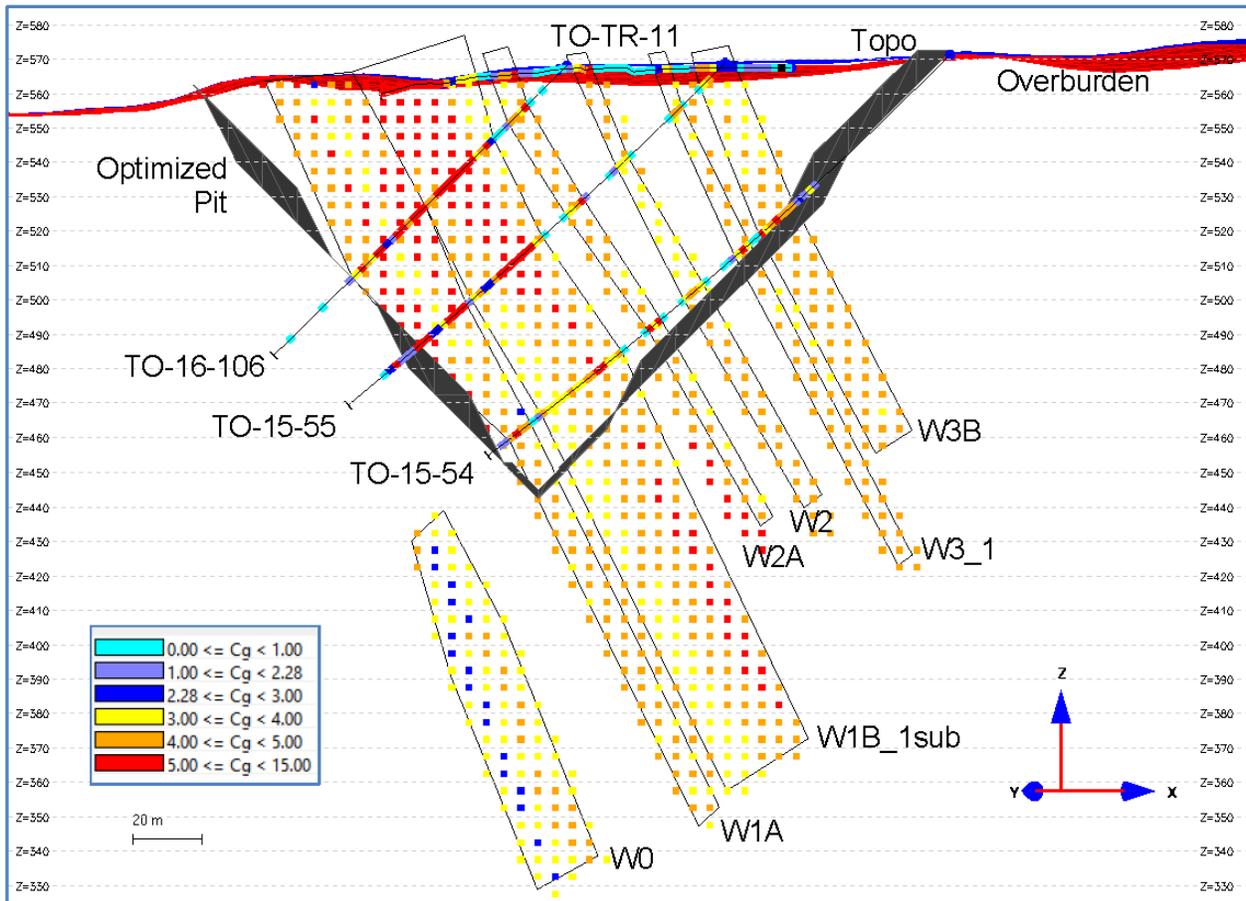


Figure 14.5 – West Zone Section 1300

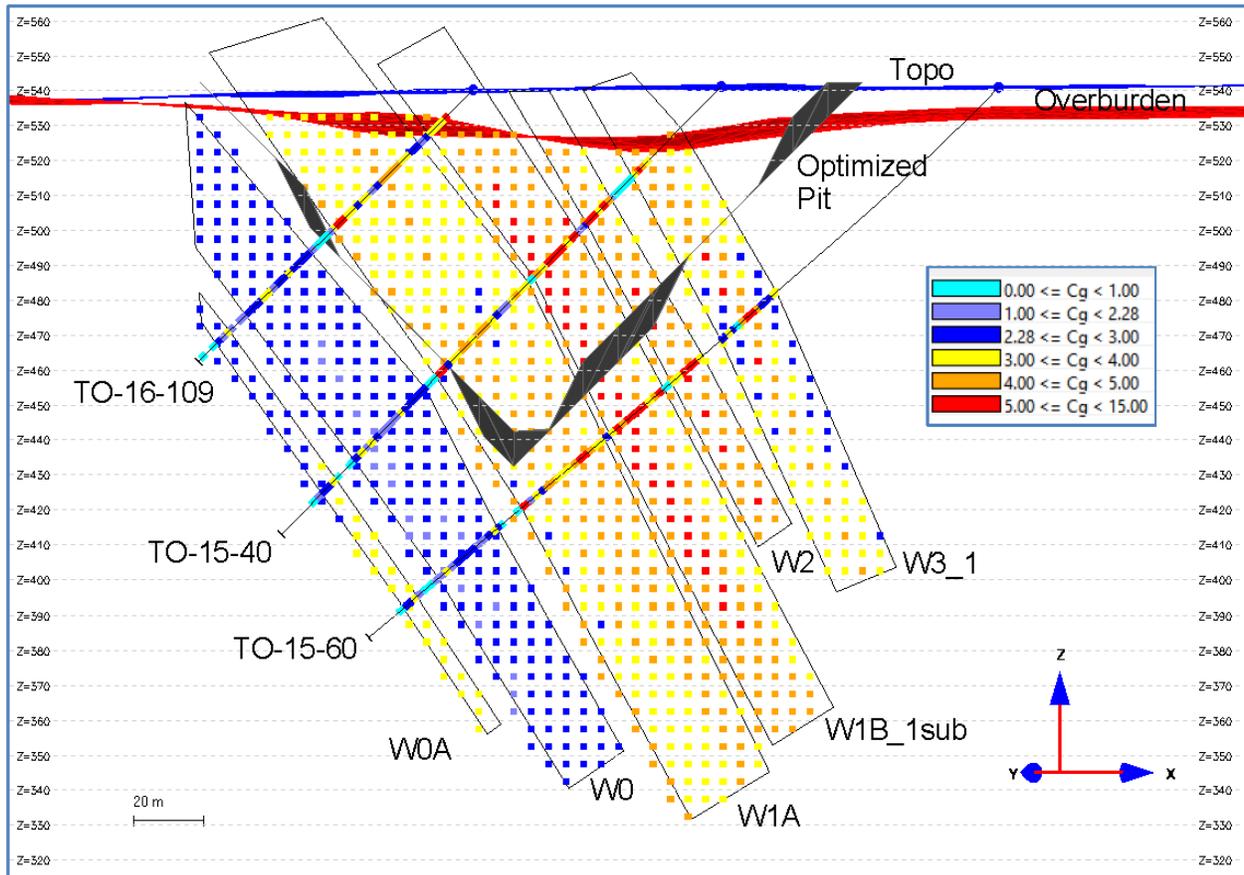


Figure 14.6 – West Zone Section 1900

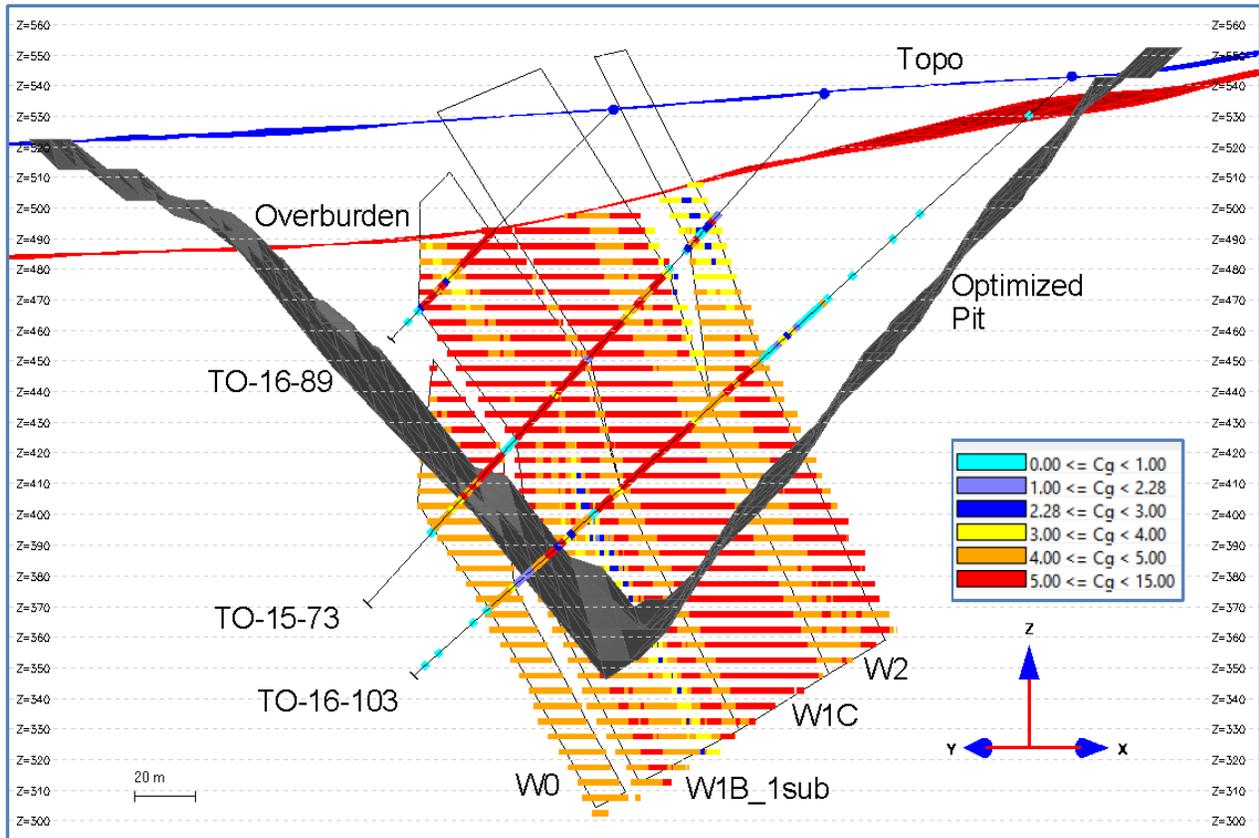
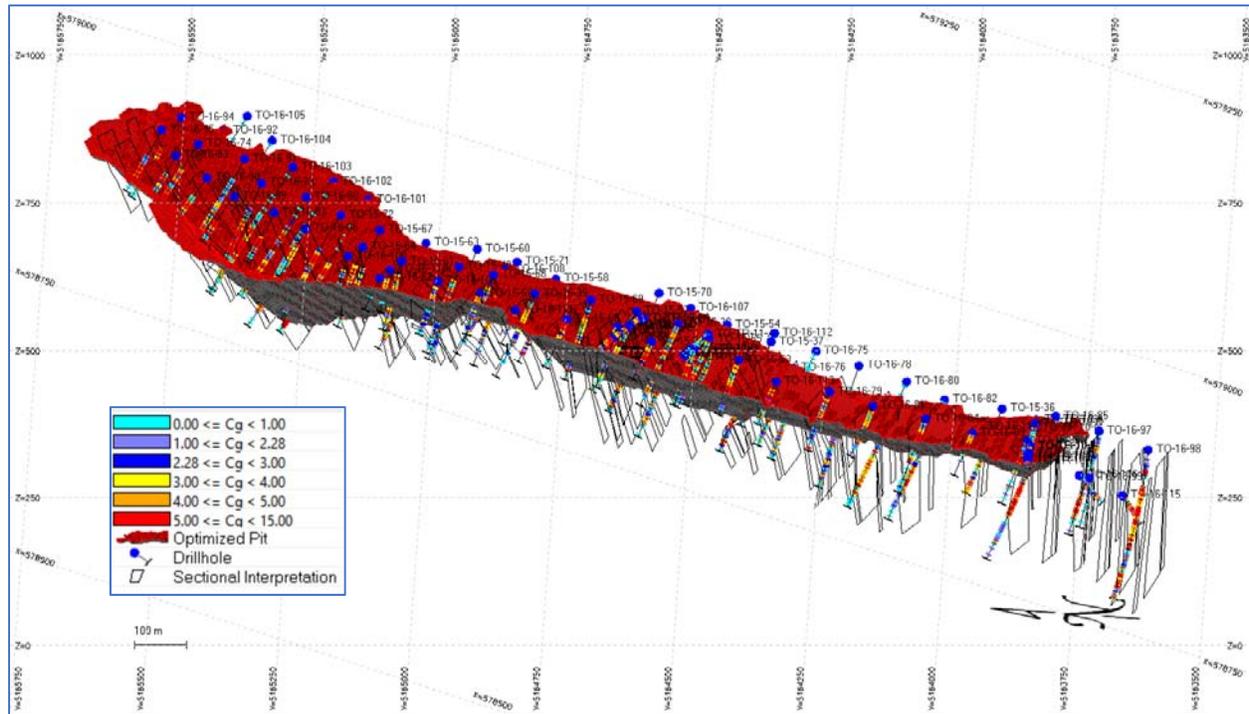


Figure 14.7 – West Zone Optimized Pit



### 14.9 Mineral Resource Estimates (West Zone Base Case)

The block model, used to generate the Current Resource of the West Zone, is based on a total of 68 core drill holes which produced 3,693 samples as well as 207 samples collected from channeling work in three (3) trenches. This does not include the quality control samples which comprise of 172 duplicates, 171 blanks and 82 standard samples, all of which returned within acceptable limits. In all, 17 mineralized horizons encased in paragneiss units were interpreted and modelled from this data.

The Current Resource block model for the West Zone was prepared by Yann Camus, P. Eng., of SGS Canada Inc. - Geostat office in Blainville, Quebec, Canada (“SGS Geostat”), using the Genesis© mining software. Interpolation was performed using inverse square distance (“ID<sup>2</sup>”) as well as different search ellipses which were adapted for the geology of the deposit. The block model was then fed to GEOVIA’s Whittle software to provide an optimized pit. The optimized pit containing the Current Resource was limited to the Tony Block Property boundary to the South of the West Zone Deposit at the effective date of the Resource Estimate (March 2<sup>nd</sup>, 2017). The resource was further constrained by an elevation of 390 m above sea level to better approximate the parameters used for the PEA. The details for the PEA resources are available in the report: “Preliminary Economic Assessment Report for the Matawinie Graphite Project” by Norda Stelo dated August 5<sup>th</sup>,

2016. Details of the PEA Resources can be found in the report available on NMG web site and on SEDAR. The Mineral Resources of the West Zone are presented in the Table 14.11.

**Table 14.11 – Resource Estimate for the West Zone**

Mineral Resource Category <sup>2</sup>	Current Resource (March 2, 2017) <sup>17</sup>		
	Tonnage (Mt) <sup>5,6</sup>	Grade [% C(g)] <sup>3</sup>	C(g) (Mt)
Indicated	32.9	4.50	1.48
Inferred <sup>4</sup>	0.2	4.84	0.01

<sup>1</sup> The Mineral Resources provided in this table were estimated using current Canadian Institute of Mining, Metallurgy and Petroleum (“CIM”) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

<sup>2</sup> Mineral resources that are not mineral reserves have not demonstrated economic viability. Additional trenching and/or drilling will be required to convert Inferred and Indicated Mineral Resources to Measured Mineral Resources. There is no certainty that any part of a mineral resource will ever be converted into reserves.

<sup>3</sup> All analyses used for the Resource Estimates were performed by ALS Minerals Laboratories and delivered as % C(g), internal analytical code C-IR18.

<sup>4</sup> Inferred Mineral Resources represent material that is considered too speculative to be included in economic evaluations. Additional trenching and/or drilling will be required to convert Inferred Mineral Resources to Indicated or Measured Mineral Resources. It cannot be assumed that all or any part of the inferred resources will ever be upgraded to a higher resource category.

<sup>5</sup> Current Resource effective March 2<sup>nd</sup>, 2017.

<sup>6</sup> Mineral Resources are stated at a cut-off grade of 2.28 % C(g).

<sup>7</sup> The Current Resource was constrained at an elevation above 390 m above sea level (ASL).

#### 14.10 Mineral Resource Estimates (South Zone Base Case)

This report also presents resources for the South Zones, which are also located on the Tony Claim Block. The South Zones are separated into the South-East and South-West Zones. The South Zones resource details are available in the PEA report: “Preliminary Economic Assessment Report for the Matawinie Graphite Project” by Norda Stelo dated August 5<sup>th</sup>, 2016. Details of the PEA Resources can be found in the report available on NMG’s web site and on SEDAR. SGS Geostat has audited the PEA resource methodology as well as the overall quantities. These mineralized Zones are considered a lower priority than the West Zone as detailed in the PEA.

The South Zones resources have been prepared with similar methodology as the West Zone presented in this Report. The mineral resources of the South Zones are presented in the Table 14.11. The location of the resources is visible in Figure 9.3 of this Report.

**Table 14.12 – Resource Estimate for the South Zones**

Mineral Resource Category <sup>2</sup>	Current Resource (March 2, 2017) <sup>15</sup>		
	Tonnage (Mt) <sup>6</sup>	Grade [% C(g)] <sup>3</sup>	In Situ C(g) Tonnage (Mt)
Indicated	26.3	3.73	0.981
Inferred <sup>4</sup>	19.2	3.67	0.705

<sup>1</sup> The Mineral Resources provided in this table were estimated using current Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

<sup>2</sup> Mineral resources that are not mineral reserves have not demonstrated economic viability. Additional trenching and/or drilling will be required to convert Inferred and Indicated Mineral Resources to Measured Mineral Resources. There is no certainty that any part of a mineral resource will ever be converted into reserves.

<sup>3</sup> All analyses used for the Resource Estimates were performed by ALS Minerals Laboratories and delivered as % C(g), internal analytical code C-IR18.

<sup>4</sup> Inferred Mineral Resources represent material that is considered too speculative to be included in economic evaluations. Additional trenching and/or drilling will be required to convert Inferred Mineral Resources to Indicated or Measured Mineral Resources. It cannot be assumed that all or any part of the inferred resources will ever be upgraded to a higher resource category.

<sup>5</sup> Current Resource still effective March 2<sup>nd</sup>, 2017 because no new data is available for the South Zones and no material has been extracted since the PEA.

<sup>6</sup> Mineral Resources are stated at a cut-off grade of 2.5% C(g). This is more conservative than current cut-off grade.

## 14.11 Conclusion

To the knowledge of SGS Geostat who prepared sections 12 and 14 of this Report, there are no special factors that could affect materially the mineral resource estimate presented here. More details about specific risks are discussed in the “Interpretation and Conclusions” of this Report.

## 15.0 MINERAL RESERVE ESTIMATES

The Open Pit Mineral Reserves for the West Zone Deposit, located on the Tony Claim Block of the Matawinie graphite Property was prepared by Richard Bonici, Eng., Mining Engineer and supervised by Patrick Perez, P. Eng. Qualified Person both with MC-DRA.

Open Pit Mineral Reserves have been developed using best practices in accordance with CIM guidelines and National Instrument 43-101 reporting.

The effective date of the Mineral Reserve estimate is July 28<sup>th</sup>, 2017.

The Mineral Reserves were derived from the Mineral Resource Block Model that was presented in Section 14.0. The Mineral Reserves are the Measured and Indicated Mineral Resources that have been identified as being economically extractable and which incorporate mining losses and mining dilution. The Mineral Reserves form the basis for the mine plan presented in Section 16.0

### 15.1 General Parameters Common to the Open Pit Mineral Reserves

The following Section discusses the geological information that was used for the open pit mine plans and mineral reserve estimate. This information includes the topographic surface, the geological block model and the material properties for ore, waste and overburden.

The mine planning work carried out for the Pre-Feasibility Study was done using MineSight® Version 12.00. MineSight® is a commercially available mine planning software that has been used by MC-DRA for over 25 years.

#### 15.1.1 Topographic Surface

The mine design for the PFS was carried out using a topographic surface based on one (1) m contour intervals. The contours were supplied by NMG and derived from a LIDAR survey that took place on December 18<sup>th</sup>, 2015.

#### 15.1.2 Resource Block Model

The mine design for the PFS is based on the 3- dimensional geological block model that was prepared by SGS Geostat, and presented in Section 14.0. Each block in the model is five (5) m wide, five (5) m long and five (5) m high and the model is rotated at 293°. Only blocks that contain mineralization are included in the 3-dimensional geological block model.

Each block in the model contains the C(g) grade, density and resource classification (Measured, Indicated and Inferred). Using the overburden surface provided by SGS

Geostat, MC-DRA was able to differentiate the non-mineralized material as either overburden or waste rock.

### 15.1.3 Material Properties

The material properties for the different rock types are outlined below. These properties are important in estimating the mineral reserves, the equipment fleet requirements as well as the dump and stockpile design capacities.

#### a) Density

As was discussed in Section 14.0 of this Report, the in-situ dry density of the mineralized material was estimated to be 2.76 t/m<sup>3</sup>. Based on the Preliminary Economic Assessment (“PEA”), MC-DRA assumed a density of 2.76 t/m<sup>3</sup> for waste. MC-DRA also assumed a density of 2.1 t/m<sup>3</sup> for the overburden.

#### b) Swell Factor

The swell factor reflects the increase in volume of material from its in-situ state to after it is blasted and loaded into the haul trucks. A swell factor of 45 % was used for the PFS, which is a typical value used for open pit hard rock mines. Once the rock is placed in the waste dumps and stockpiles, the swell factor is reduced to 35 % due to compaction.

#### c) Moisture Content

The moisture content reflects the amount of water that is present within the rock formation. It affects the estimation of haul truck requirements and must be considered during the payload calculations. The moisture content is also an important factor for the process water balance.

Since the mineral reserves are estimated using the dry density, they are not affected by the moisture content value. A moisture content of five (5) % was used for the PFS. This value is typical for similar projects in the region.

## 15.2 Open Pit Mineral Reserves

### 15.2.1 Open Pit Optimization

The first step in the mineral reserve estimate is to carry out a pit optimization analysis. The pit optimization analysis uses economic criteria to determine the cut-off grade and to what extent the deposit can be mined profitably.

The pit optimization analysis was done using the MS-Economic Planner module of MineSight® Version 11.5. The optimizer uses the 3D Lerchs-Grossmann algorithm to

determine the economic pit limits based on input of mining and processing costs and revenue per block. In order to comply with NI 43-101 guidelines regarding the Standards of Disclosure for Mineral Projects, only blocks classified in the Measured and Indicated categories are allowed to drive the pit optimizer. Inferred resource blocks are treated as waste, bearing no economic value.

Table 15.1 presents the parameters that were used for the pit optimization analysis. All figures are in Canadian Dollars. The cost and operating parameters that were used are preliminary estimates for developing the economic pit and should not be confused with the operating costs subsequently developed for the PFS and presented in Section 21.0.

**Table 15.1 – Pit Optimization Parameters**

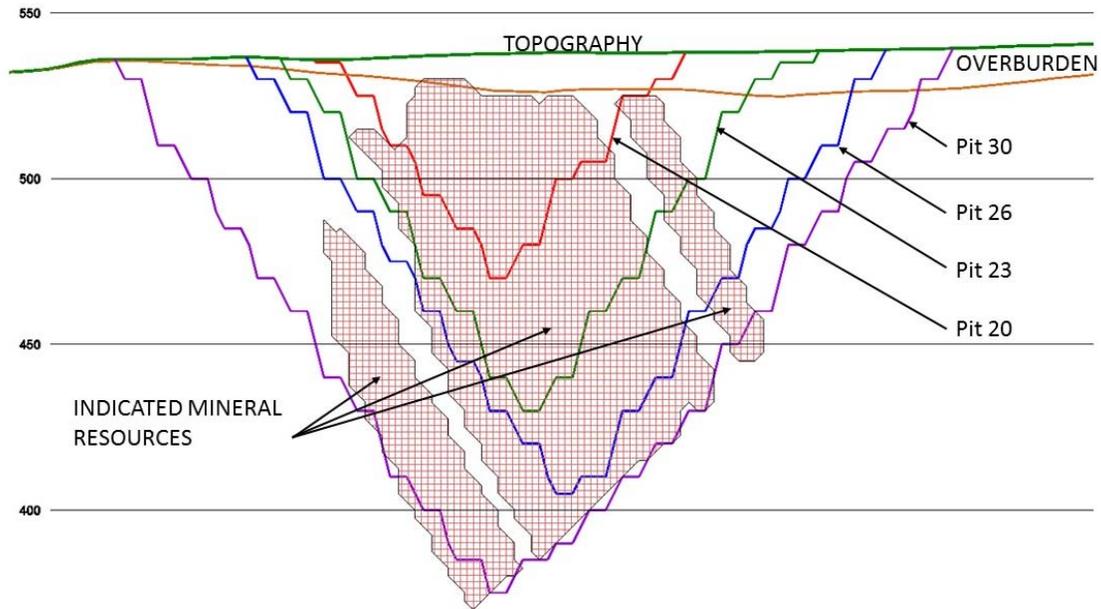
Item	Value	Units
Mining Cost – Overburden	4.02	\$/t mined
Mining Cost – Ore and Waste <sup>1</sup>	5.18	\$/t mined
Processing Cost	13.64	\$/t milled
Administration Cost	3.60	\$/t milled
Sales Price (FOB Montréal)	1,000	\$/t concentrate.
Mill Recovery	94	%
Concentrate Grade	97.3	%
Pit Slope <sup>1</sup>	55	Degree
Dilution <sup>2</sup>	5	%

1 – A pit slope of 30° was considered in overburden material to simulate a shallow slope.  
 2 – Diluted C(g) grade was estimated in block model considering cut-off grade [2.32 % C(g)].

The pit optimization analysis considered the C(g) grades after mining dilution was accounted for. Mining dilution is discussed in the next Section of this Report.

Using the cost and operating parameters, a series of 15 pit shells was generated by varying the selling price (revenue factor) from \$ 500 to \$ 1,200 /t. Figure 15.1 shows a typical section through the deposit with several of the pit shells.

Figure 15.1 – Pit Optimization Shells



The tonnages and grades associated with each of the pit shells are presented in Table 15.2. The Net Present Value (“NPV”) of each shell was calculated assuming a selling price of \$ 1,000/t of concentrate, a discount rate of 8 % and an annual production of 52,000 tonnes of concentrate. Figure 15.2 presents the results in a graphical format.

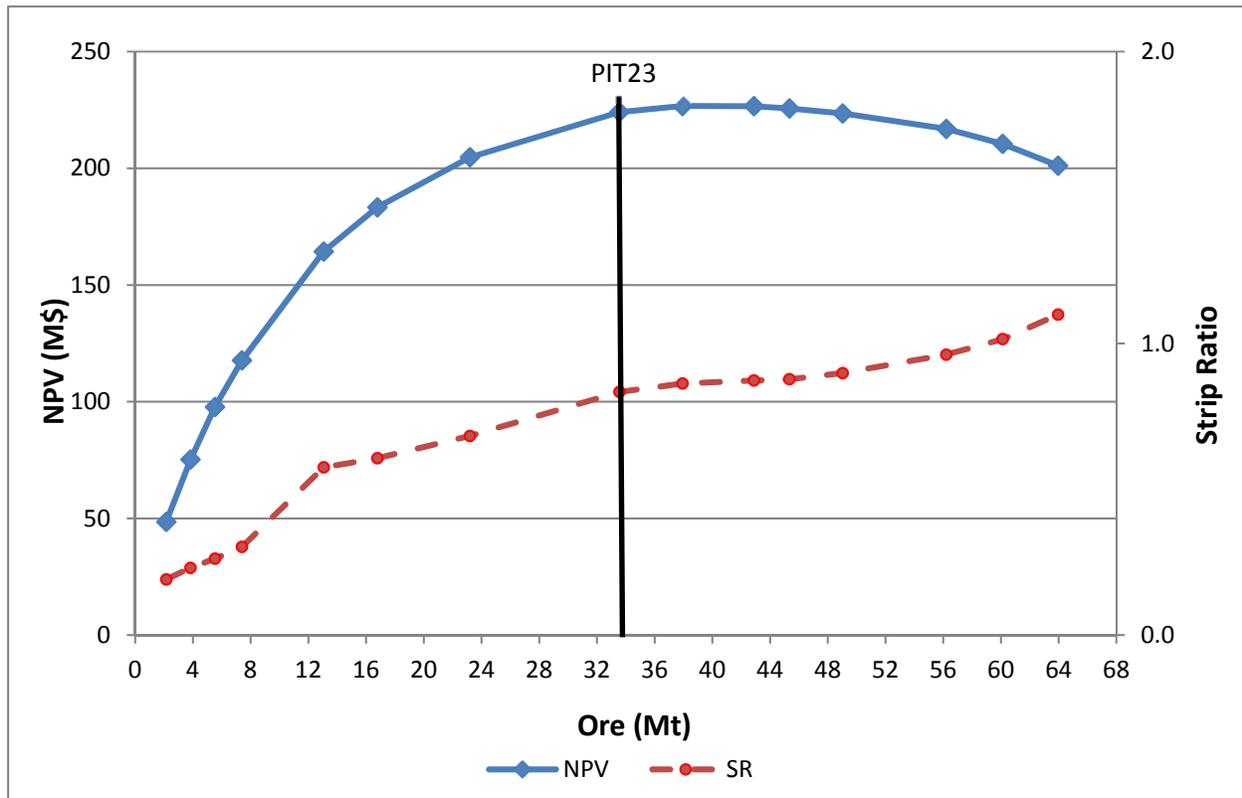
The pit optimization analysis shows that the open pit design should be based on PIT23 (Revenue Factor - 0.7). This pit shell contains 33.6 Mt of Indicated Mineral Resources at a strip ratio of 0.8 to 1. Mining additional resources with an open pit beyond the limits of this pit shell increases the strip ratio but does not increase the NPV of the project.

Upon completion of the PFS, MC-DRA confirmed that the pit optimization exercise was still valid using the updated cost estimate developed in the Study.

**Table 15.2 – Pit Optimization Results**

<b>Pit</b>	<b>Revenue Factor</b>	<b>Ore (Mt)</b>	<b>C(g) (%)</b>	<b>Total Waste (Mt)</b>	<b>Strip Ratio</b>	<b>Concentrate (Mt)</b>	<b>NPV (M\$)</b>	<b>Mine Life (y)</b>
PIT16	0.53	2.2	5.07	0.4	0.2	0.1	48	3
PIT17	0.55	3.8	4.89	0.9	0.2	0.2	75	4
PIT18	0.58	5.5	4.79	1.4	0.3	0.3	98	5
PIT19	0.60	7.4	4.70	2.2	0.3	0.3	118	7
PIT20	0.63	13.1	4.67	7.5	0.6	0.6	164	12
PIT21	0.65	16.8	4.60	10.2	0.6	0.7	183	15
PIT22	0.68	23.2	4.53	15.8	0.7	1.0	205	20
PIT23	0.70	33.6	4.55	28.0	0.8	1.5	224	28
PIT24	0.73	37.9	4.52	32.7	0.9	1.6	227	32
PIT25	0.75	42.9	4.47	37.4	0.9	1.8	227	36
PIT26	0.78	45.3	4.44	39.8	0.9	1.9	226	37
PIT27	0.80	49.0	4.41	44.0	0.9	2.1	224	40
PIT28	0.90	56.2	4.36	54.0	1.0	2.3	217	45
PIT29	1.00	60.1	4.33	61.0	1.0	2.5	210	48
PIT30	1.20	64.0	4.29	70.3	1.1	2.6	201	51

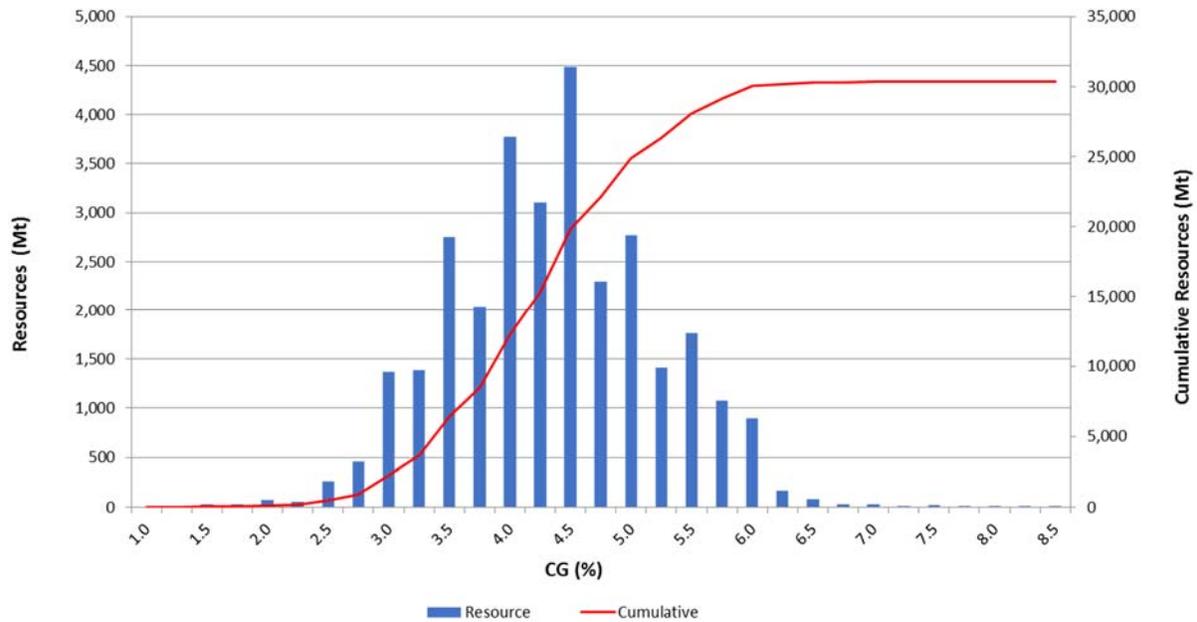
Figure 15.2 – Pit Optimization Results



Using the economic parameters presented in Table 15.1, the open pit cut-off grade was calculated to be 2.32 %. The cut-off grade is used to determine whether the material being mined will generate a profit after paying for the processing, transportation and General and Administration costs. Material that is mined below the cut-off grade is sent to the waste dump.

Figure 15.3 presents a histogram of the grades and tonnage of the Indicated Mineral Resources. The histogram shows that the West Zone Deposit contains very little tonnage below the cut-off grade.

Figure 15.3 – Grade Tonnage Curve



### 15.2.2 Open Pit Design

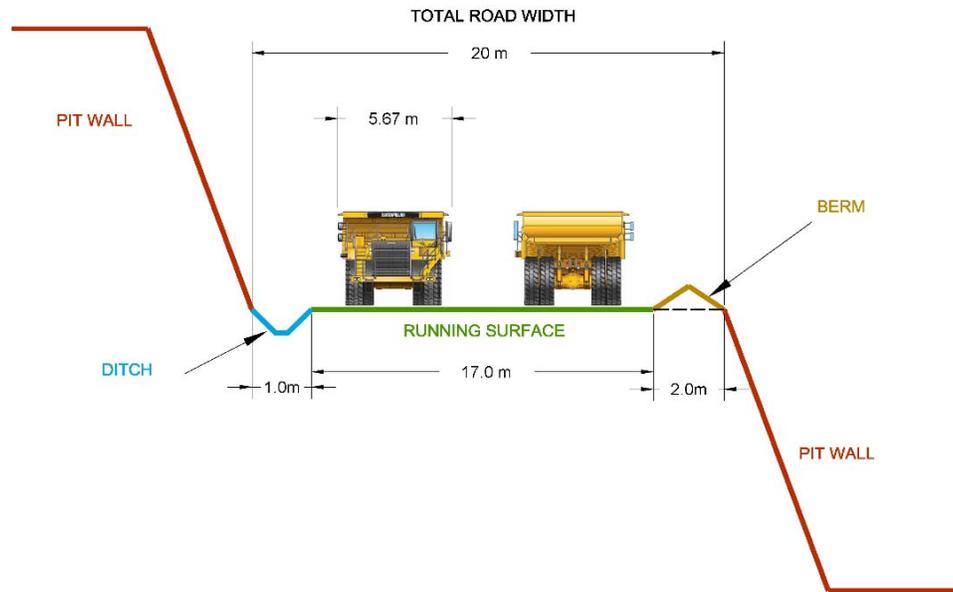
The next step in the Mineral Reserve estimation process is to design an operational pit that will form the basis of the production plan. This pit design uses the pit shell as a guideline and includes smoothing the pit wall, adding ramps to access the pit bottom and ensuring that the pit can be mined using the initially selected equipment. The following Section provides the parameters that were used for the open pit design and presents the results.

#### a) Haul Road Design

The ramps and haul roads were designed with an overall width of 20 m. For double lane traffic, industry practice indicates the running surface width to be a minimum of three (3) times the width of the largest truck. The overall width of a 64-tonne rigid frame haul truck is 5.6 m which results in a running surface of 17 m. The allowance for berms and ditches increases the overall haul road width to 20 m.

A maximum ramp grade of 10 % was used. This grade is acceptable for a 64-tonne rigid frame haul truck. Figure 15.4 presents a typical section of the in-pit ramp design.

Figure 15.4 – Ramp Design



b) Mine Dilution and Ore Loss

In every mining operation, it is impossible to perfectly separate the ore and waste, as a result of the large scale of the mining equipment and the use of drilling and blasting. In order to account for mining dilution, MC-DRA assign a diluted C(g) grade value for each block of ore that neighbors a waste block.

The mining dilution was estimated at 5 %, meaning that for each five (5) m wide block of ore, 0.25 m of the neighboring waste block was included as dilution. A C(g) grade of 0 % was used for the waste. The addition of mining dilution resulted in lowering the C(g) grade of the Mineral Reserves from 4.46 % to 4.39 %.

The gain in tonnage that results from including the 0.25 m wide slice of waste was not included in the Mineral Reserves in order to remain conservative with the methodology of applying mining dilution and ore losses.

c) Minimum Mining Width

A minimum mining width of 25 m was considered for the open pit design. This is based on a 23.5 m turning radius for a 64-tonne haul truck.

### 15.2.3 Open Pit Design Results

The pit designed for the West Zone Deposit consists of four (4) phases of varying size and grade. The ultimate pit (all phases combined) is approximately 2,200 m long with a maximum width of 330 m at surface and a maximum pit depth from surface of 186 m. The total surface area of the pit is roughly 450,000 m<sup>2</sup>. The overburden thickness varies along the strike of the orebody increasing in thickness towards the North. For phases 1, 2 and 3 of the Project, overburden thickness is on average five (5) m ranging between 0 to 15 m in thickness. In Phase 4, overburden thickness increases and varies between 10 and 38 m.

The pit considers multiple permanent access ramps to facilitate in-pit dumping. All pit ramps enter the pit on the East side at different elevations. Each phase of the Project has a ramp which follows the East side of the pit wall. The deepest part of the open pit is in Phase 4 at an elevation of 355 m at a depth of 186 m below surface.

The open pit design is constrained by previous property limits to the South West. The Tony Bloc Claim Property limits were extended during the PFS, this is not reflected in current PFS pit design limits.

Figure 15.5 presents the open pit design for the West Zone Deposit, indicating both design and updated property limits.

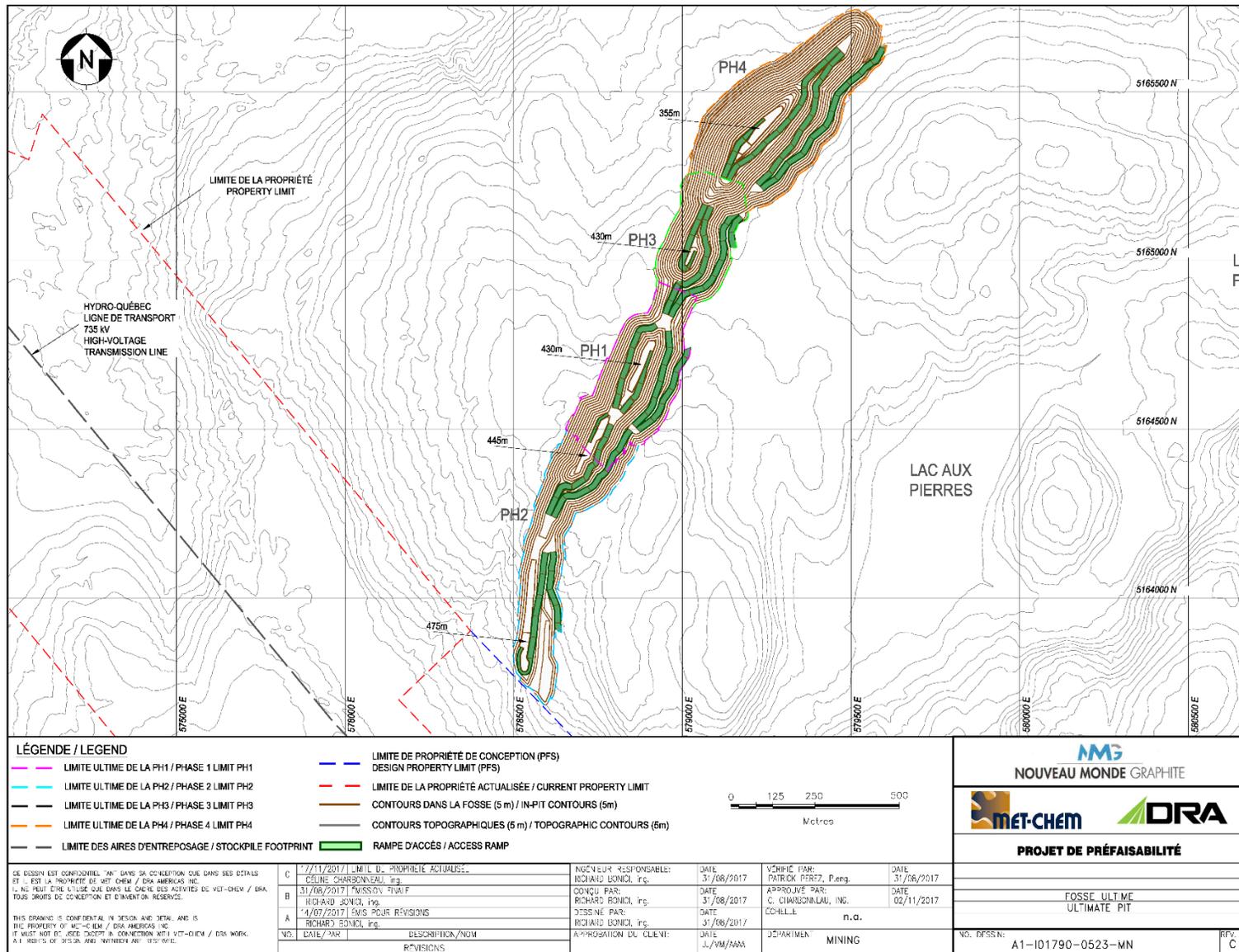
### 15.2.4 Open Pit Mineral Reserves Estimate

The open pit design includes 33.0 Mt of Probable Mineral Reserves at a grade of 4.39 % C(g). In order to access these reserves, 9.8 Mt of overburden and 24.6 Mt of waste rock (which includes 0.13 Mt of Inferred Mineral Resources) will need to be removed. This results in a stripping ratio of 1.04 to 1. Table 15.3 presents the open pit Mineral Reserves for the West Zone Deposit.

**Table 15.3 – Open Pit Mineral Reserves**

Category	Tonnage (Mt)	C(g) Grade (%)
Proven	0	0
Probable	33.0	4.39
Proven & Probable	33.0	4.39

Figure 15.5 – Open Pit Design



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## 16.0 MINING METHODS

### 16.1 Open Pit Mining

#### 16.1.1 Open Pit Mining Method

The mining method selected for the Project is a conventional open pit, truck and shovel, drill and blast operation. Vegetation, topsoil and overburden will be stripped and stockpiled for future reclamation use. The ore and waste rock will be mined considering five (5) m high benches, drilled, blasted and loaded into rigid frame haul trucks with hydraulic excavators and wheel loaders.

#### 16.1.2 Geotechnical Pit Slope Parameters

Journeaux Assoc (“**Journeaux**”) performed a geotechnical analysis of the West Zone Deposit in parallel with the PFS to evaluate the pit slope design recommendations for the open pit mine located West of *Lac aux Pierres*, six (6) km South West of the community of *Saint-Michel-des-Saints, Québec*.

MC-DRA provided Journeaux with delineated pit limits as well as drill core information, seen in Figure 16.1 below, to assess the structural geologic features of the rock formation that will affect the stability of the ultimate pit walls of the West Zone Deposit.

The results of the geotechnical pit slope parameters estimated by Journeaux can be seen in the following Figure 16.2. The report recommends an overall pit slope of 55° for the West wall (hanging wall) and an overall pit slope of 60° for the East wall (foot wall). The 55° slope is achieved with ten (10) m bench heights, a bench face angle of 75° and a seven (7) m wide catch bench per two (2) benches. For the 60° slope, the catch bench is 6.2 m wide.

Figure 16.1 – Pit Limits and Drill Holes

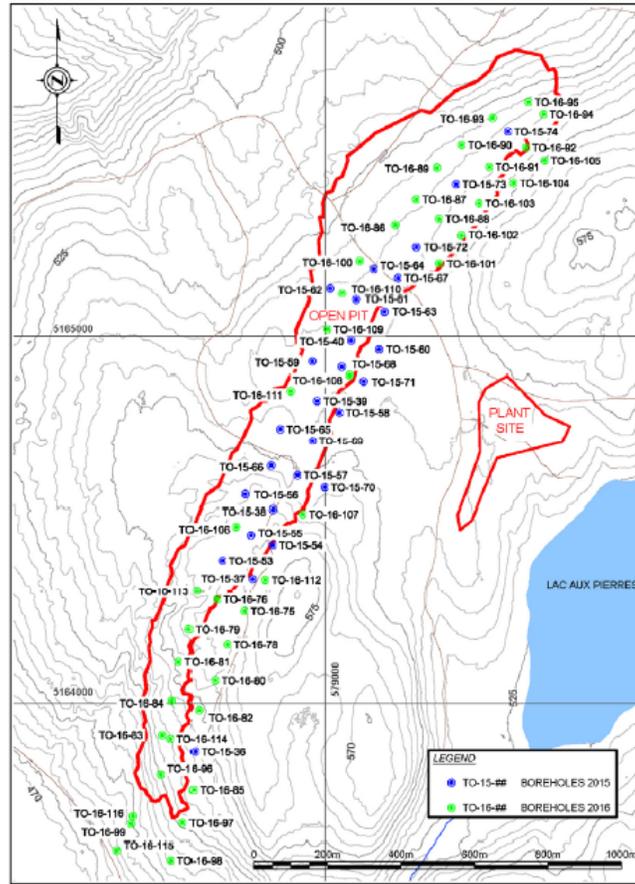
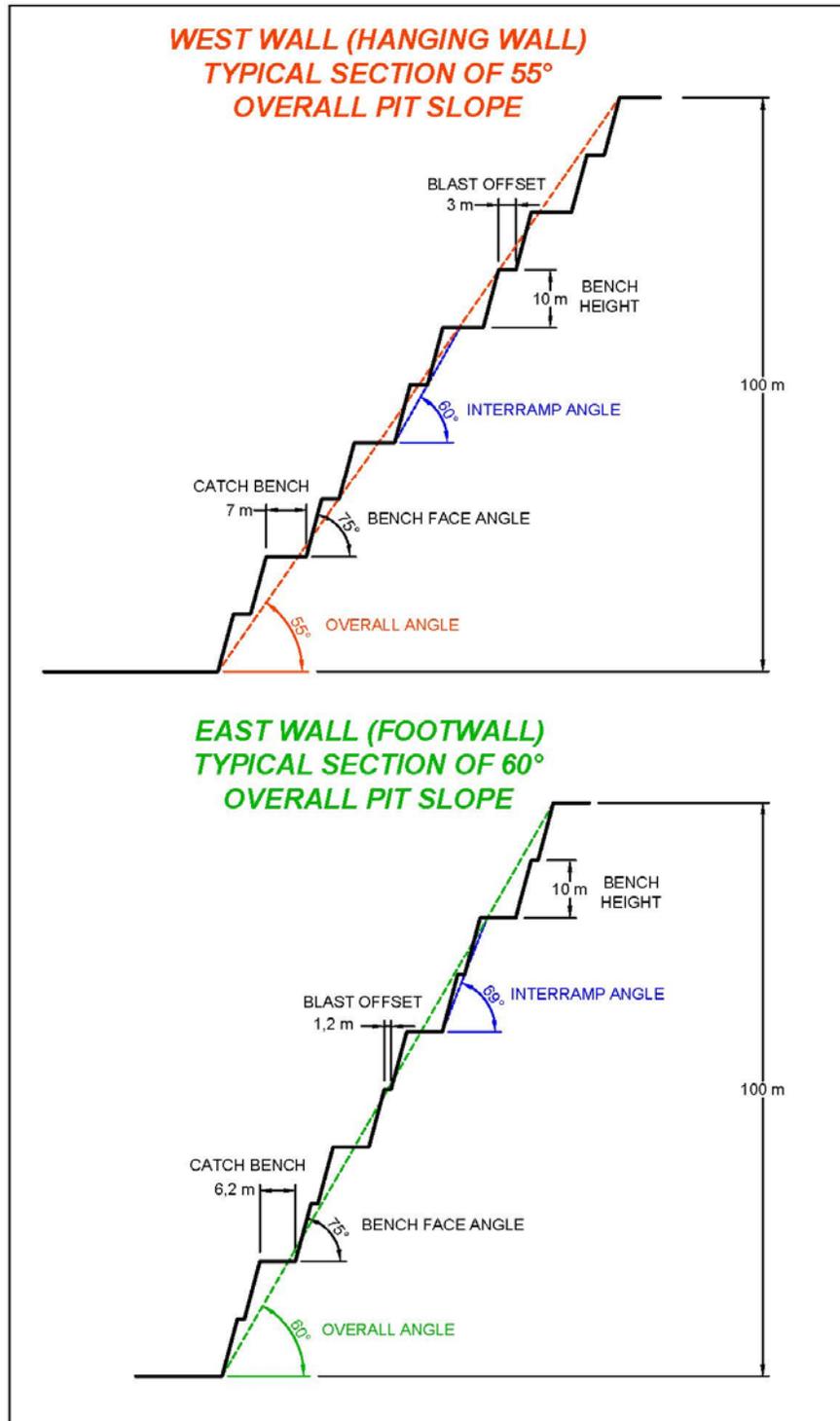
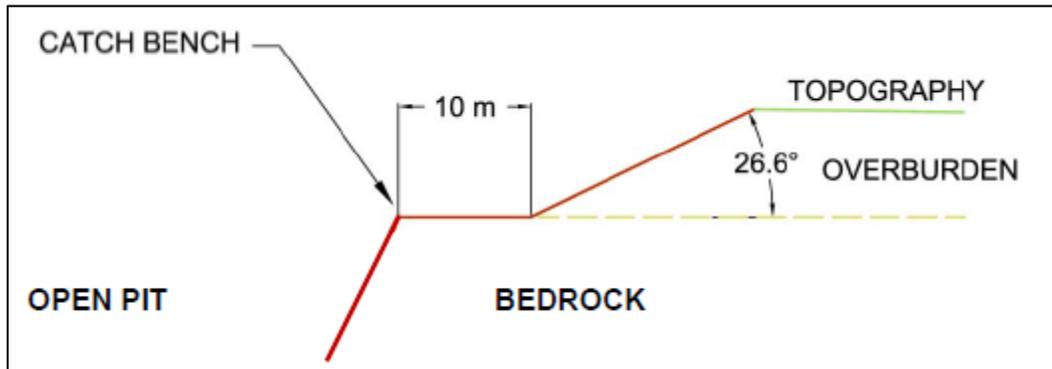


Figure 16.2 – Wall Sections of Proposed West Zone Deposit Pit Walls



The recommended slope through the overburden formation is  $26.6^\circ$  with a ten (10) m wide catch bench at the contact between the overburden and the bedrock. The pit wall configuration is presented in Figure 16.3.

**Figure 16.3 – Pit Wall Configuration**



The recommended slopes assume that pre-shearing blasting techniques will be used.

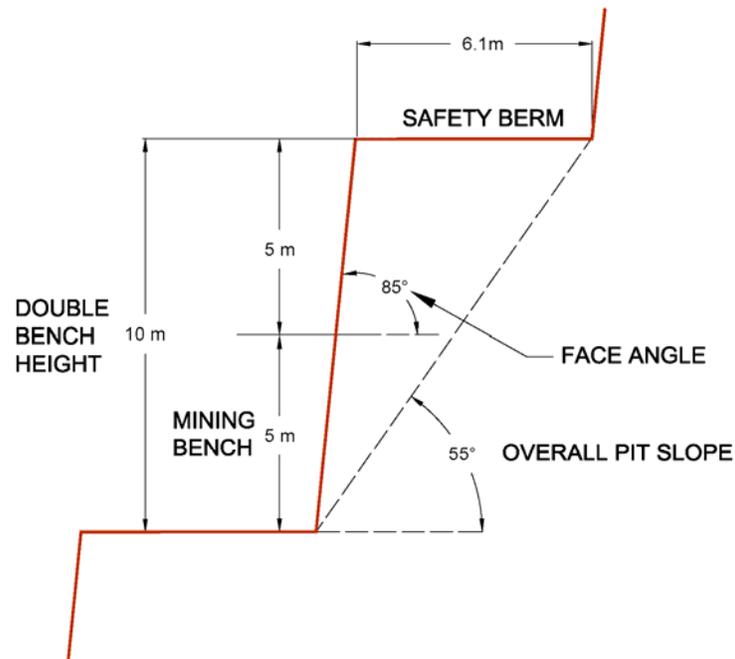
The parameters considered for the PFS pit design are an overall pit slope of  $55^\circ$  in hard rock and  $30^\circ$  in overburden.

Based on Journeaux's preliminary geotechnical results of the proposed West Zone pit, MC-DRA pit design parameters considered for the PFS are conservative. Considering a steeper overall pit slope on the East wall of the pit is an opportunity to reduce the overall stripping ratio and potentially allow access to lower production benches. Furthermore, maintaining a ramp on the East side of the pit will allow for an Inter-ramp angle of  $60^\circ$  to be considered on the West side of the pit.

For the PFS, MC-DRA considered five (5) m high mining benches to allow for selective mining, a pit face angle of  $85^\circ$  and a safety berm every second bench (6.1 m wide). Pre-shear drilling and blasting was considered over a ten (10) m vertical separation to minimize rock falls. See Figure 16.4 for pit slope profile MC-DRA considered for the PFS.

Journeaux and Assoc. recommends a  $75^\circ$  face angle with an allowance for blast offsets between safety berms every 20 m. This updated pit slope design should be considered in the next level of study. An increase in the overall pit slope angle provides opportunity as a reduction in overall pit strip ratio can help reduce mining costs.

Figure 16.4 – Pit Slope Profile



### 16.1.3 Hydrogeology and Hydrology Parameters

Hydrogeological testing is ongoing for the Matawinie project. Potential water sources that affect the mining operation are surface run-off, rainfall, snowmelt and groundwater. The quantity for each of these sources of water will need to be estimated in the next level of study in order to calculate the mine dewatering requirements.

### 16.1.4 Property Limits

The pit design has been done respecting the property limits at the time. During the course of the PFS, the property limits have been extended South West of the pit. This property extension will be considered in the next level of study.

### 16.1.5 Phase Design

The ultimate pit design consists of four (4) phases. The initial starter pit (Phase 1) was designed in a high-grade zone closest to the crusher to optimize project NPV by minimizing overburden (“OB”) removal and development costs. Phase 1 will supply the majority of the run of mine ore for the first seven (7) years of the operation and will be mined to completion to allow in-pit backfilling of waste material. Phase 1 backfilling of waste material will commence in Year 9 and will continue to Year 10. Phase 2 consists of an extension of Phase 1 to design limits on the South West end, backfilling of waste will start on the South end of Phase 2 in Year 13 and will progress towards the North. Based on the

current mine plan, all waste mined after Year 13 will be backfilled in-pit. Phase 3 consists of a low-grade zone which will be blended with Phase 2 and Phase 4 run of mine to assure a consistent C(g) feed grade to the mill. Waste material from Phase 3 will be stockpiled and backfilled within Phase 2 limits. Phase 4 yields the highest C(g) grade in comparison to other phases; however, it also requires a large amount of OB and waste stripping. Phase 4 OB will be placed overtop the Waste pile as to reduce clearing and grubbing costs and facilitate the reclamation of the ex-pit waste stockpile. Table 16.1 summarizes the reserves by phase.

**Table 16.1 – Mine Reserves by Phase**

		<b>PH1</b>	<b>PH2</b>	<b>PH3</b>	<b>PH4</b>	<b>TOTAL</b>
Resources (Indicated)	kt	8,165	7,790	4,847	12,198	33,000
C(g) Grade	%	4.42	4.34	4.05	4.73	4.46
C(g) Grade (diluted)1	%	4.35	4.26	3.97	4.66	4.39
Waste	kt	4,194	5,322	2,528	12,560	24,604
OB	kt	715	500	1,361	7,213	9,790
SR (w/o)	t/t	0.6	0.8	0.8	1.6	1.0

\*Totals may not add up due to rounding

### 16.1.6 Stockpile Design

Both topsoil and overburden stockpiles were designed considering five (5) m lifts, an overall slope of 18.4° (3H:1V), a 24.4° lift slope which results in a four (4) m safety berm per lift. The waste stockpile was also designed considering five (5) m lift heights, an overall slope of 29.1° (1.8H:1V), a 45° lift slope resulting in a four (4) m safety berm per lift. All stockpiles designs consider four (4) m safety berms to comply with Quebec Regulation respecting pits and quarries (R.R.Q., 1981, c. Q-2, r. 2, s. 39).

The primary overburden stockpile was placed on the South West end of the Property partially outside of the Tony Bloc Claims with the agreement of NMG. A secondary overburden dump was designed considering the large amount of surface material mined in Phase 4. Given the current Mine plan, this stockpile will be placed on top of the primary ex-pit waste stockpile South East of the pit, also out of the direct line of site of the neighboring community. Placing surface material on top of the waste pile will help reduce the Project footprint and promote reclamation of the waste stockpile. In addition, the topsoil stockpile was designed East of Phase 4 (just west of the crusher) and will be used for rehabilitation of stockpiles and pit area as per the mine closure plan.

Backfilling of waste material in the pit was considered as to reduce the environmental footprint of the Project. As a result, any waste material mined after Year 13 given the current mine plan will be placed in-pit.

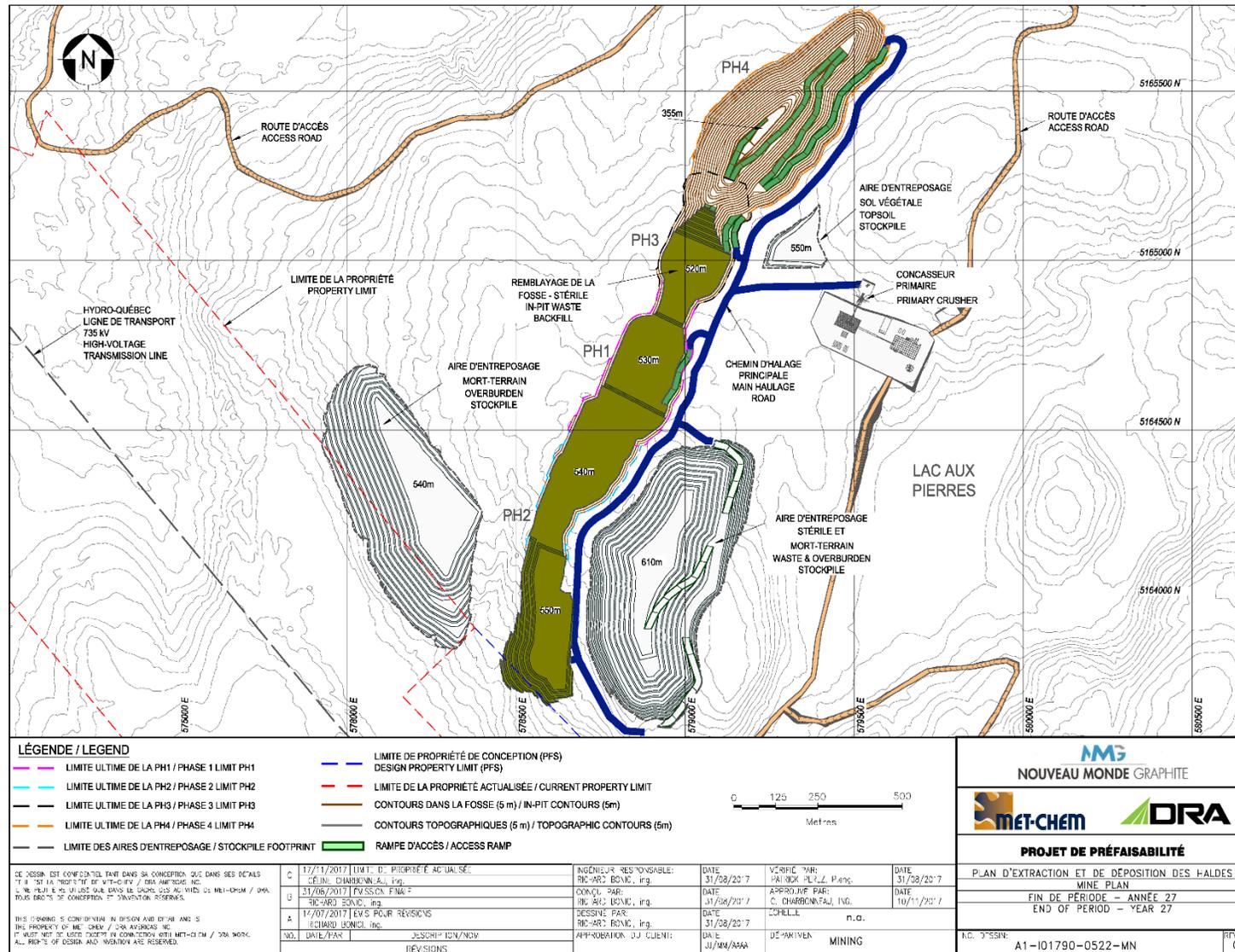
A topsoil stockpile capacity of approximately 90,000 m<sup>3</sup> was estimated based on the amount of dump and pit clearing required for the project and based on an average topsoil thickness of ten (10) cm. The topsoil stockpile footprint is 20,000 m<sup>2</sup>, a top elevation of 550 m and a maximum height of ten (10) m. Material that is placed in this stockpile will be used for future reclamation.

The waste pile, which will be built from the start of the operation until Year 13, has a capacity of 3.5 Mm<sup>3</sup>. This pile has a footprint area of 266,000 m<sup>2</sup>, a top elevation of 580 m and a maximum height of 35 m. With the addition of the OB stockpile, the ultimate top elevation will be 610 m with a maximum height of 65 m.

All stockpiles were designed to be a minimum distance of 20 m from haulage roads. The waste piles as well as the topsoil and overburden stockpiles will have a perimeter ditch around their toes to capture water run-off.

Figure 16.5 presents a layout of the waste piles and overburden stockpile.

Figure 16.5 – Waste Piles and Overburden Stockpile Layout



### 16.1.7 Mine Planning

The following section discusses the mine plan that was prepared for the open pit for the Pre-Feasibility Study. This mine plan forms the basis of the mine capital and operating cost estimate presented in Section 21.0. The mine plan was established annually for the first twenty (20) years of production, followed by a five (5) year period and then by a two (2) year period for a total of 27 years.

a) Mine Planning Parameters

- Work Schedule

Mining operations for the Project will be 51 weeks per year, operating five (5) days per week on a 12 hours shift per day. One (1) week closure was considered accounting for adverse weather conditions. The concentrator will be fed from a crushed ore stockpile (after primary crushing) as to facilitate a 24 hr per day, seven (7) days per week plant operation. The primary crusher will operate on the mine work schedule and be fed via mine haul trucks. In case of emergencies or unforeseen down times, a Run of Mine stockpile containing three (3) days of production can also supplement the primary crusher. In addition, the crushed ore stockpile will contain three (3) days worth of production. The mine fleet and manpower will be contracted and will abide to this work schedule.

- Annual Production Requirements

The mine plan is based on an annual production of 52,000 tonnes of concentrate. The production in Year 1 was limited to 39,000 tonnes of concentrate (75 % of full production), to account for start-up and commissioning.

- Mill Recovery and Concentrate Grade

The following calculation is used to determine the amount of concentrate that is produced from the run of mine ore. The mill recovery is 94 % and the concentrate grade is 97 % C(t).

$$\text{Concentrate Tonnes} = \frac{\text{Run of Mine Ore (t)} \times \text{C(G) Grade diluted (\%)} \times \text{Mill Recovery (\%)}}{\text{Concentrate Grade (\%)}}$$

b) Mine Production Schedule

Table 16.1 presents the mine production schedule that was developed for the 27-year life of the open pit mine. This schedule includes a pre-production phase of two (2) months which is required for pit development. During this period, 30,000 tonnes

of overburden and 70,000 tonnes of waste rock will be mined. A total of 50,000 tonnes of ore will also be stockpiled during pre-production. This ore stockpile will be processed during the first year of production and will be replenished as an emergency stockpile to feed the primary crusher.

The total material mined per year during the 27-year period ranges from 1.8 Mt to a maximum of 5.0 Mt which occurs during periods of elevated stripping between Year 16 and Year 20. Figure 16.3 presents a chart showing the tonnages mined each year. The average annual diluted grade of C(g) varies between 4.04 % to 4.97 % during the 27-year period.

Figure 16.7, Figure 16.8 and Figure 16.9 show the pit, waste pile and overburden stockpile advances as of Year 3, Year 10 and Year 20 respectively.

Table 16.2 – Mine Production Schedule

Description	Units	Pre-Prod	Year 01	Year 02	Year 03	Year 04	Year 05	Year 06	Year 07	Year 08	Year 09	Year 10	Years 11 - 15	Years 16 - 20	Years 21 - 25	Years 26 - 27	Total
Concentrate	kt	2	37	52	52	52	52	52	52	52	52	52	260	260	260	112	1,399
% Full Production	%		75	100	100	100	100	100	100	100	100	100	100	100	100	108	
Run of Mine Ore	kt	50	877	1,244	1,253	1,266	1,278	1,251	1,195	1,228	1,250	1,283	6,487	6,285	5,711	2,342	33,000
C(g)	%	4.26	4.47	4.42	4.38	4.32	4.28	4.36	4.57	4.46	4.39	4.27	4.23	4.35	4.77	5.02	4.46
C(g) (diluted)	%	4.11	4.37	4.33	4.30	4.25	4.21	4.30	4.50	4.39	4.31	4.20	4.15	4.28	4.71	4.97	4.39
Total Waste	kt	100	1,125	1,371	831	573	651	610	979	1,063	947	924	7,425	13,557	3,907	291	34,355
Waste Rock	kt	70	774	1,091	664	573	452	610	592	1,063	947	876	3,830	8,864	3,907	291	24,605
Overburden	kt	30	351	280	167	0	199	0	387	0	0	48	3,595	4,693	0	0	9,749
<b>Total Material</b>	<b>kt</b>	<b>150</b>	<b>2,002</b>	<b>2,615</b>	<b>2,084</b>	<b>1,839</b>	<b>1,929</b>	<b>1,861</b>	<b>2,174</b>	<b>2,290</b>	<b>2,197</b>	<b>2,207</b>	<b>13,912</b>	<b>19,843</b>	<b>9,618</b>	<b>2,633</b>	<b>67,355</b>
Stripping Ratio		n/a	1.3	1.1	0.7	0.5	0.5	0.5	0.8	0.9	0.8	0.7	1.1	2.2	0.7	0.1	1.0

Figure 16.6 – Mine Production Schedule

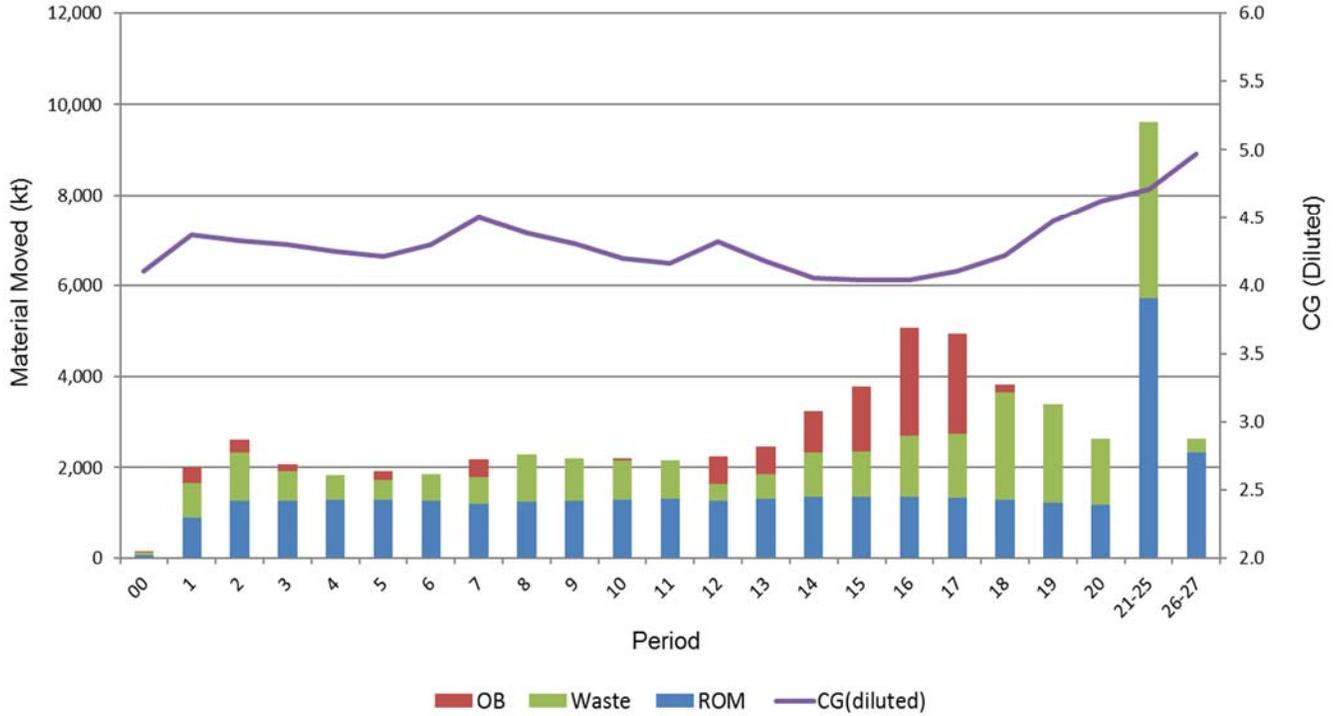


Figure 16.7 – End of Year 03

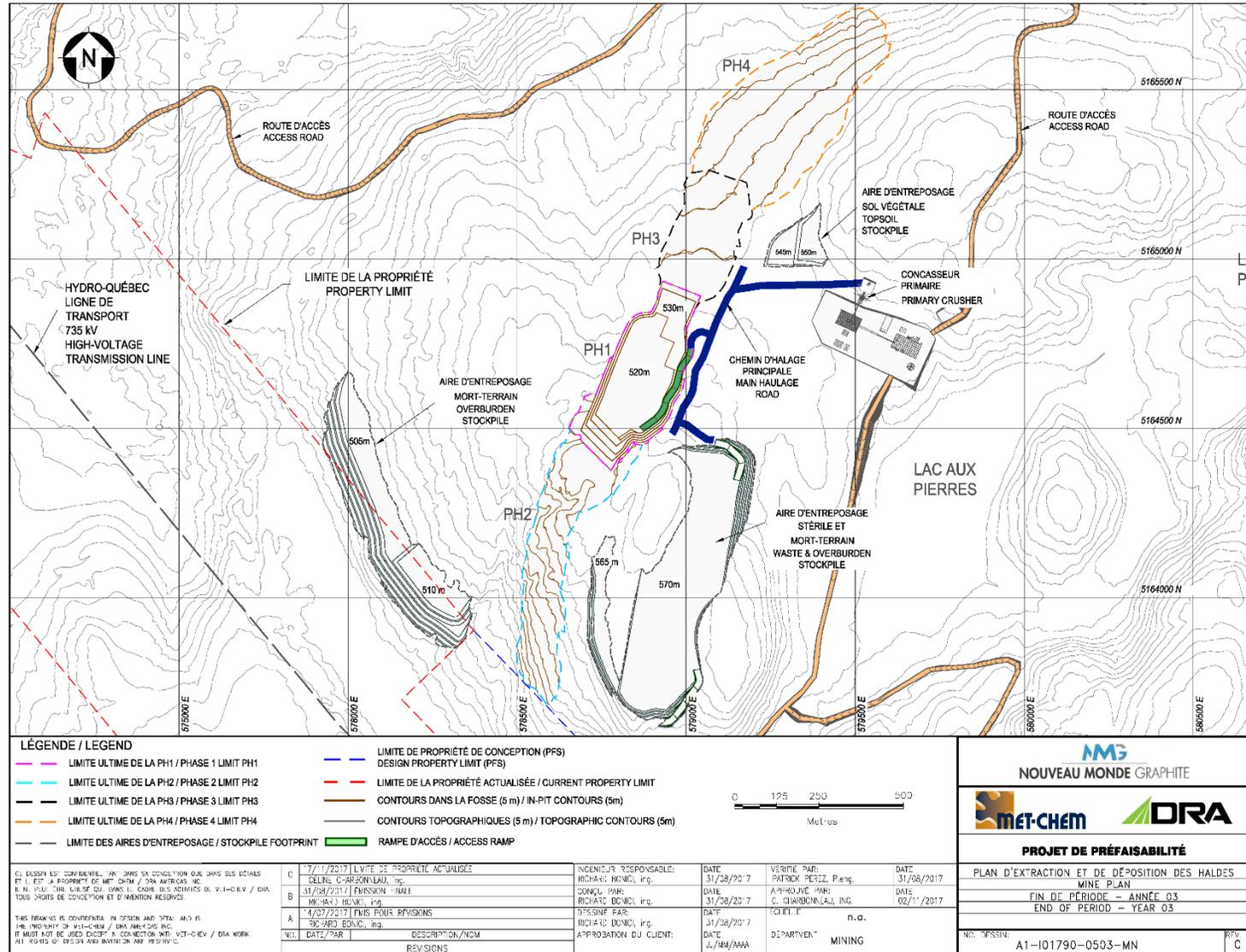


Figure 16.8 – End of Year 10

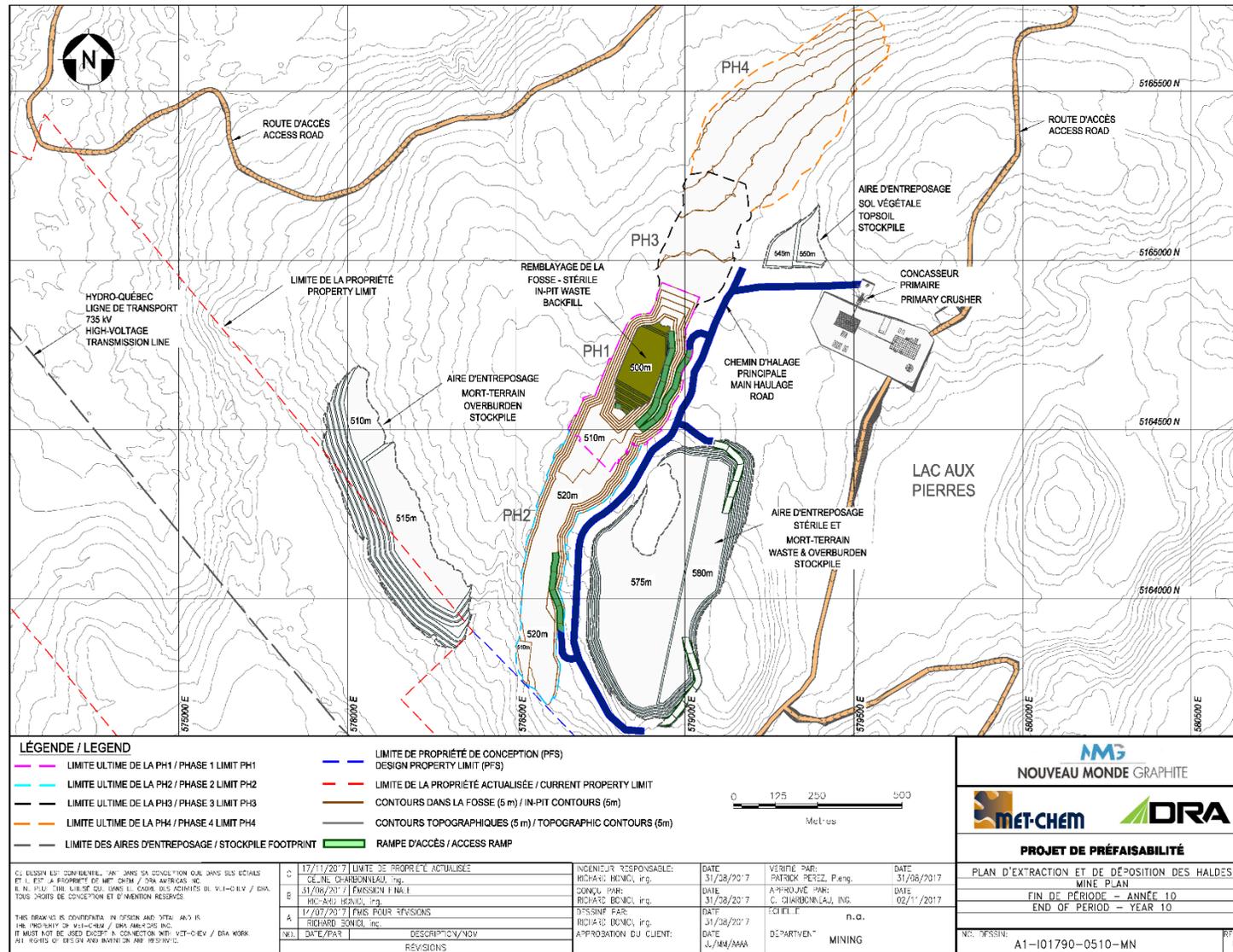
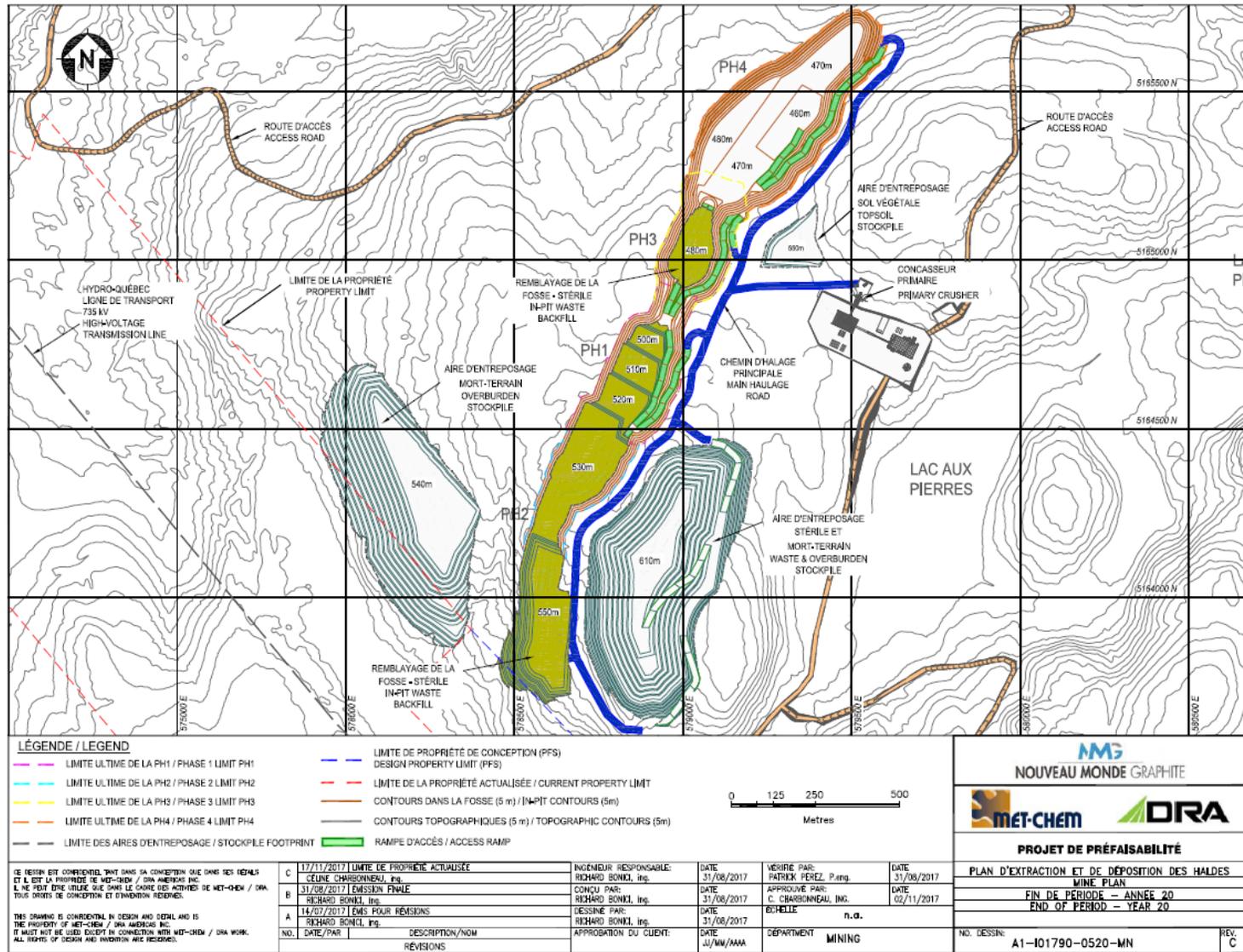


Figure 16.9 – End of Year 20



### 16.1.8 Mine Equipment Fleet

The following Section discusses equipment selection and fleet requirements to carry out the mine plan for the open pit. Although the mine will be operated by contractor, the following section presents the mine equipment selection and methodology that was used to estimate the fleet requirements and manpower from an owner operated perspective. This provided a basis of estimation for contractor pricing which was subsequently used to evaluate project economics in Section 21.0.

The owner fleet is based on a five (5) day per week, 12 hours per day work schedule, operating 51 weeks per year. Table 16.3 identifies the mine fleet selected for Year 5 of the mine plan to give the reader an appreciation for the size of the operation.

**Table 16.3 – Mining Equipment Fleet at Year 5**

Equipment	Typical Model	Description	Units
Major Equipment			
Haul Truck	CCAT 775	Payload – 64 t	3
Hydraulic Excavator	CAT 6015	Bucket – 6 m <sup>3</sup>	1
Production/Pre-shear Drill	Pantera DP 1500i	114 mm hole	1
Support Equipment			
Wheel Loader	988K	373 - 393 kW	2
Track Dozer	D6T	123 kW	1
Road Grader	160M2	160 - 170 kW	1
Water Truck	Peterbuilt 365	20,000-litre	1
Light Plant	n/a	6 kW	4
Fuel and Lube Truck	Peterbuilt 365	330 kW	1
Pickup Truck	Ford F250	300 kW	4
Dewatering Pump	HL130M	220 kW	1

a) Haul Trucks

The haul truck selected for the Project is a rigid frame mining truck with a payload of 64 tonnes. This size truck was selected since it matches well with the production requirements and results in a manageable fleet size. The following parameters were used to calculate the number of trucks required to carry out the mine plan. These parameters result in 1,931 working hours per year for each truck as is presented in Table 16.4.

- Mechanical Availability – 85 %;
- Utilization – 90 % (non-utilized time is accrued when the truck is not operating due to blasting, excavator relocation and no operator available);
- Nominal Payload – 64 tonnes (42.3 m<sup>3</sup> heaped);
- Shift Schedule – One (1), 12 hours shift per day, five (5) days per week;
- Operational Delays – 60 min/shift (this includes 15 minutes for equipment inspection and 45 minutes for lunch). Fueling will be carried out during off hours once a day and is not included as an operating delay;
- Job Efficiency – 90 % (54 min/h; this represents lost time due to queuing at the shovel and dump as well as interference on the haul road);
- Rolling Resistance – 3%.

**Table 16.4 – Annual Truck Hours**

Description	Annual Hours	Details
Total Hours	3,060	5 days per week, 12 hours per day, 51 weeks per year
Down Mechanically	459	15 % of total hours
Available	2,601	Total hours minus hours down mechanically
Standby	260	10 % of available hours (represents 90% utilization)
Operating	2,341	Available hours minus standby hours
Operating Delays	195	80 min/shift
Net Operating Hours	2,146	Operating hours minus operating delays
Working Hours	1,931	90 % of net operating hours (reflects job efficiency)

Haul routes were designed for each period of the mine plan to calculate the truck requirements. These haul routes were imported in Talpac<sup>®</sup>, a commercially available truck simulation software package that MC-DRA has validated with

mining operations. Talpac<sup>©</sup> calculated the travel time required for a 64-tonne haul truck to complete each route. Table 16.5 shows the various components of a truck's cycle time. The load time is calculated using a hydraulic excavator with a 6 m<sup>3</sup> (13-tonne) bucket as the loading unit. This size excavator which is discussed in the following section loads ore and waste rock in a 64-tonne haul truck in five (5) passes, six (6) for overburden.

**Table 16.5 – Truck Cycle Time**

Activity	Duration (sec)
Spot @ Excavator	30
Load Time <sup>1</sup>	100
Travel Time	Calculated by Talpac <sup>©</sup>
Spot @ Dump	30
Dump Time	30

1. Five (5) Passes @ 20 sec/pass.

Haul productivities (tonnes per work hour) were calculated for each haul route using the truck payload and cycle time. Table 16.6 shows the cycle time and productivity for the mineralization and waste haul routes in Year 5 as an example.

**Table 16.6 – Truck Productivities (Year 5)**

Material	Cycle Times (min)					Productivity	
	Travel	Spot	Load	Spot & Dump	Total	Loads/h	t/h
Ore	7.65	0.50	1.7	1.00	10.8	5.6	356
Overburden	7.13	0.50	2.3	1.00	10.9	5.5	351
Waste	10.04	0.50	1.7	1.00	13.2	4.5	291

\*Results may not add due to rounding

Truck hour requirements were calculated by applying the tonnages hauled to the productivity for each haul route.

A fleet of two (2) trucks is required during pre-production, three (3) trucks in Year 1. This number increases to five (5) in Year 2, six (6) in Year 7 and reaches a peak of nine (9) in Year 15.

b) Excavators

The main loading machine selected for the Project is a hydraulic excavator (backhoe) with a of 6 m<sup>3</sup> bucket. For maximum productivity, the excavators will be placed on top of the muck pile and the haul trucks will be at the bottom of the loading face.

Even though one (1) excavator can handle the amount of tonnages scheduled in the mine plan until Year 16, two (2) 6 m<sup>3</sup> bucket wheel loaders were included in the fleet to assist with production and as a backup when the primary machine is unavailable.

The production wheel loaders will also serve for re-handling of the emergency ore stockpile to the primary crusher and will assist in pushing material on the crushed ore pad during the mine operations down time. This machine will also be equipped with a dozer attachment for cleanups and road maintenance if required.

c) Drilling and Blasting

For the Pre-feasibility study, a contractor was considered for the drill and blast portion of the Project. This is reflected in the Project economics in Section 21.0 of this Report.

Production drilling will be carried out with diesel powered track mounted down the hole (“DTH”) drills. Using the following parameters; 85 % mechanical availability, 80 % utilization and a penetration rate of 34 m/h, MC-DRA calculated that one (1) drill is sufficient to complete the drilling requirements up to Year 14 of the mine plan. A second drill will be required in higher stripping periods after Year 14. Provided the mines work schedule, major repairs will be performed during off hours as to maximize use of this machine during working hours. Table 16.7 presents the drilling and blasting parameters for both production and pre-shear holes that have been designed for the PFS. Pre-shear drilling and blasting techniques will be used for the development of the final pit walls and will be completed with the same DTH drills to provide for a flexible operation. The table shows one (1) value for both ore and waste rock since the two (2) rock types have relatively similar densities.

**Table 16.7 – Drilling and Blasting Parameters**

Parameter	Units	Production	Pre-Shearing
Bench Height	m	5	10
Blasthole Diameter	mm	114	83
Burden	m	3.1	n/a
Spacing	m	3.1	1.8
Subdrilling	m	1.0	0.6
Stemming	m	2.1	0.6
Explosives Density	g/cm <sup>3</sup>	1.20	1.37
Powder Factor	kg/t	0.37	n/a
Shear Factor	kg/m <sup>2</sup>	n/a	0.61

The blasting will be carried out with bulk emulsion and non-electric detonators for production ore and waste drilling and blasting. For wall control work on final pit walls packaged continuous emulsion of 28 mm to 40 mm diameter were used. MC-DRA evaluated the use of either ANFO or bulk emulsion and even though bulk emulsion was costlier, it was considered for the following reasons;

- Performs better under wet loading conditions;
- Produces less residual ammonia;
- Overall better fragmentation.

The bulk emulsion will be transported to site in 12,000 kg tankers and loaded directly into blast holes. The size of the blasts are based on the maximum load that can be delivered which is about 12,000 kg during most months of the year. In the spring when half load restrictions apply the load per blast will drop to 9500 kg hence the blasting will need to be scheduled more often to maintain the same volume per week. For days when pre-shearing is required this should be planned with a production blast and would require an additional helper to load the blast.

The actual drill patterns recommended are 3.1 m x 3.1 m for ore when loading bulk gassed emulsion. In waste, the drill pattern can be increase slightly to 3.2 x 3.2 m. In both cases recommending a square drill pattern as that will be easier to layout and drill than a staggered drill pattern.

The holes will be loaded and shot on the same day once to twice a week. In order to reduce capital expenditures for the Project, considerations were not made for the storage of bulk explosive and detonators onsite. Since the load and shoot operation will be contracted, the mine equipment fleet will not include a bulk truck and a powder truck, neither will the mine workforce include a blasting crew as the drill and blast operation will be entirely contracted.

#### 16.1.9 Mine Manpower Requirements (Operations)

Owner operated manpower requirements were estimated and range from 18 to 22 during the first five (5) years of production where three (3) additional trucks are required (3 operators and 1 mechanic). Table 16.8 shows the mine operator manpower requirement in Year 5 of the Mine plan. Since the work schedule is based on 12 hr/day five (5) days per week, MC-DRA considered 1.5 crews (2,040 hr working hours per year per employee).

**Table 16.8 – Mine Manpower Requirements**

Description	Personnel
Mine Operations	
Pit Foreman	1
Truck Operator	4.5
Excavator Operator	1.5
Drill Operators	1.5
Dozer Operators	1.5
Grader Operator	1.5
Mechanic	4
Labourer	4.5
Total Mine Workforce	20

The total mine manpower requirements during peak production is expected to reach 33 operators in Years 16 to 18 of the mine plan. Mine salaried staff was not accounted for in this estimate, it was taken into consideration as a mine management cost which is detailed in Section 21.2.1.

## 16.2 Mine Equipment Fleet and Manpower (Contract Mining)

The contract miner whose pricing was used for the cost estimate that is presented in Section 21 has elected to use a very similar fleet to the one that was presented in this Section of this Report.

The contractor's workforce includes all the mine equipment operators, a pit foreman to assign objectives to the operators. This workforce will also include a drill and blast crew.

In order to supervise the contractor and to provide engineering and geology support, the owner will have the following four (4) personnel as workforce, a Senior mining engineer, a geologist, a surveyor and a mine planner.

## 17.0 RECOVERY METHODS

### 17.1 Matawinie Plant – 52,000 Concentrate Tonnes per Year

The processing facility or concentrator consists of a crushing area, beneficiation, dewatering, bagging and tailings processing areas.

The concentrator is designed to produce a graphite concentrate containing 97 % C(t) from an ore containing 4.39 % C(t). To achieve this concentration the beneficiation processes, include crushing, grinding, conventional flotation, polishing and column flotation. The facility will also perform thickening, filtration, drying, screening, bagging and material handling.

Tailings will be processed to generate two (2) tailings stream, non-sulphide and sulphide. Each stream will be dewatered and filtered to a product containing 15 % moisture.

#### 17.1.1 Design Criteria

Graphite quality is measured in flake size and purity. The design of the processing facility takes this into account to avoid degradation of graphite flakes while producing high purity graphite. All throughput rates are based on the production of 52,000 dry tonnes of 97 % C(t) graphite concentrate from a feed grade of 4.39 % C(t). Average weight recovery of 4.3 % and average graphite recovery of 94 % are used for design. These figures are based on lock cycle test work results and may change depending on ore composition.

Except for the crushing plant, the Matawinie concentrator will operate 24 hours per day, seven (7) days per week, 52 weeks per year. Operating availability of the concentrator is 92 %. The crushing plant will operate 12 hours per day, five (5) days per week, 52 weeks per year with an operating availability of 83 %.

The concentrator capacity has been established at an average rate of 3,349 dry tonnes per day or a nominal throughput rate of 151.7 dry tonnes of ore per hour. A detailed process design criteria has been developed. Table 17.1 summarizes the design basis for the crusher, concentrator and shipping facilities.

**Table 17.1 – Design Criteria – Plant Capacity**

Parameter	Units	Value
Total Ore Processing Rate	Dry tonnes per year	1,222,314
Average Concentrator Ore Processing Rate	Dry tonnes per day	3,349
Ore Moisture	Percentage	5.0
Graphite Ore Grade	Percentage	4.39
Crusher Operating Time	Percentage	83.0
Nominal Ore Crushing Rate	Dry tonnes per hour	472.0
Concentrator Operating Time	Percentage	92.0
Nominal Ore Processing Rate	Dry tonnes per hour	151.7
Final Graphite Concentrate Grade	Percentage	97.0
Final Graphite Concentrate Recovery	Percentage	94.0
Flakes (+ 48 mesh) Graphite Production	Dry tonnes per year	8,602
Coarse (- 48 + 80 mesh) Graphite Production	Dry tonnes per year	16,424
Intermediate (- 80 + 100 mesh) Graphite Production	Dry tonnes per year	6,049
Fine (- 100 mesh) Graphite Production	Dry tonnes per year	20,925
Total Graphite Production	Dry tonnes per year	52,000

### 17.1.2 Mass Balance and Water Balance

The process plant mass balance has been calculated based on the developed flow sheet and design criteria previously discussed. Table 17.2 below shows a summary of the mass balance. Throughput and flow rates are shown in t/d and m<sup>3</sup>/d. One (1) m<sup>3</sup>/d of water is one (1) t/d.

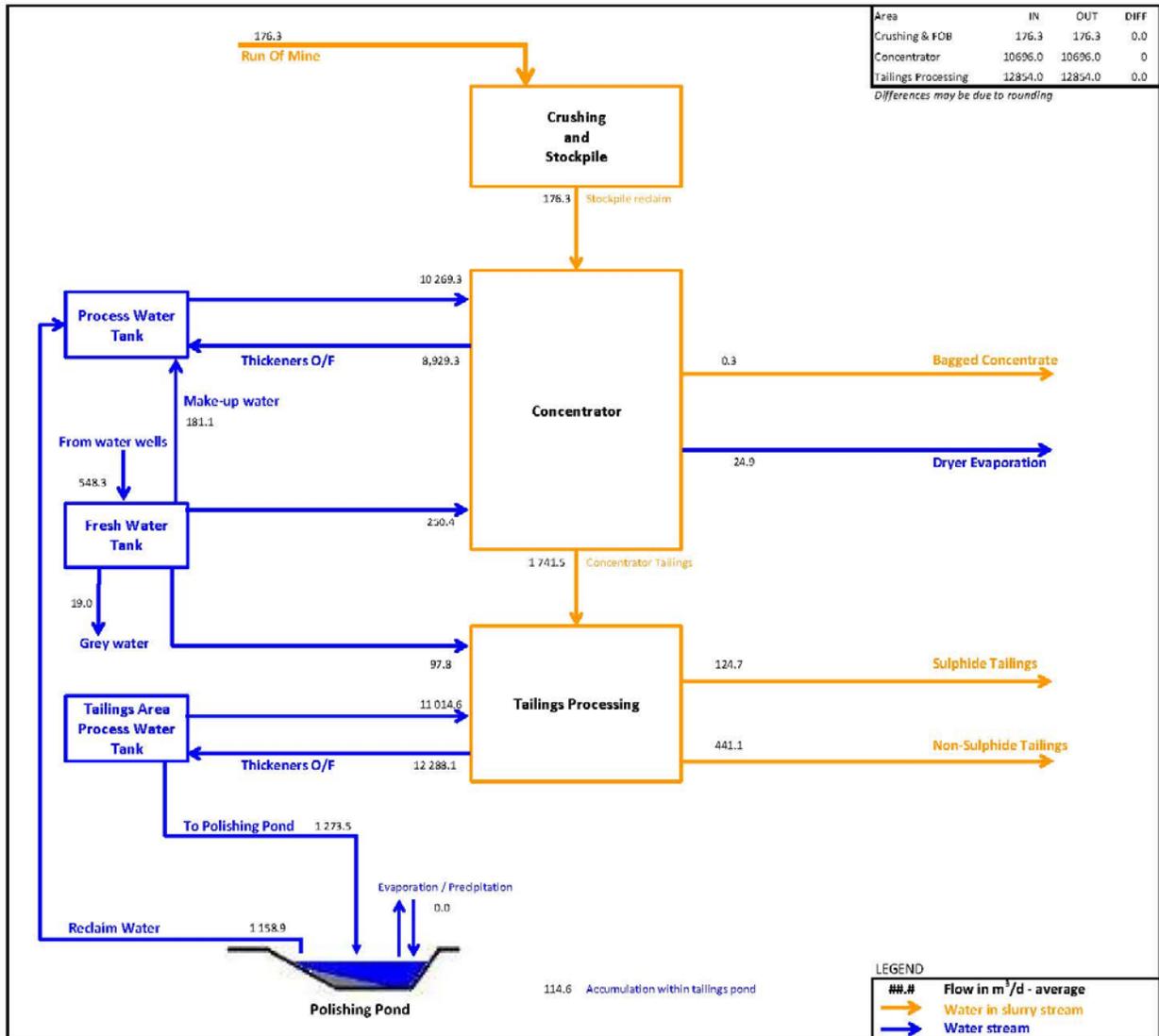
Figure 17.1 below shows a more detailed water balance. The polishing pond is not considered part of the processing facility water system and is only added for illustrative purposes.

Fresh water requirement is 548 m<sup>3</sup>/d.

**Table 17.2 – Matawinie Concentrator Summarised Process Mass Balance**

Mass Entering System				Mass Exiting System			
Streams	Dry Solids (t/d)	Water (m <sup>3</sup> /d)	Total Mass (t/d)	Streams	Dry Solids (t/d)	Water (m <sup>3</sup> /d)	Total Mass (t/d)
Graphite Ore to Concentrator	3,348.8	176.2	3,525	Water evaporation from dryer	—	24.9	24.9
Fresh Water from Wells	—	548.3	548	Grey water	—	19.0	19.0
Reclaim Water from Polishing Pond	—	1,158.9	1,159	To polishing pond	—	1,273.5	1,274
				Final concentrate	142.4	0.3	142
				Sulphide filter cake	706.9	124.7	832
				Non-sulphide tailings filter cake	2,499.4	441,1	2,940
Total Entering	3,349	1,883	5,232	Total Exiting	3,348	1,884	5,232

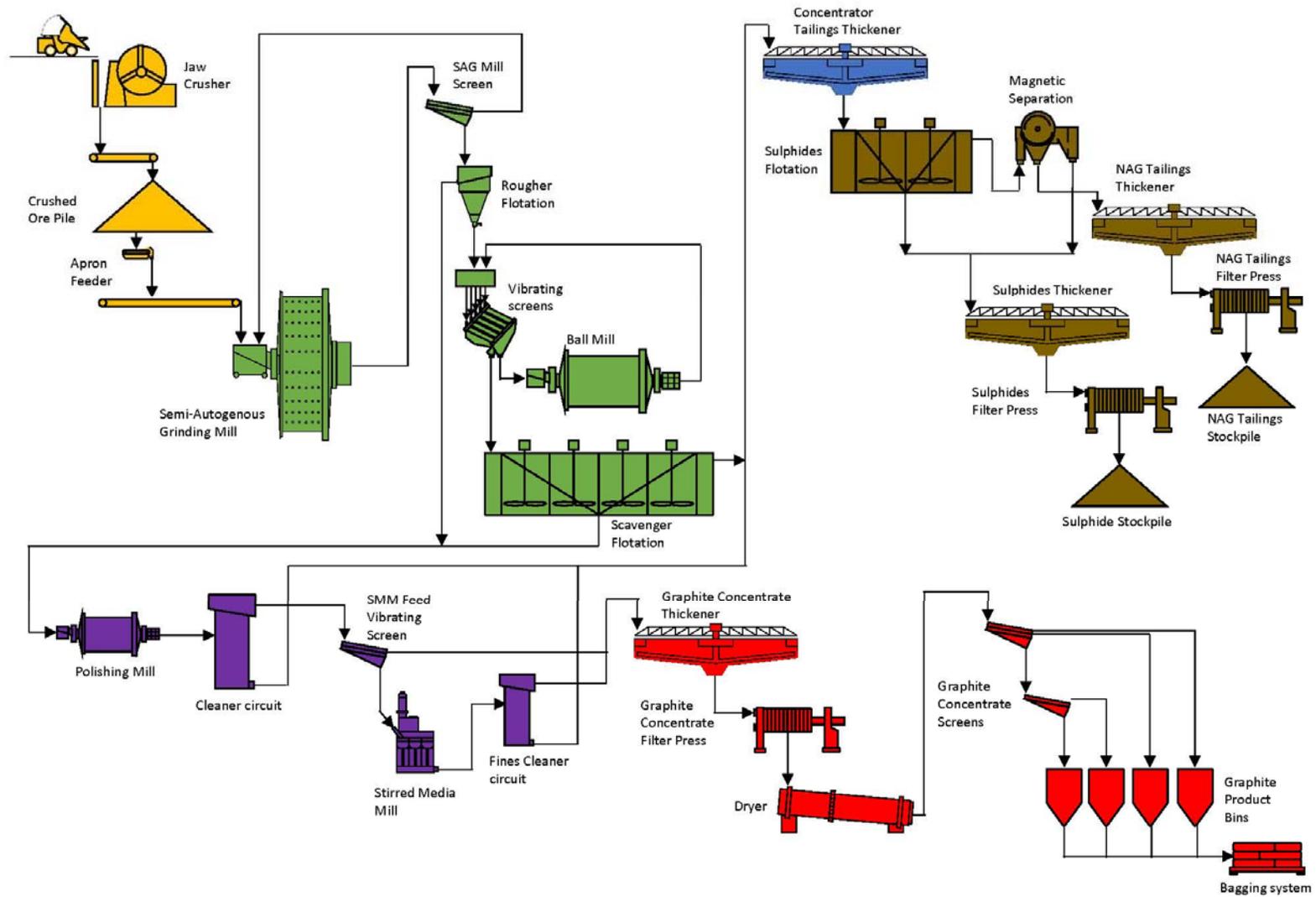
Figure 17.1 – Water Balance



17.1.3 Flow Sheets and Process Description

Figure 17.2 shows a simplified flow sheet indicative of the process. The concentrator has six (6) distinct areas: crushing, grinding and flotation, polishing, graphite concentrates dewatering and bagging, graphite tailings dewatering and tailings processing.

Figure 17.2 – Simplified Flow Sheet



The crushing facility will operate independent from the rest of the concentrator, using a stockpile to decouple its operations from the rest of the plant. The graphite concentrate dewatering area covers thickening, filtration and drying, while the bagging area consists of final product screening and bagging. The tailings dewatering area, located in the main concentrator building, consists of a single thickener to remove and recycle water from the concentrator tailings prior to processing at the tailings processing facility.

The simplified flow sheet presented below is very general. The following Sections describe each area in more detail.

#### 17.1.4 Crushing

The crushing plant is fed from the run-of-mine stockpile. The run of mine stockpile has a storage capacity of three (3) days and contains material containing 4.39 % C(t) and 5 % moisture. Run of mine ore is dumped onto a grizzly by mine haul trucks. The ore falls through the grizzly into a hopper and then via a grizzly feeder into the jaw crusher. The jaw crusher breaks the ore and the broken material is transported via conveyors to a stockpile. The jaw crusher discharges rocks with a particle size distribution of 80 % less than ( $P_{80}$ ) 123 mm.

#### 17.1.5 Primary Grinding and Rougher Flotation

Crushed ore is withdrawn from the 10,920 tonnes stockpile using three (3) apron feeders. The apron feeders transfer the crushed ore via a conveyor to a SAG mill. The SAG mill is in closed circuit with a double deck vibrating screen. The SAG mill circuit aims to produce a product with a  $P_{80} = 0.81$  mm. The screen undersize is pumped to the rougher flotation circuit.

The rougher flotation circuit aims to remove large graphite flakes early in the process, such as to minimize flake degradation through processing. Fuel oil and MIBC are added to aid with the flotation process. There is no modifier required in the flotation process. The rougher flotation circuit consists of a single flotation cell which provides 5.5 minutes of retention time. The rougher graphite concentrate is expected to contain 76.7 % C(t). The rougher flotation tailings, with an expected 1.3 % C(t), are directed to the secondary grinding circuit.

#### 17.1.6 Second Grinding and Scavenger Flotation

The secondary grinding and scavenger flotation circuit consists of a ball mill and a scavenger flotation bank. The ball mill operates in closed circuit with a set of hydrocyclones to liberate finer graphite particles. The rougher flotation tailings are combined with the ball mill discharge and pumped to the ball mill hydrocyclones. The hydrocyclones underflow reports back to the ball mill while the overflow proceeds to

flotation. The hydrocyclones overflow is expected to have a particle size distribution of 80 % less than (P<sub>80</sub>) 0.211 mm.

The scavenger flotation circuit consists of four (4) mechanical cells and aims to float the remaining graphite. The four (4) cells will provide 2.5 minutes of retention time. Fuel oil and MIBC will be used to assist the flotation process.

The scavenger concentrate containing 40.5 % C(t) will be combined with the rougher concentrate and directed to the polishing circuit. The scavenger tails containing 0.07 % C(t) will be directed to the concentrator tailings thickener.

The combined concentrate from the rougher and scavenger circuits is expected to contain 62.9 % C(t) and achieve 97 % graphite recovery.

#### 17.1.7 Primary Cleaner Circuit

The cleaning of graphite concentrate is done in two (2) distinct phases. The first cleaning phase consists of polishing, column flotation and cleaning-scavenger flotation. The second cleaning phase consists of size classification. The coarse fraction is directed to final concentrate while the fines fraction is upgraded through polishing, column flotation and cleaner-scavenging.

The primary cleaning circuit aims to remove surface contaminants from graphite. The combined concentrate coming from the rougher and scavenger circuits is dewatered to control the density inside the polishing mill. The dewatering screen oversize, which is almost all graphite concentrate, goes to the polishing mill. The polishing mill which uses ceramic media, scrubs gangue minerals from the surface of the graphite flakes. The screen undersize and the polishing mill discharge are re-combined and pumped to primary cleaning column flotation.

The primary cleaning flotation column is expected to upgrade the rougher and scavenger graphite concentrate from 62.9 % C(t) to 95 % C(t). The column tailings are directed to a cleaner-scavenger step to recover any remaining graphite. The concentrate of the cleaner-scavenger step is pumped back to the primary cleaner column feed and the tailings report to the concentrator tailings thickener.

#### 17.1.8 Secondary Cleaner Circuit

The primary cleaner concentrate is dewatered using a set of hydrocyclones. The underflow from the hydrocyclones is then screened to separate coarse flakes. The screen oversize is > 0.18 mm and will be directed to final graphite concentrate.

The underflow from the vibrating screen is directed to the stirred media mill for a gentle scrub followed by column flotation. The fine cleaner column concentrate is above

97 % C(t) and is directed to the final graphite concentrate thickener. The tailings of the column are directed to the fines cleaner-scavenger. The concentrate from the cleaner-scavenger is pumped back to the fines cleaner column feed and the tailings report to the concentrator tailings thickener.

### 17.1.9 Graphite Dewatering

The coarse flakes concentrate and the fines cleaner column concentrate are thickened to 35 % solids in a high capacity thickener. The thickener underflow is pumped to a holding tank prior to being pumped to a pressure filter. The holding tank purpose is to de-couple the continuous operation of the thickener upstream from the batch nature of the pressure filter downstream.

The pressure filter consists of a vertical plate pressure filter and delivers a graphite product containing 15 % moisture. The filtered concentrate is dropped onto a conveyor and is transported via a hopper and screw conveyor to the dryer.

A natural gas rotary dryer will dry the graphite concentrate to 0.3 % moisture. Low moisture content is required to ensure product integrity and quality.

### 17.1.10 Graphite Dry Screening and Bagging

NMG aims to produce four (4) different size products (Table 17.3). After the dryer, dry graphite is pneumatically transported to a bulk graphite bin. From this bin, graphite is blown to eight (8) separate primary double deck sizing screens. The oversize product of the top deck is collected in the jumbo flake graphite bin while the oversize of the bottom screen reports to the coarse graphite bin. The undersize of the primary screens drops onto four (4) secondary single deck sizing screens. The oversize of the screen is collected in the intermediate graphite bin and the undersize reports to the fine graphite bin.

**Table 17.3 – Matawinie Graphite Concentrate Breakdown**

<b>Graphite Concentrate Size Fraction</b>	<b>Weight (%)</b>	<b>Annual Production (t)</b>
+ 48 mesh	16.5	8,602
- 48 + 80 mesh	31.6	16,424
- 80 + 100 mesh	11.6	6,049
- 100 mesh	40.2	20,925

Below each bin is an automated product sampler and pneumatic conveying system to transport the product to the semi-automatic bagging system. Each bag can contain up to

1,000 kg graphite. Small amounts of bags can be stored in the bagging facility. There will be a separate bag storage facility for excess production.

#### 17.1.11 Concentrator Tailings Dewatering

The concentrator tailings are treated in three (3) stages: primary dewatering, upgrading and dewatering/filtering. The first stage, primary dewatering, takes place in the main concentrator area and comprises thickening of the concentrator tailings. Upgrading is done in the tailings processing plant and consists of flotation and magnetic separation to produce two (2) tailings streams. Lastly, the two (2) tailings streams are thickened and filtered for stack deposition.

The combined tailings from the scavenger, primary cleaner scavenger and fines cleaner scavenger report to the concentrator tailings thickener. The aim is to maximize the recovery of process water in the main plant. This is important for two (2) reasons: a) to minimize the amount of water in the main plant exposed to xanthate and b) to reduce the volume of slurry/water to be pumped.

A high capacity thickener is used to thicken the combined tailings to 65 % solids. The thickener underflow is then pumped to the tailings processing plant while the overflow is pumped to the concentrator process water tank.

#### 17.1.12 Sulphide Upgrading

Sulphide upgrading takes place in two (2) phases: sulphide flotation and magnetic separation. The thickened tailings from the main concentrator report to the sulphide flotation circuit. The pulp density of the stream is adjusted for flotation using process water. Potassium Amyl Xanthate (“PAX”), Methyl Isobutyl Carbinol (“MIBC”) are used to produce a sulphide concentrate.

The tailings from flotation are directed to a low intensity magnetic separator (“LIMS”) to extract any remaining sulphides. The LIMS concentrate combines with the sulphide flotation concentrate and is directed to the sulphide thickener. The sulphides concentrate is expected to contain < 0.2 % C(t) and 20.3 % S. The LIMS tailings, containing < 0.05 % C(t) and < 0.1 % S, report to the non-sulphide tailings thickener.

#### 17.1.13 Tailings Dewatering

Tailings dewatering is comprised of two (2) parallel circuits: sulphides dewatering and non-sulphide tailings dewatering.

Sulphide concentrate is thickened to 65 % solids in a high capacity thickener. The thickener underflow is pumped to a holding tank and from there into a pressure filter to obtain a final product containing 15 % moisture. The filtered product is dropped onto a conveyor and is

transported to the sulphide stockpile. A truck is then used to transport the sulphide concentrate to the sulphides stack deposition site.

The non-sulphide tailings dewatering circuit consists of a high capacity thickener and two (2) parallel pressure filters. The thickener, containing 65 % solids, is pumped to a holding tank followed by a pressure filter. Given the high tonnages processed in this circuit, two (2) pressure filters are required. The material then drops onto a set of conveyors which transport the material to the non-sulphide tailings stockpile. A truck is then used to transport the non-sulphide tailings to its corresponding stack deposition site.

## 17.2 Matawinie Processing Plant – Equipment Sizing and Selection

The equipment selection was based on the fulfillment of the design criteria. The equipment list was prepared and the equipment was sized based on the design criteria developed, flow sheet drawings and the mass balance.

Design factors used where: 0 % for comminution equipment, 20 % for most processing equipment and 5 % for slurry pumps.

### 17.2.1 Primary Crushing

Crushing takes place in a separate building. The primary crusher is a jaw crusher as it is the most cost effective choice for the throughput required.

Run of mine ore is hauled from the open pit mine. The ore comes from mine haul trucks and is dump directly or introduced by wheeled loader from the emergency stockpile into the crusher hopper. A grizzly feeder meters the ore in a 1,250 mm × 950 mm – 150 kW jaw crusher. The crushed product has a particle size distribution of 80 % less than (P<sub>80</sub>) 123 mm. A conveyor transports the crushed ore to the process plant stockpile.

### 17.2.2 Primary Grinding and Rougher Flotation

The crushed product is placed in a stockpile with a maximum storage capacity for three (3) days. Ore is withdrawn from the bottom of the stockpile using a maximum of three (3) apron feeders with variable speed drives. Each feeder has the capacity to provide the SAG mill with 100 % throughput rate.

The SAG mill is 6.0 m in diameter by 2.6 m long with 1,336 kW variable speed motor. The SAG mill operates in closed circuit with one (1) double deck vibrating screen with top deck screen panel apertures of 8.0 mm and bottom deck screen panel apertures of 2.0 mm. The top deck protects the bottom deck from pebble damage. Both top deck and bottom deck oversize are returned to the SAG mill for more comminution. The screen undersize has a P<sub>80</sub> of 0.81 mm and is pumped to rougher flotation. The rougher flotation circuit is composed of a single mechanical cell with a volume of 34 m<sup>3</sup>.

The SAG mill, vibrating screen and rougher flotation circuit design are based on test work and MC-DRA experience. The variable speed motor and automatic ball addition for the SAG mill should create excellent size reduction control.

### 17.2.3 Secondary Grinding and Scavenger Flotation

The secondary grinding circuit consists of a ball mill in closed circuit with a hydrocyclone pack. The ball mill is 3.7 m in diameter by 7.5 m long with 1,350 kW variable speed motor. The hydrocyclone pack comprises eight (8) 20-inch cyclones. The cyclone overflow with a P<sub>80</sub> of 0.21 mm is pumped to the scavenger flotation circuit while the underflow is directed back to the ball mill for further grinding. The scavenger flotation circuit is composed of four (4) mechanical flotation cells.

The ball mill, vibrating screen and scavenger flotation circuit design are based on test work and MC-DRA experience. The variable speed motor for the ball mill, should control the size reduction and mechanical flotation cells are selected to minimize the risk of sanding.

### 17.2.4 Primary Cleaning Circuit

The primary cleaning circuit consists of one (1) dewatering screen, one (1) polishing mill, one (1) flotation column and two (2) mechanical cleaner scavenger flotation cells.

The combined rougher and scavenger flotation concentrates are dewatered using a dewatering screen with a 300-micron aperture to produce an oversize containing 68 % solids.

A polishing mill is used to scrub the graphite flakes and loosen gangue minerals from the graphite surface without reducing flake size. The polishing mill is 2.7 m in diameter by 4.1 m long, equipped with a 186-kW motor. The polishing mill discharge is re-combined with the dewatering screen undersize and pumped to the cleaner flotation column.

The cleaner flotation column is 2.5 m in diameter by 8.0 m high and is aerated using spargers. The column concentrate goes to the secondary cleaning circuit. The column tailings are pumped to two (2) mechanical cleaner scavenger cells with a volume of 2.8 m<sup>3</sup> each.

The dewatering screen, polishing mill, primary column flotation and cleaner scavenger flotation circuit designs are based on test work, supplier input and MC-DRA experience. Column flotation using spargers should reduce graphite flake degradation as compared to mechanical cells or cavitation column. Mechanical cells are used as scavenger cells only.

### 17.2.5 Secondary Cleaning Circuit

The secondary cleaning circuit consists of two (2) hydrocyclones, one (1) vibrating screen, one (1) stirred media mill, one (1) flotation column for fines flotation and two (2) mechanical cleaner scavenger flotation cells for fines flotation.

Concentrate coming from the primary cleaner flotation column is dewatered using hydrocyclones to produce a slurry containing 65 % solids (by weight). The hydrocyclones underflow flows to a five (5) set stack-sizer vibrating screen with 0.18 mm screen panel openings. The screen oversize reports to the graphite concentrate thickener while the screen undersize is fed to the stirred media mill for fines polishing.

The stirred media mill is a vertical stirred media mill equipped with a 185-kW motor. This mill polishes the small graphite flakes gently to maintain flake integrity. The stirred media mill discharge is combined with the hydrocyclones overflow and pumped to the fines cleaner column.

The fines cleaner column is 1.8 m in diameter by 8.0 m high and is aerated using spargers. The column concentrate goes to final graphite concentrate while the tailings are pumped to two (2) mechanical fines cleaner scavenger cells with a volume of 2.8 m<sup>3</sup> each.

The hydrocyclones, vibrating screen, stirred media mill, fines column flotation and fines cleaner scavenger flotation circuit designs are based on test work, supplier input and MC-DRA experience. The design aims to minimize graphite degradation while improving the graphite grade.

### 17.2.6 Graphite Concentrate Dewatering

The dewatering circuit consist of one (1) high rate concentrate thickener, one (1) pressure filter and one (1) dryer.

The combined graphite concentrate is pumped to the 7.0 m diameter concentrate thickener. The thickener overflow is pumped to the process water tank for recirculation of process water while the concentrate thickener underflow, at 35 % solids, is pumped to the graphite concentrate holding tank. This tank is 2.85 m diameter × 3.0 m high and has an 18.6 kW agitator to keep solids in suspension.

From the holding tank, the concentrate is pumped to the graphite concentrate pressure filter. The pressure filter will have a total filter area of 57 m<sup>2</sup>. The filtrate is re-circulated to the graphite concentrate thickener by a filtrate pump. The filter cake at 15 % moisture is conveyed to a dryer hopper.

The dryer hopper evenly distributes the filtered graphite into the dryer. The dryer is a natural gas rotary dryer 1.5 m in diameter × 10.7 m long with a natural gas burner with a

capacity of 7.9 GJ per hour. The dryer is complete with bag house and exhaust fan. The dried product is pumped using pneumatic conveyance to a bulk graphite holding bin.

The concentrate thickener, pressure filter and dryer circuits designs are based on test work, supplier input and MC-DRA experience.

#### 17.2.7 Graphite Dry Screening and Bagging

From the bulk graphite holding bin, the dried concentrate is pneumatically transported to a distributor that splits the concentrate into eight (8) streams. Each stream feeds a double deck screen. The top deck has openings of 0.30 mm and the bottom one has openings of 0.18 mm. The oversize of the top deck and that of the bottom deck are pneumatically transported to the jumbo flake graphite bin and the coarse graphite bin, respectively.

The underflow of the double deck screens drops by gravity onto a set of single deck screens. The underflow of two (2) double deck screens is combined to feed one (1) single deck screen, for a total of four (4) single deck screens. The fines screen has openings of 0.15 mm. The oversize and undersize of the screens are pneumatically transported to the intermediate graphite bin and the fine graphite bin, respectively.

If different graphite product sizes are required, screen panels can be changed in a very short time.

The bagging system is a semi-automatic system with an automatic sampling system for quality control. The actual super sack filling is automated; the super sack positioning is manually accomplished. The filled bags must be removed manually.

The graphite concentrate dry screening and bagging circuit designs are based on test work, supplier input and MC-DRA experience.

#### 17.2.8 Concentrator Tailings Dewatering

The tailings from the scavenger, cleaner scavenger and fines cleaner scavenger circuits are fed to the concentrator tailings thickener. This is a high rate thickener with a 25-m diameter and sits outside the main processing building. The thickener overflow is pumped to the process water tank for recirculation of process water. The thickener underflow, at 65 % solids, is pumped to the concentrator holding tank and from there it is pumped to the tailings processing facility.

The concentrator tailings thickener design is based on test work, supplier input and MC-DRA experience.

### 17.2.9 Sulphide Upgrading

The sulphide upgrading circuit consists of two (2) mechanical sulphide flotation cells and one (1) LIMS.

The thickened tailings from the concentrator are pumped to the sulphide flotation circuit. This circuit is composed of two (2) mechanical flotation cells with a volume of 100 m<sup>3</sup> each. The sulphide flotation tailings are directed to the LIMS while the concentrate reports to the sulphide thickener.

The sulphide flotation and LIMS circuit designs are based on test work, supplier input and MC-DRA experience.

### 17.2.10 Tailings Dewatering

The tailings dewatering circuit is composed of one (1) sulphide thickener, one (1) sulphide pressure filter, one (1) non-acid generating tailings thickener and two (2) non-acid generating pressure filters.

The combined concentrate from the sulphide flotation and the low intensity magnetic separation circuits is pumped to a 10 m diameter high rate thickener. The thickener overflow is pumped to the tailings area process water tank for recirculation of process water. The thickener underflow, at 65 % solids, is pumped to the sulphide holding tank. This tank is 2.85 m diameter × 3.00 m high and has an 18.6-kW agitator to keep solids in suspension.

From the holding tank, the sulphide concentrate is pumped to the sulphide pressure filter. The pressure filter will have a total filter area of 200 m<sup>2</sup>. The filtrate is re-circulated to the sulphide thickener by a filtrate pump. The filter cake at 15 % moisture is conveyed to the sulphide stockpile.

The tailings from the LIMS are pumped to an 18 m diameter high rate thickener. The thickener overflow is pumped to the tailings area process water tank for recirculation of process water. The thickener underflow, at 65 % solids, is pumped to the non-sulphide tailings holding tank. This tank is 2.85 m diameter × 3.00 m high and has an 18.6-kW agitator to keep solids in suspension.

From the holding tank the non-sulphide tailings are pumped to a pressure filter. The pressure filter will have a total filter area of 400 m<sup>2</sup>. The filtrate is re-circulated to the non-sulphide tailings thickener by a filtrate pump. The filter cake at 15 % moisture is conveyed via two (2) conveyors to the non-sulphide tailings stockpile.

### 17.2.11 Reagents

a) Fuel Oil

Fuel Oil # two (2) (diesel) is used as collector for graphite flotation. The fuel oil will be delivered by the mine fuel truck on request from the mill and stored in a 4.0 m<sup>3</sup> double walled tank. The expected fuel oil usage is 423 litres per day.

b) Methyl Isobutyl Carbinol

MIBC is used as frother for graphite flotation. MIBC will be delivered by tanker truck, which will transfer its contents into the storage tanks at the concentrator and the tailings processing facility. Each storage tank has a capacity of 40 m<sup>3</sup>. MIBC will be transferred from the storage tank to a one (1) m<sup>3</sup> holding tank within each facility for distribution in the process. The bulk shipment of MIBC will remove possible container disposal issues. The expected MIBC consumption is 580 litres per day.

c) Flocculant

Flocculant is used in the all four (4) thickener to aid the settling of graphite concentrate and tailings. Given the location of the thickeners, two (2) separate flocculant mixing systems are required, one (1) for the main processing plant and one (1) for the tailings processing area.

The flocculant requirements at each location are small and therefore 25 kg bags and a small mixing systems have been selected. The total expected flocculant consumption is 131 kg per day.

d) Potassium Amyl Xanthate

PAX is used as collector for sulphide flotation. PAX is a very strong non-selective sulphide collector. It will be delivered in bulk bags and stored on pallets at the tailings processing plant. The PAX mixing system design is based on the bulk bag size. The total expected PAX consumption is 64 kg per day.

e) Lime

Lime will be available to the environmental group in case it is required for increasing the tailings pond alkalinity. The anticipated lime usage is 270 kg per day.

### 17.3 Matawinie Processing Plant - Utilities

#### 17.3.1 Concentrator Water Services

The water consumption is based on concentrator plant nominal water consumption per hour.

a) Fresh Water

The main fresh water source for the Matawinie concentrator will be underground water wells. Fresh water will be pumped to a 9.5 m diameter × 11.7 m high fresh water/fire water tank at a nominal flow rate of 24.8 m<sup>3</sup>/h for an operating percentage of 92 %. Potable water will be used for: process, gland water, potable water, and tailings processing. Table 17.4 summarizes the distribution of fresh water.

**Table 17.4 – Fresh Water Breakdown**

	<b>Consumption (m<sup>3</sup>/h)</b>
Process Water Tank	8.2
Gland Water Tank	11.3
Potable Water Treatment System	0.9
Tailings Processing	4.4

b) Gland Water

The gland water system has a separate 2.5 m diameter × 3.0 m high gland water tank. The source is fresh water with a flow rate of 11.3 m<sup>3</sup>/h.

c) Process Water

Reclaim Water is recycled back, at a nominal rate of 52.5 m<sup>3</sup>/h, from the polishing pond. The remainder of the water, 456.9 m<sup>3</sup>/h comes from overflow of the concentrate and concentrator tailings thickener. The process water tank will be 8.3 m diameter × 11.1 m high with a capacity of 555 m<sup>3</sup>.

d) Fire Water

Fire water comes from the fresh water system, under normal circumstances the flow rate is 0. However, the system can pump water up to 325 m<sup>3</sup>/h.

### 17.3.2 Tailings Processing Facility Water Services

a) Fresh Water

Fresh water in the tailings processing area will be supplied from the concentrator fresh/fire water tank and stored in the 6.5 m diameter × 8.7 m high fresh/fire water tank. Potable water will be used for gland water at a rate of 4.4 m<sup>3</sup>/h.

b) Process Water

Overflow water from the sulphide and non-sulphide tailings thickeners will be pumped to the tailings area process water tank at a rate of 556.5 m<sup>3</sup>/h. The process water tank will be 8.5 m diameter × 12.5 m high with a capacity of 664 m<sup>3</sup>.

### 17.3.3 Concentrator Pressurized Air

a) High Pressure Air

The concentrator will have three (3) sets of high pressure air compressors. Set #1 has two (2) compressors and it is designed for instrument air and plant air. In addition, it includes an air dryer and separate instrumentation air receiver.

Set #2 consists of one (1) air compressor dedicated to the flotation columns.

Set #3 consists of one (1) air compressor dedicated to the pressure filter.

b) Low Pressure Air

The concentrator will have two (2) air blowers for the mechanical flotation cells.

### 17.3.4 Tailings Processing Pressurized Air

a) High Pressure Air

The tailings facility will have two (2) compressors to supply air for instrumentation air and filtration air. The instrument air system includes an air dryer and separate instrumentation air receiver.

b) Low Pressure Air

The tailings facility will have one (1) air blower for the mechanical flotation cells.

## 18.0 PROJECT INFRASTRUCTURE

This Section describes infrastructure, buildings, and other facilities such as access road and power line, that are required to complement the processing of graphite ore.

All topographic information for locating the infrastructure was based on a LiDAR topographic map survey data that was made available by NMG for the PFS.

No geotechnical investigations were conducted for surface infrastructure including the plant concentrator and the tailings pile. Additional geotechnical investigations will need to be performed at a later stage prior to detailed engineering to confirm civil design criteria related to the foundation requirements of mills, process plant and other infrastructure such as the administration offices and electrical substation.

An overall general site layout and access is shown on Figure 18.1 below. Figure 18.2 and Figure 18.3 show the concentrator processing plant and the tailings plant more precisely.

The Project infrastructure includes the 34.5 kV electrical power line, the main access road and site roads, general site works, site electrical distribution and communication, site fire protection, fresh water, potable water and sewage treatment, auxiliary buildings, fuel storage, tailings and water management facilities.

### 18.1 Power Line

The considered premise was that the electrical power will be supplied by Hydro-Québec through a new 34.5 kV distribution line from Hydro-Québec nearest post (*Poste Prevost*) to the mine substation.

Figure 18.1 – Overall General Site Layout and Access

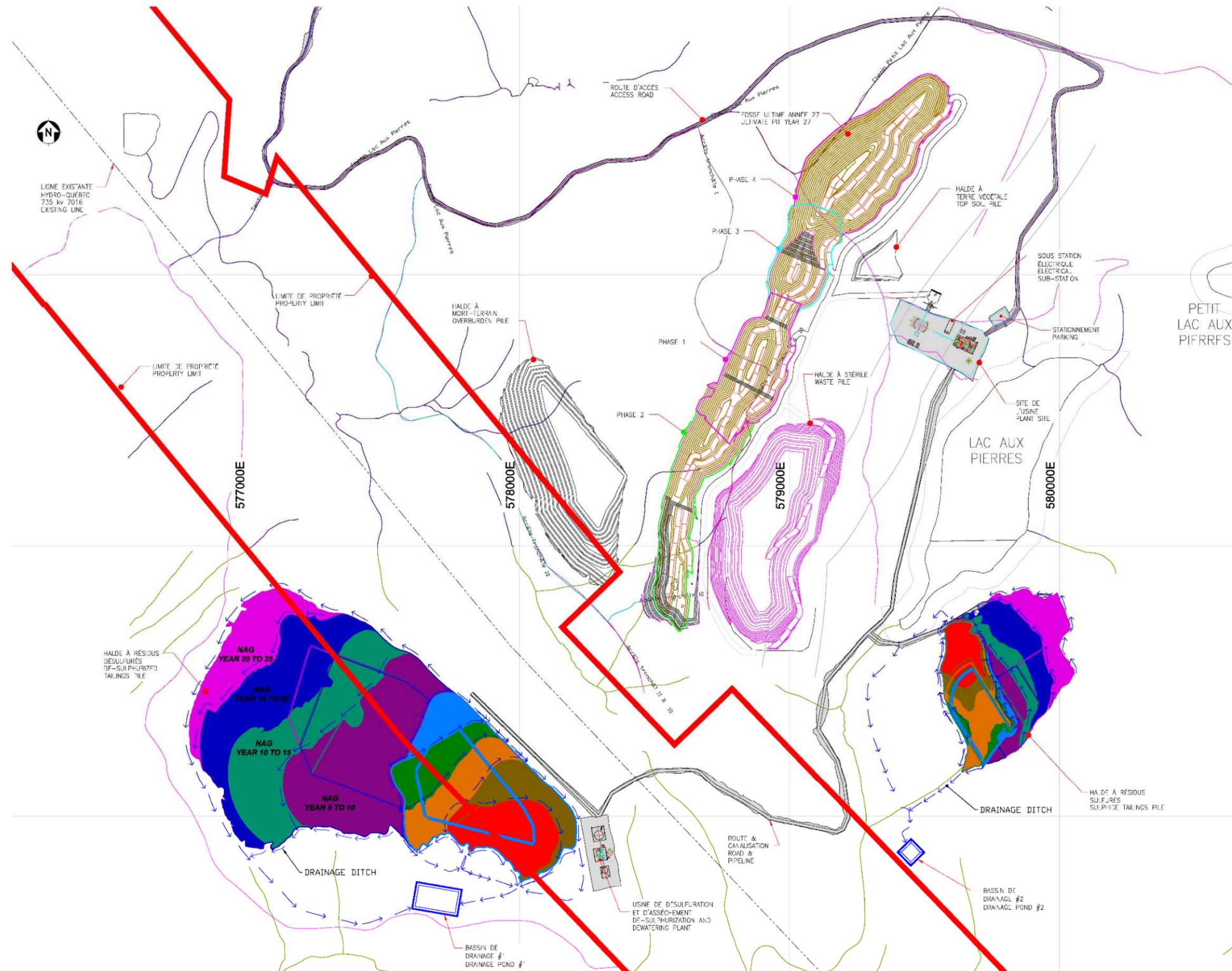
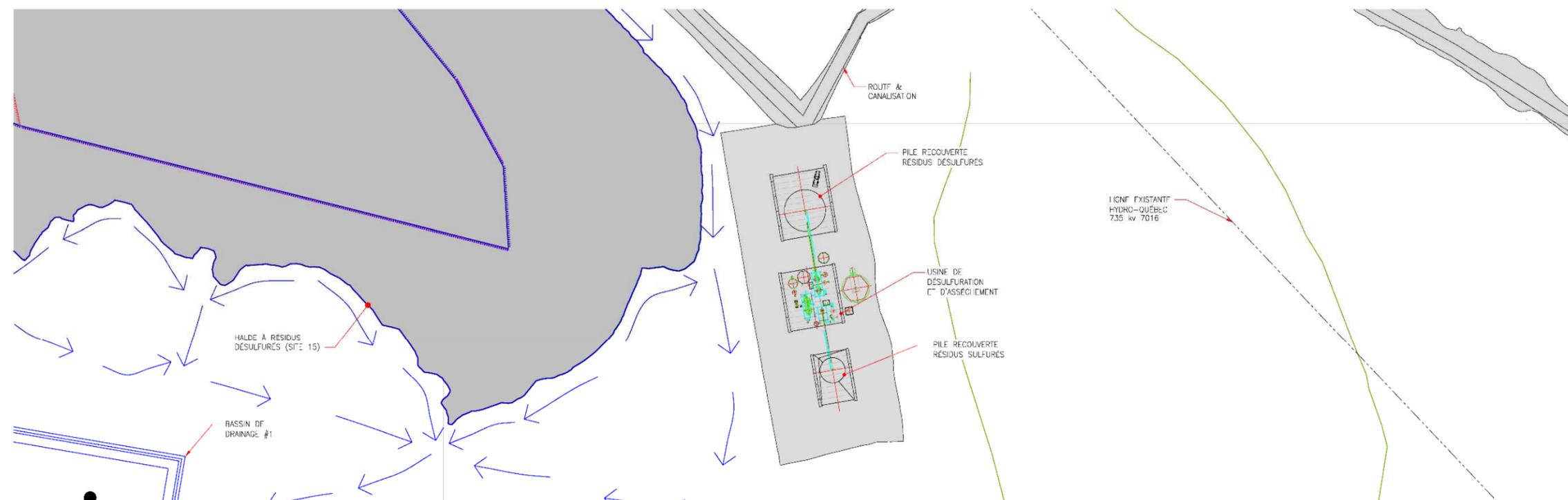


Figure 18.2 – Processing Plant



Figure 18.3 – Tailings Plant



## 18.2 Main Access Road and Site Roads

### 18.2.1 Main Access Road

The design of the main access road considers a Class 1 road as per the *Ministère des Ressources Naturelles du Québec* classification. A trade-off study was conducted identifying three (3) possible options for the main access road.

The retained main access road commences at the existing *Chemin Matawin Est* and generally follows the existing trails from *Chemin Matawin Est* to the Project site. There are slight deviations to suit the maximum gradient of eight (8) % and to avoid creeks and rivers.

The main access road work is estimated to be 8.3 km long from *Pit à Midas* to the main gate. A parking lot for workers and visitors is located outside the main property with access through the gatehouse and security.

### 18.2.2 Service Roads

Service roads cover access from the main gate to the process areas, the raw material stockpile, the crusher area, and the tailings areas. Roads servicing the explosives plant, the mine warehouse and garage are provided by the mine contractor and included in the cost per tonne for the mining operation.

The service road to the tailings areas will be 18 m wide to support the use of 64-tonne trucks (3 times operating width) moving the dry tailings material from the tailings plant to the de-sulphurized (“**NAG**”) and sulphide (“**PAG**”) tailings piles. The tailings discharge pipe, and the water reclaim pipe will run above ground side by side from the tailings pumps at the concentrator to the tailings plant and from the reclaim water system to the concentrator.

- Process facilities to tailings plant: 18 m width x 2,800 m length;
- Tailings plant to de-sulphurized tailings piles: 18 m width x 700 m length;
- Tailings plant to sulphurized tailings piles: 18 m width x 1,060 m length.

All other service roads will be eight (8) m wide, unless otherwise specified.

## 18.3 Water Management

The water required for the concentrator process will be recirculated from the site collection pond and the Tailings Management Facilities (“**TMF**”). Limited fresh water make-up (367 m<sup>3</sup>/day) will be required for the plant gland seal water system, the potable water system

and to fill the fire protection water tank at the beginning of operation. The fresh water intake is from two (2) deep wells located in a separate building adjacent to the concentrator.

A ditch system will limit precipitation run-off accumulating in the open pit and will drain surface water towards the site collection pond located East of the pit. Similarly, the precipitation run-off water around plant site will collect to the site collector pond. Precipitation and groundwater collected in the in-pit sump will be pumped to the surface to the same site collection pond. All site collection pond water will be recycled to the plant.

The NAG stockpile surface drainage will collect in drainage pond #1. Most of the water from this pond will be recycled to the plant. Excess water not required for the plant will overflow to a polishing pond to further settle sediments before being directed to the *Ruisseau à l'eau morte* watershed. This water will meet the criteria of the Directive 019.

The PAG stockpile surface drainage will collect in drainage pond #2. All water from this pond will be recycled to the plant.

The reclaim water system is composed of a floating pumping systems that will be located in the ponds.

#### 18.4 Camp Site Accommodations

Considering the close proximity of the town of Saint-Michel-des-Saints and the surrounding area, and the expected labour workforce, no permanent camp has been provided for the Project. It is expected the nearby towns will provide some of the work force and all of the housing to the employees.

#### 18.5 Site Buildings

##### 18.5.1 Processing Plant Area

The processing plant area is located East of the open-pit. The site is approximately 150 m by 400 m and slightly sloping towards South. The access road reaches the site from the North-West and the service road towards the TMF exits from the South-East.

##### 18.5.2 Crusher Building

The crusher building is a conventional type insulated building. The crusher building houses the feeder, jaw crusher, conveyors, dust collector, etc.

The rock breaker and hopper are enclosed in a shelter close to the crusher building.

The dimensions of the crusher building are 12 m wide by 24 m long and 18 m high.

### 18.5.3 Crushed Ore Storage Dome

The crushed ore from the crusher building will be stored in Norseman type dome or approved equivalent. The stockpile height at full capacity will be 15.7 m. The dome dimensions are 42.6 m span by 67.1 m long. The dome will be installed on two (2) rows of containers to reach the desired height.

The storage area will be on a concrete slab on grade to prevent spillage. Allowance is made for a loader to assist feeding the apron feeders when the stockpile volume is low. The crushed ore will be reclaimed via three (3) apron feeders located under the pile in a concrete reclaim tunnel. The inside dimensions of the concrete tunnel are 7.0 m wide by 34.3 m long by 6.7 m high.

The transition from concrete tunnel to grade are AIL type corrugated multiplates, one (1) for the SAG mill feed conveyor and one (1) as an emergency exit.

### 18.5.4 Concentrator Building

The concentrator building is a conventional ore processing type insulated building. Figure 18.4 shows the main process equipment inside the concentrator building. The concentrator building houses and the grinding area on the West side of the building. The flotation area and regrind area are located in the center of the plant. The graphite concentrate thickening and filtering area is located to the east-center of the building. The concentrate dryer and the bagging system will be located in the east side of the building. The load out section of the building is located on the North East corner.

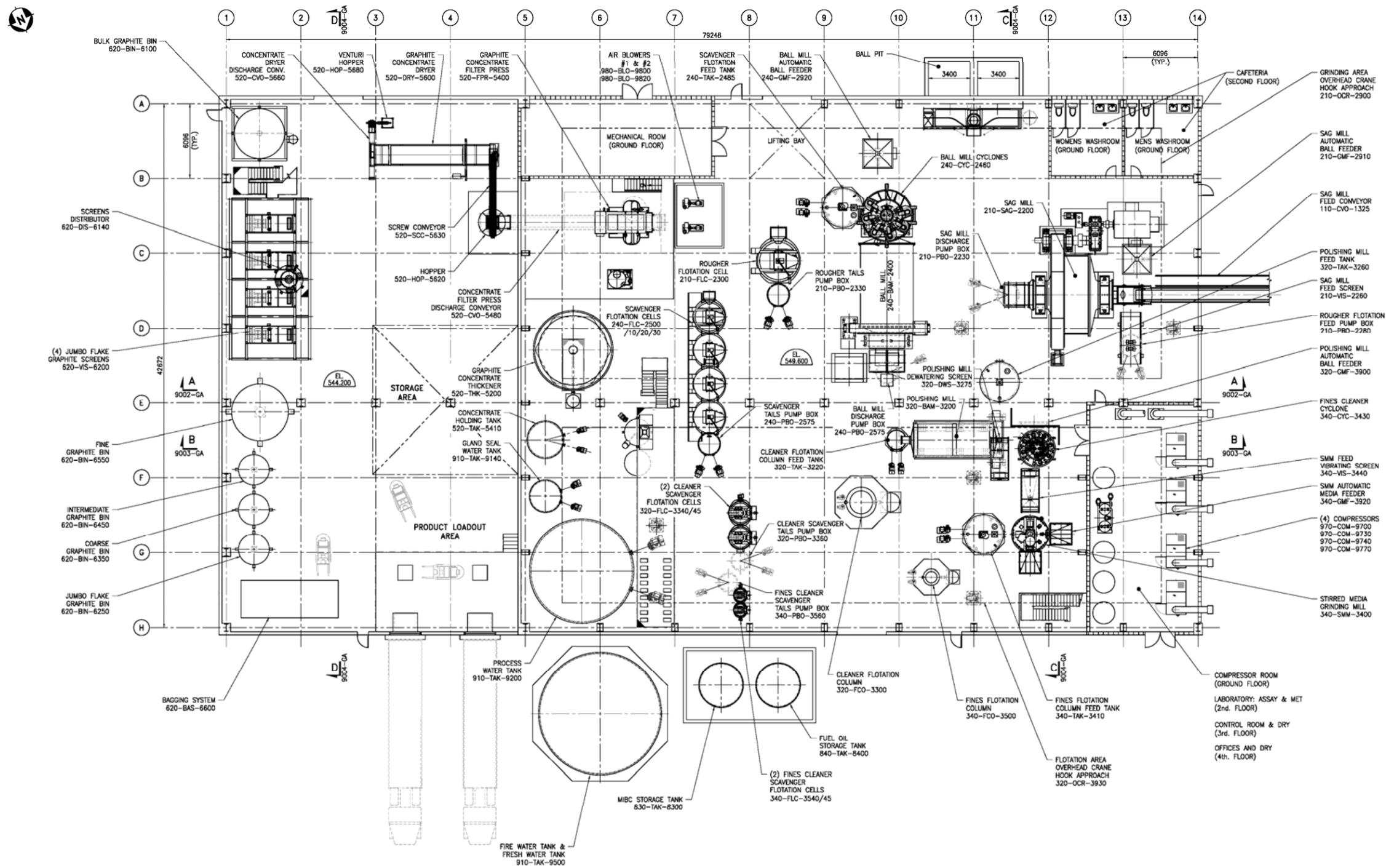
Provisions were made in the design to isolate the dried graphite concentrate area in order to ensure effective graphite dust control and venting.

Two (2) electrical rooms are provided in the design and are located in containers adjacent to the concentrator. Mechanical and electrical maintenance shops are located on the ground floor in the filter press area.

The employee's changing room and cafeteria are located on the third and fourth floors of the building above the compressor room. Offices are located on the fourth floor.

The size of the concentrator building is determined to be 80 m × 43 m and will be 28 m high.

Figure 18.4 – Concentrator Plant – First Floor and Operating Floors



#### 18.5.5 Office Complex

Provision has been made for administration offices on the fourth floor of the concentrator building. Provision has also been made for a first aid station as well as a conference room and a lunchroom for employees. The senior management staff will have offices located in Saint-Michel-des-Saints.

#### 18.5.6 Mine Equipment Maintenance Building

The mining contractor whom will be responsible to provide ore to the crusher will also provide for the mine equipment maintenance building. Facilities provided consist typically of a light structure building that will provide maintenance bays to accommodate the largest mining equipment. One maintenance bay is also provided as a wash bay as well as a space for the compressor room and the workshop area. The wash bay will be equipped with a pressure washing system and an oil/water separator.

#### 18.5.7 Product Warehousing

Storage space is allocated for the drying/bagging area of the plant to store 1-tonne bags.

#### 18.5.8 Cold Warehouse

The cold warehouse will be located near the crushed ore storage dome inside containers. The containers will be modified to include access doors, shelving, and lighting to maintain an inventory for maintenance and repairs of the equipment.

#### 18.5.9 Mine Dry – Change House

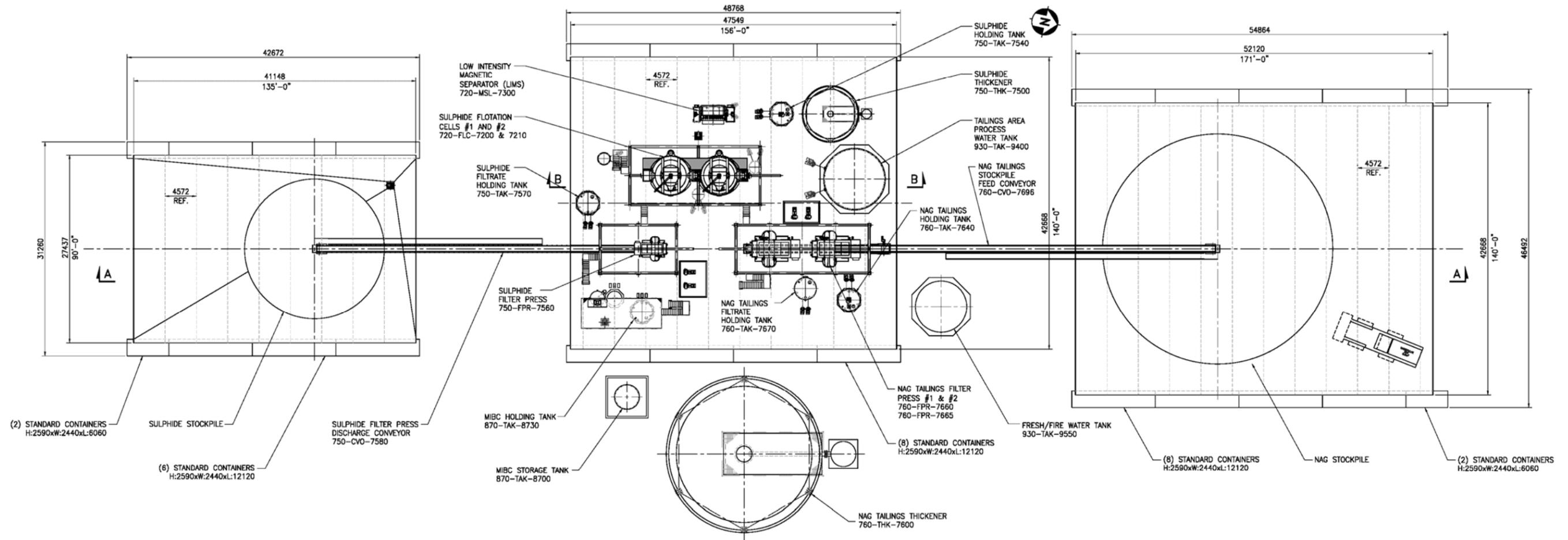
Provision for a change house area is provided on the third and fourth floors of the concentrator above the compressor room and laboratory. It has a floor space of 216 m<sup>2</sup> and includes showers and changing rooms, which will be ventilated. It will be able to accommodate the employees of the concentrator up to a total of 64 persons. A direct access to the lunch room is provided and located on the same floor.

#### 18.5.10 Tailings Plant Domes

The tailings plant is located South of the process plant close to the tailings piles. The tailings plant consists of three (3) Norseman type or approved equivalent domes. The Figure 18.5 shows the tailings plant layout.

- A 27.5 m span by 42.7 m long dome is used for the sulphide stockpile;
- A 42.7 m span by 48.8 m long dome is used for the process equipment such as, flotation equipment, magnetic separator, tank, conveyor, filter presses etc.;

Figure 18.5 – Tailings Plant Layout



- A 46.5 m span by 54.9 m long dome is used for the de-sulphurized stockpile.

Both the sulphide and de-sulphurized stockpile domes allow for material to be reclaimed by loader and truck.

All domes are installed on one (1) row of containers. The containers will also serve as office space, storage and shops.

## 18.6 Site Services

### 18.6.1 Potable Water Treatment

Provision is made for a potable water treatment system based on ultra-filtration membrane, to provide service water for the employees.

### 18.6.2 Sanitary Waste Water Treatment

One (1) sanitary waste water treatment system will be provided for the concentrator, it is designed for a maximum of about 100 people. No other sanitary waste water treatment system is required for the site.

Provisions are made for a modular-type sanitary waste water treatment unit using a Rotating Biological Contactor (“**RBC**”) type process. Sanitary and shower waste water are collected via underground piping and discharged into these modularized sanitary waste water treatment units. Sludge will need to be removed about twice a year by a local contractor.

At the tailings plant, portable toilets will be installed close to the center dome.

### 18.6.3 Fuel Storage and Fueling Station

The mining equipment will be fed diesel directly from supply vehicles which will arrive on site from the town of Saint-Michel-des-Saints. There will be no storage of diesel fuel for the mining equipment on site. The diesel required for the process plant will be delivered to the day tanks in the same fashion.

### 18.6.4 Site Fire Protection

A fire protection loop is planned around the process facilities area to distribute fire protection water to different buildings located within the site pad area. It is assumed that the process facilities will be equipped with sprinkler systems where and as required. One (1) electric fire protection pump, one (1) diesel fire pump, and one (1) jockey pump are included.

## 18.7 Electrical and Communications

### 18.7.1 Site Load

The total power demand is estimated at 9.4 MW with 7 MW for the concentrator process. The remaining power is required to service the following: offices, mechanical shop, laboratory, electric rooms, cold warehouse, guard house, heating of the concentrator as well as losses in transformers and feeders. The process power demand was estimated based on data from the mechanical equipment list prepared for the Project. A breakdown by area is presented below in Table 18.1.

**Table 18.1 – Project Power Requirements**

<b>Process Area</b>	<b>Description</b>	<b>Power Demand Requirements (kW)</b>
1100	Crushing and Crushed Ore Storage	274
1200	Grinding and Coarse Flotation	3,175
1300	Polishing Area	535
1400	Graphite Tailings Dewatering	221
1500	Graphite Concentrate Dewatering	213
1600	Dry Screening	736
1700	Tailings	863
1800	Reagents Preparation	27
1900	Concentrator Utilities	935
	<b>Total Process</b>	<b>6,978</b>
	Process Plant – Services, HVAC, Lighting (Crusher, ER-s, Mechanical Shop, Laboratory, Offices)	2,202
	General Services	23
	Losses in Transformers, etc	184
<b>Total General Process and Services</b>		<b>9,387</b>

The mine site does not require electrical power since all the mining equipment (shovels, drills, pumps) will be diesel operated.

The electrical installation for the entire plant (process and services) is presented on the single line diagrams that were prepared for the Project.

The plant will be supplied by a 34.5 kV/4.16 kV main substation installed North of the concentrator. The step-down transformer (ONAN, 12 MVA) is sized to provide the operation of the entire site and to allow some future expansion. The transformer is protected on the primary side by the recloser 950-VCR-01. The electrical equipment will be installed in the main substation electrical room ER-950 (prefabricated type) and in four (4) Electrical Rooms (“ER”): ER-501 and ER-502 for process area, ER-511 for the crusher area and ER-701 for the tailings plant area. The fresh water source pumps, the pond water pumps and the reclaim water pumps are locally supplied and controlled.

The concentrator electrical rooms will be 4.16 kV supplied with buried cable from the main substation’s electrical room to the concentrator building and then in cable trays. The cable supplying the crusher (ER-511) will be partially installed on the conveyor. The 4.16 kV pole lines site distribution network supplies to the following sites:

- One (1) line for the tailings plant area (ER-701);
- One (1) line for the communication tower, guard house, cold warehouse.

### 18.7.2 MV and LV Distribution Levels, Systems Grounding and Load Ranges

The proposed distribution voltage levels for equipment and the type of motors are defined as indicated in the table below.

**Table 18.2 – Voltage and Loads**

Voltage	Grounding	Loads
4.16 kV, 3 Ph, 3 W	LRG (400 A)	MV Distribution Fixed speed and variable speed motors 4 kV
600 V, 3 Ph, 3 W	HRG (5 A)	Fixed speed and variable speed motors 575 V Non process loads larger than 6 kW
600/347 V, 3 Ph, 4 W	Solidly Grounded	Large HVAC Lighting in Process Area Welding receptacles
208/120 V, 3 Ph, 4 W or 120 V, 1 Ph	Solidly Grounded	Small motors 115 V Lighting in Buildings and Small HVAC Small loads up to 6 kW

### 18.7.3 Hazardous Locations

Part of the graphite concentrate and bagging system areas related to the dry screening equipment and the area around the graphite concentrate dryer is classified as hazardous

area Class II, Division 2, Group F. These areas are located in the concentrator building and are separated from the rest of the building by a wall.

The electrical enclosures will be as per NEMA 7 and 9 and the motor enclosures will be as per Explosion Proof, Class II, Division 2, Group F.

The electrical equipment used in this area will be marked with the group of the specific dust for which it has been approved.

The luminaries, receptacles, cable trays, cables and the electrical installation will conform to the rules of the Canadian Electrical Code, Section 18.0 Hazardous Location.

#### 18.7.4 Emergency Power

An emergency power system will be provided as a standby source of power to feed essential services (emergency and exit lighting, etc.) as well as critical process loads (installed in a dedicated Emergency LV-MCC) in the event of power loss from the power grid. The standby power source consists of one (1) diesel generator (500 kW, 600 V, PF = 0.8) located in the vicinity of the ER-502.

#### 18.7.5 Electrical Rooms

The main electrical equipment is installed in five (5) electrical rooms.

The main substation's electrical room ER-950 is a walk-in and outdoor type and it is located in the main substation yard.

ER-501 and ER-502 will be prefabricated containers, in the vicinity of the concentrator and will feed the concentrator plant.

ER-511 is a prefabricated container, located in the crusher area to house the equipment to feed the crusher.

ER-701 is located in the tailings plant area and feeds the equipment related to tailings plant area.

#### 18.7.6 Motors and Starting Methods

All the motors are induction motors, high efficiency or premium efficiency. A starting method is selected depending on the motor size, on the type of starting torque, on the process needs (fixed speed or variable speed) but also on the grid reliability and on the starter cost. The retained starting methods are:

Direct-on-line (“DOL”) starting is the most common method. The advantage is that it is simple, reliable and less expensive. The disadvantage is that the starting line current is five

to six (5 to 6) times rated current. The DOL method is used for all low voltage motors, fixed speed applications.

The Variable Frequency Drives (“VFD”) enables low starting currents because the motor can produce the required torque at the rated current from zero to full speed. The VFD start provides smooth, step-less acceleration of motor and load while controlling inrush current and the starting torque. As a voltage regulator, they can be used to control the stopping of the process.

#### 18.7.7 Power Factor Correction and Harmonics Filters

In order, to meet the Hydro-Québec requirements concerning the connexion to the distribution grid the power factor value must be equal or greater than 0.95, the harmonics must be under the limits of all Hydro-Québec requirements.

For the power factor correction and harmonic filtration, a power factor correction unit (MV-PFC-200, 1,200 kvar, synchronized to 4.8-th harmonic) was installed at the main substation.

The equipment generating harmonics are the VFDs used in the process equipment requesting variable speed in operation. Part of the 600 V heaters, controlled by SCRs, will also generate harmonics.

To reduce the harmonics limits, the VFDs supplying the SAG mill and the Ball mill will be the Very Low Harmonics Type (AFE or minimum 24 pulses); the other VFDs will be provided with 3 % line reactors.

#### 18.7.8 Grounding

For system grounding, the neutral of the main substation power transformer and the neutrals of the distribution transformers will be resistance grounded to provide a better protection to equipment and personnel and limit damage due to arcing faults.

For equipment grounding, a grounding system, consisting of a network of copper conductors, will be provided for each process building and substation. The ground conductors will run externally around each building with taps thermo-welded to every other column. The individual ground grids will be tied together with interconnecting ground cables.

All major electrical equipment such as transformers, switchgears, large motors, motor controllers, cable tray systems, water and fuel tanks, substation fencing, etc. will be individually connected to the ground network from two (2) points.

The grounding system will be designed to limit the overall resistance to ground to four ohms ( $4 \Omega$ ) or less.

A separate ground bus in electrical rooms and/or control room will be dedicated to instrumentation cables and equipment grounding. This ground bus shall be connected to an isolated grounding system and insulated from the main plant ground. An insulated green ground wire will run to the instrumentation equipment ground studs to ensure instrument grounding system integrity. The instrument ground bus will be connected to the main plant grounding system.

#### 18.7.9 Cables and Cable Trays

The power cables will consist of a single (1) conductor or three (3) conductors, copper, XLPE-insulated, aluminum or steel armor, PVC sheathed 90 °C.

Cable trays will be ladder type, galvanized steel. Cable trays for instrument cables will have a separated section. Separate trays will be provided for cables of different voltage ratings, or if installed in the same tray, separating barriers will be provided.

#### 18.7.10 Lighting and Small Power

The necessary illumination levels will be provided for all areas.

Process areas with high headroom (3 m +) will be lit by metal halide industrial high or low bay lighting fixtures with integral ballast or LED type. Other internal areas of the plant [process areas that are less than three (3) m high, offices, electrical and control rooms, etc.] will be lit by energy saving fluorescent lamps.

Outdoor areas (process yards, roads, parking, etc.) will be lit by high-pressure sodium roadway lighting fixtures and floodlights installed on steel poles.

Process working areas, control and electrical rooms, etc. will be fitted with rapid restarting fixtures to provide partial or full illumination after voltage dips or normal power failure.

To permit movement of personnel during a power failure or emergency situation, all areas will be fitted with individual battery pack units located near passages, stairwells and exits. The exit lights will have built-in batteries and energy efficient lights; the modules will be located near the exits.

The lighting system and receptacle power will be fed by 120 / 240 V dry type transformers and panel boards located in electrical rooms.

Lighting in process and production areas will be switched from panel boards. Outdoor lighting will be controlled by photo-cells or timers.

Welding/power outlets will be installed at appropriate locations for supplying power to portable welders and similar loads.

#### 18.7.11 Electrical Equipment Specification

The characteristics of major electrical equipment have been based on design criteria and the cost estimate on the information received from suppliers invited to quote on the Project.

### 18.8 Automation

#### 18.8.1 Control System Philosophy

The Project includes production facilities such as crusher, concentrator and concentrate packaging equipment. There is a remote location that includes the tailings plant.

The above mentioned production facilities are controlled and supervised from the central control room equipped with a Supervisory Control And Data Acquisition (“**SCADA**”) system located in the ore processing plant.

The control system philosophy is based on the utilisation of Programmable Logic Controller (“**PLC’s**”) in all key areas of the plant. The ring topology is proposed to reduce the risk of downtime.

The PLC’s network will include one (1) PLC for the crusher area, two (2) PLC’s for the concentrator and one (1) PLC for the tailings plant.

There will be remote operator control stations for the following areas: crusher, grinding, flotation, dewatering and drying, reagents preparation, bagging, laboratory, and offices.

The proposed control system is built with standard industrial automation equipment and is easily expandable.

The proposed automation concept for the Project was based on documents prepared for the study such as:

- Automation Control Philosophy and Design Criteria;
- Control Architecture drawings;

Automation costs for the Project are included in the overall capital cost estimate.

### 18.8.2 Piping and Instrumentation Diagrams

The Project process flow sheets and typical Piping and Instrumentation Diagrams (“**P&ID**”) drawings from MC-DRA’s database were used to prepare automation quantity estimates. Preliminary P&ID drawings were prepared for the Project.

MC-DRA has also used supplier preliminary drawings and technical information received from bidders.

### 18.8.3 Process Control System Input / Output Count

The Input / Output (“**I/O**”) count has been done. The I/O count includes the digital points, the process instruments, the on / off valves, the control valves and the instruments supplied with the mechanical equipment.

All the I/O’s of the process areas are integrated in local PLC automation panels rack located in electrical room of the area.

The following method was used to calculate the I/O count:

- All fix speed motor starters and VFD are supplied with electronic overload. The electronic overload includes input / output module and a communication link to transfer motor status and command to the PLC. All motor local push button stations will be wired to the electronic overload;
- Two (2) digital inputs and one (1) digital output for process valves equipped with position switches to indicate the close/open status;
- All instruments will support the Hart protocol and will be wired to the PLC I/O rack with a 4 to 20 mA signal;
- All pump boxes are equipped with a non-contact level detector (Ultrasonic or Radar type for dusty applications);
- All conveyors are equipped and supplied with safety pull cords, misalignment switches and zero speed switches. All switches are wired to PLC I/O cards. The pull cords are wired to the motor starter for safety;
- The overall I/O count total for the Project is 1,692.

### 18.8.4 Local Control System and Instruments

The proposed control system includes local push button stations for all motors for maintenance and safety.

The push button stations include a local start, stop and emergency stop button for all motor. Proposed local push button stations do not include a selector switch for local/remote mode in the field. The local/remote function is accessible only at the HMI and is programmed by equipment. The local station start button can be activated only when the plant operator has turned the equipment in local mode.

For the critical equipment, an extra push button (Emergency Stop) is added directly connected to the motor starter.

All the control loops are integrated and controlled by the PLC. For complex instrument or equipment supplied with PLC, a communication link is added to get remote status and diagnostics for the plant supervision control system.

All the field instruments and switches are wired to the PLC through junction boxes and digital and analogue input/output modules mounted in automation panels located in area electrical rooms. The standard 4-20 mA signal with Hart protocol is the standard for instrumentation. The control logic is performed by the PLC.

The proposed PLC wiring includes junction boxes for instrument power supply, digital signals and analogue signals. The junction boxes will be located and installed in all the process areas. The junction boxes are interconnected to the remote Input / Output rack panel by multi-conductor cables.

#### 18.8.5 Fibre Optic Network

An Ethernet network will be installed in the ore processing plant.

The proposed network communication system includes one (1) fiber optic cable (24 fibers) with patch panels for the PLC and operator stations. The PLC communication network and the operator stations used different fibers from the same cable.

The details of the proposed configuration and the cable path are shown on control architecture drawings.

The Ethernet protocol communication system for a PLC application is fast, reliable and is the industry standard. All PLC manufacturers support the Ethernet protocol.

#### 18.8.6 System Server / Software

For the ore processing plant, the proposed system includes a redundant system server, one (1) historian server and two (2) operator workstations located in the central control room and remote operator stations in the field. The redundant server insures network availability and data protection.

An engineering station is also supplied for the system programming and the maintenance debugging. The station will be located in the central control room.

The proposed system is designed with PLC's and the equipment is supplied with standard PLC programming software and standard software for the SCADA system. This type of equipment is available from any major PLC supplier.

The Scada system includes a development licence and run time licenses for the supervision and control of the entire plant operation and has the capacity to communicate with management's computer network.

The electrical power supply for all PLC and servers will include Uninterrupted Power Supply ("UPS") units located in pressurized electrical rooms.

#### 18.8.7 Site Telecommunications

Telecommunications for the Project include all surface communications which includes the exterior backbone structure, telecommunication pathways, spaces and structured cables, IP network, digital land mobile radio communications, Wi-Fi communications, fixed voice communications, security, access control, video surveillance and enterprise system network. It is assumed that the local wireless network is good enough to support cell communication.

#### 18.8.8 Telecommunication Network

The plant telecommunication system will be linked to the service provider by microwave link with provision for future mobile telecom equipment and installed in the local telecommunication tower and shelter. The site plant communication system will be based on Ethernet links throughout the crushing, the ore processing plant and the tailings plant.

A single mode fiber optic cable will be deployed through the plant for telephony and Internet communication. The proposal included also redundant plant servers and firewall routers and a back-up server located in the telecom shelter. The monthly cost for the local telephony, internet access and mobile radio is included in the operation costs.

#### 18.8.9 Telecommunication System and Mobile Radio System

The telecommunication services include the communication tower located on site and a communication shelter hosting the plant communication interface.

The telecommunication systems include:

- IP PBX phone system;
- Internet access;

- Mobile radio communication system;
- Camera and security system.

The mobile radio system will be used for the construction phase, the operation of the mine site and the maintenance crew.

#### 18.8.10 Telecommunication Services

The site will be connected to Internet service provider (“ISP”) and IP PBX phone system (“ITSP”) via a microwave communications link between the production site and the closest provider. The microwave link will be supplied and maintained by the service supplier.

For the Study, the bandwidth cost has been evaluated with one (1) Gbps as communication speed. The communication system will be installed in phases.

#### 18.8.11 Telecommunication Distribution

Telecommunication distribution will be through the concentrator fiber optic network covering all areas of the concentrator, offices and gate house.

A radio communication system will be used for the mine and other auxiliary outside of the concentrator.

#### 18.8.12 Camera and Security system

A camera system, with recorder and viewer, will be installed in the main gate office. Aside from the gate cameras, five (5) cameras will be installed in the concentrator for metallurgical process supervision. One (1) viewer station will be installed in the central control room.

### 18.9 Tailings Maintenance Facility

Tailings disposal requirements to store and manage the tailings were assessed and prepared for the life of mine of the Matawinie Project.

The tailings will be stored in a “dry” state using dry pile method. The tailings management facility is composed of two (2) tailings piles, placed at separate locations within the mine property, associated to the tailings plant.

The scheme of operation proposes pumping the tailings in a slurry form (about 64.8 % w/w) to the tailings plant located in proximity to the tailings piles. Here the tailings will be dried to about 15 % water content and stacked using conventional equipment (trucks, loaders, dozers, compactors). This pipeline scheme limits the emission of gas into the

atmosphere produced from hauling trucks due to shorter hauling distances. The water recovered will be recycled to the plant to be reused in the process.

The tailings storage requirements were based on a production of a total of 31.7 Mt of tailings over a period of 27 years.

### 18.9.1 Design Criteria

The proposed mine is estimated to produce a total of about 14.6 Mm<sup>3</sup> of tailings during a continuous operation of 27 years. By volume, about 78 % of the tailings (11.9 Mm<sup>3</sup>) will be non-acid generating (“NAG”) while the remaining 22 % (2.7 Mm<sup>3</sup>) are considered potentially acid-generating (“PAG”).

Two (2) separate tailings piles will be produced, one (1) for the NAG tailings and one (1) for the PAG tailings. A tailings plant for dewatering and filtering will be constructed in proximity to the NAG tailings pile. The final placement dry densities were estimated at 2.4 t/m<sup>3</sup> for the NAG tailings and 3.0 t/m<sup>3</sup> for the PAG tailings based on specific gravities of 2.71 g/cm<sup>3</sup> and 3.42 g/cm<sup>3</sup>, respectively.

Ditches with low berms will surround the tailings piles to collect drainage/run-off water which will then be directed to sedimentation basins for treatment before it is recycled to the plant. The overburden excavated for the construction of the ditches will be used for the construction of the low berms.

The PAG tailings pile, peripheral collector ditches and sedimentation basin will be underlain by an impermeable layer composed of geotextiles (for protection) and a geomembrane (impermeable) to prevent acid water infiltration to the foundation soils and comply with environmental requirements.

The conceptual design of the tailings piles was based on the following parameters and assumptions:

- The overall slope of the dry tailings piles is 5H: 1V, composed of ten (10) m lifts with 4H:1V slope and ten (10) m wide benches;
- The maximum elevation of the pile does not surpass the maximum elevation of the surrounding hills in order to blend with the topography of the site and reduce/eliminate visual disturbance to the town and resort areas;
- Flatter areas for construction of the PAG tailings piles were considered to facilitate installation of the impermeable base;
- As much as possible, the slopes of the piles face away from the town and resort areas, consequently minimizing visual disturbance and dust generation;

- A minimum distance of 60 m was maintained between the tailings piles and water bodies and a minimum distance of 300 m was maintained between the tailings piles and the open pit perimeter (for potential flying rocks due to blasting).

### 18.9.2 Tailings Storage Location Selection

Several scenarios were examined in order to optimize the location of the tailings dry piles with respect to:

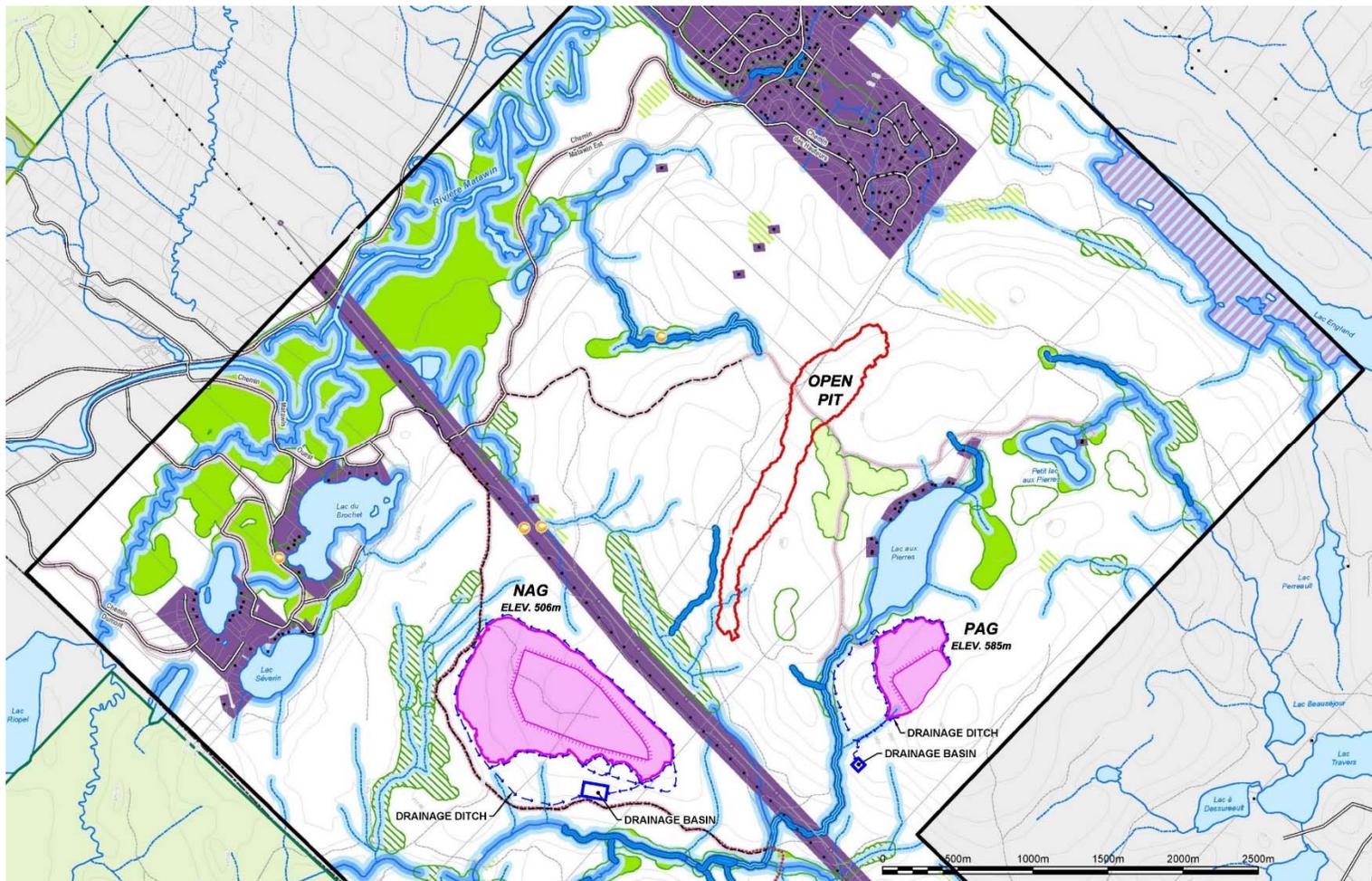
- Topography;
- Distance/accessibility from the processing plant, items are associated to costs for tailings transportation (pumping);
- Environmental impact on water bodies (lakes, rivers, creeks), wetlands, wildlife, fish habitat;
- Distance from the nearby town and proximity of cottages (for dust, noise);
- Potential for expansion of claims; areas of mineralization;
- Interference with other NMG mine operations;
- Quantities for construction (footprint area, length, volume) for peripheral berms, ditches and impermeabilization (by means of a geomembrane) of the PAG tailings;
- Elevation of tailings piles with respect to surrounding hills (visual pollution, dust generation);
- Minimizing interference with present and possible future mining zones.

The terrain is forested and hilly with only a few relatively “flatter” zones. Numerous lakes and streams of various sizes surround the site. The Matawin River stretches from South-West to North-East of the NMG claims zone. The town of Saint-Michel-des-Saints is located at about six (6) kilometres North-East of the proposed mine. The Project area is composed of public areas, private and mixed tenures and it is primarily used for forestry and recreational activities (hunting, fishing and other) with a number of cottages built near the banks of the various lakes and streams.

Various areas were examined within a ten (10) km radius of the processing plant (outside and inside mining claims) to optimize the location of the tailings piles.

The selected sites for the Project were considered for minimizing environmental and community impacts as well as the most beneficial, less disturbing and cost efficient from both construction and operation points of view. The location of the tailings piles sites relative to the mine is shown in Figure 18.6.

Figure 18.6 – Location of The Tailings Piles Relative to The Mine and Inhabited Zones.



### 18.9.3 Construction of the Tailings Management Facilities

The construction of the dry tailings piles will be done progressively to minimize initial capital costs especially for the dry PAG tailings pile which require impermeabilization of the footprint area. The drainage water collection basins will be constructed entirely during the mine construction period while the drainage collection ditches will be constructed progressively as the dry tailings pile footprint increases.

Figure 18.7 and Figure 18.8 display the sequence of construction for the NAG and PAG tailings Parks.

**Figure 18.7 – Yearly Construction Sequence of The Tailings Piles, Years 0 To 5**

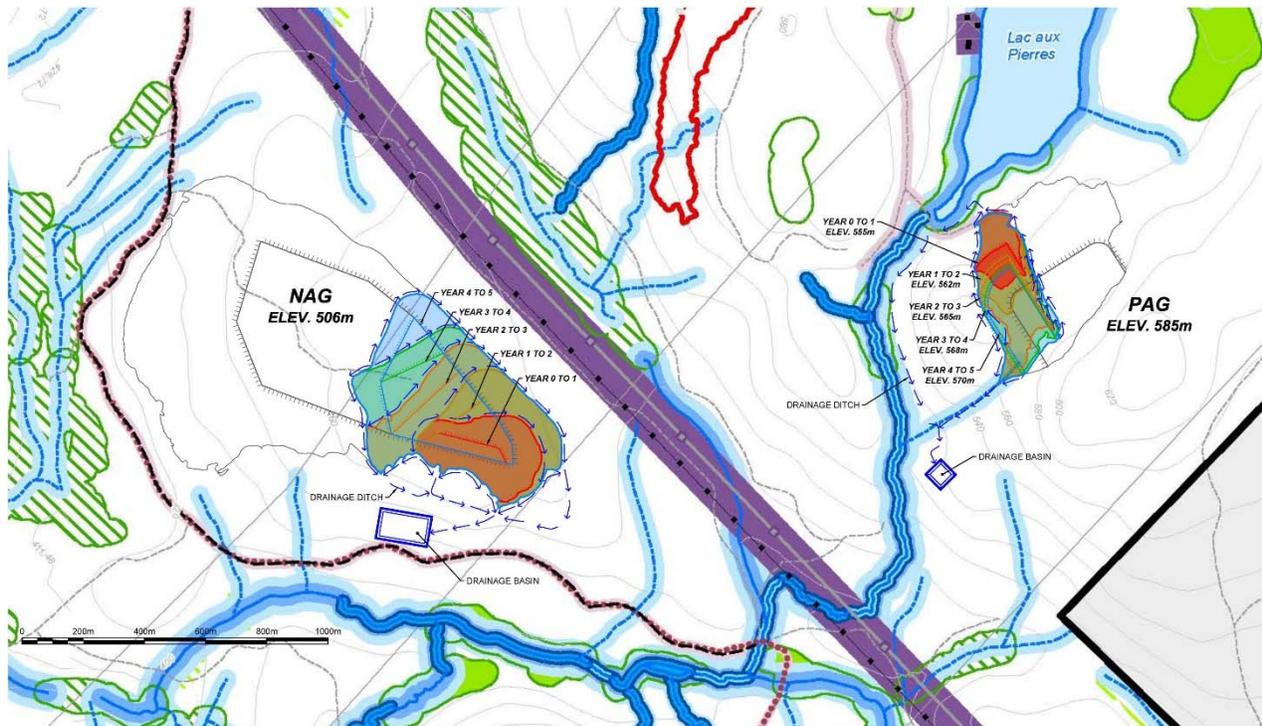
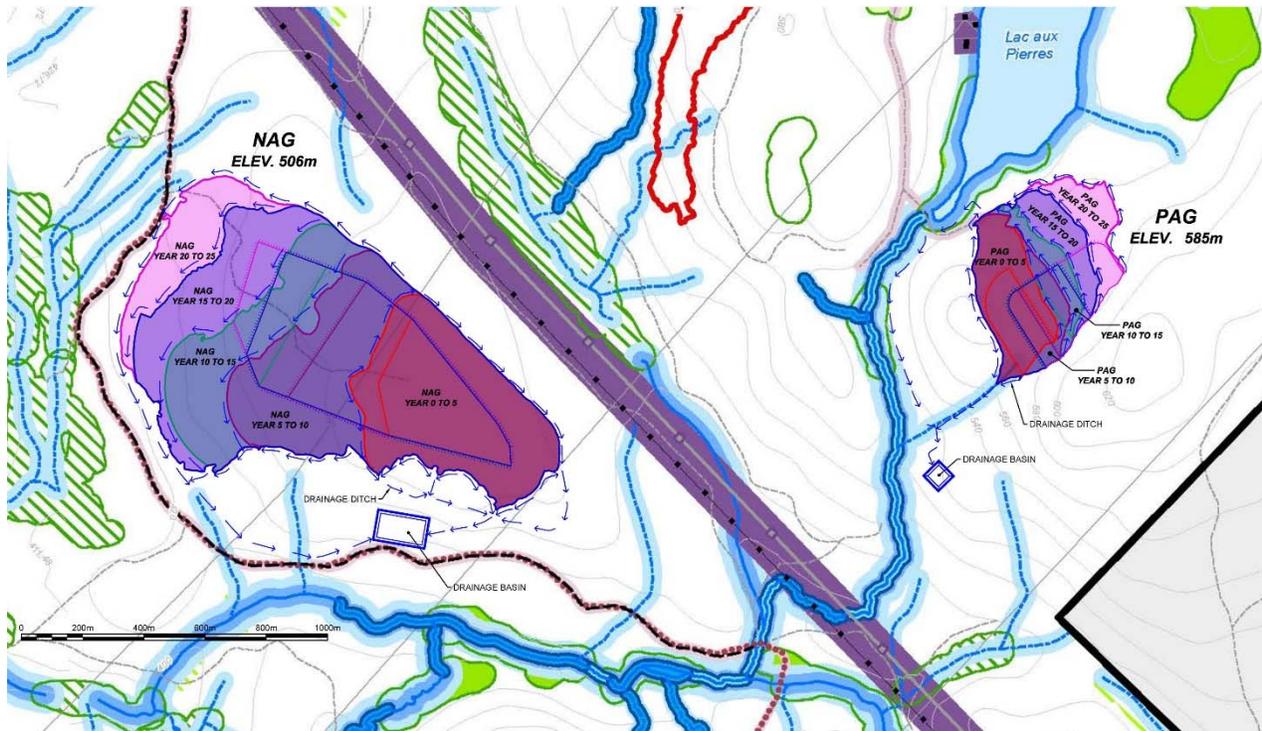


Figure 18.8 – Construction Sequence of The Tailings Parks, Years 0 To 25 In 5 Years Intervals



#### 18.9.4 Revegetation of the Tailings Management Facilities

Revegetation of the tailings piles will be done progressively during the mine operation life. At the end of the mining operations, revegetation of the dry tailings piles will be completed along with restoration of the associated drainage infrastructures (ditches and sedimentation basins).

The dry PAG tailings pile will be covered with an impermeable membrane and topped with overburden which will be revegetated. Its associated drainage infrastructure (already lined with an impermeable geomembrane) will be covered with overburden and revegetated.

## 19.0 MARKET STUDIES AND CONTRACTS

Mr. Armando Farhate supplied the data and elaborated the basis of this Section. He is a mechanical engineer graduated from UNIP – São Paulo, SP, Brazil in 1987. He obtains a post graduate in Business Administration (MBA) from Mauá – São Paulo, SP, Brazil in 1998. He has worked as a C-Level executive in graphite mining companies in Brazil and Canada for six (6) years.

### 19.1 Introduction

Graphite is a form of carbon characterized by its bi-dimensional hexagonal crystalline structure known as graphene, stacked in several thousand layers bound by Van der Waals force. It occurs naturally in metamorphic rocks such as marble, schist and gneiss, or is obtained synthetically by the calcination of various carbon sources such as petroleum coke. When subjected to extremely high pressure and temperature, the only other existing form of crystalline carbon is generated: diamond, with its three-dimensional structure.

Graphite has unique chemical, electrical, mechanical and thermal properties, such as:

- High electric conductivity due to the free flow of electrons through the atoms forming the graphene grid;
- Heat conductivity along the molecular plane, and heat insulation in the thru plane;
- Low reactivity, due to the high stability of the hexagonal C atom structure, providing very high resistance to oxidation, thermal shock and chemical attack;
- High melting point (3,500 °C);
- Low expansion coefficient;
- Low friction coefficient thanks to the slipping effect between graphene layers;
- Low absorption of X rays.

This set of properties allows graphite to find demand from a very wide array of applications, from pencil lids and refractory bricks, to battery active anode.

Graphite is commercially available in four (4) types, depending on the source, particle size and crystallinity:

Natural Amorphous [60-85 % C(g)]: Less than 200 mesh in size, low crystallinity;

- Natural Flake [ $> 75$  % C(g)]: From large flakes (+ 50 mesh) to fine flake (- 150 mesh), high crystallinity;

- Synthetic Flake [ $> 99.55\%$  C(g)]: Fine particle size (- 150 mesh), very high crystallinity;
- Vein [ $> 95\%$  C(g)]: found in lumps that can be worked into shapes, high crystallinity.

The Matawinie deposit contains natural flake graphite. The table below shows the different types of natural flake graphite, for both primary and secondary transformation processes along with the typical purity and particle size distribution.

**Table 19.1 – Different Types of Natural Flake Graphite**

Type	Feed Material	Typical Purity	Type of Processes	Typical Particle Size Distribution
Flake Graphite	Ore	75 % to 98 %	Mechanical concentration and flotation	+ 50 mesh to - 100 mesh
High Purity	Flake graphite	99 % to 99.9 %	Leaching or calcination	+ 50 mesh to - 100 mesh
Micronized	Flake graphite	95 % to 98 %	Milling	$< 100\ \mu\text{m}$
High Purity Micronized	High purity	99 % to 99.9 %	Milling	$< 100\ \mu\text{m}$
Spherical	High purity micronized	99.9 %	Shaping	$< 30\ \mu\text{m}$
Expandable	Flake graphite	95 % to 98 %	Chemical intercalation	$> + 80\ \text{mesh}$
High Purity Expandable	High purity	99 % to 99.5 %	Chemical intercalation	$> + 80\ \text{mesh}$
Expanded	High purity expandable	99 % to 99.9 %	Heat shock and milling	$< 100\ \mu\text{m}$
Foil	Expandable	95 % to 99.5 %	Heat shock and lamination	Various

## 19.2 Uses and Demand Trends

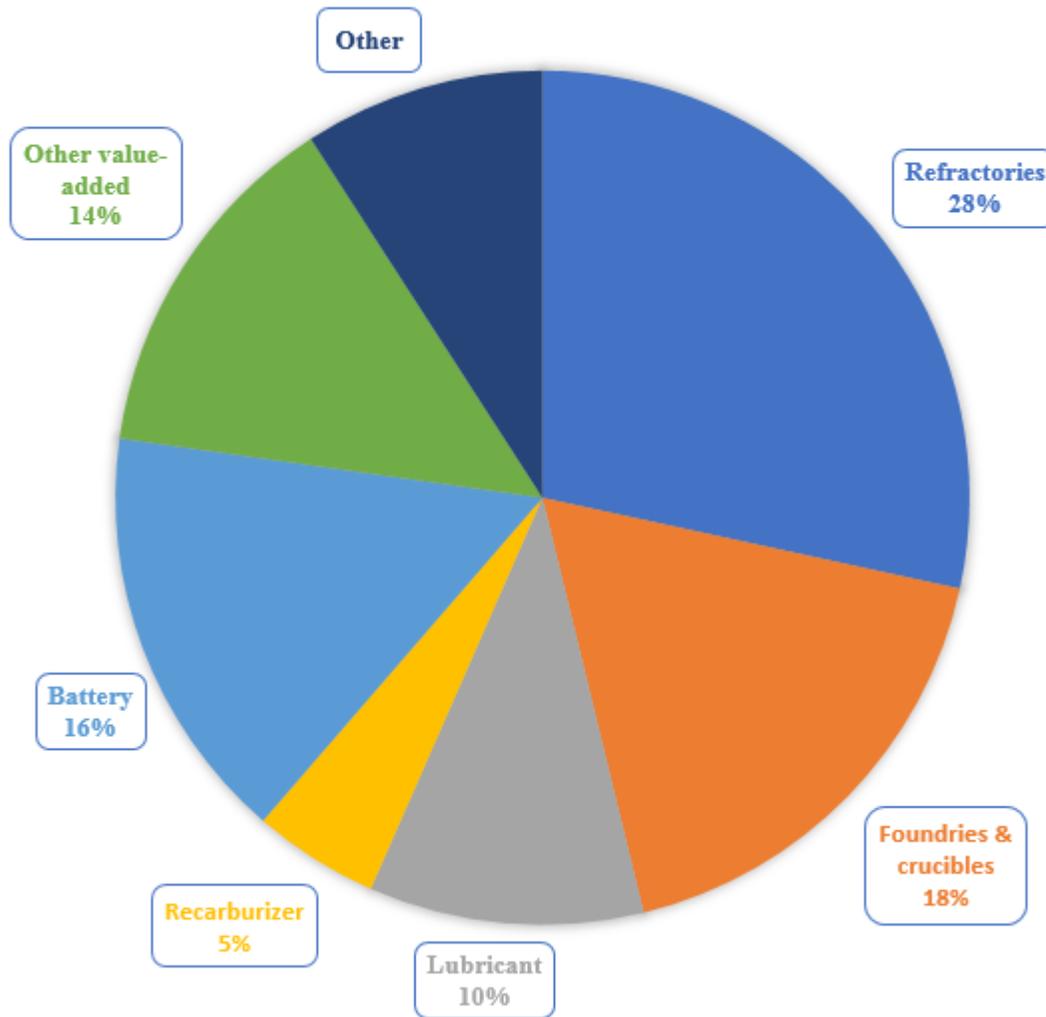
The most relevant commercial uses of natural flake graphite are listed below:

- Refractories – Flake graphite;
- Batteries:

- Alkaline – High purity micronized, expanded;
- Lithium-ion – Spherical;
- Lead Acid – High purity;
- Ni-MH – High purity.
- Powder Metallurgy – Micronized;
- Gaskets and Seals – Foil;
- Thermal Management – Foil;
- Polymers – Flake graphite, micronized, high purity micronized, expanded;
- Carbon Raiser – Flake graphite;
- Friction Materials – Flake graphite, micronized;
- Carbon Brushes – High purity;
- Flame Retardants – Salt, high purity salt;
- Drilling Lubrication – Flake graphite;
- Seed Lubrication – Flake graphite;
- Greases and Oils – Flake graphite, micronized;
- Pencils – Micronized;
- Coatings and Paints – Flake graphite;
- Hot Metal Forming – High purity;
- Fuel Cells – High purity;
- Nuclear Cores – High purity.

The Figure 19.1 summarizes the graphite market by main applications.

Figure 19.1 – Natural Graphite Demand per Application



Source: Benchmark Minerals.

The Table 19.2 lists the future demand trends by main applications.

**Table 19.2 –Future Demand Trends by Main Applications**

Application	Trend	Opportunities	Threats
Li-ion Batteries	High Growth	Advance of EV, PEV, HPEV	New anode technologies
Flame Retardants	High Growth	Stringent construction rules	
Polymers – Conductivity / Strength	High Growth	Replacement of metallic parts on automotive	Competing materials
Polymers – Insulation	GDP Growth	Stringent construction rules	EPS cost reduction
Thermal Management	GDP Growth	Growth of electronic market; New applications on construction	Downsizing of electronics
Lead-acid Batteries	GDP Growth	Replacement of carbon black; Start-stop vehicles	Eventual replacement for Li-ion
Friction	GDP Growth	Growth on automotive and OEM markets	Advance of alternative technologies
Gaskets and Seals	GDP Growth	Growth on automotive and OEM markets	
Powder Metallurgy	GDP Growth	Replacement of machined parts on automotive	
Carbon Brushes	GDP Growth	Electric motors, automotive	
Nuclear Cores	GDP Growth	Replacement of coal thermal generation, advancement of Pebble Bed reactors	Wind and solar power
Fuel Cells	GDP Growth	Hydrogen vehicles	
Refractories	Stable	Rebound on steel demand driven by construction and oil exploration	Improved quality and technology by the brick manufactures reducing demand per ton of steel; Advance of monolithic
Alkaline Batteries	Stable	Replacement of synthetic graphite at lower cost	Growth of rechargeable batteries
Lubricants	Stable	Organic growth	Talc and other minerals
Foundries	Declining	New alloys	Replacement by polymers, composite materials and powder metallurgy

Natural graphite cannot be directly recycled in virtually all applications due to contamination, wear, and to becoming an intrinsic part of the alloy it composes. However,

in the latter case, it undergoes secondary recycling, mainly for steel. This means that even in mature markets, recycling is not a demand-limiting factor for primary natural graphite mining.

Possible future influence on graphite demand from the high growth trending applications are describe below.

a) Lithium-ion Batteries

Under the existing technology, graphite is the sole material suitable for anodes of Li-ion batteries, and this type of battery is steadily replacing all other types of small rechargeable batteries. The consumption of graphite for this application was 100,000 tonnes in 2014, with a split of 40 % of Natural Graphite, and 60 % of synthetic graphite. The estimated usage of natural graphite in 2015 was 52,000 tonnes, which corresponds to a growth of 30 % year-over-year. There are many different projections for growth of graphite demand for Li-ion batteries; the most pessimistic growth projections are already in the range of significant 15 % Compound Annual Growth Rate (“CAGR”) per year.

The development of vehicle electrification is the primary factor generating demand growth for this type of material. This is further made evident though the latest announcements of major car companies who recently committed to produce electric vehicles (“EV”) in greater numbers, with the announcement of 120 new models to be launched from now until 2020<sup>3</sup>. Even modest replacements of petrol vehicles by EVs will have a substantial effect on the graphite market. One million (1 M) EVs, which represent less than two per cent (2 %) of annual new car sales, require up to 50,000 tonnes of anode graphite to produce the batteries, which due to the low shaping process yield, corresponds to 150,000 tonnes of feed material.

b) Flame Retardants

New and more stringent fire prevention rules have been implemented on most of the developed markets, and may be implemented by growing markets as well. The application of a layer of salt (large flake natural graphite intercalated with acid molecules) with a bonding agent, around the edges of building doors, is used as a sealing agent triggered by high temperatures. In case of fire, the heat causes the salt particles to expand, increasing volume over 200 times, and thus sealing the gap between the door and the frame, preventing smoke from the fire to propagate through the building.

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<sup>3</sup> Article from Tom Randall, April 25, 2017.  
<https://www.bloomberg.com/news/articles/2017-04-25/electric-car-boom-seen-triggering-peak-oil-demand-in-2030s>.

Expandable graphite is also used as additive to rubbers and foams, causing these materials to improve their fire-retardant properties.

This application requires large graphite flakes (> 80 mesh), which has demonstrated to be present and retrieved from NMG's West Zone Deposit.

c) Thermal Management

The introduction of flat screens for electronic appliances created the need to evenly dissipate the heat generated by electronic components. The screens are sensitive to heat, and eventual hot spots behind them in the electronic components cause dark spots on the screen. In case of very thin appliances, high purity foils are required since they allow lamination to lower thickness.

Other applications for the heat dissipating foils, mainly in construction, are under development, and can boost demand in the near future.

### 19.3 Supplies

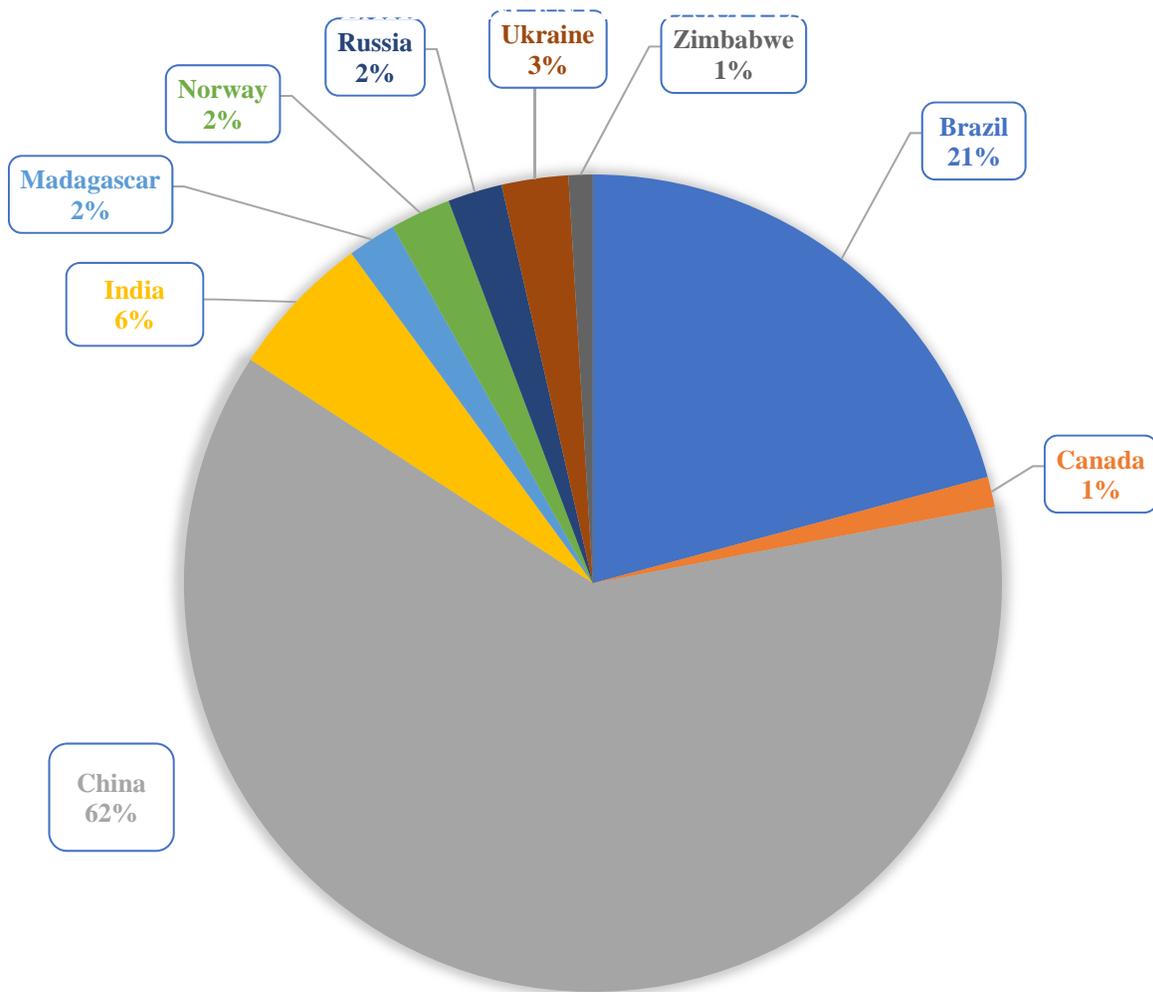
China is the largest producer of natural graphite, followed by Brazil and India.

Besides being the largest producer, China also detains extensive reserves for future exploration. Such dominance is reflected overall in the market, as Chinese price fluctuations affect the global market. The Chinese government, as in any relevant economic activity, dictates the strategy and takes action to ensure alignment to the country's long-term project.

As an example, it introduced a 20 % export duty on raw natural graphite in 2010, in order to force replacement of low value added exports by utilization of this material for higher value added applications within China, anticipating the then emerging demand for lithium-ion batteries. This duty caused a strong elevation on international prices in 2010 and 2011. In parallel, new restricting environmental regulatory measures were implemented in China, forcing the older and more outdated producers to either go out of business or to consolidate with larger producers, which in a first moment caused a reduction on total production of around 30 %. Consequently, many graphite exploration projects around the world were started or resumed.

Since 2012, however, the decrease of commodity prices and reduction on China's growth pace had a negative impact on demand, and consequently on price, which reached a record low at the end of 2016, when the Chinese government dropped its export duty.

Figure 19.2 – Natural Graphite Production per Country



Source: Benchmark Minerals

## 19.4 Second Transformation

NMG is currently developing second transformation processes in order to serve more profitable value-added markets. Note that the company already possesses a market mapping which is comprehensive to all natural graphite applications, including those of added value products.

### 19.4.1 Purification and Shaping

The main targets for second transformation are purification and shaping, in order to produce uncoated anode material for Li-ion batteries.

Today, 100 % of the production of spherical graphite is made in China. The shaping process consists of consecutive milling steps, which is an energy intensive process, and provides a yield of 30 to 50 %, meaning that 50% to 70% of the raw material is rendered useless for this application during processing. In the case of natural graphite, the shaping must be preceded by purification. In China, this is obtained by chemical leaching, with its consequent wastewater contamination. The graphite by-product generated due to the low yield is also a liability, and either it is discarded in the environment, or sold at marginal prices to low-end applications such as pencil leads.

The above scenario is a tangible risk for the battery manufacturers who aim to serve the western world markets. Tesla Motors, the most prominent electric vehicle manufacturer in the United States, is in the process of building a “gigafactory” of batteries in Nevada, with investments in the range of US\$ 5 billion. They have already announced that their objective is to acquire all minerals in North America, from environment friendly suppliers. As natural graphite deposits are rare and small in the United States and Mexico, this represents an excellent competitive position for Canadian producers, particularly in Québec, where the energy cost is low enough to allow purification by calcination instead of leaching. There is also an opportunity for the application of more modern and effective shaping techniques: in pilot production scale, yields reaching around 80 % have already been achieved by means of higher capital demanding equipment, but with payoffs in energy consumption and by-product generation.

NMG aims to produce high purity flake graphite, as shown possible by its metallurgical test results, which are consistent with the Li-ion anode raw material needs (private communications between Li-ion battery manufacturers and NMG). The company is presently focusing its efforts towards this market.

#### 19.4.2 Purification

Utilizing the same purification installation required for item 19.4.1 above, other more profitable value-added markets can be served. Purified large natural graphite flakes serve the high-end foil and refractory applications, and prices range from USD 2,000 to 2,500/tonne. Purified fines are used in pencils and carbon brushes.

#### 19.4.3 Micronization

Non-purified materials from this second transformation serve different end markets such as powder metallurgy and polymers. Purified materials serve mainly the traditional alkaline battery market.

#### 19.4.4 Intercalation

This second transformation produces expandable graphite salt, and aims the application of flame retardants. It also allows for the production of feed material for expanded graphite.

### 19.5 Price Forecast

The graphite concentrate sale price used for the PFS was established at US\$ 1,429/tonne. The selling price was determined using pricing information, averaged during a period of 60 months (from January 2012 to December 2016) and calculated from the Benchmark Mineral Intelligence (Benchmark) Flake Graphite Price Index.

We have chosen to exclude prices from the first half of 2017 from the statistic information, because this period was directly affected by a one-time event, the elimination of the Chinese import duty of 20 %. The initial effect on prices was an unprecedented drop on prices, because the market had the expectation that the elimination of this duty would have a direct reflection on the prices offered by Chinese producers. However, shortly after the initial impact, the offer of Chinese graphite began to decrease, motivated by two (2) main factors: severe environmental restrictions adopted by the Chinese government, resulting on mine shutdowns and operation consolidations, particularly in the Shandong province; and some remaining mines suffering from depletion of the richer parts of their deposits. Starting on June 2017, the prices recovered sharply, and the general market expectation is that there will be more pressure on the demand side driven by growth of vehicle electrification, bringing the prices to levels similar to the period between 2012 and 2016.

Benchmark is an independent credible source who compiles international graphite prices for various commercial size fractions and concentrate purities. The Tony Block's West Zone graphite concentrate value was calculated based on the weighted average of each size fraction and purities obtained during the metallurgical testing described in Section 13.5. The sales price conditions have been set as ex-works mine site. However, due to its strategic location close to the Montreal port (around 160 km by paved road) and North American end users (mostly based in the Great Lakes area), customers will have low transportation cost to their producing facilities.

Since Benchmark's price database is proprietary and a fee is required to access it, the detailed data cannot be published. Nevertheless, Table 19.3 summarizes the West Zone graphite concentrate weighted average value per size fraction over a 60-month period calculated from Benchmark's acquired database.

**Table 19.3 – Price per Size Fraction**

<b>Size Fraction</b>	<b>Weight (%)</b>	<b>Purity [% C(g)]</b>	<b>Price C(g), Ex-Works (US\$/tonne)</b>
+ 50 mesh	17	94 - 97	2,197
+ 80 mesh	31	94 - 97	1,466
+ 100 mesh	12	94 - 97	1,301
- 100 mesh	40	94 - 97	1,124
<b>Weighted Average</b>	<b>100</b>	<b>94 - 97</b>	<b>1,429</b>

For more details on pricing, please visit <http://benchmarkminerals.com/>.

## 19.6 Contracts

No contracts have been established by NMG. The company has not hedged, nor committed any of its production pursuant to an off-take agreement.

## 20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

### 20.1 Environmental Studies

Several environmental studies have been initiated since 2015. Field work to describe the receiving environment started in June 2016 and continued in 2017. The content of this Section has been provided following site visits by SNC-Lavalin to set the environmental reference values and to identify any major environmental issues:

- Mr. Christian Fortin, Biologist for SNC-Lavalin, has conducted two (2) site visits for a small mammal survey to the Property on August 15<sup>th</sup> to 17<sup>th</sup>, 2016, and for an amphibian and reptile survey on May 10<sup>th</sup> and 11<sup>th</sup>, 2017.
- Mrs. Catherine Dumais, Biologist for SNC-Lavalin, has conducted a site visit to the Property for aquatic fauna and fish habitat survey from August 31<sup>st</sup> to September 10<sup>th</sup>, 2016.
- Mr. Benoit Caron, Biologist for SNC-Lavalin, has conducted a site visit for aquatic fauna and fish habitat survey, benthic fauna, water quality and sediment characterization and hydrology to the Property from August 31<sup>st</sup> to September 10<sup>th</sup>, 2016.
- Mr. Abdel Mounem Benlahcen, Geologist for SNC-Lavalin, has conducted several site visits to the Property for hydrological surveys (December 9<sup>th</sup> to 16<sup>th</sup> 2016; July 4<sup>th</sup> to 5<sup>th</sup>, 2017; and for soil characterization on November 9<sup>th</sup>, 2016.

The following Section reports the main findings of these studies.

#### 20.1.1 Physical Environment Baseline Studies

##### a) Climate and Meteorology

The climate of the study area is continental subarctic (or boreal) according to the Köppen-Geiger climate classification system (SNC-Lavalin 2017a). Winters are long and cold and summers are short. Rainfall is moderate without a dry or wet season. The hottest month is July (17.8 °C) and the coldest month is January (-14.0 °C). The temperature is above the freezing point approximately 270 days annually.

Total annual precipitation is approximately 940 mm, of which 78 % is rain and 22 % is snow. The direction of prevailing winds is West from September to April, and southwest during the summer, from May to August.

b) Air Quality

The initial air quality was assessed based on regional air quality data from Québec's monitoring network and on regional air emission sources (SNC-Lavalin 2017b). The initial air quality of the Project site is considered to be good.

NMG has also conducted a preliminary atmospheric dispersion modelling of total particulate matter and fine particulates emissions from mining operations (Consulair 2017). The main objective of this study was to identify the main sources of impact on air quality and provide guidance for the Feasibility Study and the Social and Environmental Impact Assessment Study.

c) Soil Characterisation

A soil characterization study was conducted in August 2016 on the Tony Block West Zone (SNC-Lavalin 2017c). The objective of this study was to determine the baseline conditions of the soils in areas potentially impacted by the Project. During this campaign, 15 soil samples were collected on the future mine site and its periphery to determine the concentration of some metals. The sampling strategy was to cover as much territory as possible that will be used for the mine site:

- For tailings and waste rocks accumulation area: nine (9) samples (1 sample/trench);
- For infrastructure pad (including concentrator): three (3) samples;
- For the open pit: three (3) samples in 2017 and 11 samples in past characterization (2016) for the air modelisation, less parameters were analyzed in this campaign.

Samples were taken in trenches, approximately two to three (2 to 3) metres depth.

Selected analytical parameters included total extractable metals (Ag, As, Ba, Be, Cd, Co, Cr III, Cr VI, Cu, Mn, Hg, Pb, Sb, Ti, Tl, V, Zn, Zr).

The analyses showed that all soil samples had metal concentrations below the criteria A of the *Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques*' ("MDDELCC") *Guide d'intervention* (Beaulieu 2016).

A second campaign was planned for November 2017 to complete the soil characterization initiated at the pit site, mining infrastructure and tailings and waste rock storage areas. Approximately 20 additional soil samples will be collected. Analysis parameters will include: pH, total sulfides, total cyanide, metals, Polycyclic Aromatic Hydrocarbons ("PAHs") and petroleum hydrocarbons

(C10C50). The 2017 and 2016 results will then be compared to the new A, B and C criteria of the *Guide d'intervention* (Beaulieu 2016).

If a contamination occurs during mining operation, contamination will have to be removed; soils will have to be characterized and managed according to the nature and level of contamination, and based on law and regulations.

At the end of operation, the land outside tailings area has to be characterized and rehabilitated according to the regulation. The mining Act ensures that land disturbed by mining activities is rehabilitated after closure. A rehabilitation plan and a financial guarantee must be approved prior to the issuance of mining leases (it is submit with closure plan, and updated during mining activities).

d) Sediment Characterisation

Surface sediment sampling was conducted in the summer of 2016 to determine its quality (SNC-Lavalin 2017d). Sediments were collected at 11 stations located in ten (10) lakes of the study area, including the *lac aux Pierres* [two (2) stations]. Analysis parameters included total extractable metals, pH, total phosphorus, total sulfur, total organic carbon, and petroleum hydrocarbons. The results were compared to the Criteria for the Assessment of Sediment Quality in Québec and Application Frameworks: Prevention, Dredging and Remediation [Environment Canada and *Ministère du Développement durable, de l'Environnement et des Parcs* (“MDDEP” 2007)]. Cadmium, mercury, lead and zinc were observed in exceedance according to these analyses. There is no issue associated with these exceedances that is likely to have an impact on resource extraction.

e) Geomorphology and Topography

The landscape of the northern part of the Lanaudière region has been shaped over the years by glaciations and movement of the Earth's crust, several million years ago. It is dominated by the presence of the Laurentians, which constitute old mountains whose summits softened or eroded over time.

High hills dominate the natural landscape of the study area, more specifically the *lac Sawin*, *lac Saint-Servais* and *lac Saint-Elphège* high hills. Also present are the hills of *lac Riopel* in the North, in the *rivière Matawin* area, and the hills of *lac de la Bouteille* in the East. These two (2) formations have smaller differences in elevation. The average elevation of the hills in the study area varies from 400 to 740 m, with a minimum elevation on the banks of *réservoir Taureau* (360 m).

f) Geochemistry

The following soil and rock materials will be disturbed by mining activities (SNC-Lavalin 2017e): overburden; waste rock that is predominated by graphitic paragneiss and mixed forms of paragneiss followed by smaller amounts of charnockite, biotite paragneiss and meta-gabbro. Processing of the graphitic ore will produce both a sulphurized concentrate (high sulphur content) and a de-sulphurized tailings stream (very low sulphur content). After that, tailings will be filtered for the dry stack tailings stream.

Representative samples of overburden, waste rock and tailings materials were subject to the following geochemical tests (SNC-Lavalin 2017e): mineralogy (XRD and QEMSCAN); Acid-Base Accounting (“**ABA**”) (Mining Environment Neutral Drainage Program [“**MEND**”] 2009); elemental analysis (*Centre d'expertise en analyse environnementale du Québec* [“**CEEAQ**”] 2012); and TCLP, SPLP and CTEU-9 static leachate tests (CEEQAQ 2012).

In relation to waste rock and overburden, ABA data suggests up to 71 % of waste rock will be Potentially Acid Generating (“**PAG**”) and includes graphitic paragneiss, mixed paragneiss and meta-gabbro. The non-PAG materials appear to be the overburden and charnockite and biotite paragneiss waste rock. No waste rock type or overburden has any elements at a concentration greater than Industrial Land Use threshold concentrations (Column C) (Beaulieu 2016). No waste rock type or overburden can be considered “high risk” according to Directive 019 criteria for TCLP leachable metals (MDDEP 2012).

In relation to tailings, ABA and mineralogical data sets suggest the sulphurized tailings will be PAG and the de-sulphurized tailings will be non-PAG. The only elements to report above Industrial Land Use Threshold Concentrations (Column C) (Beaulieu 2016) were molybdenum and nickel for the sulphurized tailings sample. Neither the sulphurized tailings nor the de-sulphurized tailings can be considered “high risk” according to Directive 019 criteria for TCLP leachable metals (MDDEP 2012).

Sampling was undertaken by NMG under the direction of Andrew Botfield from SNC-Lavalin (Principal geoscientist and geochemistry specialist). The program had 77 samples and is sufficient to inform the pre-feasibility stage of the Project. A Phase II of geochemical characterization is scheduled to start in December 2017 and will include more samples to be representative of the life of mine tonnages at a feasibility level of detail. Also, further geochemical test work is ongoing (e.g. kinetic test work upon waste rock, ore and tailings) and results will be incorporated into subsequent feasibility and environmental impact studies associated with the Project.

Before, during mine operation, and until the site meet the environmental criteria for post-closure, the following principles will be applied to the handling and storage of known PAG materials: use of surface water diversion structures to minimize contact water volumes; acid-rock drainage capture and water treatment infrastructure.

At the next engineering stage (feasibility) the tailings and waste rocks restoration concept should be further optimized to ensure that oxidation of acid generator sulphide mine tailings and rocks waste is mitigated adequately.

g) Hydrology

Several watercourses drain the northern part of the Lanaudière region, including the *rivière Matawin* which drains almost the entire territory of Saint-Michel-des-Saints (SNC-Lavalin 2017a). The water of the area is drained into the *baie du Village* in the *réservoir Taureau*, less than ten (10) km northeast of the study area. Ultimately, the *rivière Matawin* ends in the *rivière Saint-Maurice*, a major subwatershed of the St. Lawrence River.

The drainage system is well-developed in the study area with several water bodies and streams. Several large lakes are present near the study area: *lac England* (135 ha), *lac du Trèfle* (203 ha), *lac Kaïagamac* (195 ha), *lac Saint-Servais* (198 ha) and *lac Sawin* (324 ha).

The mineralized zone of the Matawinie Project is located on a high point, at the head of three (3) small watercourses. Two (2) of these watercourses flow to the northeast and empty into the *rivière Matawin*. The third watercourse is connected to the *lac aux Pierres* and flows South into the *ruisseau à l'Eau Morte*, which is a tributary of the *rivière Matawin*. The *ruisseau à l'Eau Morte* watershed has an area of 85 km<sup>2</sup>. It is the most likely to receive the effluent from the Matawinie Project's water treatment plant.

h) Hydrogeology

Preliminary investigations to establish the baseline hydrogeologic conditions on the future mine site (Tony Bloc, West Zone) and its surrounding areas took place during the period ranging from the fall of 2016 to the summer of 2017 (SNC-Lavalin 2016a, 2017f). This work included an inventory of existing private wells in the area, groundwater quality determination, piezometric survey of private wells and exploratory boreholes, as well as hydraulic drilling tests. The main conclusions of this study are as follows:

i) Private Wells Inventory

The inventory of private wells identified 25 private wells within three (3) km of the future mine site. Most of these wells are located North of the Project site and are built in the rock. Fifteen (15) private wells and two (2) surface water sources were sampled and analyzed in the laboratory. Water quality is generally good. Results and potential problems are identified at Section j.

ii) Pit Area

Two (2) hydrogeological units were identified, i.e. unconsolidated deposits composed of sandy-silty till especially northeast of the future mine site, reaching up to 40 m in thickness, and the underlying fractured rock mainly composed of paragneiss and gneiss.

Groundwater depth in the rock unit is very variable, ranging from the ground surface to nearly 30 m below it. This variation of water levels is typical of environments with a rugged topography. At the site scale, there is a piezometric dome in the southwestern part of the future mine site, where groundwater flows on both sides of the dome axis in a northeast and southwest direction, due to the topography of the site.

Hydraulic drilling tests estimated very locally the hydraulic conductivity of the various rock stratigraphic units along the deposit. This hydraulic conductivity is relatively variable from low to moderate permeability, ranging from  $1 \times 10^{-9}$  m/s (solid rock) to  $5 \times 10^{-6}$  m/s (fractured rock).

Additional hydrogeological studies are in progress based on the preliminary hydrogeological information and on the dewatering activities of the future mine site that will be carried out in order to extract the resource, as well as on the potential impacts on neighboring wells and receptors. They include the drilling of pumping wells in deep rock and of monitoring wells in rock and unconsolidated deposits; pump tests and permeability tests; sampling and analysis of groundwater. All of the data collected will be used to draw a portrait of the underground water and develop a numerical model on groundwater in the area. This model will be used to evaluate various dewatering scenarios as well as potential impacts.

i) Surface Water Quality

Surface water sampling was conducted during two (2) periods, i.e. in the summer of 2016 and in the spring of 2017, to determine its quality (SNC-Lavalin 2017d).

Surface water was sampled at 16 stations located in ten (10) lakes and six (6) watercourses.

The analysis was performed on four (4) main parameter groups: basic physicochemistry and nutrients; anions-cations; extractable trace metals; and petroleum hydrocarbons and phenols. The results were compared to the provincial criteria for surface water and the Canadian Council of Ministers of the Environment (“CCME”) Canadian Water Quality Guidelines for the Protection of Aquatic Life at the federal level.

Surface water quality is generally good, although some exceedances were observed for iron and aluminum in almost all lakes, as well as for lead in two (2) lakes. However, according to the MDDELCC, natural concentrations can sometimes be higher than the water quality criterion for these parameters. There is no issue associated with these exceedances that is likely to have an impact on resource extraction.

j) Groundwater Quality

The groundwater quality of the future mine site and neighboring areas was determined to establish the baseline conditions that prevail before the onset of the future mine’s activities (SNC-Lavalin 2017f). Groundwater samples were collected in six (6) exploratory boreholes, 15 private wells and two (2) surface water sources, and then analyzed by a certified laboratory. The findings were as follows:

- Groundwater in the area is described as freshwater given its low dissolved solids concentration, which varied between 38 mg/L and 240 mg/L;
- The geochemical signature of groundwater in the area is characterized by the presence of water essentially of the calcium (Ca) and carbonate ( $\text{HCO}_3$ ) type. More specifically, the groundwater in private wells located in surface deposits has a geochemical signature rich in Ca and  $\text{HCO}_3$ , whereas the groundwater in wells located in the rock has a more variable signature with magnesium (Mg) or sulphate ( $\text{SO}_4$ ) proportions;
- The concentrations of the parameters analyzed (inorganic, phenols, hydrocarbons (PAH and  $\text{C}_{10}$ - $\text{C}_{50}$ ) meet the provincial criteria of the Regulation Respecting the Quality of Drinking Water. Only point concentrations for manganese and iron were observed exceeding the threshold values. It should be mentioned, however, that both iron and manganese are aesthetic criteria, as recommended by Health Canada;
- Atypical bacteria concentrations exceed the drinking water criterion (200 CFU/100 ml) in three (3) private wells and two (2) water sources sampled. One (1) of the water sources has *E. coli* concentrations.

To complete the portrait of groundwater quality, water samples will be collected in ten (10) or so additional monitoring wells, and further analyzed in the laboratory in autumn 2017.

k) Noise Environment

A baseline noise survey was conducted on September 15<sup>th</sup> and 16<sup>th</sup>, 2016 on the Project site and on sites that could eventually be impacted by the Project (SNC-Lavalin 2016b). The objective of the noise survey was to determine the initial day and night sound level prior to the implementation of the Project.

On the Project site, the noise level was 32 dBA (24-hour noise level) whereas it varied from 32 to 34 dBA in the nearby recreational sites. In Saint-Michel-des-Saints, measurements at one (1) site indicated a noise level of 42 dBA (SNC-Lavalin 2016b). Additional noise measurement was completed on August 13<sup>th</sup>, 14<sup>th</sup>, 15<sup>th</sup> and 16<sup>th</sup>, 2017 (Soft dB 2017) in Saint-Michel-des-Saints and results varied from 62 dBA (24-hour noise level), near industrial site to 50-53 dBA in the village. In the *Domaine Lagrange*, the noise level varied from 38 to 44 dBA according to the day of measurement.

The *Règlement relatif aux nuisances* (421-2000) of the MRC de Matawinie and the Municipality of Saint-Michel-des-Saints prohibits the making of noise likely to disturb the peace and well-being of the neighborhood by conducting construction work and other activities between 10 pm and 7 am. The MDDELCC guidelines and instructions include noise limits for construction and operation phases of the project. These limits will be used to assess the conformity of the Project, determine the impacts and develop mitigation measures.

### 20.1.2 Vegetation and Wildlife Baseline Studies

a) Vegetation, Wetlands and Special Status Plant Species

i) Vegetation

Forest habitats were characterized in the field during the last two (2) weeks of July 2016 (SNC-Lavalin 2017g). Overall, 20 characterization stations were placed taking into account the forest types present in the study area and focusing on the areas that could be impacted by the Project. The objective of the characterization study was to inform on the plant associations and identify the main plant communities for each stand.

Hardwood stands are the most widespread in the study area and cover an area of 1,824.3 ha. The main plant communities are white birch and sugar maple stands. Mixed stands cover an area of 831.6 ha and are mainly

represented by balsam fir–white birch stands. Coniferous stands are scarce in the study area (277.4 ha) and are almost exclusively represented by balsam fir stands. A tamarack – balsam fir stand was also characterized along the *rivière Matawin*. The remaining of the study area is composed of wetlands (456.9 ha), agricultural land (9.4 ha), disturbed areas (natural or anthropogenic; 93.5 ha), water (213.1 ha) and islands (1.9 ha).

ii) Wetlands

Wetland characterization was conducted between July 19<sup>th</sup> and August 11<sup>th</sup>, 2016 (SNC-Lavalin 2017g). Characterization stations were placed in all wetlands potentially impacted by the Project (Project footprint of July 2016) to portrait the diversity throughout the study area. Wetland characterization and delineation were performed following MDDELCC’s guidelines (Bazoge et al. 2014). The ecological value of wetlands was then estimated using field data and cartographic analysis.

Wetlands include swamps, marshes, peatlands, as well as shallow waters. They represent an area of 456.9 ha in the study area. The most abundant wetlands are riparian shrub swamps (204.6 ha) and wooded swamps (102.2 ha). Peatlands cover 80.6 ha in the study area and are divided into two (2) types: bogs (41.5 ha) and fens (39.1 ha). Marshes represent 56.3 ha of the study area. Those characterized are located on old beaver dam sites or existing beaver ponds. Finally, shallow water with grass beds are mainly located in water bodies of the *rivière Matawin* floodplain and cover 13.6 ha in the study area.

The ecological value of characterized wetlands is generally high. Some isolated wetlands (wooded swamps and peatlands) have a medium ecological value. None of the wetlands have a low ecological value.

Considering that some wetland areas overlap the Project footprint, specific mitigation measures could be required by the MDDELCC. In addition, a certificate of authorisation (“CA”) under section 22 of the Environment Quality Act (“EQA”) must be received from the MDDELCC prior to the start of work. According to section 46.0.5 of the Act Respecting the Conservation of Wetlands and Bodies of Water, the CA issuance is conditional on the payment of a financial contribution based on the wetland area impacted by the Project.

iii) Special Status Plant Species

All potential habitats identified using the *Guide de reconnaissance des habitats forestiers des plantes menacées ou vulnérables: Outaouais, Laurentides et Lanaudière* (Couillard et al. 2012) and potentially impacted by the Project were visited during the summer, at the same time as the plant surveys in forested habitats (SNC-Lavalin 2017g). A specific survey was also conducted on July 28<sup>th</sup> and 29<sup>th</sup>, 2016 to gather information on the non-forested habitats likely to be impacted by the Project and that may contain threatened, vulnerable or likely to be so designated plant species.

Occurrences reported in the region by the *Centre de données sur le patrimoine naturel du Québec* (“**CDPNQ**”) are the wild leek (vulnerable in Quebec), northern adder's-tongue (likely to be designated as threatened or vulnerable in Quebec) and Vasey's pondweed (likely to be designated as threatened or vulnerable in Quebec).

Wild leek is associated with forests but its habitat is absent from the study area. Terrestrial and palustrine habitats associated with northern adder's-tongue, i.e. sandy shores, wet meadows, fens and rocky outcrops/escarpments, sand dunes and exposed sands, were explored. Vasey's pondweed habitats, i.e. sunny areas in open water and aquatic grass beds in medium and large rivers or lakes, were also explored. No special status plant species were observed in the study area.

During the surveys, an invasive alien plant was detected in the study area. This species, the common reed, had a colony northeast of the *lac aux Pierres*.

b) Aquatic Fauna and Fish Habitat

Information on the fish fauna present or likely to be present in the study area comes from existing data (*Ministère des Forêts, de la Faune et des Parcs* [“**MFFP**”] 2015), as well as from specific field surveys conducted in 2016 and 2017 (SNC-Lavalin 2017h). Field surveys targeted the watercourses and water bodies likely to be impacted by the Project. Fish habitat was characterized using the homogeneous segments method and experimental fisheries (electrofishing, net, shore seine, fyke net, and bait trap) in two (2) water bodies, i.e. the *lac aux Pierres* and the *Petit lac aux Pierres*, as well as in 35 unnamed watercourses, the *rivière Matawin* and the *ruisseau à l'Eau Morte*.

The surveys confirmed the presence of 12 fish species in the study area. In shallow watercourses, the number of species is fairly low, with six (6) species. The brook

trout was caught in one (1) of these watercourses. The creek chub, however, dominates catches. In water bodies, the *rivière Matawin* and the *ruisseau à l'Eau Morte*, which have been fished with fixed fishing gear, the diversity is 12 species. The creek chub is the most abundant species. The *lac aux Pierres* contains only the brook trout whereas the *Petit lac aux Pierres* is inhabited by two (2) species, i.e. the brown bullhead and the creek chub. The *rivière Matawin* has a larger diversity with seven (7) species, including the yellow perch and the smallmouth bass which, like brook trout, are species of fishing interest. No special status species was observed in the study area.

Watercourses where fish presence was confirmed and other watercourses with potential fish habitat are considered to be a fish habitat, i.e. a regulated wildlife habitat. These habitats benefit from a legal status of protection under the Regulation Respecting Wildlife Habitats at the provincial level and under the Fisheries Act at the federal level. Authorizations will therefore be necessary to comply with these legislations if these habitats were to be impacted by the Project.

- c) Terrestrial Fauna
  - i) Big Game

No field survey was conducted for this group of species due to the absence of a particular issue. The information comes from existing data (Lamontagne et al. 2006, Hénault 2015, MFFP 2015, Government of Quebec 2016).

The white-tailed deer population in hunting zone 15 is located at the northern limit of its range. In 2008, the density was estimated at 2.4 deer/km<sup>2</sup> of habitat for zone 15 West (Huot and Lebel 2012). Harvest varied from 63 to 247 deer between 2011 and 2015 (Government of Quebec 2016). MFFP (2015) reports the presence of white-tailed deer yards at the same latitudes of the study area, but outside its boundaries.

Moose are relatively abundant in hunting zone 15, especially because of a good quality habitat (Hénault 2015). The last estimate of the population in zone 15 was 1.8 moose/10 km<sup>2</sup> (Hénault 2015). In addition, the total moose harvest in hunting zone 15 varied from 231 to 256 moose between 2011 and 2015 (Government of Quebec 2016). MFFP (2015) reports the presence of a few moose yards within the study area.

The black bear is also relatively abundant in hunting zone 15 (Lamontagne et al. 2006). Population density was estimated at 2.4 bears/10 km<sup>2</sup> (Lamontagne et al. 2006). Besides, the bear population in zone 15 is quite

harvested, as the number of black bears harvested was 309 in 2015 (Government of Quebec 2016).

There is no issue associated with this group of species that is likely to have an impact on resource extraction.

ii) Furbearers

No field survey was conducted for this group of species due to the absence of a particular issue. The information comes from existing data (Prescott and Richard 2013, Government of Quebec 2016).

Overall, 16 furbearer species are likely to frequent the study area (Prescott and Richard 2013). The study area overlaps two (2) furbearer management units (UGAF), i.e. UGAF No. 26 and 27. The main furbearers trapped in this UGAF in 2015-2016 were the American beaver, the muskrat, weasels, the American marten and the raccoon (Government of Quebec 2016). All these species are common in Quebec. There is no issue associated with this group of species that is likely to have an impact on resource extraction.

iii) Small Mammals

The information used to describe the small mammals that inhabit or are likely to inhabit the study area come from a review of existing data (Desrosiers et al. 2002, MFFP 2015), as well as from a small mammals-specific survey conducted from August 17<sup>th</sup> to 22<sup>nd</sup>, 2016 (SNC-Lavalin 2016c). This survey was conducted using Victor snap traps placed at four (4) sites and focused on the southern bog lemming and the rock vole, two (2) special status species.

Overall, 203 small mammals belonging to at least nine (9) species were caught. The main species caught was the southern red-backed vole, with 47 specimens. The southern bog lemming was caught at each of the four (4) sites, for a total of 11 specimens. There was no rock vole among the specimens captured and its habitat seems rare in the study area. The other species caught are the short-tailed shrew, the masked shrew, the smoky shrew, the meadow vole, the meadow jumping mouse, the woodland jumping mouse, and the deer mouse. According to Desrosiers et al. (2002), the American water shrew, the pigmy shrew, the Eastern heather vole, the hairy-tailed mole and the star-nosed mole could also use the study area.

Considering the presence of a special status species in the study area, i.e. the southern bog lemming, specific mitigation measures could be required by the MFFP.

iv) Amphibians and Reptiles

The information used to describe the amphibians and reptiles that inhabit or are likely to inhabit the study area come from a review of existing data (*Atlas des amphibiens et des reptiles du Québec* [“AARQ”] 2015, MFFP 2015), as well as from targeted field surveys conducted in 2016 and 2017 (SNC-Lavalin 2017i). The surveys consisted in listening to anuran breeding calls, active searches for pickerel frogs, stream salamanders, forest salamanders and snakes, monitoring artificial shelters for snakes, and in a boat-based turtle survey along the *rivière Matawin*, which has a high potential for the presence of wood turtles. Survey protocols were previously approved by the MFFP.

The listening sessions conducted on August 2<sup>nd</sup>, 2016, May 11<sup>th</sup> and June 6<sup>th</sup>, 2017 identified four (4) anuran species, i.e. the Northern spring peeper, the Eastern American toad, the wood frog and the green frog. The bullfrog was observed during active searches and adds to these species. The active searches conducted between May 10<sup>th</sup> and June 21<sup>st</sup>, 2017 identified four (4) salamander species, i.e. the blue-spotted salamander, the yellow-spotted salamander, the Eastern redback salamander and the Northern two-lined salamander. Despite a significant survey effort, only two (2) snake species were observed in 2017: the Eastern common garter snake and the Northern redbelly snake. No turtle was observed during the three (3) surveys along the *rivière Matawin* on May 24<sup>th</sup> and June 7<sup>th</sup> and 22<sup>nd</sup>, 2017. However, the potential presence of other species, such as turtles, cannot be excluded. The CDPNQ (MFFP 2015) and the AARQ (2015) report occurrences of two (2) other anurans (Eastern newt and mink frog) and four (4) other reptiles (smooth greensnake, Eastern painted turtle, common snapping turtle and wood turtle) near the study area.

Of all the species mentioned above, three (3) have a special status: the smooth greensnake, the wood turtle and the common snapping turtle. The smooth greensnake was targeted by specific surveys but was not detected. The two (2) turtle species have also been the subject of specific surveys; they were not inventoried but survey conditions were not optimal. However, the habitats used by these turtles (lakes, water bodies, large watercourses, shorelines) do not overlap the current Project footprint. There is no issue associated with this group of species that is likely to have an impact on resource extraction.

v) Bats

The presence and nocturnal activity of bats were characterized with a fixed acoustic survey using eight (8) recording stations located near water bodies and wetlands (Fabianek 2016). The survey ran from June 29<sup>th</sup> to July 19<sup>th</sup>, 2016, i.e. during the birth and lactation periods of bats in Quebec. In addition, field searches for hibernacula were carried out from June 29<sup>th</sup> to 30<sup>th</sup>, 2016. The survey protocol was previously approved by the MFFP.

This survey confirmed the presence of five (5) bat species already reported in the Lanaudière region. The hoary bat was the most active, followed by the silver-haired bat, the little brown bat, the big brown bat and the red bat. All these species have a special protection status, except the big brown bat. Passes of *Myotis* bats, bats of the big brown/silver-haired complex and unidentified bat species were also detected. This 20-night survey recorded a total of 296 cumulated passes, all species combined. This activity index is comparable to other study areas sampled after the arrival of the white-nose syndrome in the province of Québec. A visual inspection of rocky outcrops visible from the road yielded no evidence of bat hibernacula in the area visited. Two (2) cottages located in the vicinity of the *lac aux Pierres* were also inspected for signs of bats. However, no guano deposit was visually identified in the areas explored.

Considering the presence of special status species in the study area, specific mitigation measures could be required by the MFFP.

d) Birds

i) Waterfowl and Other Waterbirds

A ground-based survey of waterfowl and other waterbirds frequenting the main water bodies of the study area (*lac de la Dame, lac à l'Île, lac aux Pierres, lac du Brochet, lac England, Petit lac aux Pierres, lac Séverin, lac Saint-Grégoire, rivière Matawin*) was conducted on May 15<sup>th</sup> and 19<sup>th</sup>, 2017 (SNC-Lavalin 2017j). The survey protocol was previously approved by the MFFP. Ten (10) waterfowl species, including eight (8) local breeders, and three (3) other waterbird species were observed in the study area. Since no special status species belonging to this group were observed in the study area, there is no issue associated with this group of species that is likely to have an impact on resource extraction.

ii) Birds of Prey

Bird of prey surveys were conducted on June 23<sup>rd</sup> and 28<sup>th</sup>, 2017 using eight (8) 500-m transects located along access roads (SNC-Lavalin 2017j). The survey protocol was previously approved by the MFFP. No bird of prey nest was found but four (4) species were detected: the turkey vulture, the bald eagle, the broad-winged hawk and the merlin. The bald eagle is designated as vulnerable in Quebec under the Act Respecting Threatened or Vulnerable Species. Since an adult of this species was observed twice in the *lac England* area, where its potential habitat is present, it is possible the bald eagle nests there.

iii) Land Birds

Land birds were inventoried from June 1<sup>st</sup> to 9<sup>th</sup> and from June 22<sup>nd</sup> to 28<sup>th</sup>, 2017 using 70 points counts located in the main habitats of the study area (SNC-Lavalin 2017j). The survey protocol was previously approved by the MFFP. The presence of 52 land bird species has been noted, mainly common species in Québec, except for the willow flycatcher and the bobolink. The bobolink is threatened according to the Committee on the Status of Endangered Wildlife in Canada, but the species has no legal protection status. Its habitat is rare in the study area and does not overlap the current Project footprint. The SOS-POP (2015) database reports the presence of known nesting sites of olive-sided flycatcher and Canada warbler in the study area but these are located outside the current Project footprint. There is no issue associated with this group of species that is likely to have an impact on resource extraction.

## 20.2 Requirements and Plans for Waste and Tailings Disposal, Site Monitoring, and Water Management

Mandatory environmental monitoring activities are addressed at Section 20.3.4. Additional environmental monitoring activities may be required according the results of the EIA process, to the conditions of certificate of authorization (MDDELCC) and the closure plan approved by the ministry (MERN).

Requirements and Plans for Waste and Tailings Disposal were addressed in Section 18.9.

## 20.3 Regulatory Context and Permitting

There are three (3) levels of government with laws, regulations and guidelines which could be applied to the Project, i.e., federal, provincial and municipal (including MRC and local municipalities). The federal and provincial regulations concern mainly the environmental aspects, while the municipal regulations concern mainly the land use planning and

cohabitation aspects. The federal and provincial regulations could impact the schedule of the Project because of their environmental impact assessment process and permitting delays (ex.: closure plan, certificate of authorizations). The environmental assessment and approval process will be described first and then the list of permits required will be presented in Table 20.1.

### 20.3.1 Federal

Under the Canadian Environmental Assessment Act, only projects designated by the Regulations Designating Physical Activities are subjected to the environmental assessment procedure. Graphite mines are not considered as a physical activity under this Regulation. Therefore, the Project would not be subjected to the process.

The Metal Mining Effluent Regulations does not apply to graphite mines.

### 20.3.2 Provincial

**Note: The EQA has been updated in March 2017. The Regulation Respecting Environmental Impact Assessment and Review will be modified no later than March 2018. The description below is based on the current environmental assessment process.**

The Matawinie Project – Tony Block should be subjected to an environmental impact assessment under Québec’s EQA. According to section 2 of the Regulation Respecting Environmental Impact Assessment and Review:

- The constructions, works, plans, programs, operations and activities described below are subject to the environmental impact assessment and review procedure provided for in Division IV.1 of the Act and must be the subject of a certificate of authorization issued by the Government in accordance with section 31.5 of the Act:
  - (n.8) the construction of an ore processing plant for:
    - metalliferous ore or asbestos ore, where the processing capacity of the plant is 2,000 metric tons or more per day, except in the case of rare earth deposits; (...)
    - › any other ore, where the processing capacity of the plant is 500 metric tons or more per day;
  - (p) the opening and operation of:
    - a metals mine or an asbestos mine that has a production capacity of 2,000 metric tons or more per day, except in the case of rare earths; (...)

- › any other mine that has a production capacity of 500 metric tons or more per day.

A graphite Project, presented in this Report is considered as “any other mine that has a production capacity of 500 metric tons or more per day and any other ore, where the processing capacity of the plant is 500 metric tons or more per day”. The nominal production rate is 3,400 metric tons per day at the concentrator. Therefore, the Québec Environmental Assessment Process will be triggered.

The environmental assessment process for southern Québec is briefly described in the following sentences.

According to section 16.1 of the Regulation respecting Environmental Impact Assessment and Review, the process could be carried out within 15 months. This 15 months period does not include the time that the proponent requires to prepare the Environmental Impact Assessment (EIA) and to provide additional information as per MDDELCC requests. Note that the term environment in EIA includes also the social aspects.

Therefore, it is reasonable to expect approximately 24 months to obtain the approval from the date that the EIA study is submitted. This 24 months period will be influenced by the seasonality of the required baselines.

The Provincial Environmental Assessment Process is typically divided in five (5) main steps which are described in further details hereunder.

- a) Step 1: Project Notice / EIA Guidelines [Expected Duration: One (1) Month]
  - The proponent submits a Project Notice to the MDDELCC to initiate the process.
  - The MDDELCC will provide the proponent with an official Project Guidelines specifying the scope and requirements of the EIA. Typically, the MDDELCC will provide the guidelines to the proponent within 2 – 3 weeks.
  - The 15-month legal timeframe begins when the MDDELCC receives the Project Notice, but is on hold as soon as the EIA guidelines are issued.

- b) Step 2: EIA Preparation [Expected Duration: six (6) to eight (8) Months]

The environmental consultant and the proponent prepare the EIA report according to the guidelines.

- Upon completion, the EIA report is submitted to the MDDELCC.
- The EIA report is reviewed by various ministries through a ministerial consultation. The MDDELCC is responsible to consult the different

governmental agencies likely to be interested by the project and to integrate their comments and questions.

- The MDDELCC issues a set of questions and comments which must be addressed promptly in the form of an addendum. It is not uncommon that the MDDELCC returns for a 2<sup>nd</sup> round or even a 3<sup>rd</sup> round of questions and answers, until the EIA report (and addenda) is judged officially receivable, meaning that it is complying with the guidelines. The time taken by the proponent to prepare the EIA and addenda to answer questions is excluded from the 15 months legal timeframe.
- This phase ends with the official emission of a letter asking the Developer to make the EIA report public. The letter formalizes the acceptance of the EIA report from the MDDELCC.

c) Step 3: Public Participation [Expected Duration: six to seven (6-7) Months]

- Once the EIA has been accepted by the MDDELCC, the proponent shall post a public notice in the newspapers inviting the public to consult the documentation. The public has 45 days to review the documentation and officially asks for public hearings on the project.
- An information session will be held by the *Bureau d'audiences publiques sur l'environnement* (“**BAPE**”) where the developer will be asked to present the project to the population. BAPE will explain the process of consultation and hearings.
- Should an application to the Minister to hold a public hearing be judged acceptable and not frivolous, the Government will assign the BAPE to conduct formal public hearings and to prepare their report and recommendations. BAPE has a legal period of four (4) months to hold the hearings and issue their report.
- Within 60 days of its reception, the BAPE report must be made public by the Minister of Environment.

d) Step 4: Government Decision [Expected Duration: three (3) Months]

- Based on the report from the BAPE and on the environmental analysis report, the MDDELCC prepares a draft of the decree authorizing the project to be signed by the government. By Order in Council, the government can authorize the project (with or without modifications and conditions) by a Decree or reject it.
- It is important to note that the Cabinet of the Government who issues the decree is not committed to any delay.

- e) Step 5: Permitting: CA (Expected Duration 1.5 – 3 Months per CA)
- Once the decree is obtained, the developer must still comply with the different regulatory requirements.
  - Several applications for a CA following the different stages of the design or the construction activities will be required. A delay of 75 days is usually contemplated by the MDDELCC for the review of an application and issuance of CAs, including the time to answer their questions, if need be.
  - In granting a CA, the MDDELCC certifies that the project is developing according to the EIA commitments and in conformity with applicable regulations.
  - At that stage, it is expected to provide more accurate technical information on the project activities as well as engineering drawings that must be stamped, signed and dated by an engineer with a right of practice in Québec.

Numerous others permits and authorizations will have to be obtained according to various sections of the EQA as indicated in Table 20.1. Permits and authorizations must also be obtained from others ministries, mainly *the Ministère de l'Énergie et des Ressources naturelles* (“**MERN**”) and potentially by the MFFP.

Besides the EQA, the Mining Act is of prime importance with regards to project permitting. The Mining Act provides a legal framework for developing, operating and closing mines, as well as for the mining site restoration process. It provides for the obligation for companies to submit and make approval by the authority a closure plan (included rehabilitation and restoration of the mine site) to the MERN prior to project approval, and to provide financial guarantees (financial guarantee is for 100 % of the whole mine site reclamation – 27 years – that shall be provided within the first 2 years of operation). The closure plan approval is a condition to obtain the mining lease from the MERN.

### 20.3.3 Municipal

a) MRC de Matawinie

The MRC de Matawinie’s development plan includes several standards and development guidelines that could apply to the Project, e.g. those related to the location of roads along lakes or watercourses, to riparian and littoral zone protection, to areas at risk of flooding or ground movement, to water, to gravel and sand pits, to sites of interest as well as to recreation and tourism routes. The certificate of compliance of the Project for the development plan of the MRC de Matawinie has been delivered on March 7<sup>th</sup>, 2016.

b) Municipality of Saint-Michel-des-Saints

The municipality of Saint-Michel-des-Saints regulations have no particular provision applying to mining projects, and the Project does not contravene with planning regulations of the municipality. The certificate of compliance of the Project to Saint-Michel-des-Saints' regulations has been delivered on January 27<sup>th</sup>, 2016.

**Table 20.1 – Permits and Authorizations Required for the Project**

<b>Legal Act</b>	<b>Section</b>	<b>Permit or Authorization</b>
<b>Federal</b>		
Fishing Act, Fisheries and Oceans Canada (DFO)	Section 35	Demand of DFO review and potentially a permit for activities in water susceptible to result in serious harm to fish that are part of a commercial recreational or Aboriginal fishery, or to fish that support such a fishery
Explosive Act	Section 7	Certificate for carrying or storing explosives
<b>Provincial</b>		
Environmental Quality Act (EQA) under the MDDELCC	Section 22	Construction and operation of the concentrator and for the opening and operation of the mine, as well as related infrastructures (mine tailings, waste rock, etc.).  Guidelines 019 for the mining industry will provide for various limits and environmental performance specifications.
	Section 32	Installation of water intake in a lake or river.  Installation of wastewater treatment units including O&G separator.  Installation of treatment unit of the sanitary effluent at the mine site.
	Section 31.75	Withdrawal of more than 75 m <sup>3</sup> of water per day and mine dewatering
	Section 48	Installation of a device or equipment designed to prevent, reduce or eliminate noise and atmospheric emissions
	Section 31.11	Industrial depollution attestation for the operation of an ore treatment facility

Legal Act	Section	Permit or Authorization
<b>Provincial</b>		
	Section 22 and Regulation respecting pits and quarries	Exploitation of borrow pits
An Act respecting the conservation of wetlands and water environment	Sections 23, 46.0.3, 46.0.5 and 46.0.6	Request for authorization
Mining Act under the MERN	Section 241	Authorization for the localization of the waste rock pile
	Section 100	Mining lease for the mine exploitation
	Section 232	Approval of closure plan and financial guarantee for the closure of the mine
Act Respecting the Lands in the Domain of the State under the MERN	Division II	Land lease for infrastructures located on the domain of the State
Sustainable Forest Development Act under the MFFP	Section 73	Forestry permit for activities carries out by a holder of mining rights in exercising those rights (tree cutting, road works)
Act Respecting the Conservation and Development of Wildlife Regulation respecting threatened or vulnerable wildlife species and their habitats Regulation Respecting Wildlife Habitats	Section 128.7 Section 26.1	Authorization to conduct an activity susceptible to affect a wildlife habitat (fish habitat) Permit for wildlife management (beaver or beaver dams), if needed.
Explosive Act under the Sûreté du Québec	Section 2,3 and 11	Permit of possession, storage and transportation of explosives
Building Act, Régie du Bâtiment	Section 35.2	Permit to store petroleum products

Legal Act	Section	Permit or Authorization
<b>Municipal</b>		
Règlements d'urbanisme Section I - Règlement de régie interne et relatif à l'Art.116 de la loi sur l'aménagement et l'urbanisme # 319-1992	Chapter 3.2 – Permits and certificates	Construction Permit

### 20.3.4 Monitoring

Once the Project restoration program will be accepted by the MDDELCC and MERN (under the closure plan) and the Project operation will start, the developer will have to establish and maintain a sample and measurement network for the mining effluent (Directive 019). Surface and underground water quality parameters will be measured according to table 2.9 of Directive 019 during the operation but also for the post restoration phase. The monitoring is mandatory for a minimum of ten (10) years for acid generating tailings (Directive 019). Additional requirement may be determined by the certificate of authorization provided by the MDDELCC.

Also, a monitoring program for the follow-up after mine closure has to be developed to ensure long term chemical and physical stability of any impoundment and engineering cover that will stay on the site after closure. The site should also be revegetated and this vegetation has to be sustainable and self-sufficient. This monitoring program has to be included and approved in the closure plan and their revision, and should be updated according to any risks or problematic on the mine site.

## 20.4 Social Context and Stakeholder Engagement

### 20.4.1 Brief Description of the Local Social Context

The North part of the MRC de Matawinie<sup>4</sup> (“*Haute-Matawinie*” in French) area is historically a forest-based economy. In the last decades, most of the Crown lands overlapping the claims have been harvested. These activities have significantly decreased in the recent past. Recently, the re-opening of the main Saint-Michel-des-Saints sawmill was announced, after being closed for several years.

The permanent population of this area is 6,048 people, including 2,354 people in Saint-Michel-des-Saints, 1,120 in Saint-Zénon, 85 people living in the non-organized territories and 2,489 people from the Manawan First Nation<sup>5</sup>, located about 70 km to the North-West of Saint-Michel-des-Saints.

Located less than a two-hour drive from Montréal, the Haute-Matawinie region is known for its cottages and recreational tourism. The area is also recognized for its hunting, fishing, boating, hiking, snowmobiling and all-terrain vehicle (“**ATV**”) riding activities. The Haute-Matawinie has many ATV and snowmobile trails, outfitters and ZECs (“*Zone*

<sup>4</sup> This large area corresponds to the northern part of the Matawinie MRC. It includes Saint-Michel-des-Saints, Saint-Zénon, the Manawan First Nation and the non-organized territory managed by the MRC.

<sup>5</sup> Source : Population of Saint-Michel-des-Saints and of Saint-Zénon : Statistics Canada, 2016 (<http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=F>); Population of the non-organized territory : MRC Matawinie, 2014 (<http://www.mrcmatawinie.org/index.jsp?p=102>); Atikamekw Nation of Manawan : Registered population living on reserve, INAC, 2017 ([http://fnp-ppn.aandc-aadnc.gc.ca/fnp/Main/Search/FNRegPopulation.aspx?BAND\\_NUMBER=78&lang=eng](http://fnp-ppn.aandc-aadnc.gc.ca/fnp/Main/Search/FNRegPopulation.aspx?BAND_NUMBER=78&lang=eng)).

*d'exploitation contrôlée*” in French). The southwest part of the Tony Block site is located within the Lavigne ZEC.

Cottage activities are significant (on private or public land) in the Haute-Matawinie area and many lakeshores are well developed. Within the one (1) kilometre buffer area around the Project site, two (2) cottage areas have been identified: the *lac aux Pierres* and the *Domaine Lagrange*. Lands dedicated to private forestry activities are also located within this buffer zone, on the Bellerose area. These are discussed further below.

#### 20.4.2 Social Acceptability and Stakeholder Engagement

Information in this Section has been provided by NMG for the matters of relation with the community. The content has been integrated by SNC.

The concept of social acceptability is hard to define, as it is intangible and multi-dimensional. In 2016, NMG has published a position statement<sup>6</sup> on its website to publically define its view of this concept. Several definitions of social acceptability exist, and NMG has adopted the following:

*“The result of a process by which the concerned parties build the conditions to be put in place together, for the harmonious integration of a project, a program or a policy, at a given time in its natural and human environment”<sup>7</sup>.*

NMG does not wish to oppose the “majority against the minority” which would lead to social polarization. Instead, NMG intends to respect minority rights and to work closely with those who may be directly affected by the Project to address their concerns and expectations. This is achieved through the establishment of a continuous dialogue and should not be seen as a “licence” to be obtained (usually referred to in the industry as the Social Licence to Operate “SLO”).

NMG has taken several steps to engage with a range of stakeholders, holding various meetings (see Section 20.4.2a) below) in addition to implementing several measures in response to stakeholder concerns (see Section 20.4.3 below).

##### a) Stakeholders

The process of engaging with stakeholders and the public was initiated in June 2015, at the same time as the exploration activities. NMG has since met and interacted with a range of stakeholders including municipal and political organizations, economic actors, environmental groups, as well as with nearby

<sup>6</sup> <https://nouveau monde.ca/wp-content/uploads/Positionnement-social.pdf>

<sup>7</sup> Free translation. Extracted from: Caron-Malenfant, Julie and Thierry Conraud, Guide pratique de l'acceptabilité sociale : pistes de réflexion et d'action, Édition DPRM, 2009.

cottagers and homeowners (importantly those located within the one (1) kilometre buffer zone around the mineralized area), and with the Atikamekw First Nation of Manawan and the Council of the Atikamekw First Nation.

The Project is facing some opposition, mainly from cottagers who want to protect their tranquility and investment, but also from environmentalists who question the overall impacts of such a project. This opposition is mostly embodied by the *Coalition des opposants à un projet minier en Haute-Matawanie* (“COPH”). NMG has engaged with this group, and has invited them to meetings on several occasions, and taken part in activities proposed by this group. In addition, representatives from this group were invited by NMG to take part in the Stakeholder Committee, presented in Section 20.4.2b) below. On the other hand, the Project is supported by local organizations, by surrounding municipalities (Saint-Michel-des-Saints and Saint-Zénon), by the business community, and by a solid base of yearlong residents.

Table 20.2 provides a summary of the key stakeholders with whom NMG has communicated in the recent past.

**Table 20.2 – NMG Key Stakeholders**

Proximity (1 km from the projected pit)	<i>Lac aux Pierres</i> cottagers/Owners
	<i>Domaine Lagrange</i> cottagers/Owners (south part)
	Others Isolated cottagers, owners and land users
Other Owners/Cottagers/ Land users related to the exploration zone (2015 works)	<i>Lac du Trèfle</i> cottagers/ Owners
	<i>Domaine Lagrange</i> Cottagers/Owners (north part)
	<i>Lac England</i> cottagers/owners
	Others Isolated cottagers, owners and land users
	Real estate proponents
First Nation	<i>Conseil des Atikamekw de Manawan</i> (Atikamekw First Nation of Manawan)
	<i>Conseil de la Nation Atikamekw</i> (Council of the Atikamekw First Nation)
Political	Federal MP (Gabriel Ste-Marie, <i>Bloc Québécois</i> )
	Provincial MNA (André Villeneuve, <i>Parti Québécois</i> )
	Minister for the Lanaudière Region
Municipal	MRC de Matawinie
	Municipality of Saint-Michel-des-Saints
	Municipality of Saint-Zénon

Gouvernemental	MERN — Mauricie-Lanaudière Regional Direction
	MERN — <i>Direction du développement et du contrôle de l'activité minière</i>
	MFFP — <i>Direction de la gestion des forêts Lanaudière - Laurentides</i>
	MDDELCC — Strategic and Environmental Assessments Regional Direction
	MDDELCC — Montréal, Laval, Lanaudière and Laurentides Regional Direction
Environmental	Saint-Maurice Watershed (“ <b>BVSM</b> ”)
	Lanaudière Environmental Regional Council (“ <b>CREL</b> ”)
Economic	Chamber of Commerce of Haute-Matawinie
	Regional Tourism Association of Lanaudière
Others	<i>Coalition des opposants à un projet minier en Haute Matawinie</i> (“ <b>COPH</b> ”)

NMG has met with these stakeholders and with members of the public on several occasions since 2015, as illustrated in Table 20.3 below. It should be mentioned that another public meeting, open to all, is planned for the end of November 2017.

**Table 20.3 – Information and Consultation Meetings and Number of Stakeholders Met**

<b>Year</b>	<b>Individual meetings, meetings with small groups (on invitation)</b>	<b>Public meetings (open to all)</b>	<b>Number of stakeholders*</b>
2015	17	0	At least 105
2016	11	2	At least 470
2017	18	1**	At least 340

\*Some individuals or representatives may have taken part to more than one (1) meeting.

\*\*Organized by the COPH.

In the course of these meetings, stakeholders have expressed a number of expectations and concerns. Invariably, discussions focused on the potential mine impacts and benefits. NMG was able to integrate some of these concerns into the Project design, or to anticipate effects that could be minimized or avoided through a range of measures (see Section 20.4.3 for details on stakeholder concerns and associated measures taken by NMG).

b) Stakeholder Committee

Given people's desire to be active in their community, the development of a mining project should include local input from the outset of the exploration stage. To this end, NMG has set up a Stakeholder Committee, with the objective to encourage the involvement of the local community in the development of the projected graphite mine. The role of the committee is to support the development of the mine with regards to the protection of the environment and the optimization of the regional economic benefits of the Project. The committee also aims at facilitating the implementation of an open and ongoing dialogue between key stakeholders and NMG's team.

The composition of the committee includes representative from several organizations (NMG, the Atikamekw First Nation of Manawan, the municipalities of Saint-Michel-des-Saints and of Saint-Zénon, the Chamber of commerce, the MRC, the recreo-touristic sectors, environmental organizations, the public health sector, land-users from the ZEC Lavigne and members of the local communities). The COPH has been invited to sit on the committee by the members on several occasions, but the invitation has been declined by this organization.

The first meeting of the Stakeholder Committee took place in May 2017, and three (3) other meetings have been held so far (June, August, and October 2017). Several themes were discussed in the course of these meetings, such as:

- The organization of the committee and its composition;
- Follow up on the overall Project's advancement and ongoing studies;
- Exploitation modalities of the mine (work schedules, waste management, etc.);
- The creation of thematic work committees;
- The Project's integration plan.

It is NMG's intention to maintain this committee throughout the mine development process to ensure the inclusion of the local community's vision as much as possible.

c) Public Meetings

Two (2) public meetings were organized by NMG in 2016 (February, September). NMG has taken part in a public meeting organized by the COPH in August 2017. NMG is also preparing another public meeting to be held in November 2017.

Advancements on the project were presented and the public had the opportunity to ask their questions to NMG representatives. A number of subjects were discussed during these meetings, ranging from hydrogeological studies to house pricing and other nuisances and concerns, and including environmental concerns (noise, dust

emissions, waste management, etc.). Potential mitigation measures that could be taken by NMG were also discussed.

d) Meetings with the Atikamekw Nation

NMG has met with the Band Council of the Manawan Atikamekw First Nation in July 2016, and with the Grand Chief of the Atikamekw Nation Council in May 2017. It was agreed by all parties to work towards a pre-development agreement.

In August 2017, a working group on this pre-development agreement was formed and a first meeting was held. In September 2017, a work plan was adopted in view of reaching this agreement in early 2018. It should be mentioned that NMG has been communicating with the Atikamekw on a weekly basis in the past few months and that one representative from Manawan is sitting on the Stakeholder Committee.

e) Other Meetings and Committees

As mentioned above, there is some opposition to the Project, and most opponents have grouped under the COPH. On August 20<sup>th</sup>, 2017, NMG took part in a public meeting organized by the COPH to answer questions on the Project. Approximately 200 people took part in this meeting.

NMG is also participating in the new Employment Committee of the Haute-Matawinie, launched by the mayor of Saint-Michel-des-Saints in October 2017, to discuss and find solutions for the recent shortage of workers in the region. This committee is composed of many municipal and regional organizations; eight (8) local companies, including NMG, also participate.

### 20.4.3 Socio-economic Issues and Measures

a) Summary of Stakeholder Concerns

The numerous interactions mentioned above with stakeholder and the public have allowed the identification of nine main social, economic and environmental issues:

- Loss of property value;
- Noise and air quality;
- Quality of the environment and of water;
- Employment and economy;
- Physical and psychosocial health;
- Community relations;
- Land use and footprint of the Project;
- Road transportation and safety;
- Justification of the Project.

Local and regional organizations are supporting the Project, mainly because of the anticipated economic benefits to the region brought by long-term job creation and business opportunities. Some concerns were expressed regarding the post-mining heritage (environmentally and socially) and the impact that a mine could have on the region's nature-based reputation. According to the feedback obtained from local people and businesses, most of the local population seems to welcome the Project. The reaction of the people in the public information meetings held in 2016 and 2017 in Saint-Michel-des-Saints confirmed this, and the progressive work undertaken at the Stakeholder Committee also supports this conclusion.

While the Project is well received at the local level, there are cottagers and local residents who understandably oppose the Project given the anticipated effects on their property. Generally, those opposed to the Project expressed concerns related to the loss of quality of life, property devaluation and potential environmental impacts. Consequently, some cottagers and homeowners expressed anger towards the Project and NMG. Some of these cottagers do not live there on a permanent basis and while they are aware that the Project will be beneficial for the local economy, they are concerned about losing their tranquility and investment. Some owners have openly expressed their opposition to the Project, while others are interested in a job or work related to the Project.

As for the Atikamekw Nation, their concerns with regards to the Project may be summarized as follows:

- Be able to leverage economic benefits from this Project. They are interested in qualified jobs, but want to ensure that training needs are identified ahead of time. Job opportunities for youth should be targeted;
- Ensure economic benefits for local Aboriginal businesses, and perhaps participate financially in the Project;
- Potential impacts on the health of their members;
- Make sure that the Atikamekw are respected throughout the Project phases.

In addition to social and environmental concerns expressed by stakeholders summarized herein, a range of expectations towards NMG were formulated:

- Transparent communication and hold public consultations;
- Involvement in finding solutions;
- Listening and empathy;
- Maximizing the benefits for the region, opportunities for local businesses, employment and training where applicable;
- Minimizing impacts, preserving the current situation to the extent possible;
- Maintain enjoyment and use of the land;

- For owners impacted, possibility to easily sell their property without any devaluation;
- Respect of the environmental and social commitments.

b) Mitigation Measures

The information and consultation process that has been put in place in the course of the past two (2) years has aimed at unpacking these concerns and at designing adequate measures to minimize adverse effects or to avoid them where possible. NMG wishes to design a mining operation with as little impact as possible beyond the projected mine site and buffer zone [one (1) kilometre]. What follows describes the main mitigation measures taken so far or to be taken by NMG. Most of these measures are presented in Table 20.4.

**Table 20.4 – Summary of Concerns and of Mitigation Measures**

Main Concerns	Mitigation Measures
Loss of Property Value	<ul style="list-style-type: none"> <li>• Offer to acquire properties located within 1 km from the projected mine pit. Preparation of an acquisition protocol.</li> <li>• Design an integration plan to the mine site territory, including the development of a housing sector.</li> </ul>
Noise and Air Quality	<ul style="list-style-type: none"> <li>• Progressive restoration of the mining waste areas.</li> <li>• Work schedule of 12 hours a day, 5 days a week for the mine operation, of the crusher and of the mining waste area.</li> <li>• Carry out preliminary sound and air emissions modelling in order to provide orientations for the feasibility study.</li> </ul>
Quality of the Environment and of Water	<ul style="list-style-type: none"> <li>• Waste management and conception of the mine waste area according to the geochemical characteristics of the waste.</li> <li>• Re-circulation of the water required for the treatment of the minerals and elimination of treatment water discharge.</li> </ul>
Employment and Economy	<ul style="list-style-type: none"> <li>• Prioritize local workforce and local businesses.</li> <li>• Engage in discussions with the Manawan Atikamekw First Nation and with the Atikamekw Nation Council to reach a pre-development agreement.</li> </ul>
Physical and Psychosocial Health	<ul style="list-style-type: none"> <li>• Carry out a literature review on the toxicity of graphite.</li> <li>• Propose a structuring and long term project around which the community may mobilize that includes local economic benefits and the project's integration plan.</li> </ul>

Main Concerns	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Carry out a literature review on the evaluation of psychosocial impacts.</li> </ul>
Community Relations	<ul style="list-style-type: none"> <li>• Multiply meetings and opportunities for dialogue with stakeholders, ever since the beginning of the exploration.</li> <li>• Setting up of a Stakeholder Committee.</li> <li>• Put in place an integrated communication process that aims at liaising with the community regarding fieldworks (web site describing field works and effected area as well as information letters to nearby property owners).</li> <li>• Opening of an office on Brassard Street (main street of Saint-Michel-des-Saints).</li> <li>• Hiring of an office and community relations employee to provide assistance with questions and possible grievances from the local population.</li> </ul>
Land Use and Footprint of the Project	<ul style="list-style-type: none"> <li>• Provision for a progressive backfill of the pit.</li> <li>• Separation of sulfides that are found in mine waste.</li> <li>• Preliminary landscape modelling and analysis in order to provide orientations for the feasibility study.</li> <li>• Ongoing assessment of concept for the co-disposal of waste for the feasibility and optimization of the mine waste areas.</li> <li>• Ongoing assessment of an electrically powered mine (including mobile equipment) to reduce the greenhouse gas emissions.</li> <li>• Valorization of the territory through an integration plan.</li> </ul>
Road Transportation and Safety	<ul style="list-style-type: none"> <li>• Identification of an optimized route.</li> </ul>
Justification of the Project	<ul style="list-style-type: none"> <li>• Development of a project that adds value and optimizes the uses of graphite.</li> <li>• Valorization of strategic resource for the electrification of transport: in addition to the traditional uses of graphite, it is necessary for the manufacturing of the anodes that are part of lithium ion batteries, which is a key element in the electrification of transport.</li> <li>• Revitalization of the local, regional and provincial economy.</li> </ul>

- Maintain Communications with Stakeholders, the Public and the Atikamekw

As discussed in Section 20.4.2a) above, NMG has engaged with a great number of stakeholders, including with Project opponents. Another public meeting open to all is scheduled to take place at the end of November 2017. It is NMG's intention to continue to communicate with stakeholders and the public, and to maintain the Stakeholder Committee and its participation in other committees as well as to ad hoc events. In addition, NMG is following its work plan to reach a pre-development agreement with the Atikamekw First Nation in the near future.

- Development of an Acquisition Protocol

NMG has developed a proactive acquisition protocol for the homes or cottages and lands located within one (1) kilometre of the mine pit. The protocol includes provision for the independent evaluation of the property value, and promotes dialogue leading to consensual agreements. Home/cottage and land owners within the area are divided into three (3) groups:

- *Lac aux Pierres*: Owners were invited to a few meetings since July 2014, and group representatives were met at several other moments. Properties have been evaluated and a meeting is scheduled to be held before the end of the year to present the results and to begin the negotiation process. There are eight (8) cabins and 12 recreational leases within the one (1) kilometre zone in this area.
- *Domaine Lagrange*: An initial meeting was held with the owners back in 2015. Since then, NMG has acquired two (2) properties in the area and has begun discussions with three (3) other owners. For the *Domaine Lagrange*, the one (1) kilometre zone includes 16 owners [some with more than one (1) property], and six (6) cabins/residences. NMG itself owns two (2) properties in this area.
- *Bellerose*: Two (2) forestry land parcels are located along the future mine site. The two (2) owners have been met and their properties will be evaluated. There are no constructions on these land properties.

- Development of an Integration Plan to the Receiving Environment

NMG has developed an integration plan of the Project to the territory, and looking forward for collaboration with stakeholders to improve it. The plan aims at ensuring proper integration of the Project in its receiving environment, using the properties acquired from the *Domaine Lagrange*.

This is also a way to give back to the community, to ensure its sustainable development, and to maintain the value of the nearby properties. In short, the integration plan aims at making this Project “more than just a mine” and is articulated around four (4) axes:

- Enhance possibilities for contact with nature (trails, viewpoints, rest areas, protection of ecological zones, valorization of historical and archaeological sites, etc.);
  - Reveal and educate on the historical local forestry activities, and provide incentives to discover the natural topography of the area (trails, ATV trails, viewpoints, etc.);
  - Develop public access to the mining exploitation and local geology and provide guided tours, interactive activities, and a research and development center;
  - Develop interactive installations featuring the use of future and cutting edge technologies for the benefit of the public (services and commodities, phytotechnologies, creation of an innovative and sustainable housing sector, etc.).
- Measures included in the Project design or operational measures aimed at minimizing impacts. Most of these measures are presented in Table 20.4. Examples include:
    - Given the presence of several cottagers, it has been determined that the work schedule for the mining activities would be of 12 hours day / five (5) days a week to avoid work during the weekends and in the evenings or at night;
    - Carry out preliminary sound and air emissions modelling in order to provide orientations for the feasibility study;
    - Ongoing assessment of concept for the co-disposal of waste for the feasibility and minimization of the mine waste areas and impact on water quality;
    - Ongoing assessment of an electrically powered mine (including mobile equipment) to reduce the greenhouse gas emissions.

#### 20.4.4 Next Steps

In the next few months, NMG is planning to hold another public meeting to provide information on the overall Project advancement. In addition, NMG will continue to work with the Stakeholder Committee and to progress on the pre-development agreement with the Atikamekw First Nation.

A key element of the Project's critical path is the undertaking of the Environmental and Social Impact Assessment. This encompassing assessment will be the occasion to obtain an overview of the Project's potential environmental and social effects and to maintain dialogue with stakeholders and the public. Further mitigation measures will be prepared to ensure that the Project responds to environmental requirements and to concerns expressed by stakeholders and the public.

## 20.5 Closure Plan

These elements were addressed in Section 18.9 and in Section 21.1.11.

## 21.0 CAPITAL AND OPERATING COSTS

The Project scope covered in this Study is based on the construction of a green field mining and processing facility with an average mill feed capacity of 1,222,314 tonnes per year of ore and producing 52,000 tonnes per year of graphite concentrate.

The capital and operating cost estimates related to the mine, the concentrator, and all required facilities and infrastructure have been developed by MC-DRA or consolidated from external sources.

The capital and the operating costs are reported in Canadian Dollars (“\$”).

### 21.1 Capital Costs Estimate

The capital cost estimate (“**Capex**”) consists of direct and indirect capital costs as well as contingency. Provisions for sustaining capital are also included, mainly for tailings storage expansion. Amounts for the mine closure and rehabilitation of the site have been estimated as well. The working capital is discussed in Section 22.0 – Economic Analysis.

#### 21.1.1 Scope of the Estimate

The Capex includes the material, equipment, labour and freight required for the mine pre-development, processing facilities, tailings storage and management, as well as all infrastructure and services necessary to support the operation.

The Capex prepared for this PFS is based on a Class 3 type estimate as per the Association for the Advancement of Cost Engineering (“**AACE**”) Recommended Practice 47R-11 with a target accuracy of  $\pm 25\%$ . Although some individual elements of the Capex may not achieve the target level of accuracy, the overall estimate falls within the parameters of the intended accuracy.

The reference period for the cost estimate is Q3 2017.

##### a) Major Assumptions

The Capex is based on the Project obtaining all relevant permits in a timely manner to meet the Project schedule.

The Capex reflects an Engineering, Procurement and Construction Management (“**EPCM**”) type execution wherein one EPCM contractor will provide the design, procurement and construction activities for the Project. All sub-contracts would be managed by the EPCM contractor.

All back-fill materials will be available from gravel pits or other sources located close to the site. Mine waste rock is not suitable for use in road construction. All excavated material will be disposed of within the site battery limits.

Hydro-Québec will provide the permanent power line in Month 5 of construction for use as construction power, while in the meantime temporary power will be available from diesel generators.

b) Major Exclusion

The following items were not included in the Capex:

- Provision for inflation, escalation, currency fluctuations and interest incurred during construction;
- Project financing costs;
- All duties and taxes were excluded from capital cost, however are considered in the economic analysis.

### 21.1.2 Capital Costs Summary

Table 21.1 presents a summary of the pre-production initial capital and the sustaining capital costs for the Project.

a) Pre-production Initial Capital Cost

The pre-production initial capital cost for the scope of work is \$ 180.8 M, of which \$ 118.2 M is direct cost, \$ 36.9 M is indirect cost, \$ 22.1 M is contingency, \$ 2.0 M is NSR by-out and \$1.6 is for closure costs.

Provision for sustaining capital is \$ 26.4 M, excluding the amounts for working capital.

b) Closure and rehabilitation costs

Based on site layouts, a provision of \$ 3.2 M was estimated for the closure and rehabilitation of the mine site. Requirements were established and cost estimation was based on material take-off and unit rates from recent database.

The expenses were accounted for in the economic analysis according to the most recent Québec legislation as follows: \$ 1.6 M will be spent as pre-production capital while the balance will be spent in each of the 1<sup>st</sup> and 2<sup>nd</sup> years of production.

No provision is required for the dismantling and disposal of the industrial facilities as it is assumed that the costs will be compensated by the salvage value.

**Table 21.1 – Summary of Capital Cost Estimate**

Description	Initial Costs (\$)	Sustaining Costs (\$)	LoM Costs (\$)
Direct Costs			
Mining	4,778,000	3,381,000	8,159,000
Processing Plant	73,986,000		73,986,000
Infrastructure	3,933,000		3,933,000
Tailings and Water Management	29,135,000	18,182,000	47,317,000
Main Electrical Distribution and Communication	6,339,000		6,339,000
<b>Sub-Total Direct Costs</b>	<b>118,171,000</b>	<b>21,564,000</b>	<b>139,734,000</b>
Indirect and Owner's Costs			
Project Development Costs	4,550,000		4,550,000
EPCM Costs	14,221,000		14,221,000
Owner's Costs	18,133,000		18,133,000
<b>Sub-Total Indirect Costs</b>	<b>36,904,000</b>		<b>36,904,000</b>
Contingency	22,150,000	3,235,000	25,385,000
Closure Costs	1,582,000	1,582,000	3,164,000
NSR Buyout	2,000,000		2,000,000
<b>TOTAL Costs</b>	<b>180,807,000</b>	<b>26,380,000</b>	<b>207,187,000</b>

The totals may not add up due to rounding.

### 21.1.3 Basis of Estimate - General

The capital cost estimate covers the facilities included in the scope of the work described in previous sections.

The Capex is based on the following key assumptions:

- The proposed construction work week is 8 hours per day, 5 days per week. All construction workers will be billeted nearby. No camp is provided;
- Fluctuations to nominated currency exchange rates are excluded;

- Allowance for industrial dispute or lost time arising from industrial actions is excluded;
- All taxes and duties are excluded;
- Escalation is excluded;
- Project financing costs and interest during construction is excluded;
- No allowance is made for acceleration or deceleration of the Project schedule;
- Project insurance is included in the Owner’s cost.

The Project schedule is presented in Section 24.0 and the Capex associated with the schedule is based on an advance period whereby the design concepts are frozen and basic engineering commences. The timing for this start is following approval of the EIS and obtaining initial permits. The work would then continue through its life-cycle until the end of the construction and commissioning.

a) Currency

The Capex base currency is Canadian dollars. The Capex consists of items quoted in various foreign currencies which have been converted into Canadian dollars using exchange rates as of August 15, 2017. The vast majority of pricing for equipment and bulk materials is based in Canadian dollars. Table 21.2 shows the currency exchange rates used in this Report.

**Table 21.2 – Currency Exchange Rates and Percent Content**

Currency Code	Currency Name	\$ Canadian
CAD	Canadian Dollar	1.00
USD	US Dollar	1.33
EUR	Euro	1.40

b) Material take-off and unit rates

All quantities generated for the estimate are mainly based on engineering material take-off (“MTO”) and deliverables which exclude contingencies of any kind.

Based on quantities for each item, budget proposals for unit rates were obtained from qualified contractors for earthwork, concrete, structural steel and architectural features. The unit rates include the material, transportation, construction equipment and direct labour as described below.

Budget provision for contractor's mobilization/demobilization and site management were also provided separately on the same basis and are accounted for in indirect costs as described further below.

c) Construction Labour, Productivity Loss Factor

For works other than earthwork, concrete, structural steel and building cladding, as well as piping, the labour costs were estimated based on man hours and hourly rates as follows: the labour rate was developed for a typical crew from detailed tables of current rates developed by the *Association de la construction du Québec*.

The all-inclusive hourly rate includes the basic hourly rates for the tradesman, social benefits and employer's burden, industrial site premium as required, direct supervision, small tools, personal protection equipment, consumables, and contractor's overhead and profit. Indirect supervision and site establishment as well as contractor's mobilization/demobilization are excluded from the hourly rate but are provided for as indirect costs in the construction contractor's site management provision as described further below.

The productivity loss factor was established in consideration of the working calendar, the work rotation, the climatic conditions and remoteness of work site.

The working calendar was defined as one (1) shift per day, eight (8) hours per shift and five (5) days per week for a total of 40 hours per week. Consequently, the hourly rate is established at \$ 141 and productivity loss factor at 1.05.

It is assumed that sufficient lodging would be available in the nearby areas; therefore, no construction camp is required and the Quebec construction regulations would apply. The provision for per diem allowances to cover room & board and traveling of workers is included in the hourly rate.

In addition to the labour cost, a construction allowance based on delivered equipment cost was established from similar projects to cover for construction material, sub-contract and mobile cranes to be paid by the Owner; the middle range factor of 5.0 % is applied.

General survey was performed with major qualified contractors to validate the basis for cost estimation of labour.

d) Construction and Contractor's Costs

Provisions have been included in the indirect costs for contractor's mobilization/demobilization and site management to cover for contractor's major equipment and supplies, including owned and rented construction equipment,

vehicles and other facilities such as trailers, tool cribs, power panels, containers, maintenance of area, janitorial and clean-up. Special installation tools, cranes, scaffolding, cribbing and dunnage were also included as well as work place weather protection. Workers transportation within the construction site is also included.

Provisions also cover for construction contractor's site management including supervision and support staff such as administration and procurement, coordination and scheduling, quality and safety.

The estimate is based on the assumption that construction contracts will be attributed on the base of a competitive bidding process amongst qualified contractors. Availability of local qualified contractors and skilled workers is expected. It is also expected that an average level of site management, contract administration, quality control and adequate safety requirements will be required from the contractors by the construction management. A realistic schedule, proper logistics and appropriate construction management are also expected as well as good site conditions, limited number of contractors on site, limited work outside in winter, limited work required in overtime and also limited work disruption due to changes, interferences or delays.

e) Freight, Duties and Taxes

Based on recent surveys and studies and when not included in the cost, the freight was accounted for by adding a factor to the value of the goods; a factor of 10.0 % is applied.

All duties and taxes were excluded from the capital cost, but relevant factors were considered for the after tax economic analysis.

#### 21.1.4 Base of Estimate - Mining

The mining operation has been estimated on the basis of an initial phase of development where a contractor will clear the mine area, the overburden stockpile, the waste stockpiles and the ore stockpile of trees and remove the topsoil to the topsoil stockpile.

Following the initial phase, the mine development phase will be carried out by a mining operator who will provide the major mine equipment, the service equipment and the mine support equipment necessary to supply the required quantity and quality of material to the crusher. The mine development work is costed as a value per tonne of material moved.

The mine development cost therefore includes all necessary mine and service equipment, supply of explosives and blasting, mine dewatering to the settling pond, and development of mine roads. Approximately 1.2 km of mine roads are required during the initial period.

The mine development cost attributed to the contractor accounts for the activities that will be carried out during a two (2) months pre-production period to prepare the mine for operations. Any ore encountered during the pre-production phase will be stockpiled close to the crusher. Since the ore has the potential to be acid generating, the capital cost for the mine includes a provision to install an impermeable membrane at the base of the ore stockpile.

The waste stockpile will be developed with liners to contain acid generating material.

Table 21.3 presents the cost breakdown for the mine Capex.

**Table 21.3 – Mining Capex**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
110	Mining Equipment	494,000
115	Mine Roads and Crusher Ramp	471,000
120	Mine Dewatering	134,000
130	Mine Pre-Production	3,676,000
150	Mine Explosives Storage*	0
180	Mine Communications	2,000
<b>TOTAL Mine Capex</b>		<b>4,778,000</b>

The totals may not add-up due to rounding errors.

\* The mine explosives storage cost is included in the drilling and blasting contract. See mining operating costs.

### 21.1.5 Base of Estimate - Main Electrical Distribution and Communications

Requirements were established for the main power line and the cost was estimated based on the hypothesis of supply by Hydro-Québec from the *Poste Provost* with 34.5 kV power line. The costs estimation for the power line and for the connection to the poste were established based on in-house database from recent similar project.

Based on the power demand and site layout, requirements were established for the main sub-station and for the site distribution power lines. Equipment budget prices and costs for material and installation were established based on qualified suppliers budget proposal and in-house database from recent similar projects.

Requirements were also established for emergency power supply. A budget price was estimated based on qualified supplier budget proposal.

Requirements were also established for communication needs and costs estimates for a communication tower were based on budget proposal from qualified supplier.

Table 21.4 presents the cost breakdown for the electrical distribution and communication capex.

**Table 21.4 – Electrical Distribution and Communication Capex**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
210	Main Substation	2,355,000
220	Power Line	2,310,000
250	Site Power Distribution	216,000
260	Main Electrical Rooms	527,000
270	Control Room	931,000
<b>TOTAL Electrical Distribution Capex</b>		<b>6,339,000</b>

The totals may not add-up due to rounding errors.

#### 21.1.6 Basis of Estimate – Infrastructure

The access road site to the mine site is designed to suit a class 1 road of sufficient width and depth to support the mining and trucking operation.

The general plant site cost includes clearing and grading of the industrial site as well as drainage ditches and collection ponds for water management. A required area for vehicles parking is available.

The mine maintenance shop and warehouse is provided by the mining contractor and no allowance has been included in the Capex to cover this facility.

The gate house will be a pre-fabricated building complete with an office, screening room and washroom. A gate is provided to control access to and from the site. A parking area located outside of the main access area will be provided for employees and visitors.

The cold warehouse will be located at the crushed ore stockpile building. All costs associated with this facility are included with the crushed ore stockpile building.

All mobile vehicles such as pick-ups, emergency vehicles, buses, boom-trucks, etc. will be leased and associated costs will be included in the operating cost estimate.

There will be no requirement for fuel storage for the vehicles (mine and others). Fuel costs are included in the operating costs and vehicles will be filled directly from local fuel suppliers.

Sanitary Waste treatment includes a waste treatment package system.

The fire protection system includes a fire water tank, pumps and a fire loop with fire hydrants surrounding the process plant area.

Table 21.5 presents the cost breakdown for the infrastructure Capex.

**Table 21.5 – Infrastructure Capex**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
310	Main Access Road	1,764,000
320	General Plant Site	680,000
340	Gate House	135,000
362	Fresh Water Pumphouse	5,000
366	Sewage Water Treatment Plant	263,000
390	Fire Protection	1,085,000
<b>TOTAL Infrastructure Capex</b>		<b>3,933,000</b>

The totals may not add-up due to rounding errors.

#### 21.1.7 Base of Estimate – Processing Areas

##### a) Process

The process facilities include the crushing plant, the concentrator and the dry products handling as well as some ancillary facilities, services and systems such as reagents and flocculants preparation and distribution, compressed air, fresh water and plant tailings systems.

##### b) Process Buildings and Facilities

The crushing plant is a conventional pre-engineered insulated building housing the primary crusher and dust suppression systems. The crushed ore storage facility will be a megadome structure with its walls sitting on 20' and 40' containers. The cold storage warehouse will be housed in a number of the 40' containers supporting the megadome.

The process building includes the concentrator area, the product handling and storage area, some control and electrical rooms as well as the laboratory, the mechanical shop, some offices, a dry facility and lunch room.

The cost for the process buildings was estimated based on quantity take-off from mechanical layouts and unit costs obtained from qualified contractors. The cost estimation for interior finishes, tools and storage racking, furniture, accessories and supplies was based on preliminary requirements and budget prices from industrial catalog or in-house database. All services were estimated as described further below.

c) Process Equipment

The process equipment list was derived from the flow sheets. For major equipment, based on data sheets, data tables or technical description, budget prices were obtained from qualified suppliers. The budget prices received and incorporated in the Capex represent more than 60 % of the all process equipment value. The remaining equipment was estimated from databases from recent similar projects or in-house cost estimation.

Labour for installation of process equipment was estimated for each piece of equipment based on in-house database or industrial publication. Provision was also added by factor to cover for special lift, sub-contract or construction material.

d) Piping and Pipelines

Process piping cost was established by factorization on delivered process equipment based on recent similar projects. The tailings and water reclaim pipelines were estimated by sizing of the lines and unit prices from recent industrial cost estimation tables.

e) Electrical

Electrical equipment list and quantities were derived from the single line diagrams. Budget prices were obtained from qualified suppliers for major equipment or based on databases from recent projects. Quantities and costs for material as well as man-hours were also established based on recent similar projects. Installation was estimated using hourly rates as described above.

f) Instrumentation

Instrumentation and automation material and equipment quantities were derived from the flow sheets. Budget prices were established based on databases from recent projects. Installation was estimated using hourly rate as described above.

g) Buildings Services and Supplies

Requirements were established for HVAC and fire protection. Cost estimation was based on budget proposal obtained from qualified suppliers.

Preliminary requirements were also established for some tooling and storage racking, interior finishing and living quarter's supplies. Cost estimation was based mainly on recent industrial catalogues and also on in-house databases.

Table 21.6 presents the cost breakdown for the Process Plant Facilities Capex.

**Table 21.6 – Process Plant Capex**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
501	Main Building Process Plant	32,325,000
510	Crushing	8,049,000
515	Ore Storage	6,310,000
520	Grinding (including Rougher Flotation)	8,421,000
525	Polishing (Cleaner Flotation)	4,977,000
530	Concentrator Dewatering	3,164,000
535	Product Size Classification	4,058,000
550	Product Packaging	328,000
560	Tailings Area	2,588,000
580	Reagent Area	872,000
590	Water Services	1,099,000
595	Air Services	1,217,000
597	Plant Metallurgical Laboratory	278,000
598	Plant Tools	300,000
<b>TOTAL Process Plant Costs</b>		<b>73,986,000</b>

The totals may not add-up due to rounding errors.

21.1.8 Base of Estimate – Tailings Management Facilities

The tailings storage site was identified based on requirements and a design was performed. Material quantities were derived from the drawings and cost estimation was based on unit rates from recent similar projects.

Table 21.7. presents the cost breakdown for the tailings management facilities Capex.

**Table 21.7 – Tailings Management Facilities Capex**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
805	Fresh Water Pumping Station	262,000
810	Tailings Management Facilities	28,873,000
<b>TOTAL Tailings Management Facilities Capex</b>		<b>29,135,000</b>

21.1.9 Base of Estimate – Indirect Costs

The indirect cost covers for project costs not directly associated with the physical construction work such as EPCM costs, temporary power and facilities, vendor representatives during commissioning and training, Owner’s costs, future studies, closure costs and contingency.

Provisions for indirect costs are summarized in Table 21.8.

**Table 21.8 – Indirect and Owner’s Costs**

<b>WBS</b>	<b>Description</b>	<b>Cost (\$)</b>
950	Project Development	4,550,000
901	EPCM Costs	14,221,000
910	Construction Indirect Costs	9,443,000
930	Commissioning and Vendor Reps	1,240,000
955	Other Owner’s Costs	7,450,000
<b>TOTAL Indirect and Owner’s Costs</b>		<b>36,904,000</b>

The totals may not add-up due to rounding errors.

a) Project Development

An allowance is provided to cover the preparation of a detailed feasibility study, geotechnical and hydrology studies, metallurgical test work, environmental studies and definition drilling.

b) EPCM Services

EPCM services have been estimated based on engineering deliverables and a breakdown of manpower per discipline as per the Project schedule.

c) Construction Indirect Costs

The construction field indirect costs include site power, temporary facilities, QA/QC (incl. survey, soil, concrete, X-Ray, etc), travel to site and contractor mobilization and demobilization. Construction camp is not required.

d) Commissioning and Vendor Representatives

Dry and wet commissioning includes vendors representative and contractor's workers. Cost estimation is based on requirements and unit hourly rates. No provision is included for rework.

e) Other Owner's Costs

The Other Owner's costs were provided by NMG's sub-consultant. The estimate has been reviewed by MC-DRA prior to the integration in the Capex.

Other Owner's costs include the following:

- Owner's EPCM support team;
- Owner's safety cost (personnel, equipment and consumables);
- Owner's project expenses on site during construction;
- Owner's vehicles during construction;
- Land acquisitions;
- Project insurances;
- Environmental permits/government approvals;
- Vendors tests works;
- Safety training;
- Third party consultants;
- Project external audit and due diligence;
- First fills;
- Trainings, and;
- Operation readiness.

f) Spares and Consumables

Capital and commissioning spare parts, liners and media for the process and electrical equipment are included in the working capital.

No provision is included for mining equipment spares and consumables since the mining will be executed by a contractor.

#### 21.1.10 Contingency

Contingency is an integral part of the estimate and can best be described as a provision for undefined items or cost elements that will be incurred and will be spent, within the defined Project scope, but that cannot be explicitly foreseen due to a lack of detailed or accurate information.

An analysis of each estimate line items was performed and the overall percentage allocated to contingency was 15 % which is generally in line with this category of estimate.

#### 21.1.11 Closure Costs

The closure costs include the following:

- The de-sulphurized tailings stockpile and associated infrastructure will be covered with overburden and will be revegetated;
- The sulphurized tailings stockpile and associated infrastructure will be covered with an impermeable membrane and topped with overburden and will be revegetated;
- The waste stockpile will already be covered before the end of the mine life since this location will be used as an overburden stockpile for the phase 4 of the mine development;
- The overburden stockpiles will be revegetated;
- Roads will be scarified and revegetated;
- All buildings will be dismantled, sold or disposed as per regulatory requirements. The surface will be covered with overburden and revegetated;
- All machinery, equipment, pipeline and tanks will be sold and removed from the site;
- Power transmission lines, poles, substations, transformers and associated electrical infrastructure will be removed from the site and sold;
- The open pit section (Phase 4) which was not backfilled during the mining operation, will be fenced for safety purposes.

Material quantities were derived from the drawings and cost estimation was based on unit rates from recent similar projects.

#### 21.1.12NSR Buyout

As mentioned in Section 0, the mineral claims are subject to a 2 % NSR royalty held by 3457265 (1.8 %) and Éric Desaulniers (0.2 %). NMG can buy back the NSR Royalty for the sum of \$ 1,000,000 for each 1 % at any time. The buyback is indicated in the Table 21.1 as a separate item as an initial cost of \$ 2 M.

#### 21.1.13Sustaining Capital Expenditures

A provision of \$ 26,380,000 was estimated for sustaining capital and includes namely:

- \$ 3,381,000 to gradually expand the mine roads and the waste pile;
- \$ 18,182,000 to gradually expand, stabilize and secure the tailings storage facilities during the mine life;
- \$ 3,235,000 for contingency, and;
- \$ 1,582,000 for the closure costs payments at Year 1 and Year 2.

The cost estimation for the expansion was based on quantity take-off and unit prices as for the initial construction.

### 21.2 Operations Costs Estimate

This Section provides information on the estimated operating costs of the Matawinie Project and covers mining, processing, general administration and site services. Table 21.9 presents the operating costs summary.

The sources of information used to develop the operating costs include in-house databases and outside sources particularly for materials, services and consumables. All amounts are in Canadian dollars (CAD), unless otherwise specified.

**Table 21.9 – Operating Costs Summary**

<b>Description</b>	<b>Cost per Year (\$)</b>	<b>Cost /tonne of concentrate (\$/t concentrate)</b>	<b>% of Total Costs (%)</b>
Mining (Average over life)	8,710,320	167.51	31.1
Tailings Handling and Transport (Average over life)	1,935,499	37.22	6.9
Ore and Tailings Processing	14,407,299	277.06	51.4
Site Services	1,036,245	19.93	3.7
General and Administration	1,915,210	36.83	6.8
<b>TOTAL Opex</b>	<b>28,004,573</b>	<b>538.55</b>	<b>100.0</b>

21.2.1 Mining Operating Costs

The mine operating cost was estimated based on budgetary pricing from local contract mining companies. The mine plan was provided to several firms to assist them with their estimate in order to ensure the accuracy of their pricing.

Table 21.10 presents the average unit rates that were applied to the tonnages of the mine plan to arrive at the total expenditures for the mine contractor. These rates include operator manpower, the cost of operating equipment, the supply of explosives, equipment maintenance/replacement, mine garage (dome type), warehouse and support services.

The mine contractor rates were provided by a local contractor for the first six (6) years of the mine plan. For the remainder of the mine plan, the operating costs associated with mine contractor services were estimated based on the proportion of the unit rates associated with haulage (proportions provided by the contractor). Based on the cycles times estimated by MC-DRA for the mine plan, mine contractor rates were interpolated for Year 7 to Year 27 of the mine plan.

**Table 21.10 – Mining Average Operating Costs – Contractor Rates**

Activity	Rate	Units
Drill and Blast*	\$/t	1.01
Overburden Excavation	\$/t	3.17
Ore Excavation	\$/t	2.05
Waste Excavation	\$/t	2.45
Tailings PAG Load and Haul	\$/t	2.22
Tailings NAG Load and Haul	\$/t	1.48
Clearing and Grubbing	\$/t	1.18
Pit Dewatering	\$/month	8,971
Road Maintenance	\$/month	32,451
Garage	\$/month	4,776

The mine operating costs do not account for the salaries that will be paid to the mine owners team which includes a senior mining engineer, a geologist, a mine planner and a surveyor. This owner management cost is accounted for as a G&A cost as described in Section 21.2.4c). The mine management team is required to supervise the contractor and provide engineering and geology support.

Table 21.11 presents a summary of the mine operating costs by type of material.

**Table 21.11 – Summary of Estimated Mine Operating Costs by Type of Material**

Type of material	Total (\$/t concentrate)	Total (%)
Overburden	27.95	13.7
Ore	76.41	37.3
Waste	63.15	30.8
Tailings (Laud and Haul)	37.22	18.2
<b>TOTAL</b>	<b>204.73</b>	<b>100</b>

\*Totals may not add up due to rounding

### 21.2.2 Processing Operating Costs

For a typical year at 52,000 t/y of graphite concentrate, the estimated process operating costs are divided into eight (8) main components: Manpower, electrical power, grinding media and reagent consumption, dryer fuel consumption, consumables consumption, bagging system, material handling and spare parts and miscellaneous. The breakdown of these costs is summarized in Table 21.12 below.

**Table 21.12 – Summary of Estimated Annual Initial Process Plant Operating Costs**

Operating Cost Area	Cost (\$/year)	Cost (\$/tonne of mill feed)	Cost (\$/tonne of graphite concentrate)	Total Costs (%)
Manpower	3,571,506	2.92	68.68	24.8
Electrical Power	3,103,154	2.54	59.68	21.5
Grinding Media and Reagent Consumption	2,764,467	2.26	53.16	19.2
Dryer Fuel Consumption	593,038	0.49	11.40	4.1
Consumables Consumption	1,982,347	1.62	38.12	13.8
Bagging System	1,869,868	1.53	35.96	13.0
Material Handling	51,722	0.04	0.99	0.4
Spare Parts and Miscellaneous	471,196	0.39	9.06	3.3
<b>TOTAL Operating Costs</b>	<b>14,407,298</b>	<b>11.79</b>	<b>277.05</b>	<b>100.0</b>

- 1) Based on production of 52 000 t/y of graphite concentrate
- 2) Spare parts, estimated as 1.5% of total equipment capital costs

#### a) Manpower Costs

It is estimated that there will be 48 employees. This includes supervision staff for the crusher and process plant, process plant operations and maintenance, as well as mechanical, electrical and instrumentation personnel. The total annual cost for the manpower is estimated at \$ 3.6 M per year. This corresponds to \$ 68.68 per tonne of concentrate produced.

**Table 21.13 – Concentrator Plant Manpower Operating Costs**

Area	Number of employees	Total Cost (\$/y)	Unit Cost (\$/tonne of graphite concentrate)
Mill Administration	2	202,800	3.90
Mill Operations	30	2,099,772	40.38
Mill Maintenance	10	792,710	15.24
Mill Metallurgy	6	476,224	9.16
<b>TOTAL Manpower</b>	<b>48</b>	<b>3,571,506</b>	<b>68.68</b>

b) Electrical Power Costs

Electrical power is required for the equipment in the processing plant such as: crushers, grinding mills, conveyors, screens, pumps, agitators, bagging system, services (compressed air and water), etc. The unit cost of electricity was established at \$ 0.055/kWh. The total annual cost for the process plant electrical power is estimated at \$ 3.1 M per year. This corresponds to \$59.68 per tonne of graphite concentrate produced.

**Table 21.14 – Concentrator Plant Manpower Operating Costs**

Area	Process Description	Power		Cost	
		Operational (kW)	Consumption (kW-h/y)	Total Cost (\$/y)	Unit Cost (\$/t)
1100	Crushing	329	791,583	43,537	0.84
1200	Grinding and Flotation	3,351	26,422,438	1,453,234	27.95
1300	Polishing	643	4,789,788	263,438	5.07
1400	Graphite Tailings Dewatering	266	1,865,530	102,604	1.97
1500	Graphite Concentrate Dewatering	256	1,836,781	101,023	1.94
1600	Screening and Bagging	885	4,652,874	255,908	4.92
1700	Tailings De-sulphurisation	1,038	7,271,150	399,913	7.69
1800	Reagent Systems	32	221,278	12,170	0.23
1900	Utilities – Water and Air Services	1,125	8,569,565	471,326	9.06
	<b>TOTAL</b>	<b>7,925</b>	<b>56,420,987</b>	<b>3,103,153</b>	<b>59.67</b>

c) Grinding Media and Reagent Consumption Costs

Processing costs for grinding media and reagent consumption have been divided in two (2) components: grinding media and reagents. Table 21.15 shows the costs described above in detail.

i) Grinding Media

The grinding mills (SAG and ball mill) will need a regular addition of steel balls to replace the worn media and exercise the proper grinding action on the material. Similarly, polishing mills (polishing and stirred media mills) will require addition of ceramic media to replace worn media. The media consumption has been estimated from the abrasion index of the ore, power consumption and from experience.

Grinding media is added using automated systems as these allow reducing the grinding media consumption. In general, grinding balls are added every day to maintain the steel load in the mills.

The total cost of grinding media for the mills is estimated at \$ 1.5 M per year or \$ 29.09 per tonne of graphite concentrate.

ii) Reagents

Diesel, MIBC and xanthate are the reagents required throughout the various stages of flotation. Flocculant is required for thickener operation. Lime will be added at the polishing pond as required.

The total costs for plant reagents is \$ 1.3 M per year or \$ 24.08 per tonne of graphite concentrate.

**Table 21.15 – Grinding Media and Reagent Costs**

	Consumption (kg/y)	Price (\$/kg)	Cost	
			(\$/y)	(\$/tonne)
Grinding Media				
SAG Mill Balls	438,811	1.35	592,065	11.39
Ball Mill Balls	391,140	1.43	558,791	10.75
Polishing Mill Ceramic Media	61,116	2.96	180,853	3.48
SMM Ceramic Media	61,116	2.96	180,853	3.48
Sub-total			1,512,562	29.10
Plant Reagent				
Collector - Diesel	146,678	0.75	110,466	2.12
Frother - MIBC	171,124	4.54	776,667	14.94
Flocculant	47,889	5.38	257,478	4.95
Sulphides Collector - Xanthate	23,406	3.14	73,545	1.41
Lime	91,834	0.37	33,749	0.65
Subtotal			1,251,905	24.07
<b>TOTAL</b>			<b>2,764,467</b>	<b>53.16</b>

d) Fuel Costs

Process fuel is required to a) fuel the concentrate dryer and b) fuel operations and maintenance mobile equipment. The concentrate dryer uses liquid nitrogen gas while mobile equipment will operate either on diesel or propane.

**Table 21.16 – Fuel Costs**

	Consumption (m <sup>3</sup> /y or l/y)	Fuel cost (\$/m <sup>3</sup> or l/y)	Cost	
			(\$/y)	(\$/tonne)
LNG <sup>1)</sup>	2,671	217.53	580,929	0.48
Diesel <sup>2)</sup>	7,802	1.00	7,802	0.01
Propane <sup>2)</sup>	5,311	0.81	4,307	< 0.01
<b>TOTAL</b>			<b>593,038</b>	<b>0.49</b>

1) Costs presented in m<sup>3</sup>/y  
 2) Costs presented in l/y

e) Consumables Costs

The consumption and costs for the jaw crusher liners, screen deck panels, grinding mill liners, polishing mill liners, flotation cell wear parts, pump wear parts, filter cloths, dryer wear parts, etc. for different equipment was obtained from the equipment suppliers and from experience with similar operations. The costs of consumables and wear parts are estimated at \$ 2.0 M per year or \$ 38.12 per tonne of concentrate produced.

f) Bagging System Costs

Bagging system consumable costs have been calculated based on discussions with consumable suppliers and experience with similar operations. The total cost is estimated at \$ 1.9 M per year or \$ 36.96 per tonne of concentrate produced.

g) Material Handling Costs

Material handling costs include rental and maintenance costs for mobile equipment in the process plant. The total cost is estimated at \$ 51,722 per year or \$ 0.99 per tonne of concentrate produced.

h) Spare parts and Miscellaneous Costs

Spare parts and miscellaneous costs were estimated as 1.5 % of the total equipment capital costs. The total spares and miscellaneous costs are estimated at \$ 471,196 per year or \$ 9.06 per tonne of concentrate produced.

21.2.3 Sites Services

Sites services includes power for heating, electrical rooms, warehouse, parking and gate. It also includes the power losses in the line, in electrical equipment and in distribution.

Maintenance of the building and for the infrastructure at site, the sewage and hazardous material removal, the snow removal, road maintenance and potable water supply are included. No provision for mobile equipment operation and maintenance has been included since all the equipment are leased. Table 21.17 summarize the site services operating costs.

**Table 21.17 – Site Services Operating Costs**

<b>Description</b>	<b>Total Cost (\$/y)</b>	<b>Unit Cost (\$/tonne of graphite concentrate)</b>
Power	439,000	8.44
Power Line and Subs losses and Distribution	72,000	1.38
Sewage Removal	2,400	0.05
Onsite Building and Infrastructure Maintenance	400,000	7.69
Hazardous Material Removal	20,880	0.40
Snow Removal/Road Maintenance	72,765	1.40
Potable Water Consumables	29,200	0.56
<b>TOTAL</b>	<b>1,036,245</b>	<b>19.93</b>

The totals may not add-up due to rounding errors.

#### 21.2.4 General and Administration Operating Costs

The General and Administration (« **G&A** ») operating costs include all materials, services and personnel costs associated with the site administration and technical services.

The G&A costs for the Project, are estimated at \$ 1.9 M/y of operation or \$ 36.83 / tonne of graphite concentrate, as summarized in Table 21.18.

**Table 21.18 – G&A Operating Costs Summary**

Description	Number of employees	Total Cost (\$/y)	Unit Cost (\$/tonne of graphite concentrate)
Administration – Manpower	6	422,500	8.13
Administration – Material and Services		829,460	15.95
Sub-Total		1,251,960	24.08
Technical services – Manpower	4	453,250	8.72
Technical services – Material and Services		210,000	4.04
Sub-Total		663,250	12.75
<b>TOTAL</b>	<b>10</b>	<b>1,915,210</b>	<b>36.83</b>

The totals may not add-up due to rounding errors.

a) Administration – Manpower

It is estimated that six (6) employees will be required for materials management, human resources and environmental. The employees working in finance and administration are under the corporate cost and not included in the Project operating costs. The unit cost for the administration manpower is \$ 8.13 /tonne of graphite concentrate. Table 21.19 shows the summary of administration manpower costs.

**Table 21.19 – Administration – Manpower Costs**

Description	Number of employees	Total Cost (\$/y)	Unit Cost (\$/tonne of graphite concentrate)
Materials Management	2	136,500	2.62
Human Resources	3	208,000	4.00
Environmental	1	78,000	1.50
<b>TOTAL Manpower</b>	<b>6</b>	<b>422,500</b>	<b>8.13</b>

The totals may not add-up due to rounding errors.

b) Administration – Material and Services

The unit cost for the administration – material and services is estimated at \$ 15.95 /tonne of graphite concentrate. The estimated annual costs for administration – material and services are provided in Table 21.20. The mining association fees and legal fees are under the corporate budget.

**Table 21.20 – Administration – Material and Services Costs**

Sector	Total Cost (\$/y)	Unit Cost (\$/tonne of graphite concentrate)
Mining Leases	\$75,000	1.44
Municipal Taxes	166,660	3.21
Site Insurance	100,000	1.92
Telecommunications	36,000	0.69
Janitorial	41,600	0.8
Office supplies and Misc. Costs	24,000	0.46
Transport of Goods	12,000	0.23
IT Maintenance and Supplies	50,000	0.96
Purchasing and Warehousing – Supplies	20,000	0.38
Recruiting	10,000	0.19
Training	55,000	1.06
Safety – Equipment and Supplies	24,000	0.46
Medical and First Aid	1,200	0.02
Employee Relations	2,000	0.04
Community Relations	50,000	0.96
Employee Transportation (on site)	12,000	0.23
Contingency	50,000	0.96
Environmental – Supplies	100,000	1.92
<b>TOTAL</b>	<b>829,460</b>	<b>15.95</b>

c) Technical Services – Costs

It is estimated that four (4) employees will be required for engineering and geology. Those employees are a senior mining engineer, a surveyor, a mine planner and a mine geologist. The unit cost for the technical services manpower is \$ 8.72 /tonne of graphite concentrate.

A provision of \$ 210,000 for external engineering services, consulting, surveying and others is included in the technical services costs. The unit cost for external engineering services is \$ 4.04 /tonne of graphite concentrate.

Table 21.21 shows the summary of technical services costs.

**Table 21.21 – Technical Services – Manpower and Services Costs**

Description	Number of employees	Total Cost (\$/y)	Unit Cost (\$/tonne of graphite concentrate)
Engineering and Geology	4	453,250	8.72
External Engineering Services		210,000	4.04
<b>TOTAL Manpower</b>	<b>4</b>	<b>663,250</b>	<b>12.75</b>

The totals may not add-up due to rounding errors.

## 22.0 ECONOMIC ANALYSIS

The economic/financial assessment of the Matawinie Project of NMG is based on Q3-2017 price projections in United States of Americas (“USA”) currency and cost estimates in Canadian currency. An exchange rate of 0.7519 USD per CAD (1.33 CAD per USD) was assumed to convert USD market price projections and particular components of the cost estimates into CAD. No provision was made for the effects of inflation. The evaluation was carried out on a 100 % equity basis. Current Canadian tax regulations were applied to assess the corporate tax liabilities while the recently adopted regulations in Québec (originally proposed as Bill 55, December 2013) were applied to assess the mining tax liabilities.

The financial indicators under base case conditions are presented in Table 22.1.

**Table 22.1 – Base Case Financial Results**

<b>Base Case Financial Results</b>	<b>Unit</b>	<b>Value</b>
Pre-tax NPV @ 8 %	M CAD	498.7
After-tax NPV @ 8 %	M CAD	297.2
Pre-tax IRR	%	32.4
After-tax IRR	%	25.9
Pre-tax Payback Period	Years	2.3
After-tax Payback Period	Years	2.6

A sensitivity analysis reveals that the Project’s viability will not be significantly vulnerable to variations in capital and operating costs, within the margins of error associated with PFS estimates. However, the Project’s viability remains more vulnerable to the USD/CAD exchange rate and the larger uncertainty in future market prices.

### 22.1 Assumptions

#### 22.1.1 Macro-Economic Assumptions

The main macro-economic assumptions used in the base case are given in Table 22.2. The price forecast for graphite concentrate is a content dependent weighted-average based on 60-month size-purity-dependent average prices provided by Benchmark Mineral Intelligence. Details on the derivation of this average price forecast are given in Section 19.0 of this Report. The sensitivity analysis examines a range of prices 30 % above and below this base case forecast.

**Table 22.2 – Macro-Economic Assumptions**

Item	Unit	Base Case Value
Average Graphite Concentrate Price (Ex Works mine)	USD/tonne	1,429
Exchange Rate	USD/CAD	0.7519
Discount Rate	% per Year	8
Discount Rate Variants	% per Year	6 and 10

An exchange rate of 0.7519 USD per CAD (1.33 CAD per USD) was used to convert the USD market price projections into Canadian currency. The sensitivity of base case financial results to variations in the exchange rate was examined. Those cost components which include USA content originally converted to Canadian currency using the base case exchange rate were adjusted accordingly.

The deposit has been certified a “Mineral Resource” by the Canada Revenue Agency. Thus, the current Canadian tax system applicable to Mineral Resource Income was used to assess the Project’s annual tax liabilities. These consist of federal and provincial corporate taxes as well as provincial mining taxes. The federal and provincial corporate tax rates currently applicable over the Project’s operating life are 15.0 % and 11.5 % (decreasing by 0.1 % per year from 11.7 % in 2018 to 11.5 % in 2020) of taxable income, respectively. The marginal tax rates applicable under the recently adopted mining tax regulations in Québec (originally proposed as Bill 55, December 2013) are 16 %, 22 % and 28 % of taxable income and depend on the profit margin. As the final product of the mine consist of sorted graphite flake concentrates, a processing allowance rate of 10 % is assumed.

The assessment was carried out on a 100 % equity basis. Apart from the base case discount rate of 8 %, two (2) variants of six (6) and 10 % were used to determine the Net Present Value of the Project. These discount rates represent possible costs of equity capital.

### 22.1.2 Royalty and Income and Benefit Agreements

This Project incorporates an “NSR” royalty agreement. This agreement calls for annual payments of 2 % of FOB (Ex Works in this case) sales. The agreement contains a buyout clause in which each percentage point of royalty can be purchased for a lump-sum amount of \$ 1 M. As the buyout option is more economical, the present economic analysis considers an additional initial investment of \$ 2 M representing the complete buyout of the royalty agreement. The mineral property lies within the limits of the municipality of Saint-Michel-des-Saints and as such, no agreement with local First Nations communities is required. However, NMG is presently in talks in order to reach a pre-development agreement with the Atikamekw First Nation in the near future.

### 22.1.3 Technical Assumptions

The main technical assumptions used in the base case are given in Table 22.3.

**Table 22.3 – Technical Assumptions**

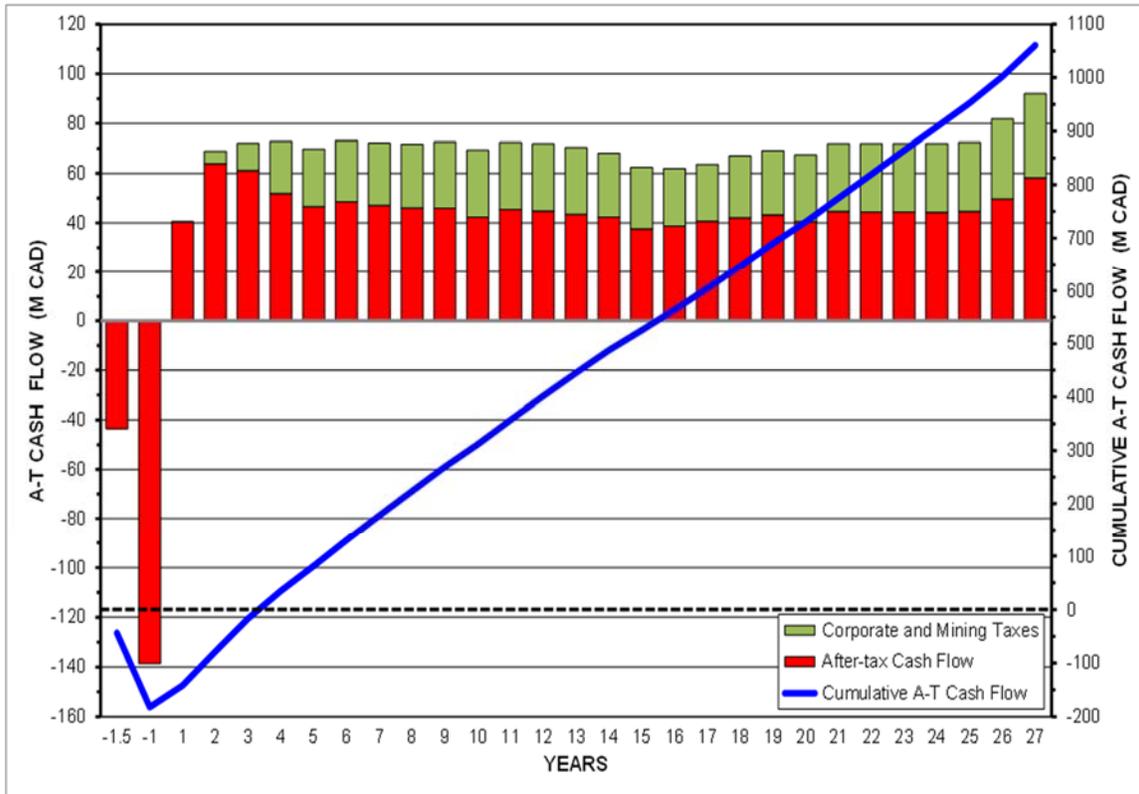
Item	Unit	Base Case Value
Open Pit Resource Mined	M tonnes	33.0
Average Mill Head Grade	% C(g)	4.39
Design Milling Rate	k tonnes/year	1,250
Average Stripping Ratio	w: o	1.041
Mine Life	Years	27
Process Recovery	%	94.0
Concentrate Grade	% C(g)	97.0
Average Concentrate Production (excludes production Year 1)	Tonnes/year	52,558
Average Mining Costs (includes primary crushing)	\$/tonne milled	7.73
Average Processing Costs (includes tailings transport)	\$/tonne milled	12.80
Average Site Services Costs	\$/tonne milled	0.82
Average General and Administration Costs	\$/tonne milled	1.52
Average Total Costs	\$/tonne concentrate	537.76

The first production year consists of a ramp-up period of nine (9) months followed by three (3) months at full production. The start of commercial production corresponds to the beginning of this three-month period.

### 22.2 Financial Model and Results

Figure 22.1 illustrates the after-tax cash flow and cumulative cash flow profiles of the Project for base case conditions. The intersection of the after-tax cumulative cash flow curve with the horizontal dashed line represents the payback period.

Figure 22.1 – After-tax Cash Flow and Cumulative Cash Flow Profiles



A summary of the evaluation results is given in Table 22.4 and Table 22.5 gives the cash flow statement, both for base case conditions.

The summary and cash flow statement indicate that the total pre-production (initial) capital costs were evaluated at \$ 179.2 M (includes royalty buy-out). The sustaining capital requirement was evaluated at \$ 24.8 M. Mine closure costs in the form of trust fund payments at the start of mine production were estimated at an additional \$ 3.2 M.

The cash flow statement shows a capital cost breakdown by area and provides an estimated capital spending schedule over the 18-month pre-production period of the Project. Working capital requirements were estimated at three (3) months of total annual operating costs. Since operating costs vary annually over the mine life, additional amounts of working capital are injected or withdrawn as required.

The total revenue derived from the sale of the concentrate products was estimated at \$ 2,667.7 M, or on average, \$ 80.84 / tonne milled. The total operating costs were estimated at \$ 751.2 M, or on average, \$ 22.87 / tonne milled.

The financial results indicate a pre-tax Net Present Value (“NPV”) of \$ 498.7 M at a discount rate of 8 %. The pre-tax Internal Rate of Return (“IRR”) is 32.4 % and the

payback period is 2.3 Years. The payback period is measured from the start of commercial production and consequently excludes the ramp-up period in production Year 1.

The after-tax NPV is \$ 297.2 M at a discount rate of 8 %. The after-tax IRR is 25.9 % and the payback period is 2.6 Years.

**Table 22.4 – Project Evaluation Summary – Base Case**

Item	Unit	Value
Total Revenue	M CAD	2,667.7
Total Operating Costs	M CAD	751.2
Initial Capital Costs (excludes Working Capital)	M CAD	177.2
Royalty Buyout	M CAD	2.0
Sustaining Capital Costs	M CAD	24.8
Mine Rehabilitation Trust Fund Payments	M CAD	3.2
Total Pre-tax Cash Flow	M CAD	1,709.4
Pre-tax NPV at 6 %	M CAD	661.0
Pre-tax NPV at 8 %	M CAD	498.7
Pre-tax NPV at 10 %	M CAD	380.7
Pre-tax IRR	%	32.4
Pre-tax Payback Period*	Years	2.3
Total After-tax Cash Flow	M CAD	1,060.6
After-tax NPV at 6 %	M CAD	400.4
After-tax NPV at 8 %	M CAD	297.2
After-tax NPV at 10 %	M CAD	221.8
After-tax IRR	%	25.9
After-tax Payback Period*	Years	2.6

\* Measured from the start of commercial production



### 22.3 Sensitivity Analysis

A sensitivity analysis has been carried out, with the base case described above as a starting point, to assess the impact of changes in total pre-production Capital Expenditure (“Capex”), Operating Costs (“Opex”), product price (“Price”) and the USD/CAD exchange rate (“FX Rate”) on the Project’s NPV at 8 % and IRR. Each variable was examined one-at-a-time. An interval of  $\pm 30\%$  with increments of 10 % was used for the first three (3) variables. USD/CAD exchanges rates of 0.65, 0.70, 0.75, 0.80, 0.85, 0.90 and 0.95 (relative variations from -13.55 to 26.35 %) were used. The USD content associated with the cost estimates was used to adjust the estimates for each exchange rate assumption.

The before-tax results of the sensitivity analysis, as shown in Figure 22.2 and Figure 22.3, indicate that, within the limits of accuracy of the cost estimates in this Study, the Project’s before-tax viability does not seem significantly vulnerable to the under-estimation of capital and operating costs, taken one at-a-time. As seen in Figure 22.2, the NPV is more sensitive to variations in Opex than Capex, as shown by the steeper slope of the Opex curve. As expected, the NPV is most sensitive to variations in price and the USD/CAD exchange rate. The NPV remains positive at the lower limit of the price interval and at the upper limit of the exchange rate interval examined.

**Figure 22.2 – Pre-tax NPV<sub>8%</sub>: Sensitivity to Capital Expenditure, Operating Cost, Price and USD/CAD Exchange Rate**

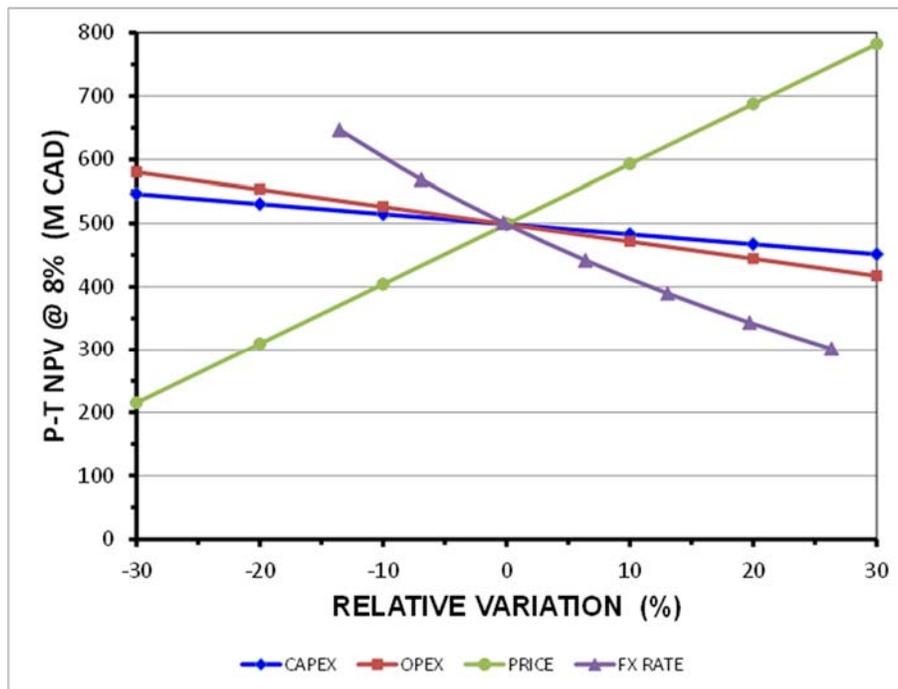
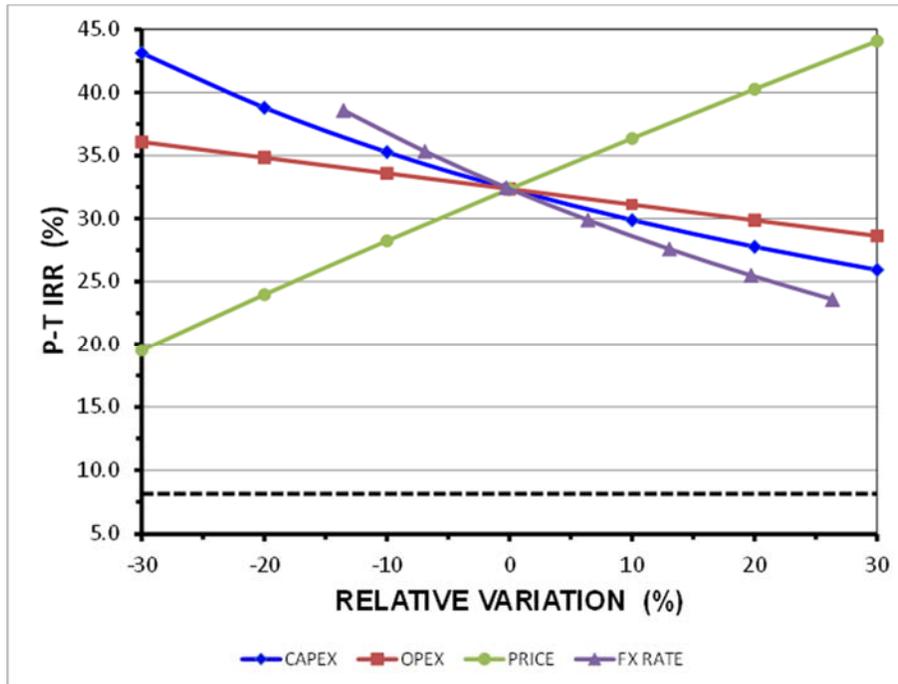


Figure 22.3, showing variations in internal rate of return, provides the same conclusions. The horizontal dashed line represents the base case discount rate of 8 %. Because of the different timing associated with Capex versus Opex, the IRR is more sensitive to variations in Capex than Opex, especially to negative variations.

**Figure 22.3 – Pre-tax IRR: Sensitivity to Capital Expenditure, Operating Cost, Price and USD/CAD Exchange Rate**



The same conclusions can be made from the after-tax results of the sensitivity analysis as shown in Figure 22.4 and Figure 22.5. Figure 22.4 indicates that the Project’s after-tax viability is mostly vulnerable to a price forecast reduction and change in the USD/CAD exchange rate, while being less affected by the under-estimation of capital and operating costs. Nevertheless, the NPV remains positive at the lower limit of the price interval and at the upper limit of the exchange rate interval examined.

**Figure 22.4 – After-tax NPV<sub>8</sub> %: Sensitivity to Capital Expenditure, Operating Cost, Price and USD/CAD Exchange Rate**

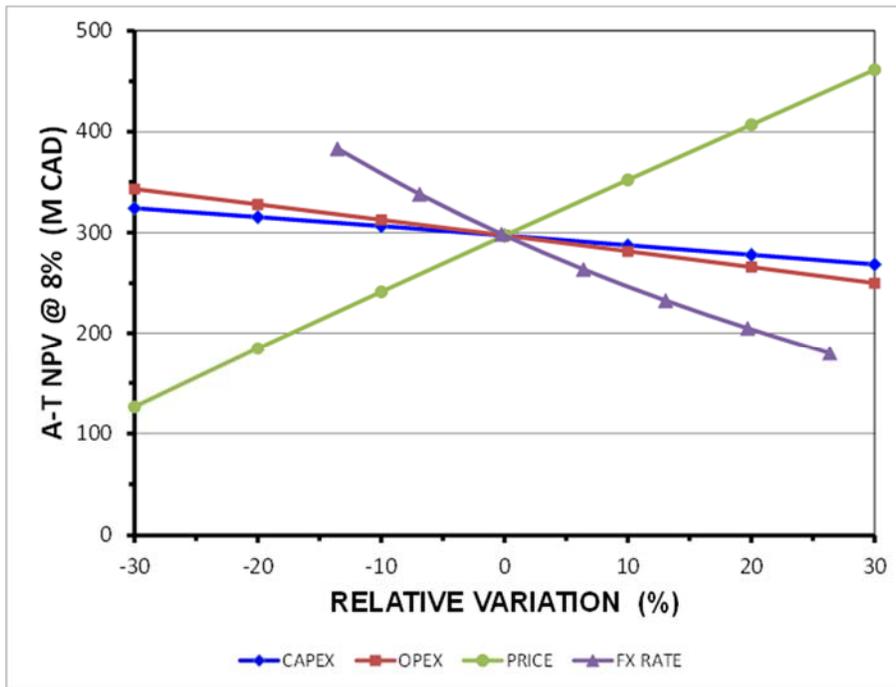
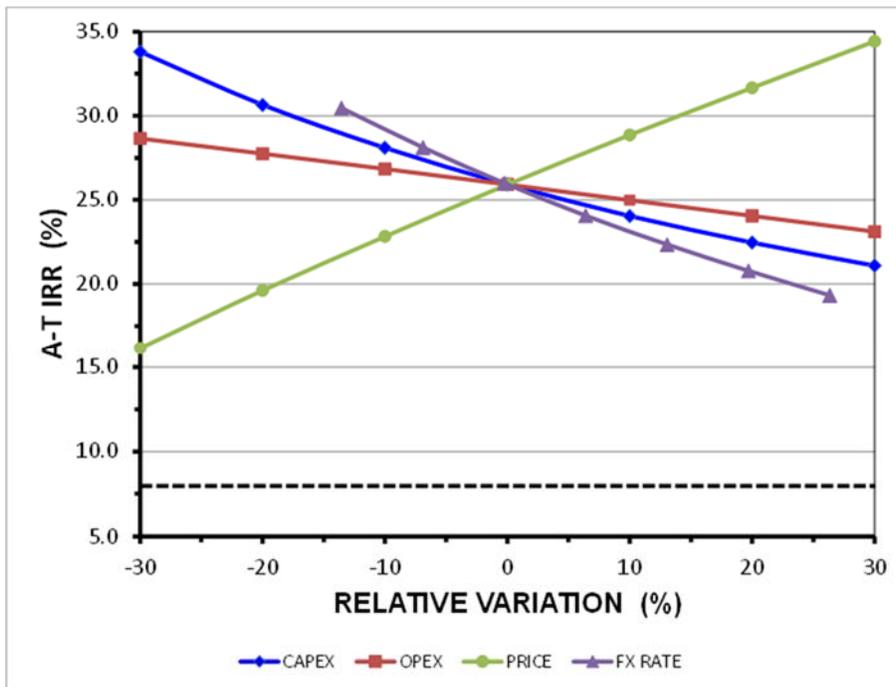


Figure 22.5, showing variations in internal rate of return, provides the same conclusions.

**Figure 22.5 – After-tax IRR: Sensitivity to Capital Expenditure, Operating Cost, Price and USD/CAD Exchange Rate**

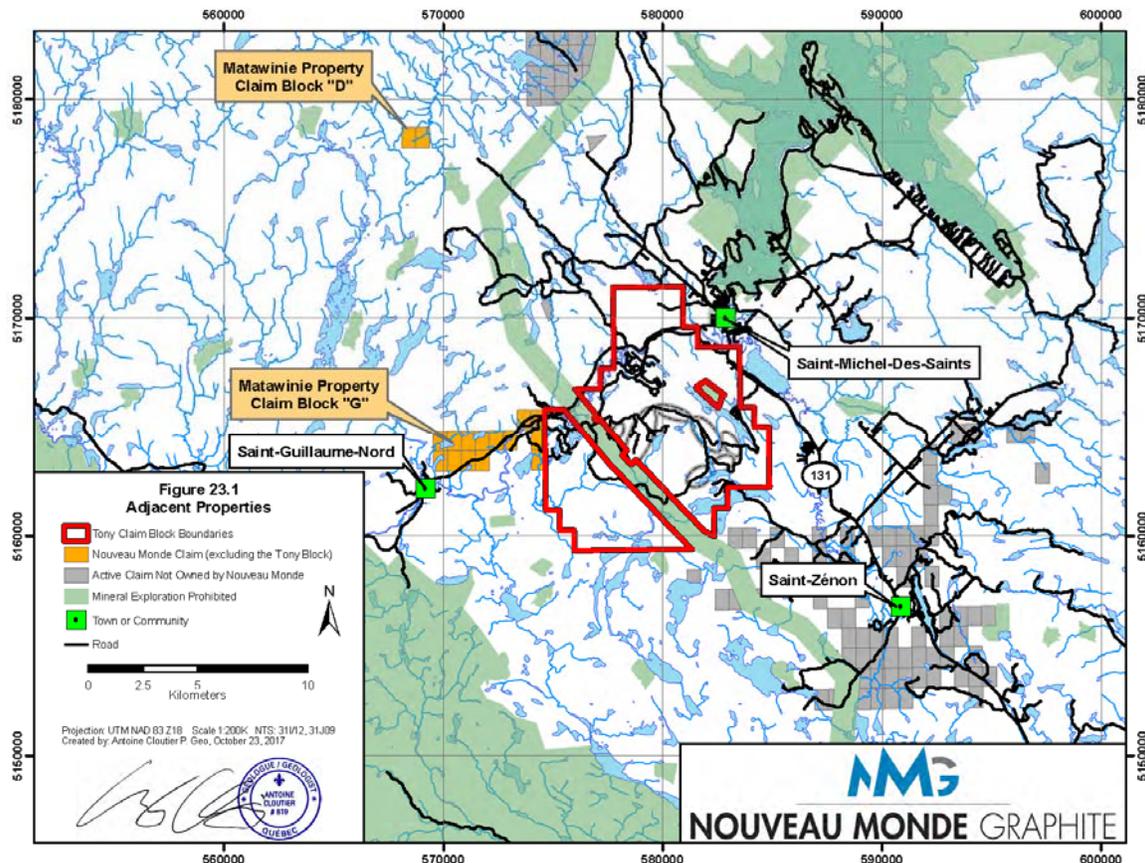


### 23.0 ADJACENT PROPERTIES

NMG owns a claim block contiguous to the western boundary of the Tony Block. This claim block, designated as claim Block “G”, is part of the Matawinie graphite Property (See Figure 4.1 and Figure 23.1) and is subject to the same agreement with 3457265 Canada Inc. described in Section 4.3. Block “G” is underlain by large conductors identified in late 2013 (Dudé, 2014, GM 69067). Since a large portion of the community of Saint-Guillaume-Nord resides near and over these conductors, and parts of these conductors are located under lakes and wetlands, the company has made the decision not to perform any exploration work in that area for the time being.

Other claim blocks forming NMG’s Matawinie Property are considered to be located too far from the Tony Block to be pertinent (See Figure 4.1) and are therefore not described in detail in the present Report. The author considers, however, that mineralization on those other property claim blocks is somewhat relevant to the mineralization observed in the Tony Block, as they share the same type of lithologies and a similar formational and tectonic environment.

Figure 23.1 – Adjacent Properties



## 24.0 OTHER RELEVANT DATA AND INFORMATION

### 24.1 Project Implementation Schedule

A Project master schedule for the PFS has been developed to cover the major Project milestones. The Project master schedule includes activities such as: studies, permitting, engineering, procurement, construction and commissioning at a pre-feasibility level (see Figure 24.1).

#### 24.1.1 Schedule Assumptions

The Project schedule is based on the following assumptions:

- The geotechnical investigation results will be available in the first two (2) months of the feasibility study;
- The hydrogeology study results will be available 20 weeks prior to the feasibility study completion and will be favorable for the Project;
- The laboratory and tests work results will be available 20 weeks prior to the feasibility study completion;
- The permitting demand will be presented to the authority as soon as the flow sheets are frozen;
- Design criteria, process and scope of work are frozen prior the start of basic engineering;
- Major equipment package bid/award duration is ten (10) weeks;
- Resources are available for engineering and construction management personnel;
- Construction workers will be available in the time of construction;
- The Hydro-Québec power line will be operational prior to the commissioning phase.

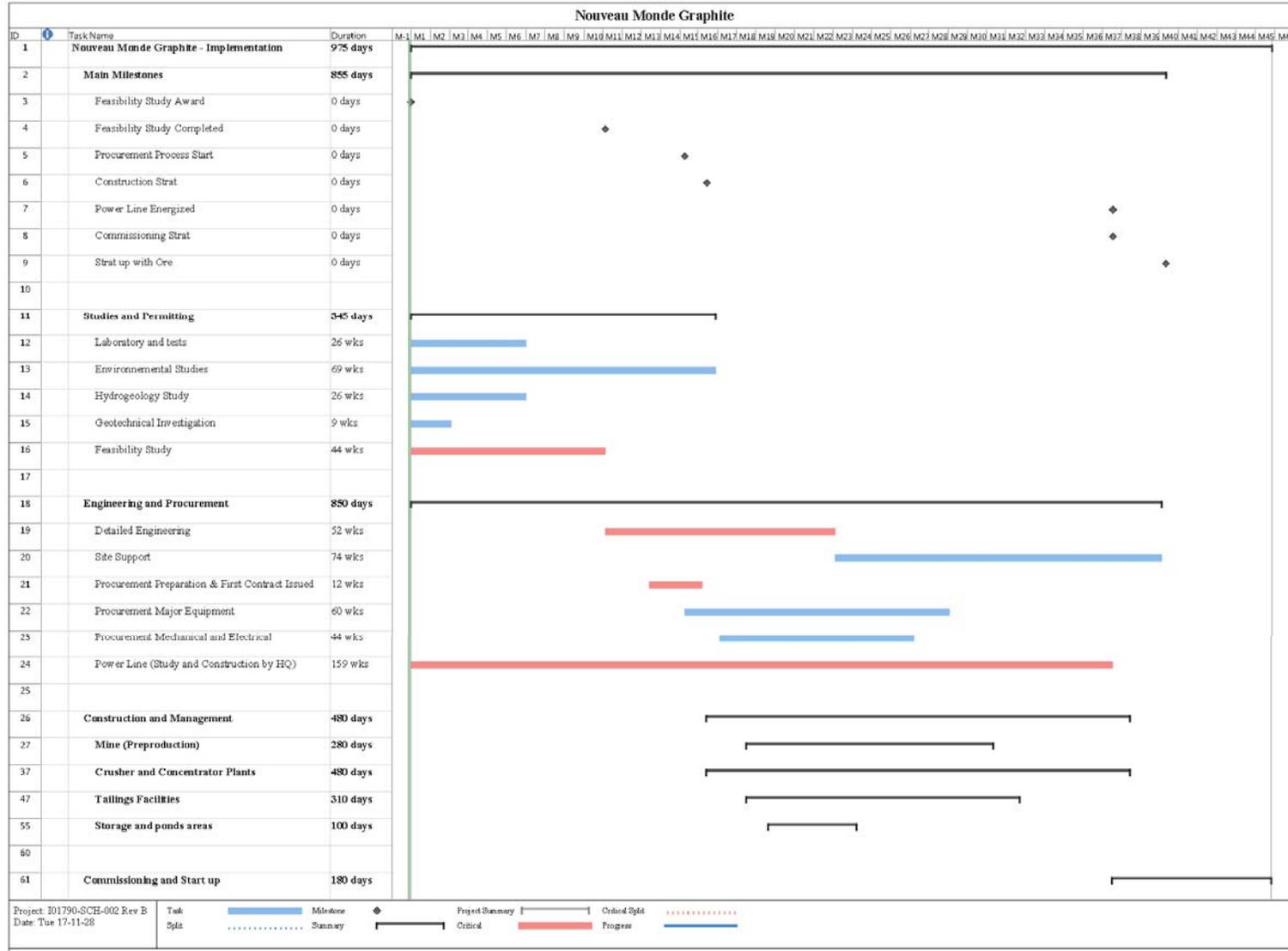
#### 24.1.2 Project Schedule / Construction Sequence

The construction flow is the following:

- Mobilization of EPCM consultant to site;
- Mobilization of mining contractor for site preparation;

- Site preparation and access road;
- Concrete construction;
- Structure steel erection;
- Architectural installations and finishes;
- Mechanical installation;
- Electrical and instrumentation installation;
- Commissioning activities.

Figure 24.1 – Project Implementation Schedule



## 25.0 INTERPRETATION AND CONCLUSIONS

### 25.1 Conclusions

#### 25.1.1 Exploration Activities

Exploration work on the Project targeted graphite mineralization which consists to date of airborne geophysics (Mag and TDEM), prospecting, ground TDEM surveying, trenching/channel sampling and core drilling. Surface and core samples were also collected for metallurgical tests including representative master composite of the West Zone. Exploration work by NMG was initiated on the Tony Claim Block in summer of 2014 which resulted in the discovery of seven (7) mineralized zones. These zones are named the Far West, West, North, North-East, East, South-East and South-West Zones. No other known mineral occurrences were identified on the Project area prior to the exploration work performed by NMG.

Exploration activities by NMG have culminated in the identification of a Probable Mineral Reserve for the West Zone as well as a Mineral Resource Estimate combining the South-East and South-West mineralization present on NMG's Tony Claim Block. The Probable Mineral Reserve of the West Zone is based on 3,693 assay intervals collected from core drilling and three (3) surface trenches providing 207 channel samples. Proper quality control measures were used throughout the exploration programs leading to the Probable Mineral Reserves detailed in this Report.

#### 25.1.2 Mineral Processing and Testing

The processing plant is designed to process 3,349 t/d of run of mine to produce approximately 52,000 tonnes per year of graphite concentrate grading at about 97 % C(t) based on a concentrate recovery of 94 %. A suitable process flow sheet includes crushing, grinding, flotation, regrind, and concentrate thickening, filtering and drying. The dried concentrate is then classified into various sized products as required by customers.

The concentrator tailings are desulphurized in the tailings treatment plant. The NAG tailings and the sulphide concentrate are stored separately in dry stacks.

#### 25.1.3 Market

NMG is developing a natural graphite Project which will have competitive advantages due to its privileged location, cost structure and experienced team. A demonstration plant (see Press Release dated April 19<sup>th</sup>, 2017) should allow NMG to have an earlier debut in the market and de-risk the first years of sales. One of the goals of this demonstration plant is to secure medium to long term supply agreements with different customers.

#### 25.1.4 Economic Analysis

The Pre-feasibility Study showed that Matawinie Graphite Project is technically feasible as well as economically viable.

Based on 27-year cash flow and assuming 100 % equity, the IRR is 32.4 % before taxes and 25.9 % after taxes.

The authors of this Technical Report consider that the Matawinie graphite Project to be sufficiently robust to warrant moving it to the feasibility phase.

#### 25.2 Risk Evaluation

The following process uncertainties have been identified at the end of the pre-feasibility program:

- The crushing and grinding circuit has been designed based on limited comminution data. Significant variations in hardness throughout the life of mine resource could cause a throughput limitation in the comminution circuit;
- Variability flotation tests completed to-date have revealed a consistent metallurgical response of composites representing large areas within the resource. However, the risk of increased variation for smaller areas within the deposit still exists. Any significant variation in the metallurgical response of the mill feed during the first few months and years of operation can have a significant impact on the economics of the Project;
- The addition of xanthate in the sulphide circuit may lead to residual xanthate in the process water that is cycled back to the front end of the graphite circuit. The xanthate could result in elevated sulphur recovery into the graphite cleaning circuit and possibly the final graphite concentrate;
- Limited mineralogical data is presently available for the West Zone mineralization. While this is not an immediate risk, a better understanding of the host rock mineralogy may assist in the final optimization of the graphite and sulphide circuits and may provide an opportunity for generating a saleable by-product; and
- Final graphite concentrate grades and recoveries are based on limited closed-circuit flotation tests. Metallurgical data from additional locked cycle tests will provide more confidence in the expected metallurgical performance and will further validate the robustness of the flow sheet.

## 26.0 RECOMMENDATIONS

### 26.1 Next Phase Estimated Costs

Table 26.1 presents the estimated costs for the next phase and the Section below described the work to be done.

**Table 26.1 – Next Phase Estimated Costs**

<b>Activity</b>	<b>Estimated Costs (\$)</b>
Definition Drilling Program	100,000
Geotechnical and Hydrogeology Studies	360,000
Metallurgical Studies and Tests Works	250,000
Environmental Studies	1,340,000
Feasibility Studies	2,500,000
<b>Estimated Total Costs</b>	<b>4,550,000</b>

### 26.2 Mining and Geology

#### 26.2.1 Definition Drilling Program

It is proposed to proceed with a 750 m drilling program in the West Zone aimed at providing more detailed geological data for sections W+0000 to W+0400. These sections only contain two (2) drill holes, one (1) additional drill hole in each of the 100 m spaced section (total of 5 drill holes) would provide a more complete and robust geological model concerning the West Zone Deposit.

#### 26.2.2 Geotechnical Program Targeting Overburden

A geotechnical program aimed at characterizing the overburden of the area is a necessary step for the project to go forward. The pit angles could be optimised further once geotechnical and hydrogeological assessments of the mine site are completed. The work program is aiming to enhance the understanding of the geotechnical conditions onsite and to characterize materials in support of the design of the open pit, tailings locations as well as the crushing and concentrator plant site. The work program includes consultant support to perform geo-mechanical mapping, drilling, trenching and a laboratory program. Additional drilling and testing is recommended in the open pit area to get detailed geotechnical information of the overburden.

### 26.2.3 Hydrogeology Program

Further hydrogeology investigations are recommended for a better understanding and management of the groundwater. The program is designed to obtain the fundamental hydrogeology characteristics and conditions for mine dewatering, open pit wall stability as well as to properly delineate a wellhead (source water) protection area.

- Data will be collected through a series of pumping test using large diameter (15 cm) drill holes.
- Numerical modelling will be performed to simulate the groundwater regime and effects from the mining activities, including potential drawdown of groundwater in private wells.
- Surface water control in hilly terrain is particularly important to allow efficient mining operations. A detailed surface water plan is also part of this program and need to be addressed prior to any mine development and long-term mining outlook.
- The use of existing and future exploration drill holes could help in lowering the proposed budget for the hydrogeology program.

### 26.3 Process

The following characterization and test program is recommended for the definite feasibility study:

- Full chemical and mineralogical characterization of LOM composite;
- Basic chemical and mineralogical characterization of 6-8 variability composites;
- Comprehensive comminution tests including unconfined compressive strength test, low energy impact tests, bond ball mill grindability test, Bond abrasion index tests, JKDropweight and SMS tests, and JKSimMet modelling. This will allow to assess ore variability and its impact on crushing and grinding design;
- Rougher/scavenger optimization to confirm consistency of composite and to optimize/simplify the sulphide rejection circuit;
- Cleaner validation for a 96-97 % C(t) target grade;
- Process water ageing tests to assess the impact of residual xanthate in the process water on rougher and scavenger flotation;
- Cleaner benchmarking tests to determine impact of freeze/thaw cycles of core on metallurgy;

- Variability flotation testing to confirm consistent metallurgical response of the material that will serve as mill feed in the first few months and years of the Project; and
- Locked cycle flotation tests to confirm closed circuit metallurgical performance.
- Demo plant to validate the design flowsheet. The demo plant should include both graphite beneficiation and sulphide rejection circuits. In addition, ability to produce a coarser graphite concentrate should be studied.
- Settling and filtration test work: Testing using the demo plant concentrate and tailings material should be arranged to validate equipment selection.

In addition, the following trade off studies are recommended:

- Cyclones versus screening: To assess the metallurgical, infrastructural and financial impact of using cyclones or screens in the secondary grinding circuit.
- Concentrate filtration: To evaluate impact of various pressure filtering technologies on flake size.
- Dryer flake degradation: To study impact of drying technology on flake integrity.
- Cleaner flotation performance in mechanical flotation cells versus flotation columns in the demo plant.

## 26.4 Environment

- Undertake the geochemistry phase II tests as well as hydrogeology modeling to better define disposition concepts that will minimize the Project' impacts;
- Undertake air emission, noise and landscape modeling during the feasibility study when the layout will be more definitive;
- Complete the EIA report following the directive that will be issued by the MDDELCC;
- Continue the collaborative work with the Stakeholder Committee;
- Make sure that the information on Project advancement is readily available to all and offer the possibility to raise other concerns as applicable;
- Ensure that all stakeholders and members of the public are engaged for the purpose of the upcoming EIA;

- Undertake the Environmental and Social Impact Assessment in the coming months, in parallel with the Feasibility Study, and according to the directive that will be issued by the Ministry responsible for the Environment (MDDELCC);
- Continue to undertake public consultations in order to properly inform the local community and stakeholders regarding the Project;
- Continue the engagement with the Atikamekw First Nation of Manawan and the Council of the Atikamekw First Nation in order to reach a pre-development agreement;
- Pursue the proactive acquisition process.

## 26.5 Opportunities

The location of NMG's Project is a key competitive advantage to supply natural graphite to the North American market. NMG's planned demonstration plant (see press release dated April 19<sup>th</sup>, 2017) could supply enough quantities of each material group to support an adequate market approach.

## 27.0 REFERENCES

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For ease of use all “GM” reports and other Quebec government publications are available for viewing free of charge on Quebec’s *Ministère Des Ressources Naturelles et de la Faune* E-SIGEOM system which is accessible on the world wide web: ([http://sigeom.mrnf.gouv.qc.ca/signet/classes/I1102\\_indexAccueil?l=a](http://sigeom.mrnf.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a)).

The “Examine” documents (and surveys) constitute the gateway to the *Géologie Québec* record holdings. They represent the overall available information describing the content of the report, in addition to locating the work perimeter. To facilitate document research, references in this report appearing on the E-SIGEOM system are listed first in GM numerical order and in other codes used by the Quebec Government.

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**Appendix A – Claims Status as of October 23<sup>rd</sup>, 2017**

Claim #*	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits	Required Credits	Renewal Fee
2396504	59.08	31I12	2013-12-27	2019-12-26	\$ 357,150.10	\$ 780.00	\$ 64.09
2396505	59.08	31I12	2013-12-27	2019-12-26	\$ 31,501.14	\$ 780.00	\$ 64.09
2396506	59.08	31I12	2013-12-27	2019-12-26	\$ 17.92	\$ 780.00	\$ 64.09
2396507	59.08	31I12	2013-12-27	2019-12-26	\$ 17.92	\$ 780.00	\$ 64.09
2396508	59.08	31I12	2013-12-27	2019-12-26	\$ 17.92	\$ 780.00	\$ 64.09
2396509	59.07	31I12	2013-12-27	2019-12-26	\$ 1,933.17	\$ 780.00	\$ 64.09
2396510	59.07	31I12	2013-12-27	2019-12-26	\$ 77,791.11	\$ 780.00	\$ 64.09
2396511	59.07	31I12	2013-12-27	2019-12-26	\$ 162,516.19	\$ 780.00	\$ 64.09
2396512	59.07	31I12	2013-12-27	2019-12-26	\$ 2,049.11	\$ 780.00	\$ 64.09
2396513	59.07	31I12	2013-12-27	2019-12-26	\$ 113,559.20	\$ 780.00	\$ 64.09
2396514	59.07	31I12	2013-12-27	2019-12-26	\$ 59,450.40	\$ 780.00	\$ 64.09
2396515	59.06	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396516	59.06	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396517	59.06	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396518	59.06	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396519	59.06	31I12	2013-12-27	2019-12-26	\$ 489.11	\$ 780.00	\$ 64.09
2396520	59.06	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396521	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396522	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396523	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396524	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396525	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2396526	59.05	31I12	2013-12-27	2019-12-26	\$ -	\$ 780.00	\$ 64.09
2399854	5.08	31I12	2014-02-18	2020-02-17	\$ 2,504.11	\$ 325.00	\$ 32.77
2399855	45.98	31I12	2014-02-18	2020-02-17	\$ 5,098.13	\$ 780.00	\$ 64.09
2399856	51.37	31I12	2014-02-18	2020-02-17	\$ 2,049.11	\$ 780.00	\$ 64.09
2399857	58.41	31I12	2014-02-18	2020-02-17	\$ -	\$ 780.00	\$ 64.09
2399858	58.56	31I12	2014-02-18	2020-02-17	\$ -	\$ 780.00	\$ 64.09
2407286	59.1	31I12	2014-07-16	2020-07-15	\$ 2,067.03	\$ 780.00	\$ 64.09
2407287	59.1	31I12	2014-07-16	2020-07-15	\$ 256,541.06	\$ 780.00	\$ 64.09

Claim #*	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits	Required Credits	Renewal Fee
2407288	59.1	31I12	2014-07-16	2020-07-15	\$ 318,495.23	\$ 780.00	\$ 64.09
2407289	59.1	31I12	2014-07-16	2020-07-15	\$ 33,550.25	\$ 780.00	\$ 64.09
2407290	59.1	31I12	2014-07-16	2020-07-15	\$ -	\$ 780.00	\$ 64.09
2407291	59.09	31I12	2014-07-16	2020-07-15	\$ -	\$ 780.00	\$ 64.09
2407292	59.09	31I12	2014-07-16	2020-07-15	\$ -	\$ 780.00	\$ 64.09
2407293	59.09	31I12	2014-07-16	2020-07-15	\$ -	\$ 780.00	\$ 64.09
2407294	59.09	31I12	2014-07-16	2020-07-15	\$ 2,067.03	\$ 780.00	\$ 64.09
2407295	59.09	31I12	2014-07-16	2020-07-15	\$ 186,642.89	\$ 780.00	\$ 64.09
2407296	59.09	31I12	2014-07-16	2020-07-15	\$ 80,149.03	\$ 780.00	\$ 64.09
2407297	59.08	31I12	2014-07-16	2020-07-15	\$ 97,785.70	\$ 780.00	\$ 64.09
2407298	59.08	31I12	2014-07-16	2020-07-15	\$ 2,067.03	\$ 780.00	\$ 64.09
2407299	59.08	31I12	2014-07-16	2020-07-15	\$ 116,744.68	\$ 780.00	\$ 64.09
2407300	59.07	31I12	2014-07-16	2020-07-15	\$ 12,071.61	\$ 780.00	\$ 64.09
2409338	45.71	31I12	2014-08-12	2020-08-11	\$ 2,067.03	\$ 780.00	\$ 64.09
2409339	55.12	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409340	43.5	31I12	2014-08-12	2020-08-11	\$ 32,008.21	\$ 780.00	\$ 64.09
2409341	58.98	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409342	59.04	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409343	59.11	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409344	59.11	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409345	59.11	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409346	59.1	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409347	59.1	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409348	59.09	31I12	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409349	59.11	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409350	59.11	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409351	59.1	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409352	59.1	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409353	59.09	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2409354	59.09	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09

Claim #*	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits	Required Credits	Renewal Fee
2409355	59.08	31J09	2014-08-12	2020-08-11	\$ -	\$ 780.00	\$ 64.09
2411654	47.87	31I12	2014-09-09	2020-09-08	\$ -	\$ 780.00	\$ 64.09
2411655	8.9	31I12	2014-09-09	2020-09-08	\$ 147.92	\$ 325.00	\$ 32.77
2411656	7.14	31I12	2014-09-09	2020-09-08	\$ 2,977.03	\$ 325.00	\$ 32.77
2411657	58.97	31I12	2014-09-09	2020-09-08	\$ -	\$ 780.00	\$ 64.09
2411658	34.01	31I12	2014-09-09	2020-09-08	\$ -	\$ 780.00	\$ 64.09
2411659	1.73	31I12	2014-09-09	2020-09-08	\$ 147.92	\$ 325.00	\$ 32.77
2411660	18.83	31I12	2014-09-09	2020-09-08	\$ 147.92	\$ 325.00	\$ 32.77
2411661	56.93	31I12	2014-09-09	2020-09-08	\$ -	\$ 780.00	\$ 64.09
2411662	19.75	31I12	2014-09-09	2020-09-08	\$ 147.92	\$ 325.00	\$ 32.77
2411663	10.86	31I12	2014-09-09	2020-09-08	\$ 2,197.21	\$ 325.00	\$ 32.77
2411664	12.67	31I12	2014-09-09	2020-09-08	\$ 147.92	\$ 325.00	\$ 32.77
2411665	53.72	31J09	2014-09-09	2020-09-08	\$ -	\$ 780.00	\$ 64.09
2426857	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426858	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426859	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426860	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426861	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426862	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426863	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2426864	59.12	31I12	2015-04-17	2019-04-16	\$ 17.92	\$ 780.00	\$ 64.09
2429408	59.12	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429409	59.11	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429410	59.11	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429411	59.11	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429412	59.08	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429413	59.07	31I12	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429414	59.07	31I12	2015-06-19	2019-06-18	\$ -	\$ 780.00	\$ 64.09
2429415	59.06	31I12	2015-06-19	2019-06-18	\$ -	\$ 780.00	\$ 64.09
2429416	59.12	31J09	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09

Claim #*	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits	Required Credits	Renewal Fee
2429417	59.11	31J09	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429418	59.11	31J09	2015-06-19	2019-06-18	\$ 17.92	\$ 780.00	\$ 64.09
2429419	59.1	31I12	2015-06-19	2019-06-18	\$ -	\$ 780.00	\$ 64.09
2429420	59.09	31I12	2015-06-19	2019-06-18	\$ -	\$ 780.00	\$ 64.09
2429421	59.08	31I12	2015-06-19	2019-06-18	\$ -	\$ 780.00	\$ 64.09
2431602	59.12	31I12	2015-07-28	2019-07-27	\$ -	\$ 780.00	\$ 64.09
2431603	37.17	31I12	2015-07-28	2019-07-27	\$ -	\$ 780.00	\$ 64.09
2431604	56.28	31I12	2015-07-28	2019-07-27	\$ 17.92	\$ 780.00	\$ 64.09
2431605	21.62	31I12	2015-07-28	2019-07-27	\$ 472.68	\$ 325.00	\$ 32.77
2431606	31.19	31I12	2015-07-28	2019-07-27	\$ -	\$ 780.00	\$ 64.09
2431607	58.68	31I12	2015-07-28	2019-07-27	\$ -	\$ 780.00	\$ 64.09
2431865	25.17	31I12	2015-08-11	2019-08-10	\$ -	\$ 780.00	\$ 64.09
2431866	2.95	31I12	2015-08-11	2019-08-10	\$ -	\$ 325.00	\$ 32.77
2433699	59.11	31J09	2015-10-02	2019-10-01	\$ -	\$ 780.00	\$ 64.09
2433700	59.1	31J09	2015-10-02	2019-10-01	\$ -	\$ 780.00	\$ 64.09
2433701	59.09	31J09	2015-10-02	2019-10-01	\$ -	\$ 780.00	\$ 64.09
2433702	59.08	31J09	2015-10-02	2019-10-01	\$ -	\$ 780.00	\$ 64.09
2433703	59.07	31J09	2015-10-02	2019-10-01	\$ -	\$ 780.00	\$ 64.09
2435494	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435495	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435496	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435497	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435498	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435499	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435500	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435501	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435502	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435503	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435504	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435505	59.04	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09

Claim #*	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits	Required Credits	Renewal Fee
2435506	59.03	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435507	59.03	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435508	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435509	59.03	31I12	2016-01-05	2020-01-04	\$ -	\$ 780.00	\$ 64.09
2435510	59.03	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435511	59.02	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435512	59.02	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435513	59.02	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435514	59.02	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435515	59.02	31I12	2016-01-05	2018-01-04	\$ -	\$ 780.00	\$ 64.09
2435633	2.84	31I12	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2435634	10.96	31I12	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2435635	1.02	31I12	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2435636	13.74	31I12	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2435637	55.49	31I12	2016-01-08	2020-01-07	\$ -	\$ 780.00	\$ 64.09
2435638	34.06	31I12	2016-01-08	2020-01-07	\$ -	\$ 780.00	\$ 64.09
2435639	48.83	31J09	2016-01-08	2020-01-07	\$ -	\$ 780.00	\$ 64.09
2435640	7.14	31J09	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2435641	15.86	31J09	2016-01-08	2020-01-07	\$ -	\$ 325.00	\$ 32.77
2496343	59.05	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09
2496344	59.04	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09
2496345	59.04	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09
2496346	59.04	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09
2496347	46.34	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09
2496348	58.53	31I12	2017-06-14	2019-06-13	\$ -	\$ 780.00	\$ 64.09

\* All claims are 100% owned by Nouveau Monde Graphite Inc. (GESTIM client # 96458)  
 \* Claim Information effective date: October 23<sup>rd</sup>, 2017