NOUVEAU MONDE GRAPHITE

NI 43-101 Technical Feasibility Study Report for

The Matawinie Mine and the Bécancour Battery Material Plant Integrated Graphite Projects

Bécancour, Québec, Canada

Prepared for:

Nouveau Monde Graphite

Effective Date: July 6, 2022

Signature Date: August 10, 2022

Prepared by the following Qualified Persons:

- André Allaire, P.Eng., PhD. ____________________ BBA Inc.
- Jeffrey Cassoff, P.Eng. ____________________ BBA Inc.
- Bernard-Olivier Martel, P.Geo. ____________________ B.O. Martel Inc.
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- Yann Camus, P.Eng. ____________________ SGS Geological Services

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DATE AND SIGNATURE PAGE

This technical report is effective as of the 6th day of July, 2022.

Original signed and sealed on file	August 10, 2022
André Allaire, P.Eng., PhD. BBA Inc.	Date

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Jeffrey Cassoff, P.Eng. BBA Inc.	Date

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CERTIFICATE OF QUALIFIED PERSON

André Allaire, P.Eng., PhD.

This certificate applies to the NI 43-101 Technical Report titled "Feasibility Study for the Matawinie Mine and the Bécancour Battery Material Plant Integrated Graphite Projects, Saint-Michel-des-Saints, Québec, Canada" (the "Technical Report"), prepared for Nouveau Monde Graphite Inc., dated August 10, 2022, with an effective date of July 6, 2022.

I, André Allaire, P.Eng.,PhD., as a co-author of the Technical Report, do hereby certify that:

1. I am currently employed as a Senior Process Engineer in the consulting firm BBA Inc. located at 2020 Robert-Bourassa Blvd., Suite 300, Montréal, Québec, Canada, H3A 2A5.
2. I graduated from McGill University of Montreal with a B.Eng. in Metallurgy in 1982, an M. Eng. In 1986 and a Ph.D. in 1991. I have practiced my profession continuously since my graduation.
3. I am a member in good standing of the Order of Engineers of Québec (# 38480) and of the Canadian Institute of Mining Metallurgy and Petroleum.
4. I have practiced my profession continuously since my graduation in 1999. My relevant experience includes open pit mining operations and many NI 43-101 studies.
5. I have read the definition of "qualified person" set out in the NI 43-101 – Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a qualified person for the purposes of NI 43-101.
6. I am independent of the issuer applying all the tests in Section 1.5 of NI 43-101.
7. I am author and responsible for the preparation of Chapters 1, 2, 3, 18, 19, 20, 21, 22, 24, 25, 26 and 27, I am also co-author and responsible for the preparation of Sections 5.6, 13.2, 17.1 and 17.3 of the Technical Report.
8. I have visited the Matawinie Property that is the subject of the Technical Report on October 20, 2021 as part of this current mandate.
9. I have had no prior involvement with the property that is the subject of the Technical Report.
10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared following NI 43-101 rules and guidelines.
11. As at the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.

Signed and sealed this 10th day of August 2022.

Original signed and sealed on file

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CERTIFICATE OF QUALIFIED PERSON

Jeffrey Cassoff, P.Eng.

This certificate applies to the NI 43-101 Technical Report titled "Feasibility Study for the Matawinie Mine and the Bécancour Battery Material Plant Integrated Graphite Projects, Saint-Michel-des-Saints, Québec, Canada" (the "Technical Report"), prepared for Nouveau Monde Graphite Inc., dated August 10, 2022, with an effective date of July 6, 2022.

I, Jeffrey Cassoff, P.Eng., as a co-author of the Technical Report, do hereby certify that:

1. I am a Senior Mining Engineer in the consulting firm BBA Inc. located at 2020 Robert-Bourassa Blvd., Suite 300, Montréal, Québec, Canada, H3A 2A5.
2. I graduated from McGill University of Montréal with a B. Eng. in Mining in 1999.
3. I am a member in good standing of the Order of Engineers of Québec (#5002252), the Professional Engineers and Geoscientists, Newfoundland and Labrador (#06205), and the Northwest Territories Association of Professional Engineers and Geoscientists (NAPEG Member No. L4142).
4. I have practiced my profession continuously since my graduation in 1999. My relevant experience includes open pit mining operations and many NI 43-101 studies, including several for Graphite Projects.
5. I have read the definition of "qualified person" set out in the NI 43-101 – Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a qualified person for the purposes of NI 43-101.
6. I am independent of the issuer applying all the tests in Section 1.5 of NI 43-101.
7. I am author and responsible for the preparation of Chapters 15 and 16. I am also co-author and responsible for the relevant portions of Chapters 1, 18, 21, 25, 26 and 27 of the Technical Report.
8. I have visited the Matawinie Property that is the subject of the Technical Report on October 20, 2021 as part of this current mandate.
9. I have had no prior involvement with the property that is the subject of the Technical Report.
10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared following NI 43-101 rules and guidelines.
11. As at the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.

Signed and sealed this 10th day of August 2022.

Original signed and sealed on file

Jeffrey Cassoff, P.Eng.

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5500, chemin de Chambly, bureau #1
St-Hubert, Québec, Canada, J3Y 3P3

CERTIFICATE OF QUALIFIED PERSON

Bernard-Olivier Martel P.Geo.

This certificate applies to the NI 43-101 Technical Report titled "Feasibility Study for the Matawinie Mine and the Bécancour Battery Material Integrated Graphite Projects, Saint-Michel-des-Saints, Québec, Canada" (the "Technical Report"), prepared for Nouveau Monde Graphite Inc. (NMG), dated August 10, 2022, with an effective date of July 6, 2022.

I, Bernard-Olivier Martel, P.Geo., as a co-author of the Technical Report, do hereby certify that:

1. I am a consulting geologist with the consulting firm B.O. Martel Inc., located at 5500, chemin de Chambly, bureau #1, St-Hubert, Québec, Canada, J3Y3P3.
2. I am a graduate from *Université du Québec à Montréal* with a bachelor's degree in geology in 1999.
3. I am a member in good standing of "Ordre des géologues 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 NI 43-101 – Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a qualified person for the purposes of NI 43-101.
6. I am independent of the issuer applying all the tests in Section1.5 of NI 43-101.
7. I am author and responsible for the preparation of Chapters 4, 6, 7, 8, 9, 10, 11, 23. I am also co-author and responsible for the relevant portions of Chapters 1, 5, 25, 26 and 27 of the Technical Report.
8. I have visited the Matawinie Property that is the subject of the Technical Report on several occasions in 2015, 2016, 2017, 2018, 2019, 2020 and 2021, with the last visit on November 23, 2021, as a consulting geologist responsible for exploration and infill drilling campaigns.
9. I have had no prior involvement with the property that is the subject of the Technical Report.
10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared following the NI 43-101 rules and guidelines.
11. As at the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.

Signed and sealed this 10th day of August 2022.

Original signed and sealed on file

Bernard-Olivier Martel, P.Geo.

SOUTEX

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CERTIFICATE OF QUALIFIED PERSON

Simon Fortier, P. Eng.

This certificate applies to the NI 43-101 Technical Report titled "Feasibility Study for the Matawinie Mine and the Bécancour Battery Material Integrated Graphite Projects, Saint-Michel-des-Saints, Québec, Canada" (the "Technical Report"), prepared for Nouveau Monde Graphite Inc. (NMG), dated August 10, 2022, with an effective date of July 6, 2022.

I, Simon Fortier, P. Eng., as a co-author of the Technical Report, do hereby certify that:

1. I am a Senior Metallurgist with the consulting firm Soutex, located at 1990 Rue Cyrille-Duquet, Local 204, Québec (QC), Canada, G1N 4K8.
2. I graduated from Laval University of Quebec with a B. Eng. in Metallurgy in 2000.
3. I am a member in good standing of the "Ordre des Ingénieurs du Quebec" (OIQ#125118).
4. I have practiced my profession continuously since 2000 and have been involved in mineral processing for a total of 22 years since my graduation from University. This has involved working in Canada and my experience in principally in ore processing.
5. I have read the definition of "qualified person" set out in the NI 43-101 – Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a qualified person for the purposes of NI 43-101.
6. I am independent of the issuer applying all the tests in Section 1.5 of NI 43-101.
7. I am author and responsible for the preparation of Sections 13.1 and 17.2. I am also co-author and responsible for the relevant portions of Chapters 1, 25, 26 and 27 of the Technical Report.
8. I have not visited the Matawinie Property that is the subject of the Technical Report as it was not required for the purpose of this mandate.
9. I have had no prior involvement with the property that is the subject of the Technical Report.
10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared following NI 43-101 rules and guidelines.
11. As at the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.

Signed and sealed this 10th day of August 2022.

Original signed and sealed on file

Simon Fortier, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

Yann Camus, P.Eng.

This certificate applies to the NI 43 101 Technical Report titled "Feasibility Study for the Matawinie Mine and the Bécancour Battery Material Integrated Graphite Projects, Saint-Michel-des-Saints, Québec, Canada" (the "Technical Report"), prepared for Nouveau Monde Graphite Inc. (NMG), dated August 10, 2022, with an effective date of July 6, 2022.

I, Yann Camus, P.Eng., as a co-author of the Technical Report, do hereby certify that:

1. a) I am a Mineral Resource Estimation Engineer for SGS Canada Inc, - SGS Geological Services with an office at 10 Boul. de la Seigneurie Est, Suite 203, Blainville Quebec Canada, J7C 3V5.
2. b) I am a graduate of the École Polytechnique de Montréal (B.Sc. Geological Engineer, in 2000).
3. I am a member of good standing, No. 125443, of the l'Ordre des Ingénieurs du Québec (Order of Engineers of Quebec).
4. My relevant experience includes continuous mineral resource estimation since my graduation from University including many copper projects.
5. I have read the definition of "qualified person" set out in the NI 43-101 - Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that, by reason of my education, affiliation with a professional association, and past relevant work experience, I fulfill the requirements to be a qualified person for the purposes of NI 43-101.
6. I am independent of the issuer applying all the tests in Section1.5 of NI 43-101.
7. I am author and responsible for the preparation of Chapters 12 and 14. I am also co-author and responsible for the relevant portions of Chapter 1 and 25 of the Technical Report.
8. I have visited the Matawinie Property that is the subject of the Technical Report on 4 occasions: August 18th, 2021, November 27th, 2019, June 21st, 2018 and November 9th, 2016.
9. My prior involvement with the property is the preparation of the updated mineral resources presented in the press release “Nouveau Monde Updates Mineral Resource Estimate for its West Zone Deposit, Matawinie Graphite Property” dated March 2nd, 2017 and in the technical report entitled “NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project” issued on December 8th, 2017. Also, I updated the resources for the report entitled “NI 43-101 Updated Technical Pre-feasibility Study Report for the Matawinie Graphite Project” prepared for Nouveau Monde Graphite Inc. effective as of June 27th, 2018, issued on August 10th, 2018. And I updated the resource for the press release “Nouveau Monde Announces Updated Resource Estimate and Increases Combined Measured & Indicated Resources by 25 % to 120.3 Mt @ 4.26 % Cg” dated March 19th, 2020.
10. I have read NI 43-101 and the sections of the Technical Report for which I am responsible have been prepared following the NI 43-101 rules and guidelines.
11. As at the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.

Signed and sealed this 10th day of August 2022.

Original signed and sealed on file

Yann Camus, P.Eng.

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TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
2D	Two dimensional
3D	Three dimensional
AACE	AACE International (Association for the Advancement of Cost Engineering)
AARQ	Atlas des amphibiens et des reptiles du Québec
AASHTO	Association of State Highway and Transportation Officials
ABA	Acid base accounting
Ag	Silver
AGV	Automated guided vehicle
Ai	Abrasion index
Al	Aluminum
ALS	ALS Minerals laboratories
AP	Acid Potential
ARD	Acid rock drainage
As	Arsenic
ATV	All-terrain vehicle
Au	Gold
Ba	Barium
bank	Bank cubic metre (volume of material in situ)
BAPE	Bureau d'audience publique sur l'environnement du Québec
BBA	BBA Inc.
BC	Principal Collection Basin
BC-1	North Area Basin
BC-2	Industrial Zone Basin
Benchmark Minerals	Benchmark Mineral Intelligence
BET	Specific surface
BFA	Bench Face Angle
Bi	Bismuth
BQ	Drill Core Size (3.65 cm diameter)
BWi	Bond work index
C	Carbon
C_{10}-C_{50}	Petroleum Hydrocarbons
Ca	Calcium
CA	Certificate of Authorization
$CaCl_2$	Calcium chloride
CAD or $	Canadian dollar

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
Capex	Capital expenditure / capital cost estimate
CCBE	Capillary barrier effect
CCTV	Closed circuit television
CDPNQ	Centre de données sur le patrimoine naturel du Québec
CEAEQ	Centre d'expertise en analyse environnementale du Québec
CFTP	Piscivorous terrestrial fauna criterion
CFU	Colony-Forming Unit
CG	Concentrated Graphite
Cg or C(g)	Graphitic carbon
CIF	Cost Insurance and Freight
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
CIS	Corporate Information System
Cl_2	Chlorine
Clnr	Cleaner
CMB	Central Metasedimentary Belt
CNRC	Canadian National Research Council
CNSC	Canadian Nuclear Safety Commission
CO	Carbon monoxide
CO_2	Carbone dioxide
CO_3	Carbon trioxide
COG	Cut-off grade
conc.	Concentrate
CPC(O)	Criterion for preventing contamination of aquatic organisms
Cr	Chromium
Cr VI	Hexavalent Chromium
CSF	Co-disposal storage facility
CSPG	Coated spherical purified graphite
Ct or C(t)	Total Carbon
Cu	Copper
$CuSO_4$	Copper sulphate
CVAC	Protection of aquatic life, chronic effect
C-VAP	Commercial added value product
CWi	Crusher work index
D.S	Dissolved solids
DAP	Delivered at Place

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
dBA	Decibel with an A filter
DDH	Diamond drill hole
Directive 019	MELCC - *Directive 019 sur l'industrie minière* (Provincial guidelines for the mining industry)
DOE	Design of experiment
DOL	Direct online
DTH	Down-the-hole
DVAP	Demonstration Value-Added Plant
DVR	Digital Video Recorder
DWT	Drop Weight Test
E	East
EDO	Environmental discharge objectives
EGL	Effective grinding length
EM	Electromagnetic
EPCM	Engineering, Procurement, Construction Management
EPS	Expandable Polystyrene
EQA	Environmental Quality Act
ESA	Environmental Site Assessment
ESG	Environmental, Social, and Governance
ESIA	Environmental and Social Impact Assessment
et al.	et alla (and others)
EV	Electric vehicle
F/F	Flange-to-flange
FDEM	Frequency Domain Electromagnetic
Fe	Iron
FID	Full Investment Decision
FOB	Freight on board
FOS	Factors of safety
FS	Feasibility Study
FTE	Full time equivalent
G&A	General and Administration
GDP	Gross domestic product
GEMS	Geovia GEMS software
GHG	Greenhouse gas
GM	Gestion des titres miniers (GESTIM)

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
GOH	Gross Operating Hours
GPS	Global Positioning System
GSC	Geological Survey of Canada
GW	Groundwater
GWh	Gigawatt hour
H2 2022	Second half of 2022
H_2O_2	Hydrogen peroxide
ha	Hectare
HCO_3	Carbonate
HDPE	High-density polyethylene
hp	Horse Power
HPEV	Hybrid plug-in electric vehicle
HQ	Hydro-Québec
HRG	High resistance grounding
HVAC	Heating, ventilation, and air conditioning
I/O	Input/output
IAS	Invasive alien species
IBA	Impact and benefit agreement
ICP	Inductively coupled plasma
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
ICP-MS	Inductively coupled plasma-mass spectrometry
ICP-OES	Inductively coupled plasma atomic emission spectroscopy (also referred to as inductively coupled plasma optical emission spectrometry)
ICS	Industrial Control System
ID	Identification
ID^2	Inverse distance square
IDS	Inverse distance squared
IEC	International Electrotechnical Commission
IP	Induced polarization
IRA	Inter-Ramp Angle
IRR	Internal rate of return
ISO	International Organization for Standardization
ISQ	Institut de la statistique du Québec
IT	Information Technology
JF	Jumbo flake

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
JSS	Job Site Solution
KPI	Key performance indicators
LCT	Locked-cycle (flotation) test
Li	Lithium
LiB	Lithium-ion battery
Li-Ion	Lithium-Ion
LIMS	Low intensity magnetic separator
LKTZ	Labelle-Kinonge Shear Zone
LOI	Loss on Ignition
LOM	Life of mine
LTE	Long Term Evolution
LWG	Lengthwise graphitization
M/S	Micronization and Spheronization
Mag	Magnetic
MCC	Motor control centre
MDDELCC	Ministère du Développement durable, de l'environnement et de la Lutte contre les changements climatiques
MDDEP	Ministère du Développement durable, de l'Environnement et des Parcs du Québec
MELCC	Ministère de l'Environnement et de la Lutte contre les changements climatiques (Ministry of Environment, and Action against Climate Change) - formerly known as Ministère du Développement durable, de l'Environnement, et de la Lutte contre les changements climatiques (MDDELCC),
MEND	Mining Environment Neutral Drainage Program
MERN	Ministère de l'Énergie et Ressources naturelles (Ministry of Energy and Natural Resources)
MFFP	Ministère des Forêts, de la Faune et des Parcs
Mg	Magnesium
MI	Mineralized intervals
MIBC	Methyl isobutyl carbinol
MIMS	Medium intensity magnetic separator
Mn	Manganese
MOU	Memorandum of Understanding
MPO	Pêches et Océans Canada (Fisheries and Oceans Canada)
MPSO	MinePlan Schedule Optimizer
MRC	Municipalité régionale de comté
MRE	Mineral Resource Estimate

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
MT	Morin Terrane
MTL	Mont-Laurier Terrane
MTO(s)	Material take-off(s)
MTQ	Ministère des Transports du Québec
N	North
N/A	Not available
NA	North America
NAG	Non-acid generating
NGR	Neutral Grounding Resistor
NI	National Instrument
Ni	Nickel
NMG	Nouveau Monde Graphite
NMS	Network Management System
No. / #	Number
NOH	Net Operating Hours
NP/AP	Neutralization potential / acidification potential
NPV	Net present value
NQ	Drill Core Size (4.8 cm diameter)
NRCAN	Natural Resources Canada
NSR	Net smelter return
NTS	National topographic system
OB	Overburden
OEM	Original Equipment Manufacturer
OER	Objectifs environnementaux de rejet
Opex	Operational expenditure / operating cost estimates
OR	Operational Readiness
ORC	Operational Readiness and Commissioning
P&ID	Piping and instrumentation diagrams
P_{80}	80% passing - Product size
PAG	Potential-acid generating
PAH(s)	Polycyclic aromatic hydrocarbon(s)
PAX	Potassium amyl xanthate
Pb	Lead
PCB	Polychlorinated biphenyl
PDA	Pre-development agreement

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
PEA	Preliminary economic assessment
PEV	Plug-in electric vehicle
PFC	Power factor correction
PFS	Pre-Feasibility study
PGA	Peak ground acceleration
pH	Potential of hydrogen
PhD	Doctor of philosophy
PIPB	Bécancour Industrial and Port Park
PJF	Purified jumbo flake
PLC	Programmable logic controller
PMF	Probable maximum flood
POV	Pre-operational verifications
PP	Pilot plant
PPI	Producer price indices
PPM	Pore Pressure Model
PVC	Polyvinyl Chloride
Q1, Q2, etc.	First Quarter, Second Quarter
QA/QC	Quality Assurance/Quality Control
QP	Qualified person
RAA	Règlement sur l'assainissement de l'atmosphère (Clean Air Regulation)
RADF	Règlement sur l'aménagement durable des forêts du domaine de l'État
RCAMHH	Règlement sur la compensation pour l'atteinte aux milieux humides et hydrique
REAFIE	Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement
RES	Resurgence in surface water (résurgence dans l'eau de surface)
RF	Revenue Factor
RLRQ	Recueil des lois et des règlements du Québec
ROM	Run of mine
RQD	Rock quality designation
RTLS	Real Time Location Service
RWi	Bond Rod Mill Work Index
S	Sulphur
S%	Sulphur content
SAG	Semi-autogenous grinding
SCC	Standards Council of Canada

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
SCR	Silicon-controlled resistors
SCSE	SAG Circuit Specific Energy
SEDAR	System for electronic document analysis and retrieval
SG	Spherical graphite
SGS	SGS Lakefield Research Limited of Canada
SIGÉOM	Système d'information géominière du Québec
SLD	Single-line diagram
SMC	SAG mill comminution
SMDS	Saint-Michel-des-Saints
SMM	Stirred media mill
SO_2	Sulphur dioxide
SO_4	Sulphate
SP	Softening point
SPG	Spherical purified graphite
SPIPB	Société du parc industriel et portuaire de Bécancour
SPLP	Synthetic Precipitation Leaching Procedure
SRK	SRK Consulting
STACOM	Static synchronous compensator
Std	Standard
TCLP	Toxicity Characteristic Leaching Procedure
TDEM	Time Domain Electromagnetic
Ti	Titanium
TSS	Total solids in suspension
U	Uranium
U.S.	United States
U/F	Underflow
U/G	Underground
UGAF	Fur-bearing animal management units
USD	United States dollar
UTM	Universal Transverse Mercator
V	Vanadium
VAFe	Final acute effluent value
VAR	Variability composites
VFD	Variable frequency drives
VOC(s)	Volatile organic compound(s)

TABLE OF ABBREVIATIONS	
Abbreviation	**Description**
VoIP	Voice-over-IP
VRLA	Valve-regulated lead acid
vs	Versus
W	West
WBS	Work breakdown structure
WEC	Work element coding
WMP	Water management plan
WSP	WSP Canada Inc.
WTP	Water treatment plant
X	X Coordinate (E-W)
XRD	X-Ray Diffraction
Y	Y coordinate (N-S)
Z	Z coordinate (depth or elevation)
Zn	Zinc
Zr	Zirconium

TABLE OF ABBREVIATIONS – UNITS OF MEASUREMENTS	
Unit	**Description**
$ or CAD	Canadian dollar
$/m²	dollar per square metre
$/m³	dollar per cubic metre
$/t	dollar per tonne
%	percent
% w/w	percent Solid by Weight
°	degree
°C	degrees Celsius
a	annum
cm	Centimetre
d	day (24 hours)
deg. or °	angular degree
ft	feet (12 inches)
g	gram
g/t	gram per tonne
Ga	billion years
GWh	gigawatt hours
h	hour (60 minutes)
ha	hectare
in	inch
J/g	Joule per grams
K	Thousands (‘000)
kg	kilogram
kg/d	kilogram per day
kg/h	kilogram per hour
kg/t	kilogram per tonne
km	kilometre
km/h	kilometre per hour
km²	square kilometre
kV	kilovolt
kVA	Kilovolt Ampere
kW	kilowatt
kWh	Kilowatt-hour
kWh/t	kilowatt hour per tonne

TABLE OF ABBREVIATIONS – UNITS OF MEASUREMENTS	
Unit	**Description**
L	litre
m	metre
m/h	metre per hour
m/s	metre per second
m^2	square metre
m^2/h	square metre per hour
m^3	cubic metre
m^3/d	cubic metre per day
m^3/h	cubic metre per hour
mAh	Milliampere hour
mg	milligram
mg/L	milligrams per litre
min	minute (60 seconds)
min/h	minute per hour
min/shift	minute per shift
ml	millilitre
mm	millimetre
Mm^3	million cubic metres
Mt	million tonnes
Mtpy	million tonnes per year
MV	medium voltage
MVA	megavolt ampere
MW	megawatt
mZ	mass-to-charge ratio
nm	nanomètre
Nm^3/h	normal cubic metre per hour
Ø	diameter
oz	ounce (troy)
ppm	parts per million
rpm	revolutions per minute
sec	seconds
t	tonne (1,000 kg) (metric ton)
t/m^2	tonne per square metre
t/m^3	tonne per cubic metre
ton or st	short ton

TABLE OF ABBREVIATIONS – UNITS OF MEASUREMENTS	
Unit	**Description**
tpd	tonne per day
tph	tonne per hour
tpy	tonne per year
µg/m³	microgram per cubic metre
µm	microns, micrometre
V	volt
W	watt
wt	wet metric tonne
wt%	weight percent
y	year (365 days)

1. Summary

Nouveau Monde Graphite ("NMG" or the "Company") is working towards developing a fully integrated source of carbon-neutral battery anode material in Québec, Canada for the growing lithium-ion and fuel cell markets. The Project includes the Matawinie Mine, a world-class graphite deposit and beneficiation plant in Saint-Michel-des-Saints (SMDS), and the Bécancour Battery Material Plant for secondary transformation of graphite concentrates into high-purity, battery-grade material to supply the lithium-ion industry.

Using a phased approach to help de-risk the Project, NMG has invested considerably in Phase 1 piloting and demonstration plants for both beneficiation and secondary transformation, while accelerating the engineering of Phase 2 commercial operations, generating process and cost optimization, and supporting commercialization with potential customers.

With ambitious ESG standards, NMG is designing a mine of the future, targeted to be all-electric, complemented by clean advanced beneficiation facilities maximizing energy efficiency in order to provide battery and EV manufacturers with responsibly extracted, environmentally transformed, and locally sourced green anode material.

This report presents the results of the Feasibility Study (FS) for the integrated Matawinie Mine, beneficiation plant and Battery Material Plant projects.

1.1. Property Description, Location and Ownership

1.1.1. Matawinie Mine Project

The Mining Property or the "Tony Block" currently consists of 159 contiguous map-designated claims totalling 8,266.42 ha. Exploration work on the Mining Property uncovered significant crystalline flake graphite mineralization with the goal to economically extract this critical and strategic mineral. After successfully identifying Mineral Reserves on its Mining Property, NMG has advanced its mining project (the "Matawinie Mine") at the development stage with ongoing detailed engineering and construction targeting the Mining Property's mineralized West Zone. The Mining Property claims are wholly owned (100%) by NMG.

The centre of the Tony Block is located approximately 6 km to the southwest of the community of SMDS in the National Topographic System (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. The centre of the Tony Block is positioned approximately 120 km as the crow flies north of Montréal, at latitude 46.63° and longitude -73.96° using the WGS 1984 geographic coordinate system.

NMG granted a hypothec to Pallinghurst Graphite Limited over substantially all of NMG's assets, including the mineral claims forming the Mining Property, to secure NMG's obligations under a secured convertible bond in the principal amount of $15 million (the "Bond"). The obligations secured by the hypothec were extinguished with the conversion of the Bond in October 2021, but the hypothec has not been discharged as of the date of this report.

The Mining Property is subject to a 0.2% Net Smelter Return (NSR) royalty agreement with Mr. Eric Desaulniers, which can be fully bought back by NMG at any time for the sum of $200,000. It is also subject to a 3.0% NSR with Pallinghurst Graphite International Ltd. ("Pallinghurst International") which is subject to a 1% buy-back right in favour of NMG for an amount equal to $1,306,036, plus accrued interests at a rate of 9% per annum from and after August 28, 2020, and up to the buy-back date. As provided for in the royalty agreement with Pallinghurst International, Pallinghurst International requested that a new hypothec be granted on the Mining Property to secure NMG's NSR obligations concurrently with the discharge of the hypothec securing NMG's obligations under the Bond.

NMG also has a collaboration and benefit-sharing agreement with the Municipality of Saint-Michel-des-Saints (respectively, the "SMDS Collaboration Agreement" and the "Municipality"). NMG will pay to the Municipality the following amounts:

- The greater of (i) 0.4% of the estimated net cash flow after taxes for the duration of the operation of the Matawinie Mine representing $400,000 annually or (ii) 2% of the net cash flow after taxes resulting from the operation of the Matawinie Mine during a calendar year;
- Between the date of the SMDS Collaboration Agreement and the first calendar year of commercial production, an aggregate annual amount of $400,000. This lump sum is an advance payment and will be deducted from the variable participation payments set out above in (ii) payable during commercial production; and
- As of the second calendar year of commercial production and for each subsequent calendar year of operation of the Matawinie Mine, 1% of the net cash flow after taxes resulting from the operation of the Matawinie Mine during the preceding calendar year shall be injected into a fund to be established by NMG to help stimulate development projects for the communities of the Upper Matawinie region.

All governmental permits as well as all authorizations from the Municipality of Saint-Michel-des-Saints pertaining to exploration, geotechnical and hydrogeological exploration and characterization work to date have been obtained.

The ministerial decree authorizing the Matawinie Mine project (Decree #47-2021) was granted by the MELCC on January 20, 2021. The Decree covers a commercial production level of 100,000 tonnes per year (tpy) of graphite concentrate, which will be used in part for NMG's value-added anode strategy – supplying material for the electrical vehicle and renewable energy storage industries.

To the knowledge of the author of Chapter 4, there are no liabilities (whether contingent or otherwise) in connection with any environmental activity relating to or affecting NMG, its subsidiaries or their properties, assets or operations, and there are no liabilities (whether contingent or otherwise) relating to the restoration or rehabilitation of land, water or any other part of the environment, in each case, which would have a material adverse effect on the Mining Property.

The Mining Property's main mineralized zones are located on public crown land. The Matawinie Mine project footprint has no accessibility restrictions known to NMG.

None of the infrastructure of the proposed Matawinie Mine is located on private or leased land other than those belonging to NMG or one of its subsidiaries, except for a portion of the main access road for which an agreement was entered into with the landowner in connection with the establishment of a right-of-way in favour of NMG.

1.1.2. Phase 2 Bécancour Battery Material Plant

The Advanced Battery Plant is located on lot 17 in the Bécancour Industrial Park. NMG's 200,000 m² L-shaped property presents no environmental limitations for construction. The property is bordered to the north by a rail line and the Trans-Canada pipeline. Road access to the property is from the west side via Avenue G.A. Boulet. Approximately half of the NMG property, areas to the south and east of the proposed plant will not be developed and will be reserved for future expansion or for use as construction lay-down areas.

The site is strategically located and offers access to all necessary infrastructure and services including:

- A safe and direct pipeline chemical supply from Olin;
- A proposed direct delivery of nitrogen via underground pipeline from an industrial gas supplier;
- Access to a 120 kV electrical line running along the northern border to the property;
- Access to a natural gas pipeline along the eastern property border;
- Direct potable and industrial water access along multiply sides of the property;
- Easy rail, port, and road access for both importing raw materials and exporting final products throughout North America and Europe.

1.2. Geological Setting and Mineralization

The Mining Property 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 Mining Property. The graphite mineralization identified in the Tony Block is hosted in paragneiss horizons and appears as disseminated graphite flakes.

1.3. Exploration

Exploration work on the Mining Property 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^2 (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 (2014-2019);
- Trenching and channel sampling of the main conductors (2014-2016);
- Drilling of the main mineralized zones (2015- 2021);
- Metallurgical testing of surface and drill core samples.

From 2014 to 2019, ground PhiSpy TDEM surveys totalling 183 line-kilometres using 100 m line spacing in the targeted areas and 25 m line spacing over the more promising Southeast, Southwest and West Zones, was performed. The PhiSpy survey 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 on 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 trenches TO-14/16-TR-03, TO-16-TR-10 and TO-16-TR-11 (207 samples) were used in the Mineral Resource Estimate for the West Zone deposit.

1.4. Drilling

Exploration drilling on the Mining Property targeted wide conductors on each of the main conductive areas outlined by the 2014 to 2019 ground PhiSpy surveys. A total of 196 sampled exploration holes were drilled in the Tony Block totalling 33,016.70 m. This includes 149 sampled holes totalling 26,203.74 m drilled in the West Zone deposit. The exploration drill holes mentioned above do not include 24 holes drilled for the pit slope geotechnical studies and 89 vertical holes for other purposes such as overburden thickness surveys, environmental monitoring, and hydrogeological modelling in the West Zone deposit area.

Mineralization was intercepted 476 times by drilling in the West Zone resulting in the interpretation of a mineralized envelope of about 100 m to 150 m thick from which 23 graphitic horizons, or volumes (17 groups of mineralized intervals), were interpreted. These horizons can be followed, sometimes sporadically, over 3 km. 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 109.9 m although this intersection is considered as being down-dip. Mineralization is open to the North, to the south and at depths greater than 200 m from surface.

The drilling in the South-East Zone of the South deposit consisted of nine holes for a total of 1,551.99 m drilled. Mineralization was intercepted 13 times by drilling resulting in the interpretation that the South-East Zone is composed of two main mineralized horizons (S1 and S2). The highlight of the Southeast Zone is the large width of the mineralized horizons. From section S2600 to section S2900 (300 m length), the mineralized horizon ranges from 117 m to 160 m true width, with grades varying from 3.19% to 3.62% C(g).

The drilling in the Southwest 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 Southwest Zone is composed of two main mineralized horizons (S1 and S2). The highlight of Southwest Zone is a first graphitic horizon (S1) about 30 m thick, followed by a mostly barren interval between 25 m and 63 m thick, and finally, a second graphitic horizon (S2) around 40 m to 50 m thick, with both graphitic horizons varying from 2.79% to 5.29% C(g).

A total of 16 other exploration holes totalling 2,644.37 m was drilled in other mineralized zones on the Mining 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, Southeast and Southwest Zones, due to thinner mineralized intercepts and/or lower graphite grades.

Drill core quality control and quality assurance (QA/QC) samples, including blanks, duplicates and graphite standards, were included in the drill core sample stream. Out of the 11,736 drill core samples from the Tony Block sent for graphic carbon (Cg) analysis, 1,225 were sent as quality control samples, including 907 QA/QC samples from the 9,181 West Zone core samples. Quality control sample results retuned within acceptable limits. No bias was introduced in the sampling procedures.

1.5. Mineral Processing and Metallurgical Testing

1.5.1. Phase 2 Matawinie Mine Project, Mineral Processing Plant

Between 2013 and 2021, multiple metallurgical process development and optimization programs have been carried out on samples from the Matawinie graphite mineralization between 2013 and 2021. The initial programs focused on the development of a flowsheet that maximizes concentrate grade and recovery, while minimizing flake degradation. The flowsheet that was developed for the Preliminary Economic Assessment (PEA) was optimized and validated during the Pre-feasibility (PFS) and Feasibility (FS) studies. All components incorporated in the Matawinie Mine process are mature technologies that have been demonstrated in many concentrators over the past several decades. The proposed flowsheet and conditions proved robust to produce a concentrate grade of 97% C(t) at a total carbon recovery of 93%. The graphite tailings are subjected to a desulphurization stage that separates most sulphides from the balance of the flotation tailings to produce two separate tailings products, namely one high-sulphur low-mass and one low-sulphur high-mass.

NMG constructed a flotation demonstration plant in 2018 to help de-risking the process and to produce larger quantities of flotation concentrate for customer evaluation and downstream value-add process development. Some of the unit process operations that were optimized in the demonstration plant to de-risk the process included the specific flotation technology for the commercial plant (tank cells and flash flotation), the cleaner circuit grinding equipment (polishing and stirred media mills), and the configuration of the desulphurization circuit.

Multiple programs were completed with equipment vendors and independent labs after completion of the Feasibility Study to support equipment selection during detailed engineering. These programs included a validation program for the comminution circuit, solid-liquid separation programs for tailings and concentrate streams, drying tests, and wet classification of intermediate concentrates. Further, supplemental tests were carried out to assist in the design of product handling systems

1.5.2. Phase 2 Bécancour Battery Material Plant

1.5.2.1. Micronization and Spheronization

The Micronization and Spheronization (M/S) Sector is divided into two main steps. The first step consists of graphite particle size reduction. The concentrated graphite (CG) is micronized to breaks down the coarser flakes to a size that is suitable for the subsequent spheronization step. The second step is the spheronization and can be seen as a shaping process. The main objective is to round the graphite particles to increase the density of the spherical graphite (SG). The density of the SG is measured in terms of tap density which represents an increased bulk density attained after mechanically tapping a container containing the powder sample. Two SG products will be produced at this spheronization step. The primary SG will be produced directly from the micronized graphite, and it will have a coarser particle size. The main objective of the Secondary spheronization batch process is to produce a smaller Spherical Graphite (SG) from the finest portion of the micronized graphite and the primary spheronization fines.

In-house large-scale testing and OEM Test Centres were used to identify the optimum process configuration to obtain spheronized material that respond to the criteria of various potential clients of the Battery Material Industry. In 2019, NMG acquired a Micronization and Spheronization unit able to process and spheronize 120 kg/h of graphite from an Original Equipment Manufacturer (OEM). This equipment was selected based on trials previously performed at the OEM test centre that showed promising results. This unit was installed in Saint-Michel-des-Saints NMG Demonstration Value-Added Plant (DVAP) and was used to perform more than 2,400 tests on the NMG Graphite to better understand the spheronization process. In 2022, NMG also acquired a different micronizing and shaping unit of 250 kW to increase the capacity of the DVAP installation and confirm the OEM test results on a full-size commercial unit.

Numerous tests were also performed at different OEM and Institutional Test Centres to evaluate the equipment capability and final products characteristics from 2016 to 2022.

NMG also characterizes the properties of the by-products resulting from the spheronization process. Several options have been evaluated to valorize the fines, or alternatively, they can be sold as carbon riser.

1.5.2.2. Purification

The purification process used by NMG to produce battery-grade graphite above 99.95% carbon is called "carbochlorination" where metal oxides are converted into their corresponding metal chlorides in the presence of carbon and chlorine gas. The advantages of this technology being a lower reaction temperature as opposed to the conventional thermal process and the absence of hazardous wastes such as fluorides, compared to the chemical process.

A similar process has been used in the past to produce ultrapure graphite for the nuclear industry but at a non-economical cost for the battery industry. A key improvement of the NMG process is the hybrid furnace, enabling higher volume of graphite and faster turnaround for the batch process. The result is an economically sound and environmentally safe operation. The hybrid furnace is a combination of lengthwise graphitization (LWG) and Acheson furnaces used in the production of synthetic graphite.

Laboratory work conducted at two test centres has demonstrated that the target purity is obtained with carbochlorination, and a demonstration plant has been built inside electrolysis hall #1 at the Olin facility in Bécancour. The Project charter and the operating permit is for the production of 250 tpy of purified graphite at 99.95%. However, the demonstration plant has been designed with the goal to demonstrate a capacity of 2,000 tpy and minimize scale-up for a commercial operation.

Pre-operational verifications (POV) began in June 2021 and the transformer-rectifier unit was put into service on July 17, 2021. POV of furnace #1 was done, starting on July 22 and furnace #2 starting on October 28. A total of 20 batches were completed as of June 8, 2022, one every 15 days on average. Final operating and cycle time parameters are not completed, and test works will continue during H2 2022 to finalize the commercial scale up criteria and the number of furnaces required in the commercial plant.

1.5.2.3. Coating

The coating process of NMG's spheronized and purified graphite, is the last important step in upgrading graphite to qualify the product for optimum economic performance in the anode materials for the li-ion battery sector. This step consists of the application of a nanometric layer of amorphous carbon on the surface of spheronized and purified graphite (SPG), to enhance the rate of performance sought by the Li-Ion battery manufacturers.

This coating process is carried out in several stages starting with the micronization of solid carbon precursor which is mixed with the spheronized graphite in a specific dosage. This uniform mixture is then heated in successive stages inside a furnace or in a high temperature reactor for the pyrolysis of the pitch on the surface of the graphite which is then calcined to obtain an amorphous carbon on the surface. Deagglomeration and sieving steps are then carried out to obtain the particle size required by the various customers.

To establish the proper technology, precursor and prove the coating concept, NMG performed different studies and tests in independent laboratories and at suppliers' test facilities. Most technology thereby chosen by NMG being widely used in the industry, further tests were performed intended to establish the right proportions and process parameters.

In the first stage, to determine the required process conditions and type of precursor needed for amorphic carbon coating, multiple laboratory tests were performed at the Canadian National Research Council (CNRC) based on literature reviews and experience from consulted experts. These trials were then evaluated, with electro-chemical tests in half coin cell, to establish the baseline of the process conditions for the following steps.

The base line conditions were then tested at a pilot scale performed at suppliers' facility. The material was subsequently evaluated to confirm the results obtained in the laboratory.

This became the baseline for the construction of the Phase 1 Battery Material Plant, a 2,000 tpy coating line in Saint-Michel-des-Saints, that will be used to optimize the process conditions.

1.6. Mineral Resource Estimate

The block model used to generate the Current Resource of the West Zone for this Feasibility Study has an effective date of May 20, 2022. This Resource is based on a total of 173 core drill holes which produced 8,274 samples as well as 207 samples collected from channelling work in three trenches. This does not include the quality control samples that are comprised of 365 duplicates, 364 blanks and 178 standard samples, all of which returned within acceptable limits. In all, 23 mineralized volumes (17 groups of mineralized intervals) encased in paragneiss units were interpreted and modelled from this data.

The Current Resource block model for the West Zone deposit was prepared by Yann Camus, P.Eng., of SGS Geological Services located in Blainville, Québec, Canada, using the Genesis© mining software. Interpolation was performed using inverse square distance (ID^2) as well as different search ellipsoids that were adapted to the geology of the deposit. The block model was then processed by 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 (May 20, 2022). The Mineral Resources of the West Zone, or the Matawinie Mine, are presented in the Table 1-1.

Table 1-1: Pit-constrained Mineral Resource Estimate for the West Zone(1)

Mineral Resource Category(2)	Current Resource (May 20, 2022)(5)(6)(7)		
	Tonnage (Mt)	Grade [% C(g)](3)	C(g) (Mt)
Measured	28.5	4.28	1.22
Indicated	101.8	4.26	4.33
Measured + Indicated	130.3	4.26	5.55
Inferred(4)	23.0	4.28	0.98

(1) The Mineral Resources provided in this table were estimated by Yann Camus P.Eng. (QP) of SGS Geological Services, using current Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

(2) 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.

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

(4) 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.

(5) Current Resource still effective July 6, 2022, because no new data is available for the West Zone and no material has been extracted since the Mineral Resource Estimate dated May 20, 2022.

(6) Mineral Resources are stated at a cut-off grade of 1.78% C(g).

(7) Standards used for this Resource Update are the same standards produced over the course of the Feasibility Study (results published December 10, 2018) and the Resource Update (results published March 19, 2020). The difference comes mainly from a newly accessible land package along the Hydro-Québec power line.

1.7. Mineral Reserve Estimate

The Matawinie Mine project will be mined using conventional open pit mining methods consisting of drilling, blasting, loading, and hauling. Ore will be hauled to the primary crusher and waste rock and tailings will be placed in a co-disposal storage facility (CSF). The CSF will initially be located at the surface and as of Year 7, will be placed inside the mined out open pit.

The Mineral Reserves for the Matawinie Mine project were prepared by Jeffrey Cassoff, P.Eng., Senior Mining Engineer with BBA Inc.; a Qualified Person as defined under National Instrument 43-101.

The Mineral Reserves have been estimated based on a graphite concentrate selling price of 2,135$/t and a 25-year life of mine (LOM) plan.

Development of the LOM plan included pit optimization, pit design, mine scheduling and the application of modifying factors to the Measured and Indicated Mineral Resources. The reference point for the Mineral Reserves is the feed to the primary crusher. The tonnages and grades reported are inclusive of mining dilution, geological losses, and operational mining losses.

Table 1-2 presents the Mineral Reserves that have been estimated for the Matawinie Mine project, which include 17. Mt of Proven Mineral Reserves at an average grade of 4.16% Cg and 44.3 Mt of Probable Mineral Reserves at an average grade of 4.26% Cg for a total of 61.7 Mt of Proven and Probable Mineral Reserves at an average grade of 4.23% Cg. To access these Mineral Reserves, 15.5 Mt of overburden and 56.2 Mt of waste rock must be mined, resulting in a strip ratio of 1.16:1.

Table 1-2: Matawinie Mine Mineral Reserves

Category	Tonnes (Mt)	Cg Grade (%)	Contained Graphite (Mt)
Proven	17.3	4.16	0.7
Probable	44.3	4.26	1.9
Proven & Probable	**61.7**	**4.23**	**2.6**

1. The Qualified Person for the Mineral Reserve Estimate is Jeffrey Cassoff, P.Eng., of BBA Inc.
2. The effective date of the estimate is July 6, 2022.
3. Mineral Reserves were estimated using a graphite concentrate selling price of 2,135$/t, and consider a 2% royalty, and selling costs of 47.92$/t. An average grade of 97% was considered for the graphite concentrate.
4. A metallurgical recovery of 93% was used.
5. A cut-off grade of 2.20% Cg was used.
6. The strip ratio for the open pit is 1.16 to 1.
7. The Mineral Reserves are inclusive of mining dilution and ore loss.
8. The reference point for the Mineral Reserves is the primary crusher.
9. Totals may not add due to rounding.

1.8. Mining Methods

Mining will be carried out with drilling and blasting on 10 m high benches and loading will be done in two 5 m flitches. The loading fleet will consist of two diesel-powered hydraulic excavators equipped with 5.4 m^3 buckets and loading will be done with a fleet of 12, 60-tonne rigid frame mining trucks. A front-end wheel loader will support the excavators with loading and ore blending.

Tailings produced by the concentrator will be segregated into non-acid generating (NAG) and potential-acid generating (PAG). Both the NAG and PAG will be loaded with a front-end wheel loader into a fleet of five 60-tonne haul trucks that will haul the tailings to the CSF. A fleet of CAT D8 dozers and hydraulic excavators will place and compact the tailings and waste rock on the CSF.

The mine will operate on two 8-hour shifts, 5 days per week, while the mill will operate 24 hours per day, 365 days per year. A crushed ore bin will be filled before the mine shuts down for the evenings and weekends.

The ultimate pit designed for the Project considers 20 m wide haul ramps for double-lane traffic, 13 m wide ramps for single-lane traffic for the lower benches, a maximum ramp grade of 10%, and a minimum mining width of 20 m. SRK Consulting carried out an open pit slope investigation and stability assessment in 2021 to update previous geotechnical work.

The ultimate pit is approximately 3,000 m long and 400 m wide at surface. The total surface area of the pit is roughly 82 ha. The pit contains five independent ramp systems which are required for pit phasing and the in-pit placement of waste rock and tailings. The deepest part of the pit is at the 345 m elevation, at the north end of the pit, where the total depth of the pit from surface reaches 185 m. The pit avoids a wetland on the southwest corner and at its closest point, is 110 m away from the Hydro-Québec power lines.

To maximize the Net Present Value (NPV) of the Project, mining phases (pushbacks) have been designed and incorporated into the mining sequence to defer waste rock stripping and to provide a blended feed grade that is acceptable for the concentrator over the life of the Project.

The deposit will be mined from south to north to ensure adequate space is available for in-pit backfilling of waste rock and tailings once the initial CSF at surface is filled to capacity. The south end of the pit can also be accessed at lower strip ratios than at the north end.

A mine production plan has been prepared using the Mine Plan Schedule Optimizer (MPSO) tool in the Hexagon MinePlan 3D software. The mine plan has been prepared quarterly for the first 2 years of production, annually for the following 11 years, and in 3-year increments thereafter. The mine plan also includes a six-month period of pre-production to prepare the pit for mining operations.

The mine plan aims to produce between 100,000 t and 105,900 t of concentrate per year, and targets the nominal mill throughput capacity of 324 tph, resulting in a maximum mill feed of 2.551 Mtpy considering an overall mill utilization of 90%.

During the 25-year life of the mining operations, the total material mined from the open pit peaks at 6.2 Mt in Year 3 and averages 5.6 Mtpy for the first 22 years. The average diluted Cg grade ranges from 4.00% to 4.40% for the first 22 years, and averages 4.88% in the final three years. The mine plan is successful at achieving the targeted concentrate production, with a low of 101,000 t in Year 12 and a peak of 105,900 t in Years 8 and 10. The average concentrate production over the life of mine averages 103,328 tpy.

Although the previous Technical Report presented a project with a fleet of battery-powered haul trucks, this current study is based on a fleet of diesel-powered machines. The battery powered operating strategy is still envisaged by NMG but since the technology is currently in the development phase, it has been decided to present a base case with a diesel operated fleet. Electrical trucks and equipment will be introduced into the mining fleet as they become available.

NMG has signed a memorandum of understanding (MOU) with Caterpillar who will supply the equipment using their Job Site Solution (JSS) service model. With this model, NMG will pay for machine use on an hourly basis which includes; machine supply and maintenance (parts and service), and a fleet management system. NMG will be responsible for the fuel consumption, machine operator, wear parts, and to supply the mine garage.

The mine workforce with includes the tailings operations team, will peak at 73 employees when the mine is in full production.

1.9. Recovery Methods

1.9.1. Phase 2 – Matawinie Beneficiation Plant

The mineral processing facility has been designed to produce 105,882 dry tonnes of graphite concentrate per year. The design was based on the results from the metallurgical testing that has been done at the NMG demonstration plant and at external labs. Table 1-3 summarizes the general process design basis.

Table 1-3: General process design criteria

Parameter	Unit	Value
Nominal ore processing rate	dry tpy	2,550,556
Graphite ore grade	% C(t)	4.36
Graphite ore grade	% C(g)	4.22
Crusher operating time	%	37.5
Concentrator operating time	%	90
Final graphite concentrate grade	% C(g)	97
Final graphite concentrate recovery	%	93
Total Nominal graphite production	**dry tonnes per year**	**105,882**

The concentrator is designed to produce a graphite concentrate containing 97% C(t) (total carbon) from an ore containing 4.33% C(t). Tailings will be processed to generate two tailings streams, non-sulphide/non-acid generating (NAG) and sulphide/potentially acid generating (PAG). Each stream will be dewatered and filtered.

Table 1-4 below shows the high-level mass balance.

Table 1-4: Concentrator mass balance

Stream	Solids		Graphite (C(t))	
	tpy	tph	Grade	Recovery
Feed	**2,550,556**	**323.5**	**4.33%**	**100.0**
All Concentrates	**105,882**	**13.4**	**97.0%**	**93.0**
+48 mesh concentrate	15,670	2.0		
-48 to +80 mesh concentrate	35,365	4.5		
-80 to +150 mesh concentrate	29,329	3.7		
-150 mesh concentrate	25,518	3.2		
All Tailings	**2,444,673**	**310.1**	**0.32%**	**7.0**
NAG		245.0		
PAG		65.1		

Run of mine (ROM) is crushed using jaw crushers. The crushed ore is transported by conveyor to the covered stockpile. Crushed ore is withdrawn from the stockpile with apron feeders and is fed to the grinding circuit using conveyor.

The SAG mill is in closed circuit with a single deck vibrating screen. The screen oversize is returned to the SAG mill and the screen undersize is sent to the ball mill circuit.

The ball mill operates in closed circuit with a rougher flotation cell and a set of cyclones. The ball mill discharge is pumped to the ball mill cyclones. The cyclones underflow report to the rougher flotation while the overflow proceeds to the scavenger flotation. The rougher flotation allows for the removal of large graphite flakes as soon as they are liberated from the ore and helps maintain graphite flake integrity. The scavenger flotation circuit aims to float the remaining graphite.

The rougher flotation and the scavenger flotation concentrates are directed to the polishing circuit. The scavenger tails will be directed to the tailings thickener.

The rougher and scavenger concentrates are first sent to a polishing mill. The polishing mill scrubs the surface of the graphite flakes and thus removes the gangue minerals that are attached to the flakes. The polishing mill discharge is sent to the 1st cleaner flotation cells. The 1st cleaner concentrate is subjected to a 2nd cleaner in form of a flotation column. The column concentrate is transferred to the classification stage and the column tailings are returned to the 1st cleaner flotation cells. The 1st cleaner tailings are treated in a scavenger stage to recover more challenging middling particles. These middlings are transferred to the polishing mill to improve mineral liberation.

The second cleaning phase starts with size classification. Cyclones are used to separate fines from coarse particles of the 2nd cleaner concentrate. The coarse fraction is directed to a coarse attrition mill and two stages cleaning flotation cells while the fines fraction is upgraded through two stages attrition and fines cleaning flotation cells, followed by a 3rd cleaning flotation column. Concentrates from the Coarse and Fines cleaning circuits are pumped to the graphite thickener.

The final graphite concentrate is thickened, filtered and dried. After drying the product is dry screened into four products and they can be either bagged and wrapped or sent to the truck loadout station. The distribution of the concentrate size fractions is shown in Table 1-5.

Table 1-5: Graphite concentrate size fraction proportion

Graphite Concentrate Size Fraction	Proportion (%)
Jumbo Flakes (+48 mesh/+300 µm)	14.8
Coarse (–48+80 mesh/-300+180 µm)	33.4
Intermediate (–80+150 mesh/-180 +106 µm)	27.7
Fine (–150 mesh/ -106 µm)	24.1

The concentrator tailings are initially thickened for process water recovery and then pumped to the tailings desulphurization circuit. Desulphurization circuit consists of two main steps, first removal of the magnetic sulphurs by the Medium Intensity Magnetic Separator (MIMS) and then treating the non-mag portion in the sulphide flotation circuit for further sulphide removal. This circuit produces Non-Acid Generating (NAG) tailings and Potentially Acid Generating (PAG) tailings. The NAG and the PAG tailings are thickened, filtered and stockpiled before being trucked to the co-disposal site.

Reagents used for the graphite concentration process are collector (Fuel oil) and frother (MIBC). A collector (Xanthate) and a frother (MIBC) are used in the Desulphurization circuit. Flocculant and lime will also be required.

Water recycling will be maximized as most of the process water will be recovered either from the thickeners or the BC-2 pond. Fresh water consumption is minimized and is only used when clean water is required as for the reagent preparation.

1.9.2. Phase 2 – Bécancour Battery Material Plant

The NMG Battery Material Plant serves to transform natural graphite concentrate produced at the concentrator into added-value battery-grade materials. The finest size fraction of the graphite concentrate, which represents the lowest value product coming from Matawinie, is trucked to Bécancour to undergo micronization and spheronization, purification and coating to produce coated spherical purified graphite (CSPG) battery grade materials. A portion of the jumbo flake product from Matawinie is also treated. However it only passes through the purification stage to produce purified jumbo flake (PJF). Both materials will be purified using a carbochlorination process to a minimum grade of 99.95% while respecting specific impurity limits set by end users.

In total, the Battery Material Plant receives 60,700 t of graphite concentrate (CG) and 3,075 t jumbo flake annually. Following the micronization and spheronization process where the CG material undergoes a size reduction and two stages of particle shaping resulting in two spherical graphite products and one fines by-product. The fines by-product represents 30% of the plant feed. The fines are bagged and sent to market for sale as carbon riser at an estimated grade of 95%C.

The carbochlorination process involves injection of chlorine gas into a custom-designed furnace at high temperature. The impurities contained in the graphite react with chlorine and are volatilized and condensed in the insulating media bed of the furnace in the form of mixed oxides and chlorides. The off-gases are scrubbed and a water treatment plant removes any remaining impurities from the water that is neutralized and recycled to the process. The layer of insulating media containing the impurities will be disposed of in an authorized containment site operated by a third party. The small amount of residue generated by the water treatment plant is filtered and the solid cake is trucked to the mine for disposal in the co-disposal facility. Approximately 4-5% of the graphite mass is lost during purification in the form of impurities, carbon monoxide (CO) gas and dust. The two sizes of spherical purified graphite (SPG) are sent to the coating area while the purified jumbo flakes are bagged for shipment to market.

The final stage of the added-value product flowsheet is the application of a coating to the spherical purified graphite. Both coarse and fine SPG materials are mixed with micronized pitch. During the treatment, 50% of the pitch is volatilized and the remaining portion is deposited and carbonized on the surface of the SPG. The final primary and secondary CSPG production is 35,849 tpy and 6,767 tpy respectively. Both materials are bagged and shipped to the end users.

1.10. Project Infrastructure

1.10.1. Phase 2 – Matawinie Mine Project

Project Infrastructure

The Project infrastructure includes the 120 kV electrical power line, the main access road and site roads, industrial area buildings including the concentrator and stockpiling domes, prefabricated electrical rooms and service buildings. It also includes the tailings storage area, water management facilities with collection basins and ditches to collect surface runoff, dewatering for the open pit, pumping stations, piping and a water treatment unit.

Site services include electrical distribution and communication, site fire protection, fresh and process water supply, potable water, and sewage treatment.

Water Management Plan

The mine water management plan addresses the surface runoff and the process water that are to be collected from the industrial areas including the open pit, the overburden/topsoil stockpiles and co-disposal storage facilities (CSF) of the Matawinie Mine site. The water management infrastructure (i.e., basins and pumping requirements) is sized based on the required volume of surface runoff to manage, which varies based on the catchment area of the CSF and the open pit. Hence, the water management plan is divided into three distinct phases (A, B1 and B2) as the drainage area increases with the mine development. Water to be used in the mineral processing will be taken directly from the basin located in the industrial area. The remaining water will be directed to the basin located south to be treated. Treated water from the Water Treatment Plant will be discharged in the *Ruisseau à l'Eau Morte* following monitoring of flow and water quality in full compliance with applicable laws, regulations, and standards.

Tailings and Waste Rock Storage Facility

Geochemical testing carried out on the tailings at the NMG Project shows that the tailings are potentially acid generators (PAG). The concentrator tailings are initially thickened for process water recovery and then desulphurized in the tailings treatment plant by sulphide flotation and magnetic separation to produce non-acid generator (NAG) and potentially acid-generator (PAG) tailings. Co-disposal methodology will be used to manage tailings and waste rock generated by mining activities. Desulphurized tailings (NAG) and sulphide concentrate (PAG) will then be filtered and placed with the waste rocks in co-disposal cells to form a co-disposal stockpile. According to the most recent mine plan, from Year 8 the co-disposal will also be carried out in the mine pit. The total quantity of waste rocks and tailings to be managed in the co-disposal stockpile and the mine pit is 67,433 Mm^3. Progressive restoration of the co-disposal stockpile will also be carried out starting at Year 4 of mine operation.

1.10.2. Phase 2 – Bécancour Battery Material Plant

The Project infrastructure includes a 120 kV electrical power line, the M/S, purification and coating buildings, mechanical services building, gas and water treatment plants and a retention pond. Additionally, a pipeline connecting the plant to Olin for delivery of gaseous chlorine is planned.

Site Water Management Plan

The surface water management plan was prepared based on the drainage of a non-hazardous site as defined by the municipal, regional and provincial regulations (REAFIE) as all industrial activities will take place inside the proposed buildings, sheltered from the weather.

The Project involves the construction of an underground storm sewer system to drain the entire developed non-risk area of the lot. The proposed network is controlled by a 3,000 m^3 capacity dry retention basin located at its downstream end. The outlet of the basin is located to the west of the lot in the Gédéon Carignan stream, which passes through the existing ditch on G.A. Boulet Street.

Waste Management Plan

Two main waste products are generated by the process: fouled insulating media and the water treatment plant sludge. The insulating media is collected from the top layer of the purification furnace where the impurities extracted from the graphite concentrate are condensed as mixed metal oxides and chlorides. The fouled media will be stored in containers and trucked to an authorized containment facility off-site. The sludge contains precipitated metal hydroxides and gypsum recovered from neutralization of the gas treatment plant scrubber effluents. The sludge is filtered and washed before being trucked to the mine site for co-disposal with the concentrator tailings.

1.11. Market Studies

This section has been updated with the information provided by Benchmark Mineral Intelligence (Benchmark Minerals). Benchmark Minerals is an independent credible source that compiles international graphite prices and other commercial information for various commercial size fractions and concentrate purities. NMG's Feasibility Study focuses on the four main products of its product portfolio; "Coated Spherical Purified Graphite (CSPG)" or Lithium Battery Active Anode Material, flake graphite, Micronized graphite and Purified flake graphite.

CSPG

The CSPG is the main value-added product. This is the product which NMG will sell directly to car manufacturers or cell/battery manufacturers.

	Life of Mine Average	
Product	CSPG 20	CSPG 10
Volume (t)[1]	35,849	6,767
Price (USD)	$8,707	$10,874

(1) Steady-state production.

Flake Graphite

Flake graphite is a product that is essentially a concentrate from the mine. No further added-value process is required. Many markets use such product (i.e., refractory industry).

	Life of Mine Average	
Product	-50/+80	+50
Volume (%)	33,4%	14,8%
Price (USD)	$1,704	$2,011

Note: Total Mine Throughput: 103,328 tonnes.

Micronized Graphite (<9 um)

Micronized graphite is the by-product from the micronization and spheronization (fine product). This material can be sold as-is in the metallurgical industry. Many other applications require such fine product. With additional NMG value-added processing, selling price can be significantly higher. NMG will evaluate each opportunity as a business case.

	Life of Mine Average
Product	< 9um
Volume (t)[1]	18,384
Price (USD)	$500

(1) Steady-state production.

Purified Flake Graphite

Purified flake graphite is needed for certain applications (i.e., Hydrogen industry) which require a very low level of impurities. NMG, unlike most graphite miners, possess its own proprietary technology to purify its own graphite. Such advantage allows NMG to sell ultra-pure graphite for niche markets.

	Annual Production
Product	**Purified +50 MESH**
Volume (t)	3,007
Price (USD)	$5,104

1.12. Environmental Studies

NMG intends to develop a world-class operation at its Phase 2 Matawinie Mine and Bécancour Battery Material Plant through the strategic integration of some of the industry's latest technological innovations and best practices to reduce greenhouse gas (GHG) emissions and minimize environmental impacts.

1.12.1. Phase 2 – Matawinie Mine

Active stakeholder engagement and an environmental and social impact assessment (ESIA) realized by SNC-Lavalin (2019) were conducted for the Matawinie Mine, underpinned by sustainable development principles. Complete inventories of fauna and flora were carried out to optimize the development by reducing the Project's footprint, avoiding sensitive habitats and integrating mitigation measures for vulnerable species. All impacts generated by the Project have been controlled and contained within 1 km of the mining site. Following an extensive public hearing process, in June 2020 NMG received the report and recommendations of the *Bureau d'audience publique sur l'environnement* (BAPE) regarding its Phase 2 Matawinie Mine project. The Government's environmental assessment analysis continued at the MELCC from November 2020 to January 2021 and resulted in the adoption of a ministerial Decree that authorized the Matawinie Mine project on January 20, 2021, on the territory of the Municipality of Saint-Michel-des-Saints (*Décret* 47-2021).

Following the issuance of the Decree, NMG must still comply with the different regulatory requirements regarding the quality of the environment, social and environmental monitoring, reporting, and permitting for different phases of construction, mining operations, and closure.

The processing plant and the co-disposal pile of tailings and waste rock will be located less than 500 metres from the mine as to minimize truck cycle times and lower the Project's operating costs. As specified in Condition 3 of the Decree, full-scale field-testing was constructed during the summer of 2020 reproducing the parameters of the tailings' co-disposal design. The goal was to simulate specific parameters of the deposition plan with instruments at certain strategic locations. The results of the cell provide insight to ensure a safe design including proof design criteria into the deposition plan and the monitoring QA/QC program (Condition 4 of the Decree). Based on collected data and correlations, project pH-dependent water-quality models for full-scale mine site components are validated (Lamont and MDAG, 2020, Lamont, 2020).

Progressive reclamation activities will be carried out during the mining activities. The final reclamation cover will be placed on the co-disposal pile as soon as an area of the pile will have reached its final elevation. Reclamation will include all activities carried out during the mining operations (progressive reclamation) and at the end of mining activities covered by the closure plan.

NMG has planned its operation activities to respect the noise limits of the zoning category I of instruction notes 98-01, which are 45 dBA during the day and 40 dBA at night (LAr, 1 h) with a voluntary acquisition program within 1 km radius. NMG will carry out annual noise measurement campaigns during construction and operation. A permanent station in the residential sector Domaine Lagrange is installed and provides real-time noise measurements, making it possible to monitor variations in noise emissions and provide reference data.

In March 2022, NMG committed to submit to the MELCC a new version of the airborne contaminant distribution modelling considering the updated information on crystalline silica with the aim of modifying Condition 2 of the ministerial Decree. From Year 2 of operation, a modification of Condition 2 of the Decree is needed to comply with the maximum of ore and waste rocks extraction to meet the total annual production. This maximum is fixed based on a degree of uncertainty regarding the proportion of crystalline silica in the dust from different sources of emission. In March 2022, NMG committed to submit to the MELCC a protocol to updated data about crystalline silica and submit a new version of the airborne contaminant distribution modelling considering the updated information from the Matawinie site. The model will be accompanied by a dust management plan to ensure compliance with the criteria.

As per Condition 6 of the Decree, NMG must present the progress of work to electrify mobile mining equipment as well as an update of the schedule for carrying out this work. In June 2021, NMG entered into of a collaboration agreement with Caterpillar Inc. under which Caterpillar Inc. will develop, test, and produce Cat® "zero-emission machines" for the Phase 2 Matawinie Mine, with a view to becoming the exclusive supplier of an all-electric mining fleet for deployment at the Phase 2 Matawinie Mine 5 years after the mine start-up.

NMG carries out the environmental monitoring activities as described in the Decree and/or as requested by the government authorities in authorizations. A Monitoring Committee is in place and acts as a consultative body as well as a platform for environmental and social surveillance of NMG's operations. Led by NMG's Community Relations Manager and composed of local citizens, First Nation members, business representatives, and local organizations, the committee will remain in place until the post-closure monitoring period of the mine.

1.12.2. Bécancour Battery Material Plant

For the future Phase 2 Bécancour Battery Material Plant, NMG completed an environmental baseline study of the 200,000-m^2 land (hereafter named Lot 17) located within an industrial park between avenue G.-A.-Boulet and Alphonse-Deshaies Boulevard in Bécancour.

The Bécancour industrial and port park covers an area of nearly 7,000 ha. It accommodates more than 30 industrial and service companies. The Phase 2 Bécancour Battery Material Plant project will become an active member of a new clean technology innovation hub. Feedback from local stakeholders will be important to ensure an inclusive and respectful diversification of the local and regional economy. Through an open and proactive dialogue, NMG strives to maintain collaborative relationships with local stakeholders, including the City and MRC of Bécancour, the Abenaki First Nation community, the regional branch of MELCC and regional industrial and associative partners.

Lot 17 is covered at 88.5% with land. Five wetlands grouped into four types of groupings and 16 terrestrial environments grouped into six types of stands. The general topography of the land is relatively flat, slightly descending towards the St. Lawrence River. No plant species that are threatened, vulnerable or likely to be so designated were listed during the survey.

A Phase I environmental site assessment (EISA) based on the CSA Z768-01 standard as well as the section 1.0 of the Terrain Characterization Guide was produced for Lot 17. The results suggest the absence of soil and water contamination in the Lot 17 resulting from the identified environmental issue on the site during the Phase II ESA.

NMG's project in Bécancour (Phase 2 Bécancour Battery Material Plant) is under section 22 of the Environment Quality Act (EQA). Several requests for authorization following the different stages of the design or the construction activities will be required.

Process emissions are the main source of GHG emissions at the Phase 2 Bécancour Battery Material Plant while NMG's proprietary purification ecotechnology leveraging hydropower enables significant reduction in the carbon footprint. To optimize the carbon performance of the Phase 2 Bécancour Battery Material Plant, NMG is evaluating opportunities to reduce the energy consumption of both its processes and buildings, and to substitute carbon-based materials with non-carbon-based ones with similar properties.

1.13. Capital and Operating Costs

1.13.1. Capital Costs

Matawinie Mine Project

The Matawinie Mine project is a greenfield mining and processing facility with average mill feed capacity of 2,550,556 tonnes per year (tpy) of ore to produce 105,882 tpy of graphite concentrate. The estimated capital cost for the mine and beneficiation plant is $480.8M including direct and indirect costs. An additional $62.4M of sustaining capital was allocated for the co-disposal facility and water management.

Table 1-6: Summary of capital cost estimate

Area	Description	Total ($)
0	Site Preparation	52,487,610
1	Mine	12,937,583
2	Ore Crushers & Stockpile	36,532,774
3	Processing Plant	234,273,297
7	Tailings and Water Management	37,152,703
Total Direct Costs		**373,383,967**
8000	Owner's Costs	11,201,519
9100	EPCM Services	27,752,679
9500	Temporary Facilities & Utilities	1,094,889
9500	Temporary Operation and Maintenance	8,891,300
9600	POV & Mechanical Acceptance	3,404,555
9700	Commissioning Spare Parts	2,269,703
9700	Initial Fill	817,989
9200	Freight	7,943,962
9600	Vendor Representatives	2,552,835
9200	Insurance and Duties	1,866,920
9800	Contingency	39,569,796
Total Indirect Costs		**107,366,146**
Total Direct + Indirect Costs		**480,750,114**

Note: Totals may not add up due to rounding.

Bécancour Battery Material Plant

The Bécancour Battery Material Plant project is a greenfield commercial processing plant equipped to produce a wide range of high-performance graphite-based materials. NMG's objective is to process 60,700 t of graphite concentrate and 3,075 t of jumbo flake in order to produce 42,616 tpy of anode material in the form of purified and coated spherical graphite (CSPG - Coated Spherical Purified Graphite), and 3,007 tpy of purified Jumbo Flake.

The capital cost for the Battery Material Plant was estimated at $923.4M.

Table 1-7: Battery Material Plant Capex summary by major area

Area	Description	Total ($)
0	General	493,230
2	Off-site Infrastructure	7,631,768
3	On-site Infrastructure	30,249,341
4	Micronization and Spheronization	153,124,224
5	Purification	214,374,794
6	Coating	169,437,142
7	Process Services	40,977,098
	Total Direct Costs	**631,071,605**
8000	Owner's Costs	41,505,826
9100	EPCM Services	85,688,000
9500	Temporary Facilities & Utilities	29,790,000
9500	Heavy Lift & Construction Cranes	3,084,124
9600	POV & Mechanical Acceptance	4,520,600
9700	Commissioning Spare Parts	2,411,000
9700	Capital Spare Parts	3,917,800
9700	Initial Fill	3,013,700
9200	Freight	5,490,000
9600	Vendor Representatives	6,536,100
9800	Contingency	106,371,000
	Total Indirect Costs	**292,328,149**
Total Direct + Indirect Costs		**923,399,755**

Note: Totals may not add up due to rounding.

1.13.2. Operating Costs

Matawinie Mine Project

The estimated operating costs of the Matawinie Mine project is 565$/t of concentrate and covers mining, tailings, processing, general administration, concentrates transportation cost to Bécancour and sales and marketing fees.

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 1-8: Operating costs summary – Phase 2 Matawinie Mine project

Description	Cost per Year ($/year)	Cost ($/t concentrate)	Total Costs (%)
Mining (Average over life)	17,330,983	169	29.7%
Tailings (Average over life)	5,655,610	55	9.7%
Ore Processing	26,083,095	252	44.6%
General and Administration	3,750,866	36	6.4%
Transport Cost to Bécancour	2,769,863	27[1]	4.7%
Sales and Marketing fees	2,831,631	27	4.8%
Total Opex	**58,422,047**	**565**	**100.0%**

(1) The total transport cost for the portion of the concentrate to be sent to Bécancour was distributed to the complete concentrate production.

Bécancour Battery Material Plant

The estimated operating costs of Phase 2 - Battery Material Plant and covers: concentrate processing, sales and marketing fees and general administration.

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 1-9: Operating costs summary – Phase 2 Battery Material Plant

Description	Cost per Year ($/year) (1)	Cost ($/t CSPG feed) (2)	Total Costs (%)
Micronization/spheronization	26,868,414	443	20%
Purification	47,330,852	780	35%
Coating	35,865,428	591	26%
General and Administration	11,126,505	183	8%
Sales & Marketing Costs	15,298,832	252	11%
Total Opex	**136,490,031**	**2,249**	**100%**

(1) The costs represent a LOM arithmetic average which considers the ramp-up period (Y1-2) and a temporary 20% electricity rebate from Hydro-Québec (Y1-8).

(2) CSPG feed to the Battery Material Plant considers 60,700t CG only.

(3) The sales and marketing costs represent 3% of the gross revenue before NSR.

1.14. Economic Analysis

1.14.1. Economic Analysis

The following economic analysis is further explained in Chapter 22.

An economic analysis based on the production and cost parameters of the Project was prepared and the results are shown in Table 1-10.

Table 1-10: Economic highlights of NMG's integrated Phase 2 - Graphite operations

Description	Units	Value
Total diluted Proven and Probable Reserve	M tonnes	61.7
Average Concentrate Production (LOM) †	tpy	103,328
Raw Material CSPG	tpy	60,700
Total Revenue	$M	14,897
Total Operating Costs	$M	4,873
Initial Capital Costs (excludes Working Capital)	$M	1,404
Sustaining Capital Costs	$M	62
Mine Rehabilitation Trust Fund Payments	$M	30
Total Pre-tax Cash Flow	$M	8,526
Total After-tax Cash Flow	$M	5,992

The financial analysis is based on the sales prices (weighted average on the life of mine) shown in Table 1-11. Prices in USD were converted to CAD with the exchange rate of 0.7843 USD per CAD (1.275 CAD per USD) was used to convert the USD market price projections into Canadian currency.

Table 1-11: Sales prices breakdown per product

Flake Size	Prices (LOM Average / in CAD)	Prices (LOM Average / in USD)	Distribution
Jumbo (+50 mesh)	2,563	2,010	15%
Coarse (-50+80 mesh)	2,170	1,702	33%
Intermediate (-80+150 mesh)	2,042	1,602	28%
Fine (-150 mesh)	1,932	1,515	24%
Matawinie Basket	2,135	1,675	100%
Purified products	**Prices (LOM Average / in CAD)**	**Prices (LOM Average / in USD)**	**Distribution**
CSPG 20 Production	11,102	8,707	56%
CSPG 10 Production	13,865	10,874	11%
CSPG Basket	11,540	9,051	67%
Purified +50 mesh	6,507	5,104	5%
By-products Fines	638	500	29%
Bécancour Basket	8,172	6,410	100%

The financial indicators associated with the economic analysis are summarized in Table 1-12:

Table 1-12: Economic highlights of NMG's integrated Phase 2 - Graphite operations.

Economic Highlights	Matawinie Mine	Bécancour Battery Material Plant	Integrated NMG Model
Pre-tax NPV (8% discount rate)	$986M	$1,374M	$2,360M
After-tax NPV (8% discount rate)	$571M	$1,010M	$1,581M
Pre-tax IRR	28.2%	22.8%	24.6%
After-tax IRR	22.2%	20.4%	21.0%
Pre-tax Payback	3.2 years	4.3 years	3.9 years
After-tax Payback	3.7 years	4.5 years	4.2 years
Annual Average Production	103,328 t of graphite concentrate	42,616 t of anode material 3,007 t of purified jumbo flakes 18,384 t of by-product fines	-
Life of Mine (LOM)	25 years	-	-

Figure 1-1 and Figure 1-2 show the sensitivity of the after-tax NPV and IRR, respectively, to variations in Capex, Opex, Sales Prices and the USD/CAD Exchange Rate. The vertical dashed lines represent the typical margin-of-error interval associated with FS-level cost estimates.

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

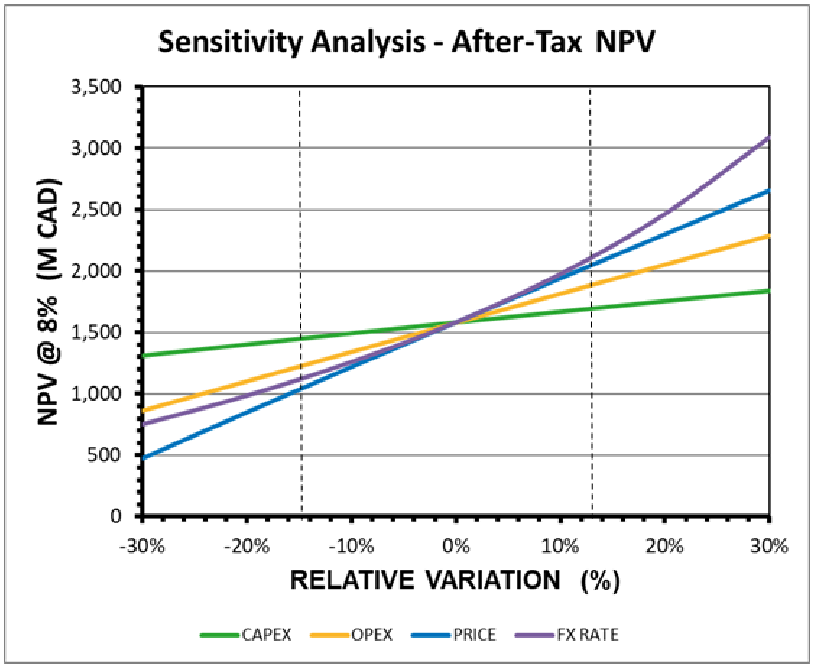


Figure 1-1: Sensitivity of Project NPV @ 8% (after tax)

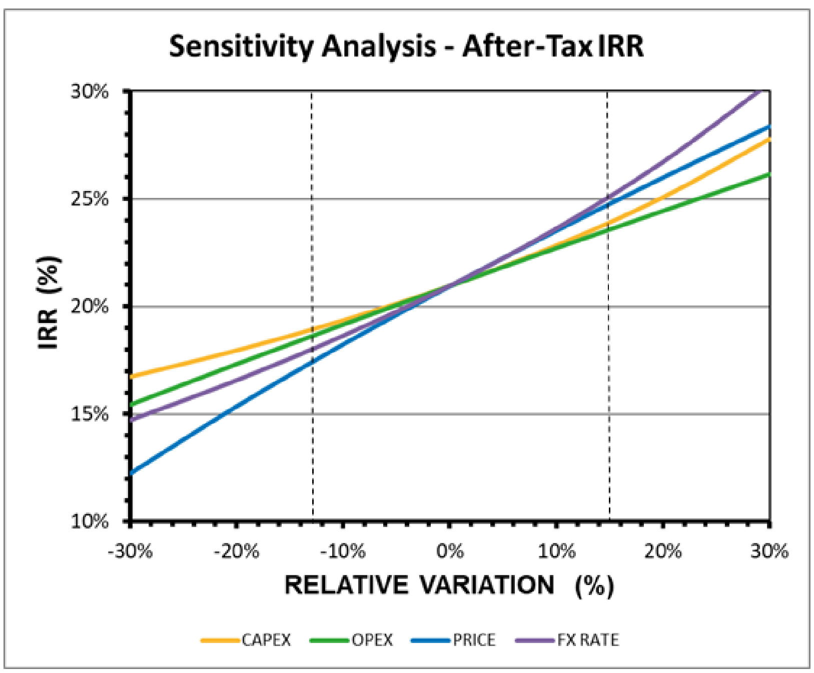


Figure 1-2: Sensitivity of Project IRR (after tax)

1.15. Interpretation and Conclusions

This Feasibility Study shows that the projects are technically feasible as well as economically viable. It further strengthens ongoing project finance efforts and active commercial discussions with a view towards securing an anchor customer agreement with potential financial participation. From the final investment decision, NMG's Phase 2 Matawinie Mine and Bécancour Battery Material Plant could be built within an approximate 30-month schedule.

There is no certainty that the economic forecasts on which this Study is based will be realized. There are a number of risks and uncertainties identifiable to any new project and usually cover the mineralization, process, financial, environment and permitting aspects. NMG's Phase 2 is no different and an evaluation of the possible risks was undertaken as part of the Study.

Following an analysis of the major risks to the Project, a P50 management risk reserve of $150 million is recommended. The top risks are: 1) Firstly, uncertainty on the duration of the purification cycle time, which could lead to additional furnaces being required. The piloting program is underway to finalize the engineering design parameters of the purification sector during H2-2022; 2) Secondly, the availability of construction workforce in the current labour market coupled with equipment delivery uncertainties associated with COVID-19 repercussions; these conditions could increase the cost of equipment and materials, and cause construction delays; and 3) Thirdly, studies and simulations are underway to finalize the scope and design of the atmospheric emission outlets' dimension and configuration for the different equipment, particularly dedusting, to ensure regulatory requirements are met. This reserve is not included in the capital cost estimate but is within the range of the financial sensitivity analysis of the capital cost.

1.15.1. Exploration Activities

Exploration work on the Mining Property 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 composites of the West Zone. Exploration work by NMG was initiated on the Tony Block in summer of 2014 which resulted in the discovery of seven mineralized zones. These zones are named the Far West, West, North, North-East, East, South-East and Southwest Zones. No other known mineral occurrences were identified on the Mining Property 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 Southeast and Southwest mineralization present on NMG's Tony Block. The Probable Mineral Reserve of the West Zone is based on 8,274 assay intervals collected from 26,203.74 m of core drilling and three 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.

1.15.2. Mineral Reserves

An analysis should be done to determine if an elevated cut-off grade can provide improved overall economics for the Project.

Additional infill drilling is recommended to convert all Probable Reserves to Proven Reserves covering the Starter pit as well as Phase 1. Such a campaign is estimated at about 2,700 m of drilling.

2. Introduction

2.1. Introduction

BBA Inc. was commissioned by Nouveau Monde Graphite (NMG) to prepare a technical report on the integrated Matawinie Mine, Beneficiation Plant, and Bécancour Battery Material Plant projects. The firms and consultants who are responsible for the content of this report are, in alphabetical order, André Allaire, (BBA), Yann Camus (SGS), Jeffrey Cassoff (BBA), Simon Fortier (Soutex) and Bernard-Olivier Martel (B.O. Martel Inc.).

Both the Matawinie Mine property and Bécancour Lot 17 are wholly owned by NMG.

2.2. Report Responsibility and Qualified Persons

The following individuals, by virtue of their education, experience and professional association, are considered qualified persons (QPs) as defined in the NI 43-101 and are members in good standing of appropriate professional institutions.

- André Allaire, P. Eng., PhD., BBA Inc.
- Jeffrey Cassoff, P. Eng., BBA Inc.
- Bernard-Olivier Martel, P.Geo., B.O. Martel Inc. (or "BOM")
- Simon Fortier, P.Eng., Soutex
- Yann Camus, P.Eng., SGS Geological Services

The preceding QPs have contributed to the writing of this Report and have provided QP certificates, included at the beginning of this Report. The information contained in the certificates outlines the sections in this Report for which each QP is responsible. Each QP has also contributed figures, tables and portions of Chapters 1 (Summary), 25 (Interpretation and Conclusions), 26 (Recommendations), and 27 (References). Table 2-1 outlines the responsibilities for the various sections of the Report and the name of the corresponding Qualified Person.

Table 2-1: Qualified Persons and areas of report responsibility

Chapter	Description	QP	Company	Comments and exceptions
1.	Summary	A.Allaire	BBA	Contributions from all authors and NMG
2.	Introduction	A.Allaire	BBA	
3.	Reliance on Other Experts	A.Allaire	BBA	
4.	Project Property Description and Location	B-O.Martel	BOM	
5.	Accessibility, Climate, Local Resource, Infrastructure and Physiography	B-O.Martel	BOM	5.6 written by BBA, A.Allaire QP
6.	History	B-O.Martel	BOM	
7.	Geological Setting and Mineralization	B-O.Martel	BOM	
8.	Deposit Types	B-O.Martel	BOM	
9.	Exploration	B-O.Martel	BOM	
10.	Drilling	B-O.Martel	BOM	
11.	Sample Preparation, Analyses and Security	B-O.Martel	BOM	
12.	Data Verification	Y.Camus	SGS	
13.	13.1 Mineral Processing and Metallurgical Testing - CMC	S.Fortier	Soutex	
	13.2 Metallurgical Testing – Advanced Battery Material Plant	A.Allaire	BBA	
14.	Mineral Resource Estimates	Y.Camus	SGS	
15.	Mineral Reserve Estimates	J.Cassoff	BBA	15.5.2 Geotechnical pit slopes prepared by E.Saunders, P.Eng. of SRK
16.	Mining Methods	J.Cassoff	BBA	
17.	Recovery Methods 17.1 Overall Graphite Balance	A.Allaire	BBA	
	17.2 Matawinie Beneficiation Plant	S.Fortier	Soutex	
	17.3 Bécancour Battery Material Plant	A.Allaire	BBA	
18.	Project Infrastructure	A.Allaire	BBA	
19.	Market Studies and Contracts	A.Allaire	BBA	
20.	Environmental Studies, Permitting, and Social or Community Impact	A.Allaire	BBA	
21.	Capital and Operating Costs	A.Allaire	BBA	Matawinie Beneficiation Plant Capex/ Opex by SNC/NMG reviewed by BBA
22.	Economic Analysis	A.Allaire	BBA	
23.	Adjacent Properties	B-O.Martel	BOM	
24.	Other Relevant Data and Information	A.Allaire	BBA	
25.	Interpretation and Conclusions	A.Allaire	BBA	Contributions from all authors and NMG
26.	Recommendations	A.Allaire	BBA	Contributions from all authors and NMG
27.	References	A.Allaire	BBA	Contributions from all authors and NMG

2.3. Effective Dates and Declaration

This report is issued in support of the NMG press release dated July 6, 2022, entitled "NMG Issues Results of Feasibility Study for its Integrated Ore-to Anode-Material Model Projected to be North America's Largest Natural Graphite Operation with Attractive Economics" as well as the Resource Update dated May 20, 2022. The effective date of this technical report, completed following NI 43-101 guidelines, is July 6, 2022 and the issue date is August 10, 2022.

2.4. Sources of Information

For the preparation of this report, the authors have relied on the reference documents listed in Chapter 27 and on the following sources of information:

- Laboratory testing (COREM, SGS Lakefield, ALS Canada Ltd., Saskatchewan Research Council (SRC), Expert Process Solution (XPS), Canadian National Research Council (CNRC), among others);
- OEM testing;
- SNC was mandated by NMG to deliver the infrastructure design and Capex for the Matawinie site, including the beneficiation plant, but excluding the mine;
- Ed Saunders, P.Eng., of SRK prepared the geotechnical rock pit slopes presented in Section 15.5.2;
- Wood was mandated by NMG to prepare the water management and co-deposition facility design for the Matawinie site.

2.5. Previous Technical Reports

The following is a list of reports issued by NMG available on SEDAR:

- NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project, December 10, 2018.
- NI 43-101 Updated Technical Pre-Feasibility Study Report for the Matawinie Graphite Project (August 10, 2018).
- NI 43-101 Technical Pre-Feasibility Study Report for the Matawinie Graphite Project, December 8, 2017.
- NI 43-101 Technical Report, Preliminary Economic Assessment, Matawinie Graphite Project, August 5, 2016.
- NI 43-101 Technical Report Technical Report Resource Estimate Update Tony Block Matawinie Property, April 8, 2016.
- NI 43-101 Technical Report Resource Estimate South-East and South-West Deposits Matawinie Property, Tony Block, January 29, 2013.

2.6. Site Visits

André Allaire and Jeffrey Cassoff (BBA) visited the Matawinie Property on October 20, 2021.

Yann Camus (SGS) visited the Matawinie Property on August 18, 2021, November 27, 2019, June 21, 2018, and November 9, 2016. An independent sampling campaign was also conducted in 2016.

Bernard-Olivier Martel visited the Matawinie Property on several occasions in 2015, 2016, 2017, 2018, 2019, 2020 and 2021, with the last visit on November 23, 2021, as a consulting geologist responsible for exploration and infill drilling campaigns.

Simon Fortier (Soutex) has not visited the Property.

2.7. Units and Currency

In this report, all currency amounts are in Canadian Dollars ("CAD" or "$") unless otherwise stated, with commodity prices typically expressed in U.S. Dollars ("USD"). Units of measurement are generally stated in the *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.

2.8. Acknowledgement

NMG would like to acknowledge the following companies and individuals for their contributions to the study and report: BBA, SNC Lavalllin, Soutex, SGS Geological Services, B.O. Martel Inc., Reel Alesa, Groupe Alphar, COREM, SGS Lakefield, KPM, ALS Canada Ltd., Metpro, Différence GCS, WSP, KPMG, Akonovia, Norda Stelo, Architecte TAD, Ecotransition, Nely (calcul GES), GWN. inc. (Graeme Norval), Pomerleau, Metso-Outotec and all other equipment manufacturers who participated in this study.

A special thanks to all Nouveau Monde Graphite employees who participated in this study.

3. Reliance on Other Experts

3.1. Introduction

In preparing this technical report, the authors have fully relied upon certain work, opinions and statements from other experts. The authors consider the reliance on other experts, as described in this section, as being reasonable based on their knowledge, experience and qualifications. The independent QPs that authored this technical report disclaim responsibility for the expert report content used in the following areas.

3.2. Mineral Tenure and Surface Rights

The authors did not perform independent verifications of land titles and tenure nor have they verified the legality of any underlying agreement(s) that may exist concerning the licences or other agreement(s) between third-parties, but have relied on NMG to have conducted the proper legal due diligence.

3.3. Taxation

The QPs have fully relied upon and disclaim responsibility for information supplied by NMG staff and experts retained by NMG, and information related to taxation as applied to the financial model presented in Chapter 22. The after-tax model presented in Chapter 22 was prepared by NMG finance team and reviewed by KPMG.

3.4. Markets

The QPs have fully relied upon, and disclaim responsibility for, information supplied by experts retained by NMG for graphite marketing and pricing. This information is presented in Chapter 19 and was used to prepare the financial model presented in Chapter 22. Three market studies pertaining to graphite concentrates and advanced battery materials were commissioned. The study retained as the reference for this Feasibility Study was prepared by Benchmark Minerals Intelligence (Benchmark).

4. Property Description and Location

4.1. Mining Property

The Mining Property (Tony Block) presently consists of 159 contiguous map-designated claims totalling 8,266.42 ha. Exploration work on the Mining Property uncovered significant graphite mineralization with the goal to economically extract this critical and strategic mineral. After successfully identifying Mineral Reserves on its Mining Property, NMG has advanced its mining project (Matawinie Mine project) at the development stage with ongoing detailed engineering and construction targeting the properties' mineralized West Zone. Other exploration stage mineralized zones are also present on the Mining Property and are briefly discussed in this report.

The Mining Property is part of NMG's broader mineral exploration claims known as the Matawinie Property with claims scattered over an area of approximately 3,500 km^2.

4.2. Location and Access

The centre of the Mining Property is located approximately six km to the southwest of the community of Saint-Michel-des-Saints. The Tony Claim Block overlaps the National Topographic System (NTS) map sheets 31J/09 and 31I/12. Most of the Mining Property, including the projected mining infrastructure and planned open pit, 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*), also located in the Lanaudière Administrative Region. The centre of the Mining Property is positioned approximately 120 km, as the crow flies, north of the city of Montréal, at latitude 46.63° and longitude -73.96° using WGS 1984 geographic coordinate system and Easting : 579570, Northing: 5164630 using the UTM, NAD83 Zone 18 projected coordinate system (Figure 4-1 and Figure 4-2).

4.3. Type of Mineral Tenure

In the Province of Québec, mineral tenures are referred to as map-designated claims which are managed by the Ministry of Energy and Natural Resources (MERN for *Ministère de l'Énergie et des Ressources naturelles*). These predetermined claims each measure 30" longitude by 30" latitude. Claims 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 years, after which a predetermined amount of accumulated work spent on the claims, known as work credits, is required for renewal as well as a renewal fee. All 159 claims composing the Mining Property are 100 % owned by NMG. The present expiry dates of claims forming the property span from June 5, 2023 to August 11, 2025. A renewal fee of $10,428.75 is required to renew all claims forming the Tony Claim Block for an additional two years following their present expiry date.

The information, downloaded from the GESTIM website on March 28, 2022, concerning the claims of the Mining Property, such as work credits required for renewal, credits accumulated from recent work, claim size and expiry date, is presented in Table 4-1. The Mining Property Claims have not been surveyed. NMG and the Author relied on data downloaded on the Gestim website regarding mineral tenure information such as claim location.

Of the 159 claims forming the Mining Property, eight are suspended awaiting partial conversion to a mining lease. This requested lease covers an irregular buffer area approximately 70 m wider than the proposed life of mine (LOM) open pit area presented in this report. In addition, an industrial land lease (lease # 394-18-914) covering an area of 20.2 ha, needed for the placement of the concentrator and related infrastructure, as well as a mine tailings land lease (lease # 278-17-914) covering 310.0 ha, has been obtained from the MERN (Figure 4-2). The industrial, tailings and mine leases need to be renewed separately and yearly.

On February 11, 2022, the partial lifting of a claim staking ban located on both sides of the restricted area centered over the Hydro-Québec powerlines, prompted the automatic expansion of bordering partial claims composing the Mining Property. The expansion of claims, as well as the liberation of parcels of claims by the lifting of restrictions, and their subsequent staking by NMG, added known graphitic mineralization to the Mining Property. This resulted in a recent request for the expansion of the proposed Mining Lease to capture known Mineral Resources that are now within the limits of the Mining Property. This request, which is pending approval by the MERN, adequately covers the LOM footprint presented in this report.

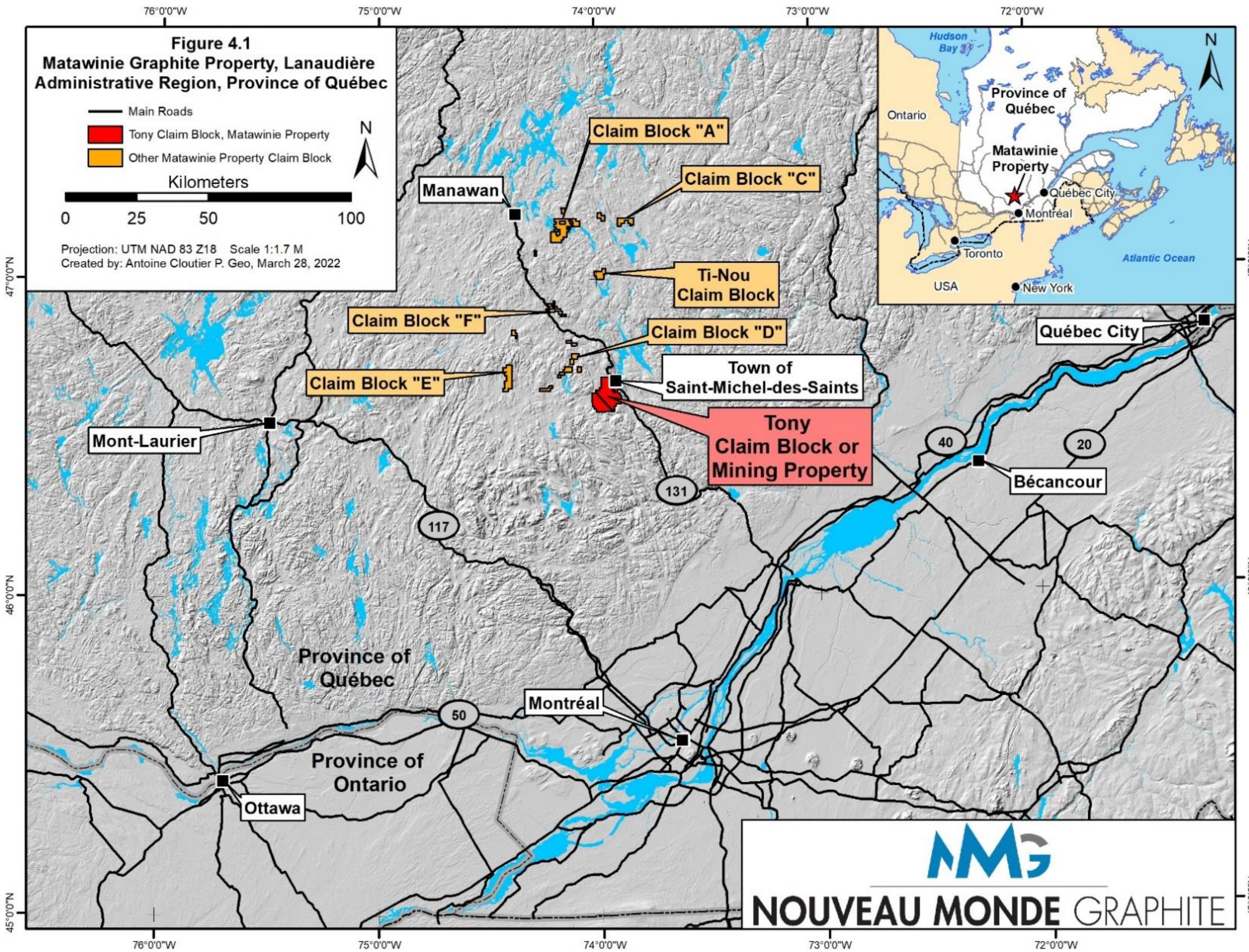


Figure 4-1: Matawinie property location

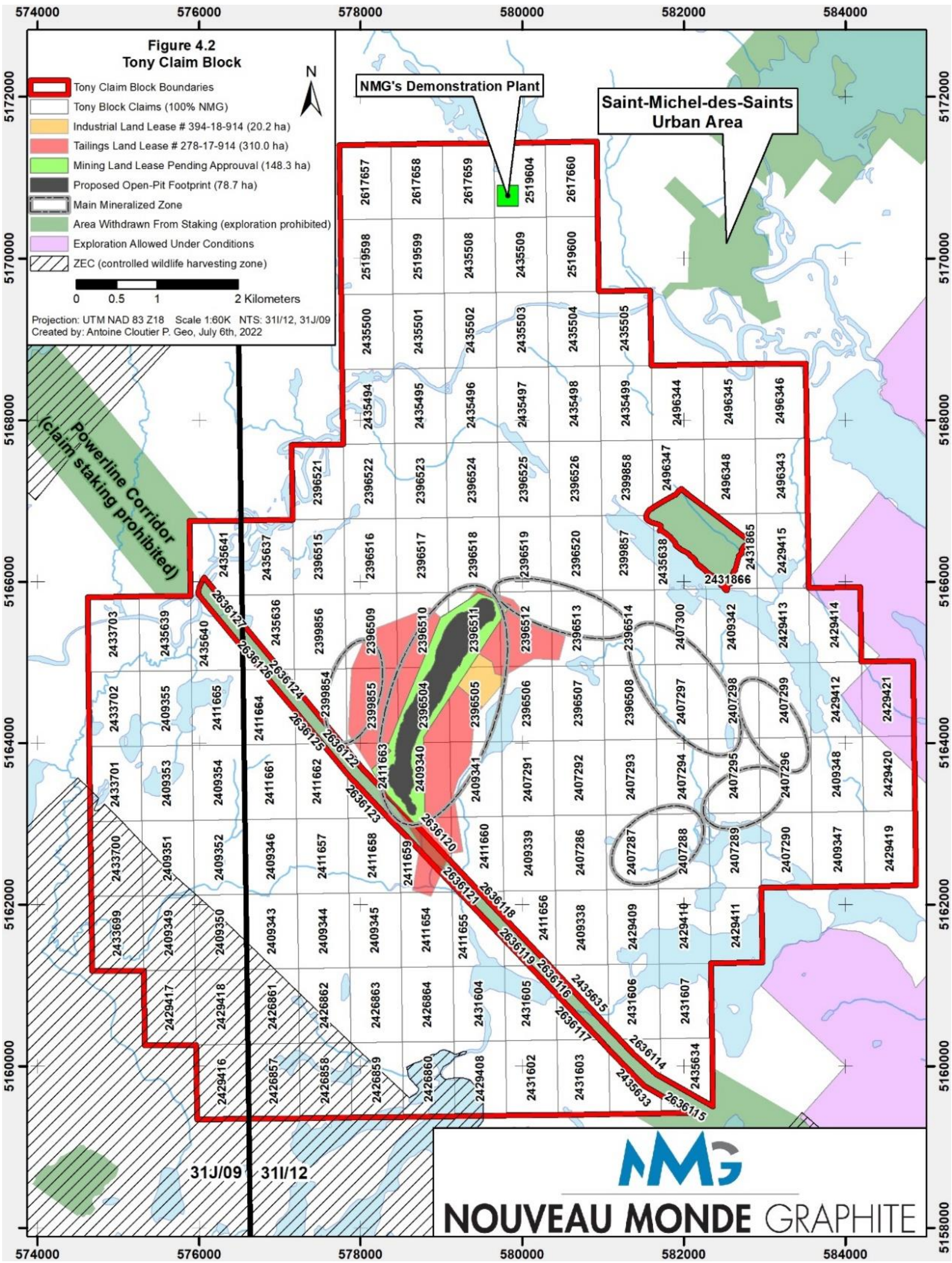


Figure 4-2: Tony Claim Block

Table 4-1: Mining property claims

Claim # (1)	Status	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits (CAD)	Required Credits for Renewal (CAD)	Renewal Fee (CAD)
2519604	Active	59.02	31I12	2018-06-06	2023-06-05	$-	$1,200.00	$68.75
2411654	Active	59.11	31I12	2014-09-09	2023-09-08	$16,795.99	$1,800.00	$68.75
2411655	Active	42.51	31I12	2014-09-09	2023-09-08	$-	$750.00	$68.75
2411656	Active	42.57	31I12	2014-09-09	2023-09-08	$2,477.03	$750.00	$68.75
2411657	Active	59.1	31I12	2014-09-09	2023-09-08	$71,544.73	$1,800.00	$68.75
2411658	Active	58.08	31I12	2014-09-09	2023-09-08	$84,740.72	$1,800.00	$68.75
2411659	Active	27.7	31I12	2014-09-09	2023-09-08	$-	$750.00	$68.75
2411660	Active	52.99	31I12	2014-09-09	2023-09-08	$72,392.65	$750.00	$68.75
2411661	Active	59.09	31I12	2014-09-09	2023-09-08	$71,544.73	$1,800.00	$68.75
2411662	Active	53.27	31I12	2014-09-09	2023-09-08	$72,392.65	$750.00	$68.75
2411664	Active	48.31	31I12	2014-09-09	2023-09-08	$-	$750.00	$68.75
2411665	Active	59.08	31J09	2014-09-09	2023-09-08	$-	$1,800.00	$68.75
2411663	Suspended	28.58	31I12	2014-09-09	2023-09-08	$437,417.44	$750.00	$68.75
2426857	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426858	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426859	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426860	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426861	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426862	Active	59.12	31I12	2015-04-17	2024-04-16	$-	$1,800.00	$68.75
2426863	Active	59.12	31I12	2015-04-17	2024-04-16	$15,613.91	$1,800.00	$68.75
2426864	Active	59.12	31I12	2015-04-17	2024-04-16	$15,614.09	$1,800.00	$68.75
2496343	Active	59.05	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2496344	Active	59.04	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2496345	Active	59.04	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2496346	Active	59.04	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2496347	Active	46.34	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2496348	Active	58.53	31I12	2017-06-14	2024-06-13	$-	$1,200.00	$68.75
2429408	Active	59.12	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429409	Active	59.11	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429410	Active	59.11	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429411	Active	59.11	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429412	Active	59.08	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75

Claim # (1)	Status	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits (CAD)	Required Credits for Renewal (CAD)	Renewal Fee (CAD)
2429413	Active	59.07	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429414	Active	59.07	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429415	Active	59.06	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429416	Active	59.12	31J09	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429417	Active	59.11	31J09	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429418	Active	59.11	31J09	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429419	Active	59.1	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429420	Active	59.09	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2429421	Active	59.08	31I12	2015-06-19	2024-06-18	$-	$1,800.00	$68.75
2431602	Active	59.13	31I12	2015-07-28	2024-07-27	$-	$1,800.00	$68.75
2431603	Active	58.42	31I12	2015-07-28	2024-07-27	$-	$1,800.00	$68.75
2431604	Active	59.12	31I12	2015-07-28	2024-07-27	$-	$1,800.00	$68.75
2431605	Active	53.08	31I12	2015-07-28	2024-07-27	$-	$750.00	$68.75
2431606	Active	58.19	31I12	2015-07-28	2024-07-27	$-	$1,800.00	$68.75
2431607	Active	59.12	31I12	2015-07-28	2024-07-27	$-	$1,800.00	$68.75
2431865	Active	25.17	31I12	2015-08-11	2024-08-10	$-	$1,800.00	$68.75
2431866	Active	2.95	31I12	2015-08-11	2024-08-10	$-	$750.00	$35.25
2617657	Active	59.02	31I12	2021-08-25	2024-08-24	$-	$1,200.00	$68.75
2617658	Active	59.02	31I12	2021-08-25	2024-08-24	$-	$1,200.00	$68.75
2617659	Active	59.02	31I12	2021-08-25	2024-08-24	$-	$1,200.00	$68.75
2617660	Active	59.02	31I12	2021-08-25	2024-08-24	$-	$1,200.00	$68.75
2433699	Active	59.11	31J09	2015-10-02	2024-10-01	$-	$1,800.00	$68.75
2433700	Active	59.1	31J09	2015-10-02	2024-10-01	$-	$1,800.00	$68.75
2433701	Active	59.09	31J09	2015-10-02	2024-10-01	$-	$1,800.00	$68.75
2433702	Active	59.08	31J09	2015-10-02	2024-10-01	$-	$1,800.00	$68.75
2433703	Active	59.07	31J09	2015-10-02	2024-10-01	$-	$1,800.00	$68.75
2396506	Active	59.08	31I12	2013-12-27	2024-12-26	$173,316.88	$1,800.00	$68.75
2396507	Active	59.08	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396508	Active	59.08	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396509	Active	59.07	31I12	2013-12-27	2024-12-26	$103,687.40	$1,800.00	$68.75
2396513	Active	59.07	31I12	2013-12-27	2024-12-26	$121,355.19	$1,800.00	$68.75
2396514	Active	59.07	31I12	2013-12-27	2024-12-26	$56,450.40	$1,800.00	$68.75
2396515	Active	59.06	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396516	Active	59.06	31I12	2013-12-27	2024-12-26	$10,195.99	$1,800.00	$68.75

Claim # (1)	Status	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits (CAD)	Required Credits for Renewal (CAD)	Renewal Fee (CAD)
2396517	Active	59.06	31I12	2013-12-27	2024-12-26	$11,395.99	$1,800.00	$68.75
2396518	Active	59.06	31I12	2013-12-27	2024-12-26	$11,395.99	$1,800.00	$68.75
2396519	Active	59.06	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396520	Active	59.06	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396521	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396522	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396523	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396524	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396525	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396526	Active	59.05	31I12	2013-12-27	2024-12-26	$-	$1,800.00	$68.75
2396504	Suspended	59.08	31I12	2013-12-27	2024-12-26	$866,905.12	$1,800.00	$68.75
2396505	Suspended	59.08	31I12	2013-12-27	2024-12-26	$203,600.10	$1,800.00	$68.75
2396510	Suspended	59.07	31I12	2013-12-27	2024-12-26	$310,478.17	$1,800.00	$68.75
2396511	Suspended	59.07	31I12	2013-12-27	2024-12-26	$877,150.50	$1,800.00	$68.75
2396512	Suspended	59.07	31I12	2013-12-27	2024-12-26	$102,603.34	$1,800.00	$68.75
2435494	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435495	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435496	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435497	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435498	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435499	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435500	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435501	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435502	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435503	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435504	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435505	Active	59.04	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435508	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435509	Active	59.03	31I12	2016-01-05	2025-01-04	$-	$1,800.00	$68.75
2435633	Active	30.38	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435634	Active	42.15	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435635	Active	28.01	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435636	Active	45.77	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435637	Active	59.06	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75

Claim # (1)	Status	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits (CAD)	Required Credits for Renewal (CAD)	Renewal Fee (CAD)
2435638	Active	34.06	31I12	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435639	Active	59.07	31J09	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435640	Active	41.83	31J09	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2435641	Active	55.9	31J09	2016-01-08	2025-01-07	$-	$1,800.00	$68.75
2636114	Active	12.94	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636115	Active	4.04	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636116	Active	0.4	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636117	Active	14.81	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636118	Active	4.95	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636119	Active	4.98	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636120	Active	14.6	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636121	Active	0.38	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636122	Active	0.25	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636123	Active	13.53	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636124	Active	1.87	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636125	Active	6.79	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636126	Active	3.01	31I12	2022-02-11	2025-02-10	$-	$500.00	$35.25
2636127	Active	5.03	31J09	2022-02-11	2025-02-10	$-	$500.00	$35.25
2399854	Active	38.65	31I12	2014-02-18	2025-02-17	$88,012.35	$1,800.00	$68.75
2399856	Active	59.07	31I12	2014-02-18	2025-02-17	$-	$1,800.00	$68.75
2399857	Active	58.41	31I12	2014-02-18	2025-02-17	$-	$1,800.00	$68.75
2399858	Active	58.56	31I12	2014-02-18	2025-02-17	$-	$1,800.00	$68.75
2399855	Suspended	59.08	31I12	2014-02-18	2025-02-17	$161,601.10	$1,800.00	$68.75
2519598	Active	59.03	31I12	2018-06-06	2025-06-05	$-	$1,200.00	$68.75
2519599	Active	59.03	31I12	2018-06-06	2025-06-05	$-	$1,200.00	$68.75
2519600	Active	59.03	31I12	2018-06-06	2025-06-05	$-	$1,200.00	$68.75
2407286	Active	59.1	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75
2407287	Active	59.1	31I12	2014-07-16	2025-07-15	$248,758.98	$1,800.00	$68.75
2407288	Active	59.1	31I12	2014-07-16	2025-07-15	$279,384.83	$1,800.00	$68.75
2407289	Active	59.1	31I12	2014-07-16	2025-07-15	$30,550.25	$1,800.00	$68.75
2407290	Active	59.1	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75
2407291	Active	59.09	31I12	2014-07-16	2025-07-15	$69,744.73	$1,800.00	$68.75
2407292	Active	59.09	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75
2407293	Active	59.09	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75

Claim # (1)	Status	Area (ha)	NTS Sheet	Staking Date	Expiry Date	Cumulated Credits (CAD)	Required Credits for Renewal (CAD)	Renewal Fee (CAD)
2407294	Active	59.09	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75
2407295	Active	59.09	31I12	2014-07-16	2025-07-15	$182,442.89	$1,800.00	$68.75
2407296	Active	59.09	31I12	2014-07-16	2025-07-15	$77,149.03	$1,800.00	$68.75
2407297	Active	59.08	31I12	2014-07-16	2025-07-15	$94,785.70	$1,800.00	$68.75
2407298	Active	59.08	31I12	2014-07-16	2025-07-15	$-	$1,800.00	$68.75
2407299	Active	59.08	31I12	2014-07-16	2025-07-15	$113,744.68	$1,800.00	$68.75
2407300	Active	59.07	31I12	2014-07-16	2025-07-15	$9,071.61	$1,800.00	$68.75
2409338	Active	59.11	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409339	Active	59.1	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409341	Active	59.09	31I12	2014-08-12	2025-08-11	$174,498.91	$1,800.00	$68.75
2409342	Active	59.04	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409343	Active	59.11	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409344	Active	59.11	31I12	2014-08-12	2025-08-11	$14,995.99	$1,800.00	$68.75
2409345	Active	59.11	31I12	2014-08-12	2025-08-11	$10,267.67	$1,800.00	$68.75
2409346	Active	59.1	31I12	2014-08-12	2025-08-11	$69,744.73	$1,800.00	$68.75
2409347	Active	59.1	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409348	Active	59.09	31I12	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409349	Active	59.11	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409350	Active	59.11	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409351	Active	59.1	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409352	Active	59.1	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409353	Active	59.09	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409354	Active	59.09	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409355	Active	59.08	31J09	2014-08-12	2025-08-11	$-	$1,800.00	$68.75
2409340	Suspended	58.33	31I12	2014-08-12	2025-08-11	$604,992.72	$1,800.00	$68.75

Notes:

(1) All claims are 100% owned by Nouveau Monde Graphite inc. (GESTIM client # 96458) - Claim information effective date: March 28, 2022.

4.4. Agreements and Royalties Obligations

Pursuant to a settlement agreement dated September 20, 2021, NMG has repurchased the portion held by 3457265 Canada Inc. of the net smelter return royalty (NSR) provided for an option agreement concerning the Matawinie Property dated February 28, 2014, as amended in January 2016. Under this same agreement, NMG has not yet repurchased the 0.2% NSR from M. Desaulniers, which can be fully bought back by NMG at any time for the sum of $200,000.

NMG entered into the SMDS Collaboration Agreement with the Municipality. Through a liaison committee, the Municipality will have the chance to actively participate in shaping, implementing and monitoring NMG's mining project. According to the SMDS Collaboration Agreement, which will cover the entire duration of NMG's commercial mining operations, NMG will pay to the Municipality the following amounts:

(1) the greater of (i) 0.4% of the estimated net cash flow after taxes for the duration of the operation of the Matawinie Mine project representing $400,000 annually, or (ii) 2% of the net cash flow after taxes resulting from the operation of the Matawinie Mine project during a calendar year.

(2) between the date of the SMDS Collaboration Agreement and the first calendar year of commercial production, an aggregate annual amount of $400,000. This lump sum is an advance payment and will be deducted from the variable participation payments set out above in (ii) payable during commercial production; and

(3) as of the second calendar year of commercial production and for each subsequent calendar year of operation of the Matawinie Mine project, 1% of the net cash flow after taxes resulting from the operation of the Matawinie Mine project during the preceding calendar year shall be injected into a fund to be established by NMG to help stimulate development projects for the communities of the Upper Matawinie region. The governance and operating procedures of this fund are established by NMG in partnership with said communities.

On July 15, 2020, NMG granted a hypothec to Pallinghurst Graphite over substantially all of NMG's assets, including the mineral claims forming the Mining Property, to secure NMG's obligations under the Bond. The obligations secured by the hypothec were extinguished with the conversion of the Bond in October 2021, but the hypothec has not been discharged to date.

NMG entered into a royalty purchase agreement dated July 14, 2020, and a royalty agreement dated August 28, 2020 (the "Pallinghurst Royalty Agreement") with Pallinghurst Graphite, whereby NMG issued and sold to Pallinghurst Graphite, in perpetuity, a 3.0% NSR (the "Pallinghurst Royalty Agreement") on all minerals mined, provided or otherwise recovered from the Matawinie Property. Until August 28, 2023, the Pallinghurst Royalty is subject to a 1% buy-back right in favour of NMG for an amount equal to $1,306,036, plus accrued interests at a rate of 9% per annum from and after August 28, 2020, and up to the buyback date. Pallinghurst Graphite has the right, until August 28, 2023, to request that the Pallinghurst Royalty be converted into a graphite stream agreement or other similar forward purchase agreement, provided that NMG will not be required to complete any such conversion if it could have a negative impact on NMG. The rights and obligations of Pallinghurst Graphite have been assigned to Pallinghurst International Graphite Limited, an entity that has control over Pallinghurst Graphite (Pallinghurst International). As provided for in the Pallinghurst Royalty Agreement, Pallinghurst International requested that a new hypothec be granted on to Matawinie Property to secure NMG's NSR obligations concurrently with the discharge of the hypothec securing NMG's obligations under the Bond.

The author of this section 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 claims forming the Mining Property have not been professionally surveyed. 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.

4.5. Permits and Environmental Liabilities

Permits needed for the exploration, geotechnical and hydrogeological exploration or characterization works completed to date consists of tree clearing permits, provided by the Ministry of Forests, Wildlife and Parks (MFFP for *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. Permits and authorizations were also obtained for NMG's demonstration plant construction and operation including the ore extraction site and tailings facilities located on the West Zone of the Mining Property. This plant uses the ore from the West Zone deposit to create natural graphite flake concentrate (for more details, see Press Releases dated May 24, 2018 and September 18, 2018). These permits consist of tree clearing permits as well as authorizations delivered by the Ministry of Environment and the Fight Against Climate Change (MELCC for *Ministère de l'Environnement et de la Lutte contre les changements climatiques*) for construction works and operation at the demonstration plant, and tailings and water storage facility. Table 4-2 lists the number of permits and authorizations obtained to date by various government entities for exploration and characterization work, as well as NMG's demonstration plant, on the Mining Property.

The permits obtained and needed to conduct the construction work and mining operation for the Matawinie Mine project and the Phase-2 Bécancour Battery Material Plant project are discussed in Chapter 20 (Section 20.1.3 for Phase 2 Matawinie Mine project and Section 20.2.9 for Phase-2 Bécancour Battery Material Plant project).

Table 4-2: Permits and authorizations acquired for exploration work, various characterization work and the demonstration plants

Project Phase	SMDS Certificate of Conformity	MFFP Permits	MERN Permits	MELCC Permits
Exploration Matawinie Mine	16	19	2	-
Phase 1 Matawinie Mine	5	4	7	10
Phase 1 Bécancour Battery Material Plant	1	-	-	2

The Ministerial Decree authorizing the Matawinie Mine project (Decree # 47-2021) was granted by the MELCC on January 20, 2021. The Decree covers a commercial production level of 100,000 tpa of graphite concentrate, which will be used in part for NMG's value-added anode strategy – supplying material for the electrical vehicles and renewable energy storage industries. All documents pertaining to the Decree are available on the MELCC website:
https://www.ree.environnement.gouv.qc.ca/projet.asp?no_dossier=3211-16-019

The permits obtained and required to conduct the wetlands compensation, construction work phases, and mining operation proposed for the Matawinie Mine project are discussed in Chapter 20.

To the author's knowledge, there are no liabilities (whether contingent or otherwise) relating to any environmental activity concerning or affecting the Company, its subsidiaries or their properties, assets or operations, and there are no liabilities (whether contingent or otherwise) relating to the restoration or rehabilitation of land, water or any other part of the environment, in each case that would have a Material Adverse Effect on the Mining Property.

4.6. Significant Factors and Risks

NMG operates in an industry that contains various risks and uncertainties. The risks and uncertainties listed below are not the only ones to which the Company is subject. Additional risks and uncertainties not presently known by NMG, or which the Company deems to be currently insignificant, may impede the Company's schedule and performance. The materialization of risks could harm the Company's activities and have significant negative impacts on its financial situation and its operating results.

Risk of New Mining Operations

The Matawinie Mine does not have an operating history. Whether income will result from any of the Company's activities, including, without limitation, the Matawinie Mine project, will depend on the successful establishment of new mining operations and expansion of current operations, including the construction and operation of the Matawinie Mine and the Bécancour Battery Material Plant projects and related infrastructure. As a result, the Company is subject to all of the risks associated with establishing or expanding new mining operations and business enterprises, including the timing and cost, which can be considerable, of the construction of mining and processing facilities and related infrastructure; the availability and cost of skilled labour and mining equipment; the need to obtain necessary environmental and other governmental approval and permits and the timing of the receipt of those approvals and permits; the availability of funds to finance construction and development activities; potential opposition from non-governmental organizations, environmental groups or local groups which may delay or prevent development activities; and potential increases in construction and operating costs due to changes in the cost of fuel, power, materials and supplies.

Various factors, including the successful construction, commissioning and ramp-up of the Matawinie Mine project, costs, actual mineralization, consistency and reliability of graphite grades, commodity prices, future cash flow and profitability can affect successful project development, and there can be no assurance that current or future estimates of these factors will reflect actual results and performance. The design and construction of efficient processing facilities, the cost and availability of suitable machinery, supplies, mining equipment and skilled labour, the existence of competent operational management and prudent financial administration, as well as the availability and reliability of appropriately skilled and experienced consultants can also affect successful project development. It is common in new mining operations to experience unexpected problems and delays during construction, development, mine start-up and commissioning activities. Such factors can add to the cost of mine development, production and operation and/or impair production and mining activities, thereby affecting the Company's profitability. Accordingly, there is no assurance that the Matawinie Mine project will ever be brought into a state of commercial production or that the Company's activities will result in profitable mining operations.

Risks Related to the Mining Property

The mining project's footprint has no accessibility restrictions known to NMG.

Information provided by the MERN cadaster database from late 2021 reveals that the mineralized zones in the Tony Claim Block, including the proposed mining installations, cover only crown land. The Tony Block also covers private properties, although these are located some distance from the targeted mineralization except for two private lots, one of which encroaches by up to 13 m the West Zone proposed open pit, while the other is located up to about 80 m from the pit boundary (Figure 4-3). These two lots are the property of Quartier Du Nouveau Monde Inc., a subsidiary of NMG, and as such, does not pose any constraints to the mining project. The closest private lot, other than those owned by NMG or one of its subsidiaries, is located about 500 m from the proposed Matawinie Mine project open pit. Additional information on surface rights is available in Section 5.5.

For more details on social, environmental, and permitting issues and risks, see Chapter 20.

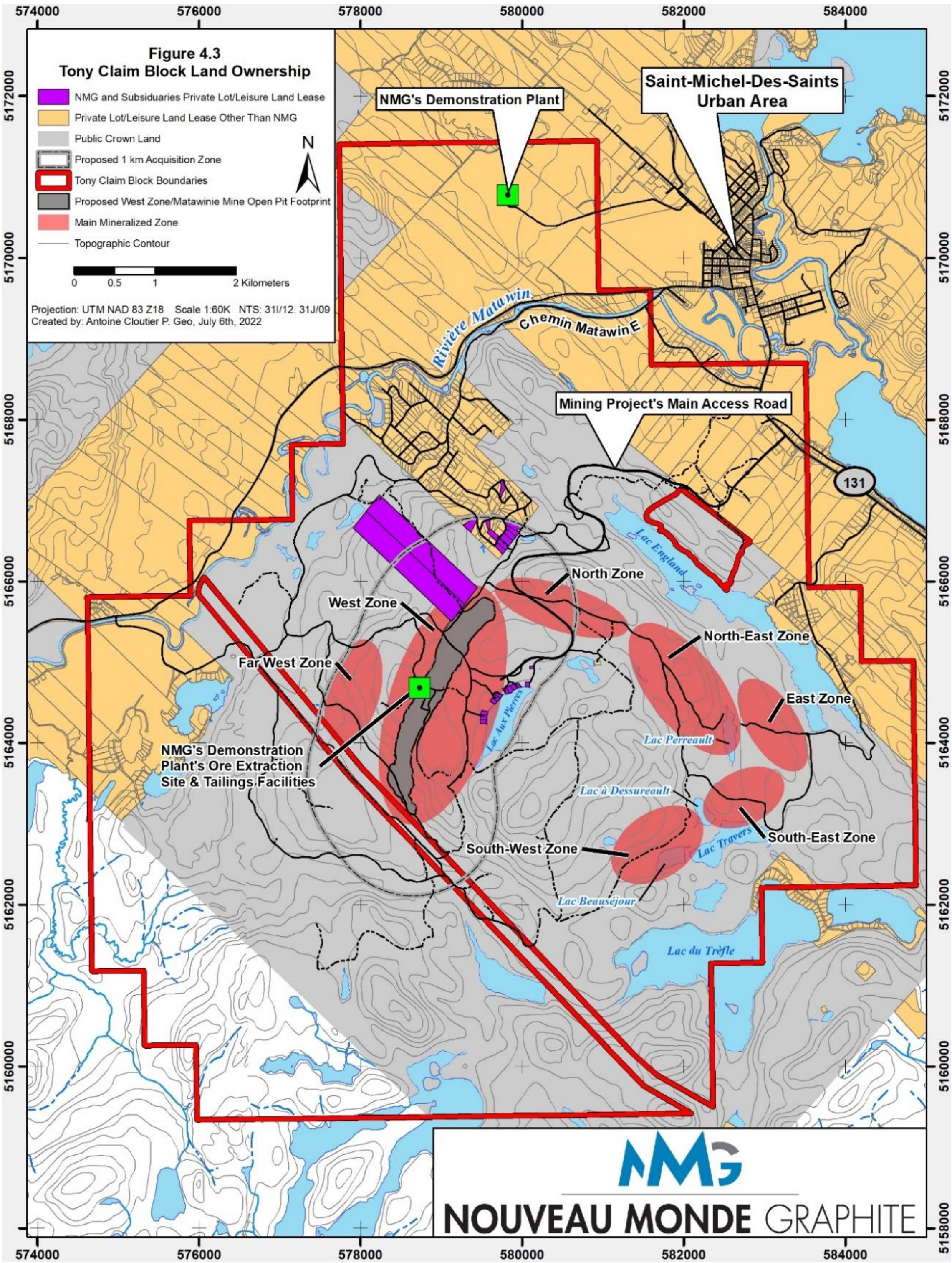


Figure 4-3: Tony Block land ownership

5. Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1. Accessibility

All mineralized zones located on the Tony Block, including the mining project footprint, are within 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 (Figure 4-2). The town itself is accessible from Montreal using the Province of Québec’s paved Route 131, the trip represents approximately 160 km (Figure 4-1).

A Forestry Class 1 gravel road, measuring 8 km in length and connecting Road 131, part of Québec’s Ministry of Transportation’s Road infrastructure to NMG’s industrial mining site, was constructed in 2021. This road crosses private lots on a length of about 1.1 km, for which an agreement was entered into with the landowner in connection with the establishment of a right-of-way in favour of NMG.

The mining project area is easily accessible using high clearance two-wheel-drive vehicle. The main mineralized zones are all accessible using logging roads of varying grades. The use of an all-terrain vehicle (ATV) or four-wheel-drive vehicle is strongly recommended to access the mineralized zones, especially in wet and slippery conditions. Road maintenance and snow removal in the project area is carried-out by NMG when needed.

5.2. Physiography

The topography of the Mining Property 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 Tony Block 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 sandy-silty till, usually about 1 m to 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, decomposed, and derived from sphagnum, mosses, and forest litter. Fluvioglacial and fluvial deposits of sand and gravels 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. Mineralized zones are mostly covered by till, with fluvioglacial material sometime present at lower elevations.

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 warm summer humid continental climate according to the Köppen-Geiger climate classification system (https://en.climate-data.org/) 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 daily maximum temperature of 24.2°C, whereas January is the coldest month with an average daily minimum temperature of -20.4°C. These statistics also show that the average annual rainfall is 731.1 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 Infrastructure

The Tony Block mineralization is located within a few kilometres 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 including the mining project footprint. According to the 2021 Federal Census, the Saint-Michel-des-Saint municipality counts a population of 2,496 with 2,020 private dwellings occupied by 1,268 usual residents in an area of about 494 km^2.

The nearest hospital or CLSC (*Centre local de services communautaires*), a free clinic operated and maintained by the provincial government, is located in the town of Saint-Michel-des-Saints and a larger hospital is located about 100 km to the south, in the town of Joliette. Two 735 kV power lines managed by Hydro-Québec pass through the Mining Property and the closest power distribution centre, the Provost post, is located at about 10 km to the east-southeast of the proposed mine.

Local resources on the Mining Property 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 being conducted on the surficial material 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. The region offers skilled workforce, such as forestry workers, mechanics and heavy equipment operators.

It is important to note that NMG has leased 6,700 m^2 of a large manufacturing plant owned by SSTM International Inc., located at 600 Chemin de la Forex inc. in Saint-Michel-des-Saints, to host its Demonstration Plant with a capacity to produce 1,000 tonnes of graphite concentrate annually (**Error! Reference source not found.**). Additionally, NMG's demonstration plant is host to commercial micronization and spheronization equipment necessary to produce lithium-ion battery (LIB) anode material and has recently started the commissioning of its spherical purified graphite coating line, thereby completing the LIB anode material added-value chain. The demonstration plant provides valuable information and experience for both engineering and personnel involved in the future mining operations. Additional information about this demonstration plant is detailed in Press Releases from NMG dated May 24, 2018, September 18, 2018, December 20, 2019, March 25, 2022 and June 17, 2022.

5.5. Surface Rights

The Tony Block main mineralized zones are located on public crown land. None of the infrastructure of the proposed Matawinie Mine project is located on private or leased land which are not owned by NMG or one of its subsidiaries, except for a portion of the main access road for which an agreement was entered into with the landowner in connection with the establishment of a right-of-way in favour of NMG. The closest land leases from the Matawinie Mine project and related infrastructure are located on the shores of *Lac aux Pierres* (Figure 4-3). Following their acquisition from private owners, these land leases are now all owned by NMG or its subsidiaries. Other nearby land leases and private lots located within a 1 km buffer of the planned open pit footprint are subject to a voluntary acquisition process put forth by NMG. Some of these lots have already been acquired by NMG (Figure 4-3). Further details about the Pre-Development Acquisition Protocol are available in NMG's Environmental and Social Impact Assessment (ESIA).

A total of three main land leases are needed for the Matawinie Mine project implementation, of which, two, the industrial and tailings land leases, have been obtained (Figure 4-2) (Section 4.2). Additional information is available in Chapter 20.

1. Land lease for tailings infrastructure located on the domain of the State;
2. Land lease for industrial infrastructure located on the domain of the State;
3. Mining lease covering the planned open pit.

5.6. Bécancour Property

5.6.1. Ownership

The proposed site of the Battery Material Plant, Lot 17 in the Bécancour industrial and port park (lot number 3 294 065 of the Cadastre of Quebec, Registration Division of Nicolet), is wholly owned by NMG. The land purchase was finalized on February 3, 2021.

5.6.2. Accessibility

The site of the Advanced Battery Material Plant is strategically located within the Bécancour industrial and port park (PIPB) which is easily accessed by provincial highways and roads. The site offers access to all necessary infrastructure and services including:

- Allowance for a safe and direct pipeline chemical supply from Olin;
- Proposed direct delivery of nitrogen via underground pipeline from an industrial gas supplier;
- Access to a 120 kV electrical line running along the northern border to the Property;
- Access to a natural gas pipeline along the eastern property border;

- Direct potable and industrial water access along multiply sides of the Property;
- Easy rail, port, and road access for both importing raw materials and exporting final products throughout North America and Europe.

The location of the Advanced Battery plant within the PIPB is presented in Figure 5-1. The map shows the proximity to the port, the main roads surrounding the site, the location of the domestic water system connection and the proposed chlorine pipeline from Olin. Additional details about the site infrastructure is presented in Section 18.2.

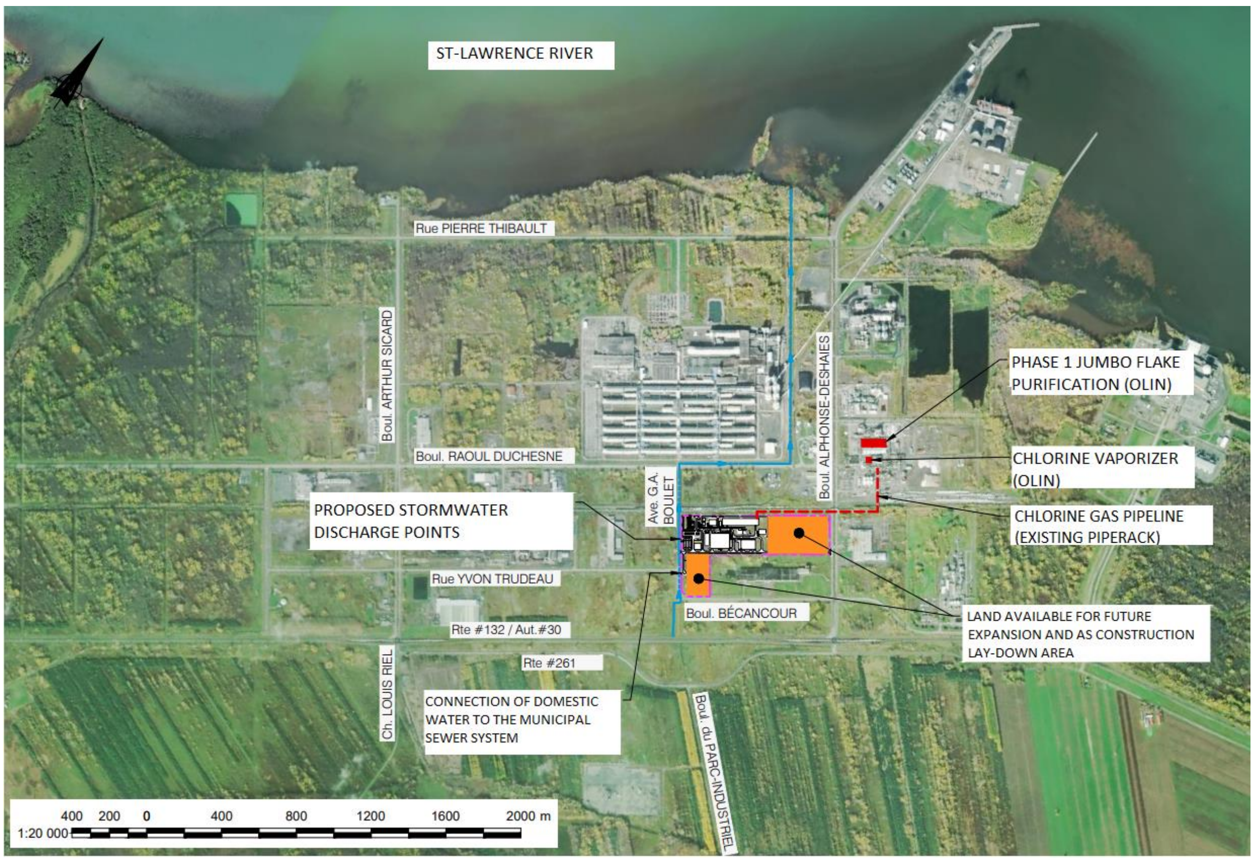


Figure 5-1: Advanced battery material plant location

5.6.3. Climate

Climate data for the Bécancour Property is based on the St. Narcisse meteorological station (climatological ID: 7017585) from Environment Canada (2022). The station is located approximately 18 km from the site. This meteorological station collected data between 1981 and 2010.

The daily average temperatures available for the Bécancour region indicate that the lowest winter temperature is -12.7°C and the highest summer temperature is 19.5°C with extremes ranging from -18.1°C in winter to +25.6°C in summer. July is the warmest month and January the coldest.

The annual mean total precipitation is 1,063.1 mm (885.1 mm as rain and 178.0 cm as snow). Annually, there are, on average, 53.6 rainy days (≥ 5 mm) and 11.8 days of snow (≥ 5 cm) in the region of Bécancour. Overall, there is no snow cover from May to October.

6. 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 a recent lake bottom sediment sampling campaign. Additional information on this survey is available in Section 6.1.

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[1], and from Natural Resources Canada (NRCAN)[2]. 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 as well as a recent lake bottom sediment sampling campaign. The MERN lake bottom geochemical survey was carried out in 2012 mostly over the Grenville geological Province. A report summarizing the results was published on March 1st, 2018 (Solgadi, F.,2018; DP 2018-03). The Report focusses on the following elements: As, Cu, La, Li, Ni, Pb, Y, and Zn. Out of the 5,779 samples collected during the survey, six are located on the Tony Claim Block. One of these sample returned Li values within the top 1%. 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[1]	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[2]	1966	Geological mapping at the 1:253,440 scale of the Mont Laurier and Kempt Lake Map Areas (NTS sheet 31J and 31O)
CGSIGEOM31I[1]	2010	Geological map compilation at the 1:50,000 scale covering NTS sheet 31I
CGSIGEOM31J[1]	2010	Geological map compilation at the 1:50,000 scale covering NTS sheet 31J
DP 2018-03[1]	2018	Lake bottom geochemical survey covering the southern portion of the Grenville Province

[1] Available on the following website: http://sigeom.mines.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a
[2] Available on the following website: http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/geoscan_e.web

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.

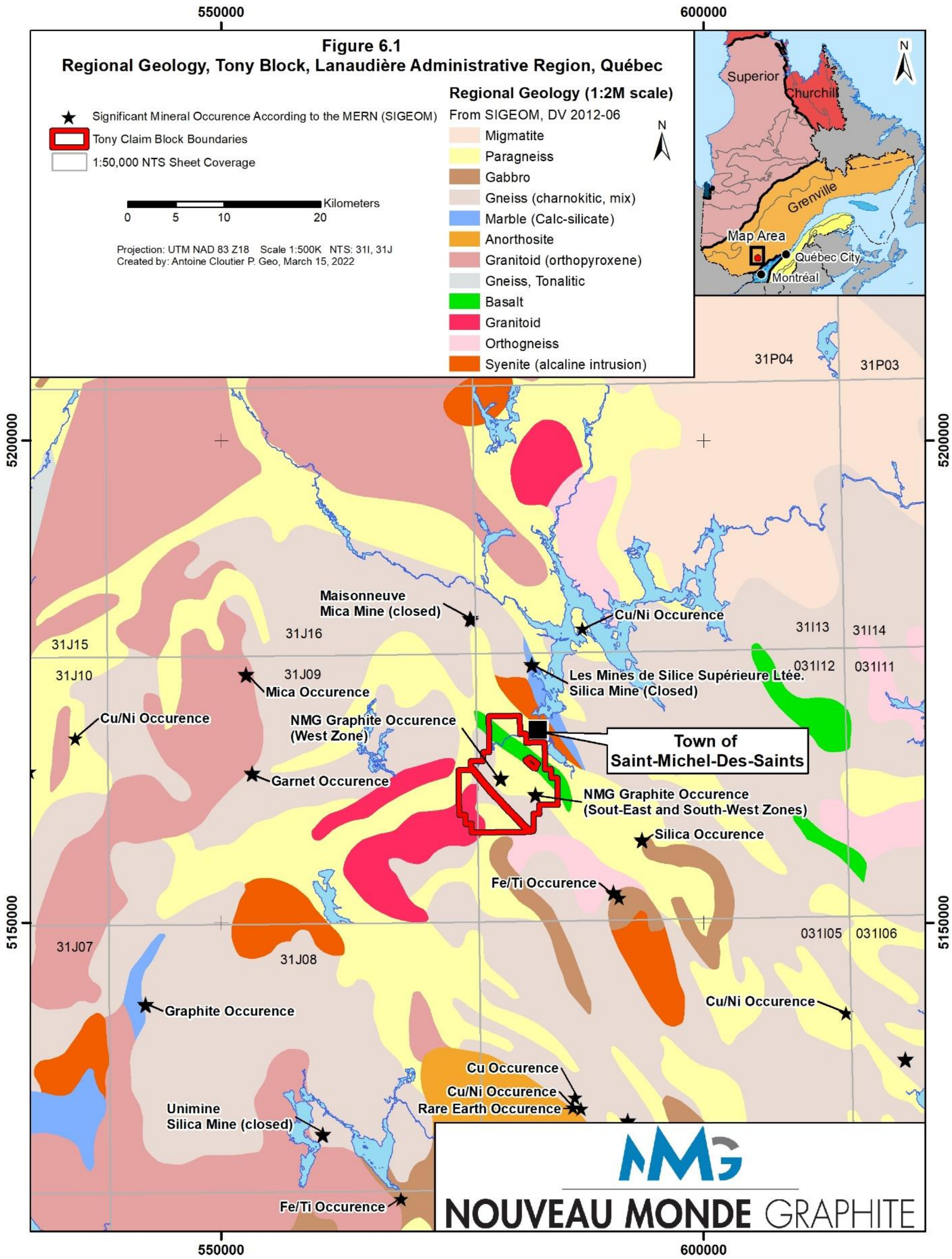


Figure 6-1: Tony Block regional geology

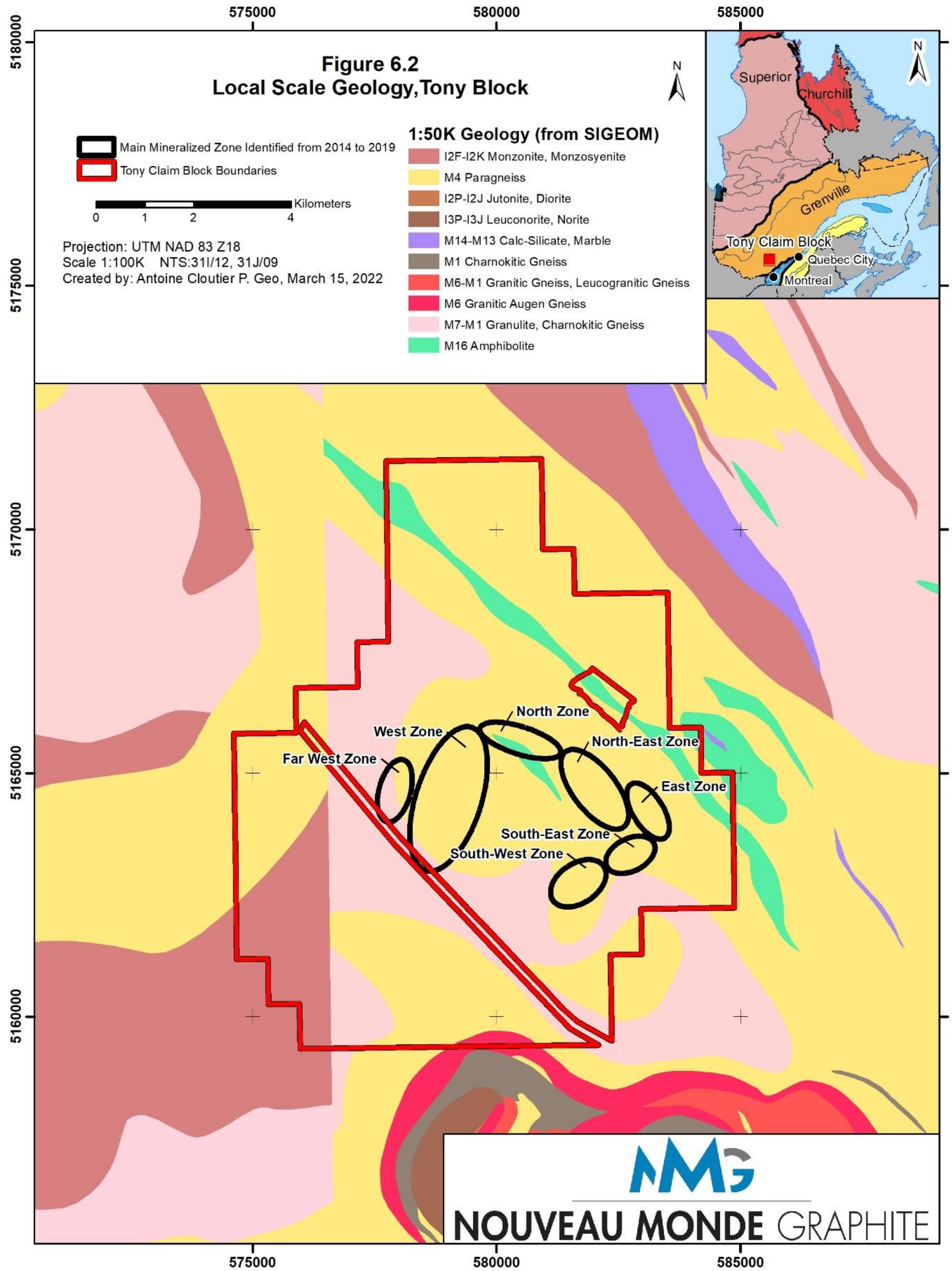


Figure 6-2: Tony Block local geology

7. 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 km 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).

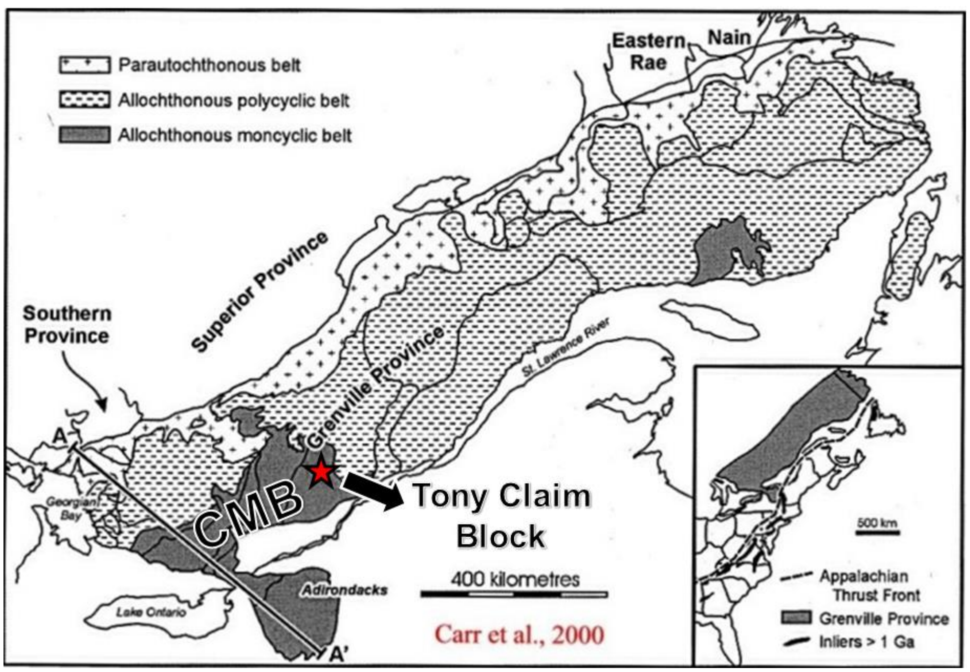


Figure 7-1: Tectonic subdivisions of the Grenville Province
Modified from Carr et al., 2000 and according to Rivers et al., 1989

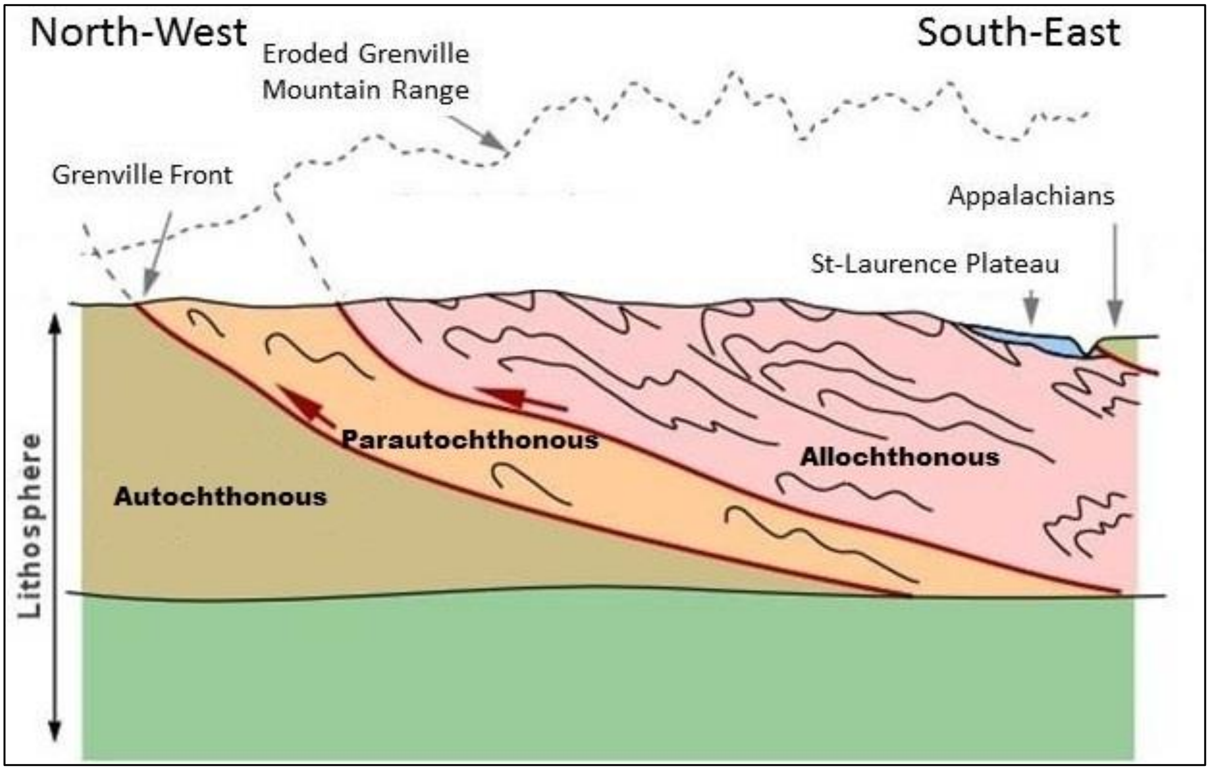


Figure 7-2: Grenville Orogeny Thrusting
From http://www2.ggl.ulaval.ca/personnel/bourque/intro.pt/planete_terre.html
[modified from Hocq et al., 1994 (MM 94-01)]

The Mining Property 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-Kinonge 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.

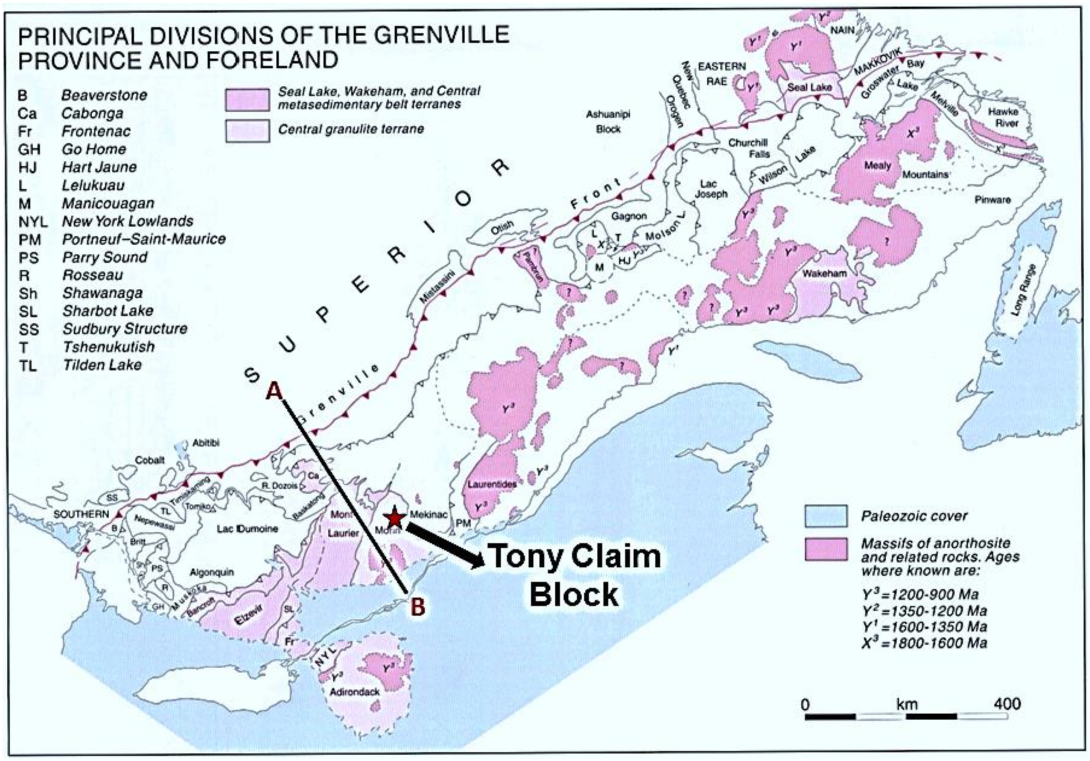


Figure 7-3: Principal divisions of the Grenville Province and location of the Tony Block
Modified from Davidson et al.,1998

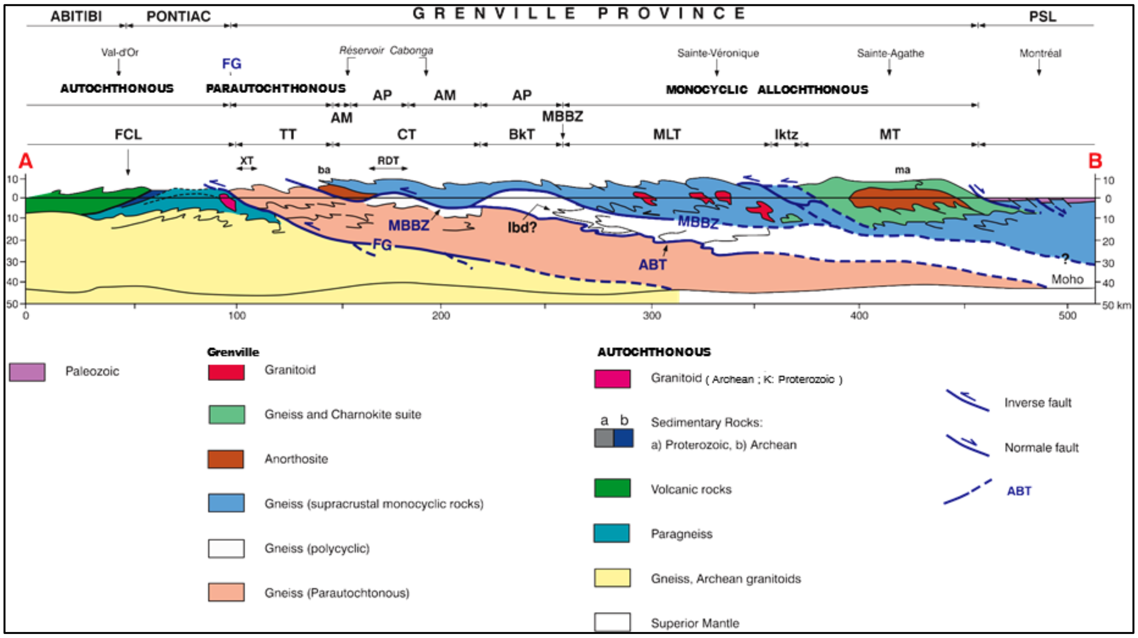


Figure 7-4: Cross-section of the Grenville Province centered over the Morin Terrane
Modified from Hocq et al., 1994 (MM 94-01)

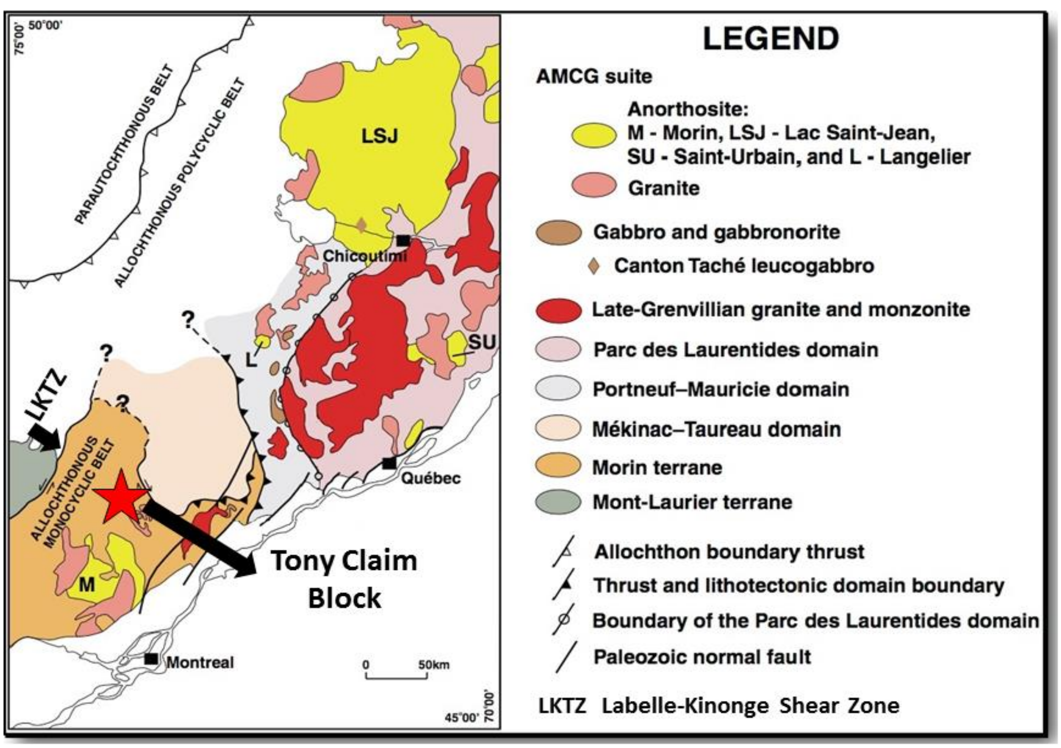


Figure 7-5: Terranes adjacent to the Tony Block

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 ± 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 Ottawan 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 charnockitic gneiss 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 Mining Property (Figure 9-2). 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 Québec, 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, garnet, sillimanite, cordierite, sulphides (pyrrhotite, pyrite), pyroxenes, muscovite 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, to a lesser extent, pyrite) as provided by comparing the analysis results of graphitic carbon and sulphur content which returns approximately a 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 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. Due to the lack of thick intercepts in drilling in the West Zone, and thus limited volume, this lithology was not modelled in the deposit but rather made part of a broader unit referred to as mixed paragneiss.

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 but most are too erratic to trace. Metagabbros represent small mafic intrusions, from decametric to metric thicknesses, 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

Several large and small outcrops of a charnockite were observed in the central part of the Tony Block and drill hole intersections are noted mostly in the northwest 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 Québec and in Ontario. These two 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.

7.2.6 West Zone Geological Model

A simplified 3D geological model of the West mineralized Zone was created by SGS Geological Services Inc.(Blainville, Québec) using the exploration drill core logs. The model is composed of five main lithologies, some of which are themselves composed of sub-lithologies. To create this geological model, lithologies traced over multiple sections and displaying thicknesses of at least 5 m were used. The main lithologies are as follows:

- Graphitic Paragneiss:
  - This unit is comprised of mineralized paragneiss derived from the bloc model created to define the most recent Mineral Resources.
- Mixed Paragneiss:
  - This unit, as the name suggests, is composed of various poorly mineralized paragneiss layers and related sub-lithologies such as garnet-rich paragneiss, quartzite, mobilizate and calc-silicates, which are intermixed and observed in thicknesses varying from centimetre to metre scale. Although the variation of individual sub-lithologies prevents tracing them individually throughout multiple sections, a grouping of these lithologies seem to be coherent within the Mineral Resource pit-shell.
- Charnockite:
  - This easily identifiable unit is mostly present in the north-east and north-west part of the Mineral Resource pit-shell.
- Biotite Paragneiss:
  - This unit is differentiated from the biotite rich paragneiss layers observed in the Mixed Paragneiss unit by the lack of associated pyrrhotite. It can be mapped throughout a few drill holes and over a few drill sections.
- Metagabbro:
  - This unit is differentiated from the other units by its intrusive origins, particular dark green colour and gabbroic texture.

A three-dimension representation of the geological model, including the Mineral Reserve pit-shell is illustrated in Figure 7-6 and estimated tonnage in the Mineral Reserve pit-shell per main lithology is available in Table 7-1.

Table 7-1: Main lithological units within the Mineral Reserve pit-shell

Simplified Lithologies	Density	Volume (Mm³) (1)	Tonnes (Mt) (1)
Graphitic Paragneiss (mostly ore)	2.76	22.3	61.5
Mixed Paragneiss	2.85	15.1	43.2
Charnockite	2.67	2.9	7.7
Biotite-Rich Paragneiss	2.75	2.0	5.5
Meta-Gabbro	2.99	0.0	0.1
Overburden	2.10	7.4	15.5

(1) Volume and tonnage within the Mineral Reserve pit-shell.

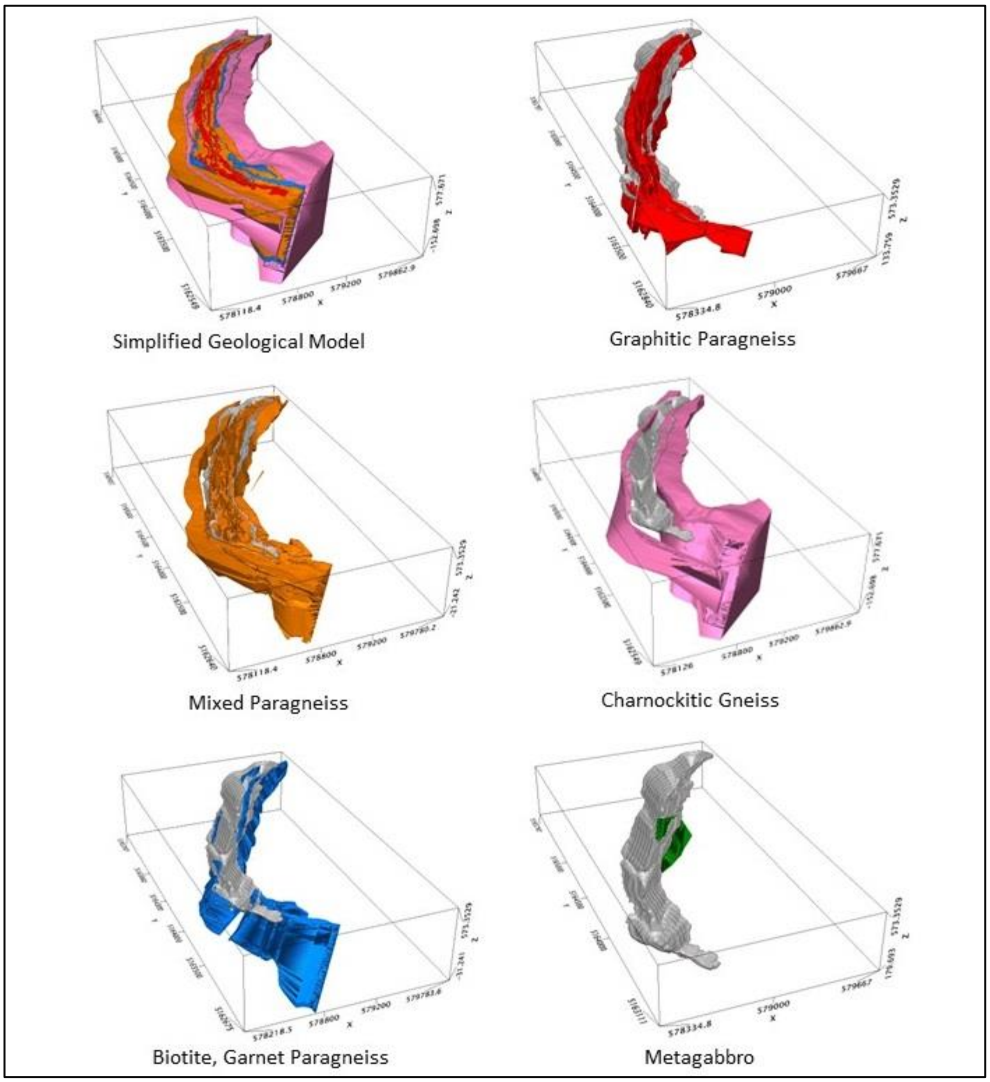


Figure 7-6: Simplified geological model of the West Zone and proposed open pit

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 7-7. 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 Québec (Figure 7-7).

The more immediate area outside of the Mining Property 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.

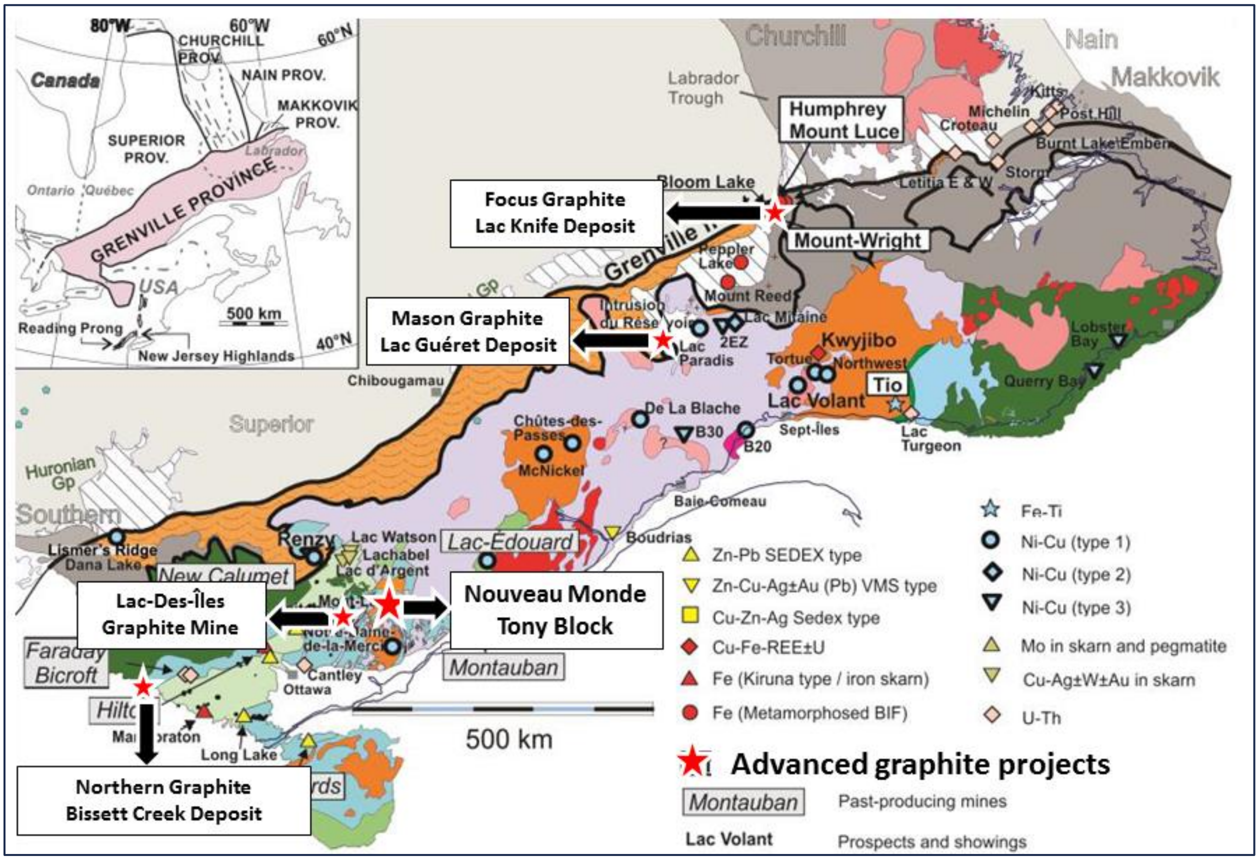


Figure 7-7: Geology and major mineral deposits of the Grenville Province
Modified from Corriveau et al., 2007

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 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 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 m. 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 totalling over 12 km in strike length and separated into seven zones: Far-West, West, North, Northeast, East, South-East, and South-West (Figure 9-2).

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 9-2 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 and finally dips at about 60 degrees towards the West 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 4 m to around 80 m in width along strike, and drilling suggests that they are mostly open at depths greater than 250 m from surface. The thickness and extent of the mineralization found to date on the Tony Block is illustrated and further discussed in Chapter 10 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, except for 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, mainly pyrrhotite.

8. Deposit Types

Crystalline flake graphite mineralization has been the focus of exploration by NMG on its Mining Property. No other type of mineralization with economic potential has been observed.

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 type of deposit 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 material, accumulated during sedimentation, is transformed into graphitic carbon crystals, or flakes, during metamorphism. This process is due to the burial of the sediments which are eventually subject to high heat and temperatures in the earths crust. Crystalline graphite deposits are commonly stratabound and hosted by porphyroblastic and granoblastic paragneiss, or pelitic gneiss, 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, centimeter 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 Québec, as well as Northern Graphite's Bissett Creek deposit in Ontario, are three other known significant crystalline graphite flake deposits found in eastern Canada and within the Grenville geological Province (Figure 7-7).

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 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 of significant targets;
- 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 3 m, although field tests indicate a useful scanning depth of 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 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 m 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. 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^2 pursuant to the instructions provided by NMG's technical staff. 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 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 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 Stelo, (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, 2016. Also, reports entitled "NI 43-101 Technical Pre-feasibility Study Report for the Matawinie Graphite Project" (MC-DRA, 2017), "NI 43-101 Updated Technical Pre-feasibility Study Report for the Matawinie Graphite Project" (MC-DRA, 2018), and NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project (MC-DRA, 2018a), were published on December 8, 2017, August 10, 2018 and December 10, 2018 respectively. These reports are available on SEDAR. Lastly, the Environmental and Social Impact Assessment of the Mining Property was published on April 15, 2019 on the MELCC website.

Table 9-1: Previous exploration reports for work performed on the Tony Block

Report	Type of Report and Comments
GM 69067*	Late 2013 Heliported Magnetic and TDEM surveys totalling 1,006 line-km over four 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.

Report	Type of Report and Comments
SEDAR**	Technical Report detailing the Mineral Resource Estimate of the South-East and South-West Zones on the Tony Block.
GM 69562* + SEDAR**	Technical Report detailing the updated Mineral Resource Estimate of the South-East, South-West and West Zones on the Tony Block.
GM 71033	2016 Trenching and Channel Sampling Campaign on the Matawinie Graphite Property.
SEDAR**	Preliminary Economic Assessment Report detailing the Mineral Resource Estimate of the West Zone.
GM 71031* + SEDAR**	Pre-Feasibility Report concerning an open pit mining operation on the Matawinie Graphite Property.
SEDAR**	Updated Pre-Feasibility Report concerning an open pit mining operation on the Matawinie Graphite Property.
GM 71818* + SEDAR**	Feasibility Report concerning an open pit mining operation on the Matawinie Graphite Property.
GM 71819* + MELCC***	Environmental and Social Impact Assessment (ESIA) of the Matawinie Graphite Project.

* Available on the following website: http://sigeom.mines.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a

** Currently available on SEDAR

*** All documents pertaining to the ESIA, including public hearings, are available on the government website: https://www.ree.environnement.gouv.qc.ca/projet.asp?no_dossier=3211-16-019

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 (2015-2021) (further discussed in Chapter 10);
- Metallurgical testing on surface and drill core samples (further discussed in Chapter 13).

An overview of the significant 2013 to 2021 exploration results are summarized in Figure 9-1 except for the metallurgical test results, which are discussed in Chapter 13.

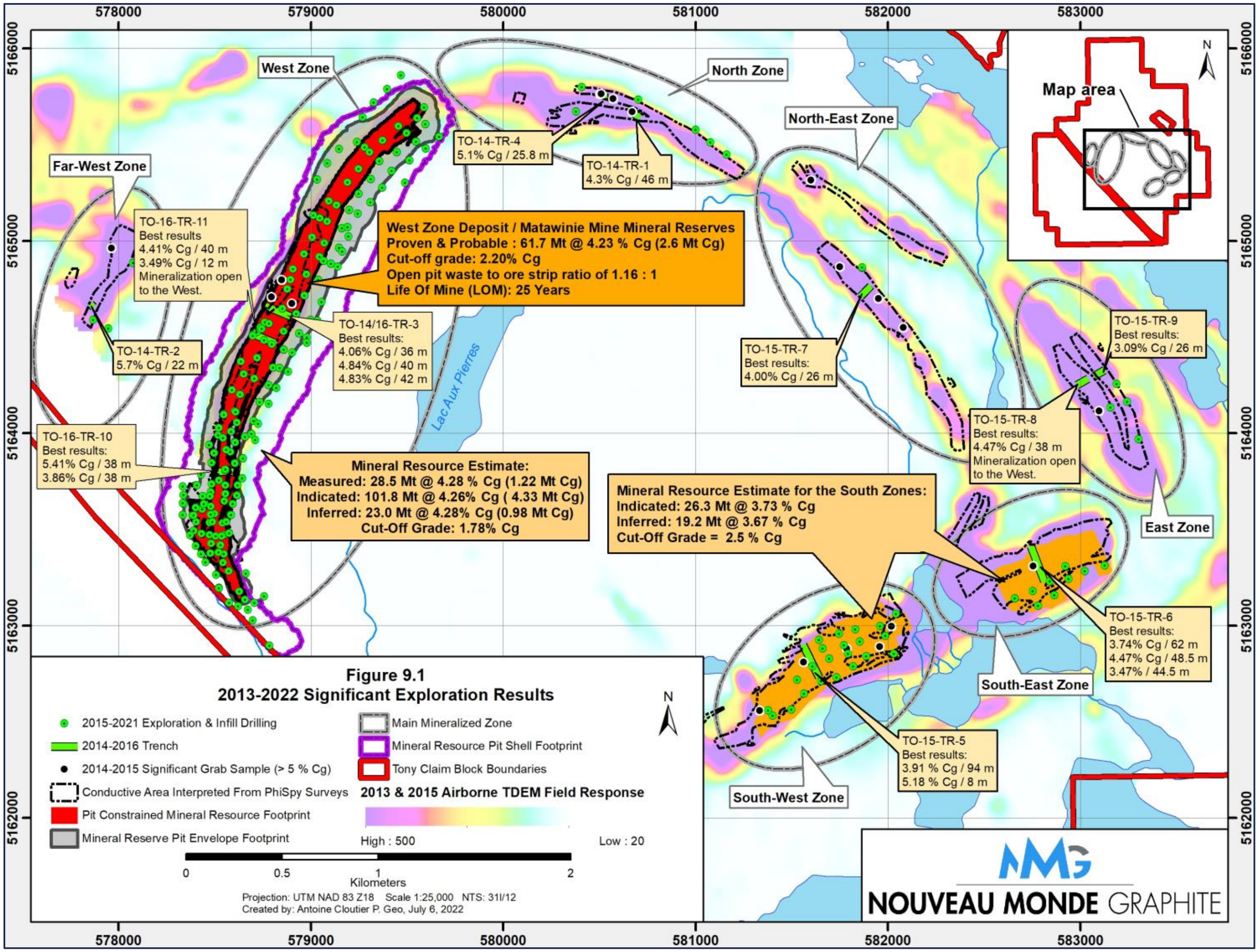


Figure 9-1: Significant 2013-2022 exploration results

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. in 2013 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^2, was flown by Prospectair Inc. (based in Gatineau, Québec) using 1 km line spacing and detected large conductors, including part of the main circular conductor present over the Tony Claim Block. Two detailed heliborne surveys were then performed, one in late 2013 and a second in early 2015, to provide better accuracy and to delineate the extent of the conductors (Figure 9-2).

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 groundwork (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 1 m, was instrumental during prospecting to scan for soil-covered shallow conductors. Generally, a grab sample, about 1 to 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.

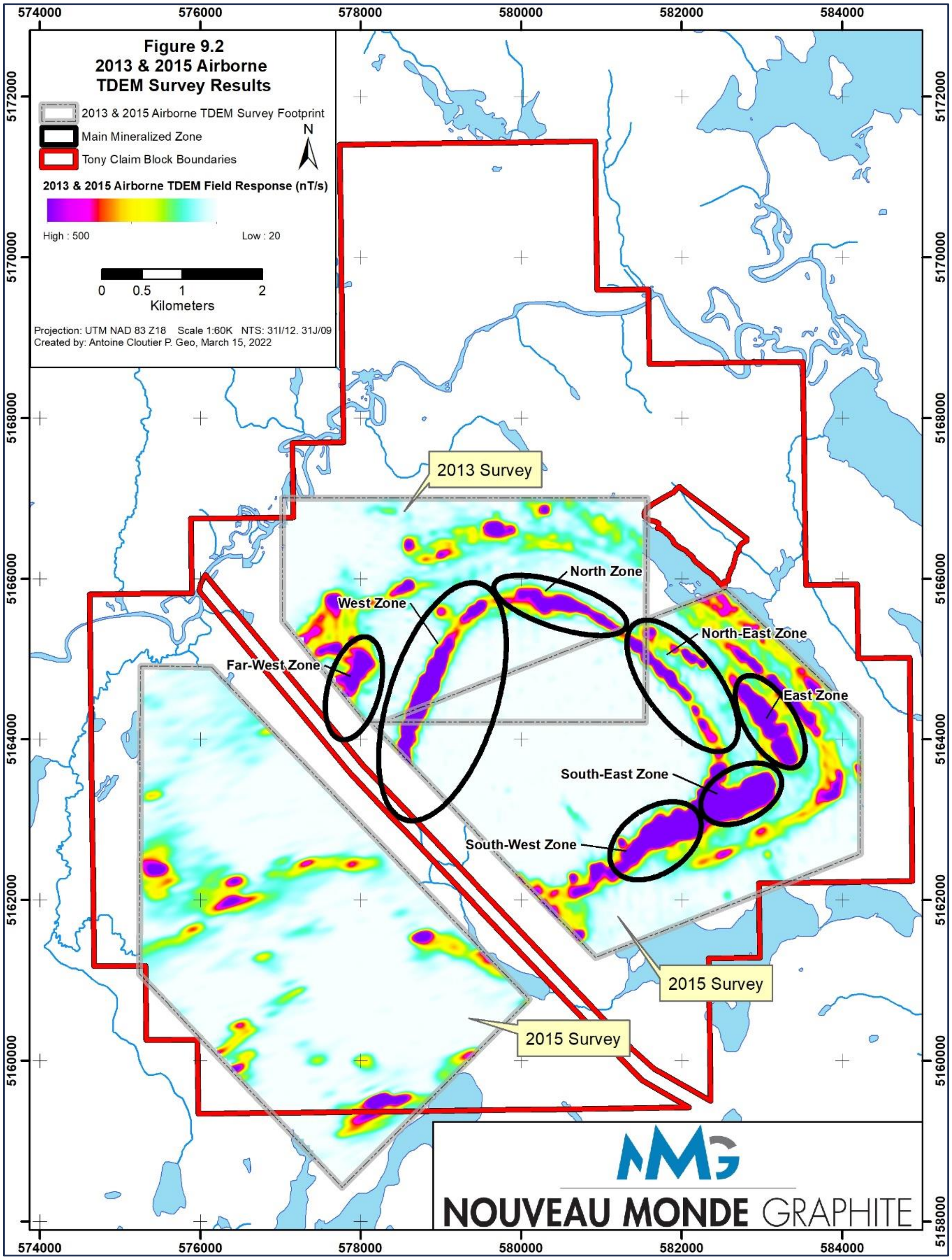


Figure 9-2: 2013 and 2015 Airborne TDEM survey results

Significant grab sample results are defined as those greater than 5% C(g). The collection of 19 samples grading above 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 9-1.

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, Québec, 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: https://www.alsglobal.com/en-ca/services-and-products/geochemistry/geochemistry-testing-and-analysis.

9.2.3 PhiSpy Surveying

From 2014 to 2019, ground PhiSpy TDEM surveys were carried out by Dynamic Discovery Geoscience Inc., based in Ottawa, Ontario. These surveys, now totalling about 183 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 9-3). The survey results were used to plan for trenching and diamond drilling operations. The PhiSpy apparatus, carried by a two-man team, has demonstrated a capacity to detect conductors to a depth of approximately 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 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 trenches were excavated in 2014, five in 2015 and three 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.

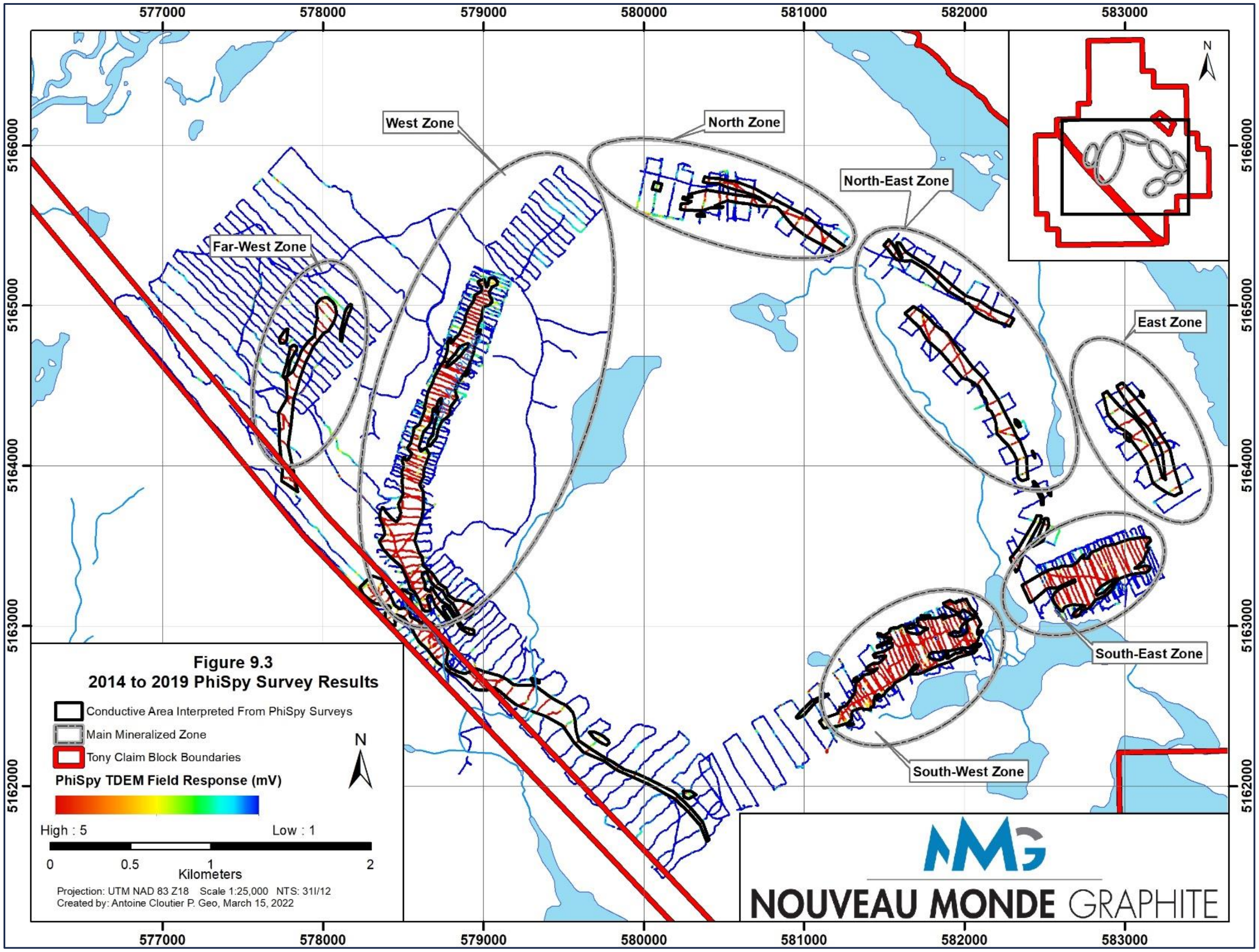


Figure 9-3: 2014-2019 PhiSpy survey results

Table 9-2: Trench location and relevant information

Trench ID	Mineralized (1) Zone	Grid Line	Trench Start (2)		Trench End (2)		GPS (2) Length (m)	Measured Length (m)	Azimuth (deg)	Total Samples
			Easting	Northing	Easting	Northing				
TO-14-TR-1	North	N/A	580673	5165671	580704	5165642	42.40	48.00	133	**23**
TO-14-TR-2	Far-West	N/A	577856	5164670	577871	5164656	20.50	22.00	133	**11**
TO-14/16-TR-3	West	W+0875	578903	5164603	578757	5164665	158.70	158.55	293	**77**
TO-14-TR-4	North	N-1000	580525	5165764	580524	5165739	25.0	25.80	182	**14**
TO-15-TR-5	South-West	S-1500	581558	5162903	581640	5162733	189.00	193.00	154	**73**
TO-15-TR-6	South-East	S-2800	582813	5163230	582740	5163424	207.00	198.00	339	**84**
TO-15-TR-7	Northeast	N-2700	581857	5164711	581910	5164765	76.00	77.00	45	**35**
TO-15-TR-8	East	E-2200	582981	5164250	583041	5164284	69.00	68.00	60	**33**
TO-15-TR-9	East	E-2200	583071	5164297	583126	5164327	63.00	62.00	61	**31**
TO-16-TR-10	West	W+0025	578631	5163800	578496	5163800	135.15	138.00	270	**69**
TO-16-TR-11	West	W+0700	578822	5164466	578711	5164511	119.30	120.00	292	**61**

(1) 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.

(2) Trench coordinates and length was measured using a Garmin GPS model 76 CSX providing about 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, and trench locations are illustrated in Figure 9-1.

Table 9-3: Significant 2014 to 2016 trench channel sample results

Trench ID	Mineralized Zone (1)	From (m)	To (m)	Grade [% C(g)] (2)
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	Northeast	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)

(1) 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.

(2) 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 to determine the potential of the mineralization while in 2015 and 2016, channel sampling usually started 2 m or 4 m [one to two 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 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 perpendicularly 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 2 m in length, 4 cm in width and 10 cm in depth, and weighed between 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 5 m. 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 precision GPS by Corriveau J. L. & Assoc. Inc, Val-d'Or, Québec. This was necessary as these sample results were to be used for the preparation of the updated Mineral Resource Estimate concerning the West Zone deposit.

Channel samples were thoroughly cleaned using a pressure washer. The top weathered crust, usually about 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 enough 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 analyzed for their graphite, total carbon and sulphur content using the C-IR18, C-IR07 and S-IR08 ALS analytical packages. In 2015, all samples underwent the C-IR18 package and one in every five sample was also tested using package S-IR08. Information on the analytical packages is available in Chapter 11 and on the ALS Minerals website (https://www.alsglobal.com/en-ca/services-and-products/geochemistry/geochemistry-testing-and-analysis).

The protocols concerning the insertion of quality control samples in 2014 included the insertion of one 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 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. Drilling

NMG initiated an extensive exploration drilling program in 2015 following repeated discoveries of high-grade graphite showings coincident with multi-kilometric conductive anomalies on the Tony Block. Exploration and delineation drilling campaigns were carried-out every year from 2015 to 2019. Core drilling on the Mining Property confirmed the presence of significant flake graphite mineralization which led to the identification of two Mineral Resources, one located on the South-East/South-West mineralized Zones and another on the West mineralized Zone. The latter was upgraded to provide Mineral Reserves in 2017 (MC-DRA, 2017) and is the main subject of this report.

The following table (Table 10-1) lists sampled exploration and definition drill hole information per mineralized zone.

Table 10-1: Tony Block exploration drilling summary

Mineralized Zone	Total Sampled Drill Holes	Metres Drilled	Number of Samples and Type of Analysis [(2)]						
			C-IR18	C-IR07	S-IR08	ME-MS41	AU-AA23	OA-GRA08	OA-GRA08b
West [(1)]	149	26,203.74	8,274	6,876	7,146	828	23	1870	97
Far-West	4	880.4	247	246	246	15	0	45	0
South-West	22	2,616.60	938	15	205	15	15	0	28
South-East	9	1,551.99	598	8	106	7	8	0	28
East	4	641.70	209	3	49	3	3	0	0
Northeast	2	210.28	34	1	9	1	1	0	7
North	6	911.99	212	6	33	6	6	0	0
Total	**196**	**33,016.70**	**10,512**	**7,155**	**7,794**	**875**	**56**	**1,915**	**160**

(1) 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.

(2) All analyses were performed by ALS Minerals Laboratories. See below for a description of each type of analytical package. QA/QC samples not included.

- 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 3 g of a powdered sample).

In 2015, drilling and core sampling operations were supervised by Yvan Bussières, P. Eng., assisted by Bernard-Olivier Martel, P. Geo. From 2016, the drilling and sampling programs were solely supervised by Bernard-Olivier Martel, P. Geo. All sampled drill hole locations are illustrated in Figure 10-1 to Figure 10-3.

It is important to note that other type of drilling was also carried-out by NMG for various reasons and not included in the following sections of the report. Oriented drilling on the West Zone Deposit was performed in 2017, 2019 and 2021. The work was carried-out to provide pit slope parameters of the proposed open pit. All oriented drilling was logged by Bernard-Olivier Martel although geomechanics data and samples were collected by Journeaux (Journeaux, 2017)), F8 Roc et Falaise (Friedlin, 2021) and SRK Consulting inc. (SRK, 2021). None the of core collected from oriented drilling has been assayed for C(g) content except for three drill holes (TO-17-117, TO-17-119 and TO-17-120). Even though most of the geomechanics drilling encountered mineralization, it was decided that the core be kept intact for future possible measurements. Information collected from this drilling, such as overburden depth, was used in the geological modelling of the deposit.

Additional vertical core drilling in the project area provided further details about overburden thickness, soil stability and lithology. Most of these only penetrated a few metres of unmineralized bedrock and thus were not sampled although the information collected was used to refine the geological model of the deposit.

The location of the unsampled drill holes is illustrated in Figure 10-4. The results of the data acquired for pit slope parameters are detailed in Chapter 16.

10.1 Drilling Program Overview

Sections 10.1 to 10.3 summarizes the exploratory and delineation core drilling which have been sampled and assayed to provide grade, tonnage, and geometry of a possible deposit.

The drilling programs were initiated based on positive results of the 2014 and subsequent 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 first drilling program consisted of one 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 on the most promising targets was planned at 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. Infill drilling on 50 m spaced sections was initiated in 2019 on the southern part of the West Zone deposit to provide Measured Mineral Resources as well as to better define this area which is more geologically complex.

Exploration and delineation drilling locations from 2015 to 2019 for the West and Far-West zones is illustrated on Figure 10-1, drilling on the South-East and South-West Zones is illustrated on Figure 10-2, and drilling locations on the North, Northeast and East Zones is illustrated on Figure 10-3.

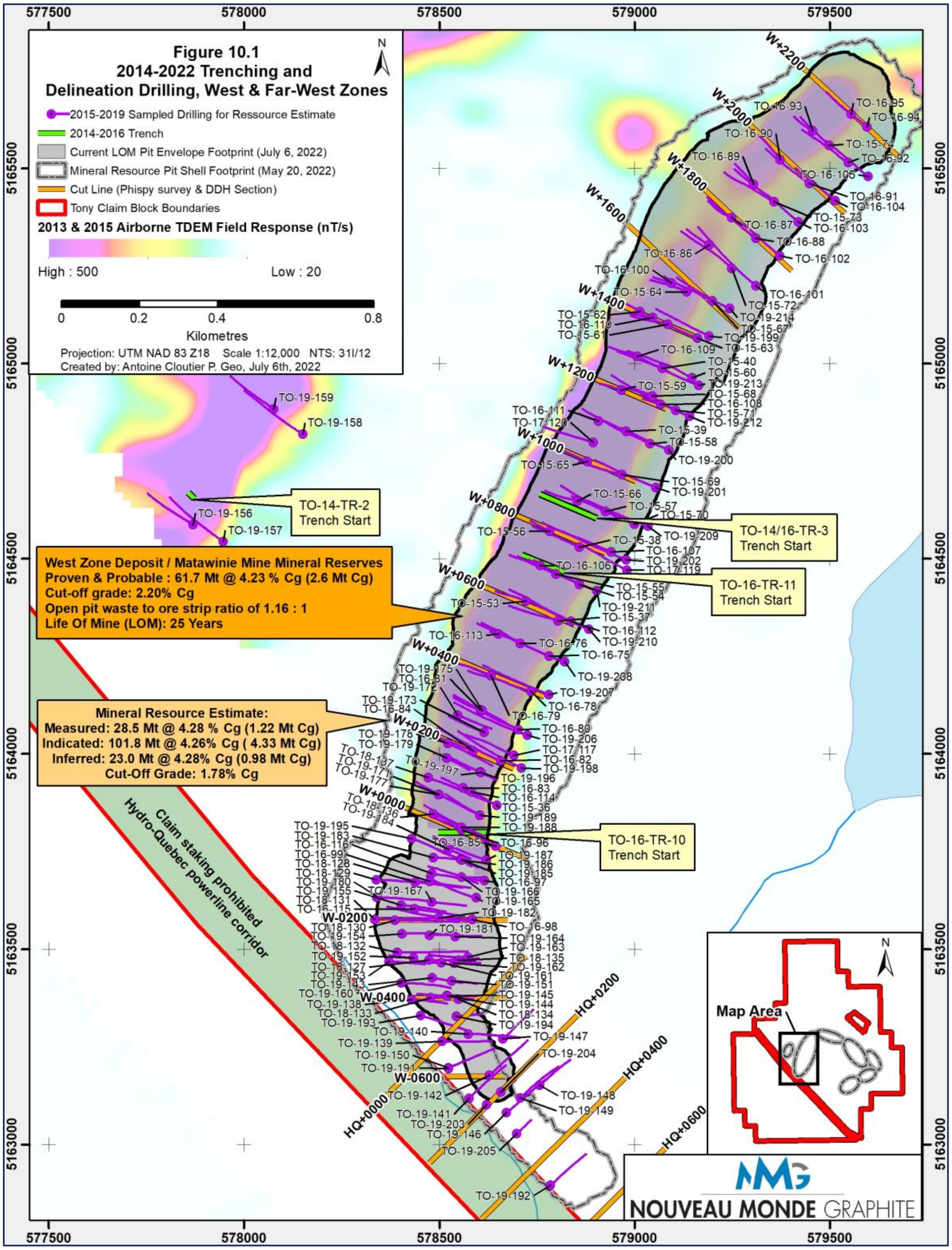


Figure 10-1: 2015-2022 Trenching and drilling programs, West Zone

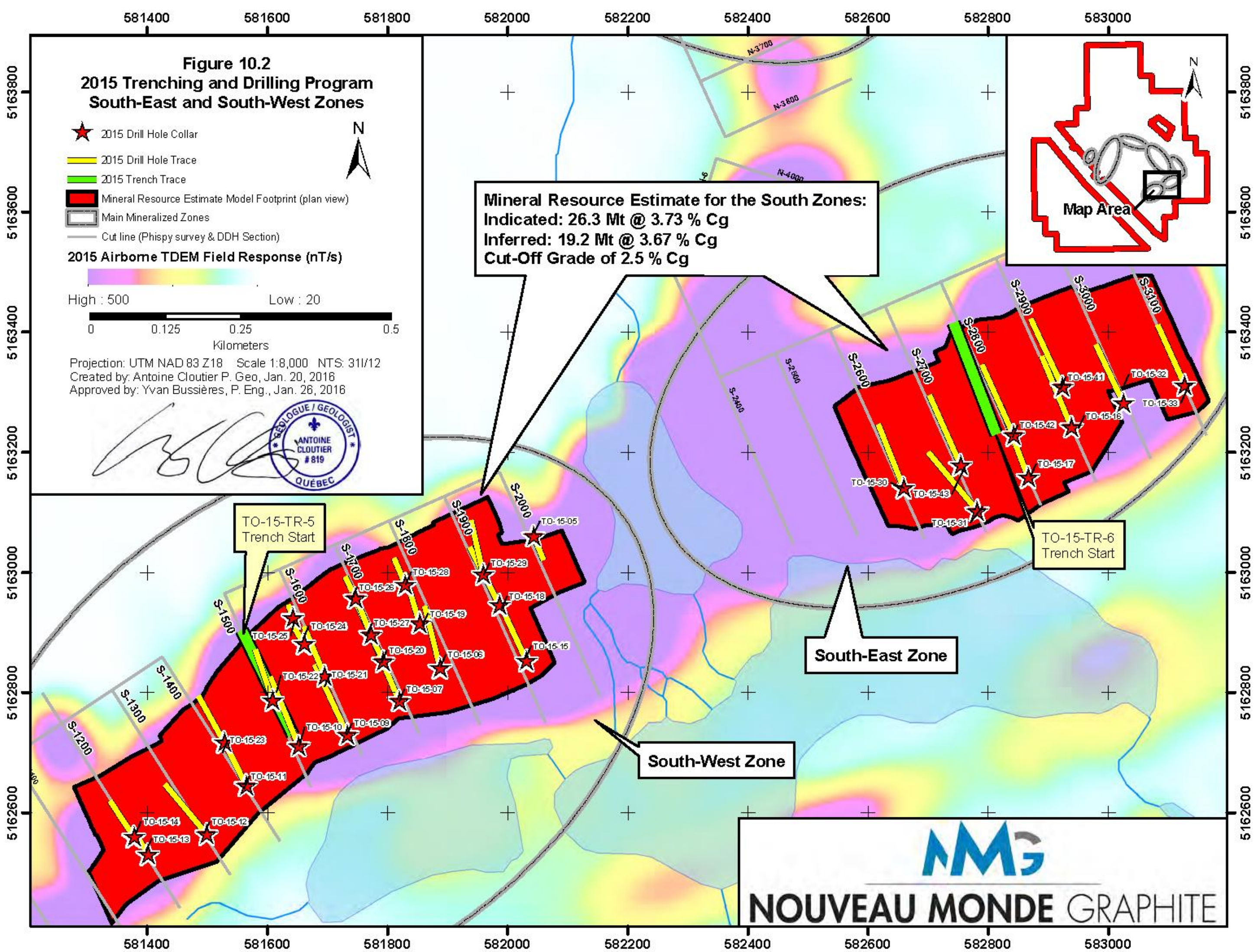


Figure 10-2: 2015 Trenching and drilling program, South-East and South-West Zones

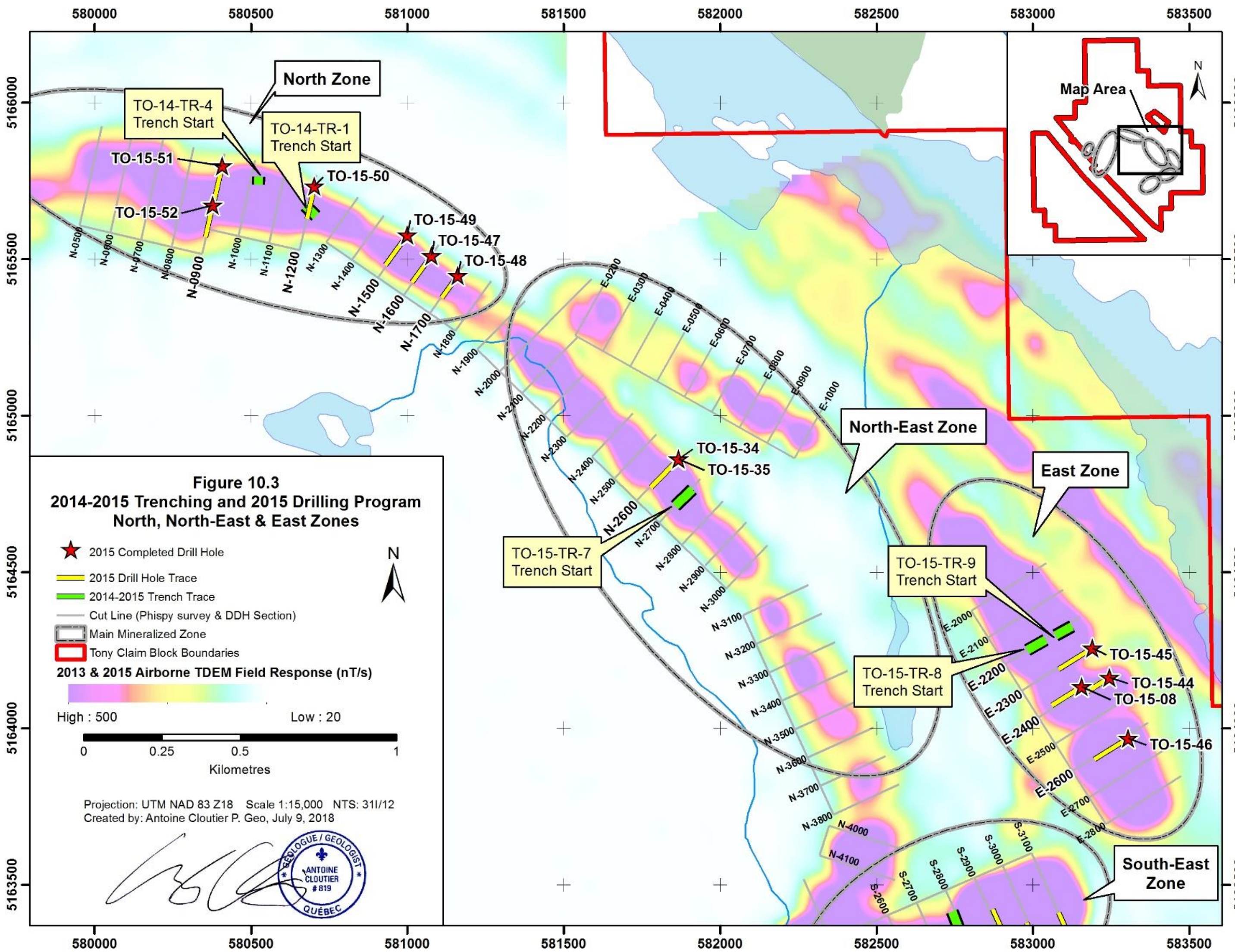


Figure 10-3: 2014-2015 Trenching and 2015 drilling program, North, Northeast, and East Zones

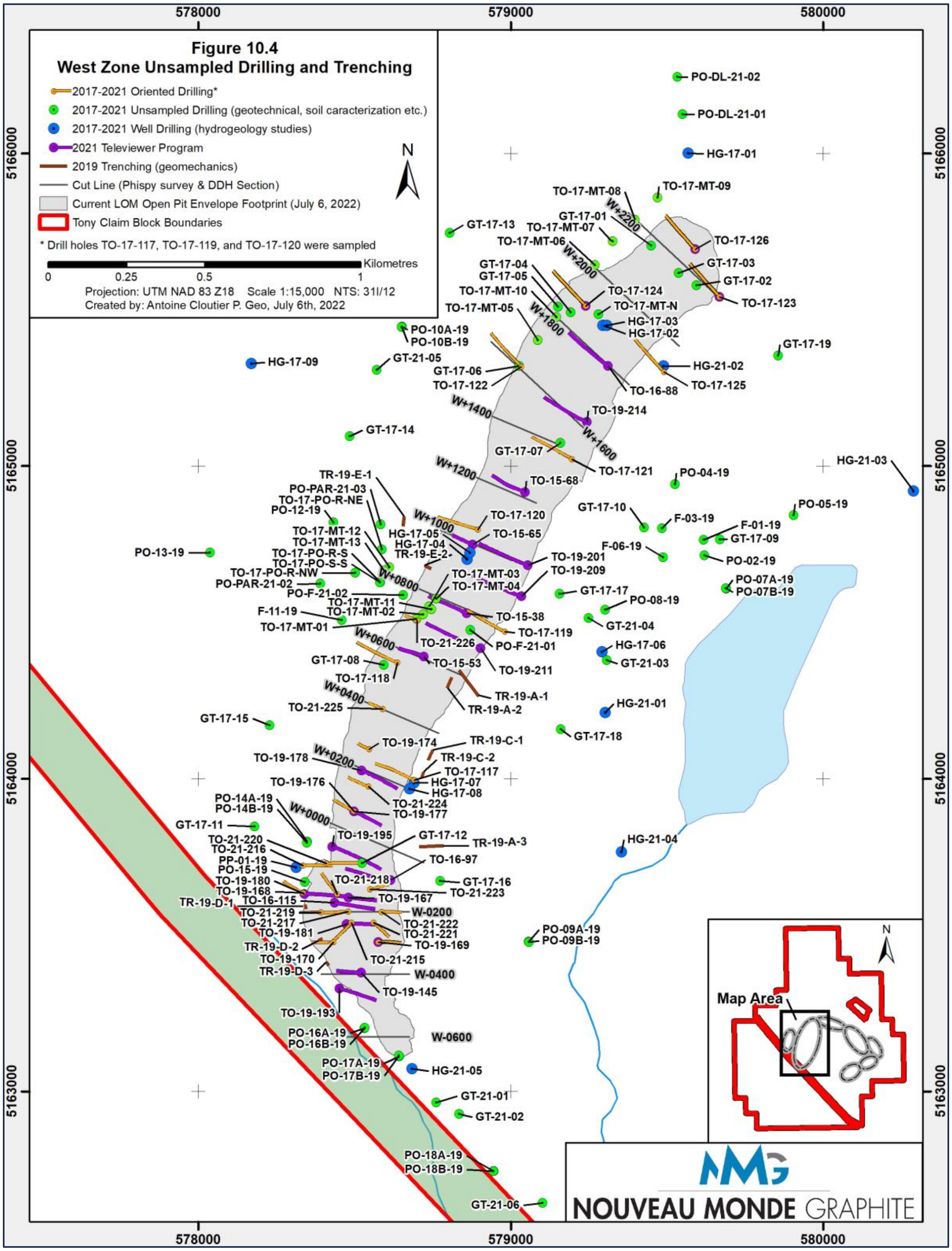


Figure 10-4: Unsampled drilling and trenching, West Zone

10.2 Drilling Protocols and Procedures

NMG applied the following drilling operation procedures for the exploration drilling on the Tony Claim Block, part of its Matawinie Graphite Property;

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 m. Drill holes were collared at approximately 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 or a gyro rig alignment tool with north seeking technology (https://sptab.com/gyro-rigaligner/). 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 starting from 2016 used NQ size tubing except for holes 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 200 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 deviation readings varying from 3 m intervals to one reading every 30 m with a maximum interval between readings of 50 m down drill holes using magnetic or gyroscopic survey instruments such as the REFLEX EZ-Trac™ and SPT's (Stockholm Precision Tools) GyroMaster™/Core Retriever™;

- The drill operator carried the full core boxes at the designated secure site, protected by a locked gate and video surveillance at the end of each shift. These sites were located at 480 rue des Aulnaie, Saint-Michel-des-Saints for the 205 to 2018 years, and at 600 de la Forex, Saint-Michel-des-Saints, in 2019;
- Before completing the drill hole, the geologist determined whether the target has been reached, and if not, the geologist requested that drilling continued.

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. From 2016, metal or tagged aluminum caps and flags identifying the hole number were screwed on the casings.
- Casing locations were professionally surveyed with a precision of 0.05 m. Surveyors Gilles Dupont, based in Repentigny (Québec), Corriveau J. L. & Assoc. Inc of, Val-d'Or (Québec) and Martin Larocque, based in Laval (Québec), 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 during the 2015 and 2016 drilling campaigns. 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 to show the sample intervals marked by the tags.

10.2.4 Core Sampling

The drill core sample was split into two core quarters and one core half using a rock saw. One 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 enough 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 field duplicates, blanks and graphite standards. The QA/QC protocol is detailed under Chapter 11.

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 Block to date.

10.3.1 Drilling Results for the West Zone Deposit

Exploration drilling in the West Zone (or the "West Deposit") consists of 149 holes totalling 26,203.74 m.

Mineralization was intercepted 476 times by drilling in the West Zone resulting in the interpretation of an envelope of 100 m to about 150 m thick from which 23 graphitic horizons, or volumes (17 groups of mineralized intervals), were interpreted. These horizons can be followed, sometimes sporadically, over 3 km. An additional feature of the West Zone is that some of the horizons separate and coalesce to form wider mineralized horizons. The longest intersection along drill core returned a graphite content of 4.76% C(g) over 109.9 m, although this intersection is considered as being down-dip. Table 10-2 summarizes the 17 groups of mineralized intervals provided by drilling in the West Zone as well as the longest mineralized drill intercepts. Chapter 14 details the mineralized horizons, referred to as mineralized volumes, interpreted from the drill core and trench channel sample assay results.

Table 10-2: Longest West Zone drilling intercepts per grouped mineralized volumes

Mineralized Volume	Longest Mineralized Core Interval [(1)]	Section	Drill Hole
W0	44.40 m @ 5.96% C(g)	W+1700	TO-16-101
W0A	29.90 m @ 4.12% C(g)	W-0150	TO-19-180
W1A	50.67 m @ 3.63% C(g)	W+1200	TO-15-59
W1B	109.90 m @ 4.76% C(g)	W-0200	TO-16-98
W1C	40.00 m @ 5.69% C(g)	W+1900	TO-16-103
W1D	90.00 m @ 3.67% C(g)	W-0400	TO-19-145
W1E	43.50 m @ 4.25% C(g)	W-0200	TO-16-98
W2	40.45 m @ 4.86% C(g)	W+1700	TO-16-101
W2A	23.00 m @ 4.76% C(g)	W+0600	TO-16-112
W3_1	54.90 m @4.61% C(g)	W+0200	TO-19-198
W3_2	12.00 m @ 3.75% C(g)	W+2000	TO-16-104
W3B	19.00 m @ 4.14% C(g)	W+0800	TO-15-38
W4	105.10 m @ 3.39% C(g)	W-0300	TO-19-163
W4_2	10.00 m @ 2.38% C(g)	W+2000	TO-16-104
W5	3.80 m @ 4.06% C(g)	W+2100	TO-16-105
W6	14.00 m @ 4.74% C(g)	W-0300	TO-18-127
W7	36.20 m @ 4.31% C(g)	W-0300	TO-18-132

[(1)] Core interval does not represent true width.

The mineralized horizons of the West Zone dip around 70° ± 10° towards the southeast at the northern 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 west-southwest 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 around section W-0200 and gradually shallows to 45 degrees southwest at the southern end of the West mineralized Zone. Mineralization on the West Zone is open to the north to the south and at depth.

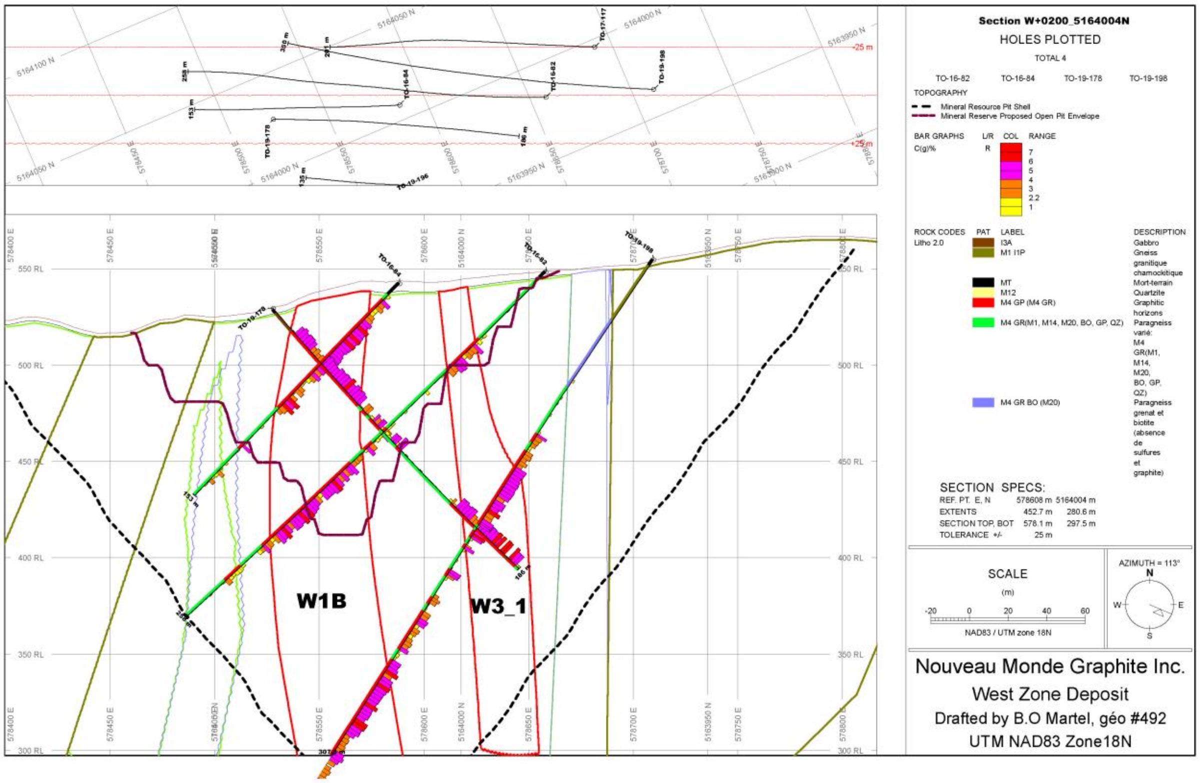


Figure 10-5: West Zone drill hole section W+0200

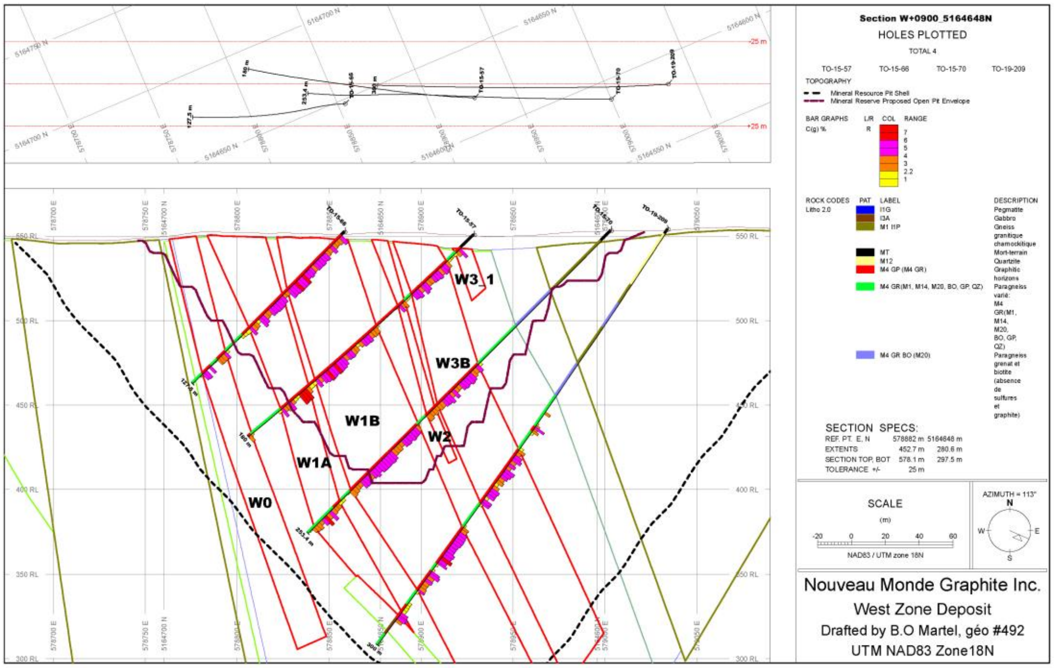


Figure 10-6: West Zone drill hole section W+0900

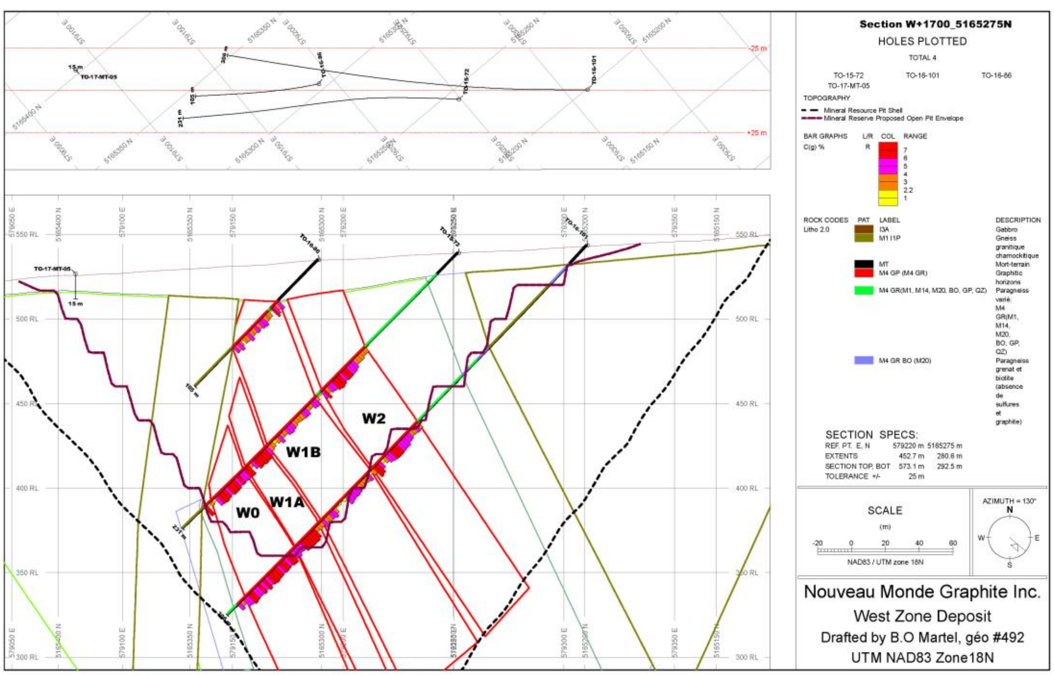


Figure 10-7: West Zone drill hole section W+1700

10.3.2 Drilling Results for the South-East Zone

The 2015 drilling program on the South-East Zone consisted of nine holes for a total of 1,551.99 m drilled. Mineralization was intercepted by drilling 13 times here resulting in the interpretation that the zone is composed of two 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 m to 160 m true width, with a grade varying from 3.19% to 3.62% C(g). As seen on section shown in Figure 10-8 (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 2,616.60 m drilled. Mineralization was intercepted 57 times by drilling in this zone resulting in the interpretation that the zone is composed of two 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 m and 63 m thick, and finally, a second graphitic horizon (S2) around 40 m to 50 m thick, with both graphitic horizons varying from 2.79% to 5.29% C(g). As seen on the section in Figure 10-9 (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 Far-West, North, Northeast, and East Zones

NMG’s 2015 drilling campaign on the North, Northeast and East Zones consisted of 12 holes for a total of 1,763.97 m drilled. Exploration drilling of four holes was performed in 2019 on the Far-West zone totalling 880.4 m. Mineralization was intercepted 37 times by drilling in these zones (see Table 10-3).

The four holes (TO-19-156, TO-19-157, TO-19-158, TO-19-159) completed on the Far-West zone were positioned on two sections about 350 m apart. The main mineralized horizon interpreted from the drilling suggest a dip of about -75° with a dip direction of 115° and true widths from 21.6 m @ 5.56% to 69.4 m @ 4.49% C(g).

The four holes (TO-15-08, TO-15-44, TO-15-45 and TO-15-46) and two trenches (TO-15-TR-8 and TO-15-TR-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 plunge sub-vertically on the East side and fold upwards at depth to the West resulting in the horizon dipping around 45° to the East on the West side.

The six holes (TO-15-47 to TO-15-52) completed on the North Zone intercepted graphitic horizons generally measuring 10 m to 30 m wide returning respectable grades of 3% to 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 Northeast Zone, intercepted graphitic horizons measuring 10 m 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 Far-West, North, Northeast 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 Far-West, North, Northeast, and East Zones

Mineralized Zone	Section	Drill Hole	From (m)	To (m)	Intercept (m)	True Width (m) (1)	Mineralized Core Intervals (% Cg)
Far-West	FW+0400	TO-19-156	29	50.6	21.6	18.7	21.6 m @ 5.56%
		TO-19-157	126	153	27	23.4	27 m @ 4.93%
			221	229	8	6.9	8.0 m @ 3.89%
	FW+0750	TO-19-158	197.9	240.15	42.25	38.3	42.25 m @ 5.83%
		TO-19-159	30.8	37	6.2	5.6	6.2 m @ 3.86%
			45.5	57	11.5	10.4	11.5 m @ 3.04%
			75	151.6	76.6	69.4	76.6 m @ 4.49%
East	E2200	TO-15-TR-8	0	42	42	29.7	42 m @ 4.28%
		TO-15-TR-9	20	54	34	34	34 m @ 2.81%
	E2300	TO-15-45	10.9	58.9	48	33.9	48 m @ 1.74%
			91	102.5	11.5	10.4	11.5 m @ 2.41%
	E2400	TO-15-08	4.6	54	49.4	49.4	49.4 m @ 2.73%
			97	108.5	11.5	11.5	11.5 m @ 2.49%
			143.5	157	13.5	13.5	13.5 m @ 3.49%
		TO-15-44	10.5	49.7	39.2	27.7	39.2 m @ 2.38%
			79.3	93.1	13.8	13.8	13.8 m @ 2.65%
	E2600	TO-15-46	6	26.2	20.2	18.3	20.2 m @ 2.68%
			46.5	79	32.5	31.4	32.5 m @ 3.39%
			90.8	101	10.2	9.9	10.2 m @ 3.37%
			164	177.83	13.8	13.3	13.8 m @ 3.77%
North	N0900	TO-15-51	9.1	32.36	23.3	13.4	23.3 m @ 4.05%
			159.53	174	14.5	8.3	14.5 m @ 4.24%
		TO-15-52	20.2	36	15.8	9.1	15.8 m @ 2.15%
			45	51	6	3.4	6 m @ 3.42%
	N1200	TO-15-50	23.54	81.85	58.3	33.4	58.3 m @ 5.11%
			125	144	19	10.9	19 m @ 3.42%
	N1500	TO-15-49	39.35	59.7	20.4	16.7	20.4 m @ 5.18%
			71	88.45	17.5	14.3	17.5 m @ 4.61%
			106.34	135.95	29.6	24.2	29.6 m @ 2.89%
	N1600	TO-15-47	35.5	59.13	23.6	20.4	23.6 m @ 4.67%
			90.38	108.3	17.9	15.5	17.9 m @ 3.44%
	N1700	TO-15-48	16.7	22.75	6.1	5	6.1 m @ 4.13%
			36	51.5	15.5	12.7	15.5 m @ 4.79%
			72.1	88	15.9	13	15.9 m @ 3.05%
Northeast	N2600	TO-15-35	53.16	66.59	13.4	10.3	13.4 m @ 4.59%
			82.3	117	34.7	26.6	34.7 m @ 2.55%
	N2700	TO-15-TR-7	26	44	18	13.8	18 m @ 4.22%

(1) True width is interpreted according to limited geological information.

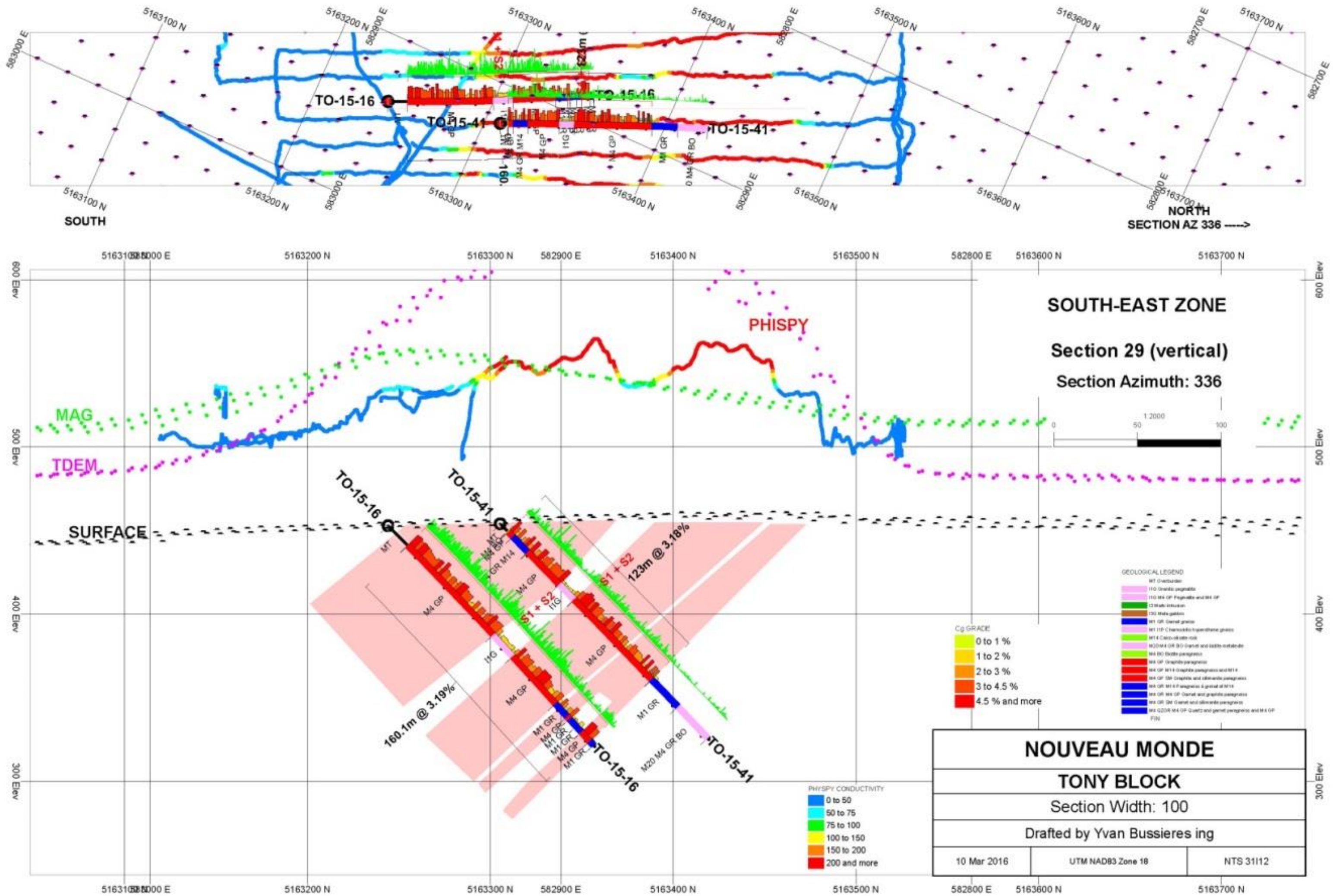


Figure 10-8: Drill hole section S2900

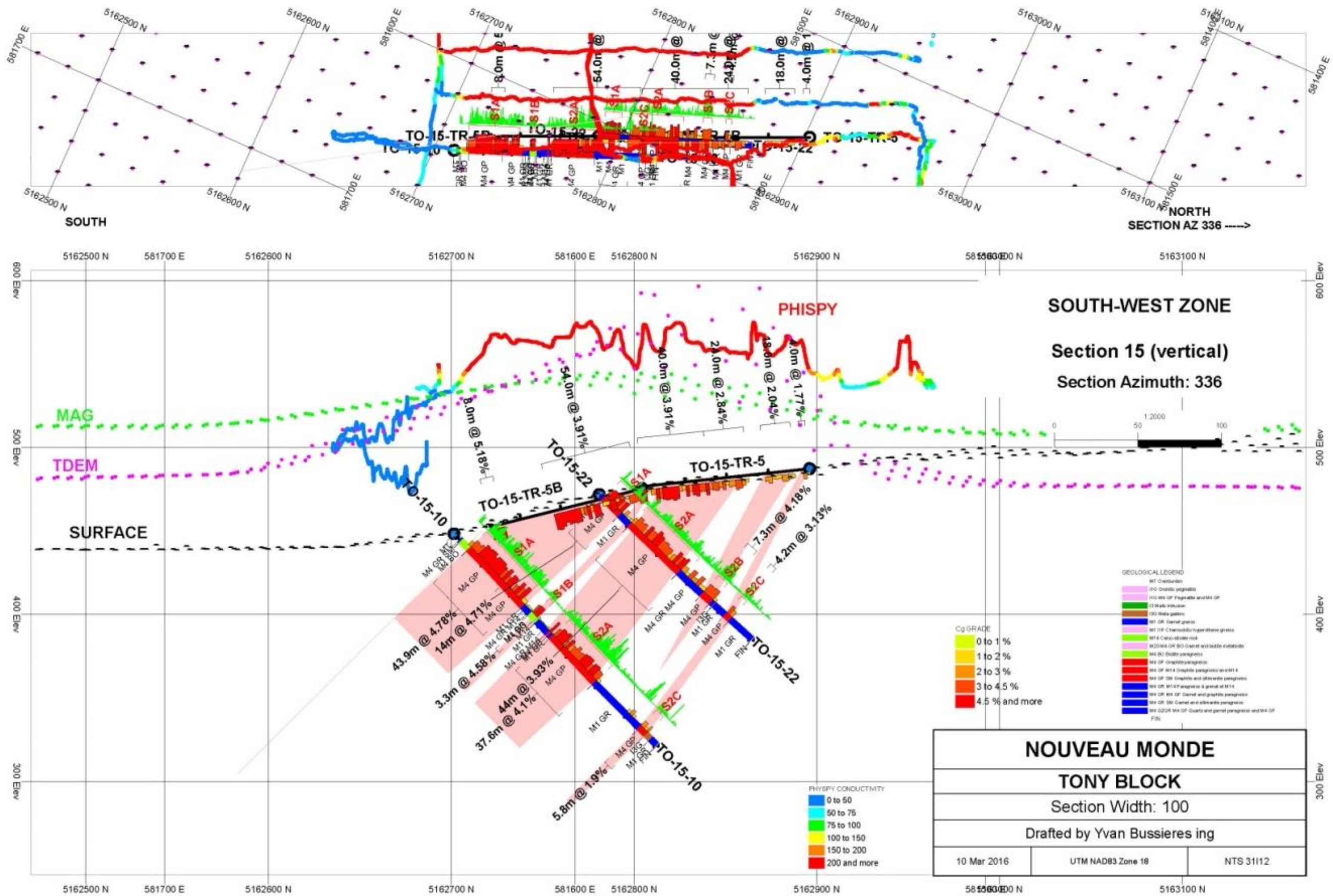


Figure 10-9: Drill hole section S1500

11. Sample Preparation, Analyses, and Security

The drill program geologists, Yvan Bussières (2015) and Bernard-Olivier Martel (2015 to 2021) 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 until 2019 when the core logging and splitting operations moved to 600 Rue de la Forex in Saint-Michel-des-Saints, at NMG's demonstration plant facilities. The main purpose of the core sampling is to determine the grade of the graphitic horizons which is used to determine the graphite resources and reserves.

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 (Ontario) 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 2 m, 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 to 2019 drilling programs);
- The geologist marked the beginning and end of each sample on the core using a wax pencil;
- The geologist added two water-resistant tags bearing the sample number in the core box. One 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 core quarters and one core half by a technician using a water-cooled rock saw equipped with a diamond blade. One 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.

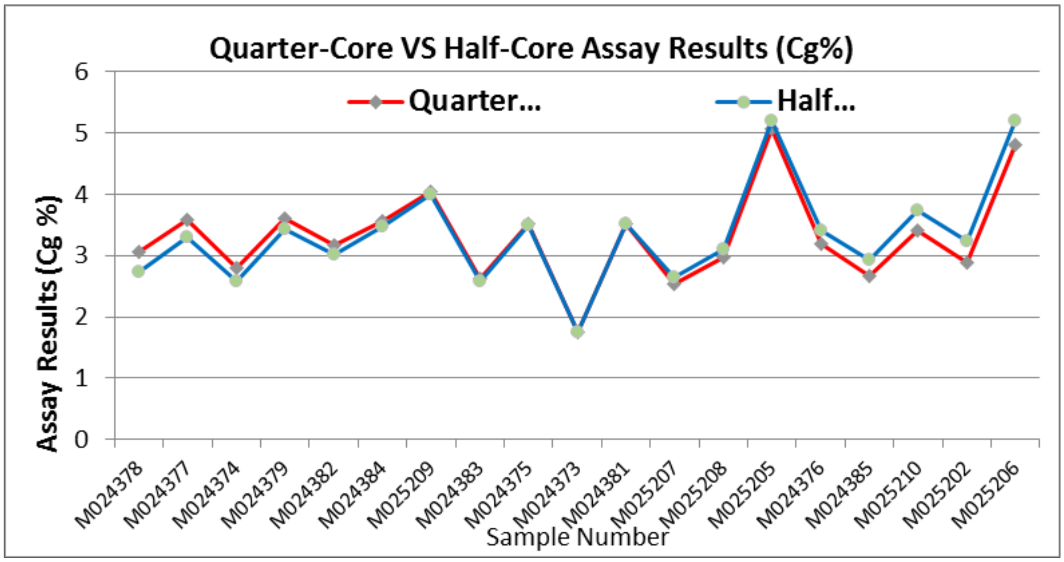


Figure 11-1: Comparison between quarter-core and half-core C(g) results

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, Québec, samples were entirely crushed to less than 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:
(https://www.alsglobal.com/en-ca/services-and-products/geochemistry/geochemistry-testing-and-analysis).

ALS's Val-d'Or and Vancouver geochemistry laboratories conform 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 to 2019 drill core samples underwent graphitic carbon [C(g)] analysis by LECO® analyzer using ALS's C-IR18 package.

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

From 2016, all samples underwent ALS's C-IR18, C-IR07 and S-IR08 analysis packages. ALS's multielement analysis package ME-MS41 was performed at every 10 m in mineralized intervals with a minimum of one sample. This type of analysis was also performed at each major lithological change along each drill hole.

The number of samples sent for each type of analysis per mineralized zone is presented in Table 10-1.

The C-IR18 package consists of digesting 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 total carbon content (C(t)) 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 minerals 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 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 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 number of contaminants, the selected sample was generally one 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). This type of analysis was only performed in 2015 and no significant Au content was measured.

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 pulverisers 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. 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 pulverisers with barren material (WSH-22) after every sample. Only method WSH-22 was used for the 2018 and 2019 samples.

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 to 2019 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 11,736 samples were assayed from the 196 drill holes sampled during the 2015 to 2019 drilling programs including quality control samples. A total of 1,225 control samples were used and therefore represent 10.4% of the samples analyzed for the Project.

Table 11-1: 2015-2019 Drill core quality control samples

Mineralized Zone	Total Samples	Samples Excluding QA/QC	Quality Control Samples Analyzed for Cg Content							
			Blank	Duplicate	Standard					
					STC	STF	STH	STM	STH-2	CDN-GR-3
West [1]	**9,181**	**8,274**	**364**	**365**	**7**	**8**	**4**	**12**	**71**	**76**
Far-West	274	247	12	10					4	1
South-West	1,068	937	43	73			6	9		
South-East	694	598	22	61			5	8		
East	234	209	10	11			2	2		
Northeast	38	34	1	2				1		
North	247	212	22	10			2	1		
Total	**11,736**	**10,511**	**474**	**532**	**7**	**8**	**19**	**33**	**75**	**77**

[1] The West Zone is the main subject of this report as it contains the only Mineral Reserves identified to date on the Property.

11.4 Analysis Standards

During the 2015 drilling programs, NMG added six different quality control standard samples, each representing different grades, to its sample stream in order to verify the accuracy of C(g) results. Five of these were produced using mineralized rock from NMG's Matawinie Property. Each of these five in-house standard samples was sent to the ALS laboratory to be crushed, homogenized, and analyzed ten times for its graphite content. From 2016, one 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 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 standard sample was inserted for every 50 samples sent to the laboratory.

Table 11-2: Summary of standard sample results

Standard Sample Statistics	In-House Standards % Cg 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	18.07	6.12	5.79
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	0.14

The 78 CDN-GR-3 standard samples inserted in the sample stream returned a mean of 2.41% C(g) and a standard deviation of 0.08. Seven of these samples returned values slightly above the certified value of 2.39% C(g) ± 0.11, ranging from 2.52% to 2.63% C(g). Three samples returned results outside of the minimum expected range with values of 2.16% to 2.26% C(g). The author is of the opinion that overall, 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 1 kg of white gravel (bag from Canadian Tire). From 2016, blank sample material (quartz) was acquired from IOS Services Geoscientifiques inc. of Chicoutimi (Québec) following the recommendations from the PEA report of using a more reliable blank standard. In 2018 and 2019, coarse silica blank samples, acquired from Analytical Solutions Ltd from Sudbury (Ontario), were also used in the sample stream. A total of 474 blank samples (364 for the West Zone and 110 for the other mineralized zones), representing a population of 4.0% of the drill program samples, were inserted within the sample stream. Blank samples were generally inserted at sample numbers ending in odd tens. The 2016 to 2019 blank standards, with an average content of <0.02% C(g) (the detection limit) has proven more suitable as a quality control material then the 2015 material, with an average content of 0.08% C(g). Figure 11-3 below shows the C(g) content for the inserted blank samples during the 2015 to 2019 drilling campaigns. The author is of the opinion that the blank sample results are within acceptable limits.

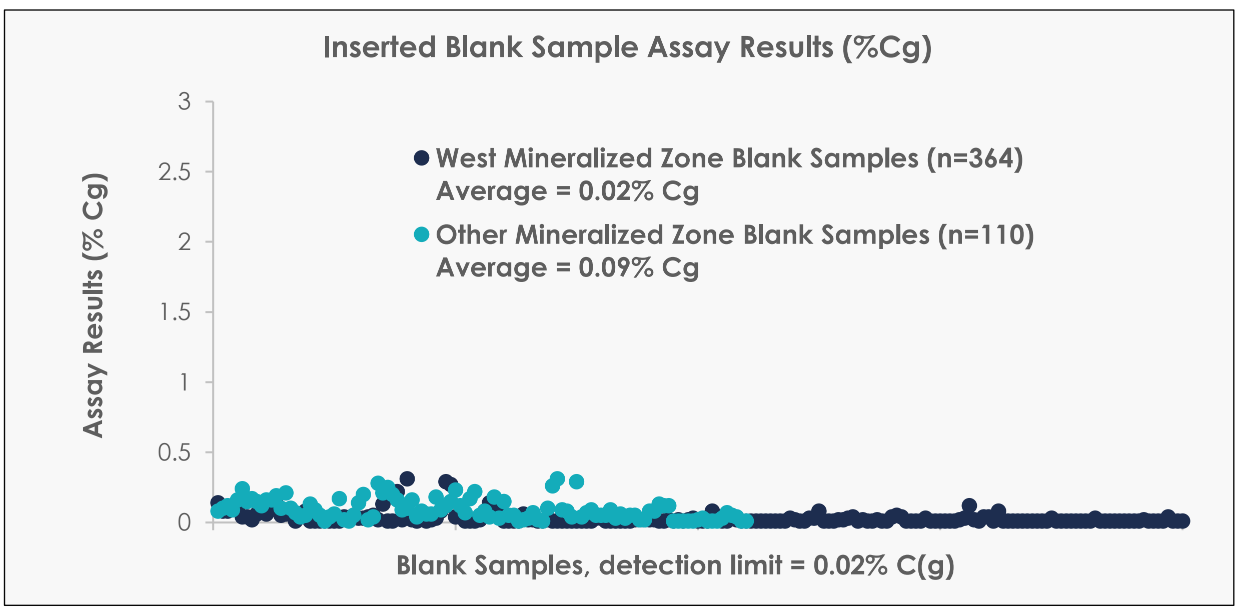


Figure 11-3: Inserted blank sample C(g) assay results

11.6 Core Duplicates

During the 2015 to 2019 drilling programs, NMG added duplicate samples to its sample stream to verify assay reproducibility. Duplicate samples were generally inserted at sample numbers ending in even tens. The 2018 duplicate samples consisted in the last 20 cm of the quarter core original sample run as opposed to a complete quarter core samples used for the 2015-2016 quality control program. In all, 532 drill core samples (365 from the West Zone and 167 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 reproducibility of C(g) results provided by the duplicate samples inserted into the 2015 to 2019 core sample stream.

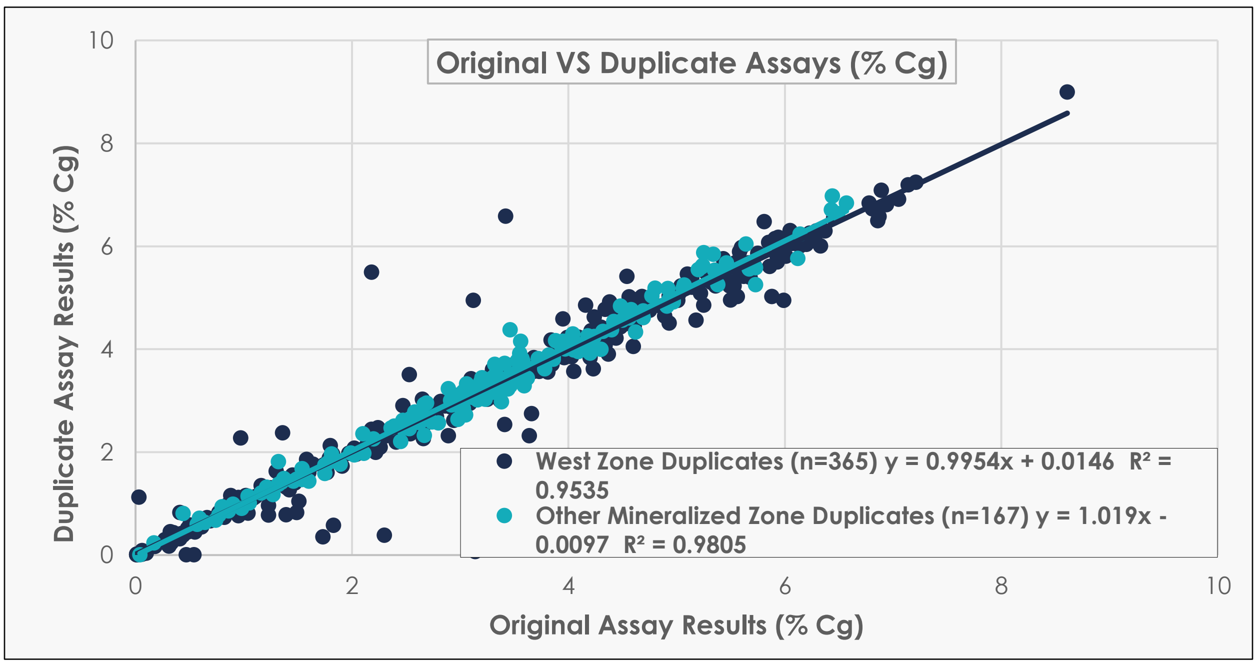


Figure 11-4: Reproducibility of duplicate samples

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 certified 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.

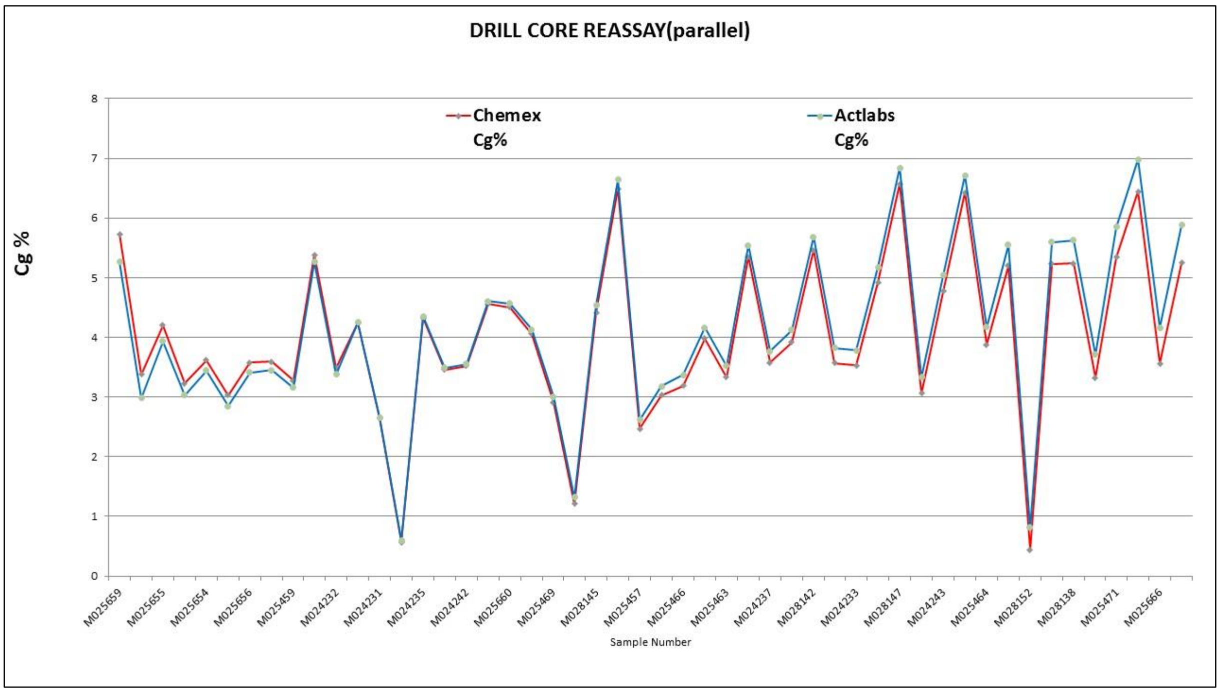


Figure 11-5: Drill core C(g) assay comparison using ALS and Actlabs

11.7 Specific Gravity

In 2015, for each drill section spaced at 100 m, different rock types (usually five to seven 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.

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

In 2016 to 2019, the specific gravity of one out of every six mineralized samples was measured using ALS's OA-GRA08 method and one sample was also measured for each lithologies along the core (https://dokumen.tips/documents/oa-gra08-specific-gravity-measurementpdf.html). 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.

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

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

A total of 2,075 samples from the 2015 to 2019 drilling campaigns were measured for their specific gravity, of which 1967 originate from the West mineralized Zone.

11.8 Quality Control Program Conclusions

In summary, based on the study of the results of the QA/QC programs, 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;
- The 2015-2016 duplicate samples demonstrated good assay reproducibility. Some of the 2018 duplicate samples demonstrated a high variability due to the fact that only 30-cm along a quarter core of the 2-m length of the original quarter core sample was analyzed. Drilling in 2019 reverted to the 2015-2016 duplicate sample protocol, which is to send the full ¼ core length for analysis, to optimize 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 the subsequent drilling campaigns.
- The in-house 2015 C(g) standards returned acceptable overall results although their standard deviation is considered higher than intended. The 2016 to 2019 standards inserted in the sample stream 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. Data Verification

The author and Qualified Person (QP) of this chapter, Yann Camus P.Eng., Mineral Resource Estimation Engineer for SGS Geological Services, performed verifications for NMG's 2017 Pre-Feasibility Study (PFS) ("43-101 Technical Pre-Feasibility Study Report for the Matawinie Graphite Project", dated December 8, 2017), additional verifications in 2018 for an updated Pre-Feasibility Study (Updated resources announced in the June 27, 2018 press release: "Nouveau Monde Increases Its Indicated Resources to 95.8 Mt at a Grade of 4.28% Cg for Its West Zone Graphite Deposit – Matawinie Property") as well as the 2018 Feasibility Study (FS)("NI 43-101 Technical Feasibility Study Report for the Matawinie Graphite Project, dated December 6, 2018) and the 2020 Resource Update (Updated resources announced in the March 19, 2020 press release: "Nouveau Monde Announces Updated Resource Estimate and Increases Combined Measured & Indicated Resources by 25% to 120.3 Mt @ 4.26% Cg"). Some verifications were also performed for this Feasibility Study. The following actions were taken to ascertain that the database supporting the estimation of resources is sound and reliable:

- Site visits on August 18, 2021, November 27, 2019, June 21, 2018, and November 9, 2016;
- Independent sampling (2016);
- Multiple databases and other documents verifications (2016/2018/2021).

SGS Canada Geological Services was hired by NMG to update the Mineral Resources for the Matawinie Mine project. Mr. Yann Camus, P.Eng. oversaw this mandate for SGS.

12.1. Site Visits

The QP visited the Mining Property on August 18, 2021, November 27, 2019, June 21, 2018 and November 9, 2016.

Details for the November 9, 2016, site visit are available in the 2017 PFS report. Details for the June 21, 2018, site visit are available in the 2018 FS report. This report only explains the details for the August 18, 2021 and November 27, 2019, site visits.

In both of the 2019 and 2021 visits, Mr. Yann Camus met with Mr. Antoine Cloutier, P. Geo. (NMG chief geologist) who led the visit during the entire day.

On these visits, Mr. Yann Camus had the chance to visit the core logging facilities, the core storage location, the field sites to witness the production pit and many drill hole collars and NMG's main office and demonstration plant, both located in Saint-Michel-des-Saint. Most discussions were related to the latest developments regarding the resources, the drilling and the plans for the development of the Project.

During both visits, Mr. Yann Camus visited an exploration drill during its operation. It was found in good order with no special comment to mention here.

Also, during both visits, 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 of the mineralization.

12.1.1. 2019 Site Visit

During the 2019 visit, the author collected 48 independent samples with the help of the NMG technicians. The procedures for the sampling were kept the same as what was done for building the drilling database, including the QA/QC procedures. Since only a quarter of the core is used for the sampling, ¾ was still in the core boxes. That enabled to use a quarter of the core for the independent sampling presented here. The samples are for holes TO-19-150 (11 samples), TO-19-150 (13 samples) and TO-19-150 (24 samples). The difference found between the database data (ALS laboratory) and the independent samples (SGS laboratory) is found in Table 12-1. The individual results are shown as a scatter plot and a QQ plot for the graphitic carbon (Cg) in Figure 12-1.

Table 12-1: Comparison between the database data and the independent samples

Lab Name	Project Database	Independent Samples	Rel. Diff. (%)
	ALS	SGS	
Count	48	48	
Cg (%)	4.22	4.37	+3.5%
Ct (%)	4.30	4.33	+0.6%
S (%)	3.20	2.81	-12%

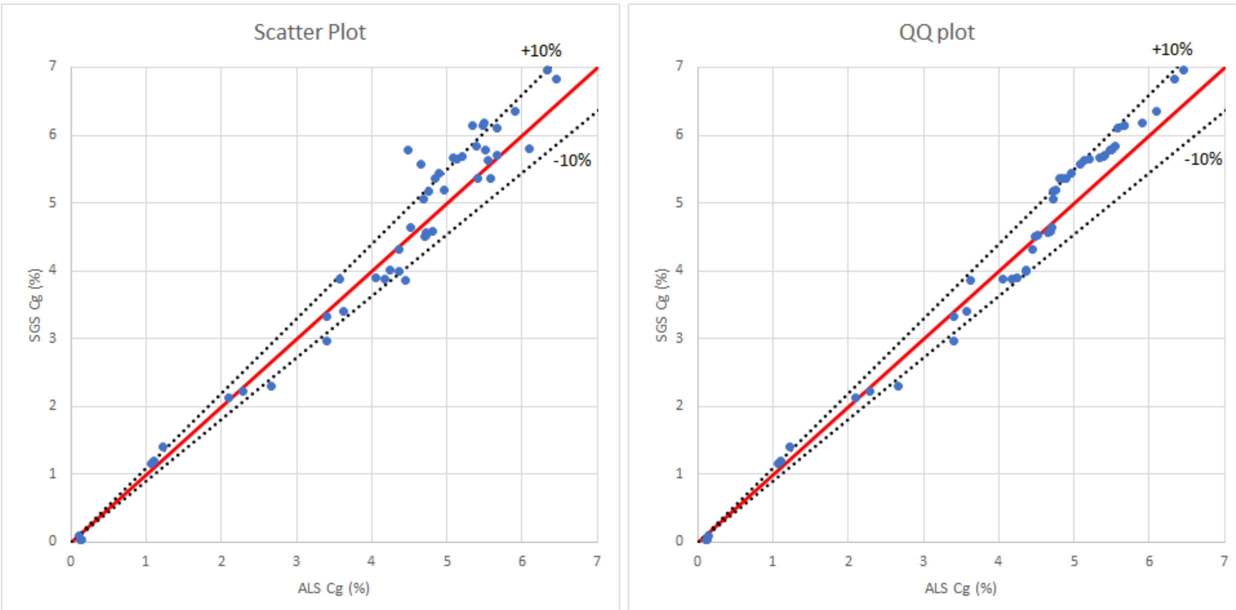


Figure 12-1: Scatter and QQ plots for the graphitic carbon independent samples

The graphitic carbon reported in the independent samples is 3.5% above the database data. It is within the +/- 5% sought after for a Feasibility study. It is common to have slightly different results between laboratories. The scatter plot shows a very good duplication of the original results. There might be two outliers with the duplicate value respectively 20% and 29% above the original values. But most of the duplicates are in the vicinity of the +/- 10% relative differences. We see on both the scatter and the QQ plots that material above 5% Cg come out as higher grade in independent samples. But since the average relative difference is within the +/- 5% sought after window, the results are deemed reasonable.

After meeting at the office in 2019, it was decided to visit the site of the West Zone deposit to witness the 2019 drill holes. The author took some pictures and measured the GPS coordinates for 12 collars along with measurements of the azimuth and dip for eight collars. These measurements were made using a compass and a handheld Garmin Etrex Legend HCx GPS. The comparison between the database information and the field readings revealed very good correlations. Only the last collar (TO-19-195) does not match well on the elevation. This must be an error on the author's handheld GPS that is notoriously wrong sometimes for elevation measurements. To confirm the elevation of that drill hole, the value in the database compared well to the topography data of the surface provided by a 2015 Lidar survey. That tends to confirm that the handheld GPS is wrong. All these verifications are satisfactory.

Table 12-2: List of results for the drill hole collars measured by handheld GPS

Hole Name	Absolute Differences			
	Distance (m)	Azimuth	Dip	Angle (3D)
TO-16-108	3	N/A	N/A	N/A
TO-19-200	6	N/A	N/A	N/A
TO-19-201	8	-2	-5	5
TO-19-209	8	-8	-1	4
TO-19-155	8	9	0	5
TO-19-161	2	-11	0	7
TO-19-162	2	-3	-1	2
TO-19-163	3	N/A	N/A	N/A
TO-19-160	7	11	0	7
TO-19-204	4	5	2	4
TO-19-146	10	N/A	N/A	N/A
TO-19-195	36	4	0	2

The visit continued with the future bulk sampling site that has been drilled and blasted since 2018 providing ore to feed NMG's Demonstration Plant (see Press Release dated December 5, 2017). This site is currently stripped from overburden and some channel samples were taken to provide a good estimation of the local grade of the mineralization. While the future sampling approach was discussed, this topic is irrelevant for the current report.

Figure 12-2: 2019 Independent sampling at the core shack (left) – Some of the core storage (right) – Collar in the field (bottom)

12.1.2. 2021 Site Visit

Much less drilling had happened recently and the few drill holes were all done for geotechnical purposes. It was decided that none of these drill holes would be sampled because of satisfactory resource definition for the time being.

The visit enabled to witness the evolution of the Project mainly in the field, in the core shack and at the office. The production pit enables to properly observe the mineralization giving access to long continuous mineralized material.

Since the geostatistics are very important for the resource estimation, the author discussed the interest in assaying each production hole individually to evaluate the variability of the graphitic carbon grade at short range within the mineralization. For the current report, only 45 production holes were assayed out of the 307 production holes drilled since the opening of the pit.

Nevertheless, these 45 production holes assays are very precious as shown in Section 14.6.1 of this report.

Figure 12-3: View of the 2021 site visit path in the vicinity of the production pit

Figure 12-4:Core shack in 2021 (top) – Graphitic carbon reflecting light (left) – Wall in the production pit (right)

12.2. 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 some changes, and the data was deemed acceptable for the resource modelling and estimation.

12.3. 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. All verifications from 2016, 2017, 2018, 2019 and 2021 for the drill holes confirmed the database information.

The standard database verifications performed by the author indicate a sound database, reliable for the estimation of resources.

13. Mineral Processing and Metallurgical Testing

The mineral processing and metallurgical testing programs are separated in two groups. The first group is related to the process development for the Matawinie beneficiation plant at the Mine site, and the second group is related to the development of the process for the Bécancour Battery Material Plant project.

13.1. Matawinie Beneficiation Plant

NMG conducted multiple test programs since the preliminary economic assessment (PEA) and continued the process development, optimization, and characterization during the Pre-Feasibility Study (PFS) and the Feasibility Study (FS).

The results of these previous metallurgical test programs are summarized in the following section.

Additional tests programs were conducted after the FS and up to the current detail engineering phase of the Matawinie Mine project. These programs were carried out by equipment manufacturers and independent research laboratories. NMG also constructed and operates a mineral processing demonstration plant with a capacity of 3.5 tph. This demonstration plant was used to carry out various Design of Experiment (DOE) programs to investigate flowsheet optimization opportunities.

The demonstration plant is now mainly used to produce material to feed other NMG demonstration plants for the development of the value-add processes and to qualify these products with potential end-users.

To understand the evolution of the process development, optimization and de-risking phases of the Project, this section of the report has been broken down into three sections:

- Historic metallurgical results: PEA, PFS, and FS;
- Internal test programs conducted at NMG demonstration plant;
- External test programs conducted by manufacturers and research laboratories.

13.1.1. Historic Metallurgical Results

The details of the historic metallurgical results are well documented in the PEA, PFS and FS already published on SEDAR. Hence, the current section of this report only provides a high-level summary of the results.

13.1.1.1. Preliminary Economical Assessment

The metallurgical programs started with initial scoping level flotation tests on grab and trench samples and culminated in a scoping level flowsheet development program that supported the PEA. The process flowsheet that was developed during this phase of testing is depicted in Figure 13-1.

The robustness of the flowsheet was confirmed in a small variability flotation program, that tested seven different composites from the West and South Zones. 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 initial flowsheet development program.

The reagent regime comprised of frother methyl isobutyl carbinol (MIBC), collector diesel, pH modifier lime, sulphide activator copper sulphate ($CuSO_4$), and sulphide collector potassium amyl xanthate (PAX).

Two bulk concentrate production pilot plant campaigns on 12 tonnes and 50 tonnes of mineralized South Zone and West Zone material, respectively, demonstrated the scalability of the proposed process flowsheet and conditions.

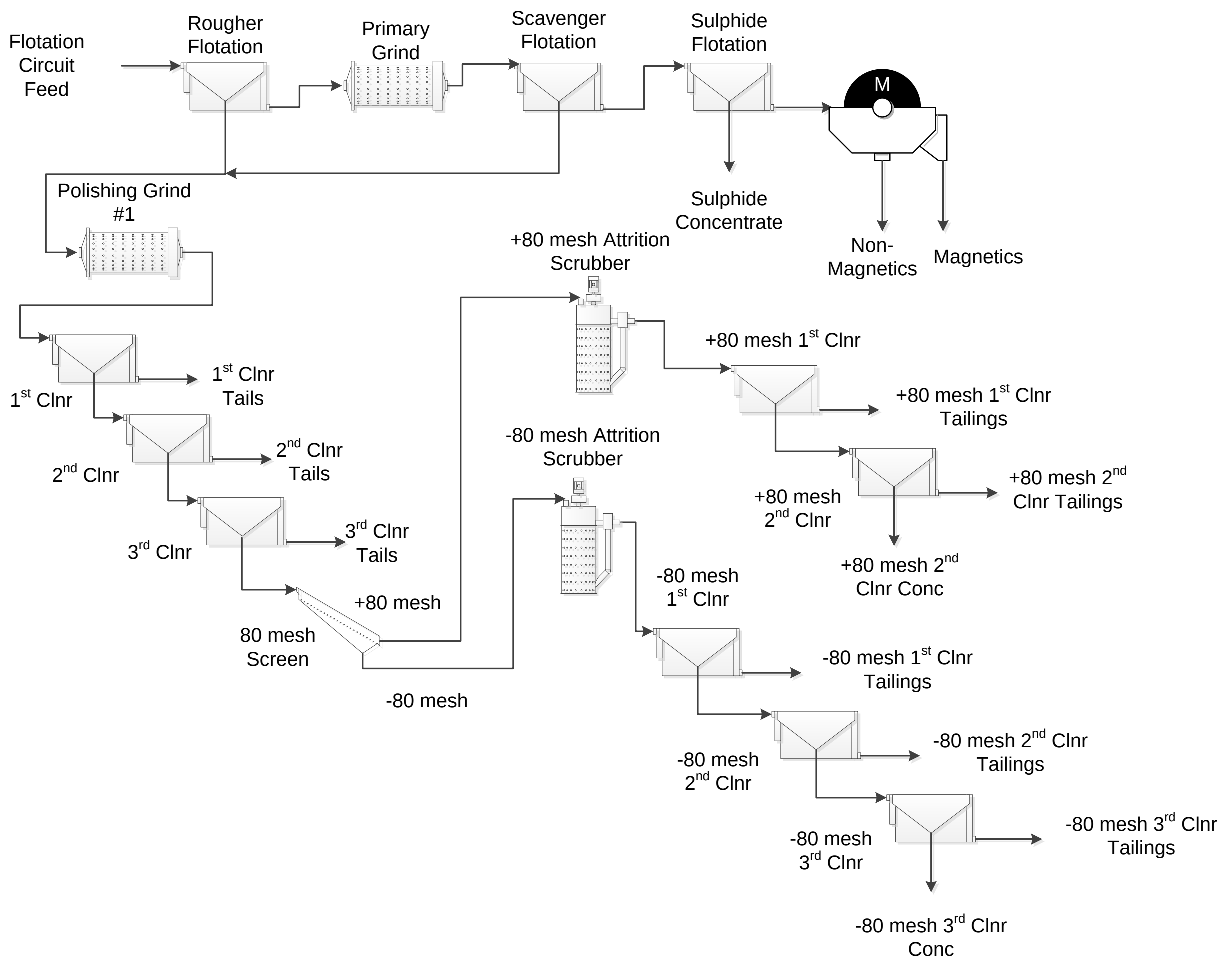


Figure 13-1: Scoping level Matawinie process flowsheet

The open circuit test results were analyzed and compared with similar projects that published both open and closed-circuit flotation (LCT) test data. 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 PEA that was completed in 2016 prior to the start of the flowsheet optimization program in 2017.

Table 13-1: Mass and grade distribution of concentrate of scoping level flowsheet development program

Product	Mass (%)	Grade (%) C(t)
+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**

13.1.1.2. Pre-Feasibility Study

The West Zone Master composite that was used in the 2017 process optimization program was generated by combining a total of 125 drill core intervals. The drill core intervals were chosen to duplicate the grade profile of the West Zone mineralization and to provide a full spatial representation of the West Zone.

Eight 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 good spatial distribution and a combined head grade that was representative for the specific zone.

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.

Table 13-2: West Zone master composite carbon speciation and sulphur head grades

Assays (%)			
C(t)	C(g)	CO_3	S
4.84	4.31	0.27	3.49

Eight variability samples were submitted for graphitic and total carbon analysis and the results are presented in Table 13-3.

Table 13-3: Total carbon analysis of variability composites

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

A series of comminution tests were carried out on the West Zone Master composite and a trench sample. Overall, the comminution results for the Matawinie West Zone material were 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 indicated lower crushing and grinding energy requirements as well as lower abrasiveness. It was postulated that these results may have been driven by the fact that the Trench sample originated from close to 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 flowsheet optimization program included a sequential development of the rougher, primary cleaning, and secondary cleaning circuits. This development strategy is paramount to ensure that each unit operation is near optimized before proceeding with the next processing step.

The PEA flowsheet was confirmed in the flowsheet optimization program and modifications included primarily adjustments to the grinding conditions, reagent dosages, cleaner flotation stages, and flotation times. The optimized flowsheet produced combined concentrate grades of over 98% C(t).

While the original objective of developing a flowsheet and conditions to maximize final concentrate grades remained in effect until the end of the development program, a lower-grade target of 94% C(t) was established at the start of the program. This lower grade was achieved with a primary cleaning circuit only. Towards the end of the program, the client adjusted this grade target to 95% C(t), which necessitated the addition of a secondary cleaning circuit for the fines.

The flowsheet that formed the basis for the PFS is depicted in Figure 13-2.

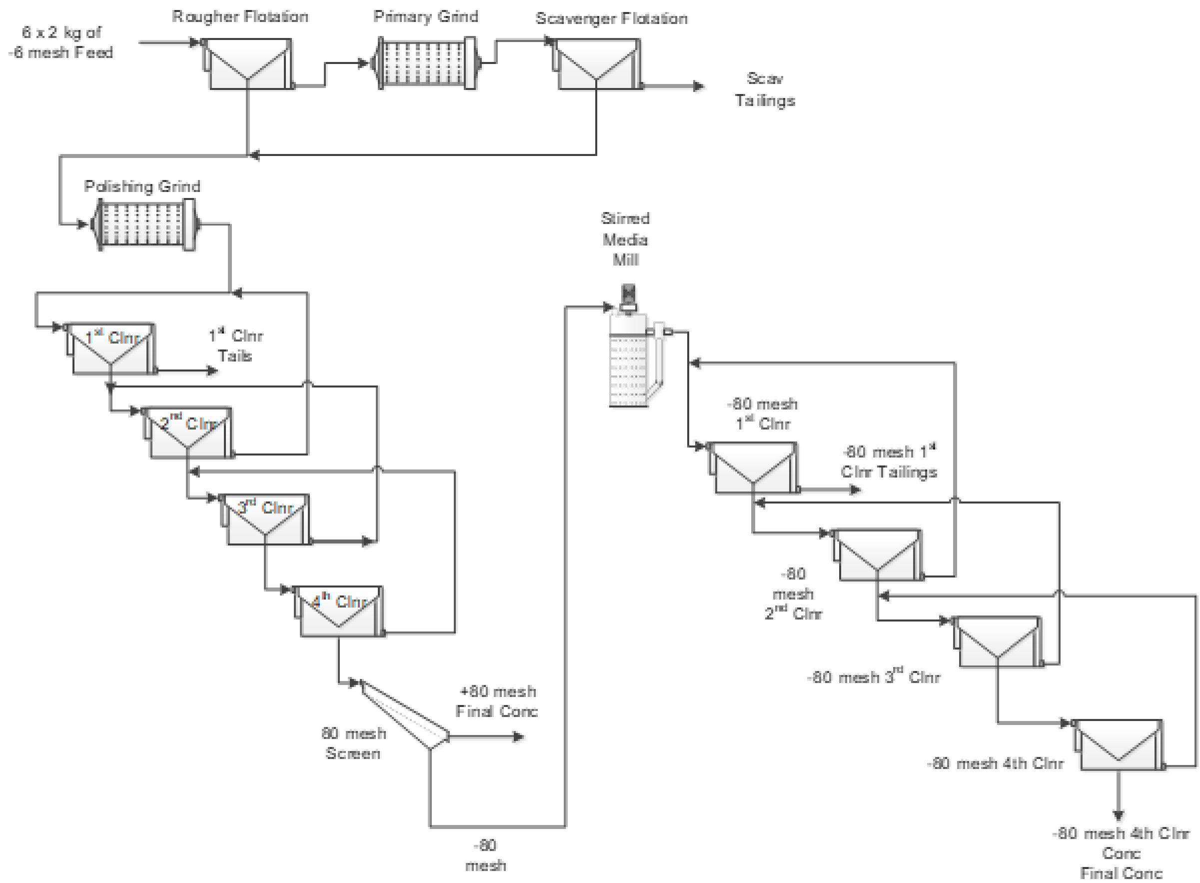


Figure 13-2: Matawinie PFS process flowsheet

A locked cycle test (LCT) was carried out on the West Zone Master composite using the PFS flowsheet and proposed conditions. The results of the mass balance and size fraction analysis are presented in Table 13-4 and Table 13-5, respectively.

The combined concentrate graded 97.0% C(t) at a graphite recovery of 97.4%. A total of 16.5% of the concentrate mass reported to the +48 mesh size fraction and another 31.6% to the -48/+80 mesh product. The -100 size fractions contained 40.2% of the concentrate mass. All size fractions graded 96.2% C(t) or higher.

Table 13-4: Mass balance of LCT

Sample ID	Weight in %	C(g) in %	C(t) Distribution in %
Combined Conc.	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
Scavenger Tails	91.8	0.07	1.4
Head (calculated)	100.0	4.42	100.0

Table 13-5: Size fraction analysis of LCT combined concentrate

Size Fraction	Weight in %	C(t) in %	C(t) Distribution in %
+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
Combined Conc	**100.0**	**97.3**	**100.0**

Desulphurization tests were completed to evaluate the impact of different sulphide activator and collector dosages on the sulphide grade of the low-sulphide tailings stream. 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.

One flotation test was performed on each of the eight variability composites. The tests were conducted as open-circuit tests, with only a primary cleaning circuit. The average concentrate grade and total carbon recovery of the eight tests were 96.2% C(t) and 94.5%, respectively. The concentrate grades ranged between 95.1% and 97.6% C(t) and carbon recoveries fell within a narrow range of 3.6%, from 92.4% to 96.0%.

In conclusion, the flowsheet optimization program to support the PFS built upon the results of the PEA metallurgical program and culminated in an optimized flowsheet and conditions that produced a graphite concentrate grade of 97.0% C(t) and 97.4% carbon recovery. The flowsheet development focused on maximizing graphite concentrate grade and recovery, while minimizing flake degradation. The flowsheet selected for the PFS was a simplified version without the +80 mesh secondary cleaning circuit as a result of a lower concentrate grade target.

Samples of the graphite flotation concentrate, high-sulphur potentially acid generating (PAG) tailings, and desulphurized non-acid generating (NAG) tailings were submitted for product characterization tests. Pertinent findings of the characterization work are summarized below.

Solids Liquid Separation Tests

Thickening and filtration tests were carried out by Outotec in 2017 to assist in the sizing of dewatering equipment. Samples of the three product streams were subjected to flocculant evaluation, dynamic thickening, as well as pressure and vacuum filtration tests.

The graphite concentrate was thickened to 39% solids (w/w) at a solid loading of 0.3 t/(m^{2}h). Pressure filtration of the thickened graphite concentrate produced a moisture content of 15.5% (w/w), while vacuum filtration yielded a significantly higher moisture content of 22% (w/w).

Dynamic thickening tests on the NAG and PAG tailings produced underflow solids concentrations of 60% solids (w/w) and 70% solids (w/w), respectively, at solids loading rates of 0.7-1.2 t/(m^{2}h).

Pressure filtration using the NAG tailings yielded a moisture content of less than 8% (w/w) at a filtration rate of 159 kgD.S/m^{2}h. In comparison, vacuum filtration on the same sample produced a moisture content of 17.5% (w/w) at a filtration rate of 1.1 tD.S /m^{2}h. Vacuum filtration on the NAG tailings yielded a lower moisture content of 9% (w/w) at a filtration rate of 755 kgD S /m^{2}h.

Overall, the graphite concentrate and tailings streams responded in line with expectations and other projects with similarly sized products.

Self-heating Tests

Self-heating tests were performed to quantify the risk of self-heating in a PAG tailings stockpile. The self-heating capacity values of 52-53 J/g for both Stages A and B place the high-sulphur tailings in 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.

Geochemical and 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 tailings streams.

The desulphurized tailings were considered non-acid generating based on the NP/AP ratio of 8.9 and uncertain based on the net neutralizing potential. The net acid generation results classified the low-sulphur tailings as non-acid forming.

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

Considering the flotation results that were obtained in the various programs leading up to the PFS, the comminution results, and the supplemental characterization work, the Matawinie mineralization responded very consistent and within expectations. Hence, the development of the FS metallurgical program focused on specific areas to improve the confidence in design data without the need to further optimize of the graphite flotation circuit.

13.1.1.3. Feasibility Study

The metallurgical test program that was completed in support of the FS was mostly limited to validation testing and the investigation of specific process opportunities and risks. Only a desulphurization flowsheet optimization was completed during the FS metallurgical test program. Other activities included:

- Completion of a comprehensive comminution program to generate more reliable data for sizing of crushing and grinding equipment;
- Mineralogical examination of samples that represents different areas of the West Zone mineralization to determine mineral composition and association of graphite;
- Locked cycle testing using a mine plan composite to confirm that a Master composite that represents the first several years of mining operation provides consistent metallurgical response using the established process flowsheet and conditions;
- Confirmation of the robustness of the flowsheet and conditions with several variability composites that represent specific areas of the Mineral Resource;
- Optimization of the desulphurization circuit to ensure that the low-sulphur tailings stream is non-acid generating;
- Assessment of the impact of circulating process water with residual sulphide collector;
- Simulation of the SkimAir® technology in the primary grinding circuit to determine if a coarser concentrate product can be obtained.

- Several comminution tests were carried out on six variability composites (VAR) and one bulk sample that was retained from a 50 t bulk concentrate production pilot plant campaign. Since the drill core that was available for the VAR samples was not suitable for MacPherson, JK DropWeight, and low-energy impact testing due to its small particle size, the bulk sample from a 50-tonne PP was used instead for these tests (Peters, 2017/2018).

A summary of the comminution tests results is provided in Table 13-6.

Table 13-6: Summary of comminution test results

Sample Name	Relative Density	JK Parameters				MacPherson Test		Work Indices (kWh/t)				AI	UCS
		A x b[1]	A x b[2]	t_a[3]	SCSE	(kg/h)	(kWh/t)	AWI	CWI	RWI	BWI	(g)	(MPa)
PP Comp Feed	2.71	67.4	72.1	0.51	7.9	19.7	3.9	8.1	9.7	8.6	9.4	0.428	77.5
VAR 2	2.74	-	59.2	0.56	8.4	-	-	-	-	9.5	9.5	0.498	-
VAR 3	2.76	-	53.3	0.50	8.8	-	-	-	-	9.4	9.5	0.473	-
VAR 5	2.77	-	56.9	0.53	8.6	-	-	-	-	9.8	9.9	0.447	-
VAR 6	2.74	-	54.0	0.51	8.7	-	-	-	-	8.8	9.0	0.468	-
VAR 7	2.74	-	51.6	0.49	8.9	-	-	-	-	9.4	9.3	0.530	-
VAR 8	2.73	-	50.2	0.48	9.0	-	-	-	-	9.2	9.9	0.533	-

[1] A x b from DWT

[2] A x b from SMC

[3] *The t_a value reported as part of the SMC procedure (shown in italics) is an estimate*

The results of the grindability tests confirmed that the Matawinie ore is considered soft to very soft ore.

Bond abrasion testing produced Ai values of 0.428 to 0.533, which replicates initial results that classify the Matawinie ore as abrasive to very abrasive ore.

Two batch cleaner tests were carried out to evaluate the impact of recirculated process water on the flotation selectivity in the graphite rougher and cleaning circuits. The main concern was the activation of sulphides due to residual xanthate in the process water. Some of these sulphides could be recovered into the final graphite concentrate, thus reducing its product quality.

To quantify the degree of sulphide activation, two batch-cleaner flotation tests were carried out back-to-back. The first test employed a PAX dosage of 200 g/t in the sulphide rougher stage, which was twice the design dosage to simulate circuit operation during slightly over-collected conditions. The sulphide rougher tailings were subjected to magnetic separation as per the current Matawinie flowsheet and the magnetic separation tailings were filtered. The filtrate was used in the following test for makeup water during grinding and flotation in the second test.

The first test with fresh Lakefield tap water (test F1) recovered 3.6% of the sulphide units into the combined graphite rougher and scavenger concentrate at a grade of 1.44%S. The sulphur recovery increased to 13.4% in the second test (test F2) with circulated process water at a grade of 5.19%S. These results reveal a clear reduction in flotation selectivity against sulphides in the graphite rougher and scavenger flotation stages due to the circulated water.

The cleaning circuit rejected most of the sulphides into the 1st cleaner tailings of test F1. Only 0.2% of the sulphur in the feed report to the final concentrate at a grade of 0.18%S.

The 1st cleaner stage of the test with recirculated process water was also very effective in reducing the sulphides. Over 95% of the sulphides in the combined graphite rougher and scavenger concentrate were rejected to the 1st cleaner tailings. However, the overall sulphide recovery into the final graphite concentrate remained higher at 0.4% and a grade of 0.31%S.

Circulating the process water resulted in an increase of the sulphur grade in the final concentrate of 72% from 0.18%S to 0.31%S. While only a single test with recirculated water was carried out, the grade increase was pronounced enough to conclude a negative impact of residual collector in the process water stream. This resulted in the recommendation to use two different process water circuits: one circuit includes of the graphite rougher and cleaner flotation circuit and the second process water circuit is dedicated to the desulphurization process.

One LCT was carried out using a FS Master composite to confirm the robustness of the flowsheet and conditions that were developed during the PFS metallurgical program using a new mine plan composite. Further, seven variability composites were also subjected to open circuit cleaner flotation testing to confirm the metallurgical response. A secondary objective of the tests was to confirm the average flake size distribution of the final concentrate and the expected variation as a function of the location.

The variability composites represented larger areas to cover the proposed mine plan. Higher variation in the flake size distribution is expected on a smaller scale, which may affect the product basket of the processing plant on a day-by-day basis.

The flowsheet of the LCT is depicted in Figure 13-3. The open circuit cleaner tests employed the identical flowsheet, but without circulation of the intermediate streams.

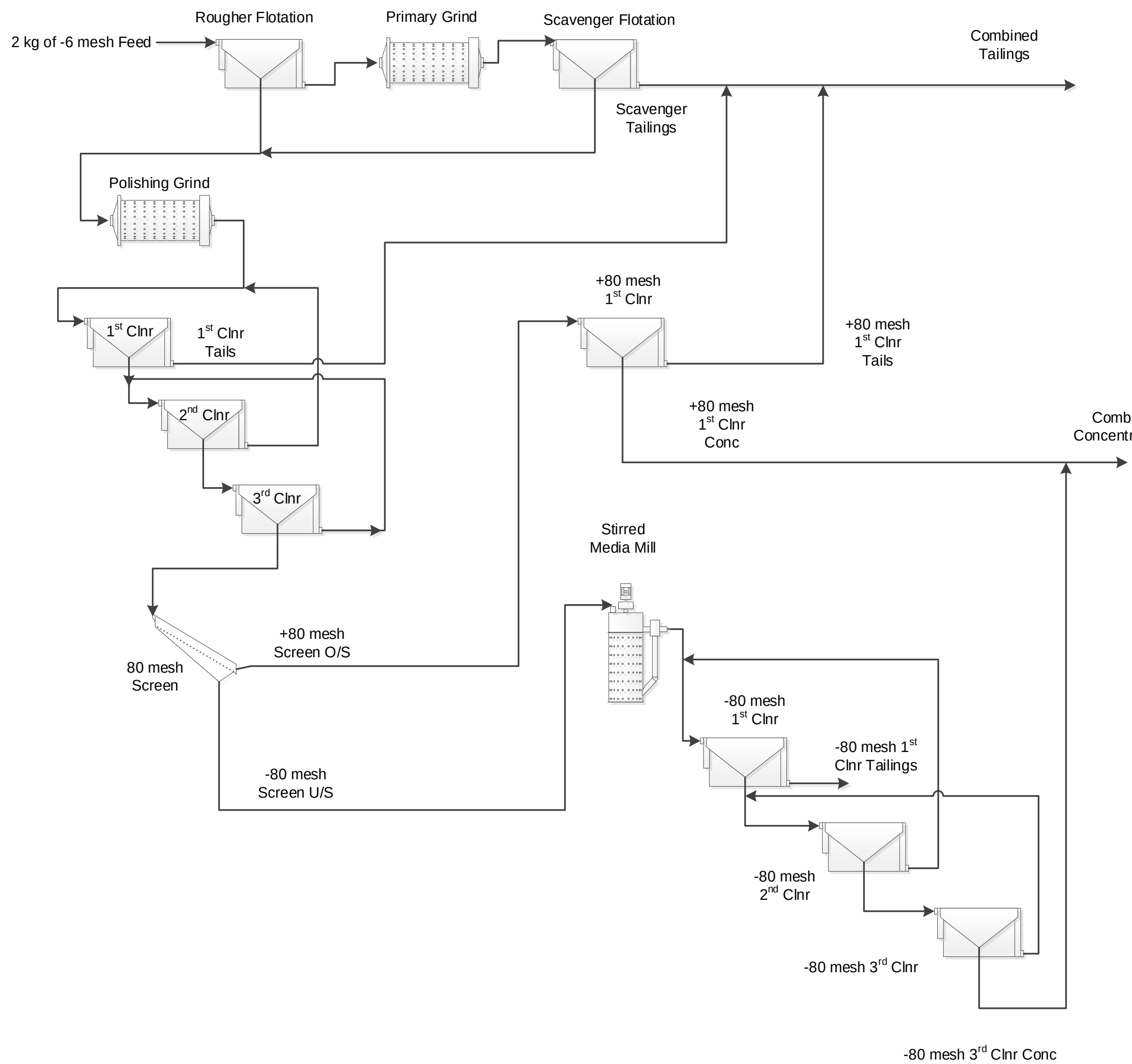


Figure 13-3: FS locked cycle test flowsheet

The LCT mass balance and results of the size fraction analysis on the final concentrate is presented in Table 13-7 and Table 13-8, respectively. The graphite recovery into the final concentrate was 94.3% at a combined concentrate grade of 97.0% C(t). Based on these results, a 97% C(t) grade and 94% graphite recovery were used for the mass balance of the FS.

A total of 13.5% of the concentrate mass reported to the jumbo flake category of +48 mesh (+300 microns) and 43% into the combined large and jumbo flake categories of +80 mesh (+180 microns).

Table 13-7: Locked cycle test results

Sample ID	Weight (%)	Assays (%) C(t)	Distr. (%) C(t)
Combined Concentrate	4.30	97.0	94.3
+80 mesh 1st Clnr Concentrate	2.20	96.6	48.1
+80 mesh 1st Clnr Tailings	0.01	50.0	0.1
-80 mesh 3rd Clnr Concentrate	2.10	97.4	46.2
-80 mesh 1st Clnr Tailings	0.13	28.3	0.8
1st Clnr Tailings	3.59	1.95	1.6
Scavenger Tailings	92.1	0.15	3.2
Combined Tailings	95.8	0.26	5.7
Head (calc)	100.1	4.42	100.0

Table 13-8: LCT graphite concentrate size fraction analysis

Size Fraction	Weight (%)	Assays (%) C(t)	Distribution (%) C(t)
+32 mesh	1.0	97.2	1.0
+48 mesh	12.5	97.6	12.5
+65 mesh	18.1	96.8	18.0
+80 mesh	11.4	96.6	11.3
+100 mesh	13.5	96.9	13.4
+150 mesh	13.5	98.4	13.7
+200 mesh	9.8	98.3	9.9
+325 mesh	9.1	97.8	9.1
+400 mesh	2.8	97.3	2.8
-400 mesh	8.2	97.2	8.2
Final Concentrate (SA)	100.0	97.4	100.0

Variability flotation tests on the seven variability concentrates produced consistent results with regards to graphite concentrate grades. The combined concentrate grade of the seven tests ranged between 96.2% C(t) for the SURF composite and 98.5% C(t) for the VAR-8 composite. The grades were above the minimum grade target of 96.0% C(t) for all tests and the average grade was close to the 97.0% C(t) that was obtained in the LCT. The open circuit total carbon recovery ranged between 89.1% for the VAR-8 composite and 93.8% for the SURF composite. Since rougher and scavenger total carbon recoveries were at least 95.3%, it is expected that the average closed-circuit performance will be in line with the LCT results.

The flake size distribution was coarser for the VAR-8 composite with a P_{80} = 296 microns. The finest product with a P_{80} = 249 microns was obtained for the VAR-2 composite. The average combined concentrate of all seven tests produced a P_{80} of 271 microns. The mass recovery into the +80-mesh size fractions varied between 40.8% for the VAR-2 composite and 51.4% for the VAR-8 composite.

Seventeen sulphide rougher kinetics tests were carried out to determine the conditions that achieve the highest sulphide recovery into a low-mass high-sulphide stream to render the remaining tailings non-acid generating.

The first block of seven tests evaluated the impact of PAX dosage, addition of copper sulphate, flotation time, and magnetic separation. Magnetic separation was deemed essential to achieve low sulphide grades in the low-sulphide tailings. This agrees well with the mineralogical characterization that identified monoclinic pyrrhotite in the Matawinie mineralization. Monoclinic pyrrhotite is often characterized by slow flotation kinetics and incomplete recoverability by means of sulphide flotation, thus requiring magnetic separation. Copper sulphate failed to increase sulphide recoveries above those achieved with PAX and magnetic separation.

While the efficiency of the magnetic separation improved gradually with increased field strength between the tested range of 1,000 Gauss to 10,000 Gauss, the maximum field strength of a commercially available permanent magnet is approximately 7,000 Gauss. Hence, the PAX dosage optimization tests were carried out at this field strength. Dosages of 50 g/t, 150 g/t, and 300 g/t were evaluated. Increasing the PAX dosage from 50 g/t to 150 g/t resulted in a statistically significant reduction of the sulphides in the magnetic separation tailings. However, increasing the dosage further to 300 g/t PAX did not produce a lower concentrate grade.

A PAX dosage of 150 g/t and magnetic separation at 7,000 Gauss was able to achieve a low-sulphide tailings grade of approximately 0.10%S. Further investigation after the FS demonstrated a higher efficiency of the desulphurization process when the magnetic separation was preceding the sulphide flotation.

The SkimAir® technology has been developed by Outotec for flash flotation and flash roughing applications. The advantage of the equipment is the removal of coarse liberated graphite before being overground in the mill. Other benefits claimed by Outotec are improved overall recovery, increased mill throughput, and improved dewatering. In the Matawinie flowsheet the recovery of graphite flakes as early as possible was the primary motivator to consider a SkimAir® flotation cell.

While it's difficult to evaluate the technology in small-scale batch flotation tests, the underlying principle can be applied on a laboratory scale. The SkimAir® flotation cell is typically installed on the hydrocyclone underflow or mill discharge stream to capture any sufficiently liberated, fast floating particles. Assuming a typical circulating load in the mill, the coarse material will circulate several times from the mill to the classification cyclone and then through the cyclone underflow back to the mill. Hence, the 10 minutes of grinding time in the ball mill was broken into four intervals (2, 2, 3, and 3 minutes) followed by rougher flotation after each grinding step.

The overall flotation response in terms of final concentrate grade was almost identical for the SkimAir® tests and the baseline test F1 at 97.7% C(t) and 97.4% C(t), respectively. The open circuit graphite recovery for the SkimAir® test at 94.1% was slightly higher compared to 90.2% in test F1.

The main reason for the SkimAir® simulation tests was to investigate the possibility of a coarser final concentrate product. A comparison of the SkimAir® test with the results obtained in the baseline test F1 did not provide a clear grade and/or flake size advantage that could serve as evidence that this technology will help to produce a superior graphite concentrate.

In conclusion, the Feasibility Study Test results confirmed a robust flowsheet and helped to refine the process design criteria for a concentrator with a global graphite concentrate grading 97% C(t) and an overall graphite recovery of 94%. However, an overall graphite recovery of 93% is used as design criteria for the current study.

The additional work conducted during the FS metallurgical program helped to de-risk several unit operations. However, certain process areas such as the benefit of SkimAir®, flotation cell design, polishing and stirred media mill operating conditions, and configuration of the desulphurization circuit still required further investigation. NMG was in the unique position to own and operate a 3.5 tph demonstration plant at Saint-Michel-des-Saints (SMDS), which was utilized post FS to firm up any remaining process design criteria with a small-scale process plant that replicates the commercial process.

13.1.2. Internal Test Programs Conducted at NMG's Demonstration Plant

With the goal of optimizing the process flow diagram following the completion of the FS, NMG studied various modifications to the FS flowsheet and conditions. Several DOEs were carried out to understand the influence of operating parameters on the concentrate quality and efficiency of the process. The main difference between the demonstration plant and the commercial plan flowsheet is that the grinding circuit at the demonstration plant includes a Rod mill and a Ball mill instead of a SAG and Ball mill. Another difference is that the commercial plant will have two separate process water circuits, one for graphite flotation and one for sulphide flotation. The separate water circuits will help minimizing the sulphur content in the graphite concentrate.

13.1.2.1. Position of the Magnetic Separator in the Desulphurization Circuit

Placing the magnetic separation ahead of sulphide flotation reduced the collector consumption by 20% from 100 g/tonne to 80 g/tonne. Reversing the sequence of sulphide flotation and magnetic separation also resulted in a reduction of the sulphur grade in the NAG tailings from 0.30%S to 0.17%S. Hence a decision was made to proceed with detailing engineering with magnetic separation as the first process step and sulphide flotation as the second process step.

It was also observed that the low intensity magnetic separator (LIMS) was not effective in reducing the sulphide content in the NAG. The LIMS was then removed from the process flow diagram and only the medium intensity magnetic separator (MIMS) was retained in the circuit.

13.1.2.2. Flash Flotation

The demonstration plant flowsheet was modified to reflect as much as possible the flowsheet of the future commercial plant. One modification was the installation of a flash flotation cell underneath the ball mill cyclone. The flash flotation cell is fed by the cyclone U/F to recover the liberated graphite coarse flakes before passing through the ball mill. It is important to recover the coarse graphite flakes as early as possible during the beneficiation process since coarse graphite flakes have a higher value than fine graphite flakes.

- A DOE program was carried out to compare the performance of the flash flotation cell versus mechanical rougher flotation cells. The flash flotation cell can produce an intermediate concentrate grading 53.5- 65% C(t) at 2.5-3.5% weight recovery of the plant feed. The flash flotation cell produced a significantly higher proportion of jumbo flakes in the rougher concentrate, compared to the conventional flotation cell. This is a clear indication that the flash cell will help preserving the integrity of the high value coarse graphite flakes.

The flash flotation tests confirmed that this equipment can accept slurry with high solids up to 60% to produce a rougher graphite concentrate recovering high percentage of very large flakes. Figure 13-4 and Figure 13-5 present the grinding circuit flowsheet at the demonstration plant including before and after the installation of the rougher flash flotation cell.

Based on the superior performance of the flash flotation cell, small footprint, and reduced risk of sanding out, a flash flotation cell was incorporated into the commercial circuit design.

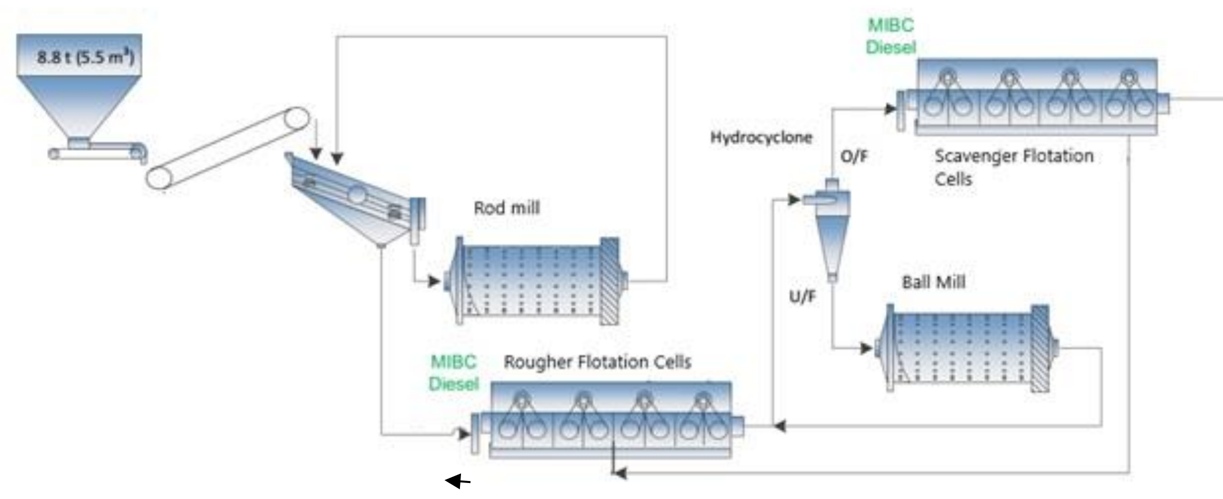


Figure 13-4: Demonstration plant rougher / scavenger circuit

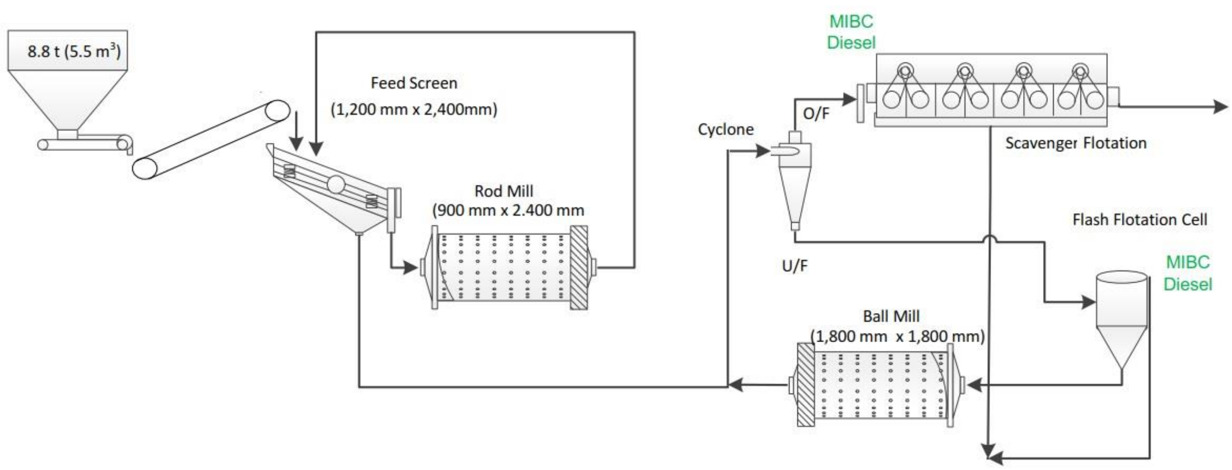


Figure 13-5: Demonstration plant with rougher flash flotation cell / scavenger circuit

13.1.2.3. Tank Cell Flotation Tests

- Most of the flotation cells at the demonstration plant are conventional mechanical flotation cells with froth paddles. Since the commercial plant has been designed with tank cells, it was decided to rent a pilot plant tank cell from Corem in Québec City to verify the suitability of this type of equipment;
- To develop optimum operating conditions, a series of DOE programs were carried out with the tank cell placed at the primary, fine and coarse cleaning stages. The effects of four parameters, namely feed percent solids, feed rate, airflow rate and the froth depth on graphite and sulphur grades in the flotation concentrate and graphite recovery were investigated;
- In the primary cleaning circuit, slurry feed density and airflow proved to be the most critical variables with regards to concentrate grade, while froth depth and airflow were the most important variables for carbon and sulphur recovery. As expected, the higher air flowrate increased graphite recovery but also reduced concentrate grades. A lower feed density benefited cleaner performance while a shallower froth depth increased graphite recovery. These findings are in line with expectations, but the DOE tests provided good starting values for the commercial operation and a suitable range;
- In the fines cleaning circuit proved very sensitive to feed density for both carbon grade and carbon recovery. A lower feed density will allow for a better separation of the graphite and gangue particles and increasing the feed density will lead to higher entrainment of gangue minerals. Froth depth was again a primary factor for high carbon stage recoveries. Airflow rates had little impact on the metallurgical performance within the evaluated range.
- The coarse cleaning circuit was the least sensitive to the four process variables and both carbon grades and recoveries fell within a narrow range of 1-2%;
- The test results indicated good metallurgical performance of the tank cells compared with conventional mechanical flotation cells that are currently installed at the demonstration plant. It was observed that the tank cell was much more stable and easier to control in the different cleaning duties;
- Optimum conditions for the process variables were established for the one primary and two secondary cleaning circuits. While these conditions are only valid for the specific equipment employed in the demonstration plant, correlations between process variables and metallurgical performance are expected to scale up well for the commercial operation.

13.1.2.4. Polishing Mill

A DOE program was conducted to quantify the effect of four operating variables on the quality of the primary cleaning stage concentrate. The results would allow the determination of the optimum operation conditions of the polishing mill, followed by the primary cleaning stage,

The four parameters included in the DOE program were:

- Polishing mill speed;
- Feed percent solids;
- Residence time;
- Ceramic media load.

After each combination of above-mentioned operating conditions, the polishing mill discharge was transferred to the primary cleaning circuit and the concentrate carbon grade and recovery of the third cleaner concentrate was determined.

The results obtained in the DOE program were consistent with results obtained during the initial commissioning phase of the demonstration plant and laboratory scale experience. As expected, retention time and pulp density in the mill had the biggest impact on the metallurgical performance.

The recovery model based on this DOE predicts a 3rd cleaner concentrate grade of 96.4% C(t) optimized conditions, higher than the 93.4% to 96.0% C(t) produced during the laboratory optimization tests. The grades that were achieved for the 3rd cleaner concentrate were already close to the design plant grade of 97% C(t) even before secondary cleaning.

13.1.2.5. Attrition Mills

The requirements for the attrition and flotation conditions are different depending on the size of the graphite flakes. Larger graphite flakes in the Matawinie mineralization generally have a higher purity compared to the smaller graphite flakes and, therefore, require different attrition and flotation conditions. To achieve an optimal overall graphite grade, the third cleaner concentrate is classified into a fine fraction and coarse fraction before the final upgrading stages.

The flow diagram of the attrition mills, fines and coarse cleaning flotation circuit are depicted in Figure 13-6.

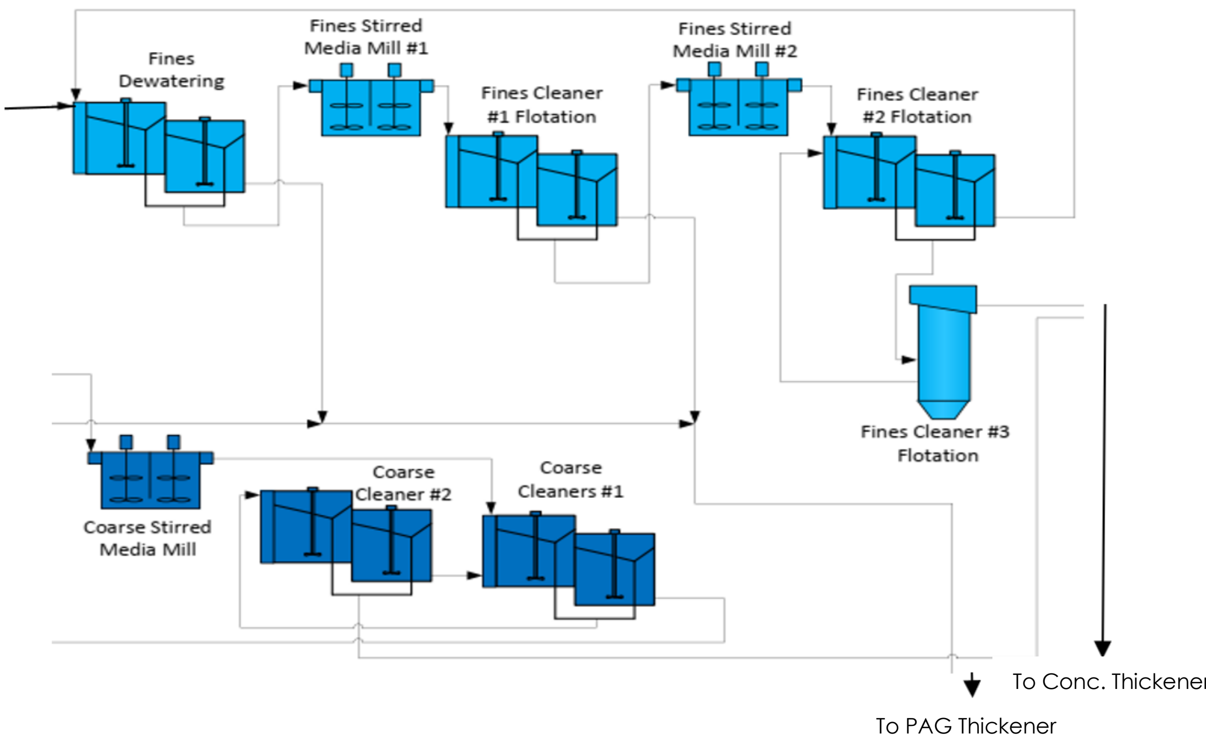


Figure 13-6: Attrition mills, fines and coarse cleaning flotation circuit

To confirm the process diagram and increase confidence in the design of the equipment for the commercial plant, attrition and flotation tests have been conducted in consultation and with the assistance of Metso-Outotec, the objectives of these tests were:

- Characterize the impact of the attrition mill on fine particles (carbon recovery) and on coarse particles (degradation of coarse flakes);
- Identify the main process control factors;
- Identify a suitable range for the various process variables of the attrition mills including residence time and pulp density. These two are essential because they determine the useful volumes of the attrition mills;
- Media type, media load, and impeller speed to evaluate their effect on the fine and coarse final concentrate quality and flakes sizes;
- Communicate design criteria to Metso Outotec for validation of the scaling between the demonstration plant internal experiments and the commercial project.

In total, six comprehensive test programs have been conducted including a first screening DOE followed by a larger campaign of research and development comprising five test programs on fine graphite(F), on coarse graphite(C) and mixed graphite(M). A summary of the scope of work of each program is presented in Table 13-9.

Table 13-9: Attrition mill DOE test matrix

Programs	Fraction tested	Constant parameters	Variable parameters	levels	Type of program	Material	Methodology
1	F and C	Media size = 2-4 mm	Media load (%) Time (min) Tip speed (m/s) %solid	5, 15, 25 10, 18, 26 4.7, 6.3, 7.9 8, 16, 26	Greco-Latin DOE (9 tests/fraction)	250l demo plat scale pin type attrition mill Lab scale flotation cell (4L)	1 attrition + 3 flotations for each fraction
2	F and C		Media load (%) Time (min) Tip speed (m/s) % solid Media size (mm)	30, 50 15, 30 2.2, 3.7 10, 20 3, 5	Full factoriel DOE (32 tests/fraction)	Lab scale petal type attrition mill (1L) Lab scale flotation cell (4L)	1 attrition + 1 flotation for each fraction
3	F	Media load = 50% Time = 30min Speed = 600rpm Density = 10% Media size = 3mm			2 complementary tests	Lab scale petal type attrition mill (1L) Lab scale flotation cell (4L)	1 attrition + 3 flotations and 1 att. + 1 flot. + 1 att. + 2 flot.
4	F	Media size = 3mm	Media load (%) Time (min) Tip speed (m/s) % solid	30, 45, 60, 75 10, 20, 30, 40 2.2, 2.6, 2.9, 3.3 5, 10, 15, 20	Partial factoriel DOE (16 tests)	Lab scale petal type attrition mill (1L) Lab scale flotation cell (4L)	1 attrition + 1 flotation
5	F, C and M	For fine : Media load = 60%, Density = 10%, Media size = 3mm For coarse : Media load = 60%, Density = 20%, Media size = 5mm For mixt : Media load = 60%, Density = 10%, Media size = 3mm	Time (min) Tip speed (m/s)	15, 30 2.2, 4.4	Full factiriel DOE + 1 central point (5 tests/fraction)	Lab scale petal type attrition mill (1L) Lab scale flotation cell (4L)	1 attrition + 1 flotation for each fraction
6	F and C	Media Load = 50% Media size = 2-3 mm	Time (min) Tip speed (m/s) % solid	15, 22.2, 30 1.6, 2.5, 3.3 10, 15, 20	Partial factoriel DOE + 6 central points (20 tests/fraction)	Lab scale pin type attrition mill Lab scale flotation cell (4L)	1 attrition + 3 flotations for fine fraction 1 attrition + 1 flottation for coarse fraction

The first program was conducted using the demonstration plant attrition mill to evaluate the impact of the media load, residence time, slurry solid percent and tip speed on the metallurgical performance. The findings of the initial test program led to further larger testing campaigns between February 2021 and July 2021.

Of the five programs, four were carried out at the NMG demonstration plant with a 1L lab scale petal type attrition mill (programs 2, 3, 4 and 5) and one at the Metso Outotec laboratory with a lab scale pin type mill (program 6). The first program of this campaign (program 2) consists of a full-factorial DOE testing five factors with two levels for coarse (+80 mesh) and fine (-80 mesh) fractions. The goal of program 2 was to investigate the factors that were evaluated in program 1 in more detail and to highlight the interactions that may exist between them to set the sizing parameters for commercial stirred media mills. The results of the program provide clear correlations between the media load, residence time, mill speed, and media type.

The test work results suggested that the -80-mesh fraction required more cleaning flotation steps than the +80-mesh fraction to enhance the carbon grade of the final concentrate. An additional attrition step may help further to maximize concentrate grade. The three stages of cleaner flotation resulted in a carbon grade increase of 1.6% from 96.5% C(t) to 98.1% C(t). Adding a second attrition step produced another 0.7% grade increase to 98.8% C(t). The two additional stages of cleaning and an attrition step resulted in lower carbon recovery. However, since the circuit was operated in open-circuit, the achieved recoveries are not reflective of a closed-circuit continuous operation.

Investigating high media loads and long retention times resulted in both inferior concentrate grades and significant flake degradation. It is postulated that the high energy input and long grind times resulted in agglomeration of graphite flakes and liberated gangue minerals.

The sixth and last program consisted of a DOE of three factors and three levels (20 tests for each fine and coarse fractions) set up by Metso-Outotec and taking into consideration the results of the previous test programs. All attrition tests were carried out in the Metso-Outotec lab with a pin type attrition mill. The 40 attritor discharges were sent back to the NMG demonstration plant laboratory to perform the flotation steps in the same conditions as for the previous tests. A single cleaning step was performed for the +80-mesh fraction and three cleaner steps for the -80 mesh feed. Even with the change of attritor type, the conclusions of this program are consistent with the other programs, which confirmed and strengthened findings of the previous five programs.

For equipment sizing purposes, operating parameters were chosen that maximize attrition performance while minimizing equipment size (strongly influenced by residence time and % solids).

The internal tests programs developed a much better understanding on how various process variables impact the metallurgical response of the Matawinie ore. Flotation and grinding equipment conditions were optimized to ensure maximum graphite concentrate grades while minimizing flake degradation. The test programs were able to significantly de-risk critical unit operations such as flotation cell design, polishing, and attrition mills. The final performance of the demonstration plant matched and exceeded the laboratory results used to develop the FS. The ability to replicate bench scale results with a 3.5 tph demonstration plant supports the scalability of the selected process equipment.

13.1.3. External Test Programs Conducted by Manufacturers and Research Laboratories

To technically de-risk the Project, additional characterization and test programs were conducted after completion of the FS to confirm some design criteria and properly size the equipment. These tests were conducted by different research laboratories and equipment manufacturers:

- Comminution (SMC) at SGS Lakefield;
- Classification tests at Multotec for the cyclones;
- Thickening tests at Diemme and at Metso Outotec;
- Filtration tests at Diemme and at Metso-Outotec;
- Drying tests at: Metso-Outotec Kumera, Heyl Patterson, ThermoPower and Vettertec;
- Inflammability and explosibility tests at XPS;
- Rheology test at Saskatchewan Research Council.

The results of these test programs we were in line with previous tests reports and were used to confirm the final sizing of most of the major equipment.

13.1.3.1. Comminution (SMC) at SGS Lakefield

A total of 12 samples from the Matawinie deposit were previously submitted for comminution testing under the SGS projects 14236-006, -007, and -010. The samples consisted of bulk samples, old drill core samples, or fresh drill core samples. A review of the comminution test results was performed by SGS under the SGS project number 14236-11 and concluded that there was a major difference in the test results, with some samples being significantly harder than others, and the cause of this discrepancy could not be explained by the age of the core, the carbon grade, or the depth of the samples.

A total of 15 samples were compiled in 2020 and submitted for SMC tests. The type of samples and the reasons they were tested are briefly summarized below:

- Two composites (SMC – 2020 and VAR 3 – 2020) which were tested originally in March 2017 and April 2018 were retested to determine if core aging had an impact on the sample competency.
- Eleven variability samples (20200805-MC-01 to 11), representing small interval samples of various grades, depths, and locations were tested to investigate the hardness variability in the deposit.
- One composite (20201001-SMC-02) representing the "contact zone" between the waste and the ore, was tested to characterize the competency of the waste.

The grindability testing results are depicted in the Table 13-10.

Table 13-10: Grindability testing summary

Sample	Sample	Tested	Tested	Average	Tested	Average	Head Assays (%)			Relative	JK Parameters		
Name	Representing	Project	Size Fraction (mm)	Depth (m) in holes	Time	Sample Age (year)	C(t)	C(g)	S	Density	A x b	t_a [(1)]	SCSE (kWh/t)
SMC	-	*14236-006*	*-31.5/+26.5*	*99*	*Mar-17*	*1.1*	-	*4.06*	-	*2.73*	*84.1*	*0.80*	*7.29*
SMC-2020	-	14236-13	-31.5/+26.5	99	Jul-20	4.5	4.43	4.10	2.72	2.76	87.0	0.82	7.22
SMC-2020 [(2)]	-	14236-13	-22.4/19.0	99	Nov-20	4.8	4.43	4.10	2.72	2.83	54.0	0.49	8.85
VAR 3	*Far West - Bottom*	*14236-010*	*-22.4/19.0*	*85*	*Apr-18*	*0.9*	*4.8*	*4.26*	*3.26*	*2.76*	*53.3*	*0.50*	*8.78*
VAR 3 - 2020	Far West - Bottom	14236-13	-22.4/19.0	85	Jul-20	3.1	4.45	4.28	3.28	2.76	56.6	0.53	8.56
20200805-SMC-01	-	14236-13	-31.5/+26.5	26	Sep-20	1.2	-	4.18	-	2.73	85.5	0.81	7.25
20200805-SMC-02	-	14236-13	-31.5/+26.5	112	Sep-20	1.2	-	3.38	-	2.76	84.3	0.79	7.31
20200805-SMC-03	-	14236-13	-31.5/+26.5	108	Sep-20	1.2	-	4.15	-	2.79	94.8	0.88	7.03
20200805-SMC-04	-	14236-13	-31.5/+26.5	99	Sep-20	1.2	-	4.73	-	2.74	83.6	0.79	7.31
20200805-SMC-05	-	14236-13	-31.5/+26.5	45	Sep-20	1.2	-	4.16	-	2.71	86.5	0.83	7.20
20200805-SMC-06	-	14236-13	-31.5/+26.5	33	Sep-20	1.2	-	4.22	-	2.73	99.1	0.94	6.88
20200805-SMC-07	-	14236-13	-31.5/+26.5	69	Sep-20	1.2	-	4.16	-	2.70	87.1	0.84	7.18
20200805-SMC-08	-	14236-13	-31.5/+26.5	167	Sep-20	4.2	-	4.18	-	2.82	85.5	0.79	7.32
20200805-SMC-09	-	14236-13	-31.5/+26.5	129	Sep-20	5.2	-	4.06	-	2.73	91.7	0.87	7.07
20200805-SMC-10	-	14236-13	-31.5/+26.5	11	Sep-20	3.2	-	4.04	-	2.75	80.3	0.76	7.43
20200805-SMC-11	-	14236-13	-31.5/+26.5	239	Sep-20	1.2	-	4.09	-	2.73	85.2	0.81	7.26
20201001-SMC-02	Contact Zone	14236-13	-31.5/+26.5	99	Nov-20	1.3	0.69	0.65	0.80	2.83	54.9	0.50	8.79

Older SMC results from previous phases are presented in italics

(1) The t_a value reported as part of the SMC procedure is an estimate

(2) Labelled as "20201001-SMC-01" for the testwork

Based on the 2020 SMC test results, the following can be concluded:

- Core aging has no significant impact on the comminution test results;
- Sample depth or sample grade does not have a strong impact on the competency of ore samples as illustrated in Figure 13-7 and Figure 13-8.

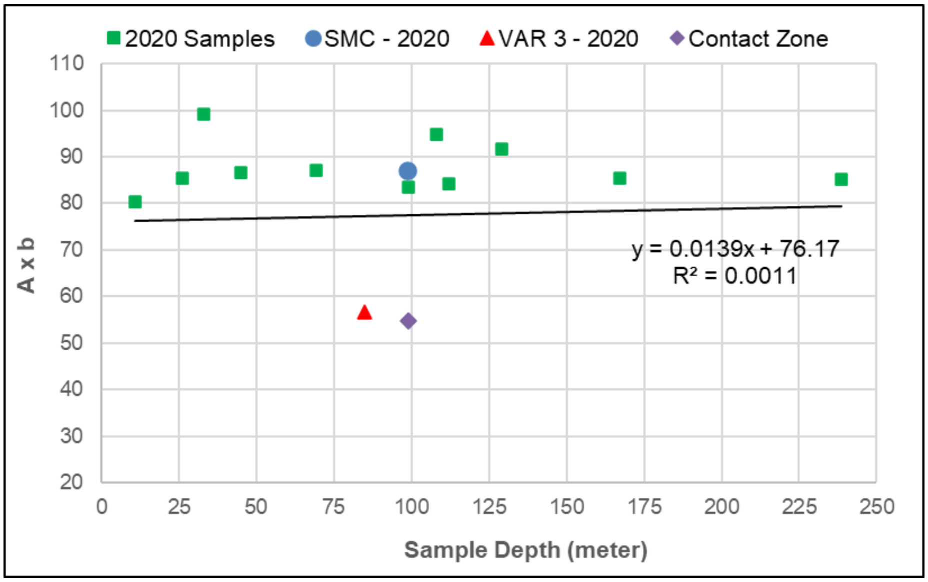


Figure 13-7: A x b values vs. Sample depth

- The variability within the orebody is generally small, with all the ore samples falling in the soft range of competency.

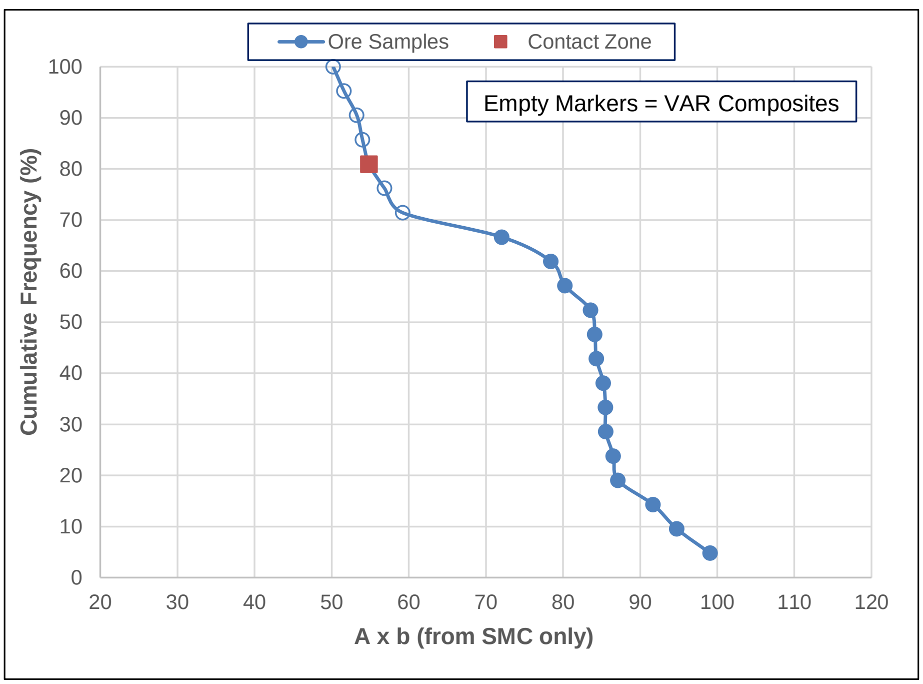


Figure 13-8: Cumulative frequency of A x b from SMC only

- The single waste/contact zone composite was significantly harder than the ore samples.
- The reason that the six VAR composites tested in 2018 were significantly harder than the other samples tested was due to the SMC testing size. In theory, the testing size should not have a significant impact on the SMC test results. However, this was proven not to be the case for this deposit.

Since the 2017 SMC results from composite VAR 3 were used for engineering design purposes, the SAG mill was effectively oversized by 15-18%. This additional level of safety ensures that the SAG mill will not become a bottle neck of the operation even if some pockets with harder ores are encountered during processing.

13.1.3.2. Classification Tests at Derrick Screens and at Multotec

Attrition in stirred media mills is required to liberate remaining impurities in the cleaner graphite concentrate prior to the final flotation steps. The requirements for attrition of the coarse graphite and the fine graphite are different due to variation of the impurities in the various size fractions. The coarse graphite tends to be of higher purity than the fine graphite and, therefore, requires different attrition conditions than the fine graphite. Hence, it is required to classify the coarse and the fine graphite prior to processing in separate cleaner flotation circuits.

Multiple tests programs with screens only and with a combination of screens and cyclones were tested without any significant results. Most of these tests were either inefficient or resulted in too much fine graphite reporting to the coarse graphite product.

Excellent results were finally obtained in a test program that was conducted by a cyclone manufacturer. The fine content in the coarse product prior to the attrition stage was reduced significantly by reprocessing the cyclone underflow of the first cyclone stage in a second stage. A two-stage cyclone configuration produced only 4.9% to 5.7% of particles finer than 106 microns in the +80-mesh cyclone underflow, which is considered a good separation efficiency for graphite flakes.

13.1.3.3. SGS – Sulphide Rejection Circuit

The metallurgical flowsheet for the Matawinie graphite mineralization includes a sulphide rejection circuit SGS, to separate the graphite scavenger tailings stream into a high mass low-sulphur tailings stream (NAG) and a low mass high-sulphide tailings stream (PAG). The sulphide rejection circuit consists of sulphide rougher flotation followed by magnetic separation to minimize the sulphide losses to the NAG tailings. The circuit has been incorporated into NMG's demonstration plant in Saint-Michel-des-Saints, but the results obtained in 2019 were inferior to previous lab results performed on master and variability composites. It was postulated that partial oxidation of the ore feeding the demo plant was responsible for the higher sulphur grades in the NAG product of the demo plant. To validate original lab scale results, NMG supplied 101 drill core samples for metallurgical testing.

The primary objectives of the test program were to:

- Confirm previous metallurgical results achieved on the Master and variability composites;
- Evaluate the impact of reagent dosage, flotation time, and magnetic field strength on the effectiveness of the sulphide rejection;
- Compare results to data that was generated for an oxidized demo plant feed sample.

The flotation time had a significant impact on the residual sulphur content in the NAG tailings and decreased from 0.34%S after 20 minutes of flotation to 0.21%S after 40 minutes of flotation. The potassium amyl xanthate (PAX) dosage has little impact on the sulphide flotation kinetics and sulphur losses to tailings.

The results of the desulphurization trials suggested decreasing flotation kinetics at lower residual sulphur levels and, therefore, the need for a long flotation residence time. Increasing the collector dosage over 100 g/t failed to further increase sulphide rejection.

13.1.3.4. Thickening tests at Diemme and at Metso Outotec

NMG contracted Diemme (Italy) and Metso Outotec (Canada) to conduct thickening test work on two graphite concentrate samples and six graphite tailings samples. The samples provided were:

- Concentrate #1 and #2;
- PAG #1 and #2;
- NAG #1 and #2, and
- Scavenger Tailings #1 and #2.

These samples were produced in the NMG demonstration plant. Two products with different particle size distributions per sample type were tested to cover a range of grind sizes for liberation of the graphite and the sulphide minerals.

Diemme and Metso Outotec received separate aliquots of the same samples. The test work programs examined the processing variables to determine the achievable operational parameters of a high-rate thickener (HRT) for the different plant products. The results were then used to determine the final sizing criteria required for the detail engineering.

The scope of the testing was to conduct thickener test work on graphite concentrate and tailings samples, with the objective to determine:

- Flocculant type and dosage;
- Overflow clarity;
- Underflow density;
- Underflow yield stress.

The Metso Outotec tests produced underflow densities of 65% to 70% for the NAG tailings and of 70% to 74% solids for the scavenger tailings w/w with clear overflows. High thickener feed rates of 1.0 to 1.8 t/(m^2h) were obtained for both tailings streams. The PAG tailings performed inferior with underflow densities of 55% to 65% and solids-loading rates of 0.6 to 1.0 t/(m^2h). Also, the overflow contained more suspended solids of 100-200 mg/L for the better tests. As expected, the graphite concentrate produced the lowest underflow densities owing to the low specific gravity of graphite. Underflow densities ranged between 40% and 46% at low solids loading rates of 0.20 – 0.30 t/(m^2h). The overflow was clear in almost all graphite thickening tests.

Diemme managed to achieve better underflow densities for the graphite concentrate with a maximum underflow density of 50% solids w/w at a solids loading rate of 0.5 t/(m^2h). The solids concentration in the underflow in the NAG and scavenger tailings tests ranged between 68% and 74% solids w/w at solid fluxes of 0.6 to 1.0 t/(m^2h). The PAG tailings tests produced underflow densities between 63% and 73% solids w/w at solids loading rates of 0.4 – 0.8 t/(m^2h).

The test work on the eight samples provided to the two vendors has shown that the material can be successfully thickened to the target densities. The interpretation of the tests results was used at the detail engineering phase to size the four NMG thickeners for the Scavenger tailings, NAG tailings, PAG tailings, and Graphite concentrate.

13.1.3.5. Filtration test at Diemme and Metso Outotec

Diemme (Italy) and Metso Outotec (Canada) conducted pressure filtration test work on three samples, namely graphite concentrate, PAG tailings, and NAG tailings. Each sample was tested at two different grind sizes (coarse and fine) to quantify filtration characteristics. All samples were produced in the NMG demonstration plant facilities.

Metso Outotec test yielded filter cake moisture contents of 12% wt for both graphite concentrate samples, 10% wt for the two PAG tailings samples, and between 8% and 9% wt for the two NAG tailings samples. The Diemme test results fell slightly short of the Metso-Outotec data with moisture contents in the graphite concentrate of 13% wt, in the PAG tailings of approximately 14% wt, and the NAG tailings of 14% wt.

The test work on the six products has shown that the material can be successfully filtered to target moisture contents of 15% or lower. The interpretation of the tests results was used to size filter presses for the graphite concentrate, the NAG and PAG tailings.

13.1.3.6. Concentrate Drying Tests Five Different Suppliers

Drying tests were carried out by five suppliers at their test facilities to verify the capability of the indirect electrical dryer to reduce the moisture of the filtered graphite concentrate from 15% to a minimum of 0.3%.

Drying tests were conducted at the following vendors:

- Metso-Outotec;
- Kumera;
- Heyl Patterson;
- ThermoPower;
- Vettertec.

In addition to the moisture content of the dried concentrate, the following technical parameters were considered:

- High availability;
- Low energy consumption;
- Optimal design and structure;
- Low emissions and emissions reduction;
- Size classification of products.

The test reports from all suppliers confirmed that their dryers can reduce the concentrate moisture at least 0.3% without any measurable degradation of the graphite flakes. However, energy consumption and footprints varied between the different drying technologies.

After review of the test results and proposals, the dryer with the lowest energy consumption and a GA that was more suitable for the NMG beneficiation plant layout was selected.

13.1.3.7. Flammability Tests at XPS

XPS conducted flammability tests on five graphite concentrate samples to assess their flammability classification according to the United Nations Part III Classification Procedures, Test Methods and Criteria Relating to Class 2, Class 3, Class 4, Division 5.1, Class 8 and Class 9, section 33.2.1. The following samples were subjected to flammability tests:

- Graphite fines;
- Graphite intermediate;
- Graphite coarse;
- Bulk sample for value-add processing;
- Baghouse dust.

The procedure for the flammability testing consists of two stages, namely preliminary screening and burning rate tests. If a sample tests positive in the preliminary screening test, it then proceeds into a burning rate test to be classified as either "Not readily combustible" or as a combustible solid according to Packing Group II or III. From the preliminary screening tests, all samples from NMG tested negative and were therefore classified as "Not readily combustible solid of Division 4.1.

13.1.3.8. Rheology test at Saskatchewan Research Centre (SRC)

SNC-Lavalin requested slurry characterization and pipeline modelling of PAG (Potentially Acid Generating) and NAG (Non-Acid Generating) tailings thickener underflow slurry streams. The PAG stream is expected to contain 63% to 70% solids by mass and the NAG stream 57% to 65% solids by mass; both streams have an anticipated operating temperature range of 30-40°C. The scope of the work carried out at SRC was to measure the physical and rheological properties of these mixtures for use in subsequent slurry pipeline predictions using SRC's Pipeflow models.

Rheology measurements identified Newtonian behaviour for the NAG carrier fluid while the PAG carrier fluid sample displayed a slight non-Newtonian behaviour.

Minimum deposition velocities of 1.2-1.4 m/s were established for the PAG slurries and slightly higher values of 1.4-1.9 m/s for the NAG slurries.

Results suggest that centrifugal pumps could be used to transport both the NAG and PAG slurries, but pipeline tests were recommended for the PAG slurry at the highest solids concentration.

13.2. Bécancour Battery Material Plant

The test work programs for the development of the Bécancour Battery Material Plant program are divided in three sections:

- Micronization and spheronization;
- Purification;
- Coating.

13.2.1. Micronization and Spheronization

13.2.1.1. Historical Test Program

In 2019, NMG acquired a Micronization and Spheronization unit from an Original Equipment Manufacturer (OEM) to be able to process and spheronize 120 kg/h of graphite. This equipment was selected based on trials previously performed at the OEM test centre that showed promising results. This unit was installed in the SMDS NMG Demonstration Value-Added Plant (DVAP) and was used to perform more than 2,400 tests on the NMG Graphite to better understand the spheronization process. In addition to being used for tests, the unit is also used as a small production line. This unit is linked to a Distributed Control System (DCS) provided by ABB that controls the M/S equipment and collects all the process data.

In 2022, NMG also acquired a second larger micronizing and shaping unit of 250 kW to increase the capacity of the DVAP installation and confirm the OEM test results on a full-size commercial unit.

Over 20 different Design of Experiments (DOE) have been performed to optimize the yield and the throughput of the equipment in correlation with the Particle Size Distribution (PSD) and Tap Density of the final spherical graphite (SG).

Numerous tests were also performed at different OEM and Institutional Test Centres to evaluate the equipment capability and final products characteristics from 2016 to 2022.

13.2.1.2. M/S Sector Flowsheet

The Micronization and Spheronization (M/S) Sector is divided into two main steps. The first step consists of graphite particle size reduction. The second step is the spheronization, where particles are rounded to obtain a spherical shape. The main objective is to round the graphite particles to increase the density of the spherical graphite. In-house large-scale testing and OEM Test Centres were used to identify the optimum process configuration.

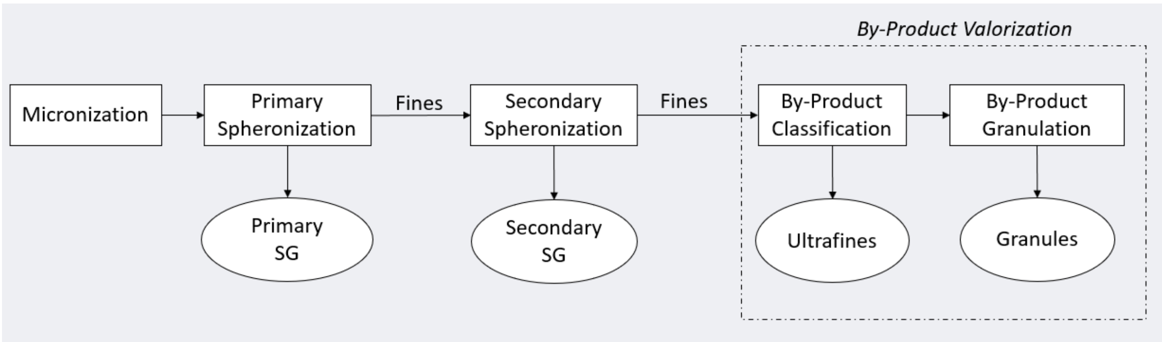


Figure 13-9: MS sector flowsheet diagram

13.2.1.3. Feed Material Characteristics

The feed material used to feed the M/S sector is the smallest graphite size particle produce by the Matawinie Beneficiation plant. This material is identified as a Concentrated Graphite (CG) at <80 mesh and represent all the CG particles that pass through an 80-mesh screen.

The Table 13-11 shows the particle size values and density for the graphite flake produced at the NMG Mineral Processing Demonstration Plant in Saint-Michel-des-Saints. Theses average values are based on the analysis of ten lots of 1 tonne produced by NMG in 2021 and 2022. The lots selected show an average carbon content of 95.4%.

Table 13-11: Feed material characteristic for MS sector

Characteristic (1)	<80 mesh
D97 (µm)	286
D90 (µm)	225
D50 (µm)	108
D10 (µm)	27
Bulk Density (g/cm³)	0.418
Tap Density (g/cm³) (1)	0.448
% Carbon	95.4

Notes:
(1) Performed with 3000 taps (Norm ASTM B527), Precision of +/- 0.03 g/cm³

Samples used to perform the different M/S test programs come from the NMG Phase-1 Matawinie Mine project and were concentrated at the Demo Plant in Saint-Michel-des-Saints and were selected to be similar to the <80 mesh specification product.

13.2.1.4. Micronization Testing Program

The first step in processing the CG is micronization that breaks down the coarser flakes (PSD as shown in Table 13-12) to a size that is suitable for the subsequent, spheronization step.

Two tests programs were performed with an OEM Test Centre and at the NMG DVAP in SMDS to evaluate the performance of the Impact Air Classifier Milling continuous process. The main objective of these tests was to identify the technology that can produce a narrow PSD of micronized graphite while generating fewer fine particles.

Based on both the Tests results, it appears that it was possible to achieve micronized graphite at 21 µm +/-1 µm with D10 between 5.5 to 6.0 µm and a D90 between 44 and 57 µm. This micronized graphite PSD is adequate for the next step – spheronization. The use of an Impact Air Classifier mill gives a yield of 100%. Thus, all the CG is processed to micronized graphite product.

Furthermore, tests performed on different CG size (>50 mesh and 50x80 mesh) at the NMG DVAP in SMDS confirm that coarser CG can be milled with the Impact Air Classifier Mill.

The test performed at the OEM can be scaled-up at a commercial level. The initial test was conducted on a unit of 90 kW with a grinding disc diameter of 630 mm and reproduced on a 250 kW unit (1,000 mm) with a throughput of 500 and 1,250 kg/h. The scale-up factor of 2.5 was calculated by the OEM between these two units. This scale-up factor was then used by the OEM to calculate the throughput from the 250 kW micronizer unit to the larger unit of 560 kW. This larger 560 kW unit will be able to micronize 3125 kg/h of CG.

13.2.1.5. Primary Spheronization

Spheronization is a shaping process that rounds the micronized graphite particles and thus, increases the density. The density of the SG is measured in terms of tap density which represents an increased bulk density attained after mechanically tapping a container containing the powder sample.

Two extensive tests programs have been performed with a European OEM Test Centre and at the NMG DVAP in SMDS to evaluate the Primary Spheronization Batch process. The main objective of these tests was to identify the best technology of spheronization based on the capability, yield and throughput of the equipment.

The product (SG) is identified by the value of its D50 in microns (µm). For example, SG20 represents a spherical graphite where 50% of the particles are smaller than 20 µm.

At the DVAP, following micronization, more than 1,900 different spheronization tests have been performed with more than 50 tonnes of CG feed stock. Different sizes of SG ranging from SG10 to SG30 were produced from the CG feed material by adjusting the micronized graphite PSD, the air classifier cutting point and the shaper parameters. Effects of other parameters have also been studied but their impact has been noted to be less influential on the final SG characteristics.

One of the parameters tested during these trials was the impact of the type of CG used, on the spheronized material. Table 13-14 shows the DOE results obtained during the NMG DVAP tests performed to produce SG20 using different CG as feed. The sizes tested include: <80 mesh, <150 mesh and 80 x 150 mesh. The 80 x 150 CG does not contain any fines particles under 150 mesh.

It was observed that the throughput of the spheronizer varies from 55 to a maximum of 60 kg/h of CG when producing SG20. The yield varies from 55% to 60% for the SG20 with a tap density of 0.90 g/cm³.

Table 13-12: DVAP Original equipment - primary SG characteristics vs. different CG feed

Primary SG Characteristic and results	Primary SG Test #1	Primary SG Test #2	Primary SG Test #3	Primary SG Test #4	Primary SG Test #5
Feed CG Size	<150 mesh	<80 mesh	<80 mesh	80 x150	80 x 150
D90 (µm)	31	31	37	31	37
D50 (µm)	17	17	20	17	20
D10 (µm)	9	9	10	9	10
Tap Density (g/cm³) (1)	0,83	0,90	0,90	0,90	0,90
SG Yield (%) (2)	55	54	58	57	58
Throughput (kg of CG/h)	60	55	60	58	60

Notes:
(1) Performed with 3000 taps (Norm ASTM B527), precision of +/- 0.03 g/cm³
(2) SG Yield is calculated as Mass of (SG product/Mass of Feed CG) x 100.

The NMG DVAP testing program results show that the tap density of the SG increases with the increase in shaping time as shown in the Figure 13-10. However, it has also been observed that higher processing times generate more fines. Thus, increasing the tap density of SG reduces the equipment throughput proportionally, thereby resulting in lower SG yield.

The extensive data hereby collected was used as a reference to design the test program performed at the OEM test centres.

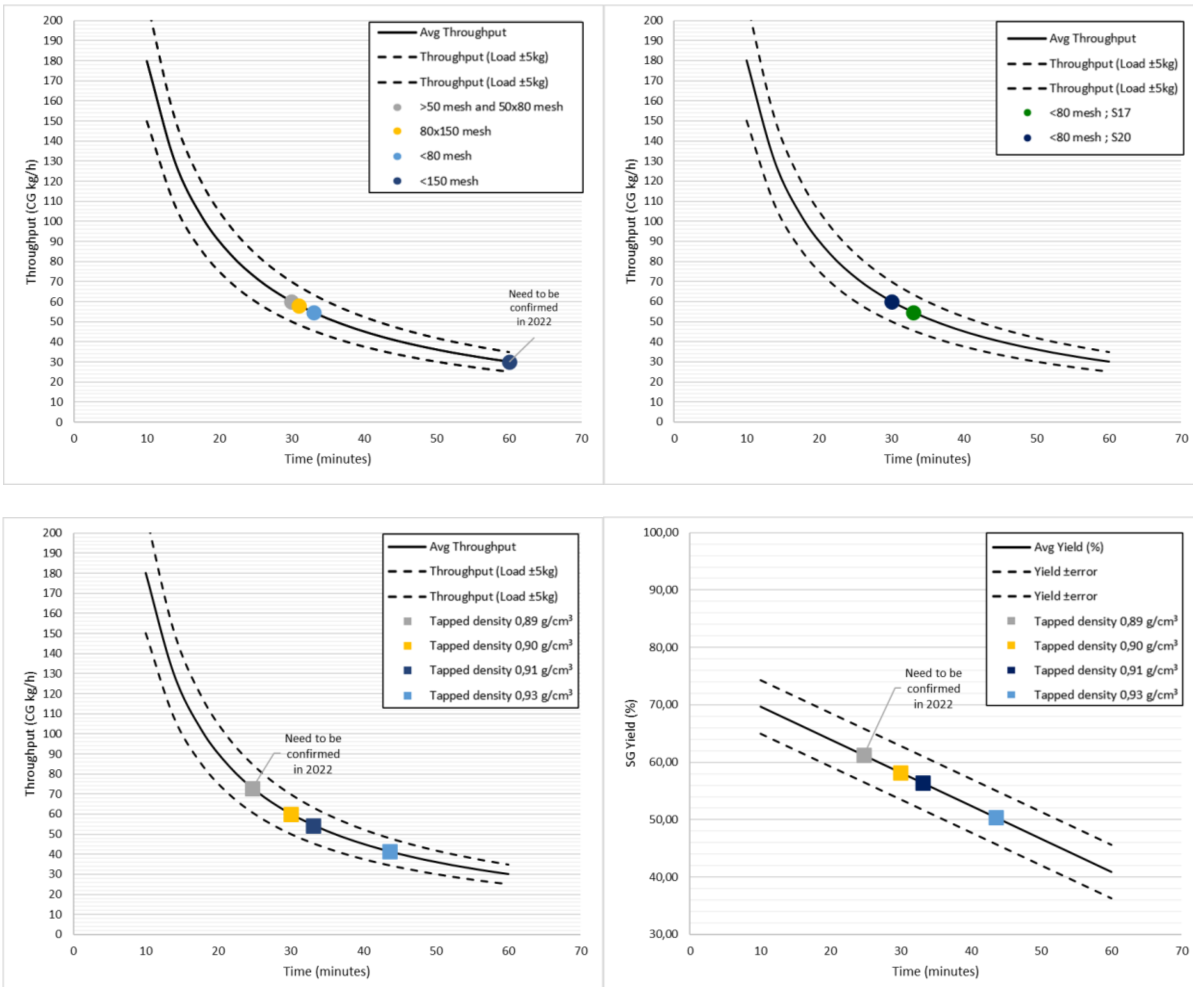


Figure 13-10: NMG DVAP primary spheronization test results summary
A) Equipment throughput for different feed material; B) Effect on throughput for different SG sizing using the same feed material; C) Effect of the shaping time on the SG Tap Density; and D) SG yields vs. tap density

The second extensive test program was performed at the European OEM test centre between 2021 and 2022. The OEM proposed a similar Spheronization Batch process technology with a higher throughput and quality equipment. The primary spheronization testing was performed on a 90 kW unit and over 4 tons of <80 mesh CG was used during these tests. Table 13-13 shows the summary of the best results obtain for three distinct sizes and tap density of SG. The highest throughput was obtained for an S18 with a tap density of 0.89 g/cm³. The yield varies between 55% to 66% and it corresponds to the ratio between the mass of primary SG over the CG feed, expressed in %.

The scale-up calculation was done by the OEM using a maximum power consumption of 80% of the 90 kW shaping disc motor. This throughput value is multiplied by 2.5, which corresponds to the official scale-up between the 90 kW Test Centre unit and the commercial 250 kW spheronizer unit.

Table 13-13: European OEM test centre - Primary SG test results

Primary SG Characteristic and results	Customer Primary SG Specification	S12	S17	S18
Test Identification	-	T1922-5	T2013-32	T2013-38
D90 (µm)	25-35	22.3	31.7	32.0
D50 (µm)	19-20	11.9	16.6	18.0
D10 (µm)	9-12	5.5	7.9	9.11
Tap Density (g/cm^3) (1)	0.85-0.95	0.7	0.90	0.89
SG Yield (%) (2)	-	55	66	58.5
Throughput (kg of CG/h)- 90 kW unit (3)	-	83	87	130
Throughput Scale-Up (kg/h) -250 kW unit (3)	-	207	218	325

Notes:
(1) Performed with 3000 taps (Norm ASTM B527)
(2) SG Yield is calculated as Mass of (SG product/Mass of Feed CG) x 100.
(3) OEM estimate the throughput at +/- 10%

The target tap density value for this primary SG is between 0.85 and 0.95 g/cm^3. In accordance with the results of the test T2013-38, a throughput value of 325 kg/h and a yield of 58.5% is estimated for the 250 kW spheronizer.

A 250 kW unit is set to be installed in the DVAP of NMG in SMDS in 2022. Further tests conducted with this unit will enable further adjustment and optimization of the PSD of primary SG.

The Primary SG can be considered as a "potatoid-shape" particle more than a perfect sphere. The Figure 13-11 show images taken by a scanning electron microscope (SEM) of the SG obtained from the Test 2011-38 performed at the European OEM Test Centre.

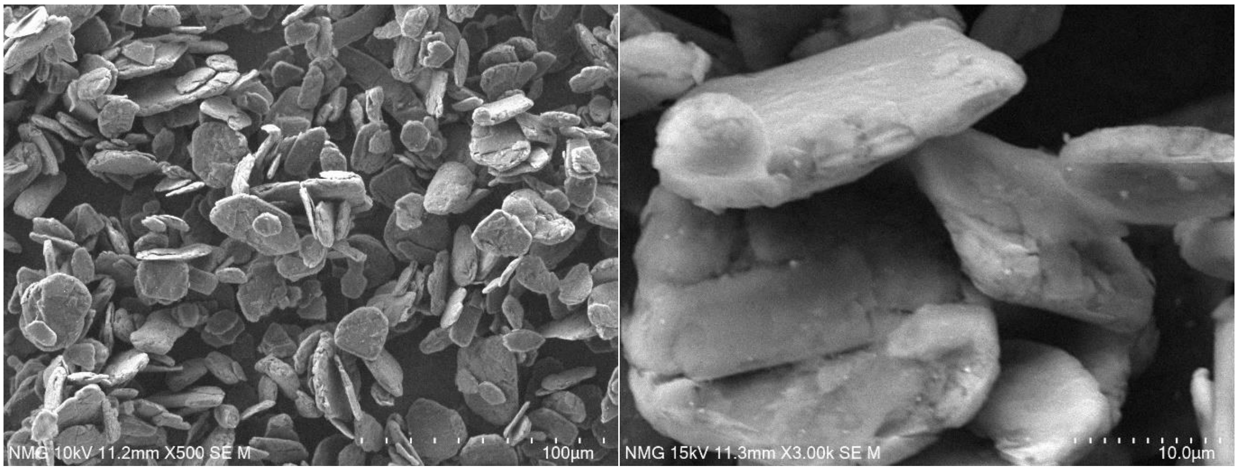


Figure 13-11: Primary spheronical graphite from European OEM (Test 2011-38)

The reject of this process step is designated as Primary Spheronization Fines and have a D50 between 5.6 to 6.8 µm, according to the NMG DVAP Test program. The fines show an average D10 of 2.2 µm and a D90 between 11.3 to 14.1 µm. The average bulk density is 0.216 g/cm³ and the average tap density is 0.329 g/cm³.

13.2.1.6. Secondary Spheronization

Two tests' programs were performed with a European OEM Test Centre and at the NMG DVAP in SMDS to evaluate the Secondary Spheronization Batch process. The main objective of these tests was to create a smaller SG from the finest portion of the micronized graphite and the primary spheronization fines. The best technology for fines' spheronization was identified based on the capability, yield and throughput of both equipment.

A testing program was performed by NMG at its DVAP installation where more than 400 different spherization tests have been processed. The primary spheronization fines were used as a feed stock for the secondary spheronization step. Fines used had a D50 between 5.6 to 6.8 µm and an average tap density of 0.329 g/cm³. The test results showed in the Table 13-14 prove that the original equipment used by NMG in the DVAP can produce a Secondary Spheronization Graphite with a tap density of over 0.75 g/cm³.

The fine graphite particles are harder to spheronize and require more energy to achieve a high tap density. This factor has a direct impact on the throughput of the equipment and a lower average throughput of 20 to 50 kg/m³ is obtained compared to the Primary Spheronization Step. The yield of the Secondary Spheronization is also lower with an average yield of 18% to 31%.

Table 13-14: DVAP Original equipment - Secondary SG characteristics tests results

Secondary SG Characteristic and results	Secondary SG Test #1	Secondary SG Test #2	Secondary SG Test #3
D90 (µm)	13.3	13.0	13.0
D50 (µm)	8.0	8.0	8.1
D10 (µm)	4.8	5.0	5.0
Bulk Density (g/cm³)	0.41	0.45	0.49
Tap Density (g/cm³) (1)	0.69	0.75	0.80
SG Yield (%) (2)	31.6	18.0	20.0
Throughput (kg of CG/h)	50	25	20

Notes:
(1) Performed with 3,000 taps (Norm ASTM B527), precision of +/- 0.03 g/cm³
(2) SG Yield is calculated as Mass of (SG product/Mass of Feed CG) x 100.

NMG DVAP Secondary Spheronization Testing program results show that the tap density of the SG increases with the augmentation of the shaping time as it is shown in Figure 13-12. The yield is directly affected by the PSD of the feed material used and the PSD of the final secondary SG PSD. All this information was used as reference to design the test program performed at the European OEM Test Centres.

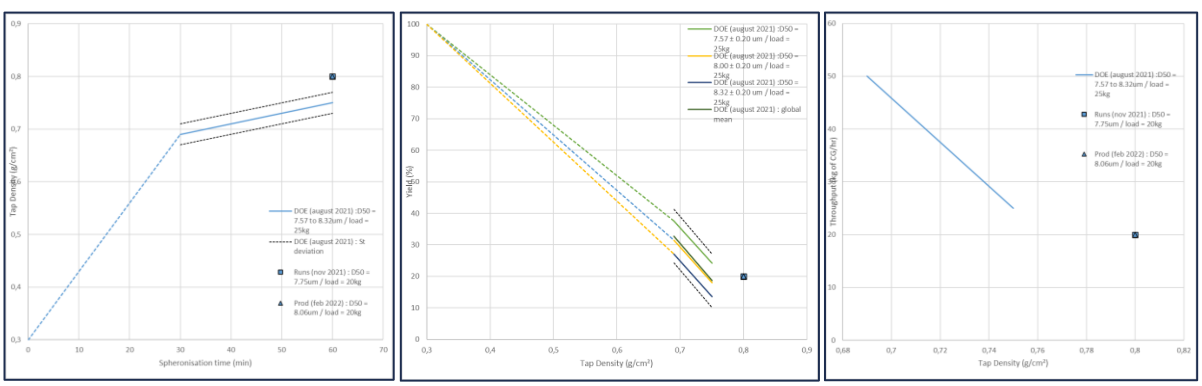


Figure 13-12: NMG DVAP secondary spheronization test results
A) Effect of the shaping time on the SG Tap Density, B) Equipment throughput vs. tap density, and C) SG yield vs. tap density

The second extensive test program was performed at the European OEM Test Centre between 2021 and 2022 on the Secondary Spheronization. The OEM used the same batch process spheronization equipment of 90 kW in three distinct phases of testing.

Table 13-14 shows the summary of the best results obtained for different sizes of SG and their corresponding tap densities. The tap density achieved for the Secondary SG varies between 0.54 to 0.85. The throughput varied between 90 to 210 kg/h for the 250 kW unit. The yield varied between 17 and 60% and this value corresponds to the ratio between the mass of Secondary SG over the Primary Spheronization Fines used as Feed, expressed in %.

The PSD of the feed material used for these tests had a direct impact on the yield and the PSD of the Secondary SG. The D50 of the feed material varies between 5.8 to 9.89 µm.

The scale-up calculation was done by the OEM using a maximum power consumption of 80% of the 90 kW shaping disc motor. This value is multiplied by 2.5, which corresponds to the official scale-up between the 90 kW Test Centre unit and the commercial 250 kW spheronizer unit.

Table 13-15: European OEM test centre - Secondary SG test results

Primary SG Characteristic and results	Customer Secondary SG Specification	T1958-17-19	T1958-32&33	T2013-39	T2013-40	T2013-47	T1922-5
Feed D90 µm	-	11.5	11.5	18.2	18.2	17.4	23.6
Feed D50 µm	-	5.8	5.8	7.6	7.6	7.18	9.89
Feed D10 µm	-	2.2	2.2	2.8	2.8	2.70	2.94
D90 (µm)	15-18	12.4	11.9	17.3	15.0	18.2	22.3
D50 (µm)	9-11	7.6	7.4	8.5	7.8	10.5	11.9
D10 (µm)	>3	4.5	4.4	4.1	3.9	5.6	5.5
Tap Density (g/cm³) (1)	0.65-0.71	0.79	0.85	0.66	0.61	0.66	0.70
SG Yield (%) (2)	-	39.4	30	58.5	58.5	17	60
Throughput (kg of CG/h)-90 kW unit (3)	-	55	36	71	70	84	83
Throughput Scale-Up (kg/h)-250 kW unit (3)	-	137	90	177	175	210	207

Notes:
(1) Performed with 3000 taps (Norm ASTM B527)
(2) SG Yield is calculated as Mass of (SG product/Mass of Feed CG) x 100.
(3) OEM estimate the throughput at +/- 10%

The graphite needs a longer shaping time to achieve a higher tap density value. The Figure 13-13 shows the impact of increasing the tap density that inadvertently decreases the throughput. The target tap density value for this secondary SG is between 0.65 and 0.71 g/cm³. A throughput value for the 250 kW spheronization of 175 kg/h and a yield of 30% is estimated to be achievable on a commercial basis.

A 250 kW unit is set to be installed in the DVAP of NMG in SMDS in 2022. Further tests conducted with this unit will enable further adjustment and optimization of the PSD of primary SG.

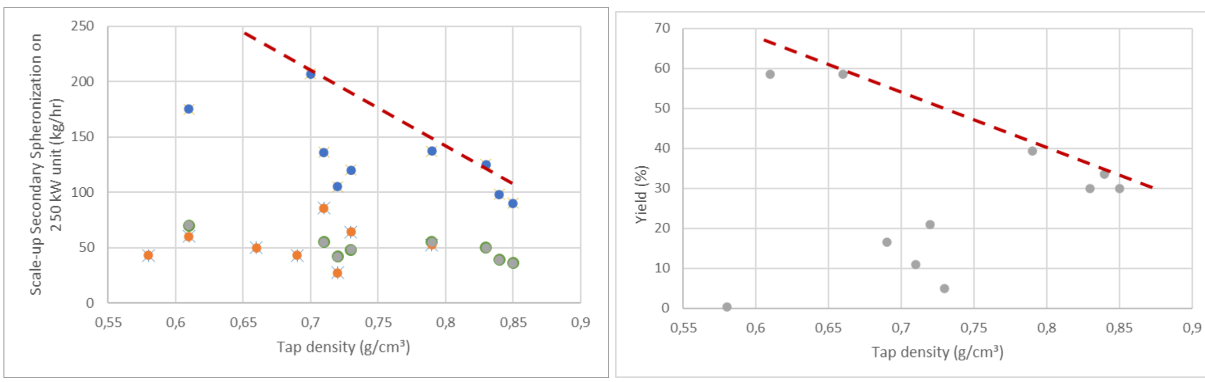


Figure 13-13: European OEM throughput vs. tap density and yield for the secondary spheronization

13.2.1.7. Impurities Balance Sheet

The impurities Balance Sheet was produced by the compilation of the graphite produced at the NMG DVAP in SMDS. The different product analysis values were based on the average results of a minimum of ten representative samples analyses were presented in Table 13-16. The primary spheronization step increases the carbon content of the graphite particle by 0.8% in comparison to CG. The secondary SG shows an average carbon content 1.2% less than the CG. The ultrafines have the lowest carbon content with a reduction of 8.0%, as the impurities were concentrated in the finer particles by the process.

Table 13-16: M/S Sector – Graphite products characteristics

NMG Analysis Results	Feed Graphite - <80 mesh	Primary SG	Secondary SG	Secondary Spheronization Fines	Ultrafine	Granule
D97 (µm)	286	39	16	11	8	-
D90 (µm)	225	31	13	9	6	-
D50 (µm)	108	17	8	5	3	-
D10 (µm)	27	9	5	2	1	-

NMG Analysis Results	Feed Graphite - <80 mesh	Primary SG	Secondary SG	Secondary Spheronization Fines	Ultrafine	Granule
Bulk Density (g/cm³)	0.418	0.584	0.456	0.213	0.136	0.986
Tap Density (g/cm³)(1)	-	0.900	0.752	0.355	0.188	-
Ash % (2)	4.4	3.2	5.1	1.1	11.7	1.08
Carbon Content % (3)	95.4	96.2	94.2	91.0	88.4	95.4
Carbon Content Increase % (4)	-	+0.8	-1.2	-4.4	-8.0	+0.0

Notes:

(1) Performed with 3,000 taps (Norm ASTM B527) LOI – Lost of Ignition at 950 °C.

(2) NMG Analysis performed with an Eltra CS580 Helios.

(3) The Carbon content increase is the difference in C% between the product and the Feed Graphite (<80 mesh);

(4) and can be seen as a partial mechanical purification if the value is positive.

The impurities can be seen with a SEM. Figure 13-14 shows the Primary Spheronization SG product with white rounded particles of similar size to the SG. These impurities were identified as Aluminosilicate (Al_2O_5Si) particles by (SEM-EDS (Energy Dispersive Spectroscopy).

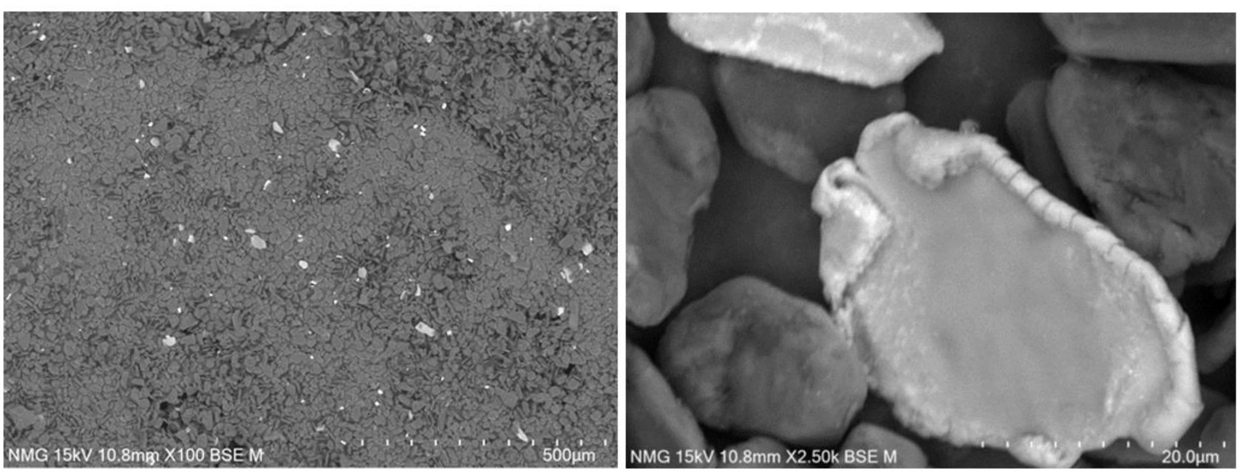


Figure 13-14: Impurties particle inside primary spheronization SG.

13.2.1.8. By-product Valorization

The Secondary Spheronization Fines that are rejected during the last step of Spheronization have a D50 of 5 µm. This product has a low density, lower carbon content and thus lower value. Tests were carried out to evaluate valorization options for the M/S fine by-products. Figure 13-15 shows the flowsheet that was evaluated by the testing program.

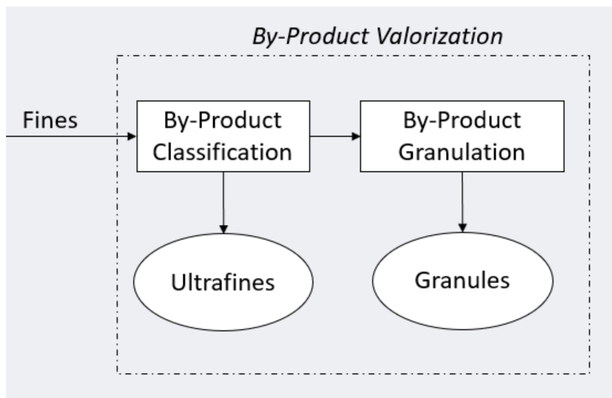


Figure 13-15: Reject valorization flowsheet diagram

13.2.1.9. By-product Classification

Two testing programs have been developed and performed with different OEM to classify these by-products and create an Ultrafine product. The classifying technology tested was the Air classifier that is generally recognized as the most efficient technology in the range of 2 to 30 µm size particles. Table 13-17 shows the result attained by these trials. The OEM #2 can achieve the smallest final product with a D50 of 2.8 µm. The yield of the classifier is directly affected by the PSD of the feed material. Materials with a lower D50 will obtain a higher yield on the classifier step. The test program with the OEM #1 was more extensive and shows the effect on the yield for a coarser product. For the same feed material, the yield increases from 25.5% to 44.4% for fines classifier products with a D50 of 3.6 to 4.4 µm.

The scale-up throughput was confirmed by the OEM #2 based on the tests results and their experience with natural graphite processing. They confirm throughput between 1,400 to 1,800 kg/h for their commercial unit powered by 45 kW air classifier motor. This scale-up calculation was based on a loading factor between 0.2 to 0.25 kg/m³ of airflow, multiplied by the airflow capacity of the commercial unit of 7,200 m³/h.

Table 13-17: Air classifier test result

Parameters	Feed Material Tested	OEM #1	OEM #2
D90 (µm)	12.7-12.9	7.2	5.9
D50 (µm)	5.8-7.1	3.6	2.8
D10 (µm)	2.2-3.3	1.4	1.2
Bulk Density (g/cm³)	0.22	0.150	0.140
Tap Density (g/cm³)	0.33	0.240	0.190
Fines Particle Yield (%)	-	25.5	24.4
Testing Classifier Power (kW)	-	11	0.55
Testing Throughput (kg/h)	-	71.8	4.2

Further testing program with OEMs will continue to optimize the throughout scale-up value and identify other high performance classifying technologies.

13.2.1.10.By-product Granulation

Four different tests programs were performed to agglomerate or densify the classified coarse particles of the fines by-product. The objective was to increase the density of the material and create a new product that can be used as a carbon riser. The best results were achieved by InnoFibre Test Centre based in Trois-Rivières with a 75 kW Annular Matrix Granulator. This equipment has a throughput capacity of 1 to 1.5 ton/h. Robust and stable granules of graphite were obtained by adding 1.5% of Activated Starch binder. The bulk density was increased from 0.213 to 0.986 g/cm³.

The granule needs to be dried at the end of the process to acquire the final resistance needed. Testing was done with drying temperatures ranging from ambient air up to 105 °C and the results showed a 13% increase in the durability of the granules. The ambient air drying achieved moisture levels at 0.6% and the drying process at 105°C, a value of 0.2% residual moisture. The optimal tests result shows a durability of 70% for granules generated with 1.5% of binder and a drying step at 105°C. The durability test is performed by rotating 500 g of granules inside a 300x300x125 mm box, at 50 rpm for 10 minutes. Durability represents the fraction of granules greater than 3 mm remaining in comparison to the mass of granules introduced.

Figure 13-16 shows the granules generated at the InnoFibre Test Centre. The particle size distribution of the final product can be adjusted with the granulator and a screening step may be required to reduce the fines. In this case, the fines can be reprocessed by the granulator.

Figure 13-16: Granule of by-product classification coarse particle with activated starch binder

Further testing programs will continue to evaluate the plan matrix granulator configuration and optimize the binder ratio and selection.

13.2.2. Purification

The purification method used by NMG to produce battery-grade graphite above 99.95% carbon is a carbochlorination process where metal oxides are converted into their corresponding metal chlorides in the presence of carbon and chlorine gas. The advantages of this technology being a lower reaction temperature as opposed to the conventional thermal process and the absence of hazardous wastes such as fluorides, compared to the chemical process.

A similar process has been used in the past to produce ultrapure graphite for the nuclear industry but at a non-economical cost for the battery industry. A key improvement of the NMG process is the custom designed furnace which enables treatment of high volumes of graphite and fast turnaround in a batch-mode process. The NMG furnace is a combination of lengthwise graphitization (LWG) and Acheson furnaces used in the production of synthetic graphite.

Bench-scale test work conducted at two external laboratories has demonstrated that the target purity can be obtained using carbochlorination and a demonstration plant has been built inside electrolysis hall #1 at the Olin facility in Bécancour to demonstrate this on a semi-commercial scale. The Project charter and the operating permit allows the production of 250 t/y of purified graphite at 99.95% at Olin. However, the demonstration plant has been designed with the goal to demonstrate a capacity of 2,000 tpy and minimize scale-up risk prior to commercial operation.

Pre-operational verifications (POV) began in June 2021 and the transformer-rectifier unit was put in service on July 17, 2021. POV of furnace #1 was done starting on July 22, and furnace #2 starting on October 28. A total of 20 cycles were completed as of June 8, 2022, one every 15 days on average.

13.2.2.1. Historical Test Work

Laboratory test work was conducted to evaluate high temperature carbochlorination to establish the ability to purify graphite concentrate using chlorine in a small-scale controlled environment. The main goal of this work was to test the effects of chlorine dosage, temperature, and residence time (chlorine injection rate) on purification and to determine the optimal conditions to reach the desired purity. The first tests were realized by Lab A in 2016 and the second series of tests was performed by Lab B in 2017 - 2018. The results presented in Table 13-18 confirmed that the targeted purity of 99.95% was achievable under various conditions.

Table 13-18: Historical laboratory carbochlorination test work results

Year	Laboratory	LOI feed (%)	Test	Cl_2 Stoechiometric feed ratio	Temperature	LOI Product (%)
2016	Lab A	98.69	1	High	Low	99.332
			2	High	High	99.974
			3	High	Low	99.902
			4	High	Medium	99.934
			5	High	Medium	99.929
			7	High	Medium	99.965
			8	High	Medium	99.98
			9	Very high	Low	99.757
			10	Very high	Medium	99.970
			11	Medium	High	99.837
			12	High	Medium	99.973
2017-2018	Lab B	98.49	1	High	High	99.96
			2	Medium	High	99.94
			3	Low	High	99.33

13.2.2.2. Lab Test Work

For the current study, a series of tests was undertaken by Lab A to refine the hypothesis regarding the optimal conditions of carbochlorination. The results obtained are presented in Table 13-19.

Table 13-19: Study carbochlorination test work results

Year	Test works by	LOI feed (%)	Test	Cl_2 Stoechiometric feed ratio	Temperature	LOI Product (%)
2022	Lab A	97.478	1	Low	High	99.126
			2	Low	High	98.787
			3	Low	High	98.971
			4	Low	Medium	98.807
			5	Low	Medium	98.378
			6	High	Medium	99.975

Following a series of unsuccessful tests, the optimal conditions of the 2016 tests were repeated and once again, the target purity of 99.95% was achieved. Due to equipment failure, the test program to continue optimization of treatment temperature, chloride dosage and feed rate was put on hold.

13.2.2.3. Demonstration Plant

An occupancy and service agreement was reached with Olin in October 2020 for the installation and operation of NMG's graphite purification plant in the electrolysis hall #1 of the Olin facility in Bécancour. Following this, site preparation began in January 2021. Key equipment components for the plant were delivered in the months of March and April, whose installation began in May and the pre-operational verification commenced in June 2021. Subsequently, dry and wet test runs of the gas treatment system were performed along with the POV of the transformer rectifier system. The complete system was powered on July 17, 2021.

To accelerate the testing of different configurations and materials, each leg of the furnace was operated independently for the duration of the demonstration phase and identified as furnaces #1 and #2. A total of 20 cycles have been completed between July 22, 2021, and June 8, 2022, at a pace of approximately one every two weeks.

Cycles #1 to #3 of Furnace #1: July 22-August 11, 2021

POV of furnace #1 began on July 22 and consisted of three different cycles ending on August 11. The furnace was tested at different temperatures and cycle duration to confirm electrical and thermal parameters. It was demonstrated that close to 20 t of graphite could be heated at the target rate and could reach the target temperature.

Cycles #4 to #6 of Furnace #1: September 15-October 19,2021

Thermal purification at high temperature, similar to synthetic graphite production, was tested to demonstrate the potential of the furnace to operate at those temperatures and the purity level that can be achieved with natural graphite in flake or spheronized form. A total of 500 kg of purified flake graphite was produced with a purity of ≥ 99.95%. Testing of different furnace configurations and insulating media was also done during this timeframe.

Cycles #7, Furnace #2: October 28-29, 2021

POV of furnace #2 was done to confirm the electrical and thermal parameters and to compare different configurations with furnace #1. Target heating rate and temperature was confirmed.

Cycles #8 and #9, Furnace #2: November 9-November 24,2021

POV of chlorine injection and first test of carbochlorination in small quantities demonstrated the safety of the system. The effectiveness of chlorine even at small quantities and low temperatures to remove impurities was demonstrated with samples reaching 99.2% to 99.9% purity.

Cycles #10 to #13, Furnace #2: December 6-February 2, 2022

Chlorine injection in different quantities and temperatures was tested and purity levels above 99.95%, and up to 99.99% were obtained for more than 50% of the samples. Tests at different temperatures also enabled impurity levels to be lowered to within the target specifications for 16 of 25 samples in Cycle #12. Cycle #13 was interrupted due to an equipment failure and not sampled. After 13 cycles, 10 had been operated successfully and only three interrupted, due to equipment or mechanical failure.

Cycles #14, furnace #2: February 16-17, 2022

POV of the chlorine vaporizer was executed successfully and this was the first cycle where a larger quantity of chlorine could be injected. A third of the samples reached purity level above 99.95%.

Cycles #15 to #17, Furnace #1: March 9-April 15, 2022

With a larger quantity of chlorine now available, carbochlorination was done in furnace #1 with a larger size configuration and a higher graphite quantity. These three cycles were not successful for a variety of reasons but enabled NMG to test different diffusion mechanisms for the larger quantity of graphite being treated. Three samples reached 99.95% purity in Cycle #17. After Cycle #17 on furnace #1, this furnace was shut down and emptied for full inspection of all components and collect as much data as possible for the design of the commercial furnaces. No major issues have been detected to date, with work still ongoing during furnace #2 operation. The furnace will be restarted in July 2022 incorporating the improvement opportunities identified so far.

Cycles #18-#19-#20 of Furnace #2: April 20-June 8, 2022

The process limits of purification were tested in these runs. It has been observed that the diffusion of chlorine improved with each cycle.

NMG's objective is to improve consistency of the results within a cycle and obtain 100% conformity (material in-grade). To date, hundreds of kilograms of in-grade material has been produced. However, the degree of purity in different areas of the furnace needs to be improved. Three zones in the furnace are defined according to location, and whether the conditions required for purification are achieved or not.

It has been demonstrated that the furnace can be heated at the required rate and that the graphite can be collected rapidly to reach the target turnaround cycle time with the current operating parameters. The optimization process is currently ongoing to improve the yield and robustness of the process to handle a variety of natural graphite to be purified (flakes or spheronized and of different sizes). The optimization process will allow NMG to finalize the process design criteria for the detail engineering of the purification process.

13.2.2.4. Assay Characteristics

The purification process highly depends on the feed characteristics and on the nature of the impurities. In order to develop a better understanding of the material, samples were taken and analyzed to establish the assay characteristics of the DVAP purification feed. Graphite concentrate samples were taken at the production facility in SMDS, and samples of primary SG and secondary SG were sourced from the NMG DVAP Spheronization Batch process in Saint-Michel-des-Saints.

According to the average results presented in Table 13-20, it was shown that Primary SG has a higher carbon grade than secondary SG as impurities tend to concentrate in finer size fractions. Therefore, the purification operating conditions can be adjusted and optimized for both products.

According to this test work, it was established that the major sources of impurities are silica, aluminum, iron, sulphur, magnesium, calcium, and potassium. Theses impurities, forming chlorine complexes during carbochlorination, are either collected in their gaseous form, or vaporized and condensed in the surface layer of the insulating media due to the high temperature gradient in the furnace.

Table 13-20 : Average assay characteristics of DVAP purification feed

Element	Units	CG	Primary SG	Secondary SG
%C	%	95.4	96.2	94.2
%S	%	0.72	0.41	0.79
%LOI	% ash	4.4	3.2	5.1
Si	ppm	5,210	5,722	8,127
Al	ppm	2,650	3,133	4,607
Fe	ppm	6,688	4,242	9,679
Mg	ppm	252	323	395
Ca	ppm	499	247	455
Ti	ppm	74	101	97
K	ppm	1,040	1,185	1,199
Mo	ppm	137	59	281
Ba	ppm	5	5	7
Bi	ppm	5	5	7
Co	ppm	3	2	5
Cu	ppm	51	31	167
Mn	ppm	193	216	194
Na	ppm	83	69	87
Ni	ppm	99	87	109
P	ppm	40	25	44
Pb	ppm	1	1	2
Sn	ppm	4	4	7
V	ppm	16	23	29
W	ppm	17	15	28
Zn	ppm	39	29	50
Zr	ppm	20	16	21

13.2.2.5. Methodology of Data Analysis and Processing

Grab samples of 500 g to 10 kg are collected by shovel from different locations in the furnace after processing. The samples are identified by cycle number and location. The samples are then subsampled and analyzed for loss on ignition (LOI), sulphur (LECO), and elemental composition using LOI ash, melted and analyzed by ICP-OE at the NMG laboratory. Some mineralogical characterization was performed through testing of samples from different locations to identify the species present.

From Cycle 12 onwards, the starting material was also sampled and analyzed by the same method, allowing the removal of impurities to be assessed.

13.2.2.6. Interpretation of Results and Discussion

At the time of writing of this report, results up to Cycle 20 were available and work is ongoing to improve the uniformity of the purification process. The last three cycles (18, 19 and 20) were run with a scale factor of approximately at 1/10th of the commercial target capacity, and the results of Cycle 20 are detailed in this section. At the end of the treatment, grab samples were collected at regular intervals. These intervals are located in one of the three zones defined as 1, 2 and 3, which are classified according to an increasing difficulty to achieve adequate purification conditions. It should be noted that there are more sampling points at regular intervals in Zones 1 and 2 than in Zone 3. It is thought that the efficiency of impurity removal is highly dependent on the ease of diffusion of Cl_2 to those areas.

Table 13-21: LOI results and elemental assays for products Cycle 20

Cycle and zone	Number of sampling points	LOI			Average impurity assay			
		Min	Max	Avg	Fe (ppm)	Al (ppm)	Si (ppm)	S (ppm)
Zone 1	12	99.96%	100.0%	99.98%	<5	<5	28	<50
Zone 2	10	99.91%	100.0%	99.97%	<5	<5	47	<50
Zone 3	2	97.99%	99.45%	98.72%	18	366	1,685	<50

The removal of impurities is highest in zones with the best Cl_2 diffusion: Zone 1 being the best, with 98% to 100% removal during Cycle 20 and Zone 3 being the worst, with 5% to 74% removal in the same cycle. Table 13-21 shows the purity and grades of major impurities obtained after the treatment.

The samples from Zone 1 consistently present a high purify. Zone 2 shows good results but with more variability, and less reliable purification performance. Zone 3 needs improvement and the chlorine dispersion uniformity is a parameter that is currently being investigated.

13.2.2.7. Conclusion

Historical and recent lab scale testing demonstrated that with the adequate temperature, residence time and chlorine addition, NMG's spherical graphite can be successfully purified to 99.95% LOI through carbochlorination.

The demonstration plant was built and successfully commissioned in 2021. A total of 20 cycles were completed as of June 8, 2022, one every 15 days on average. The last two cycles were operated at a scale factor of 1/10 compared to the commercial target and purification was achieved in many parts of the furnace. Work is ongoing to improve homogeneity of the process and the uniformity of the chlorine distribution.

At the lab scale, the carbochlorination conditions can be further optimized to improve the capacity and environmental impact of the process. The process also needs to be tested on finer products.

The furnace installed at Bécancour allows NMG to significantly reduce the risk related to the scaling-up of an innovative process. Once at full capacity, the demonstration scale-up factor will be close to ½ of the commercial target. Ongoing work on chlorine injection method as well as some other design adjustments should allow optimization of the NMG furnace design resulting in the implementation of a low risk and robust purification process.

An extensive testing program is currently being conducted to develop processes that will allow to characterize, reuse, and valorize the residues collected during the purification process.

13.2.3. Coating

The coating process of NMG's spheronized and purified graphite, is the last important step in upgrading graphite to qualify the product for optimum economic performance in the anode materials for the li-ion battery sector. This step consists of the application of a nanometric layer of amorphous carbon on the surface of spheronized and purified graphite (SPG), to enhance the rate of performance sought by the Li-Ion battery manufacturers.

This coating process is carried out in several stages starting with the micronization of solid carbon precursor which is mixed with the spheronized graphite in a specific dosage. This uniform mixture is then heated in successive stages inside a furnace or in a high temperature reactor for the pyrolysis of the pitch on the surface of the graphite which is then calcined to obtain an amorphous carbon on the surface. Deglomeration and sieving steps are then carried out to obtain the particle size required by the various customers.

To establish the proper technology, precursor and prove the coating concept, NMG performed different studies and tests in independent laboratory and at supplier's test facility. Most technology thereby chosen by NMG being widely used in the industry, further tests were performed intended to establish the right proportions and process parameters.

In the first stage, to determine the required process conditions and type of precursor needed for amorphic carbon coating, multiple laboratory tests were performed at the Canadian National Research Council (CNRC) based on literature reviews and experience from consulted experts. These trials were then evaluated, with electro-chemical tests in half coin cell, to establish the baseline of the process conditions for the following steps.

The base line conditions were then tested at a pilot scale performed at suppliers' facility. The material was subsequently evaluated to confirm the results obtained in the laboratory.

This became the baseline for the construction of the Phase 1 Battery Material Plant project, a 2,000 tpy coating line in SMDS that will be used to optimize the process conditions.

13.2.3.1. Laboratory Test at CNRC

The laboratory tests proved the concept of coating the NMG spheronized purified graphite (SPG) with a solid carbon precursor and established the baseline parameters needed for the coating process to achieve the material properties needed for the Li-ion battery quality.

Table 13-22 indicates the parameters that were tested.

Table 13-22: Tested parameters related to coating

Parameters	Level
Precursor material	Coal base / Petroleum base
Type	Low, Medium, high SPM
Proportion	Low, mid to high %
Particle's size	Fine to coarse (um)
Pyrolysis heating rate	Slow to rapid C/h
pyrolysis condition	Agitated/fixed

The different tests were evaluated based on X-Ray Diffraction Analysis, Specific surface (BET) process yield, half-cell coulombic efficiency and reversible capacity results.

Pyrolysis Calcining Heating Ramp Evaluation

Objective

Determine the possible coating heat treatment rate and evaluate the possible impact of the heating ramp on the quality of the coating. This will also determine the possible throughput of the pyrolysis-calcining equipment.

To realize this objective, two heating ramp configurations were tested for the thermal treatment – a fast ramp and a slow ramp, to determine their impact on the quality of coating achieved.

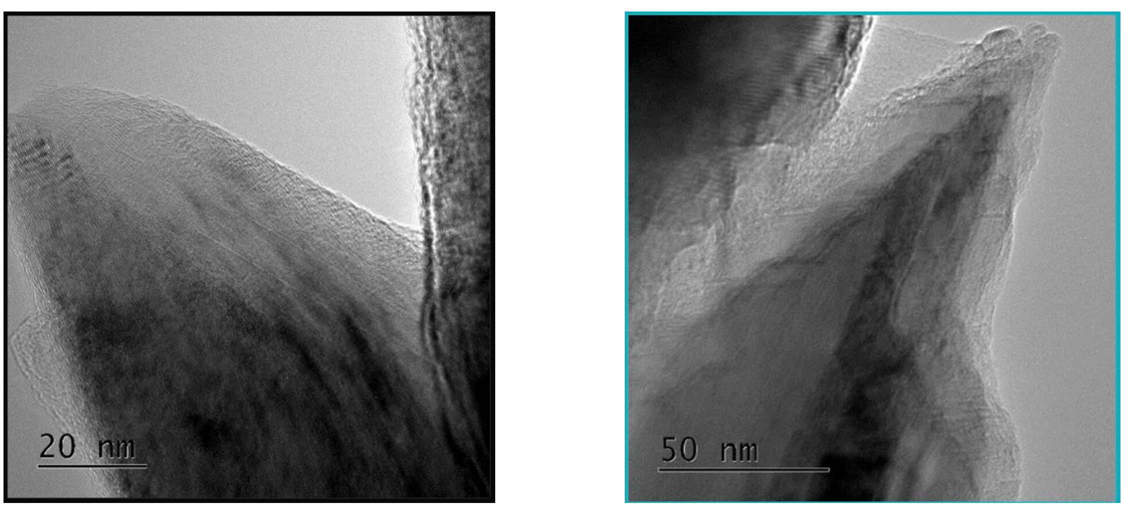
Test Characteristics

A fast, and a slow thermal treatment was performed. From 300 °C to 1,000 °C

- Slow rate: A °C/h
- Fast Rate: B °C/h

Results

Evaluation did not show any signs of pores or mesophase formation at the slow ramp of A °C/h or the fast rate of B °C/h. The amorphic carbon coating morphology is not influenced by heating profile and in both cases, remain continuous and at around 10 ηm thickness as shown in the TEM (Transmission Electron Microscope) evaluation.



Slow °C/h

Fast °C/h

Figure 13-17: Amorphic carbon coating morphology at different heating profile

The DRX results (X-RAY diffraction) showed that the crystallinity of the graphite was not affected by the different thermal profile.

The specific surface area (BET) after coating was not influenced by the heating rate and the electrochemical performance was the same in both cases and comparable to the commercial anodes reference material.

Table 13-23: BET versus half-cell results

Test	BET (m^2/g)	1st charge (mAh/g)	1stdischarge (mAh/g)	Initial Coulombic Efficiency ICE
Commercial SPGPT 803	3,43	385	352	91,3
NMG not coated	6,4	380	240	89,3
Slow thermal rate	2,12	390	253	90,6
Fast Thermal rate	1,93	392	356	90,9

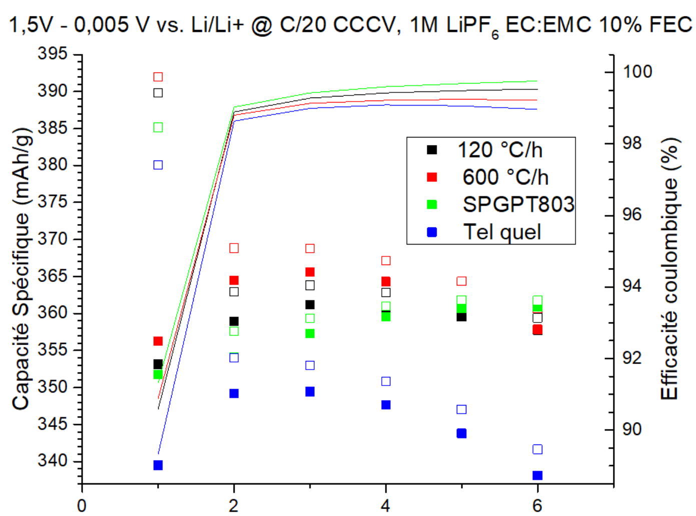


Figure 13-18: Specific capacity and coulombic efficiency versus number of cycles

Conclusion

At both extremes, the heating rate for the pyrolysis and calcination had no impact on the test results. Commercial heating would be in the 150°C/h with possible up-heat of 300°C/h. This is within the test parameters and show that the effect should be negligible on the quality of the amorphic carbon and leave room for optimization of the coating pyrolysis-calcination process.

SPG/Precursor Ratio

Objective

Validate the precursor/SPG ratio to obtain the BET specification of maximum 2.0 m^2/g and verify the impact on possible particle's agglomeration.

Test Characteristics

Weight ratio: low, mid, high % precursor/mixed SPG.

Results

- The increase of the precursor ratio lowers the BET, other parameters being constant.
- High SP precursor gives lower BET.
- Low SP Precursor can yield BET bellow 2.0 but higher ration need
- A low precursor concentration, it's not sufficient to achieve the 2.0 m^2/g.

In the case of using a high % precursor in the mix, after the heat treatment, microscopic analysis showed carbonized mesophase beads on the surface of the graphite that may indicate an over saturation of the graphite.

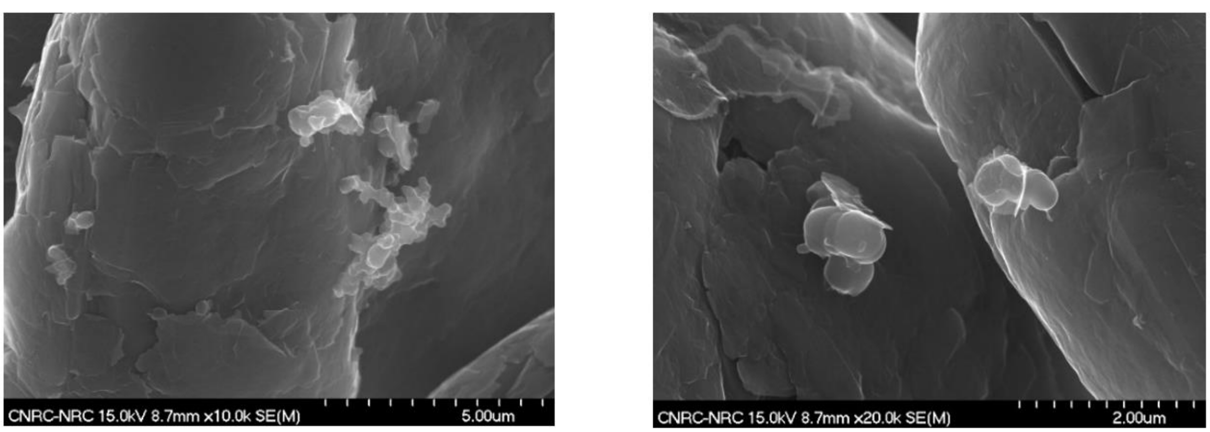


Figure 13-19: Carbonized mesophase beads on the surface of the graphite

Table 13-24 shows the combination of precursor type and concentration (%) that results in a BET surface area.

Table 13-24: Precursor type versus specific surface

Test#	Precursor type	% Precursor	Precursor milling size	Specific Surface BET (m²/g)
SPG (NMG)		0	---	6.4
1	High SP	low	Corse	3,14
2	High SP	mid	Corse	1.86
3	High SP	high	Corse	1.40
5	Low SP	low	Corse	3.55
7	Low SP	mid	Corse	2.49
8	Low SP	high	Corse	1.62

Impact of Precursor Softening Point on the Coating Efficiency

Objective

Different precursor types can be used to achieve an amorphous carbon layer on the surface of the SPG. A high carbon content is preferable, and a high-softening point (SP) is needed in order to do a solid mixing prior to the pyrolysis-calcination process.

Test Characteristics

For the test, two types of precursors presently in use by the industry, were chosen. A mid and a high °C SP were compared.

Results

A lower softening point precursor yields a higher BET, increasing it from 13 to 33%, while other parameters are kept constant. Thus, at lower SP, a BET below 2.0 m²/g can only be achieved using a higher precursor ratio. This was expected, as the lower the SP, the lower the carbon content.

Table 13-25: Precursor type and ratio versus specific surface

Test#	Precursor type	Precursor ratio	Specific Surface BET (m²/g)
SPG (none coated material)		0	6.4
1	High SP	low	3,14
2	Low SP	low	3,55
3	High SP	mid	1,86
4	Low SP	mid	2,49
5	High SP	high	1,4
6	Low SP	high	1,62

Most importantly, with the same mix ratio, the higher SP gives better electrochemical properties in the half-cell evaluation.

Table 13-26: BET versus ICE

Test	BET (m²/g)	1st Charge	1st Discharge	ICE
High SP + coarse + mid%	1,86	394	359	91,1
Low SP + coarse + mid%	2,49	368	334	90,8

Impact of the Solid Precursor Sizing

Objective

To have a uniform coating on the surface of the SPG, it's important to understand the impact of the sizing distribution of the milled precursor. This will give the information on the type of equipment needed to mill the material and evaluate the potential impact on the quality of the final products.

Test Characteristics

The precursor was milled as shown at a fine, and coarse particle sizing for the tests.

The blended materials were then put to a rotary pyrolysis equipment and heated up to 1,000°C

Figure 13-20: Rotary pyrolysis equipment

Results

First observation of the final product showed a significant number of agglomerated particles. It seems that part of the precursor acts as a binder, linking the graphite particles instead of creating a surface coating. Furthermore, the rotation creates a "snowball effect" creating these agglomerates.

As show in the Table 13-27 and Figure 13-21 the agglomerates are relatively important from 6 to 15% to both, fine and coarse milled precursor, and it's not possible to draw a definitive conclusion.

Table 13-27: Percentage of agglomerates in the milled precursor

Tests	Pre-pyrolysis weight (g)	% Agglomerates
Coarse milled low %	200.2	6.00%
Coarse milled mid %	200.04	7.70%
Coarse milled high %	200.15	8.80%
Fine milled mid%	200.01	15.00%
Fine milled high%	199.94	9.90%

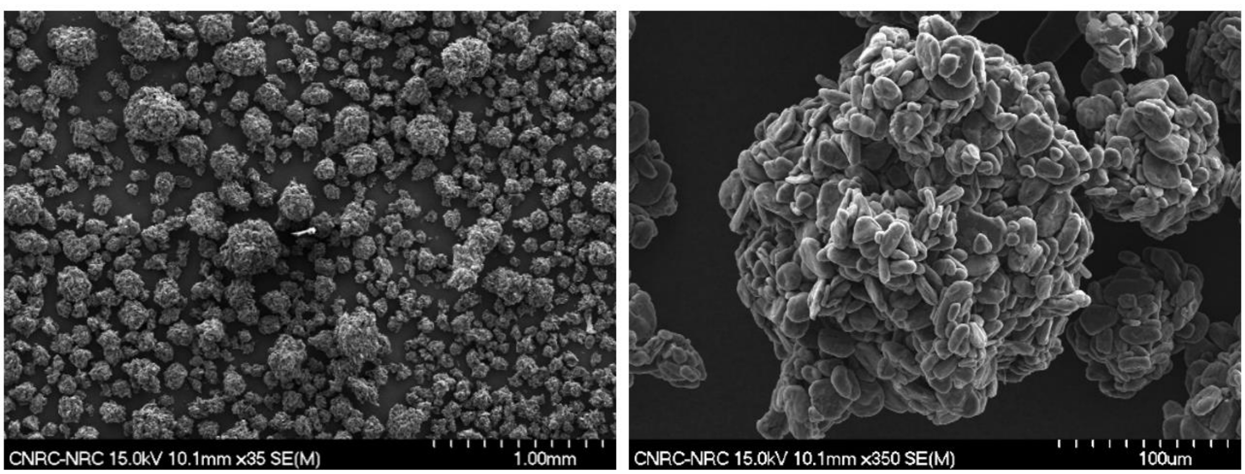


Figure 13-21: Agglomerates in milled precursor

Impact of Rotation/Agitation During Pyrolysis with Different Precursor Particles Sizing

Objective

As shown previously, the rotation during the pyrolysis & calcination process creates a significant number of agglomerates. To reduce the agglomeration potentially caused by a "snowball effect", pyrolysis tests were performed with the powder in a fixed bed. Also, since the precursor may impact the results, both fine and coarsely milled precursors were used to evaluate the difference.

Test Characteristics

- Same precursor/SPG ratio: mid-level;
- Same precursor type: High SP;
- Same temperature profile;
- Half of the test with fine precursor, half with coarse.

Results

When a mixture of SPG and finely micronized precursor were pyrolyzed and calcined with the powder in a fixed bed (instead of using a rotary kiln), a significant reduction in agglomeration was observed. This is demonstrated by the results tabulated in Table 13-28

Furthermore, it is also shown that coarsely milled precursor leads to the formation of more agglomerates, regardless of the pyrolysis condition since the large particles tend to act as a core for agglomeration. Thus, a portion of the coarse precursor acts as a binder as opposed to coating the surface of the SPG.

Clearly, the interaction between the precursor size and the type of pyrolysis, agitated (rotation) or fixed, is important. To effectively minimize the agglomerates in the final product, it is essential to use fine precursor particles and perform the heat treatment in a fixed bed (i.e., in crucibles).

Table 13-28: Precursor and pyrolysis types versus net yield

Test	Pre-pyrolysis weight (g)	Sieved weight 45 µm (g)	% Agglomerate	Net Yield
Fine milled Rotating	200,01	176,1	15,00%	85%
Coarse milled Rotating	250	209,7	11,80%	88%
Coarse milled Fixed	250	230,7	14,00%	86%
Fine milled Fixed	232,9	218,8	2,30%	98%
Fine milled Fixed (repeat)	129,4	122,6	1,40%	99%

These different final products were sieved to remove the agglomerates and subsequently tested in half coin cells to evaluate their electro-chemical properties.

With the accuracy of a half-coin cell, it can be said that the low SP and the high precursor ratio seems to yield lower performance. All the others have similar performance and are comparable to the commercial material SGSPT803 as indicated in Table 13-29.

Table 13-29: BET versus ICE

Test	BET (m^2/g)	1st Charge	1st Discharge	ICE
Coarse milled mid %	1,86	394	359	91,1
Coarse milled high%	1,40	387	349	90,2
Fine milled mid%	3,03	394	357	90,5
Fine milled high%	1,61	388	353	91,1
Mid SP, Coarse milled mid %	2,49	368	334	90,8
Coarse milled mid%	1,62	396	362	91,42
Coarse milled mid% fixed	2,05	395	361	91,34
Fine milled Mid %	1,71	401	366	91,26
SPGPT803	3,43	392	357	91,07

As the amount of agglomerates is substantial in some cases and cannot be neglected, they were milled down to nominal sizes and then assessed in half-cells. This demonstrated an increase in the specific surface area (BET) and a lower reversible capacity and initial coulombic efficiency. It is, therefore, important to limit the agglomeration during pyrolysis as shown in Table 13-30

Table 13-30: Effect of deagglomeration on BET versus ICE

Test	BET (m^2/g)	1st Charge	1st Discharge	ICE (%)
De-agglomeration with Jet Mill	3,06 / 3,02	372	325	87,36

Evaluation of Alternate Sources of Precursor

Objective

Validate that with the same baseline parameters described in Table 13-31, other sources of precursors can be used with similar results.

Test Characteristics

Precursor material from two Chinese suppliers known in the industry were chosen. One from the petroleum base and the other from coal tar base, each supplying low, medium, and high SP. All precursors were processed with the same baseline:

- Fine milled precursor;
- Medium mix ratio;
- Fixed bed pyrolysis;
- A slow heating ramp up.

Results

The specific surface seems to decrease as the SP increases.

The type of precursor does not seem to affect the agglomeration of the final product.

No difference on the morphology of the coating were noticed by the BEM or TEM analysis.

The electrochemical characteristics in half-cell coin are not affected by the type of precursor, as shown in Table 13-31. The low SP precursors were problematic to mill and could cause issue on a commercial scale-up

Overall, different types and sources of the precursor can be used, as long as the properties remain equivalent.

The electro-chemical properties are similar and within the levels of the commercial material, in all cases. The BET of certain materials is slightly higher than required but with some minor adjustments, this can be corrected.

These results prove that the base line process parameters are sturdy enough to yield good results from different sources or types of precursors.

Table 13-31: BET versus ICE

Test	BET (m^2/g)	1 st Charge	1st Discharge	ICE (%)
Precursor A low SP	2,334	412	378	91,75
Precursor A medium SP	2,186	412	373	90,53
Precursor A high SP	2,007	412	372	90,29
Precursor B low SP	2,036	402	367	91,29
Precursor B medium SP	2,094	408	369	90,44
Precursor B high SP	1,899	396	362	91,41
NMG Base precursor medium SP	1,71	401	366	91,26
SPGPT803	3,43	392	357	91,07

Final CNRC Trial Summary

From all the different tests and validation done at the CNRC laboratory, we could identify the proper operating conditions, parameters, precursor type and specifications to achieve the electro-chemical properties necessary for the Li-ion anode material. Many NMG samples tested equal or slightly better than the commercial material used as comparison.

These baselines were used to characterize parameters of the equipment needed for the Phases 1 and 2 Battery Material Plant.

Conclusion

From all the tests performed in a laboratory scale in CNRC, we could determine the base line process parameters to achieve equal or better performance in a commercial coated anode material.

The base line parameters are:

- Pyrolysis/calcining rate up to 600°C/h between 300°C and 1,000°C can be used;
- The higher SP precursor is preferable for the quality of the product;
- Fixed bed pyrolysis/calcining is significantly reducing the agglomeration in the final product;
- Fine milled precursor particles are essential to achieve low agglomeration;
- Reclaimed agglomerates from the pyrolysis process are observed to have lower electrochemical properties as opposed to well-coated particles.

13.2.3.2. Pilot and Equipment Testing

From the base line parameters developed in the laboratory study, key equipment were tested in pilot plant to ensure that the supplier proposed technology could respond to the requested criteria and allowed NMG to correctly identify the capability and capacity of each. This would allow NMG to determine the size and quantity of the equipment needed for the Phase 2 Bécancour Battery Material Plant.

Precursor Milling Equipment (Suppliers 1 & 2)

As evaluated in the laboratory test, the milled precursor sizing is very important to achieve proper coating.

Two types of milling equipment were tested, to achieve a defined size distribution as shown in Figure 13-22 and Figure 13-23.

In both cases, the two types of milling equipment achieved the required sizing distribution, and similar distribution. The decision of the technology to use will then be determined based on economical reasons, efficiency, maintenance requirements.

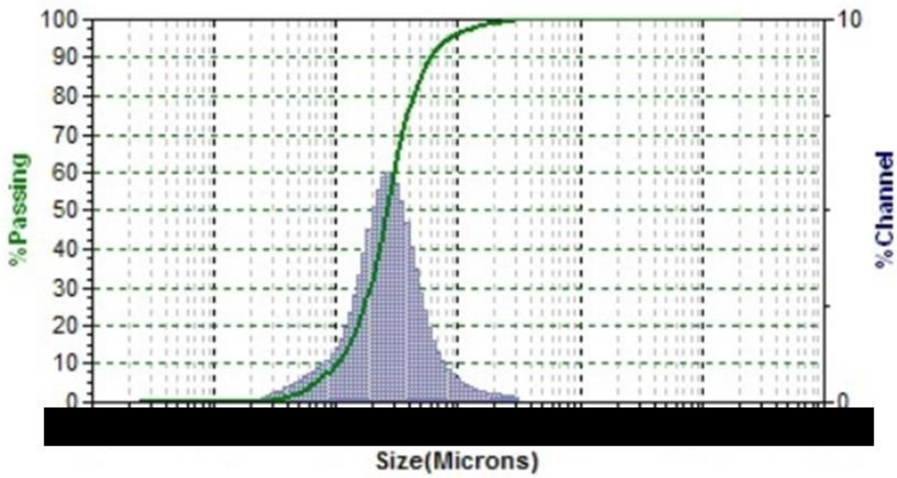


Figure 13-22: Size distribution with milling Equipment A/ Supplier 1

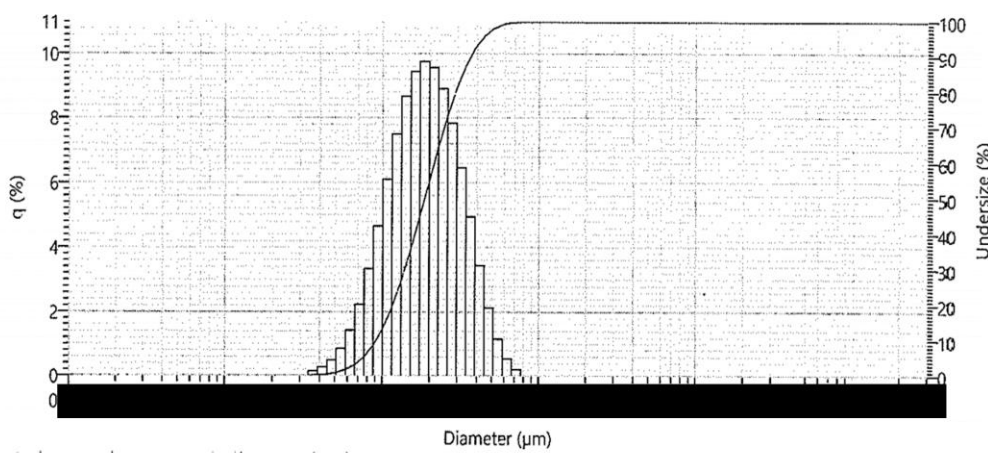


Figure 13-23: Size distribution with milling Equipment B/ Supplier 2

Pyrolysis & Calcination Kiln (Supplier 3)

The laboratory testing clearly demonstrated the importance of having a kiln capable of doing the pyrolysis & calcination in a fixed bed, to avoid agglomeration of the graphite particles. The kiln needed to match the temperature profile of the laboratory, with a maximum target temperature of 1,100˚C, capable of reaching it within 8 hours, with heating ramp at 200°C/h.

A total of 20 kg of mixed material was sent to a dedicated kiln supplier to be tested in a pilot kiln of a scale approximately 1 to 4 compared to the commercial size.

Results

The pilot scale test matches the temperature profile quite adequately but due to some limitations, the kiln was not fully loaded and the maximum temperature was limited to 1,000 °C

The final product was then evaluated at the CNRC lab in half coin cell.

The results presented in Table 13-32 confirm that this material, treated in the pilot plant, is in the quality range of the material produced at the laboratory scale.

Table 13-32: BET versus ICE

Test	BET (m^2/g)	1st Charge	1st Discharge	ICE (%)
Pilot CSPG	1,69	384	356	92,7
NMG lab. (ref)	1,70	407	371	91,15

Theses good results confirmed the technology chosen for the Phases 1 and 2 of the anode material plant.

This material was also used to perform pouch cell testing. The pouch cell tests were conducted over several months to verify the performance, over numerous cycles. After 166 cycles, the ongoing pouch test has shown no issues.

Mixing Trial (Suppliers 4 and 5)

The industry is presently using paddle mixer to make the SPG/precursor.

For efficiency purposes, two other types of mixers were tested at a pilot scale to validate a more efficient mixer. Up to one tonne of material was mixed, in over 40 batches, with a good efficiency and consistency, to validate the usage of the alternative technology in the Phase 2.

Microscopic analysis of over 90 samples showed a good uniformity of the blend within the batch and between the different batches. As required, the precursor particles were, in majority, “attached” to a graphite particle, well distributed and no agglomeration of precursor was observed, as demonstrated in the following figures:

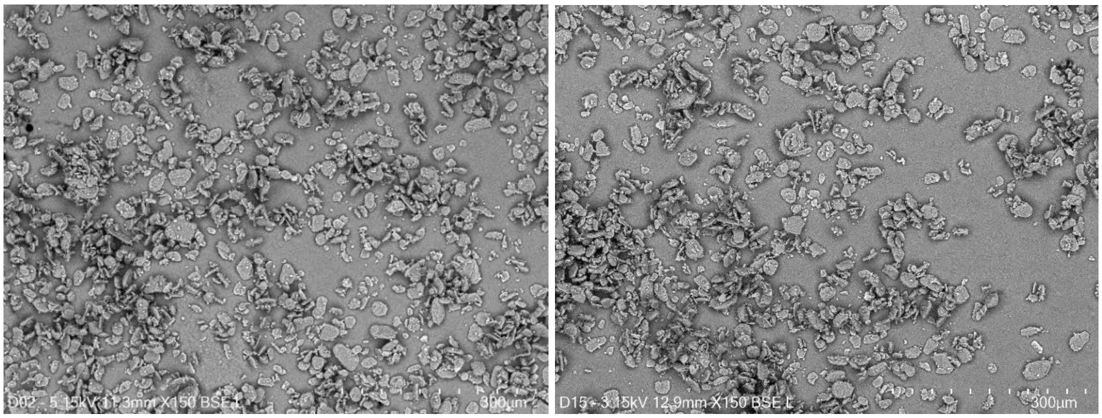


Figure 13-24: Paddle mixing with equipment from Supplier 4 and 5

Sieving & Magnetic Separation (Suppliers 6 & 7)

Both types of equipment are standard in the battery anode industry to remove all coarse and magnetic impurities that may have been picked up during the process following purification. The tests performed were to establish the sizing design criteria, to select the equipment for Phase 1 and 2 of the anode plant.

It also confirmed the ability of the sieving equipment, to sort the material properly for different customers, based on their specifications and to validate that the magnetic separator can retrieve the magnetic impurities efficiently. See Table 13-33

Table 13-33: Yield and capacity of magnetic separators

Processing of the DVMF: 5000 Gauss, Coarse Ex Matrix						
Sample ID	Mag Wt(g)	Mag Yield (%)	N-Mag Wt (%)	N-Mag Yield (g)	4" DVMF (kg/h)	6" DVMF (kg/h)
Product A -NMG batch 21-0004	54	0,5	11750	99,5	270	607
Product A -NMG batch 21-0003	64	0,5	11750	99,5	294	663
Product B -NMG batch RF 102-52	134	1,4	9650	98,6	130	292
Product B -NMG batch RF101-52	103	0,9	10900	99,1	142	320

13.2.3.3. Conclusion

The different tests performed on a laboratory scale, established the key parameters, and levels, that have a significant influence on the quality of the SPG coating, and consequently, the battery's electrochemical properties. The results obtained were comparable to that of commercial anode material, currently in the market.

As such, the solid precursor needs to be finely micronized. This material also needs to be uniformly distributed and avoid unnecessary agglomerates in the graphite powder.

To achieve proper coating, the precursor needs to be mixed with the SPG at a certain ratio, determined by the extensive tests conducted so far.

Then, the pyrolysis & calcination can be done at a relatively rapid temperature rise, up to a minimum temperature. This is performed in a fixed bed kiln to avoid unwanted agglomeration.

The coated graphite powder produced with these base line process parameters were tested and compared to commercial material in half coin cell. The electrochemical properties were equivalent to the commercial material, in terms of the BET value, 1st charge, 1st discharge and initial coulombic efficiency.

Based on these process parameters, pilot scale volumes were performed at different key suppliers to validate the technology and evaluate the capability and capacity necessary in Phases 1 and 2 of NMG's Battery Material Plant project.

To ensure the quality of the material at a pilot scale, electrochemical tests on multiple cells were performed and resulted in a quality equivalent to the material produced at the laboratory scale.

13.2.3.4. Recommendations

At this stage, it is recommended to use the base line process parameters for the FS, as no red flags or issues were observed, and the quality was within the target.

However, there remains the possibility that the basic parameters were not tested under the optimum conditions. NMG recognizes this and further tests will be performed in the coming months in Phase 1, SMDS, to test the various levers available to, if possible, improve the quality of the battery material in an efficient manner.

14. Mineral Resource Estimates

Mineral Resources on the West Zone deposit were estimated with an effective date of May 20, 2022. This report explains details about this updated Resource Estimate. This report also presents resources for the South Zones that namely separate into the Southeast and Southwest Zones, which are also located within the Mining Property.

The increase in resources of the West Zone deposit shown in this report is mostly due to the expansion of claims following a partial lifting of a staking ban (see Section 4.3 for further details). Many drill holes from 2019 are included in this estimation. The previous resource estimation was dated March 19, 2020 and announced in the "Nouveau Monde Announces Updated Resource Estimate and Increases Combined Measured & Indicated Resources by 25% to 120.3 Mt @ 4.26% Cg" press release also from March 19, 2020. A few drill holes were drilled in 2021 for geomechanics pit-slope angle assessment and geotechnical data (Chapters 10 and 16).

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14.1. Drill Hole Database

NMG provided SGS with the digital version of the drilling database. 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

Field	Number of Entries	Length (m)
Drill holes collars (DDH)	173	27,888.24
Sampled trenches	3	418.55
Deviation measurements	2,235	
Lithologies	2,323	
Assays (excluding trench samples)	8,274	15,557.58
Assays (trenches only)	207	418.51

Notes:

1. A total of 24 drill holes from 2021 are included in Table 14-1, of which 13 had visible mineralization in core that was not assayed since they were purely performed for geotechnical, geomechanics and groundwater testing. These drill holes are GT-21-01 to GT-21-06, PO-DL-21-01, PO-DL-21-02, PO-F-21-01, PO-F-21-02, PO-PAR-21-02, PO-PAR-21-03 and TO-21-215 to TO-21-226. The lithology of these holes has been considered for the geological modelling (see Note 3).
2. A drill hole from 2017 (TO-17-120, 201 m, 20 assays) is included in the table but was not used for the modelling and the estimation because it does not cross the complete thickness of the mineralization and is judged not representative of the zone while other drill holes in the vicinity have it covered.
3. In total 320 assay intervals were NOT counted in the table because the sample intervals were only selected but not assayed at the time of the resource estimation.

While the complete Nouveau Monde database also covers other areas of the Tony Claim Block, Table 14-1 only presents the holes used to model the resource and to model the overburden surface used to constrain the resources for the West Zone deposit. Holes were surveyed using a Reflex or a Ranger downhole orientation instrument and appear to be sampled consistently every 50 m or less down the hole. Trench samples were surveyed at approximately every 2 m. Drill holes and trenches are surveyed using the UTM projection, NAD83 CSRS Zone 18.

Assays were made into mineralized intervals (MI). A modelling cut-off grade of 2.0% C(g) was used to delineate mineralized volumes. There are 476 MIs including 451 from core drilling and 25 from surface trench channel samples. The total length for the MIs is of 11,092.91 m. The shortest MI created is of 2 m. The longest MI created is of 109.9 m and is in the W1B mineralized zone.

14.2. Mineralized Volumes

The mineralized volumes were prepared using the Genesis© mining software. The mineralized volumes were modelled 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 hole spacing is not perfectly even. There are currently 23 mineralized volumes in the West Zone. Out of these 23 volumes, three of them are a continuity of each other: W1B, W1B_2 and W1B_3. W0 and W0_1 are not touching but are in the same alignment so MIs are all tagged W0. W0A and W0A_1 are not touching but are in the same alignment so MIs are all tagged W0A. W1D and W1D_2 are not touching but are in the same alignment so MIs are all tagged W1D. W7 and W7_1 are not touching but are in the same alignment so MIs are all tagged W7. Therefore, there are 17 groups of MIs that were used independently for the estimation. The volumes under topography are listed in Table 14-2 along with the number of mineralized intervals that pierce these volumes. The volumes have been modelled on 69 sections as shown on Figure 14-1.

Table 14-2: List of mineralized volume groups and number of mineralized intervals

Mineralized Volume Group	Volume (m^3)	Mineralized Intervals
W0	5,421,704	36
W0A	261,910	5
W1A	7,353,802	49
W1D	4,605,227	30
W1E	343,042	4
W2	4,077,565	46
W31	6,938,639	75
W32	261,961	4
W3B	694,290	16
W4	3,255,780	54
W42	214,743	4
W5	57,020	2
W6	66,911	3
W7	181,372	2
W1B	24,697,052	131
W1C	1,594,724	6
W2A	601,213	9
Total	**60,626,955**	**476**

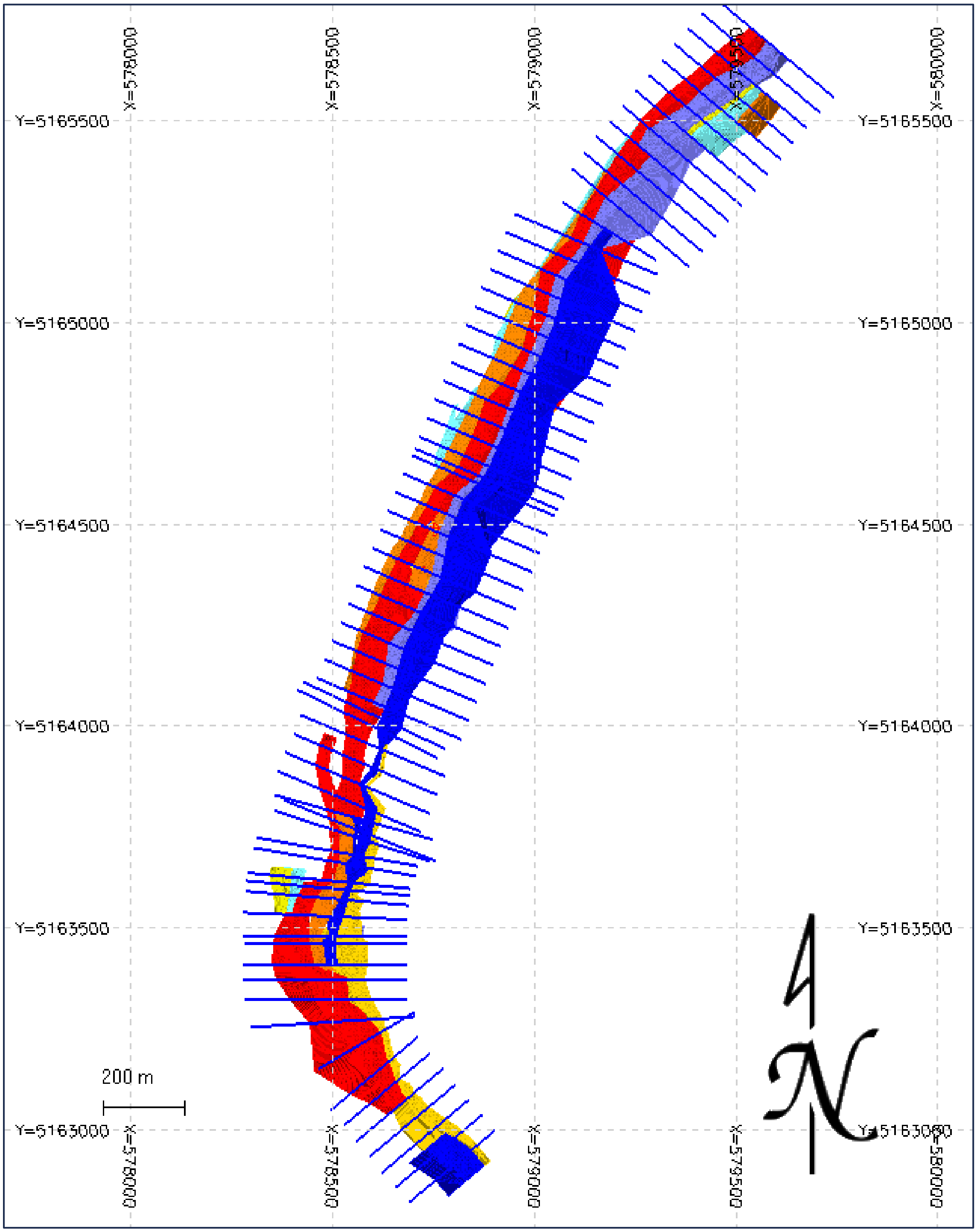


Figure 14-1: Sections (blue) and mineralized volumes (multiple colours)

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 has chosen to use the calculated length algorithm that does not leave any remainders. Composites have been created inside mineralized intervals (MI). Out of the 5,572 composites, 5,163 (93%) are between 1.9 and 2.1 m in length. The smallest composite is 1.45 m and the longest is 2.5 m long. After verifications for possible outliers, it was decided to cap the four highest composites to 8% Cg. This translates in a loss of less than 0.1% of the Cg in the deposit.

The composites were prepared in the Genesis software. Composites were divided into 17 separate sets to prepare the estimation for the 23 volumes. Table 14-3 and Table 14-4 show the composite statistics by zone. The attribution of the 17 separate sets that correspond to the 23 mineralized volumes are presented in Table 14-5.

Table 14-3: Statistics on the composites [C(g)%] for the West Zone

Statistics on the Composites [C(g) %] for the West Zone			
Before Capping		After Capping	
Count	5,572	Count	5,572
Min	0	Min	0
Max	14.21	Max	8
Mean	4.266	Mean	4.264
Median	4.34	Median	4.34
Standard Deviation	1.34	Standard Deviation	1.34

Table 14-4: Statistics on the capped composites [C(g)%] for each grouped mineralized volume

	W0	W0A	W1A	W1B	W1C	W1D	W1E	W2	W2A	W31	W32	W3B	W4	W42	W5	W6	W7
Count	318	29	522	2345	100	483	50	282	60	737	15	66	512	14	4	14	21
Min % C(g)	0.27	1.5	1.28	0	0.37	0.05	0.14	0.52	2.15	0.06	1.3	1.22	0.11	1.19	3.64	3.08	2.69
Max % C(g)	7.24	6.41	8	8	7.53	7.21	6.7	8	6.03	6.76	6.17	6.13	7.32	3.89	4.67	7.18	6.02
Mean % C(g)	4.008	3.508	4.062	4.451	4.850	4.171	4.232	4.233	4.536	4.116	2.988	3.938	4.089	2.686	4.105	5.006	4.443
Median % C(g)	3.85	3.28	3.905	4.57	5	4.29	4.395	4.3	4.51	4.21	3	4.115	4.11	2.57	4.055	4.955	4.75
StDev % C(g)	1.49	1.14	1.29	1.31	1.43	1.39	1.38	1.32	0.90	1.23	1.24	0.97	1.41	0.69	0.50	1.10	1.04

Table 14-5: List of volumes and corresponding composite sets

Volume		Composite Set	
Number	Name	Number	Name
1	W0	1	W0
2	W0_1	1	W0
3	W0A	2	W0A
4	W0A_1	2	W0A
5	W1A	3	W1A
6	W1D	4	W1D
7	W1D_2	4	W1D
8	W1E	5	W1E
9	W2	6	W2
10	W31	7	W31
11	W32	8	W32
12	W3B	9	W3B
13	W4	10	W4
14	W42	11	W42
15	W5	12	W5
16	W6	13	W6
17	W7	14	W7
18	W7_1	14	W7
19	W1B	15	W1B
20	W1B_2	15	W1B
21	W1B_3	15	W1B
22	W1C	16	W1C
23	W2A	17	W2A

14.4. Capping

A capping study was carried out and the conclusion is that capping is not required. As a matter of form, SGS decided to cap four composites at 8% C(g) but it has an insignificant impact on the average grade. The capping at a grade of 8% C(g) reduced the global graphitic carbon content of the resource by less than 0.1% with the average grade going from 4.266% to 4.264% C(g).

14.5. Density

An estimated density was attributed to each block of the block model depending on the geological unit. Also, the parts of blocks that fall in the overburden unit have been attributed a density of 2.1 t/m^3, which was set to the whole West Zone deposit.

This density data comes from the density database prepared by NMG. This database consists of a total of 1626 density measurements. These measurements are from 2015 (97), 2016 (176), 2017 (28), 2018 (192), 2019 (1133). The statistical T-test on populations confirmed that the zones have significantly different densities. From this observation, it was decided to estimate each zone separately. Blocks too far from density information were attributed the average density for the zone. The statistic for the density is detailed in Table 14-6 by zone and in total.

Table 14-6: Density statistics for the seven composite sets

Zone	Mineralization (other)	Mineralization (W1D, W1E)	Mixed Paragneiss	BO GR Paragneiss		Charno-ckite	Meta-gabbro
Code	1	2	33	44	442	55	66
Count	717	97	676	68	17	48	3
Min	2.62	2.6	2.58	2.62	2.69	2.61	3.12
Max	3.06	2.96	3.24	3	3.11	2.78	3.12
Mean	2.76	2.73	2.82	2.76	2.93	2.66	3.12
Median	2.75	2.72	2.78	2.73	2.98	2.64	3.12
Std.Dev.	0.068	0.068	0.148	0.119	0.178	0.055	0.000

Note: The code 442 has been attributed to a BO GR Paragneiss (biotite rich paragneiss) that has a clear higher density compared to the other BO GR Paragneiss zones.

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, and its origin is (x, y, z) → (579,000 – 5,162,000 – -2.5) with block size of 5 m × 5 m × 5 m. The number of indices is of (x, y, z) → 820, 400, 121). These coordinates are the centres of the blocks. There is also a rotation to the block model of -67 degrees (counterclockwise rotation). Block percentages were used where there are percentages estimated for all the lithologies present in the vicinity of the deposit. One large block model was created using those parameters inside (and outside, to some extent) of 23 mineralized volumes, and each volume was tagged in the block model and estimated separately with its respective set of composites as explained in the "Composite Data" paragraph.

Table 14-7: Block model settings – Origin and size

Grid	X	Y	Z
Origin (Center of Block)	579,000	5,162,000	-2.5
Size	5	5	5
Discretization	2	2	2
Starting Coordinate	579,000	5,162,000	-2.5
Starting Block Index	1	1	1
Ending Block Index	820	400	121

14.6.1. Variography

Some variography has been done along with an estimation by kriging for verification purpose. The kriged model is globally the same as the IDS model. The kriged model was not retained as the final estimation for this report.

The variograms and the estimation by kriging were done in 2018 and 2020. SGS used a normal variogram, with no normalization of the data. The 2018 variogram is presented in Figure 14-2. For the final long-range variogram, SGS manipulated the composites in several ways to improve the calculated variograms (like rotations and unfolding) it was found successful. Some variograms have been calculated in 2020 and use 65% more composites due to the 2019 drilling. They show similar results. The 2018 variogram is shown here because it looks better given the several ways used to improve the calculated variograms at the time.

What is new in 2022 is the availability of 45 samples from production holes. Given the fact that these assays represent well the "along strike" and "perpendicular to mineralization" directions, this new scarce data is invaluable for the variogram validation. SGS has overlaid the variogram from these production data points to the 2018 variogram. It is a great thing that the few pairs in the "along strike" direction confirm superbly the 2018 variogram model (red line / red circles on the graph). On the other side, the few pairs in the "perpendicular to mineralization" direction seem to show that there is a better continuity in the 2022 production data (grey circles) compared to the 2018 variogram model (black line). But this is totally normal since the production holes represent about 15 m of rock versus the exploration composites that represent only 2 m of rock. More production data will enable to improve the variography. At some point in the development of the project, it might be recommended to use kriging to estimate the block model as additional data is gathered.

It is interesting to note that no nugget effect was found in 2018, which was also confirmed with the 2022 production data.

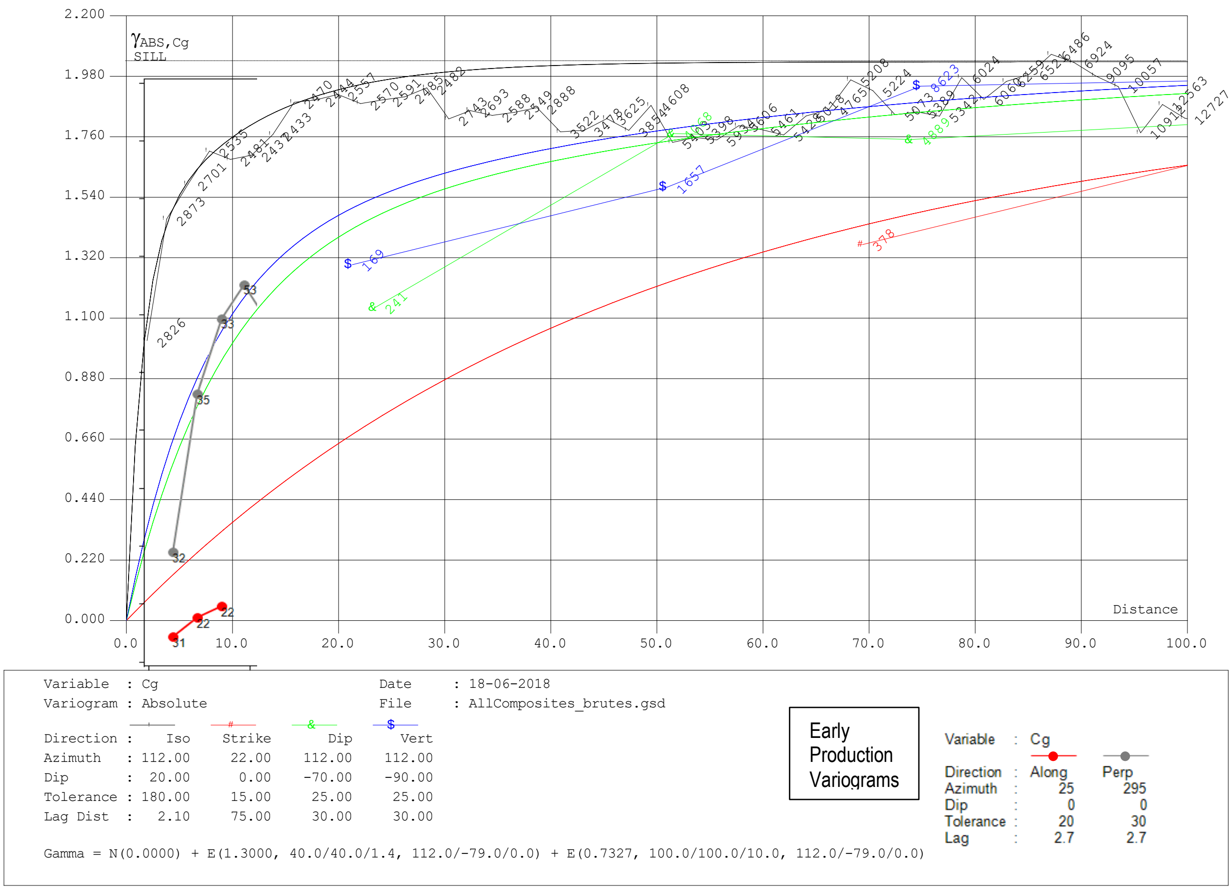


Figure 14-2: Variogram model

Table 14-8: Summary of the variogram model

Component			Ranges (m)			Orientation (degrees)		
Number	Type	Sill	Long	Medium	Short	Azimuth	Dip	Spin
3	Exponential	0.7327	100	100	10	112	-79	0
2	Exponential	1.3	40	40	1.4	112	-79	0
1	Nugget	0	N/A	N/A	N/A	N/A	N/A	N/A

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, a larger ellipsoid for the second pass and larger again ellipsoid for the third pass. The small ellipsoid has a radius of 50 m x 50 m x 15 m, the medium ellipsoid has a radius of 100 m x 100 m x 30 m, and the large ellipsoid has a radius 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 and second passes of the estimation used a minimum of five and a maximum of 11 composites, with the additional limit of three composites per drill hole. The third pass of the estimation used a minimum of four and a maximum of 11 composites, with the additional limit of three composites per drill hole. There are exceptions: for the volumes W0_1, W0A, W1B, W1C, W1D_2, W1E, W31, W4 and W7, the third pass of the estimation used a minimum of three and a maximum of 11 composites, with the additional limit of three composites per drill hole to estimate the full volumes.

Of all blocks inside the mineralized volumes, 100% of them 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: https://mrmr.cim.org/media/1128/cim-definition-standards_2014.pdf.

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 classification was made from an automatic classification algorithm using search ellipsoids centered on composites.

In the end, the extents for Measured and Indicated Resources are based on the distance between drill holes in the vicinity of the estimated block. If a grid of at least three drill holes intersect a mineralized volume and with 70 m between sections or less and 50 m between holes on a section or less, the blocks in that region are classified as Measured. If a grid of at least two drill holes intersect a mineralized volume and with 110 m between sections or less and 80 m between holes on a section or less, the blocks in that region are classified as Indicated. Other estimated blocks are classified as Inferred.

The classified block model is visible in Figure 14-3.

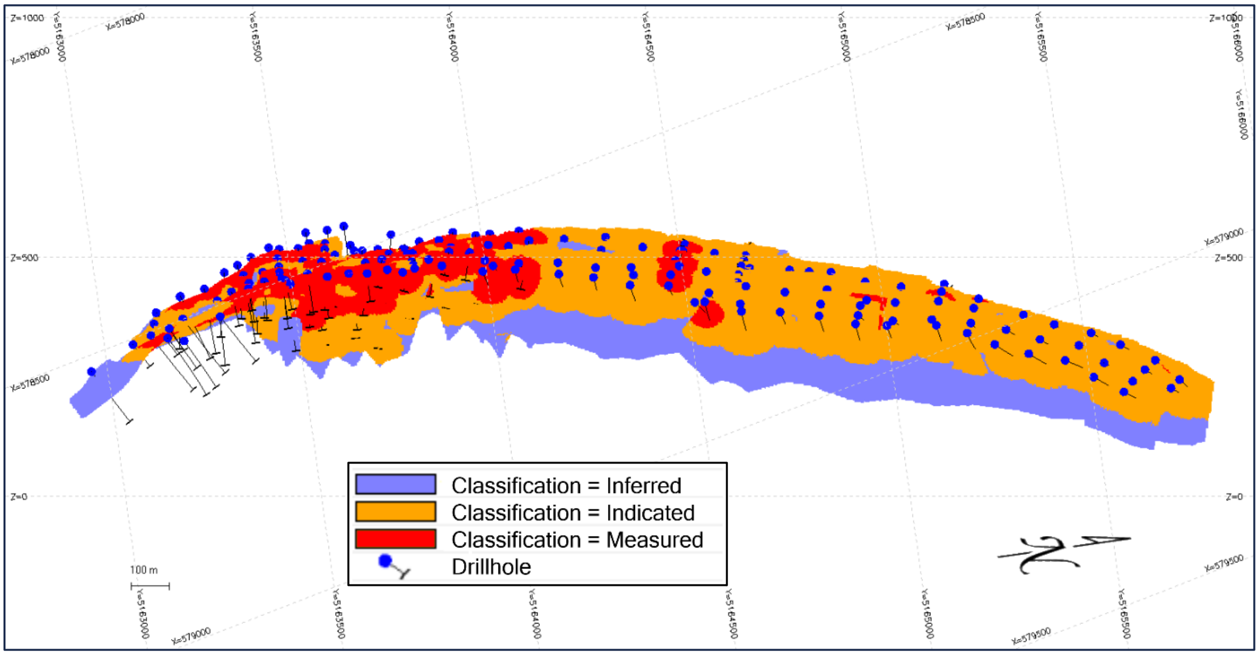


Figure 14-3: Block model coloured by classification with drill hole traces

14.8. Pit Shell and Cut-off Grade Used to Constrain the Mineral Resources

The mining method chosen for the project is conventional open pit truck and shovel. The Mineral Resources have therefore been constrained by an optimized pit shell. The block model was loaded into GEOVIA's Whittle software to generate an optimized pit shell using the assumption for concentrate selling price, operating costs, and technical mining factors, which are presented in Table 14-9. A cut-off grade (COG) of 1.78% Cg was used for the Mineral Resource Estimate. The open pit used to constrain the Mineral Resources, which is presented below does not include haul ramp designs. The 1.78% Cg cut-off grade was used to constrain the Project's resource estimates since July 10, 2018 but the actual economic cut-off is currently closer to 1% as explained in Section 15.4.2. A COG sensitivity analysis presented in Section 14.11 demonstrates that the Mineral Resources do not vary much between a COG of 1.0% C(g) and 2.0% C(g), thus the COG value of 1.78% Cg was retained for ease of comparison. Any cut-off grade equal or higher than 1.0% Cg can be used to report Mineral Resources and meet the "reasonable prospects for eventual economic extraction" criteria.

14.8.1. Pit Shell

The Whittle software was used to create pit shells based on the Mineral Resource model, the topographic surface and the overburden/bedrock contact. The final pit shell has been selected with a revenue factor of 1 for the concentrate selling price.

Figure 14-4, Figure 14-5, Figure 14-6, and Figure 14-7 illustrate several interpretations of the mineralization with the drill holes, assay results, topographic and overburden/bedrock contact surfaces, the block model and the optimized pit shell that was selected to constrain the Mineral Resources.

Table 14-9: Assumptions used to generate the constraining pit shell (CAD)

Parameters	Values	
Block size	5 m x 5 m x 5 m	
Specific gravity	Variable – Estimated in the Block Model	
Overall slope angles	Rock (East wall)	50°
	Rock (West wall)	52°
	Overburden	23°
Pit selection method	Revenue factor of 1	
Mining cost	Ore / Waste / Overburden	4.22$/t
Increment bench cost under reference level (590 mZ)	0.04$/t/bench level	
Mining dilution	5%	
Mining recovery	95%	
Processing cost (all inclusive)	13.18$/t	
Processing recovery	93%	
Selling price of concentrate	1,439.00$/t Minus 47.92$/t Selling costs	

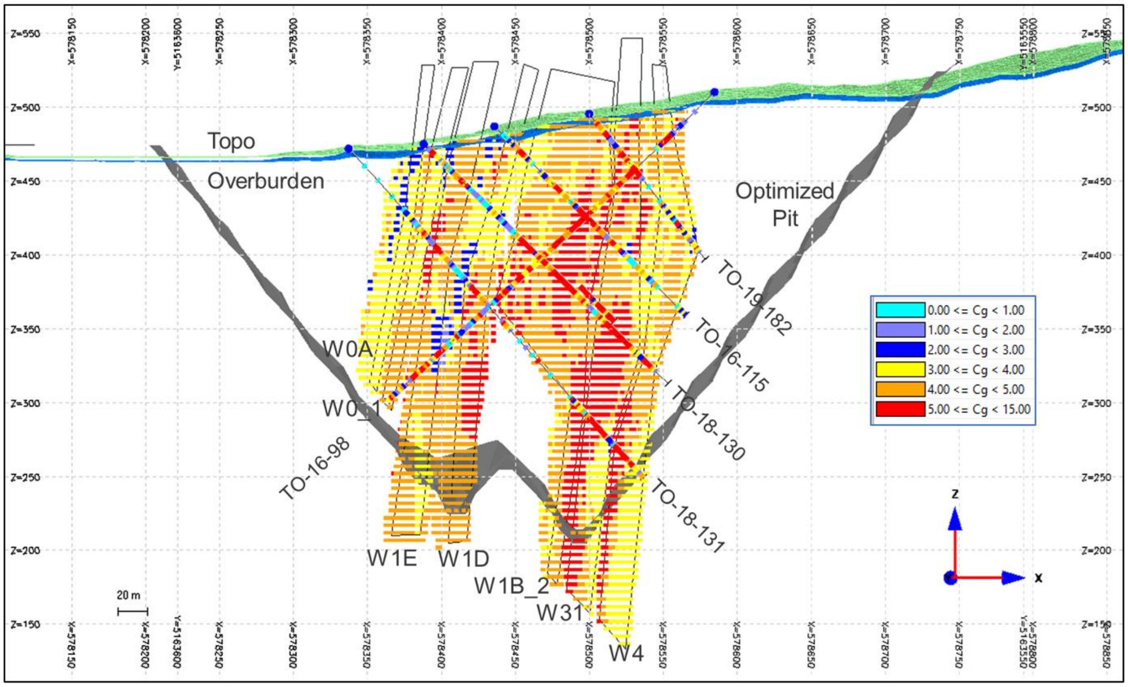


Figure 14-4: West Zone section -200

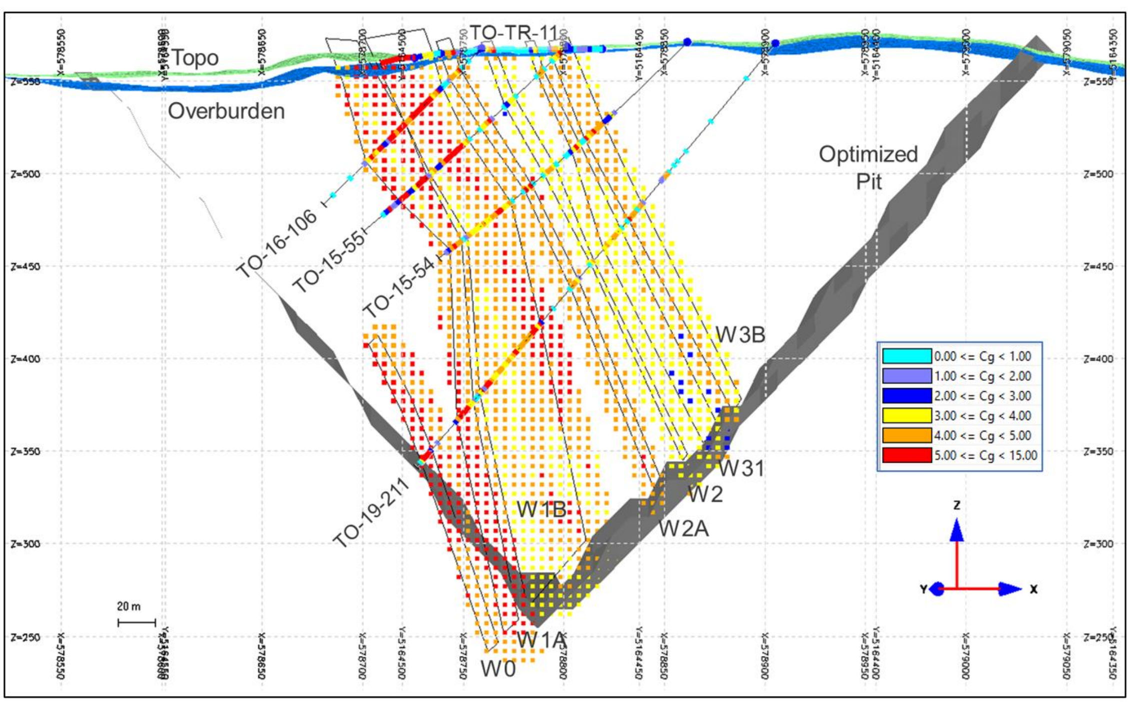


Figure 14-5: West Zone section 700

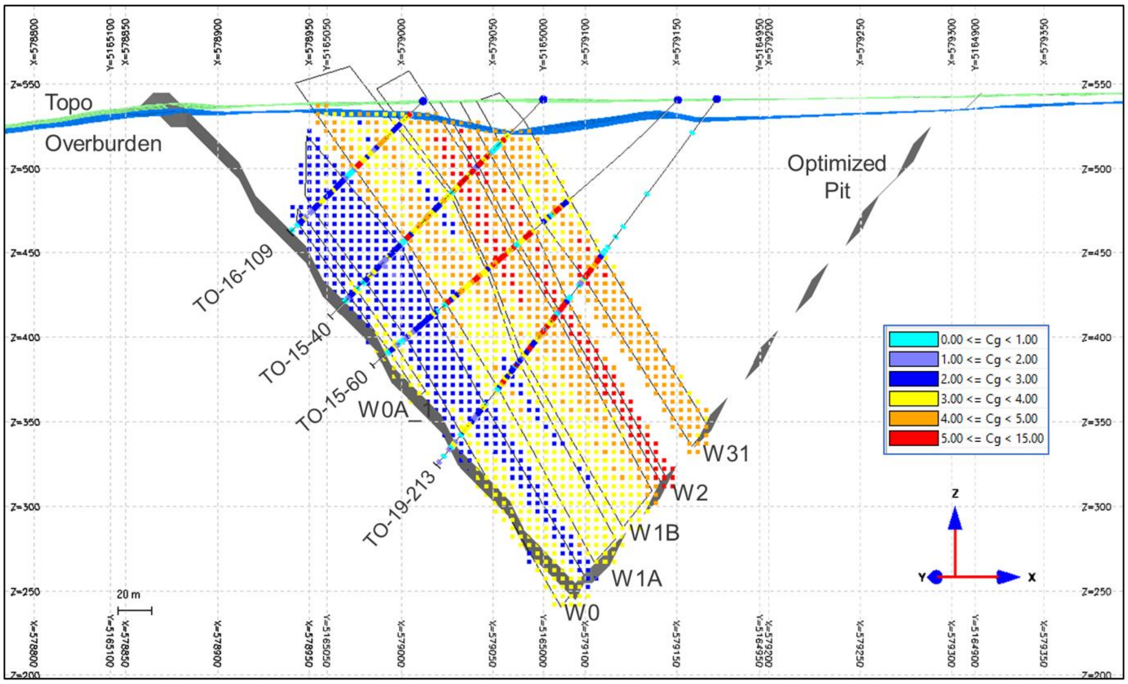


Figure 14-6: West Zone section 1300

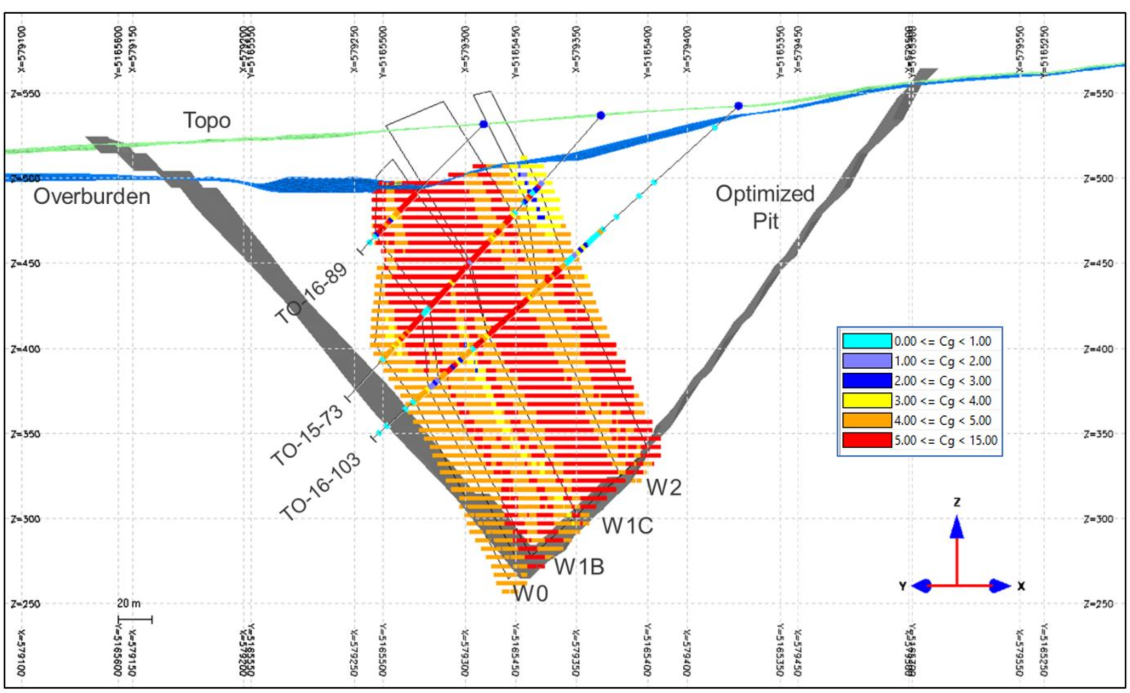


Figure 14-7: West Zone section 1900

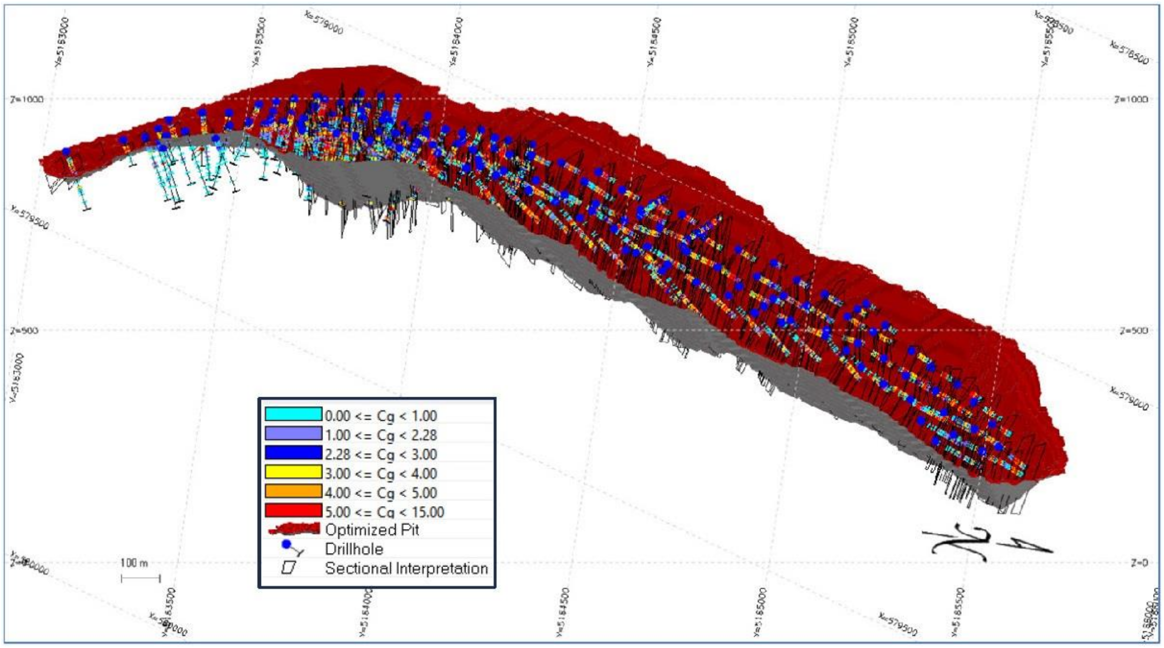


Figure 14-8: West Zone optimized pit

14.9. Mineral Resource Estimates (West Zone Base Case)

The block model, used to generate the Current Resources of the West Zone, is based on a total of 173 core drill holes that produced 8,274 samples as well as 207 samples collected from channelling work in three trenches. This does not include the quality control samples that comprise 365 duplicates, 364 blanks and 178 standard samples, all of which returned within acceptable limits. In all, 23 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., Qualified Person, of SGS Geological Services in Blainville, Québec, Canada (SGS), using the Genesis© mining software. Interpolation was performed using inverse square distance (ID^2) as well as different search ellipsoids that were adapted for the geology of the deposit. 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 (May 20, 2022). The Mineral Resources of the West Zone are presented in the Table 14-10.

Table 14-10: Pit-constrained Mineral Resource Estimate for the West Zone (1)

Mineral Resource Category (2)	Current Resource (May 20, 2022) (5)(6) (7)		
	Tonnage (Mt)	Grade [% C(g)] (3)	C(g) (Mt)
Measured	28.5	4.28	1.22
Indicated	101.8	4.26	4.33
Measured + Indicated	130.3	4.26	5.55
Inferred (4)	23.0	4.28	0.98

(1) The Mineral Resources provided in this table were estimated by Yann Camus, P.Eng. (QP) of SGS Geological Services, using current Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

(2) 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.

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

(4) 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.

(5) Current Resource still effective July 6, 2022, because no new data is available for the West Zone and no material has been extracted since the Resource Estimate dated May 20, 2022.

(6) Mineral Resources are stated at a cut-off grade of 1.78% C(g).

(7) Standards used for this Resource Update are the same standards produced over the course of the Feasibility Study (results published December 10, 2018) and the Resource Update (results published March 19, 2020). The difference comes mainly from a newly accessible land package along the Hydro-Québec power line.

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, 2016. Details of the PEA Resources can be found in the report available on NMG's web site and on SEDAR. SGS has audited the PEA resource methodology as well as the overall quantities. These Mineralized Zones are considered a lower priority then 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 9-1 and Figure 10-1 of this report.

Table 14-11: Pit-constrained Mineral Resource Estimate for the South Zones

Mineral Resource Category (2)	Current Resource (July 6, 2022 (1) (5) (6)		
	Tonnage (Mt)	Grade [% C(g)] (3)	In Situ C(g) Tonnage (Mt)
Indicated	26.3	3.73	0.981
Inferred (4)	19.2	3.67	0.705

(1) The Mineral Resources provided in this table were estimated by Yvan Bussieres, P.Eng. (Québec) and Antoine Yassa, P.Geo., using current Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves, Definitions and Guidelines.

(2) 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.

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

(4) 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.

(5) Current Resource still effective July 6, 2022, because no new data is available for the South Zones and no material has been extracted since the South-East and South-West Resource Estimate dated December 15, 2015 (Bussière and Yassa, 2016).

(6) 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. Mineral Resource Estimates (West Zone Sensitivity Analysis)

To get an idea of the sensitivity of the resource numbers to changes in economical parameters, the resource table was estimated at various cut-off grades that all correspond to reasonable economic scenarios. All cut-off grades presented meet the "reasonable prospects for eventual economic extraction" criteria. The results are shown in Table 14-12.

Table 14-12: Sensitivity of the pit-constrained Mineral Resource Estimate for the West Zone (1)

Cut-off Grade [% C(g)]	Mineral Resource Category (2)	Current Resource (May 20, 2022) (6)		
		Tonnage (Mt) (5)(6)	Grade [% C(g)] (3)	C(g) (Mt)
1.00	Measured	28.6	4.27	1.22
	Indicated	102.1	4.25	4.34
	Measured + Indicated	130.7	4.25	5.56
	Inferred (4)	23.0	4.28	0.98

Cut-off Grade [% C(g)]	Mineral Resource Category [2]	Current Resource (May 20, 2022) [6]		
		Tonnage (Mt) [5][6]	Grade [% C(g)] [3]	C(g) (Mt)
1.25	Measured	28.6	4.27	1.22
	Indicated	102.0	4.25	4.34
	Measured + Indicated	130.6	4.26	5.56
	Inferred [4]	23.0	4.28	0.98
1.50	Measured	28.6	4.27	1.22
	Indicated	101.9	4.25	4.34
	Measured + Indicated	130.5	4.26	5.56
	Inferred [4]	23.0	4.28	0.98
1.75	Measured	28.5	4.28	1.22
	Indicated	101.8	4.26	4.33
	Measured + Indicated	130.3	4.26	5.55
	Inferred [4]	23.0	4.28	0.98
2.00	Measured	28.4	4.28	1.22
	Indicated	101.6	4.26	4.33
	Measured + Indicated	130.0	4.27	5.55
	Inferred [4]	23.0	4.28	0.98
2.20	Measured	28.3	4.29	1.22
	Indicated	101.2	4.27	4.32
	Measured + Indicated	129.5	4.28	5.54
	Inferred [4]	23.0	4.28	0.98

(1) 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.

(2) 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.

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

(4) 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.

(5) Current Resource effective May 20, 2022.

(6) Standards used for this resource update are the same standards produced over the course of the Feasibility Study (results published December 10, 2018) and the Resource Update (results published March 19, 2020). The difference comes mainly from a newly accessible land package along the Hydro-Québec power line.

14.12. Conclusion

To the knowledge of the author who prepared Chapters 12 and 14 of this report, there are no special factors that could affect materially the Mineral Resource Estimate presented here. More details about general and specific risks are discussed in Chapters 4 and 25 of this report.

15. Mineral Reserve Estimate

The Matawinie Mine project will be mined using conventional open pit mining methods consisting of drilling, blasting, loading, and hauling. Ore will be hauled to the primary crusher and waste rock and tailings will be placed in a co-disposal storage facility (CSF). The CSF will initially be located at surface and, as of Year 7, will be placed inside the mined out open pit. The Project life of mine (LOM) plan and subsequent Mineral Reserves are based on a graphite concentrate selling price of 2,135$/t. The effective date of the Mineral Reserve estimate is July 6, 2022.

Development of the LOM plan included pit optimization, pit design, mine scheduling and the application of modifying factors to the Measured and Indicated Mineral Resources. The reference point for the Mineral Reserves is the feed to the primary crusher. The tonnages and grades reported are inclusive of mining dilution, geological losses and operational mining losses.

The Mineral Reserves for the Matawinie Mine project were prepared by Jeffrey Cassoff, P.Eng., Senior Mining Engineer with BBA Inc.; a Qualified Person as defined under National Instrument 43-101.

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

The QP is of the opinion that no other known risks, including legal, political or environmental, would materially affect potential development of the Mineral Reserves, except for those risks already discussed in this report.

Table 15-1 presents the Mineral Reserves that have been estimated for the Matawinie Mine project, which include 17.3 Mt of Proven Mineral Reserves at an average Graphitic Carbon grade (Cg) of 4.16% and 44.3 Mt of Probable Mineral Reserves at an average grade of 4.26% Cg, for a total of 61.7 Mt of Proven and Probable Mineral Reserves at an average grade of 4.23% Cg. To access these Mineral Reserves, 15.5 Mt of overburden and 56.2 Mt of waste rock must be mined, resulting in a strip ratio of 1.16:1.

Table 15-1: Matawinie Mine Mineral Reserves

Category	Tonnes (Mt)	Cg Grade (%)	Contained Graphite (Mt)
Proven	17.3	4.16	0.7
Probable	44.3	4.26	1.9
Proven & Probable	**61.7**	**4.23**	**2.6**

1. The Qualified Person for the Mineral Reserve Estimate is Jeffrey Cassoff, P.Eng., of BBA Inc.
2. The effective date of the estimate is July 6, 2022.
3. Mineral Reserves were estimated using a graphite concentrate selling price of 2,135$/t, and consider a 2% royalty, and selling costs of 47.92$/t. An average grade of 97% was considered for the graphite concentrate.
4. A metallurgical recovery of 93% was used.
5. A cut-off grade of 2.20% Cg was used.
6. The strip ratio for the open pit is 1.16 to 1.
7. The Mineral Reserves are inclusive of mining dilution and ore loss.
8. The reference point for the Mineral Reserves is the primary crusher.
9. Totals may not add due to rounding.

15.1. General Parameters Used to Estimate the Mineral Reserves

The following section discusses the geological information that was used for the mine design and Mineral Reserve estimate. This information includes the topographic surface, the geological block model and the material properties for ore, waste rock, and overburden.

The mine design and mine planning were done using Hexagon's MinePlan 3D software Version 15.8 (formerly known as MineSight). The mine design work was completed using the NAD83 CSRS Zone 18 coordinate system, in metric units.

15.1.1. Topographical Data

The mine design for the Feasibility Study was carried out using a topographic surface based on 1-metre contour intervals. The contours were derived from a LiDAR survey that took place on December 18, 2015.

15.2. Mineral Resource Block Model

The mine design for the Feasibility Study is based on the 3-dimensional (3D) geological block model that was prepared by SGS Geological Services and presented in Chapter 14. The blocks are 5 m wide, 5 m long and 5 m high and the model is rotated at 293°.

The block model is a percent model whereby each block contains the percentages of mineralized and non-mineralized volumes. The items in each block include: the Cg grade (for both the mineralized and non-mineralized parts of the block, the sulfur grade, the percentage of each rock type, the density of each rock type, and the resource classification (Measured, Indicated and Inferred).

It should be noted that the block model contains the Graphitic Carbon grade (Cg), while the metallurgical recovery quoted in this report is based on the Total Carbon grade (Ct). A statistical analysis on the deposit shows that, on average, the values for Ct can be assumed to be 3% higher than the values for Cg.

An overburden/bedrock contact surface was also provided by SGS Geological Services, and the percentages of overburden were coded in the model.

15.3. Material Properties

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

Bulk Density

Bulk density is an important measurement that converts volumes modelled by the geologists into tonnages and contained tonnes of graphite. It is also used to estimate mine equipment requirements. The methodology used to estimate the bulk densities for ore and waste rock was presented in Chapter 14. The ore density within the open pit averages 2.76 t/m^3, and the waste rock density averages 2.80 t/m^3. A density of 2.10 t/m^3 was considered for overburden.

Swell Factor

The swell factor reflects the increase in volume of the material from its in situ state to its state after it has been blasted and loaded into the haul trucks. The swell factor is an important parameter that is used to determine the loading and hauling equipment requirements, as well as the CSF and stockpile designs. A swell factor of 40% has been considered for the FS, as well as a compaction factor of 5% for when waste rock is placed in the CSF. A swell factor of 20% was used for overburden.

Moisture Content

Mineral Resources and Mineral Reserves are reported as in situ dry tonnes. The moisture content reflects the amount of water 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 a contributing factor for the process water balance. A moisture content of 4% has been used for blasted ore, 2% for blasted waste rock, and 8% for overburden.

15.4. Modifying Factors that Affect the Mineral Reserves

The following section presents the modifying factors that were applied to convert Mineral Resources into Mineral Reserves for the Project, as well as the pit optimization analysis and open pit design.

15.4.1. Mining Dilution and Ore Loss

In every mining operation, it is impossible to perfectly separate the ore and waste due to the large scale of the mining equipment and the use of drilling and blasting. The Matawinie deposit contains several mineralized dykes with thicknesses greater than 20 m as well as several narrower mineralized dykes with thickness of less than 5 m.

To estimate mining dilution, BBA used a “whole block” dilution method for the narrow vein dykes by summing the percentages of mineralization and non-mineralization material and calculated a diluted grade using the weighted average. No mining dilution was applied for the wider dykes.

Within the open pit for the Feasibility Study, the application of mining dilution resulted in the in situ Cg grade of 4.35% decreasing to 4.23%. No additional tonnage adjustment was done.

15.4.2. Pit Optimization

A pit optimization analysis has been completed to determine the extent of the deposit that can be mined and processed economically. The pit optimization was done using the pseudo-flow algorithm in the Economic Planner module of MinePlan 3D. The algorithm determines the economic limits of the open pit at a range of selling prices based on input of mining and processing costs, revenue per block, and operational parameters such as the metallurgical recovery, pit slopes and other imposed physical constraints. The pseudo-flow algorithm provides similar results as the Lerch-Grossman algorithm with the benefit of shorter computing times. Since this study is at an FS level, NI 43-101 guidelines do not allow for Inferred Mineral Resources to be considered in the pit optimization and mine plan and have therefore been treated as waste rock.

Table 15-2 presents the input parameters that were used for the pit optimization analysis. All figures are in Canadian Dollars unless otherwise specified. The input parameters were developed from the results of the 2018 Feasibility Study with adjustments for inflation and updated project knowledge. The costs used for the pit optimization are inputs and should therefore not be confused with the final operating costs for the Study presented in Chapter 21. Upon completion of the Feasibility Study, BBA confirmed that the pit optimization analysis was still valid using the updated cost estimate developed in the Study.

The pit optimization considered pit slopes that were developed by SRK and presented in Section 15.5.2. The pit slopes were adjusted for the pit optimization to account for the ramp system that it added in the pit design stage.

The pit optimization was limited to the NMG mineral claims and was also restricted to not mine out the haul road on the west side of the pit as well as the plant infrastructure area on the east side of the pit. A scenario was run using only the NMG mining claims as a physical restriction and although the pit becomes larger, the graphite grades and strip ratio for a 25-year pit remain relatively unchanged.

Table 15-2: Pit optimization parameters

Item	Unit	Value
Mining Cost (Ore)	$/t (mined)	4.00
Mining Cost (Waste)	$/t (mined)	4.00
Mining Cost (Overburden)	$/t (mined)	4.20
Incremental Bench Mining Cost (per 5 m)	$/t (mined)	0.018
Reference Bench for Incremental Cost	m	500
Processing Cost (includes tailings)	$/t (processed)	9.31
General & Administration Cost	$/t (processed)	3.87
Concentrate Sales Price (97% Cg)	USD/t	1,150
Exchange Rate	USD	1.25
Concentrate Sales Price (97% Cg)	$/t	1,439
Selling Costs	$/t	47.92
Royalty	%	2%
Metallurgical Recovery	%	93
Conversion of Cg to Ct		1.03

Cut-off Grade

The cut-off grade (COG) is calculated to determine if material within the pit should be sent to the mill for processing or to the waste rock pile. The marginal COG, referred to as the "Open Pit Discard COG" in the CIM Estimation of Mineral Resource and Mineral Reserves Best Practice Guidelines, differs from the breakeven COG since mining costs are excluded from the calculation. The reason for excluding mining costs is that material already defined to be within the limits of the open pit must be mined, regardless of whether it is classified as ore or waste, to access the bench below. The only exception where a mining cost would be included in the marginal COG calculation is if there is an incremental cost for mining ore relative to mining waste. The following calculation was used to calculate the marginal COG for the Matawinie deposit.

$$Marginal\ COG = \frac{Processing\ Cost\ x\ Concentrate\ Grade}{(\text{Sales Price} - \text{Royalty} - \text{Selling Cost} - \text{G\&A Cost})x\ Mill\ Recovery}$$

The marginal open pit cut-off grade was calculated to be 1.0% Cg. To ensure an average feed grade to the processing plant that can provide a high-quality concentrate, the cut-off grade was artificially elevated to 2.2% Cg. It should be noted that, within the open pit, there are approximately 5.7 Mt of Measured and Indicated Mineral Resources that have a grade between 1.0 and 2.2% Cg. The average grade of these resources is 1.63% Cg.

Pit Optimization Results

Using the cost and operating parameters, a series of 34 pit shells was generated by varying the selling price (revenue factor) from 475$/t to 1,583$/t. The tonnages and grades associated with each of the pit shells are presented in Table 15-3. The Net Present Value (NPV) of each shell was calculated assuming a selling price of 1,439$/t of graphite concentrate, a discount rate of 8% and an annual production rate of 2.6 Mtpy of ore. It is important to note that the NPV's presented do not include initial and sustaining capital costs and are therefore not indicative of the Project's NPV, they are merely used to compare the pit shells relative to each other.

Figure 15-1 presents the results in a graphical format and Figure 15-2 presents a typical section through the deposit highlighting several of the important pit shells.

The pit shell with the maximum NPV is the Revenue Factor (RF) 0.55, which has an NPV of $956M. The pit shell that was selected to guide the design of the ultimate pit is the RF 0.50 shell which has an NPV of $947M. This shell was selected since it provides a 25-year mine life and the loss on NPV versus the RF 0.55 is easily offset by the incremental strip ratio of 2.1:1 between the two shells.

The RF 0.50 pit contains 63.1 Mt of Measured and Indicated Mineral Resources with an average diluted Cg grade of 4.24% and a strip ratio of 1.16:1.

Table 15-3: Pit optimization results

Revenue Factor	Ore (Mt)	Cg (%)	OB (Mt)	Waste Rock (Mt)	Total Waste (Mt)	Strip Ratio	Mine Life (y)	NPV (M$)
0.33	2.7	4.92	0.5	0.4	0.9	0.32	1.1	121
0.34	3.6	4.85	0.6	0.7	1.3	0.35	1.4	154
0.35	5.4	4.74	0.9	1.2	2.2	0.40	2.1	217
0.36	7.2	4.65	1.2	1.8	3.0	0.42	2.8	270
0.37	9.9	4.57	1.8	2.9	4.7	0.47	3.9	349
0.38	13.7	4.46	2.8	4.0	6.8	0.50	5.4	439
0.39	16.3	4.42	3.2	5.4	8.7	0.53	6.4	495
0.40	18.6	4.38	3.5	6.9	10.4	0.56	7.3	540
0.41	30.7	4.43	9.6	18.3	27.8	0.91	12.0	744
0.42	34.8	4.41	10.2	22.7	32.9	0.95	13.6	792
0.43	41.2	4.40	13.4	28.6	42.0	1.02	16.1	854
0.44	44.7	4.37	13.7	32.5	46.3	1.03	17.5	878
0.45	49.8	4.31	14.1	37.6	51.7	1.04	19.5	903
0.46	52.8	4.29	14.4	41.6	56.0	1.06	20.7	916
0.47	56.3	4.27	14.7	46.9	61.7	1.09	22.1	930
0.48	58.2	4.26	14.9	49.7	64.6	1.11	22.8	936
0.49	60.8	4.25	15.2	54.2	69.4	1.14	23.8	943
0.50	63.1	4.24	15.4	58.0	73.4	1.16	24.8	947
0.51	65.2	4.22	15.5	61.8	77.3	1.19	25.6	950
0.52	68.1	4.21	15.7	67.3	83.0	1.22	26.7	953
0.53	70.1	4.20	15.8	71.4	87.2	1.24	27.5	955
0.54	71.6	4.19	15.9	75.0	90.9	1.27	28.1	956
0.55	72.2	4.19	15.9	76.4	92.3	1.28	28.3	956
0.60	75.8	4.18	16.3	86.2	102.5	1.35	29.7	954
0.65	77.4	4.17	16.4	91.6	108.0	1.39	30.3	952
0.70	78.7	4.17	16.5	96.8	113.3	1.44	30.9	948
0.75	79.6	4.16	16.6	100.4	117.0	1.47	31.2	946
0.80	80.0	4.16	16.7	102.3	119.0	1.49	31.4	944
0.85	80.4	4.16	16.7	104.7	121.4	1.51	31.5	942
0.90	80.7	4.16	16.7	106.1	122.9	1.52	31.6	940
0.95	81.0	4.16	16.8	108.3	125.1	1.54	31.8	938
1.00	81.2	4.16	16.9	109.6	126.5	1.56	31.8	936
1.05	81.3	4.16	16.9	110.4	127.3	1.57	31.9	935
1.10	81.4	4.16	17.0	111.6	128.6	1.58	31.9	934

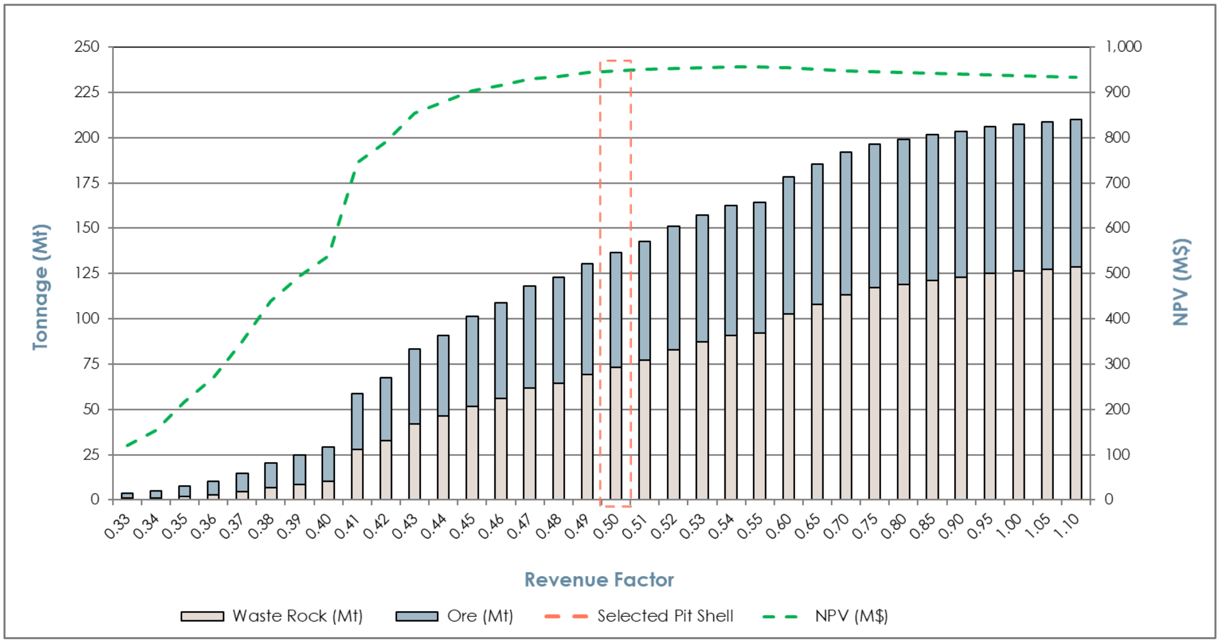


Figure 15-1: Pit optimization results

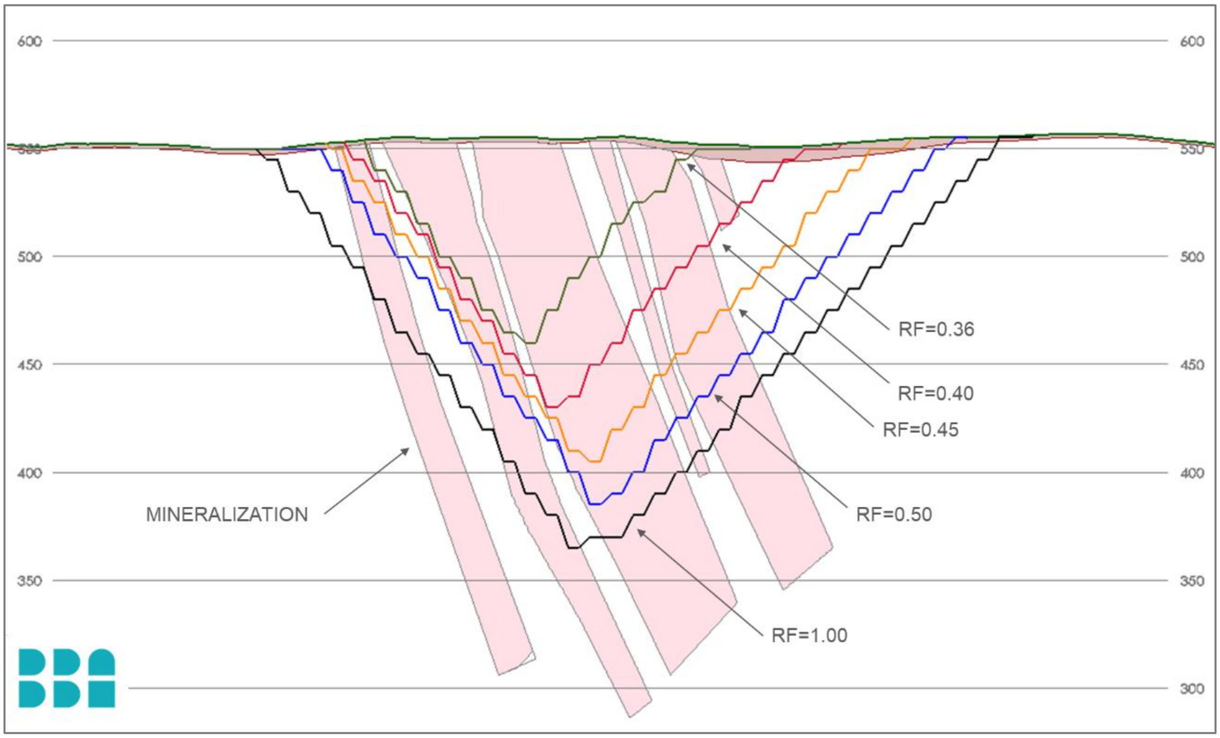


Figure 15-2: Pit optimization shells

15.5. Open Pit Design

Using the results of the pit optimization analysis, an operational pit was designed, which is the basis of the LOM plan. This pit design uses the selected pit shell as a guide and includes smoothing the pit wall, adding ramps to access the pit bottom and ensures that the pit can be mined safely and efficiently. The following section provides the parameters that were used for the open pit design and presents the results.

15.5.1. Bench Height

A 10-m high bench height was selected for the Matawinie deposit. Ore will be mined in two 5 m flitches, and waste rock will be mined in 10 m benches.

15.5.2. Geotechnical Pit Rock Slope Parameters

This section of the report was written by Ed Saunders, Relevant Expert of SRK Consulting (SRK), for the open pit rock slopes for this Study.

Overburden Slope

Considering the overall slope of 2H:1V (26.6 degrees) recommended for the overburden by SNC (Arié and Boutelja, 2018), a set-back bench berm at the overburden-rock contact with surface water interception ditches to capture and divert water flow from the pit crest should be included in the design. At the north end of the pit, where the overburden thickness ranges between 30 m to 60 m, a set-back width of 10 m should be incorporated in the design. A set-back width of 5 m should be incorporated in the design at the south end of the pit where the overburden thickness is shallower.

Open Pit Rock Geotechnical Slope Design

SRK carried out an open pit slope investigation, stability assessment and design update in 2021 (SRK, 2021). The work was carried out to develop rock slope design criteria for the initial and final pits. In summary, the Matawinie Mine pit slope stability and resulting design is defined by:

- Good quality, high strength rock mass units;
- The orientation of the regional east-dipping foliation structures (west and northwest walls);
- The kinematic stability related to the major joint sets (all pit walls).

The deposit is characterized by very good quality rock masses that have been subject to high ductile strain. The rock fabric is gneissic and generally becomes more massive toward the Charnokite Gneiss, located east and west of the centre graphite shear zone.

For the West Walls and portions of the East Wall (South 1 Domain) and North Wall (North Domain), the achievable design slopes are reliant on stripping along foliation to form the design bench faces. The objective is to reduce planar sliding mechanisms through an appropriate Bench Face Angle (BFA) that does not undercut the continuous structures. Although the rock masses have low open fracture counts, it is expected that incipient foliation structures will open during the blasting cycles.

Field and Laboratory Investigation

SRK conducted pit slope geotechnical investigations in 2021 to address data gaps and improve the reliability of the rock mass and fault models used to inform the design. The investigations included three new diamond geotechnical drill holes, re-logging of core from five previous geotechnical drill holes and a total of 21 televiewer surveys completed in open historical exploration holes. In addition, NMG have collected recovery and RQD logging data in all exploration drill holes completed to date. The investigation was supported with the new rock strength laboratory testing that expanded the historical database. The investigation locations are shown in Figure 15-3.

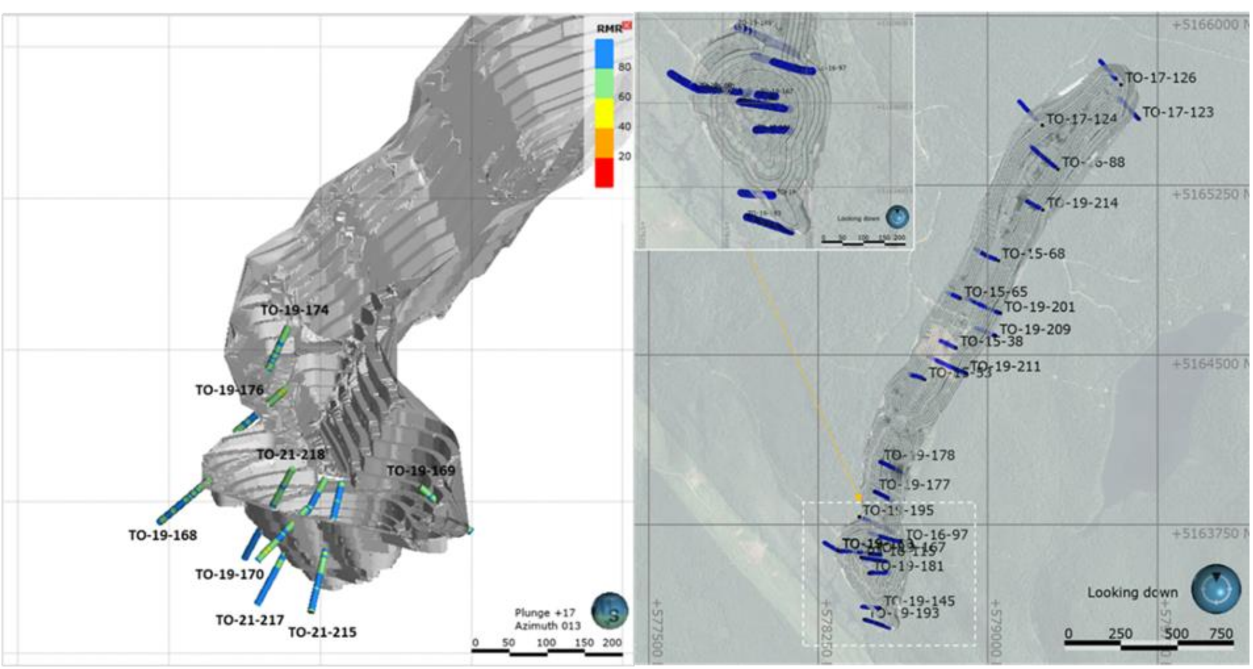


Figure 15-3: Location of geotechnical diamond drill holes and televiewer surveys

Foliation and Structural Geology Models

SRK completed a brittle-structural interpretation of the deposit and developed a 3D structural model, presented in Figure 15-4. The structural model contains a total of 15 fault structures. The core review indicates that most of the faults are represented as intervals of increased fracturing, typically orientated parallel to foliation (11 of 15 faults). Oblique or perpendicular to foliation faults were identified and interpreted in the south.

Orientation, shear strength, and fracture spacing components are critical stability controls for the foliation-parallel pit slopes. All valid orientation data was processed in Leapfrog™ to generate a 3D model as shown in Figure 15-5. The model has a high reliability in the North, Central and South Domain 1 sectors. The mode has a low reliability in South Domain 2 as the deposit is considered to be increasingly ductile in rock fabric with multiple foliation trends.

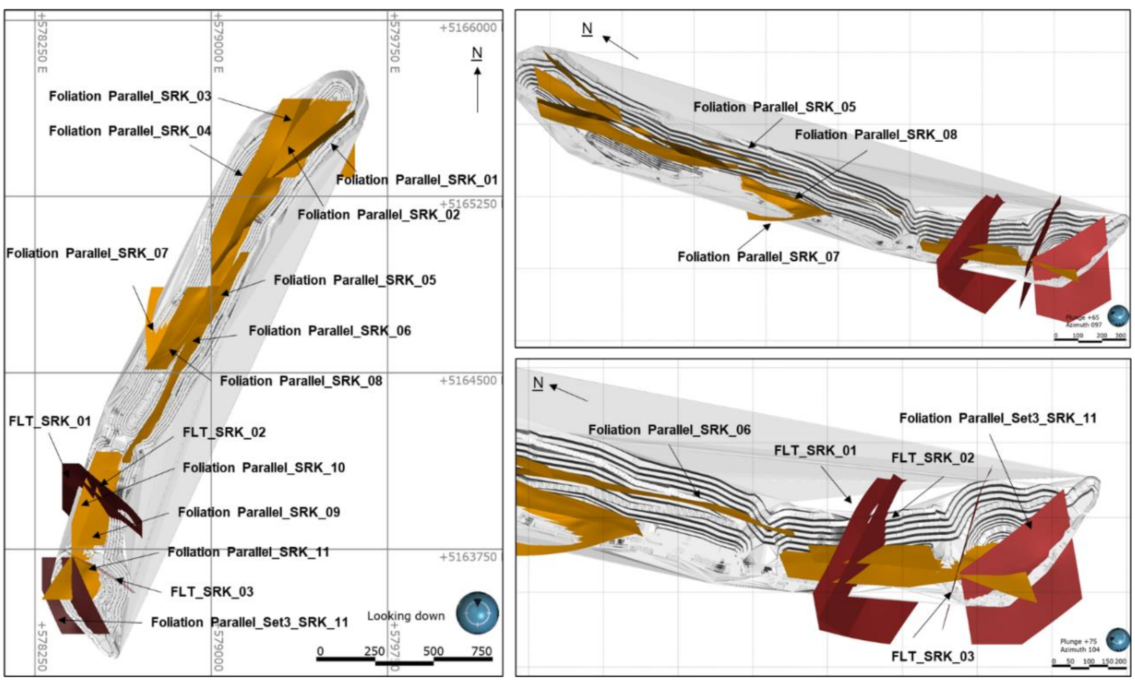


Figure 15-4: Matawinie Mine 3D structural model interpretation

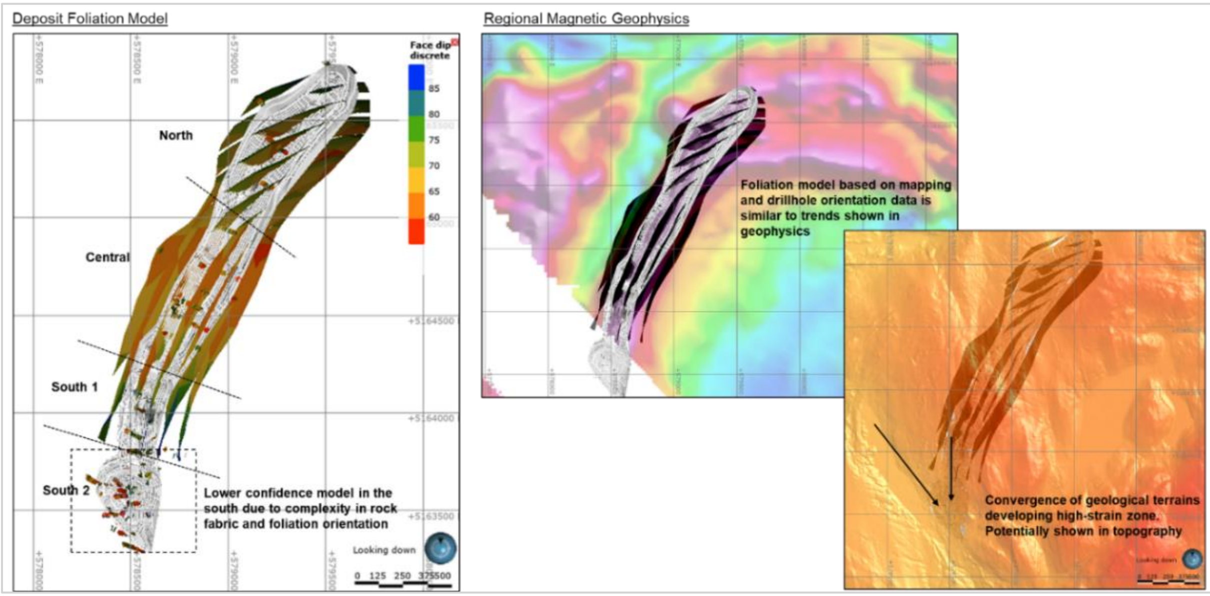


Figure 15-5: Matawinie Mine 3D foliation model

Stability Assessment

A rock slope stability assessment was carried out using multiple approaches with a combination of software packages, as summarized in Table 15-4.

Table 15-4: Overview of stability assessment approach and software

Pit Slope Scale	Approach	Software Utilized
Bench	Observed bench and blast slope performance Kinematic stability analyses 3D interpolant (foliation) models Modified Richie criteria (bench widths)	DIPS™ Leapfrog™ SBlock™
Inter-Ramp	Observed bench and blast slope performance 3D fault/joint geometric intersections 3D interpolant (foliation) models Kinematic stability analyses LE stability analyses	DIPS™ Leapfrog™ SWedge™ Slide2D™
Overall	LE stability analyses FE stability analyses	Leapfrog™ Slide2D™ RS2™

Kinematic analyses were carried out using Dips™ and SBlock™ for defined litho-structural domains and all applicable slope face directions. The analyses were carried out for 30° segments to identify the potential kinematic failure modes that could limit the design. Both wedge intersection and planar sliding mechanisms were assessed to be high risk at the bench scale for some of the analyzed slope aspects prior to adopting the current mitigating design recommendations.

Two-dimensional slope stability analyses were used to evaluate the expected design rock slope stability conditions. The analyses were conducted using Slide2D™ and RS2™. The stability analyses considered the potential for overall non-circular failure through the anisotropic rock mass. Stability analyses were carried out for a total of three design sections, including four sections through the final pit, presented in Figure 15-6.

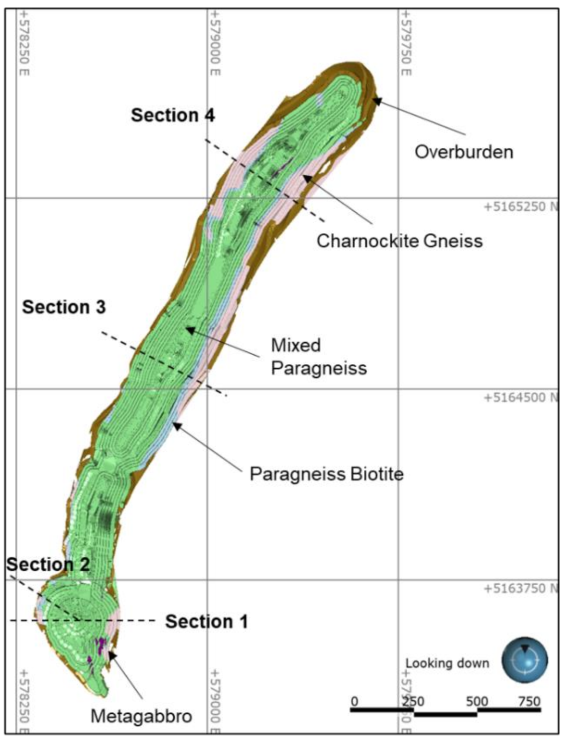


Figure 15-6: Final pit stability section locations

The results indicated that a Factor of Safety (FOS) of equal or greater than 1.5 for both the Phreatic Surface Groundwater (GW) and Pore Pressure Model (PPM) cases, except for Section 2 (South 2 Domain, West Wall) under the GW Case. The results are presented in Table 15-5. The PPM case is considered the design case as it simulates some downward hydraulic gradients in the fractured rock mass. Both cases represent limited drawdown behind the excavated slope faces, indicating little sensitivity to groundwater.

Table 15-5: Summary of limit equilibrium results for Final Pit

Domain	Pit Wall	Stability Section	Pit height (m)	Modelled IRA (°)	Minimum DAC FOS	Factor of Safety	
						GW1	PPM (Design Case)
South 1	West	Section 1A	150	52	1.5	1.7	2.1
	East	Section 1B	190	55	1.5	1.5	1.8
South 2	West	Section 2	155	52	1.5	1.3	1.7
Central	West	Section 3A	185	48	1.5	1.9	1.5
	East	Section 3B	190	57, 59	1.5	1.5	1.6
North	West	Section 4	185	55	1.5	1.8	1.5

Pit Slope Design Recommendations

The pit slope design recommendations are presented in Table 15-6, which are based on the litho-structural domains shown in Figure 15-7. In addition to these slopes, a 15 m wide geotechnical berm should be included if the benches exceed a height of 120 m uninterrupted by a ramp.

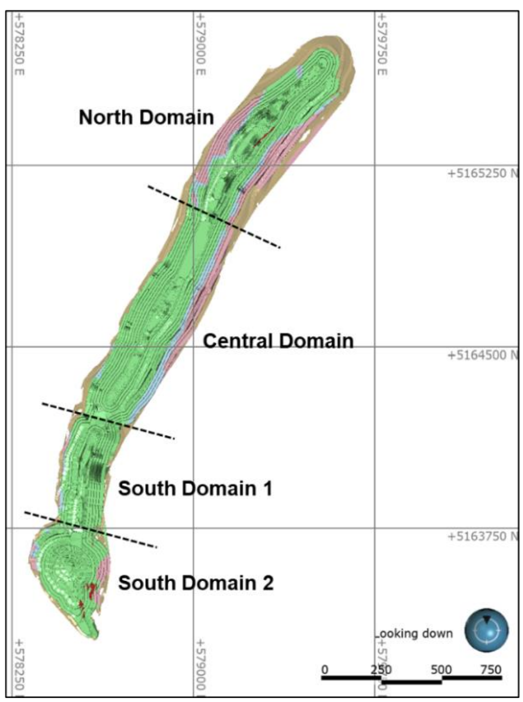


Figure 15-7: Litho-structural domains utilized for implementation of the design recommendations

Table 15-6: Final pit slope design recommendations

Design Sector				Design Recommendations			
Design Domain	Pit Wall	Slope Dip Direction (°)		Lithology	BFA (°)	Catch-Bench Width (m)	IRA (°)
		From	To				
North	North	170	230	Mixed Paragneiss	70	8.5	52
	Northeast-East	230	330	Mixed Paragneiss	80	9.0	58
				Biotite Paragneiss, Charnokite	80	8.0	60
	South-Southeast	330	60	Mixed Paragneiss	80	10.2	56
	Southwest	60	100	Mixed Paragneiss	75	10.2	52
	West-Northwest	100	170	Mixed Paragneiss, Biotite Paragneiss, Charnokite	75	8.5	55
Central	North	160	200	Mixed Paragneiss	80	10.2	56
	East	250	330	Mixed Paragneiss	80	9.0	58
				Biotite Paragneiss, Charnokite	80	8.0	60
	South	330	070	Mixed Paragneiss	80	8.5	59
	West-1	070	140	Mixed Paragneiss	67	8.0	50
	West-2	070	140	Mixed Paragneiss	65	8.0	49
	West-3	070	140	Mixed Paragneiss	70	8.0	53
South 1	North	130	250	Mixed Paragneiss	75	10.2	52
	East	250	290	Mixed Paragneiss	80	8.5	59
	South	290	030	Mixed Paragneiss	80	10.2	56
	West	030	130	Mixed Paragneiss	75	7.5	57
South 2	North-Northwest	140	205	Mixed Paragneiss	70	8.5	52
	Northeast	205	245	Mixed Paragneiss	75	8.5	55
	East	245	290	Mixed Paragneiss, Charnokite	75	8.5	55
	Southeast-South	290	080	Mixed Paragneiss, Charnokite	80	9.5	57
	West	080	125	Mixed Paragneiss	70	8.5	52

In addition, the following design guidelines are provided:

- The irregular bedrock-overburden profile will need to be considered in the pit design work in bedrock at the crest of the slope;
- The initial bench should be limited to a single bench height due to the increased fracturing and irregular joint orientations observed in shallow bench slopes;
- The foliation parallel BFA's are based on achievable blasting results and will need to be proved;
- Bullnoses (convex slopes) of one or more stack heights should be stepped-out and assigned a lower IRA, depending on their size, location, and radius of curvature;
- Implementation of a two-ramp approach through the pit phases to reduce consequences of an instability location above or below critical access.

Risks

Based on the findings of this study, the following risks should be considered:

- The design bench configuration is reliant on best practice blasting to successfully implement the slope recommendations. The kinematic stability work indicates the bench slopes could be susceptible to toppling (East Wall) and planar sliding along foliation (West Wall, North Wall, and South Domain 2 East Wall).
- With respect to the East Wall, the design BFA's of 80-degrees may need to be reduced where significant toppling risks exist. There is potential for toppling to have a greater risk than currently expected where foliation is more closely spaced than the current geotechnical logging indicates, and potentially due to incipient features opening during the blast cycles.
- There may be cases where foliation has limited influence on the bench faces in the massive rocks (i.e., Charnokite) and hang-ups occur. This may result in rock fall risks and challenges to implement the West Wall designs.
- The 3D structural geology model was developed with the geotechnical and exploration drill hole data. There may be stability risks associated with possible adversely orientated fault structures that were not intercepted by the drill holes.
- A planar sliding risk is identified along the FoliationParallel_SRK_08 fault located on the West Wall, Starter Pit/Central Domain. Review of the core indicates that this fault has a low confidence and is likely to be discontinuous.
- During the 2021 SRK site visits, several boxes of core were observed to have accelerated weathering characteristics close to the Graphite Paragneiss which results in full deterioration to finer-grained materials. The severely weathered materials are limited to shallow depths.

Opportunities

The following opportunities are considered:

- Should the rock mass conditions within Biotite Paragneiss and Charnokite have less influence from continuous foliation structures, there may be opportunities to form a steeper bench configuration along the West Wall (where rock is too massive to be impacted by foliation).
- The shallowest foliation data is within the Central Domain, West Wall. Should foliation be steeper than the current data indicates, a resulting steeper bench can be formed.

15.5.3. Haul Ramp Design

The haul ramps were designed for haulage with 60-t sized rigid frame mining trucks, with an overall width of 20 m. For double lane traffic, industry practice indicates the running surface width to be a minimum of three times the width of the largest truck. The overall width of a 60-t rigid frame mining truck is 5 m which results in a running surface of 15 m. The allowance for berms and ditches increases the overall width to 20 m. Single-lane traffic has been considered for the final six benches (60 m in elevation), reducing the overall ramp width to 13 m. Figure 15-8 presents the haul road configuration for 2-way traffic A maximum ramp grade of 10% was used.

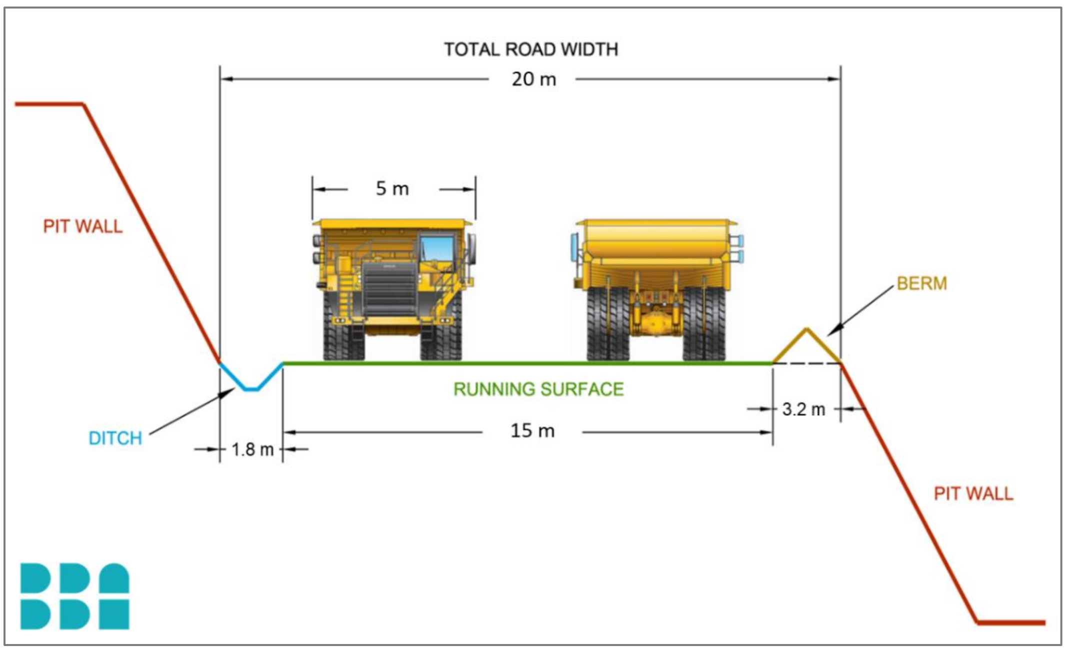


Figure 15-8: Ramp design

15.5.4. Minimum Mining Width

A minimum mining width of 20 m was considered for the pit design. This width must be respected to ensure that a 60-t haul truck, which has a turning radius of 12 m, can safely enter the mining area and make a 180° turn to be positioned for loading. Figure 15-9 is a conceptual sketch which shows a haul truck positioning for loading.

15.5.5. Final Bench Access

To reduce the strip ratio as much as is feasibly safe and efficient, the access ramp has not been designed to the bottom of the pit. When mining the final bench, the haul trucks will be positioned on the bench crest rather than on the bench toe. Figure 15-9 illustrates this operating scenario, commonly referred to in the industry as a goodbye cut. The final bench has been designed at a height of 8 m. There are also temporary ramps at the bottom of the pit that will be mined out at the end of the operation and are therefore not shown on Figure 15-10, which presents the pit design.

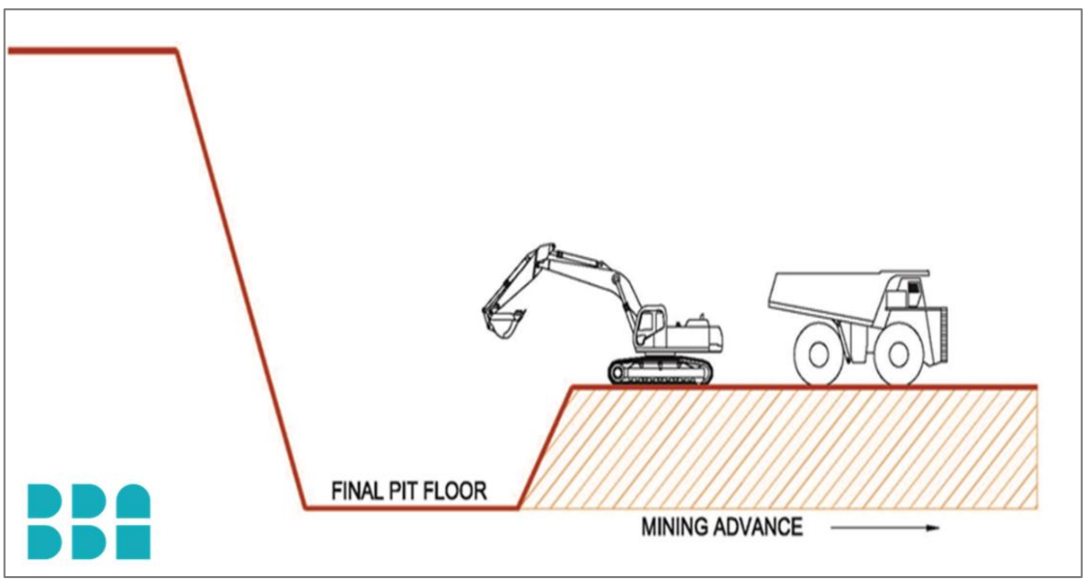


Figure 15-9: Final bench access

15.5.6. Open Pit Design Results and Mineral Reserves

The open pit that has been designed for the Project is approximately 3,000 m long and 400 m wide at surface. The total surface area of the pit is roughly 82 ha. The pit contains five independent ramp systems which are required for pit phasing and the in-pit placement of waste rock and tailings. The deepest part of the pit is at the 345 m elevation at the north end of the pit, where the total depth of the pit reaches 185 m. The pit avoids a wetland on the southwest corner and is 110 m away from the Hydro-Québec power lines.

Accounting for mining dilution and ore loss, the open pit includes 17.3 Mt of Proven Mineral Reserves at an average Cg grade of 4.16% and 44.4 Mt of Probable Mineral Reserves at an average Cg grade of 4.26%, for a total of 61.6 Mt of Proven and Probable Mineral Reserves at an average Cg grade of 4.23%. To access these Mineral Reserves, 71.8 Mt of overburden and waste rock must be mined, resulting in a strip ratio of 1.16:1. There are less than 100,000 t of Inferred Mineral Resources in the open pit. Figure 15-10 presents a plan view of the open pit design.

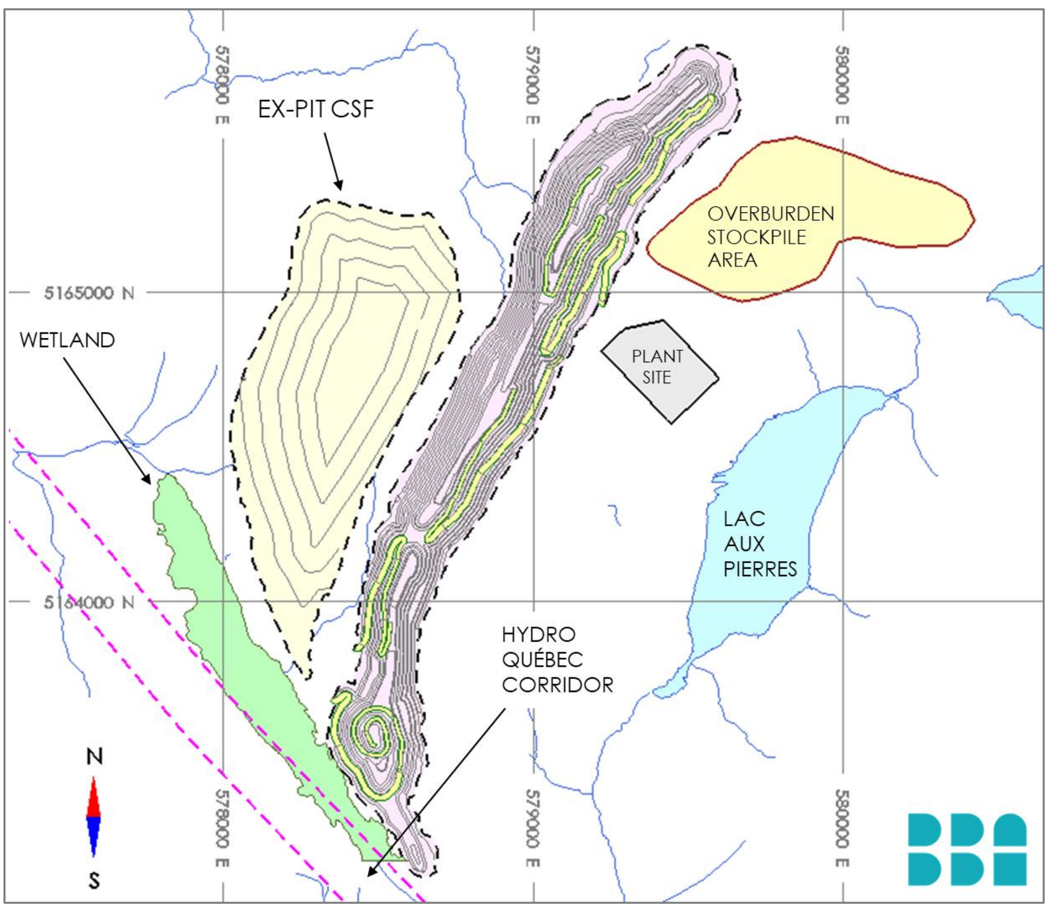


Figure 15-10: Open pit design

16. Mining Methods

16.1. Introduction

The Matawinie Mine project will be mined using conventional open pit mining methods consisting of drilling, blasting, loading, and hauling. Vegetation, topsoil, and overburden will be stripped and stockpiled for future reclamation use. The ore and waste rock will be drilled and blasted with 10 m high benches. Ore will be loaded into haul trucks in two 5 m flitches with a fleet of diesel-powered hydraulic excavators and a front-end wheel loader, and the waste rock will be mined in 10 m high benches.

Waste rock will be hauled to the co-disposal storage facility (CSF) where a portion will be used as construction material with the excess being stored at the same site. Once the initial CSF is filled, the tailings and waste rock will be placed in the mined-out pit.

The mine will operate on two 8-hour shifts, five days per week, while the mill will operate 24 hours per day, 365 days per year. A crushed ore bin will be filled before the mine shuts down for the weekend.

16.2. Geotechnical Pit Slope Parameters

The geotechnical pit slope parameters are presented in Section 15.5.2.

16.3. Hydrogeology

The hydrogeology studies that have been done on the property are discussed in Section 20.2.6. Potential water sources that affect the mining operation are surface run-off, rainfall, snowmelt, and groundwater. mine dewatering is presented in Section 16.8.

16.4. Phase Designs

To maximize the NPV of the Project, mining phases (pushbacks) have been designed and incorporated into the mining sequence to defer waste rock stripping and to provide a blended feed grade that is acceptable for the concentrator over the life of the project.

It was decided to mine the deposit from south to north in order to ensure that required space is available for in-pit backfilling of waste rock and tailings once the initial CSF at surface is filled to capacity. Even though the south part of the pit is further away from the crusher and the initial construction area of the CSF, it was selected since the stripping ratios are lower at the south end of the pit relative to the north end.

A total of six phases have been designed. The Starter Pit is located in the centre of the deposit and was selected since it has a very low strip ratio of 0.6:1. The starter pit contains 8.8 Mt of ore at an average diluted Graphitic Carbon grade (Cg) of 4.35%. The starter pit will be mined down to the 452 m elevation for a total depth from surface of approximately 100 m.

Phase 1 is located at the extreme south end of the pit. Phase 1 contains 6.6 Mt of ore at an average diluted grade of 4.01% Cg and a strip ratio of 1.1:1. Phase 1 will be mined down to the 367 m elevation for a total depth from surface of approximately 130 m. Phase 1 and the Starter Pit will be mined simultaneously in order to ensure the concentrator is fed an acceptable grade of graphite and also to split the operation into two mining areas to improve fleet productivities.

Phase 2 is located directly to the north of Phase 1 and to the south of the Starter Pit. Phase 2 contains 8.4 Mt of ore at an average diluted grade of 4.14% Cg and a strip ratio of 1.2:1. Phase 2 will be mined down to the 404 m elevation for a total depth from surface of approximately 150 m.

Phase 3 is located directly to the north of Phase 2 and expands on the Starter Pit. Phase 3 contains 11.5 Mt of ore at an average diluted grade of 4.09% Cg and a strip ratio of 1.2:1. Phase 3 will be mined down to the 404 m elevation for a total depth from surface of approximately 150 m.

Phase 4 is located directly to the north of Phase 3 and expands on the Starter Pit. Phase 4 contains 15.6 Mt of ore at an average diluted grade of 4.08% Cg and a strip ratio of 1.2:1. Phase 3 will be mined down to the 367 m elevation for a total depth from surface of approximately 170 m.

Phase 5 is the final phase and is located at the extreme north end of the pit. Phase 5 contains 10.8 Mt of ore at an average diluted grade of 4.73% Cg and a strip ratio of 1.6:1. Phase 5 will be mined down to the 360 m elevation for a total depth from surface of approximately 150 m.

Table 16-1 presents the Mineral Reserves for each phase, Figure 16-1 presents a plan view of the phases and Figure 16-1 to Figure 16-7 present isometric view of the phase designs.

Table 16-1: Mineral Reserves by phase

Description	Ore (Mt)	Cg (%)	OB (Mt)	Waste Rock (Mt)	Total Waste (Mt)	Strip Ratio
Starter Pit	8.8	4.35	1.1	4.2	5.3	0.60
PH1	6.6	4.01	1.0	6.4	7.4	1.12
PH2	8.4	4.14	1.2	9.2	10.4	1.24
PH3	11.5	4.09	1.2	12.7	13.9	1.20
PH4	15.6	4.08	4.1	14.0	18.1	1.15
PH5	10.8	4.73	7.0	9.8	16.8	1.56
Total	**61.7**	**4.23**	**15.5**	**56.3**	**71.8**	**1.16**

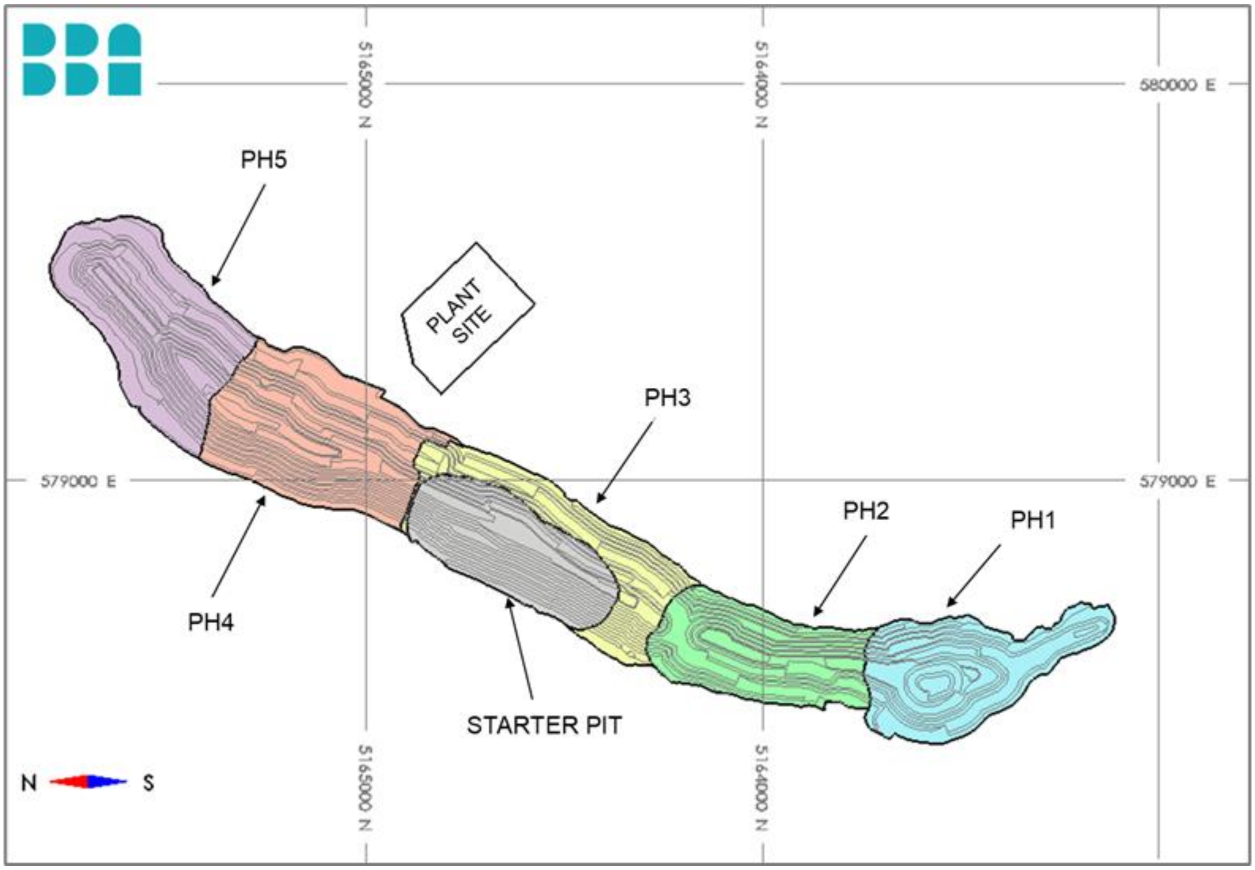


Figure 16-1: Phase designs

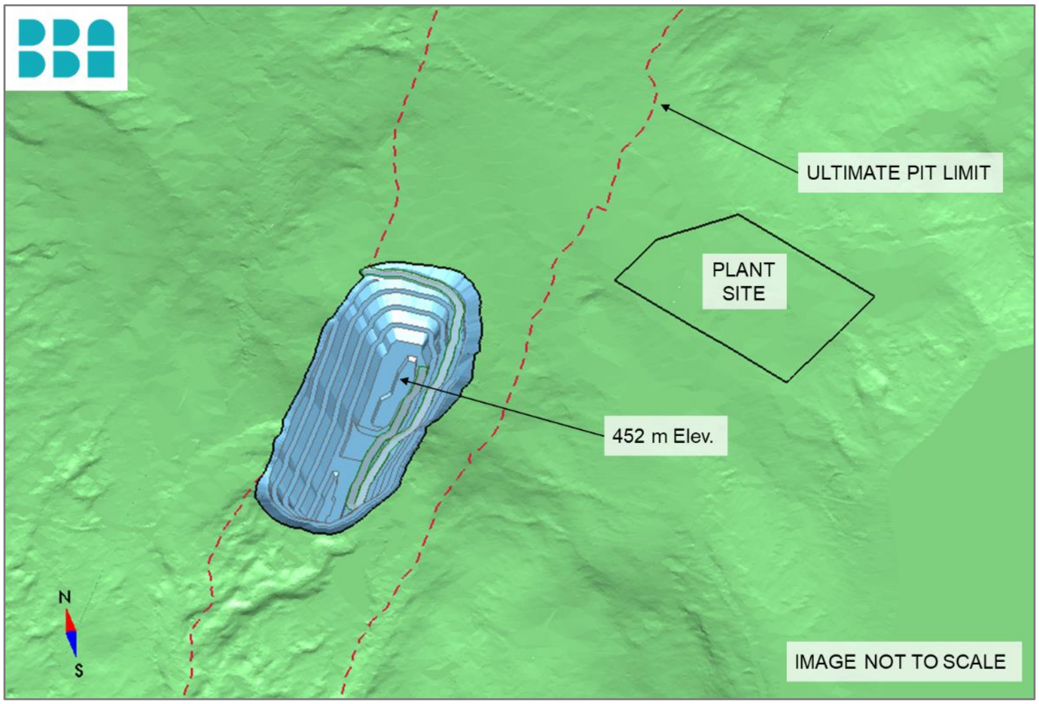


Figure 16-2: Starter pit design

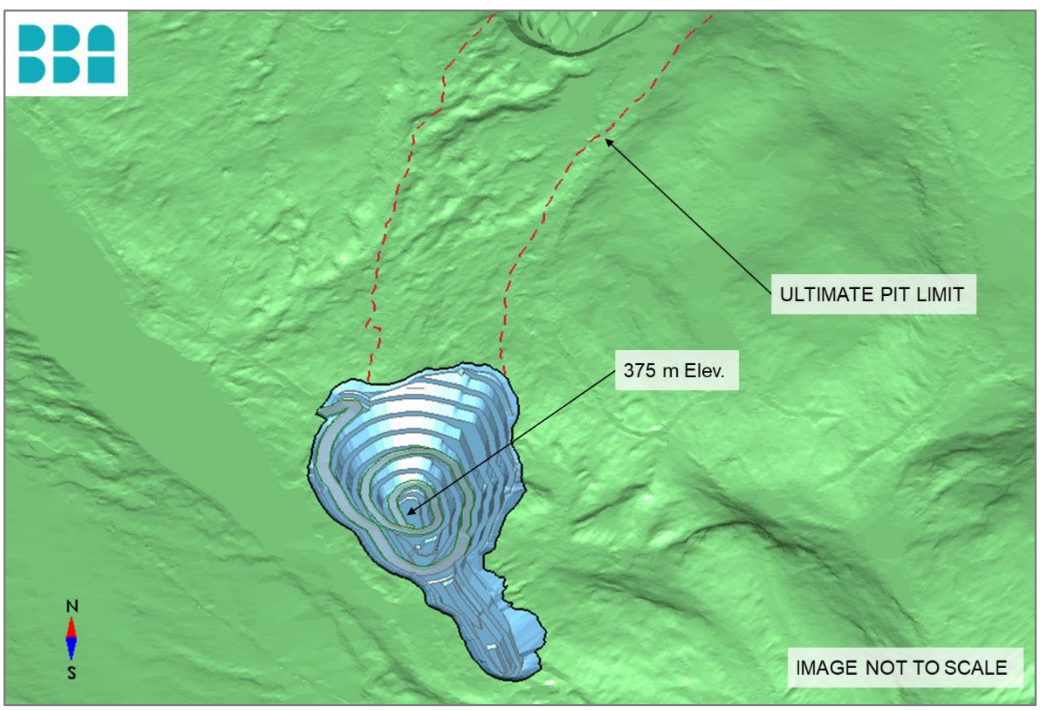


Figure 16-3: Phase 1 design

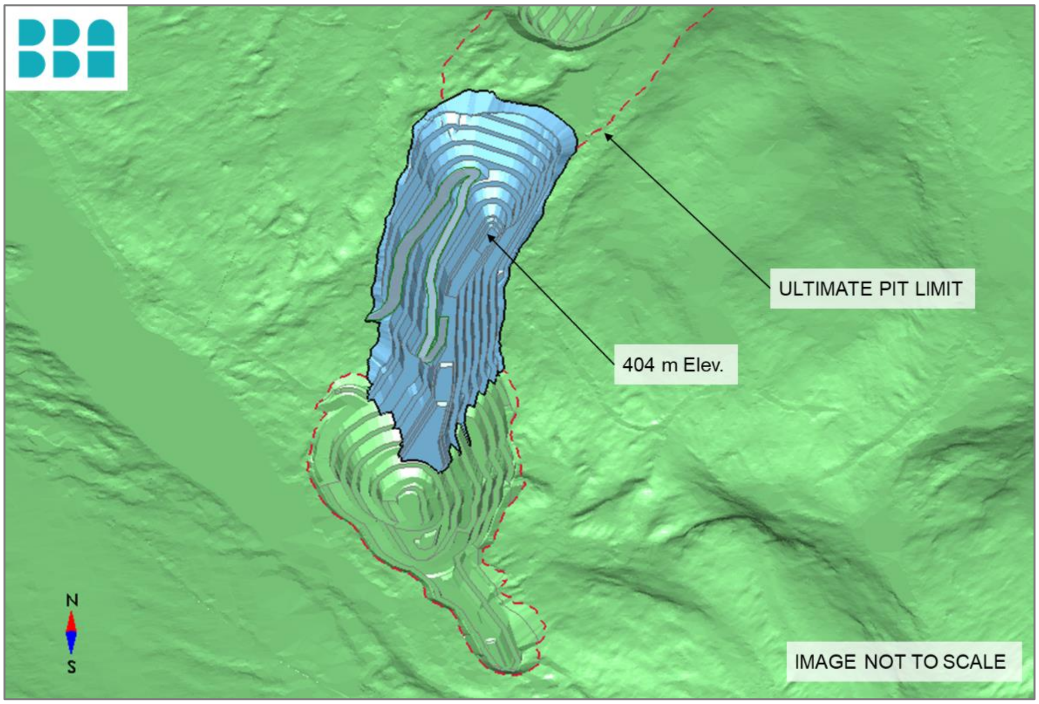


Figure 16-4: Phase 2 design

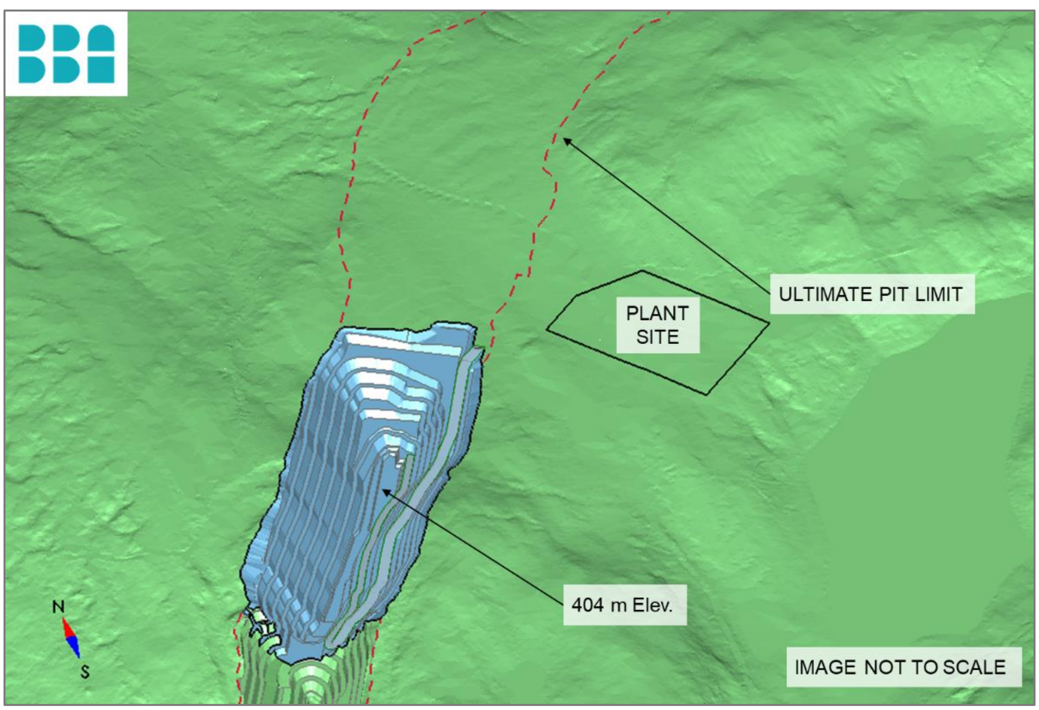


Figure 16-5: Phase 3 design

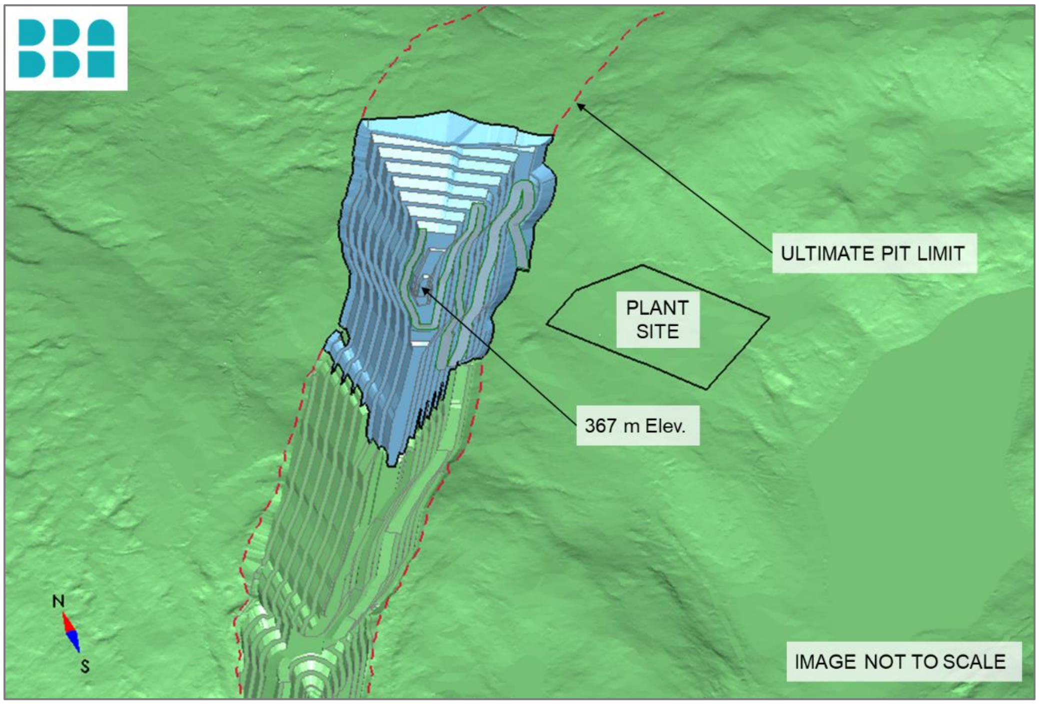


Figure 16-6: Phase 4 design

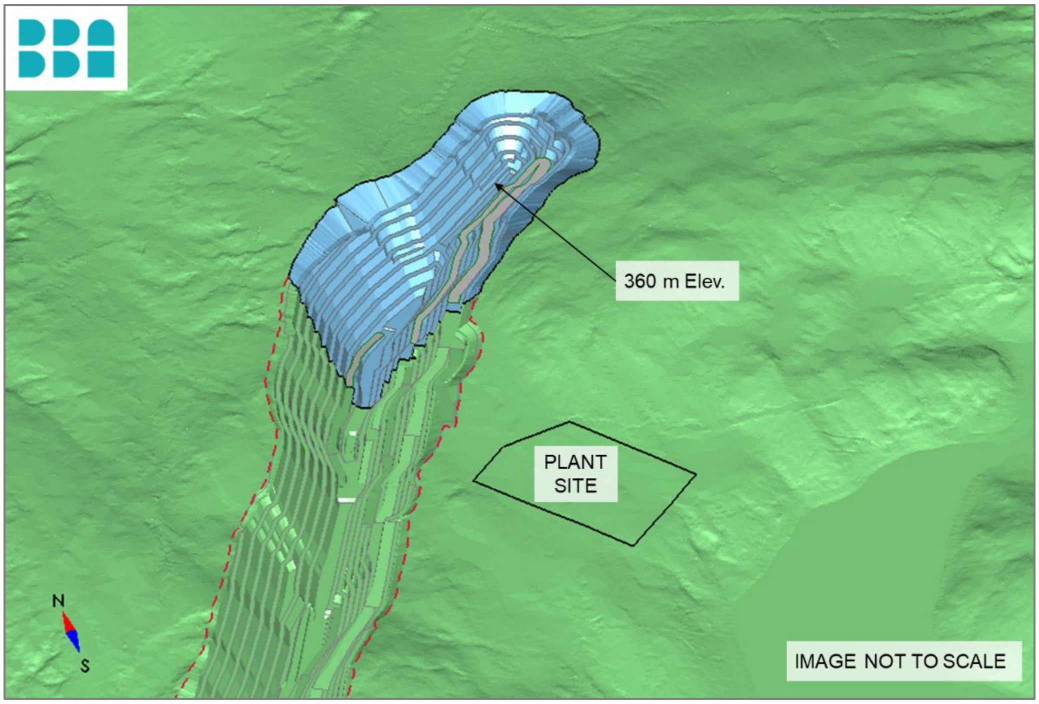


Figure 16-7: Phase 5 design

16.5. Waste Rock Storage Facility and Stockpiles

Material mined from the open pit that is not directly hauled to the primary crusher will be placed in several storage facilities across the site. These facilities, discussed in further detail below, include topsoil stockpiles, an overburden stockpile, the CSF, the pre-production ore stockpile, and an emergency ore stockpile. Note that trees will be cleared prior to placing material in these piles.

16.5.1. Topsoil Stockpile

An average topsoil thickness of 30 cm in the open pit was considered for the Study. The topsoil (organic material) will be stripped and placed separately in a stockpile and will be used for closure and reclamation activities. The topsoil stockpiles will be strategically located around the site to minimize haul distances. Topsoil will also be hauled directly to certain areas if they are available for reclamation, thus reducing costs by limiting re-handling activities.

16.5.2. Overburden Stockpile

During pre-production, and for the first two years of the operation, overburden will be stripped and hauled to the overburden stockpile which is located to the north of the concentrator. Beginning in Year 3, overburden will be hauled and placed directly on the CSF to cap areas that have reached the final design and to begin the closure and reclamation activities.

In total, 1.1 Mm^3 of overburden will be hauled to the overburden stockpile.

16.5.3. Pre-production Ore Stockpile

Ore mined during the pre-production period will be placed in an ore stockpile and reclaimed in the following year. The ore stockpile will be located in an area near the primary crusher.

16.5.4. Emergency Ore Stockpile

To ensure the primary crusher can be fed when the mine will be shut down during extreme weather events, an emergency ore stockpile has been located on the run of mine (ROM) pad. The emergency ore stockpile has a 10,000-t capacity to provide 24 hours of crusher feed. The emergency ore stockpile has a height of 5 m and a surface area of 1,000 m^2. Ore from this stockpile will be rehandled with a wheel loader that will dump directly into the hopper of the primary crusher.

16.5.5. Co-Disposal Storage Facility

Waste rock mined from the open pit will be placed in the CSF. The CSF is discussed in further detail in Sections 18.2 and 18.3. Once the initial CSF at surface is filled to capacity, which is expected to occur in the sixth year of the operations, waste rock and tailings will be backfilled in the mined-out pit. Figure 16-8 presents an image showing the final layout of the CSF.

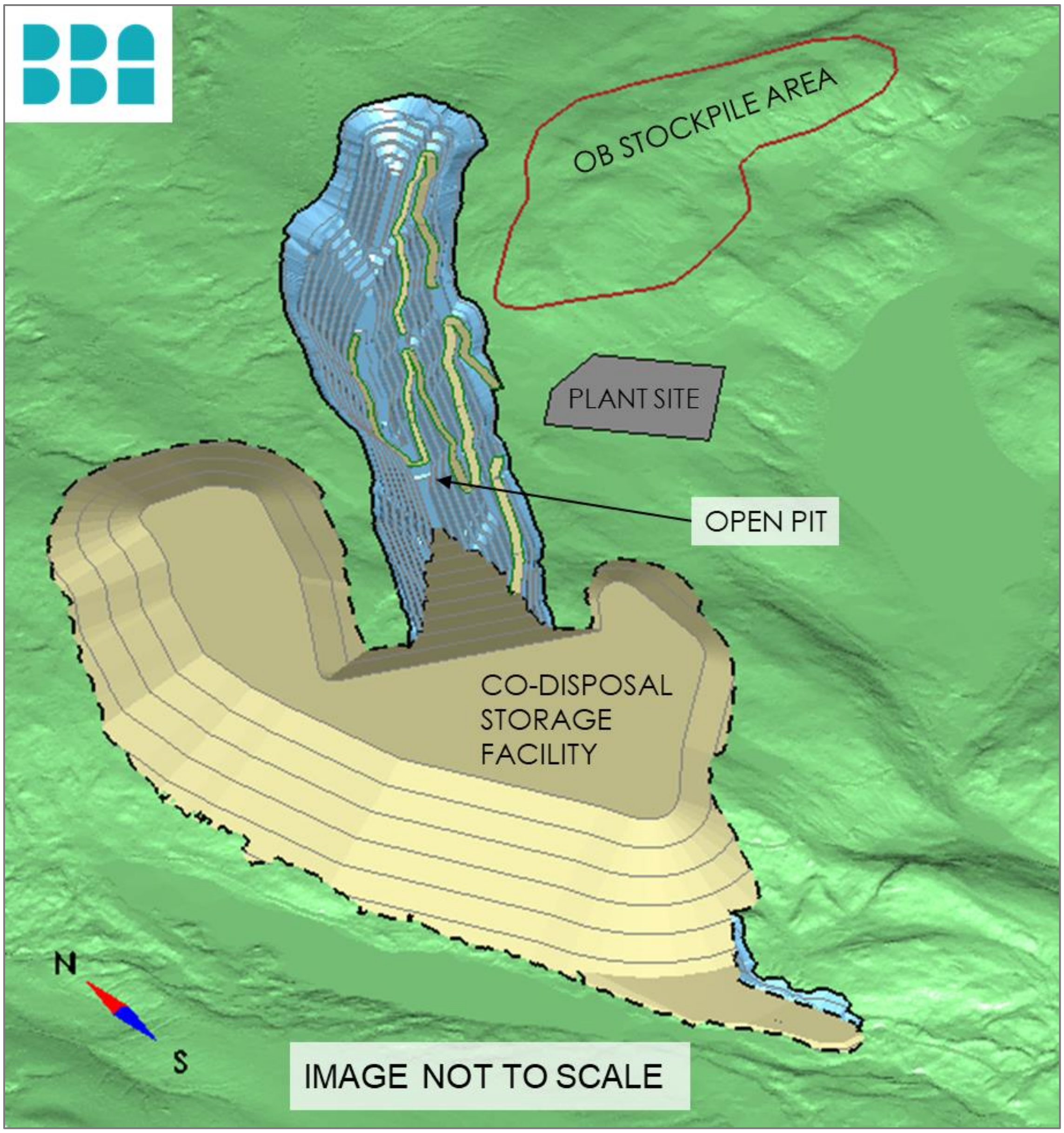


Figure 16-8: Waste rock storage facility and stockpiles

16.6. Mine Planning

16.6.1. Mine Planning Parameters

The mine production plan has been prepared using the MinePlan Schedule Optimizer (MPSO) tool in the Hexagon MinePlan 3D software. Provided with economic input parameters and operational constraints such as phase sequencing, maximum bench sink rates, and mining and milling capacities, the software determines the optimal mining sequence which maximizes the NPV of the mine production plan.

The mine plan has been prepared quarterly for the first two years of production, annually for the following 11 years, and in three-year increments thereafter. The mine plan also includes a six-month period of pre-production. The purpose of the pre-production period is for the mine to provide waste rock for construction material and to prepare the pit for mining operations.

The mine plan has been prepared using cuts that are 60 m x 60 m x 10 m high, for the first four phases, and 120 m x 120 m x 10 m high for the final two phases.

No specific maximum bench sink rate was used as a constraining parameter for the mine plan, but upon completion it was verified that the mining advances in each period were not too aggressive.

The mine plan targets the nominal mill throughput capacity of 324 tph, resulting in a maximum mill feed of 2.551 Mtpy considering an overall mill utilization of 90%. The mine plan accounts for the following process plant utilization ramp-up prior to achieving nominal capacity, which is based on the Series 1 McNulty curve.

- Month 1 – 37%;
- Month 2 – 45%;
- Month 3 – 75%;
- Month 4 – 80%;
- Month 5 – 90%;
- Month 6 – 100%.

The following calculation is used to determine the amount of concentrate that is produced from the run of mine ore. The mill recovery is 93% and the concentrate grade is 97%, as presented in Section 15.4.2. The factor of 1.03 is used to convert Graphitic Carbon grade (Cg) into Total Carbon grade (Ct), as discussed in Section 15.2.

$$Concentrate\ Tonnes = \frac{Run\ of\ mine\ ore\ (t)\ x\ Cg\ grade\ (\%)\ x\ 1.03}{Concentrate\ Grade\ (\%)\ x\ Mill\ Recovery\ (\%)}$$

The mine plan aims to produce 105,900 t of concentrate per year. This is achievable given the mill capacity, assuming the feed grade is 4.20% Cg. The mine plan sequencing, therefore, ensures that multiple ore faces are available to mine to provide an average feed grade close to 4.20% Cg.

16.6.2. Matawinie Mine Production Schedule

The Matawinie Mine project has a 25-year mine life plus a six-month period of pre-production development referred to as Year 0. During pre-production, a total of 750 kt of material is mined, including 313 kt of overburden, 203 kt of waste rock, and 235 kt of ore.

During the mining operation, the total material mined from the open pit peaks at 6.2 Mt in Year 3 and averages 5.6 Mtpy for the first 22 years. The average diluted Cg grade ranges from 4.00% to 4.40% for the first 22 years, and averages 4.88% in the final three years. The mine plan is successful at achieving the targeted concentrate production, with a low of 101,000 t in Year 12 and a peak of 105,900 t in Years 8 and 10. The average concentrate production over the life of mine averages 103,328 tpy.

Mining of the six phases follows the sequence presented below:

- Starter Pit – Year 0 to Year 8;
- Phase 1 – Year 0 to Year 7;
- Phase 2 – Year 3 to Year 11;
- Phase 3 – Year 6 to Year 16;
- Phase 4 – Year 10 to Year 22;
- Phase 5 – Year 17 to Year 25.

Table 16-2 presents the mine production schedule. Figure 16-9 to Figure 16-12 present various charts which display the mine production schedule. Figures presenting the pit advances and CSF construction sequencing for Years 4, 10, 20 and 25 are presented in Chapter 18.

It should be noted that mining in Phase 1 is complete in Year 7 while the CSF at surface will be filled to capacity in Year 6. This should be addressed in subsequent mine planning work to either advance Phase 1 mining by a year or add capacity to the initial CSF at surface.

Table 16-2: Mine production schedule

Description	Unit	PP	Year 01				Year 02				Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14 - 16	Y17 - 19	Y20 - 22	Y23 - 24	Y25	Total
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4																	
Mill Feed	kt	0	286	509	643	643	629	636	643	643	2,551	2,551	2,557	2,551	2,551	2,551	2,557	2,551	2,551	2,551	2,551	7,652	7,652	7,313	4,465	1,948	**61,730**
Cg Grade	%	0.00	4.20	4.20	4.20	4.20	4.20	4.08	4.20	4.20	4.13	4.13	4.04	4.10	4.17	4.20	4.12	4.20	4.07	4.00	4.14	4.10	4.13	4.40	4.80	5.04	**4.23**
Concentrate Produced	kt	0.0	11.9	21.1	26.7	26.7	26.1	25.6	26.7	26.7	104.0	104.0	102.0	103.3	104.9	105.7	104.1	105.9	102.6	100.7	104.2	309.6	312.2	317.6	211.8	96.9	**2,581**
ROM to Mill	kt	0	51	509	643	643	629	636	643	643	2,551	2,551	2,557	2,551	2,551	2,551	2,557	2,551	2,551	2,551	2,551	7,652	7,652	7,313	4,465	1,948	**61,495**
Cg Grade	%	0.00	4.17	4.20	4.20	4.20	4.20	4.08	4.20	4.20	4.13	4.13	4.04	4.10	4.17	4.20	4.12	4.20	4.07	4.00	4.14	4.10	4.13	4.40	4.80	5.04	**4.23**
ROM to Stockpile	kt	235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**235**
Cg Grade	%	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**4.21**
Stockpile to Mill	kt	0	235	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**235**
Cg Grade	%	0.00	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**4.21**
Overburden	kt	313	331	166	168	305	282	91	161	114	942	222	139	351	525	599	17	482	826	1,089	1,007	417	3,223	3,736	0	0	**15,504**
Waste Rock	kt	203	133	192	621	553	416	516	686	450	2,685	2,152	2,422	3,099	2,925	2,850	3,425	2,967	2,623	2,360	2,443	7,638	5,521	6,864	2,352	205	**56,304**
Total Material Moved	kt	750	750	867	1,432	1,500	1,327	1,243	1,490	1,207	6,178	4,924	5,119	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	15,706	16,396	17,914	6,817	2,153	**133,773**
Total Material Mined	kt	750	515	867	1,432	1,500	1,327	1,243	1,490	1,207	6,178	4,924	5,119	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	15,706	16,396	17,914	6,817	2,153	**133,538**
Strip Ratio		2.2	9.0	0.7	1.2	1.3	1.1	1.0	1.3	0.9	1.4	0.9	1.0	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4	1.1	1.1	1.4	0.5	0.1	**1.2**

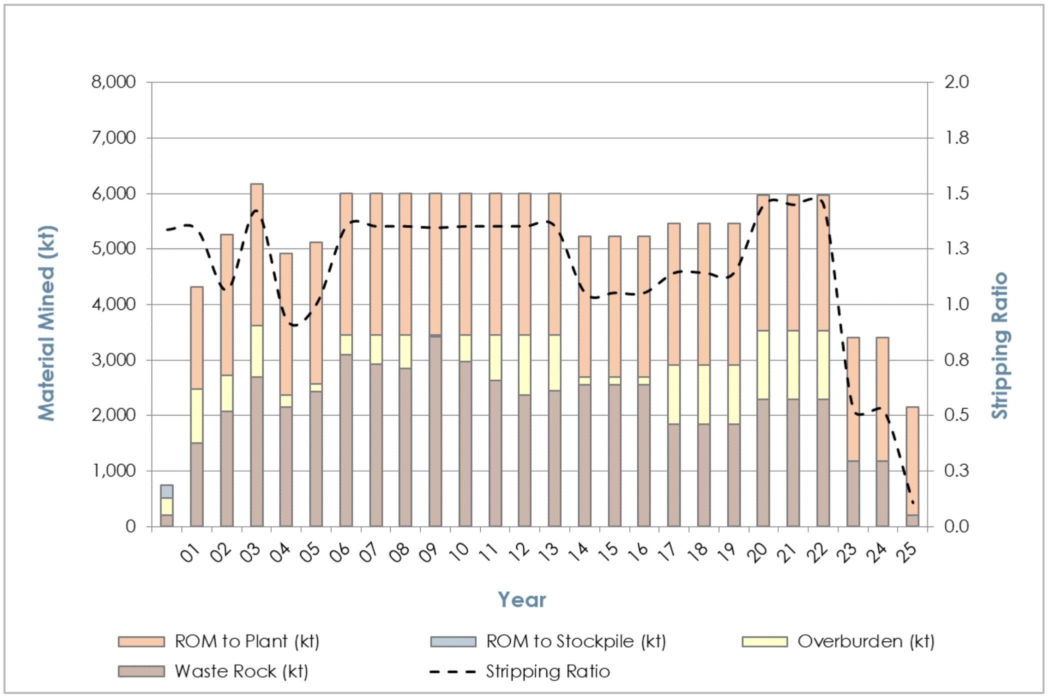


Figure 16-9: Mine production schedule

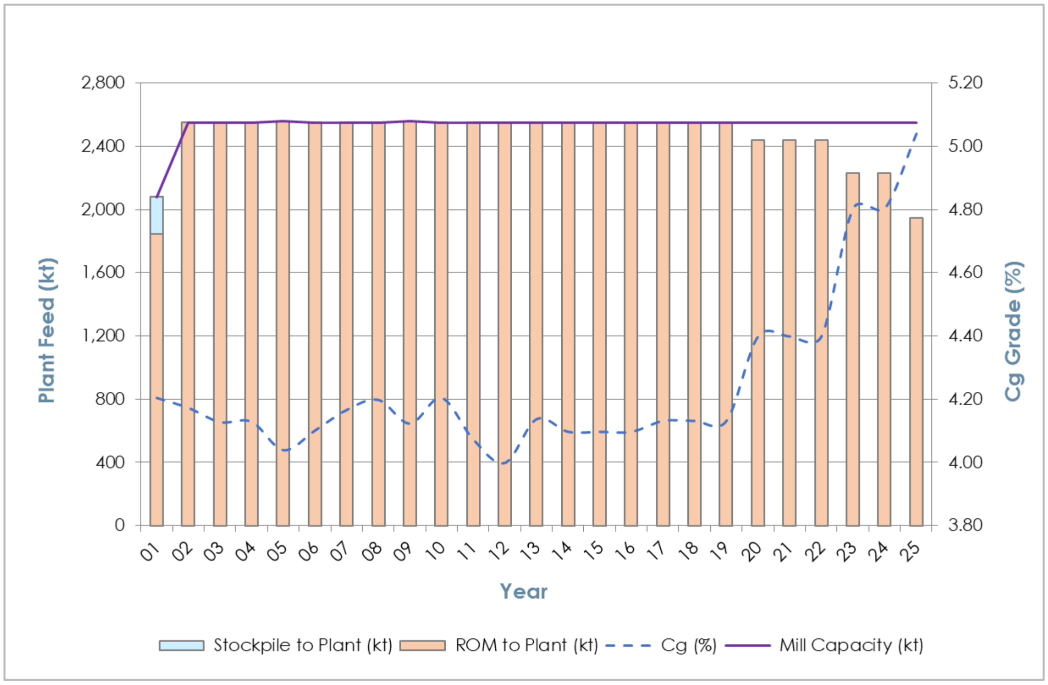


Figure 16-10: Process plant feed

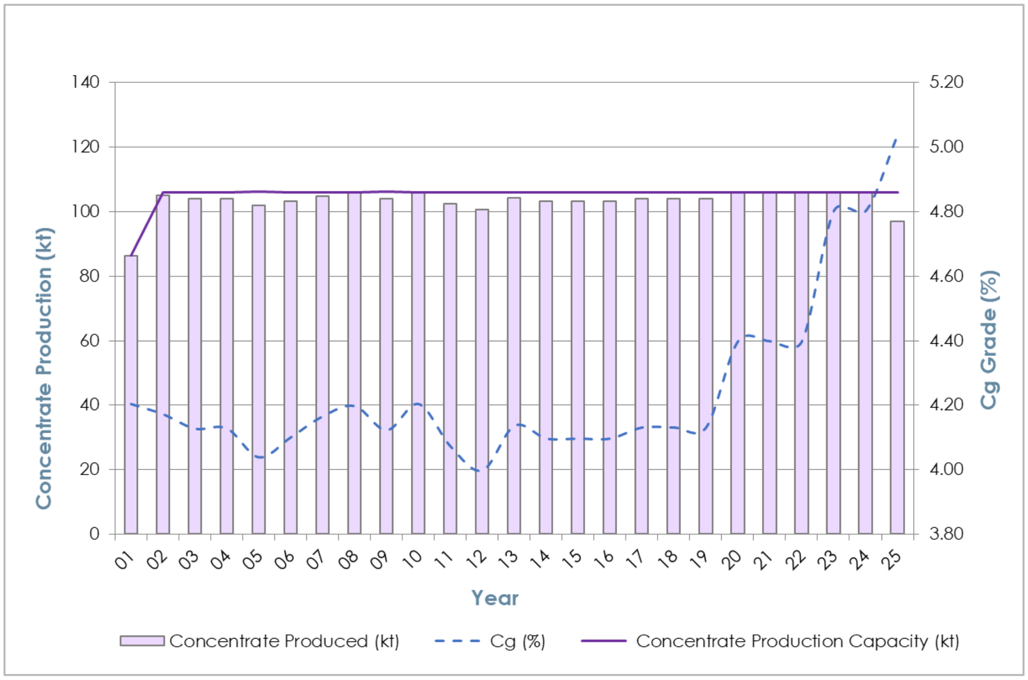


Figure 16-11: Concentrate production

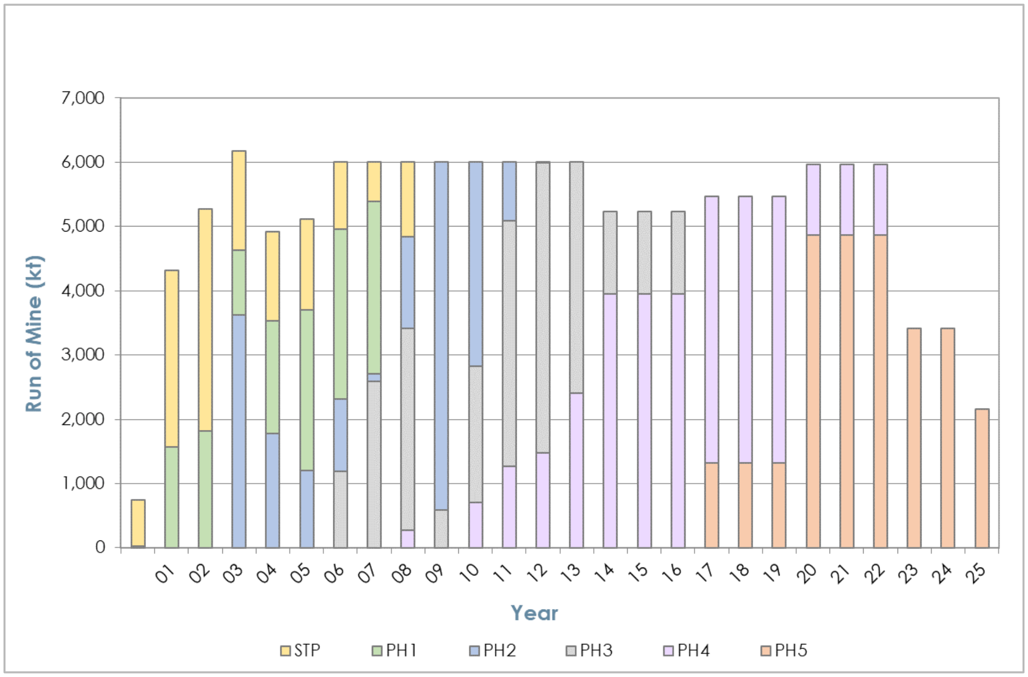


Figure 16-12: Material mined by phase

16.7. Mine Equipment Fleet

The following section discusses equipment selection and fleet requirements to carry out the mine plan. Equipment required for the construction of the CSF is not included in this table and is discussed in Section 16.9. The mine will be operated by an owner fleet with the peak requirements presented in Table 16-3. NMG has signed a memorandum of understanding (MOU) with Caterpillar, who will supply the equipment using their Job Site Solution (JSS) service model. With this model, NMG will pay for machine use on an hourly basis which includes; machine supply and maintenance (parts and service), and a fleet management system. NMG will be responsible for the fuel consumption, machine operator, wear parts, and to supply the mine garage.

It should be noted that the previous Technical Report presented a project with a fleet of battery-powered haul trucks. This operating strategy is still envisaged by NMG but since the technology is currently in the development phase, it has been decided to present a base case with a diesel operated fleet. Electrical trucks and equipment will be introduced into the mining fleet as they become available. An on-site prototype will be tested during the first five years of the mining operation to define the technical-economic parameters. As per Condition 6 of the Matawinie Mine project Authorization (the Decree), NMG must present the progress of work towards the electrification of the mobile mining equipment as well as an update of the schedule for carrying out this work. This progression is presented in Section 20.2.1.4.

Table 16-3: Mining equipment fleet

Equipment	Model	Description	Units
Haul Truck	CAT 775G	Payload – 60 t	11
Hydraulic Excavator	CAT 395	Operating Weight – 94,000 kg	2
Wheel Loader	CAT 988	Payload – 12 t	1
Production Drill	Epiroc D65	Operating Weight – 23,000 kg	2
Track Dozer	CAT D8T	Operating Weight – 38,000 kg	2
Road Grader	CAT 14M	Operating Weight – 24,000 kg	2
Water / Sand Truck	CAT 740	Capacity – 40,000 litres	1
Utility Excavator	CAT 336	Operating Weight – 37,000 kg	1
Stemming Loader	CAT IT14		1
Transport Bus	GMC	20 passengers	1
Powder Truck	n/a	n/a	1
Lowboy			1
Pickup Truck	Ford F250	Crew Cab	10
Light Plant	n/a	6 kW	6
Dewatering Pump	n/a	85 kW	4

16.7.1. Operating Schedule

The mine will operate on two 8-hour shifts, five days per week from Monday to Friday. For equipment calculations, a total of five days per year of lost production time has been considered for poor weather conditions. During these periods, the primary crusher, if operating, will be fed from the emergency ore stockpile located on the run-of-mine pad.

Equipment maintenance will be carried out on Monday to Friday, but the weekends can be used to carryout certain maintenance activities that will increase fleet availability. Equipment refuelling will be by a contractor who will refuel the equipment at the end of the second shift to increase fleet utilization.

16.7.2. Equipment Utilization Model

Figure 16-13 presents the equipment utilization model that is used to understand the key performance indictors (KPI) that govern the fleet requirements. The definitions for each time component are presented below using haul trucks as an example.

Scheduled Time (S)				
Available Time (AT)			Down Time (DT)	
Operation Time (GOH)		Standby Time (ST)	Planned Loss	Breakdown Loss
Utilized Time (NOH)	Delay Time (DL)			
Travelling empty	Waiting for Shovel	Shift Change	Scheduled Maintenance	Breakdown
Spotting at Shovel	Shovel Repositioning	Lunch & Coffee Breaks	Preventative Maintenance	Waiting for Parts
Loading	Crusher Down	Refueling	Inspections	Repair Time
Travelling Full	Queuing at Shovel	Pre-start Checks	Overhauls	
Spotting at Dump	Weather	No Operator Available		
Dumping				

Figure 16-13: Equipment utilization model

- Scheduled Time – full calendar year less unplanned shutdowns;
- Down Time – unit is inoperable due to scheduled maintenance or unplanned breakdown;
- Available Time – scheduled time less down time;
- Standby Time – the unit is available mechanically but not being used (the engine will typically be shut off while the unit is on standby);
- Utilized Time – available time less standby time. This time is also referred to as the Gross Operating Hours (GOH);
- Operating Delays – the unit is available and not on standby but not effectively producing (the engine will be running during the operating delays);
- Operating Time – utilized time minus operating delays. This time is also referred to as the Net Operating Hours (NOH).

The following KPI's can be calculated from using the formulas below:

- Availability – (NOH + Op. Delays + Standby) / (NOH + Op. Delays + Standby + Down);
- Use of Availability – (NOH + Op. Delays) / (NOH + Op. Delays + Standby);
- Machine Utilization – (NOH + Op. Delays) / (Scheduled Time);
- Operating Efficiency – (NOH) / (NOH + Op. Delays);
- Effective Utilization – (NOH) / (Scheduled Time).

Table 16-4 presents the KPI's and time assumptions used for the fleet of trucks, excavators, and drills.

Table 16-4: Mine equipment KPI's

Description	Units	Trucks	Excavators	Drills
Availability	%	90.0	85.0	75.0
Use of Availability	%	84.6	85.5	85.3
Machine Utilization	%	86.7	85.5	84.3
Operating Efficiency	%	76.2	72.7	63.9
Effective Utilization	**%**	**66.0**	**62.1**	**53.9**
Scheduled Time	h/y	4,171	4,171	4,171
Down Time	h/y	417	626	1,043
Standby Time	h/y	578	513	461
Operating Delays	h/y	424	440	419
Utilized Time (GOH)	h/y	3,177	3,033	2,668
Operating Time (NOH)	**h/y**	**2,753**	**2,592**	**2,248**

16.7.3. Drilling and Blasting

Production drilling will be done with diesel-powered down-the-hole (DTH) drills that will drill 5.5-inch (140 mm) diameter holes on 10 m high benches. Drilling productivities have been calculated using an instantaneous drill penetration rate of 35 m/h and the fixed time drilling components presented in Table 16-5.

Table 16-5: Fixed drilling time per hole

Description	Unit	Value
Steel retract	min	0.40
Jack up	min	0.30
Tramming	min	2.50
Jack down	min	0.50
Collar time	min	3.00
Bit change	min	0.30
Total	**min**	**7.00**

The drill productivities have been applied to the number of holes drilled per year to determine the annual hours of drilling and number of units required. In addition to the number of holes, which is based on the blast pattern presented in Table 16-6, an additional 2% will be considered for holes that will require re-drilling.

Table 16-6: Drilling and blasting parameters (ore and waste rock)

Parameter	Unit	Value
Bench Height	m	10
Blast hole Diameter	mm	140
Burden	m	4.25
Spacing	m	4.25
Sub drilling	m	1.5
Stemming	m	2.8
Explosives Density	g/cm^3	1.20
Powder Factor	kg/t	0.32

NMG is evaluating fully electrified surface drill rigs for the first five years of the mining operation. A recently concluded study and concept review from a major OEM identified an electric equivalent production drill, capable of drilling production and pre-sheer holes; the model is currently available as a diesel vehicle. Based on the initial discussion it is possible to receive a first prototype as early as 2023.

Blasting will be carried out using emulsion with an explosive density of 1.20 g/cm^3. Blasting will be done using electric detonation and drill holes will be double-primed (two detonators and two boosters per hole). Pre-split drilling and blasting will be done on the final pit walls.

A total of two production drills are required.

Explosive products and accessories will be delivered to site by an explosives supplier. Production holes will be loaded using a "just-in-time" philosophy, therefore no bulk products will be stored on-site. The NMG explosives team will consist of a blaster and a blaster's helper. Two magazines will be installed to store accessories and packaged products, which will be located to the west of the CSF.

There will be roughly one blast per week that will generate between 100,000 t to 200,000 t of rock. The quantity of explosives averages approximately 1,500,000 kg per year.

Blasting mats will be used in the southwest corner of the pit to protect against rock projections due to the proximity of the Hydro-Québec high-voltage power lines. In addition, the blasts will be designed to protect the surrounding infrastructure from potential vibration damages. If a risk is identified, the blast design will be modified to reduce the total explosive charge per delay.

A flyrock projection analysis identified that blasting within 300 m of buildings will require blasting mats or a modified blasting pattern. Occupied buildings within 500 m of blasts will need to be evacuated; alternatively, blasting mats and/or modified blast patterns could be used.

16.7.4. Loading

Loading will be done on 5 m benches using diesel-powered hydraulic backhoe excavators equipped with 6.5 m^3 buckets. Productivities have been calculated considering bucket swing times of 40 seconds and a 90% fill factor.

During peak production, the fleet will include two excavators. A wheel loader has also been included in the fleet to assist the excavators and for reclaiming the emergency ore stockpile.

16.7.5. Hauling

Hauling will be done with 60-t rigid frame haul trucks. Haul productivities have been calculated considering effective payloads of 58 t, which have been reduced from the nominal payloads to account for a carryback of 2%.

A haulage network was established in MPSO that considers the hauls for each mining cut to each potential dumping destination. Using rimpull curves provided by the truck manufacturers, MPSO calculated the travel times for each haul. The travel times were then added to the fixed haulage cycle times to arrive at the total cycle times. The fixed cycle times consider 42 seconds for truck spotting, 40 seconds for each bucket, and 72 seconds for spotting and dumping at the destination. It is assumed that the excavator will be waiting for a truck with a loaded bucket 50% of the time, resulting in a 5-second first bucket pass in those instances. A total of seven buckets is required to load each truck, resulting in an average total fixed cycle time of 405 seconds. In addition to these haulage parameters, the truck productivity calculations consider a 3% rolling resistance for in-pit and on the stockpile hauling, a 2% rolling resistance for surface haul roads, a maximum speed of 40 km/h and a downhill maximum speed of 25 km/h.

A total of four trucks are required in pre-production, ramping up to eight in Year 1, nine in Year 3, and reaching a peak of 11 in Year 6. Truck requirements remain at 11 until ramping down in the final few years.

The average one-way haul distances for the open pit over the life of mine are 1.9 km for ore to the crusher and 2.0 km for waste rock to the CSF.

The trucks will be equipped with rubber box liners to minimize potential noise disturbance.

16.7.6. Auxiliary Equipment

A fleet of support equipment has been included for haul road maintenance, drill pad preparation, and cleaning around the loading face. The fleet of support equipment includes dozers, graders, a water/sand truck, and a utility excavator.

A fleet of service equipment such as fuel and lube trucks, lowboys to transport the tracked equipment, a personnel bus, maintenance vehicles, and pick-up trucks is also included.

16.8. Mine Dewatering

The four sources of water that affect the mining operation are surface run-off, rainfall, snowmelt, and groundwater.

16.8.1. Surface Run-off

Around the CSF and the haul roads, surface run-off water will be collected in a ditch system and will be directed to a collecting basin, and eventually discharged back into the environment. The surface run-off water is expected to be relatively minimal since the majority of the pit is located at the top of watersheds. Where needed, diversion ditches will be added to divert surface run-off water from entering the pit.

To limit the surface run-off from entering the pit, a perimeter ditch will be established around the pit to capture the surface water before it enters the mining area. Water collected in the ditch system will be directed to a settling basin and eventually discharged back into the environment.

16.8.2. Rainfall and Snowmelt

Rainfall and snowmelt within the pit will be collected in in-pit sumps and pumped to surface where the water will be discharged into the surface water management system.

16.8.3. Groundwater

Groundwater infiltration is an important consideration in open pit mining operations since not only must the water be collected and pumped out of the pit, but it is also an important factor in the stability of the pit slopes. Water pressures act in direct opposition to stabilizing forces and, as such, must be considered for the results of stability modelling to be realistic. A pit dewatering system must be considered in the mine design and mine planning as groundwater drawdown is vital for a safe and efficient mining operation. Vertical piezometers will be installed behind the pit walls to evaluate the efficiency and success of the drainage system on the groundwater drawdown. The daily pit dewatering quantities were maintained from the 2018 Study, which vary from 1,070 to 2,000 m^3/day.

For the first five years of the operation a total of three 115 hp (86 kW) standard high head diesel pumps will be required. Starting in Year 5, the mine dewatering system will be electrified.

16.9. Co-Disposal Storage Facility Construction and Operation

The following section provides a brief description of the construction of the CSF with further details provided in Section 16.9. The CSF will be built with waste rock from the mine, non-acid generating tailings (NAG) and potentially non-acid generating tailings (PAG). In a full-production year where the mill will process 2.551 Mt of ore at an average grade of 4.20% Cg, it has been assumed that 2.219 Mt of NAG and 0.659 Mt of PAG will be produced, each stream containing between 15% to 18% moisture. The moisture content will be determined as required for stability, geochemical (increase saturation to mitigate sulfur oxidation), and transportation purposes (no liquefaction).

Table 16-7 presents the densities that are used to calculate the volumes that will be placed in the CSF. These densities consider the swell factor, compaction factor, and the moisture content.

Table 16-7: Densities

Material	Unit	Value
PAG	t/m^3	1.94
NAG	t/m^3	1.63
Waste Rock	t/m^3	2.13

An initial berm will be constructed using the waste rock mined in pre-production. During the operation, waste rock will be used to construct cells that will contain the NAG and PAG material. Several cells will remain active during deposition to allow for an efficient and productive operation.

The tailings generated at the concentrator will be loaded by a CAT 988 front-end wheel loader into a fleet of CAT 775 haul trucks. The load and haul operation of NAG and PAG will be batched to ensure that the loader bucket and truck boxes can be washed appropriately to avoid PAG contamination. The trucks will be equipped with a tarp cover to minimize dust emissions when transporting PAG. A total of five trucks are required to haul the tailings.

The tailings will be spread by a D8 dozer and compacted in thin lifts. The lift thickness and number of dozers passes required will be determined by test-pad scale-tests to provide sufficient compaction. A quality assurance program, including how the thickness of the layers and the compaction required would be achieved, must be included into the operation manual and the deposition plan of the CSF.

Areas of the CSF that have reached the final construction design will be capped with a layer of overburden as part of the closure plan. The overburden will either come directly from the open pit or will be rehandled from the overburden stockpile. Placement and spreading of the overburden will be done by backhoe excavators.

The mine road graders and water/sand trucks will be used to maintain the roads related to the CSF.

The CSF construction activities will follow the same five days per week schedule as the mine operations. There is enough storage capacity at the concentrator for the tailings that will be produced on the weekends.

16.10. Mine Workforce

The mine workforce requirement, presented in Table 16-8, reaches 73 during peak production. The mine operations team will work on a 2-crew system, with the first crew working the morning shift and the second crew working the afternoon shift, both from Monday to Friday. Overtime may be required on weekends to make up for production shortfalls.

The fleet of Caterpillar equipment will be maintained by Toromont service crews. NMG will have a small maintenance crew to service the non-Caterpillar equipment and to repair the ground engaging tools and wear items. Field maintenance will be carried out on both the morning and afternoon shifts, and shop maintenance will be done only on the morning shift.

The technical services, which includes engineers, geologists, and mining technicians, will work Monday to Friday.

The workforce to operate the CSF will be comprised of the wheel loader, trucks, dozer, and excavator operators, as well as a shift foreman, and a tailings planner.

Table 16-8: Mine workforce requirements

Description	Number
Mine Operations	
Mine Manager	1
Pit Foreman	2
Equipment Operator	33
Labourer	4
Driller	4
Drill Helper	2
Blaster	1
Blaster Helper	1
Mechanic	4
Mine Technical	
Mining Engineer	1
Geologist	1
Sampler	2
Surveyor	1
Tailings Operations	
Tailings Foremen	1
Tailings Planner	1
Truck Operator	10
Tailings Loader Operator	2
Tailings Dozer Operator	2
Total Mine Workforce	**73**

17. Recovery Methods

17.1. Overall Graphite Balance

The overall graphite balance for the integrated Matawinie Mine Beneficiation Plant and Battery Material Plant projects is presented in Figure 17-1.

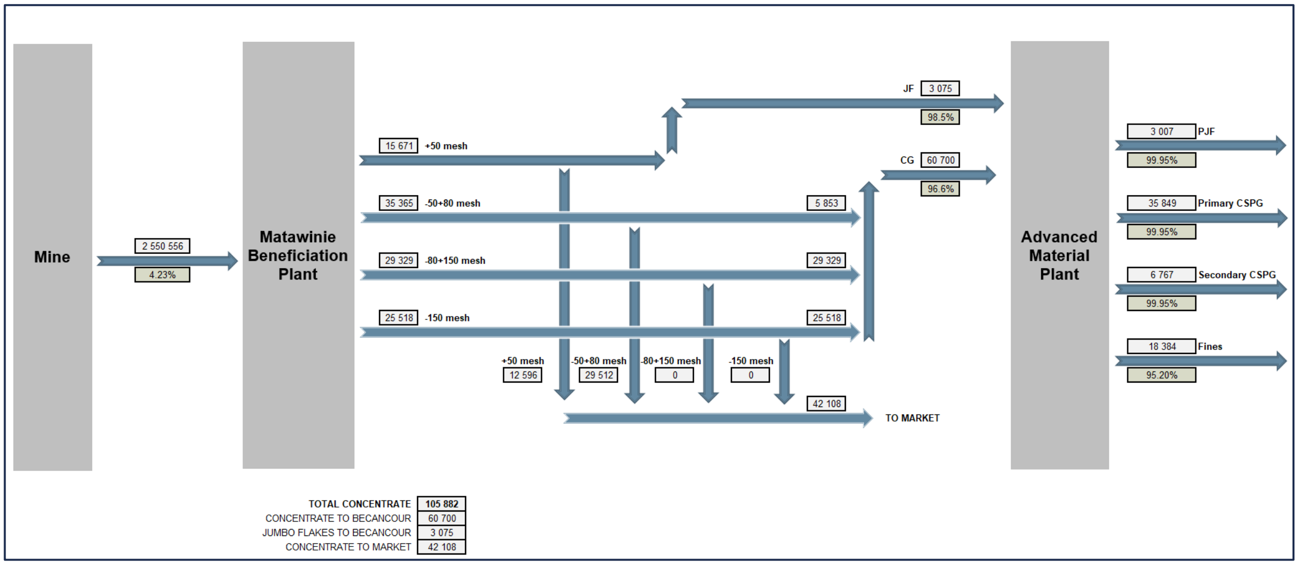


Figure 17-1: Overall graphite balance

17.2. Matawinie Beneficiation Plant

17.2.1. Mineral Processing Facility Design

The mineral processing facility has been designed to produce 105,882 dry tonnes of graphite concentrate per year. This is increased from the scenario evaluated in the Pre-Feasibility Study, which was 52,000 tonnes per year (tpy).

The mineral processing facility consists of crushing, comminution, beneficiation, dewatering, bagging and tailings processing areas.

The concentrator is designed to produce a graphite concentrate containing 97% C(t) (total carbon) from an ore containing 4.33% C(t). To achieve this concentration, the comminution and beneficiation processes include crushing, grinding, flash flotation, conventional flotation, polishing and stirred media milling, and column flotation. The facility will also perform thickening, filtration, magnetic separation, drying, screening, bagging and material handling.

Tailings will be processed to generate two tailings streams, non-sulphide/non-acid generating (NAG) and sulphide / potentially acid generating (PAG). Each stream will be dewatered and filtered to a product containing 15% moisture.

17.2.1.1. Design Criteria

Graphite quality is measured in flake size and purity. The design of the concentrator takes this into account to avoid degradation of graphite flakes while producing high purity graphite. All throughput rates are based on the production of 105,882 dry tonnes of 97% C(t) graphite concentrate from a feed grade 4.33% C(t). Average graphite recovery of 93% is used for design which results in an average weight recovery of 4.15%. These figures are based on lock cycle test work results and may change depending on ore composition. The operation of NMG demonstration plant confirmed that 97% C(t) graphite concentrate with a 93% recovery can comfortably be achieved. The concentrator will operate 24 hours per day, 7 days per week, 52 weeks per year. Operating availability of the concentrator is 90%.

The concentrator capacity has been established at an average rate of 7,764 dry tonnes per day or a nominal throughput rate of 324 dry tonnes of ore per hour. Table 17-1: summarizes the design basis for the crusher, concentrator and shipping facilities.

Table 17-1: Process design criteria

Plant Capacity		
Parameter	**Unit**	**Value**
Total ore processing rate	dry tpy	2,550,556
Average concentrator ore processing rate	dry tpd	7,764
Ore moisture	%	5.0
Graphite ore grade C(g) (average over LOM)	%	4.23
Crusher operating time	%	37.5
Nominal ore crushing rate	dry tph	772
Concentrator operating time	%	90
Nominal ore processing rate	dry tph	324

Plant Capacity		
Parameter	**Unit**	**Value**
Final graphite concentrate grade C(g)	%	97.0
Final graphite concentrate recovery	%	93
Jumbo (+48 mesh) graphite production (14,8%)	dry tpy	15,671
Coarse (–48+80 mesh) graphite production (33.4%)	dry tpy	35,365
Intermediate (–80+150 mesh) graphite production (27.7%)	dry tpy	29,329
Fine (–150 mesh) graphite production (24.1%)	dry tpy	25,518
Total graphite production (nominal)	dry tpy	105,882
Total graphite production (average over LOM)	dry tpy	103,328

17.2.2. Mass and Water Balances

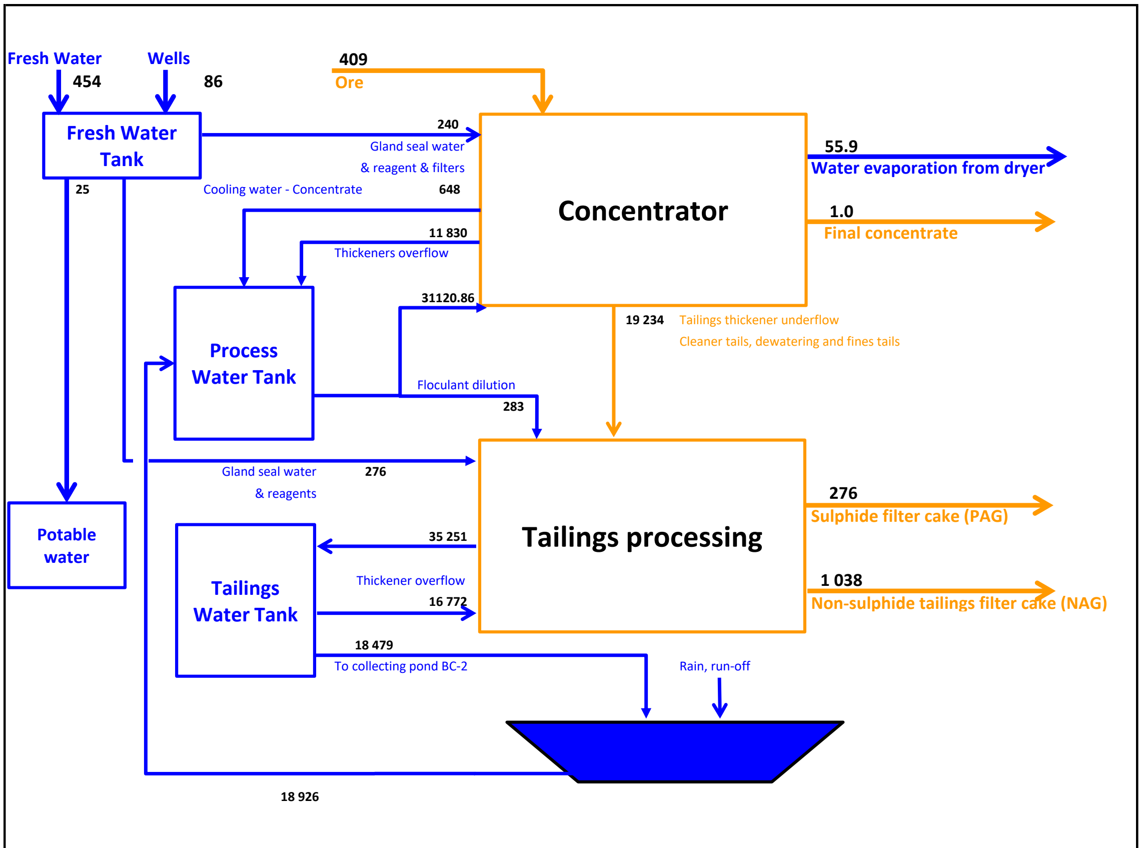
The process plant mass balance has been calculated based on the developed flowsheet and design criteria.

Table 17-2 shows a summary of the mass balance. Throughput and flow rates are shown in tpd (tonnes per day) and m³/d (cubic metres per day); 1 m³/d of water is equal to 1 tpd.

Table 17-2: Matawinie concentrator summarized process mass balance

Mass Entering System				Mass Exiting System			
Streams	**Dry Solids (tpd)**	**Water (m^3/d)**	**Total Mass (tpd)**	**Streams**	**Dry Solids (tpd)**	**Water (m^3/d)**	**Total Mass (tpd)**
Graphite ore to Concentrator	7,764	409	8,173	Potable water	—	25	25
Fresh water from sources	—	540	540	Water evaporation from dryer	—	56	56
Reclaim water from surroundings	—	18,926	18,926	Final Concentrate	322	1	323
				Sulphide filter cake	1,563	276	1,839
				Non-sulphide tailings filter cake	5,879	1,038	6,917
				To collecting basin	—	18,479	18,479
Total Entering	**7,764**	**19,875**	**27,639**	**Total Exiting**	**7,764**	**19,875**	**27,639**

Figure 17-2 below shows a more detailed water balance. The polishing basin is not considered part of the processing facility water system and is only added for illustrative purpose.



Water Balance

Circuit	In	Out	+/-
Concentrator	31 769	31 769	0.0
Tailings processing	36 565	36 565	0.0
Total	19 875	19 875	0.0

Figure 17-2: Water balance

17.2.3. Process Flowsheet and Process Description

Figure 17-3 shows a simplified flowsheet indicative of the process. The mineral processing facility has seven distinct areas: crushing and stockpile, grinding and flotation, polishing and cleaning (including classification, stirred media mills and secondary cleaning), graphite concentrates dewatering, screening and packaging, and tailings processing and dewatering.

The simplified flowsheet presented below is general. The following sections describe each area in more detail.

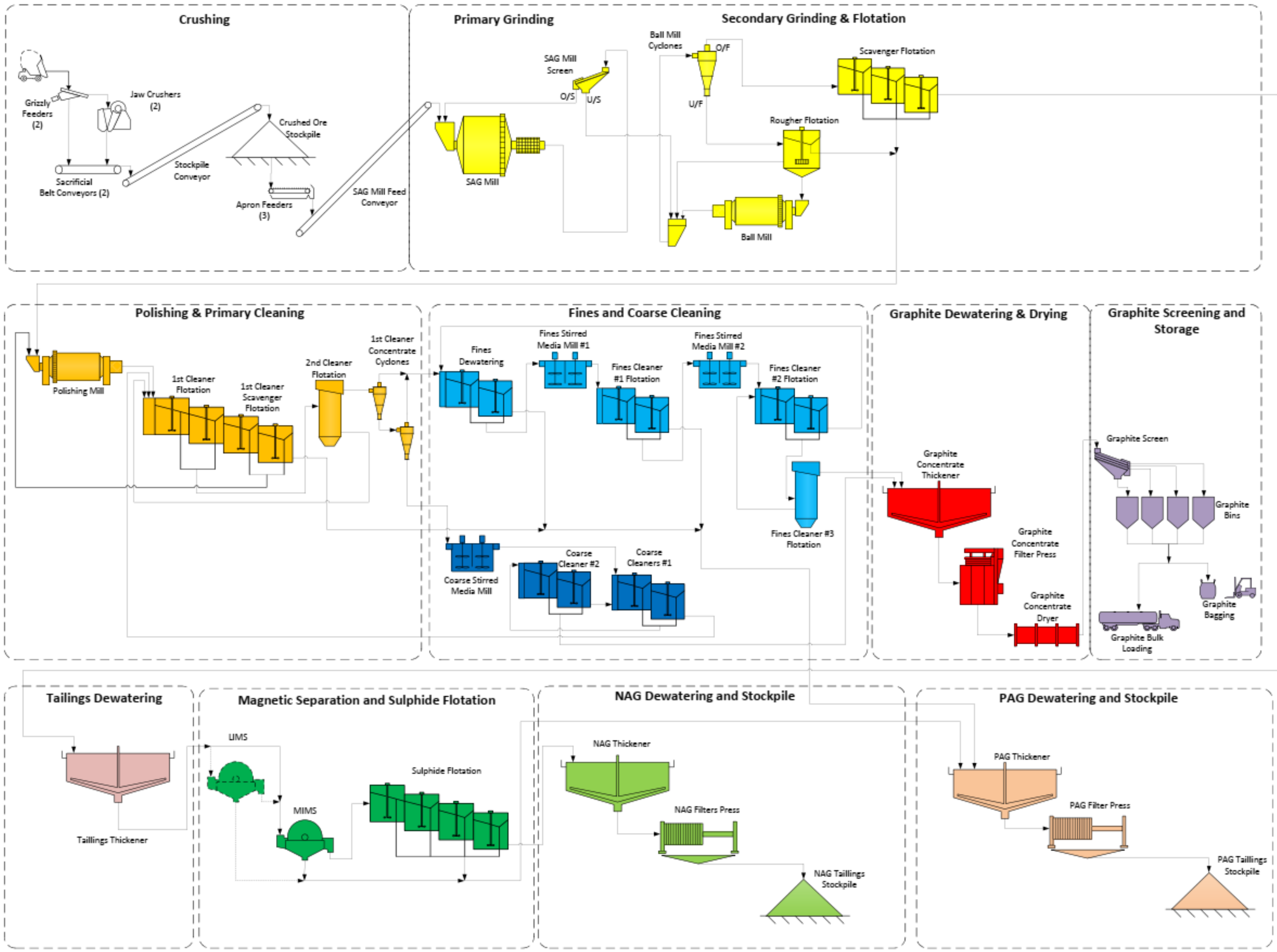


Figure 17-3: Simplified flowsheet

17.2.4. Crushing

The crushing circuit has two almost identical crushing lines having the same equipment and same capacity. In normal operation, both lines are in operation, but it is possible to operate only one line if required. The crushing circuit is designed to operate during the daytime (16 hours per day) and only on weekdays. As the rest of the plant is operating 24 hours per day, seven days per week, the crushing circuit has a higher capacity than the rest of the plant and there is a crushed ore stockpile between the crushing and the grinding circuit to ensure a constant and stable feed to the grinding circuit.

Trucks from the mine discharge the fresh ore on the two Grizzly Feeders. Fines material is collected at the undersize of the feeders and is directed to the Sacrificial Belt Conveyors. Coarse material is fed to the Jaw Crushers. They crush the ore to a smaller size before it can move on to the grinding step of the process. Jaw Crushers discharges are sent to the Sacrificial Belt Conveyors.

Metal detectors are installed on the Sacrificial Belt Conveyors to detect metal bits before ore is transferred to the stockpile conveyor.

The Stockpile Conveyor is used to carry the crushed ore out of the Primary Crusher Building and onto a stockpile. Dust material from Crusher Dust Collector System is also fed onto the conveyor.

17.2.5. Crushed Ore Storage Building

The crushed ore brought from the Primary Crusher is kept on a stockpile in the Crushed Ore Storage Building before being moved on to the grinding step of the process. As the crushing circuit is operating only during the weekdays and the rest of the plant all week, the objective of the stockpile is to ensure a constant and stable feed to the grinding circuit.

17.2.6. Grinding and Flotation

Crushed ore is withdrawn from the stockpile using three 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 single deck vibrating screen. The screen undersize is sent to the ball mill discharge pump box by gravity, while the screen oversize is recirculated to the SAG mill.

The ball mill operates in closed circuit with the rougher flotation and a set of cyclones. The ball mill discharge is pumped to the ball mill cyclones. The cyclones underflow report to the rougher flotation while the overflow proceeds to the scavenger flotation. The rougher flotation allows for the removal of large graphite flakes as soon as they are liberated from the ore and helps maintain graphite flake integrity. Fuel oil and methyl isobutyl carbinol (MIBC) are added to the flotation process. There is no modifier required in the flotation process. The rougher flotation circuit consists of a single coarse flotation cell. The rougher graphite concentrate is expected to contain 76.7% C(t) and will be pumped to the polishing circuit. The rougher flotation tailings are returned to the ball mill.

The cyclones overflow is expected to have a particle size distribution of 80% less than (P80) 0.212 and 0.150 mm for nominal and design cases respectively.

The scavenger flotation circuit consists of three mechanical tank cells and aims to float the remaining graphite.

The scavenger concentrate containing 40.5% C(t) will be directed to the polishing circuit. The scavenger tails containing 0.18% C(t) will be directed to the concentrator tailings thickener.

The combined concentrate from the rougher and scavenger circuits is expected to contain 55.6% C(t) and achieve 96.4% graphite recovery.

17.2.7. Polishing and Primary Cleaning

The cleaning of graphite concentrate is done in two distinct phases. The primary cleaning phase consists of polishing, cleaning flotation cells, cleaning-scavenging flotation cells and column flotation.

The rougher and scavenger concentrates are first sent to a polishing mill. The mill discharge is pumped to a mechanical flotation cell as the first cleaner. The first cleaner concentrate is subjected to a second cleaner in form of a flotation column. The column concentrate is transferred to the classification stage and the column tailings are returned to the first cleaner flotation cells.

The first cleaner rejects the majority of liberated gangue before the first cleaner concentrate is subjected to more selective column flotation with countercurrent washing. The first cleaner tailings are treated in a scavenger stage to recover more challenging middling particles. These middling particles are transferred to the polishing mill to improve mineral liberation. This flowsheet configuration was evaluated in the demo plant and produced the significantly higher concentrate grades compared to the 2018 Feasibility Study flowsheet design.

17.2.8. Fines and Coarse Cleaning Circuits

The second cleaning phase starts with size classification. The Primary Cleaner Concentrate Cyclones are used to separate fines from coarse particles of the second cleaner concentrate. The coarse fraction is directed to a coarse attrition mill and two stages cleaning flotation while the fines fraction is upgraded through two stages attrition and fines cleaning flotation cells, followed by a 3rd cleaning flotation column.

17.2.8.1. Fines Cleaning Circuit

The FS flowsheet includes a flotation column with scavenger cells to treat the fine graphite flakes. Based on the experience in the demonstration plant, a single stage of column flotation does not achieve the full upgrading potential.

The revised flowsheet includes a first stage of fines cleaning using mechanical flotation cells. This stage will remove gangue minerals that have been liberated in the fines stirred media Mill #1. The first fines cleaner concentrate is transferred to the fines stirred media Mill #2 for further liberation and to a second bank of mechanical cells that act as a cleaner and column scavenger. The cleaner concentrate of these cells is subjected to a final cleaning stage using a flotation column. Column concentrate is sent to the concentrate thickener.

17.2.8.2. Coarse Cleaning Circuit

The FS flowsheet did not include beneficiation of the coarse fraction, and this was a missed opportunity while the PFS flowsheet includes a flotation column with scavenger cells to treat the coarse graphite flakes. Based on the experience in the demo plant and SGS pilot plants, recovering the coarse flakes with a flotation column can be challenging since the process is very sensitive to the effective air dispersion of the spargers.

The revised flowsheet includes a coarse stirred media mill and two stages of mechanical flotation cells to replace the column. Entrainment of fines is of lesser concern for the coarse flake circuit and good upgrading was achieved in the demo plant with two banks of flotation cells.

17.2.9. Graphite Concentrate Dewatering

Graphite concentrate dewatering is done using a thickener and filter before being sent to the dryer.

The graphite concentrate thickener is used to dewater the flotation concentrates. This thickener receives concentrate from the fines cleaner #3 flotation column and the coarse cleaner #2 flotation cells.

The thickener overflow is pumped to the Process Water Tank and the thickener underflow, with 35% solids, is discharged to a holding tank prior to being pumped to a press filter. The purpose of a holding tank is to decouple the continuous operation of the thickener upstream from the batch nature of the press-filter downstream.

The concentrate filter delivers a graphite product containing 15% moisture. The filtered concentrate is dropped in a hopper and a screw conveyor send it to the concentrate dryer.

The Concentrate Filter filtrate is recirculated into the thickening circuit.

17.2.10. Tailings Thickening

The tailings thickener is fed by the scavenger flotation cell tails. This thickener increases the tailings slurry density and allows recovering process water with no sulphide flotation reagents to be reused in the graphite flotation circuits.

The thickener overflow is pumped to the process water tank and the thickener underflow is sent to the desulphurization circuit.

17.2.11. Graphite Drying, Screening and Bagging

17.2.11.1. Graphite Dryer

The graphite concentrate dryer is used to decrease the concentrate filter cake moisture to less than 0.3% and prepares it for dry screening and bagging.

Filter cake from the concentrate filter press will fall in a hopper and a screw conveyor will take it to the dryer.

The dryer air is discharged into the graphite dryer dust collector and the dry concentrate into the dry concentrate water-cooled screw conveyors.

The graphite dryer dust collector is used to remove the dust generated by the concentrate drying operations from the discharge air to the atmosphere below the permitted emission level. The clean air is then discharged to the atmosphere.

The dust collector solid material removed from the air is sent back into the water-cooled screw conveyors.

17.2.11.2. Graphite Dry Screening, Bagging and Loadout

NMG aims to produce four different size products (see Table 17). After the dryer, dry graphite is pneumatically transported to a bulk graphite bin. From this bin, graphite is blown to two parallel screening lines to produce four size fractions as follows. The distribution is shown in Table 17.

Table 17-3: Matawinie graphite concentrate breakdown

Graphite Concentrate Size Fraction	Weight (%)	Annual Production (tonnes)
Jumbo Flakes (+48 mesh/+300 µm)	14.8	15,670
Coarse (–48+80 mesh/-300+180 µm)	33.4	35,365
Intermediate (–80+150 mesh/-180 +106 µm)	27.7	29,329
Fine (–150 mesh/ -106 µm)	24.1	25,518

The products will first be stored in indoor silos, and then they can be either bagged and wrapped or sent to the truck loadout station to be loaded into 37 t bulk tanker trucks.

Below each bin is a vibrating feeder to transport the product to two semi-automatic bagging systems which includes automatic sampling systems. Each bag can contain up to 1,134 kg graphite. Small quantities of bags can be stored in the bagging facility. There will be a separate bag storage facility for excess production. Once the commercial added value product (C-VAP) plant will be in operation in Bécancour, the screen panels will be changed in alternance to fulfill the bulk size requirement or the size fraction bagging requirements.

17.2.12. Desulphurization and Stockpiles

17.2.12.1. Magnetic Separation and Sulphide Flotation

The desulphurization circuit consists of two main steps, first removal of the magnetic sulphurs by the medium intensity magnetic separator (MIMS) and then treating the non-mag portion in the sulphide flotation circuit for further sulphide removal. Putting the MIMS before flotation circuit would save some reagents consumption at the flotation stage. This hypothesis was confirmed by conducting the above-mentioned configuration at the demonstration plant.

There are two identical parallel lines for the magnetic separation composed each of a medium intensity magnetic separator feeding by a pump from tailings thickener U/F.

MIMS are used as the first step of the desulphurization to remove sulphur compounds from the concentrator tailings.

MIMS concentrates are pumped to the sulphide (PAG) thickener. MIMS tails are sent to the sulphide flotation conditioning tank. The reagent PAX will be added to the sulphide flotation conditioning tank and a good mixing ensure the conditioning of the slurry with the reagent. The tank content is fed by gravity into the sulphide flotation Cell #1.

The sulphide flotation cells are used to float the remaining sulphide from the MIMS non-mag. They can be fed with MIBC and PAX.

Sulphide flotation concentrate is sent to the PAG thickener and sulphide flotation tails are directed to the NAG thickener.

17.2.13. Tailings Dewatering

Tailings dewatering is comprised of two parallel circuits: sulphide tailings (PAG) dewatering and non-sulphide tailings (NAG) dewatering.

17.2.13.1. Sulphide (PAG) Tailings Dewatering

The sulphide (PAG) thickener is fed by the sulphide flotation cell concentrate, the first cleaner scavenger flotation cell tails and the fines cleaner #1 flotation cell tails. Flocculant is also added at the thickener feed.

The thickener overflow is pumped to the tailings water tank.

The sulphide (PAG) thickener U/F pumps send the thickener underflow with 65% solids to the sulphide (PAG) holding tank and this tank is discharged to the PAG filter press.

The filter press cake with 15% moisture falls onto the PAG discharge conveyor. The material continues to the PAG transfer conveyor, then onto the PAG stockpile conveyor, and finally to be stored on the sulphide (PAG) tailings stockpile.

The content of the PAG filtrate tank is pumped back into the PAG thickener.

17.2.13.2. Desulphurized (NAG) Tailings Dewatering

The NAG thickener is fed by MIMS concentrate, the magnetic separator tails and the sulphide flotation cell tails. Flocculant is also added at the thickener feed. The NAG thickener overflow is pumped to the tailings water tank.

The NAG thickener underflow is sent to the NAG Holding tank with 65% solids and the tank content is pumped to the NAG filter presses.

NAG filter presses filter cake with 15% solids first falls onto the discharge conveyors. The material continues onto the NAG stockpile conveyor then falls onto the desulphurized (NAG) tailings stockpile.

The content of the NAG filtrate tank is pumped back into the NAG thickener.

17.2.14. Reagent Area

17.2.14.1. Flocculant

The dry flocculant feed system is used to distribute dry flocculant from bulk bags. There are two flocculant systems, one for the concentrate thickener and one for the other three thickeners. Both systems have the same flowsheet. The flocculant bulk bags are first unloaded into the feed system. Flocculant and fresh water are added into an eductor and directed into the flocculant mix tank.

The mixing tank is equipped with an agitator and is used to mix the flocculant solution thoroughly. Once the mix tank content is mixed for a determined time, it is pumped into the flocculant holding tank.

The flocculant holding tank stocks the flocculant before it is distributed into the process by the metering pumps and their in-line mixers.

17.2.14.2. MIBC

The MIBC storage tank receives and stocks the MIBC delivered at the plant by tanker truck. It is discharged into the MIBC holding tank by the MIBC transfer pump.

The MIBC holding tank is used to stock the MIBC before it is distributed into the process. The tank content is discharged into the metering pumps by the MIBC circulating pump.

17.2.14.3. Fuel Oil

The fuel oil storage tank receives and stocks the fuel oil delivered at the plant by tanker truck. It is discharged into the fuel oil holding tank by the fuel oil transfer pump.

The fuel oil holding tank is used to stock the fuel oil before it is distributed into the process. The tank content is discharged into the metering pumps by the fuel oil circulating pump.

17.2.14.4. Lime

The lime mix tank is used to mix the lime with water to prepare the lime, fed into the process.

Bulk bags containing lime are first unloaded into the hopper. The dry lime is pushed by fresh water into an eductor and directed into the lime mix tank. The mixing tank is equipped with the Lime Mix Tank Agitator to mix its content.

The tank content is discharged by the lime distribution pump, which can recirculate the lime back into the tank, or to the grinding circuit, the polishing mill, the desulphurization circuit, and the NAG thickener.

17.2.14.5. Xanthate

The xanthate mixing tank is used to prepare the xanthate solution to be fed into the process.

Bulk bags containing xanthate are first unloaded into the hopper with bag breaker, which then discharges its content into the mixing tank. The tank is filled with fresh water. It can also receive the overflow from the xanthate holding tank. The mixing tank is equipped with the agitator to mix its content.

The mixing tank content is pumped into the xanthate holding tank. Fumes from the mixing tank are managed by the PAX tank fan, which releases them into the atmosphere.

The xanthate holding tank is used to store the prepared PAX until it can be distributed into the process. The tank content is discharged by the metering pumps to the sulphide flotation circuit.

17.2.15. 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 developed design criteria, flowsheet drawings, the mass balance, and layout considerations.

The design criteria have been updated many times based on the experimental tests results that have been done at the NMG demonstration plant as well as the tests results, have been done at the external laboratories and suppliers' test facilities.

Design factors used were: 4.2% for the crushing and comminution equipment, 20% for the most processing equipment and 25% for the slurry pumps.

17.2.16. Crushing

Ore crushing will be performed by two C130 jaw crushers. The crushing station also includes one rock breaker, two grizzly feeders, two sacrificial conveyors and a crushed ore stockpile feed conveyor. The crushed ore stockpile has a total and live storage capacity of approximately three days and 22 hours respectively, assuming 5% average ore moisture. The crushers feed top size will be 700 mm with a D80 of 488 mm, the top size can be respected by mining operation that manages the ROM maximum size not to exceed this size limit.

The crusher supplier confirmed that the grizzly feeders and the chute opening before jaw crushers can handle a maximum lump size up to 1 m.

The crushing plant discharges rocks with a particle size distribution of 80% less than (P_{80}) 106 mm, including the grizzly feeders undersize.

17.2.17. Primary Grinding and Rougher and Scavenger Flotation

Ore is withdrawn from the bottom of the stockpile using a maximum of three apron feeders with variable speed drives. Each feeder has the capacity to provide the SAG mill with 100% nominal throughput rate.

The SAG mill is 7.32 m in diameter by 3.96 m F/F (3.12 m EGL) long with 3,000 kW variable-frequency drive motor. The SAG mill operates in closed circuit with one single deck vibrating screen with panel apertures of 10 mm. Screen oversize is returned to the SAG mill for more comminution. The screen undersize has a P_{80} of 0.70 mm and is discharged to the ball mill discharge pump box by gravity.

The secondary grinding circuit consists of a ball mill in closed circuit with a cyclone cluster and rougher flotation cell. The cyclone cluster comprising nine 400 mm cyclones, seven operating, two spares. The cyclone underflow flows into the rougher flotation cell with a volume of 53 m^3. The cyclones overflow is expected to have a particle size distribution of 80% less than (P_{80}) 0.212 and 0.150 mm for nominal and design cases respectively.

The rougher flotation concentrate goes to the polishing mill, while the rougher tailings are discharged to the ball mill. The ball mill is 4.1 m in diameter by 6.6 m long F/F (6.4 m EGL) with 1.800 kW variable-frequency drive motor. The cyclone overflow is directed to the scavenger flotation circuit. The scavenger flotation circuit is composed of three mechanical flotation cells each with a volume of 30 m^3. Scavenger concentrate is sent to the polishing mill.

The SAG mill and vibrating screen circuit design criteria are based on the ore comminution characteristics and test work programs, supplier simulations, recommendations and NMG demonstration plant operational experience. The variable-speed motor and automatic ball addition for the SAG mill should create good size reduction control.

The ball mill, cyclone and rougher flotation and scavenger flotation circuit design are based on test work, supplier simulations, recommendations and NMG demonstration plant operational experience. The variable-speed motor for the ball mill should control the size reduction and flash and mechanical flotation cells are selected to minimize the risk of sanding.

17.2.18. Primary Cleaning and Secondary Cleaning Circuit

The primary cleaning circuit consists of, one polishing mill, four mechanical flotation cells that will be used as the first cleaner and first cleaner scavenger and one flotation column.

The rougher and scavenger flotation concentrates are pumped to the polishing mill.

The 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 5.49 m in diameter by 9.0 m long flange to flange (8.84 m EGL), equipped with 1,800 kW motor. Mill discharge is pumped to the first cleaner flotation circuit.

The first cleaner circuit consists of two flotation cells of 20 m^3. The first cleaner tails are sent to first two cleaner scavenger flotation cells of 20 m^3. The first cleaner concentrate is sent to a flotation column with a diameter of 3.8 m and a height of 8.0 m. The second cleaner flotation column concentrate is sent to the classification cyclones.

The polishing mill, first cleaner and first cleaner-scavenger flotation cell and second flotation column designs are based on the test work, supplier input and NMG demonstration plant operational experience.

Concentrate coming from the primary cleaner flotation column is split into the fines and coarse graphite using two-stage classification cyclones comprising of one cyclone cluster of eight 250 mm cyclones and one cyclone cluster of three 250 mm cyclones. The second stage cyclone underflow is directed to the coarse stirred media mill (SMM) while the cyclone overflow of both stages is sent to the fines dewatering flotation cells to increase the solid density before sending it to the fines SMM #1.

Fines cleaning circuit consists of two SMM with 2 x 185 kW each, 2 x 30 m^3 fines dewatering tank cells, 2 x 10 m^3 fines cleaner #1 and 2 x 10 m^3 fines cleaner #2 as well as a column flotation with 2.3 m in diameter by 8.0 m high which is aerated using spargers. Column concentrate is the fines final concentrate that will be pumped to the concentrate thickener.

This stage will remove gangue minerals that have been liberated in the fine SMM #1. The first cleaner concentrate is transferred to the second Fine SMM. The SMM #2 discharge is pumped to a second bank of mechanical cells that act as a cleaner and column scavenger. The cleaner concentrate of these cells is subjected to a final cleaning stage using a flotation column.

Coarse cleaning circuit consists of one SMM with 2 x 185 kW motors, 2 x 10 m^3 coarse cleaner #1 and 2 x 10 m^3 coarse cleaner #2. Coarse cleaner #2 concentrate is the final coarse concentrate that will be pumped to the concentrate thickener.

The cyclones, stirred media mills, fines column flotation and fines/coarse cleaner scavenger flotation circuit designs are based on test work, supplier input and NMG demonstration plant operational experience. The design aims to minimize graphite degradation while improving the graphite grade.

17.2.19. Graphite Concentrate Dewatering

The dewatering circuit consists of one high-rate concentrate thickener, one pressure filter and one dryer.

The combined graphite concentrate is pumped to the 9.0 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 6.0 m diameter x 10.5 m high.

From the holding tank, the concentrate is pumped to the graphite concentrate pressure filter. The filter press will be Outotec Larox PF 55/60. The filtrate is recirculated to the graphite concentrate thickener. The filter cake at 15% moisture is discharged to a hopper.

From the hopper, a screw conveyor feeds the filtered graphite into the dryer. The dryer is an electric rotary dryer 1.9 m diameter x 30.0 m long (24.0 m hot working length) containing electric heaters with a 2,600 kW capacity. 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 circuit designs are based on test work, supplier input and NMG demonstration plant operational experience.

17.2.20. Graphite Dry Screening and Bagging

The bulk receiver from the pneumatic conveying system will discharge the dried graphite through a fluidized siphon with three possible outlets, each with an automatic material flow control valve. The discharge can be split as follows:

- Outlet 1 to screening Line 1 simultaneous with Outlet 2 to screening Line 2 (each receiving 50% of the flow);
- Outlet 3 to Truck loadout (100 m^3 fine silo outdoors) or to screening Line 2 (168 m^3 fine silo indoors) at 100% of the flow.

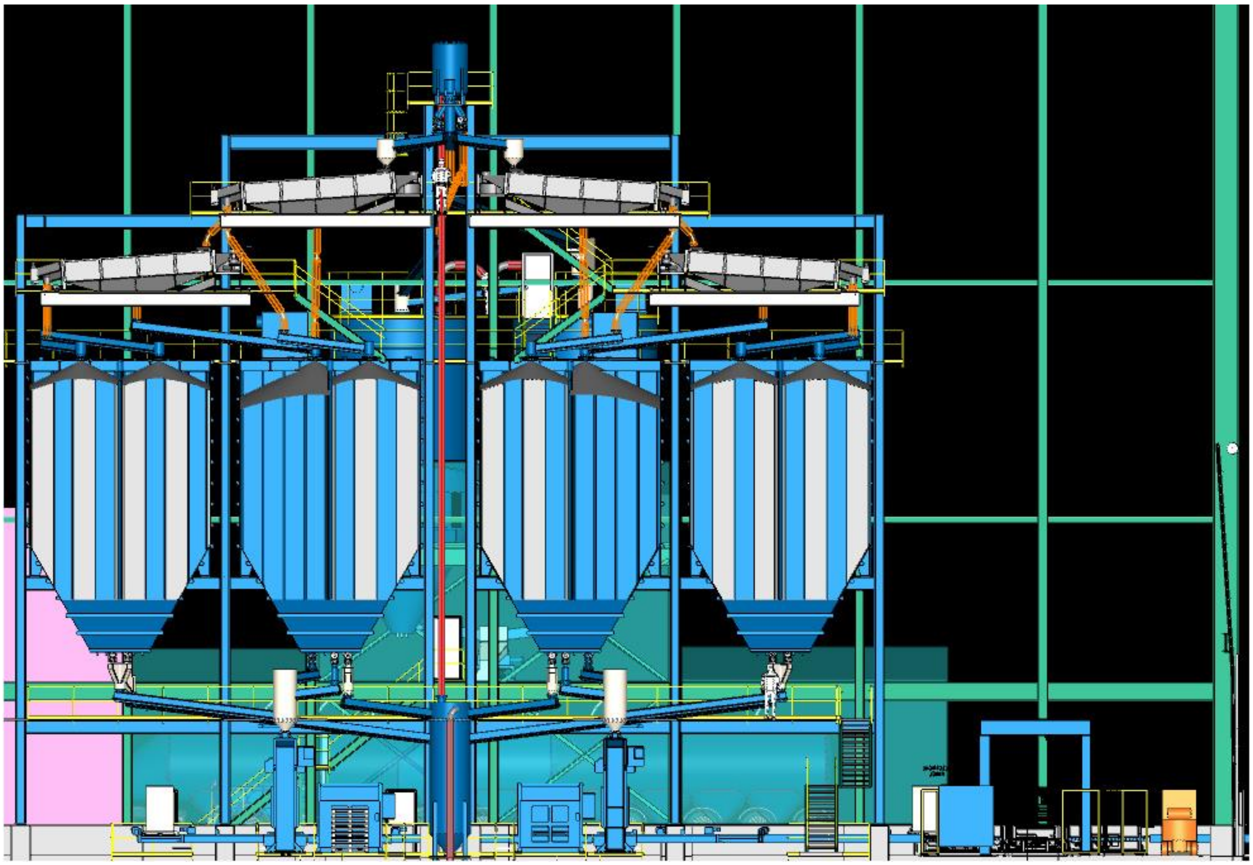


Figure 17-4: Screening arrangement from bulk receiver

The normal path is to split the flow equally between the two screening lines. The siphon will naturally make an even split between these two outlets since it works on an overflow principal, and the two outlets will be at the same level as the fluidized siphon pot. If left unrestricted, the flow out (50% to each screening line) would be at the same rate as the flow into the Bulk Receiver. However, the pneumatic conveying system will deliver the bulk graphite into the receiver in two-minute-long batches at 16 tph rate, then there will be several seconds with no graphite flow. Since it is desired to have an almost continuous flow out of the siphon to the screeners, the material flow control valves will regulate the flow according to the buffer level in the Bulk Receiver.

With the concentrator and dryer out putting graphite in the range of 11 tph to 16 tph, the screening lines would each handle 5,500 kg/h to 8,000 kg/h flow rate.

Each screening line has two gyratory-reciprocating motion screeners in series, and each screener has two screening decks. The graphite enters the primary screener, which separates the jumbo flake off the top deck. The material that passes the top deck, is then screened on the lower deck. What passes this lower deck is classified as fine. It is estimated that some 75% of the total fine material will be separate at this primary stage. The material that passes the first deck, but is retained by the second deck, will be transferred to the secondary screening stage. This amount is roughly two thirds of the original flow to the primary screen.

The secondary screen, also with two decks, will separate the remaining material into coarse, intermediate and fine.

Both primary and secondary screeners have 2 m screening width x 4.4 m length for a total of 8.8 m2 per deck. However, in the construction of the machine, there is a physical divider down the centre, effectively making the machine as two 1 m-width machines. From each side of the machine, pretensioned panels of 965 mm x 1,143 mm size are installed two decks high. There is an internal mesh cleaning system with rubber balls installed in bevelled pockets below each section of mesh.

With this physical barrier down the centre of the machine, it is possible to generate different size ranges of the various screened products, which can be named A and B. Further, the screen meshes can be different from one screening line to the other. It was decided on each screening line, to have two variations of coarse in this manner and by partitioning the silo below. Thus, there can be up to four different variations of coarse (Line 1A/1B and Line 2A/2B) and two of Inter (Line 1 / Line 2).

From the screener discharges, the various products (Jumbo, Coarse A/B, Inter and Fine) are directed to their respective silo compartments using airslides.

17.2.21. Tailings Thickener

The tailings from the scavenger circuit are fed to the tailings thickener. This is an 18 m diameter high-rate thickener. The thickener overflow is pumped to the process water tank for recirculation of process water. The thickener underflow at 62-65% solids is pumped to the tailings desulphurization circuit.

The tailings thickener design is based on test work, supplier input and NMG demonstration plant operational experience.

17.2.22. Tailings Processing and Tailings Dewatering

The sulphide removal circuit consists of two medium intensity magnetic separator (MIMS) and four mechanical sulphide flotation cells

The thickened tailings from the concentrator are pumped to the medium intensity magnetic separator. Magnetic concentrate is sent to the sulphide (PAG) thickener. Non-magnetic tails are sent to the sulphide flotation circuit. This circuit is composed of four mechanical flotation cells with a volume of 160 m^3 each. The sulphide flotation tailings are directed to the NAG thickener while the concentrate reports to the sulphide (PAG) thickener.

The sulphide flotation and magnetic separation circuit designs are based on test work, supplier input and NMG demonstration plant operational experience.

The tailings dewatering circuit is composed of one sulphide thickener, one sulphide press filter, one NAG tailings thickener and two NAG press filters.

The combined concentrate from the sulphide flotation and the magnetic separation circuits is pumped to a 13 m diameter high-rate thickener. The thickener overflow is pumped to the tailings process water tank for recirculation of process water. The thickener underflow at 60% solids is pumped to the sulphide holding tank. This tank is 8.5 m diameter x 10.5 m high and has a volume of 500 m^3 with an agitator to keep solids in suspension.

From the holding tank, the sulphide concentrate is pumped to the sulphide press filter. The filter will have 45 plates, expandable to 50 plates. The filtrate is recirculated to the sulphide thickener by a filtrate pump. The filter cake at 15% moisture is conveyed to the sulphide stockpile.

The NAG tailings are the sulphide flotation tailings which are pumped to a 15 m high-compression 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 7.75 m diameter x 10.5 m high and has a volume of 350 m^3 with an agitator to keep solids in suspension.

From the holding tank the non-sulphide tailings are pumped to two press filters. The filters will have 98 plates that is the maximum plate number on this filter. Each filter has the capacity to process the nominal tonnage of non-sulphide tailings. In normal operation, only one is operating. The filtrate is recirculated to the non-sulphide tailings thickener by a filtrate pump. The filter cake at 15% moisture is conveyed to the non-sulphide tailings stockpile.

17.2.23. Reagents

17.2.23.1. Fuel Oil

Fuel oil #2 is used as a collector for graphite flotation. The fuel oil will be delivered by the fuel truck on request from the mill and stored in a 46 m^3 double walled tank. The expected fuel oil usage is 200 litres per day. The fuel oil will be transferred from the storage tank to a one 2.3 m^3 holding tank for distribution in the process.

17.2.23.2. Methyl Isobutyl Carbinol (MIBC)

MIBC is used as the frother for both graphite and sulphide flotation. The 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 46 m^3. MIBC will be transferred from the storage tank to a one 2.3 m^3 holding tank for distribution in the process. The bulk shipment of MIBC will remove possible container disposal issues. The expected MIBC consumption is 383 litres per day.

17.2.23.3. Flocculant

Flocculant is used in all four thickeners to aid the settling of graphite concentrate and tailings. Given the location of the thickeners, two separate flocculant mixing systems are required, the small one for the graphite concentrate thickener that will be installed inside the main processing plant and the other one will be used for the PAG, NAG and concentrator tailings thickeners.

The flocculant requirements at each location are small and therefore 25 kg bags and small mixing systems have been selected. The total expected flocculant consumption is 307 kg per day.

17.2.23.4. Potassium Amyl Xanthate

PAX is used as collector for sulphide flotation. PAX is a very non-selective sulphide collector. It will be delivered in bulk bags and stored in pallets at the tailings processing plant. The PAX mixing system design is based on the bulk bag size. The total expected PAX consumption is 621 kg per day.

17.2.23.5. Lime

Lime is not required for the graphite recovery, but it will be possible to add lime at different locations in the circuit to keep the pH between 6.5 and 8 to prevent metal leaching. The maximum anticipated lime usage is 233 kg per day.

17.2.24. Utilities

17.2.24.1. Concentrator Water Services

Fresh Water, Process Water

The collecting pond, BC-2 Pond, is fed with water from the Tailings water tank overflow and the site run-off. From this pond, it is pumped to the Process water tanks. Excess water of the BC-2 Pond is sent to the BC pond.

Process water tank is used to feed the process water distribution network. The tank is mainly fed by the thickeners overflow (concentrate and tailings thickeners), the make-up process water is pumped from the BC-2 Pond. If required, fresh water can be added to this tank. The process water tank will have a capacity of 1,650 m^3.

The fresh water/fire water tank is used to provide fresh water for the reagent preparation (Flocculant, Xanthate, Lime) and for the concentrate filter, gland seal water to the slurry pumps, and fire water to the plant fire water system. The tank is fed by the underground water wells. The tank is separated in two, 300 m^3 is for the fresh water and 900 m^3 is for the fire water.

Tailings Area Process Water

The tailings water tank is fed by the PAG and NAG thickeners overflow. If required, reclaim water from the BC-2 can be added to this tank. Excess water from the tailings water tank overflows to the BC-2 Pond. The tailings water tank will have a capacity of 875 m^3.

The tailings water is used for the PAG and NAG filter presses and the other equipment in the tailings circuit area.

17.2.24.2. Compressed Air, Air Blowers

Two plant air compressors are available to provide plant and instrument air to the concentrator equipment. In normal operation, one compressor is in operation and the other is on standby. Compressed air feeds the instrument air distribution circuit, the plant air distribution circuit and the flotation columns.

Two flotation air blowers provide air to all flotation cells. In normal operation, one blower is in operation and the other is on standby.

Two filter pressing air compressors are available to provide compressed air to the PAG and NAG filter presses. This air is used to inflate membranes in the filter chambers to compress the filter cake and expel water. In normal operation, one compressor is in operation and the other is on standby.

Three filter drying air compressors are available to provide compressed air to the concentrate, PAG and NAG filter presses. This air is used to blow the water out of filter cake to reduce cake moisture. In normal operation, two compressors are in operation and the other is on standby.

17.3. Bécancour Battery Material Plant

The NMG Battery Material Plant serves to transform natural graphite concentrate produced at the concentrator into added-value battery-grade materials. The finest size fraction of the graphite concentrate, which represents the lowest value product coming from Matawinie, is trucked to Bécancour to undergo micronization and spheronization, purification and coating to produce coated spherical purified graphite (CSPG) battery grade materials. A portion of the jumbo flake product from Matawinie is also treated. However, it only passes through the purification stage to produce purified jumbo flake (PJF). Both materials will be purified using a carbochlorination process to a minimum grade of 99.95% while respecting specific impurity limits set by end-users.

In total, the Battery Material Plant receives 60,700 t of graphite concentrate and 3,075 jumbo flake annually. Following the micronization and spheronization process where the CG materials undergo a size reduction and two stages of particle shaping resulting in two spherical graphite products and one fines by-product. The fines by-product represents 30% of the plant feed. The fines are bagged and sent to market for sale as carbon riser at an estimated grade of 95% C.

The carbochlorination process involves injection of chlorine gas into a custom furnace at high temperature. The impurities contained in the graphite react with chlorine and are volatilized from the graphite and condensed in the insulating media bed of the furnace. The off-gases are scrubbed and a water treatment plant removes any impurities from the water which is neutralized and recycled to the process. The fouled insulating media, containing impurities in the form of mixed chlorides and oxides, will be disposed of in an authorized containment site operated by a third party. The small amount of residue generated by the water treatment plant is filtered and the solid cake is trucked to the mine for disposal in the concentrator's tailings management facility. Approximately 4-5% of the graphite mass is lost during purification in the form of impurities, carbon monoxide (CO) gas and dust. The two sizes of spherical purified graphite (SPG) are sent to the coating area while the purified jumbo flakes are bagged for shipment to market.

The final stage of the added-value product flowsheet is the application of a coating to the spherical purified graphite. Both coarse and fine SPG materials are mixed with micronized pitch. During the treatment, 50% of the pitch is volatilized and the remaining portion is deposited and carbonized on the surface of the SPG. The final primary and secondary CSPG production is 35,849 tpy and 6,767 tpy respectively. Both materials are bagged and shipped to the end users.

17.3.1. Process Design Criteria

The Battery Material Plant is designed to produce the highest output of primary CSPG, followed by secondary CSPG. The JF will only go through purification be treated in a stand alone building reusing the demonstration plant infrastructure.

All throughput rates are based on the production of 42,616 t of CSPG and 3,007 t of purified JF. The average CG feed purity is 96.6%C, while the average JF purity is 98.5%C based on test work results and may change depending on the CG elemental composition. The process plant will operate 365 days per year, 24 hours per day and will have a plant availability of 92%.

Micronization and spheronization was designed to produce spherical particles of a size of 20 microns (Primary SG) and 10 microns (Secondary SG). The target purified grade of SPG is 99.95% and purification is realized by carbochlorination in a custom Acheson-type furnace. Coating is achieved by mixing graphite with pitch to create a thin layer of 3-25 nm of carbon precursor.

The plant capacity was estimated based at an average feed rate of 180 tpd and an hourly throughput of 7.5 t. Table 17-4 presents a summary of the design basis for micronization, spheronization, purification and coating.

Table 17-4: Battery Material Plant process design criteria

Criteria	Unit	Value
General		
Operating days	d/y	365
Operating hours	h/d	24
Plant availability	%	92
Plant feed		
Graphite concentrate tonnage	tpy	60,700
Graphite concentrate grade	%C	96.6
Jumbo Flake	tpy	3,075
Jumbo Flake grade	%C	98.5
Plant production		
Total CSPG production	tpy	42,616
CSPG20 production	*tpy*	*35,849*
CSPG10 production	*tpy*	*6,767*
Purified Jumbo Flakes production	tpy	3,007
Fines (by-product)	tpy	18,384

Criteria	Unit	Value
Micronization & Spheronization		
Number of lines	#	3
Number micronizers per line	#	3
Number of spheronizers per line (primary and secondary)	#	11
Primary spheronization target particle size	µm	20
Secondary spheronization target particle size	µm	10
Primary spheronization mass recovery	%	59
Secondary spheronization mass recovery	%	11
By-products (fines) mass recovery	%	30
Purification		
Target purified graphite grade	%C	99.95
Purification method	-	Carbochlorination
Type of purification furnace	-	Custom Acheson-type
Number of gas treatment systems	#	2
Gas treatment neutralization agent	-	Hydrated lime
Number of water treatment plants	#	1
Coating		
Furnace atmosphere	-	Inert (nitrogen)
Number of operating furnaces	#	6
Coating precursor		Pitch
Precursor addition	%	5-13
Fraction precursor deposition	%	50
Target coating thickness	nm	3-25

17.3.2. Battery Material Plant Flowsheet

A diagram illustrating the material flow thought the Battery Material Plant is presented in Figure 17-5.

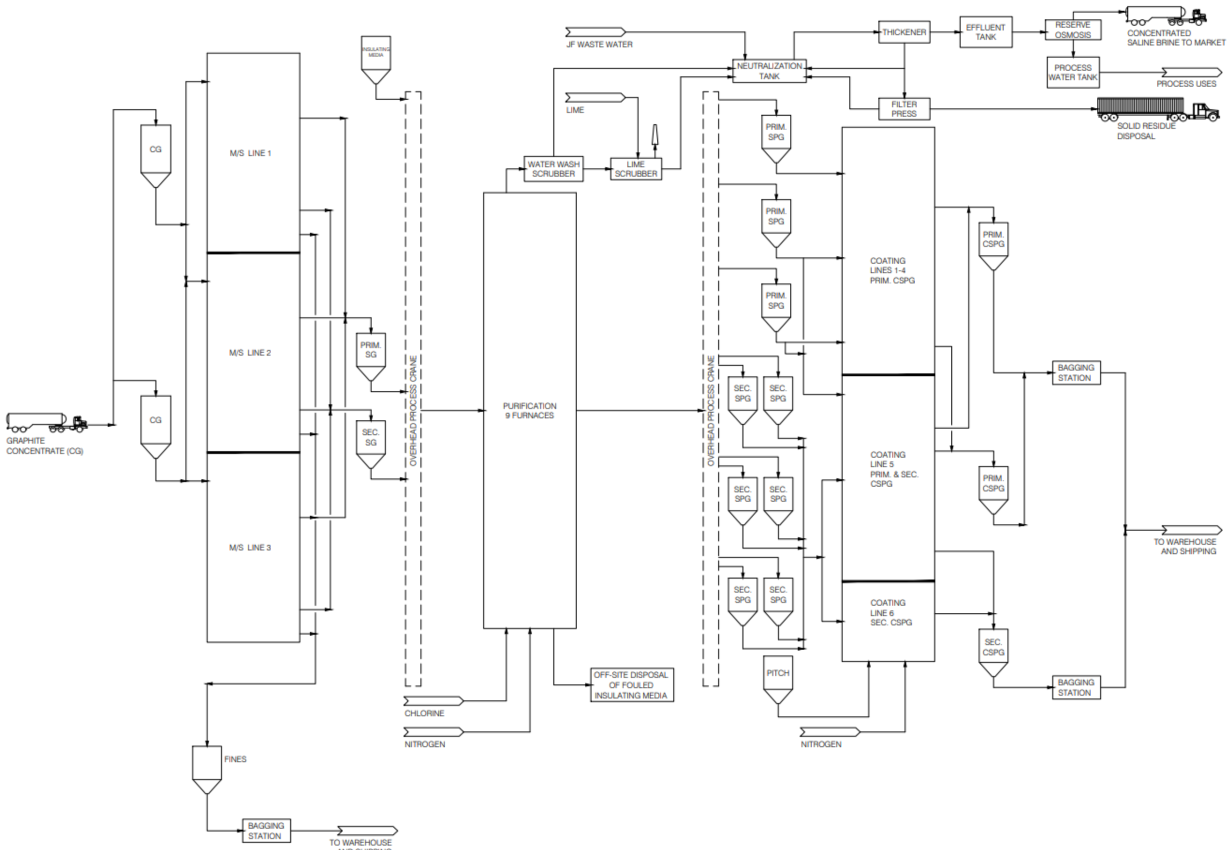


Figure 17-5: Battery Material Plant block flow diagram

17.3.2.1. Material Reception

The Battery Material Plant capacity processes 60,700 tpy of CG at 97% purity from Matawinie to produce 42,616 tpy of CSPG at a purity of 99.95%. The finest fractions of CG produced at Matawinie (-50, -80 & -150 mesh) is shipped to the Battery Material Plant via 35 t trucks.

Based on an operation of seven days per week, 24 hours per day and 92% plant availability, the plant receives approximately five truckloads per day, which corresponds to 175 tpd. The feed material is stored in two silos of 450 t each, for a total storage capacity of 900 t which is equivalent to five days of operation.

The coarsest fraction of CG (+50 mesh), called jumbo flakes, is fed to jumbo flake reception silos and are purified in a stand alone building reusing the demonstration plant infrastructure.

17.3.2.2. Micronization

There are three lines of micronization and spheronization, each line containing one operating micronizer. The CG material is discharged of the CG silos by fluidized bottom and airslides into three micronizers of a capacity of 20,230 tpy operating continuously. The purpose of micronization is to grind graphite to a finer size.

17.3.2.3. Spheronization

Spheronization allows the production of spherical particle form. It is essential to optimize the surface of particles to reach the highest anodic performances. Micronized graphite is fed to a two-staged spheronization by pneumatic transportation. Primary spheronization contains five spheronizers operating in parallel per line, for a total of 15 spheronizers. The coarse particles (Primary SG), representing 58.5% of the feed, are collected into a main collector and are sent to purification by pneumatic transportation.

Finer particles are collected and sent to secondary spheronization, which contains six spheronizers per line for a total of 18 secondary spheronizers. These finer particles (Secondary SG), represent 11% of the feed, and are collected into a main collector and are sent to purification by pneumatic transportation, while the remaining fines by-product particles are sent directly to the bagging station.

17.3.2.4. Purification

Purification consists of a thermochemical treatment to increase the purity of SG from 97% to 99.95% and produce spherical purified graphite (SPG). The unit contains nine custom Acheson-type furnaces treating, in turn, Primary and Secondary SG material. The JF are purified in a stand alone building reusing the demonstration plant infrastructure. The furnaces are loaded with graphite and a carbon-based insulating media.

The proprietary carbochlorination process developed by NMG was selected because it leads to formation of chlorinated metallic complexes, which reduces the boiling point of the mineral species present in the CG. For the purposes of the FS, it was assumed that the main impurities (Al, Si, Fe, S, Ca, K, Cr, etc.) vaporize and settle on the surface of the insulating media bed due to the high temperature gradient in the furnace. This layer of condensed chlorinated metals, the crust, is collected and sent for disposal. This hypothesis is under investigation in the purification demonstration plant. Since sulphur and carbon might react with the residual oxygen contained in the graphite bed during the first heating period, it is expected that SO_2 and CO is collected in the gas treatment, along with the excess of chlorine.

The amount of chlorine injected to the furnace is based on the elemental assay of the material. It will be delivered via pipeline in a gaseous state by a local supplier.

A typical purification cycle consists of heating the material and injecting chlorine at an optimized flowrate. Once the optimal temperature is reached, chlorine is given sufficient time to diffuse through the graphite bed and to react with the metallic impurities. Nitrogen purges both during and after carbochlorination will help to act as a carrier gas to remove off-gases and residual vaporized impurities while also helping to remove residual chlorine at the end of the cycle. Once the carbochlorination treatment is complete, the material will be cooled down over several days before being discharged and sent to coating.

17.3.2.5. Coating

The coating process is the final step of the CSPG production process. The objective of this step is to coat particles with a thin film of carbon precursor (3-25 nanometres thick) which is then crystallized. This involves milling pitch, mixing the milled pitch with SG, and finally thermally treating the mixture in a coating furnace.

The furnace consists of several zones to vaporize the pitch and coat the graphite particles. The excess pitch vapours are evacuated from the furnace and burned off in a thermal oxidizer before being released to the environment. The coated graphite then continues its treatment in a carbonization zone. Finally, the cooling zones to reduce the temperature to below 125°C before the coated graphite is exposed to oxygen. The furnace is operated under a very tight control of inert atmosphere (nitrogen addition) to prevent graphite oxidation.

The cooled coated graphite is deagglomerated and sieved to ensure the final product meets stringent particle size specifications. An automatic sampler will collect coated spheronized graphite prior to bagging for quality control purposes. A manual sampler will allow for collection of agglomerates for spot-checks as required.

Coating is done in six lines with each line having one coating furnace. Four lines are dedicated to coat primary SPG only, one is dedicated to coat secondary SPG and one hybrid furnace that can treat both materials.

17.3.2.6. Gas Treatment

The Battery Material Plant contains two gas treatment systems. The main one processes the gas flow coming out of the purification furnaces treating primary and secondary SG. There is also a smaller unit located in a stand alone building reusing the demonstration plant infrastructure for JF purification off-gas treatment.

During purification, the gas flow coming out of the furnaces is collected in the furnace hood and sent to the gas treatment system. The first step consists of a venturi scrubber collecting entrained particles and a portion of the sulphur dioxide and the excess chlorine. The purge is collected into a buffer tank, while the residual gas is sent to the lime scrubber. A hydrated lime solution is fed into the scrubber to capture residual gas and the purge is sent to the lime scrubber buffer tank. The clean gas is sent to a stack and released in the atmosphere, while both purge solutions are treated in the water treatment.

17.3.2.7. Water Treatment

The Micronization/spheronization (M/S) and coating sectors are dry, the purification areas removing impurities from spherical graphite (SG) and jumbo flakes (JF) require two independent gas treatment systems whose liquid effluents are directed to the WTP.

The water wash scrubber captures particulates, small amounts of volatilized impurities from the purification process and some residual sulphur dioxide (SO_2). The lime scrubber serves to capture excess unreacted chlorine to prevent it from being released to the environment. The effluents from these scrubbers for both SG and JF purification are collected in two separate buffer tanks and then neutralized using lime and/or hydrochloric acid (HCl). Hydrogen peroxide (H_2O_2) is also used to destroy hypochlorite ions and to destroy cyanide ions in the event any is detected in the solution. The purge solutions are sent to a neutralization tank where the pH is adjusted in order to precipitate metal hydroxides and gypsum.

The neutralized slurry is sent to a thickener for solid-liquid separation., gypsum and metal hydroxides separation. The thickener overflow consists of a supernatant composed of 7-8 wt% of calcium chloride ($CaCl_2$) brine. The thickener underflow consists of a 20-30 wt% solids sludge containing gypsum and metal hydroxides. The sludge produced is in part returned at the thickener feed and the rest pumped to a filter press for further dewatering. The filter press cake is washed to remove any residual $CaCl_2$ solution and is loaded into a container for transportation to the Matawinie co-disposal facility. The thickener overflow brine solution is further processed using reverse osmosis to concentrate the brine to 12 wt% $CaCl_2$ while the recovered water (the permeate from the reverse osmosis process) is recycled to the process to minimize industrial water consumption (see Section 17.3.3.2 for a detailed description of the plant water balance). A letter of intent is in place by a third party to purchase the concentrated brine solution.

In total, 20 m^3/h of brine is produced and on average, 21 m^3/h of clean water is recycled to the process water tank.

17.3.3. Energy, Water and Consumables Requirements

17.3.3.1. Energy

The total installed power required for the Battery Material Plant is 105 MW. The energy requirements vary by sector and represent 21%, 38% and 25% of the overall load for the Micronization/ Spheronization (M/S), purification and coating areas, respectively. The remaining users are mainly the services including compressed air and water cooling to support the process. The electrical substation, administration building, laboratory, storage and maintenance facilities make up less than 2% of the energy needs for the Bécancour site.

17.3.3.2. Plant Water Balance

Industrial Water

An average of 21 m^3/h of industrial water make-up is required. The make-up is slightly higher in winter due to lack of humidity collected in from cooling tower blowdown. The industrial water available at the Bécancour industrial site comes from the St-Lawrence River. The water quality depends on the intake location in the river but in general, colour, turbidity, total suspended solids (TSS and total organic carbon (TOC) are the main elements of concern.

In order to use the industrial water as a source for process water make-up, a water treatment system is required to achieve the quality standards set forth by the Québec MELCC guideline and requirements.

The proposed treatment consists of filtration through membranes (nanofiltration or reverse osmosis) in order to reduce colour that could originate from decomposed organic matters which needs to be removed before disinfection.

Prior to the membranes, a pre-treatment consisting of a pre-screening of the water and a micro-filtration will be used to remove any particulate matter of large objects that could have been entrained to the treatment process and also to reduce TSS which can hinder membrane operations and efficiency. After the membrane filtration, a disinfection system is planned to maintain residual chlorine in the distribution system as per RQEP (Règlement sur la qualité d'eau potable) from MELCC.

If not already in place, an injection point of chlorine will need to be added at the intake to prevent zebra mussels from developing and obstructing the water flow through the system.

Process Water

Process water is mainly used for gas treatment as well as for reagent preparation and dilution of hydrated lime slurry, polymer for thickening, hydrogen peroxide and hydrochloric acid. The main source of process water is clean water recycled from the water treatment reverse osmosis system. Condensed water from the demisters, dehumidifying the air intake to spheronization, and water collected from the cooling tower blowdown, is also collected in the process water tank. Industrial water is used as make-up water when required. A total of 37 m^3/h or process water is required for the various users.

Cooling and Chilled Water

Chilled water is used to cool the air intake of spheronizers, material handling equipment in purification and mixers and magnetic separators in the coating sector. It is cooled at a temperature of 7.2 °C and returns at 13 °C in a closed loop.

Cooling water is supplied to purification and coating. It is used to cool the furnace electrodes during the heating phase of purification and to cool the coated material coming out of the coating furnace. The cooling water, circulating in a closed loop, is cooled down at 40 °C by cooling towers and returns at an average temperature of 55 °C.

Water Losses

Water contained in the salable brine, the residual moisture in the filter press sludge and evaporation are the main sources of water losses.

17.3.3.3. Reagents

Reagents will be required in various areas of the plant such as: purification, gas and water treatment and coating.

Table 17-5: Reagents required

Reagent	Use	Annual Consumption (tpy)
Chlorine	Graphite purification (carbochlorination)	8,541
Nitrogen	Purge gas in purification, coating mixers and coating furnaces	29,233
Hydrated Lime	Neutralizing agent in the purification off-gas treatment system and pH adjustment in the WTP	13,628
Hydrochloric Acid	pH adjustment in WTP	560
Hydrogen Peroxide	Hypochlorite neutralization in WTP	7,785

Reagent	Use	Annual Consumption (tpy)
Polymer	Sludge thickening in WTP	1
Carbon-based insulating media	Thermal insulator in purification	3,281
Pitch	Precursor for graphite coating	4,059

Insulating Media

The insulating media for purification will be delivered by truck and stored in a 110-t capacity silo. It is estimated that 3,300 t of fresh media will be consumed per year to replace dust losses and material lost alongside the vaporized impurities in purification as a fouled waste material.

Chlorine

Liquid chlorine provided by Olin will be vaporized and transported to NMG via pipeline. Approximately 8,500 t of Cl_2 will be consumed per year in the purification process. See Section 18.2.5 for a detailed description of the chlorine delivery.

Nitrogen

Nitrogen gas will be provided by a local supplier and distributed to purification and coating furnaces, and mixers in the coating area.

Hydrated Lime

Hydrated lime will be delivered in 28 t vacuum trucks from which it will be transferred into a 100-t storage silo. Volumetric screw feeders at the bottom of the silo will convey the lime to a mixing tank where water will be added to produce a 5 wt% slurry concentration. The lime slurry will be used in the lime scrubbers for gas treatment and neutralize excess Cl_2 and in the water treatment plant for metal precipitation and pH adjustment.

Hydrogen Peroxide

Hydrogen peroxide solution will be delivered in 30-tonne tanker trucks and transferred to a storage tank. Two metering pumps will deliver the solution to the water treatment plant.

Flocculant

Flocculant will be delivered in 25 kg bags. The flocculant is emptied into a feed system which in turn feeds the flocculant into an eductor where it is contacted with water. The mixture is then directed into the flocculant mix tank.

The mixing tank is equipped with an agitator and is used to mix the flocculant solution thoroughly. Once the mix tank content is mixed for a determined time, it is pumped into the flocculant holding tank.

The flocculant holding tank stocks the flocculant before it is pumped to the WTP thickener by the metering pumps and their in-line mixers.

Pitch

Pitch will be delivered in 1 t bags by flatbed trailer trucks. The bags will be lifted by a fork lift outside the process building and then stored in a shelter located in the restricted pitch holding area inside the building.

The operator will bring the big bag to the discharge unit to feed a storage silo of non-micronized pitch. Then the silo will feed two pre-crusher and two jet mills to micronize the pitch to the desired particle size.

The pitch is then transferred via pneumatic conveyor to each coating line and stored in bins above the furnace.

17.3.3.4. Quality Assurance and Quality Control (QA/QC)

Quality Assurance and Quality Control of the material is ensured by multiple control points throughout the facility. The grind size is measured by on-line particle size analyzers placed after micronization and spheronization to ensure that the primary and secondary products meet the targeted particle size. Samples are taken and analyzed after purification to measure chemical properties and to ensure that the minimum target grade of 99.95%C is achieved. In coating, an on-line particle size analyzer measures the pitch grind size after going through the jet mill. The pitch grind is essential to achieve a 3-25 nm layer on the coated product. The final product is sampled and analyzed to provide a certificate of analysis on each final product bag. Manual grab samples will be taken regularly throughout the plant and analyzed to ensure that the product meets the targeted composition, mechanical and electrochemical properties.

18. Project Infrastructure

18.1. Mine and Concentrator Infrastructure

This section describes infrastructure, buildings, and other facilities such as access roads and power lines, which are required to complement the processing of graphite ore.

Topographic information for locating the infrastructure is based on a LiDAR topographic map survey data performed in 2015 by NMG and a 2018 MERN Lidar Survey at a time when the area was forested. NMG performed some punctual on-site surveys of elevations with a GPS. Given that the areas of the overburden storage facility, industrial pad and BC-02 were deforested in 2021, a new topographic survey would provide additional accuracy to the topography.

In addition to the geotechnical investigations available at the time of the preparation of July 2018 version of the NI 43-101 Technical Feasibility Study Report for the Matawinie Mine project, complementary geotechnical investigations, including a geotechnical report, a geophysical survey and complementary test pits were performed within the limits of the industrial platform (crusher, reclaim, mills, process plants and ditches) to confirm the probable rock elevation for the purpose of civil and foundation design of the concentrator. NMG also performed additional geotechnical and hydrogeological investigations at the co-disposal storage area, ditches and water management collecting basin area.

The overall general site layout showing the concentrator processing plant and access is shown in Figure 18-1 and Figure 18-2.

The Project infrastructure includes the 120 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, tailings and water management facilities.

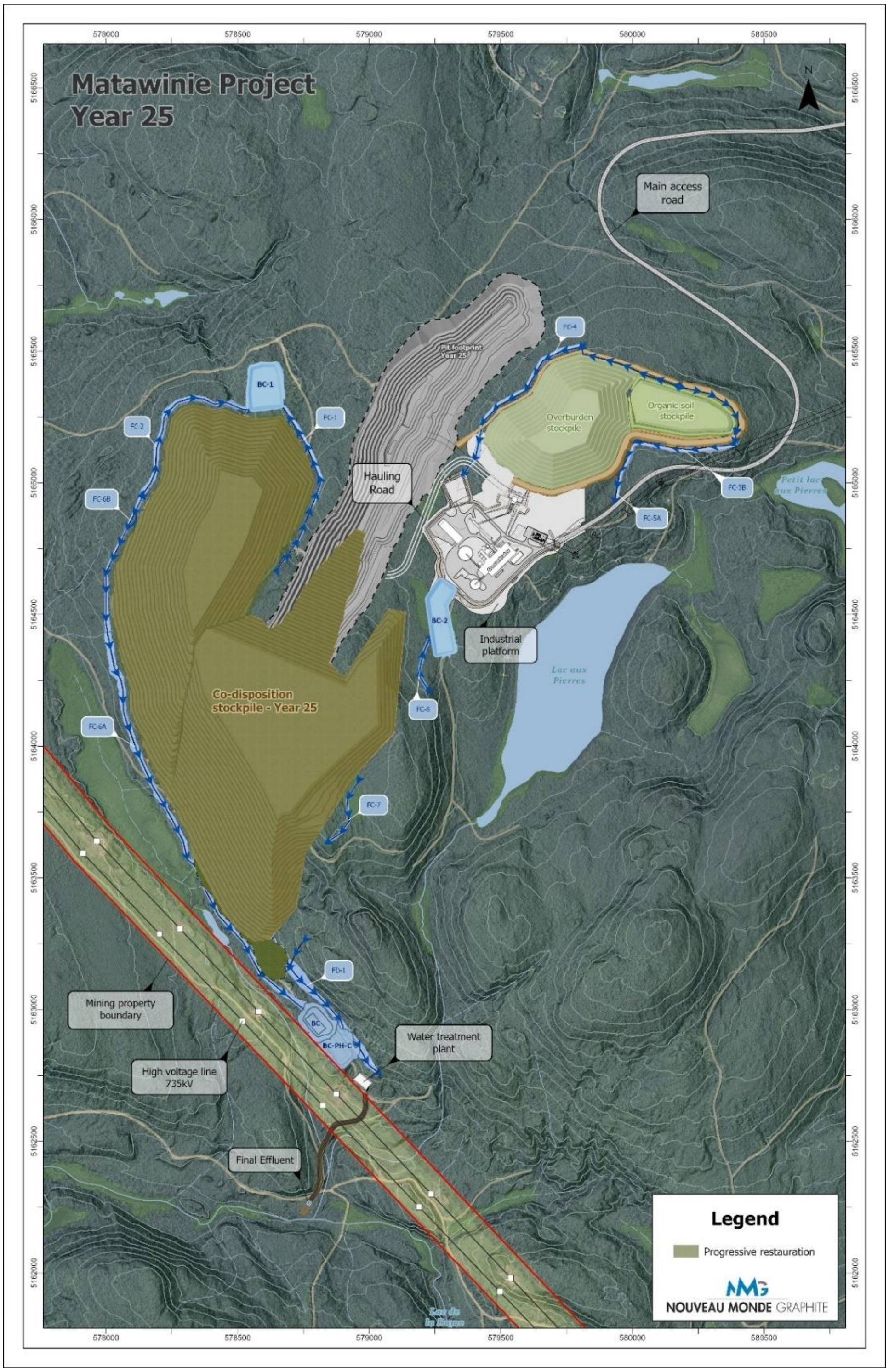


Figure 18-1: Overall general site layout and access

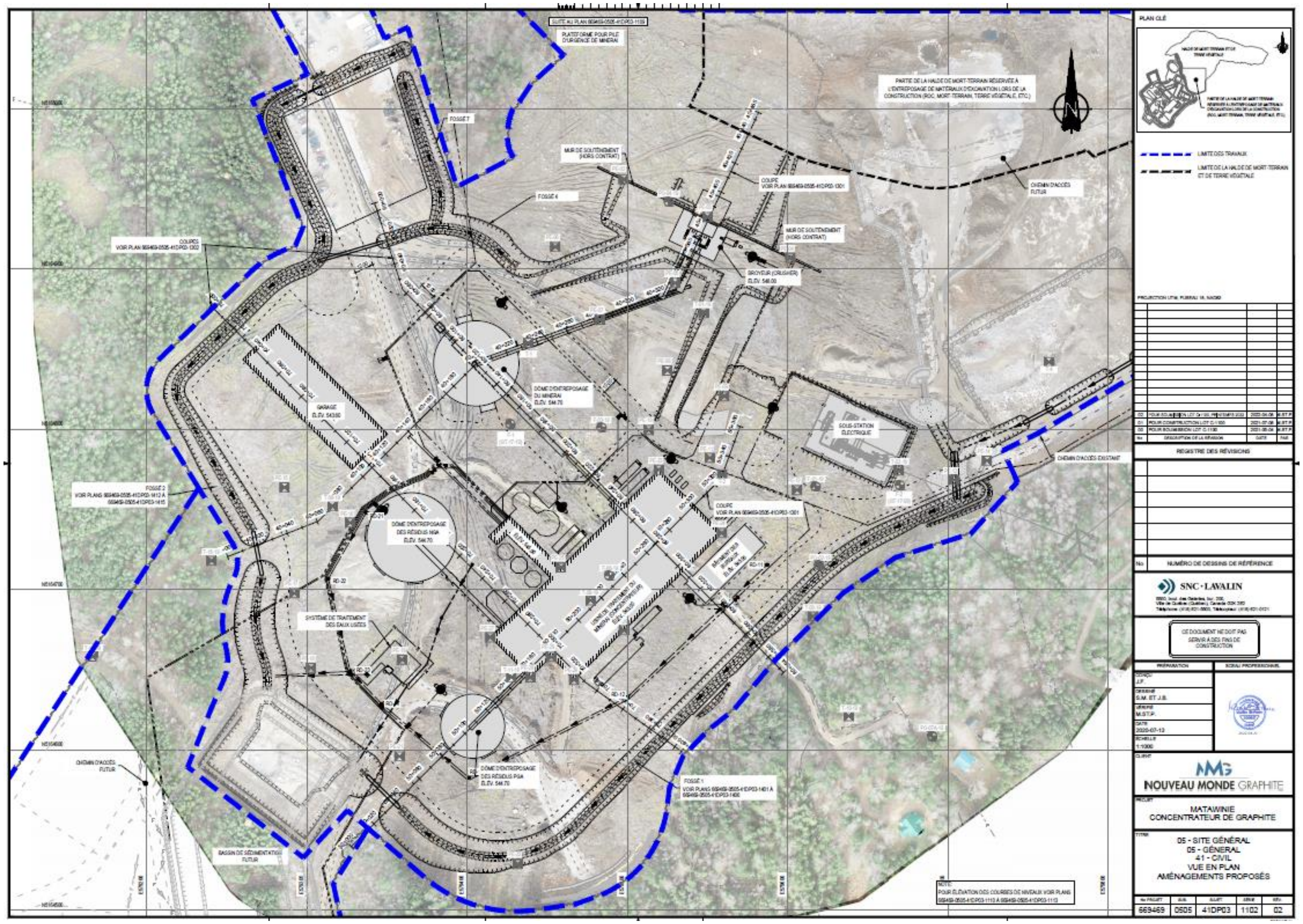


Figure 18-2: Processing plant area

Power Line Main, Substation and Site Electrical Distribution

The electrical power for the Matawinie Mine will be supplied by Hydro-Québec through a new 120 kV transmission line and will provide 28.2 MVA of available power at the beginning of operations. This approximately 11 km line, which will feed a new outdoor mine substation, is expected to be connected to Hydro-Québec's nearest station, Poste Provost. The power line will be dedicated to the Project and will allow for possible future expansion of the graphite concentrator.

A new main power substation 120-13.8 kV will be built to accommodate the new graphite mine and all infrastructure's power demand. This substation will be located at the Northeast of the mining area.

In the main power substation, in addition to the high-voltage equipment, a main 15 kV switchgear fed by a 35 MVA, 120 kV to 13.8 kV step-down transformer, will be installed in a prefabricated electrical room, which will supply the new mine power demand.

The main 15 kV switchgear will be feeding downstream step-down distribution transformers, which will provide power to:

- One 15 kV power factor correction unit located near the substation area, via cable ducts and trays;
- Two 600 V prefabricated electrical rooms (3001-EHR-001 and 3001-EHR-002) which will be located on the northeast corner of the concentrator;
- Two 600 V prefabricated electrical rooms (3001-EHR-003 and 3001-EHR-004) that will be located on the north of the concentrator;
- Two 600 V prefabricated electrical rooms (3001-EHR-005 and 3001-EHR-006) that will be located on the south of the concentrator;

Also, from the main 15 kV switchgear:

- Two 15 kV cables will supply power to the grinding mills motors, through a 15 kV to 2 X 1,725 V transformers;
- Two overhead 13.8 kV lines on wooden posts will be used to supply power to other areas of the mine. One 13.8 kV line will run across the site and across the north and east side of the co-disposal area to supply power to collection ponds pumps located in BC-01, BC-02, BC and water treatment plants, to the charging station located near the co-disposal area and to the open pit equipment. The other main branch will run northeast to supply power to the crushing station. The distribution of overhead power lines will be installed along the access roads towards the facilities around the site.

All infrastructure across the site will be fed by 13.8 kV overhead distribution power lines or underground duct banks from the main electrical room in the 120 kV to 13.8 kV power substation.

The mine site single-line diagram of the mine presented in Figure 18-3 provides more details.

Power to the mining operations will be located along mining and facilities access roads. As the mining operation progress, the 13.8 kV power lines will be modified accordingly.

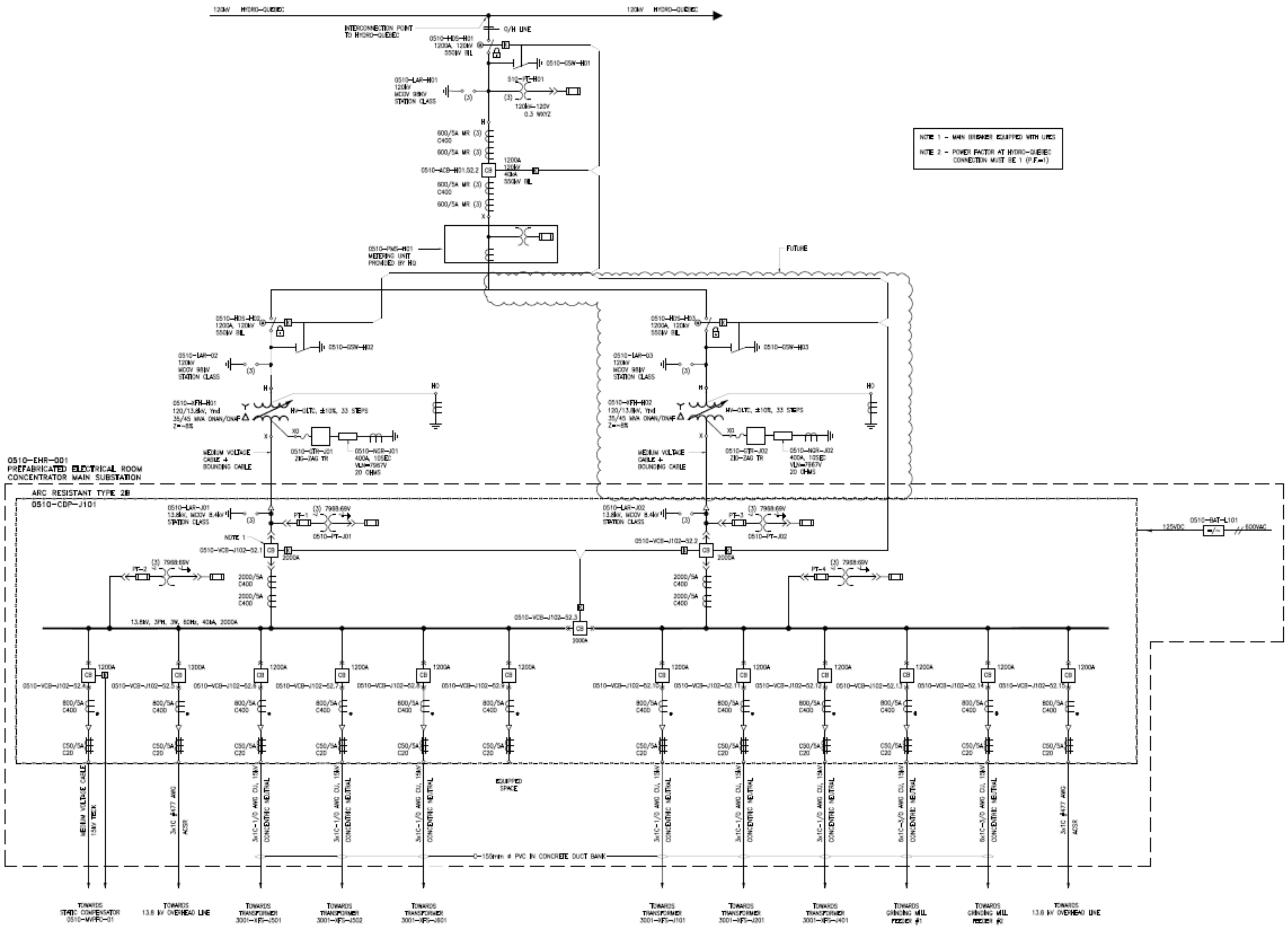


Figure 18-3: Mine site single line diagram

18.1.1. Battery Charger

Substation

The substation 125 V_{DC} system specified for medium voltage (13.8 kV) and high-voltage (120 kV) equipment control and protection systems will consist of battery banks and chargers, which will be installed in a clean, well-ventilated electrical room. The battery banks will be designed for 8 hours discharge time and 10-hour recharge time. Batteries will be of the valve-regulated lead acid (VRLA) low-maintenance type.

Mining Equipment

Rapid and slow battery charging stations will be located on the mine site at Year 6 as the mining equipment fleet merges from diesel to electric. The capacity, required load, voltage, and location of these charging stations will be confirmed once the complete electric solution is developed. Development on this solution is underway by Caterpillar and should be available in 2023. Current load is estimated and presented in Figure 18-4a and b.

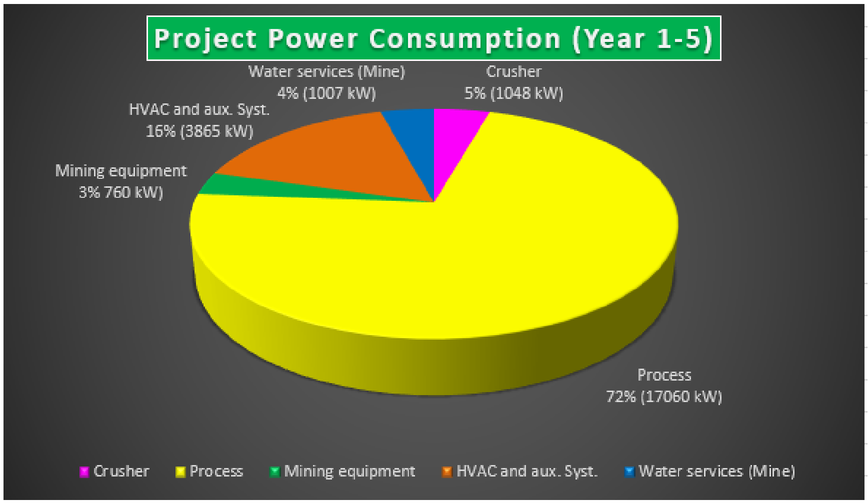
Mine Power Requirements

The mine will progressively become an all-electric operation (excluding the emergency power supply), including ore extraction and hauling as mining hauling equipment will be converted to all electrical at Year 6. The net power demand is estimated to be 23.7 MW at the start-up and will increase in Year 6, to 26.7 MW as more mining equipment becomes electrical and charging stations are added. The estimated power for the concentrator is 17 MW. The remaining power is required to service the crushing station, the concentrator services such as heating and ventilation, water services including runoff pumps and the water treatment, electrical mining drills service rooms such as mechanical, laboratory, offices, electrical rooms, etc.

The process power demand is estimated based on data from the mechanical equipment list prepared for the Project. A breakdown by subsystem is presented in Figure 18-4a, it shows the power consumption for Years 1 to 5. During this period, only two drills (760 kW) are connected to the electrical power. Thus, the net power demand is estimated at 23.7 MW. However, in Year 6 and after, more mining equipment such as excavators, loaders, graders, water/sand trucks, etc., will be connected to the electrical power, therefore, the net power required is estimated at 26.7 MW. The breakdown is presented in Figure 18-4b.

Power for the electrical mining and eventually EV charging stations will be provided by electric cables, supplied from mobile prefabricated electrical rooms. These electrical rooms will be moved as required by the development of mining operation. Some of the mining equipment (excavators and graders) might be run by hydrogen and trucks and loaders are planned to be powered by batteries after Year 6.

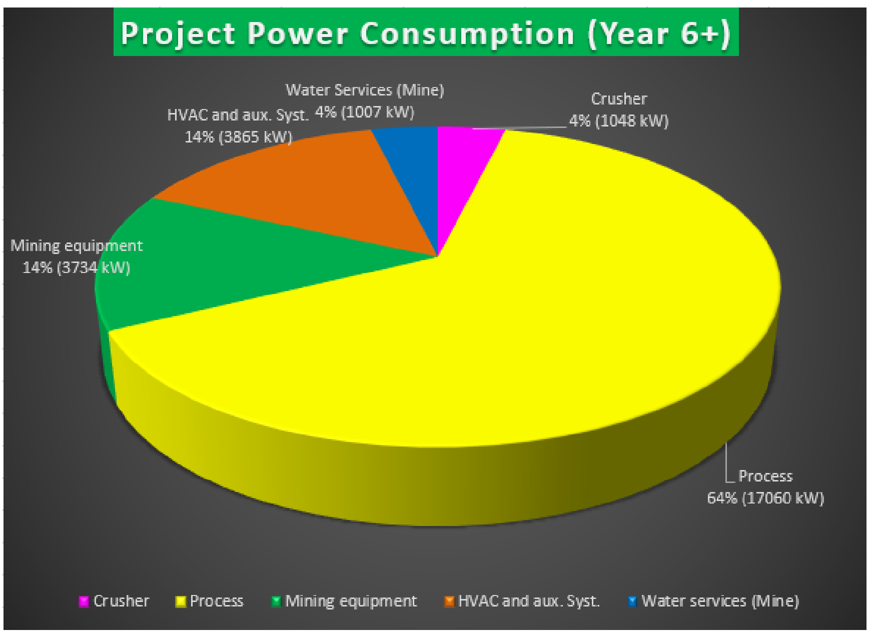
There will probably be two types of charging stations for the equipment, one fast-charging station will be located near the co-disposal area and allow for partial charging for 1 hour employee breaks and one slow-charging station will be located near a vehicle maintenance area where trucks will be parked and charged during the night.



Notes:

1. This total Process Power (kW) is based on operation power from the mechanical load list;
2. The total load of mining equipment is based on data received from NMG.

Figure 18-4: Project power requirements
18-4a Project power requirement Years 1 to 5



Notes:

3. This total Process Power (kW) is based on operation power from the mechanical load list;
4. The total load of mining equipment is based on data received from NMG.

18-4b Project power requirement Years 6 and plus

18.1.2. Main Access Road and Site Roads

Main Access Road

The main access road is a Forestry Class 1 gravel road, measuring 8 km in length and connecting Road 131, part of Québec's Ministry of Transportation's Road infrastructure to NMG's industrial mining site. The road was constructed in 2021 with final layers to complete in 2022. The structural dimensioning was carried out using the "Chaussée 2" design software of the *Ministère des Transports du Québec* (MTQ), in accordance with the methodology of the dimensioning guide of the American Association of State Highway and Transportation Officials (AASHTO), 1993 edition, for a life of 25 years. The design of the main access road considers a Class 1 road as per the *Ministère des Ressources Naturelles du Québec* classification. The main access road work will be designed at 8.5 m wide with ditches on both sides (1 m shoulders). A parking lot for workers and visitors will be located inside the main property close to the industrial platform with access through the main gate.

Access through the main gate will require communication with the plant security, located in the process plant, which will then remotely activate the main gate to permit entry to the Project site. Access cameras will be provided at the main gate for visual confirmation of vehicles and personnel desiring access to the Project site.

Service Roads

Service roads cover access from the main gate entrance at the end of the main access road to the industrial area process facilities and connect to the various mining facilities including the mining pit, the rock stockpile next to the crusher, the overburden/peat storage facility, the co-disposal area, and to the water management facilities. The roads will be developed as the mining facilities develop over the life of the mine. These will be located within utility corridors in which the electrical lines run.

Mine Haul Roads

A mine haul road will be built during pre-production which will connect the mine to the CSF, the primary crusher, the mine garage, and the overburden stockpile. The haul road has been designed for 60 tonne haul trucks with a 112,000 kg targeted operating weight. The haul road will be 27 m wide and 2.5 km long. When haul road will be outside the pit, cut and fill from NAG waste rocks or approved construction materials will be used. Several small road segments will be built over the LOM to connect the mine haul road to the haul ramp exits as the different pit phases are developed.

18.1.3. Surface Water Management

Design Criteria

The design criteria for surface water management are based on the Mining Industry *Directive 019* published by the MDDEP in March 2012. For the Project, all the surface water collection basins, pumping stations, and the water treatment system are designed to manage the spring runoff which is a combination of a 100-year snow accumulation, melting over a 30-day period and a 2,000-year 24-hour rainfall event, in accordance with the *Directive 019* guidelines.

Environmental weather data to generate hydrological data for the NMG Project were taken from the closest weather station of Saint-Michel-des-Saints located 6 km north of the Project.

Ditches

The criteria below were retained for the design of the ditches of the Matawinie Mine project:

- Diversion ditches (clean water) and collection ditches (contaminated water) are designed to be able to adequately evacuate a summer 100-year flood event;
- Collection ditches around the perimeter of the co-disposal stockpile will be impervious using geomembrane;
- The collection ditches around the perimeter of the overburden dump and the diversion ditches are protected with rockfill for the sections where it is required based on the flow velocity;
- The ditches will have:
  - A trapezoidal section;
  - A minimum width at the base of 1.0 m;
  - A minimum depth of 1.0 m;
  - A minimum slope of 0.1%;
  - The minimum side slopes of 2H: 1V in the ground and 1H: 10V in the rock;
  - A minimum freeboard of 0.30 m.

Culverts

The criteria below were retained for the design of the culverts for the Matawinie Mine project:

- The culverts are designed to adequately manage, at a minimum, a 100-year flood event;
- The minimum slope is 1% to avoid sedimentation and allow self-cleaning;
- Corrugated galvanized steel pipes are considered with a Manning coefficient of 0.028;
- The bedding thickness varies between 300 mm and 600 mm.

Collection Basins

- The basins have a minimum freeboard between the emergency spillway's threshold and the maximum water level caused by the design flood. This freeboard is 1.0 m;
- A minimum height of 1.0 m at the bottom of the basins is used to consider the accumulation of sediments and for pumping purposes;
- All basins have an emergency spillway.

Emergency Spillways

In accordance with the requirements of *Directive 019*, the emergency spillways of the basins are designed to be able to safely evacuate the probable maximum flood (PMF), while preventing the integrity of the retention structure being affected.

- The spillway's threshold is placed 1 m below the crest of the peripheral berms of the basins;
- The design of the spillway is carried out assuming that the water level in the basins is at the spillway's threshold before the arrival of the PMF.

Water Management Design

The mine water management plan (WMP) addresses the surface runoff and the process of water that are to be collected from the industrial areas including the open pit dewatering, the overburden/topsoil stockpiles and CSF facilities of the mine site. These mine waters are to be collected through a series of nine collection ditches that will discharge into the collection basins. These collection basins are interconnected to a main collection basin (BC) by a pumping system (pumping stations and piping lines) and from there to a treatment system. Two diversion ditches are placed to divert clean water to the environment.

As part of the Project, the BC will be designed to provide an area to allow the settling of suspended solids prior to water treatment at the water treatment plant (WTP). The WTP will be designed to remove residual suspended solids and dissolved metal ions that are potentially leachable from the tailings or waste rocks. Treated water from the WTP will be discharged directly to the environment at the final effluent. The discharge point of the final effluent is the *ruisseau à l'eau morte* located south of the mine site. Pit dewatering will be carried out throughout the mine life and post-reclamation or until water meets MELCC criteria.

Co-disposal, progressive reclamation and revegetation of the CSF facility area will be carried out during mining operations to improve surface runoff and seepage water quality during mining operations.

NMG will prioritize reusing and recycling treated water in the process water make-up to minimize freshwater intake from freshwater wells. It should be mentioned that the suspended solids collected in the basins and the sludge generated in the WTP will be managed on-site and co-disposed with the tailings.

A conceptual water flow diagram that corresponds to the WMP is shown in Figure 18-5.

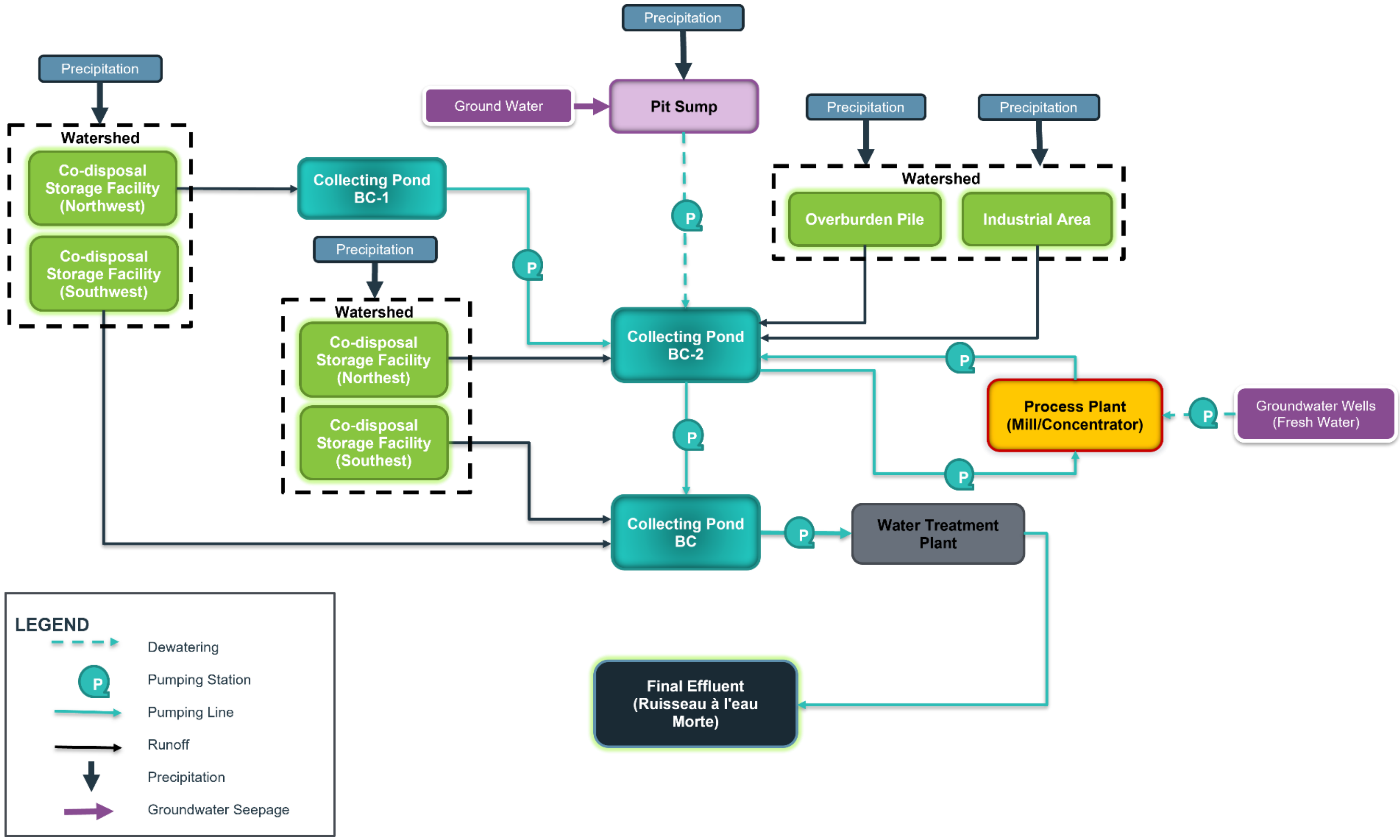


Figure 18-5: Water flow diagram

18.1.4. Water Management Facilities

The Matawinie Mine project site has been divided into 13 main watersheds which have been subdivided into sub-watershed for the tailings CSF facility and overburden stockpile sectors.

Table 18-1 shows the areas of the main watersheds.

Table 18-1: Main watersheds area for Matawinie Mine project site

Watershed ID	Area (m^2)	Area (acres)
1	388,740	38.87
2	980,635	98.06
3	144,293	14.43
4	226,299	22.63
5	144,658	14.47
6	55,174	5.52
7	118,709	11.87
8	402,853	40.29
9	33,574	3.36
10	39,084	3.91
11	503,385	50.34
12	90,702	9.07
13	622,088	62.21

Figure 18-6 presents the main watersheds of the Matawinie Mine project site.

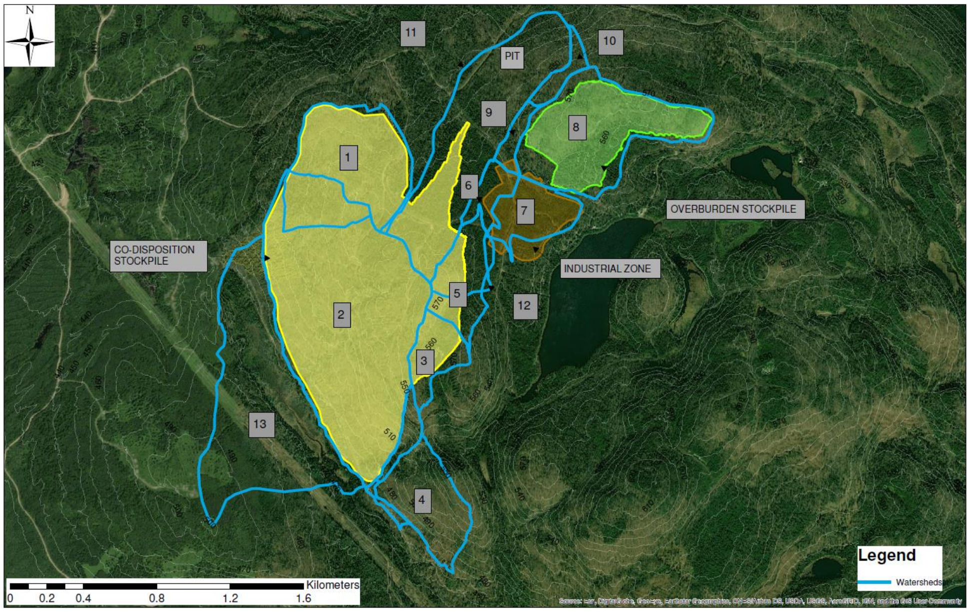


Figure 18-6: Main watersheds for the Matawinie Mine project site

Table 18-2 and Figure 18-7 present the sub-watersheds of the Matawinie Mine project site.

Table 18-2: Sub-watersheds for Matawinie Mine project site

Sub-watershed ID	Area (m^2)	Area (acres)
1A	246,010	24.60
1A.1	103,991	10.40
1B	142,729	14.27
2A	125,652	12,57
2B	237,929	23.79
2C	320,913	32.09
2D	296,141	29.61
3A	95,641	9.56
4A	194,535	19.45
8A	162,426	16.24
8B	139,784	13.98
8C	57,555	5.76
8D	43,088	4.31

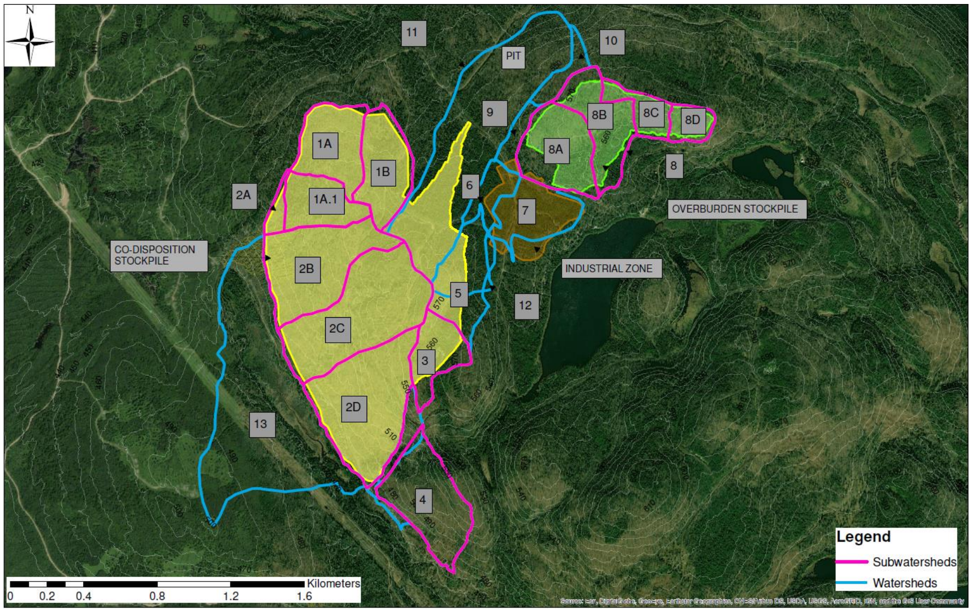


Figure 18-7: Sub-watersheds for Matawinie Mine project site

The development of the WMP for the Matawinie Mine project has been designed and optimized to promote flow by gravity considering the development of the site.

The water management infrastructure (i.e., basins and pumping requirements) is sized based on the required volume of surface runoff to manage, which varies based on the size and development of the CSF facilities and the mine pit. By the end of the Project, a total of three water collection basins are required to manage the surface runoff on the Project.

Ditches

During the first four years, the CSF deposition plan targets the use of the northern sector to the west of the open pit (watershed 1). The collection ditches FC-1, FC-2 and FC-3 will drain runoff water from this sector and send it to the collection basin BC-1. Ditch FC-3 is an extension of the ditch FC-2, and this section will be built during the second year of tailings deposition.

Depending on the use of the overburden stockpile, located northeast of the Matawinie Mine project industrial zone, ditches FC-5 and FC-4 will allow the drainage of runoff water from this sector towards the BC-2 collection basin by passing through the ditches of the industrial zone. It is planned to use the southeast portion of the overburden stockpile first. The FC-5 collection ditch can therefore be built in a whole or in part during the first year. If the northwest portion of the overburden stockpile must be used, the FC-4 ditch must be built to capture the runoff from this portion of the stockpile.

The FD-1 diversion ditch will intercept and direct runoff to the environment. The first 175 m (approximately) of the ditch will be useful when there is no tailings deposition in the southeast portion of the pit. In addition, the FD-2 diversion ditch will prevent runoff from arriving near the industrial zone. As soon as there is tailings deposition in this sector, the FD-2 will no longer be functional and will have to be decommissioned.

The drainage system is designed to evolve as the mine expands. Therefore, as tailings deposition progresses south, new collection ditches will be required.

To the west of the co-disposal stockpile, FC-6A ditch will carry runoff along the toe of the stockpile to the main collection basin (BC). This ditch must be operational during the fifth year. Three years later, the FC-6B ditch will be connected to the FC-6A ditch and the FC-3 ditch will have to be decommissioned.

Prior to the commissioning of the FC-7 ditch, during the 14th year, a modification to the FD-1 ditch is required. After decommissioning the first 175 m (approximately) of the FD-1 ditch, an extension of this ditch to the north will be necessary. This will capture clean water runoff and redirect it to the environment before it mixes with runoff from the co-disposal stockpile. The contact water transported by ditch FC-7 will be routed naturally to ditch FC-6A which will then discharge to the main collection basin (BC).

In addition, the FC-8 ditch will be in service during the 14th year, which means the FD-2 ditch will have to be decommissioned. Water from FC-8 ditch will be directed to the BC-2 basin, located near the industrial zone.

The basins and ditches for each phase of the Project are illustrated in Figure 18-8 and Figure 18-9. For all phases, the pumping stations will be designed with sufficient redundancy and flexibility for maintenance.

Figure 18-8: Water management infrastructure for Phase A (Years 0–6)

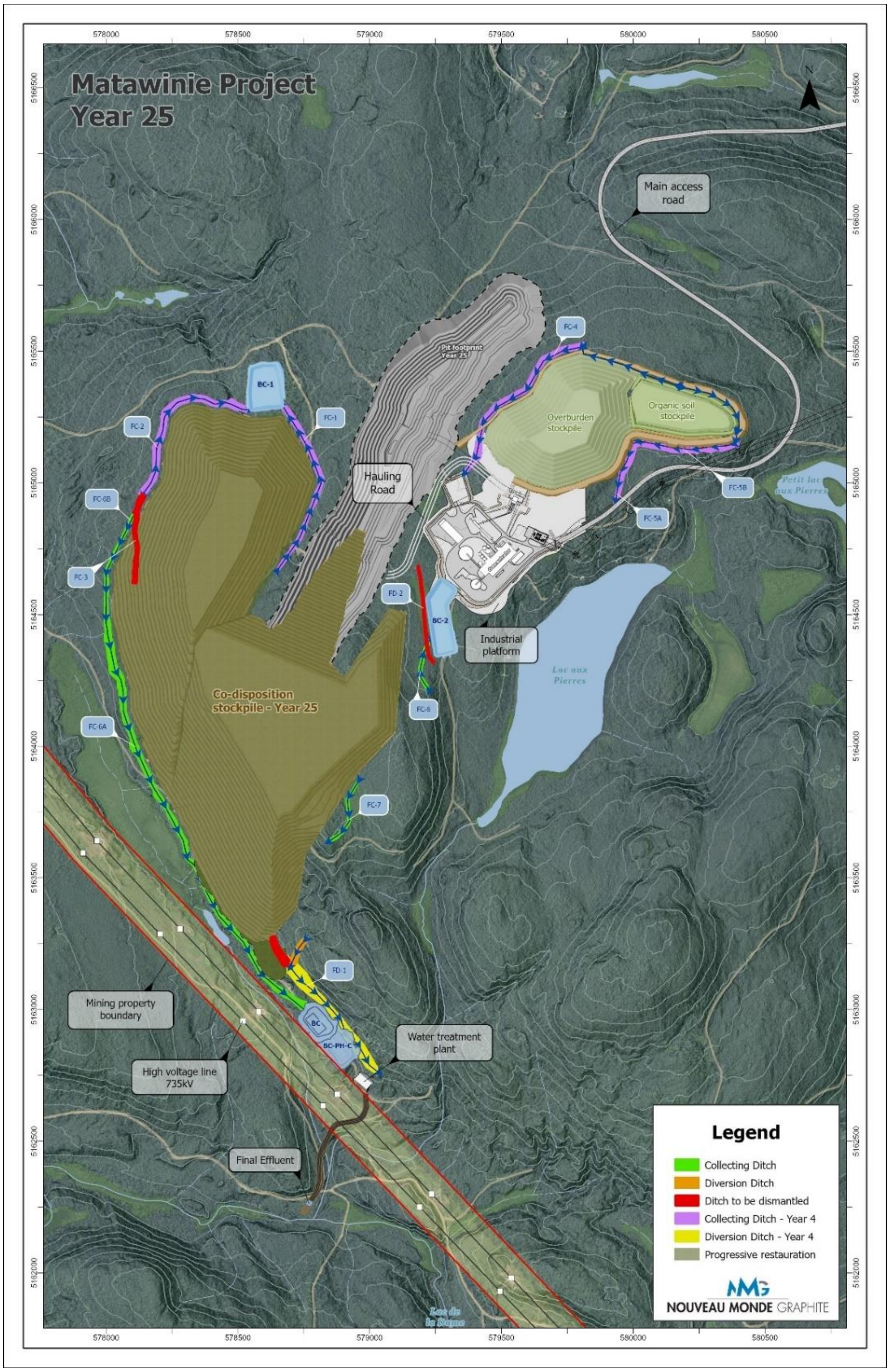


Figure 18-9: Water management infrastructure for Phase B (Years 7–28)

Collecting Basin

From the water management Phase A (Years 0 to 6), all three collection basins (BC-1, BC-2, and BC) and adjacent ditches need to be built. With the increase of the surface drainage area, a second portion of the collecting basin (BC) will be excavated in the beginning of Phase B2, around Year 16. Furthermore, at the beginning of each phase, the treatment capacity of the WTP will be increased to manage the higher volumes of surface water runoff.

The criteria considered in the design of collection basins are based on the *Directive 019*. Each collection basin must be able to contain the volume of water generated on its watershed during the design flood corresponding to a combination of a 100-year snow accumulation, melting over a 30-day period and a 2,000-year 24-hour rainfall event. It should be noted that pumping from one basin to another or treatment is considered starting 5 to 10 days after the onset of melting.

In addition to collecting surface water from its watershed, the BC-2 also collects water from pit dewatering. The quantity of dewatering water varies according to the evolution of the exploitation of the pit. It should also be noted that process water is continuously recirculated from BC-2. As the tailings are dewatered in the plant, the small quantity of water remained in the dry tailings has not been considered at this stage (which is conservative). The process water inflow entering the BC-2 is therefore equal to the outflow redirected to the plant. This type of operation has been considered in the total volume of BC-2, therefore does not affect the required storage capacity of the BC-2.

Table 18-3 presents the storage capacity for each collection basin to contain and manage the design flood.

Table 18-3: Basins storage capacity

Collecting Basin	Phase A	Phase B1	Phase B2
North Area Basin (BC-1)	150,000 m^3	150,000 m^3	150,000 m^3
Industrial Zone Basin (BC-2)	125,000 m^3	125,000 m^3	125,000 m^3
Principal Collection Basin (BC)	90,000 m^3	90,000 m^3	165,000 m^3

Pumping Stations and Pipelines

Throughout these years of operation, water from the pit, runoff and process will be routed to the basins (BC-1, BC-2, and BC). Water from basin BC-1 will be pumped to basin BC-2; and that of basin BC-2 towards basin BC. From the BC, the water will be pumped to the water treatment plant (WTP). In addition, the pumping station of the main collection basin BC will be able to transfer water, in the reverse direction, to the basin BC-2 using the same pipeline and a set of valves. These valves will be operated manually.

Table 18-4 presents the mean annual pumping capacities and the pumping capacities for the management of the design flood for water transfers, i.e., from the basin BC-1 to BC-2 then to BC and towards the WTP.

The principal collection basin pumping station directly feeds the WTP, therefore the flow rates identified in Table 18-4 are the WTP design flow rates which take into consideration the availability factor of the WTP. This availability factor has been set to 95%.

Table 18-4: Pumping capacity at each collection basin

Pumping system	Unit	Phase A	Phase B1	Phase B2
From North Area Basin (BC-1) to the Industrial Zone Basin (BC-2)				
Mean Annual Pumping Capacity	(m^3/h)	50	50	35
Pumping Capacity for Design Flood	(m^3/h)	200	200	100
From Industrial Zone Basin (BC-2) to the Principal Collection Basin (BC)				
Mean Annual Pumping Capacity	(m^3/h)	130	140	300
Pumping Capacity for Design Flood	(m^3/h)	375	385	510
From Principal Collection Basin (BC) to the WTP				
Mean Annual Pumping Capacity	(m^3/h)	120	295	580
Pumping Capacity for Design Flood	(m^3/h)	325	920	1,500

Table 18-5 summarizes the development of the water management infrastructure.

Table 18-5: Development of water management infrastructure

Infrastructure	Watershed	Inflow from	Outflow to	Year of Commissioning	Year of Decommissioning
Collection Ditch					
FC-1	1B	East side of the northern portion of the co-disposal stockpile	BC-1	0	-
FC-2	1A	West side of the northern portion of the co-disposal stockpile	BC-1	0	-
FC-3	1A.1		FC-2	2	8
FC-4	8A_O + 8B_O + 9	Northwestern portion of the overburden stockpile	BC-2 – transit by industrial zone ditches	depending on the overburden stockpile evolution	At closure

Infrastructure	Watershed	Inflow from	Outflow to	Year of Commissioning	Year of Decommissioning
FC-5	8A_E + 8B_E + 8C_S + 8D_S	Southeastern portion of the overburden stockpile	BC-2 - transit by industrial area ditches	1	At closure
FC-6A	2 + 3	Southern portion of the co-disposal stockpile	BC	5	At closure
FC-6B	2A	Centre portion of the co-disposal stockpile	BC	8	At closure
FC-7	3A	Southeastern portion of the co-disposal stockpile	BC	14	At closure
FC-8	5	Eastern portion of the co-disposal stockpile	BC-2	14	At closure
Diversion Ditch					
FD-1	4A	Undisturbed watershed north of the BC	Environment	0	At closure
FD-2	12	Upstream of the industrial zone	Environment	0	14
Collecting Basin					
BC1–150,000 m^3	1	Its Watershed	BC-2 by pumping	0	At closure
BC2–125,000 m^3	5 + 6 + 7 + 8 +9	Its Watershed + BC-1 by pumping	BC by pumping	0	At closure
BC–90,000 m^3	2 (C, D)	Its Watershed + BC-2 by pumping	WTP by pumping	0	-
BC–165,000 m^3	2 + 3	Its Watershed + BC-2 by pumping	WTP by pumping	16	At closure

Section – Water Treatment

The water treatment plant (WTP) will be designed to meet effluent quality requirements under the "*Directive 019 sur l'industrie minière*". The methods of water treatment and management of the discharge of water to the receiving environment (discharge point) will also make it possible to meet the criteria defined in *Directive 019* and achieve the environmental release targets (*objectifs environnementaux de rejet* (OER)) in the receiving environment (*ruisseau à L'Eau Morte*).

The WTP will be designed to the Project flow rates and raw water quality criteria to meet the requirements concentrations. To do this, the WTP will be able to treat the Project's flood design flows for each phase; 470 m^3/h for phase A and 950 m^3/h for phase B1. The quality of the raw water for the design are from SNC-Lavalin's feasibility report (2020), maximum concentrations are from Appendix A of the project prediction study (Lamont, 2020) and anticipated water chemistry are from the co-disposal test cells outflow.

The location of the WTP will be directly south of the mine, more precisely, to the southeast of the principal basin (BC); the latter serves as storage and is the final destination of all mine water (pit infiltration water, runoff, process water) upstream of the WTP (see Figure 18-10 – the yellow arrow shows the location). Downstream of the WTP, the treated water will be piped to the Eau Morte Creek from 600 to 800 m from the WTP.

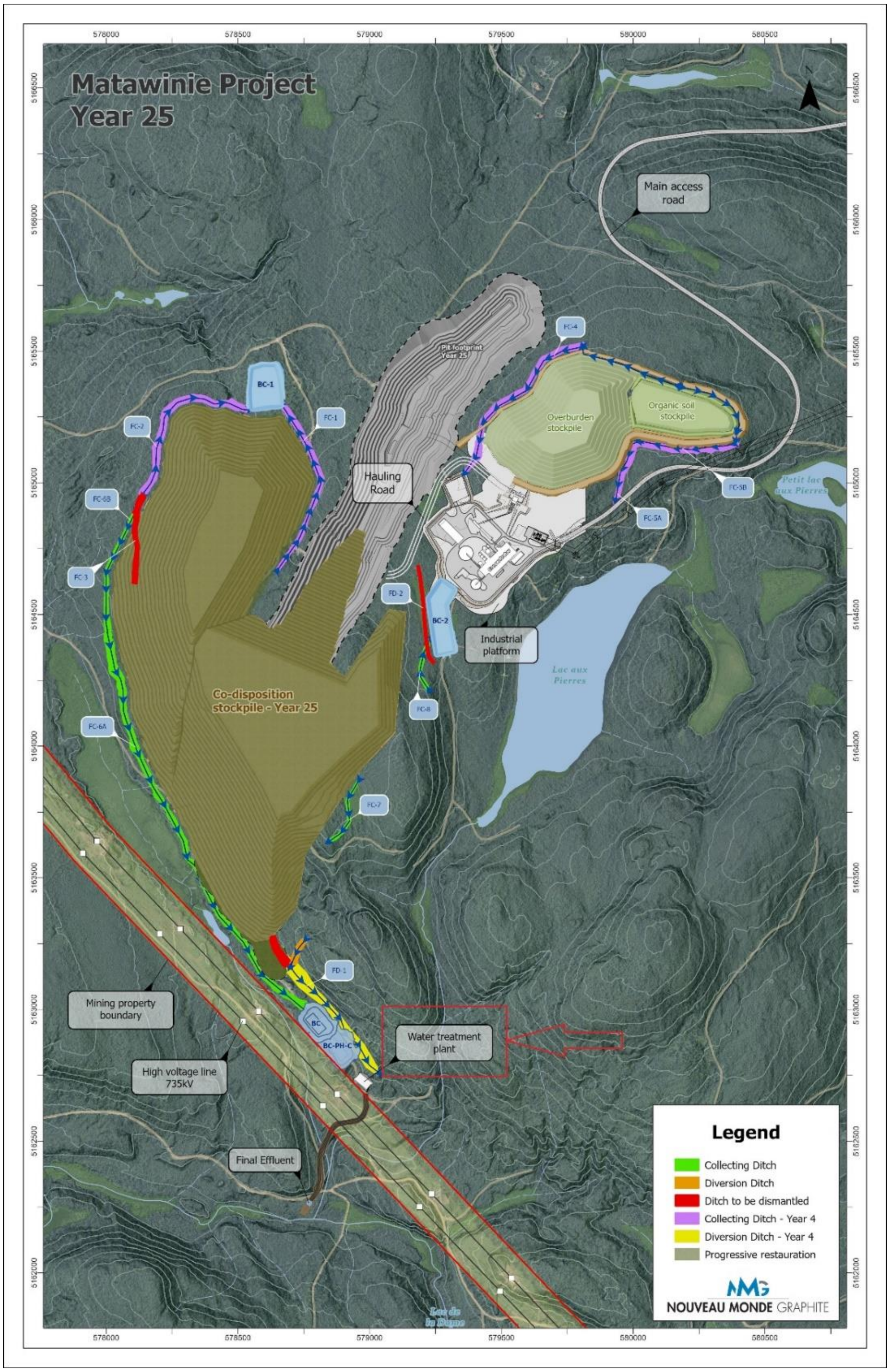


Figure 18-10: Location plan of the WTP

The treatment will be a physical-chemical process with the addition of sludge thickening and dewatering processes. There will be two trains to meet the hydraulic requirements of Phases A and B1. Each train will have a design flow of 500 m^3/h, for a total of 1,000 m^3/h.

The processing steps for the liquid processing chain will be as follows (a Block Flow Diagram is shown in Figure 18-11):

1. Neutralization (towards an alkaline pH);
2. Coagulation;
3. Flocculation;
4. Clarification;
5. Neutralization (towards an acid pH);
6. Filtration.

The treatment stream for the sludge treatment chain will be as follows:

1. Sludge thickening;
2. Dewatering.

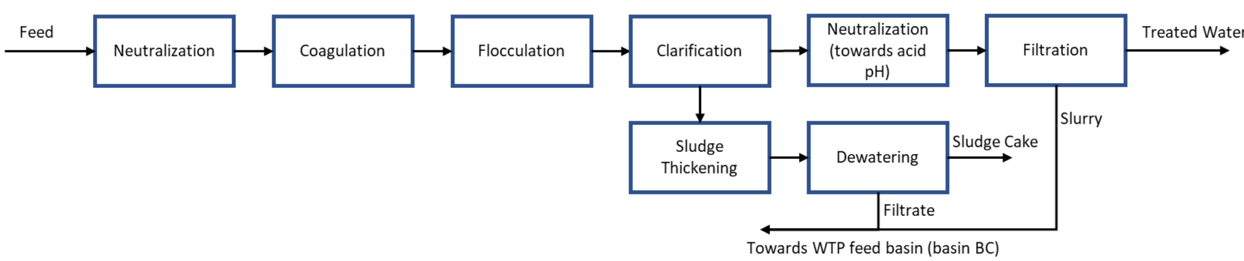


Figure 18-11: Block flow diagram of the WTP

The neutralization process is required to increase the pH of the feed water; this promotes the precipitation of hydroxides. The addition of a coagulant serves to destabilize the net charge on the surface of the suspended particles and the addition of a polymer promotes the agglomeration of these smaller particles; this physical-chemical process is used to increase the settling rate at the next stage.

The clarification stage, the final step of the physical-chemical process, allows the separation of particles from water. The clarified water is directed to a neutralization basin for the final pH adjustment. While the sludge, which contains the particles removed from the solution, is thickened and pumped to the filter press for dewatering.

The clarified water from the clarifier overflow is directed, by gravity flow, to a pH neutralization reactor and then to a disc filter, the polishing and final step in the liquid treatment chain. The extracted solids from the disk filter are pumped to the BC basin upstream of the WTP.

Initially, the sludge is thickened in a thickener directly below the lamella clarifier. It is then transferred to a filter press for dewatering; the products (or cake) will be transported from the WTP by truck. The liquid extracted from the sludge is transferred to the BC basin upstream of the WTP. This completes the solid processing chain.

18.1.5. Camp Site Accommodations

Considering the proximity of the town of Saint-Michel-des-Saints and other communities, no permanent camp has been provided for the Project. The premise is that the nearby towns will provide some of the work force and all the housing to the construction employees.

18.1.6. Site Buildings

Processing Plant Area

The processing plant area is located east of the open pit. The plant area (industrial pad) where the concentrator facilities will be built on the site is approximately 400 m by 400 m and slopes towards the south (see Figure 18-12).

The area will be excavated and backfilled to variable elevations. The elevation level next to the concentrator will 544.85 m.

The plant area is sloped, diversion and collecting ditches direct the surface water away from the plant to collector points.

The main facilities, part of the concentrator area, are shown in Figure 18-13.

Crushed Ore Storage Dome

The crushed ore from the crusher(s) will be stored in a 52 m diameter and 26 m high dome. The storage dome walls will rest on concrete foundations. The storage dome will be uninsulated, ventilated, and unheated.

The storage area will be on a concrete slab on grades to prevent spillage. Truck doors will be positioned at each end to allow for a loader to assist in feeding the apron feeders when the stockpile volume is low. The crushed ore will be reclaimed via three apron feeders located under the stockpile in a concrete reclaim tunnel. The inside dimensions of the concrete tunnel are 5.5 m wide by 36.7 m long by 6.7 m high.

The transition from the concrete tunnel to grade is by corrugated multiplate culverts, one for the SAG mill feed conveyor and one as an emergency exit.

Concentrator Building and Area

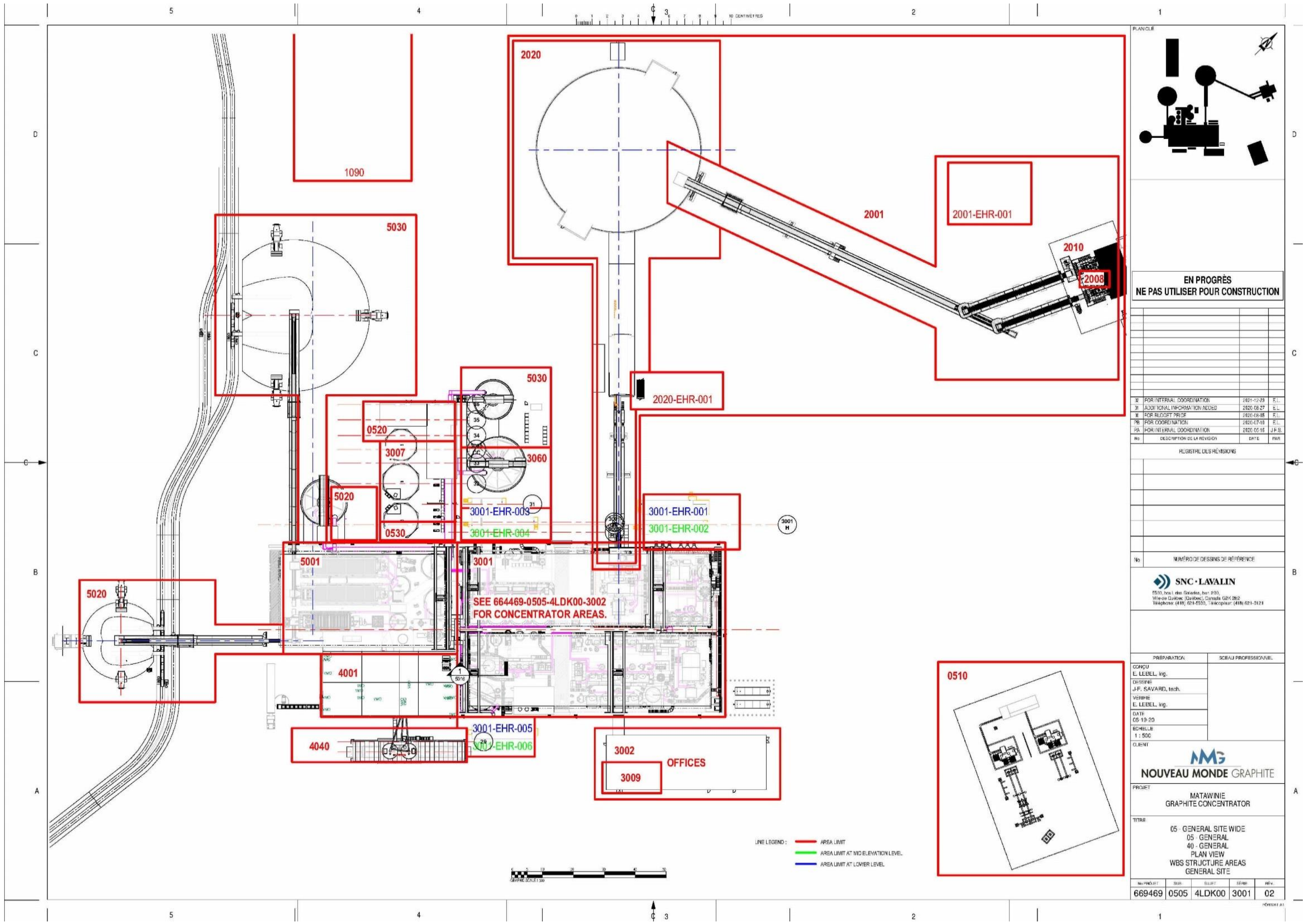
The concentrator is subdivided in the areas shown in Figure 18-12.

Sector 3000 Concentrator area including: the primary grinding, rougher/scavenger flotation, polishing and primary cleaning, stirred media and flotation, graphite dewatering, tailings thickening, magnetic separation.

Sector 4000 area including: the dryer, the handling and screening system, the classified graphite storage silos, the bagging system and the bulk load-out section. One tonne classified graphite concentrate bags will be transferred outdoors, ready to be shipped.

Sector 5000 area including: the tailings dewatering equipment for both the NAG and the PAG

The concentrator area also includes the pump room, the exterior tanks (process water, fresh water, and tailings water), NAG and PAG thickeners as well as domes for the NAG and PAG tailings.



Note: The railveyor has since been removed.

Figure 18-12: Concentrator area

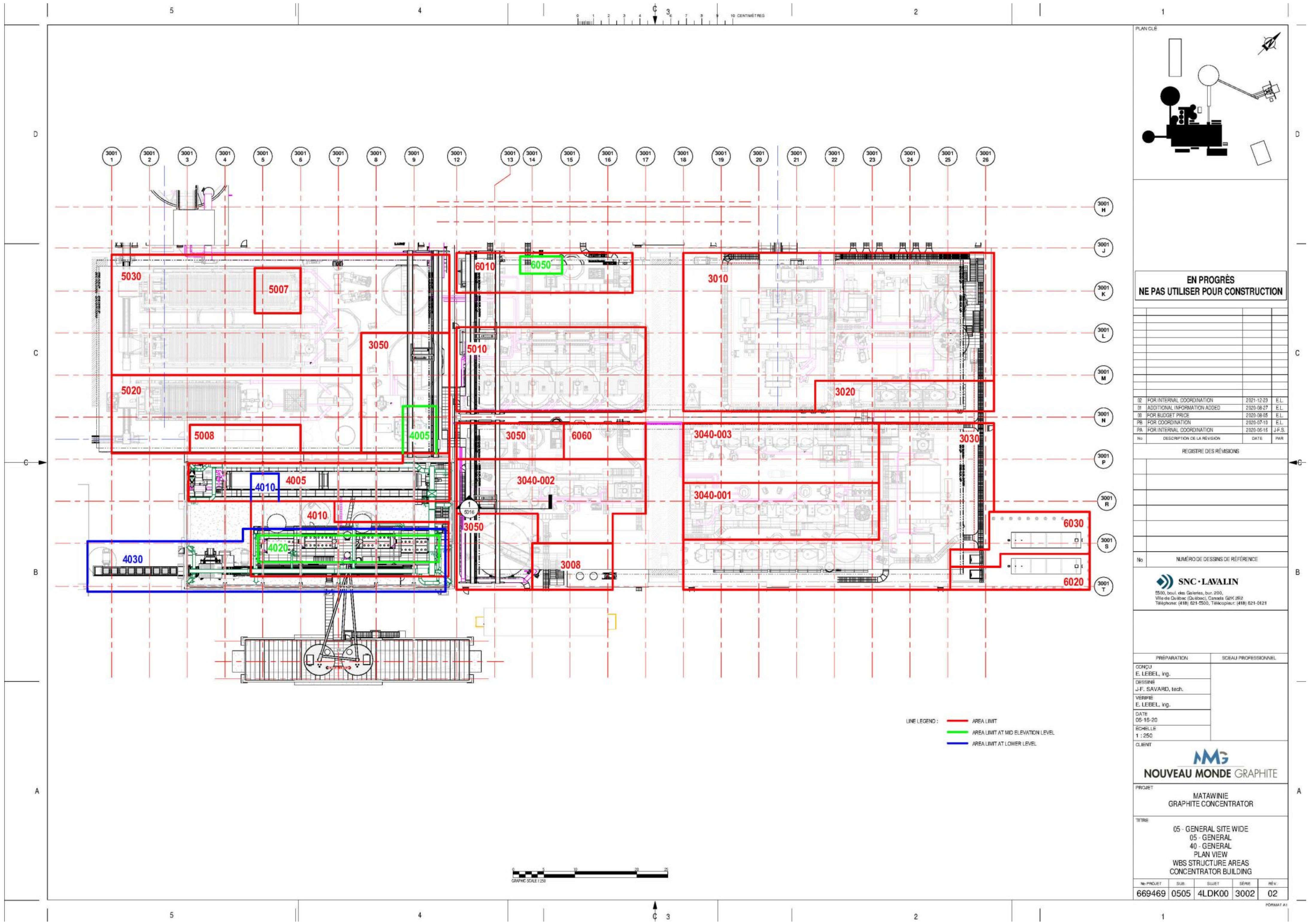


Figure 18-13: Concentrator plant floor layout

NAG and PAG Storage

Both the NAG and PAG storage buildings will be dome structures with allowance for material to be reclaimed by loaders and trucks. Both domes will be uninsulated, unheated and ventilated. The domes will be accessible by loaders and trucks for loading of the residues to be trucked to the co-disposal facility.

The NAG dome will be 48 m in diameter and 24 m in height and the PAG dome will be 30 m wide by 15 m high. Each dome wall will sit on concrete foundations. The PAG storage area will be designed to retain, capture and drain PAG contact water to BC-02.

Office Complex

A provision has been made for administration offices as a distinct building accessible from the concentrator. This complex will be modular and house offices, a conference room, a lunchroom, a locker room with showers, sanitary installations, and a laboratory. The layout will be updated to reflect this modular structure as the current layout footprint is for a stick-built two-storey office complexes.

Mine Garage

The mine maintenance facilities will be in the industrial area and will be a modular structure which will include a repair bay, a wash bay, administrative offices and washroom facilities. The mine maintenance facilities will be used to service the fleet of mining equipment and the light vehicles. The layout in Figure 18-2 will be updated to reflect this modular structure as the current layout footprint is a combined garage/warehouse stick-built building.

18.1.7. Site Services

Potable Water Treatment

Provision is made for a potable water treatment based on ultrafiltration membrane system to provide service water for the employees. The potable treatment system will be fed from on-site fresh water well(s).

Sanitary Wastewater Treatment

A domestic wastewater treatment system will be provided for on-site use. The planned system includes a septic tank and biological field system (Bionest). Sewage will be collected by underground pipes. The wastewater treatment plant effluent will be directed to BC-02.

Fuel Storage and Fuelling Station

There will be no requirement for the storage of fuel other than the fuel required for the process. This fuel will be stored in an exterior 46,000 L contained tank. The system will also have a 2,270 L interior daily tank.

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 industrial pad area. The concentrator is not protected by sprinkler. Some equipment will be protected by a sprinkler system where and as required. One electric fire protection pump, one diesel fixed pump, and one jockey pump are part of the system.

18.1.8. Electrical Distribution – Concentrator

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 Table 18-6. Detailed engineering during the main project phase shall follow the CSA M421 “Use of Electricity in Mines” standard.

Table 18-6: Voltage and loads

Voltage	Grounding	Loads
13.8 kV, 3-Phase, 3 W	LRG (400 A)	MV main distribution
4.16 kV or 3.3 kV, 3-Phase, 3 W	LRG (100 A)	MV distribution Fixed speed and variable speed motors 5 kV
600 V, 3-Phase, 3 W	HRG (5 A)	Fixed speed and variable speed motors 575 V Process loads no larger than 600 kW
600/347 V, 3-Phase, 4 W	Solidly Grounded	Large HVAC Lighting in Process Area Welding receptacles
208/120 V, 3-Phase, 4 W or 120V, 1-Phase	Solidly Grounded	Small motors 115 V Lighting in Buildings and Small HVAC Small loads up to 6 kW

Hazardous Locations

During the Feasibility Study, the graphite concentrate, and bagging system areas related to the dry screening equipment and the area around the graphite concentrate dryer were considered classified as a hazardous Class II, Division 2, Group F area. In fact, these areas located in the concentrator building would have been separated from the rest of the building by an explosion-proof and fire-rated wall. Therefore, the electrical equipment enclosures would have been rated NEMA 7 and NEMA 9 and the motor enclosures would have been rated Explosion-Proof, Class II, Division 2, Group F.

However, after verification during the detailed engineering, it was concluded in the Dekra study report that the graphite is not combustible. Thus, there will be no need to provide rated Explosion-Proof electrical equipment enclosures in the bagging system area.

Emergency Power Concentrator

An emergency power system will be provided as a standby source of power to feed critical processes loads and essential services within the concentrator (e.g., low voltage (< 1 kV) system control, emergency and exit lighting) in the event of power loss from the power grid.

The standby power source will consist of one 1.5 MW or three 0.5 kW, 600 V diesel generators located in the vicinity of the concentrator area. The total power required for emergency power is estimated at 1.5 MW. If required, the diesel generators might be used during the construction period to supply the temporary construction power.

All critical loads in the concentrator and the substation will be supplied by the same generators located near the concentrator area.

The diesel generator(s) will start automatically once the main 120 kV source is lost. The control system will shed loads, keeping only the critical process and services loads engaged.

The UPS system will be specified for the 30-minute operation of the critical loads such as the LV control system. The 125 V_{DC} Battery and chargers will be designed for 8 hours of discharge for the MV and HV system control and protection.

The telecommunications system will be provided with embedded batteries to ensure emergency communications during a shutdown of the power line.

Electrical Rooms

The main substation electrical room 0510-EHR-001 will be a walk-in outdoor type, located within the substation, will house the 13.8 kV distribution switchgear, protection control and Hydro-Québec metering panels.

Counting the electrical substation, there are nine electrical rooms. The concentrator electrical equipment will be installed in eight electrical rooms. The electrical rooms will be prefabricated insulated units with necessary HVAC systems.

Six electrical rooms (3001-EHR-001 to 3001-EHR-006) will be located adjacent to the vicinity of the concentrator and will provide power to the concentrator plant via overhead cable trays.

Electrical room 2001-EHR-001 will be located in the crusher area, housing the low-voltage equipment.

Electrical room 2020-EHR-001 will be located near the stockpile tunnel, it will supply to the low-voltage equipment under the stockpile dome.

As required, mobile electrical rooms will be designed to supply power to feed in-pit and co-disposal mobile mining equipment such as electrically cabled drills, shovels, bulldozers in addition to local auxiliary services. These electrical rooms will be moved as required depending on the stage of mining development.

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, in 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 online (DOL) motor starting is the most common method. The advantage is that it is simple, reliable and less expensive. The disadvantage is that the starting line currently is five to six 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 of the rated current from zero to full speed. The VFD start provides smooth, step-less acceleration of motor and loads while controlling inrush current and the starting torque. As a voltage regulator, they can be used to control the stopping of the process.

Power Factor Correction and Harmonics Filters

Usually, Hydro-Québec's requirements concerning the connection to the power grid, is to maintain the overall system power factor at 0.95 or higher, and harmonics must be under the limits of all Hydro-Québec requirements.

It was planned to install beside the main 13.8 kV substation area, one 4.5 MVAR three-step power factor correction unit (PFC), synchronized to the 4.8th harmonic, to be able to maintain the power factor at 0.95. During the Project planification, and to avoid significant investment in Poste Provost (where the Project substation is fed from), Hydro-Québec has agreed with NMG that the overall project power factor must be brought to 1 instead of 0.95. In fact, a static synchronous compensator (STACOM) will be provided and installed in the substation to meet Hydro-Québec requirements.

The equipment that may generate harmonics are the VFDs used for the process equipment that demand variable speed while in operation. In addition, LED lights and some of the heaters controlled by silicon-controlled resistors (SCR) may also generate harmonics. To limit harmonics generated in the network, low harmonic VFDs will be provided for larger size of motors (250 HP and plus) controlled by VFD.

In addition, to reduce the harmonic limits, the medium-voltage VFDs supplying the SAG, Ball and Polishing mills will be of the Very Low Harmonics type (active front end or at least 24 pulses).

Grounding

For grounding systems, the neutral of the main substation power transformer and the neutrals of the distribution transformers will be resistance-grounded to provide better protection for 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 the process of building and another for the substation. The ground conductors will run externally around each building with taps 18-34 hermos-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 and substation fencing will be individually connected to the grounding network from two points.

The grounding system will be designed to limit the overall resistance to the ground to four ohms (4 Ω) 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.

Cables and Cable Trays

The power cables will consist of a single conductor or three copper conductors, XLPE-insulated, with aluminum or steel armour, PVC-sheathed and rated for 75 C.

Cable trays will be ladder-type and made of galvanized steel. Cable trays for instrument cables will have a separated section. For cables of different voltage ratings, either separate trays will be provided or separating barriers will be installed if they lie in the same tray.

Lighting and Small Power

The necessary illumination levels will be provided for all areas as per the lighting specification, in accordance with the Mining Code.

Process areas with high headroom (higher than 3 m) will be lit by LED fixtures. Other internal areas of the plant (e.g., process areas that are less than 3 m high, offices, electrical and control rooms) will be lit by LED lamps as well.

Outdoor areas (e.g., exterior of process buildings, roads and parking lots) will be lit by LED Roadway lighting fixtures and floodlights installed on wooden poles and structures.

Other areas such as process working zones, control and electrical rooms 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 an emergency, 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 / 208 V dry-type transformers and panel boards located in electrical rooms.

Lighting in the process and production areas will be switched from panel boards. Outdoor lighting will be controlled by photocells or timers.

Welding/power outlets will be installed at appropriate locations for supplying power to portable welders and similar loads.

Electrical Equipment Specifications

The characteristics of major electrical equipment were based on developed design criteria and then applied to the mechanical equipment list to generate documents such as electrical single-line diagrams (SLD), equipment datasheets and specifications. These datasheets and specifications were then sent to qualified suppliers to obtain budgetary and firm quotations.

18.1.9. Automation and Telecommunication

Control System Philosophy

The block diagram shown in Figure 18-14 shows the various levels of communication within the control system. It should be noted that, for this Project, all communications have been specified to be via Ethernet.

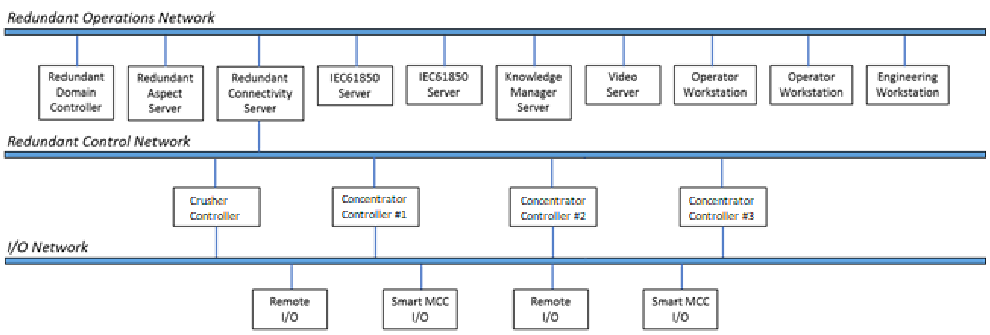


Figure 18-14: Communication block diagram

The instruments and hardwired signals will be wired to the control system using remote junction box-style cabinets situated throughout the process. The remote input/output (I/O) cabinets will be connected to the controller via a fibre-optic Ethernet loop. The remote-IO cabinets will connect to the system servers via Ethernet switches installed in the control room.

Four dedicated controllers for each area have been specified for this Project. All controllers will be located in Electrical Room and centralized into a DCS architecture in the Control Room. No redundant controllers have been specified.

All the I/Os, such as the signals/commands from the smart electrical equipment or skid controls, will be linked to the controllers via hardwired signals or through a communication bus such as Ethernet or ProfiNET.

Process Control System Input / Output (I/O) Count

The I/O count was based on the piping and instrumentation diagrams (P&ID) and is presented in Table 18-7.

Table 18-7: Input-output summary

Area	AI	AO	DI	DO	VFD	MCU
Concentrator	483	163	745	303	66	231

Note: All VFD or MCU are accessed via a network, no hardwired I/O are used.

Table 18-8 lists the remote I/Os to be connected to the Remote I/O cabinets in the plant.

Table 18-8: Input-output per area

Area	AI	AO	DI	DO	MCU/VFD
05XX - GENERAL SITE	6	0	0	0	8
20XX – PRIMARY CRUSHER	36	8	127	24	23
30XX - CONCENTRATOR	362	88	331	165	173
40XX – GRAPHITE DRY	8	8	16	16	7
50XX - DESULPHURIZATION	63	18	136	58	63
60XX - REAGENT	16	49	151	56	23
GENERATOR	0	0	13	3	0
PIT	2	0	10	0	3
TAILINGS	2	0	5	5	3
WATER TREATMENT	0	0	9	3	4

Note: Allowance is made from 4 to 5 soft I/Os per MCU/VFD.

For the FS, 20% spare I/O capacity has been considered in the design.

Local Control System and Instruments

One local control panel will be provided for each motor or process group of motors related to conveyors. The associated I/Os (stop/start/remote/local) will be hardwired to the I/O cabinets. The control system will then be responsible for relaying start/stop commands to the respective cells in the smart Motor Control Centres (MCC).

Fibre-Optic Network

Within the control room, the servers, workstations, and controllers will be connected using a Star topology. The fibre optic I/O network is a loop starting with the server in the control room and connected to the nodes of the network using switches and coming back to the control room.

System Server / Software

A DCS architecture with dedicated PLC will be used as the control system platform. The DCS architecture is based on a Client/Server architecture. Server applications presented in Figure 18-14 above are loaded into servers configured in a Virtual Machine environment. Operator clients will also be loaded onto servers and will connect to thin clients using Remote Desktop Services.

Site Telecommunications

The wireless communication system will provide service coverage to:

- Plant operation area (outdoor);
- Concentrator building (indoor);
- Entrance gate (indoor/outdoor);
- Mine operation area (outdoor).

The solution will be based on a broadband mesh communication network based on 802.11n (license-free) dual band. Routers/Access Points density shall be such that continuous connectivity service would be provided to low RF output power devices like VoIP phones, laptops and other personal devices.

Based on the design, there will be a number of gateways connected to existing fibre or copper Ethernet backhaul network infrastructure, and Nodes that will connect to the gateways wirelessly and extend the service coverage area.

There will be a single "carrier class" Network Management System (NMS) to configure, manage and control all routers of the network. It will be installed in the server room in the concentrator building.

The broadband wireless mesh network will be capable of operation without relying on NMS operation (controller-less network architecture).

Telecommunication Network and Mobile Radio System

The broadband wireless solution shall be capable of supporting multiple concurrent applications with various levels of priority, including traffic segmentation and VLAN, for example. The main applications that will be supported are:

- Wi-Fi unwired remote access to the internet & company intranet;
- SCADA (mobile and stationary) and telemetry;
- Voice-over-IP (VoIP) telephony (IP PBX phone system);
- Camera and security system;
- Other applications as needed in the Project, such as Access Control, RTLS (Real-time location service).

During construction, a mobile radio system will be used for communication between workers and staff. However, after the completion of mine construction, communications will switch over to the Wi-Fi-based VoIP telephony system. Aside from the communications equipment deployed outdoors or in the process areas, the key infrastructure, such as servers, will be housed in the control room in the concentrator building.

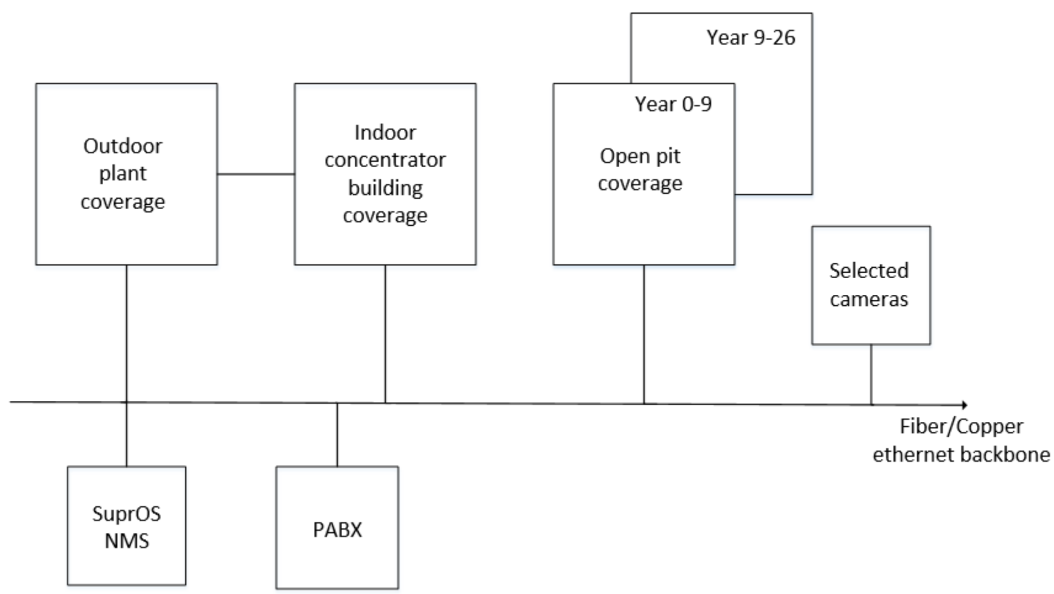


Figure 18-15: High-level architecture of the wireless network

Location of Devices

Devices will be located to ensure the concentrator plant area is adequately covered with Wi-Fi coverage and across the different areas of the mine according to the mine development plan. For the first years of operation, coverage of the open pit will be limited to the co-disposal areas and the southern half of the pit. Additional equipment will start to be installed in the north to allow for coverage in that area as the mining operations are developed.

A total number of seven nodes have been planned for the outdoor plant coverage (two TropOS Gateway fibre and five TropOS Nodes).

As per the indoor Concentrator plant, a total of six TopOS Gateway fibres have been planned.

Camera and Security System

All inside cameras and outside cameras that are near buildings shall be wired through a dedicated star Ethernet network (copper or fibre when needed). The network will be dedicated especially to the camera network and will be connected to a DVR (Digital Video Recorder).

As for the wireless cameras, a Broadband Wireless Mesh Network will support high-definition camera connectivity to the fibre backhaul via dedicated PtP links while providing Wi-Fi access and mesh network redundancy.

18.1.10. Tailings and Waste Rock Storage Facility

Geochemical testing carried out on the tailings at the NMG Project shows that the tailings are potentially acid generators (PAG). The concentrator tailings are initially thickened for process water recovery and then desulphurized in the tailings treatment plant by sulphide flotation and magnetic separation to produce non-acid generator (NAG) and PAG tailings.

The tailings follow a filtration process to decrease the water and they are then stockpiled on the industrial platform. Both PAG and NAG tailings are transported to the co-disposal area either by truck or via conveyors (using a Rail-Veyor system is considered for after Year 5). The next step will be to place the tailings in the co-disposal cells.

In general, the co-disposal method is meant to manage the PAG and NAG tailings and waste rock together. This waste management system significantly reduces the affected areas. In addition, as the exploitation of the mining pit progresses, the deposition will take place in the mining pit. This further reduces the environmental footprint of the Project.

Design Criteria

The co-disposal stockpile is designed using the following parameters:

- PAG tailings density of 1.94 t/m³, NAG tailings density of 1.63 t/m³ and waste rock density of 2.13 t/m³;
- Offset of 70 m between the co-disposal pile and the mining pit;
- Offset of 10 m between the toe of the co-disposal pile and the centreline of any peripheral catchment ditches;
- Maximum height of 7 m per bench (except the first bench);
- 2.5:1 bench slope;
- 2.5:1 waste rock slope;
- 3:1 final waste stockpile slope after restoration;
- Maximum co-disposal pile height of 80 m with respect to the natural ground;
- The surface underneath the waste stockpile will be stripped and smoothed, followed by the installation of a geomembrane, with a geotextile layer below and above. The geotextile layer can be replaced by a lift of sand (min. 300 mm);
- Maximum elevation of 599 m above sea level.

Co-disposal Storage Facilities and Timeline

The waste management process is planned over the course of 28 years (including the construction phase and pre-mining), the projected life of infrastructure construction and the mine. Detailed monthly plans were developed for the first two years, followed by yearly plans for the remainder of the life of mine. A detailed map representing the progress of the co-disposal storage facilities is depicted in Figure 18-16.

The waste management process is separated into three phases to optimize costs and reduce the environmental footprint:

- Phase A (short-term, 0 to 6 years);
- Phase B1 (medium-term, 7 to 15 years);
- Phase B2 (long term, 16 to 28 years).

The deposition plan presented in the following sections *Short-Term plans* and *Long-Terms plans* are based on the previous mining plan. In May 2022, NMG updated their planning and upon reviewing the mine plan, few modifications will have to been made for the co disposal storage facilities and timeline and are presented in the section's hereafter *Modification to the mining plan.*

Short-term Plans

During Phase A, the co-disposal storage facility will begin west of the mining pit. This area is separated in three sectors: north, centre and south. The sectors are divided depending on the sub-watersheds of each sector. The cells of the first two years will be constructed in the north sector because the topography favours natural drainage with peripheral ditches towards the collection basin BC-1 located in the northwest of the co-disposal stockpile.

According to the current mine plan, the mine will only produce waste rock during the first six months. An initial berm, composed of waste rock, will be constructed to contain the waste rock volume at the beginning of the Project. Afterwards, this berm will be divided into several cells by constructing intermediate waste rock berms. In addition, toe-drains will be integrated at the foot of the first level berm to help reduce the water table inside the co-disposal stockpile once the exterior surface is covered in NAG tailings. Considering the waste rock is transported from the pit to the co-disposal pile and the tailings are transported from the industrial platform, the waste management is divided into two parts: the eastern part of co-disposal cells and the western part to manage any waste rock surplus (always in the north sector). This facilitates operations by creating two separate work areas. The scale of the cells is related directly to the PAG volume that must be managed for a specific time. Overall, the idea is to limit the exposure of PAG tailings to one month. More specifically, the deposition in the cells will advance such that by the end of the month, the cell is covered with NAG tailings. This will reduce the risk of generating acid mine drainage or leaching during mine life.

To encourage flexibility during the tailings management process, at least two cells are always ready and free in case the deposition cannot take place in the planned cell. Also, the maximum height of PAG tailings inside a cell is limited to 3 m. The remaining volume is filled with either NAG tailings or waste rock, depending on the remaining quantities.

The waste management will progress bench by bench. Each bench is delimited by an initial berm composed of waste rock and then divided in cells using intermediate berms. Considering the varied topography, the height of the first level will vary and will not respect the maximum 7 m height requirement. At the end of the second year, the waste stockpile will still be in the north sector, contoured by the peripheral ditches and the watershed limits. Its elevation will vary between 555 m and 556.5 m.

Long-term Plans

At the end of the 2nd production year, the co-disposal stockpile will be raised to an elevation of 578 m. For Years 3 and 4, the deposition will start to take place in the central sector, west of the mining pit. The contaminated water will still naturally drain towards basin BC-1 and the FC-3 ditch must be built during the second year. The waste pile will reach the same elevation as the stockpile in the north sector, and they will attain a maximum elevation of 599 m at the end of the 4th production year.

During Year 5, always to the west of the open pit, the waste will be deposited in the south sector. The contaminated water from this sector will be directed towards the principal collection basin (BC) via ditch FC-6A. At the end of Phase A, the co-disposal pile will attain an elevation of 557 m in the southern sector. According to the current mine plan, the in-pit backfill can only start in the 3rd quarter of the seventh year. By this time, the first exploitation phase of the mine will be completed, and the southern portion of the open pit will be ready to be backfilled. Between Years 7 and 9, the deposition will take place in and west of the mine pit, in the southern sector. These sectors represent a capacity of approximately 7.2 Mm^3. Outside of the open pit, the waste pile will attain a maximum elevation of 599 m, the same elevation as the north and centre sectors. In the open pit, the southern section will be filled to an elevation of 480 m.

At the beginning of Year 10, the second phase of the mine plan will be completed, and the deposition will switch to the open pit and advance north. Between Years 10 and 13, the deposition will advance north in the open pit by approximately 500 m, and the elevation will increase from 480 m to 530 m. In addition, over the course of these years, the waste in the open pit will connect to the previously deposited waste in the west.

From Years 14 and 15, the deposition will take place above the open pit and the elevation will increase by 20 m, to an elevation of 550 m. In addition, the real estate to the east of the open pit will be exploited and the waste will be deposited to an elevation of 590 m. During these years, there will not be any progress towards the northern end of the pit because the 3rd phase of mining exploitation inside the pit will not be sufficiently advanced.

After Year 15 and until the end of the life of mine, the deposition will take place above the open pit until the co-disposal stockpiles to the east and to the west are connected together. The waste above the mining pit will attain a maximum elevation of 590 m at the end of the 19th Year and will increase by increments of 100 m towards the north every two years.

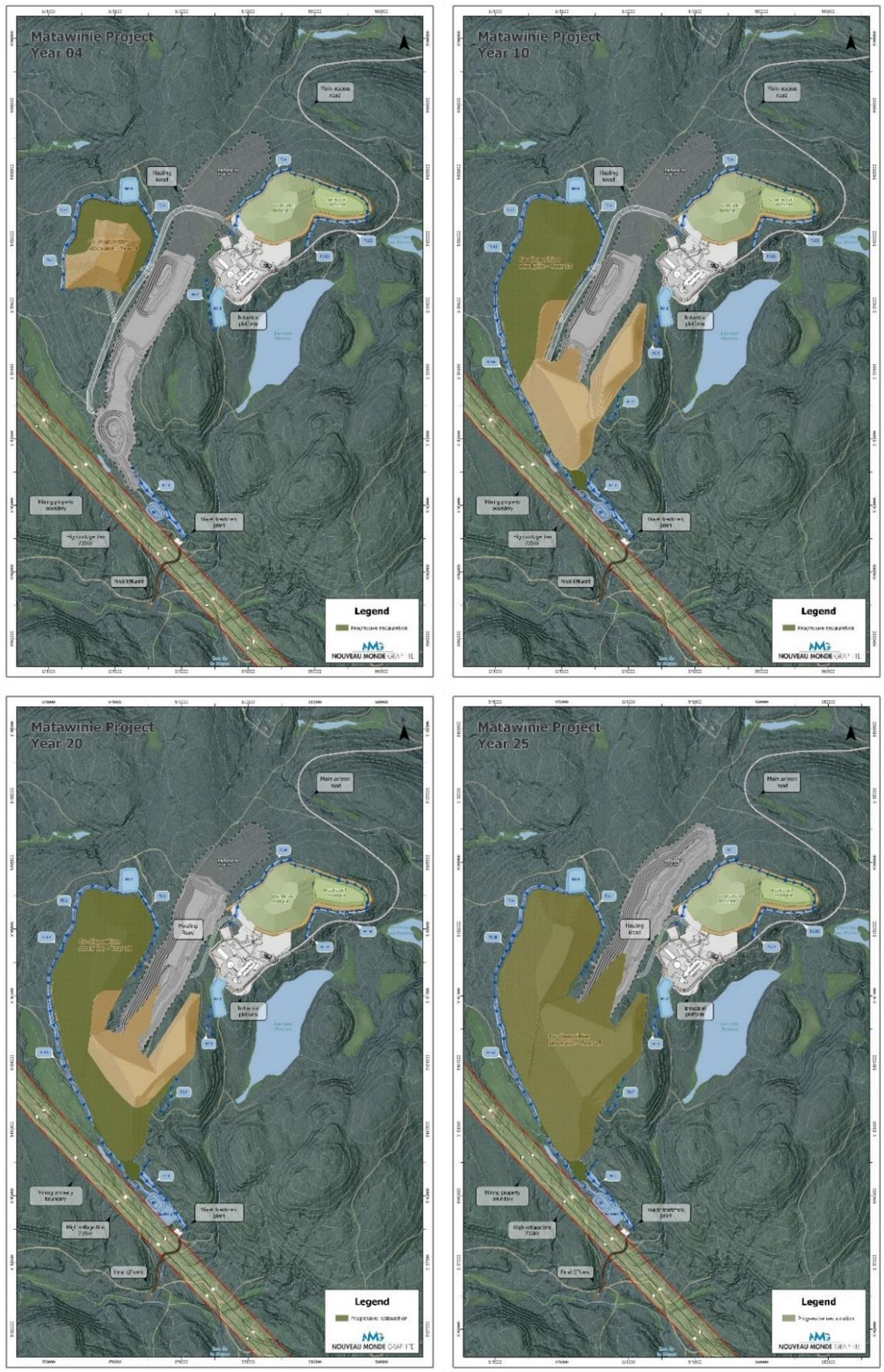


Figure 18-16: Evolution of the co-disposal stockpile

Modifications to the Mine Plan

In May 2022, Nouveau Monde updated their planning and upon reviewing the revised mine plan, few modifications have been made and they will reflect on how the co-disposal pile will advance in time. One key change is that the pit is now extended towards the southeast which prolongs the first phase of mining (Phase 1). Initially, as mentioned in the Long-Term Plan section above, the in-pit backfill was scheduled to take place in Year 7. However, the new mine plan indicates that the south part of the open pit is available to be backfilled only at the beginning of Year 8. This results in managing an extra 3.2 Mm^3 of waste outside of the pit. Since the co-disposal stockpile has reached its final elevation (599 m) to the west of the pit by Year 7 and that the pit cannot be backfilled, the sector to the east of the pit will need to be prepared to store excess waste. This also implies that FC-7 and FC-8 ditches should be commissioned earlier than initially planned.

The other change to the mine plan is that the mining has been accelerated and the life of mine has been reduced from 25,5 years to 25 years. According to the most recent mine plan, approximately 67,433,000 m^3 of waste will be produced over the LOM and details are presented in Table 18-9.

Table 18-9: Tailings and waste material summary

Material	Tonnage (Mt)	Volume (Mm^3)
PAG Tailings (Wet @ 17.7%)	15.945	8.219
NAG Tailings (Wet @ 17.7%)	53.674	32.929
Waste Rock	56.304	26.286
Total to Manage	125.923	67.433

Construction of the CSF Facilities

The co-disposal stockpile will contain cells that will be built in an engineered manner to contain the acid generating tailings, all while respecting the general stability of the stockpile. The goal is to encapsulate the PAG tailings with the NAG tailings and waste rock to limit the flow of oxygen to prevent the start acid drainage or leaching.

The current assumption is to limit the exposure of the PAG tailings to one month. This will be redefined by the ongoing studies by NMG in collaboration with the NRC and the field results from the experimental cells. It's important to note that this assumption gives flexibility regarding the final dimensions of each cell. By limiting the NAG tailings exposure to one month and depending on how much the mill is producing each type of waste, the dimensions and location of each cell can be adjusted in the co-disposal pile.

Each cell is initially constructed by berms made of waste rock. The base of each cell is also covered with a metre of waste rock before placing the PAG tailings inside the cell. Once the cell is filled with PAG tailings, it will be covered by NAG tailings. As explain earlier, by encapsulating the PAG tailings with the NAG tailings and waste rock, the flow of oxygen is limited.

Figure 18-17 shows a typical cross-section of the co-disposal pile with the arrangement of the different materials.

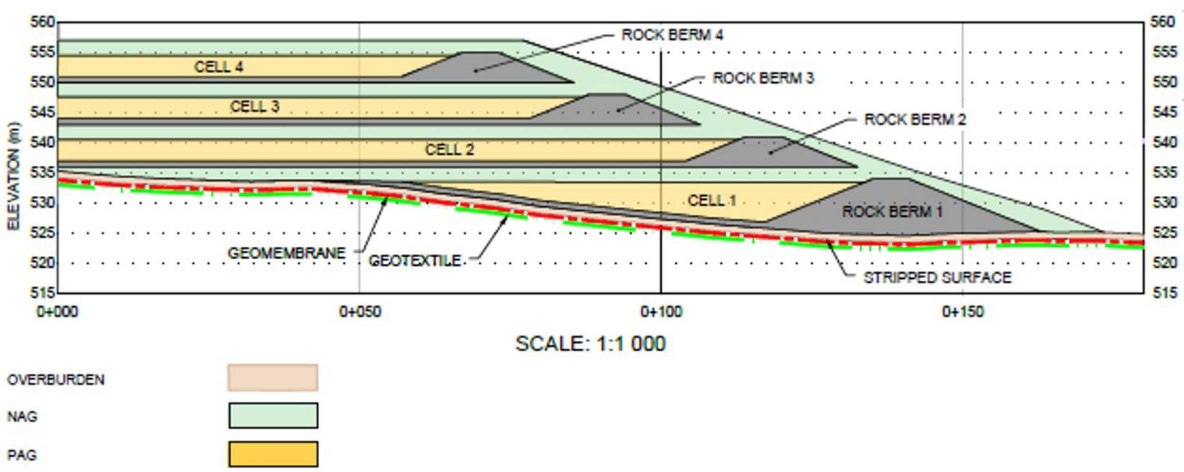


Figure 18-17: Typical cross-section of the co-disposal stockpile

Reclamation and Revegetation of the CSF

The co-disposal pile will be gradually covered, using a cover with capillary barrier effect (CCBE) as soon as it reaches its final elevation in the pile. This cover will act as an oxygen barrier and is designed to ensure long-term geochemical stability within the pile. The thickness and function of each layer of the cover will be:

- 0.5 m of screened waste rock, to act as a drainage layer;
- 0.4 m of NAG tailings, to act as the water retention layer;
- 0.3 m of overburden, as a protection layer;
- 0.3 m of topsoil, to promote vegetation growth afterwards.

Based on co-disposal results that will be presented to MELCC and MERN, the cover might not be required as described and will be composed of the co-disposal cells acting for the drainage and water retention layer for the capillary barrier effect covered off by at least 1 m of overburden, 0.3 m of topsoil and vegetation.

Stability of Co-disposal Facility

The stability of the co-disposal facility has been studied under static and pseudo-static conditions along four different cross-sections. These cross-sections have been selected in ways to adequately analyze the global (maximum elevation of 599 m) and the local (each bench) stability of the facility. The results show that under the loading conditions mentioned above, the factors of safety (FOS) obtained respect the targets specified by the *Directive 019*. For the static loading, the FOS vary between 1.79 and 2.22 with the target being 1.5 under the pseudo-static condition, the calculated FOS vary between 1.52 and 1.91 with the target being 1.1.

The settlement at the base of the co-disposal stockpile has also been studied using 2D modelling (Sigma/W). The results show that the maximum settlement is approximately 45 cm and will be completed after the placement of the materials (immediate settlement).

The findings of this stability review indicate that the co-disposal area that is currently designed with a 60 m setback to the Starter Pit West Wall is expected to achieve minimum acceptance design criteria. This is predominately due to the good quality Mixed Paragneiss, Biotite Paragneiss and Charnockite rock units that are located below the dump and form the West Wall. This review should be read in conjunction with pit slope geotechnical recommendations.

18.2. Battery Material Plant Infrastructure

The Battery Material Plant located in the Bécancour Industrial Park. NMG's 200,000 m² L-shaped property presents no environmental limitations for construction. A 3D rendering of the property is presented in Figure 18-18. The property is bordered to the north by a rail line and the Trans-Canada pipeline. Road access to the property is from the west side via Avenue G.A. Boulet. Approximately half of the NMG property, the areas to the south and east of the proposed plant, will not be developed and will be reserved for future expansion and/or for use as construction lay-down areas.

Figure 18-18: Bécancour advanced Battery Material Plant 3D rendering (source: NMG)

The site is strategically located and offers access to all necessary infrastructure and services including:

- A safe and direct pipeline chemical supply from Olin;
- Proposed direct delivery of nitrogen via underground pipeline from an industrial gas supplier;
- Access to a 120kV electrical line running along the northern border to the property;
- Access to a natural gas pipeline along the eastern property border;
- Direct potable and industrial water access along multiply sides of the property;
- Easy rail, port, and road access for both importing raw materials and exporting final products throughout North America and Europe.

The various services and infrastructure accessible from NMG's property is outlined in Figure 18-19. The NMG property is represented by the red L-shaped box.

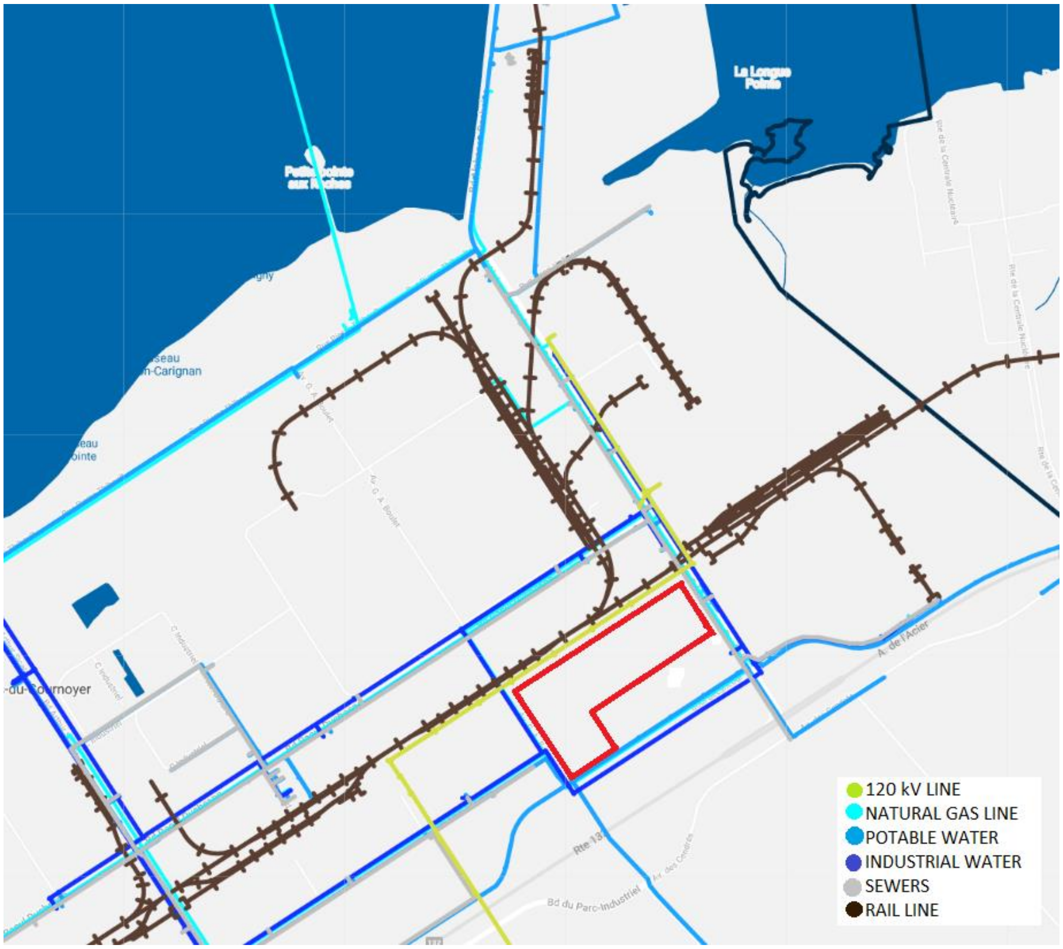


Figure 18-19: Existing PIPB infrastructure

The positioning of the process, services and maintenance buildings as well as the electrical substation and retention pond on the Bécancour site is illustrated in Figure 18-20.

Figure 18-20: Proposed site plan for the Advanced Battery Material Plant in Bécancour

The electrical substation is located on the northeastern corner of the lot directly in-line with the positioning of the 120 kV line servicing the industrial park. The 3,000 m^3 capacity retention pond sits to the south of the electrical substation with the proposed release point located along Avenue G.A. Boulet bordering the west side of the property.

The main process buildings for Micronization/spheronization, purification and coating were placed to minimize material handling distances between processing stages. The gas and water treatment plants were located adjacent to the purification building.

18.2.1. Power Supply

The electrical system will be designed to ensure safe, reliable and cost-effective operation with redundancy where required. A back-up power supply will be provided to supply loads deemed critical in the event that their normal power supply is unavailable. The electrical system will be designed to operate continuously, 24 hours a day, 7 days a week.

Electrical Load Segregation

For increased operational reliability, the distribution of loads to electrical distribution equipment was designed to match the design of the mechanical systems where applicable. For example, where there are parallel mechanical systems, the electrical loads associated with each system should be supplied from separate switchgears. Alternatively, where there is standby or emergency equipment, it should be supplied from a separate switchgear. Wherever possible, process loads, auxiliary loads and emergency/critical loads should be supplied from separate switchgears.

Arc Flash

Priority is given to reducing the intensity and duration of internal arc faults through design rather than simply containing and/or diverting the energy during these occurrences. The aim is to keep the level of worker exposure to incident arc flash energy below 12 cal/cm². Where this is not possible, mitigation measures should be implemented to reduce the risk as much as possible.

Uniformity of Equipment

When selecting electrical equipment, consideration was given to providing identical components to allow interchangeability, minimise spare parts and simplify training, maintenance and repairs. All suppliers providing electrical equipment and components as part of a procurement package will provide items that are compatible with the electrical equipment and components provided as part of the main plant design.

The design of the electrical distribution system considers the inclusion of spare components in the switchgear as well as free space in the electrical rooms for future additions.

Noise Level

All equipment noise levels are targeted at 80 dBA or less with a level of 85 dBA considered an absolute maximum. Equipment with noise levels above 85 dBA (as per IEEE Standard 85) will require additional attenuation devices to limit the noise to 80 dBA or less. These devices, if required, will be provided by suppliers and included in the procurement packages, where possible.

Power Sources

Normal Power Supply

Power for the Project site will come from a 120 kV, single circuit transmission line supplied by Hydro-Québec. The power utility, Hydro-Québec, will extend its existing 120 kV network up to the Project site and connect its transmission line to the site's main substation gantry located on the northwest side of the property.

Emergency Power Supply

In the event of loss of normal power, either throughout the plant or at specific locations, standby power will be provided by 600 V diesel generator sets to allow the quick restart of critical equipment. The generator sets will be installed in appropriate locations, near the buildings where the standby power will be required.

The generator sets will start automatically in the event of normal power loss. Automatic transfer switches will then switch over to standby power and the emergency buses will be powered back up, typically under less than 10 sec.

Switching back from standby power to normal power will be done using delayed-transition mode.

At critical, uninterruptible power supplies (UPS) will be provided to ensure uninterrupted power transition to instrumentation distribution panels and other sensitive equipment. The autonomy of the UPS will be determined according to the needs and criticality of the equipment. The emergency power system was designed to supply critical loads associated with the process. Emergency power for emergency lighting systems, exit signs and fire alarm systems will be battery-powered, with sufficient autonomy to meet the requirements of the Electrical Code and the National Building Code. The emergency fire pump will be driven by a diesel engine.

Operating Voltage

The following voltage levels will be used throughout the Project site:

Table 18-10: Project voltage levels

System	Voltage	Phase	Wires	Lightning surge capacity (kV peak)	Short circuit capacity (kA sym.)	Neutral system
HV Utility Distribution	120 kV	3	3	650	40	Effectively grounded
Primary MV Distribution	25 kV	3	3	125 [150*]	25	Grounded by zigzag transformer and resistor 200 A, 10 sec 25 A cont.
Secondary MV Distribution	4.16 kV	3	3	60 [75*]	25	Resistance grounded 10 A cont.
LV Distribution	600 V	3	3	20 [30*]	65	Resistance grounded 5 A cont.

System	Voltage	Phase	Wires	Lightning surge capacity (kV peak)	Short circuit capacity (kA sym.)	Neutral system
Lighting and low power loads	208/120 V	3	4	-	10	Solid grounding
ASC <15 kVA	240/120 V	1	3	-	10	Solid grounding
ASC ≥15 kVA	208/120 V	3	4	-	10	Solid grounding
DC – Control and protection devices	125 V	N/A	2	-	10	Floating
DC – power supply to furnaces	300 V (TBC)	N/A	2	-	TBC	Floating
[*] For outdoor equipment and power transformers						

Power Distribution

Power for the plant will come from a 120 kV transmission line from Hydro-Québec. Voltage will be stepped-down to 25 kV inside the main electrical substation using two 120-25 kV liquid-filled power transformers with power ratings allowing for N-1 transformer redundancy. The 25 kV system neutral will be grounded through 25 kV zig-zag transformers and NGRs.

The secondary side of these power transformers will feed a 25 kV switchgear, in a main-tie-main configuration, also installed in the main substation within a prefabricated electrical room. This switchgear will be used for power distribution at 25 kV throughout the plant, using medium voltage cables, either installed direct buried, in buried conduits, in duct bank, or preferably, installed in cable trays along pipe rack whenever that is possible. When routing electric cables between the main substation and the plant, the possibility of a future expansion will be considered and the path least likely to be impacted by such work will be chosen, as far as possible. 25 kV feeder will supply the following equipment:

- 25 kV harmonic filters and/or reactive power compensation (if required)
- 25 kV rectifier transformer group;
- Power transformers 25-4.16 kV;
- Power transformers 25-0.6 kV.

The 25-4.16 kV power transformers will be used to step down the voltage to 4.16 kV and will feed the 4.16 kV switchgears installed inside the electrical rooms in a main-tie-main configuration. These switchgears will then feed the larger 4.16 kV loads, such as compressors and chillers.

The 25-0.6 kV power transformers will be used to step down the voltage to 600 V and will feed 600 V switchgears installed inside the electrical rooms in an open loop configuration. These switchgears will then supply 600 V to the motor control centres (MCCs) and other large 600 V loads, such as the larger variable frequency drives (VFDs), air handling units (AHUs) and 600 V power panels.

The 600 V system neutral will be high resistance grounded (HRG) with a continuous rating of 5 A, allowing continuous operation on a first ground fault. A pulsing system on the NGR will assist in locating ground fault.

600-208/120V distribution transformers, with neutral solidly grounded, will be used to supply 208/120 V distribution panels for the small power and lighting loads.

Main Electrical Substation

The main substation, located on the north-west side of the property, will be supplied by from a 120 kV single circuit transmission line and will be designed as a single bus arrangement. The substation was designed to allow for the addition of a third 120-25 kV power transformer in the event of plant expansion (Phase 3). All 120 kV infrastructure will be located outdoors and designed to allow for safe working practices when the 120 kV network is energised. The 120-25 kV power transformers, and their associated grounding transformer, will be of the liquid filled (mineral oil) type. Each power transformer, and its associated grounding transformer, will be installed within an oil containment basins filled with crushed stones. A common oil/water separator will be installed to drain the water from the oil containment basins of both transformers.

Each power transformers will be separated from the other and from the prefabricated electrical room, respecting the minimum distances according to the regulation code (FM Global).

The main substation will be fenced in accordance with the Electrical Code, local code and regulation requirements.

The 25 kV switchgear, auxiliary power distribution, protection and control panels and telecommunication infrastructure will be installed inside a prefabricated electrical room located in the main substation.

The main substation will be designed to be of the intelligent digital substation type, with equipment selected in order to allow for complete digitalization and automation of the substation. All equipment will be equipped with intelligent electronic devices (IEDs), with IEC 61850 communication capability whenever relevant and available

Harmonic Filters and Reactive Power Factor Compensation

Specialized electrical power system studies will be conducted during detailed engineering to ensure, among other things, that the interference emission limits and power factor comply with Hydro-Québec requirements. Harmonic filters and reactive power factor compensation may be required to mitigate power quality problems associated with, among other things, the supply of high-power rectifiers, VFDs and other non-linear loads.

Protection Against Direct Lightning Strikes

The design of the direct lightning stroke shielding will be based on the rolling sphere principle, with shielding measures such as shield wires, rods and mast. All equipment/structural metallic surfaces shall, at a minimum, be bonded at two points. However, in all cases the substation direct lightning stroke shielding shall meet or exceed the level of protection provided by IEEE Standard 998.

Grounding

A substation grounding system will be provided to limit step, touch, and transferred potentials in the substation to values specified in the Electrical Code. The grounding system shall be designed for a low grounding resistance to minimize the maximum ground potential rise during line to ground faults. Substation grounding shall be designed in accordance with IEEE Standard 80.

18.2.2. Mechanical Services

The mechanical services consist of the auxiliary systems that support the process equipment and buildings. For graphite treatment, the principal services include, building and process ventilation, chilled and cooling water, heating water and compressed air systems.

Ventilation

Each building will be ventilated and heated using air handling units. These units heat the air using a glycol water coil. Air conditioning unit are use for areas requiring cooling such as offices and electrical rooms. Pretreated fresh air is used to pressurise sensitive areas such as the electrical, mechanical and control rooms to avoid graphite contamination of electrical components. Specific electric unit heaters are also installed to ensure perimetric heat requirements are met, for example, in front of garage doors. Louvers and exhaust fans are installed to allow fresh air cooling when required during summer and mid-seasons.

Chilled Water

A chilled water circuit is designed using three chillers each in closed loop with a cooling tower. The chillers bring the water-glycol temperature to 7.2°C. This water is supplied to the following users:

- Spheronizers;
- M/S electrical room;
- Insulating media cooling screws;
- Pitch/SPG blender;
- Air dryer and compressors;
- Cooling air unit for offices.

Cooling Water

A specific cooling water circuit was designed for the coating area kilns. The circuit uses using two cooling towers to bring water to 45°C. This water circulates in a close loop circuit, feeding the six coating furnaces. The hot return water passes through a recovery heat exchanger to increase the heated water circuit temperature.

A second specific cooling water circuit is designed for the purification area to cool the furnace electrodes. This water is mixed with glycol and is cooled using two (2) indirect cooling towers to bring the water temperature to 45°C. The water circulates in a close loop circuit, feeding the nine purification furnaces.

Heating Water

A glycol heated water circuit distributes hot water across the site into the air conditioning units to ensure the air inside most buildings is warm. This circuit recovers heat from the chiller condenser and the cooling water circuit using a heat exchanger. An electric boiler is also installed within the circuit to compensate for when heat from process equipment isn't available.

Compressed Air

Four (4) air compressors located in the main services building are producing the compressed air for delivery throughout the site. Filters and dryers are also installed to ensure the production of high-quality dry air.

The main process areas (Micronization, Purification and Coating) have their own local air receivers to deliver constant flowrate and pressure to all consumers. The principal consumers are the following process equipment:

- Micronizer;
- Spheronizer collectors;
- Pitch jet mills;
- CSPG Silos air blender.

The material handling between process buildings is achieved using pneumatic conveying which consumes a lot of air. This air needs to be dried and filtered to achieve a high level of purity in order to avoid any contamination. For this reason, there is no separate network for instrumentation air, the same network is used for both applications.

Energy Efficiency

The mechanical services were developed to be a Carbon Zero installation; therefore the heating is generated using electricity and not with fossil fuels. The buildings, graphite treatment and material pneumatic conveying require large amounts of fresh air that is energy-intensive to preheat. To reduce the energy consumption and operating cost, energy recovery measures have been implanted.

The cooling and the heating needs are fulfilled with district network systems. The district networks allow for more efficient centralized heating and cooling equipment and for whole site energy recovery. Main equipment, such as air compressors for example, are water-cooled to enhance their operation and to allow energy recovery. During cold season, the heat rejected from the chillers is recovered and used for heating the fresh air for the entire site.

18.2.3. Telecom

The telecommunication and industrial IT infrastructure part of this study is aligned with the design of a modern factory with all the services required to support operation, such as state of the art control rooms, on-premise high availability servers, unified mobile communication systems, secured access-controlled buildings and CCTV with recording capabilities.

The equipment, accessories, and installation services to supply the following systems have been included in the study estimate:

- A single mode fibre optic backbone with a ring topology covering the treatment plant in addition to the administrative building, electrical rooms, pumping station and auxiliary services. Fibre optic communication with Olin corporation facility nearby is planned.

- Three fully equipped server rooms at three different locations on the site for resiliency. Includes cabinets, UPS, patch panels, core switches, firewalls, and ancillaries.
- Three separate hyperconverged server clusters for CIS (Corporate Information System), IDMZ (Industrial DMZ) and ICS (Industrial Control System) spread across the three server rooms to provide operations continuity in case one server room burns down.
- Telecommunication cabinets of various sizes and configurations in all facilities and sectors with switches, patch panels, IP telephones, and Wi-Fi access points.
- Indoor Wi-Fi coverage in all facilities where a network cabinet is installed.
- Operators, supervisors, and engineering workstations and mobile HMIs (rugged tablets).
- Office workstations, workgroup printers, individual printers, and one plan printer.
- A unified telephony system with regular VoIP telephones, and external phone lines.
- A PoC (Push-to-Talk-over-Cellular/Wi-Fi) system will be used to allow contractor smartphones and workers rugged smartphones to function like two-way VHF radios.
  - PoC (PTT-over-Cellular/Wi-Fi) PC licences for operators and supervisor workstations to communicate with workers equipped with rugged smartphones and contractors/consultants equipped with regular smartphones.
  - A set of LTE (and Wi-Fi) capable rugged smartphones (with large PTT button, SOS button, and man down functions) for plant personnel.
  - A set of rugged tablets for operators, supervisors and workers who may require it to perform their daily tasks.
- Process video system with cameras installed in the purification area and the pumping station.
- For security, CCTV video surveillance system, access control system including cameras and access control hardware (magnetic card reader, pin pad, and electric latch). Mechanical gates at the gatehouse control points are not included in the CAPEX estimate (by other discipline)
- A primary WAN fibre optic link with sufficient bandwidth and low latency.
- A secondary WAN link 4G/LTE for when the primary link fails.
- The above systems are included in the Telecom CAPEX estimate except where otherwise indicated.

18.2.4. Process Gas Supply

The process consumes two industrial gases: chlorine (Cl_2) and nitrogen (N_2). Their uses and method of delivery to site are described in the following sections.

Chlorine

Chlorine gas is used in the carbochlorination process to remove impurities from graphite. The Advanced Battery Material Plant is located adjacent to Olin's manufacturing facility ensuring a safe, secure supply of the reagent which is central to the production of high-quality battery grade graphite.

Currently, a corporate agreement is in the approval phase between NMG and Olin Canada. In this agreement, Olin will commit to supply chlorine gas, via an overhead piping system, using the existing Trans Canada Pipeline racks between the two plants.

The current Feasibility Study includes all additional buildings, piping, equipment and accessories that must be added on both Olin and NMG properties to ensure a continuous and safe supply of chlorine gas from Olin to the NMG plant located 1 km away.

The system design is based on an instantaneous consumption rate of 1,000 kg/h of pure Cl_2, which will be evaporated at Olin at a pressure of 5 Bar and 30 degrees Celsius and will enter the NMG plant from the northeast side, in the purification area at a pressure of 4 Bar, and the pressure will be controlled around 1 Bar to feed the clarinet of the furnace flow meters.

An overview of the proposed chlorine supply is illustrated in Figure 18-21.

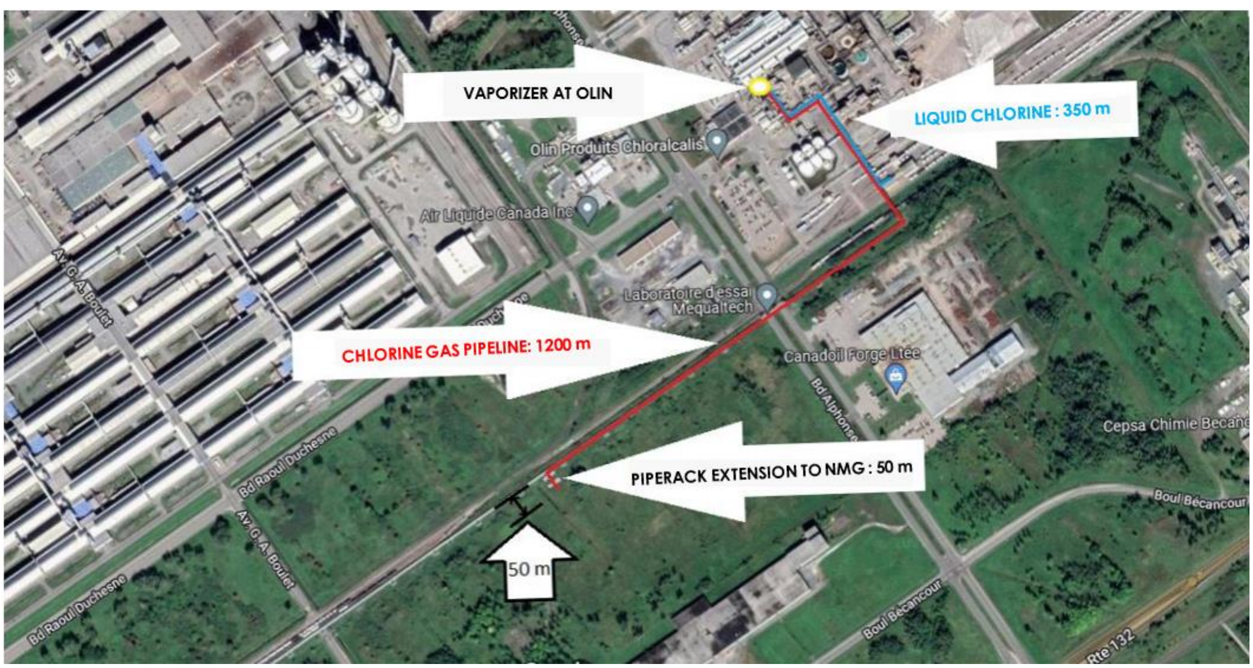


Figure 18-21: Overview of the liquid and gas chlorine pipelines between Olin and NMG

Liquid and Gaseous Chlorine Supply

Liquid chlorine will be fed directly from Olin's 4" liquid chlorine supply line. A 1" connection will run 350 metres along the Olin rack to where an evaporator will be located. The strategic location of the 1" feeder connection will allow liquid chlorine to be supplied from Olin's existing railcar loading stations when their chlorine supply system is interrupted (a few days per year) thus ensuring a continuous supply of chlorine throughout the year.

The liquid chlorine that will arrive via the 1" line will be protected by a buffer tank. The evaporator will superheat the chlorine gas by 20°C with steam supplied by Olin.

The evaporator will be installed in an existing enclosure at Olin. At this location, the necessary utilities are available within 10 m including: electricity, steam, condensate, nitrogen, instrument air and a vacuum line to the Chlorine Destroyer. Chlorine analyzers will be installed in the chamber to safely depressurize the system if chlorine is present.

The chlorine evaporator will be protected from overpressure by a rupture disc and safety valve which will be directed to the Olin vent and gas cleaning system. The outlet of the evaporator will be equipped with a pressure control valve to ensure a constant supply and a flow meter.

Chlorine Line and Piperack

The line from the evaporator to the NMG plant will be installed on the Olin rack, on the Trans Canada rack, and on a new 50-m rack to be constructed between the Trans Canada rack and the NMG plant.

The 1,200 m chlorine gas pipeline will be made of low temperature resistant steel (Class 300#) without flanges to prevent leakage. Constructed to Chlorine Institute standards, the pipe will be 2 in, insulated and heat-traced to prevent chlorine condensation.

Along the rack, chlorine analyzers and temperature sensors will be installed every 150 m to ensure the integrity of the piping and the efficiency of the heating.

On the Boulevard Alphonse Deshaies footbridge (7.7 m clearance), protective barriers will be added on each side to protect the rack from possible impact from heavy vehicles. Impact sensors will be installed, which will automatically shut off the chlorine supply, and activate the depressurization of the pipe to a chlorine destructor. Cameras and chlorine analyzers, with audible and visual alarms, will be installed on each side of the walkway.

Chlorine Line at NMG

The line will enter on the northeast side of the plant. A flow meter will be installed at the inlet and a droplet separator. A pressure regulation system will be installed to regulate the pressure according to the demand for the purification.

The equipment in the building will be insulated and heat traced to prevent chlorine condensation in the pipes to the furnaces. A nitrogen supply with automatic valves will ensure that the line is purged to an emergency scrubber when required.

Safety Equipment

In order to make the operation of the chlorine evaporation system as safe as possible for people and the environment, detection and protection equipment will be installed for this project:

Chlorine analyzers will be installed:

- At Olin in the evaporator enclosure: Leak detection on the equipment;
- At Olin in the condensate drain line: Leak detection of evaporator bayonets;
- Along the chlorine line from Olin to NMG;
- On both sides of the pipe bridge near Alphonse-Deshaies Boulevard.

Chlorine gas flow meters will be installed at the evaporator outlet and at the inlet to Nouveau Monde Graphite. A difference in these two flow meters will stop and depressurize the chlorine line to a purification system.

Impact detectors will be installed on each side of the pipe bridge near Alphonse-Deshaies Boulevard.

Nitrogen

High purity (99.999%) nitrogen gas is required mainly in the coating area to (1) maintain an inert atmosphere in the furnaces to prevent burning graphite at high temperature and (2) during mixing of purified graphite and the ground pitch prior to being fed to the furnace. Nitrogen is also used to purge the purification furnaces.

Consumption

The total estimated consumption of N_2 is 23.4 million Nm^3 per year. Over 99% of the nitrogen used in the process is consumed in the coating furnaces which operate at a peak consumption of 500 Nm^3/h each. While the SPG+pitch mixing and purification furnace purging applications do not require as pure of a gas, it was considered more economical to source a single purity of gas for the entirety of the plant.

Supply

A letter of intention was signed with an industrial gas supplier who is planning to build a facility in the Bécancour industrial park. The gas supplier would build the nitrogen production facilities and would assume all associated capital and operating costs associated with installation and maintenance. An underground pipeline would be brought directly to NMG's plant where a metering station would measure consumption. NMG would be responsible for the piping to distribute to the various users in the purification and coating areas.

18.2.5. Water Treatment Plant

A single water treatment plant (WTP) services the Battery Material Plant. While the Micronization/spheronization (M/S) and coating sectors are dry, the purification areas removing impurities from spherical graphite (SG) and jumbo flakes (JF) require two independent gas treatment systems whose liquid effluents are directed to the WTP. The water wash scrubber captures particulates, small amounts of volatilized impurities from the purification process and some residual sulfite (SO_2). The lime scrubber serves to capture and neutralize excess unreacted chlorine to prevent it from being released to the environment. The effluents from these scrubbers for both SG and JF purification are collected in two separate buffer tanks and then neutralized using lime and hydrochloric acid (HCl), if needed. The pH is further adjusted in a neutralization tank in order to precipitate metal hydroxides. Here, gypsum is also formed. The neutralized slurry is sent to a thickener where the slurry undergoes solid-liquid separation with gypsum and the metal hydroxides solids reporting to the underflow. The thickener overflow consists of supernatant brine containing 7-8 wt% calcium chloride ($CaCl_2$). The thickener underflow consists of a 20-30 wt% solids sludge. The sludge produced is in part returned at the head of the WTP process and the rest pumped to a filter press for further dewatering. The filter press cake is washed to remove any residual $CaCl_2$ solution and is then stored in a container for transport to the CMC tailings management facility. The thickener overflow solution is further processed using reverse osmosis to concentrate the brine to 12 wt% $CaCl_2$ while the recovered water (the permeate from the reverse osmosis process) is recycled to the process to minimize industrial water consumption (see Section 17.3.3.2 for a detailed description of the plant water balance). A letter of intent is in place with third party to purchase the concentrated brine solution.

18.2.6. Surface Water Management

NMG's property is located in an industrial environment with no underground storm sewer system in the area. The Project includes the construction of buildings, access and circulation roads, as well as an electrical substation. The surface water management plan was prepared based on the drainage of a non-hazardous site as defined by the municipal, regional and provincial regulations

(REAFIE) as all industrial activities will take place inside the proposed buildings, sheltered from the weather. A few small, isolated risk areas are planned, notably for loading and unloading materials. Surface waters for these particular areas will be treated according to the applicable regulations.

The Project involves the construction of an underground storm sewer system to drain the entire developed non-risk area of the lot. The proposed network is controlled by a dry retention basin located at its downstream end. Two hydrodynamic separator type pretreatment units are provided upstream of the retention basin. The outlet of the basin is located to the west of the lot in the Gédéon Carignan stream, which passes through the existing ditch on G.A. Boulet Street.

For the purposes of the FS, it is considered that the area tributary to the proposed storm sewer system is limited to the developed portion of the NMG lot. The total area to be drained is described as follows:

Table 18-11: Proposed catchment basin characteristics

Basin	Surface area (m^2)	Slope (m/m)	Runoff coefficient
Catchment basin	106,000	0.01	0.90

Discharge Rate

In accordance with municipal, regional and provincial regulations (REAFIE), the following design criteria were applied:

- Design rainfall recurrence: 10 years and 100 years;
- The maximum discharge rate is 50 L/s/ha;
- The pre-project hydraulic conditions are the same or less than after development.

Precipitation values were taken from Environment Canada for the Trois-Rivières station A. For a 50-year and above return period, to take into account, the impacts of climate change, runoff coefficients below 0.95 were increased by 25% and rainfall intensities are increased by 18%.

The plant will be drained using 34 catch basins which will be connected to a retention pond measuring 60 m x 40 m x 3.35 m with capacity 3,000 m^3. This allows for the storage of surplus water and its discharge to the existing ditch according to the permitted flow rates. A pump with a flow regulator will be installed in the manhole downstream of the pond, which will allow a controlled release rate. An outlet will then direct the water to the existing ditch along the western side of the plant.

18.2.7. Warehouse and Product Transport

All products are bagged in 1t supersacks using automatic bagging machines. The CSPG bags are covered using a stretch-hood machine to protect the bags from environmental contaminants before being transported to the warehouse on a dedicated conveyor. The fines by-product has a dedicated wrapping machine and its own conveyor line to bring the bags to the warehouse.

The 21 m x 67 m x 16 m on-site warehouse has the capacity to store three days of production inventory of primary CSPG and five days each of secondary CSPG and Fines materials. Once in the warehouse, an automated guided vehicle (AGV) will move the palletized/wrapped product bags from the two conveyors on to the pallet racking. The pallets are then stacked four high using the ground and a racking system with three levels.

The warehouse was designed with three loading docks to load approximately eight trucks per day. Forklift operators will load the bags from the pallet racking onto the trucks.

19. Market Studies and Contracts

This section has been updated with the information provided by Benchmark Mineral Intelligence (Benchmark Minerals). Benchmark Minerals is an independent credible source which compiles international graphite prices and other commercial information for various commercial size fractions and concentrate purities.

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 Walls 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 attacks;
- High sublimation point (≈4,000 °K at 1 atmosphere);
- Low expansion coefficient;
- Low friction coefficient as a result of 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 anode material.

Graphite is commercially available in four 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 jumbo 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 Mine project contains natural flake graphite. Table 19-1 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	91% to 98%	Milling	< 100 µm
High Purity Micronized	High purity	99% to 99.9%	Milling	< 100 µm
Spherical	High purity micronized	≥ 99.95%	Shaping	< 30 µm
Expandable	Flake graphite	95% to 98%	Chemical intercalation	> + 80 mesh
High Purity Expandable	High purity	99% to 99.5%	Chemical intercalation	> + 80 mesh
Expanded	High purity expandable	99% to 99.9%	Heat shock and milling	< 100 µm
Foil	Expandable	95% to 99.5%	Heat shock and lamination	Various

Source: Internal Market Data

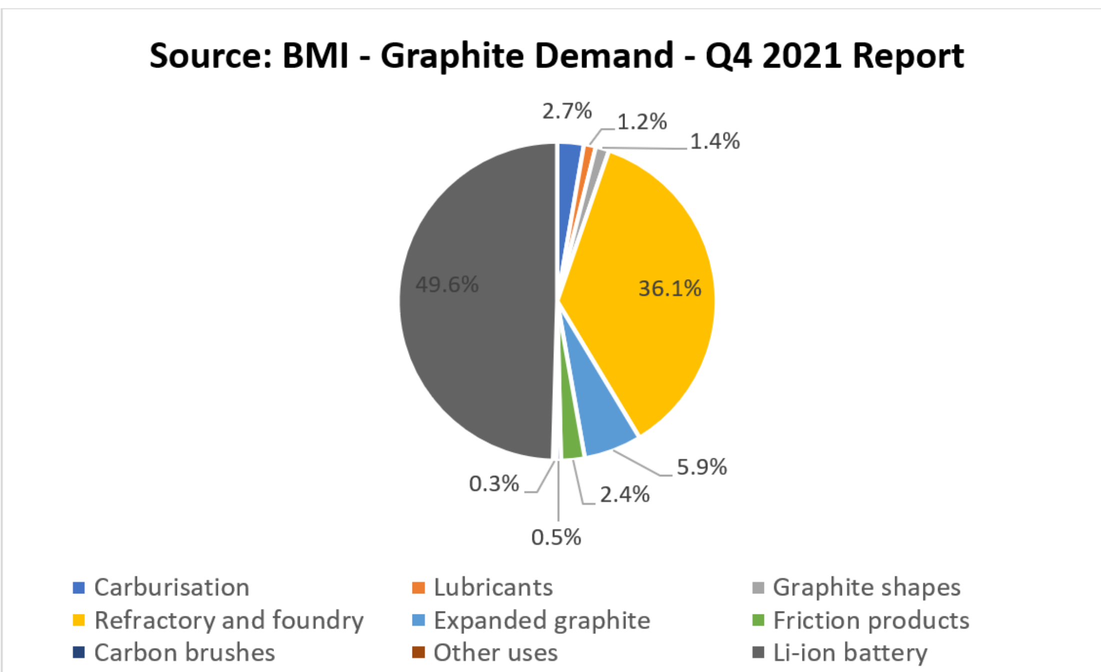
19.2. Uses and Demand Trends

The most relevant commercial uses of natural flake graphite are listed below:

- Refractories – Flake graphite;
- Batteries:
  - Alkaline – High purity micronized, expanded;
  - Lithium-ion – Spherical, coated and uncoated;
  - 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/micronized graphite;
- Friction Materials – Flake graphite, high purity, micronized;
- Carbon Brushes – High purity, micronized
- Flame Retardants – Expandable, high purity expandable;
- Drilling Lubrication – Flake graphite;
- Seed Lubrication – Flake graphite;
- Greases and Oils – Flake graphite, micronized;
- Pencils – Micronized, high purity;
- Coatings and Paints – Flake graphite, high purity;
- Hot Metal Forming – High purity;
- Fuel Cells – Flake graphite, high purity;
- Nuclear Cores – High purity.

Figure 19-1 summarizes the graphite market by main applications.



Source: Benchmark Minerals, 2021 Q4 report

Figure 19-1: Natural graphite demand per application

Table 19-2: Natural graphite demand per application in tonnes

Global demand by application (kt)	2022	2025	2030	2040
Electrodes	1,206	1,377	1,530	1,561
Natural	0	0	0	0
▪ Flake	0	0	0	0
▪ Amorphous	0	0	0	0
Synthetic	1,206	1,377	1,530	1,561
Refractories (includes crucibles)	506	474	442	425
Natural	458	429	399	384
▪ Flake	388	371	352	339
▪ Amorphous	70	58	47	45
Synthetic	47	45	43	41
Foundries (sand casting and mold washes)	171	184	200	237
Natural	132	141	154	180
▪ Flake	79	90	108	140
▪ Amorphous	53	51	46	40
Synthetic	39	42	46	57
Batteries(1)	889	1,419	2,951	4,946
Natural	541	816	1,600	2,406
▪ Flake	535	807	1,581	2,376
▪ Amorphous	6	9	19	30
Synthetic	348	603	1,351	2,540
Friction products	114	121	130	151
Natural	47	51	55	64
▪ Flake	18	21	22	26
▪ Amorphous	28	30	33	38
Synthetic	67	70	76	88
Lubricants	137	144	154	175
Natural	41	43	45	52
▪ Flake	29	31	34	39
▪ Amorphous	11	12	11	13
Synthetic	96	101	109	124
Recarburizing	384	423	456	522
Natural	50	51	44	50
▪ Flake	20	26	30	35
▪ Amorphous	29	25	13	15

Global demand by application (kt)	2022	2025	2030	2040
Synthetic	334	372	413	472
Graphite shapes (mainly carbon brushes)	141	154	175	222
Natural	19	22	25	34
▪ Flake	17	20	24	32
▪ Amorphous	1	2	2	2
Synthetic	123	133	150	188
Other[(1)]	215	237	282	417
Natural	118	133	159	233
▪ Flake	103	119	147	221
▪ Amorphous	16	14	12	12
Synthetic	97	104	123	184
Total	3,762	4,533	6,320	8,656
Natural	1,405	1,686	2,481	3,402
▪ Flake	1,189	1,485	2,298	3,207
▪ Amorphous	215	201	183	195
Synthetic	2,358	2,847	3,839	5,254

Note:

(1) Other breakdown: flexural graphite, flame retardants, conductive polymers and rubbers, powder metallurgy, nuclear, fuel cells, foams, paints, synthetic diamonds, etc.

Table 19-3 lists the future demand trends by main applications. NMG plans to address these markets to diversify its revenue streams and fully utilize its product portfolio.

Table 19-3: 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

Application	Trend	Opportunities	Threats
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	High Growth	Hydrogen vehicles	
Refractories	Stable	Rebound on steel demand driven by construction and oil exploration	Improved quality and technology by the brick manufacturers 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

Note: Source: Internal Market Data

Natural graphite cannot be directly recycled in virtually all applications due to contamination, wear, and by becoming an intrinsic part of the alloy it composes. However, in the latter case, it undergoes secondary recycling it can be repurposed. This means that even in mature markets, recycling is not a demand-limiting factor for primary natural graphite mining.

Possible future influences on graphite demand from the high growth trending applications are described below.

19.2.1. Lithium-Ion (Li-Ion) Batteries

Under the existing technology, graphite is the most suitable material for anodes of Li-ion batteries, and this type of battery is steadily replacing all other types of small rechargeable batteries. The demand of graphite to satisfy the global lithium-ion cell/Gigafactory capacity was 1,244,000 tonnes in 2021 and will increase to 7,665,000 tonnes in 2031 (Source: BMI - Gigafactory Assessment - April 2022). As shown in Figure 19-2, Natural Graphite is forecasted to increase its market share against Synthetic Graphite and other technologies from 39% in 2020 to 49% in 2030, (Source: BMI-2020), which corresponds to a growth of 26% year-over-year.

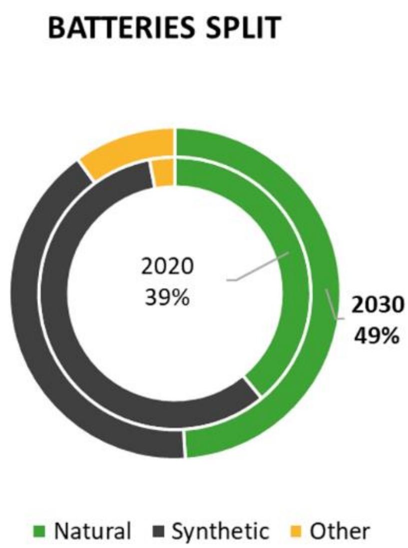
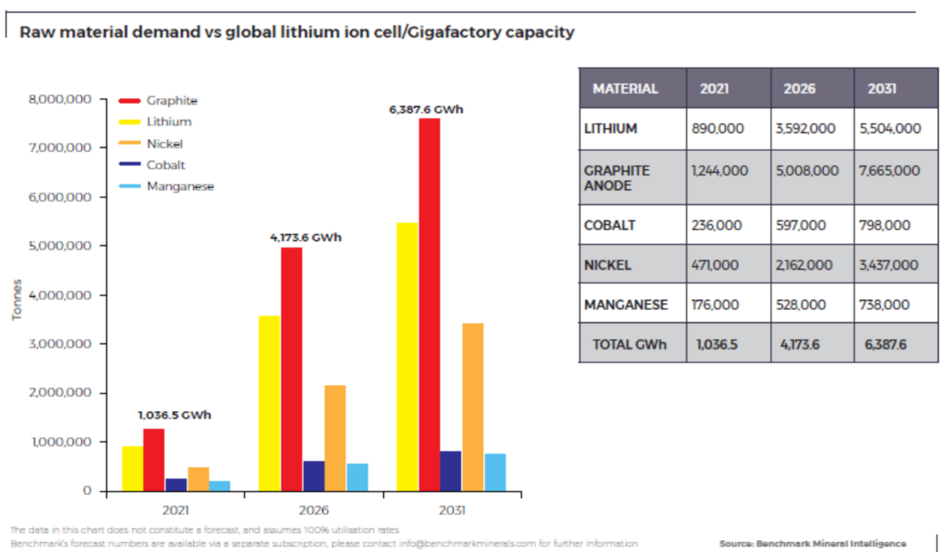


**Figure 19-2: Battery split
(Anode composition)**



MATERIAL	2021	2026	2031
LITHIUM	890,000	3,592,000	5,504,000
GRAPHITE ANODE	1,244,000	5,008,000	7,665,000
COBALT	236,000	597,000	798,000
NICKEL	471,000	2,162,000	3,437,000
MANGANESE	176,000	528,000	738,000
TOTAL GWh	1,036.5	4,173.6	6,387.6

Figure 19-3: Raw material demand

The development of e-mobility is the primary factor generating demand growth for this type of material. This is made evident through the lithium-ion battery production capacity pipeline of 6,387.6 GWh (304 plants) (Source: BMI - Gigafactory Assessment - May 2022).

19.2.2. Flame Retardants

New and more stringent fire prevention rules have been implemented in most of the advanced countries and may be implemented in emerging countries as well. The application of a layer of expandable graphite (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 decompose and form gases, increasing volumes over 200 times, and thus sealing the gap between the door and the frame, preventing smoke from the fire to propagate through the building.

Expandable graphite is also used as additives to rubber and foam, 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.

19.2.3. 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.

With the roll-out of the 5G communication technology, the jumbo and large graphite flake demand for heat dissipation foils will grow significantly above GDP growth.

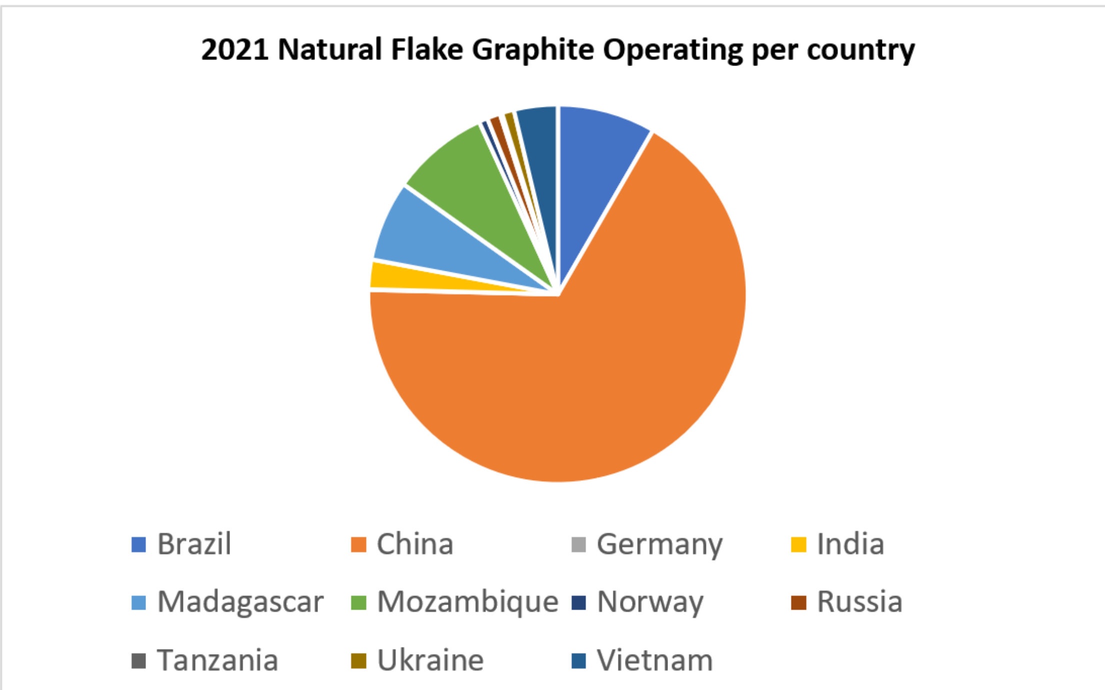
19.3. Producer

China is the largest producer of natural graphite, followed by Brazil, Mozambique and Madagascar.

Besides being the largest producer, China also has reserves for future exploration. Such dominance is well observed in the market, as Chinese price fluctuations affect the global market. The Chinese government, as in any relevant economic activity, steers the strategy and to ensure alignment to the country's long-term projection. China has also built a very strong manufacturing ecosystem for graphite transformation.

For example, China introduced a 20% export duty on raw natural graphite in 2010, in order to force replacement of low value-added exports by use of this material for higher value-added applications within China, anticipating the then emerging demand for lithium-ion batteries. In parallel, new restrictive 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 initially caused a reduction in total production of around 30%. Consequently, many graphite exploration projects were initiated or resumed worldwide.

More recent geopolitical events such as the disputes between the United States and China and the Russian-Ukrainian conflict made the battery makers and EV producers realize the importance to secure supply of critical materials locally to de-risk their supply chain. In addition, the latest ESG trends and regulations have been steering the European and North American battery / EV manufacturers to source from local suppliers which offers more sustainable practices (i.e., low CO_2 footprint).



Source: BMI Q4 2021 report

Figure 19-4: 2021 Natural flake graphite operating per country

19.4. Second Transformation

NMG aims at possessing and mastering all value-added processes to offer most variations of value-added natural graphite products which will position us as a rare fully integrated Western world, geopolitically stable supplier for most natural graphite markets.

19.4.1. Shaping and Purification (Lithium-Ion Battery market)

The main targets for second transformation are shaping, purification and coating, in order to produce uncoated and coated spherical purified graphite for anode material manufacturing.

Currently, most of the production of spherical graphite is made in China. The shaping process consists of consecutive milling steps, which is an energy-intensive process. In the case of natural graphite, the shaping can be performed before or after purification. In China, this is carried out by chemical leaching using hydrofluoric acid, with its consequent wastewater management. The graphite by-products generated during spheronization must also be considered as a revenue source.

The above scenario, which is China centred, presents a growing risk for the battery manufacturers who aim to serve western world markets.

Since natural graphite deposits are rare and rather small in the United States and Mexico, this represents an excellent competitive position for Canadian producers, particularly in Québec, where electricity cost is very competitive , to use a thermochemical purification process instead of leaching. In pilot production scale, yields between 55% and 75% have already been achieved by means of optimized procedures and equipment design.

19.4.2. Purification

Using the same purification installation required for Section 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. Purified fines are used in pencils and carbon brushes. Other markets, such as fuel cells, require for high purity jumbo flakes as well.

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, used in the application of flame retardants. It also allows for the production of feed material for expanded graphite. The latter is used to produce foils and gaskets.

19.5. Price Forecast

This pricing section represents NMG's main markets, mainly in North America, into which it intends to sell its product portfolio. Price forecasts made by Benchmark Minerals consider assumptions which values NMG's advantages; optimal logistic cost (direct and indirect), low geopolitical risks, net zero carbon footprint, no US import tariffs, etc.

19.5.1. Coated, Spheronized, Purified Natural Graphite (CSPG – Lithium-Ion Battery)

Table 19-4 presents Benchmark Minerals forecast of graphite anode material prices for the LOM for the two most common grades for lithium-ion batteries (17-20 µm and 8-11 µm) in USD/t – North America CIF, 99.95% C, Real USD.

Table 19-4: Coated, spheronized, purified natural graphite (CSPG – Lithium-Ion Battery) prices forecasted in North America

Life of Mine Average			
Product	**Unit**	**CSPG 20**	**CSPG 10**
Volume [1]	t	35,849	6,767
Price	USD/t	8,707	10,874

Notes:
Benchmark Minerals – Natural Graphite Market Study – June 2022.
(1) Steady-state production.

It is the opinion of NMG that graphite prices in North America and Europe will likely follow other commodity price increase like lithium, nickel and cobalt. The main reasons are the strong need from the North American and European EV manufacturers to secure local supply chains to minimize geopolitical risks. In addition, North American customers are currently exposed to a 25% import tariff on CSPG coming from China. Since the vast majority of the natural graphite suppliers are based on China, logistic costs are also increasing paid prices versus North American suppliers. Finally, NMG has the lowest carbon footprint among all natural CSPG producers. This, currently, has a direct cost saving impact in Europe for European car manufacturers, due to European regulation which has set CO_2 emission targets per vehicle. It is likely that such industry targets will also be implemented in North America to prevent global warming sources. On top of the 1.8 Mt of natural graphite flakes global shortage expected by 2030 (Source: BMI), NMG believes most of this shortage will be felt primarily in Europe and North America since these regions do not have enough graphite mines and processing plants to meet the anode material demand.

19.5.2. Flakes

NMG's initial FS made in 2018 selling graphite price was established at 1,730 USD/t. The selling price was calculated using price forecasts provided by Benchmark Minerals as of July 2018 for Matawinie flakes mesh basket composition.

The Tony Block's West Zone graphite concentrate value was calculated based on the weighted average of each size fraction and purity obtained during the metallurgical testing presented in Table 19-5 (volume %)

NMG's actual FS weighted selling graphite prices are established at 2,094 USD/t for year 2025 or 1,798 USD/t for the life of mine (LOM) for North American customers. The selling was calculated using prices provided by Benchmark Minerals as of May 2022 for Matawinie flakes mesh -50/+80 and +50. Table 19-5 presents graphite concentrate prices in USD for various size fractions.

Due to its strategic location close to two seaports (approximately 160 km to Montréal and Trois-Rivières by paved roads) and proximity to North American end users (mostly based in the Great Lakes area), customers will benefit of low logistic cost to their manufacturing facilities.

Based on mixed sales into large and jumbo flake markets, NMG will reach an average price of 1,798 USD/t.

Table 19-5: Weighted average flake prices forecasted in North America

Life of Mine Average			
Product	**Unit**	**-50/+80 Mesh**	**+50 Mesh**
Volume	%	33.4	14.8
Price	USD/t	1,702	2,010

Notes:

Benchmark Minerals – Natural Graphite Market Study – June 2022.

1. Total Mine Throughput: 103,328 tonnes.

19.5.3. Micronized By-products

Table 19-6 shows typical applications that use micronized graphite particles. Some of these applications require a high level of purity above 99%.

Table 19-6: Micronized graphite markets

Applications	Known Specifications	Market Size in 2020	Market Prices known USD/t
Powder Metallurgy	15 µm to 44 µm >96% purity	10 kt	Average pricing 1,500-2,500
Alkaline Batteries	Expanded graphite 90 µm 99.8% purity	7 kt	Average pricing 8,000-10,000
Carbon Brushes / Pencils	12 µm to 150 µm 90% to 99.5% purity	10 kt	Average pricing 1,500-2,500
Lubricants	10 µm. to 44 µm >96% purity	35 kt	Average pricing 1,500-2,500
Thermoplastics / Rubber	1 µm to 25 µm >99% purity	52 kt	Average pricing 1,500-20,000 and 3,000-4,000 for expandable graphite.
Metallurgy (piping, coating, forging)	6 µm to 150 µm. >99% purity	110 kt	Average pricing 1,500-4,000

Notes:
Source: Internal Market Data
1. Total Market Size: 224 kt.

Table 19-7 shows typical specifications of natural graphite for Carburizer application that could be a market for the unpurified very fine particles (agglomerated).

Table 19-7: Carburizer markets

Material	Purity	Size Distribution	Required physical properties
Graphite +895	Carbon content: min. 95%	Size: >80 mesh min. 80% 0,5-1 mm max 28% >1 mm max 2%	Ash: max.5% Moisture: max. 0,5%
Graphite +196	Carbon content: min. 96%	Size: >100 mesh min. 80%	Ash: max. 4% Moisture: max. 0,3%

Note: Source: Internal Market Data

Localization of NMG's plant close to North America metallurgical production is an advantage because the fine and ultra-fine particles have a very low density, which would make logistic cost of such products over long distances not commercially advantageous. Based on the carburizer's market, NMG can achieve at least a value of 400 USD/t. Based on Benchmark Minerals for less than 9 microns micronized product, prices in those markets fluctuate between 1,074 USD/t and 2,705 USD/t.

Based on mixed sales into carburizer and other micronized graphite markets, NMG will reach a selling price of at least 500 USD/t. (See Table 19-8).

Table 19-8: Average micronized flake price actual forecasted in North America

Annual Production		
Product	**Unit**	**<9µm**
Volume [(1)]	t	18,384
Price	USD/t	500

Notes:
Benchmark Minerals – Natural Graphite Market Study – June 2022.
(1) Steady-state production.

19.5.4. Purified Jumbo Flakes (+50 Mesh)

This section covers a niche product which requires Jumbo or coarse flake graphite. For this, NMG will use its Jumbo flakes (+50 µm) and purify it up to the required purity. This niche market will likely grow in the future since it is related to the increase usage of hydrogen. NMG's purification process allow, also, to purify flake graphite.

Table 19-9: Average purified flake price actual forecasted in North America

Life of Mine Average		
Product	**Unit**	**Purified +50 MESH**
Volume [(1)]	t	3,007
Price	USD/t	5,104

Notes:
Benchmark Minerals – Natural Graphite Market Study – June 2022.
(1) Steady-state production.

19.6. Contracts

NMG has so far agreed to distribution contract for some of its customers. NMG is also inquiring other distribution agreements for selected markets. The average fee will be approximately of 3% of the sales price.

NMG, due to its commercial workforce, aims at selling a significant amount of its capacity directly to end-users.

NMG has already qualified many of its finished products including large and jumbo flakes, LiB products, at several different customers. Commercial discussions are on-going regarding volume allocation when NMG will enter commercial operation.

20. Environmental Studies, Permitting, and Social or Community Impact

NMG intends to develop a world-class operation at its Phase 2 Matawinie Mine and Bécancour Battery Material Plant through the strategic integration of some of the industry's latest technological innovations and best practices to reduce greenhouse gas (GHG) emissions and minimize environmental impacts.

20.1. Phase 2 Matawinie Mine Project

Active stakeholder engagement and an Environmental and Social Impact Assessment (ESIA) were conducted for the Matawinie Mine, underpinned by per sustainable development principles.

Several environmental studies have been completed since 2015. Fieldwork to describe the receiving environment started in June 2016. The following sections summarize and update the environmental baseline described in Section 20.2 of DRA (2018).

20.1.1. Physical Environment Baseline Studies

20.1.1.1. 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, 2017a). The initial air quality of the Project site is good. Air emission modelling was performed in accordance with the *Ministère de l'Environnement et de la Lutte contre les changements climatiques* (MELCC) guidelines in the ESIA process.

The modelling territory is centered on the proposed mine facilities and covers 400 km^2. Contaminant concentrations were modelled at the location of 1,850 receptors, some of which represent schools, daycare centres or seniors' residences and at places of prolonged presence such as camps, cabins and residences or frequented locations by individuals. To consider activities during the 25 years of life of mine (LOM), which would gradually approach the receptors with the pit footprint and mine operations, three scenarios corresponding to Years 3, 15 and 20 were modelled. The most favourable dispersal conditions are used as an assumption in the modelling. Furthermore, in accordance with the MELCC requirements aimed at modelling the worst possible case, the presence of forest cover on the edge of the mine site has not been considered and it has been assumed that there will be no precipitation, which would have the effect of bringing dust to the ground.

Air contaminant emissions during operations will mainly come from drilling, blasting, material transportation, vehicle traffic, ore management, overburden and ore stockpiles, tailings and waste rock, and the concentrator. To mitigate them, NMG has developed the following specific measures:

- Change of the crusher model to retain a fixed model located in a partially enclosed building with a dust collector;
- Commitment to verify the proper functioning of dust collectors and that their performance is maintained over time;
- Regular roadway maintenance to reduce the silt content on the road surface;
- Reduction in the generation of dust on mining roads by regular sprinkling with water or by applying a dust suppressant authorized by the MELCC. This measure would reduce dust emissions by 75% in summer;
- Hydroseeding of the inactive sections of the co-disposition piles before the final restoration to avoid wind erosion and the generation and dispersion of dust;
- Selection of road covering materials with low crystalline silica content or use of materials emitting low quantities of respirable crystalline silica.

According to the modelling, the emissions of atmospheric contaminants of particulate matter, metals and combustion gases generated by the Project will respect the standards of the *Règlement sur l'assainissement de l'atmosphère* (Clean Air Regulation) (RAA) and the criteria of the MELCC for all sensitive receptors located on the periphery of the mine. However, there is still an uncertainty about the proportion of crystalline silica in the particles for the different emission sources.

According to the environmental analysis, uncertainties persist as to the concentrations of crystalline silicas that would be in the air during mining. The MELCC considers that commitments made by NMG about the validation of the hypotheses used to carry out the modelling of the atmospheric dispersion of contaminants and the implementation of additional mitigation measures to reduce emissions, if necessary, will contribute to meeting the criteria for crystalline silica during mining. Monitoring results from dust collectors as well as appropriated mitigation measures will be integrated in the mine operations and an update of dust modelling. This will ensure the protection of the environment and the health and quality of life of residents and users of the territory.

The uncertainty regarding crystalline silicas is related to Condition 2 of the MELCC's authorization for Phase 2 of the Matawinie Mine project with a maximum of ore and waste rocks extraction per day and is discussed at Section 20.1.3.2.

20.1.1.2. Soil Characterization

According to field observations and the results obtained from analyses and tests carried out in 2016, 2017 and 2019, the main conclusions of the study are:

- The stratigraphy encountered in most exploration trenches and boreholes manuals corresponds to a thin layer of organic soil on the surface covering a layer of compact to loose silty sand or gravelly sand;
- Except for a sulphur concentration that is within the A-B range, all the calculated vibrissa values in samples from material layer organic are below criterion "A" (MELCC. 2021);
- All whisker values calculated in the silty sand layer are lower than the criterion "A";
- Except for a hexavalent chromium (Cr VI) concentration that is within the A-B range, all whisker values calculated in the samples from the layer of gravelly sand are below the "A" criterion.

The higher whisker values presented in the characterization (SNC-Lavalin, 2019) should be representative of the initial state of the soil before the implementation of the mining project. Thus, during the eventual cessation of mining activities, the vibrissa values obtained within the framework of this study could be used as a point of comparison to interpret the results of analyses that will be obtained.

20.1.1.3. Surface Water and Sediment

Surface water and sediment quality was assessed from samples collected between 2016 and 2018 from ten lakes and six streams. The surface water quality of these water bodies is generally good, but some exceedances of the criterion for the protection of aquatic life for chronic toxicity of the MELCC have been observed for iron, aluminum, and lead. The alkalinity of the waters can be described as low, and they are therefore sensitive to acidification. Fecal coliforms were detected, mainly in the Matawin River and the r*uisseau à l'Eau Morte*. Sediment quality is also good. Nevertheless, exceedances of the criteria for assessing sediment quality in Québec[1] have been observed. Most of the exceedances relate to the concentration of rare effects and the threshold concentration producing an effect. Exceedances of the concentration of occasional effects concern cadmium, lead and zinc at one of the stations at *lac aux Pierres*, as well as lead at *lac England*.

[1] Environnement Canada et MDDEP, 2007.

20.1.1.4. Geochemistry

The following soil and rock materials will be disturbed by mining activities (SNC-Lavalin, 2017b): overburden; waste rock that is predominated by mixed forms of paragneiss and followed by smaller amounts of charnockite, biotite paragneiss, meta-gabbro and graphitic paragneiss. Processing of the graphitic ore will produce both a sulphurized and a de-sulphurized tailings stream.

Representative samples of overburden, waste rock and tailings materials were subject to the following geochemical tests (SNC-Lavalin 2017b, 2019): 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* [CEAEQ] 2012); and TCLP, SPLP and CTEU-9 static leachate tests (CEAEQ, 2012).

In relation to waste rock and overburden, ABA data suggests that up to 81% of waste rock will be potentially acid generating (PAG) and includes graphitic paragneiss and mixed paragneiss. The non-PAG materials appear to be the overburden, charnockite, meta-gabbro and biotite paragneiss waste rock. No waste rock type or overburden is considered "high risk" according to Directive 019 criteria for TCLP leachable metals (MDDEP, 2012). The graphitic paragneiss waste rock showed a leaching potential for zinc and a lower leaching potential for copper and cadmium. Kinetic test on waste rocks using humid cells showed exceeding of criteria *résurgences des eaux souterraines dans les eaux de surface* (resurgence of groundwater in surface water (RES)) and Directive 019 criteria for iron, nickel and zinc in late rinse (55 to 65 weeks). The kinetic column test done on the same kind of waste rock also showed exceeding of RES and Directive 019 criteria for iron, nickel, cadmium, manganese and zinc. Every single lithology showed at least one exceeding of criteria at one time during these column tests.

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 PAG tailings showed a leaching potential for cadmium and nickel. The NAG tailings did not show any leaching potential. 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).

PAG tailings overall results show the following: 1) Significant sulphide content pyrrhotite predominant and only minor fractions of net-neutralizing reactive carbonate minerals; 2) Rapid sulphide oxidation kinetics; and 3) Mine waste drainage water quality over the short to longer term may have elevated loadings of the following range of contaminants of concern in relation to potential impacts to effluent discharge or groundwater that may be received by a surface water body: acidity, copper, iron, manganese, nickel, lead, zinc and mercury. These identified contaminants of concern are a conservative guide and do not consider any field specific conditions.

NAG tailings overall results show the following: 1) Low sulphide content with moderate fractions of net-neutralizing reactive carbonate minerals; 2) Negligible to very low amounts of acidity generated over the long term; and 3) Mine waste drainage over the short to longer term to be confirmed. Mine waste drainage water quality over the short to longer term is likely to have a range of contaminants of concern, specifically slightly elevated concentrations of the following: iron, copper, and zinc from the column tests only. These identified contaminants of concern are a conservative guide and do not consider any field specific conditions or engineering criterion as the NMG co-disposal designed to prevent acid drainage and metals leaching.

Large-scale test field of tailings management design (co-disposal) results are summarized in Section 20.1.3.3.

20.1.1.5. 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 2018). The water of the area is drained into the reservoir *Taureau*, less than 10 km northeast of the study area. Ultimately, *rivière Matawin* ends in *rivière Saint-Maurice*, a major sub-watershed 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 Phase 2 Matawinie Mine project is located on a high point, at the head of three small watercourses. Two of these watercourses flow to the northwest and eventually 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^2. This watercourse will receive the effluent of the Phase 2 Matawinie Mine project's treated water plant. The water quality and sediments have been characterized in 2017 and 2018. The environmental objective for the effluent in this watercourse that have been obtained by the MELCC in 2020 and presented below (Table 20-1).

Table 20-1: Environmental discharge objectives (EDOs) for the final effluent (Qe = 3,204 m³/d) (November 12, 2020)

Contaminant	Utilization	Criterion (mg/L)	Upstream concentration (mg/L)	Effluent permitted concentration (mg/L)	Permissible effluent load (kg/d)	Period
Conventional						
Suspended matters	CVAC	5,8	0,8	Directive 019		Year
Metals and metalloids						
Aluminum	CVAC	0,43	0,05	1,36	4,4	Year
Silver	CVAC	0,0001	0,000002	0,00034	0,00109	Year
Arsenic	CPC(O)	0,021	0,0001	0,074	0,24	Year
Barium	CVAC	0,046	0,0076	0,140	0,45	Year
Beryllium	CVAC	0,000011	0,000005	0,000027	0,000085	Year
Cadmium	CVAC	0,000056	0,000003	0,000187	0,00060	Year
Chromium	CVAC	0,011	0,00009	0,038	0,121	Year
Cobalt	CVAC	0,1	0,000065	0,35	1,11	Year
Copper	CVAC	0,0015	0,00028	0,0046	0,0147	Year
Iron	CVAC	1,3	0,09	4,3	13,7	Year
Manganese	CVAC	0,30	0,013	1,00	3,2	Year
Mercury	CFTP	0,0000013	0	0,0000013	0,0000042	Year
Nickel	CVAC	0,0087	0,00027	0,029	0,094	Year
Lead	CVAC	0,00021	0,000035	0,00065	0,0021	Year
Zinc	CVAC	0,020	0,00097	0,066	0,21	Year
Other parameters						
Ammonia nitrogen (winter) (mg/l-N)	CVAC	1,9	0,01	6,6	21,0	June 1 to November 30
Ammonia nitrogen (summer) (mg/l-N)	CVAC	1,2	0,01	4,2	13,5	December 1 to May 31
Diesel	CVAC	0,2	0	0,70	2,6	Year
Fluorides	CVAC	0,2	0,03	0,62	2,0	Year
Nitrates (mg/l-N)	CVAC	3	0,01	10,3	33	Year
Nitrites (mg/l-N)	CVAC	0,02	0	0,069	0,22	Year
pH				6,0 to 9,5		Year

Contaminant	Utilization	Criterion (mg/L)	Upstream concentration (mg/L)	Effluent permitted concentration (mg/L)	Permissible effluent load (kg/d)	Period
Toxicity tests						
Acute toxicity	VAFe	1,0 UTa		1,0 UTa		Year
Chronic toxicity	CVAC	1,0 UTc		3,5 UTc		Year
Monitoring						
Conductivity				Quality monitoring		Year
Hardness				Quality monitoring		Year
Total phosphorus (mg/L-P)				Quality monitoring		Year
Total Dissolved Solids				Quality monitoring		Year

CPC(O): Criterion for preventing contamination of aquatic organisms
CFTP: Piscivorous terrestrial fauna criterion
VAFe: Final acute effluent value
CVAC: Criterion of chronic aquatic life

The comparison between the EDOs and the measured (or expected) concentrations in the effluent must be made according to the terms of the addendum from the MDDELCC (2017) of the MDDEP (2008) guidelines document.

20.1.1.6. Groundwater

The groundwater quality of the future mine site and neighbouring areas was determined to establish the baseline conditions that prevail before the future mine's activities (SNC-Lavalin, 2017c). Groundwater samples were collected in six exploratory boreholes, 15 private wells and two 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 (D.S) 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 (HCO_3) type. More specifically, groundwater in private wells located in surface deposits has a geochemical signature rich in Ca and HCO_3, whereas the groundwater in wells located in the rock has a more variable signature with magnesium (Mg) or sulphate (SO_4) proportions.

- The concentrations of the parameters analyzed (inorganic, phenols, hydrocarbons [PAH and C_{10}-C_{50}]) meet the provincial criteria for drinking water and/or seepage into surface water (MELCC, 2021). 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 for drinking water, as recommended by Health Canada.
- Atypic bacteria concentrations exceed the drinking water criterion (200 CFU/100 ml) in three private wells and two water sources sampled. One of the water sources has E. coli concentrations.
- Few other dissolved metals (Cu, As, and Al) exceeded the seepage into surface water criteria locally in two to three wells.

Private Well Inventory

The inventory of private wells identified 25 private wells within 3 km of the future mine site. Most of these wells are located north of the Project site and are bored in the rock. Fifteen private wells and two surface water sources were sampled and analyzed in the laboratory. Water quality is generally good. Most total metal concentrations are below the potable water criterions.

Pit Area

- Two hydrogeological units were identified, namely unconsolidated deposits composed of sandy-silty till, especially northeast of the future mine site, reaching 40 m in thickness, and the underlying fractured rock is mainly composed of paragneiss and gneiss.
- Groundwater depth in the rock unit is very variable, ranging from the ground surface to nearly 38 m below it, corresponding to water elevation variation between 481 m and 572 m above sea level. Artesian condition is observed in the roc aquifer in the areas where the groundwater table intersects ground level (particularly northeast and southwest of the deposit).

The variation of water levels is typical of environments with variable topography. At the site scale, there is a piezometric dome oriented northeast-southwest, due to the topography of the site, where groundwater flows towards each side of this dome axis.

At the sub-watershed scale, groundwater hydrology is controlled by the general topography and surface drainage of this sub-watershed; it flows from south to north towards the *rivière Matawin*.

A hydrogeological conceptual model was developed based on fieldwork results and some assumptions that allowed creating a 3D model simulation (FEFLOW) calibrated for the natural groundwater flow condition (SNC-Lavalin, 2020). A hydrogeological model (MODFLOW) simulating for waste rock backfilling has also been performed (LAMONT and MDAG, 2020). Both models are to simulate contaminant transport and evaluate the potential contaminant impacts on neighbouring wells and receptors from the mine site, especially from the tailings and waste co-disposal pile and pit backfill. Results show no contamination flow to receptors according to specific design criteria and appropriated mitigation measures that have been integrated in the ESIA Report and Ministerial Authorization (the Decree), the detailed engineering, and the deposition plan.

During the operation phase, to keep the bottom of the pit dry, water will be pumped; this will have the effect of lowering the level of the water table. Dewatering activities will therefore lead to a change in the flow regime and a lowering of the water table. The results of the hydrogeological modelling indicate that a maximum drawdown of 1 m is expected at a maximum distance of 1.9 km from the pit in the northeast/southwest axis while in the transverse axis, the drawdown of 1 m is reached at a maximum distance of 0.6 km.

The potential effects of dewatering could also be felt at four individual wells in *Domaine Lagrange* (decrease in water level varying between 0.73 m and 3.22 m) and three wells belonging to the proponent located between the proposed open pit and the *Domaine Lagrange*.

The other nearest groundwater users are located in the *Domaine Lagrange* neighbourhood and no effect is anticipated on the levels of these wells. It is also planned that wells will be installed in the sector of the industrial zone or within the pit limits (Phases 3 and 4 to start the Project) to withdraw fresh water necessary for the concentrator. The effect of the addition of the wells will be modelled and will be the object of the certificate of authorization to the MELCC before its implementation.

NMG will monitor the water level every day using pressure sensors in an observation well located between the *Domaine Lagrange* sector and the pit, and in four individual wells in the *Domaine Lagrange*. Interventions will be implemented when the long-term trend of fluctuations in one of the piezometers or individual well allows the interpretation of a drawdown approaching the modelled values. In addition, mitigation measures (e.g., deepening the catchment structure, constructing a new structure, supplying water during corrective works) are planned when the measured values exceed the alert threshold or when negative impacts are observed or projected in the short term.

At the end of the operation phase, pit dewatering and water dewatering activities will cease. There will first be a groundwater inflow to the pit, until the state of equilibrium (hydrostatic) is reached. Once the water level in the pit has stabilized, groundwater flow will return to its initial state on a regional scale, whereas in the site footprint, it will be mainly redirected towards the tributary from the *ruisseau à l'Eau Morte* with only a little flow towards the *Domaine Lagrange*.

20.1.1.7. Noise Environment

The MELCC guidelines and instructions include noise limits for construction and operation phases of the Project. These limits have been used to assess the conformity of the Project, determine the impacts, and develop mitigation measures.

NMG has undertaken to respect during operation the noise limits of zoning category I of instruction note 98-01, which are 45 dBA during the day and 40 dBA at night (LAr, 1 h), to dwellings located outside the 1-km radius of the voluntary acquisition program.

NMG will carry out annual noise measurement campaigns during the summer, taking readings lasting 24 consecutive hours and using 5 to 10 locations. The day and night evaluation levels thus obtained will be compared to the noise limits of instruction note 98-01 to establish compliance. A permanent station in the *Domaine Lagrange* is installed and provides real-time noise measurements, making it possible to monitor variations in noise emissions and provide reference data in the event of complaints.

20.1.2. Vegetation and Wildlife Baseline Studies

20.1.2.1. Vegetation, Wetlands and Special Status Plant Species

Vegetation

Forest habitats were characterized in the field during the ESIA. Overall, 20 characterization stations were placed considering the forest types present in the study area and focusing on the areas that could be impacted by the Project.

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).

Wetlands

Wetland characterization was conducted between July 19 and August 11, 2016 (SNC-Lavalin, 2017f). Characterization stations were placed in all wetlands potentially impacted by the Project (project footprint of July 2016) to portray the diversity throughout the study area. Wetland characterization and delineation were performed following the MELCC guidelines in effect at that time (Bazoge et al., 2014). The ecological value of wetlands was then estimated using field data and cartographic analysis. A new wetland field campaign was carried out for the current footprint of the Project in 2018 to complete the data acquired in 2016 (SNC-Lavalin, 2019).

Wetlands include swamps, marshes, peatlands, as well as shallow waters. They represent an area of 472.1 ha in the study area. The most abundant wetlands are riparian shrub swamps (204.2 ha) and wooded swamps (93.2 ha). Peatlands cover 106.7 ha in the study area and are divided into two types, i.e., bogs (62.4 ha) and fens (44.3 ha). Marshes represent 54.8 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 13.2 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.

An authorization under section 22 of the Environment Quality Act (EQA) must be received from the MELCC prior to start of work. The issuance is conditional on the payment of a financial contribution based on the wetland area impacted by the Project.

The construction of the access road and the industrial pad of the Phase 2- Matawinie Mine project in 2021 were financially compensated as provided in the Regulation respecting compensation for damage to wetlands and bodies of water (*Règlement sur la compensation pour l'atteinte aux milieux humides et hydriques* (RCAMHH)). In 2021, NMG paid $400,659.36 in financial contribution for the loss of 6.64 ha of wetlands and $138,380.15 in 2022 for the loss of 2.24 ha of wetlands.

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) that could potentially be impacted by the Project were visited, at the same time as the plant surveys in forested habitats (SNC-Lavalin, 2017f). A specific survey was also conducted on July 28 and 29, 2016 to inform 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 Québec), northern adder's-tongue (likely to be designated as threatened or vulnerable in Québec) and Vasey's pondweed (likely to be designated as threatened or vulnerable in Québec).

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, namely 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.

Invasive Alien Plant Species

During the 2016 plant surveys, an invasive alien plant was detected in the study area. This species, the common reed, had a colony northeast of the Project location. A survey of invasive alien plant species was carried out in early fall 2018 to further document the presence of such species in the study area. No additional invasive alien colony was identified.

20.1.2.2. Aquatic Fauna and Fish Habitat

Information on the fish fauna present or likely to be present in the study area comes from existing data (MFFP, 2015), as well as from specific field surveys conducted in 2016 and 2017 (SNC-Lavalin, 2017g and 2018. 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 water bodies, i.e. *lac aux Pierres* and *Petit lac aux Pierres*, as well as in 38 unnamed watercourses, *rivière Matawin* and *ruisseau à l'Eau Morte*.

The 2016-2017 surveys confirmed the presence of 12 fish species in the study area. In shallow watercourses, the number of species is fairly low, with five species. The brook trout was caught in one of these watercourses. The creek chub, however, dominates catches. In water bodies, *rivière Matawin* and *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 species, namely the brown bullhead and the creek chub. *Rivière Matawin* has a larger diversity with seven species, including yellow perch and 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.

20.1.2.3. Terrestrial Fauna

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; MFFP, 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^2 of habitat for Zone 15 West (Huot and Lebel, 2012). Harvest varied from 63 to 247 deer between 2011 and 2015 (MFFP, 2016). The MFFP (2015) reports the presence of white-tailed deer yards at the same latitudes of the study area, but outside of the Project's study area. White-tailed deer are frequently observed in the Project's study area.

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^2 (Hénault, 2015). In addition, the total moose harvest in hunting Zone 15 varied from 231 to 256 moose between 2011 and 2015 (MFFP, 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 has been estimated at 2.4 bears/10 km^2 (Lamontagne et al., 2006). In fact, the bear population in Zone 15 is quite harvested, as the number of black bears harvested was 309 in 2015 (MFFP, 2016).

There is no issue associated with this group of species that is likely to have an impact on resource extraction.

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; MFFP, 2016).

Overall, 16 furbearer species are likely to frequent the study area (Prescott and Richard, 2013). The study area overlaps two furbearer management units (UGAF), i.e., UGAF Nos. 26 and 27. The main furbearers trapped in this UGAF in 2015-2016 were the American beaver, muskrat, weasel, American marten and raccoon (MFFP, 2016). All these species are common in Québec.

There is no issue associated with this group of species that is likely to have an impact on resource extraction.

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 to 22, 2016 (SNC-Lavalin, 2016). This survey was conducted using Victor snap traps placed at four sites and focused on the southern bog lemming and the rock vole, two special status species.

Overall, 203 small mammals belonging to at least nine 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 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. Other species caught were the short-tailed shrew, masked shrew, smoky shrew, meadow vole, meadow jumping mouse, woodland jumping mouse, and deer mouse. According to Desrosiers et al. (2002), the American water shrew, pigmy shrew, Eastern heather vole, hairy-tailed mole, and 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.

Amphibians and Reptiles

The information used to describe the amphibians and reptiles that inhabit or are likely to inhabit the study area comes from a review of existing data (AARQ, 2015; MFFP, 2015), as well as from targeted field surveys conducted in 2016 and 2017 (SNC-Lavalin 2017d). 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.

Four species of anuran were identified, namely 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 and June 21, 2017, identified four species of salamander, 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 snake species were observed in 2017, the Eastern common garter snake and the Northern redbelly snake. No turtle was observed during the three surveys along the *rivière Matawin* on May 24 and June 7 and 22, 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 other anurans (Eastern newt and mink frog) and four other reptiles (smooth greensnake, Eastern painted turtle, common snapping turtle and wood turtle) near the study area. The gray treefrog was also reported during the 2018 bird survey along the eastern access variant.

Of all the species mentioned above, three have a special status, namely the smooth greensnake, the wood turtle and common snapping turtle. The smooth greensnake was targeted by specific surveys but was not detected. The two 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.

20.1.2.4. Bats

The presence and nocturnal activity of bats were characterized with a fixed acoustic survey using eight recording stations located near water bodies and wetlands (Fabianek, 2016). The survey ran from June 29 to July 19, 2016, i.e., during the birth and lactation periods of bats in Québec. In addition, field searches for hibernacula were carried out from June 29 to 30, 2016. The survey protocol was previously approved by the MFFP.

This survey confirmed the presence of five bat species already reported in the *Lanaudière* region. The hoary bat was the most active, followed by the silver-haired bat, little brown bat, big brown bat and 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 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.

20.1.2.5. Birds

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 and 19, 2017 (SNC-Lavalin, 2017e). The survey protocol was previously approved by the MFFP. Ten waterfowl species, including eight local breeders, and three 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.

Birds of Prey

Bird of prey surveys were conducted on June 23 and 28, 2017 using eight 500-m transects located along access roads (SNC-Lavalin, 2017e). The survey protocol was previously approved by the MFFP. No bird of prey nest was found, but four species were detected, namely the turkey vulture, bald eagle, broad-winged hawk, and merlin. The bald eagle is designated as vulnerable in Québec 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 was deemed possible the bald eagle would nest there. To confirm this, a helicopter survey was carried out in early May 2018 along the shore of *lac England,* of *Lac aux Pierres* and all other large waterbodies of the study area. No bald eagle nest was found, confirming that this species does not nest in the study area.

Land Birds

Land birds were inventoried from June 1 to 9 and from June 22 to 28, 2017 using 70 point counts located in the main habitats of the study area (SNC-Lavalin, 2018). On June 18 and July 4, 2018, six new point counts were carried out in potential special status species habitats to double verify the presence of such species in the study area, as well as along a potential access road east of the study area. A nighthawk survey was also performed at five stations on July 3, 2018 to detect the presence of the common nighthawk. The survey protocols were previously approved by the MFFP. The presence of 53 land bird species has been noted in the study area, 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.

20.1.3. Phase 2 Matawinie Mine Project Authorization

In April 2019, NMG issued the ESIA to the MELCC. The main steps carried out to obtain the Phase 2 Matawinie Mine project authorization (the Decree) are listed in Table 20-2.

Table 20-2: Chronology of significant steps in the Phase 2 Matawinie Mine project ESIA

Date	Event
2018-01-18	Receipt of the Project notice from the MELCC
2018-02-12	Delivery of the directive
2019-04-05	Reception of the ESIA
2019-07-08	Transmission of questions to the Project initiator
2019-09-27	Reception of questions
2019-10-07	Reception of the physicochemical characterization of the initial state of the soils
2019-10-30	Reception of the rehabilitation and restoration plan
2019-11-15	Transmission to the Project initiator of commitment requests and comments for the environmental analysis
2019-11-25	Reception of responses to commitment requests
2020-01-27 au 2020-05-26	Period of public hearing
2020-11-05	Reception of the latest information from the Project initiator
2020-10-30	Reception of the last opinion of the government (ministries) and stakeholders

On June 26, 2020, NMG received the report and recommendations of the *Bureau d'audience publique sur Environnement* (BAPE) regarding its Phase 2 Matawinie Mine project. The Government's environmental assessment analysis continued at the MELCC from November 2020 to January 2021 and resulted in the adoption of a ministerial Decree that authorized the Matawinie Mine project on January 20,2021, on the territory of the municipality of Saint-Michel-des-Saints *(Décret 47-2021, Gazette officielle du Québec, 10 février 2021*, 153e Year, no 6). Once the Decree is obtained, NMG must still comply with the different regulatory requirements and develop the Project according to the ESIA commitments and in conformity with applicable regulations.

Condition 1 of the Decree stipulates that Matawinie Mine project on the territory of the municipality of Saint-Michel-des-Saints must comply with the terms and measures set out in the following documents:

- *Matawinie – Étude d'impact environnemental et social - Saint-Michel-des-Saints – Étude d'impact sur l'environnement déposée au ministre de l'Environnement et de la Lutte contre les changements climatiques – Ref. : 3211- 16-019, par SNC-Lavalin, avril 2019, totalisant environ 5 206 pages incluant 10 annexes;*
- *Matawinie – Étude d'impact environnemental et social Saint-Michel-des-Saints – Addenda no 1 – déposé au ministre de l'Environnement et de la Lutte contre les changements climatiques – Ref. : 3211-16-019, par Globerpro International Inc., 23 mai 2019, totalisant environ 25 pages incluant 2 annexes;*

- *Matawinie – Étude d'impact environnemental et social – Réponses aux questions – Nouveau Monde Graphite, par SNC-Lavalin, septembre 2019, totalisant environ 557 pages incluant 7 annexes;*
- *Matawinie – Caractérisation physicochimique de l'état initial des sols - Saint-Michel-des-Saints (Québec) - Nouveau Monde Graphite, par SNC-Lavalin, 7 octobre 2019, totalisant environ 317 pages incluant 7 annexes;*
- *Matawinie – Saint-Michel-des-Saints – Plan de réaménagement et de restauration pour le site du projet minier Matawinie – Ref.: 3211-16-019, par SNC-Lavalin, octobre 2019, totalisant environ 213 pages incluant 7 annexes;*
- *Lettre de M. Fréderic Gauthier, de Nouveau Monde Graphite Inc., à Mme Dominique Lavoie, du ministère de l'Environnement et de la Lutte contre les changements climatiques, datée du 25 novembre 2019, concernant les réponses aux demandes d'engagements, 7 pages;*
- *Prédiction de la qualité des eaux dans la fosse et effets sur le milieu récepteur sous différentes conditions – Projet Matawinie - Saint-Michel-des-Saints, Québec – Préparé pour : Nouveau Monde Graphite – Par LAMONT MDAG, par LAMONT Inc., janvier 2020, totalisant environ 240 pages incluant 4 annexes;*
- *Plan d'intégration au territoire du projet minier Matawinie - Sommaire intégré, janvier 2020, environ 147 pages;*
- *Projet Matawinie – Étude d'impact environnemental et social – Saint-Michel-des-Saints – Étude d'impact sur l'environnement déposée au ministre de l'Environne- ment et de la Lutte contre les changements climatiques – Ref.: 3211-16-019 – Février 2020 – Projet: 653897-L022-Réponses aux demandes d'engagement du 15 novembre 2019, par SNC-Lavalin - février 2020, totalisant environ 75 pages incluant 2 annexes;*
- *Projet Matawinie – Étude d'impact environnemental et social - Saint-Michel-des-Saints - Étude d'impact sur l'environnement déposée au ministre de l'Environnement et de la Lutte contre les changements climatiques– Ref. : 3211-16-019 – Juin 2020 – Projet : 653897-L023*
- *Volume Réponses aux questions – Analyse environnementale du 1er mai 2020, par SNC-Lavalin, juin 2020, totalisant environ 271 pages incluant 8 annexes;*
- *Note technique : L025 – Réf : 653897 – N/Document n° : 653897 - Date : 2020-06-09 – À Frédéric Gauthier – Nouveau Monde Graphite – Lieu : Lévis – Projet : 653897*
- *Inventaire sites potentiels de ponte des tortues, par SNC-Lavalin, juin 2020, totalisant environ 20 pages incluant 1 annexe;*
- *Projet minier Matawinie – Étude d'impact environnemental et social – Dossier 3211-16-019 – Document de réponses aux questions de l'analyse environnementale du 7 août 2020, 20 août 2020, totalisant environ 15 pages;*

- *Projet minier Matawinie – Étude d'impact environnemental et social – Dossier 3211-16-019 – Réponses à la QCAE-2 du 7 août 2020 et mise à jour des acquisitions dans la zone d'acquisition volontaire, 4 septembre 2020, totalisant environ 20 pages;*
- *Projet minier Matawinie – Étude d'impact environnemental et social – Dossier 3211-16-019 – Document de réponses aux questions et commentaires de l'analyse environnementale du MELCC du 8 octobre 2020, 19 octobre 2020, 9 pages;*
- *Lettre de M. Fréderic Gauthier, de Nouveau Monde Graphite Inc., à Mme Dominique Lavoie, du ministère de l'Environnement et de la Lutte contre les changements climatiques, datée du 5 novembre 2020, concernant les réponses aux commentaires du 3 novembre 2020, 2 pages.*

From the documents in Condition 1, specific conditions have been outlined in Conditions 2 to 16 of the Authorization (the Decree). The main conditions to be included within permits applications are summarized in Sections 20.1.3.2 to 20.1.3.4. The Decree of NMG is available in the *Gazette officielle du Québec* (2021)[2], which is available online: https://www.environnement.gouv.qc.ca/evaluations/decret/2021/47-2021.pdf

20.1.3.1. Permits for Construction and Exploitation

Several applications for Authorization's following the different stages of the design or the construction activities will be required from the *Ministère des Forêts, de la Faune et des Parcs* (MFFP) and the *Ministère de l'Énergie et des Ressources Naturelles* (MERN), the municipality of Saint-Michel-des-Saints, and Fisheries and Oceans Canada (MPO).

From September 2020, the MELCC adopted an in-depth modification of its environmental authorization policy system under section 22 of the *Environment Quality Act* (EQA) named the *Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement* (REAFIE) (MELCC, 2022). The Regulation oversees activities in need of an authorization based on their environmental impact (REAFIE) (Q-2, r. 17.1). Activities with moderate environmental risk need a ministerial authorization, those at low risk, a declaration of conformity, and those at negligible risk, an exemption. The REAFIE contains transitional provisions that ended December 31, 2021, for the application of the requirements relating to the admissibility of a request for authorization, modification, and renewal as well as the use of mandatory forms and the electronic transmission of information or documents required under the REAFIE.

[2] Gazette officielle du Québec, 2021. Lois et règlements. 153e année. Partie 2, no 6. 10 février 2021.

Based on the REAFIE, risk categories of each work phases needed for the construction of the Phase 2 Matawinie Mine, NMG received in 2021 the authorization for activities at moderate environmental risk from the MELCC for tree clearing works of the industrial pad, access road construction and the launch of civil construction works related to the industrial platform.

Certificates of compliance from the municipality of Saint-Michel-des-Saints were issued for each phase of the construction. Authorizations were also issued by the *Ministère des Forêts, de la Faune et des Parcs* (MFFP) *and the Ministère de l'Énergie et des Ressources Naturelles* (MERN). Access road construction plans, and specifications have been reviewed with the MFFP and the *Fishing Act*, Fisheries and Oceans Canada (MPO) and were approved accordingly to the *Règlement sur l'aménagement durable des forêts du domaine de l'État* (RADF) (MFFP, 2021). Main permits received for Phase 2 Matawinie Mine project are summarized in Table 20-3.

Table 20-3: Main permits received for the Phase 2 Matawinie Mine project

Activities	Object	Authority	Received date
Wood Cleaning – Industrial Pad and Access Road	Attestation of conformity - Municipality of Saint-Michel-des-Saints	Municipality of Saint-Michel-des-Saints	2021-02-22
Wood Cleaning – Industrial Pad and Access Road	Provisory - Land lease for infrastructure located on the domain of the State	MERN	2021-02-24
Wood Cleaning – Industrial Pad and Access Road	Intervention permit	MFFP	2020-2021
Wood Cleaning – Industrial Pad and Access Road	Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC	2021-02-26, 2021-04-20
Phase 2 Matawinie Mine project	Attestation of conformity - Municipality of Saint-Michel-des-Saints	Municipality of Saint-Michel-des-Saints	2021-06-11, 2021-01-27
Phase 2 Matawinie Mine project	Land lease for tailings infrastructure located on the domain of the State	MERN	2021-08-10, 2022-03-16
Phase 2 Matawinie Mine project	Land lease for infrastructure located on the domain of the State	MERN	2021-08-10
Industrial Pad Site Preparation - Site preparation and installation of underground water and sanitary sewer infrastructure	Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC	2021-07-23
Industrial Pad Site Preparation	Attestation of conformity - Municipality of Saint-Michel-des-Saints	Municipality of Saint-Michel-des-Saints	2020-07-27, 2021-12-16

Activities	Object	Authority	Received date
Wetlands backfill[3]	Authorization	MELCC	2022-02-21
Access road - Installation of culverts and rock blasting as part of the construction of the access road	Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC	2021-07-06
Extension - Wood Cleaning – Industrial Pad and Access Road	Forestry intervention permit	MFFP	2021-2022
Access Road Construction	Authorization to construct, improve or close a multi-use path	MFFP	2020-2021
Access Road Construction	Activity susceptible to affect a wildlife habitat (fish habitat)	MFFP	2021-07-07
Access Road Construction	RADF Applications	MPO	
Addenda Wood Cleaning – Industrial Pad and Access Road	Forestry intervention permit	MFFP	2020-2021

NMG separated the permitting sequence based on engineering advancement. The next phases will prioritize the following construction works: 1) Industrial platform concentrator and building; 2) tailings and water management infrastructure construction; 3) pit and mine site preparation; and finally 4) mine operation (including concentrator start-up, ore extraction, on-site tailings). NMG also needs approval of the Closure Plan and payment of 50% of the financial guarantee within 90 days of approval, followed by 25% of the financial guarantee paid in the first and 2nd year after MERN approval, as well as Mining leases for any construction or operations within the pit area.

20.1.3.2. Environmental Monitoring

As per Condition 14 of the Decree, environmental monitoring and a follow-up program for the Phase 2 Matawinie Mine project was transmitted on February 2021 to the MELCC for review and approval. Answers and additional information are to be filed by NMG into a revised version that incorporates MELCC comments and must be included in the authorizations under article 22 or, where applicable, under article 30 of the LEA for which the works that will generate the impact are planned and justify the monitoring and follow-up. All monitoring and follow-up requirements and approval regarding activities are already in place and related authorizations are communicated with the NMG environmental program for the construction of the Phase 2 Matawinie Mine project (Table 20-3). A summary table of NMG environmental commitments and

[3] According to section 46.0.5 of the Act Respecting the Conservation of Wetlands and Bodies of Water, the CA issuance comes with the payment of a financial contribution based on the wetland area impacted by the Project.

conditions (NMG, 2021), as part of the Phase 2 Matawinie Mine, is available on the company's website in accordance with the analysis and authorization procedures of the Québec Government. This table is updated twice a year.

Regarding the final monitoring and follow-up program for mine exploitation, follow-up work has already started such as the hydrological monitoring of the receiving watercourses CE36, CE05 and CE20 in order to acquire as much information as possible on the flows of the watercourses affected by the Project, the groundwater monitoring and the monitoring of air quality because of the uncertainties at the level of airborne crystalline silica.

As per Condition 2 of the Decree, a maximum of ore and waste rocks extraction are fixed based on a degree of uncertainty regarding the proportion of crystalline silica in the dust from different sources of emission. In its answer to question QCAE-24 of May 1, 2020[4], NMG presented crystalline silica contents for different particle sizes of dust, measured on the Canadian Malartic mine site in Malartic, Québec. The MELCC indicated that the assumptions concerning the ratios and crystalline silica contents that NMG used to establish the emission rates presented in its modelling must be reviewed and adapted to the Phase 2 Matawinie Mine project using more representative geological material. In March 2022, NMG committed to submit a new version of the airborne contaminant distribution modelling considering the updated information on crystalline silica with the aim of modifying Condition 2 of the ministerial Decree. The materials used for the Matawinie mining operations, including surficial road material, will be characterized as the construction and mining plan progresses. The information will allow NMG to review Condition 2 before mine operations begin. The model will be accompanied by a dust management plan to ensure compliance with the criteria in terms of crystalline silica. The monitoring program will be reviewed accordingly. Therefore, as requested by the MELCC, the modelling will be updated with data from the site and the monitoring program will include on-site follow-up during mine operation to ensure dust emissions meet all criteria.

20.1.3.3. Tailings Management

As specified in Condition 3 of the Decree, full scale field testing was undertaken during the summer of 2020. A 16 m x 16 m cell reproducing parameters of the co-disposal design (Section 18.1.10) was constructed. The goal was to simulate specific parameters of the deposition plan with instruments at certain strategic locations. Probes for measuring temperature, capillary pressure, water content and oxygen content have been installed and data has been collected and analyzed since August 2020. Also, contact water has been collected and analyzed every month. The mine tailings co-disposition scheme is shown in Figure 20-1.

[4] Volume Réponses aux questions – Analyse environnementale du 1er mai 2020, par SNC-Lavalin, juin 2020, totalisant environ 271 pages incluant 8 annexes.

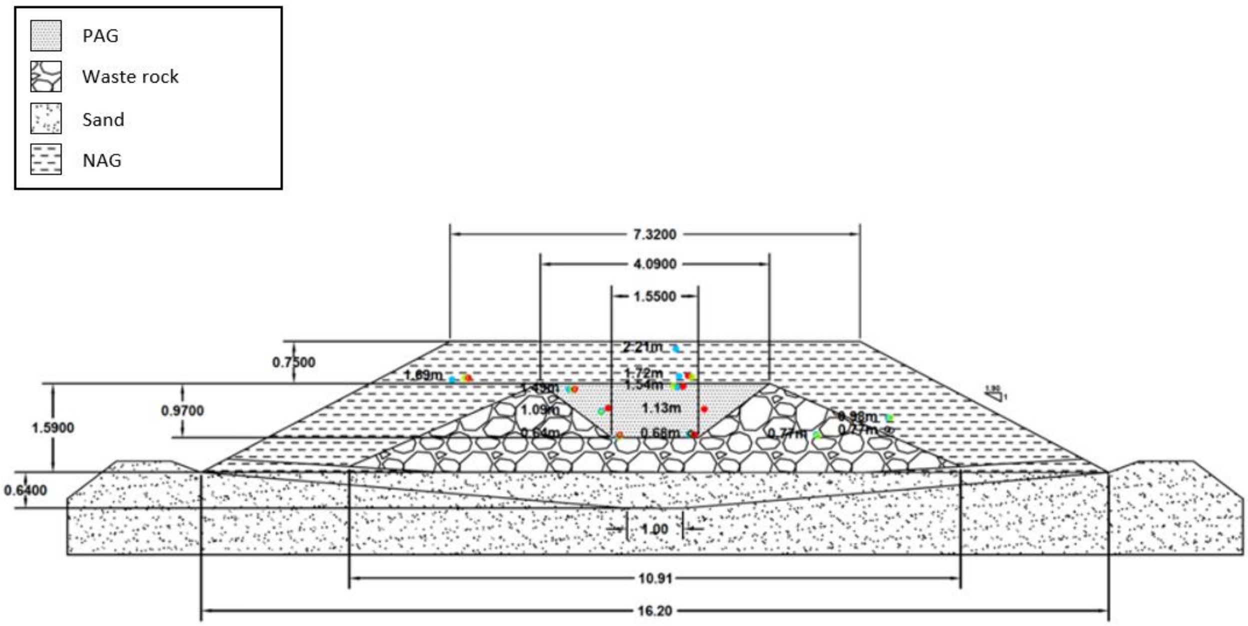


Figure 20-1 Typical section of the experimental cell and position (metric) of the instruments (red-oxygen; green-suction; blue-water content and temperature)

Oxygen Content

The monitoring of the probes shows that the oxygen is consumed in the desulphurized non-acid generating (NAG) tailings. In the sulphurous potentially acid generating (PAG) tailings, the high degree of water saturation prevents the concentration of gaseous oxygen, which has been zero since the start of the test.

Water Content

The profile of the water content in the test cell shows that the tailings near the surface are the most influenced by weather conditions. We then see seasonal variations at all levels, but in general, sulphurous PAG tailings retain a high degree of saturation. This observation supports the assumptions underlying the concept.

Temperature

The temperature fluctuates in the layers and the amplitude is related to the proximity of the probe to the atmosphere. The temperature is an indication of the rate of oxidation which, in the case of the oxidation of sulphides, is an exothermic reaction. No increase in temperature was observed in the PAGs, which is an indicator of the absence of oxidation reaction and confirms that the PAG may not be self heating.

Suction

The probes made it possible to measure the suction in the layers of NAG and PAG. Suction is related to the degree of compaction, water content, and the ability of fine materials to retain water. The measured suctions show that the compaction was not optimal. This result was expected given the light equipment used for compaction and subsequent side effects. Compaction with a properly sized Dozer in bigger cell (100 m X 200 m), such as what is expected during commercial operations, should avoid this issue.

Contact Water

Monitoring the quality of contact water over the course of a year demonstrated the validity of the prediction model developed during the feasibility and impact studies (LAMONT and MDAG, 2020). The model can therefore be used to predict what the water quality will be once the mine is in operation and the co-disposition pile is under construction.

Conclusion

Monitoring the scale field cell confirms the assumptions on the effectiveness of the design. The results of the cell can provide tools to ensure a safe design including proof design criteria into the deposition plan and the monitoring QA/QC program (Condition 4 of the Decree).

Based on data and correlations from laboratory kinetic test work and large-scale on-site tests, scatterplots with pH are compiled Project pH-dependent water-quality model for full-scale mine site components and validated modelling results (LAMONT and MDAG, 2020, LAMONT, 2020) presented to MELCC. Many minerals were close to or above ideal saturation at pH 4, 6, and 8 based on the Matawinie water-quality model. This is an indicator that aqueous concentrations of many elements can represent maximum "equilibrium" concentrations representative of full-scale mine site components meaning that no scaling factors are needed as scale increases.

A complete report concerning the co-disposal test cell will be submitted to the MELCC in 2022 when applying for authorization under section 22 of the EQA (chapter Q-2) or, where applicable, under section 30 of that EQA, concerning the tailings storage facility and tailings management. As requested in Condition 5 of the Decree, the groundwater modelling will be updated and should confirm the assumptions used in the Impact Assessment modelling.

20.1.3.4. Mine Electrification

As per Condition 6 of the Decree, NMG must present the progress of work to electrify mobile mining equipment as well as an update of the schedule for carrying out this work.

In December 2021, a mandate was signed with Hydro-Québec to carry out the preliminary project encompassing the development, installation and operation of a 120-kV electrical line that will supply its Phase 2 Matawinie Mine and help the Company meet its carbon-neutrality targets. The goal is to connect the Phase 2 Matawinie Mine and its concentrator to the province's main power grid via a dedicated line expected to be active for the start of the Phase 2 Matawinie Mine's operations.

NMG plans by the end of the first five consecutive year period after the start date of the commercial operation of the Matawinie Mine the replacement of its then-existing diesel fleet of construction and mining machines and equipment, with construction and mining machines and other equipment that operate with zero emissions of greenhouse gas ("Zero Emission Machines"). In June, 2021, NMG entered into of a collaboration agreement with Caterpillar Inc. under which Caterpillar Inc. will develop, test, and produce Cat® "zero-emission machines" for the Phase 2 Matawinie Mine, with a view to becoming the exclusive supplier of an all-electric mining fleet for deployment at the Phase 2 Matawinie Mine 5 years after the mine start-up.

NMG is evaluating fully electrified surface drill rigs for mining operations. A recently concluded study and concept review from a major OEM identified an electric equivalent production drill, capable of drilling production and pre-sheer holes; the model is currently available as a diesel vehicle. Based on the initial discussion, it is possible to receive a first prototype as early as 2023.

The National Research Council has funded a project to analyze the performance of a battery electric truck prototype that will be tested and implemented at the NMG mine site. The purpose of the study was to address the gaps in public evidence and preconceptions relating to the electrification of mining vehicles, particularly those for open-pit operations. The study aims to estimate energy and power demands using route-demand simulations of the prototype under various terrain conditions and route profiles. The results of the report are intended to provide an estimate of the energy demands for the operation at the NMG site and highlight the sensitivity of the results to different environmental and operational factors. The simulation results demonstrate that the operation of electric vehicles in the mining environment is extremely energy intensive, with peak shift demands averaging between 675 kWh and 710 kWh. The use of regenerative braking was demonstrated to reduce energy demands on average by approximately 5% in simulations. The two environmental factors having the greatest impact on energy demand were found to be rolling resistance and the load of the vehicle. The results provide valuable insight into optimizing the design of the mine site, such as aligning high payload driving intervals with downhill road sections where regen braking can be maximized. The simulations also indicate that energy demands correlate linearly with the rolling resistance factor of the road, implying the importance of road maintenance for energy efficiency of electric vehicles. The next stage of the Project will be to perform on-site testing in 2022. The objective of these tests will be to verify modelling results and perform additional sensitivity analysis with respect to rolling resistance and maximum speed and inform how mine routes should be adjusted.

20.1.3.5. Social and Community Impact Update

NMG has a head office at 481 Brassard Street in Saint-Michel-des-Saints that is open for community enquiries, drop-in visits, employment applications or business inquiries.

The most recent survey (NMG, 2019) of the local population was conducted by Marketing Léger Inc. and confirmed favourable reception of the Matawinie Graphite Property, with 82% of respondents calling the Project positive or very positive. The results have remained consistent, with an equivalent rate of support (83% in 2018 and 82% in 2019) and viewpoints that remain positive regarding economic benefits (89%) and community integration with respect to quality of life (76%) and the environment (70%). In addition to refining the Project, open dialogue with the community has helped identify avenues for integration and revealed a strong interest in training, employment, and business opportunities.

On April 23, 2019, NMG entered into a pre-development agreement (the "PDA") with the *Conseil des Atikamekw de Manawan* and the *Conseil de la Nation Atikamekw* for the Phase 2 Matawinie Mine project. The PDA outlines the respective rights and interests of all parties with respect to pre-development activities and provides a guideline for negotiating an impact and benefit agreement (the "IBA") relating to the Phase 2 Matawinie Mine project. According to the PDA, the parties support the development of the Phase 1 Matawinie Mine in a manner that respects the environment, sustainability principles, culture, and lifestyle of the Atikamekw First Nation. As part of the PDA, the Company shall provide training, employment and business opportunities to members of the Atikamekw Nation, as well as establish a joint training fund with the *Conseil des Atikamekw de Manawan* and the *Conseil de la Nation Atikamekw*.

NMG is actively progressing towards the elaboration of the IBA for the Phase 2 Matawinie Mine to maximize opportunities. The spirit of the proposed IBA measures is already reflected in the Company's current practices, namely through the deployment of a specific training program, preferred employment mechanisms, active promotion of business opportunities, procurement process examining contractors' effort to include Indigenous components (labour or subcontractors), awareness training for staff, etc.

On January 24, 2020, NMG announced the signing of a collaboration and benefit-sharing agreement between the Company and the municipality of Saint-Michel-des-Saints for the Phase 2 Matawinie Mine (the "Saint-Michel-des-Saints Collaboration Agreement"). The Saint-Michel-des-Saints Collaboration Agreement was based on requests expressed by local stakeholders, on sustainable development principles, and on an agreement in principle reached in August 2018 and summarized in Section 4.3.

Relevant stakeholder groups were initially identified during the exploration phase of the Phase 2 Matawinie Mine project back in 2014 when NMG commenced its participative approach. NMG consulted and continues to actively engage with stakeholders. The Company participated in over 80 information events, including public sessions, consultations, and open-house events, to establish a transparent and constructive dialogue with local organizations, residents, cottage owners, and members of the First Nations. NMG continues to collect feedback from stakeholders, provide transparent information on its activities, plans and EGS (Environmental, Social and Governance) performance, and maintain an active profile within the milieu thanks to dedicated local resources such as a Community Relations Manager and a community office.

Table 20-4: Engagement with main stakeholder groups

Stakeholders	Communication channels
Citizens and users of the territory	▪ Public newsletter, website, social media ▪ Site visits and direct interaction with NMG's representatives ▪ Representation at the Phase 2 Matawinie Mine monitoring committee (the "Monitoring Committee") ▪ ESG Report
Community and economic development organizations	▪ Representation at the Monitoring Committee ▪ Meetings and direct interaction with NMG's representatives ▪ ESG Report
Employees	▪ Internal newsletter ▪ Team weekly meetings ▪ Annual full-staff training seminar and other internal events
Environmental groups	▪ Representation at the Monitoring Committee ▪ Site visits and direct interaction with NMG's representatives
Indigenous peoples' communities and organizations	▪ Meetings, site visits and direct interaction with NMG's representatives ▪ Local events ▪ Representation at the Monitoring Committee ▪ ESG Report ▪ Public newsletter, website, social media
Members of the public, media, and end-users	▪ Press releases, quarterly and annual reports ▪ Public newsletter, website, social media ▪ ESG Report ▪ Site visits and direct interaction with NMG's representatives
Municipal and governmental authorities	▪ Meetings, site visits and direct interaction with NMG's representatives ▪ Representation at the Monitoring Committee ▪ Biannual activities report ▪ Press releases, quarterly and annual reports ▪ ESG Report

Stakeholders	Communication channels
Shareholders and investors	▪ Annual meeting ▪ Site visits and direct interaction with NMG's representatives ▪ Press releases, quarterly and annual reports ▪ ESG Report ▪ Website, newsletter, social media ▪ Events, panels and conferences
Supplier and business partners	▪ Annual information session on upcoming business opportunities ▪ Meetings and direct interaction with NMG's representatives ▪ Website, social media ▪ Press releases, quarterly and annual reports

NMG is an active participant within the regional community and associative network, including the Chamber of Commerce, working to promote indirect economic opportunities associated with our operations and workforce attraction. Information sessions are held annually to present the upcoming construction work and associated business opportunities.

Since 2018, work advisories have been sent regularly, every month to every quarter, and for significant events depending on the nature of the work, to nearby residents and other interested stakeholders to relay key information of on-site activities and potential local impacts associated with our Phase 2 Matawinie Mine.

News regarding NMG's activities and development updates are published through various platforms – monthly page in local paper, social media, press releases, website, local media, newsletter, quarterly corporate financial reports, etc. – to enable community members to access information.

The Stakeholder Committee that has been assisting NMG in developing the mining project since 2017 has become the Monitoring Committee. The Monitoring Committee functions as both a consultative body and a platform for environmental and social surveillance of NMG's operations. Led by NMG Community Relations Manager and composed of local citizens, First Nation members, business representatives, and local organizations, the Monitoring Committee plays a crucial role in helping NMG identify its stakeholders' concerns and improvement avenues for the next steps of the Project. The Monitoring Committee will remain in place until the post-closure monitoring period of the mine. Minutes for each meeting are publicly available on NMG's website.

A Complaint Management Policy was adopted in February 2021 by the Monitoring Committee to provide a framework for handling comments and complaints made to NMG. All complaints received by NMG are recorded in the Company's complaints register and discussed during the Monitoring Committee meetings. NMG received two complaints in 2021; both were addressed and resolved within 24 hours. NMG discloses a quarterly summary of its complaint register on its website.

20.1.3.6. GHG Emissions Phase 2 Matawinie Mine

NMG has applied innovative environmental initiatives to limit the footprint of the Phase 2 Matawinie Mine on the natural environment. Through design and operation choices, NMG is planning to minimize tree clearing from the industrial site construction, develop forest products from harvesting, optimize mining infrastructure through the co-disposal of tailings and waste rock, progressively backfill the proposed open pit, progressively rehabilitate the site by vegetating the stockpile and pit, compensate for the loss of (and even improve where possible) wetlands, and electrify our mining fleet (see Section 20.1.3.4) and concentrator operations. Electrifying our production is NMG's central mechanism for decarbonizing its operations and products. NMG commits to adopt clean energy sources and technologies in every area of our operations as they become available.

NMG has identified opportunities to further reduce process emissions as part of its Climate Action Plan. Figure 20-2 presents the GHG emissions projections for the Phase 2 Matawinie Mine project.

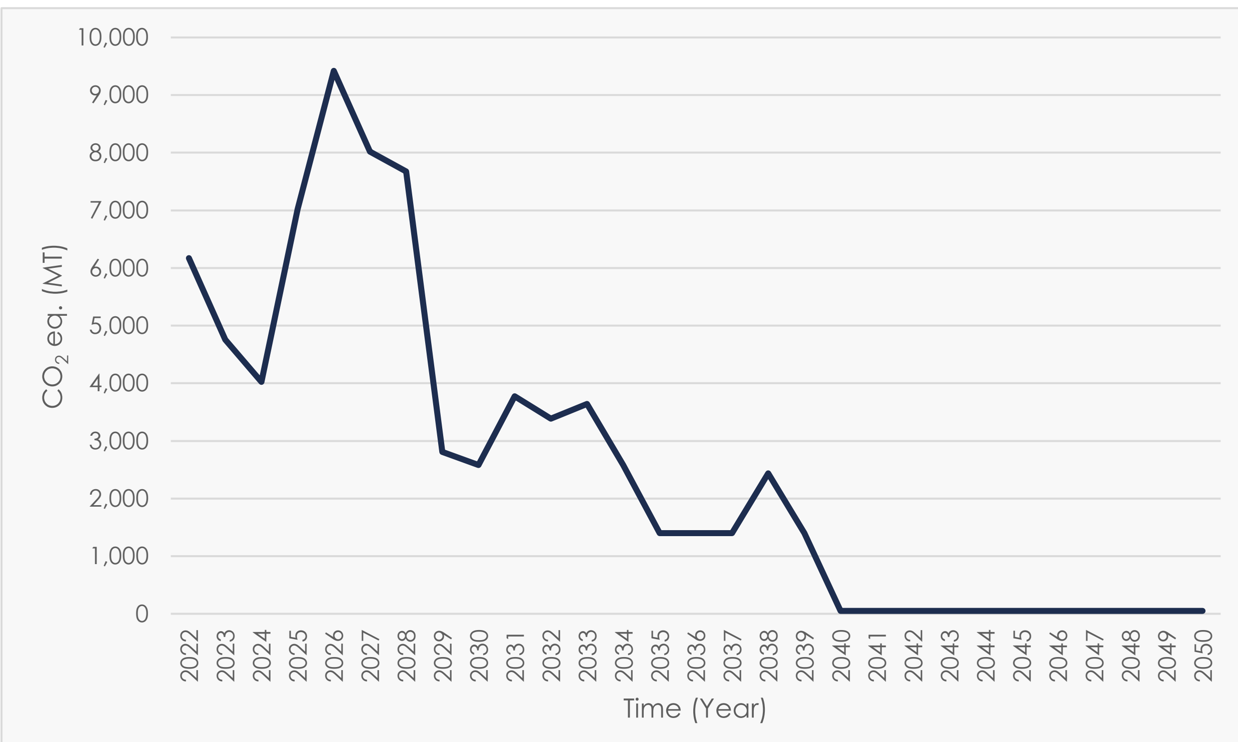


Figure 20-2 Projected emissions at Phase 2 Matawinie Mine

20.1.4. Closure Plan

Section 232.1 of the *Mining Act* states that a rehabilitation and closure plan is a requirement and must be approved before the mining lease is issued and a financial guarantee to cover all reclamation cost is provided in the two years following the approval of the plan. Hence, a reclamation and rehabilitation plan has been presented to the MERN in October 2019. The rehabilitation and reclamation plan has been developed following the provincial Guidelines for Preparing a Mining Site Rehabilitation Plan and General Mining Site Rehabilitation Requirements (2017), which provides to the proponents the rehabilitation requirements. (SNC-Lavalin, 2019b)

Reclamation will include all activities carried out during the mining operations (progressive reclamation) and at the end of mining activities covered by the closure plan.

Progressive reclamation activities will be carried out during the mining activities. The final reclamation cover will be placed on the co-disposal pile as soon as an area of the pile will have reached its final elevation (starting at Year 4). It will reduce the volume of water to treat (after post-closure follow-up) from the co-disposal pile and minimize the visual impact of such structures.

Also, the progressive backfilling of the pit with PGA tailings, NGA tailings and waste rocks will begin between the sixth to eighth year of operation. Throughout mining, the open portion of the pit will be secured as its contour reaches its final surface position. A berm composed of blocks of waste rock or other materials 2 m high with a horizontal crest 2 m wide will be constructed at a safe distance from the pit and signposts will indicate the presence of the pit. At the end of the operation, the proponent expects that a body of water will form in its unfilled portion, i.e., the northern section.

At the end of the mine life, surface infrastructure and equipment will be dismantled and removed from the mine site. This includes, but is not limited to, electricity transport equipment, e-houses, semi-mobile crusher and conveyors, site buildings, storage sheds and other mine structures. Concrete slabs will be removed and/or covered to enable the growth of vegetation. Backfilling and levelling of ditches and the implementation of wetlands in the collection basin footprint are planned and part of the reclamation activities. A water body is expected to form at the northern portion of the pit. At the end of the monitoring phase, if applicable, access and site roads will be scarified and revegetated.

Restoration work will be carried out gradually during the operation phase. Otherwise, most of the restoration work will be spread over a maximum period of two years after the operation phase. The costs for the work planned during the restoration of the mine site of the Project as presented are estimated by SNC-Lavalin at $30 million.

20.2. Phase 2 Bécancour Battery Material Plant

NMG completed an environmental baseline study of the 200,000-m² land (hereafter named Lot 17) located within an industrial park for the future Phase 2 Bécancour Battery Material Plant (WSP, 2021) between avenue G.-A.-Boulet and Alphonse-Deshaies boulevard in Bécancour.

20.2.1. Regional Climate

Climate data is based on the St. Narcisse meteorological station (climatological ID: 7017585) from Environment Canada (2022). The station is located approximately 17,98 km from the site. This meteorological station collected data between 1981 and 2010.

The average temperatures available for the Bécancour region are presented in the Table 20-5.

Table 20-5: Average temperatures (Environment Canada, 2022)

Month	Daily average (°C)	Daily maximum (°C)	Daily minimum (°C)
January	-12.7	-7.2	-18.1
February	-10.2	-4.5	-15.9
March	-4.2	1.2	-9.6
April	4.4	9.5	-0.9
May	11.9	18.3	5.6
June	17.1	23.3	10.8
July	19.5	25.6	13.5
August	18.4	24.6	12.3
September	13.7	19.4	7.9
October	6.8	11.8	1.9
November	0.2	4.0	-3.6
December	-8.2	-3.6	-12.8
Annual	**4.7**	**10.2**	**-0.8**

July is the warmest month and January the coldest. The extreme temperature events data are:

- Extreme maximum temperature: 35.5°C on May 25, 2010;
- Extreme minimum temperature: -41.0 on January 18, 1982.

The mean annual total precipitation is 1,063.1 mm (885.1 mm as rain and 178.0 cm as snow). Table 20-6 presents the average precipitation in snowfall and rainfall (*Environment Canada*, 2022).

Table 20-6 Average precipitation, snowfall and rainfall (Environment Canada, 2022)

Month	Rainfall (mm)	Snowfall (cm)	Precipitation (mm)
January	19	42.3	61.4
February	16.1	33.9	50
March	33.3	30	63.3
April	71.7	6.8	78.4
May	96	0.3	96.2
June	105.3	0	105.3
July	116.5	0	116.5
August	104.5	0	104.5
September	111.5	0	111.5
October	104.2	1.5	105.7
November	75.3	18.1	93.4
December	31.8	45	76.9

Annually, there are, on average, 53.6 rainy days (≥ 5 mm) and 11,8 days of snow (≥ 5 cm) in the region of Bécancour. Overall, there is no snow cover from May to October. The average snow-depth is presented in the Table 20-7.

Table 20-7 Average snow-depth at the St Narcisse meteorological station (Environment Canada, 2022)

Month	Average snow-depth (cm)
January	38
February	53
March	52
April	5
May	0
June	0
July	0
August	0
September	0
October	0
November	2
December	19
Annual	**14**

Statistical data for the different temperatures and precipitations are taken from Environment Canada (2022). The website is available in references in Chapter 27.

The wind rose from the Trois-Rivières station (climatological ID 7018562) is shown in Figure 20-3.

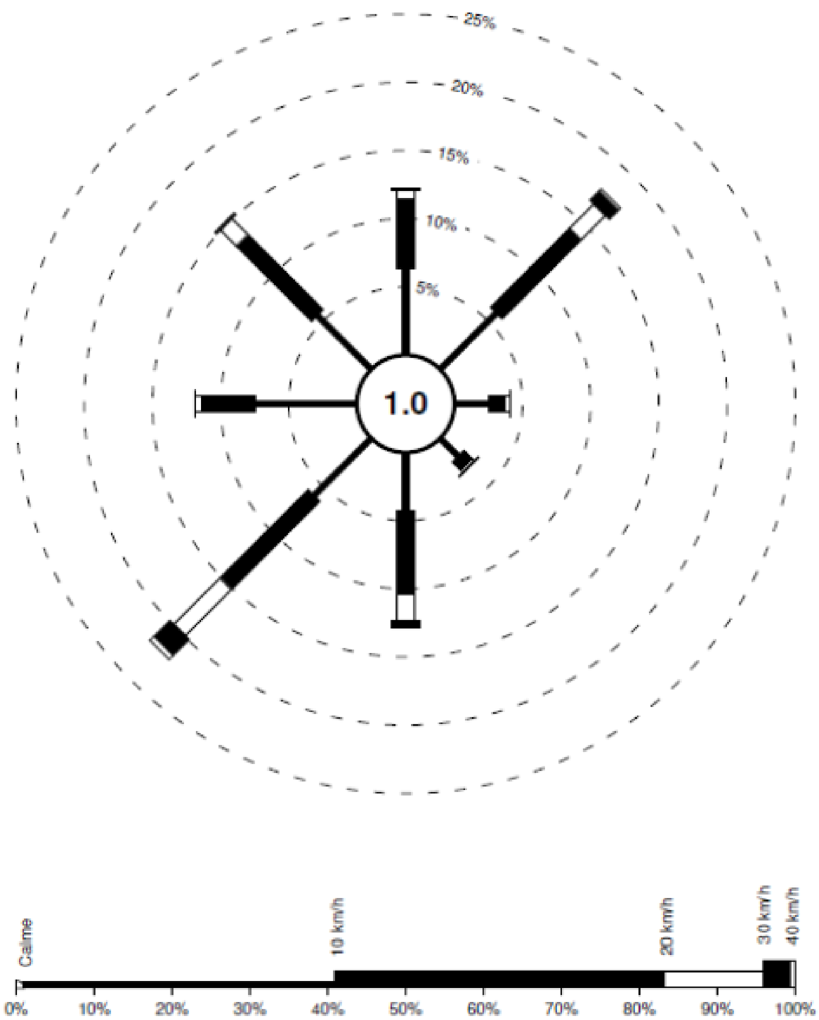


Figure 20-3: Wind rose from the Trois-Rivières station (climatological ID 7018562) (SMC, 2022)

20.2.2. Anticipated Regional Effects of Climate Change

According to the map provided by Ouranos (2015), the Project is located in the southern region of Québec. The projected relative changes of average temperatures are shown in Table 20-8. The intervals in Table 20-8 indicate the 10th and 90th percentiles of the climate simulations made by Ouranos (2015).

Table 20-8 Annually projected relative change of average temperatures (Ouranos, 2015)

Δ (°C)					
Horizon 2020		Horizon 2050		Horizon 2080	
10th percentiles	90th percentiles	10th percentiles	90th percentiles	10th percentiles	90th percentiles
+0.9 to +2.1	+1.1 to +2.3	+1.7 to +3.7	+2.4 to +4.6	+2.1 to +4.7	+4.1 to +7.2

Overall, there is a minimum increase of 0.9°C to be expected in the region of the Phase 2 Bécancour Battery Material Plant.

Climate change will inevitably lead to increased precipitation. Table 20-9 presents the increase in precipitation predicted according to Ouranos (2015).

Table 20-9 Projected relative changes in precipitation total (Ouranos, 2015)

Δ (°C)					
Horizon 2020		Horizon 2050		Horizon 2080	
10th percentiles	90th percentiles	10th percentiles	90th percentiles	10th percentiles	90th percentiles
+2 to +7	+0 to +7	+3 to +11	+5 to +14	+3 to +14	+5 to +20

By 2050, there will be at least 3% increase in total precipitation to be expected.

Snow cover will react to changes in temperature and precipitation. According to Ouranos (2015), the change in snow cover will vary, depending on the region, based on several parameters (altitude, climatic regime, type of surface and vegetation). All climate change predictions will be used in the detailed engineering design. Obviously, extreme weather events are likely to increase. Climate change will also increase water flows and sea level.

20.2.3. Soil Characterization

20.2.3.1. Phase 1 ESA

A Phase I environmental site assessment (ESA) based on the CSA Z768-01 standard as well as section 1.0 of the Terrain Characterization Guide was produced for Lot 17. It included a review documentary, field visits and recognition of adjacent properties from the public domain. Those activities made it possible to identify issues for Lot 17, namely:

- An environmental issue on the site (presence of two backfill areas with contamination potential; petroleum hydrocarbons, polycyclic aromatic hydrocarbons [PAHs], metals, organic compounds volatile [VOC] and/or residual hazardous material);
- A significant potential environmental issue in connection with a neighbouring property (presence of land contaminated adjacent to southeast; PAHs, metals, fluorides, sulphur).

Considering this, the soil and groundwater characterization protocols in Lot 17 have been adapted to validate or invalidate the presence of contamination related to these issues.

20.2.3.2. Soil Characterization

A characterization comprising 12 boreholes was carried out from July 27 to 30, 2020 on Lot 17. A continuous soil sampling was done on this occasion within in situ measurements of the concentrations of volatile organic compounds (VOCs). A total of 19 soil samples were submitted for laboratory analysis for the following parameters: petroleum hydrocarbons C10-C50 (HP C10-C50), aromatic hydrocarbons polycyclics (PAHs) and metals (14). No organoleptic index (visual and/or olfactory) of contamination with petroleum products has been observed in the soils in line with the surveys. The in situ measurements VOCs were all zero.

The result of the soil analyses were compared with the criteria in Appendices I and II of the Regulation respecting the protection and the rehabilitation of land, corresponding to criteria B (residential or institutional) and C (industrial or commercial) of the Intervention Guide – Soil Protection and Land Rehabilitation (MELCC, 2021). Background levels (criterion A) of metals and metalloids were also used.

All the results obtained show that criterion C of the Intervention Guide – Soil Protection and Rehabilitation land, applicable for a land of industrial use, is respected. In fact, all the results of HP C_{10}-C_{50} and PAH remained below the detection limit of the laboratory. Moreover, most metal analysis results remain below the A criterion corresponding to natural (322 results < A out of 342 analyses). There are 16 results in the A-B range, mostly for arsenic (12 cases), and four results in range B-C for manganese. The data accumulated during the Phase I ESA does not identify any source or cause explaining the presence of arsenic and manganese in the field.

These results suggest the absence of contamination in Lot 17 resulting from the identified environmental issue on the site during the Phase I ESA. Indeed, the surveys carried out in the backfill areas found on Lot 17, like all the other surveys, do not show a binding level of contamination for use industrialist of this land.

20.2.4. Geomorphology and Topography

Lot 17 is in the Bécancour Industrial and Port Park (PIPB) and is bordered by road or industrial infrastructure. The inventoried portion of land is crossed by drainage ditches with a mainly north-south orientation. Five wetlands grouped into four types of groupings and 16 terrestrial environments grouped into six types of stands were listed. The soils have little organic matter and are mostly composed of loam clay and clay. Figure 20-4 illustrates the spatial distribution of all environments.

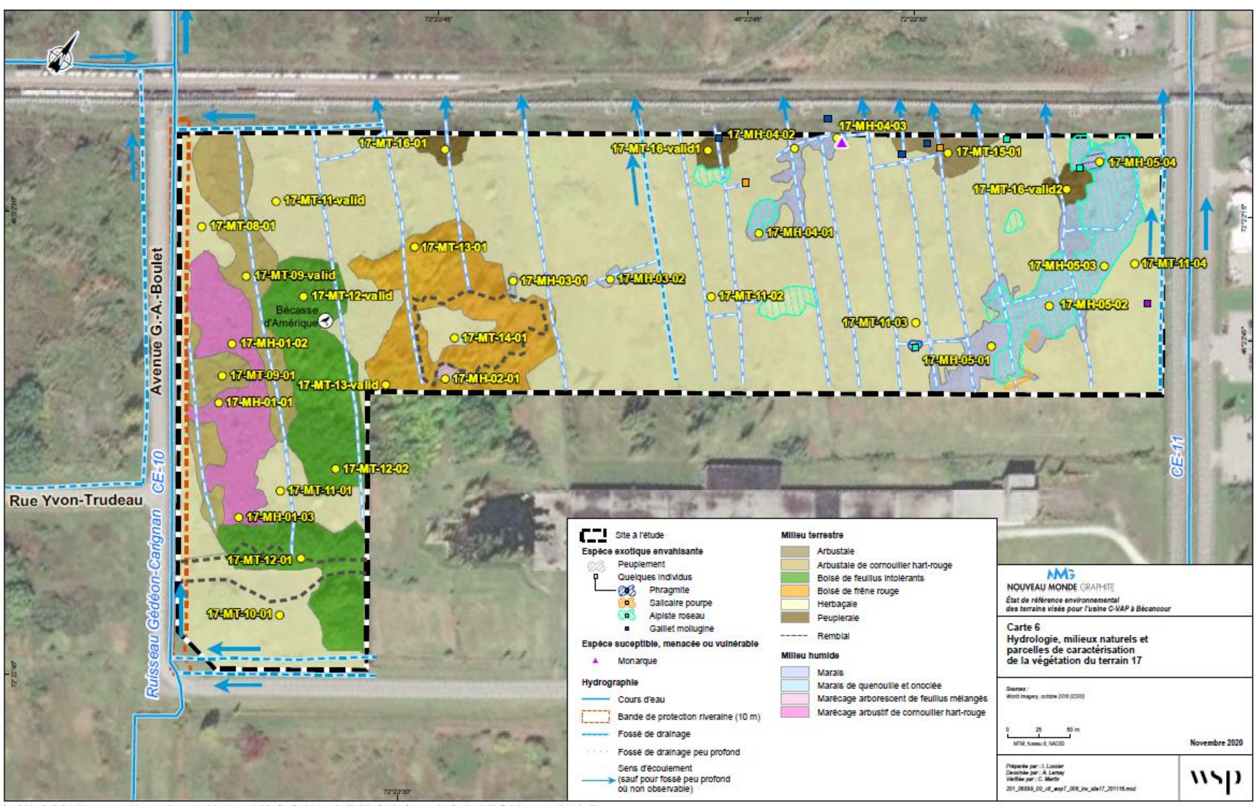


Figure 20-4: Spatial distribution of all environments on Lot 17

In all, 88.5% of the study area is covered with land. Most of the study area is composed of herbaceous plants (Table 20-10). In a smaller area, there are shrublands, a deciduous woodland intolerant, a wooded area of red ash and islets of poplar plantations. The size and nature of the terrestrial environments are determined by the silvicultural treatments and the nature of the soil. A backfill is located under grass grove 17-MT-14 and partly under red ash woodland 17-MT-13. The second embankment is in part under the grassland 17-MT-10 and the intolerant deciduous woodland 17-MT-12. The presence of backfill slows the regeneration of the environment for these stands and the vegetation near the roads is maintained regularly.

The general topography of the land is relatively flat, slightly descending towards the St. Lawrence River.

Table 20-10: Areas and proportions of terrestrial environments observed on Lot 17

Plant group	ID	Area in the study area (m²)	Proportion in the study area (%)
Herb cover	17-MT-08	5 584	2.8
	17-MT-10	9 738	4.9
	17-MT-11	114 693	57.8
	17-MT-14	1 496	0.8
Shrub cover	17-MT-09	9 864	5.0
	17-MT-15	1 679	0.8
Grove of intolerant hardwoods	17-MT-12	17 146	8.6
Grove of red ash	17-MT-13	13 089	6.6
Poplar forest	17-MT-16	2 339	1.2
Total		**175 628**	**88.5**

20.2.5. Hydrology

The study area consists of 11.5% wetlands (Table 20-11). The two biggest wetlands listed on the site are a marsh, mainly composed of reed canary grass (*Phalaris arundinacea*; 17-MH-05), and red osier dogwood shrub swamp (*Cornus sericea*; 17-MH-01). In a smaller area, there is also a marsh, a cattail and fern marsh, as well as a mixed hardwood tree swamp. All the wetlands on Lot 17 are isolated from each other. Thus, no complex of wetlands is present on the site.

Only the Gédéon-Carignan stream flows on the western margin of Lot 17. Two types of ditches are present on the two sites under study. A very large number of little drainage ditches deep squares the sites. These ditches are generally less than 40 cm deep, are completely vegetated and accumulate water during periods of melting or rain. Roadside ditches and some ditches crossing the sites are deeper (1 m and more), partly vegetated and water is generally present in these.

Table 20-11: Areas and proportions of wetlands observed on Lot 17

Plant group	ID	Area in the study area (m²)	Proportion in the study area (%)
Marsh	17-MH-05	11 893	6.0
	17-MH-04	2 095	1.1
Marsh of cattails and ferns	17-MH-03	374	0.2
Cornus sericea shrub swamp	17-MH-01	8 066	4.1
Mixed hardwoods swamp	17-MH-02	365	0.2
Total		**22 793**	**11.5**

20.2.6. Hydrogeology

Sampling of the new observation wells installed on Lot 17 was carried out on August 14 and October 23, 2020. The low flow, low drawdown (micropurge) purging, and sampling method has been used for all observation wells. Two (one of the wells being dry) and three samples have respectively been subjected to laboratory analysis during each sampling for the following parameters: petroleum hydrocarbons C_{10}-C_{50} (HP C_{10}-C_{50}); polycyclic aromatic hydrocarbons (PAHs); and metals (18) and fluorides. No indication of contamination (free phase or immiscible liquid) was observed in the water underground during the two sampling campaigns.

The result of the groundwater analysis were compared to the resurgence criteria in surface waters (RES) of Appendix 7 of the Intervention Guide – Soil Protection and Rehabilitation of Contaminated Sites.

The results show that all the concentrations of HP C_{10}-C_{50} and PAHs remain below the limits of laboratory detection and applicable RES criteria. Examination of metal and fluoride results reveals that the RES criteria are respected everywhere, as are the alert thresholds set at 50% of these criteria.

These results suggest the absence of contamination on the Lot 17 resulting from a migration of the stake significant environmental potential identified on the neighbouring property upstream hydraulic during the Phase I ESA.

20.2.7. Vegetation and Wildlife Baseline Studies

20.2.7.1. Invasive Alien Species

On Lot 17, reed canarygrass (Phalaris arundinacea), purple loosestrife (Phragmites australis), (Lythrum salicaria) and European bedstraw (Galium mollugo) are ubiquitous.

20.2.7.2. Floristic Species Threatened, Vulnerable or Likely to be Designated

Fifteen plant species at risk have been identified in the past within an 8-km radius of the site. However, no plant species that are threatened, vulnerable or likely to be so designated were listed during the survey. At the level of invasive alien species (IAS), phragmites (Phragmites australis), reed canarygrass (Phalaris arundinacea), purple loosestrife (Lythrum salicaria) and bedstraw (Galium mollugo) are ubiquitous. Moreover, it is important to note the strong dominance of reed canarygrass in a large proportion of wetlands surveyed in Lot 17 (WSP, 2021).

Opportunistic observations during Lot 17 inventories made it possible to detect the presence of the woodcock of America and the Monarch butterfly (considered endangered by the federal authorities). Besides the monarch, none of the species observed has protection status.

20.2.8. Physical Environmental Baseline Studies

Additional inventories were carried out in the spring of 2022 to confirm the absence of certain other species with precarious status on the land covered by the Project for which the recommended inventory periods had not been covered in 2021. The reference state of the components following environmental conditions:

- Herpetofauna (amphibians and reptiles);
- Chiropter (bats);
- Avifauna;
- Validation during the summer period of the absence of certain species with a precarious status potentially present in this area, especially nightjars and short-eared owls.

List of valuable components are identified in Table 20-12 with their provincial, federal and international status.

Table 20-12: List of valuable components

Species	Identified species with special status		
	Provincial status[5]	Federal status[6]	International status[7]
Common Nighthawk (Chordeiles minor)	Likely[8]	Threatened	Least concern
Collared Sand Martin (Riparia)		Threatened	Least concern
Barn Swallow (Hirundo rustica)		Threatened	Least concern
Eastern Meadowlark (Sturnella magna)		Threatened	Near threatened
Little brown bat (Myotis lucifugus)		Endangered	Endangered
Eastern Pipistrelle (Pipistrellus subflavus)	Likely	Endangered	Vulnerable
Silver-haired Bat (Lasionycteris noctivagans)	Likely		Least concerned
Hoary bat (Lasiurus cinereus)	Likely		Least concerned
Eastern red bat (Lasiurus borealis)	Likely		Least concerned

20.2.8.1. Herpetofauna

Anurans

Incidental observations made in 2021 were noted. Five species were detected in the study area, including American toad (Anaxyrus americanus), green frog (Lithobates clamitans), leopard frog (Lithobates pipiens), spring peeper (Pseudacris crucifer) and gray tree frog (Dryophytes versicolor). They are all common and widespread species in southern Québec. Inventories specific to this faunal group could however be carried out in 2022, according to the MFFP protocols appropriate.

Urodeles

No salamanders were detected during active excavations carried out in 2021. Furthermore, no mounds of sphagnum suitable for the four-toed salamander has been observed and very few stretches of watercourses are favourable to stream salamanders.

Inventories specific to these species could however be carried out in 2022, according to the MFFP appropriate protocols.

[5] *Loi sur les espèces menacées ou vulnérables*, Government of Québec, 2021.
[6] Annex 1 of the Species at Risk Act, Government of Canada, 2021.
[7] IUCN Red List Index, 2022.
[8] Means the species is likely to be designated as threatened or vulnerable in Québec

Snakes

The inventory carried out using the asphalt shingle method and the active search made it possible to detect four garter snakes (Thamnophis sirtalis) and 13 red-bellied snakes (Storeria occipitomaculata. These two species are common and widespread in Québec.

Avian fauna

Inventories carried out in 2021 confirmed the presence of 46 species of birds, three of which could be confirmed breeding in the study area. Four species of birds with a precarious status, in Québec or in Canada, have been observed, namely the common nighthawk, the bank swallow, the barn swallow and the meadowlark. The latter probably nests on the site.

The environment in which the new plant is located has a bird diversity typical of fallow environments and offers a favourable nesting habitat for these species, including the Eastern Meadowlark. We therefore believe that the implementation of the new plant could lead to a loss of breeding habitat for these species and an alteration of the area feeding aerial insectivores, such as bank and barn swallows. To reduce the effects of project on these species, mitigation measures, such as restrictions on cutting times, could be applied.

Chiroptera

The inventory identified six species and two species complexes. Migratory bats represent the main part of the frequentation by bats of the two stations and their level of activity remains relatively stable during breeding and migration periods. This finding is consistent with the marked decrease in populations of resident bat species in Québec.

The activity levels recorded for the different species during the breeding season do not suggest the presence, in the immediate vicinity of the stations, of habitats housing maternity colonies.

Station CS-01, which presents a mosaic of wooded islets and open and humid environments, is the most interesting in terms of habitats for bats. It is moreover at this station that the activity levels identified were the highest, especially for the less frequent species.

Despite the strong anthropization of the study area, the results of the acoustic inventory of bats indicate that favourable habitats remain in the sector of the Bécancour industrial park. Although these are often residual, they are even more important for bats as they are less frequent. Moreover, apart from the big brown bat, all the species recorded in the study area are the object of a special status in Québec or Canada.

Therefore, project activities likely to have an impact on bats and their habitats, such as deforestation, should be carried out outside the period from mid-May to mid-August to avoid the season birth and rearing of young bats.

20.2.9. Regulatory Context and Permitting

The NMG project in Bécancour (Phase 2 Bécancour Battery Material Plant) is under section 22 of the Environment Quality Act (EQA). There are three levels of government with laws, regulations and guidelines that 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 neighbourhood aspects. Federal and provincial regulations may have the most impact on the Project schedule. The list of permits required is presented in Table 20-13.

Several requests for authorization following the different stages of the design or the construction activities will be required. A delay of 75 days to 6 months is usually contemplated by the Ministry of the Environment and the Fight against Climate Change (MELCC) for the review of a request and issuance of an authorization. This delay could be longer depending on the time required to respond to MELCC questions, if needed. The request form and all required documents must be sent to the MELCC Mauricie and Centre-du-Québec regional office.

In granting an authorization, the MELCC certifies that the Project is developing 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 permits and authorizations will have to be obtained according to various sections of the EQA as indicated in Table 20-13. Permits and authorizations must also be obtained from other ministries, mainly the Ministry of Energy and Natural Resources (MERN) and by the Ministry of Forests, Wildlife and Parks (MFFP).

Table 20-13: Permits and authorizations required for Phase 2 Bécancour Battery Material Plant

Activities	Object	Authority
Provincial		
Wood Cleaning – Trailer Pad – Site Levelling, Site Securing (entrance and exit) and Site Boundaries (fences)	Request for Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC
Wood Cleaning – Trailer Pad – Site Levelling, Site Securing (entrance and exit) and Site Boundaries (fences)	Compensation for adverse effects on wetlands and bodies of water and other regulatory provisions (RCAMHH, Chapitre Q-2, r. 9.1)	MELCC
Wood Cleaning – Trailer Pad – Site Levelling, Site Securing (entrance and exit) and Site Boundaries (fences)	Forestry permit for activities carries out by a holder of mining rights in exercising those rights (tree cutting, road works)	*Sustainable Forest Development Act* under the MFFP

Activities	Object	Authority
Stripping – Drainage – Water basin	Request for Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC
Stripping – Drainage – Water basin	Demande d'objectifs environnementaux de rejet (OER) (L.R.Q., c. Q-2; articles 22, 31.1, 32, 70.9, 164 et 201)	MELCC
Stripping – Drainage – Water basin	Threatened or Vulnerable Species (LEMV, RLRQ, Chapitre E-12.01, r. 2 floristiques r. 3 fauniques)	MFFP
Establishment of the Anode-Plant	Request for Authorization (RLRQ, Chapitre-Q-2, article 22)	MELCC
Establishment of the Anode-Plant	Devis de modélisation atmosphérique – Règlement sur l'assainissement de l'atmosphère (RQA, Chapitre Q-2, r. 38)	MELCC
Operation of the Anode-Plant	Request for Authorization (RLRQ, Chapitre-Q-2, article 22) including Rapport de modélisation atmosphérique – Règlement sur l'assainissement de l'atmosphère (RQA, Chapitre Q-2, r. 38)	MELCC
Explosive Activities	Permit of possession, storage, and transportation of explosives, if needed	Explosive Act under the *Sûreté du Québec*
Establishment and operation of the Anode-Plant	Permit to store petroleum products	Building Act, *Régie du Bâtiment*
Municipal		
Establishment and operation of the Anode-Plant	Construction Permit	City of Bécancour
Federal		
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	Demand for MPO reviews and potentially a permit, if needed	Fishing Act, Fisheries and Oceans Canada (MPO)
Possession and use of radiation devices	Authorization for the possession and use of radiation devices	Nuclear Safety and Control Act, Canadian Nuclear Safety Commission (CNSC)

20.2.10. Requirements and Plans for Waste and Tailings Disposal, Site Monitoring, and Water Management

20.2.10.1. Water Management

As part of the provincial environmental authorization process, the water management plan will have to be approved by the regional MELCC.

- A detailed site water balance will have to be produced as part of this procedure.
- The water management plan will include the collection and treatment, if required, of all waters that will have been in contact with the Project activities.
- Stormwater management facilities will be designed based on the guidelines of *Code de Conception* of a stormwater management system. The facilities will be designed to provide quantitative and qualitative control of stormwater before their discharging into existing ditches bordering the limits of the study area.

20.2.10.2. Waste Management

Process Waste

Two waste products are generated by the Battery Material plant: fouled insulating media and the water treatment plant sludge. The fouled media consists of a surface layer of carbon-based insulating material from the purification furnace in which the vaporized impurities from the purified graphite are collected and condensed. Analyses indicate that the composition is a mixture of inert carbon, and mixed metal oxide and chloride species. Preliminary test work is underway to understand how the media could be treated to remove the metallic impurities to enable recycling of the insulating material to the purification process and to determine what level of impurity contamination can be tolerated in recycled media. For the purposes of the FS, it was assumed that the 5,800t of this material generated per year would be trucked to an authorized disposal site located near Montréal.

The second waste material produced is the water treatment plant sludge. The sludge generated consists of precipitated metal hydroxides and gypsum. Approximately 4,800 t of sludge produced annually are trucked to Matawinie for co-disposal with the concentrator tailings. Additional details about the sludge material are available in Section 17.3.2.7.

Waste and Hazardous Waste

The MRC of Bécancour hosts two MELCC-authorized landfill and treatment sites for wastes and hazardous wastes, both owned by Enfouibec. One is located next to the Laviolette Bridge, in St-Grégoire, about 10 km west of the PIPB, and the other in Ste-Gertrude, about 16 km south-east of the PIPB. Enfouibec recuperates dry materials (asphalt, concrete, wood, paving stone, bricks), offers treatment and landfilling services for contaminated soils, and recovers and transforms residues from the pulp and paper industry (sludge, ashes and fertilizers). It should be noted that the Ste-Gertrude site is used for non-recoverable dry materials.

Compagnies located in the PIPB are responsible for managing their own wastes, both non-hazardous and hazardous. Gestion 3LB Inc., a subsidiary of Enfouibec, recently developed an engineered landfill (designated in French as a "*lieu d'enfouissement technique*", or LET, in the applicable provincial regulation) within the limits of the PIPB. This landfill is exclusively intended for industries and service providers located within the PIPB area who wish to dispose of non-hazardous waste.

The use of undesirable materials (related to health and/or the environment) such as PCBs, CFCs, asbestos, lead, halons, formaldehyde-based insulation and lead-based paints is prohibited. The presence of chlorine gas and conductive graphite dust in some production areas requires special consideration in the selection of electrical equipment and installation methods at these locations.

20.2.11. Social Context and Stakeholder Engagement

Proposed advanced manufacturing operations will be in Bécancour, Québec, approximately 150 km northeast of Montréal, by the St. Lawrence River. The robust local infrastructure provides the Project with a direct supply of required chemicals in addition to affordable hydroelectricity, a skilled workforce, and a multi-modal logistical base that includes a major international port in proximity to U.S. and European markets.

20.2.11.1. Socio-Economic Context

The MRC of Bécancour covers an area of 1,234 km^2, has a population of 20,451 and brings together 12 municipalities (city, municipality or parish). The city of Bécancour is the most populated, with 13,132 people in 2017 (MAMOT, 2017a and b). The population of the MRC of Bécancour increased by 1.6% between 2011 and 2016, and the population of the city of Bécancour, by 4.8% between 2011 and 2016 (MAMOT, a; *Statistique Canada*, 2015).

The metropolitan area of Trois-Rivières, which includes Trois-Rivières and the neighbouring municipalities as well as the city of Bécancour had 156,042 inhabitants in 2016, which represents an increase of 2.8% compared to 2011.

In 2015, the Centre-du-Québec region had 19.9% of people over 65 years old while young people under 24 accounted for 26.7%. The proportions were similar in the MRC of Bécancour with 20.9% of people over 65 and 25.4% of people under 24. The proportion of 25-64 years old considered to be the working population was lower in the Centre-du-Québec (53.4%) and the MRC of Bécancour (53.7%) than in all of Québec (55.1%) (ISQ, 2015a). According to the demographic trends of the *Institut de la statistique du Québec* (ISQ), between 2011 and 2036, the population of the MRC of Bécancour could increase by 13.1% (ISQ, 2015b).

The economic activity of the Centre-du-Québec is strongly linked to economic activity of La Mauricie region. The city of Trois-Rivières is the economic centre and is located less than 20 minutes from Bécancour. The economic activity of the Centre-du-Québec should grow over the next few years, stimulated by several projects that will require investments comparable to those of recent years, i.e., approximately $830 millions.

The employment rate in the MRC of Bécancour is lower than the average provincial rate while the city of Bécancour's employment rate is similar to the provincial average rate. Unemployment rates are lower than the rates of the province, both for the city and the MRC of Bécancour.

In the MRC of Bécancour, agriculture occupies nearly 48% of the territory. Dairy farming represents 43% of producers and generates more than 60% of incomes. The primary sector of the MRC is also characterized by agricultural products transformation activities such as cheese and cranberries. Nearly 70% of jobs in the secondary sector are associated with the *Parc Industriel et Portuaire de Bécancour* (PIPB). The MRC also has the *Parc Industriel & Commercial 30-55* located near the Laviolette bridge. More than 4,000 jobs distributed in 516 companies are listed in the tertiary sector.

The PIPB is currently experiencing a major development boom with the announced arrival of strategic players of the battery value chain sector. In addition to NMG's development through its Phase 1 purification plant within Olin's facility and proposed Phase 2 Bécancour Battery Material Plant, the PIPB has attracted major players from the battery sector namely BASF, GM-POSCO and Nemaska Lithium that have all announced the construction of commercial plants by 2025.

Under the law respecting the *Société du parc industriel et portuaire de Bécancour* (SPIPB), the mission of the SPIPB is to promote Québec's economic development by developing and operating, with an objective of self-financing, an industrial and harbour park at Bécancour (LégisQuébec, 2018).

The Bécancour industrial and harbour park covers an area of nearly 7,000 ha. It accommodates over thirty industrial and services companies. The Bécancour industrial and harbour park currently attracts a strong interest. Twenty industrial and commercial projects are under construction or under study.

20.2.12. Relations with Stakeholders

As the Phase 2 Bécancour Battery Material Plant project will become an active member of a new clean technology innovation hub, feedback from local stakeholders will be even more important to ensure an inclusive and respectful diversification of the local and regional economy. Through an open and proactive dialogue, NMG strives to maintain collaborative relationships with local stakeholders, including the City and MRC of Bécancour, the Abenaki First Nation community, the regional branch of MELCC and regional industrial and associative partners. As the Project unfolds, other stakeholder groups will be included in discussions around development initiatives that are aligned with current realities, needs and ambitions. The current stakeholder groups are listed in Table 20-14.

Table 20-14: Current stakeholders for the Bécancour Battery Material Plant

Relevant local and regional stakeholder groups
Citizens
Community and economic development organizations
Employees
Environmental groups
Indigenous Peoples communities and organizations
Industry and sectoral associations
Members of the public and media
Municipal and governmental authorities
Suppliers and business partners

Listening and responding to community concerns is a priority and a stakeholder engagement strategy will be developed to address issues as they emerge. NMG has already met with representatives from the PIPB, the Grand Council of the Waban-Aki Nation, the Bécancour Environmental Consultative Council, the Bécancour political representatives (municipal, provincial and federal) as well as the regional Chamber of Commerce. The interaction has been very positive so far, with a focus on collaboration opportunities to create shared value and advance local interests. NMG has already started integrating feedback into its project management workplan, with the carrying out of an archeological potential study for its Phase 2 site and upcoming on-site archeological work in 2022.

NMG intends to expand and deepen its community engagement as it advances the Project. The strategy will be tailored to meet the needs of each stakeholder group and will include regular updates on progress through various communication channels, outreach and consultation activities, and long-term partnerships.

20.2.13. GHG Emissions Phase 2 Bécancour Battery Material Plant

Process emissions are the main source of GHG emissions at the Phase 2 Bécancour Battery Material Plant while NMG's proprietary purification ecotechnology leveraging hydropower enables significant reduction in the carbon footprint. To optimize the carbon performance of the Phase 2 Bécancour Battery Material Plant, NMG is evaluating opportunities to reduce the energy consumption of both its processes and buildings, and to substitute carbon-based materials with non-carbon-based ones with similar properties.

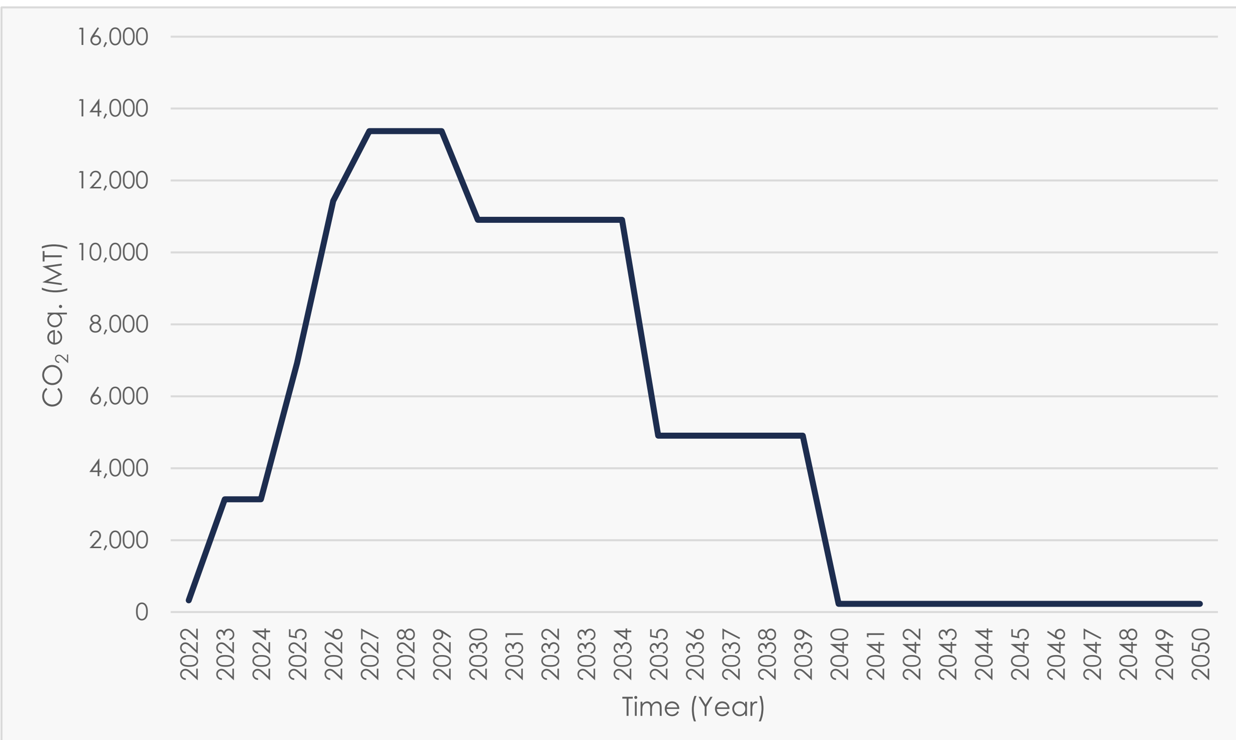


Figure 20-5: Projected emissions at Phase 2 Bécancour Battery Material Plant

21. Capital and Operating Costs

The Matawinie Mine project is a greenfield mining and processing facility with average mill feed capacity of 2,550,556 tonnes per year (tpy) of ore to produce 105,882 tpy of graphite concentrate.

The Bécancour Battery Material Plant project is a greenfield commercial processing plant equipped to produce a wide range of high-performance graphite-based materials, thanks to the micronization, spheronization, purification and coating units. NMG's objective is to produce 42,616 tpy of anode material in the form of purified and coated spherical graphite (CSPG - Coated Spherical Purified Graphite), and 3,007 tpy of large purified Jumbo Flakes. Supported by Québec hydroelectricity, the Plant aims to achieve a neutral carbon footprint and bring a sustainable product to the market.

The capital and operating cost estimates related to the mine, the concentrator and Battery Material Plant have been developed by external consultants and consolidated by NMG as per the sources listed below:

Matawinie Mine Project

- BBA prepared the capital cost estimate for the purchase of the mine equipment fleet and the development of the open pit;
- SNC Lavalin prepared the capital cost estimates for all facilities except for the incoming power line, the electrical distribution, the water treatment facility and co-disposal area, consisting of the wastewater treatment plant and the sewage treatment plant relate to the co-disposal area;
- Hydro-Québec provided the capital cost estimate for the incoming 120 kV power line;
- Wood prepared the design layouts and quantities for the initial and sustaining capital cost estimates for the tailings co-disposal storage facilities and their respective reclamation cover as well as for the water management infrastructure. Unit rates for the tailings co-disposal area as well as for the water management infrastructure were developed by Wood, except for geotextile and geomembrane, which were under NMG's responsibility. Wood has also prepared the initial and sustaining capital cost estimates for the water treatment plant, including pumps and HDPE piping and equipment;
- Water treatment plant, pumps and HDPE piping were priced based on formal budgetary bids from vendors following Wood's performance specifications;
- ABB prepared the capital cost and sustaining cost estimates for all electrical and automation requirements for the Project;
- All costs provided by external sources were free of contingency and escalation;

- BBA performed a due diligence of the SNC Lavalin cost estimate and costs were adjusted to reflect latest market pricing for bulk materials and labour costs as of Q2 2022 and for consistency with the commercial plant Capex.

Bécancour Battery Material Plant Project

- A detailed feasibility level capital cost estimate was prepared by BBA based on detailed lists and material take-offs and supported by extensive market pricing;
- Over 90% of equipment pricing supported by budgetary quotes;
- The Project implemented a detailed trending and cost forecasting programming in the early stages of the study to assist in scope and layout optimization;
- Construction hours and labour costs for major bulk materials reviewed by local contractor.

The estimate base date is May 27, 2022.

The estimate base currency is Canadian dollars (CAD or $).

All bulk material pricing is based on Canadian dollars.

Budgetary pricing received for equipment has been converted to Canadian dollars using the following exchange rates provided by NMG.

Currency Code	Currency Name	Rate
CAD	Canadian Dollar	1.00
USD	US Dollar	1.275
EUR	Euro	1.35

21.11. Capital Cost Basis of Estimate and Assumptions Matawinie

The capital cost estimate (Capex) consists of direct and indirect capital costs, Owner's Costs as well as contingency. Provisions for sustaining capital are also included, mainly for the co-disposal storage facility (CSF) expansion. Amounts for the mine closure and rehabilitation of the site have been estimated as well. The working capital is discussed in Chapter 22.

21.11.1. Estimate Type and Purpose

The capital costs estimate prepared for this Feasibility Study are based on engineering deliverables, methodology and level of detail consistent with a Class 3 as defined by AACE International Recommended Practice 47R-11. The accuracy achieved was evaluated in the consideration of the level of definition reached in major engineering deliverables, execution strategy and pricing for each plant.

The capital cost estimates were developed within the expected accuracy range of ± 15% as attested by the results of the probabilistic contingency analysis using Monte Carlo analysis. The Estimate Accuracy inclusive of contingency is measured from P50.

The estimates have been organized by WBS, by discipline and commodity coding. Additionally, dedicated columns allow to filter detailed line items by MTO contributor.

The main objectives of this estimate are:

- Formulate the basis for the capital cost and financial section of the NI43 101 feasibility report;
- Permit NMG to reassess the economic viability of the Project;
- Formulate the basis for project funding;
- Allow for the potential reassessment of project scope via value engineering.

21.11.2. 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 Engineering, Procurement, and Construction Management (EPCM) type execution, in which one EPCM contractor will provide design and construction management activities for all processes and related infrastructure elements of the scope, as well as procurement activities for the entire Project, and one EPCM contractor will provide design and construction management activities for the elements of the scope pertaining to co-disposal and water management of the Project. All subcontracts would be managed by either one of the EPCM contractors.

All backfill materials will be available from gravel pits or other sources located close to the site. Mine waste rock from the open pit is not suitable for road construction due to its possibility of being acid generating. All excavated material will be disposed of within the site battery limits.

Temporary power during the construction phase would be provided through temporary genset until the permanent power is provided by Hydro-Québec.

21.11.2.1. Major Exclusions

The following items have not been included in the Capex:

- Provisions for inflation, escalation, and currency fluctuations;
- Provisions for risk and mitigation plans;
- Interest incurred during construction;
- Project financing costs;
- All duties and taxes.

21.11.3. Capital Costs Summary

Table 21-1 presents a summary of the initial capital and sustaining capital costs for the Project.

Table 21-1: Summary of capital cost estimate

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
Direct Costs								
0	Site Preparation	86,893	175	15,180,599	12,772,908	9,045,748	15,488,355	52,487,610
1	Mine	40,178	189	7,608,503	4,531,580	797,500	0	12,937,583
2	Ore Crushers & Stockpile	105,399	152	15,971,553	9,897,747	10,663,474	0	36,532,774
3	Processing Plant	632,075	149	93,992,459	50,810,783	86,470,054	3,000,000	234,273,297
7	Tailings and Water Management	124,867	182	22,734,192	7,910,121	6,508,390	0	37,152,703
Total Direct Costs:		**989,411**	**157**	**155,487,307**	**85,923,139**	**113,485,167**	**18,488,355**	**373,383,967**

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
Indirect Costs								
8000	Owner's Costs						11,201,519	11,201,519
9100	EPCM Services						27,752,679	27,752,679
9500	Temporary Facilities & Utilities						1,094,889	1,094,889
9500	Temporary Operation and Maintenance						8,891,300	8,891,300
9600	POV & Mechanical Acceptance						3,404,555	3,404,555
9700	Commissioning Spare Parts						2,269,703	2,269,703
9700	Initial Fill						817,989	817,989
9200	Freight						7,943,962	7,943,962
9600	Vendor Representatives						2,552,835	2,552,835
9200	Insurance and Duties						1,866,920	1,866,920
9800	Contingency						39,569,796	39,569,796
Total Indirect Costs							**107,366,146**	**107,366,146**
Total Direct + Indirect Costs		**989,411**	**157**	**155,487,307**	**85,923,139**	**113,485,167**	**125,854,501**	**480,750,114**

Note: Totals may not add up due to rounding.

21.11.3.1. Initial Capital Cost

The initial capital cost for the Project as outlined in the previous sections of this report is $480.8M of which $373.4M is direct costs, $107.4M is indirect costs including $39.6M is for contingency.

An amount of $62.4M has been provided to cover the sustaining capital over the life of mine. This amount excludes any requirement for working capital, which is included in the economic analysis.

21.11.3.2. Sustaining Capital

Sustaining capital is the amount required to periodically invest in the operations phase to maintain the functionality of the mining and processing operations. The Capex was developed to minimize outlays in the pre-production phase and delay any capital expenditures to later periods during Project revenue streams.

For this Project, the sustaining capital estimated at $62.4M is mainly related to the co-disposal system and water management. The initial period covers the development of preliminary drainage ditches, collection ditches, initial preparation of the west area for the co-disposal system, and the basins BC-1 and BC-2. All other work is scheduled for Years 2 through 26.

Allowances have also been provided for the removal and repositioning of the mine e-houses, power lines and charging stations as the mine advances to the north. Other sustaining capital consists of the replacement of the main transformers after periods of 10 and 20 years.

21.11.3.3. Closure and Rehabilitation Costs

Based on site layouts, a provision of $30M was estimated for the closure and rehabilitation of the mine site. Requirements were established, and cost estimates were prepared based on material take-offs and unit rates from recent databases. Quantities for the CSF reclamation cover were provided by SNC and priced by BBA.

The closure and rehabilitation costs include the dismantling and removal of all facilities and services and revegetation of the area. Part of the cover placement is included in the Opex as it will be part of the operation. Possible revenue from the salvage of equipment and materials was not considered in the closure costs.

21.11.4. 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 based on a 40-hour week, with no construction work during the weekend or on official holidays;
- Fluctuations to nominated currency exchange rates are excluded;
- Allowances for industrial disputes or lost time arising from industrial actions are excluded;
- Project financing costs and interest during construction are not included in the Capex;

- No allowance is provided for acceleration or deceleration of the Project schedule;
- Project insurances are included in the Owner's costs;

The Project Schedule is presented in Chapter 24.

21.11.4.1. Material Take-Off and Unit Rates

All quantities generated for the estimate are mainly based on material take-offs (MTOs) and deliverables that exclude contingencies of any kind. The MTOs were developed using the general layout drawings and cross-sections and general arrangement drawings.

Based on quantities generated by the MTOs, NMG received quotations from qualified contractors for concrete, structural steel and architectural features as well as prices for the four dome structures required for the Project.

The rates included the material, transportation, and direct labour to perform the work. Mobilization and demobilization, as well as indirect costs such as site management, construction equipment, and office trailers, were provided as separate costs and included in the Capex.

21.11.4.2. Construction Labour, Productivity Loss Factor

For works other than earthworks, concrete, structural steel and building cladding, as well as piping, the labour costs were estimated based on man hours and hourly rates developed for a typical crew from detailed tables of current rates developed by the *Association de la construction du Québec*.

The average all-inclusive hourly rate of $157 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 contractors' mobilization/ demobilization are included in the hourly rate.

The productivity loss factor of 1.20 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 shift per day, 8 hours per shift and 5 days per week for a total of 40 hours per week. Some contractors stated their preference for 10-hour days, 4 days per week, which was deemed acceptable. No weekend work was permitted due to possible interruptions to the local community.

It is assumed that sufficient lodging would be available in the nearby areas; therefore, no construction camp is required, and the Québec construction regulations would apply. The provision for per diem allowances to cover room and board and travelling of workers is included in the hourly rate.

21.11.4.3. Construction and Contractor's Costs

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 construction allowance based on delivered equipment cost was established from similar projects to cover for construction material, subcontract and mobile cranes. This allowance varied from 2% to 12% depending on the trade.

The estimate is based on the assumption that construction contracts will be attributed on the base of a competitive bidding process amongst qualified contractors. It is assumed that construction contracts will be cost plus or unit rates; hence, this Capex does not consider any time and material type contract.

Availability of qualified local contractors and skilled workers is assumed. It is also assumed 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 assumed as well as good site conditions, limited number of contractors on-site, limited work outside in winter and limited work disruption due to changes, interferences or delays.

21.11.4.4. 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 7.0% is applied.

All duties and taxes were excluded from the capital cost, but relevant factors were considered for the after-tax economic analysis.

21.11.5. Basis of Estimate – Mining

The capital costs for the mine include the expenses incurred during the pre-production phase to clear the trees and strip topsoil within the open pit, and to excavate 750,000 tonnes (t) of overburden, ore and waste rock. The capital costs also include the construction of the main haul road which will connect the pit to the crusher pad, the CSF, and the mine garage, as well as the purchase of the certain support and service equipment.

Since the mining fleet will be supplied by Caterpillar using their Job Site Solution (JSS) service model, the only mining equipment that will be purchased at the start of the Project will be certain support and service equipment. The fleet of production drills and the water/sand truck will be leased, with further details provided in the operating cost section of this report.

Table 21-2 presents the cost breakdown for the mine Capex.

Table 21-2: Mining Capex

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
1	**Mine**	**40,178**	**$189**	**$7,608,503**	**$4,531,580**	**$797,500**	**$0**	**$12,937,583**
1010	Pre-Prod	22,609	198	4,466,811	0	0	0	4,466,811
1015	Roads	12,916	193	2,496,089	0	0	0	2,496,089
1500	Mobile Equipment	0			2,206,580	0	0	2,206,580
1800	Other	0		0	0	797,500	0	797,500
1900	Garage & Office	4,653	139	645,604	2,325,000	0	0	2,970,604

21.11.6. Basis of Estimate – Infrastructure

Infrastructure for the Project covers those areas that are required for a mining project but are not process nor mining related. Infrastructure includes site earthwork preparation, main substation, sewage treatment plant, fresh water pumphouse and Power Line by Hydro-Québec.

Table 21-3 presents the cost breakdown for the infrastructure Capex.

Table 21-3: Infrastructure Capex

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
0	**Site Preparation**	**86,893**	**$175**	**$15,180,599**	**$12,772,908**	**$9,045,748**	**$15,488,355**	**$52,487,610**
0505	Infrastructure	48,782	189	9,236,031	10,718,135	4,392,182	0	24,346,348
0510	Electrical Substation	16,891	152	2,569,467	273,019	4,383,316	0	7,225,803
0520	Fresh water	19,044	161	3,072,982	1,421,341	0	0	4,494,323
0530	Potable water	0		0	0	0	0	0
0540	Wastewater	2,176	139	302,119	360,413	270,250	0	932,781
0550	Power Line	0		0	0	0	15,488,355	15,488,355

21.11.6.1. General Plant Site

The general plant site cost includes site preparation, grading, excavation and backfill of the industrial site to a working elevation of 544 m. The area of over 100,000 m^2 covers the process plant, the desulphurization plant and storage areas, the ore storage building, the substation and electrical rooms and the construction laydown and office areas.

21.11.6.2. Basis of Electrical Estimate

The design and estimate for the electrical and automation / instrumentation was provided by ABB Inc. ABB based the design and the MTOs of their electrical and automation equipment and materials on the mechanical equipment list, layouts, P&IDs, instrument lists and flow diagrams prepared by SNC. For equipment and materials not provided internally by ABB, quotations were received from equipment manufacturers.

Fresh Water Pumphouse

The fresh water and makeup water will be provided by two artesian wells located adjacent to the concentrator. Two pumps, one for each well, will be housed in a prefabricated structure.

Process water make-up will be supplied by the collecting basin and the costs for this operation is included in the water management section.

21.11.6.3. Sewage Water Treatment Plant

The sewage treatment plant is a self-contained unit which is located adjacent to the concentrator. The effluent is distributed to the environment. The capital cost estimate for this treatment plant was provided by SNC as a part of their water management system.

21.11.6.4. Fire Protection

The fire protection system Capex includes for an insulated fire water tank, pumps, buried water lines with fire hydrants placed at strategic locations around the plant site, and a diesel generated fire pump in case of power outages. Any fire protection system located within each facility, is included in that facility.

21.11.7. Basis of Estimate – Crushing Areas

21.11.7.1. Crushing Station

Primary crushing will be a jaw station module crushing units. The conveyors from the crushers to the ore storage building, including transfer towers, are included in the crushing and conveying section. The crushing and conveying system terminate at the top of the storage building.

The conveyor foundations are based on concrete.

21.11.7.2. Ore Storage

The ore storage building will be a tubular Triodetic frame structure with its walls sitting on cast in place concrete foundations. The apron feeder foundations are also cast in place concrete. The conveyor tunnel and emergency tunnel are based on corrugated metal sleeves set on concrete bases.

Table 21-4: Crushing Capex

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
2	**Ore Crushers & Stockpile**	**105,399**	**152**	**15,971,553**	**9,897,747**	**10,663,474**	**0**	**36,532,774**
2010	General Services	6,997	142	994,193	349,539	771,225	0	2,114,957
2100	Primary Crusher	36,046	162	5,830,780	2,812,464	6,597,189	0	15,240,433
2200	Crushed Ore Storage	62,356	147	9,146,580	6,735,744	3,295,060	0	19,177,385

21.11.8. Basis of Estimate – Processing Areas

21.11.8.1. Process Equipment

The process equipment list was derived from the flowsheets. For major equipment, based on data sheets, data tables or technical description, prices were obtained from qualified suppliers. The prices received and incorporated in the Capex represent more than 90% of the 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 publications. Provision was also added to cover for special lifts, subcontracts or construction material.

21.11.8.2. Main Process Plant

The main process plant includes the building structure, foundations, process and service piping, electrical rooms and equipment, and instrumentation / automation.

The estimated costs for the foundations were based on the layout drawings and factored based on experience on other similar projects. Unit cost for concrete supply was obtained from a qualified contractor. The estimated costs for structural steel were based on the layout drawings and factored based on experience on other similar projects. Unit costs for steel supply and installation were 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 catalogues or in-house databases.

Process piping cost was established by factorization on delivered process equipment based on recent similar projects.

Estimated costs for electrical and instrumentation equipment were provided by ABB based on Sections 18.1.8 and 18.1.9 of this technical report.

Preliminary requirements were also established for some tooling and storage racking, interior finishing and living quarters supplies. Cost estimation was based mainly on recent industrial catalogues as well as in-house databases.

21.11.8.3. Process Plant Capex

Table 21-5 presents the cost breakdown for the Process plant facilities Capex.

Table 21-5: Process plant Capex

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect/ subcontract ($)	Total ($)
3	**Processing Plant**	**632,075**	**149**	**93,992,459**	**50,810,783**	**86,470,054**	**3,000,000**	**234,273,297**
3001	General Services	232,694	145	33,693,161	26,315,669	8,051,002	0	68,059,832
3002	Office, Dry, Labo, etc.	846	139	117,383	500,000	1,250,000	3,000,000	4,867,383
3007	Water Services	44,715	148	6,639,600	2,980,475	853,746	0	10,473,821
3008	Air Services	18,247	149	2,718,570	662,080	1,852,978	0	5,233,628
3010	Primary Grinding	40,184	153	6,163,135	1,373,362	22,754,107	0	30,290,603
3020	Rougher/Scavenger Flotation	8,063	150	1,206,386	279,731	917,111	0	2,403,228
3030	Polishing & Primary Cleaning	25,156	152	3,830,082	617,301	5,338,014	0	9,785,397
3040	Stirred Media Mill & Flotation	27,201	150	4,091,932	843,900	4,727,865	0	9,663,697
3050	Graphite Concentrate Dewatering	13,590	150	2,032,246	371,802	3,464,297	0	5,868,345
3060	Tailings Thickener	7,750	152	1,178,665	165,768	1,652,050	0	2,996,482
4001	Graphite Dry Screening & Bagging - General	30,070	154	4,622,533	3,213,275	3,578,469	0	11,414,276
4005	Graphite Dryer & Cooling Screw	4,980	154	765,739	162,697	2,604,744	0	3,533,180
4010	Graphite Handling and Screening	751	141	105,909	15,335	107,908	0	229,152
4030	Graphite Bagging and Wrapping	3,373	155	522,094	39,593	2,639,275	0	3,200,962
4040	Graphite Load Out	3,394	145	493,303	215,518	0	0	708,820
5001	Desulphurization & Stockpiles - General	48,763	148	7,197,140	7,423,407	363,245	0	14,983,792
5010	Desulphurization & Stockpiles - Sulphide Flotation & Magnetic Separation	11,934	154	1,841,184	456,303	2,683,524	0	4,981,011
5020	Desulphurization & Stockpiles - Sulphide (PAG) Tailings Dewatering	31,908	152	4,862,450	1,411,572	7,989,886	0	14,263,908
5030	Desulphurization & Stockpiles - Desulphur ized (NAG) Tailings Dewatering	51,012	153	7,827,698	2,295,407	14,330,081	0	24,453,187
6010	Reagents - Flocculant	4,717	151	712,621	102,377	542,115	0	1,357,113

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect/ subcontract ($)	Total ($)
6020	Reagents - MIBC	9,969	148	1,480,219	633,107	338,794	0	2,452,120
6030	Reagents - Fuel Oil	5,765	148	854,154	150,738	201,775	0	1,206,667
6050	Reagents - Lime	3,605	149	537,356	298,763	20,400	0	856,519
6060	Reagents - PAX	3,385	147	498,899	282,602	208,669	0	990,171

21.11.9. Base of Estimate – Tailings Management Facilities

The tailings management facilities cover areas within the process plant complex such as the desulphurization facility and the NAG and PAG storage buildings, the access road and return water pipeline from the water treatment plant to the complex, the water treatment plant, the collection ditches and basins and the tailings and wastes rocks co-disposal area.

The desulphurization plant and storage facilities were estimated by SNC.

21.11.9.1. Co-Disposal Tailings and Waste Rocks Storage Facilities

The design and quantities estimate for the tailings storage facilities were prepared by Wood. The design criteria and information are provided in Chapter 18. The Capex was prepared on the basis of immediate requirements to start the CSF and defer what could be delayed to future years. On that basis, the construction work was limited to the initial start of the CSF, initial work on BC-1 and BC-2. The BC will be required at Year 5. The estimates for the sizing of the CSF, and the basins were developed on a year-by-year basis and included in the sustaining capital.

The Capex was based on the design layouts and quantities provided by Wood. Geomembrane and geotextile cost estimation are based on NMG extensive cost from the existing demonstration plant project at NMG.

21.11.9.2. Tailings and Water Management Access Roads

The access roads to the CSF and to the water infrastructure and WTP were designed and estimated with layouts provided by Wood. The plant roads were designed at 6 metres and, during the initial period, covered only from the processing area to and around BC-1 and terminating at BC-2. The other plant roads were from the mine road to the WTP and from the WTP to the process area.

21.11.9.3. Tailings Management and CSF Capex

Table 21-6 presents the cost breakdown for the CSF Capex.

Table 21-6: Tailings management and CSF Capex

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
7	**Tailings and Water Management**	**124,867**	**182**	**22,734,192**	**7,910,121**	**6,508,390**	**0**	**37,152,703**
7010	Water Management & Water Services	10,420	145	1,508,072	774,833	672,000	0	2,954,905
7012	Contact Water Ditches	3,777	195	735,057	984,014	0	0	1,719,071
7013	Deviation Ditches	3,995	194	776,608	61,490	0	0	838,098
7014	Collection Ponds	55,237	214	11,795,225	165,000	0	0	11,960,225
7015	Contact Water Pumping Network	16,275	150	2,449,222	838,463	1,236,390	0	4,524,075
7016	Water Treatment Plant	4,873	164	796,834	0	4,600,000	0	5,396,834
7020	Tailings Management	30,291	154	4,673,174	5,086,322	0	0	9,759,496

21.11.10. 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.

21.11.10.1. EPCM Costs

EPCM services have been estimated based on engineering deliverables and a breakdown of manpower per discipline as per the Project schedule. The EPCM costs include for engineering, project management, procurement and construction management activities.

21.11.10.2. Construction Indirect Costs

The construction field indirect costs include site power, temporary facilities, QA/QC (incl. survey, soil, concrete, X-ray, etc.). A construction camp is not required as there are available facilities in the nearby town.

21.11.10.3. Commissioning and Vendor Representatives

Dry and wet commissioning includes vendors' representatives and contractor's workers. Cost estimation is based on requirements and unit hourly rates. No provision is included for rework.

21.11.10.4. Other Owner's Costs

The Other Owner's costs were provided by NMG. The estimate has been reviewed by BBA 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
- Operational readiness.

21.11.10.5. Spares and Consumables

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.

21.11.10.6. Indirect and Owner's Costs

Provisions for indirect costs are summarized in Table 21-7.

Table 21-7: Indirect and owner's costs

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
8000	Owner's Costs						11,201,519	11,201,519
9100	EPCM Services						27,752,679	27,752,679
9500	Temporary Facilities & Utilities						1,094,889	1,094,889
9500	Temporary Operation and Maintenance						8,891,300	8,891,300
9600	POV & Mechanical Acceptance						3,404,555	3,404,555
9700	Commissioning Spare Parts						2,269,703	2,269,703
9700	Initial Fill						817,989	817,989
9200	Freight						7,943,962	7,943,962
9600	Vendor Representatives						2,552,835	2,552,835
9200	Insurance and Duties						1,866,920	1,866,920
9800	Contingency						39,569,796	39,569,796
Total Indirect Costs							**107,366,146**	**107,366,146**

21.11.11. 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.

Contingency factors do not include for Project risk associated with currency fluctuations, labour interruptions, changes in Government policies, changes in Project scope, market conditions and other items outside normal Project activities.

An analysis of each estimate line item was performed, and the overall percentage allocated to contingency was 9.7% at P50 which is generally in line with this category of estimate.

21.11.12.Closure Costs

The closure costs include the expenditures necessary to dismantle the Project's facilities at the end of the life of the mine and to prepare the land back to a natural state. Material quantities were derived from the drawings and cost estimation was based on unit rates from recent similar projects. Quantities for the CSF reclamation cover were provided by SNC and priced by MC-DRA.

The initial topsoil will be stored and redistributed over the property at intervals during the mine life and at the end of the mine life. A revegetation program will be developed to cover the mine site during the mine life and at the end of the mine life.

The closure costs include the following:

- The co-disposal stockpile will be gradually covered, as soon as it reaches its final elevation in the pile;
- 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, not fill up with waste rock and overburden, will be fenced for safety purposes.

21.11.13.Sustaining Capital Expenditures

The sustaining capital expenditure of $62.4M was estimated by activity which is further described in this section. The cost estimation for the sustaining capital was based on quantity take-off and unit prices as for the initial construction.

21.11.13.1. CSF and Water Management Area

The sustaining expenditures for the CSF and water management area cover the enlargements, diversion ditches and collection ditches on the mine site. The activities covering this Section include:

- New Diversion Ditch FD-02;
- Expansion of Collecting Ditches FC-03, FC-08, FC-9 and FC-10;
- New Collecting Ditches FC-01, 04, 05, 06, 09, 10, 14, 15, 16 and 17.

The work required in future years for the west and southwest areas comprises in the expansion of the initial west area to encompass the annual requirement of tailings product and waste rocks. The work includes the clearing and grubbing of the area, scraping, placing and compacting of sand, installing geo-membrane (PEHD, 1.5 mm) and geotextile for Years 1 through 16 inclusive and Years 21 and 25.

The cost estimation for the expansion was based on quantity take-off for geotextile and geomembrane liner as for the initial construction and was prepared by Wood.

21.11.13.2. Pumping and Piping

The work included under this section covers the expansion of the water treatment plant in Year 1 and in Year 7. Water treatment will already be in place from Years 0 and 1 from the demonstration project. Additional water pipeline requirements for mine dewatering and new pumping and pipelines for the new basins as the mine footprint increase when the open pit operation proceeds from south to north.

21.11.13.3. Engineering for CSF and Water Management Area

Engineering has been prepared by Wood for the design and construction management for CSF and water management facilities to be delayed to future years. These facilities include the CSF area, water treatment plant, catch basins, and new collecting and diversion ditches.

21.12. Capital Cost Basis of Estimate Battery Material Plant

21.12.1. Estimate Type and Purpose

The main objectives of this estimate are as follows:

- Formulate the basis for the capital cost and financial section of the NI43 101 feasibility report;
- Permit NMG to reassess the economic viability of the Project;
- Formulate the basis for project funding;
- Allow for the potential reassessment of project scope via value engineering.

The capital cost estimates were developed within the expected accuracy range of ± 15% as attested by the results of the probabilistic contingency analysis using Monte Carlo analysis. The Estimate Accuracy inclusive of contingency is measured from P50.

The estimate has been organized by WBS, by discipline and by BBA’s work element coding (WEC). Additionally, dedicated columns allow to filter the line items by MTO contributor.

21.12.2. Codification

- Work Breakdown Structure (WBS) – The WBS separates the Project into all its physical elements followed by sub-elements and components. Cost estimates, engineering deliverables, and quantities will be developed in accordance with the WBS;
- Work Element Coding (WEC) – The WEC coding structure represents BBA's commodity coding structure to collect the estimate items into groups of work of a similar nature or discipline;
- Unit of measurement – metric;
- Estimate Cost Type – The estimate direct costs are captured in three principal cost categories: labour, permanent equipment and permanent material that have been identified with a pricing basis according to the following parameters:
  - Firm – Pricing based on firm and/or awarded PO or contract;
  - Budgetary – Budgetary pricing;
  - Informal – Informal e-mail quote and/or budgetary pricing that has been scaled or adjusted;
  - REEL Alesa – Pricing received by REEL Alesa for material handling and process cranes at +/- 10%;
  - In-house – Pricing from previous studies, escalated PO, etc.;
- Estimated – Unit price applied to developed quantities;
  - Allowance – Examples include cost contractor provided materials for equipment installation.

21.12.3. Principal Scope Elements

The principal elements of the Project are listed below:

- Off-site equipment (HQ distribution line; pipeline, truck load out at CMC);
- Infrastructure (underground services, compressed air, chilled water, electrical substations, etc.);
- Micronization & Spheronization;
- Purification (building, material handling, warehousing, process, gas treatment);
- Coating (building, substations, process);
- Buildings, equipment, and services (administration building, central warehouse, mobile equipment, IT).

21.12.4. Pricing and Quantity Basis

21.12.4.1. Quantity Development Overview

The approach chosen for the estimate was the standard one of issuing key engineering deliverables to the estimating group in a timely fashion and in such a manner that any subsequent revisions to these key core documents were clearly identified. All material take-offs (MTO's) and lists were identified with a revision and issue date through document control.

Engineering has generated all (MTOs) except structural steel for the central warehouse which was estimated by the Estimator(s).

All quantities generated for the estimate exclude contingency. Growth allowances have been applied to the MTO's and are managed with a unique column within the details of the estimate.

Allowances, fabrication losses, cut and waste losses and wastage have been applied to the material unit price. Table 21-8 provides a summary of the factors used.

Table 21-8: Growth and waste allowances

Commodity	Growth (on MTO)	Growth (on pricing)	Waste (on material)
Civil	10%	none	none
Purification Furnaces - concrete MTO	5%	none	3%
Concrete MTO's – other	7.5%	none	3%
Steel MTO's – structural members	5% growth 10% connection	none	none
Steel MTO's – other	7.5%	none	none
Mechanical and electrical equipment	none	none	none
Mechanical (ductwork, plate work)	10%	none	5%
Piping	10%	none	5%
Wire and cable	10%	none	5%

21.12.4.2. Major Quantity Summary

Table 21-9 provides a high-level summary of major quantities.

Table 21-9: Major quantity summary

Cost Element	Unit	Current Estimate
Excavation	m^3	70,835
Backfill	m^3	85,738
lean concrete	m^3	2,874
Concrete	m^3	18,663
Furnace Concrete	m^3	4,819
Structural Steel	t	7,567
Roofing	m^2	19,591
Siding	m^2	34,929
Piping – piping MTO	m	18,618
Building services (plumbing, roof drains, drainage, etc.)	m	5,364
Electrical - 1kV to 46kV cable	m	13,203
Electrical - <1kV cable	m	129,251
Electrical - grounding cable	m	19,158
Electrical - cable tray	m	13,172
Electrical - control cables	m	215,472
Instruments / control valves	Ea	5,416

21.12.4.3. Pricing Development Overview

The estimate is expressed in Canadian dollars (CAD) reflecting market pricing as of the 2nd quarter 2022 (Q2 2022) for all bulk material pricing and equipment supply. All estimate pricing is exclusive of forward escalation.

Budgetary pricing was received from multiple vendors for major mechanical and electrical equipment packages. Technical reviews were performed by package. Equipment pricing is exclusive of spare parts or vendor assistance for installation and commissioning. These costs are captured separately in the indirect costs

For roughly half of the equipment packages, and a majority of the major packages, equipment pricing has been quoted DAP Bécancour or the vendor has provided pricing for shipping DAP Bécancour. In these instances, the shipping costs are reflected in the equipment pricing and captured as part of direct costs. Shipping costs for the balance of packages are reported in the indirect costs under freight.

Table 21-10 provides a summary of the mechanical and electrical equipment pricing basis.

Table 21-10: Mechanical & electrical equipment supply basis

Pricing Basis – Equipment Supply	Total
Budgetary	89.9%
Informal quote	2.3%
Scaled	1.8%
In-house	2.0%
Estimated	4.0%

21.12.5. Labour Costs

21.12.5.1. Labour Rates

Installation labour costs are based on a standard forty hours (40) work week (5 x 8) based primarily on a single day shift with allowance for a second day shift usually reserved for mechanical and piping. The bulk of the work is done on the first shift at straight time and the second shift is used where possible and when needed to meet the overall duration allowed to the contractors. The second shift usually carries a 15% premium but varies according to trades.

An allowance has been included for casual overtime equivalent to three hours per week.

Wage rates for crafts have been established based on the Québec construction industry labour agreement of hourly labour costs for industrial projects in accordance with the collective institutional/commercial and industrial sectors for 2022. Double time is considered after eight hours per day and weekends.

Composite crew wage rates have been established for each commodity based on a craft mix comprised of foreman, journeymen, apprentices and general labour across all construction trades. The composite crew rates include the following costs:

- Craft base rates fringe benefits and overtime;
- Mobilization & demobilization of contractors' items;
- Non-manual labour (general foreman, superintendent, project manager, etc.);
- Indirect manual labour;
- Small tools and consumables;
- Ownership and operational costs of construction equipment (inclusive of fuel);
- Construction cranes up to 130T;
- Health, safety, and environmental requirements;
- Site supervision and administration;
- Contractor temporary site facilities;
- Overhead and profit.

Construction equipment is developed and assigned by specific crews. Hourly equipment costs include the material portion (depreciation, interest, cost of repair and maintenance, insurances permits and taxes) and operating portion (fuel, lubricants, and filters). Sources for rates include the yearly Québec Government publication entitled "Taux de Location de Machinerie Lourde" used by the Ministry of Transport for civil contracts related to public works, roads and highways, contractor pricing and/or pricing received by crane suppliers. The cost of the operator is excluded from the hourly operating cost and included in the crew mix.

The collective agreement contains provision for travel and accommodation allowances, which vary according to the distance of residence to the construction site. The full room and board allowance of $150 per day is for workers whose principal residence is 120 km or more from the job site.

The crew rates contain an allowance for 25% room and board for all construction disciplines, except for civil where 10% has been assumed and concrete where 15% has been applied.

Table 21-11: Hourly labour crew rates

Typical Crew	Labour Rate		Equipment ($)	Hourly Rate ($)
	Direct ($)	Indirect ($)		
Site Preparation	75.71	36.39	47.98	160.10
Civil works	76.43	39.93	79.72	196.10
Concrete works	77.69	40.55	14.26	132.50
Metal works	78.72	46.89	33.41	159.00
Mechanical	81.77	46.83	22.67	151.25
Piping	78.94	45.33	19.64	143.90
Electrical	81.68	45.52	9.25	136.45
Automation/Telecom	80.45	44.92	6.24	131.60

21.12.5.2. Labour Hours and Productivity

Direct field labour is the skilled and unskilled labour required to install the permanent plant equipment and bulk materials at the Project site. Unit installation hours are exclusive of contractors' non-manual labour (site supervisors, accountants, clerks) and indirect manual labour, which are captured in the composite crew rates. The following items were considered when developing the labour productivity factors:

Site location	Weather conditions
Extended overtime	Scattered items of work
Access to work area	Complexity
Height – Scaffolding	Overcrowded / Tight work areas
Availability of skilled workers	Efficiency
Labour turnover	Supervision
Inspection + QA / QC	Revamps / Connections / Tie-ins
Sophisticated specifications	Fast-track requirements
Materials + Equipment – Handling	Safety / Security

Table 21-12 provides a summary of the factors applied to the base construction hours.

Table 21-12: Productivity factors

Activity	Factor
Civil works	1.12
Concrete Works	1.12
Metal Works	1.12
Mechanical Works	1.15
Mechanical Works (redundancy)	1.00
Piping Works	1.15
Electrical/Automation/Telecom.	1.15

21.12.6. Indirect Costs

21.12.6.1. EPCM Services

The value of engineering, procurement, construction management (EPCM) services is comprised of three major components:

- Budgetary pricing provided by REEL Alesa for detailed engineering services covering their scope of supply for material handling evaluated at $6.788M;
- Programming (BBA discipline 4T) for implementation of management and production systems estimated at a value of $3.09M;
- EPCM services based on a preliminary assessment.

The EPCM value excludes the costs of the previous, current, and further studies that may have to be undertaken before the design is ready to be detailed.

This value also excludes support during commissioning, which is covered under the allowance for Vendor Reps and third party commissioning support.

21.12.6.2. Temporary Construction Facilities and Services

Temporary services and site facilities outside the scope of the contractors is based on a preliminary estimate and covers the following broad items:

- Temporary roads, fencing and facilities, lay down areas, signage, and parking;
- Temporary buildings such as trailers, offices, sheds, portable toilets;
- Material handling and warehousing;
- Construction site services (surveying, security, medical, scaffolding, janitorial, concrete testing, craft training, etc.);
- Temporary utilities such as potable water supply pipe and sewage drainage pipe;
- Temporary power during construction.

A separate allowance has been included to cover contractor safety inductions of 16 hours.

A separate allowance has been included to cover the rental cost of a 240-ton crane for a period of 40 weeks.

21.12.6.3. Freight

In general terms inland freight for all non-process bulk materials is included in the material pricing.

For roughly half of the equipment packages, and majority of the major packages, equipment pricing has been quoted DAP Bécancour, or the vendor has provided pricing for shipping DAP Bécancour. In these instances, the shipping costs are reflected in the equipment pricing and captured as part of direct costs. Shipping costs for the balance of packages has been estimated in consideration of the Incoterms or Ex-works location and estimated quantity of containers.

The balance of freight cost amounts to $5.5M, representing roughly 5% of the equipment value.

21.12.6.4. Spare Parts

Spare parts for commissioning & capital spares have been provided by vendors for a handful of packages including PM0003. The balance of packages is based on percentages of the equipment supply value.

Spare parts for the balance commissioning spares amount to 0.9% of equipment supply and 1.3% for capital spares.

21.12.6.5. POV and Mechanical Acceptance

These costs cover the contractor support for pre-operational verification and pre-commissioning support and is based on 1.5% of the value of equipment.

Vendor Representatives and Third-Party Commissioning

Cost for vendor representatives required for assistance during equipment installation, commissioning, and start-ups as well as third-party support for commissioning is based on 1,800 total days of support amounting to 2.1% of the equipment value.

21.12.7. Contingency

Contingency is an integral part of the estimate and can best be described as an allowance for undefined items or cost elements that will be incurred, within the defined project scope, but that cannot be explicitly foreseen due to a lack of detailed or accurate information.

Contingency analysis does not consider Owner's costs, project risk, currency fluctuations, escalation beyond predicted rates, or costs due to potential scope changes or labour stoppages including potential Covid-19-related disruptions and work stoppages.

Contingency is based on a probabilistic range analysis using Monte Carlo simulations. This approach provides the level of contingency as a function of probability of underrun and provides the level of confidence, or probability that the estimate falls within the estimate target precision.

The results of the contingency analysis yield accuracy at P50 of -14.8% + 15.7% to the extreme points of the simulation results.

The estimate contingency value has been set at 13.7% of direct and indirect costs excluding Owner's Costs to correspond to the simulation results at P50.

Table 21-13: Contingency analysis results (excluding Owner's costs)

Percentile	Simulation Values	Contingency Amount	%
5%	824,821,158	49,326,229	6.4%
10%	836,580,192	61,085,263	7.9%
15%	844,695,114	69,200,185	8.9%
20%	851,279,609	75,784,680	9.8%
25%	857,337,049	81,842,120	10.6%
30%	862,470,805	86,975,877	11.2%
35%	867,466,250	91,971,321	11.9%
40%	871,744,666	96,249,737	12.4%
45%	876,741,011	101,246,082	13.1%
P50	881,865,902	106,370,973	13.7%
55%	886,490,215	110,995,286	14.3%
60%	891,447,807	115,952,879	15.0%
65%	896,334,354	120,839,425	15.6%
70%	901,624,486	126,129,557	16.3%
75%	907,466,516	131,971,587	17.0%
P80	913,952,073	138,457,144	17.9%
85%	921,550,619	146,055,690	18.8%
90%	930,397,899	154,902,971	20.0%
95%	944,419,172	168,924,244	21.8%

21.12.8. Owner's Costs

Owner's costs have been provided by NMG for the FS Capex and are not under BBA's control. The value provided by NMG represents 6.6% of direct costs for the purposes of the Capex Update.

The following list shows the items included by NMG:

- Owner's project team salaries and expenses;
- Owner's project site office expenses;
- Site operation & maintenance of temporary infrastructure;
- Third party consultant & specialists for various studies;
- Owners team travel expenses;
- Training centre & training personnel (excluding trainees);
- ORP planning & deployment (material, systems, processes, SOPs) (excluding early hiring of staff & labour);
- Senior staff salaries as of Year -2;
- Plant labour, progressive deployment during Year -1;
- Environmental, construction permits & approvals;
- Environment consultant.

21.12.9. Escalation

All costs are valid to the estimate base date (May 27, 2022). All forward escalation from the estimate base date through to mechanical completion is excluded from the estimate. Given the current state of market instability and unpredictability with respect to potential increases or decreases to the producer price indices (PPI) for commodities and equipment, it is recommended that escalation associated with permanent material and equipment pricing be treated as a project risk.

21.12.10.Capital Cost Summaries

Table 21-14 presents the cost breakdown of the commercial plant by major area.

Table 21-14: Battery Material Plant Capex summary by major area

Area	Description	Labour Hours	Avg. Crew Rate ($)	Labour ($)	Material ($)	Equipment ($)	Indirect / subcontract ($)	Total ($)
Direct Costs								
0	General	362	132	47,581	445,649	0	0	493,230
2	Off-site Infrastructure	14,291	145	2,065,017	1,675,001	3,073,350	818,400	7,631,768
3	On-site Infrastructure	64,446	145	9,338,673	9,139,961	11,367,651	403,056	30,249,341
4	Micronization and Spheronization	236,776	143	33,965,752	25,324,123	93,600,549	233,800	153,124,224
5	Purification	422,086	143	60,554,713	68,174,764	84,679,548	965,769	214,374,794
6	Coating	323,746	144	46,569,183	34,624,133	87,843,486	400,339	169,437,142
7	Process Services	88,410	143	12,679,903	10,198,344	17,126,333	972,518	40,977,098
	Total Direct Costs	**1,183,456**	**144**	**169,842,235**	**156,063,987**	**301,371,503**	**3,793,881**	**631,071,605**
Indirect Costs								
8000	Owner's Costs						41,505,826	41,505,826
9100	EPCM Services						85,688,000	85,688,000
9500	Temporary Facilities & Utilities						29,790,000	29,790,000
9500	Heavy Lift & Construction Cranes						3,084,124	3,084,124
9600	POV & Mechanical Acceptance						4,520,600	4,520,600
9700	Commissioning Spare Parts						2,411,000	2,411,000
9700	Capital Spare Parts						3,917,800	3,917,800
9700	Initial Fill						3,013,700	3,013,700
9200	Freight						5,490,000	5,490,000
9600	Vendor Representatives						6,536,100	6,536,100
9800	Contingency						106,371,000	106,371,000
	Total Indirect Costs						**292,328,149**	**292,328,149**
Total Direct + Indirect Costs		**1,183,456**	**144**	**169,842,235**	**156,063,987**	**301,371,503**	**296,122,030**	**923,399,755**

21.12.11. Qualifications and Exclusions

The following items are excluded from the Capex:

- Currency fluctuations;
- Allowance for upgrade of off-site facilities not previously identified;
- Technology fees;
- Sunk costs;
- Soil decontamination;
- Land acquisition and rights of way;
- Project risk and risk reserve;
- Escalation.

21.13. Operating Costs Estimate – Matawinie Mine

The contributors to the estimation of operating costs for the mine, beneficiation plant and Battery Material Plant are listed in Table 21-15.

Table 21-15: Operating cost estimate contributors

Scope / Responsibility	Contributor(s)
Mine Operation	NMG and BBA
Concentrator Operation	NMG and Soutex
Battery Material Plant Operation	NMG and BBA
General and Administration (G&A)	NMG

21.13.1. Phase 2 Matawinie Mine Project

This section provides information on the estimated operating costs of the Matawinie Mine project and covers mining, tailing, processing, site services and general administration. Table 21-16 presents a summary of the operating costs.

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 21-16: Operating costs summary – Phase 2 Matawinie Mine project

Description	Cost per Year ($/year)	Cost ($/t concentrate) [(2)]	Total Costs (%)
Mining (average over life)	17,330,983	169	29.7%
Tailings (average over life)	5,655,610	55	9.7%
Ore Processing	26,083,095	252	44.6%
General and Administration	3,750,866	36	6.4%
Transport Cost to Bécancour	2,769,863	27[(1)]	4.7%
Sales and Marketing fees [(3)]	2,831,631	27	4.8%
Total Opex	**58,422,047**	**565**	**100.0%**

(1) The total transport cost for the portion of the concentrate to be sent to Bécancour was distributed to the complete concentrate production.

(2) The costs presented are calculated based on LOM average production of 103,328 tpy.

(3) The sales and marketing fees represent 3% of the gross revenue before NSR.

21.13.1.1. Mining Operating Costs

Mine operating costs have been estimated for each period of the mine plan and are based on operating the mining equipment, the labour associated with operating the mine, the cost for explosives as well as pit dewatering, road maintenance, and other miscellaneous activities.

The mine operating costs over the 25-year mine life have been estimated for a total of $433M and average 3.26$/t mined (168$/t of concentrate). Table 21-17 presents the mine operating cost by activity and Table 21-18 presents the mine operating cost by consumable.

Table 21-17: Mining operating costs by activity

Activity	Unit	Value
Loading	$/t	0.23
Hauling	$/t	1.10
Drilling and Blasting	$/t	0.61
Ancillary Equipment	$/t	0.36
Labour	$/t	0.88
Equipment Leasing	$/t	0.02
Other	$/t	0.06
Total	**$/t**	**3.26**

Totals may not add up due to rounding.

Table 21-18: Mining operating costs by consumable

Activity	Unit	Value
Fuel	$/t	0.51
Tires	$/t	0.05
Parts	$/t	0.37
Explosives	$/t	0.38
Labour	$/t	0.88
Equipment Leasing	$/t	0.02
Job Site Solution	$/t	1.00
Other	$/t	0.06
Total	**$/t**	**3.26**

Totals may not add up due to rounding.

Mining Equipment

NMG has signed a memorandum of understanding (MOU) with Caterpillar, who will supply the majority of the fleet of mining equipment using their Job Site Solution (JSS) service model. With this model, NMG will pay for machine use on an hourly basis which includes machine supply and maintenance (parts and service), and a fleet management system. NMG will be responsible for the fuel consumption, machine operator, wear parts, and to supply the mine garage. The mine operating costs are based on pricing received by Caterpillar and their local dealer, Toromont, in Q1 2022.

For the fleet of equipment that will not be included in the JSS, such as the production drills and service equipment, BBA requested quotations from equipment manufacturers to estimate the cost to operate and maintain these machines.

A diesel price of 1.15$/litre was considered as well as an additional 0.02$/litre that will be paid to the fuelling contractor.

Explosives and Accessories

An emulsion cost of 0.89$/kg was used, which is based on budgetary pricing from local explosive suppliers. The suppliers also provided pricing for explosive accessories such as detonators, boosters, connectors, and surface wire, as well as a cost for delivery to site.

Equipment Leasing

The mine operating costs consider leasing for the production drills and the water/sand truck. Leasing costs have been estimated using a rate of 5% and a 60-month term.

Other Miscellaneous Costs

The mine operating costs include an additional $0.3M/y, which consider the costs for ore grade control, dewatering costs that are in addition to the operation of the pumps, as well as other miscellaneous costs.

Mine Labour

The workforce cost for the mining operations averages approximately $6M per year, which has been calculated based on the number of employees and their annual salaries. The salaries include fringe benefits of 30% as well as bonuses.

21.13.1.2. Tailings Loading, Transportation, and Placement

The costs to load, transport and place the tailings in the co-disposal facility have been estimated to average 1.80$/t of tailings (48$/t of concentrate) over the life of the mine. This cost was developed using the same basis of estimate as described for the mine operating costs above. The addition of water management costs brings the total tailings cost to 54.73$/t of concentrate.

21.13.1.3. Ore Processing Operating Costs

For a typical year at 105,882 tpy of graphite concentrate, the estimated process operating costs are divided into seven main components: manpower, electrical power, grinding media and reagent consumption, maintenance and wear parts consumables consumption, bagging system, and material handling. The breakdown of these costs is summarized in Table 21-19 below.

Table 21-19: Summary of estimated annual initial process plant operating costs

Operating Cost Area	Cost ($/year)	Cost ($/t of mill feed)	Cost ($/t of graphite concentrate)[(1)]	Total Costs (%)
Manpower	6,738,784	2.64	63.64	25.3
Electrical Power	7,313,391	2.87	69.07	27.4
Grinding Media and Reagent Consumption	6,214,651	2.44	58.69	23.3
Maintenance & Wear Parts Consumption	3,889,570	1.52	36.73	14.6
Bagging System	2,163,460	0.85	20.44	8.1
Material Handling	342,428	0.13	3.23	1.3
Total Operating Costs	**26,662,284**	**10.45**	**251.80**	**100.0%**

(1) Based on production of 105,882 tpy of graphite concentrate.

Manpower Costs

It is estimated that there will be 72 employees for the administration, operations, maintenance and mill metallurgy. The total annual cost for the manpower is estimated at $6.7M per year. This corresponds to 63.64$/t of concentrate produced.

Electrical Power Costs

Electrical power is required for the equipment in the processing plant such as crushers, grinding mills, flotation cells, attritors, conveyors, screens, pumps, agitators, dryer, bagging system, services (compressed air and water), etc. The unit cost of electricity was established, using "Tarif L of Hydro-Québec" and is equivalent to 0.0523$/kWh. The total annual cost for the process plant electrical power is estimated at $7.3M per year. This corresponds to 69.07$/t of graphite concentrate produced.

The estimated electrical operating costs are based on the crushing plant operating 5 days a week 16 hours per day, and on the processing plant operating 24 hours per day, 7 days per week, and an annual production of 105,882 t of graphite, The electrical power consumption was developed from the mechanical equipment list and from power requirements from equipment suppliers. Variations of outdoor temperatures through the year were also considered to evaluate the energy consumption related to the ventilation and heating the processing plant.

Grinding Media and Reagent Consumption Costs

Processing costs for grinding media and reagent consumption have been divided in two components:

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 the operation of the demonstration plant Phase 1 - Matawinie Mine project.

The total cost of grinding media for the mills is estimated at $4.1M per year or 38.69$/t of graphite concentrate.

Reagents

Diesel, MIBC, and xanthate are the reagents required throughout the various stages of flotation. Flocculant is required for thickener operations. Lime will be added at the polishing basin and in the plant as required. The annual quantities were determined based test work results and, on the consumption, at the demonstration plant of Phase 1 - Matawinie Mine project.

The total cost for plant reagents is $2.1M per year or 20.01$/t of graphite concentrate.

Maintenance and Wear Parts Consumptions

The maintenance and wear parts consumptions and costs for the crushers 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 were estimated as percentages of the cost of the various equipment (from 2% to 6% and averaging 3.5%). The costs of consumables and wear parts are estimated at $3.9M per year or 36.73$/t of concentrate produced.

Bagging System Costs

Bagging system costs have been calculated based on discussions with consumable suppliers and experience with similar operations. The total cost is estimated at $2.2M per year or 20.43$/t of concentrate produced.

Material Handling Costs

Material handling costs include rental and maintenance costs for mobile equipment in the process plant. The total cost is estimated at $342 K per year or 3.23$/t of concentrate produced.

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 $719K per year or 7.19$/t of concentrate produced.

21.13.1.4. General and Administration Operating Costs: Phase 2 Matawinie Mine Project

The General and Administration (G&A) operating costs include all materials, services and personnel costs associated with the site administration and technical services. These exclude all costs related to corporate office.

The G&A costs for the Matawinie Mine project, are estimated at $3,750,866 per year of operation on average or 36.30$/t of graphite concentrate, as summarized in Table 21-20.

Table 21-20: G&A Operating costs summary – Matawinie Mine project

Category	Annual Cost ($/y)	Unit Cost ($/t of graphite concentrate)	Description
Supplies, Utilities, Taxes, Insurance and Fees	1,685,321	16.31	Property taxes, Insurance, Mining leases, Travel and office supplies
Manpower	1,001,000	9.69	Total staff salaries for the 9 full-time equivalent (FTE) employees that will cover human resources, Procurement, Health & safety, environment, IT and accounting.
Programs	512,769	4.96	Training, Onboarding, Emergency Health Services and Community Development & Outreach
Environment	495,325	4.79	Carbon tax, Air Quality & Emission monitoring, Water Effluent, Groundwater Follow-Up, Wetlands compensation, Soil & Spill management and Noise, vibration, level Follow-Up
Infrastructure and Maintenance	56,450	0.55	Mobile Equipment, Snow Removal, Road & Land Maintenance, IS/IT, Telecommunication and Other Maintenance
Total	**3,750,866**	**36.30**	

Totals may not add up due to rounding.

21.13.2. Opex Phase 2 Bécancour Battery Material Plant

This section provides information on the estimated operating costs of the Phase 2 - Battery Material Plant operating at an annual average production rate of 42.6 kt of coated spherical purified graphite and 3 kt of purified jumbo flakes. The costs cover both concentrate processing and general administration costs. Table 21-21 presents a summary of the operating costs.

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 21-21: Operating costs summary – Phase 2 Battery Material Plant

Description	Cost per Year ($/year) (1)	Cost ($/t CSPG feed) (2)	Total Costs (%)
Concentrate Processing	110,064,694	1,813	81%
General and Administration	11,126,505	183	8%
Sales & Marketing Costs (3)	15,298,832	252	11%
Total Opex	**136,490,031**	**2,249**	**100.0%**

(1) The costs represent a LOM arithmetic average which considers the ramp-up period (Y1-2) and a temporary 20% electricity rebate from Hydro-Québec (Y1-8).

(2) CSPG feed to the Battery Material Plant considers 60,700t CG only.

(3) The sales and marketing costs represent 3% of the gross revenue before NSR.

21.13.2.1. Concentrate Processing Cost

The operating costs of the Battery Material Plant were estimated to be $113.8M per year based on a steady-state annual production of 42.6 kt of coated spherical purified graphite (CSPG) and 3 kt of purified jumbo flake (PJF). The costs were established from test work results, pilot/demonstration plant operation, supplier quotations and BBA's in-house database. The estimated operating costs are divided into six main components: labour, electrical & natural gas consumption, maintenance, consumables, reagents as well as waste disposal and water costs. The cost breakdown is presented in Table 21-22.

Table 21-22: Battery Material Plant operating costs summary

Description	Cost per year ($M/y) (1)	Total Costs (%)
Labour	19,160,438	17
Electrical & Natural Gas Consumption	29, 962,449	26
Maintenance	17,096,989	15
Consumables	13,165,880	12
Reagents	31,041,150	27
Waste Disposal and Water	3,350,730	3
Total	**113,777,636**	**100%**

Totals may not add up due to rounding.

(1) The costs represent a full production year and do not consider the ramp-up period (Y1-2) or the temporary electricity rebate from HQ (Y1-8).

Table 21-23: Battery Material Plant operating cost per product type

Description	Annual Production (tpy)	Cost ($/t)	Total Costs ($M)[1]
Primary CSPG	35,849	2,260	81.0
Secondary CSPG	6,767	4,202	28.4
Purified JF	3,007	845	2.5
Fines by-product	18,384	97	1.8
Total	**-**	**-**	**113.8**

Totals may not add up due to rounding.

[1] The costs represent a full production year and do not consider the ramp-up period (Y1-2) or the temporary electricity rebate from HQ (Y1-8).

Table 21-24: Battery Material Plant operating per transformation step

Description	Cost per year ($M/y) [1]	Total Costs (%)
Micronization/spheronization	27.9	25
Purification	48.8	43
Coating	37.1	33
Total	**113.8**	**100%**

Totals may not add up due to rounding.

[1] The costs represent a full production year and do not consider the ramp-up period (Y1-2) or the temporary electricity rebate from HQ (Y1-8).

21.13.2.2. Labour Costs

It is estimated that the plant operation will require 175 employees. This includes the supervisory and operating staff for all sectors, plant maintenance and mechanical, electrical and instrumentation personnel. The personnel list was developed by NMG and reviewed by BBA. The base pay, fringe benefits, overtime and bonuses for both the 39 salaried and 136 hourly workers were developed by NMG's human resources team. The total cost of labour is estimated at $19.2M per year, which corresponds to 17% of the total operating costs. A breakdown of the number of employees and cost per sector is presented in Table 21-25.

Table 21-25: Battery Material Plant labour

Area	Number of employees
Micronization & Spheronization	24
Purification	28
Jumbo Flake Plant	8
Coating	32
Fines By-product	4
Maintenance	56
General Operating expenses	23
Total Labour	**175**

21.13.2.3. Electrical Power and Natural Gas Costs

The cost of electrical power for the Project was calculated using Hydro-Québec's "rate L" industrial rate of 13.224$/kW in addition to 0.03362$/kWh for large-power customers. The total annual cost of electricity for the Battery Material Plant is based on electrical power requirements of processing equipment, such as pneumatic conveying systems, services (compressed air and water), micronizers, spheronizers, purification furnaces, coating furnaces, bagging systems, etc. The total electrical consumption is estimated at 561.4 GWh with a cost of $30M per year.

The design basis used for the estimation of the electrical operating cost is based on the plant operating 24 hours per day, 7 days per week, at a plant availability of 92%. The electrical power consumption was established from the mechanical equipment list and adjusted with the appropriate load and efficiency factors. The estimated electrical operating cost are listed in Table 21-26.

Table 21-26: Advanced material plant electrical operating costs

Area	Connected Load (kVA)	Annual Consumption (GWh)
Micronization & Spheronization	23,000	145.3
SG Purification	37,100	149.1
Jumbo Flake Purification	1,000	3.9
Gas & Water Treatment	3,800	23.6
Coating	27,600	17.8
Electrical substation and Services (compressed air and chilled water)	16,650	101.2
Main Office, Change House & Main Lab Building	1,000	4.6
Maintenance & Storage Building	650	3.0
Total	**110,800**	**561.4**

Natural gas is used only for the thermal oxidizers treating the off-gases of the coating furnaces. They ensure that all volatiles are fully converted to CO_2 and H_2O before being exhausted to the environment. Because the combustion reactions are exothermic, the natural gas consumption is limited to maintaining a pilot light per oxidizer and for heating requirements during equipment start-up following maintenance shutdowns. The annual consumption is estimated at 52,740 m^3.

21.13.2.4. Reagent Consumption Costs

Reagents required throughout the different stages of the process are chlorine, nitrogen, hydrated lime, hydrochloric acid, hydrogen peroxide and polymer (flocculant).

Table 21-27: Reagent use and consumption for the Battery Material Plant

Reagent	Use	Annual Consumption (tpy)
Chlorine	Graphite purification (carbochlorination)	8,541
Nitrogen	Purge gas in purification, coating mixers and coating furnaces	29,233
Hydrated Lime	Neutralizing agent in the purification off-gas treatment system and pH regulator in the WTP	13,628
Hydrochloric Acid	pH regulator in WTP	560
Hydrogen Peroxide	Hypochlorite neutralization in WTP	7,785
Polymer	Sludge thickening in WTP	1
Carbon-based insulating media	Thermal insulator in purification	3,281
Pitch	Precursor for graphite coating	4,059

The annual consumption of reagents was calculated based on test work results, demonstration plant operation as well as on gas and water treatment models. The total cost of reagents is $31.0M per year which represents 27% of the total operating costs.

21.13.2.5. Maintenance and Consumable Costs

Maintenance Costs were estimated based on fixed percentage of 5% of the equipment capital costs. The total maintenance cost is $17.1M per year which accounts for 15% of the Opex.

Consumable costs consist of known replacement parts including dust collector cartridge filters, spare parts for micronizers, classifiers and spheronizers, electrode and lance replacement for the purification furnaces, replacement pieces for the coating furnaces and costs associated with final product bagging (bags, pallets, shrink wrap). These costs were mainly developed using supplier quotations and recommendations as well as demonstration plant operation data. The consumable costs are estimated at $13.2M annually.

21.13.2.6. Waste Disposal, Water and Environment

The Battery Material Plant generates two types of waste: fouled insulating media and a water treatment plant sludge. The fouled media consists of the surface layer of the purification furnace where the majority of the vaporized metallic impurities are collected in chloride or oxide form. The water treatment sludge is a mixture of the remaining impurities precipitated from the final brine solution. The filtered, washed sludge is returned to the Matawinie for co-disposal with the concentrator tailings and therefore only incurs transportation costs based on the tonnage handled. The fouled insulating media with contains chloride species are trucked to a specialized disposal site operated by a third party. The operating costs for handling the fouled media include both the disposal and transportation costs.

The site recycles as much process water as is possible including the use of condensed water from process services. These efforts limit the average industrial water make-up requirement to 18 m^3/h. The cost of the industrial water from the SPIPB is estimated at $5,000 per year. The potable water requirements are calculated based on the number of personnel on site. The cost of potable water supplied by the city of Bécancour is also approximately $5,000 per year.

21.13.2.7. General and Administration Operating Costs: Phase 2 Bécancour Battery Material Plant

The G&A costs for the Bécancour Battery Material Plant, are estimated at $11.1M per year of operation on average or 183.30$/t of CSPG throughput, as summarized in Table 21-28.

Table 21-28: G&A Operating costs summary – Bécancour Battery Material Plant

Category	Annual Cost ($/y)	Unit Cost ($/t of CSPG Throughput) (1)	Description
Supplies, Utilities, Taxes, Insurance and Fees	8,429,200	138.87	Property taxes, Insurance, Mining leases, Travel and office supplies.
Manpower	858,000	14.14	Total staff salaries for the 8 full-time equivalent (FTE) employees that will cover human resources, Procurement, Health & safety, environment, IT and accounting.
Programs	747,500	12.31	Training, Onboarding, Emergency Health Services and Community Development & Outreach.
Environment	442,423	7.29	Carbon tax, Air Quality & Emission monitoring, Water Effluent, Groundwater Follow-Up, Wetlands compensation, Soil & Spill management and Noise, vibration, level Follow-Up.
Infrastructure and Maintenance	649,382	10.70	Mobile Equipment, Snow Removal, Road & Land Maintenance, IS/IT, Telecommunication and Other Maintenance
Total	**11,126,505**	**183.30**	

Totals may not add up due to rounding.

(1) CSPG feed to the Battery Material Plant considers 60,700t CG only.

22. Economic Analysis

The economic assessment of the integrated project of Nouveau Monde Graphite Inc. (NMG) is based on Q2 2022 price projections in U.S. currency (USD) and cost estimates in Canadian currency (CAD). An exchange rate of 0.7843 USD per CAD (1.275 CAD per USD) was used to convert USD market price projections and specific components of the cost estimates into CAD. No provision has been made for the effects of inflation. The evaluation was conducted on a 100%-equity basis. Current Canadian tax regulations were applied to assess the corporate tax liabilities while the Québec mining tax regulations adopted in 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: Integrated project economic highlights

Economic Highlights	Unit	Matawinie Mine	Bécancour Battery Material Plant	Integrated NMG Model
Pre-tax NPV @ 8 %	M CAD	986	1,374	2,360
After-tax NPV @ 8 %	M CAD	571	1,010	1,581
Pre-tax IRR	%	28.2%	22.8%	24.6%
After-tax IRR	%	22.2%	20.4%	21.0%
Pre-tax Payback Period	year	3.2	4.3	3.9
After-tax Payback Period	year	3.7	4.5	4.2

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 FS 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 listed in Table 22-2. The weighted-average annual price forecast for the Project's basket of graphite concentrate product is based on size-purity-dependent price projections provided by Benchmark Mineral Intelligence. Details on the derivation of this price forecast are provided in Chapter 19 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
Exchange Rate	USD/CAD	0.7843
Discount Rate	% per year	8
Discount Rate Variants	% per year	6 and 10

The financial analysis is based on the sales prices (weighted average on the life of mine) shown in Table 22-3. These prices are derived from the assumptions and sources in Chapter 19.

Table 22-3: Sales prices breakdown per product

Flake Size	Prices (LOM Average / in CAD)	Prices (LOM Average / in USD)	Distribution
Jumbo (+50 mesh)	2,563	2,010	15%
Coarse (-50+80 mesh)	2,170	1,702	33%
Intermediate (-80+150 mesh)	2,042	1,602	28%
Fine (-150 mesh)	1,932	1,515	24%
Matawinie Basket	**2,135**	**1,675**	**100%**
Purified Products	**Prices (LOM Average / in CAD)**	**Prices (LOM Average / in USD)**	**Distribution**
CSPG 20 Production	11,102	8,707	56%
CSPG 10 Production	13,865	10,874	11%
CSPG Basket	**11,540**	**9,051**	**67%**
Purified +50 mesh	6,507	5,104	5%
By-products Fines	638	500	29%
Bécancour Basket	**8,172**	**6,410**	**100%**

An exchange rate of 0.7843 USD per CAD (1.275 CAD per USD) was used to convert the USD market price projections into Canadian currency. The sensitivity of the base case financial results to variations in the exchange rate was examined. These cost components, which include U.S. content originally converted into 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. This consists 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% of taxable income, respectively. The applicable marginal tax rates under the Québec mining tax regulations are 16%, 22% and 28% of taxable income and depend on the profit margin. As the final product of the mine for the purpose of this assessment consists of sorted graphite flake concentrates, a processing allowance rate of 13% is assumed.

The assessment was conducted on a 100%-equity basis using a discount rate of 8%.

22.1.2. Royalty, and Income and Benefit Agreements

The Mining Property is subject to a 0.2% Net Smelter Return (NSR) royalty agreement with Mr. Eric Desaulniers, which can be fully bought back by NMG at any time for the sum of $200,000. It is also subject to a 3% NSR with Pallinghurst Graphite International Ltd. ("Pallinghurst International") which is subject to a 1% buy-back right in favour of NMG for an amount equal to $1,306,036, plus accrued interests at a rate of 9% per annum from and after August 28, 2020, and up to the buy- back date. As provided for in the royalty agreement with Pallinghurst International, Pallinghurst International requested that a new hypothec be granted on the Mining Property to secure NMG's NSR obligations concurrently with the discharge of the hypothec securing NMG's obligations under the Bond.

NMG also has a collaboration and benefit-sharing agreement with the Municipality of Saint-Michel-des-Saints (respectively, the "SMDS Collaboration Agreement" and the "Municipality"). NMG will pay to the Municipality the following amounts:

- The greater of (i) 0.4% of the estimated net cash flow after taxes for the duration of the operation of the Matawinie Mine representing $400,000 annually or (ii) 2% of the net cash flow after taxes resulting from the operation of the Matawinie Mine during a calendar year;
- Between the date of the SMDS Collaboration Agreement and the first calendar year of commercial production, an aggregate annual amount of $400,000. This lump sum is an advance payment and will be deducted from the variable participation payments set out above in (ii) payable during commercial production; and
- As of the second calendar year of commercial production and for each subsequent calendar year of operation of the Matawinie Mine, 1% of the net cash flow after taxes resulting from the operation of the Matawinie Mine during the preceding calendar year shall be injected into a fund to be established by NMG to help stimulate development projects for the communities of the Upper Matawinie region.

22.1.3. Technical Assumptions

The main technical assumptions used in the base case are listed in Table 22-4. More details are available in Chapters 16 and 17.

Table 22-4: Technical assumptions for the Matawinie Mine project

Item	Unit	Base Case Value
Total diluted Proven and Probable Reserve	M tonnes	61.7
Average Grade	% Cg	4.23
Annual Processing Rate	k tpy	2,55
Average Stripping Ratio	w : o	1.16
Mine Life	year	25
Process Recovery	%	93
Concentrate Grade	% Cg	97
Average Concentrate Production (LOM)	tpy	103,328
Average Mining Costs	$/t of graphite concentrate	168
Average Processing Costs	$/t of graphite concentrate	252
Average Tailings Costs	$/t of graphite concentrate	55
Average General and Administration Costs	$/t of graphite concentrate	36
Average Transport Cost to Bécancour	$/t of graphite concentrate	27
Average Sales and Marketing	$/t of graphite concentrate	27
Average Matawinie Mine Total Costs	$/t of graphite concentrate	565

The first production year consists of a ramp-up period of 3 months followed by 9 months at quasi-full production.

Table 22-5: Technical assumptions - Bécancour Battery Material Plant

Item	Unit	Base Case Value
Raw Material CSPG	tpy	60,700
CSPG 20 Production	tpy	35,849
CSPG 10 Production	tpy	6,767
Raw Material in for Purified +50 mesh	tpy	3,075
Purified +50 mesh	tpy	3,007
By-products Fines	tpy	18,384
Average Shaping Costs	$/t of CSPG throughput	443
Average Purification Costs	$/t of CSPG throughput	780
Average Coating Costs	$/t of CSPG throughput	591
Average General and Administration Costs	$/t of CSPG throughput	183
Average Sales and Marketing	$/t of CSPG throughput	252
Average Bécancour Plant Total Costs	$/t of CSPG throughput	2,249

The production ramp-up period has been defined per quarter for the first 2 years all three lines of production. On a yearly basis, the analysis resulted in a ramp-up of 43% for Year 1 (Y1) and 94% for Y2.

22.2. Financial Model and Results

Figure 22-1 illustrates the after-tax cash flow and cumulative cash flow profiles of the Project for the base case conditions.

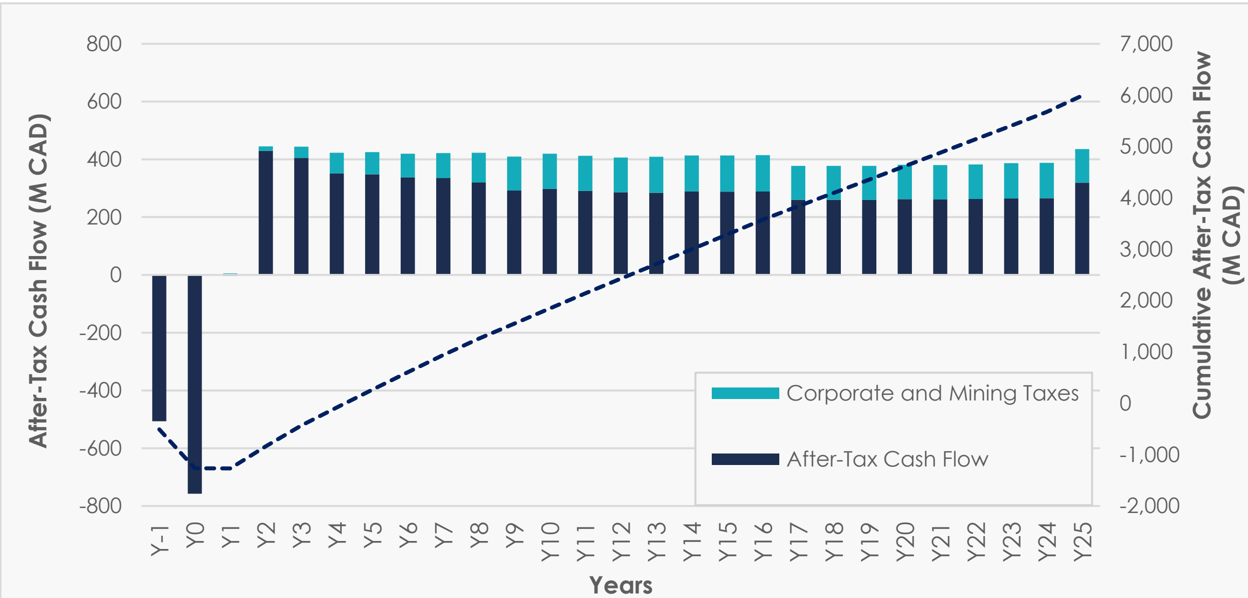


Figure 22-1: After-tax cash flow and cumulative cash flow profiles

A summary of the evaluation results is presented in Table 22-6 and Table 22-7 provides the cash flow statement, both for base case conditions.

The summary table and cash flow statement indicate that the total pre-production (initial) capital costs were evaluated at $1,404M. The sustaining capital requirement was evaluated at $62M. Mine closure costs in the form of trust fund payments at the start of mine production were estimated at an additional $30M.

The cash flow statement shows a capital cost breakdown by area and provides an estimated capital spending schedule over the 24-month pre-production period of the Project. Working capital requirements were estimated at 4 months of total annual operating costs. As operating costs vary annually over the mine life, additional amounts of working capital are injected or withdrawn as required.

The total revenue for the integrated project was estimated at $14,897M, and the total operating costs were estimated at $4,873M.

The financial results indicate a pre-tax NPV of $2,360M at a discount rate of 8%. The pre-tax Internal Rate of Return (IRR) is 24.6% and the payback period is 3.9 years. The after-tax NPV is $1,581M at a discount rate of 8%. The after-tax IRR is 21.0% and the payback period is 4.2 years.

Table 22-6: Project evaluation summary – Base Case

Item	Unit	Integrated Project
Total Revenue	M CAD	14,897
Total Operating Costs	M CAD	4,873
Initial Capital Costs (excludes Working Capital)	M CAD	1,473
Sustaining Capital Costs	M CAD	62
Mine Rehabilitation Trust Fund Payments	M CAD	30
Total Pre-tax Cash Flow	M CAD	8,526
Pre-tax NPV @ 6 %	M CAD	3,213
Pre-tax NPV @ 8 %	M CAD	2,360
re-tax NPV @ 10 %	M CAD	1,736
Pre-tax IRR	%	24.6%
Pre-tax Payback Period [(1)]	year	3.9
Total After-tax Cash Flow	M CAD	5,992
After-tax NPV @ 6 %	M CAD	2,197
After-tax NPV @ 8 %	M CAD	1,581
After-tax NPV @ 10 %	M CAD	1,128
After-tax IRR	%	21.0%
After-tax Payback Period [(1)]	year	4.2

(1) Measured from the start of commercial production.

Table 22-7: Cash Flow Statement – Base Case

All monetary values are in CAD except where specified otherwise

Exchange Rate (USD per CAD) 0.7843

			Y-1	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
Year			-1	0	1	2	3	4	5	6	7	8	9	10	11	12
1st Transformation - Mass Balance																
Mineralization (t)			0	234,716	1,845,868	2,550,506	2,550,506	2,550,506	2,557,494	2,550,506	2,550,506	2,550,506	2,557,494	2,550,506	2,550,506	2,550,506
Waste (t)			0	202,608	1,498,769	2,068,471	2,685,282	2,151,741	2,422,471	3,098,962	2,924,704	2,850,391	3,425,484	2,967,228	2,623,351	2,360,459
Overburden (t)			0	312,676	970,084	647,313	941,970	221,801	138,884	350,532	524,790	599,103	17,022	482,266	826,143	1,089,035
Total Material Mined (t)			0	750,000	4,314,722	5,266,291	6,177,758	4,924,047	5,118,848	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Stripping Ratio (w : o)			0.000	2.195	1.338	1.065	1.422	0.931	1.002	1.352	1.352	1.352	1.346	1.352	1.352	1.352
Mineralization Processed (t)			0	0	2,080,584	2,550,506	2,550,506	2,550,506	2,557,494	2,550,506	2,550,506	2,550,506	2,557,494	2,550,506	2,550,506	2,550,506
Grade (% Ct)		97.0%	0.00	0.00	4.33	4.30	4.26	4.26	4.16	4.23	4.29	4.33	4.25	4.33	4.20	4.12
Process Recovery (%)			0.0	0.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0
Concentrate Production (t)	Grade (% Cg)	97.0%	0	0	86,450	105,181	104,055	104,073	102,098	103,379	105,015	105,824	104,216	105,977	102,666	100,801
Concentrate Sold (t)			0	0	86,450	105,181	104,055	104,073	102,098	103,379	105,015	105,824	104,216	105,977	102,666	100,801
1st Transformation - Revenue ($)																
Mine Revenue	EXW Mine Site		0	0	207,269,680	242,444,117	232,098,988	225,582,692	219,041,653	219,568,738	221,382,747	223,087,066	219,698,228	223,410,068	216,429,690	212,498,335
Net Smelter Returns (NSR)			0	0	3,013,208	2,281,792	1,917,617	1,852,339	1,737,222	1,800,847	1,860,485	1,895,863	1,825,517	1,902,568	1,757,669	1,676,061
Total revenue after NSR deduction - 1st			**0**	**0**	**204,256,471**	**240,162,325**	**230,181,370**	**223,730,353**	**217,304,432**	**217,767,891**	**219,522,262**	**221,191,203**	**217,872,711**	**221,507,500**	**214,672,021**	**210,822,274**
2nd Transformation - Mass Balance																
Raw Material In for CSPG (t)			0	0	26,025	57,286	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700
Raw Material In for Purified +50 mesh (t)			0	0	1,318	2,902	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075
CSPG 20 Production (t)			0	0	15,370	33,832	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849
CSPG 10 Production (t)			0	0	2,901	6,386	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767
Purified +50 mesh (t)			0	0	1,289	2,838	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007
By-products Fines (t)			0	0	7,882	17,350	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384
2nd Transformation - Revenue ($)																
CSPG 20 Production			0	0	179,256,193	405,527,455	420,446,151	413,431,539	411,906,623	405,968,422	406,947,362	406,947,362	406,947,362	406,947,362	406,947,362	406,947,362
CSPG 10 Production			0	0	43,104,602	97,514,621	101,102,025	99,415,266	99,048,579	97,620,657	97,236,715	97,236,715	97,236,715	97,236,715	97,236,715	97,236,715
Purified +50 mesh			0	0	8,289,554	17,799,544	18,602,456	18,316,173	18,710,617	19,309,640	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245
By-products Fines			0	0	5,024,864	11,060,561	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800
Gross revenue - Second Transformation			**0**	**0**	**235,675,214**	**531,902,181**	**551,870,432**	**542,882,778**	**541,385,619**	**534,618,520**	**535,687,122**	**535,687,122**	**535,687,122**	**535,687,122**	**535,687,122**	**535,687,122**
Net Smelter Returns (NSR)			0	0	1,940,187	6,920,991	7,224,710	7,050,350	7,021,305	6,890,023	6,910,754	6,910,754	6,790,904	6,790,904	6,790,904	6,790,904
Total revenue after NSR deduction - 2nd			**0**	**0**	**233,735,026**	**524,981,190**	**544,645,722**	**535,832,428**	**534,364,314**	**527,728,497**	**528,776,368**	**528,776,368**	**528,896,218**	**528,896,218**	**528,896,218**	**528,896,218**
Total revenue after NSR deduction - Combined			**0**	**0**	**381,382,231**	**636,788,988**	**638,608,977**	**626,597,055**	**619,488,180**	**615,969,999**	**619,940,129**	**621,673,678**	**618,346,571**	**622,122,069**	**615,021,977**	**611,023,199**
1st Transformation - Opex																
Mining Costs ($)			0	0	14,298,409	16,629,219	18,249,102	16,894,277	17,090,957	19,301,865	20,401,919	18,442,102	18,934,041	19,071,083	18,680,873	20,449,140
Processing Costs ($)			0	0	24,912,782	25,397,528	25,091,026	25,093,083	24,869,219	25,014,433	25,199,885	25,291,507	26,572,006	26,771,550	26,396,293	26,184,948
Tailings & Water Management ($)			0	0	4,645,698	5,418,439	5,658,222	5,444,013	5,724,000	5,830,662	6,012,885	6,558,253	6,232,440	5,815,134	5,852,986	5,672,108
G&A Costs ($)			0	0	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866
Transportation Cost to Bécancour ($)			0	0	1,218,154	2,681,360	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176
Sales and Marketing ($)			0	0	4,519,812	3,422,688	2,876,426	2,778,509	2,605,833	2,701,270	2,790,727	2,843,795	2,738,276	2,853,853	2,636,503	2,514,091
Operating Costs - 1st			**0**	**0**	**53,345,721**	**57,300,099**	**58,466,819**	**56,801,924**	**56,882,051**	**59,440,272**	**60,997,459**	**59,727,699**	**61,068,805**	**61,103,661**	**60,158,696**	**61,412,329**
2nd Transformation - Opex																
Raw Material CSPG Opex ($)			0	0	52,914,264	120,592,805	128,325,427	125,431,461	124,623,483	121,892,461	120,481,769	120,417,161	120,545,626	120,404,917	120,669,530	120,818,561
Raw Material In for Purified +50 mesh Opex ($)			0	0	3,695,003	7,761,722	7,892,689	7,534,265	7,557,083	7,633,927	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732
Shaping ($)			0	0	17,468,240	24,982,719	25,803,475	25,803,475	25,803,475	25,803,475	25,803,475	25,803,475	27,908,149	27,908,149	27,908,149	27,908,149
Purification ($)			0	0	27,858,823	44,913,500	46,776,268	46,776,268	46,776,268	46,776,268	46,776,268	46,776,268	48,814,198	48,814,198	48,814,198	48,814,198
Coating ($)			0	0	21,597,875	33,865,494	35,205,404	35,205,404	35,205,404	35,205,404	35,205,404	35,205,404	37,055,289	37,055,289	37,055,289	37,055,289
Sales and Marketing ($)			0	0	7,070,256	15,957,065	16,556,113	16,286,483	16,241,569	16,038,556	16,070,614	16,070,614	16,070,614	16,070,614	16,070,614	16,070,614
G&A Costs ($)			0	0	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505
Operating Costs - 2nd			**0**	**0**	**141,730,965**	**259,199,809**	**271,685,880**	**268,163,861**	**267,333,786**	**264,476,596**	**263,340,765**	**263,276,158**	**269,397,112**	**269,256,403**	**269,521,017**	**269,670,047**
Interco Elimination			0	0	-56,609,267	-128,354,527	-136,218,115	-132,965,726	-132,180,566	-129,526,389	-128,358,501	-128,293,893	-128,422,358	-128,281,648	-128,546,262	-128,695,293
Total Operating Costs - Combined			**0**	**0**	**138,467,419**	**188,145,381**	**193,934,583**	**192,000,058**	**192,035,271**	**194,390,479**	**195,979,723**	**194,709,964**	**202,043,560**	**202,078,416**	**201,133,451**	**202,387,084**
Operating Profit - 1st ($)			0	0	150,910,750	182,862,226	171,714,552	166,928,429	160,422,381	158,327,619	158,524,803	161,463,504	156,803,906	160,403,838	154,513,325	149,409,945
Operating Profit - 2nd ($)			0	0	92,004,061	265,781,381	272,959,842	267,668,567	267,030,528	263,251,901	265,435,602	265,500,210	259,499,105	259,639,814	259,375,201	259,226,170
Operating Profit - Combined			**0**	**0**	**242,914,811**	**448,643,606**	**444,674,394**	**434,596,996**	**427,452,909**	**421,579,520**	**423,960,406**	**426,963,714**	**416,303,011**	**420,043,653**	**413,888,526**	**408,636,115**
1st Transformation - Capex																
Matawinie Mine Capital Expenditure ($)			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Site Preparation / Infrastructure			18,370,664	26,243,805	7,873,142	0	0	0	0	0	0	0	0	0	0	0
Mine Development - pre-stripping			4,528,154	6,468,792	1,940,638	0	0	0	0	0	0	0	0	0	0	0
Ore Crushers & Stockpile			12,786,471	18,266,387	5,479,916	0	0	0	0	0	0	0	0	0	0	0
Processing Plant			81,995,654	117,136,648	35,140,995	0	0	0	0	0	0	0	0	0	0	0
Tailings and Water Management			13,003,446	18,576,352	5,572,906	0	0	0	0	0	0	0	0	0	0	0
Indirect Cost			23,728,723	33,898,175	10,169,453	0	0	0	0	0	0	0	0	0	0	0
Contingency			13,849,428	19,784,898	5,935,469	0	0	0	0	0	0	0	0	0	0	0
Working Capital ($)			0	17,781,907	1,318,126	388,907	-554,965	26,709	852,740	519,062	-423,253	447,035	11,619	-314,988	417,878	-644,893
Sustaining Capital Expenditures ($)			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mining Facilities			0	0	400,000	357,085	300,000	0	335,426	605,000	1,333,809	430,400	0	0	305,000	305,000
Tailings & Water Management			0	0	6,092,469	1,524,600	1,016,400	11,414,171	1,016,400	1,016,400	1,016,400	1,016,400	6,431,398	1,016,400	1,016,400	2,729,684
Capex - 1st			**168,262,540**	**258,156,964**	**79,923,112**	**2,270,591**	**761,435**	**11,440,880**	**2,204,566**	**2,140,462**	**1,926,956**	**1,893,835**	**6,443,017**	**701,412**	**1,739,278**	**2,389,791**

	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20	Y21	Y22	Y23	Y24	Y25		
Year	13	14	15	16	17	18	19	20	21	22	23	24	25		**Total**
1st Transformation - Mass Balance															
Mineralization (t)	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,437,766	2,437,766	2,437,766	2,232,677	2,232,677	1,947,674	0	**61,729,994**
Waste (t)	2,442,853	2,546,091	2,546,091	2,546,091	1,840,441	1,840,441	1,840,441	2,288,162	2,288,162	2,288,162	1,176,035	1,176,035	204,979	0	**56,303,905**
Overburden (t)	1,006,641	138,879	138,879	138,879	1,074,407	1,074,407	1,074,407	1,245,320	1,245,320	1,245,320	3	3	1	0	**15,504,086**
Total Material Mined (t)	6,000,000	5,235,477	5,235,477	5,235,477	5,465,354	5,465,354	5,465,354	5,971,248	5,971,248	5,971,248	3,408,715	3,408,715	2,152,654	0	**133,537,985**
Stripping Ratio (w : o)	1.352	1.053	1.053	1.053	1.143	1.143	1.143	1.449	1.449	1.449	0.527	0.527	0.105	0	**1.163**
Mineralization Processed (t)	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,550,506	2,437,766	2,437,766	2,437,766	2,232,677	2,232,677	1,947,674	0	**61,729,994**
Grade (% Ct)	4.26	4.22	4.22	4.22	4.26	4.26	4.26	4.53	4.53	4.53	4.95	4.95	5.19	0	**4.36**
Process Recovery (%)	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	0	**93.0**
Concentrate Production (t)	104,286	103,281	103,281	103,281	104,149	104,149	104,149	105,977	105,977	105,977	105,977	105,977	96,998	0	**2,583,195**
Concentrate Sold (t)	104,286	103,281	103,281	103,281	104,149	104,149	104,149	105,977	105,977	105,977	105,977	105,977	96,998	0	**2,583,195**
1st Transformation - Revenue ($)															
Mine Revenue	219,846,264	217,727,467	217,727,467	217,727,467	219,556,691	219,556,691	219,556,691	223,410,456	223,410,456	223,410,456	223,410,238	223,410,238	204,481,032	0	**5,515,743,617**
Net Smelter Returns (NSR)	1,828,590	1,784,608	1,784,608	1,784,608	1,822,579	1,822,579	1,822,579	1,902,576	1,902,576	1,902,576	1,902,572	1,902,572	1,509,636	0	**47,193,851**
Total revenue after NSR deduction - 1st	**218,017,674**	**215,942,859**	**215,942,859**	**215,942,859**	**217,734,111**	**217,734,111**	**217,734,111**	**221,507,880**	**221,507,880**	**221,507,880**	**221,507,666**	**221,507,666**	**202,971,396**	**0**	**5,468,549,766**
2nd Transformation - Mass Balance															
Raw Material In for CSPG (t)	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	60,700	0	**1,479,411**
Raw Material In for Purified +50 mesh (t)	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075	0	**74,945**
CSPG 20 Production (t)	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	35,849	0	**873,730**
CSPG 10 Production (t)	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	6,767	0	**164,929**
Purified +50 mesh (t)	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	3,007	0	**73,288**
By-products Fines (t)	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	18,384	0	**448,064**
2nd Transformation - Revenue ($)															
CSPG 20 Production	406,947,362	406,947,362	406,947,362	406,947,362	377,086,669	377,086,669	377,086,669	377,086,669	377,086,669	377,086,669	377,086,669	377,086,669	377,086,669	0	**9,699,790,024**
CSPG 10 Production	97,236,715	97,236,715	97,236,715	97,236,715	86,279,250	86,279,250	86,279,250	86,279,250	86,279,250	86,279,250	86,279,250	86,279,250	86,279,250	0	**2,286,686,148**
Purified +50 mesh	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	19,783,245	0	**476,909,633**
By-products Fines	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	11,719,800	0	**285,640,826**
Gross revenue - Second Transformation	**535,687,122**	**535,687,122**	**535,687,122**	**535,687,122**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**494,868,963**	**0**	**12,749,026,630**
Net Smelter Returns (NSR)	6,790,904	6,790,904	6,790,904	6,790,904	5,999,032	5,999,032	5,999,032	5,999,032	7,045,552	7,045,552	7,045,552	7,045,552	7,045,552	0	164,420,192
Total revenue after NSR deduction - 2nd	**528,896,218**	**528,896,218**	**528,896,218**	**528,896,218**	**488,869,932**	**488,869,932**	**488,869,932**	**488,869,932**	**487,823,412**	**487,823,412**	**487,823,412**	**487,823,412**	**487,823,412**	**0**	**12,584,606,438**
Total revenue after NSR deduction - Combined	**618,497,146**	**616,342,011**	**616,342,011**	**616,342,011**	**578,176,320**	**578,176,320**	**578,176,320**	**582,096,178**	**581,049,658**	**581,049,658**	**581,049,436**	**581,049,436**	**561,795,594**	**0**	**14,897,105,149**
1st Transformation - Opex															
Mining Costs ($)	18,246,678	17,632,016	17,632,016	17,632,016	17,592,403	17,592,403	17,592,403	18,358,436	18,358,436	18,358,436	12,639,841	12,639,841	10,556,661	0	**433,274,577**
Processing Costs ($)	26,579,964	26,466,060	26,466,060	26,466,060	26,564,397	26,564,397	26,564,397	26,771,571	26,771,571	26,771,571	26,771,559	26,771,559	25,753,947	0	**652,077,369**
Tailings & Water Management ($)	5,316,081	6,890,051	6,890,051	7,126,496	5,428,619	5,428,619	5,428,619	5,124,489	5,124,489	5,124,489	4,956,500	4,956,500	4,730,406	0	**141,390,252**
G&A Costs ($)	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	3,750,866	0	**93,771,638**
Transportation Cost to Bécancour ($)	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	2,841,176	0	**69,246,568**
Sales and Marketing ($)	2,742,886	2,676,912	2,676,912	2,676,912	2,733,869	2,733,869	2,733,869	2,853,865	2,853,865	2,853,865	2,853,858	2,853,858	2,264,455	0	**70,790,777**
Operating Costs - 1st	**59,477,650**	**60,257,081**	**60,257,081**	**60,493,526**	**58,911,330**	**58,911,330**	**58,911,330**	**59,700,403**	**59,700,403**	**59,700,403**	**53,813,799**	**53,813,799**	**49,897,511**	**0**	**1,460,551,181**
2nd Transformation - Opex															
Raw Material CSPG Opex ($)	120,540,014	120,620,334	120,620,334	120,620,334	120,550,991	120,550,991	120,550,991	120,404,902	120,404,902	120,404,902	120,404,910	120,404,910	121,122,482	0	**2,964,318,465**
Raw Material In for Purified +50 mesh Opex ($)	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	7,876,732	0	**191,732,590**
Shaping ($)	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	27,908,149	0	**671,710,351**
Purification ($)	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	48,814,198	0	**1,183,271,288**
Coating ($)	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	37,055,289	0	**896,635,709**
Sales and Marketing ($)	16,070,614	16,070,614	16,070,614	16,070,614	14,846,069	14,846,069	14,846,069	14,846,069	14,846,069	14,846,069	14,846,069	14,846,069	14,846,069	0	**382,470,799**
G&A Costs ($)	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	11,126,505	0	**278,162,618**
Operating Costs - 2nd	**269,391,501**	**269,471,820**	**269,471,820**	**269,471,820**	**268,177,933**	**268,177,933**	**268,177,933**	**268,031,844**	**268,031,844**	**268,031,844**	**268,031,852**	**268,031,852**	**268,749,424**	**0**	**6,568,301,819**
Interco Elimination	-128,416,746	-128,497,066	-128,497,066	-128,497,066	-128,427,723	-128,427,723	-128,427,723	-128,281,634	-128,281,634	-128,281,634	-128,281,642	-128,281,642	-128,999,214	0	**-3,156,051,055**
Total Operating Costs - Combined	**200,452,405**	**201,231,836**	**201,231,836**	**201,468,281**	**198,661,540**	**198,661,540**	**198,661,540**	**199,450,613**	**199,450,613**	**199,450,613**	**193,564,009**	**193,564,009**	**189,647,721**	**0**	**4,872,801,944**
Operating Profit - 1st ($)	158,540,024	155,685,778	155,685,778	155,449,333	158,822,782	158,822,782	158,822,782	161,807,477	161,807,477	161,807,477	167,693,867	167,693,867	153,073,886	0	**4,007,998,585**
Operating Profit - 2nd ($)	259,504,717	259,424,397	259,424,397	259,424,397	220,691,999	220,691,999	220,691,999	220,838,088	219,791,568	219,791,568	219,791,560	219,791,560	219,073,988	0	**6,016,304,620**
Operating Profit - Combined	**418,044,741**	**415,110,175**	**415,110,175**	**414,873,730**	**379,514,780**	**379,514,780**	**379,514,780**	**382,645,565**	**381,599,045**	**381,599,045**	**387,485,427**	**387,485,427**	**372,147,873**	**0**	**10,024,303,205**
1st Transformation - Capex															
Matawinie Mine Capital Expenditure ($)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Site Preparation / Infrastructure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**34,116,947**
Mine Development - pre-stripping	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**8,409,429**
Ore Crushers & Stockpile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**23,746,303**
Processing Plant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**152,277,643**
Tailings and Water Management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**24,149,257**
Indirect Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Working Capital ($)	259,810	0	78,815	-527,399	0	0	263,024	0	0	-1,962,201	0	-1,305,429	-16,632,504	0	**0**
Sustaining Capital Expenditures ($)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Mining Facilities	0	315,115	315,115	315,115	335,000	335,000	335,000	0	0	0	0	0	0	0	**6,322,066**
Tailings & Water Management	8,528,635	1,099,691	1,099,691	1,099,691	1,535,088	1,535,088	1,535,088	1,101,656	1,101,656	1,101,656	508,200	508,200	0	0	**56,061,460**
Capex - 1st	**8,788,445**	**1,414,806**	**1,493,621**	**887,407**	**1,870,088**	**1,870,088**	**2,133,112**	**1,101,656**	**1,101,656**	**(860,545)**	**508,200**	**(797,229)**	**(16,632,504)**	**0**	**374,871,100**

Year		-1	0	1	2	3	4	5	6	7	8
2nd Transformation - Capex											
Bécancour Plant Capital Expenditure ($)		0	0	0	0	0	0	0	0	0	0
Shaping		61,830,330	88,329,043	26,498,713	0	0	0	0	0	0	0
Purification		91,504,881	130,721,258	39,216,378	0	0	0	0	0	0	0
Coating		67,539,851	96,485,502	28,945,650	0	0	0	0	0	0	0
Indirect Cost		65,085,002	92,978,575	27,893,572	0	0	0	0	0	0	0
Contingency		37,229,850	53,185,500	15,955,650	0	0	0	0	0	0	0
Working Capital ($)		0	28,373,899	15,241,195	1,540,827	-89,877	-14,972	-67,671	10,686	0	1,997,497
Capex - 2nd		**323,189,914**	**490,073,777**	**153,751,158**	**1,540,827**	**(89,877)**	**(14,972)**	**(67,671)**	**10,686**	**(0)**	**1,997,497**
Total Capital Expenditure ($)		**491,452,454**	**748,230,741**	**233,674,270**	**3,811,419**	**671,559**	**11,425,908**	**2,136,895**	**2,151,148**	**1,926,956**	**3,891,332**
Mine Rehabilitation Trust Fund Payments ($)		**15,041,382**	**7,520,691**	**7,520,691**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Mine Closure Costs ($)		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NSR Buyback ($)		**0**	**1,795,745**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Federal Corporate Income Tax	Proportions of Total 48.6%	0	0	4,804,587	12,771,011	29,039,689	41,417,248	45,463,148	48,578,163	51,883,226	54,438,453
Provincial Corporate Income Tax	32.5%	0	0	0	0	0	17,511,940	16,959,243	16,569,239	16,445,319	28,658,234
Quebec Mining Tax	18.9%	0	0	457,183	2,787,985	10,443,362	12,568,375	14,685,221	16,633,699	18,290,461	20,231,495
Total Corporate Income and Mining Taxes ($)	Total 1.00	**0**	**0**	**5,261,771**	**15,558,996**	**39,483,051**	**71,497,563**	**77,107,611**	**81,781,102**	**86,619,006**	**103,328,182**
PRE-TAX CASH FLOW		**(506,493,836)**	**(757,547,176)**	**1,719,851**	**444,832,188**	**444,002,835**	**423,171,088**	**425,316,013**	**419,428,372**	**422,033,449**	**423,072,382**
Cumulative P-T CF		(506,493,836)	(1,264,041,012)	(1,262,321,161)	(817,488,973)	(373,486,138)	49,684,950	475,000,964	894,429,336	1,316,462,785	1,739,535,167
Payback period work area		0.0	0.0	1.0	1.0	1.0	0.9	0.0	0.0	0.0	0.0
After-Tax Cash Flow		**(506,493,836)**	**(757,547,176)**	**(3,541,920)**	**429,273,192**	**404,519,784**	**351,673,525**	**348,208,402**	**337,647,271**	**335,414,443**	**319,744,199**
Cumulative A-T CF		(506,493,836)	(1,264,041,012)	(1,267,582,932)	(838,309,740)	(433,789,956)	(82,116,430)	266,091,972	603,739,242	939,153,685	1,258,897,885
Payback period work area		0.0	0.0	1.0	1.0	1.0	1.0	0.2	0.0	0.0	0.0

Year	9	10	11	12	13	14	15	16	17
2nd Transformation - Capex									
Bécancour Plant Capital Expenditure ($)	0	0	0	0	0	0	0	0	0
Shaping	0	0	0	0	0	0	0	0	0
Purification	0	0	0	0	0	0	0	0	0
Coating	0	0	0	0	0	0	0	0	0
Indirect Cost	0	0	0	0	0	0	0	0	0
Contingency	0	0	0	0	0	0	0	0	0
Working Capital ($)	0	0	0	0	0	0	0	-408,182	0
Capex - 2nd	**(0)**	**0**	**(0)**	**0**	**(0)**	**0**	**0**	**(408,182)**	**0**
Total Capital Expenditure ($)	**6,443,017**	**701,412**	**1,739,278**	**2,389,791**	**8,788,445**	**1,414,806**	**1,493,621**	**479,225**	**1,870,088**
Mine Rehabilitation Trust Fund Payments ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Mine Closure Costs ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NSR Buyback ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Federal Corporate Income Tax	54,613,166	56,217,971	56,437,889	56,538,067	58,118,710	58,068,662	58,424,877	58,668,524	53,443,354
Provincial Corporate Income Tax	43,251,750	44,134,392	44,042,903	43,925,118	44,991,341	44,844,004	45,035,542	45,161,284	41,109,611
Quebec Mining Tax	19,717,785	21,483,509	20,733,825	19,751,361	21,742,483	21,444,520	21,734,238	21,870,837	22,843,715
Total Corporate Income and Mining Taxes ($)	**117,582,701**	**121,835,871**	**121,214,617**	**120,214,546**	**124,852,533**	**124,357,186**	**125,194,657**	**125,700,645**	**117,396,679**
PRE-TAX CASH FLOW	**409,859,994**	**419,342,241**	**412,149,248**	**406,246,324**	**409,256,296**	**413,695,369**	**413,616,554**	**414,394,505**	**377,644,692**
Cumulative P-T CF	2,149,395,161	2,568,737,402	2,980,886,650	3,387,132,974	3,796,389,270	4,210,084,639	4,623,701,193	5,038,095,698	5,415,740,390
Payback period work area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
After-Tax Cash Flow	**292,277,293**	**297,506,370**	**290,934,631**	**286,031,778**	**284,403,762**	**289,338,183**	**288,421,897**	**288,693,860**	**260,248,013**
Cumulative A-T CF	1,551,175,178	1,848,681,548	2,139,616,180	2,425,647,958	2,710,051,720	2,999,389,903	3,287,811,800	3,576,505,660	3,836,753,673
Payback period work area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year	18	19	20	21	22	23	24	25		Total
2nd Transformation - Capex										
Bécancour Plant Capital Expenditure ($)	0	0	0	0	0	0	0	0	0	
Shaping	0	0	0	0	0	0	0	0	0	**114,827,755**
Purification	0	0	0	0	0	0	0	0	0	**169,937,636**
Coating	0	0	0	0	0	0	0	0	0	**125,431,152**
Indirect Cost	0	0	0	0	0	0	0	0	0	**120,872,147**
Contingency	0	0	0	0	0	0	0	0	0	**69,141,150**
Working Capital ($)	0	0	0	0	0	0	0	-46,583,403	0	**0**
Capex - 2nd	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**(46,583,403)**	**0**	**600,209,840**
Total Capital Expenditure ($)	**1,870,088**	**2,133,112**	**1,101,656**	**1,101,656**	**(860,545)**	**508,200**	**(797,229)**	**(63,215,907)**	**0**	**975,080,940**
Mine Rehabilitation Trust Fund Payments ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**(30,082,763)**	**(15,041,382)**
Mine Closure Costs ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**30,082,763**	
NSR Buyback ($)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,795,745**
Federal Corporate Income Tax	53,585,898	53,693,299	54,165,010	54,087,382	54,147,403	54,832,150	54,880,665	53,028,561	0	1,231,347,114
Provincial Corporate Income Tax	41,184,670	41,241,381	41,583,832	41,509,941	41,545,188	42,062,093	42,093,245	40,668,771	0	824,529,041
Quebec Mining Tax	22,916,317	22,967,139	23,744,114	23,814,201	23,863,261	25,595,652	25,654,587	22,425,252	0	478,400,576
Total Corporate Income and Mining Taxes ($)	**117,686,885**	**117,901,820**	**119,492,956**	**119,411,524**	**119,555,852**	**122,489,895**	**122,628,497**	**116,122,584**	**0**	**2,534,276,731**
PRE-TAX CASH FLOW	**377,644,692**	**377,381,668**	**381,543,909**	**380,497,389**	**382,459,590**	**386,977,227**	**388,282,656**	**435,363,780**	**0**	**8,525,891,302**
Cumulative P-T CF	5,793,385,083	6,170,766,751	6,552,310,660	6,932,808,049	7,315,267,639	7,702,244,866	8,090,527,522	8,525,891,302	8,525,891,302	**100,030,538,631**
Payback period work area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3.9
After-Tax Cash Flow	**259,957,807**	**259,479,848**	**262,050,952**	**261,085,865**	**262,903,739**	**264,487,331**	**265,654,159**	**319,241,196**	**0**	**5,991,614,571**
Cumulative A-T CF	4,096,711,480	4,356,191,329	4,618,242,281	4,879,328,146	5,142,231,885	5,406,719,216	5,672,373,375	5,991,614,571	5,991,614,571	69,206,209,353
Payback period work area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		4.2

FINANCIAL INDICATORS				
Pre Tax				
Payback Period (years)			**3.9**	
Total Cash Flow ($)			**8,525,891,302**	
Net Present Value ($)	Discount Rate	6.0%	**3,212,862,999**	
Net Present Value ($)	Discount Rate	8.0%	**2,360,312,534**	
Net Present Value ($)	Discount Rate	10.0%	**1,735,750,637**	
Internal Rate of Return (%)			**24.6%**	
After Tax				Effective Tax Rates
Payback Period (years)			**4.2**	
Total CashFlow ($)			**5,991,614,571**	29.7%
Net Present Value ($)	Discount Rate	6.0%	**2,196,881,140**	31.6%
Net Present Value ($)	Discount Rate	8.0%	**1,581,097,056**	33.0%
Net Present Value ($)	Discount Rate	10.0%	**1,127,647,528**	35.0%
Internal Rate of Return (%)			**21.0%**	

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 (initial) capital expenditure (Capex), operating costs (Opex), product prices (price) and the USD/CAD exchange rate on the Project's NPV @ 8% and IRR. Each variable was examined one-at-a-time (price forecasts of the different concentrate products are varied together). An interval of ±30% with increments of 10% was used for the first three variables. The U.S. 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 FS (±15%, as shown by the vertical dashed lines), 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 (±30%) and at the upper limit of the exchange rate interval examined.

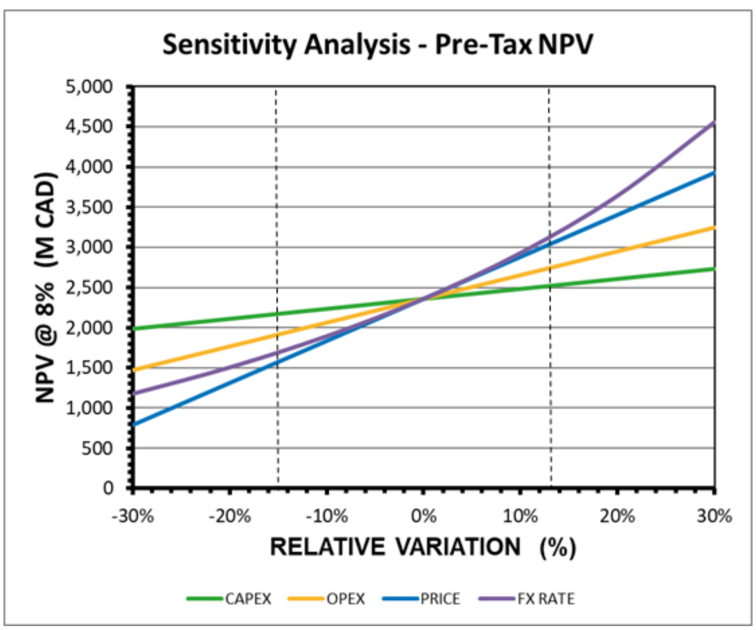


Figure 22-2: Pre-tax NPV 8% – Sensitivity to capital Expenditure, operating cost, prices, and USD/CAD exchange rate

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%. Due to the different timing associated with Capex versus Opex, the IRR is more sensitive to variations in Capex than in Opex.

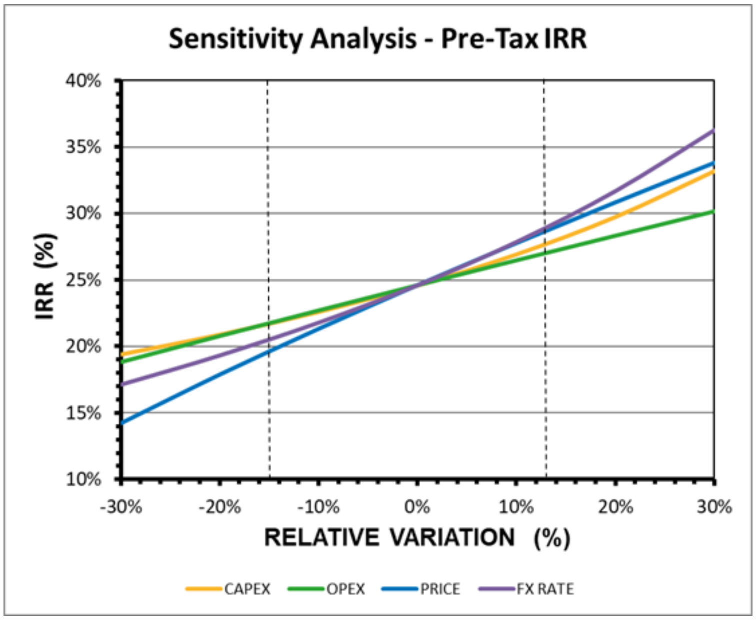


Figure 22-3: Pre-tax IRR – Sensitivity to capital expenditure, operating cost, prices, and USD/CAD exchange rate

The same conclusions can be made for 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.

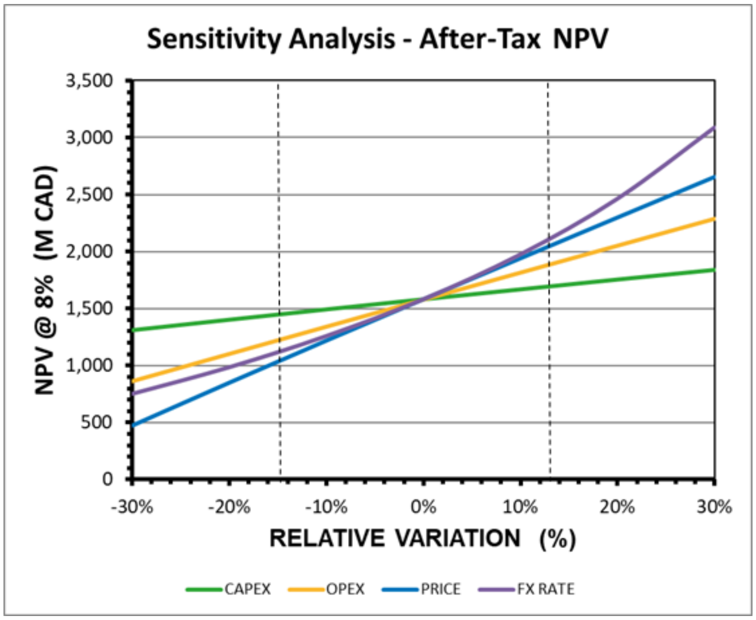


Figure 22-4: After-tax NPV 8% – Sensitivity to capital expenditure, operating cost, prices, and USD/CAD exchange rate

Figure 22-5 showing variations in internal rate of return, provides the same conclusions.

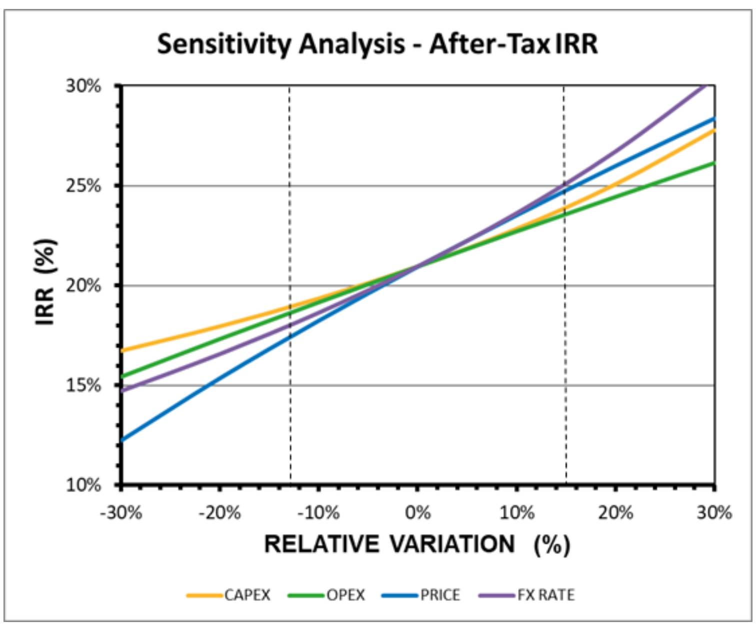


Figure 22-5: After-tax IRR – Sensitivity to capital Expenditure, operating cost, prices, and USD/CAD exchange rate

23. Adjacent Properties

No other mineral properties owned by NMG are located contiguous to the Tony Claim Block and no other advanced mining projects are noted in the area. Other exploration stage claim blocks forming NMG's Matawinie Property are located between 8 km and 60 km from the Mining Property (see Figure 4-1) and are therefore not described in the current 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 below illustrates the Tony Claim Block and the surrounding active claims obtained from the MERN on March 28, 2022.

Detailed claim information can be viewed on the MERN's Claim Management System, GESTIM (https://gestim.mines.gouv.qc.ca).

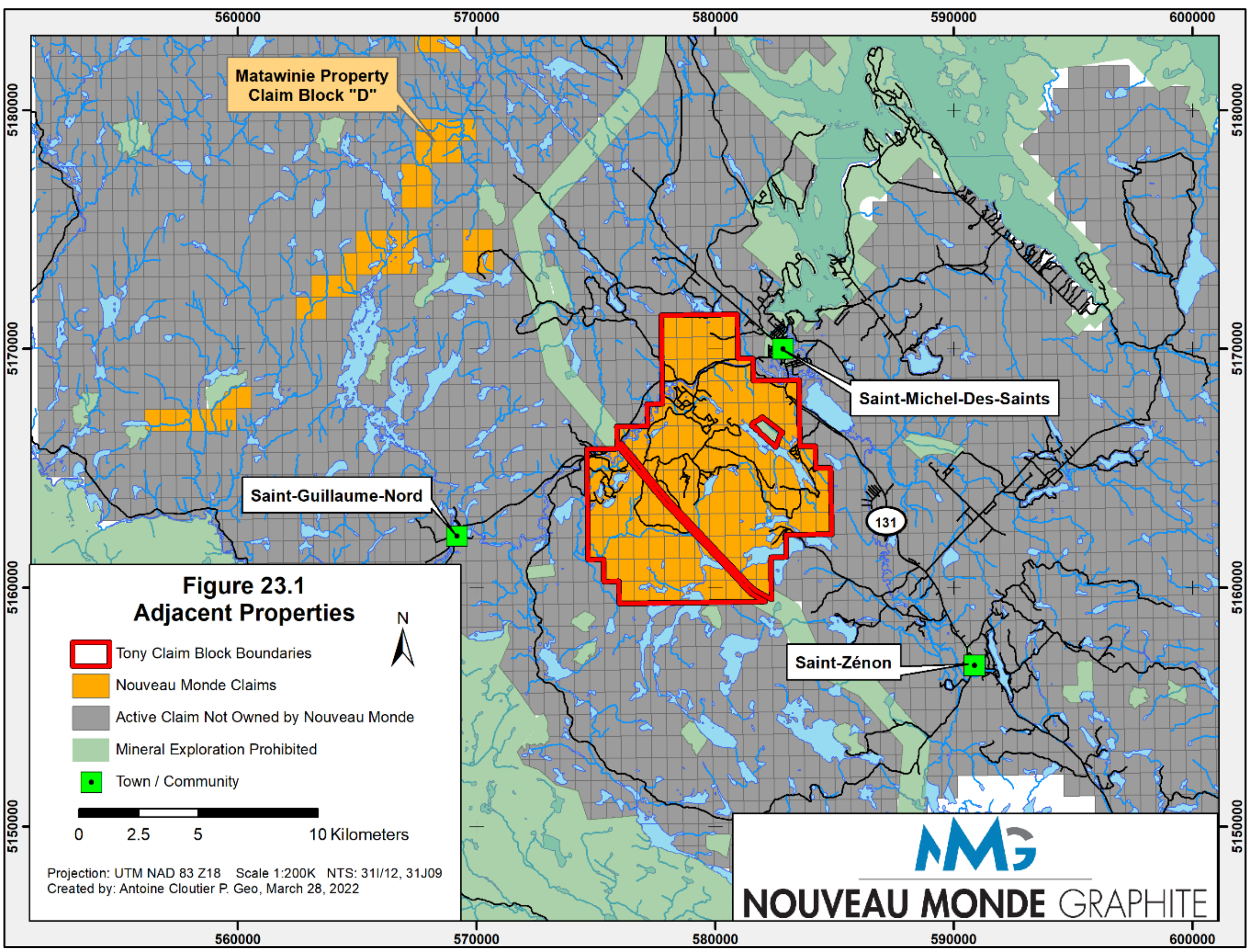


Figure 23-1: Adjacent properties

24. Other Relevant Data and Information

24.1. Project Implementation and Execution Plan

This section of the report provides a summary and general description of the Project Execution Plan upon which the Project schedule and the capital cost estimate were developed. The major Project milestones are listed in Table 24-1

Table 24-1: Project milestones

Activity	Start Date	Completion Date
Global Milestones		
Provincial Global Certificate of Authorization (Environmental)		Complete
Interim Financing Available		Month (-6)
Full Investment Decision (FID)		time 0
Matawinie Mine (Saint-Michel-des-Saints, Québec)		
Civil Site Works – Main Access Road and Concentrator Pad	Month (-6)	Month 6
Detail Engineering	Month (-6)	Month 9
Full power Available on Site		Month 13
Mill Construction	Month 1	Month 22
Tailings Facility Construction	Month 6	Month 22
Cold Commissioning	Month 22	Month 24
First tonnes Delivered to Bécancour		Month 26
Hot Commissioning	Month 25	Month 27
Battery Material Plant (Bécancour, Québec)		
Feasibility Study Optimization	Month (-9)	Month (-6)
Major Supplier Engineering	Month (-6)	Month 2
Detailed Engineering	Month (-6)	Month 12
Site Preparation Permit Obtained		Month (-3)
Site Preparation and U/G Services	Month 1	Month 6
Major Equipment Fabrication & Deliveries	Month 1	Month 20
Micronization & Spheronization Construction to Line 1 Completion	Month 6	Month 24
Purification Construction to Mechanical Completion	Month 6	Month 27
Coating Construction to Line 1 Completion	Month 6	Month 24
Cold Commissioning Line 1	Month 23	Month 27
Cold Commissioning Lines 2 & 3	Month 28	Month 30
Hot Commissioning Line 1	Month 28	Month 30
Hot Commissioning Lines 2 & 3	Month 30	Month 33

The Project execution schedule developed in this study and described herein covers the period from the resumption of detailed engineering for the Matawinie Mine in Saint-Michel-des-Saints (SMDS) and the launch of detail engineering for the Bécancour Battery Material Plant.

Major assumptions driving the key milestones for the Matawinie Mine and Concentrator are as follows:

- PFDs are frozen;
- Certificate of authorization is approved;
- Site pre-development will resume upon the interim financing agreement at month -6;
- Purchase orders for supplier engineering information will be awarded starting at the interim financing agreement at month -6;
- Full Investment Decision is time 0;
- Concrete work will begin in 2 months after FID;
- The mill delivery 18 months after FID;
- The initial co-deposition dry tailings facility will start in month 6 and be completed in month 18;
- Ramp-up to be achieved in 12 months with 60% capacity achieved 3 months after cold commissioning completion.

Major assumptions driving the key milestones for the Battery Material Plant are as follows:

- Feasibility Study optimization completes positively the purification piloting;
- PFDs for the micronization and spheronization area remain unchanged;
- PFDs for the coating area remain unchanged;
- Three phased permitting is successful, meaning:
    1. Site preparation and underground services permit is available at FID;
    2. Buildings construction permit is available 4 months after FID;
    3. Process equipment installation permit is available 10 months after FID.
- Purchase orders for supplier engineering are awarded starting at interim financing agreement at month -6 and equipment fabrication is authorized at FID;
- Site preparation work and temporary site installations start 2 months after FID;
- Early selection of prefabricated concrete and steel fabricators to allow early procurement of base materials and meet required on site dates;

- Construction plan aims for commissioning of a first line of micronizer and spheronizers, the full purification area and the first two coating kilns to allow commissioning and startup of the plant at 33% capacity;
- Graphite concentrate is available from the mine to proceed with hot commissioning at month 27;
- Hot commissioning of line 1 will be completed prior to starting lines 2 & 3 by month 30;
- Lessons learned from line 1 will be implemented on lines 2 & 3 start-up;
- Hot commissioning of lines 2 & 3 to be completed by month 33;
- Ramp-up to name-plate capacity to be completed in 18 months.

24.1.1. Master Schedule

The master schedule is based on the completion of the construction and achieving mechanical completion of the mine and concentrator by month 22, 6 months of commissioning and ramp-up to produce sufficient graphite for the Battery Material Plant by month 27. To this end, the civil works surrounding the fine ore storage dome and reclaim area should be completed in the interim financing period so that concrete work on the reclaim tunnel can be undertaken as soon as the FID is confirmed (Figure 24-1).

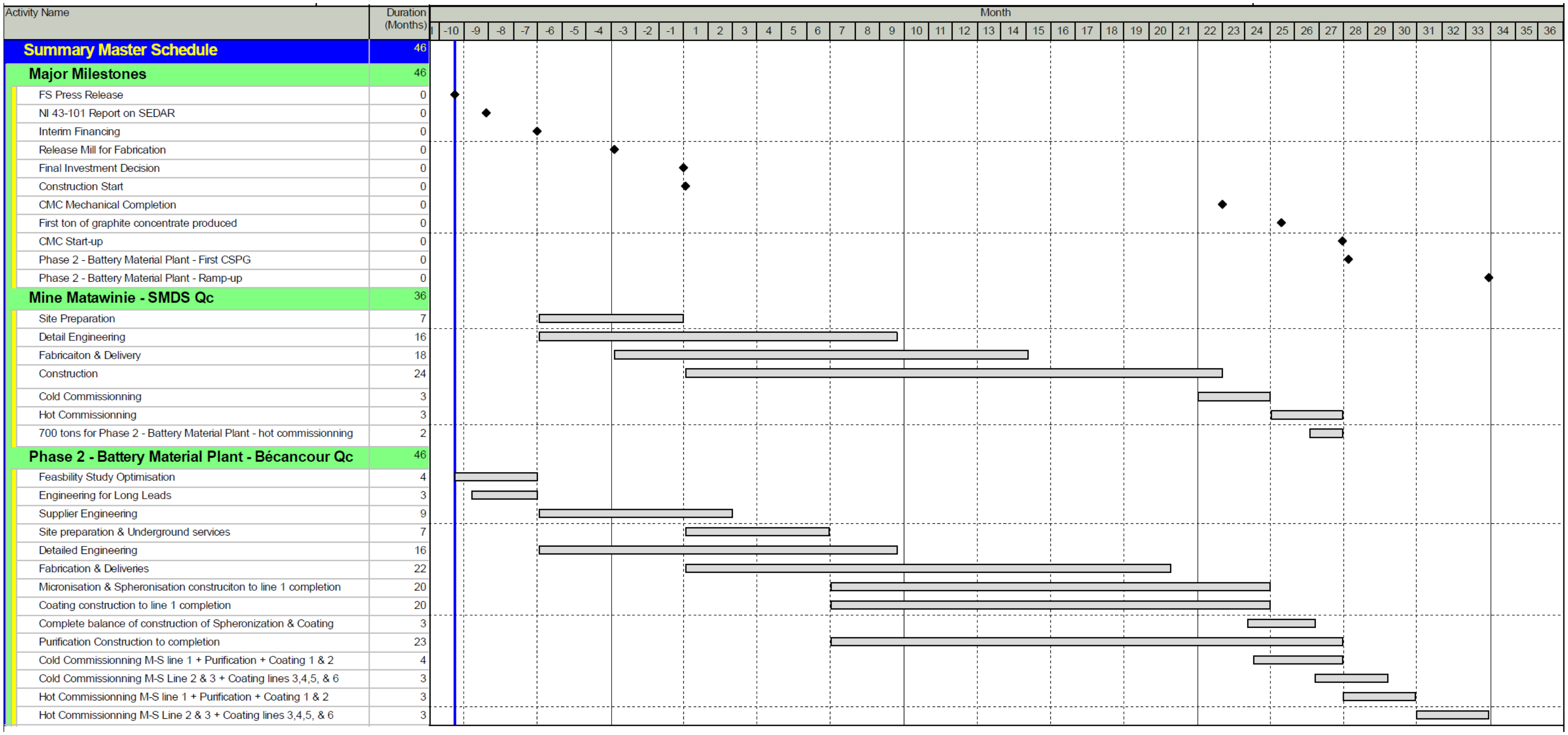


Figure 24-1: Master schedule

24.1.2. Project Organization

Under the supervision of NMG project managers and procurement managers, an integrated team of NMG personnel, engineering services providers and construction manager for each site will design, procure and construct the Matawinie Mine and Concentrator, and the Bécancour Battery Material Plant.

Project Management and Control

Under the direction of the NMG project manager and NMG project control director, the project control team of the engineering and procurement services provider of each site will finalize the definitive control budget and schedule for the Projects.

Engineering and Procurement

Each site will have its own engineering team. For the Matawinie Mine, the design is to be split in process plant design and site infrastructure with one firm, and the tailings co-deposition with another firm.

For the Bécancour Battery Material Plant, the design is expected to be with one firm but split in six design teams where a team will be responsible for each of the three major process areas. The three other teams will be responsible for the process services and site infrastructure, one team will be responsible for the gas and water treatment area of the purification and the last team will be responsible for the main substation design.

To support the construction schedule, the following activities will be closely monitored:

- The engineering and procurement mandates for each projects will be authorized to proceed as soon as an interim financing agreement is in place.
  1. For the Matawinie Mine project, the key starting activities are:
     - Updating quotations from bidders selected from previous bid processes and award of long lead equipment;
     - With confirmed information, engineering will complete the design for construction bid packages;
     - First drawings for construction required are for site preparation and excavation of the ore reclaim area;
     - Engineering is expected to be substantially complete by month 8.

2. For the Bécancour Battery Material Plant, the key activities are:
   - The award of the four major packages and the finalization of the purification area basic design. The four major packages are the following:
     - Micronization & spheronization;
     - Process crane bridges;
     - Material handling system;
     - Coating furnaces.
   - Freeze site plan in month -3;
   - Prepare supporting documentation for building construction permit request;
   - Pre-select prefabricated concrete and steel fabricators for assistance in design and early material procurement;
   - Complete P&IDs and HAZOP in months -3 to -1.
   - Detail engineering is expected to be substantially complete by month 12.

As for procurement, as well as managing the usual bidding and awarding process for purchase packages and contracts, a key to the Project's success will be efficient expediting and development of logistical strategies to minimize the impact of the current supply chain problems.

Construction Management

For each site, NMG will hire an experienced general contractor to act as construction manager. The construction manager will be hired soon after the interim financing agreement to assist engineering design with constructability concerns.

The Matawinie Mine construction management team will be structured in two teams. One team will manage and coordinate all activities directly related to the concentrator. The second team will manage all ancillaries including, the site preparation, roads, mine pre-production, tailings management facility, main substation, etc. Both teams will report to the Matawinie Mine construction manager.

The Battery Material Plant construction management will be structured in four teams. One team will manage all activities related to the micronization and spheronization area. Another team will manage all activities related to the purification area. A third team will manage the activities related to the coating area. The fourth team will be coordinating and managing all the remaining construction activities.

Each team will be composed of a construction superintendent, specialized trade coordinators, contract administrators, planning and progress specialist and a BIM specialist. These teams will be located in offices near their respective construction areas.

At each site, the construction manager will be assisted by a heath and safety manager, an environment manager, a site project controls manager, a materials control manager, a resident engineer who will coordinate with office engineering as well as lead the field QA/QC personnel.

24.1.3. Project Construction Strategy

Matawinie Mine

Under the leadership of a NMG construction director who will supervise the general contractor hired for construction management, contracts will be organized by major areas and segregated by trades. The construction strategy is based on completing construction and commissioning as soon as possible. The Project is located 175 km north of Montréal, Québec.

Execution will be segmented and managed in two sectors:

- Mine pre-production, tailings, and water management, comprised of earthwork movement (mass excavation topsoil and rock), road, water management (basins and water treatment plant) will all be constructed in parallel to meet the demand of the concentrator.
- Concentrator comprised of primary crusher ore dome and tailings domes. The concentrator building shell will be erected leaving openings for later insertion of large equipment to avoid delaying the construction, and subsequently, commissioning of the production.

The critical path of the construction duration is driven mostly by the extended period of fabrication of the major equipment, i.e., the ball and SAG mills, and the filter press have a 20-month delivery period. As a result, they will be purchased prior to FID to reduce the overall construction duration. In addition, the 120 kV power line needs to be closely monitored as this portion of the Project is not managed by NMG, it is under the management of Hydro-Québec (permitting and construction).

The expected direct labour force requirements for the mine and concentrator at SMDS are shown in Figure 24-2.

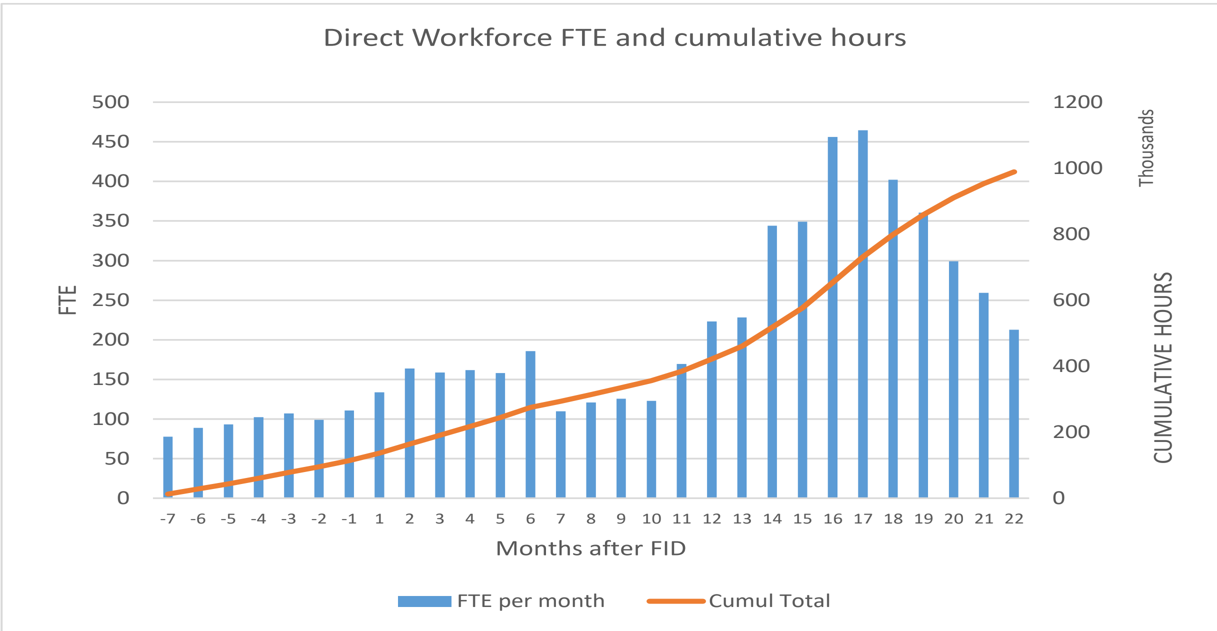


Figure 24-2: Direct workforce for the mine and concentrator

Bécancour Battery Material Plant

The construction strategy is based is on commissioning a single production line as early as possible. The Project is situated in an industrial zone where multiple construction projects are expected to solicit the available labour workforce. As such, a labour shortage is expected in the region. Multiple constructability reviews and construction sequence scenarios were developed with this restriction taken into consideration. The strategies developed were reviewed, challenged, and ultimately deemed proficient by an external team of construction experts from a contractor at the forefront of the Canadian Construction Industry.

To build efficiently while minimizing the impact of labour shortage, an off-site prefabrication philosophy was instigated wherever reasonable. Although cost savings and quality gains are expected in many cases, the forefront argument is to minimize the hours of work required at site, redistributing these hours in supplier shops in less solicited regions.

Execution will be segmented and managed in four sectors:

- Micronization and Spheronization, comprised of three parallel production lines. The building shell will be erected leaving openings in the roof for later insertion of large equipment to avoid delaying the construction, and subsequently, commissioning of the first production line.

- Purification, characterized by a large hall with great spans of structural steel. Construction for the furnaces within will require a temporary construction overhead crane. Commissioning of this sector is tied to the completion of its gas and water treatment buildings.
- Coating, comprised of multiple floors of structure to house gravity-fed collectors associated with the main hall's six coating furnaces. Construction of this sector will be performed through multiple steps of structural steel and equipment insertion, prioritizing the first two coating furnace trains for commissioning of the facility.
- "Balance of plant", including notably the power substation, compressor building, maintenance shop, administration building and a prefabricated utility rack network providing air, water and electricity to each area of the plant. The compressor and utility rack systems are first to be commissioned, in order to supply other systems with the necessary services for their own commissioning.

The critical path of the execution schedule lies in commissioning the coating sector's systems. This is coherent with the commissioning plan, which follows the flow of graphite until its final transformation in this sector. An additional margin of comfort on this critical path can be gained by leveraging winter installation of prefabricated concrete in the first construction steps. The additional costs for doing so are not necessary to achieve the targets of the execution schedule and thus were not implemented in the master schedule. Winter installation of prefabricated concrete was however integrated into the schedule for the electrical substation, compressor building and the gas/water treatment plants. This ensures that commissioning not only begins early enough, but also in optimal process order.

The expected direct labour force requirements for the Battery Material Plant are shown in Figure 24-3.

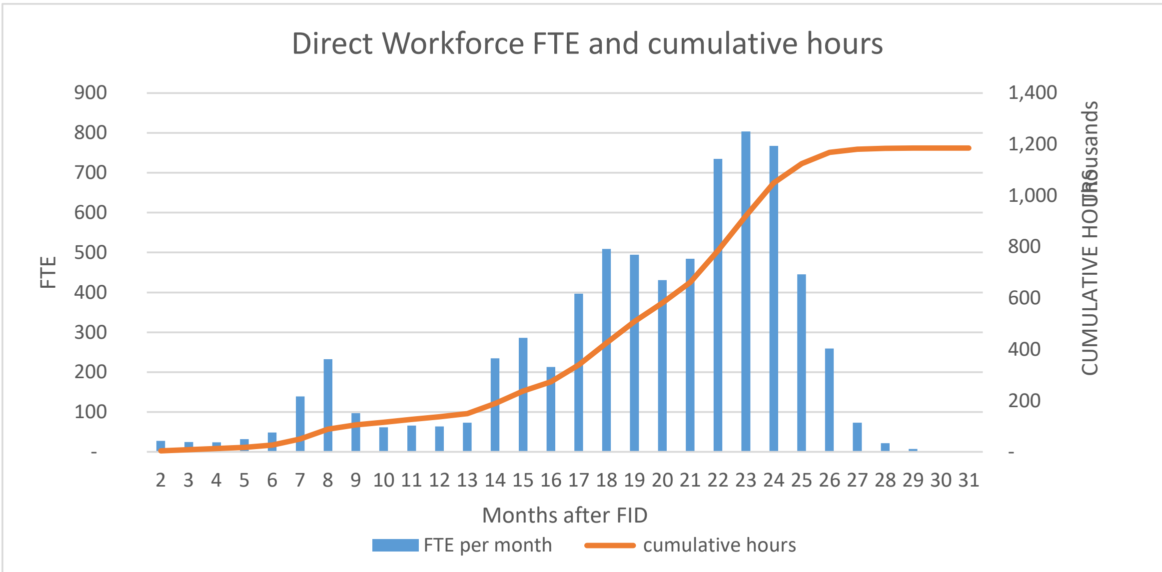


Figure 24-3: Direct workforce for the Battery Material Plant

24.1.4. Operational Readiness and Commissioning (ORC)

The ORC execution plan prepared during the Feasibility Study enabled NMG to identify potential risks to the Project. Workshops were held to better understand the market in which NMG evolves and the intrinsic values that the organization wishes to develop. The main findings were:

- The job market in the Bécancour region will be particularly competitive;
- Rare skills will be necessary;
- An innovative graphite transformation process will be commissioned.

Several actions and recommendations were taken and/or elaborated to address those issues during the Feasibility Study or during the next phase of the Project.

24.1.5. Operational Readiness (OR)

OR activities as detailed in the ORC execution plan will be led by NMG with the help of external consultants specialized in OR planning and execution.

Maintenance and operation personnel will be part of the pre-commissioning and commissioning activities to gain as much experience as possible and be more efficient in the coming operation and maintenance activities. Hiring and training of the maintenance and operation personal involved will have to be planned accordingly.

24.1.6. Pre-commissioning

Understanding the challenge of pre-commissioning and commissioning, NMG has integrated pre-commissioning system definition into the coding methodology of all equipment, piping, electrical and instrumentation components. System transfers from the construction team to the pre-commissioning team and respect of commissioning sequence will be facilitated.

Pre-commissioning activities will be executed by a team made of NMG's maintenance personnel and experienced multidisciplinary personnel from consulting firms selected by NMG for their expertise in pre-commissioning.

24.1.7. Commissioning

The strategy identified by NMG to mitigate the risk associated with their process technology is to commission, in Bécancour, one-third of the production equipment in a first phase and the remaining equipment in a second phase. A detailed commissioning sequence has been identified and illustrated in the 3D model of the Project using specific views prepared to communicate the commissioning strategy.

The main production lines and equipment of the commissioning phase will be:

- All common services (electrical power, compressed air, nitrogen, etc.) commissioned before any production equipment;
- One of the three production lines of Micronization and Spheronization area;
- Three of the nine furnaces of the purification area along with the associated gas and water treatment services;
- Two of the six furnaces of the coating area.

The commissioning activities will be performed by NMG's operation personnel supported by the pre-commissioning team. The first commissioning phase will enable NMG to gain experience on the process and identify problems and bottlenecks early in the ramp-up phase. A special task force will be responsible to resolve issues identified during the first phase and implement the same corrective actions on equipment of the second phase before commissioning.

24.1.8. Production Ramp-up

Similar to commissioning, production ramp-up will be in two phases performed by NMG's operation personnel supported by the pre-commissioning team and the special task force.

25. Interpretation and Conclusions

The results of the FS for the integrated Phase-2 Matawinie Mine and the Bécancour Battery Material Plant projects demonstrate that the Project is financially sound and remains economical within the limits of the sensitivity analysis performed on Capex and Opex costs as well as on selling price.

25.1. 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 composites 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 mineralized zones. These zones are named the Far-West, West, North, Northeast, East, Southeast and Southwest Zones. No other known mineral occurrences were identified on the Project area prior to the exploration work performed by NMG. Proper quality control measures, including the insertion of duplicate, blank and standard samples were used throughout the exploration programs and returned within acceptable limits. Recent exploration work focused on the more promising results from the West Zone.

25.2. Mineral Resources

Exploration activities by NMG have culminated in the identification of Proven and Probable Mineral Reserves for the West mineralized Zone. The Resource Estimate from which the Reserves are built is based on 8,274 assay intervals collected from 27, 888.24 m of core drilling and three surface trenches providing 207 channel samples. The Mineral Resources of the West Zone, dated May 20, 2022, include: 28.5 Mt of Measured Resources at an average Graphitic Carbon grade (Cg) of 4.28% (1.22 Mt Cg), 101.8 Mt of Indicated Resources at an average Cg grade of 4.26% (4.33 Mt Cg) and 23.0 Mt of Inferred Resources at an average Cg grade of 4.28% (0.98 Mt Cg) using a cut-off grade of 1.78% Cg.

25.3. Mineral Reserves

The Matawinie Mine will be mined using conventional open pit mining methods consisting of drilling, blasting, loading, and hauling. Ore will be hauled to the primary crusher and waste rock and tailings will be placed in a co-disposal storage facility (CSF). The CSF will initially be located at the surface and, as of Year 7, will be placed inside the mined out open pit.

The Mineral Reserves for the Matawinie Mine project are based on a 25-year mine life and include 17.3 Mt of Proven Mineral Reserves at an average Graphitic Carbon grade (Cg) of 4.16% and 44.3 Mt of Probable Mineral Reserves at an average grade of 4.26% Cg, for a total of 61.7 Mt of Proven and Probable Mineral Reserves at an average grade of 4.23% Cg. To access these Mineral Reserves, 15.5 Mt of overburden and 56.2 Mt of waste rock must be mined, resulting in a strip ratio of 1.16:1.

25.4. Mineral Processing and Testing

25.4.1. Matawinie Mine Project

The metallurgical test programs that were carried out to support the FS confirmed the robustness of the flowsheet that was developed during the PFS.

The additional testing that was completed to address risks and opportunities that have been identified led to the following conclusions:

- A master composite representing the first few years of planned mining operation and several mine plan variability composites confirmed the metallurgical results that were obtained in the flowsheet development and optimization programs. This consistent metallurgical response validates the robustness of the flowsheet and conditions and therefore, further reduces the process risk of the Project.
- Process water recirculation can result in undesirable activation of sulphides in the rougher/scavenger stage and increased sulphide grades in the final graphite concentrate. To mitigate this issue, two process water circuits have been considered for the design of the commercial plant. One process water circuit for the graphite concentration circuit and the other one for the desulphurization circuit. However, still there is some excess water from the desulphurization circuit with some xanthate residue that goes to the collecting basin which then feeds the graphite concentration circuit. Further work will be required to develop a better understanding of the impact of the time and ageing on the xanthate degradation in the recirculation water from the collecting basin. This said, the current demonstration plant operates with only one process water circuit, and concentrate at 97% C(g) is produced with a sulfur content below 0.3%S.
- A flash flotation cell was installed at the demonstration plant under the ball mill cyclone and was fed by the cyclone U/F to recover the liberated graphite coarse flakes before passing through the ball mill. The flash flotation tests confirmed that this equipment can produce a rougher graphite concentrate recovering a high percentage of the jumbo flakes.

- Optimized conditions have been developed for the desulphurization stage at the exterior laboratories, moreover, additional tests have been conducted at the demonstration plant, inverting the position of the magnetic separators with the sulphide flotation. The new configuration (magnetic separation before flotation) resulted in lower collector consumption as well as lower S% in the NAG tailings.

The operation of the demonstration plant facilitated the optimization of all unit operations and a systematic investigation of the grinding conditions for the polishing and stirred media mill applications. It also allowed confirming the efficiency of flash cell technology at the graphite flotation rougher stage, tank cells efficiency, desulphurization circuit, The operation of the demonstration plant provided critical process data to finalize the flowsheet necessary for the detailed engineering phase.

Several external test programs were carried out to generate process data to confirm equipment sizing during detailed engineering.

The evaluation of critical process equipment on a demonstration scale reduced the uncertainty associated with equipment scale-up from bench scale to commercial operation. Furthermore, the continuous operation of the flotation circuit assisted in identifying metallurgical challenges that only arise after extending operation. It also allowed for the systematic optimization of each process variable under controlled conditions (e.g., polishing and stirred media grinding conditions).

All test programs completed to date generated conclusive results and further laboratory scale development testing is deemed unnecessary at this point, especially when considering the 3.5 tph demonstration plant commissioned in 2018 to process the West Zone material.

25.4.2. Bécancour Battery Material Plant

Successful secondary transformation of Matawinie graphite concentrate has been demonstrated for all the processing stages including micronization/spheronization (M/S), purification and coating. Laboratory, OEM and partial demonstration plant trials have proven that the production of high-quality battery grade material is achievable from graphite concentrate. Continued operation of the demonstration plant facilities, in particular for purification and coating, is required to confirm the design criteria for detailed engineering.

25.4.2.1. Micronization and Spheronization

The extensive tests performed with the micronization and spheronization equipment at the demonstration plant have enabled NMG to get a better understanding of this process step and optimize it. The test results demonstrate that:

- The equipment can successfully micronize and spheronize feed material of different sizes;
- Multiple factors such as the size of the feed material and the various equipment operating parameters have an impact on the final product obtained. These factors can be used as process optimization levers;
- It is possible to have a precise control over the spheronized graphite powder properties while respecting the limits of the equipment, by taking advantage of the various optimization levers available;
- Spheronized material with different particle size distributions (d50 varying from 8 to 20 µm) and tap densities can be obtained to meet customers' individual specific needs with acceptable throughput and yield;
- Ability to maximize utilization of the feed by performing secondary spheronization and using the ultra-fines in applications such as a carbon riser.

Tests at the OEM test centres have solidified the above-mentioned observations and proven the scalability of the demonstration equipment for commercial operations.

- For the primary spheronization, a yield of 58.5% was achieved for a d50 of 18µm with a tap density of 0.89 g/cm³;
- For the secondary spheronization of producing a d50 of 8µm (from the fines of the primary spheronization) with a tap density value between 0.65 and 0.71 g/cm³, a yield of 30% is estimated to be achievable on a commercial basis.

25.4.2.2. Purification

The capability of the carbochlorination process to produce 99.95% graphite has been demonstrated both at the laboratory and, in a limited capacity, demonstration plant scale.

Piloting of the carbochlorination process is ongoing in order to obtain the data required to fix the cycle time for purification and the design parameters for the gas treatment process. Operation of the demonstration plant has been progressing, but has not yet confirmed the hypotheses required for the charging, heating and treatment, and discharging phases of furnaces for the commercial plant. The demonstration plant has however served to produce large pre-commercial samples for potential clients. While progress at the demonstration plant has been steady, questions remain about some of the process design criteria. The potential changes include optimization of chlorine dosage, Cl_2 injection rate and dispersion, operating temperature and overall cycle time. These parameters affect the number of purification furnaces required and due to the uncertainty remaining, the cost for additional furnaces has been considered in the management reserve.

This sector of the plant is considered at the pre-feasibility level until the piloting phase is completed. A large part of the managerial reserve is aimed controlling the risk of this sector of the plant.

25.4.3. Coating

The extended test at the CNRC laboratory proved the concept of a coating from pitch. The base line of precursor content, sizing, the pyrolysis, calcining condition, and other process parameters were tested and validated in half-cell battery test, which showed similar performance to commercial material.

For the coating process, the base technology chosen is based on the industry standard with the exception of the pyrolysis/calcining kiln limiting the risk of new alternative technology.

Further pilot scale performed in testing facilities with key technology suppliers confirm the results obtained with the lab testing.

- Micronization of the precursor on the low micron size was proven at pilot scale with throughput needed for the commercial plant;
- Material preparation of the required SPG/precursor blend were performed with the necessary uniformity;
- The pyrolysis and calcining of the material blend was performed at the equipment supplier pilot plant confirming the equipment capability and material properties;
- Pilot scale material prepared was tested in half-cell battery and performed as in the lab test and comparable in performance as the commercial comparison;
- The different evaluation of the material prepared at the commercial process condition showed a uniform and continuous around 10 nm;
- The specific surface is on the target below 2 m^2/g;
- The 1st charge and discharge of the pilot-scale material are slightly lower than the lab material but within acceptable levels at 356 and 384 mAh/g but the initial coulombic efficiency was better at 92.7%.

Overall, the coating technology that will be implemented in Phase 2 is able to provide the results required by battery manufacturers in terms of electrochemical performance.

Some uncertainty remains due to the limited amount of material tested, but the similarity in the lab and pilot scale test results shows that the basic parameters are well defined.

The efficiency of the different equipment and the process parameters were tested with some suppliers but wasn't optimized leading to some degree of uncertainty. However, the risks are considered minor as no significant changes are foreseen.

The coating demonstration plant in SMDS will complete the evaluation and eliminate the scale-up risk as it will be in the range of 3 to 1 in terms of individual equipment.

25.5. Environmental Studies and Permitting

NMG received the report and recommendations of the *Bureau d'audience publique sur l'environnement* (BAPE) regarding its Phase 2 Matawinie Mine project. The Government's environmental assessment analysis continued at the MELCC from November 2020 to January 2021 and resulted in the adoption of a ministerial decree that authorized the Matawinie Mine project on January 20, 2021, on the territory of the municipality of Saint-Michel-des-Saints (Décret 47-2021).

The permitting sequence following a ministerial decree is based on engineering advancement. Authorizations for the access road construction and industrial platform site preparation have been obtained and construction has started. Next phases are: 1) the building and concentrator construction; 2) tailings and water management infrastructure; 3) pit and mine site preparation; and 4) mine operation.

From Year 2 of operation, a modification to Condition 2 of the Decree will be needed to comply with the maximum of ore and waste rock extraction to meet the total annual production. This maximum is fix based on a degree of uncertainty regarding the proportion of crystalline silica in the dust from different sources of emission. In March 2022, NMG submitted to the MELCC a protocol to update data regarding crystalline silica and submit a new version of the airborne contaminant distribution modelling considering the updated information from the Matawinie site. The model will be accompanied by a dust management plan to ensure compliance with the criteria.

As specified in Condition 3 of the Decree, full scale field testing of co-disposal of tailings was undertaken during the summer of 2020. Monitoring the scale field cell confirms the assumptions on the effectiveness of the design. The results of the cell can provide tools to ensure a safe design including proof design criteria into the deposition plan and the monitoring QA/QC program (Condition 4 of the Decree).

As per Condition 6 of the Decree, NMG continues the progress of work to electrify mobile mining equipment. In June 2021, NMG entered into of a collaboration agreement with Caterpillar Inc. under which Caterpillar Inc. will develop, test, and produce Cat® "zero-emission machines" for the Phase 2 Matawinie Mine, with a view to becoming the exclusive supplier of an all-electric mining fleet for deployment at the Phase 2 Matawinie Mine 5 years after the start-up of the mine.

Through every phase of the Project, including construction and the preparation for mine operations, a Monitoring Committee, previously operating as NMG's Accompanying Committee since 2017, is in place. The committee functions both as a consultative body as well as a platform for environmental and social surveillance of NMG's operations.

25.6. Recovery Methods

25.6.1. Matawinie Mine Project

The processing plant is designed to process 324 tph of run of mine to produce up to 105,882 tpy of graphite concentrate grading at 97% C(g) based on a concentrate recovery of 93%. Considering the variation of feed stock to the processing plant over the mine life the processing plant will produce an average of 103,328 tpy. A suitable process flowsheet has been developed which includes crushing, grinding, flotation, polishing, 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 desulphurization circuit which includes magnetic separation and sulphide flotation. The non-acid generating (NAG) tailings and the sulphide tailings (PAG) are conveyed to separate stockpiles before being trucked to the co-disposal storage facility.

25.6.2. Bécancour Battery Material Plant

The Battery Material Plant is designed to process 60,700 tpy of graphite concentrates from Matawinie through the M/S, purification and coating stages of the secondary transformation process. Additionally, 3,075 tpy of jumbo flakes will be purified at the Bécancour site. The proposed flowsheet will produce a combined 42,616 tpy of primary and secondary CSPG materials, 18,834 tpy of fines by-products and 3,007 tpy of purified jumbo flakes.

The main waste materials generated by the process are fouled insulating media where the impurities extracted from the graphite condense in the form of mixed oxides and chlorides and the water treatment plant sludge. The fouled media will be disposed of in an authorized containment facility while the sludge will be trucked to Matawinie for co-disposal with the concentrator tailings. The water treatment plant also produces a 12% $CaCl_2$ saleable brine.

25.6.3. Bécancour / Environmental Studies and Permitting

For the future Phase 2 Bécancour Battery Material Plant, NMG completed an environmental baseline study of the 200,000-m^2 land (hereafter named Lot 17) located within an industrial park.

Phase 2 Bécancour Battery Material Plant is under section 22 of the Environment Quality Act (EQA). Several requests for authorization following the different stages of the design or the construction activities will be required.

25.7. Market

NMG is implementing a natural graphite project that has competitive advantages due to its privileged location, low carbon footprint, cost structure and experienced team. A demonstration plant located near the mine site has been constructed to allow NMG to supply representative samples for qualification which allows for an earlier debut in the market and de-risk the first years of sales. NMG's large graphite flake reserve allows NMG to follow the growth of its customers. One of the goals of this demonstration plant is to secure medium to long-term supply agreements with different customers.

NMG commissioned three market studies and based the financial evaluation of the project on a more conservative outlook on future graphite material pricing.

25.8. Economic Analysis

This report shows that the integrated project of NMG is technically feasible as well as economically viable.

Based on a 25-year production period and assuming 100% equity financing, the total Project Internal Rates of Return (IRR) is 24.6% before taxes and 21.0% after taxes. The Net Present Values (NPV), at 8% discount rate, is $2,360M before taxes and $1,581M after taxes. The payback period is 3.9 years before taxes and 4.2 years after taxes.

The authors of this report consider that the Project is sufficiently robust to warrant moving it to the development phase except for the carbochlorination process. The other sectors of the plant can move to development immediately, but approximately 3 to 6 months of test work is required to freeze the design criteria of the commercial furnace purification sector.

25.9. Risk Evaluation

There are a number of risks and uncertainties identifiable to any new project and usually cover the mineralization, process, financial, environment and permitting aspects. This project is no different and an evaluation of the possible risks was undertaken which is summarized in this section.

25.9.1. Geology

No foreseeable risks for a significant reduction of the deposit are expected. The highly metamorphosed geological environment of the area limits detailed interpretation of the mineralized horizons which could be thinner than interpreted thus resulting in higher dilution that modelled. However, the geological interpretations and assay results obtained from infill drilling on the West Zone is sufficient to support the simplified geological model and the mineral resources presented in this report.

25.9.2. Mineral Resources

- The Mineral Resource Estimates for the Property have been prepared following the NI 43--101 rules and guidelines. There are numerous uncertainties inherent in estimating Mineral Resources and no assurance can be given that the anticipated tonnages and grades will be achieved, that the indicated level of recovery will be realized or that any categories of Mineral Resources will be upgraded to higher categories. The estimation of mineralization is a subjective process, and the accuracy of estimates is a function of quantity and quality of available data, the accuracy of statistical computations and the assumptions and judgments made in interpreting engineering and geological information.
- Only the West Mineralized Zone has been incorporated into the Matawinie Mine project. Other mineralized zones identified on the Property have not been studied to be integrated in the Mineral Reserves or mine plan. Additional work, such as core drilling and assaying, is needed to properly assess the potential of these zones.

25.9.3. Mineral Reserves

- The Probable Mineral Reserves represent 72% of the total Mineral Reserves for the Matawinie Mine project. Probable Mineral Reserves, which are derived from Indicated Mineral Resources have a lower level of confidence than Proven Mineral Reserves which are derived from Measured Mineral Resources. There could therefore be unexpected internal grade variations which could alter the mine plan.
- Once construction of the external CSF is complete the plan is to place tailings and waste rock in the mined-out pit. There is a potential risk that the expit facility will be completed prior to having enough space in the mined-out pit. Mitigation to this risk is to expand the expit facility.

- Since the ore is potentially acid generating, the current plan is to have limited stockpiling. This poses a potential risk if stockpiling is required for blending or mine production-related issues. Mitigation to this risk is to construct an ore stockpile pad which would be designed accordingly.

25.9.3.1. Process – Matawinie Mine Project

- The process has been developed based on significant test work on representative samples extracted from the mineralization and was also based on the operation of the demonstration plant for more than three years. Most of the risks related to the process identified during the project have been lowered major variations in the quality of mineralization could result in limitation of throughput and quality throughout the process. These limitations include:
  - The crushing and grinding circuits have been designed based on samples from mineralized ores. Significant variations in hardness throughout the LOM resource could cause a throughput limitation in the comminution circuit. However, test results shown that the variability within the orebody is generally small, with all the ore samples falling in the soft range of competency, except for the contact zone between the waste and the ore. This risk was partially mitigated by the comminution program that was carried out before detailed engineering. However, variations on a daily basis may still occur;
  - 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 selected process instrumentation package has not been tested at the demonstration scale and may result in challenges during initial operations. This said, the actual demonstration plant operates with very limited instrumentation and therefore the future instrumentation package should help optimizing the operations after its implementation;
  - Access to operators trained in graphite operations is limited. Although the demonstration plant provided an excellent training tool, commercial operations will require a much larger workforce.

25.9.3.2. Process – Bécancour Battery Material Plant

The production of battery grade materials has been demonstrated in the M/S, purification and coating sectors through laboratory test work, test work with external labs and OEMs as well as though the operation of NMG's demonstration plants.

The operability of the M/S has been demonstrated on a continuous basis in the demonstration plant, however, continued testing of the optimized flowsheet on commercial size equipment will help to further de-risk the project and support the targeted 6-month window for commercial acceptance.

In purification, the capability of the carbochlorination process to produce 99.95% graphite has been demonstrated at the lab scale and in limited demonstration plant trials. Continuous operation of the demonstration plant is required to confirm the hypotheses used for the loading, heating and treatment, and discharging phases of furnaces for the commercial plant. Continued definition of the process parameters discussed earlier as well as dynamic simulations of the material handling and storage aspects of the process should be pursued.

Coating of SPG to optimize battery performance has been proven at a lab scale and the demonstration plant is currently being commissioned. The operation of the demonstration plant will allow production of pre-commercial samples for potential clients and to de-risk the commercial plant start-up and help to minimize the commercial acceptance period.

25.9.4. Infrastructure

25.9.4.1. Matawinie Mine Infrastructure

Risk reviews of Mine Infrastructure were conducted at regular intervals during the Project, notably the Feasibility Study review and gap analysis process and at 30% detailed engineering in May 2022. The scope of the risk analysis included Infrastructure within SNC Lavalin's scope but also included some of the project wide infrastructure risks. In the period during these risk analysis, most previously identified risks were addressed at detailed design and risks remaining after the June 2022 were quantified.

The updated risk register and associated report were issued to NMG in June 2022.

25.9.4.2. Bécancour Battery Material Plant

A number of opportunities were identified during the course of the Project. Work to optimize the site layout and several proposed trade-off studies on small parts of the Project will continue to narrow the scope of the Project ahead of detailed engineering.

25.9.5. Market

The main risk associated with the commercial activities of NMG is the stringent product performance requirements that makes the product developments and qualification a long process. A second risk could be other graphite mining projects starting in North America.

25.9.6. Financing

- The results of the report were based on certain assumptions that were given as of the date of the report. The economic assessment 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 the report estimates. However, the Project's viability remains more vulnerable to the USD/CAD exchange rate and the larger uncertainty in future market prices. Delays and cost overrun can impact the Project rendering it uneconomic.
- Currently, there is a significant demand on the mining community for funds for mining opportunities worldwide. NMG is one of those mining companies who would be seeking financing for a project. Even though, the results of this financial analysis are positive and shows a positive return on investment, NMG is a smaller mining operator and funds could be difficult to obtain.
- The mining industry is heavily dependent upon the market price of the metals or minerals being mined. There is no assurance that a profitable market will exist for the sale of the same. There can be no assurance that mineral prices will be such that the Project can be mined at a profit. Mineral prices largely fluctuated over the last years and any serious downturn could prevent the continuation of the exploration, construction, and development activities of the Corporation.

25.9.7. Environmental and Permitting

Matawinie Mine Project

- The Project requires licenses and permits from various governmental authorities such as the MELCC. From Year 2, the Project requires decree modifications from the MELCC with respect to Condition 2 where a maximum of ore and waste rock extraction is fixed based on a degree of uncertainty regarding the proportion of crystalline silica in the dust from different sources of emission. There can be no assurance that NMG will be able to obtain or maintain all necessary licenses, permits or decree modifications that may be required to carry out exploration, development and mining operations, and failure to do so could delay or prevent the construction, start-up of the mine or operations as economically planned.
- Any delay in obtaining the anticipated construction permits or decree modifications could have an adverse effect on the timing and costs associated with start-up and operation. Such delays may also allow other third-party projects to commence production before the Matawinie Graphite Property, thereby potentially reducing NMG's target market share, which would have an adverse impact on the level of product sales, operations, and economics of the Matawinie Graphite Property.
- Although NMG has had communications with the local communities and has worked with these communities to mitigate their concerns about the potential project's environmental and social impact, the Project could be delayed by changes in the communities' attitudes necessitating additional studies and design alternatives.

Bécancour Battery Material Plant

Continued operation of the purification demonstration plant is recommended to optimize operating parameters and to confirm the effluents of the gas and water treatment plants, as well as to finalize the waste treatment strategy.

Studies and simulations are underway to finalize the scope and design of the atmospheric emission outlets' dimension and configuration for the different equipment, particularly dedusting, to ensure regulatory requirements are met.

26. Recommendations

26.1. Mining and Geology

26.1.1. Follow-up Geological Work During Pre-production and Mining Operation

As the mining operations progress, and removal of overburden and drilling for blasting is performed, additional mapping of the mineralization of the West Zone deposit should be carried out and fed into an ever-evolving block model. A strict grade control program should be implemented as operations advance. This is part of standard mining operations and helps optimize ore recovery by having a more detailed and reliable geological model. Additional parameters such as flake size distribution and purity, as well as sulphur content should also be included in the modelled data to enhance the understanding of the deposit.

26.1.2. Mineral Reserves

An analysis should be done to determine if an elevated cut-off grade can provide improved overall economics for the Project.

Additional infill drilling is recommended to convert all Probable Reserves to Proven Reserves covering the Starter pit as well as Phase 1. Such a campaign is estimated at about 2,700 m of drilling.

26.2. Metallurgical Studies and Test Work

26.2.1. Matawinie Mine Project

- Packaging cycle times will be determined, and logistics will be optimized for bag loading, inflating, filling, and storage.
- Develop a better understanding of the relationship between PAX dosage in the sulphide rougher and the recovery of sulphides into the final graphite concentrate under continuous operating conditions. This includes the implementation of control mechanisms to reduce the risk of overcollection and the investigation of xanthate destruction technologies and xanthate degradation over time.
- The demonstration plant should be used as a training facility for new operators. This will allow the operators to be further along the learning curve when commercial operations begins, which should reduce the Project ramp-up time.

26.2.2. Bécancour Battery Material Plant

Continued work is recommended at both the lab and demonstration plant scale to optimize the secondary transformation process. Operation of the demonstration plants using commercial scale equipment will be critical to achieve the targeted 6 months for commercial acceptance.

26.2.2.1. Micronization and Spheronization

- Additional testing and stability analysis will be required to confirm the performance of the European OEM for the micronization, spheronization and classification steps.
- Since the scalability and performance of this European equipment was evaluated in a test centre on a demonstration scale, these tests need to be replicated on a commercial size equipment to assert large scale production. Such tests will be executed on the commercial sized equipment that will be installed in the demonstration plant in Saint-Michel-des-Saints.
- The energy requirements of the micronization and spheronization steps will have to be confirmed.
- Further investigation needs to be conducted to improve the sphericity of the spheronized graphite.
- More avenues need to be explored for the efficient utilization of the ultra-fines obtained as a by-product of the secondary spheronization.

26.2.2.2. Purification

- Continue to operate the demonstration plant to confirm optimal process parameters including:
  - Chlorine dosage and injection rate;
  - Operating temperature;
  - Degree of graphite compaction.
- Operate the gas and water treatment plants in the proposed configuration to confirm the flowsheet and to confirm the suitability of the waste disposal plan and the saleability of the brine solution.
- Develop a better understanding of the metallic crust collected and refine the crust treatment through lab and pilot scale test works.

26.2.2.3. Coating

- Operate demonstration plant to produce pre-commercial samples.

26.3. Tailings and Water Management Infrastructure

The following additional information is required to address project design refinements and confirm the assumptions made in co-disposal and water treatment engineering:

- Continue and complete detailed engineering on collecting basins slope design to ensure geomembrane installation is optimal.
- Additional stability analysis will be required to include recommendations and optimization in the next engineering phases for pit backfill:
  - The co-disposal stockpile including the pit wall data for areas where the pile will be located near the pit;
  - The co-disposal stockpile when placed over the backfilled mine pit;
  - Additional stability analyses to evaluate the effect of the blasting activities on the pit and the co-disposal pile will have to be carried out.
- Additional validation and engineering will have to be carried out regarding a protective rock layer between the in-pit co-disposal and the northern part of the pit where a lake will form after site reclamation.

26.4. Environment

- Continue the collaborative work with the Community, the Atikamekw First Nation of Manawan and the Stakeholder Committee.
- Continue the engagement with the Atikamekw First Nation of Manawan and the Council of the Atikamekw First Nation in order to reach the pre-development agreement.
- Continue holding public consultations in order to properly inform and take into account the local communities' and stakeholders' concerns regarding the Project.
- Pursue the proactive acquisition process of private and leased lands within a 1 km radius of the proposed open pit.
- Fulfill NMG's engagements and put forth mitigation measures when possible.
- Continue the procedure with the ministry of environment, MELCC, to request modifications to the mining decree to increase the daily mining production tonnages to reach the production level of the mining plan. Not doing so would reduce the annual production rate.

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 demonstration plants, which uses ore material from the West Zone to create natural graphite flakes concentrate, is a pivotal component in de-risking NMG's open pit natural graphite mining project on its Matawinie and Bécancour properties. The demonstration plants serve to:

- Supply enough quantities of each material group to support an adequate market approach.
- Qualify NMG graphite products and establish a sales record.
- Test and improve processes for commercial operation optimization.
- Implement high standard and innovative technology for tailings and mine waste management as well as site reclamation.
- Start employee training and local future workforce outreach program.
- The property is host to other mineralized zones that could eventually be further investigated and integrated to the Matawinie Mine project if found economically viable.
- Establish Quality Control and Quality Management procedures and system that will be later implemented during the Commercial phase.
- Have a better understanding of NMG's production costs.
- De-risking of the scale-up of the commercial plant by having already implemented commercial equipment in the demonstration plants.

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For ease of use, all "GM" reports and other Québec government publications are available for viewing free of charge on Québec'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).

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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