



Graphite One Resources Inc.
NI 43-101 Preliminary Economic
Analysis
On the
Graphite One Project

Qualified Persons:

R.J. Robinson, P. Geol., TRU Group

I. Roumeliotis, Eng., TRU Group

M. Paterson, P. Eng., TRU Group



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Glossary of Terms

<u><i>Elements/Assays</i></u>		<u><i>Financial/Tax Initialisms</i></u>	
C, %C	carbon, weight percent carbon	EBDIT	earnings before depreciation, interest, & taxes
Cg, %Cg	graphitic carbon, weight percent graphite	IRR	internal rate of return
CO	carbon monoxide	NPV	net present value
CO ₂	carbon dioxide	\$	US dollars
Li	lithium	ACIT	State of Alaska Corporate Income Tax
Li+	lithium ion	AMLT	Alaska Mining License Tax
K	krypton	APR	Alaska Production Royalty
Ar	Argon	B&O	Washington State Business & Occupation Tax
40K/40Ar	krypton 40 / argon 40 dating methodology	DAPD	Domestic Activities Production Deduction
		EIC	Exploration Incentive Credit
		NSR	Net Smelter Return
<u><i>Mass, Length, Area, Volume</i></u>		<u><i>Time, Rate</i></u>	
wt%	weight percent	s	second(s)
kg	kilogram(s) 1000 kg =1 metric tonne	h	hour(s)
lbs	pounds; 1 kg = 2.2025 lbs	pa	per annum
t	metric tonne(s)		
t-conc	metric tonnes graphite concentrate	<u><i>Initialisms</i></u>	
\$US per t	US dollars per metric tonne	BET	Brunauer–Emmett–Teller
tpa	metric tonnes per annum	CIM	Canadian Institute of Mining, Metallurgy & Petroleum
tpd	metric tonnes per day	EV	electric vehicle
tpy	metric tonnes per year	FOB	free on board
g/cm ³	grams per cubic centimeter	FS	Feasibility Study
kg/m ³	kilograms per cubic meter	GPS	global positioning system
sg	specific gravity	HMS	heavy media separation
m ² /g	square meters per gram	IGL	Independent Graphite Laboratory
m ²	square meter(s)	IMPL	Independent Mineral Processing Laboratory
km	kilometer(s)	LNG	liquefied natural gas
m	meter(s)	LOI	loss on ignition analytical method
mm	millimeter(s)	PFS	Prefeasibility Study
µm	microns/micrometer(s)	QA	quality assurance
nm	nanometer(s)	QC	quality control
D ₅₀	50% passing particle size	QP	qualified person
		ROM	run of mine
		TPF	Thermal Processing Facility

<i>Symbols</i>	
>	greater than or higher than
<	less than or below

<i>Power/Energy/Temperature</i>	
kW	kilowatt(s); 1000 kW = 1 MW
kWh	kilowatt hour(s)
MW	megawatt(s); 1000 MW = 1GW
MWh	megawatt hour(s)
MWh-y	megawatt hours per year
GWh	gigawatt hour(s)
Ah/kg	Ampere hour per kilogram
V	Volt(s)
°C	degrees Celsius

<i>Graphite Products</i>	
MG	milled graphite
NMG	non-milled graphite
NM-P-SG	non-milled purified spherical graphite
M-P-SG	milled purified spherical graphite
CSG	coated spherical graphite
M-P-CSG	milled purified coated spherical graphite

NOTE: The currency used in this Preliminary Economic Assessment is the United States dollar and the \$ symbol means United States dollar.

1 SUMMARY

1.1 Project Overview

Graphite One Resources Inc.'s Graphite One Project ("the Project") has been conceived as the vertically-integrated manufacturer of high grade coated spherical graphite. The concept is illustrated in the following Figure 1-1. It is framed as an American interstate project with

1. Mining and mineral processing at the Graphite Creek Property ("the Property") in Alaska; and
2. Upgrading and graphite processing performed in the State of Washington within proximity of a seaport¹.

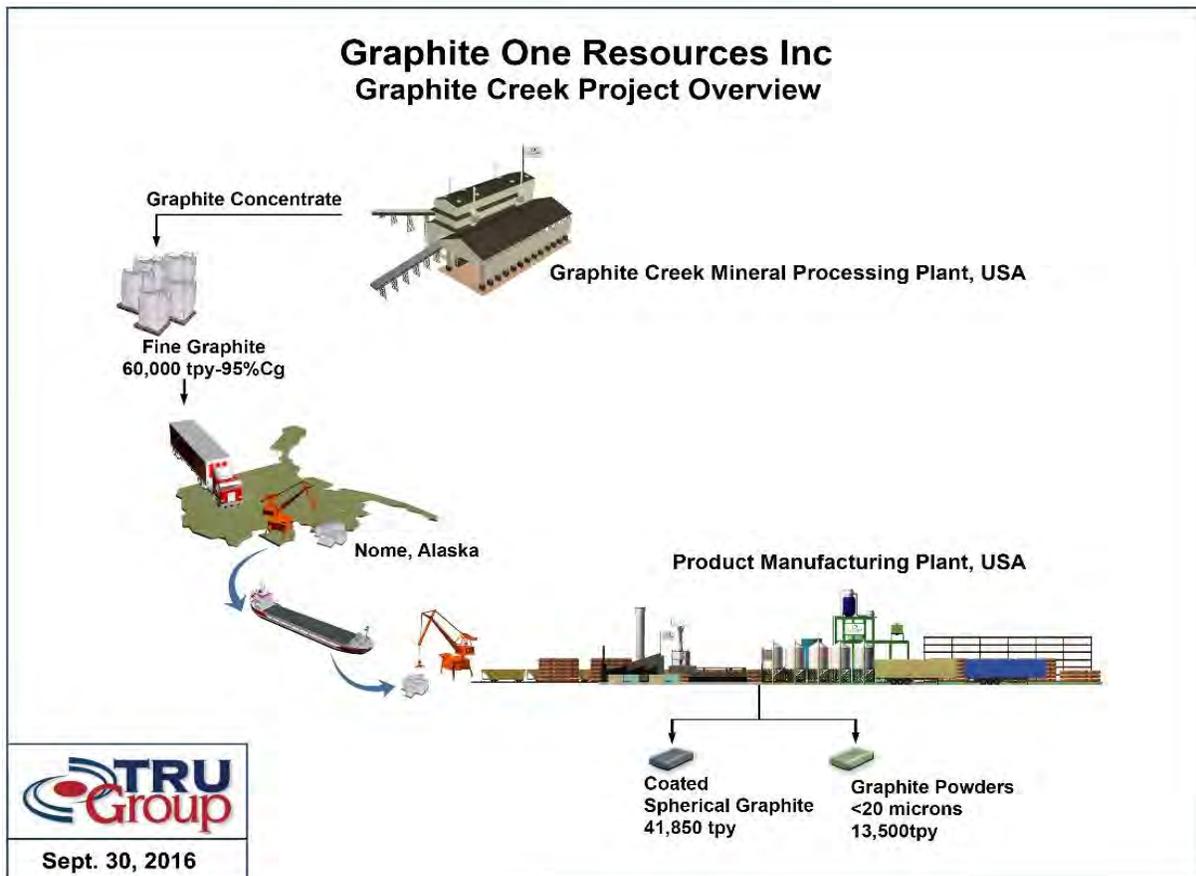


Figure 1-1: Concept for the Graphite One Project at full production

¹ TRU Group has only reviewed Washington State as a potential site for the Product Manufacturing Plant for the PEA because it readily satisfies the economic, logistical and infrastructure criteria. Graphite One will also be reviewing optional sites in the State of Alaska.

Key considerations for this concept includes the following factors -

- ❖ Minimizes the amount of material requiring transport out of Alaska in order to minimize expenditures for barge transport
- ❖ The proposed location for the Product Manufacturing Plant has the low-cost hydro-electric power needed for the energy- intensive purification processing and products manufacturing and is a good strategic geographic location for marketing finished products.

When the Project reaches full production capacity, open pit mining will deliver 1,018,000 tpy of graphite mineralization to the Mineral Processing Plant for the extraction and recovery of graphite into 60,000 tpy concentrate grading 95% graphite (Cg). The single concentrate is then transported overland to the Port of Nome and shipped by barge to a coastal location in proximity of the Product Manufacturing Plant¹. The sequence of processing at the Product Manufacturing Plant includes: thermal purification of the concentrate to 99.95%+ Cg; mechano-chemical processing (spheronization) of the refined product and classification of the processed material into spherical graphite and reject fractions; coating the spherical graphite; and heat treatment of the 'green' surface coated spherical graphite. The plant is designed to deliver 41,850 tpy of high-grade coated spherical graphite for lithium-ion battery applications along with 13,500 tpy of refined, sub 20-micron graphite powder for various end-uses.

1.2 Geological Setting and Mineralization

The Graphite One Graphite Creek Property area is underlain by high-grade metamorphic rocks of the Kigluaik Group. These metamorphic rocks are composed of continental crustal material of Proterozoic to middle Paleozoic age that were subjected to crustal imbrication and thickening in middle Mesozoic time and widespread plutonic activity in mid-Cretaceous to Late Cretaceous time. Some authors have proposed that at least part, and perhaps a significant portion, of high-grade metasedimentary and metaigneous rocks of the Kigluaik Group were originally blueschist-facies rocks of the Nome Complex subsequent to a high-grade metamorphic overprinting.

All of the formations of the Kigluaik Group are cut by intrusive rocks, the most common of which is granite. These intrusions are more abundant in the lower part of the group. Besides granite intrusions, dykes and sills of diorite, diabase and pegmatite are present.

Peak metamorphic grade in the area is thought to have occurred in the Cretaceous (91 Ma), immediately preceding or coincident with the intrusion of the Kigluaik Pluton (Amato and Wright, 1998). Other dating methods have yielded younger ages. 40K/40Ar and 40Ar/39Ar dating have yielded ages of ~95-81 Ma. The younger ages likely date the onset of high grade regional metamorphism of the Kigluaik Group (Adler and Bundtzen, 2011).

Bedrock is either exposed or covered minimally by surficial overburden material throughout most of the Property area, particularly in the incised creek valleys and/or relatively steep slopes adjacent to the Kigluaik Fault. Surficial Quaternary deposits dominate the area to the north of the Graphite One Property. The surficial deposits include: glacially deposited sand, gravel, and

¹ A port facility proposed by Bering Straits Native Corporation at Port Clarence could be a possible alternative to the Port of Nome during the life of the project and reduce overland transportation distance from the mine site.

boulders; fluvial gravel and sand; marine and fluvial terrace deposits; and wetlands (Till et al., 2011).

The Graphite Creek graphite deposit is located on the north side of the Kigluaik Mountains (at about 230 m elevation). More specifically, the graphitic schist occurs on the upslope and footwall surface trace of the reactivated Kigluaik normal fault. The Kigluaik Fault generally strikes at approximately azimuth 250° and dips 75° to the north over a distance of approximately 35 km. Contemporary movement on this fault has uplifted the rugged Kigluaik Mountains to the south and downthrown the lowlands of the Imuruk Basin to the north.

Graphite occurs as high-grade massive to semi-massive segregations and disseminations within amphibolite facies metasedimentary rocks, primarily biotite-quartz schist with zones of sillimanite-garnet-biotite-quartz schist. The graphite-bearing schist units strike subparallel to the mountain front and dip north between 40° and 75°.

There are two distinctive graphite-bearing schist intervals at Graphite Creek. The first is sillimanite-garnet-biotite-quartz schist that contains coarse, semi-massive and massive graphite segregations and disseminated graphite. The other interval unit is biotite-quartz schist that typically contains disseminated graphite. The sillimanite-garnet-biotite-quartz schist is the principal host to higher grade graphite and makes up two distinctive layers in the metasedimentary sequence along the north flank of the Kigluaik Mountains. A third potential horizon is defined by 'pods' of sillimanite-garnet-biotite-quartz schist. Shallow-dipping erosional remnants of the southern-most third layer makes up a few discontinuous perched masses at higher elevations. The sillimanite-garnet-biotite-quartz schist layers strike obliquely to the mountain front and dip northwards at 40° to 78°.

1.3 Drilling

Table 1-1 below provides a summary of the diamond drilling carried out to date on the Graphite Creek property. There is no evidence of any drilling being conducted on the property before Graphite One began working on the property.

Table 1-1 Diamond drilling summary by year

YEAR	PROGRAM START DATE	PROGRAM END DATE	NUMBER OF HOLES	METERS DRILLED
2012	29-Jun-12	17-Aug-12	18	4,248
2013	17-Sep-13	08-Oct-13	10	1,024
2014	21-Sep-14	05-Nov-14	20	2,221
TOTALS			48	7,493

A total of 7,493 m of diamond drilling for lithological determination and assay analysis has been completed on the property in 48 holes. An additional 91.59 m of drilling in two holes was carried out in the 2014 program to provide metallurgical test samples.

1.4 Resources

A thorough review of the previous resource estimations and geological modeling was carried out for the preparation of this report. Previous resource estimates used a base cut-off grade of 3% graphite. This cut-off was used in modeling the various mineralized domains or “Lodes” identified within the deposit. The decision to continue the use of the 3% cut-off value was based on an examination of the distribution of graphite grades throughout the deposit. The majority of the mineralized units within the deposit boundaries contain at least three percent graphite, and there is a definite natural cut-off below that grade. Units containing less than three percent graphite tend to be almost completely un-mineralized, which makes the three percent value a natural cut-off point.

The Indicated and Inferred Graphite Creek resource estimate in this report is reported in accordance with the Canadian Securities Administrators National Instrument 43-101 and has been estimated using the Canadian Institute of Mining’s (CIM) “CIM Definition Standards for Mineral Resources and Mineral Reserves,” dated May 10, 2014 and “Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines,” dated November 23rd, 2003. Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no guarantee that all or any part of the mineral resource will be converted into a mineral reserve.

The Graphite Creek deposit contains 10.3 million tonnes classified as Indicated resource at a mining cut-off of 6% graphitic carbon and 71.2 million tonnes of Inferred resource, also at a 6% mining cut-off grade. Table 1-2 and Table 1-3 respectively show the Indicated and Inferred resource at several cut-off grades. A final mining cut-off grade of six percent graphitic carbon was selected as it would produce mill feed grading seven percent graphitic carbon.

Table 1-2 Graphite Creek Deposit Indicated Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INDICATED	3.0	17.97	6.3%	1,134,000
	4.0	17.34	6.4%	1,111,000
	5.0	15.10	6.7%	1,009,000
	6.0	10.32	7.2%	744,000
	7.0	4.46	8.2%	367,000
	8.0	2.07	9.1%	189,000
	9.0	0.76	10.3%	78,000
	10.0	0.29	11.7%	34,000

Notes to the Mineral Resource Estimate:

1. Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no guarantee that all or any part of the indicated or inferred mineral resource will be converted into a mineral reserve. 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.

2. Values in the tables have been rounded. Totals may not tally due to rounding errors.
3. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs

Table 1-3 Graphite Creek Deposit Inferred Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INFERRED	3.0	154.44	5.7%	8,769,000
	4.0	121.62	6.2%	7,591,000
	5.0	105.81	6.5%	6,881,000
	6.0	71.24	7.0%	4,969,000
	7.0	22.24	8.2%	1,823,000
	8.0	8.79	9.3%	817,000
	9.0	3.45	10.8%	374,000
	10.0	1.52	12.6%	192,000

Notes to the Mineral Resource Estimate:

4. Mineral resources are not mineral reserves and do not have demonstrated economic viability. 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.
5. Values in the tables have been rounded. Totals may not tally due to rounding errors.
6. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs

1.5 Mining Methodology

The area selected for modelling, and planned for mining is located along a relatively continuous 1500-meter outcrop and appears to be segregated into three separate zones of graphite mineralization, termed Lodes 1, 2 and 3. During the modelling process, it was determined that the barren rock zone between Lodes 2 and 3 appears to be highly variable in thickness ranging from zero to as much as 5 meters. The three Lodes dip gently to the north under an increasing amount of overburden.

The mining methodology is planned as a truck and shovel operation mining along several contiguous, en-echelon, pits starting at the outcrop and progressing in the down dip direction.

This method of mining is characterized by its flexibility in mining mineral deposits of variable thickness and its ability to operate in a multi-pit situation. The material to be moved (whether mineralized material or waste rock) is first blasted to loosen and break up the material. The loosened material is then scooped up by large volume shovels and deposited in large trucks,

which transport the material to the mill feed treatment area or to the waste rock dump area. Basic planning has presumed four mining benches each using a large shovel and at least two trucks for material haulage.

An estimate of the overburden ratio was generated utilizing the cross sections generated during the modelling process. Based upon these assessments it is estimated that the overburden ratio for this project ranges between 2:1 and 4:1. For all subsequent assessments, a value for the overburden ratio was selected to be 3:1. When the Project attains full capacity, the delivery of mineralized feed to the Mineral Processing Plant will be 1,018,000 tpy at a nominal head grade of 7% Cg.

1.6 Mineral Processing and Metallurgical Test Work

Table 1-4 summarizes the mineral processing and metallurgical test work programs commissioned by Graphite One to date along with their respective key observations. This Preliminary Economic Assessment (PEA) is based on the results and observations of the latter three programs (5 to 7) mandated to TRU Group.

The key outcomes of the test work defined important process parameters incorporated into the conceptualization and economics of the Project that –

- ▶ Identified the naturally occurring and unique morphological aspects of the Graphite Creek graphite branded as “STAX” Graphite by TRU Group in order to highlight observed shapes –
 - ▶ **“S” as in Spheroidal**
 - ▶ **“T” as in Thin**
 - ▶ **“A” as in Aggregate**
 - ▶ **“X” as in Expanded**
- ▶ Determined the high feed product conversion (74.6%) yield to spherical graphite suitable for lithium-ion battery applications; this result was achieved without any prior jet milling, i.e., direct spheronization, of the purified graphite, used the entire size distribution of the graphite feed, and required half the residence time with one third of the energy input to the spheronizing mill compared to conventional Chinese flake graphite.
- ▶ Generated a simplified mineral processing flowsheet, Figure 1-2, that streamlines mineral beneficiation towards the production of one concentrate with less equipment than otherwise would be needed for production of a coarse flake concentrate and finer flake concentrate with two circuits. Direct benefits are lower capital costs and operating costs for the Project. In addition, a higher proportion of value-added manufacturing is directed towards spherical graphite production which has the highest projected growth of all graphite end-use segments at the highest unit selling price, Table 19-1.

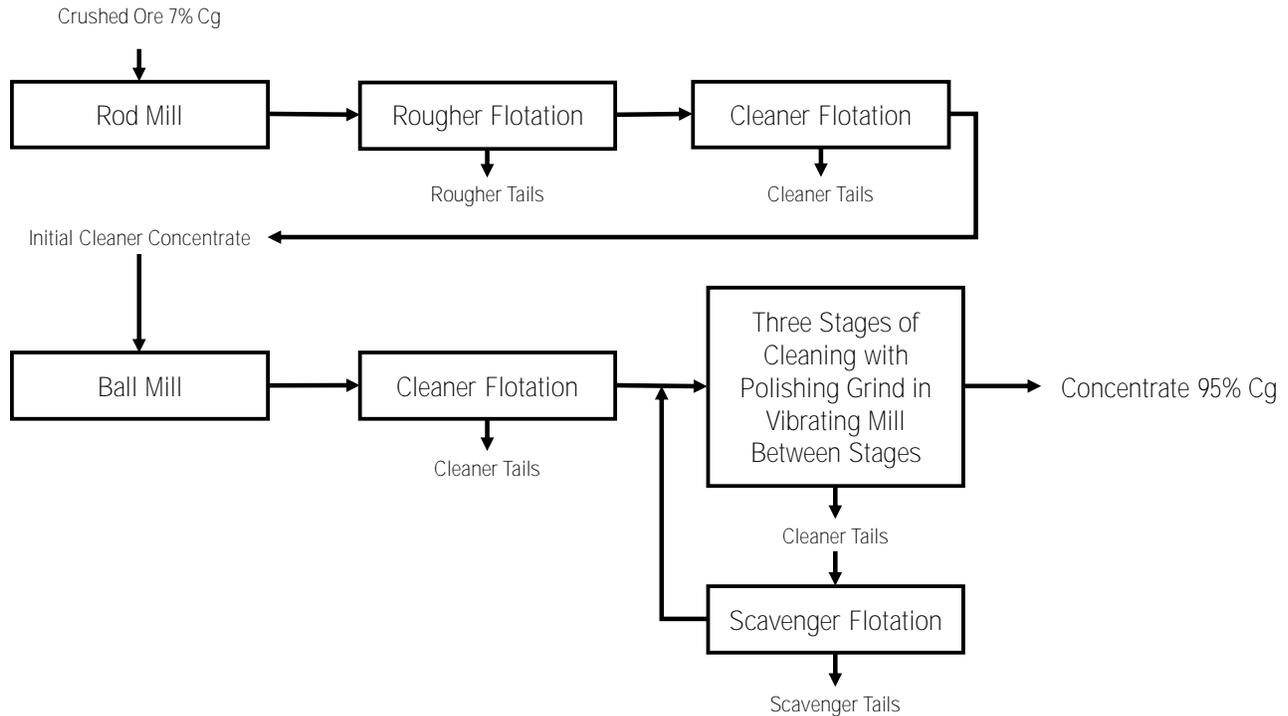


Figure 1-2: TRU Proposed flowsheet to produce 95% Cg concentrate

Table 1-4 Summary of key findings from executed test work programs

TEST WORK PROGRAM	YEAR	OBSERVATIONS
1. Analysis of Graphite Mineral Samples from Alaska (Hazen)	2011	Graphite occurs both as liberated particles and intergrown with gangue minerals The majority of the sample mass and graphite in wet screened samples is distributed in coarse fractions of 10 by 40 mesh
2. Analysis of Graphite Core Samples from Alaska (Hazen)	2012	Graphite occurs both as liberated particles and intergrown with gangue minerals The plurality of the sample mass and graphite in wet screened samples is distributed in coarse fractions of 10 by 40 mesh
3. Upgrading of Coarse High Grade Graphite Mineral Samples (Hazen)	2012	Coarse graphite in the size fraction of 40 by 80 mesh could not be upgraded beyond 92% Cg due to intimate association of gangue with graphite particles
4. Scoping Level Evaluation of Graphite Creek Mineralization (SGS)	2013	Production of graphite concentrate enriched to 90% Cg at Recovery of 80%

TEST WORK PROGRAM	YEAR	OBSERVATIONS
5. Characterization of Graphite Mineralization from Six Drill Cores (TRU Group)	2014-2015	Natural occurrence of STAX graphite morphologies pointing to potential high conversion of graphite at Graphite Creek to spherical graphite Particle size distribution and/or D ₅₀ of coarse fractions shifts to smaller size upon exposure to sonication Detection of platinum & titanium impurities in ash
6. Exploratory Product Development with Graphite Mineralization Samples from Surface (TRU Group)	2015-2016	Direct spheronization of purified graphite with wide particle size distribution and without prior micronization achieves high (74.6%) conversion to spherical product segment suitable for EV lithium-ion batteries High first discharge capacity attained in uncoated and coated spherical graphite points to high quality graphite
7. Mineral Processing of Composite Drill Core Segments (TRU Group)	2016	Recovery of actual coarse graphite fractions are low following mineral processing investigation Production of singular graphite concentrate enriched to 95% Cg at a recovery of 80% integrated to a manufacturing facility dedicated to spherical graphite production

1.7 Project Infrastructure

1.7.1 Graphite Creek Mine and Mineral Processing Plant

There are no permanent structures on the Graphite Creek Property. The infrastructure that is being currently proposed for the Graphite Creek site includes:

- Process plant
- Access and site roads
- Power generation
 - Substation
 - Distribution to various parts of the site
- Mining/processing water distribution/storage facility
- Tailings pond
- Year-round road access via 36 km of connecting road to Nome-Teller highway
- Water treatment facility
- Camp with administration offices
- Sewage treatment facilities
- Communications towers/equipment
- Storage facilities

1.7.2 Product Manufacturing Plant

The Product Manufacturing Plant is assumed to be situated at a brownfield industrial site that is serviced by public utilities with developed road and rail infrastructure. Criteria relevant to deciding the location of such facilities include power cost and supply, availability of industrial zoned land, proximity to tidewater and port facilities, and infrastructure that supports both the workforce and delivery logistics for input materials, services and finished products.

The main building at the manufacturing site is a processing plant with a plot area of 70 m × 65 m in size. The following unit operations/activities are located in the plant.:

- Bag handling
- Pelletizing
- Spheronizing
- Carbonization
- Powder milling and classifying
- Bagging and warehousing
- Administration and Control

Further, the design includes the following storage structures:

- Several silos for incoming, intermediary, and finished products
- A 70 m × 70 m structure to warehouse the finished product awaiting transport to customer facilities.

1.8 Environmental, Permitting, Social Impact

Graphite One is conducting and planning to conduct a number of baseline studies to examine the potential impact of the Project on the environment and on land and water use by Alaska Native communities. These studies and their status are summarized in Table 1-5. To the knowledge of the QP, there are no outstanding environmental liabilities to which any portion of the project is subject.

Table 1-5 Graphite One baseline environment studies and current execution status

BASELINE ENVIRONMENTAL STUDY	STATUS
Hydrology and Water Quality	Sampling of streams on Graphite Creek Property- 2014, 2015, 2016 Additional studies planned
Wetlands	Desktop completed. Additional studies planned
Aquatic Life and Fisheries	Initial desktop and field surveys completed in 2014. Anadromous species in Cobblestone River. No fish species documented in Graphite Creek, Ptarmigan Creek, Ruby Creek, Trail Creek.

BASELINE ENVIRONMENTAL STUDY	STATUS
	Additional aquatic life and fisheries studies planned
Metal Leaching and Acid Base Accounting	Acid leach studies of different rock types and mineralogies – Planned
Archeology	Planned
Hydrogeology	Planned
Meteorology, Air Quality	Planned
Noise and Visual Impacts	Planned
Wildlife	Planned

Graphite One Resources conducts mineral exploration under the State of Alaska Annual Hardrock Exploration (AHEA) Permit #2299. The AHEA covers drilling activities, water usage, temporary camps and small land disturbances. In addition, GPH participates in the BLM and State reclamation bonding pools.

Many state and federal permits will be required to conduct mining operations at the Property. A full list will not be determined until after a Feasibility study has been conducted and a Plan of Operations has been developed. Absent that plan, Graphite One has provisionally identified ten federal and twenty-four state permits/certificates that could be required to undertake mining on the Graphite Creek Property. These along with the issuing agencies and/or departments are summarized in Section 20 of this report. Graphite One has in place a Community Relations Program with the objective of fostering relations with the local population through regular, open dialogue and information sharing to ensure that all stakeholders have a voice in the project's planning, exploration and development phases. The program has focused on building the company's relationship with the Inupiaq communities closest to the Property (Teller, Brevig Mission and Mary's Igloo) as well as the City of Nome. Over the last two years, Graphite One has held numerous meetings with residents of the communities of Teller, Brevig Mission, Mary's Igloo and the City of Nome. In addition, meetings have been regularly held with regional organizations and governing bodies such as Kawerak, Inc. and Bering Straits Native Corporation. The company has assisted the Inupiaq communities in establishing Subsistence Advisory Councils to, among other things, advise the project on matters related to the Alaska native hunting and gathering issues. There is a high level of interest in the project and the possibility that it could bring economic and employment benefits to the region. There are also concerns that the project might disrupt the region's subsistence way of life. Once the Preliminary Economic Assessment is completed and provides more detail on the project, Graphite One will review the document with each of the communities.

1.9 Market Studies and Contracts

1.9.1 Market Outlook

Global demand for all types of graphite (natural and synthetic) was about 2.4 million t in 2011 and expected to grow at a modest 4% per annum to reach 2.8 million t in 2016. Table 1-6 provides data on global markets for graphite demand by end-use application segment for 2011, 2016 and TRU's five-year illustrative forecast through 2021 when total consumption will reach 3.4 million t. The natural graphite market is quite mature with overall growth of around 3-4% per annum. Some segments are expected to trend higher than the average: Notably the battery use of graphite as electric vehicle (EV) adoption accelerates. Our estimate of the global demand for natural graphite concentrate for 2021 is 1.5 million t-conc with refractories use continuing to very much determine the overall trend.

**Table 1-6 Global graphite demand outlook by end-use application
2011-2021 in t-concentrate**

Target Application	2011	%	2016	%	2021	%	Growth % pa	
							total	total
Graphite One Segments	368,000	15%	500,000	18%	800,000	33%	6%	10%
batteries - all types	85,000	4%	160,000	6%	400,000	12%	13%	20%
lubricants / friction	186,000	8%	220,000	8%	260,000	8%	3%	3%
other natural specialty	97,000	4%	120,000	4%	140,000	4%	4%	3%
All Other Uses	2,042,000	85%	2,320,000	82%	2,630,000	77%	3%	3%
TOTAL ALL USES	2,410,000	100%	2,820,000	100%	3,430,000	100%	3%	4%
<i>Natural Graphite in t-conc:</i>	<i>930,000</i>	<i>39%</i>	<i>1,200,000</i>	<i>43%</i>	<i>1,581,400</i>	<i>46%</i>	<i>5%</i>	<i>6%</i>
<i>Synthetic Graphite in t:</i>	<i>1,480,000</i>	<i>61%</i>	<i>1,620,000</i>	<i>57%</i>	<i>1,848,600</i>	<i>54%</i>	<i>2%</i>	<i>3%</i>

Sources and notes -

September 6, 2016

1 Roskill data 2011 with 2016 from various sources and estimates by TRU

2 Forecasts are illustrative TRU estimates subject to detailed study

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In addition, it is expected that advances in natural graphite technology, and significantly increased western supply, will provide natural graphite with an opportunity to gain share in EV battery anodes and other synthetic graphite segments in some applications.

1.9.2 Market Pricing

The prices negotiated between buyer and seller are based on a number of factors including carbon content, presence of ash, level / type of impurities, flake (particle) size, as well as quantity purchased. This would explain some of the value in US dollars per tonne (\$US per t) variations by country of destination for China exports shown for 2016 in Table 1-7.

Table 1-7 Graphite export value US\$ per t FOB China year-to-date May 2016

Harmonized HS Code	GRAPHITE EXPORT PRODUCT	Destination FOB China US\$ per t				
		World	USA	Germany	Japan	Korea
25041010	Natural graphite in flakes	\$791	\$750	\$1,010	\$930	\$810
25041091	Spherical graphite	\$4,150	\$1,700	\$2,200	\$3,310	\$5,110
25041099	Other natural graphite, in powder of in flakes	\$420	\$400	\$550	\$390	\$720
25049000	Other natural graphite, not in flakes / powder	\$220	-	\$680	\$290	\$180
38011000	Artificial graphite	\$880	\$830	\$630	\$1,050	\$990

Sources & notes:

Exports to the US year-to-date 2016 was only 75 t and not a good reflection of prices
China trade statistics

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The average dollar value for China exports to all countries year-to-date May 2016 was \$794 per tonne for natural graphite flake and US\$4150 per tonne for spherical graphite.

Export values from China to the United States were \$750 and \$1700 per tonne respectively for flake and spherical graphite¹. However, only 75 tonnes of spherical graphite was shipped to the United States and the export value therefore would not be a suitable indicator of the market price for spherical graphite in the USA due to the insignificant volume.

For the domestic US market, the average US dollar value per tonne for US imports of natural flake at foreign ports was US\$1,240 for year 2015.² US latest year-to-date April 2016 data import statistics provide further insight on the current US domestic graphite price environment, Table 1-8.

Table 1-8 US graphite custom import values US\$ per t year-to-date April 2016

Harmonized HS Code	GRAPHITE IMPORT PRODUCT	Source USA US\$ per t CV				
		World	Canada	China	Brazil	Mexico
2504101000	Natural Graphite Crystalline Flake Excpt Flake Dust	\$1,300	\$1,240	\$1,250	\$2,310	-
2504105000	Natural Graphite In Powder Or Flakes, Nesoi	\$1,290	\$1,580	\$2,090	\$2,014	\$380
2504900000	Natural Graphite Except Powder Or Flakes	\$790	-	\$2,910	-	\$330
38011000	Artificial graphite	\$1,660	\$1,250	\$810	\$7,340	\$1,350

Sources & notes:

CV = Custom Import Value, price actually paid excluding import duties, freight, insurance, and other charges.
Global Trade Statistics

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¹ China export data, 2016. Natural flake HS code 25041010 and Spherical Graphite code 25041091.

² U.S. Geological Survey, Mineral Commodity Summaries, January 2016

1.9.3 Graphite One's Market & Competitive Positioning

At full capacity, the Product Manufacturing Production Plant is designed to produce 55,350 tpa of graphite finished products for sale. Approximately three quarters of sales or 41,850 t is Coated Spherical Graphite suitable for lithium-ion (Li-ion) batteries, Table 1-9.

Table 1-9 Graphite One projected sales volume by material segmentation and end-use tpy at full capacity

PRODUCTION SEGMENTATION By Graphite Material	Target End-Use			TOTALS	
	Li-ion Battery ¹	Lubes Other ¹	Frict High ²	tpy	%
Coated Spherical Graphite	99.9%	41,850	0	41,850	76%
Graphite Powders <20 microns	99.8%	0	13,500	13,500	24%
TOTALS BY END-USE		41,850	13,500	55,350	100%
<i>% of total</i>		76%	24%	100%	

Sources & notes -

- 1 Other uses for spherical graphite include as an additive in specialty plastics & lubricants
- 2 Other high grade target uses include conductive plastics and powder metallurgy

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Note that all the coated spherical graphite will be of purity aiming at meeting or exceeding the requirements for electric vehicle battery anodes. However, variations of this product may be quite suitable for all li-ion batteries (for electronics, power tools etc.) and other non-battery uses such as an additive in specialty plastics and lubricants. These end-use segments may prove profitable as targets for Graphite One. The average price of the Graphite One manufactured output products is projected to be around US\$5,050 per t ex-plant on a 2016 constant dollar ex-plant basis. The average reflects TRU estimates for the likely achievable price for the individual products after examining various sources of data and China export value per t data. The price estimates are shown in Table 1-10.

Graphite One could be a globally prominent producer of premier CSG for use in EV Li-ion battery anodes within the planned production horizon targeting markets in the United States, Japan, Korea and Europe. Distribution of the manufactured products is expected to be largely direct to anode and Li-ion battery manufacturers. Graphite One is in conversation with such potential customers and is arranging in due course to send product samples to some for their evaluation.

Table 1-10 Graphite One sales segmentation by product – volume t & value 2016\$US ex-plant at full capacity

Graphite One Sales Segmentation by Product - Volume & Value Ex Plant

Graphite Product Segment	Volume ¹ tpa	Price ² US\$ per t	SALES	
			US\$million	%
Coated Spherical Graphite ³	41,850	\$6,200	\$259	93%
Purified Graphite Powders <20 microns	13,500	\$1,500	\$20	7%
- <i>standard powders</i>	6,750	\$1,000	\$6.8	
- <i>niche-segment powders</i>	6,750	\$2,000	\$13.5	
TOTAL SALES	55,350	\$5,054	\$280	100%

Sources & notes -

1 Volume segmentation TRU estimates for plant at full capacity

2 Prices are TRU estimates in 2016 US\$ per t ex plant subject to detailed market study

3 Coated spherical graphite price based on China export value for uncoated plus coating charge

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TRU price estimates are reasonable considering the state of development of the market and consider the planned large volume operation. The coated spherical graphite price of US\$6,200 per t ex-plant is based on China export value for uncoated plus a coating charge. Purified Graphite Powders sub 20-microns is also a target market for Graphite One. In concentrate terms, the global market for natural graphite demand for these uses is about the same volume for that projected for batteries in 2021 – 400,000 t-conc. In the markets where natural graphite is well established – lubricants and friction products – the projected demand represents two-thirds of this. For powder metallurgy, high-purity graphite of around 96-99% Cg is preferred, with a particle size of around 5µm and thus the Graphite One material would be particularly well suited. However, the powder metallurgy segment requires much further assessment once more technical data is known about the Graphite One by-product material.

Graphite One aims to achieve market price leadership (with a target price of \$6,200 per t) given that several potential competitors have announced plans to build such a facility in the United States. At this time, Alabama Graphite Corp is the only US based junior saying it plans to produce coated spherical graphite from graphite sourced in the US.

The Graphite One business model generates cash earnings of US\$178 million per year on sales of US\$280 million at full capacity with a consolidated operating margin (EBDIT) of 63% on sales. Coated Spherical Graphite accounts for 92.8% or US\$259.5 million, of the total revenue. Purified Graphite Powders account for the balance with sales of US\$20 million.

Project economics is most sensitive to product selling prices than any other variable analyzed in Section 22.3 Sensitivity Analysis of this report. That analysis shows that a price assumption for coated spherical graphite of \$8,060 per t rather than the \$6,200 base case would result in an IRR of 35 % compared to the projected 27 %.

Graphite One's strategy is to focus first on markets in the United States and then Japan and Korea. In 2016, demand for spherical graphite in the United States is currently limited but expectations for market growth are high – much of it based on the Tesla Motors plan to completed its Li-ion battery plant in Nevada. Other developments in the field of power storage are also expected to contributed to demand growth.

The United States is already home to 8,925 MWh per year or 20% of global EV Li-ion battery capacity and will have about one-third of the total in the short term when existing facilities are operating at full capacity, Table 1-11.

Table 1-11 Global automotive Li-ion battery manufacturing capacity by stage (MWh per Year)

Global Automotive Lithium-Ion Battery Manufacturing Capacity (MWh-y) by Stage

Country	OPERATING			% of Total	PLANNED	
	Fully	Partially	Total		Begun	Announced
United States	8,925	8,750	17,675	32%	26,250	150
Foreign Countries	34,735	3,038	37,773	68%	16,244	120
<i>China</i>	<i>11,152</i>	<i>3,038</i>	<i>14,190</i>	<i>26%</i>	<i>16244</i>	<i>0</i>
<i>Japan</i>	<i>13,623</i>	<i>0</i>	<i>13,623</i>	<i>25%</i>	<i>0</i>	<i>0</i>
<i>Korea</i>	<i>6,570</i>	<i>0</i>	<i>6,570</i>	<i>12%</i>	<i>0</i>	<i>0</i>
<i>European Union</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0</i>
<i>Rest of World</i>	<i>3,390</i>	<i>0</i>	<i>3,390</i>	<i>6%</i>	<i>0</i>	<i>120</i>
Global Capacity in MWh-y	43,660	11,788	55,448	100%	42,494	270

Sources & notes -

¹ Clean Energy Manufacturing Analysis Centre, April 2016 "Automotive Lithium-ion Cell Manufacturing: Regional Cost Structures and Supply Chain Considerations"

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Over 26,000 MWh per year of new EV Li-ion battery capacity is currently under construction in the United States. While there is currently over capacity of EV batteries, if such large US battery plants do in fact reach their design capacities, it nonetheless will be a positive development for domestic Li ion battery commercialization. Assuming adoption of an accelerated development program, Graphite One could be producing an estimated 16,600 t of CSG or around 8% of global demand in this segment by 2021. Potentially, a significant proportion could be sold domestically but strategically Japan and Korea would be considered accessible markets given the advantageous location of the Graphite One Product Manufacturing Plant. Within this time frame, Graphite One could potentially become the dominant, if not the only American producer, of high grade CSG that is integrated with a domestic graphite resource.

The most important competitive advantage to be relied upon will be Graphite One's anticipated ability to manufacture very high quality spherical coated graphite with a favourable (low) level of powder by-product production. In the laboratory setting, STAX graphite spheronizes much more efficiently (compared to industry norms), coats well and exhibits outstanding electrical

properties. Trials on commercial equipment are planned to determine whether these advantages transfer to the plant environment. It is realized also that a significant R&D and product development effort is required due to the uniqueness of the Graphite Creek (STAX) graphite to be processed.

1.10 Capital Investment and Operating Costs

The mining/milling/manufacturing process for the proposed graphite products was developed by TRU based on the set of assumptions illustrated in Sections 16,17,18. The operating and capital costs were developed by TRU for:

- the Graphite Creek mine in Alaska and mine infrastructure;
- the Mineral Processing Plant located at the mine site; and
- the graphite Products Manufacturing Plant.

Production is based on a resource of 44 million t at 7% Cg and a project life of 40 years.

1.10.1 Capital Cost Estimate for Integrated Spherical Graphite Production

The order-of-magnitude capital cost (CAPEX) for mining operations, the Mineral Processing Plant and Product Manufacturing plant and infrastructure was estimated at \$363 million. A summary of the CAPEX estimates is shown in Table 1-12. Mining and mineral processing operations represent 64% of the total capital outlay. No contingency is included for the two Plants. Indirect costs for the two Plants were assumed to be 33% of the direct costs: 20% for EPCM (engineering, procurement, construction & management), 10% for freight and capital spare parts, and 3% for commissioning and start-up costs.

Table 1-12 Capital cost summary 2016 \$million by operation

Summary of Capital Cost Estimate

OPERATIONS CATEGORY	CAPITAL COST US\$ millions
Graphite Creek Mine & Mineral Processing	\$233
<i>Mining</i>	\$43
<i>Mineral Processing</i>	\$158
<i>Infrastructure</i>	\$32
Product Manufacturing Plant	\$130
TOTAL ALL OPERATIONS	\$363

1.10.2 Operating Cost Estimate for Integrated Spherical Graphite Production

The order-of-magnitude operating cost (OPEX) for the entire project at full capacity inclusive of Graphite Creek Mining, the Mineral Processing Plant and Infrastructure, and the Product Manufacturing Plant is estimated at \$98 million per year. On a plant input/output basis, the total project OPEX translates to US\$96/t-Mineral Processing Plant Feed or US\$1,774 per t of Manufacturing Plant graphite product. The OPEX estimates are shown in Table 1-13.

Table 1-13 Mine and Plants operating cost summary 2016\$US

Operating Cost Estimates, Mine and Plants at full capacity -US\$

MAJOR OPERATING COST ITEM	Graphite Creek		Product Manufacturing
	Mining	Mineral Processing	
	\$	\$	
Labour	\$21,887,000	\$12,170,000	\$7,270,000
Energy (Power and Diesel) ¹		\$9,900,000	\$14,900,000
Equipment Operation	\$2,799,500		
Consumables		\$3,300,000	\$7,100,000
Maintenance & Supplies	\$1,781,500	\$2,700,000	\$3,600,000
Miscellaneous	\$1,272,500		
Concentrate Shipping		\$1,800,000	\$7,698,000
Total Operating Cost	\$27,740,500	\$29,870,000	\$40,568,000
Operating Cost/t Mineral Processing Plant feed	\$27	\$29	\$40
Operating Cost/t Concentrate	\$462	\$498	\$676
Operating Cost/t Graphite Product	\$501	\$540	\$733

Sources & notes -

¹ The mining energy cost is included in Alaska Plant cost
TRU Estimates

The Project CAPEX/OPEX estimates and financial analysis were based on the initial rate of production and phased expansion of both the Mineral Processing Plant and the Product Manufacturing Plant as tabulated in Table 1-14. The phased rate of capacity expansion is based on market conditions with a projected uptick in graphite demand. The Mineral Processing Plant is designed to initially produce 18,000 tpy-concentrate and increase to full Plant production capacity of 60,000 tpy-concentrate by Year 6. The Product Manufacturing Plant is designed to initially produce 16,600 tpy-product and reach full capacity of 55,350 tpy-product by end-of-Year 6. The lag in capacity expansion between the two Plants is due to the 5-month operating window for barge transport between the two plants. Graphite product distribution at full capacity of 41,850 tpy of coated spherical graphite (CSG) selling at US\$6,200 per t and 13,500 tpy purified graphite powders <20 micron selling at an average price of \$1500 per t.

Table 1-14 Plants schedule production capacities assumptions

Planned Production Unit Capacities by Period in tpy

UNIT PRODUCTION INPUT-OUTPUT	PLANNED CAPACITY						
	tpy						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Years 7+
Mineral Processing Plant							
Plant Feed	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000
Graphite Concentrate Output	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Products Manufacturing Plant							
Concentrate Feed from Alaska Mineral Processing	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Graphite Manufactured Products Output	16,605	22,140	27,675	44,280	49,815	55,350	55,350

Sources & notes -
TRU Estimates

Order-of-magnitude annual production costs for the first 10 years of the project appear in the following Table 1-15. These operating costs were used in determining the profitability of the Project. When at full capacity by end of year six, the cost to produce 55,350 tpy of graphite products is estimated at \$98 million or \$1,774 per t-product.

Table 1-15 Graphite One Project Plants cash operating costs by item

Graphite One Integrated Operations Annual Costs Plant Type and Item

US\$ 2016 Constant

DIRECT CASH COST BY ITEM	\$ Unit Cost	Units	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Mineralization delivered to Mill			0	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000	1,018,000	1,018,000	1,018,000
Mining Cost & Mineralization delivered to Mill	\$27.25	t	\$0	\$8,322,150	\$11,096,200	\$13,870,250	\$22,192,400	\$24,966,450	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500
Graphite Creek Graphite Concentrate Output		t	0	18,000	24,000	30,000	48,000	54,000	60,000	60,000	60,000	60,000	60,000
Concentrate Trucking to Nome	\$30	per t		\$540,000	\$720,000	\$900,000	\$1,440,000	\$1,620,000	\$1,800,000	\$1,800,000	\$1,800,000	\$1,800,000	\$1,800,000
Concentrate Barge Shipping	\$128	per t	\$-	\$2,309,400	\$3,079,200	\$3,849,000	\$6,158,400	\$6,928,200	\$7,698,000	\$7,698,000	\$7,698,000	\$7,698,000	\$7,698,000
Product Manufacturing Plant Output		t	0	16,605	22,140	27,675	44,280	49,815	55,350	55,350	55,350	55,350	55,350
Labor Costs:													
Direct Labor - Mineral Processing			\$2,434,000	\$6,693,500	\$6,693,500	\$6,693,500	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000
Direct Labor - Product Manufacturing			\$1,454,000	\$4,725,500	\$4,725,500	\$4,725,500	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000
Equipment Repairs/Maintenance - Mineral Processing			\$0	\$810,000	\$1,080,000	\$1,350,000	\$2,160,000	\$2,430,000	\$2,700,000	\$2,700,000	\$2,700,000	\$2,700,000	\$2,700,000
Equipment Repairs/Maintenance - Product Manufacturing			\$0	\$1,080,000	\$1,440,000	\$1,800,000	\$2,880,000	\$3,240,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000
Other Operating costs - Mining & Mineral Processing													
Diesel (Power)	\$1,100	m3		\$2,970,000	\$3,960,000	\$4,950,000	\$7,920,000	\$8,910,000	\$9,900,000	\$9,900,000	\$9,900,000	\$9,900,000	\$9,900,000
Other Operating costs - Product Manufacturing													
Power	\$40	MWh	\$0	\$4,470,000	\$5,960,000	\$7,450,000	\$11,920,000	\$13,410,000	\$14,900,000	\$14,900,000	\$14,900,000	\$14,900,000	\$14,900,000
Process Reagents - Mineral Processing													
Grinding media/ liners/reagents			\$0	\$990,000	\$1,320,000	\$1,650,000	\$2,640,000	\$2,970,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000
Process Reagents - Product Manufacturing													
Coating Pre-cursor	\$2,100	t	\$0	\$1,380,000	\$1,840,000	\$2,300,000	\$3,680,000	\$4,140,000	\$4,600,000	\$4,600,000	\$4,600,000	\$4,600,000	\$4,600,000
Graphite (furnace electrode)			\$0	\$750,000	\$1,000,000	\$1,250,000	\$2,000,000	\$2,250,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000
TOTAL INTEGRATED PRODUCTION COSTS			\$3,888,000	\$35,040,550	\$42,914,400	\$50,788,250	\$82,430,800	\$90,304,650	\$98,178,500	\$98,178,500	\$98,178,500	\$98,178,500	\$98,178,500
Mining			\$0	\$8,322,150	\$11,096,200	\$13,870,250	\$22,192,400	\$24,966,450	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500
Mineral Processing Plant*			\$2,434,000	\$12,003,500	\$13,773,500	\$15,543,500	\$26,330,000	\$28,100,000	\$29,870,000	\$29,870,000	\$29,870,000	\$29,870,000	\$29,870,000
Products Manufacturing Plant**			\$1,454,000	\$14,714,900	\$18,044,700	\$21,374,500	\$33,908,400	\$37,238,200	\$40,568,000	\$40,568,000	\$40,568,000	\$40,568,000	\$40,568,000
Cost per unit t of Graphite Product Out \$ per t				\$2,110	\$1,938	\$1,835	\$1,862	\$1,813	\$1,774	\$1,774	\$1,774	\$1,774	\$1,774

* Mineral Processing cost includes cost of concentrate shipments to Nome from Mill.

**Product Manufacturing cost includes cost of concentrate shipments from Nome to Product Manufacturing Plant
TRU Estimates

The summary distribution of operating costs, Table 1-16, shows that power (25%) and labour (42%) are the major contributors to the total costs of the integrated operation. The cost of electrical power at the Mineral Processing Plant generated by a diesel power plant accounts for 33% of the plant operating costs. Electrical power for the Product Manufacturing Plant provided from the grid is 37% of the plant operating cost. Concentrate shipping from Nome, Alaska to the Product Manufacturing Plant is also a large cost item accounting for 19% of the latter's operating cost. Diesel supply, alternative power generation and concentrate shipping options require further investigation in future studies.

**Table 1-16 Summary operating cost structure by operation at full capacity
2016\$**

MAJOR OPERATING COST ITEM	GRAPHITE CREEK OPERATIONS				PRODUCT MANUFACTURING		INTEGRATED PLANTS TOTAL	
	MINING		MINERAL PROCESSING		\$	%	\$	%
	\$	%	\$	%				
Labour	\$21,887,000	79%	\$12,170,000	41%	\$7,270,000	18%	\$41,327,000	42%
Energy (Power and Diesel) ¹			\$9,900,000	33%	\$14,900,000	37%	\$24,800,000	25%
Equipment Operation	\$2,799,500	10%					\$2,799,500	3%
Consumables			\$3,300,000	11%	\$7,100,000	18%	\$10,400,000	11%
Maintenance & Supplies	\$1,781,500	6%	\$2,700,000	9%	\$3,600,000	9%	\$8,081,500	8%
Miscellaneous	\$1,272,500	5%					\$1,272,500	1%
Concentrate Shipping			\$1,800,000	6%	\$7,698,000	19%	\$9,498,000	10%
Total Operating Cost	\$27,740,500	100%	\$29,870,000	100%	\$40,568,000	100%	\$98,178,500	100%
- % of total :	28%		30%		41%		100%	

Sources & notes -

1 Mining energy cost included in Alaska Plant cost
TRU Estimates

The weighted average price of the Graphite One manufactured output products at full capacity of 55,350 tpy-product is projected to be US\$5054 per t, on a 2016 constant dollar ex-plant basis. The average reflects TRU estimates for the likely achievable price for the individual products after examining various sources of data and China export value data on per t basis. The price estimates are shown in Section 19, Page 19-15, Table 19-11 Graphite One sales segmentation by product – volume t & value 2016\$US.

1.11 Economic Analysis

The Company cautions that this PEA is preliminary in nature and is based on technical and economic assumptions that will be further investigated and established with greater confidence in future studies. The PEA is based on the current resource model (November 2016), which includes estimates of indicated and inferred resources. The current information is insufficient to convert mineral resources to mineral reserves; mineral resources that are not mineral reserves do not have demonstrated economic viability. As such, there is no certainty that PEA will be realized.

1.11.1 Graphite One Project Profitability

The Graphite One business model generates cash earnings of US\$178 million per year on sales of US\$280 million at full capacity with a consolidated operating margin (EBDIT) of 63% on sales. Coated Spherical Graphite accounts for 92.8% or US\$259.5 million, of the total revenue. Purified Graphite Powders account for the balance with sales of US\$20 million. Fast-paced capacity expansion is aimed at quickly gaining a dominating share of the global market by the sixth year of production.

The required project total capital cash outlay over ten years is estimated at \$368 million, which includes working capital. The resultant Net Present Value (NPV) is \$1,037 million using a 10% discount rate and mine life of 40 years. The Internal Rate of Return (IRR) is 27% with payback in Year 4 from the start-up of production. The consolidated summary is given in following Table 1-17.

Table 1-17 Graphite One Project consolidated financial estimates 2016\$million

Graphite One Projected Consolidated Financial Estimates $\pm 45\%$ ³ US\$ millions Constant 2016

LINE ITEM	Year(-1)	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
TOTAL SALES REVENUE		\$0	\$84	\$112	\$140	\$224	\$252	\$280	\$280	\$280	\$280	\$280
Less Plant Operating Costs:		\$4	\$35	\$43	\$51	\$82	\$90	\$98	\$98	\$98	\$98	\$98
Plant Operating Profit		-\$4	\$49	\$69	\$89	\$141	\$161	\$182	\$182	\$182	\$182	\$182
<i>- operating margin %</i>			58%	62%	64%	63%	64%	65%	65%	65%	65%	65%
Less Company Overhead Costs:		\$2	\$5	\$5	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
<i>Corporate and SG&A:</i>			\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
<i>Product Development R&D:</i>		\$2	\$2	\$2	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
EARNINGS - EBDIT		-\$6	\$44	\$64	\$85	\$137	\$157	\$178	\$178	\$178	\$178	\$178
ANNUAL CAPITAL OUTLAY	\$164	\$164	\$38	\$2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Plant and Equipment Cost:	\$164	\$164	\$36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Working Capital:			\$2	\$2								
ANNUAL NET CASH FLOW	-\$164	-\$169	\$6	\$62	\$85	\$137	\$157	\$178	\$178	\$178	\$178	\$178
<i>Cumulative Cash Flow:</i>	-\$164	-\$333	-\$327	-\$265	-\$180	-\$43	\$114	\$292	\$469	\$647	\$825	\$1,002
PROFITABILITY ANALYSIS:												
EBDIT as % of Revenue			52%	57%	61%	61%	63%	63%	63%	63%	63%	63%
Net Present Value [NPV] at	\$1,037											
discounting rate 10%												
Internal Rate of Return [IRR]	27%											
Payback in Production Year	4											

Sources & notes:

1 EBDIT = earnings before depreciation, interest and taxes

2 NPV rate adjusted for elevated risk calculated for forty years operation with no terminal value

3 TRU estimates subject to error caution stated in the text of the report

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Distribution of the manufactured output products is expected to be largely direct to anode and anode or lithium-ion battery manufacturers. This likely will involve some contracts with large customers. Graphite One Resources is in conversation with such customers and is arranging to send product samples to some for their evaluation.

1.11.2 Post-Tax Economic Summary

The post-tax Graphite One Project financial highlights are summarized below in Table 1-18.

Table 1-18 Graphite One Project post-tax financial highlights

Parameter	Value
Earnings Post-Tax (Year-8 +)	\$118 million per year
NPV at 10% Discounting Rate	\$616 million
IRR	21.8 %
Payback	Production Year 4

The post-tax consolidated financial statement for the Graphite One integrated project appears in Table 1-19. Following the expansion of spherical graphite production to full capacity in Production Year 7.5 and the concurrent expiration of depreciation allowances and EIC credits, the Earnings Post-Tax stabilize at \$118 million per year with an operating margin of 42% in Production Year 8. The project NPV at a 10% discounting rate is calculated at \$616 million. Project IRR is 22% with payback achieved during Production Year 4.

Table 1-19 Graphite One Project post-tax financial estimates 2016\$million

Graphite One Financial Projections in Constant 2016 US\$ million POST TAX

Graphite One Projected Consolidated Financial Estimates $\pm 45\%$ ² US\$ millions Constant 2016

LINE ITEM	Year(-1)	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
TOTAL SALES REVENUE		\$0	\$84	\$112	\$140	\$224	\$252	\$280	\$280	\$280	\$280	\$280
Less Plant Operating Costs:		\$4	\$35	\$43	\$51	\$82	\$90	\$98	\$98	\$98	\$98	\$98
Plant Operating Profit		-\$4	\$49	\$69	\$89	\$141	\$161	\$182	\$182	\$182	\$182	\$182
<i>- operating margin %</i>			58%	62%	64%	63%	64%	65%	65%	65%	65%	65%
Less Company Overhead Costs:		\$2	\$5	\$5	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
<i>Corporate and SG&A:</i>			\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
<i>Product Development R&D:</i>			\$2	\$2	\$2	\$1	\$1	\$1	\$1	\$1	\$1	\$1
TAXES, ROYALTIES												
Combined Federal, Alaska & Washington Taxes & Royalties		-\$0.1	\$5.0	\$6.8	\$16.8	\$31.7	\$39.8	\$45.8	\$47.8	\$59.4	\$59.4	\$59.4
<i>Federal Tax</i>			\$3.3	\$3.7	\$11.3	\$21.3	\$25.2	\$29.1	\$29.1	\$34.3	\$34.3	\$34.3
<i>Alaska State Tax</i>			\$0.6	\$1.3	\$2.0	\$3.7	\$4.4	\$5.1	\$7.1	\$11.8	\$11.8	\$11.8
<i>Washington B&O Tax</i>			\$0.4	\$0.5	\$0.7	\$1.1	\$1.2	\$1.4	\$1.4	\$1.4	\$1.4	\$1.4
<i>Production Royalties</i>			\$0.3	\$0.8	\$1.1	\$2.4	\$2.8	\$3.2	\$3.2	\$3.8	\$3.8	\$3.8
<i>NSR Royalties</i>			\$0.4	\$0.5	\$0.7	\$1.1	\$1.2	\$1.3	\$1.3	\$1.3	\$1.3	\$1.3
<i>Mining License Tax</i>			\$0.0	\$0.0	\$1.1	\$2.1	\$5.0	\$5.7	\$5.7	\$6.8	\$6.8	\$6.8
EARNINGS - Post Tax		-\$6	\$39	\$57	\$68	\$106	\$118	\$132	\$130	\$118	\$118	\$118
ANNUAL CAPITAL OUTLAY		\$164	\$169	\$38	\$2	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Plant and Equipment Cost:		\$164	\$164	\$36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Working Capital:				\$2	\$2							
NSR Buyout/Buydown			\$5									
ANNUAL NET CASH FLOW		-\$164	-\$175	\$1	\$55	\$68	\$106	\$118	\$132	\$130	\$118	\$118
<i>Cumulative Cash Flow:</i>		-\$164	-\$338	-\$338	-\$282	-\$214	-\$108	\$9	\$141	\$271	\$389	\$625
PROFITABILITY ANALYSIS:												
Earnings Post-Tax as % of Revenue			46%	51%	49%	47%	47%	47%	46%	42%	42%	42%
1 Net Present Value [NPV] at		\$616										
discounting rate 10%												
Internal Rate of Return [IRR]		22%										
Payback in Production Year		4										

Sources & notes:

- 1 NPV rate adjusted for elevated risk calculated for forty years operation with no terminal value
- 2 TRU estimates subject to error caution stated in the text of the report

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1.11.3 Sensitivity Analysis

A sensitivity analysis was carried out on the pre-tax (EBDIT) consolidated financials to determine the effect of the following parameters on the NPV (at a 10% discount rate) and IRR.

- Coated spherical graphite product selling price
- Capital cost
- Operating cost
- Graphite (Cg) head grade, and
- Graphite (Cg) recovery

The analysis was based on varying each parameter by reasonable plus and minus factors and running the economic analysis using the base case financial model.

Summary findings of the sensitivity analysis are tabulated in Table 1-20 which show the net impact on NPV and IRR for a 10% increment change in the variable parameter. The product selling price had the greatest impact on the NPV and IRR. A 10% change in the selling price resulted in a change of about \$210 million in the NPV and 2.9% in the IRR.

Table 1-20 Impact of 10% variation in selected parameters on Graphite One Project NPV and IRR

Variable Parameter (10%)	NPV Impact	IRR Impact
CSG Selling Price	\$210 million	2.93%
Operating Cost	\$80 million	1.3%
Recovery	\$60 million	1.2%
Head Grade	\$50 million	1.2%
Capital Cost	\$35 million	1.3%

The impact on NPV and IRR for various increment changes in selling prices are shown in Table 1-21.

The NPV at 10% discount rate and IRR results for a range increment changes in all the above variable parameters are respectively shown in Figure 1-3 and Figure 1-4.

Table 1-21 NPV and IRR results for coated spherical graphite product selling price variations

COATED SPHERICAL GRAPHITE PRODUCT SELLING PRICE					
	PRICE	CHANGE	NPV	IRR	PAYBACK
	\$/t	%	\$million	%	Production Year
	3720	-40%	199	14	7
	4340	-30%	408	18	6
	4960	-20%	616	21	5
	5580	-10%	827	24	4
Base Case	6200	0%	1037	27	4
	6820	10%	1246	30	3
	7440	20%	1456	33	3
	8060	30%	1665	35	3
	9300	50%	2084	40	3

Sources & notes -
TRU Estimates
TRU Group Inc

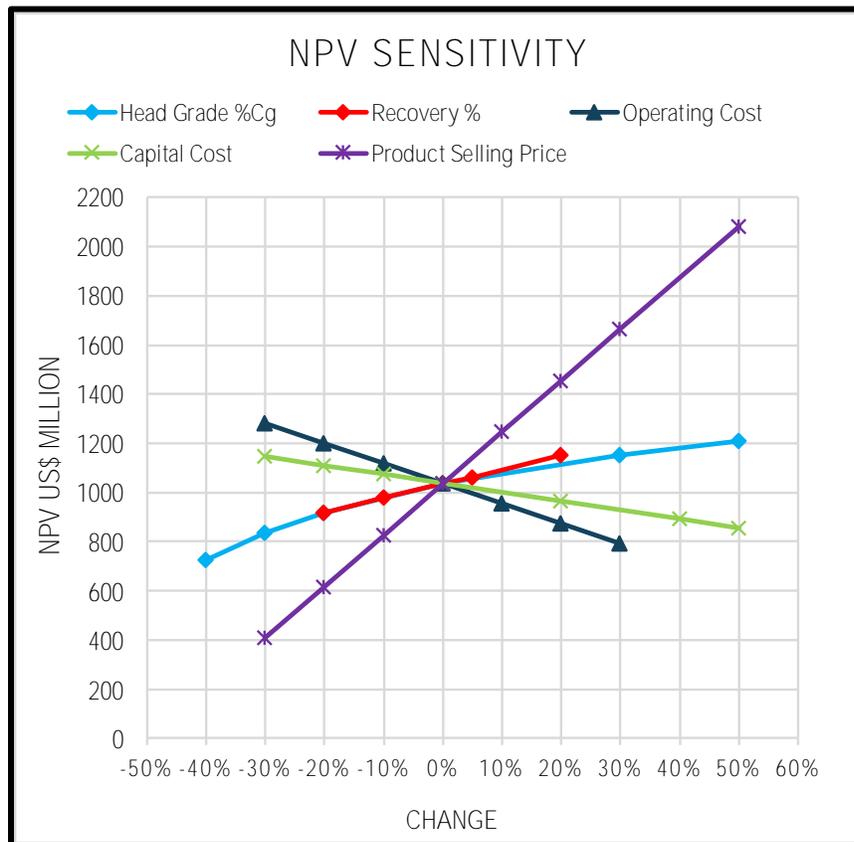


Figure 1-3: NPV Sensitivity Graph (before tax)

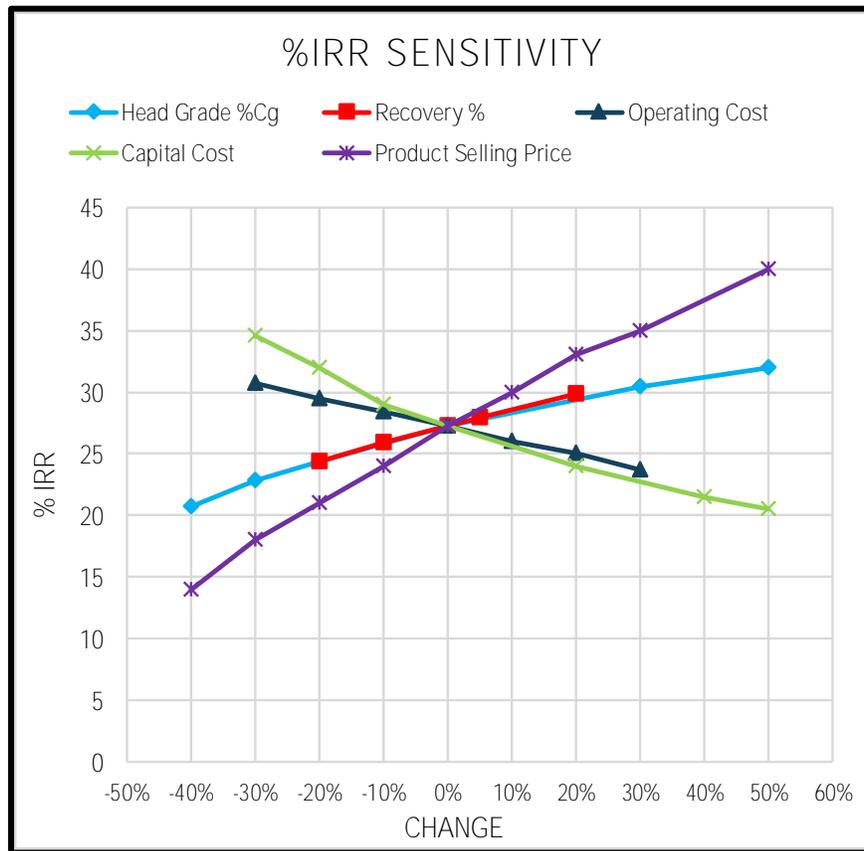


Figure 1-4: IRR Sensitivity Graph (before tax)

1.12 Recommendations

Geology and Mineral Resources

Follow-up exploration and development at the Graphite Creek graphite deposit is recommended based on results from: 1) historic and recent (2011-2014) exploration and laboratory work; 2) the lateral continuity of at least nine mineralized graphitic schist lodes; 3) high-grade graphite situated at surface or near-surface in Lodes 1 and 2; 4) the 2015 Indicated Mineral Resource and a sizeable Inferred Mineral Resource as documented in this Technical Report; and 5) a potential open pit mining scenario that can be initiated by side-cutting into the northern slopes of the Kigluaik Mountains to reduce the strip ratio and maximize access to the high-grade graphitic schist.

The total cost to complete the next exploration program is estimated to be \$5,350,000 (Table 1-22). With a 10% contingency, the total budget becomes \$5,885,000.

The next logical steps to advance the project include:

1. Infill drilling program

- ▶ It is recommended that Graphite One continue with infill drilling within the Inferred resource portion of the Graphite Creek deposit to expand and upgrade the Indicated Mineral Resource.
- ▶ The infill drilling should include approximately 8,000 m of drilling, which is equivalent to roughly 65 drill holes drilled to depths of 120 m.
- ▶ The infill drilling should include a series of drill set-ups with at least two drillholes orientated at different dips to further define the strike and dip of the Kigluaik Fault, delineate local fault/offsets (including the Graphite Creek Fault), and further develop the mineralization model at the Graphite Creek Deposit.
- ▶ The next program should focus on several key areas of investigation. Firstly, it is important to develop a better understanding of the indicated resource trending northwards and adjacent to the Kigluaik fault. At present, the geological model assumes the Kigluaik Fault dips vertically. However, the Kigluaik Fault has been interpreted as dipping northwards at 75° (e.g., Hudson and Plafker, 1978). This has ramifications for the resource, as some lodes in the model (e.g., high- grade, near surface Lode 1) are currently truncated by the assumed 'vertical' fault. If the Kigluaik Fault dips at a shallower angle to the north, then the lodes would not be cut off and the size of the lodes and resource could potentially increase down dip from the modeled fault. The second key focus should be to drill test directly east of the current Indicated Resource area between Graphite Creek and the Cobblestone watershed to potentially expand the Indicated Mineral Resource. Infill drilling between drill holes 14GCH020 and 12GC005 (approximately 150 m), for example, could increase the Indicated portion of the resource to about 15% of the overall drill-tested graphitic schist and Inferred Mineral Resource.
- ▶ The estimated cost of the infill drilling is about \$4.8 million.

2. Geotechnical Drilling Program

- ▶ It is recommended that Graphite One conduct a geotechnical drilling program to provide a basis for excavation stability analyses; optimal pit slope angles; and pit architecture for mine design purposes.
- ▶ Key geotechnical aspects towards open pit mining include: slope stability of both the waste and mineralized material; rock mass strength; discontinuity orientation and strength; overburden characteristics and strength; hydrology and hydrogeology; and structural geology and fault strengths.
- ▶ Six geotechnical drill holes are recommended for initial assessment at an estimated cost of \$500,000.

3. When the new drill data has been compiled, a new deposit model should be constructed, and a new resource estimate calculated. It is assumed that this work would cost in the order of \$50,000.

Table 1-22 Estimated cost breakdown for next phase of exploration

ITEM	DESCRIPTION	COST \$US
Infill drilling	8,000 meters of infill drilling within the inferred resource portion of the Graphite Creek deposit to expand the indicated resource	\$4,800,000
Geotechnical drilling	Six pit well drill holes to provide an initial basis for excavation stability analyses; optimal pit slope angles; and pit architecture for mine design purposes	\$500,000
Update Resource Estimate and report	Update the deposit model and recalculate resource estimate based on new drill results	\$50,000
CONTINGENCY (10%)		\$535,000
	TOTAL ESTIMATED COST – NEW EXPLORATION	\$5,885,000

Mining

- ▶ Further refinement of the mining plan is required following a more detailed engineering study of the overburden ratio that has been conservatively estimated at 3:1
- ▶ Following above, develop an initial mining operations plan
- ▶ Perform hydrological and hydrogeological studies to identify potential drainage issues on the open pit operations
- ▶ Conduct a rock mechanics study in the context of proposed en-echelon mining strategy
- ▶ Refine the mining costs as per the results of the recommended studies

Mineral Processing

- ▶ Determine whether there is a relationship between drill core interval depth and mineral grade with observed variation in particle morphology and particle size distribution
- ▶ Assess possible separation of integral from pressed flake as actual quantification of integral vs aggregate graphite flake in the mineralized sample is complex
- ▶ Continue with ongoing test work that will validate the entire mineral processing flowsheet, which will also generate concentrate for the further product development test work.
- ▶ Assess the concentrate physical characteristics prior to further value-added processing

Product Purification and Manufacturing

- ▶ Identify particle types and morphologies that will survive the purification steps
- ▶ Verify the stated levels of performance with graphite recovered and spheronized from subterranean formations at the Graphite Creek Property
- ▶ Examine friable fractions that are more amenable to milling and assess the suitability of large aspect ratio / pressed flakes for making foil and sheet production
- ▶ Confirm ease of spheronizing and recovery rates in commercial equipment
- ▶ Assess carbon coating performance in commercial equipment

Project Financials and Marketing Strategy

- ▶ The robust financials for vertically-integrated production of coated spherical graphite at the projected unit pricing of \$6,200 per tonne merits that the Project proceed to a feasibility study (FS) to maintain an accelerated project schedule that would coincide with market demand in 2021. This is contingent on the upgraded classification of the resource base, definition of mineral reserves, and completion of baseline studies and the requisite R&D and pilot studies and permits acquisitions. Progressing through a Prefeasibility Study PFS may be considered optional as mineral processing of the graphite mineralization is considered low risk
- ▶ A detailed market study of the coated spherical and purified power graphite market be conducted to obtain a full understanding of the market characteristics, including market potential, customer requirements and the competitive landscape
- ▶ Graphite One continue to pursue a robust product development program for both the coated spherical and purified power graphite, including customer trials, in readiness for start of commercial operations.

2 INTRODUCTION

Graphite One Resources (The Company) is a Canadian public company that trades on TSX Venture Exchange and the OTCQX under the respective stock symbols GPH and GPHOF. The Company holds title to state and federal mining claims along the Kigluaik Mountains in north-western Alaska which constitute the Graphite Creek Property. R.J. Robinson of TRU Group visited the property and the sample preparation and core and sample storage facilities in Nome between October 13 and 15, 2015. Mr. Robinson was given full access to all Graphite One data and the property and facilities in Nome, and provided with helicopter access to the property. Mr. Robinson is responsible for Sections 6, 7, 9, 10, 11, 12, 14, 15, 16, 23 and portions of sections 1, 2, 5, 25 and 26 pertaining to resource estimation and recommended future exploration.

TRU Group Inc. was commissioned by Graphite One Resources Inc to prepare an independent report on a conceptual framework for the Graphite One Project, which has been conceived in terms of an American vertically-integrated production of high grade coated spherical graphite. Unique morphological features, previously unseen and inherent to the Graphite Creek graphite mineralization have been shown in exploratory product development testwork to be amenable to high conversion to spherical graphite (74.6%) which is electrochemically stable and in the size range applicable to advanced lithium ion battery systems.

Graphite One Resources Inc's concept of the Graphite One Project ("the Project") is a vertically-integrated, multi-site project includes mining and mineral processing at the Graphite Creek Property in Alaska with upgrading and graphite processing performed at a different location within proximity of a seaport. The PEA assumes an unspecified brownfield location in Washington State in view of established trade and maritime links with western Alaska and the potential beneficial cost structure and strategic advantage that a developed site offers. It is recognized that Graphite One is also reviewing potential sites in Alaska positioned for industrial development.

The following definitions have been adopted to distinguish the integrated Project from its constituent components –

Graphite One Project ("the Project"): the vertically integrated operations consisting of mining, mineral processing and product manufacturing;

Graphite Creek Property ("the Property"): the 200 mining claims, with their areal extent, held by Graphite One (Alaska) Inc, a wholly owned subsidiary of Graphite One Resources Inc. and located in the State of Alaska, on the Seward Peninsula, on the north side of the Kigluaik Mountains;

Graphite Creek Project ("the Graphite Creek Project"): the proposed mine and mineral processing plant to be located on the Property;

Mineral Processing Plant: proposed mineral processing plant to be located on the Property; and

Product Manufacturing Plant: graphite processing and manufacturing plant located near proximity of a seaport.

The estimated life of mine, notwithstanding additional resources that can be identified with expanded exploration drilling at Graphite Creek, based on geological modeling of the indicated and inferred resources is 40 years at a head grade of 7% Cg in the graphite mineralization. At full scale production, 1,018,000 tonnes per year (tpy) of graphite mineralization at 7% Cg is beneficiated into 60,000 tpy of concentrate grading 95% Cg. The single concentrate is moved overland to the Port of Nome⁵ and transported during the seasonal shipping window to the Product Manufacturing Plant where it is thermally purified to over 99.95% Cg product. The entire purified graphite product is mechano-chemically processed into 41,850 tpy of high grade coated spherical graphite for advanced lithium-ion battery applications. Spherical processing of the purified graphite also yields 13,500 tpy of refined sub 20-micron powder, which has number of end-uses including lubricants and greases, friction products, conductivity enhancers, and powder metallurgy.

The PEA of the Graphite One Project was prepared in accordance to National Instrument 43-101 Standards for the Disclosure of Mineral Projects. Financial modeling of the project is based on a preliminary mine plan developed on inferred and indicated resources. Per CIM Definitions Standards “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.” and as such the inferred resource base is speculative in nature.

It is cautioned that the PEA is preliminary in nature and is based on technical and economic assumptions that will be further investigated and established with greater confidence in future studies. The PEA is based on the current resource model (November 2016), which includes estimates of indicated and inferred resources. The current information is insufficient to convert mineral resources to mineral reserves; mineral resources that are not mineral reserves do not have demonstrated economic viability. As such, there is no certainty that PEA will be realized. The accuracy of the economic and financial analyses is estimated to within +/-45%. No added contingency is explicitly included for major capital and operating items; contingency is effectively subsumed within the current level of accuracy of the PEA analysis.

Previous exploration and research work on the Graphite Creek property has been described in three NI 43-101 technical reports issued by Graphite One. These reports, Duplessis et al. (2013), Eccles and Nicolls (2014), and Eccles et al. (2015), are clear and comprehensive. They form the foundation upon which the geology, resource estimate and mining sections of this report are based. Through a comprehensive review of previous data, a site visit, a program of check assays, re-creation of the deposit model and re-estimation of the mineral resource, the author has determined that the previous data were valid and suitable for use and inclusion in this report. The author assumes responsibility for the validity and applicability of the data derived from the previous technical reports issued on the property.

The authors have examined metallurgical test work studies conducted prior to their engagement on this assignment in the context of reviewing the progression of metallurgical test work to date.

⁵ A port facility proposed by Bering Straits Native Corporation at Port Clarence could be an alternative to the Port of Nome during the life of the Project and reduce overland transportation distance from the mine site.

However, the proposed vertically-integrated project for spherical graphite production is principally based on:

- ❖ TRU Group geological review and modeling of the Graphite Creek exploration area and the derived (preliminary) mine plan
- ❖ TRU Group managed technical programs including:
 - Exploratory product development test work on the manufacturing of coated spherical graphite and the assessment of its physical and electrochemical properties at an Independent Graphite Laboratory (IGL)
 - Mineral processing test work on the production and recovery of a 95% Cg graphite concentrate at an Independent Mineral Processing Laboratory (IMPL)

The identity of IGL and IMPL remain confidential to safeguard Graphite One's commercial and competitive advantages. Metallurgical testing results were obtained from test work undertaken at an Independent Graphite Laboratory and an Independent Mineral Processing Laboratory.

The Qualified Persons (QPs) have relied on information provided by Graphite One regarding the current status of mineral claims described in Section 5 Accessibility, Climate, Local Resources, Infrastructure and Physiography. Titular status of state and federal mining claims that constitute the Property was independently verified on the mining claims mapper made available through the Alaska Department of Natural Resources Public Information Center⁶. A similar examination for (potential) adjacent properties was made on the mining claims mapper.

HDR Alaska Inc. of Anchorage was commissioned by Graphite One to complete a desktop wetlands study of the road options and also completed a preliminary road route scoping design from the Teller highway to the mine site. This route appears in the PEA under Section 18 Project Infrastructure as Figure 18-1: Conceptual road route: Graphite Creek Mine site to Nome-Teller Highway.

The QPs have also relied on information provided or previously published by Graphite One and reviewed by TRU Group regarding the current status of rights, (future) road access to Graphite Creek Project site, progression of environmental studies, permitting processes and community relations as described in Section 20 Environment, Permitting, Social Impact.

Market pricing and information was prepared by TRU Group following examination and interpretation of world trade statistics and import and export values on various graphite products.

All pricing and currency estimates are made in constant 2016 US dollars. All units of measure are in metric unless otherwise stated.

Applicable US state and federal corporate income taxes and deductions used in the post-tax analysis of the Project are based on publicly available information from the relevant state (Alaska, Washington) and federal authorities and/or agencies and/or legislation.

References/citations to other works are included throughout the report with the full citation appearing in Section 27.

The effective date of this report is November 28, 2016.

⁶ <http://dnr.alaska.gov/commis/pic/maps>

3 RELIANCE ON OTHER EXPERTS

There has been no reliance on other experts in regards legal, political, environmental and tax matters.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Graphite Creek Property Location

The Graphite Creek Property is part of the Project that is the subject of this PEA and comprises 200 mining claims (24 unpatented federal leased claims and 176 state mining claims) located in the State of Alaska, on the Seward Peninsula, on the north side of the Kigluaik Mountains (“the Property”). This is a rugged range some 65km in length, and not visited often. The graphite of interest is found within bedrock that crops out in creek valleys perpendicular to the northern Kigluaik Mountain front. The Graphite Creek graphite deposit is situated directly south, just upslope, of the Kigluaik normal fault at an elevation of about 230 m above sea level (m asl).

The closest significant port, industrial/population centre is Nome, situated some 59 km to the south. There is no current road access to the Property; the closest seasonal road is 20km to the Southeast (the Nome-Taylor Highway).

4.2 Graphite Creek Mineral Tenure

Graphite One Project’s mineral tenure consists of 200 claims categorized as three groups based upon the way the claims were acquired by Graphite One Resources. The three groups are nominally referred to as:

- i) the GC Leased Property;
- ii) the GC Staked Property; and
- iii) the GC Purchased Property.

The claims constituting the three groups are depicted in Figure 4-1. The first group consists of federal claims shaded red that overlap the latter two groups shaded blue, which form a contiguous block of Alaska state claims. Graphite One has stated that the federal claims are in the process of being converted into state claims. Each group is further described in the following sections and summarized in Table 4-3, Table 4-3 and Table 4-3 respectively.

Readers are cautioned that the summaries do not constitute full disclosure, and that each agreement has not been referenced to confirm the status and application of any of the royalty or lease agreement payments. TRU Group did not establish the legal status of the mineral claims, and has relied upon the guidance of Graphite One in describing the claims and the agreements with involved parties. The QP has no knowledge of further encumbrances, beyond what has been described, that would impact the mining claims.

4.2.1 The “GC Leased Property”

Graphite Creek gained control of the “GC Leased Property” (shown in red in Figure 4-1) via a long-term lease agreement with Kougarok LLC, a restated version of which lease was executed in May of 2015. The lease has an initial term of twenty (20) years, commencing January 2014, and has provision for extension through the life of the Project. The payments and production royalties due under the lease are as follows:

1. An advance royalty of \$30,000 was paid to the Lessor (Kougarok LLC) upon execution of the lease agreement.
2. Annual advance royalty payments of \$30,000 until 2019, then increasing by \$10,000 per year until production begins.
3. Production royalties:
 - a. 5% from lands in the 4 federal claims staked in 1943;
 - b. 2.5% from lands within the other 20 federal claims;
 - c. Except as provided in 3b above, 5% from lands within the claims staked by Graphite One Alaska; and
 - d. Except as provided in 3a above, 2.5% from lands within the claims purchased by Graphite One Alaska
4. Graphite One has the option to reduce production royalties by up to 2% by paying \$2,000,000 for each 1% reduction of the royalty.
5. Note that all advance royalties may be recouped from production royalties.
6. Lessor and Graphite One are continuing efforts to have the lands within the federal claims be conveyed to the State of Alaska so that the parties may rely for their mineral rights solely on their overlapping state claims; Graphite One anticipates completion of this process in early 2017.

Table 4-1 Graphite Creek Property: Federal Mining Claims

Claim Number	Claim Owner	Claim Name	Township Location
AKFF 045512	Kougarok LLC	The Chicken Hawk	K 5S 34W 29 NE
AKFF 045513	Kougarok LLC	The Eagle	K 5S 34W 29 NE
AKFF 045514	Kougarok LLC	The Black Bird	K 5S 34W 29 NW
AKFF 045515	Kougarok LLC	The Rough Leg	K 5S 34W 30 NE
AKFF 045516	Kougarok LLC	The Crane	K 5S 34W 30 SE
AKFF 045517	Kougarok LLC	The Artic Tern	K 5S 34W 30 SW
AKFF 045518	Kougarok LLC	Sea Gull	K 5S 34W 21 SE
AKFF 045519	Kougarok LLC	Crow	K 5S 34W 22 SW
AKFF 045520	Kougarok LLC	Raven	K 5S 34W 22 SW
AKFF 045521	Kougarok LLC	Duck	K 5S 34W 28 NW
AKFF 071303	Kougarok LLC	G #1	K 5S 34W 23 SW
AKFF 071304	Kougarok LLC	G #2	K 5S 34W 22 SE
AKFF 071305	Kougarok LLC	G #3	K 5S 34W 22 SW
AKFF 071306	Kougarok LLC	G #4	K 5S 34W 28 NE
AKFF 071307	Kougarok LLC	G #5	K 5S 34W 28 NE
AKFF 071308	Kougarok LLC	G #6	K 5S 34W 28 NW
AKFF 071309	Kougarok LLC	G #7	K 5S 34W 29 NE
AKFF 071310	Kougarok LLC	G #8	K 5S 34W 29 NE
AKFF 071311	Kougarok LLC	G #9	K 5S 34W 29 NW
AKFF 071312	Kougarok LLC	G #10	K 5S 34W 30 NE

Claim Number	Claim Owner	Claim Name	Township Location
AKFF 071313	Kougarok LLC	G #11	K 5S 34W 30 SE
AKFF 071314	Kougarok LLC	G #12	K 5S 34W 30 SW
AKFF 071359	Kougarok LLC	G #1A	K 5S 34W 22 SE
AKFF 071360	Kougarok LLC	G #12A	K 5S 34W 30 SW

4.2.2 The “GC Staked Property”

The GC Staked Properties consist of 120 Alaska state mining claims located by Graphite One (Alaska) Inc., a wholly owned subsidiary of Graphite One. (Included with the blue coloured claims in Figure 4-1).

**Table 4-2 GC Staked Property: Alaska State mining claims
(All claims are a full ¼ Section (160 acres))**

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 710772	Graphite One Alaska Inc	GC 001	22-Nov-11	K 005S 034W 22SE
ADL 710773	Graphite One Alaska Inc	GC 002	22-Nov-11	K 005S 034W 28NW
ADL 710774	Graphite One Alaska Inc	GC 003	22-Nov-11	K 005S 034W 28NE
ADL 710775	Graphite One Alaska Inc	GC 004	22-Nov-11	K 005S 034W 27NW
ADL 710776	Graphite One Alaska Inc	GC 005	22-Nov-11	K 005S 034W 27NE
ADL 710777	Graphite One Alaska Inc	GC 006	22-Nov-11	K 005S 034W 26NW
ADL 710778	Graphite One Alaska Inc	GC 007	22-Nov-11	K 005S 034W 26NE
ADL 710779	Graphite One Alaska Inc	GC 008	22-Nov-11	K 005S 034W 30SW
ADL 710780	Graphite One Alaska Inc	GC 009	22-Nov-11	K 005S 034W 30SE
ADL 710781	Graphite One Alaska Inc	GC 010	22-Nov-11	K 005S 034W 29SW
ADL 710782	Graphite One Alaska Inc	GC 011	22-Nov-11	K 005S 034W 29SE
ADL 710783	Graphite One Alaska Inc	GC 012	22-Nov-11	K 005S 034W 28SW
ADL 710784	Graphite One Alaska Inc	GC 013	22-Nov-11	K 005S 034W 28SE
ADL 710785	Graphite One Alaska Inc	GC 014	22-Nov-11	K 005S 035W 36NW
ADL 710786	Graphite One Alaska Inc	GC 015	22-Nov-11	K 005S 035W 36NE
ADL 710787	Graphite One Alaska Inc	GC 016	22-Nov-11	K 005S 034W 31NW
ADL 710788	Graphite One Alaska Inc	GC 017	22-Nov-11	K 005S 034W 31NE
ADL 710789	Graphite One Alaska Inc	GC 018	22-Nov-11	K 005S 034W 32NW
ADL 710790	Graphite One Alaska Inc	GC 019	22-Nov-11	K 005S 034W 32NE
ADL 617072	Graphite One Alaska Inc	GCX-01	04-Jun-12	K 005S 034W 24NW
ADL 617073	Graphite One Alaska Inc	GCX-02	04-Jun-12	K 005S 034W 13SE
ADL 617074	Graphite One Alaska Inc	GCX-03	04-Jun-12	K 005S 034W 13SW
ADL 617075	Graphite One Alaska Inc	GCX-04	04-Jun-12	K 005S 034W 14SE
ADL 617076	Graphite One Alaska Inc	GCX-05	04-Jun-12	K 005S 034W 14SW
ADL 617077	Graphite One Alaska Inc	GCX-06	04-Jun-12	K 005S 034W 14NW
ADL 617078	Graphite One Alaska Inc	GCX-07	04-Jun-12	K 005S 034W 14NE
ADL 617079	Graphite One Alaska Inc	GCX-08	04-Jun-12	K 005S 034W 13NW
ADL 617080	Graphite One Alaska Inc	GCX-09	04-Jun-12	K 005S 034W 13NE
ADL 617595	Graphite One Alaska Inc	GCX-052	29-Aug-12	K 005S 034W 24NE
ADL 617596	Graphite One Alaska Inc	GCX-053	29-Aug-12	K 005S 034W 24NE

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 617599	Graphite One Alaska Inc	GCX-057	29-Aug-12	K 005S 034W 24SE
ADL 617602	Graphite One Alaska Inc	GCX-061	29-Aug-12	K 005S 034W 26SE
ADL 617604	Graphite One Alaska Inc	GCX-063	08-Sep-12	K 005S 034W 26SW
ADL 617606	Graphite One Alaska Inc	GCX-065	08-Sep-12	K 005S 034W 27SE
ADL 617608	Graphite One Alaska Inc	GCX-067	08-Sep-12	K 005S 034W 27SW
ADL 617081	Graphite One Alaska Inc	GCX-010	04-Jun-12	K 005S 033W 18NW
ADL 617082	Graphite One Alaska Inc	GCX-011	04-Jun-12	K 005S 033W 07SW
ADL 617083	Graphite One Alaska Inc	GCX-012	04-Jun-12	K 005S 034W 12SE
ADL 617084	Graphite One Alaska Inc	GCX-013	04-Jun-12	K 005S 034W 12SW
ADL 617085	Graphite One Alaska Inc	GCX-014	04-Jun-12	K 005S 034W 11SE
ADL 617086	Graphite One Alaska Inc	GCX-015	04-Jun-12	K 005S 034W 12NW
ADL 617087	Graphite One Alaska Inc	GCX-016	04-Jun-12	K 005S 034W 12NE
ADL 617088	Graphite One Alaska Inc	GCX-017	04-Jun-12	K 005S 033W 07NW
ADL 617571	Graphite One Alaska Inc	GCX-018	29-Aug-12	K 005S 033W 16NW
ADL 617572	Graphite One Alaska Inc	GCX-019	29-Aug-12	K 005S 033W 16SW
ADL 617573	Graphite One Alaska Inc	GCX-020	29-Aug-12	K 005S 033W 21NW
ADL 617574	Graphite One Alaska Inc	GCX-021	08-Sep-12	K 005 S033W 21SW
ADL 617575	Graphite One Alaska Inc	GCX-025	29-Aug-12	K 005S 033W 17NE
ADL 617576	Graphite One Alaska Inc	GCX-026	29-Aug-12	K 005S 033W 17SE
ADL 617577	Graphite One Alaska Inc	GCX-027	29-Aug-12	K 005S 033W 20NE
ADL 617578	Graphite One Alaska Inc	GCX-028	08-Sep-12	K 005S 033W 20SE
ADL 617579	Graphite One Alaska Inc	GCX-032	29-Aug-12	K 005S 033W 17NW
ADL 617580	Graphite One Alaska Inc	GCX-033	29-Aug-12	K 005S 033W 17SW
ADL 617581	Graphite One Alaska Inc	GCX-034	29-Aug-12	K 005S 033W 20NW
ADL 617582	Graphite One Alaska Inc	GCX-035	08-Sep-12	K 005S 033W 20SW
ADL 617583	Graphite One Alaska Inc	GCX-036	08-Sep-12	K 005S 033W 29NW
ADL 617584	Graphite One Alaska Inc	GCX-039	29-Aug-12	K 005S 033W 18NE
ADL 617585	Graphite One Alaska Inc	GCX-040	29-Aug-12	K 005S 033W 18SE
ADL 617586	Graphite One Alaska Inc	GCX-041	29-Aug-12	K 005S 033W 19NE
ADL 617587	Graphite One Alaska Inc	GCX-042	08-Sep-12	K 005S 033W 19SE
ADL 617588	Graphite One Alaska Inc	GCX-043	08-Sep-12	K 005S 033W 30NE
ADL 617589	Graphite One Alaska Inc	GCX-044	08-Sep-12	K 005S 033W 30SE
ADL 617590	Graphite One Alaska Inc	GCX-046	29-Aug-12	K 005S 033W 18SW
ADL 617591	Graphite One Alaska Inc	GCX-047	29-Aug-12	K 005S 033W 19NW
ADL 617592	Graphite One Alaska Inc	GCX-048	08-Sep-12	K 005S 033W 19SW
ADL 617593	Graphite One Alaska Inc	GCX-049	08-Sep-12	K 005S 033W 30NW
ADL 617594	Graphite One Alaska Inc	GCX-050	08-Sep-12	K 005S 033W 30SW

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 617597	Graphite One Alaska Inc	GCX-054	29-Aug-12	K 005S 034W 25NE
ADL 617598	Graphite One Alaska Inc	GCX-055	29-Aug-12	K 005S 034W 25SE
ADL 617600	Graphite One Alaska Inc	GCX-058	29-Aug-12	K 005S 034W 25NW
ADL 617601	Graphite One Alaska Inc	GCX-059	29-Aug-12	K 005S 034W 25SW
ADL 617603	Graphite One Alaska Inc	GCX-062	29-Aug-12	K 005S 034W 35NE
ADL 617605	Graphite One Alaska Inc	GCX-064	29-Aug-12	K 005S 034W 35NW
ADL 617607	Graphite One Alaska Inc	GCX-066	08-Sep-12	K 005S 034W 34NE
ADL 617609	Graphite One Alaska Inc	GCX-068	08-Sep-12	K 005S 034W 34NW
ADL 617610	Graphite One Alaska Inc	GCX-069	08-Sep-12	K 005S 034W 33NE
ADL 710791	Graphite One Alaska Inc	GC-020	22-Nov-12	K 005S 034W 33NW
ADL 720914	Graphite One Alaska Inc	GCN-001	15-Jun-15	K 005S 034W 15NW
ADL 720915	Graphite One Alaska Inc	GCN-002	15-Jun-15	K 005S 034W 15NE
ADL720916	Graphite One Alaska Inc	GCN-003	15-Jun-15	K 005S 034W 15SW
ADL 720917	Graphite One Alaska Inc	GCN-004	15-Jun-15	K 005S 034W 15SE
ADL 720918	Graphite One Alaska Inc	GCN-005	15-Jun-15	K 005S 034W 20NW
ADL 720919	Graphite One Alaska Inc	GCN-006	15-Jun-15	K 005S 034W 20NE
ADL 720920	Graphite One Alaska Inc	GCN-007	15-Jun-15	K 005S 034W 21 NW
ADL 720921	Graphite One Alaska Inc	GCN-008	15-Jun-15	K 005S 034W 21NE
ADL 721240	Graphite One Alaska Inc	GCN-009	Nov-20-2015	K 005S 034W 17SW
ADL 721241	Graphite One Alaska Inc	GCN-010	Nov-20-2015	K 005S 034W 17SE
ADL 721242	Graphite One Alaska Inc	GCN-011	Nov-20-2015	K 005S 034W 16SW
ADL 721243	Graphite One Alaska Inc	GCN-012	Nov-20-2015	K 005S 034W 16SE
ADL 721244	Graphite One Alaska Inc	GCN-013	Nov-20-2015	K 005S 034W 17NW
ADL 721245	Graphite One Alaska Inc	GCN-014	Nov-20-2015	K 005S 034W 17NE
ADL 721246	Graphite One Alaska Inc	GCN-015	Nov-20-2015	K 005S 034W 16NW
ADL 721247	Graphite One Alaska Inc	GCN-016	Nov-20-2015	K 005S 034W 16NE
ADL 721248	Graphite One Alaska Inc	GCN-017	Nov-20-2015	K 005S 034W 9SW
ADL 721249	Graphite One Alaska Inc	GCN-018	Nov-20-2015	K 005S 034W 9SE
ADL 721250	Graphite One Alaska Inc	GCN-019	Nov-20-2015	K 005S 034W 10SW
ADL 721251	Graphite One Alaska Inc	GCN-020	Nov-20-2015	K 005S 034W 10SE
ADL 721252	Graphite One Alaska Inc	GCN-021	Nov-20-2015	K 005S 034W 9NW
ADL 721253	Graphite One Alaska Inc	GCN-022	Nov-20-2015	K 005S 034W 9NE
ADL 721254	Graphite One Alaska Inc	GCN-023	Nov-20-2015	K 005S 034W 10NW
ADL 721255	Graphite One Alaska Inc	GCN-024	Nov-20-2015	K 005S 034W 10NE
ADL 721256	Graphite One Alaska Inc	GCN-025	Nov-20-2015	K 005S 034W 3SW
ADL 721257	Graphite One Alaska Inc	GCN-026	Nov-20-2015	K 005S 034W 3SE

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 721258	Graphite One Alaska Inc	GCN-027	Nov-20-2015	K 005S 034W 3NW
ADL 721259	Graphite One Alaska Inc	GCN-028	Nov-20-2015	K 005S 034W 3NE
ADL 721260	Graphite One Alaska Inc	GCN-029	Nov-20-2015	K 005S 034W 2NW
ADL 721261	Graphite One Alaska Inc	GCN-030	Nov-20-2015	K 004S 034W 31SW
ADL 721262	Graphite One Alaska Inc	GCN-031	Nov-20-2015	K 004S 034W 31SE
ADL 721263	Graphite One Alaska Inc	GCN-032	Nov-20-2015	K 004S 034W 32SW
ADL 721264	Graphite One Alaska Inc	GCN-033	Nov-20-2015	K 004S 034W 32SE
ADL 721265	Graphite One Alaska Inc	GCN-034	Nov-20-2015	K 004S 034W 31NW
ADL 721266	Graphite One Alaska Inc	GCN-035	Nov-20-2015	K 004S 034W 31NE
ADL 721267	Graphite One Alaska Inc	GCN-036	Nov-20-2015	K 004S 034W 32NW
ADL 721268	Graphite One Alaska Inc	GCN-037	Nov-20-2015	K 004S 034W 32NE
ADL 721269	Graphite One Alaska Inc	GCN-038	Nov-20-2015	K 004S 034W 30SW
ADL 721270	Graphite One Alaska Inc	GCN-039	Nov-20-2015	K 004S 034W 30SE
ADL 721271	Graphite One Alaska Inc	GCN-040	Nov-20-2015	K 004S 034W 29SW
ADL 721272	Graphite One Alaska Inc	GCN-041	Nov-20-2015	K 004S 034W 29SE
ADL 721273	Graphite One Alaska Inc	GCN-042	Nov-20-2015	K 004S 034W 29NW
ADL 721274	Graphite One Alaska Inc	GCN-043	Nov-20-2015	K 004S 034W 29NE

4.2.3 The “GC Purchased Properties”

Graphite One purchased the “GC Purchased Properties” in two transactions each acquiring 28 Alaska state mining claims covering the same lands and representing the junior and senior state mining claims that overlap and surround the GC Leased Property. The first group of 28 claims was purchased in 2012 for \$20,000 and a 2% production royalty on future production from the particular claims. Graphite One has the right to purchase the production royalty for \$1 million until at any time on or before the earlier of (i) January 24, 2017, or (ii) the date that is six (6) months after the release by Graphite One of a feasibility study on the Graphite Creek Property. The second group of 28 claims was purchased in 2015 for \$50,000, the issuance of 3 million common shares of the Company at a fair value of \$270,000 and a royalty interest equal to 1% of the Net Smelter Returns received by Graphite One on production from the particular claims. Graphite One has the right to purchase the royalty for \$500,000 at any time within 36 months following the start of mine production.

**Table 4-3 GC Purchased Property: Alaska State mining claims
(All claims are a full ¼ Section (160 acres))**

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 710571	Graphite One Alaska Inc	GRAPHITE CREEK 1	29-OCT-11	K 005S 035W 34SW
ADL 710572	Graphite One Alaska Inc	GRAPHITE CREEK 2	29-OCT-11	K 005S 035W 34NW
ADL 710573	Graphite One Alaska Inc	GRAPHITE CREEK 3	29-OCT-11	K 005S 035W 34NE
ADL 710574	Graphite One Alaska Inc	GRAPHITE CREEK 4	29-OCT-11	K 005S 035W 35NW

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 710575	Graphite One Alaska Inc	GRAPHITE CREEK 5	29-OCT-11	K 005S 035W 35NE
ADL 710576	Graphite One Alaska Inc	GRAPHITE CREEK 6	29-OCT-11	K 005S 035W 27SE
ADL 710577	Graphite One Alaska Inc	GRAPHITE CREEK 7	29-OCT-11	K 005S 035W 26SW
ADL 710578	Graphite One Alaska Inc	GRAPHITE CREEK 8	29-OCT-11	K 005S 035W 26SE
ADL 710579	Graphite One Alaska Inc	GRAPHITE CREEK 9	29-OCT-11	K 005S 035W 25SW
ADL 710580	Graphite One Alaska Inc	GRAPHITE CREEK 10	29-OCT-11	K 005S 035W 25SE
ADL 710581	Graphite One Alaska Inc	GRAPHITE CREEK 11	29-OCT-11	K 005S 035W 26NE
ADL 710582	Graphite One Alaska Inc	GRAPHITE CREEK 12	29-OCT-11	K 005S 035W 25NW
ADL 710583	Graphite One Alaska Inc	GRAPHITE CREEK 13	29-OCT-11	K 005S 035W 25NE
ADL 710584	Graphite One Alaska Inc	GRAPHITE CREEK 14	29-OCT-11	K 005S 034W 30NW
ADL 710585	Graphite One Alaska Inc	GRAPHITE CREEK 15	29-OCT-11	K 005S 034W 30NE
ADL 710586	Graphite One Alaska Inc	GRAPHITE CREEK 16	29-OCT-11	K 005S 034W 29NW
ADL 710587	Graphite One Alaska Inc	GRAPHITE CREEK 17	29-OCT-11	K 005S 034W 29NE
ADL 710588	Graphite One Alaska Inc	GRAPHITE CREEK 18	29-OCT-11	K 005S 034W 20SW
ADL 710589	Graphite One Alaska Inc	GRAPHITE CREEK 19	29-OCT-11	K 005S 034W 20SE
ADL 710590	Graphite One Alaska Inc	GRAPHITE CREEK 20	29-OCT-11	K 005S 034W 21SW
ADL 710591	Graphite One Alaska Inc	GRAPHITE CREEK 21	29-OCT-11	K 005S 034W 21SE
ADL 710592	Graphite One Alaska Inc	GRAPHITE CREEK 22	29-OCT-11	K 005S 034W 22SW
ADL 710593	Graphite One Alaska Inc	GRAPHITE CREEK 23	29-OCT-11	K 005S 034W 22NW
ADL 710594	Graphite One Alaska Inc	GRAPHITE CREEK 24	29-OCT-11	K 005S 034W 22NE
ADL 710595	Graphite One Alaska Inc	GRAPHITE CREEK 25	29-OCT-11	K 005S 034W 23NW
ADL 710596	Graphite One Alaska Inc	GRAPHITE CREEK 26	29-OCT-11	K 005S 034W 23NE
ADL 710597	Graphite One Alaska Inc	GRAPHITE CREEK 27	29-OCT-11	K 005S 034W 23SW
ADL 710598	Graphite One Alaska Inc	GRAPHITE CREEK 28	29-OCT-11	K 005S 034W 23SE
ADL 716180	Graphite One Alaska Inc	GPH-1	August 10, 2012	K 005S 035W 34SW
ADL 716181	Graphite One Alaska Inc	GPH-2	July 10, 2012	K 005S 035W 34NW
ADL 716182	Graphite One Alaska Inc	GPH-3	July 10, 2012	K 005S 035W 34NE
ADL 716183	Graphite One Alaska Inc	GPH-4	August 10, 2012	K 005S 035W 35NW
ADL 716184	Graphite One Alaska Inc	GPH-5	August 10, 2012	K 005S 035W 35NE
ADL 716185	Graphite One Alaska Inc	GPH-6	June 10, 2012	K 005S 035W 27SE
ADL 716186	Graphite One Alaska Inc	GPH-7	June 10, 2012	K 005S 035W 26SW

Claim Number	Claim Owner	Claim Name	Location Date	Township Location
ADL 716187	Graphite One Alaska Inc	GPH-8	June 10, 2012	K 005S 035W 26SE
ADL 716188	Graphite One Alaska Inc	GPH-9	July 10, 2012	K 005S 035W 25SW
ADL 716189	Graphite One Alaska Inc	GPH-10	June 10, 2012	K 005S 035W 25SE
ADL 716190	Graphite One Alaska Inc	GPH-11	June 10, 2012	K 005S 035W 26NE
ADL 716191	Graphite One Alaska Inc	GPH-12	June 10, 2012	K 005S 035W 25NW
ADL 716192	Graphite One Alaska Inc	GPH-13	June 10, 2012	K 005S 035W 25NE
ADL 716193	Graphite One Alaska Inc	GPH-14	June 10, 2012	K 005S 034W 30NW
ADL 716194	Graphite One Alaska Inc	GPH-15	June 10, 2012	K 005S 034W 30NE
ADL 716195	Graphite One Alaska Inc	GPH-16	June 10, 2012	K 005S 034W 29NW
ADL 716196	Graphite One Alaska Inc	GPH-17	June 10, 2012	K 005S 034W 29NE
ADL 716197	Graphite One Alaska Inc	GPH-18	April 10, 2012	K 005S 034W 20SW
ADL 716198	Graphite One Alaska Inc	GPH-19	April 10, 2012	K 005S 034W 20SE
ADL 716199	Graphite One Alaska Inc	GPH-20	April 10, 2012	K 005S 034W 21SW
ADL 716200	Graphite One Alaska Inc	GPH-21	April 10, 2012	K 005S 034W 21SE
ADL 716201	Graphite One Alaska Inc	GPH-22	June 10, 2012	K 005S 034W 22SW
ADL 716202	Graphite One Alaska Inc	GPH-23	March 10, 2012	K 005S 034W 22NW
ADL 716203	Graphite One Alaska Inc	GPH-24	March 10, 2012	K 005S 034W 22NE
ADL 716204	Graphite One Alaska Inc	GPH-25	April 10, 2012	K 005S 034W 23NW
ADL 716205	Graphite One Alaska Inc	GPH-26	April 10, 2012	K 005S 034W 23NE
ADL 716206	Graphite One Alaska Inc	GPH-27	April 10, 2012	K 005S 034W 23SW
ADL 716207	Graphite One Alaska Inc	GPH-28	March 10, 2012	K 005S 034W 23SE

4.2.4 Surface Rights and Permitting

For Alaska State mining claims surface rights remain with the State, while surface activities that are required for mining are allowed. The permits required for mining are more fully outlined in Section 20 of this Assessment, but as a minimum, the following are expected:

- i. a Regional General Permit (“RGP”) 2006-1944 or an RGP 2007 or an Individual Permit
- ii. an Alaska Pollutant Discharge Elimination System (“APDES”) Permit

To the knowledge of the QP, there are no outstanding environmental liabilities to which any portion of the project is subject.

To the knowledge of the QP, there are no other significant factors and risks that may affect access, title, or the right or ability to perform work on the property.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Topography, Elevation, and Vegetation

The Property is part of the Seward Peninsula in Alaska, and located approximately 59 km North from Nome, AK which is the closest major centre. On its northern edge, the Property borders onto the Imuruk Basin, a shallow tidal body of water that leads, via the Tuksuk Channel out to Grantley Harbor, and thus to Port Clarence and the Bering Sea. The elevation of the Property gently rises from the basin to the Kigluaik Mountains, which reach some 1190 m above sea level. The proposed mine site would be located between 100 and 500m in elevation along the base of the Kigluaik mountain range front adjacent to Graphite Creek, a small drainage descending from the mountains west facing slopes.

Permafrost is present, as this is an arctic tundra environment, with low vegetation composed primarily of shrubs, grasses and lichens.

5.2 Accessibility

With major urban center Nome to the South, the closest village to the Property is the Inupiat village of Teller (2009 population of 269 persons), located 42 km northwest. There is no road access to the Property at present. The roads closest to the site are marked in Figure 5-1. The Nome-Teller (Bob Blodgett Highway) Highway passes the western periphery of the Kigluaik Mountain chain approximately 30 km west of the Graphite One property and ends at Teller, Alaska. The Nome-Taylor (Kougarok Highway) Highway circumvents the eastern part of the Mountain range along its southern flank 20 km southeast of the Graphite Creek Project area and ends at the Kougarok River Bridge. A (local) road spur leading off the Nome-Taylor highway leads to Pilgrim Hot Springs just north of the eastern flank of the Kigluaik Mountain Range. Both highways are well-maintained gravel roads but neither highway is entirely maintained during winter months (October to May) beyond certain mile posts, which for Nome-Taylor is mile post 13 and for Nome-Teller is mile post 8. The highways are typically closed after the first snow storm, which can occur as late as the end December.

During the 2012 and 2013 field exploration programs, the project used the Salmon Lake Camp and airstrip as its base camp, which is about 50 km north-northeast of Nome. Daily access to the Property was achieved by helicopter. Future mining operations will be supported by a proposed overland route connecting the mine site to the Nome-Taylor highway.



Figure 5-1: Main highways and roads from Nome leading towards Graphite Creek Project Area⁷.

Seward Peninsula lacks rivers of adequate depth for commercial transport and navigation to be commonplace. The navigational route from the Property on the Imuruk Basin at Windy Cove through the Tuksuk Channel to Grantley Harbor and on to Port Clarence would have to be assessed for larger bulk transport of material at the proposed scale of operation. Imuruk Basin is a shallow lagoon with recorded depths of 1.8 to 2.7 metres (1 to 2 fathoms)⁸. Employment of a port facility on the Imuruk Basin is not the primary focus for a transport option due to a combination of factors including: difficult passage through Tuksuk channel; uncertainty of water depths; determining an appropriate/passable route; the presence of two threatened seal species, and concerns regarding potential Alaska Natives fishing and hunting sustenance constraints. The bodies of water of interest are shown in Figure 5-2. A year-round road connected to the Teller Highway is presently considered to be the most suitable and practical transport option. The proposed road length and location is discussed in more detail in Section 18 Project Infrastructure.

⁷ Source: Alaska Department of Transportation <http://dot.alaska.gov/stwdplng/fclass/fclassmaps.shtml>

⁸ Source: US National Oceanic and Atmospheric Administration (NOAA) http://ocsddata.nco.noaa.gov/BookletChart/16200_BookletChart.pdf

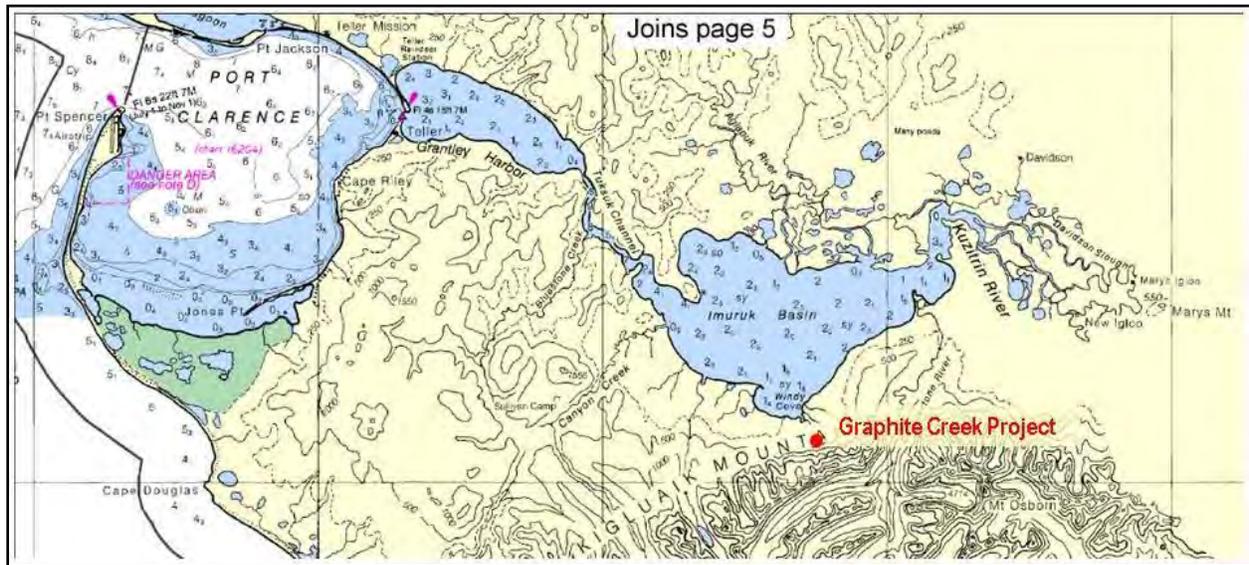


Figure 5-2: Soundings (in fathoms, 1 fathom = 1.8 metres) of Port Clarence, Grantley Harbor and Imuruk Basin from US NOAA.

5.3 Climate

The climate local to the Property is categorized as maritime in the months when the Bering Sea is ice-free and acting as a modifier. In winter (mid-November to mid-June), when the sea is ice-covered, the climate is categorized as continental, with drier, colder conditions. It is more generally described as a sub-arctic climate. Average temperatures for Nome range from -19 °C in the winter months to 15 °C in the summer months with an average freeze-free period of 81 days. Precipitation in Nome averages 421 mm rain and 1,453 mm snow on an annual basis.

5.4 Infrastructure

There is no permanent infrastructure at the site. For Alaska State mining claims surface rights remain with the State, while surface activities that are required for mining are allowed. Graphite One maintains sufficient land holdings to support the mining and processing operations currently envisioned. There is adequate room to significantly increase the magnitude of the operations if it is deemed desirable in the future.

5.4.1 Energy Infrastructure

There are presently no large, interconnected grids of power transmission and distribution lines in the Seward Peninsula. The only intra-state grid network is found in the more populated areas of eastern Alaska running the corridor from Fairbanks to Anchorage.

Most power in the Seward Peninsula is generated by consumer-owned electric cooperatives near the serviced communities. Teller, Brevig Mission and Nome generate electricity via diesel-

fuel power plants with respective electrical generating capacities of 1,050 kW⁹ (approx. 1 MW) and 20.4 MW¹⁰. The project area and western Alaska in general are far from the eastern oil producing areas and the Alaska oil pipeline and access to the intra-state electrical grid. However, the Tuksuk Channel that links Imuruk Basin to Grantley Harbor has been identified as potential site for hydroelectric power generation on maps by the Alaska Energy Authority (Figure 5-3)¹¹ and was evaluated in a 1980 study on Alaskan hydroelectric resource to have potential generating capacity of 66 MW¹².

There are various options for electric power generation on site, ranging from the more likely diesel generation to liquid natural gas (LNG), to wind (Nome has local experience in setting up arctic-grade wind generation systems), and even to some geothermal generation from Bering Straits Native Corporations Pilgrim Hot Springs project. These options are being explored through discussions between Graphite One and the Alaska Industrial Development and Import Authority and the University of Alaska at Anchorage, with a view to incorporate some renewable energy at a cost advantage to the project. Further discussion of this is included in Section 18 Project Infrastructure.

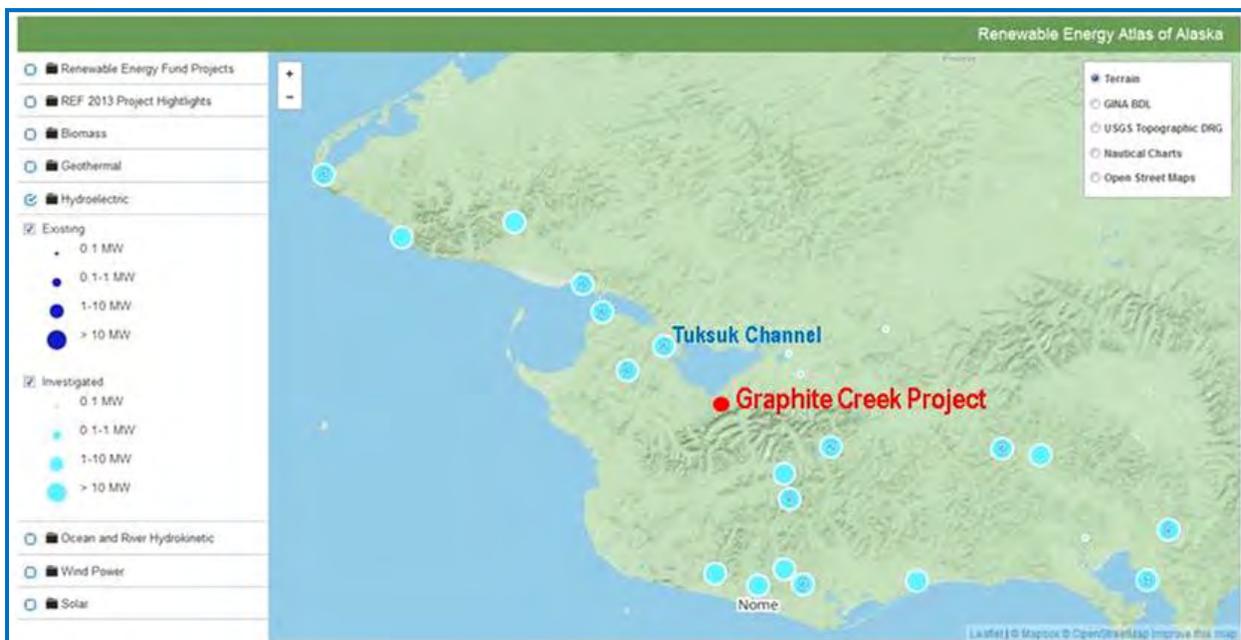


Figure 5-3: Alaska Energy Authority map identifying sites with hydroelectric potential in the Seward Peninsula.

⁹ Source: Alaska Village Energy Cooperative. <http://www.avec.org/communities/community.php?ID=47>

¹⁰ Source: US Energy Information Administration <http://www.eia.gov/state/?sid=AK>

¹¹ Source: Alaska Energy Authority. <http://map.akenergyinventory.org/#>

¹² Source: Alaska Power Authority. Report – DEPD 81-001-2 DOE/EV/73002-1, 1980.

5.4.2 Water Source(s)

There is sufficient water source on or available at the Property to support mining operations, and a site for a tailings pond has been identified. Environmental considerations must be taken into account in the planning for water use and disposal. This review is in the beginning stages, as outlined later (Section 20) in this Assessment.

5.4.3 Processing Plant Site(s)

Sites are under consideration for use as processing plant locations. Due to the early stage of investigation, with several key processing and transport questions still unanswered, no firm decisions have been made in this regard.

5.5 Physiography

The following description of the physiography of the Graphite Creek Property is paraphrased from Eccles et al. (2015).

The Property is located in the southwestern part of the Seward Peninsula, approximately 59 km north of Nome, and 3 km south of Windy Cove on the Imuruk Basin. The Imuruk Basin is a shallow intertidal basin that connects to the Bering Sea at Grantley Harbor. A gently sloping alluvial plain extends inland from Windy Cove to the Kigluaik Mountains. Elevation on the property varies from approximately 77 m asl in the alluvial plains to 1190 m asl in the mountains.

Vegetation on the property is characteristic of the arctic tundra biome, where vegetation is low and dominated by shrubs, sedges, perennial forbs, grasses mosses and lichens. Additionally, a layer of discontinuous permafrost is present.

The operating season on the property is approximately from mid-June to the beginning of November. From early June until mid-November the Bering Sea is typically ice free and the area of the Property is considered a maritime climate zone. The climate changes to continental in the winter, with drier and colder conditions. Average annual precipitation in Nome is 421 mm precipitation and 1,453 mm of snow. Average temperatures range from 15°C in summer to -19°C during winter.

6 HISTORY

6.1 Overview

Historical graphite excavations and occurrences, and other mineral commodities around Graphite One's Graphite Creek property are shown on Figure 6.1. The only areas of historic graphite mining in the region occur within the property boundary. Other undeveloped occurrences of graphite are documented at Windy Creek and Christophosen Creek about 8-10 km southeast of the Property.

No work has been completed by the Company or any other Qualified Person on the historic mining or historic reported deposits or mineral inventory in the area. Therefore, those deposits and resources are not considered modern mineral resources or mineral reserves. The QP has solely relied on data procured during the exploration programs undertaken by Graphite One between 2011 and 2014, and reported in three NI 43-101 compliant technical reports issued by Graphite One (Duplessis et al. (2013), Eccles and Nicolls (2014), and Eccles et al. (2015).

Graphitic bedrock was first documented on the north side of the Kigluaik Mountains in the early twentieth century (Moffit, 1913). The graphite showings are known to crop out in incised creek valleys on the north side of the Kigluaik Mountains and it is from these exposures that the graphite showings have been described by various authors (e.g., Mertie, 1918; Coats, 1944; Cobb, 1972; Cobb and Sainsbury, 1972; Sainsbury, 1972; Weiss, 1973; Cobb, 1975; Hudson and Plafker, 1978; Hudson, 1981, 1998; Swainbank et al., 1995; Adler and Bundtzen, 2011; Nelson, 2011). From west to east these creek exposures include Christophosen Creek, Hot Springs Creek, Trail Creek, Glacier Canyon Creek, Ruby Creek and Graphite Creek. A general historical overview of each of the historical graphite showings is described in Duplessis et al. (2013).

6.2 Historical Mining

Historic mining production and resource estimates were originally published in imperial units. All values have been converted to metric units for clarity and convenience.

During the early 1900s, at least two companies mined in the area. The first known claims were staked in 1900 by Uncle Sam Alaska Mining Syndicate ("USAMS") in Graphite Bay, now known as Windy Cove (Harrington, 1919). In 1912, USAMS shipped 120 tonnes of graphite to Seattle and the San Francisco Bay area, and by 1916 had stockpiled another 275 tonnes (Mertie, 1918). The Alaska Graphite Mining Co. staked claims in 1905, and added additional claims in 1915 and 1916 (Mertie, 1918; Harrington, 1919). A total of 32 tonnes of graphite was mined from talus in 1907 (Coats, 1944). Employing about seven people, 90 tonnes of graphite was mined in 1916 (Mertie, 1918). This production was hauled a short distance overland to Windy Cove, from there to Teller by boat, and then shipped to Seattle and San Francisco (Harrington, 1919).

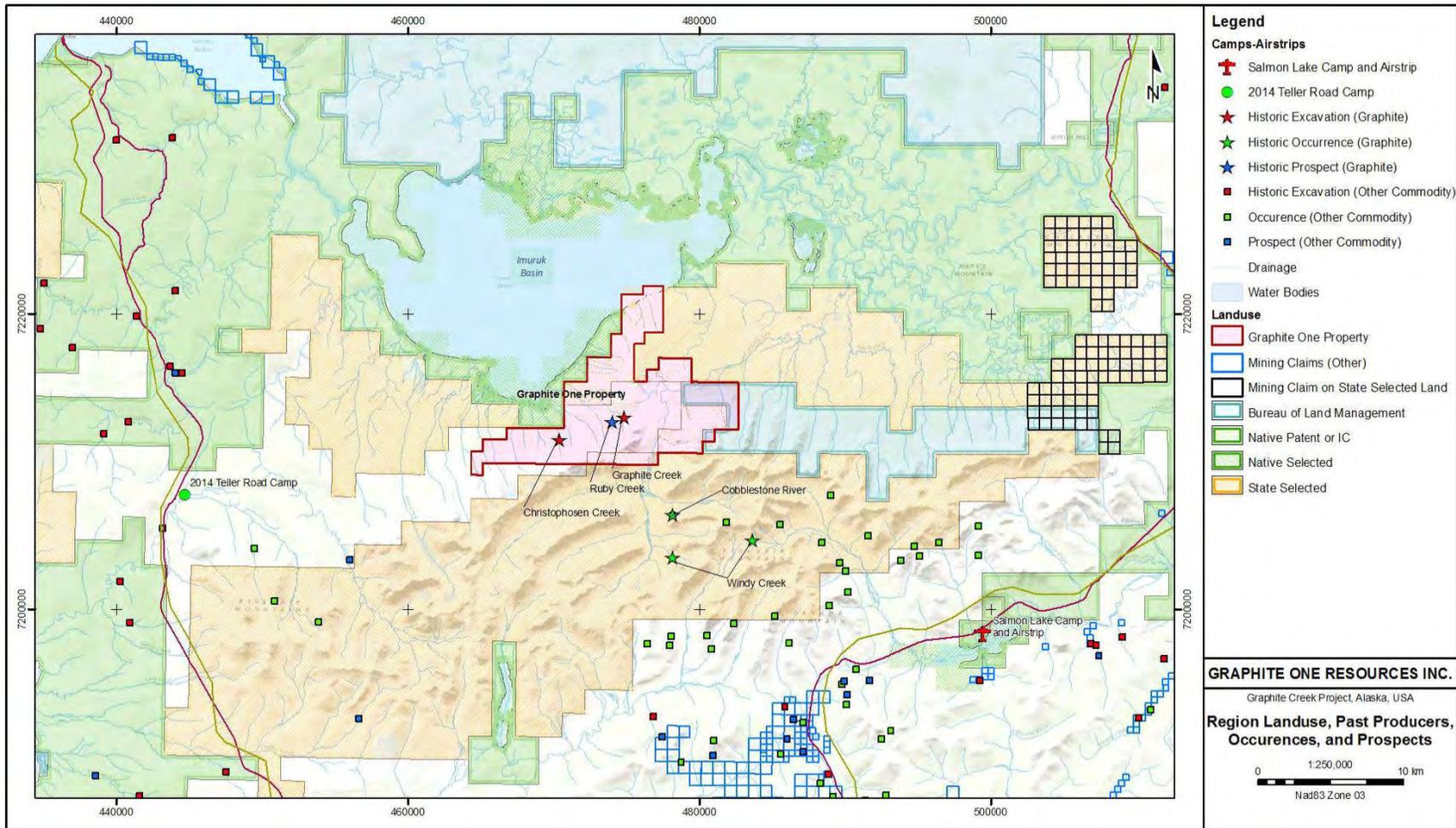


Figure 6-1: Property location, historic deposits, showings and occurrences, and land disposition in the property area

6.3 Prior Exploration

After initial early 1900s production, the properties lay dormant until 1943 when USGS geologist Robert Coats visited the area. His field crew sampled material from several sorted piles of previously mined graphite, and from several high grade graphitic lenses on the Property (Coats, 1944). Three specific areas underwent surface excavation work and were named by Coats as Christophosen Creek, Ruby Creek, and Graphite Creek (Figure 6.1). Coats (1944) reported that exposed high-grade lenses in these three areas varied from a few centimetres to a metre in thickness with lengths that are ten to fifteen times their width, and contained up to 59.7% graphite.

The last known exploration interest in the area was in 1981 when a brief field examination of the showings was conducted by the Anaconda Copper Company when several samples were taken for analysis during a one-day visit (Hudson, 1981; Wolgemuth, 1982).

The historical work, which includes inferences to middle 1910s 'mining' by way of hand-sorting high-grade graphite material from small (<10 m) excavations into outcrop, is superseded by recent investigations conducted by Graphite One.

Exploration work performed by Graphite One during 2011 to 2014 consisted of a variety of programs, the details of which are reported in Duplessis et al. (2013), Eccles and Nicolls (2014), and Eccles et al. (2015). Those programs can be summarized as follows:

1. In 2011, Mr. S. Nelson conducted a helicopter-supported mapping and sampling program on behalf of Graphite One. He identified and mapped the distribution of graphite bearing meta-sediments along the north-central slope of the Kigluaik Mountains (Nelson, 2011). Graphite-rich host rocks were reported across a continuous strike length in excess of five kilometres.
2. During the 2011 field season, three 15-kilogram composite samples were collected from outcrop (Hudson, 2011). The samples were characterized as high grade, mixed grade and mixed/disseminated grade. The samples were submitted for petrographic and laboratory screen analysis.

The high-grade, mixed-grade and disseminated graphite samples contained 56.9, 14.5, and 8.2% graphite respectively. Screening analyses of the samples that were crushed to -10 mesh and it was determined that they contained 84.3%, 93.6% and 76.5% large flake graphite. Large flake being defined as flake size greater than 80 mesh in one dimension (Hudson, 2011). Graphite flakes varied between a few microns to about 1.5 mm in its longest direction with averages between 150-250 microns. The graphite was described as consisting of lath-shaped particles with deformed or foliated texture, liberated crystals and intergrowths with other constituents.

3. An ambitious exploration program was carried out over the property during the summer of 2012. This program consisted of an airborne geophysical survey, detailed 1:5,000 scale mapping and sampling, bulk pit sampling, and a diamond drilling program consisting of 4,248 metres in 18 holes. The results of the helicopter-borne time domain electromagnetic (EM) survey are shown in Figure 6.2. Interpretation of the geophysical survey results coupled with the mapping and sampling program led the researchers to

believe that graphite mineralization was present along an 18 km corridor of metasediments on the flank of the Kigluaik Mountains.

A total of 591 rock samples were collected by Graphite One's consultants APEX Geoscience Ltd. across the Property. Graphite mineralization grading between 0.05% and 51% Cg was found to occur within biotite-quartz schist and sillimanite-garnet-biotite-quartz schist units. The sillimanite-garnet-biotite-quartz schist is typically high-grade due to graphite concentrated as massive to semi-massive segregations that contain up to 80.9% Cg. Of the 591 grab samples collected in 2012, 11 samples yielded >45% Cg, 47 samples had >10% Cg and 137 samples had >3% Cg.

Fifteen bulk samples of between 558 kg and 739 kg totaling 9,916 kg were collected from three different areas including the Graphite Creek, Christophosen Creek and Child Drainages.

The initial drill hole spacing was approximately 200 m between holes along strike, but later in the program some infill drilling was carried out with hole spacings as close as 50 m. Graphite mineralization was encountered in all drill holes, including the last hole, 12GCH008 which was collared approximately 2.3 km to the west along strike to test the lateral extent of the mineralization.

Several composite samples were selected from drill core and submitted for laboratory analysis to characterize the graphite flake size and structure and the nature and abundance of the various gangue minerals. The graphite the graphite was described by Hazen Research of Golden, Colorado (Hazen) as occurring mostly as liberated flakes/crystals in the minus 40 mesh fractions, and occurring together with less common intergrowths of graphite and other gangue schist components (quartz, mica and other siliceous materials and iron oxides. The samples supplied to Hazen were described as "...consist(ing) mainly of quartz, with minor amounts of mica, clay, magnetite, ilmenite, and titanium oxides. The graphite is present as: minute scales or flakes; fine, undulated stringers along schist planes; liberated lath- shaped or tabular-foliated crystals; or as blocky and irregular deformed particles." (Hazen Research Inc., 2012). One 5 kg composite sample was collected from drill core and sent to Activation Laboratories Ltd. in Thunder Bay, Ontario for x-ray diffraction analysis. Mineral 'mapping' on the Mineral Liberation Analyzer shows that most of the graphite flakes/crystals/particles occur as free (liberated) graphite with 50% of the graphite passing through 120 µm and 80% passing through 330 µm.

Based on the 2012 drilling and exploration results, APEX reported an inferred mineral resource of 107.2 million tonnes of graphite mineralization grading 5.78% Cg at a cut-off grade of 3.0% (Duplessis et al., 2013).

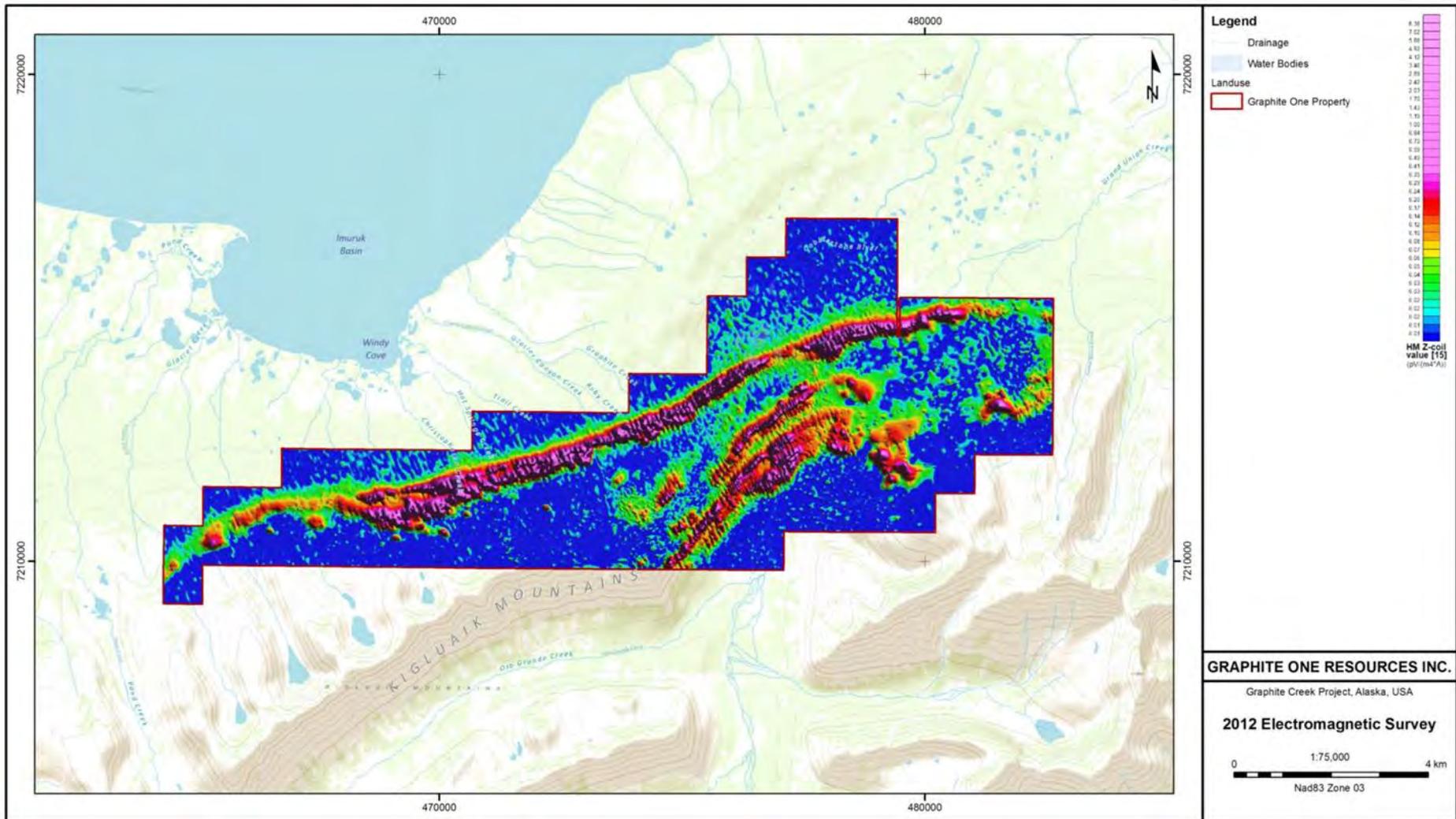


Figure 6-2: SkyTEM helicopter-borne time-domain electromagnetic image; High Moment Z-coil Channel 05. Warm colours (red) represent high signal and cold colours (blue) represent low signal. The continuous northeast-trending, high electromagnetic anomaly is approximately 18 km in length.

4. The 2013 exploration program consisted of a small diamond drilling program, calculation of a new resource estimate, and a bench-scale beneficiation test. The diamond drilling program consisted of 1,024 m of drilling in ten drill holes. Again, graphite mineralization was encountered in all of the drill holes. The holes were drilled with a collar spacing of approximately 250 m and increased the mineral resource to a zone approximately five kilometres in length, and at depths from surface or near surface to depths of 147 m below surface.

The issuer's consultants calculated a new resource estimate based on the cumulative drill data from the 2012 and 2013 drill programs. The APEX geologists calculated that the deposit contained approximately 186.9 million tonnes of graphite-bearing mineralization at a grade of 5.5% Cg, using a cut-off grade of 3.0% Cg (Eccles and Nicholls, 2014). The model and resource estimate based on it was calculated by dividing the deposit into eight different domains or lodes, based on lateral continuity and statistical grade analysis of the assayed core samples.

The bench-scale beneficiation study demonstrated that it was feasible to produce high-purity 99.2% Cg from a rough concentrate (Graphite One Resources Inc., 2013). The methods used included flotation cells and a leaching process to produce the high-purity graphite.

5. The most recent exploration program on the property was carried out between September 21st, 2014 and November 5th, 2014. That program consisted of diamond drilling, collection of metallurgical samples, and the calculation of a new resource estimate. That program is described in detail in a technical report issued by Graphite One Resources in March, 2015 (Eccles et al., 2015).

The drill program was designed to both increase the confidence level and the extent of the resource. The program consisted of 20 holes totaling approximately 2,221 m logged and assayed, and 2 holes totaling 91.6 m used for metallurgical testing. A total of 2,354 samples were collected in the 2014 program, of which 2,274 were submitted for assay, and 80 retained for metallurgical test-work. The 2014 drill holes were collared on sections approximately apart and at least two holes were drilled on each section, in an effort to confirm continuity of the mineralization, both vertically and laterally. Once again, all holes encountered significant Cg mineralization.

The increased drill density in the central region of the deposit, combined with the demonstrated continuity of the mineralization allowed the resource in this section to be classified as Indicated. The Indicated Mineral Resource area is spatially constrained by the boundary of the 2014 drill program and defines an area measuring: approximately 730 m along the northeast-striking trend of the graphitic schist; approximately 185 m across the strike of the schist; and to a depth of approximately 200 m below surface. Using a preferred base cut-off of 3% Cg, the Indicated Mineral Resource estimation contains 17.95 million tonnes of mineralized graphite schist at a grade of 6.3% Cg. Based on this tonnage, grade and 3% Cg cut-off, the in situ graphite contained within the Indicated Mineral Resource area is estimated to be 1.13 million tonnes.

The Inferred Mineral Resource area is constrained by the drilled portions of the graphitic conductor that are not included within the Indicated Resource area. Accordingly, the

Inferred Resource area is: approximately 5.0 km along the northeast- striking trend of the graphitic schist (minus the 730 m portion of the Indicated Resource); approximately 200 m across the strike of the graphitic schist; and to a depth of approximately 320 m below surface. Using a preferred base cut-off of 3% Cg, the Inferred Mineral Resource estimates that 154.36 million tonnes of mineralized graphite schist at a graphite grade of 5.7% Cg are present at the Graphite Creek deposit. Based on this tonnage, grade and 3% Cg cut-off, the in-situ graphite of the Inferred Mineral Resource is 8.76 million tonnes.

The mineral resource estimate is discussed in more detail in Section 14 Mineral Resource Estimates

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The following synopsis of the regional geology of the property area is quoted from previous technical reports issued for the property (Duplessis, et al., 2013, Eccles and Nicholls, 2014, and Eccles et al., 2015). No regional-scale research has been carried out in the area since the synopsis was written, and the description is still current and applicable.

The Kigluaik Group consists of amphibolite and granulite facies metamorphic rocks and is therefore divided into two sub-groups, an upper and lower assemblage. Amphibolite grade upper Kigluaik Group schist is exposed on the southern flanks of the Kigluaik mountain range. Pelitic gneiss samples from the upper section of the Kigluaik group have been dated using Rb/Sr to ~735 Ma (Bunker et al., 1979). The basal Kigluaik Group contains granulite grade schist and gneiss, and is exposed on north flank of the mountains (Figure 7.1). These rocks have no direct counterparts in the adjacent mountain ranges and are believed to represent the deepest crustal rocks exposed in northwestern Alaska (Miller, 1994). The lower Kigluaik Group comprises coarse marble, quartzo-feldspathic gneiss, schist and gneiss of mafic and ultramafic composition, graphite rich schist, and garnet lherzolite.

The Graphite One Property area is underlain by high-grade metamorphic rocks of the Kigluaik Group (Figure 10). These metamorphic rocks are composed of continental crustal material of Proterozoic to middle Paleozoic age that were subjected to crustal imbrication and thickening in middle Mesozoic time and widespread plutonic activity in mid-Cretaceous to Late Cretaceous time (Sainsbury, 1972, 1975; Bunker et al., 1979; Miller, 1994; Till and Dumoulin, 1994; Armstrong et al., 1986; Amato and Wright, 1998; Till et al., 2011). However, some authors have proposed that at least part, and perhaps a significant part, of high-grade metasedimentary and metaigneous rocks of the Kigluaik Group (unit PzPh on Figure 7.1) was originally blueschist-facies rocks of the Nome Complex subsequent to a high-grade metamorphic overprinting (Hannula and McWilliams, 1995; Till et al., 2011).

All of the formations of the Kigluaik Group are cut by intrusive rocks, the most common of which is granite. These intrusions are more abundant in the lower part of the group. Besides granite intrusions, dykes and sills of diorite, diabase and pegmatite are present.

Peak metamorphic grade in the area is thought to have occurred in the Cretaceous (91 Ma), immediately preceding or coincident with the intrusion of the Kigluaik Pluton (Amato and Wright, 1998). Other dating methods have yielded younger ages. 40K/40Ar and 40Ar/39Ar dating have yielded ages of ~95-81 Ma. The younger ages likely dates the onset of high grade regional metamorphism of the Kigluaik Group (Adler and Bundtzen, 2011).

Bedrock is either exposed or covered minimally by surficial overburden material throughout most of the Property area, particularly in the incised creek valleys and/or relatively steep slopes adjacent to the Kigluaik Fault. Surficial Quaternary deposits dominate the area to the north of the Graphite One Property (Figure 7-1). The surficial deposits include: glacially deposited sand, gravel, and boulders; fluvial gravel and sand; marine and fluvial terrace deposits; and wetlands (Till et al., 2011).

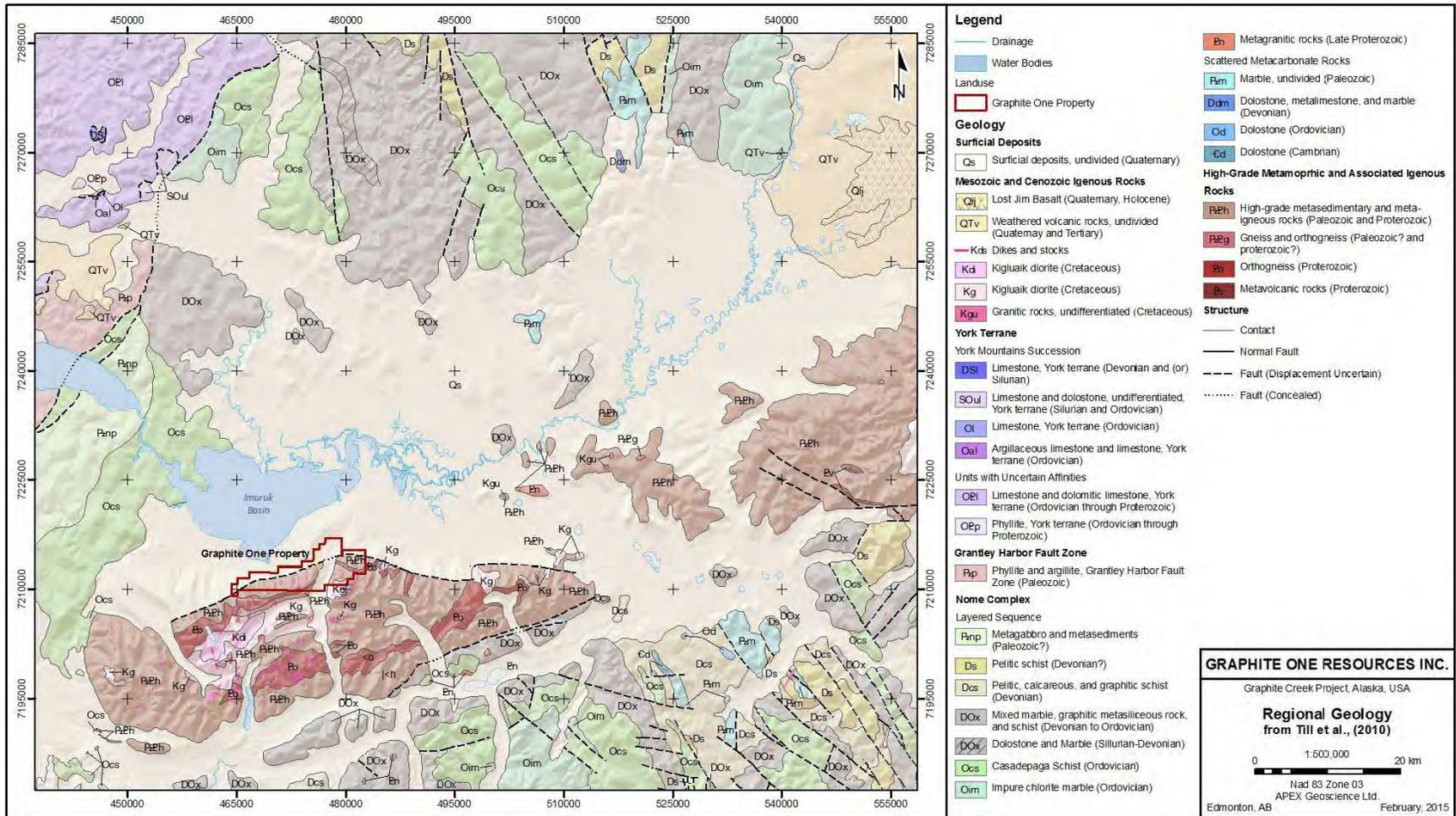


Figure 7-1: Regional geology of the Graphite Creek property area. (From Eccles et al., 2015)

7.2 Property Geology

The property-scale geology in the Graphite Creek Project area has been described in previous technical reports issued for the property. The following synopsis of the Property geology is quoted from Eccles, et al. (2015). No property-scale mapping has been completed on the property since this synopsis was published, and this is a fair and accurate description of the property geology.

The Graphite Creek graphite deposit is located on the north side of the Kigluaik Mountains (at about 230 m elevation). More specifically, the graphitic schist occurs on the upslope and footwall surface trace of the reactivated Kigluaik normal fault. The Kigluaik Fault generally strikes at approximately azimuth 250° and dips 75° to the north over a distance of approximately 35 km. Contemporary movement on this fault has uplifted the rugged and youthful Kigluaik Mountains to the south and down thrown the lowlands of the Imuruk Basin to the north (Hudson and Plafker, 1978).

Graphite occurs as high-grade massive to semi-massive segregations and disseminations within amphibolite facies metasedimentary rocks, primarily biotite-quartz schist with zones of sillimanite-garnet-biotite-quartz schist (Figure 7.2; Sainsbury, 1972). Based on their apparent association with the Kigluaik Fault, the graphite-bearing schist units strike subparallel to the mountain front and dip north between 40° and 75°.

The 2012 geological mapping program confirmed historical observations of distinct geological layers comprising high-grade massive to semi-massive segregated and disseminated graphite in sillimanite-garnet-biotite-quartz schist and disseminated graphite in biotite-quartz schist (±garnet). Based on strike/dip measurements, the layers consistently dip northwards such that these layers appear to represent continuous geological units and are not overly distorted by complex regional or large-scale fold belts. Small localized folding does exist on the <1 m scale, but it is more or less confined within the high-grade graphite schist layers.

A total of 591 rock grab samples collected from throughout the Graphite Creek Property during 2012 include graphitic sillimanite-garnet-biotite-quartz and biotite-quartz (±garnet) schistose units plus localized intrusive diorite. All samples were analyzed for specific gravity and graphitic carbon. Of the 591 samples, 11 samples yielded >45% Cg (up to 80.9% Cg), 47 samples had >10% Cg and 137 samples had >3% Cg.

A 1,523.5 line-kilometre time-domain, helicopter-borne magnetic and electromagnetic survey over the Graphite One Property shows that bands of continuous high-electromagnetic anomalies mimic historical and 2012 geological mapping of high grade graphitic schist in the Graphite Creek Property area. The high-electromagnetic bands also correlate well with 2012-2014 drill results. Subsequently, interpretation of the electromagnetic data provides preliminary evidence that the high-grade graphite layers observed in incised creek exposures are continuous along strike in a north-easterly direction for approximately 18 km.

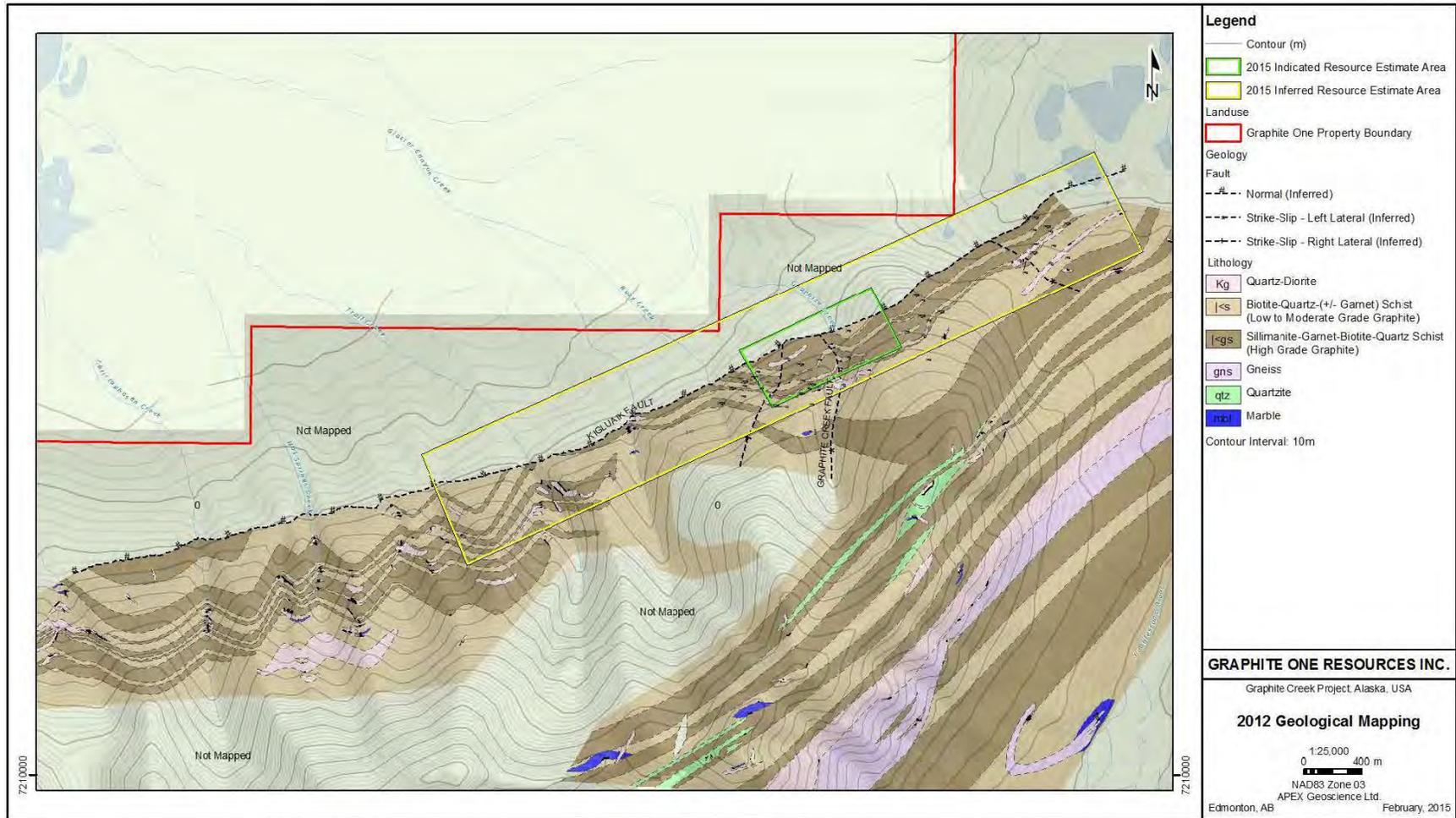


Figure 7-2: Detailed geologic map of a portion of the Graphite Creek property. The boundaries of the Indicated and Inferred resource blocks are also shown. (From Eccles et al., 2015)

7.3 Mineralization

The mineralization in the Property area has been described in previous technical reports issued for the property. The following synopsis of the mineralization on the Graphite Creek property is quoted from Eccles, et al. (2015). No study of the mineralization has been completed on the property since this synopsis was published, and this is a fair and accurate description of the mineralization.

There are two distinctive graphite-bearing schist intervals at Graphite Creek. The first is sillimanite-garnet-biotite-quartz schist that contains coarse, semi-massive and massive graphite segregations and disseminated graphite (Figure 7.2). The other interval unit is biotite-quartz schist that typically contains disseminated graphite. The sillimanite-garnet-biotite-quartz schist is the principal host to higher grade graphite and makes up two distinctive layers in the metasedimentary sequence along the north flank of the Kigluaik Mountains. A third potential horizon is defined by 'pods' of sillimanite-garnet-biotite-quartz schist (Figure 7.2). The position of these layers is most likely structurally controlled; that is a folded unit with the third pod-like layer forming in this style as uppermost erosional features (T. Hudson, personal communication, 2012). Hence, shallow-dipping erosional remnants of the southern-most third layer makes up a few discontinuous perched masses at higher elevations. The sillimanite-garnet-biotite-quartz schist layers strike obliquely to the mountain front and dip northwards at 40° to 78°.

The sillimanite-garnet-biotite-quartz schist typically is fine to coarse grained, weathers grey, has a wavy and crenulated schistosity, garnet porphyroblasts (up to 2 cm across), and augen-shaped quartz grains. Discontinuous segregations (lenses and streaks) of coarse high-grade graphite, from centimeters to a few meters thick, are common. These high-grade graphite lenses in the sillimanite-garnet-biotite-quartz-schist have up to 60% coarse, crystalline graphite and were no doubt the sources of hand sorted graphite produced in the early 1900's. Disseminated flakes of graphite, up to 1 mm or more across, make up several percent of the rock.

The biotite-quartz schist is fine-grained, weathers a rusty ochre colour and has regular layering with individual layers commonly 3 to 10 cm thick. Graphite occurs as disseminated flakes up to about 1 mm across and can make up several percent of the rock. Higher grade graphite-rich layers, varying from 3 to 25 cm in width are present, but are not as common as in the sillimanite-garnet-biotite-quartz schist.

8 DEPOSIT TYPES

Graphitic carbon deposit types have been described in previous technical reports issued for the property. The following synopsis of graphitic carbon deposits is quoted from Eccles, et al., (2015). The author is not aware of any research published subsequent to the 2015 technical report which would render the observations and conclusions invalid. This is a fair and accurate description of the various deposit types around the world.

Graphite deposits of commercial interest occur widely in regionally or thermally metamorphosed sedimentary rocks, and in hydrothermal and metasomatic deposits. Harben and Kužvart (1996) identified five deposit types:

- 1) Deposits formed by concentration and crystallization of carbon (from coal or carbonaceous sedimentary rocks) during regional or contact metamorphism (Cameron and Weiss, 1960; Graffin, 1975; Krauss et al., 1988; Sutphin et al., 1991; Weiss, 1973; Weiss and Salas, 1978);
- 2) Vein deposits, where graphite is thought to form epigenetically from carbon-rich hydrothermal or pneumatolytic solutions as interlocking aggregates of coarse graphite crystals in veins containing 75-100% carbon (Cameron and Weiss, 1960; Harben and Bates, 1984; Krauss et al., 1988; Rumble et al., 1986; Sutphin et al., 1991; Weiss, 1973);
- 3) Contact metasomatic (skarn) deposits resulting from a concentration of preexisting carbon in sediments (Bugge, 1978) that could include calc-silicate hornfelses or reaction skarns (Evans, 1993);
- 4) Residual Deposits that may be concentrated in deposits formed through weathering/leaching of graphitic gneiss and schist because of the unreactive nature of graphite (Dill, 2009; Murdoch, 1967; Fogg and Boyle, 1987); and
- 5) Early magmatic deposits (rare) such as peraluminous dacite and gabbro (Tsuchiya et al., 1991; Kanaris-Sotiriou, 1997), and alkaline pegmatite (Jaszczak et al., 2007; Satish-Kumar and Santosh, 1998).

Most economic deposits of graphite occur as flake graphite in high-grade metamorphic rock (i.e., granulite facies) forming under pressures of 1 GPa and 750° C. Disseminated flake graphite deposits develop syngenetically from carbonaceous material in sedimentary rocks that have been subjected to garnet grade or higher regional metamorphism (Cameron and Weiss, 1960; Harben and Bates, 1984; Krauss et al., 1988; Sutphin et al., 1991). Since graphite is a form of carbon, and all carbon oxidizes at high temperature, graphite must have a reducing environment in order to be stable at high temperature.

Flake graphite deposits may be any age, but are commonly Archean to late Proterozoic in age. Host rocks typically consist of metasedimentary rocks such as quartz-mica schist, gneiss, micaceous quartzite, micaceous-feldspathic quartzite and marble. Associated rocks are pegmatite, aplite, and granite intrusives. Gangue mineralogy may include quartz, calcite, biotite, muscovite, feldspars, garnet, and sometimes amphibole, pyrrhotite, pyrite and magnetite. A typical rock type where flake graphite may be found is sulphidic biotite-quartz-feldspar gneiss;

such is the rock type of the Mesoproterozoic graphite deposits in the Highlands region of New Jersey, USA (Volkert et al., 2000).

Deposits are usually stratabound and consist of individual beds or lenses in gneiss, schist, and marble that are richer in graphite than associated beds. Deposits are typically up to 35 m thick and several kilometres or more long. Concurrent, intense large-scale folding of the metasedimentary sequences is common and graphite deposits commonly occur on the limbs of such folds. Deposits tend to occur in metamorphosed continental margin or intercratonic basinal sediments. Regional depositional environments include regional metamorphism and large-scale deformation of carbon rich sedimentary sequences. Rarely, graphite veins may be associated with disseminated flake graphite deposits.

Most of the world's production of flake graphite comes from deposits of disseminated graphite in areas characterized by regionally metamorphosed rocks. Large deposits of flake graphite are known and/or have been mined in the United States, Central America, South America, Canada, Africa, India, Germany, Ukraine, Russia, Madagascar and China. Small, localized deposits of flake or flake-like graphite are known from literally hundreds of other localities. Mined flake graphite deposits commonly have grades of 10% to 12% graphite. Mexico and South Korea are significant sources of amorphous, or microcrystalline, graphite. Sri Lanka is home to the largest known deposits of crystalline vein graphite. Contact metasomatic or hydrothermal graphite deposits were mined in Canada and the United States, but these deposits are generally small and of relatively low grade.

Landis (1971) tentatively concluded that graphite formation is primarily dependent on metamorphic temperature and forms above 400°C, with pressure and variation in starting material constituting secondary controls.

Since the Graphite One Project graphite deposit occurs in a quartz-granite-biotite-sillimanite schist, which is a high grade metamorphic rock, the Graphite Creek mineralization is considered to be of a **Flake Graphite Type Mineralization**.

Characterization test work executed by TRU Group at an Independent Graphite Laboratory confirmed graphite flake characteristics along with unique, naturally occurring morphologies in mineralized samples in drill core segments taken from seven drill holes. Graphite characterization and morphologies identified at Graphite Creek are discussed in greater detail in Section 13.3 IGL STAX Graphite Characterization

9 EXPLORATION

A general summary of Graphite One's 2011 to 2014 exploration work at the Graphite Creek Property is presented in the Section 6 (History) of this Technical Report. The summary includes the general results of the 2012, 2013 and 2014 exploration programs that involved:

- A time-domain, helicopter-borne electromagnetic survey;
- Geological mapping; surface grab, channel and bulk pit sampling;
- Diamond drilling programs in 2012, 2013 and 2014;
- Flake-size distribution analysis; and
- Graphite beneficiation tests.

For greater detail on the 2012, 2013 and 2014 exploration programs, the reader is referred to Duplessis et al. (2013), Eccles and Nicholls (2014), and Eccles et al. (2015).

No exploration has occurred on the property since the last technical report was published in March of 2015.

10 DRILLING

10.1 Overview

No drilling has been undertaken on the Graphite Creek property since the most recent program completed in the autumn of 2014.

10.2 2012 Drill Program

A diamond drilling program consisting of 4,248 metres in 18 holes was carried out in 2012. The initial drill hole spacing was approximately 200 m between holes along strike, but later in the program some infill drilling was carried out with hole spacings as close as 50 m. Graphite mineralization was encountered in all drill holes, including the last hole, 12GCH008 which was collared approximately 2.3 km to the west along strike to test the lateral extent of the mineralization.

Several composite samples were selected from drill core and submitted for laboratory analysis to characterize the graphite flake size and structure and the nature and abundance of the various gangue minerals. The graphite was described by Hazen Research of Golden, Colorado (Hazen) as occurring mostly as liberated flakes/crystals in the minus 40 mesh fractions, and occurring together with less common intergrowths of graphite and other gangue schist components (quartz, mica and other siliceous materials and iron oxides. The samples supplied to Hazen were described as "...consist(ing) mainly of quartz, with minor amounts of mica, clay, magnetite, ilmenite, and titanium oxides. The graphite is present as: minute scales or flakes; fine, undulated stringers along schist planes; liberated lath- shaped or tabular-foliated crystals; or as blocky and irregular deformed particles." (Hazen Research Inc., 2012). One 5 kg composite sample was collected from drill core and sent to Activation Laboratories Ltd. in Thunder Bay, Ontario for x-ray diffraction analysis. Mineral 'mapping' on the Mineral Liberation Analyzer shows that most of the graphite flakes/crystals/particles occur as free (liberated) graphite with 50% of the graphite passing through 120 µm and 80% passing through 330 µm.

10.3 2013 Drill Program

The 2013 exploration program consisted of a small diamond drilling program, calculation of a new resource estimate, and a bench-scale beneficiation test. The diamond drilling program consisted of 1,024 m of drilling in ten drill holes. Again, graphite mineralization was encountered in all of the drill holes. The holes were drilled with a collar spacing of approximately 250 m and increased the mineral resource to a zone approximately five kilometres in length, and at depths from surface or near surface to depths of 147 m below surface.

10.4 2014 Drill Program

The most recent exploration program on the property was carried out between September 21st, 2014 and November 5th, 2014. That program consisted of diamond drilling, collection of metallurgical samples, and the calculation of a new resource estimate. That program is

described in detail in a technical report issued by Graphite One Resources in March 2015 (Eccles et al., 2015).

The drill program was designed to both increase the confidence level and the extent of the resource. The program consisted of 20 holes totaling approximately 2,221 m logged and assayed, and 2 holes totaling 91.6 m used for metallurgical testing. A total of 2,354 samples were collected in the 2014 program, of which 2,274 were submitted for assay, and 80 retained for metallurgical test-work. The 2014 drill holes were collared on sections approximately 50 m apart and at least two holes were drilled on each section, in an effort to confirm continuity of the mineralization, both vertically and laterally. Once again, all holes encountered significant Cg mineralization.

10.5 TRU Opinion of Drilling

It is the opinion of the author that the previous drill campaigns have been conducted according to current industry best practices. The results and interpretations of that drilling are consistent with the current geological knowledge of the property and with current theories of graphite deposit metallogeny.

The data provided by the drilling and interpretations derived therefrom are adequate for the purposes for which they are used in this report.

11 SAMPLE PREPARATION, ANALYSES & SECURITY

The sample preparation, analysis and security procedures and protocols followed during the various exploration phases carried out on the property are discussed in the previous technical reports issued by Graphite One. For detailed descriptions and analyses of the various protocols followed, reader is referred to Duplessis et al. (2013), Eccles and Nicholls (2014), and Eccles et al. (2015). The procedures and protocols employed are described in detail and the results of all verification procedures and quality control protocols are discussed at length. The practices employed were exemplary and there are no questions as to the thoroughness and quality of the work performed. All phases of the sample handling, preparation, and analysis were supervised by qualified personnel.

11.1 Sample Preparation

During the three seasons of sample collection and analysis, Graphite One maintained a sample preparation facility in Nome. This preparation laboratory was set up and crewed by employees of the main analytical laboratory used during the work programs - Activation Laboratories Ltd. in Ancaster, ON ("ActLabs"). The prep lab in Nome, Alaska was used to dry, crush and package all rock and drill core samples for shipping, via commercial carrier, from Nome to ActLabs for analysis.

All samples were run through a Boyd Jaw Crusher to -150 mesh crush. Samples were then riffle split down to 100 g portions to be pulverized in an ESSA LM2 miller ring and puck pulverizer, which pulverized the rock to -80 mesh. The milling bowls had sealed gasket lids to avoid contamination that could be associated with, dust, or poor ventilation. The milled (pulverized) sample (the 'pulp') was split into a 30 g portion, placed into labeled bags and sent to the ActLabs facility for testing. In between samples, the milling bowls were cleaned out with cleaning sand for approximately 20 seconds. High graphite samples were followed up with river rock and cleaning by air guns to prevent contamination of low graphite samples. A subset of 282 duplicate samples was sent to two separate laboratories: ActLabs; and Acme Analytical (Acme) Laboratories in Vancouver, BC.

11.2 Sample Analyses

The laboratory used for the majority of the Cg analyses was ActLabs, which is ISO 17025 accredited and/or certified to 9001: 2008. The core samples were subjected to the following analytical procedure prior to determination of total graphitic carbon using a LECO CR-412 Carbon Analyzer. A 0.5 g pulp sample is either digested with hydrochloric and perchloric acids, or subjected to a multistage furnace treatment to remove all forms of carbon with the exception of graphitic carbon. The residue is vacuum-filtered and dried. Accelerator material is added to the dried filter. The inductive elements of the sample and accelerator couple with the high frequency field of the induction furnace. The pure oxygen environment and the heat generated by this coupling cause the sample to combust.

During combustion, carbon-bearing elements are reduced, releasing the carbon, which immediately binds with the oxygen to form carbon monoxide (CO) and carbon dioxide (CO₂), the

majority being CO₂. Carbon is measured as CO₂ in the infra-red (IR) cell as gases flow through the IR cells. CO₂ absorbs IR energy at a precise wavelength within the IR spectrum. Energy from the IR source is absorbed as the gas passes through the cell, preventing it from reaching the IR detector. All other IR energy is prevented from reaching the IR detector by a narrow bandpass filter. Because of the filter, the absorption of IR energy can be attributed only to CO₂. The concentration of CO₂ is detected as a reduction in the level of energy at the detector.

A subset of the core samples was submitted to Acme, which has subsequently been acquired by Bureau Veritas, but during the time it was used by Graphite One it held global certifications for Quality ISO9001:2008, Environmental Management: ISO14001 and Safety Management OH SAS 18001 and AS4801.

11.3 QA and QC Procedures

Rigorous QA/QC procedures were followed during all exploration programs conducted by Graphite One. The protocols followed for sample preparation, handling, security and analysis, as well as testing and verification of results meet or exceed industry standards.

QA/QC procedures employed included submitting standard reference samples, certified blank samples, and duplicate samples into the sample stream. A subset of samples was also submitted to Acme Analytical Laboratories in Vancouver, BC as a final verification of the sample results. The laboratories also employed their own protocols which included re-analysis of samples and the analysis of internal blanks and standards.

11.4 Samples Security

Core and rock samples were transported from the field to camp by helicopter, where they were palletized, loaded onto a flatbed truck, and driven to Graphite One's warehouse in Nome for processing which included geotechnical logging, core logging, core photography, core splitting and core sampling. All measurements and core logging observations were recorded directly into a logging spreadsheet that included a predetermined set of codes to describe rock type, lithology, mineralization, texture and competency over the entire length of the drill core. Digital photographs were taken of each individual core box by using a stationary camera and lighting.

Shipping of the pulp samples from Graphite One's sample preparation lab in Nome was conducted by ActLabs personnel. Security tags, which had bag identifiers other than drill hole names and/or sample coordinates, were used to seal the sample bags. To complete the chain of custody, individual samples with same sample numbers originally recorded in the field were continued all the way to ActLabs. Similarly, metallurgical samples for flake-size testing were sent to Hazen Golden, CO and/or ActLabs in Thunder Bay, ON, and/or SGS Mineral Services, Lakefield, ON. Once the samples arrived at the laboratories, they remained in the custody of the independent lab until final processing was completed. ActLabs has achieved the ultimate accreditation to international standards, the ISO 17025 standard. Hazen also holds several professional accreditations.

11.5 TRU Opinion on QA/QC Procedures

It is the opinion of the author that the quality assurance/quality control (QA/QC) procedures and protocols followed by Graphite One's geological and geophysical consultants and contractors follow industry best practices. The sample data provided by previous exploration programs are suitable for the purposes for which they are used in this report.

12 DATA VERIFICATION

12.1 Field Verification

During the author's property visit in 2015, he was able to locate many drill collars and sample sites. Past work was clearly carried out as described in the previous technical reports issued by Graphite One.

The author visited many collar locations and was able to verify the coordinates to within the accuracy of his hand-held GPS. He visited and sampled several historic sample locations and the analyses returned for his samples correlated well with historically recorded values. The author also inspected the core and sample storage areas, core logging facility and the sample preparation facility. All these facilities were observed to be exactly as described in the previously issued technical reports. Random sections of drill core were examined and compared to the descriptions recorded in the drill logs. The logs were judged to accurately reflect the observations made by the author. Several samples were collected from stored sample rejects and from stored drill core. These samples were kept in the custody of the author until they were shipped to the ALS Minerals sample preparation facility in Fairbanks. The samples were analyzed for graphitic carbon and the results were compared to the results reported by Graphite One in their previous technical reports. The results of the check assays were found to correlate very well with the previously-reported values as illustrated in Table 12-1.

Table 12-1 Comparison of previously-reported assay values to check assays.

TYPE	SAMPLE LOCATION	SAMPLE DESCRIPTION	ORIGINAL ASSAY Cg (%)	CHECK ASSAY Cg (%)
ROCK	West side Graphite Creek, below adit	Quartz biotite schist in outcrop. Disseminated Graphite <0.5%	Low Grade	<0.02
ROCK	West wall, old Graphite Creek adit	Channel sample across 50cm band of quartz biotite garnet + sillimanite schist	15-20% (Est.)	18.1
ROCK	West wall, old Graphite Creek adit	Grab sample from pod of high grade graphite	>50% (Est.)	>50
PULP	Sample P661772	Grain size varies from powder to 1.5mm. Tan, some oxidization. Qz-Bi, minor graphite	0.91	1.17
PULP	Sample P661776	Grain size as above. Med grey. Graphitic streak overall. Qz, Bi, Garnet, Sillimanite, graphite	6.17	5.34
CORE	Hole 14GCH016 63.67-64.67	Qz Bi Schist with minor garnet and minor sillimanite. 2-5% graphite. Minor Po? Brownish-red oxide, possibly iron carbonate	4.71	4.61
CORE	Hole 14GCH016 16 68.00-69.00	Nearly massive graphite schist with 5% pink garnets and minor Qz-Bi-Si	15.00	14.45
CORE	Hole 14GCH016 17 71.23-72.23	Qz Bi Garnet Sillimanite schist with ~10% graphite. Intermediate between low-grade below and high-grade above. Blob of MX graphite at 72.15m	13.50	11.25
CORE	Hole 12GCH004 33.32-34.00	Qz Bi schist with some pink garnets. 2cm garnet at 33.58m	4.26	5.41
CORE	Hole 12GC005 180.00-181.00	Qz Bi Garnet schist with ~3% graphite. Wavy bands of biotite and graphite. Flakes to 1mm	7.16	6.08

12.2 Database Verification

An unlocked version of the geological database was obtained by the author from Graphite One in Microsoft Excel format. The lithologic and structural descriptions were compared to field observations, and no discrepancies were observed. The assay results in the database were compared to original certificates of analysis and no errors or discrepancies were noted. Collar coordinates were compared to field observations made during the site visit, maps and original field observations. No discrepancies beyond normal GPS variations were discovered.

The data recorded in the Project database were found to be correct, verifiable, suitable and adequate for the purposes for which they are used.

13 METALLURGICAL TESTING

Table 13-1 summarizes the mineral processing and metallurgical test work programs commissioned by Graphite One to date along with their respective key observations. The PEA is based on the results and observations from the latter three programs (5 to 7) mandated to TRU Group.

Table 13-1 Summary of key findings from executed test work programs

TEST WORK PROGRAM	YEAR	OBSERVATIONS
1. Analysis of Graphite Mineral Samples from Alaska (Hazen)	2011	Graphite occurs both as liberated particles and intergrown with gangue minerals The majority of the sample mass and graphite in wet screened samples is distributed in coarse fractions of 10 by 40 mesh
2. Analysis of Graphite Core Samples from Alaska (Hazen)	2012	Graphite occurs both as liberated particles and intergrown with gangue minerals The plurality of the sample mass and graphite in wet screened samples is distributed in coarse fractions of 10 by 40 mesh
3. Upgrading of Coarse High Grade Graphite Mineral Samples (Hazen)	2012	Coarse graphite in the size fraction of 40 by 80 mesh could not be upgraded beyond 92% Cg due to intimate association of gangue with graphite particles
4. Scoping Level Evaluation of Graphite Creek Mineralization (SGS)	2013	Production of graphite concentrate enriched to 90% Cg at Recovery of 80%
5. Characterization of Graphite Mineralization from Six Drill Cores (TRU Group)	2014-2015	Natural occurrence of STAX graphite morphologies pointing to potential high conversion of graphite at Graphite Creek to spherical graphite Particle size distribution and/or D ₅₀ of coarse fractions shifts to smaller size upon exposure to sonication Detection of platinum and titanium impurities in ash
6. Exploratory Product Development with Graphite Mineralization Samples from Surface (TRU Group)	2015-2016	Direct spheronization of purified graphite with wide particle size distribution and without prior micronization achieves high (74.6%) conversion to spherical product segment suitable for EV lithium-ion batteries High first discharge capacity attained in uncoated and coated spherical graphite points to high quality graphite
7. Mineral Processing of Composite Drill Core Segments (TRU Group)	2016	Recovery of actual coarse graphite fractions are low following mineral processing investigation Production of singular graphite concentrate enriched to 95% Cg at a recovery of 80% integrated to a manufacturing facility dedicated to spherical graphite production

13.1 Hazen Research Inc.

13.1.1 Analysis of Graphite Mineral Samples from Alaska (Hazen 2011)¹³

Hazen Research, Inc. carried out an analysis on three mineral samples varying from low to high grade graphite mineralization, referred to in order of increasing graphite grade as Disseminated (8.2% Cg), Mixed (14.5% Cg) and High (56.9% Cg). The purpose of the study was to quantify the graphite content by chemical analyses (carbon assays), determine the size distribution by screen analysis, and determine the textural characteristics by optical microscopy of three graphite mineral samples.

As-received samples were stage-crushed to minus ½ inch with split samples for screen analysis further crushed to minus 10 mesh. Samples intended for chemical and x-ray fluorescence analysis were pulverized to minus 200 mesh. All size fractions from the screen analysis were subjected to moisture determination, loss on ignition (LOI) at 850°C for 2 hours and CO₂ assay evolution for carbonates. The graphite content was then calculated from the LOI determination after subtraction of moisture and CO₂ from carbonates.

Optical examination of polished sections of Disseminated graphite samples showed siliceous gangue (mostly quartz) with minor amounts of micas, magnetite, ilmenite, and titanium oxides. Graphite was very abundant, consisted of lath-shaped particles with sometimes deformed or foliated texture, occurred as liberated crystals, and also intergrown with the other constituents, Figure 13-1. The size of the graphite varied between a few microns up to about 1.5 mm in the long dimension and averaged about 150–250 µm.

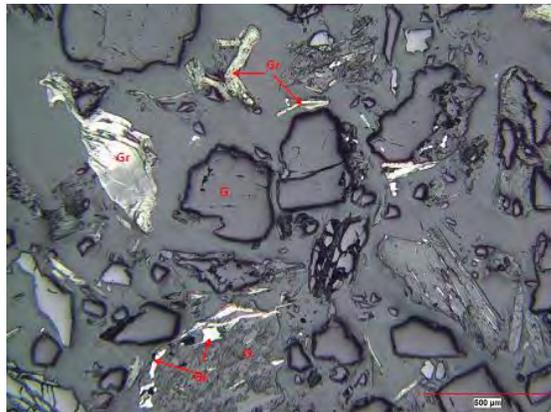


Figure 13-1: Micrograph showing coarse and fine graphite (Gr) crystals forming intergrowths with gangue (G) and liberated crystals.

Selected results of wet screening at 10, 40, 80 and 100 mesh and the carbon assay by size fraction appear in Table 13-1. In all three samples, the 10 by 40 mesh fraction holds bulk majority of the distributed sample mass and of the distributed graphite followed by the 40 by 80 size class. The two size fractions in generally accounted for over three-quarters of the mass and graphite in each sample.

¹³ Based sections extracted or summarized from Hazen Project 11384 (Oct 2011)

Table 13-2 Selected results of screen analysis and graphite assay by size fraction for different graphite mineralization samples

Sample ID	Mass Distribution %	Graphite Assay % Cg	Graphite Distribution %
High Grade			
10 by 40	57.5	55.9	56.7
40 by 80	18.0	61.5	19.5
Disseminated			
10 by 40	71.1	7.5	64.3
40 by 80	7.7	11.5	10.7
Mixed			
10 by 40	66.0	15	62.8
40 by 80	16.6	19.3	20.3

13.1.2 Upgrading of Coarse High Grade Graphite Mineral Samples (2012)¹⁴

The 40 by 80 mesh fraction from the High Grade graphite mineralization was subsequently examined by Hazen for upgrading to 95% Cg by way of gravity separation coupled with heavy media separation (HMS) and also by conventional flotation coupled with HMS.

Previously crushed material was wet screened at 40 and 80 mesh and then fed to an eighth-size Wilfley table to separate heavier gangue from the lighter graphite concentrate. Initial HMS of the gravity concentrate effected at 2.6 sg produced a float concentrate grading 90.7% Cg. Secondary (cleaner) stage HMS performed at 2.45 sg slightly increased the float concentrate grade to 91.7% Cg. TRU calculated the overall graphite recovery at 46.6% for the initial HMS and 45.7% following second stage HMS. Cleaning of the initial HMS float concentrate was also attempted by conventional flotation but did not much improve concentrate grade, which assayed at 92, 91.2, and 91.7% graphite (Cg) in triplicate analyses.

Optical microscopy on polished sections of the float concentrates from both HMS stages revealed the presence of liberated particles of graphite and gangue along with graphite particles inter-grown with gangue in the initial concentrate while only liberated graphite and fewer graphite-gangue inter-grown particles were present in the second stage concentrate. The relative low graphite assay of the second HMS float concentrate and absence of discrete gangue particles implied that unliberated gangue was trapped between graphite flakes.

Rougher flotation of the 40 by 80 mesh fraction followed by three stages of cleaner flotation yielded concentrate grading 76% Cg at a graphite recovery calculated by TRU to be approximately 73%. Further cleaning of this concentrate by HMS at 2.45 sg produced a float concentrate assaying at 86.8, 87, and 87.3% Cg, which was not an improvement on the grade compared to the previous method using gravity separation with HMS.

Hazen concluded that upgrading to 92% graphite was the limit for the 40- by 80-mesh fraction due to the intimate occurrence of impurities with the graphite.

¹⁴ Extracted or summarized from report Hazen Project 010-276 (Jan 2012)

13.1.3 Analysis of Graphite Core Samples from Alaska (2012)¹⁵

Hazen also conducted screen analyses at 10, 40, 80 and 100 mesh and assay by size fraction on four drill core graphite mineralization samples identified as 12GPHFL001 (8.7 % Cg), 12GPHFL002 (13.7% Cg), 12GPHFL003 (14.9% Cg) and 12GPHFL005 (8.0 %Cg). XRD analysis was performed to determine of major constituents of the samples along with optical examination of polished sample cross sections of the different screening size fractions.

Selected results of wet screening and the carbon assay for each fraction appear in Table 13-3. In all three samples, the 10 by 40 mesh fraction had the highest distribution of sample mass and graphite followed by the 40 by 80 fraction. Optical examination of the different size fractions again identified discrete particles of liberated graphite along with graphite intergrown with gangue. XRD patterns for all drill cores showed that all samples consist of major quartz, minor muscovite, sillimanite, chlorite, and minor to trace amounts of kaolinite.

Table 13-3 Selected results of screen analysis and graphite assay by size fraction on drill core samples

Sample ID	Mass Distribution %	Graphite Assay % Cg	Graphite Distribution %
12GPHFL001			
10 by 40	51.5	7.3	42.2
40 by 80	19.2	9.6	20.7
12GPHFL002			
10 by 40	54.4	12.7	48.7
40 by 80	19.9	15.2	21.3
12GPHFL003			
10 by 40	43.7	13	38.9
40 by 80	24.3	15.0	25.0
12GPHFL005			
10 by 40	43.2	6.7	35.8
40 by 80	21.0	9.1	23.5

13.2 SGS Lakefield Beneficiation Tests (2013)

13.2.1 Scoping Level Evaluation of Graphite Creek Mineralization¹⁶

SGS Lakefield conducted a scoping flotation study on one composite sample of low grading graphite mineralization (5.41% C, 5.3% Cg) from the Graphite Creek property. Eight open circuit flotation tests were carried out with the objective of producing a concentrate grading 94%C. Investigated process variables included flowsheet configuration, polishing grind times, and grinding media size.

¹⁵ Based on sections extracted or summarized from Hazen Project 11613 (Nov 2012)

¹⁶ Extracted or summarized from Project 14369-001 – Final Report (Dec 2014)

Flowsheet FT6 seen in Figure 13-2 yielded the best results, which did not achieve the target concentrate grade. Initial flash flotation tails were subjected to a regrind and rougher flotation. Rougher concentrate was combined with the recovered flash concentrate and subjected to a polishing grind followed by four stages of cleaning. The fourth stage cleaner concentrate was screened at 80 mesh to divide the concentrate into two fractions that were further processed: +80 Mesh (coarse) oversize was subjected to a polishing grind and three stages of cleaning and produced a concentrate grade of 91.7% C; -80 Mesh (fine) undersize was subjected to a polishing grind and four stages of cleaning and produced a concentrate grade of 89% C. The combined concentrate grade was 89.7% at a total carbon recovery of 86.9%.

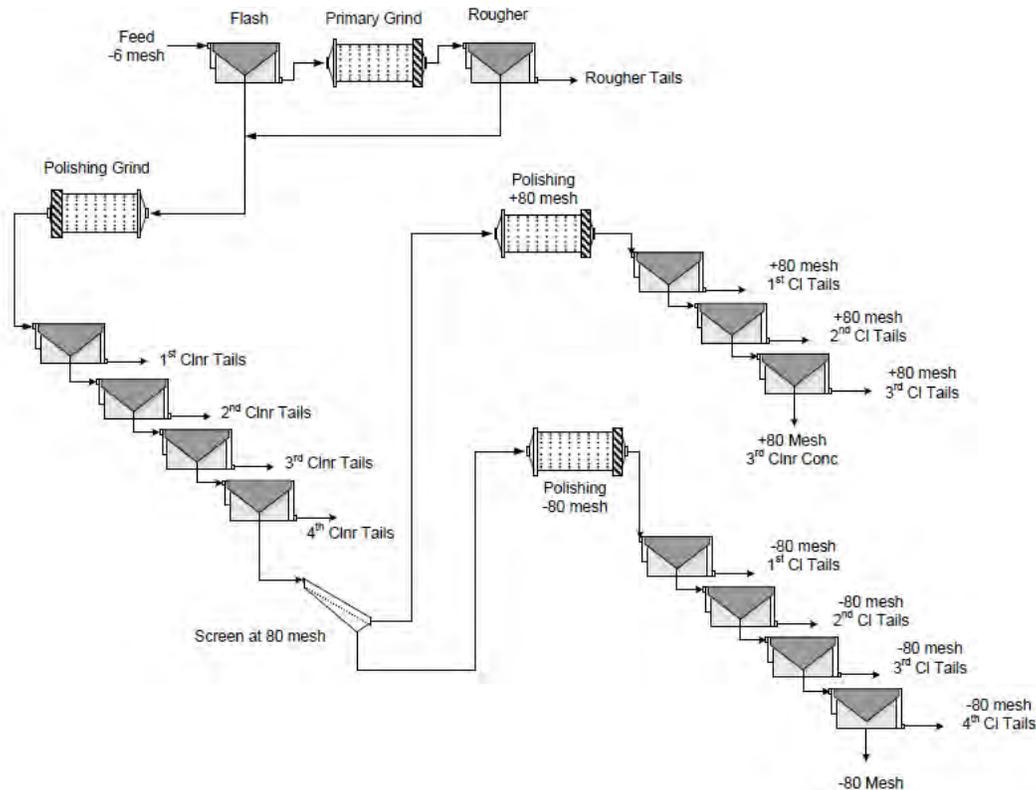


Figure 13-2: SGS Conceptual Graphite Creek Flowsheet for the production of coarse (+80 Mesh) concentrate and fine concentrate (-80 Mesh)

Screen analysis and assay by size fraction of the combined concentrates revealed the graphite grade was the highest in the coarse fraction of +48 mesh (300 microns) at 93.6% C and gradually decreased to 89.6% C as flake size decrease although in the smallest size fraction of -325 mesh (44 microns) the grade increased to 91.7% C. Additionally, 18.6% of the concentrate mass reported to the +80 mesh (180 microns) size fractions and 35.8% to the -80/+200 mesh products. The remaining concentrate mass of 45.6% consisted of graphite flakes smaller than 200 mesh (75 microns).

SGS attributed the inability of flotation to reach the grade target of 94% C to: the rapid flotation kinetics which resulted in the entrainment liberated gangue material with the floated graphite; impurities that attached to the surface of the graphite flakes or entered into crevices or pores on the graphite and were not removed; and complex associations of graphite and impurities possibly trapped between graphite layers.

13.3 IGL STAX Graphite Characterization¹⁷

TRU mandated an Independent Graphite Laboratory (referred to as “IGL” throughout this report) to characterize the basic physical properties of graphite recovered from selected mineralized drill core samples from Graphite One’s Graphite Creek property. The investigation provided an early assessment of the recovered graphite’s potential suitability for value-added products and end uses. Table 13-4 lists the drill hole core segments selected for characterization and gross sample masses received by IGL. All the samples were selected from the upper Quartz-Granite-Biotite-Sillimanite-Schist (QGBSS) layer associated with high graphite mineralization.

Table 13-4 Origin and mass of mineralized samples

Drill Hole ID	Drill Core Interval Measured from Surface		Interval Length (m)	Sample Mass (kg)
	From (m)	To (m)		
13GCH012	37	46	9	7.0
12GCH002	10	19	9	8.2
12GCH003	3.9	20.1	16.1	10.6
12GCH004	6.2	21.3	15.1	5.2
12GC007	60	71	11	12.4
12GC009	94.3	102.8	8.5	11.8

The graphite mineralization samples were subjected to modest crushing followed by a wet classification technique to extract rudimentary concentrates for characterization. The main physicochemical properties of the extracted graphite concentrate samples were elucidated from the analytical methods listed in Table 13-5.

Table 13-5 Graphite Characterization Techniques Employed by IGL

CHARACTERIZATION METHOD	OUTCOME
Screening Analysis	Sizing of graphite mineralization samples and graphite concentrate
Laser Light Scattering	Statistical particle size distribution
Scanning Electron Microscopy (SEM)	Morphological and topological information
Optical Microscopy	Morphological and topological information
Loss on Ignition (LOI)	Characterization of carbon content
Surface Area by BET	Surface area
Density Measurements	Tap Density Apparent (bulk) Density by Scott Volume method True Density by Helium Pycnometry
Inductively Coupled Plasma	Spectroscopic method to characterize ash impurity contents
Fourier Transform Infrared Spectroscopy	Spectroscopy analysis that probes carbon-carbon bonds

¹⁷ Summarized from IGL Characterization Study (March 2015)

13.3.1 Graphite Concentrate Extraction by Wet Classification

A composite mineralized sample from each drill holes was moderately crushed and then floated by a proprietary wet classification technique to extract a graphite concentrate with a representative cross section of the graphite particle size fractions. The method facilitates separation of particles by weight under gravity; heavy particles, typically rock, sink while the light particles, graphite, that float. Addition of surfactant allows separation of both phases.

CARBON CONTENT ON LOSS ON IGNITION

All mineral samples and graphite concentrate samples featured in this study were assayed for carbon by Loss on Ignition (LOI) analytical technique as per ASTM C561 Standard Test Method for Ash in a Graphite Sample, Table 13-6. Noteworthy was that the lowest grading mineralization sample produced the highest grade concentrate with the highest concentration factor which indicative of the high degree of liberation from gangue.

Table 13-6 Assays of graphite mineralization samples and floated concentrate

Sample ID	Graphite Mineralization (%C)	Floated Concentrate (%C)	Concentration Factor
13GCH012	14.1	67.4	4.8
12GCH002	9.0	85.0	9.4
12GCH003	29.7	79.4	2.7
12GCH004	12.1	67.3	5.6
12GC007	14.1	65.3	4.6
12GC009	11.3	69.5	6.2

SCREEN ANALYSIS

Screening analysis results of all drill hole concentrates are shown in Figure 13-3. All concentrates contained a variable but sizeable fraction of the +20 mesh (850 µm) particles indicating the presence of coarse graphite. Sample 12GCH002 has the finest particle distribution and also attained the highest grade graphite concentrate after one pass of wet classification. The particle size distribution of 12GCH002 concentrate may be considered the most representative of the native graphite at the Graphite Creek Property as the graphite was the most easily liberated from the gangue and produced the highest grade concentrate. Conversely the size data for the other drill core concentrates could have been influenced by the presence of a greater proportion retained gangue. This particular subject is complex as there were competing considerations in the extraction of graphite concentrate from the mineralized samples; achieving higher grade in the concentrate with more intensive processing or extracting a better representation of the graphite particles in a lower grade concentrate. The latter was deemed more important for this characterization study whose scope and objectives did not include maximizing graphite recovery or process development and optimization.

In a later section, laser light scattering particle size analysis of coarse size fractions that were sonicated (subjected to high intensity sound waves) showed a demonstrable shift towards a finer particle size distribution. This occurrence was attributed to de-aggregation or disintegration of some of the unique morphologies identified in the graphite concentrates discussed below.

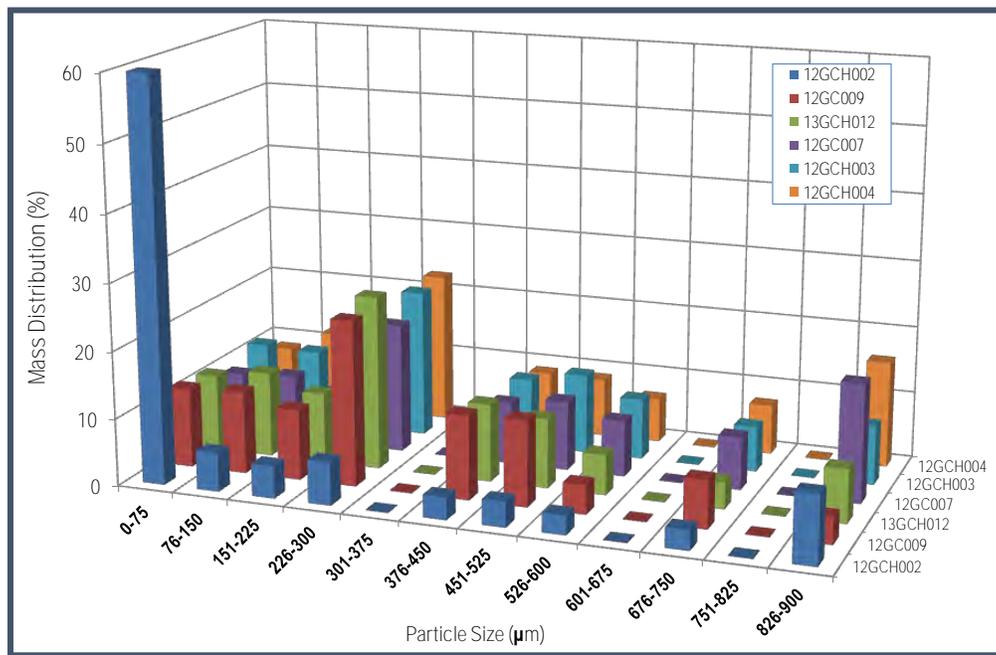


Figure 13-3: Particle size distribution histograms based on screen analysis test

OPTICAL MICROSCOPE EXAMINATION OF THE COARSE PARTICLE FRACTIONS

Differences in +25 mesh graphite particle features were evident between different drill hole concentrates: 12GC009 had a bulky morphology; 12GCH003 particles were three-dimensional structures reminiscent of vein graphite; while 12GCH004 graphite was a lot flakier. Flake type as a function of excavation location was not determined but merits further investigation.

MORPHOLOGICAL UNIQUENESS OF GRAPHITE CREEK GRAPHITE

Analysis of the overall distribution of graphite revealed unusual morphologies in the samples –

- I. High-aspect ratio, elongated thin flakes;
- II. Ultra-thin, self-scrolling large sheets;
- III. Pebble-shaped particles (naturally spherical graphite);
- IV. Naturally expanded structures
- V. Three-dimensional aggregates of ultra-fine flakes (so-called pressed flake);
- VI. Classical natural flake graphite (so-called integral flake).

All morphologies are seen concurrently in Figure 13-4. High resolution SEM images of the specific morphologies are seen in the sequence of Figure 13-5 to Figure 13-8. These unique morphologies may well turn out to be by far the major competitive advantage of Graphite One. A high-resolution SEM image of a pebble shaped particle from 13GCH012 concentrate is shown in Figure 13-8. The aggregate nature of this particle can be clearly observed. It should be emphasized that spherical/pebble shaped particles were found in the concentrates for each drill core examined by the IGL. The actual proportion of the different morphologies and differentiation between aggregate and integral properties has not been quantified.

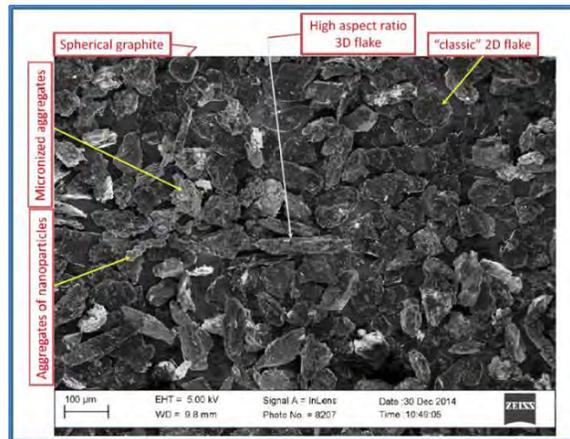


Figure 13-4: Various Morphologies from the +100 mesh cut in 12GCH002 graphite

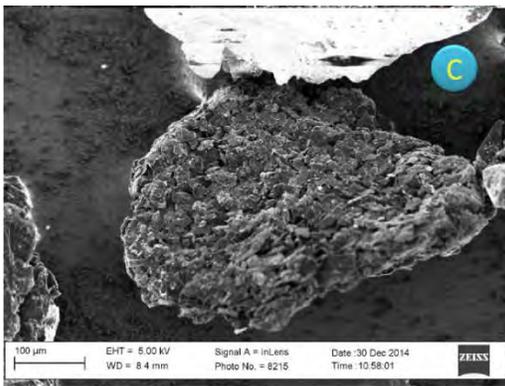


Figure 13-5: Close up of an Aggregate of "Pressed Flake" from the +50 mesh fraction of 12GCH002 (C)

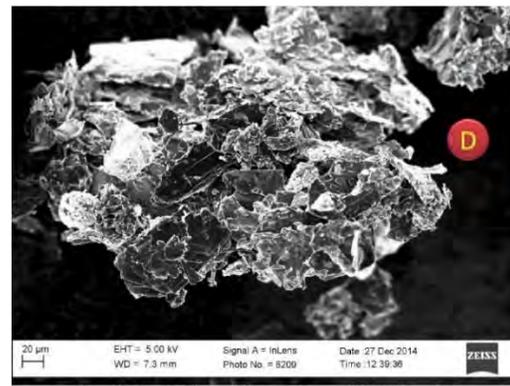


Figure 13-6: Graphite Unique Morphology in 12GCH003 showing a natural expanded graphite structure

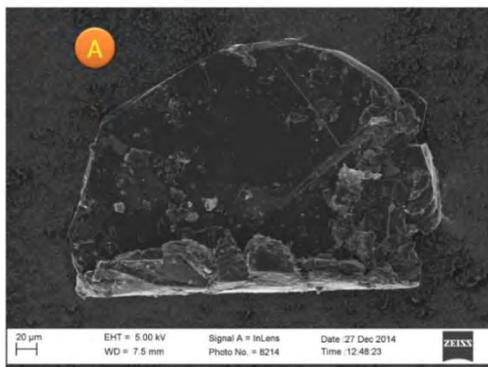


Figure 13-7: Classic Coarse "Integral Flake" from 12GC009

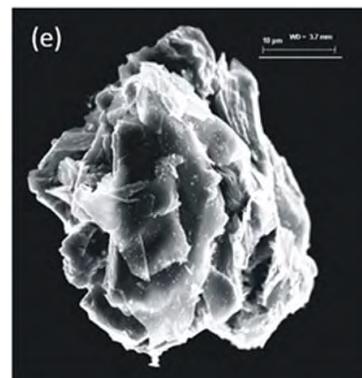


Figure 13-8: High resolution SEM image of a pebble shaped particle from 13GCH012 concentrate

NATURAL SPHERICAL MORPHOLOGY OF GRAPHITE CREEK GRAPHITE

Optical examination of the various size classes for each of the drill hole composite concentrates revealed the presence of naturally occurring pebble/spheroidal shaped graphite. Visible progression of increasing (natural) sphericity and proportion to other morphologies with decreasing particle size class can be observed in the optical micrographs of 12GCH002 concentrate from +53 μm (+270 mesh) and +25 μm (+500 mesh).

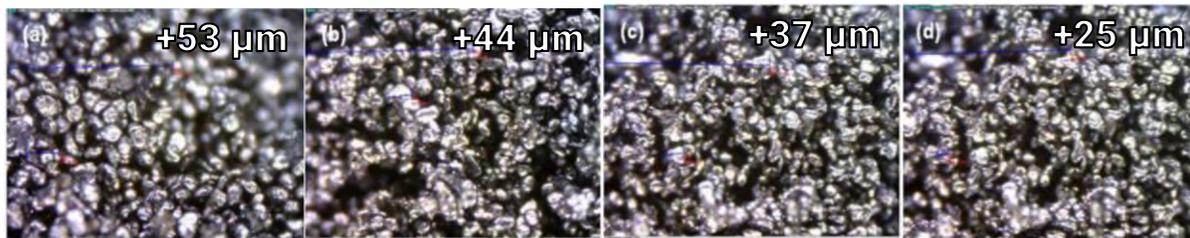


Figure 13-9: Optical micrographs showing progressive increased sphericity with decreasing particle size cut

LASER LIGHT SCATTERING OF MATERIAL TAKEN FROM CYLINDER TEST

Laser light scattering was used to obtain particle size distributions, to fill in the missing size fraction from screening as well as to measure the stability/friability of the graphite. All samples examined were recovered from a graduated cylinder settling/float test. The limitation of the graduate cylinder settling test is that it can only extract “classic” flaky particles when it comes to graphite which is coarser than +30 mesh (600 μm) (i.e. ultra-coarse grades).

Analysis of the data indicated that all the drill hole concentrates have bimodal particle size distributions with sizeable fraction of coarse particles. Example distributions are shown in Figure 13-10 for 12GCH002 and 12GCH003 concentrates where it is evident that coarser particles dominate the distribution for 12GCH002 whereas in 12GCH003 there is a greater proportion of 40 μm particles.

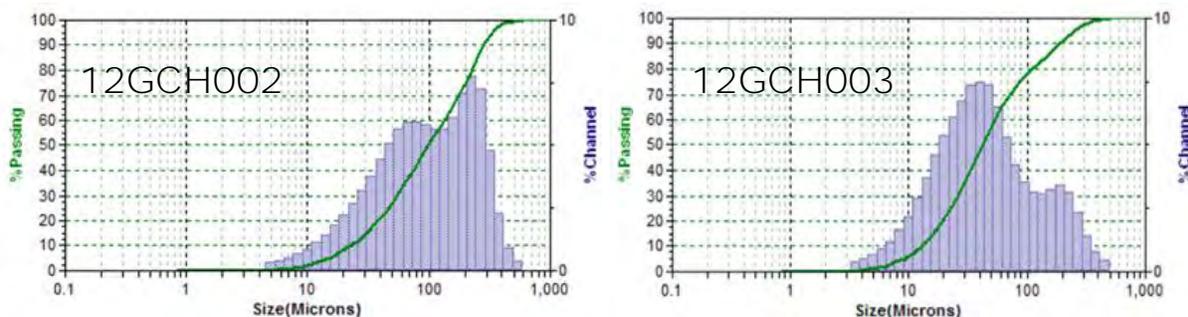


Figure 13-10: Bimodal particle size distribution in concentrates 12GCH002 and 12GCH003

The stability of the graphite particles was also of interest due to the apparent morphologies of the flakes which included aggregate flakes, pebbles or other 3D shapes and ultra-thin integral flakes that could lead to friability. Friability here refers to the ability of the graphite solids to reduce to smaller particles under the application of external stresses. Friability was examined by

comparing the shift in particle D_{50} before and after heavy sonication in all screened size cuts from graphite concentrate 12GCH002. Non-sonicated and sonicated 12GCH002 +20 mesh and +50 mesh concentrate size fractions are respectively compared in Figure 13-11 and Figure 13-12. The +20 mesh fraction is seen to highly friable; the coarse flake fraction is gone after sonication and the remaining particles are $< 100 \mu\text{m}$. Conversely, the sonicated +50 mesh size fraction retained a coarse fraction over a wider particle size distribution.

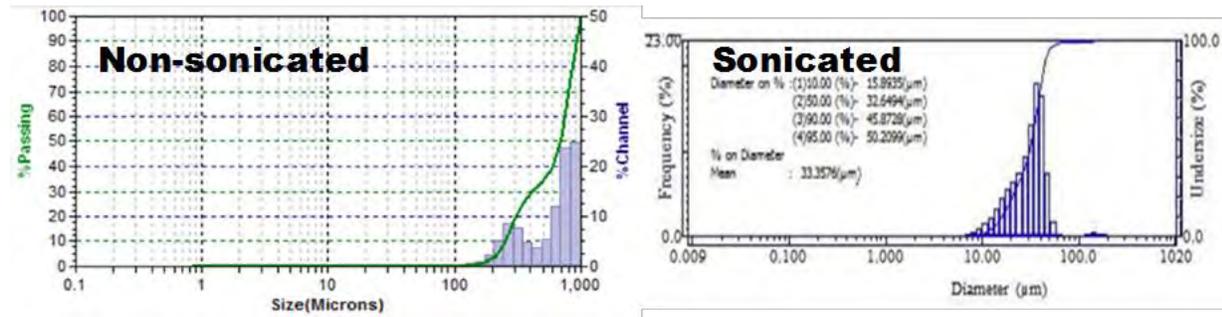


Figure 13-11: 12GCH002 +20 Mesh particle size distribution before & after sonication

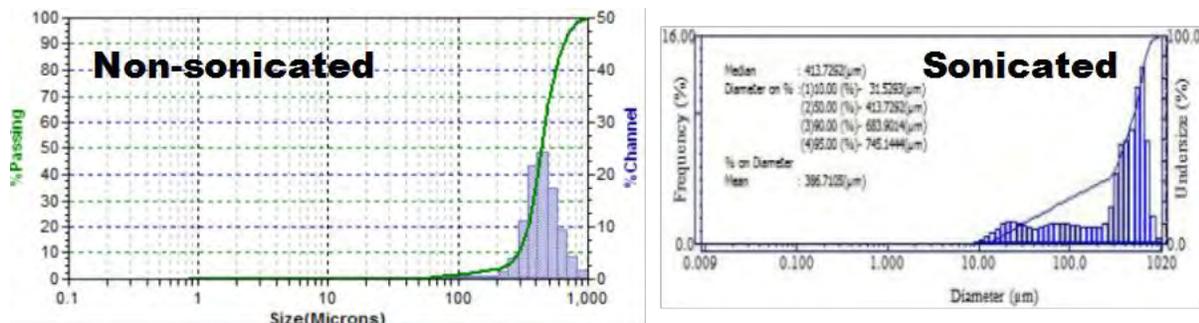


Figure 13-12: 12GCH002 +50 Mesh particle size distribution before & after sonication

Detailed analysis of the various size fractions from 12GCH002 concentrate indicated that:

- ⦿ +20 and +40 mesh size cuts are highly friable;
- ⦿ +25 and +30 mesh have low friability and could survive downstream processing;
- ⦿ +50 mesh cut is highly stable with negligible friability. This cut contained three-dimensional shapes which are mostly aggregates and rather unusual elongated flakes reminiscent of vein graphite;
- ⦿ -60/+70 mesh cut has limited friability and contains classic flake like particles;
- ⦿ +230 to +500 mesh cuts range is dominated by spherical and pebble type particles. In particular, the +325 mesh fraction has low friability.
- ⦿ -635 mesh fraction is composed mainly of flaky, mostly non-spherical particles.

No link between particle morphology and friability could be established since the proportions of each morphology in each of the mesh cuts was unknown combined with the fact that light scattering provides an average diameter measurement for all particles types.

ICP ANALYSES OF LOI ASH

ICP analysis was performed on LOI ash samples to determine concentrations of those impurities in graphite which are known to cause problems in electrochemical applications. Advanced battery systems have stringent purity requirements setting a minimum purity on the graphite precursor at 99.95 wt% C while the content of the remaining 0.05 wt% ash must respect a threshold concentration limit on certain “critical” impurities, which for some are limited to singular digit values in ppm (parts per million). These critical elements include –

- As (arsenic)
- Cr (chromium)
- Fe (iron)
- Mo (molybdenum)
- Sb (antimony)
- Sn (tin)
- Ca (calcium)
- Al (aluminum)
- Pb (lead) and others.

Table 13-7 summarizes the ash composition of the Graphite Creek concentrates. Immediately apparent is that As, Sb, Pb are at low levels. Sn, Pb and Al are relatively low melting point metals that can be easily removed by thermal purification. Refractory metals such as molybdenum could be problematic for thermal purification if its concentration exceeds 20 to 30 ppm as removal to tolerable threshold limits might prove challenging. 12GCH002 concentrate assayed 60.52 ppm for molybdenum. However, other graphite concentrates samples assayed one to two orders of magnitude lower than 12GCH002 in the range of 0.52 to 4.4 ppm, which is lower than typical occurrences in Chinese flake graphite. Blending with low-molybdenum mineralized samples could lower the overall molybdenum content and concentration. Improved mineral beneficiation could see partial removal of various impurities from the graphite structure.

Table 13-7 Elemental impurities by ICP in select Graphite Creek graphite concentrate

Graphite source	12GCH-002-1	12GCH-003	12GCH-007	12GCH-009	13GCH-012
Element	Concentration of impurities, ppm				
Al	1428	708.2	546.5	3912	3781
As	<0.1	<0.1	<0.1	<0.1	<0.1
Ca	157.5	230.9	207.1	368.1	505.3
Co	<0.1	ND	<0.1	<0.1	<0.1
Cr	10.74	27.84	10.92	43.01	5.845
Cu	28.01	1.974	2.646	36.65	5.653
Fe	833.2	700.3	397	6107	1518
Mo	60.52	4.303	2.164	4.402	0.521
Ni	3.53	1.265	0.885	28.67	3.127
Pb	3.454	<0.1	2.177	0.545	1.642
Sb	<0.1	<0.1	<0.1	<0.1	<0.1
Si	171.3	144.5	41.57	312.7	100.8
Sn	193.8	149	78.19	1584	359.1
V	22.15	9.38	11.41	35.37	7.286

Although all six drill core samples were treated under the same process conditions the resultant grade of the concentrate samples were different as was the color of ash and the shape of the unburned particulates, Figure 13-13, which are indicative of inhomogeneity between the drill core samples.



Figure 13-13: Homogeneity / consistency by ash color – poor (naturally occurring)

PRELIMINARY IDENTIFICATION OF COMPONENTS IN GRAPHITE’S GANGUE

Golden colored particulates as seen in Figure 13-14 appeared in a number of crucibles with LOI/ash from burnt concentrate. Analysis of the 12GCH004 ash revealed the presence of precious metal and other valuable impurities such as titanium, chromium, platinum (and iron). More golden particles were found in the ash of oversized mineral sample that had not passed primary crushing to (-16 mesh). It is conceivable that these values could be recovered ahead of graphite recovery. More work is needed to confirm preliminary findings.

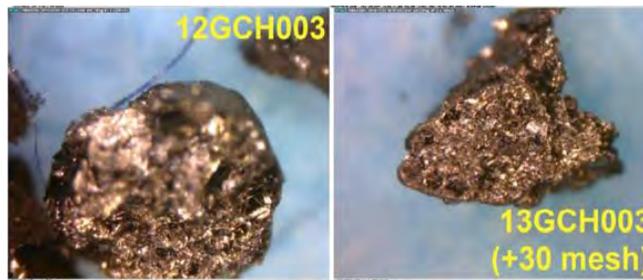


Figure 13-14: Coarse “golden” particles in the ash of graphite 12GCH004

DENSITY MEASUREMENTS

Measured density values for concentrate samples 12GCH002 (82.8% C) and 12GCH003 (79.4% C) are shown in Table 13-8 and compared to reference values. Tap and bulk density tests were run at the conclusion of the characterization effort; therefore, measurements.

Table 13-8 Measured density of select Graphite Creek concentrates vs reference values

Density Parameter	12GCH002 82.8wt% C (g/cm ³)	12GCH003 79.4wt% C (g/cm ³)	Reference Chinese flake K0598 98 wt%C (g/cm ³)	Theoretical Value at 293K for pure Mono- crystalline Graphite (g/cm ³)	Commercial, Poly-crystalline Graphite (g/cm ³)
True Density	2.174	-	2.258	2.266	< 2.039
Tap Density	0.604	0.658	0.663	-	-
Scott Volume	-	0.63	0.49	-	-

The main conclusions drawn from the density measurements are:

- ❖ True density values for 12GCH002 at 82.8 wt%C and the Chinese reference at 98%C are sufficiently close to the theoretical value to be considered fully graphitic
- ❖ Both concentrates have similar Tap Density values which occupy the range from 0.604 to 0.663 g/cm³. Lower values are indicative of finer particle size distributions

CONFIRMING FLAKE GRAPHITE PROPERTIES BY FTIR SPECTROSCOPY

Graphite powder was subjected to infra-red (IR) photons over broad spectrum of frequencies. “Classic” flake graphite has a characteristic transmission signature under infrared scan. It manifests itself as a sloping, near straight line dependence of percent transmission as a function of wavelengths in the infrared region of electromagnetic spectra that also has a characteristic triplet peak in the range of wavelengths from 2,300 to 1,900 cm⁻¹. From Figure 13-15 it was concluded that the FTIR signature of 12GCH002 is typical of natural crystalline flake graphite.

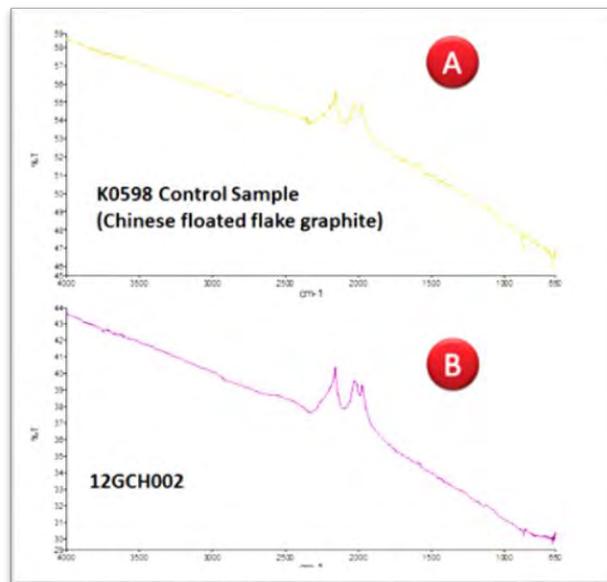


Figure 13-15: FTIR patterns of (A) control +50 mesh flake graphite K0598 and (B) 12GCH002

SURFACE AREA BY BET

Specific surface area is an important property of carbon material for batteries. Generally, the higher the value of surface area, the finer the material, and the more breaks and crevices on the surface. High surface area is generally a positive feature for applications of graphite in alkaline batteries. In contrast, lithium-ion battery applications require a surface area of grades as low as possible, albeit exceptions apply. Surface area reduction in lithium-ion batteries is one of the ways for ensuring low irreversible capacity loss on the anodes and enhanced battery safety.

The surface area of the graphite powders was measured by a Quantachrome Instruments NOVA 2200e surface analyzer. The instrument utilizes a modified Brunauer–Emmett–Teller (BET) theory equation to quantify the physical adsorption of gas molecules on a solid, porous surface of carbon powder and relate it to surface area.

Average surface area measurements for the drill hole concentrates appear in Table 13-9. The values range from low to moderate; the lowest measured BET value was 2.71 m²/g in 12GC009 while the highest was 4.29 m²/g in 13GCH012.

Table 13-9 BET surface area measurements

Concentrate Sample ID	BET Surface Area (m ² /g)
13GCH012	4.29
12GCH002	3.36
12GCH003	3.60
12GCH004	3.94
12GC007	4.00
12GC009	2.71

IGL COMMENTARY RELATED TO GRAPHITE CREEK SAMPLES UNIQUENESS

The Graphite Creek formation hosts some of the most uniquely shaped graphite particles which IGL has encountered in its many years of experience with the industrial graphite and carbon industries. This deposit contains some the following graphites -

- ⊙ Naturally occurring spheroidal (pebble-shaped) graphite in the size range from +200 to +635 mesh;
- ⊙ +20 mesh ultra-thin self-scrolling sheets;
- ⊙ +50 mesh graphite aggregates whose primary particles are 20-30 µm in diameter;
- ⊙ Up to +20 mesh three-dimensional bulky and needle-shaped graphite (12GCH003);
- ⊙ Elongated high aspect ratio flakes of +200 to +100 mesh size;
- ⊙ Nanosized flake graphite material whose one dimension is naturally as thin as 100 nm (12GC009);
- ⊙ Naturally occurring flake graphite whose particle architecture closely matches that of expanded graphite without any intercalation, expansion and delamination done to it.

13.3.2 Characterization Test Work Key Conclusions

IGL CORE FINDINGS

The following conclusions can be drawn from the characterization work –

- ▶ **Characterization points to natural crystalline flake:** FTIR spectroscopy results along with Bulk, Tap and True densities, BET surface area confirmed crystalline flake graphite.
- ▶ **Spherical/pebble shaped particles:** Remarkably, natural spherical morphology was seen in all the Graphite Creek drill hole concentrate samples; first noted at below 100 mesh, the proportion increased relative to other shapes with decreasing size classes until +500 mesh.
- ▶ **The graphite deposit is further unique:** Observed morphologies ranged from flakes, and three dimensional expanded shapes to spherical and pebble shaped particles. Proportions varied by mesh size cut within each drill hole concentrate.

- ▶ **Mineralization in-homogeneity:** Graphite Creek mineralization of the selected drill holes displayed non-homogeneity as evidenced by the variability of the graphite grade, impurity content and ash appearance between drill hole concentrates. Mineralization blending could be used to mitigate such variations.
- ▶ **Impurities:** Drill hole concentrates impurity concentrations were largely within the treatment capabilities of thermal purification to achieve tolerances for battery applications; only 12GCH002 concentrate had a high molybdenum concentration. Mineralization blending and improved mineral beneficiation could reduce the concentration of molybdenum and other problem impurities to accepted threshold limits. Value impurities such as titanium and platinum, the latter detected in 12GCH002 LOI ash at 0.43 wt% could be investigated for recovery ahead of graphite extraction.
- ▶ **Contains significant coarse flake proportion:** Screening analysis and optical microscopy demonstrate that Graphite Creek's deposit possesses sizeable proportions of the coarse flake but further examination is required to assess the relative amount of integral versus aggregate flake and whether flake fragility will affect recovery.

TRU INSIGHT ON THE CHARACTERIZATION RESULTS

Advantages of uniqueness of the Graphite Creek graphite mineralization relate –

- ▶ Naturally occurring graphite in the shape of pebbles or spheres are close to the size ranges of interest for lithium ion battery grade graphite;
 - There is a possibility of increasing the yield of spherical graphite from the normal industry yield of 30%-40% to a yield as high as 70% (proven in Section 13.4 Exploratory Product Development – Spherical Graphite).
 - Time in the spheronizing mill could be reduced, thus resulting in lower intensity milling (proven in Section 13.4) and lower operating and capital costs for this step
- ▶ The inherent high aspect ratio and high friability of certain size ranges of particles could render them more amenable to milling and realize a 50% reduction in operating costs for the micronizing milling step in the Products Manufacturing Plant;

This uniqueness also requires extraordinary future research and development to –

- Determine whether there is a relationship between drill core interval depth and mineral grade with observed variation in particle morphology and particle size distribution.
- Discern whether 12GCH002 which showed high liberation from gangue during extraction is representative of the Graphite Creek mineralization in the upper QGBSS layer, is an outlier or is representative of a particular sector of graphite mineralization.
- Assess possible separation of integral from pressed flake;
- Identify particle types and morphologies that will survive the purification steps;
- Examine friable fractions that are more amenable to milling and assess the suitability of large aspect ratio / pressed flakes for making foil and sheet production¹⁸;
- Confirm ease of spheronizing and recovery rates in commercial equipment

¹⁸ The thin, high aspect ratio graphite could also be directed for premium alkaline battery market as a fallback position: Generally the alkaline battery market is not considered a target use for Graphite One as long term demand prospects are questionable and competition fierce

“STAX GRAPHITE” BRAND OF THE UNIQUE GRAPHITE CREEK MINERALIZATION

TRU recommends that Graphite One brand the unique aspects of the Graphite Creek mineralization to distinguish it from other commercially mined graphite. TRU selected brand name “STAX Graphite” highlight the main descriptive morphological aspects of the graphite–

- ☑ **“S” as in Spheroidal**
- ☑ **“T” as in Thin**
- ☑ **“A” as in Aggregate**
- ☑ **“X” as in Expanded**

☑ **STAX Graphite is unique and commercially important:** The importance was demonstrated exploratory product development test work which achieved high conversion yield to spherical graphite which also achieved high performance during electrochemical testing. STAX graphite (subject to study in further extraordinary product development R&D) is projected as being uniquely amenable for use in several applications, including lithium-ion, alkaline batteries, greases and lubricants, friction, motor brushes, crucibles, etc.

13.4 Exploratory Product Development – Spherical Graphite¹⁹

An exploratory product development program was performed at USA-based IGL under the management of TRU Group with the following objectives:

- 1) Develop experience and a knowledge base on the mechanical processing of STAX graphite; and
- 2) Produce a preliminary spherical graphite product suitable for lithium ion batteries for EV applications and characterize the physical and electrochemical properties in CR2016 coin cells.

Historical surface samples collected from the Graphite Creek Property were sent to IGL in November 2015 as the raw feed to execute the test work. Graphite concentrate was extracted from the mineral samples in two-stage flotation with only prior pre-crushing of the mineralized material. The resulting concentrate was thermally purified to exceed the minimum threshold of 99.95% C required of graphite for lithium ion battery applications. Following thermal purification, the graphite was spheronized and classified into different size classes. The physical properties of each recovered size class were characterized; those fractions identified as suitable for anode material in lithium ion battery applications were electrochemically assessed in both non-coated and coated spherical graphite forms.

13.4.1 Preparation of Graphite Concentrate

Received mineral samples which were collected from the surface outcrop bulk sampling program of 2012 were sorted by IGL into three lots on the basis of macroscopic mineralogy. Following the analysis of the three rock types, the lot which appeared as Gray Marble was selected for beneficiation and graphite extraction as they were determined to be have similar mineralogy to the Quartz-Garnet-Biotite-Sillimanite Schist which is mineral zone of interest for

¹⁹ Summarized from IGL Exploratory Product Development Study (Sept 2016)

graphite exploitation. This sample lot was first crushed to 100% passing 3/4" mesh and then crushed to -18 mesh. LOI 950 °C analysis of the rock yielded an assay of 48.2% C. Two stages of non-optimized flotation produced approximately 3.3 kg of bulk graphite concentrate assaying 79.6 %C by LOI 950 °C.

13.4.2 Thermal Purification of Graphite Concentrate

Concentrate was thermally purified at USA-based Thermal Processing Facility (TPF) external to IGL at high temperature and under a halogen atmosphere to achieve minimum target purity of 99.95% C and threshold limits on certain individual impurities. The concentrate grade at 79.6%C grade was low by TPF processing standards and therefore a sample cut of 288 g was air-jet milled in advance by IGL and then submitted for trial purification. The increased surface area milled concentrate was intended to assist thermal purification. During this exercise, IGL observed that only 30-35 psi of the energy input was required to mill the Graphite Creek graphite as opposed to 100-120 psi that is typical for "conventional" China flake. Following successful treatment of the trial sample, most (2733.4 g) of the remaining bulk concentrate was also air-jet milled ahead of thermal purification. A third concentrate sample cut of 299.4 g was thermally treated without any prior air-jet milling. Analysis of the concentrate samples by LOI 950°C and recorded mass losses in Table 13-10 show that the target purity of 99.95% C was exceeded. Mass loss was attributed to impurity volatilization and thermal decomposition of other minerals. Separate analyses for impurity content were also within threshold limits.

Table 13-10 Carbon assay and recorded mass loss of milled (MG) and non-milled (NMG) purified graphite samples

Sample ID	Initial Mass (g)	Final Mass (g)	Mass Loss (%)	LOI Assay (%C)
MG-Trial	288	202	30%	99.990
MG-Bulk	2733.4	2041.2	25%	99.987
NMG	299.4	198.4	34%	99.992

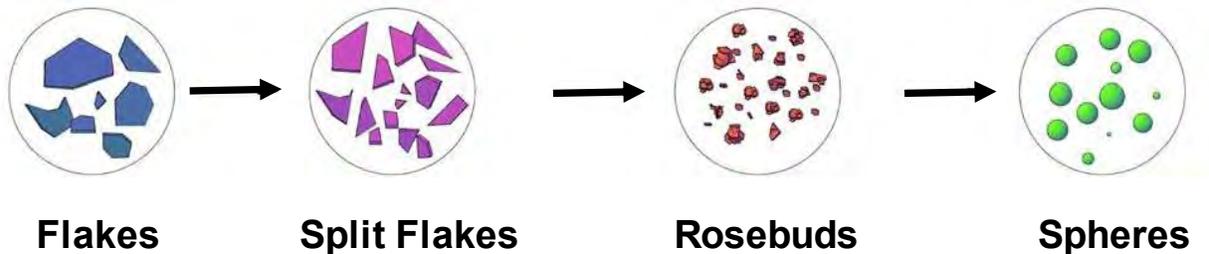
13.4.3 Spherical Graphite Preparation

Purified milled (MG) and non-milled (NMG) graphite samples were converted into spherical graphite in a single, non-optimized trial. Purified MG material was processed by normal production protocols with –

- 1) (Additional) air-jet milling of the MG bulk concentrate to ensure the mean particle size (D_{50}) was between 25 and 35 microns (μm) to improve conversion yield
- 2) Mechano-chemical (spheronization) processing of the air-jet milled graphite to achieve the desired particle (spheroidal/potato) shape

The NMG sample cut was directly fed to the spheronization mill without any prior air-jet milling as an investigative exercise on the potential outcome.

Mechano-chemical processing or “spheronization” progressively transformed pre-cursor (air-jet milled) flakes into spheroidal or potato shapes in the sequence depicted below.



13.4.4 Spherical Graphite Physical Characterization

After spheronization, the recovered spherical graphite (SG) product was classified into different size fractions and characterized. Both the non-milled purified and spheronized graphite (NM-P-SG) cut and the bulk milled purified and spheronized (M-P-SG) graphite were physically characterized. A carbon-coated counterpart (M-P-CSG) of the latter was also physically characterized. There was insufficient quantity of non-milled graphite sample to manufacture a coated product.

PRINCIPAL CHARACTERIZATION METHODS

The techniques to characterize the physical properties above-mentioned purified, spherical graphite samples were similar to those used to characterize the graphite mineral samples from drill core segments which are summarized in Table 13-5, Section 13.3.

CHARACTERIZATION OF NON-MILLED PURIFIED Spheronized GRAPHITE (NM-P-SG)

Non-milled graphite samples that were purified and directly spheronized (NM-P-SG) without any prior size reduction were classified into eight size fractions. Results of physical characterization and particle size analysis are presented in Table 13-11. Most significant was the high conversion yield at 74.6 wt% to spheroidal size cuts potentially suited for advanced lithium-ion battery applications – highlighted samples PNM-SG-0 and PNM-SG-1. This result was achieved without any prior jet milling, i.e., direct spheronization, of the purified graphite, used the entire size distribution of the graphite feed, and required half the residence time with one third of the energy input to the spheronizing mill compared to conventional Chinese flake graphite.

Table 13-11 Physical characterization of directly spheronized graphite by size cut

Sample ID	Mass (g)	Mass Distribution (%)	Tap Density (g/cm ³)	Scott Volume (g/cm ³)	BET (m ² /g)	Sonicated Particle Size Analysis			
						D ₁₀ (µm)	D ₅₀ (µm)	D ₉₀ (µm)	Mean (µm)
NM-P-SG-0	49.5	41.6%	1.17	0.76	11.9015	11.02	22.5	30.63	21.73
NM-P-SG--1	39.4	33.1%	0.88	--	10.1715	7.08	13.46	19.77	13.63
NM-P-SG--2	18.1	15.2%	--	--	11.4095	--	--	--	--
NM-P-SG--3	2.4	2.0%	0.859	--	16.66	4.26	8.04	13.18	8.5
NM-P-SG--4	2.3	1.9%	0.87	--	9.3	3.85	7.57	13.01	8.19
NM-P-SG--5	2.4	2.0%	--	--	9.34025	4.77	8.26	13.94	8.97
NM-P-SG--6	2.6	2.2%	--	--	10.491	5.7	7.93	10.37	7.99
NM-P-SG--SG-7	2.4	2.0%	0.708	--		3.03	5.72	9.91	6.22
NM-P-SG-SG-Mix-0-1	10		1.063			6.7	16.68	39.9	21.44

Of the two size cuts, NM-P-SG-0 featured a verified Scott Volume of 0.76 g/cm³ with a Tap Density of 1.17 g/cm³. In the IGL team's many years of tangible experience with graphite for batteries, this is the highest packing density of all graphites seen. The remarkable packing density is achieved as a result of form factor and size of the resultant particles. Scanning electron microscopy (SEM) micrographs of NM-P-SG-0 particles in Figure 13-16 show, dense spheroidal matter, very uniform, and aligned with expectations of graphite for applications in the advanced lithium-ion battery systems. Particles of "-1" cut range from spheroidal to the rounded-edge three-dimensional shapes. Comparison between the unmilled "-0" and "-1" size cuts reveals that the former has a higher degree of sphericity. This manifests itself in a greater packing density for the "-0" cut. NM-P-SG-0 and NM-P-SG-1 size cuts were mixed in amounts proportional to their yield for testing in uncoated form in CR2016 coin cell batteries. The resultant tap density of 1.063 g/cm³ is a sign of superior material for application in lithium-ion battery anodes. Sample cuts NM-P-SG-5 and NM-P-SG-6 are very fine and spheroidal in nature. Their packing density is in line with values of the NM-P-SG-1 cut, at 45% of the particle size. With particle D₅₀ values between 8 and 9 µm, these spheroids could be suitable candidates for ultra-high-rate military lithium-ion and plug-in hybrid electric vehicle batteries. Future studies should focus on yield optimization.

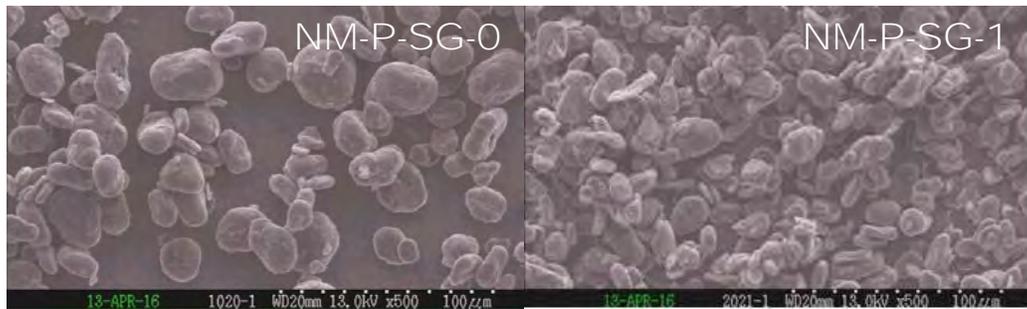


Figure 13-16: SEM micrographs of spherical graphite from size cuts NM-P-SG-0 and NM-P-SG-1

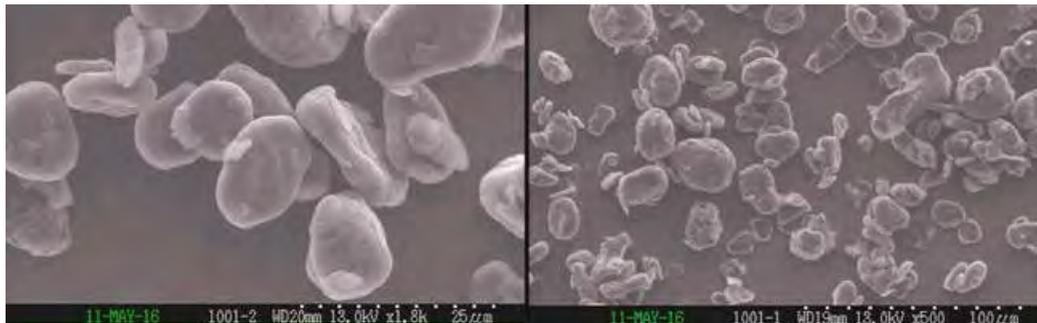


Figure 13-17: SEM micrographs of proportionally mixed fractions of NM-P-SG-0 and NM-P-SG-1

CHARACTERIZATION OF MILLED PURIFIED SPHERONIZED GRAPHITE (MG-P-SG)

Density measurements (Tap, Scott Volume and BET) and particle size analysis of MG that was purified and spheronized (M-P-SG) are presented in Table 13-3. Top size cuts by particle size and tap density are: M-P-SG-0, MP-SG-1 and MP-SG-2 which represent 49% of the converted feed. Relative to the graphite that was directly spheronized, the conversion yield was lower and the degree of spheronization qualitatively less.

Table 13-12 Physical characterization of milled spheronized graphite by size cut

Sample ID	Mass (g)	Mass Distb'n (%)	True Density (g/cm ³)	Tap Density (g/cm ³)	Scott Volume (g/cm ³)	BET (m ² /g)	Sonicated Particle Size Analysis			
							D ₁₀ (µm)	D ₅₀ (µm)	D ₉₀ (µm)	Mean (µm)
M-P-SG-0	190.9	13%	--	0.93	0.529	4.394	9.77	18.31	27.43	18.56
M-P-SG-1	325.5	22%	2.2341	0.91	0.492	4.472	8.26	18.06	31.92	19.49
M-P-SG-2	207.71	14%	--	0.863	0.37	--	6.63	14.36	24.16	15.07
M-P-SG-3	177.2	12%	--	0.76	0.328	--	5.97	12.2	20.41	12.85
M-P-SG-4	114.38	8%	--	0.672	0.316	5.692	6.4	11.79	18.29	12.16
M-P-SG-5	77.7	5%	--	0.683	--	6.8805	4.99	10.74	19.35	11.8
M-P-SG-6	69.2	5%	--	0.616	--	5.116	4.98	10	16.67	10.54
M-P-SG-7	321.1	22%	--	0.75	0.279	7.362	4.28	8.34	14.92	9.13
M-P-SG-Mix-0-2-5	31.6			0.8938	0.589					

CHARACTERIZATION OF MILLED PURIFIED COATED SPHERONIZED GRAPHITE (MG-P-CSG)

Non-coated spherical graphite will attain a higher first discharge capacity but at higher (double digit percentage) irreversible capacity loss compared to coated material. However, lithium ion battery applications require spherical graphite be coated with nano-sized particles to reduce BET surface area to improve (reduce) irreversible capacity loss and battery safety. Table 13-13 summarizes the physical properties of coated spherical graphite blended from size cuts of milled spheronized graphite above. As anticipated, the carbon coating resulted in lower True Density (due to the lower density of the coating); higher Tap Density and Scott Volume; and lower BET.

Table 13-13 Physical characterization of coated spherical graphite samples

Sample ID	Mass (g)	True Density (g/cm ³)	Tap Density (g/cm ³)	Scott Volume (g/cm ³)	BET (m ² /g)	Sonicated Particle Size Analysis			
						D ₁₀ (µm)	D ₅₀ (µm)	D ₉₀ (µm)	Mean (µm)
M-P-CSG 325	220.2	1.911	0.8766	0.5954	0.938	17.08	65.56	193.2	87.78
M-P-CSG -325/+400	61.7	--	0.942	0.5639	0.868	10.71	21.78	28.72	20.48
M-P-CSG -400/+450	429.1	--	0.917	0.5841	--	11.05	17.83	24.2	17.76
M-P-CSG -450/+500	7	--	0.902	0.588	0.867	10.2	14.8	19.6	14.86
M-P-CSG-Mix-0-2-5	80.5	--	0.85	0.5179	1.04	10.54	19.47	28.67	19.58
M-P-CSG-Mix-4-7-6	291.6	--	0.802	0.4287	0.998	8.23	14.7	22.96	15.24

13.4.5 Spherical Graphite Electrochemical Characterization

Baseline electrochemical characterization was performed with uncoated and coated spherical graphite samples identified with physical characteristics suitable for use in lithium-ion batteries. Three spherical graphite samples tested in CR2016 coin cells assembled by IGL included:

1. Non-milled purified spheronized graphite blended mixture (NM-P-SG-Mix-0-1) that were:
 - a. Not carbon coated
2. Milled purified spheronized graphite blended mixtures that were:
 - a. Not carbon coated (M-P-SG-Mix-0-2-5)
 - b. Carbon coated and heat treated (M-P-CSG-Mix-0-2-5)

Initial electrochemical performance of lithium-ion battery grade active materials (uncoated and coated spherical graphite) was assessed in standard CR2016 coin cells. The cells were assembled into the “half-cell” design which, in this context assumes testing the graphite anode vs the Li/Li⁺ counter electrode. Cycling was performed at the following typical rates: C/20 (3 cycles), followed by C/10 – 3 cycles; C/5 – 1 cycle; C/2 – 20+ cycles from 1.1V to either 1.8 or 2.0 V vs. Li/Li⁺ for graphite materials of interest.

ELECTROCHEMICAL CHARACTERIZATION OF SPHERONIZED GRAPHITE

Electrochemical performance of non-carbon coated spheronized graphite was examined in two types of tests in order to provide a comparative baseline for coated spherical graphite:

1. Initial galvanostatic cycling at C/20 rate to record and assess the first discharge capacity and irreversible (first cycle) capacity loss on coin cells manufactured with M-P-SG samples and NM-P-SG samples followed by repeat charge-discharge cycle(s) to examine performance stability
2. Short-duration continuous galvanostatic cycling at C/3 rate on one sample to examine cycling stability on one cell manufactured with NM-P-SG samples

Summary galvanostatic test results for uncoated spherical graphite are shown in Table 13-14. Selected galvanostatic curves from coin cells 1203, 1207 and 1211 appear in Figure 13-18, and Figure 13-21 to Figure 13-21 respectively.

Table 13-14 Galvanostatic test results for coin cells made with M-P-SG-0-2-5 blend and NM-P-SG-0-1 blend

Coin Cell ID	Spherical Graphite Product	First Charge Capacity	First (Reversible) Discharge Capacity at 1.8 V vs Li/Li+	First (Irreversible) Cycle Loss
		(Ah/kg)	(Ah/kg)	(%)
1203	M-P-SG-0-2-5	421.6	372.0	11.8
1207	M-P-SG-0-2-5	395.5	370.9	6.2
1208	M-P-SG-0-2-5	415.6	369.2	11.2
1209	NM-P-SG-0-1	442.7	367.4	17.0
1211	NM-P-SG-0-1	427.4	360.7	15.6

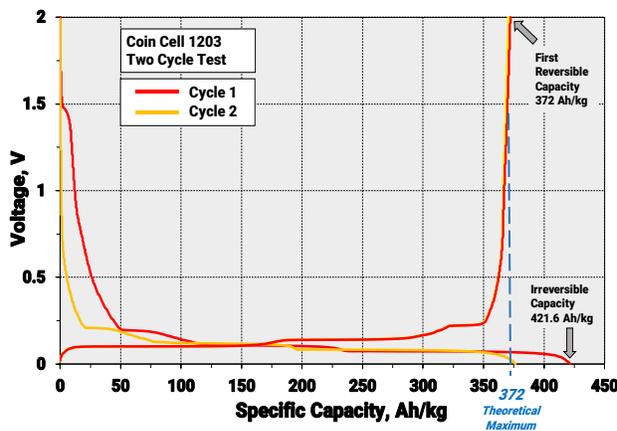


Figure 13-18: Initial galvanostatic cycling of CR2016 coin cell 1203 vs. Li/Li+ counter electrode at C/20 rate (limited electrolyte)

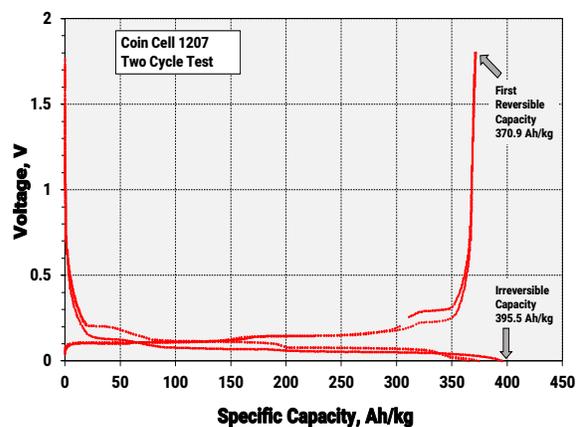


Figure 13-19: Initial galvanostatic cycling of CR2016 coin cell 1211 vs. Li/Li+ counter electrode at C/20 rate

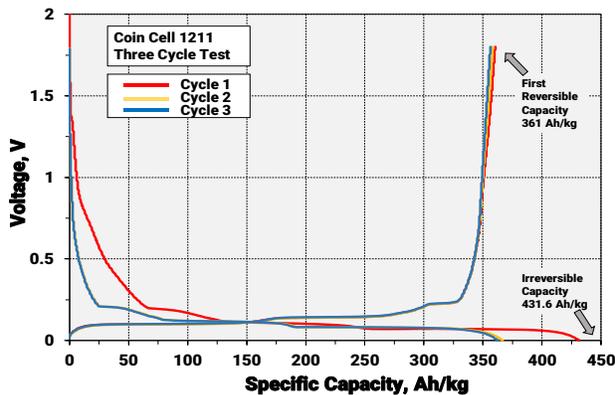


Figure 13-20: Initial galvanostatic cycling of CR2016 coin cell 1211 vs. Li/Li⁺ counter electrode at C/20 rate

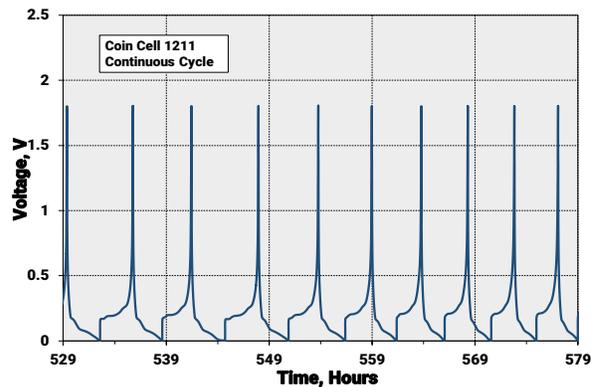


Figure 13-21: Continuous galvanostatic cycling of CR2016 coin cell 1211

IGL asserted that most of the galvanostatic curves are excellent as per:

- ▶ The reversible capacity of the uncoated spheronized graphite from Graphite Creek achieved at or near the theoretical reversible capacity of 372 Ah/kg for graphite; coin cell 1203 attained 372.0 Ah/kg while coin cell 1207 reached 370.9 Ah/kg.
- ▶ The above performance was realised at an active material loading level of near 11 mg/cm², which is used in commercial batteries.
- ▶ Repeatability of graphite performance was observed with consecutive cycling. Most cells consistent performance over multiple cycles (2-3 cycles)
- ▶ Even though IGL did not build cells with a specific design that would survive continuous cycling, coin cell 1211 shows good stability in short duration continuous recharge as seen in Figure 13-20 for cycles #16 through #26 (50 hours).

ELECTROCHEMICAL CHARACTERIZATION OF COATED SPHERONIZED GRAPHITE

Summary galvanostatic test results for three CR2016 coin cells manufactured with M-P-CSG-0-2-5 blend are seen in Table 13-15. All three coin cells experienced single digit irreversible capacity loss consistent with expectations relative to coin cells made with non-coated spherical graphite. Of the three, coin cell 1220 performed best with respect to all parameters and also showed stability and reproducibility over three charge-discharge cycles, Figure 13-22; first discharge capacity was near theoretical at 370.1 Ah/kg for an irreversible capacity loss of 6.3%

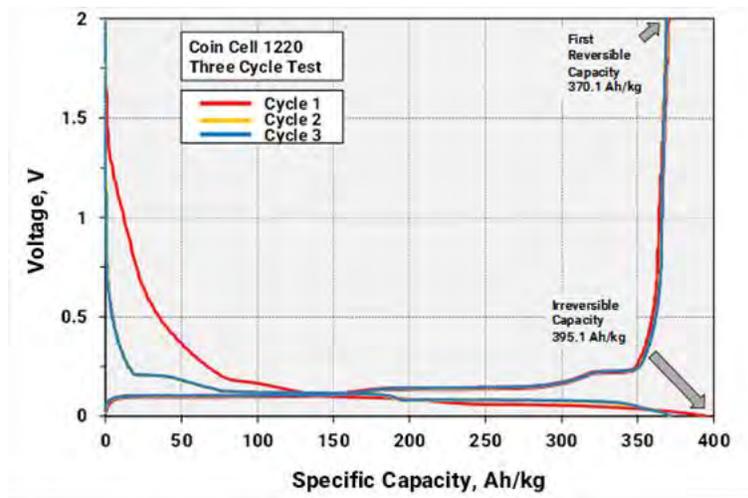


Figure 13-22: Initial galvanostatic cycling of coated SG in CR2016 coin cell 1220 vs. **Li/Li+ counter electrode at C/20 rate**

Table 13-15 Galvanostatic test results for coin cells made with M-P-CSG-0-2-5 blend

Coin Cell ID	Spherical Graphite Product	First charge capacity (Ah/kg)	First (Reversible) Discharge Capacity at 1.8 V vs Li/Li+ (Ah/kg)	First (Irreversible) Cycle Loss (%)
1220	M-P-CSG-0-2-5	395.2	370.1	6.3
1221	M-P-CSG-0-2-5	401.1	364.1	9.2
1228	M-P-CSG-0-2-5	398.8	367.9	7.8

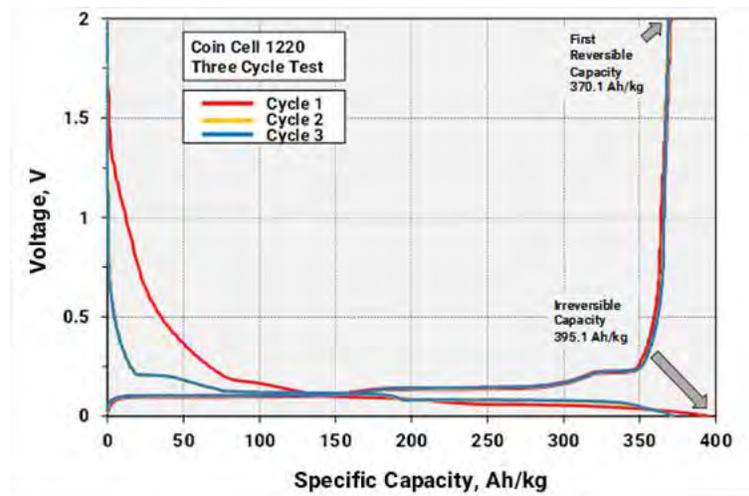


Figure 13-22: Initial galvanostatic cycling of coated SG in CR2016 coin cell 1220 vs. Li/Li⁺ counter electrode at C/20 rate

13.4.6 Summary

- ❖ Direct spheronization of non-milled, purified graphite achieved approximately 74.6 wt% yield of usable spherical product.
- ❖ A record Tap Density value at 1.17 g/cm³ was measured with the non-milled spheroidal flake – higher Tap Density translates to more particle insertion (higher energy density) in the electrode assembly.
- ❖ Carbon coating on to the spherical flake resulted in a low BET surface area product.
- ❖ Uncoated and coated spheronized graphite tested for their initial electrochemical properties in CR2016 coin cells both delivered near theoretical performance, which is promising for application in advanced lithium-ion battery systems.
- ❖ More work is needed in order to verify the stated levels of performance with graphite recovered and spheronized from subterranean formations at the Graphite Creek and to assess carbon coating performance in commercial equipment

13.5 TRU Group Beneficiation Test Work²⁰

Mineral processing test work under the management of TRU Group was conducted at another independent USA-based mineral processing laboratory (IMPL). Two series of flotation tests were carried with the first series using graphite mineralization from drill core segments grading 15-17 %C while the second series used graphite mineralization from drill core segments representative of the preliminary mine plan and grading 5-7% C High grade mineral pockets exit on the Graphite Creek property and mechanical concentration of such material provides data on feed variability recoveries.

²⁰ Summarized from IMPL Mechanical Concentration Study (Oct 2016)

13.5.1 Mechanical Concentration of Graphite Mineralization 15-17% C

The test work investigated the potential recovery of a coarse graphite concentrate (+80 mesh) and fine graphite concentrate (-80 mesh) from drill core segments with graphite mineralization grading at 15-17 %C. One flowsheet examined in this series of tests appears in Figure 13-23. The objective was to produce two concentrates grading near or above 95% Cg.

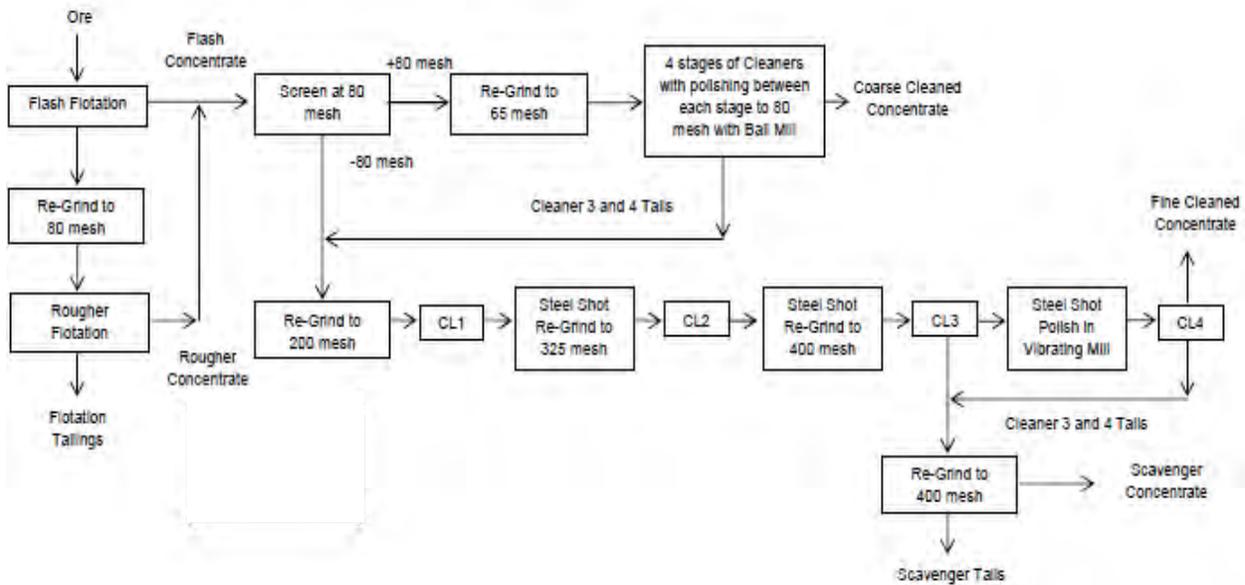


Figure 13-23: Flowsheet to produce minimum 95% Cg grade in coarse and fine concentrates

Feed ground to 16 mesh was subjected to flash and rougher flotation. The rougher and flash concentrates were combined and screened at 80 mesh. The oversize (coarse) and undersize (fine) were each subjected to four sequences of regrind/polishing coupled with cleaner flotation. The recovered coarse concentrate was screened at 80 mesh; the amount of oversize (+80 mesh) was negligible and could not be analyzed. This finding does not pre-suppose that the fraction of true (integral) coarse particles was non-existent in the feed but may rather indicate that the intensity of processing was too high to preserve the original flakes that were either integral or aggregate structures. As per the characterization test work in Section 13.3, actual quantification of integral vs aggregate graphite flake in the mineralized sample is complex and detailed study will be required in a future investigation.

13.5.2 TRU Proposed Mineral Processing Flowsheet

Subsequent mineral processing test work investigated a simplified flowsheet proposed by TRU Group to produce a single concentrate from lower grade graphite mineralization samples consistent with and representative of the targeted exploitation zone discussed in Section 14. Table 13-16 summarizes the drill core segments used in this study identified by drill hole, drilling interval and assay for the interval according to drill core logs. The proposed simplified flowsheet,

Figure 13-24, is the basis for the recovery methods appearing in Section 19 and is integrated to the requirements of spherical graphite product manufacturing. It requires less equipment for mineral processing with the consequent benefit of lowering capital costs and operating costs for the Graphite Creek Project. In addition, a higher proportion of value-added manufacturing is directed to spherical graphite product which has the highest projected growth of all graphite end-use segments and the highest unit selling price.

Table 13-16 Drill core segments used in performance baseline test and rougher flotation

Drill Hole ID	Interval		Mass (kg)	Assay %Cg
	From (m)	To (m)		
12GC004	25	47	60.7	6.78
12GC007	65	75	27.6	7.05
12GC007	114	124	27.6	7.05
12GC009	57	77.06	55.3	7.81
13GCH010	72	82	19.0	7.17

The design was supported by prior flotation test findings, which showed low recovery of actual coarse graphite while exploratory product development test work demonstrated high (75%) conversion of feed with a broad particle size distribution to spherical graphite.

Flash flotation is excluded since there is no separate recovery of coarse graphite fractions. TRU attributes prior unsuccessful attempts to upgrade graphite mineralization from Graphite Creek to 95% Cg to insufficient mechanical liberation of the graphite largely due to the choice of grinding regimen, mill type and grinding media. Crushed mill feed material is fed to rod mill for primary grinding to a P80 of 150 mesh. Rod mill slurry is conditioned with reagents and subjected to rougher flotation followed by cleaner flotation. The initial cleaner pulp is then re-ground in a ball mill and subjected to further cleaner flotation. The three tailings streams from rougher, initial cleaning and secondary cleaning are not processed further for graphite recovery. At the laboratory scale, three additional sequences of polishing grinding in vibratory mills coupled with cleaner flotation produce the final graphite concentrate. The tailings from these cleaner stages are sent for scavenger flotation; scavenger concentrate is recirculated to the first polishing grind while scavenger tails are not processed any further.

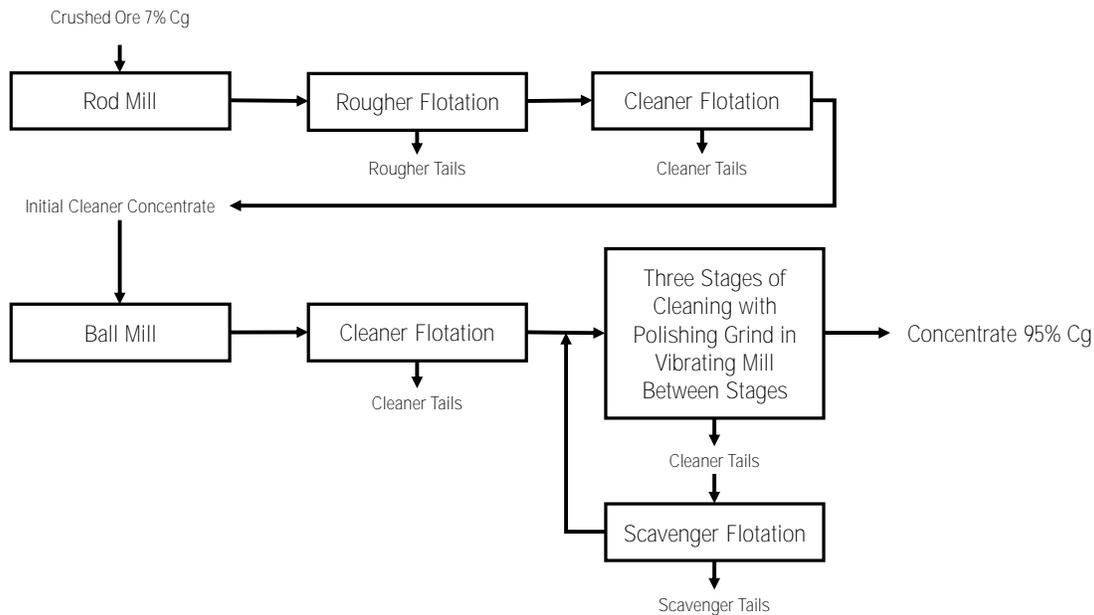


Figure 13-24: TRU Proposed flowsheet to produce 95% Cg concentrate

TRU projected performance of the flowsheet at the Graphite Creek Mineral Processing Plant based on composite test results is 80% graphite recovery in a concentrate grading 95% Cg. As the head grade of the graphite mineral samples was similar to that used in the SGS test work, a baseline performance test was conducted to confirm the reproducibility of SGS flotation test FT6 and establish cleaner performance. The results of the baseline performance test, Table 13-17, showed good agreement with SGS FT6 and established the high performance of cleaner flotation stages. Subsequent tests assessed the performance of rougher flotation with only prior grinding of the feed to P80 325 mesh, which resulted in a carbon recovery of 99% in a concentrate grade of 33-34% C at a mass pull of 17.4%. Increasing the P80 size of rod mill grind to 150 mesh, employing flotation columns for the latter four cleaning stages, and using specialized mills for polishing grinds will, in TRU opinion, deliver the projected performance targets. Ongoing test work will validate the entire flowsheet, which will also generate concentrate for the further product development test work.

Table 13-17 Comparison of baseline performance test results with SGS test FT6

Product	Overall Recovery % Wt		Overall Recovery % C		Individual Cleaner Recovery % C		Concentrate Grade % C	
	IMPL	SGS	IMPL	SGS	IMPL	SGS	IMPL	SGS
+80 CL3 Conc +80	0.5	1.5	8.5	22.0	Combined CL1-3		96.2	91.7
+80 CL3 Conc -80	0.4	1.5	6.1	22.0	97.4	97.3	94.6	91.7
-80 CL4 Conc	4.7	4.7	76.7	64.9	Combined CL1-4		94.3	89.0
					96.4	93.8		
CL4 Conc	6.2	7.0	94.5	91.9	Combined CL2-4		88.1	84.4
					96.7	96.7		
CL1 Conc	8.1	8.6	97.7	94.9	99.0	99.2	69.4	71.6
Flash/Rougher Conc	19.5	16.5	98.7	95.7	----		32.1	37.5

14 MINERAL RESOURCE ESTIMATES

14.1 Summary

Mr. Ronald James Robinson, P.Geol., a qualified Person as defined by National Instrument 43-101 carried out a review of the data analysis, modeling and resource estimation included in this report. The modeling, statistical analyses and estimation review were completed using Surpac™ modelling and resource software, v. 6.6.2, from Dassault Systemes Geovia (formerly Gemcom Software International Inc.), of Vancouver, BC. This section will include explanations of the process used to create the 3D model of the Graphite Creek deposit and calculate and report on the mineral resource. The work and results in this section are based on a review of the work of D. Roy Eccles and Steven Nicholls, both of APEX Geoscience Ltd. (APEX) (Eccles, et al, 2015).

The only commodity of economic interest identified to date on the Graphite Creek property is graphite. Therefore, this analysis and resource estimate is focused solely on the grade and distribution of graphite within the deposit.

Coordinates of the Graphite Creek Project area are given in Universal Transverse Mercator (UTM), North American Datum (NAD) 1983 and UTM Zone 3. A block size of 12.5 m (X) x 12.5 m (Y) x 2.5 m (Z) was used in the construction of the block model. The Indicated and Inferred Graphite Creek resource modeling utilized fifty drill holes that were drilled in 2012, 2013 and 2014.

14.2 Exploration Database

The various drill programs from which the geological data were derived were carried out under the supervision of professional geologists employing current best practices pertaining to mineral exploration, sample and data security, and data quality assurance and quality control. Grade (assay) and geologic information is derived from work conducted by APEX personnel, on behalf of Graphite One, during the 2012, 2013 and 2014 field seasons. All geologic information and assay data have been verified by the author, and the sample handling, data standards and security and geological investigations and determinations are appropriate, compliant with national standards and suitable for use in calculating and reporting a mineral resource estimate. The author takes complete responsibility for all aspects of the data verification, deposit modeling and the calculation and reporting of this mineral resource estimate.

The locations of the diamond drill holes in relation to local geographic features are shown in Figure 14-1.

Previous resource estimates used a base cut-off grade of 3% graphite. This cut-off was used in modeling the various mineralized domains or “lodes” identified within the deposit. The decision to continue the use of the 3% cut-off value was based on an examination of the distribution of graphite grades throughout the deposit. The majority of the mineralized units within the deposit boundaries contain at least three percent graphite, and there is a definite natural cut-off below that grade. Units containing less than three percent graphite tend to be almost completely un-mineralized, which makes the three percent value a natural cut-off point.

The Indicated and Inferred Graphite Creek Resource estimate is reported in accordance with the Canadian Securities Administrators National Instrument 43-101 and has been estimated using the CIM “CIM Definition Standards for Mineral Resources and Mineral Reserves,” dated May 10, 2014 and “Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines,” dated November 23rd, 2003. 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. The term Mineral Resource covers mineralization and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of Modifying Factors. The reader is cautioned that mineral resources that are not mineral reserves do not have demonstrated economic viability.

Before beginning work on the deposit model, all assay results in the assay database provided by Graphite One were checked against the assay certificates issued by the analytical laboratory. No discrepancies were noted. A drillhole database was constructed in Surpac. The database included tables for collar locations, survey data, assay data, intersections, composites, specific gravity and lithology. Data were imported into the Surpac database from Excel data files. During the import process, data were checked for duplicate sample numbers, duplicate intervals, overlap of sample intervals, positive sample length, and samples beyond the end of the hole.

14.3 Geological Interpretation and Geologic Boundaries

The graphitic carbon (Cg) values were then displayed alongside the drill hole traces, weighted average composites were created and manually edited to produce intersections with a minimum true width of 3m and a minimum value of 3.0% Cg.

The composited Cg values and lithology were displayed on the drill hole traces. Cross-sections were then digitized to include those composites meeting the minimum width and grade parameters and reflecting the lithologic interpretation of the units logged in the drill holes. It should be noted that there was a strong correlation between graphite grade and logged lithologies. Drill hole intersections were extrapolated 150 m up and down dip and along strike, and half way to adjacent drill holes, if within 150 m. The tops of the mineralized lodes were truncated by overburden where present, or the topographic surface where no overburden was present. The down-dip extensions of the lodes were truncated by intersection with the interpreted location of the Kigluaik fault.

Polygons were triangulated between digitized sections to create 3D wireframe models of the various domains. In the Graphite Creek deposit, it is apparent that there are nine separate, mappable domains or lodes which can be modelled. The 3D wireframes were inspected and edited to ensure that they matched all logging observations, field observations and mapping. Upon examination and interpretation of the results of the in-fill 2014 drill program, it was observed that the geometry of the deposit is somewhat more complex than had initially been thought. All in-fill drill holes encountered mineralization where expected, but the width of the mineralized zones varied more than previously noted, and the grades were also less consistent

between intersections. The assay data were composited to allow for statistical analysis using the Surpac™ composite downhole function with the following parameters:

- composite length: 3.0m
- composite length determined by: fixed length
- minimum percent of sample to be included: 75
- dilute negative samples: yes.
- selection method: none

Intersections between drill holes and the 3D models were calculated to produce intersection tables in the database. Assay values were then composited within each lode within the deposit. Simple statistical analyses were performed on graphite grades in each zone and structure, to determine top cut limits. In this modeling exercise, no top-cutting was performed as no mining or reconciliation studies between forecast grade and recovered product have been performed on the deposit, and no comparisons can be drawn to producing graphite mines. The composited assay values for each element in each zone and structure were subjected to variogram analysis to determine appropriate search ellipsoids and variogram models for block model estimation.

14.4 Specific Gravity

A total of 7,202 specific gravity measurements were recorded from drill cores within the Graphite Creek deposit area. Of these, 2,830 were located within the mineralized lodes. Due to the availability of this high-quality and detailed data set, it was decided to estimate the density of each block within the block modes as was done with the graphite grades. It was felt that this process would provide a more detailed picture of the variations in the specific gravity of the various rock units within the deposit.

The estimation process used to calculate specific gravity was described clearly in (Eccles et al. 2015):

“The estimation technique used to calculate the density value for each block was inverse-distance squared. A search range of 200 m x 50 m x 50 m was used, which was once again governed by variographic analysis of the density measurements. The search ellipsoids for the density calculation were the same as the one used for the grade calculation. Run one used a search ellipsoid range of half the suggested range (200 m x 500 m x 50 m) with a minimum of two samples from two drill holes; run two applied the suggested range with a minimum of two samples from two drill holes; run three applied the suggested search range with the requirement of two sample from one drillhole; and finally, run four used a search ellipsoid five times the suggested ranges to capture any remaining blocks.”

“Due to a slight overestimation of the density values in comparison with the mean of the density samples for Lode 8, it was decided to apply a nominal density of 2.73 kg/m³ to all blocks situated within Lode 8. The mean of the density values collected for Lode 8 was 2.75 kg/m³, so applying a nominal value of 2.73 kg/m³ is considered conservative. Lode 8 is singled out because this part of the resource has only wide spaced drilling. All other blocks were estimated using the parameters stated above. The results of all interpretations, analyses and investigations in this study were compared to the results of the 2015 technical report (Eccles, et al. 2015) and no significant differences were noted.”

14.5 Block Model

A block model was then constructed for the Graphite Creek deposit. The table definition for the deposit is given in Table 14-1.

Table 14-1 Block model definition and attributes

TYPE	Y	X	Z
Minimum Coordinates	7210500	471000	-200
Maximum Coordinates	7215000	477500	500
User Block Size	12.5	12.5	2.5
Min. Block Size	12.5	12.5	2.5
Rotation	0	0	0
Total Blocks			
		529718	
Storage Efficiency %			
		98.98	
ATTRIBUTE NAME	TYPE	DECIMALS	BACKGROUND
x_extent	Real	1	0
y_extent	Real	1	0
z_extent	Real	1	0
hg_domain	Integer	-	0
lg_domain	Integer	-	0
name	Character	-	
cg	Real	2	0
class	Integer	-	0
sg	Real	2	0
contained_graphite	Integer	-	0

A block size of 12.5 m x 12.5 m x 2.5 m was selected to reflect the anticipated mining method of open pit truck and shovel extraction.

14.6 Grade Estimating Parameters

Once the block model was created, and the variography and isotropy determined, the block model was estimated using the Inverse Distance Squared estimation method. The nine lodes in the deposit were estimated separately, constrained by the appropriate 3D model for each estimation. This prevented the estimation routine from using intersections from adjacent lodes when calculating individual block grades.

The grade estimation process consisted of carrying out four passes of calculations for each lode. This was done to differentiate between the levels of confidence for the grade distribution within various regions of the deposit. It also provided for the estimation for all blocks within the defined lodes, leaving no blank regions. To be classified as Indicated, a block had to meet the following criteria: a nominal search distance of 100 m x 50 m x 40 m, and at least two composites from at least two different drill holes used in the estimation. To be classified as inferred, a block had to fall within one of the mineralized lodes and not meet the requirements for classification as Indicated.

14.7 Mineral Resources Classification

The Indicated and Inferred Graphite Creek Resource estimate has been classified in accordance with guidelines established by the CIM “Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines” dated November 23rd, 2003 and CIM “Definition Standards for Mineral Resources and Mineral Reserves” dated May 10, 2014.

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.

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.

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.

The Indicated and Inferred Graphite Creek Resource estimate has been classified according to the CIM definition standards. The classification was based on geological confidence, data quality and grade continuity. The most relevant factors used in the classification process were:

- Drillhole spacing density;
- Level of confidence in the geological interpretation where the observed stratigraphic horizons are easily identifiable along strike and across the deposit, which provides confidence in the geological and mineralization continuity; and
- Estimation parameters (i.e., continuity of mineralization).

14.8 Mineral Resource Estimates

The Graphite Creek deposit contains 10.3 million tonnes classified as Indicated resource at a mining cut-off of 6% graphitic carbon and 71.2 tonnes of Inferred resource, also at a 6% mining cut-off grade. Table 14-2 and Table 14-3 respectively show the Indicated and Inferred resource at several different cut-off grades. A final mining cut-off grade of six percent graphitic carbon was selected as it would produce mill feed grading seven percent graphitic carbon. This has been determined to be the minimum grade required to support economically viable graphite production in western Alaska. The six percent cut-off information has been highlighted for clarity. The various factors supporting the selected mining cut-off value are described in the appropriate sections elsewhere in this report.

Figure 14-2 shows the location of the diamond drill holes, the portions of the resource classified as Indicated and Inferred. This figure also shows the locations and relative positions of the nine mineralized lodes.

Table 14-2 Graphite Creek Deposit Indicated Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INDICATED	3.0	17.97	6.3%	1,134,000
	4.0	17.34	6.4%	1,111,000
	5.0	15.10	6.7%	1,009,000
	6.0	10.32	7.2%	744,000
	7.0	4.46	8.2%	367,000
	8.0	2.07	9.1%	189,000
	9.0	0.76	10.3%	78,000
	10.0	0.29	11.7%	34,000

Notes to the Mineral Resource Estimate:

1. Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no guarantee that all or any part of the indicated or inferred mineral resource will be converted into a mineral reserve. 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.
2. Values in the tables have been rounded. Totals may not tally due to rounding errors.
3. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs

Table 14-3 Graphite Creek Deposit Inferred Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INFERRED	3.0	154.44	5.7%	8,769,000
	4.0	121.62	6.2%	7,591,000
	5.0	105.81	6.5%	6,881,000
	6.0	71.24	7.0%	4,969,000
	7.0	22.24	8.2%	1,823,000
	8.0	8.79	9.3%	817,000
	9.0	3.45	10.8%	374,000
	10.0	1.52	12.6%	192,000

Notes to the Mineral Resource Estimate:

1. Mineral resources are not mineral reserves and do not have demonstrated economic viability. 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.
2. Values in the tables have been rounded. Totals may not tally due to rounding errors.
3. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs

Figure 14-2 below shows the location of the diamond drill holes, the portions of the resource classified as Indicated and Inferred. This figure also shows the locations and relative positions of the nine mineralized lodes.

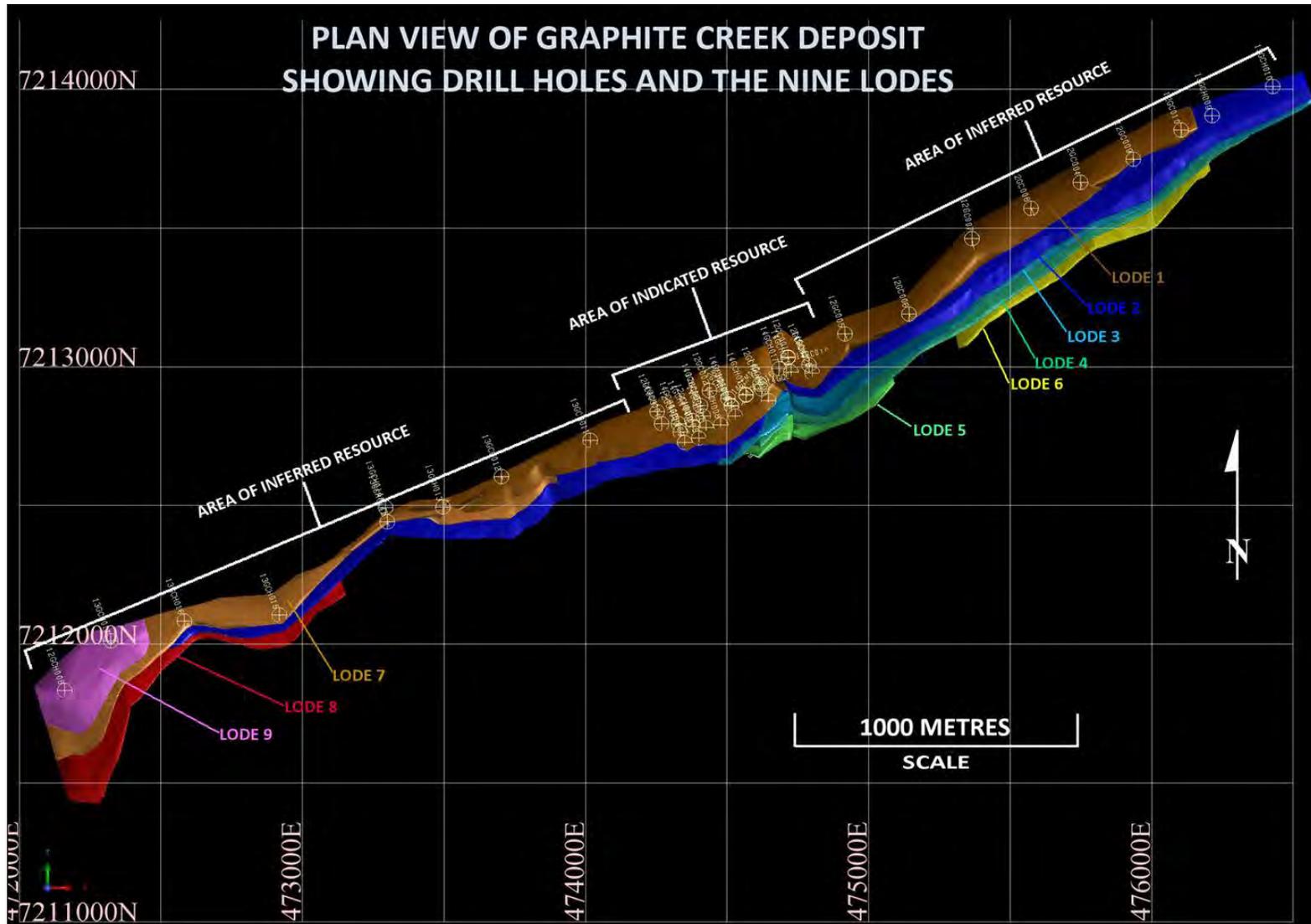


Figure 14-2: Plan view of the Graphite Creek Deposit showing diamond drill hole locations and the location and relative positions of the 9 identified mineral lodges

Figure 14-3 is a cross section looking northeast, showing a slice through the block model in the eastern zone. Drill hole 12GC010 is shown on section, as are the graphite grades for the blocks on the section in Lodes 1, 2 and 3, from left to right in the section. Lodes 4, 5 and 7 have been omitted from the section for the sake of clarity.

Figure 14-4 is a cross section looking east through the central portion of the deposit in the Indicated Resource area. Four drill holes and Lodes 1, 2, and 3 are visible on the section and the continuity between drill holes within the individual lodes is clearly apparent. The remainder of the lodes have been omitted for the sake of clarity.

14.9 Modifying Factors

Economic factors pertaining to transportation, infrastructure, markets, prices and types of products to be produced from the mined graphite are discussed in detail in the appropriate sections of this report.

14.9.1 Mineral Processing Feed

Investigations were carried out with the goal of locating near-surface, mineralization that would be available as mill feed at or near the start of operations. The scale of graphite mineralization for different grade intervals and increasing cut-off grades as identified in the geological model is summarized in Table 14-4.

Table 14-4 Tonnage and grade of near-surface zone of higher than average grade at east end of the deposit

CUT-OFF GRADE (% Cg)	TONNAGE (TONNES)	GRAPHITE GRADE (%Cg)	CONTAINED GRAPHITE (TONNES)
6.0	43,660,000	7.0%	3,050,000
7.0	11,650,000	8.5%	990,000
8.0	5,640,000	9.6%	540,000
9.0	2,360,000	11.4%	270,000
10.0	1,450,000	12.4%	180,000
11.0	1,320,000	12.9%	170,000
12.0	1,170,000	12.8%	150,000

The Graphite Creek Project has been designed on a basis of six percent mining cut-off grade, producing a 7.0% mill-feed Cg grade, as this is the long term projected average grade of the area targeted for exploitation. The scale of available material at 7% Cg is estimated 43.66 million tonnes, which is sufficient to support over 40 years of mining at full-scale production of 1,018,000 tonnes per year.

This current life-of-mine (LOM) estimate does include other material at 7% Cg that may be available outside the current drilling exploration area, which only constitutes a small portion of the Property.

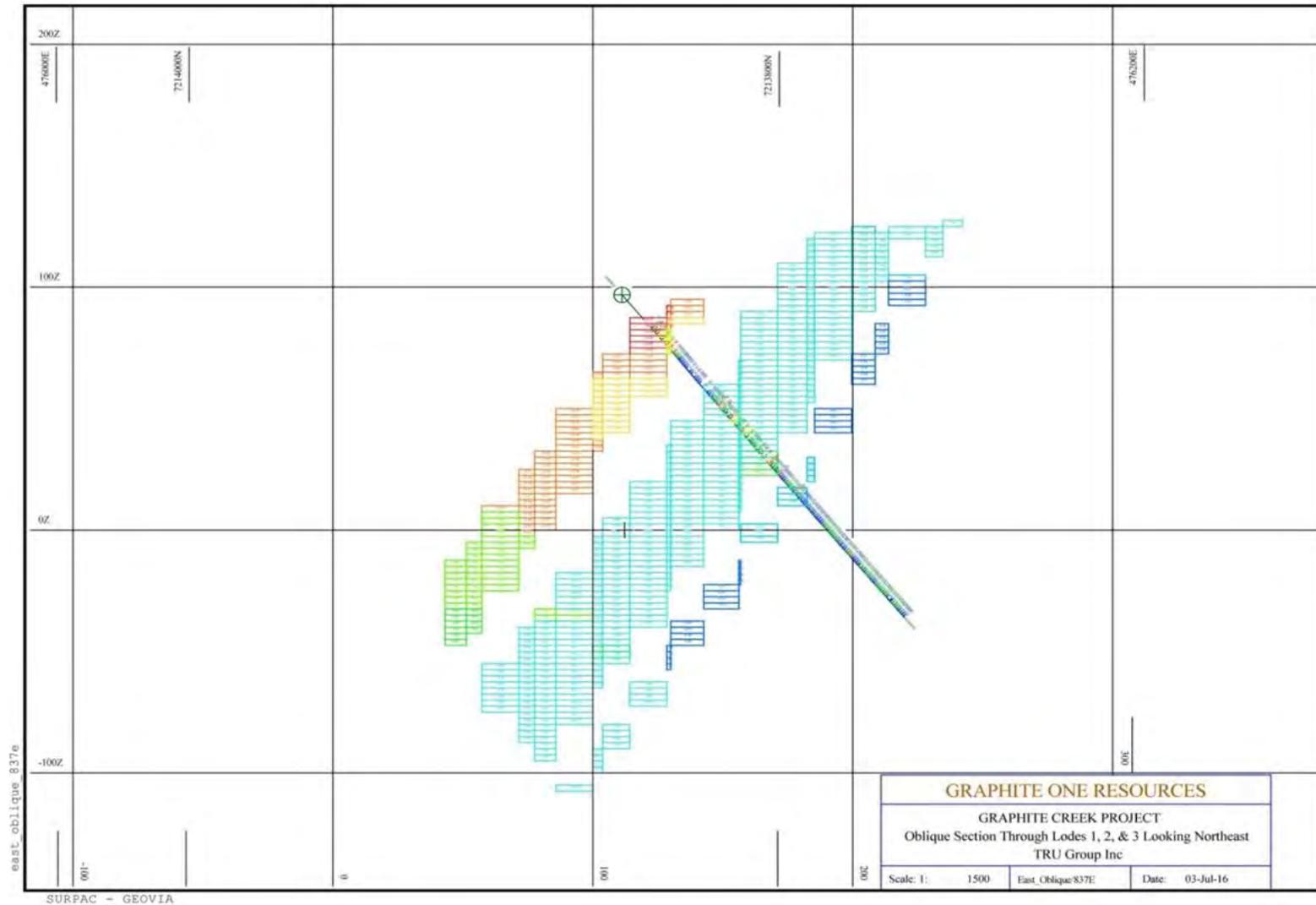


Figure 14-3: Oblique section through drill hole 12GC010 and block model representation of Lodes 1, 2 and 3 at east end of the deposit

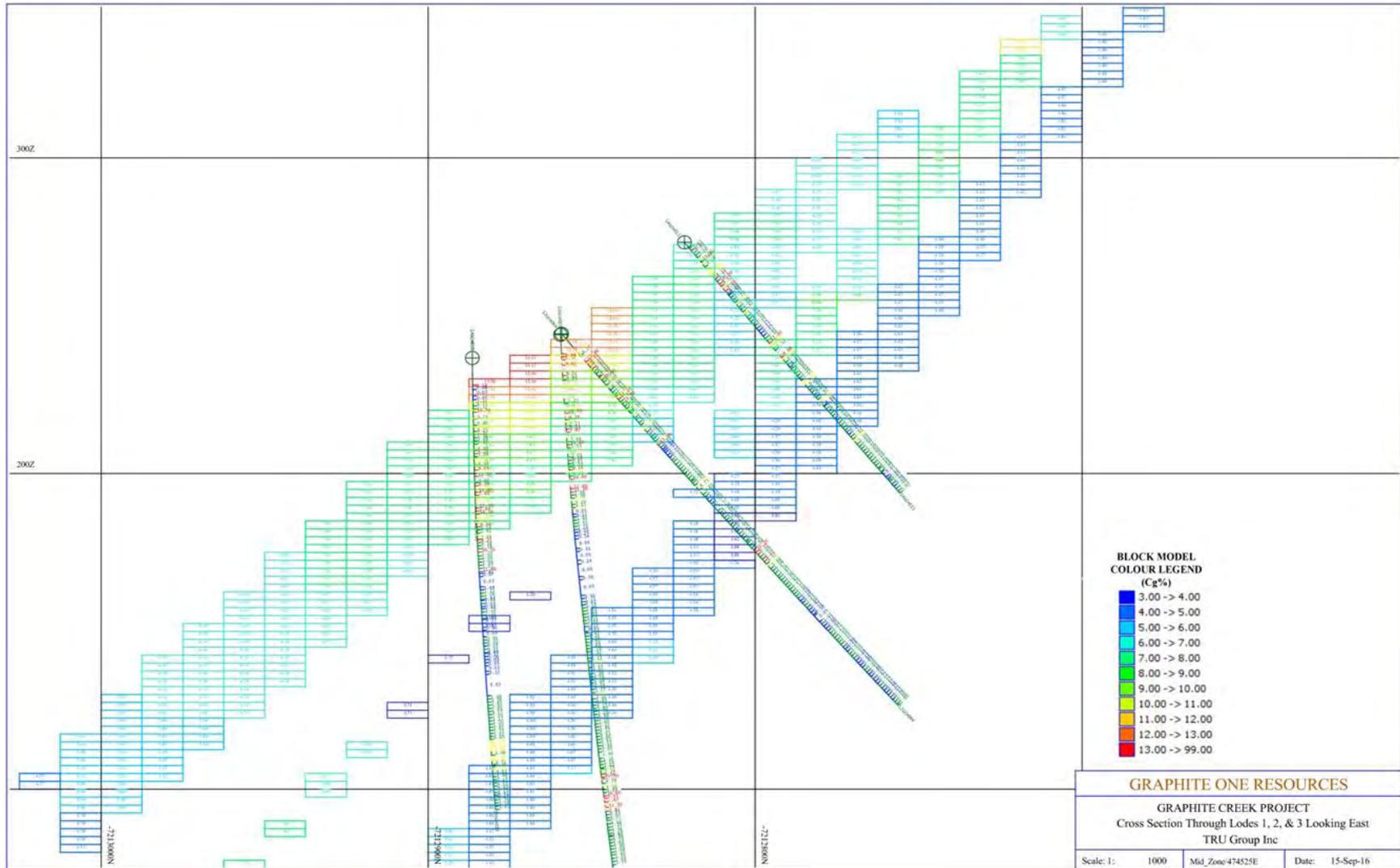


Figure 14-4: Cross section through lodes 1, 2, and 3 on section 474525E near centre of indicated resource

15 MINERAL RESERVE ESTIMATES

There are currently no mineral reserves defined for the Graphite Creek property as a feasibility study has not been carried out. There is no guarantee that any or all of the reported mineral resources will be upgraded to mineral reserves.

16 MINING METHODS

16.1 Introduction

The Graphite Creek deposit outcrops at the surface, along a significant length of outcrop and maintains a relatively shallow dip below the land surface. The most cost-effective mining methods to be utilized for this project would be a surface mining technique. Mining capital cost allocations are discussed in Section 21 Capital Costs and Operating Costs, but a brief summary of production rates and equipment requirements is included here for clarity. It is currently presumed that mining is performed year-round to optimize the use of capital and equipment and as with all other aspects of the project, would be owner operated. This is preferable due to the economic and security advantages provided by vertical integration of the project from mine to finished product.

A summary of the equipment required to operate an open pit mine as envisioned in this study is included in Section 16.4 Mine Equipment, Facilities & Personnel.

16.1.1 Mine Operator

Graphite One could contract the mining operations should the Company find it beneficial to do so. The decision would most likely be based upon the client's ability to effectively manage the overall mining operations, the cost of acquiring the necessary capital to build the mine, and the increase to the per tonne mining cost that would be required to allow the contract miner to make an effective profit. Regardless of whether the client operates the mine or if it is contracted out, the methodology and approximate base-line costs generated in this report still apply.

16.1.2 Operating Season

Seasonal mining is a possible future operating scenario. However, it has been presumed that a year-round operation would provide a much more effective use of the mining equipment, afford the use of smaller-scale equipment, and would not be seriously affected by winter weather. Many mines operate in a similar environment without significant decrease in efficiency or increase in operating costs. A few examples include; Teck Red Dog and Kinross Fort Knox in Alaska, the Diavik, Ekati and Gahcho Kue diamond mines in Canada's Northwest Territories, the Meadowbank gold mine in Nunavut, also in Canada, as well as numerous mines across Scandinavia and Russia. The success of these operations demonstrates the feasibility of mining year-round in the North.

Should Graphite One wish to operate on a seasonal basis, it would likely increase costs based upon the necessity to utilize larger equipment to move more overburden and mill feed in a shorter time frame. It would add additional costs for maintaining a large stockpile and the associated re-handle costs for moving the extracted graphite mineralization from the stockpile to the mill. While this type of operation could be feasible in the future, for this analysis, it was simpler to presume a year-round operation to minimize the mining costs.

16.1.3 Geotechnical Assessments

Insufficient technical assessments specifically suitable for explicit definition of the geotechnical parameters for the Graphite One Graphite Creek mineralization are currently available. All drill core recovered by the company has undergone geotechnical logging along with geological, structural and mineralization characterization. The data obtained through analysis of the core will be utilized in the proposed geotechnical evaluations. This will include additional core drilling and further slope stability studies.

16.1.4 Hydrological/Hydrogeological Assessments

Insufficient technical assessments specifically suitable for explicit definition of the hydrogeologic parameters for the Graphite One mineralization are currently available. Graphite One has completed four seasons of surface groundwater volume and flow measurements on the creeks in the project footprint and Cobblestone River as part of the baseline sampling program. Groundwater depth locations in the exploration core holes completed during the three seasons of drilling were recorded in the driller's logs and geologists field notes. The assessment of the groundwater hydrology of the site will require drilling of monitoring wells and more detailed hydrological investigations.

16.1.5 Seismic Monitoring and Assessment

Seismicity issues were not considered in conceptual design at this point in the project planning. The seismicity must be assessed and considered in subsequent and more advanced engineering stages of the project.

16.2 Open Pit Mining

The area which has been modeled in greater detail and selected for the earliest phases of mining is located along a relatively continuous 1500-meter outcrop of mineralized material between approximately 474,000 E and 475,500 E (see Figure 16-1). This zone has been modeled as being segregated into three separate zones of graphite mineralization, termed Lodes 1, 2 and 3. Based on surface mapping and diamond drilling, it was determined that the barren rock zone between Lodes 2 and 3 are highly variable, with thicknesses ranging from zero to as much as 5 meters (Figure 16-2). The three Lodes dip gently at approximately 45° down slope to the north under an increasing amount of overburden.

It has been assumed that the open pit mining will likely be designed to first remove the non-resource bearing overburden, then mine the resource defined as Lode 1. Subsequent to this removal, the resource-barren interburden between the base of Lode 1 and the top of Lode 2 will be removed and discarded. Since the resource-barren interburden between Lode 2 and Lode 3 is rather small and inconsistent in thickness, it has been assumed that Lode 2 and Lode 3 will be mined as a single unit, with the extraction of the non-resource bearing material done as a sub-stage of the mining process.

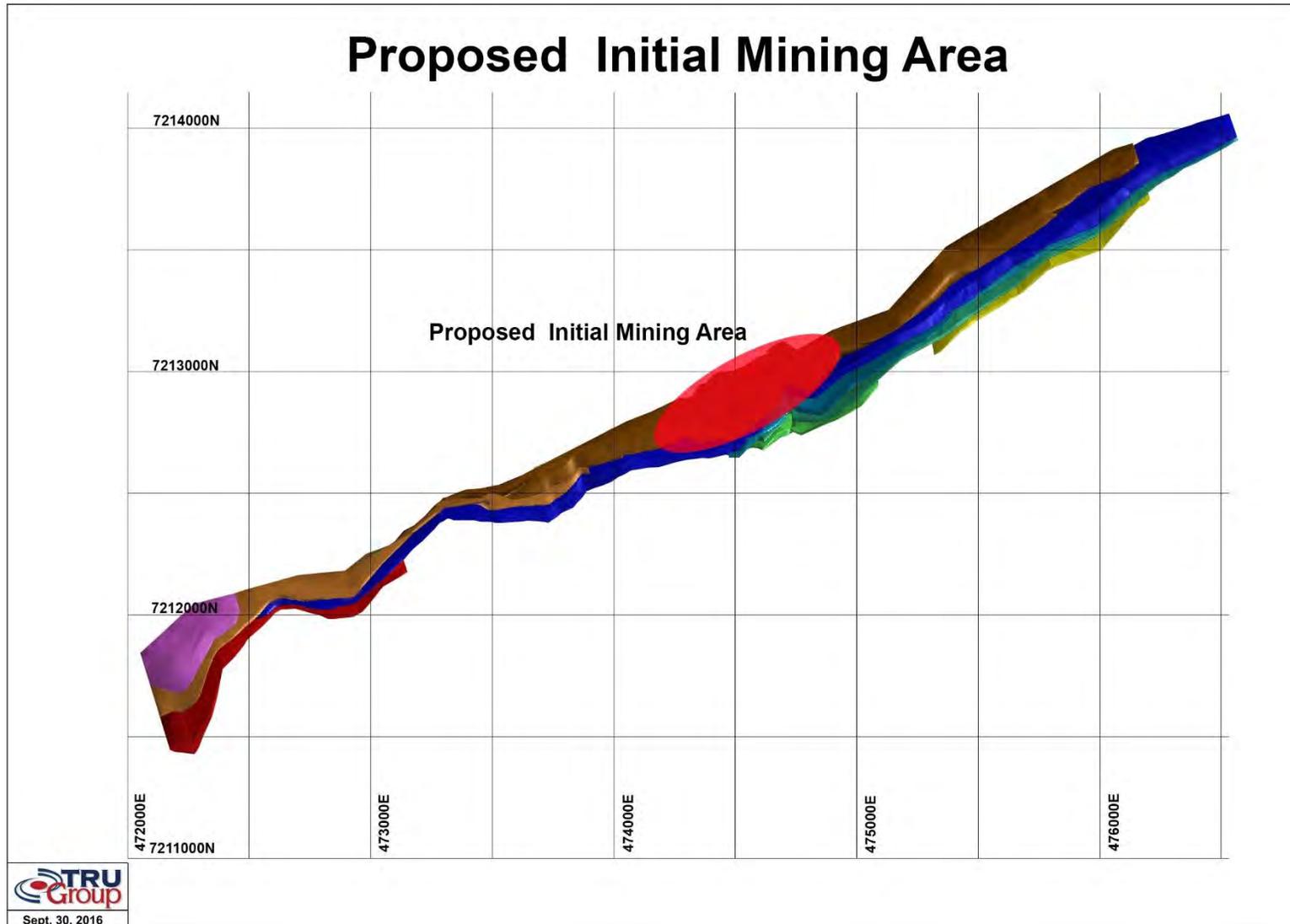


Figure 16-1: Proposed open pit mining area encircled in red.

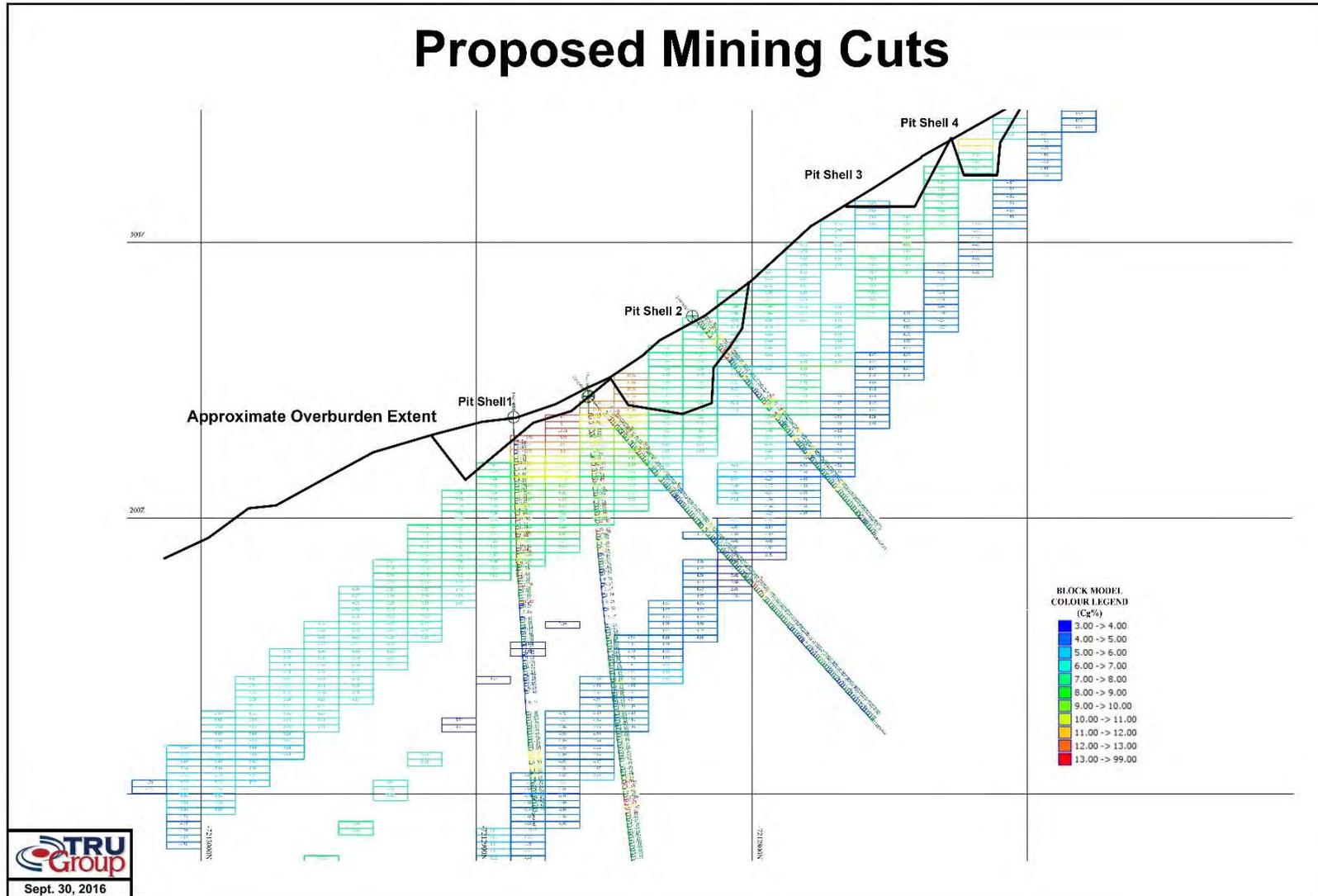


Figure 16-2: Idealized cross section through middle of pit area showing relative positions of the four bench areas

The mining methodology is planned as a truck and shovel operation mining along several contiguous, en-echelon, pits starting at the outcrop and progressing in the down dip direction. This method of mining allows the maximum flexibility as the equipment is highly mobile and can be moved between the active mining pits to offer the most economic extraction of the material and allow the mining engineers a high degree of flexibility in mining the resource-bearing material in a manner which allows the delivery of a consistent grade to the processing plant.

The mine has been designed to operate on a 24-hour per day schedule (assuming two 12-hour shifts per day) on a year-round basis. Numerous mines operating in similar climates were evaluated and it was determined that the continuous operation model offers the most cost-effective type operation. The factors leading to this cost-effectiveness stem primarily from the use of smaller equipment over a longer time frame. This significantly reduces the initial capital expense of purchasing smaller sized equipment as well as offering the reduction in the day-to-day operations and maintenance costs of operating smaller equipment. Additionally, the smaller equipment offered by this plan is much more flexible and mobile and offers significant cost savings in operating the mine in the most cost effective manner by keeping the equipment operational for longer periods of time.

16.2.1 Mine Design

The mining operation would be conducted along 4 active benches: Bench 1 – Overburden extraction, Bench 2 – Mining of Lode 1, Bench 3 – Extraction of Inter-burden, and Bench 4 – Mining of Lode 2/3. As mining progresses with time, the benches will proceed along the outcrop surface and will also continue to mine to depth in the down dip direction.

Bench 1: This initial bench (see Figure 16-3) will remove the non-graphite bearing material from the surface down to the top of the graphite-bearing Lode 1. The mining involved with this bench will remove the non-graphite bearing material situated from the topographic surface down to the top of the graphite-bearing Lode 1. As this bench will initiate at the outcrop, the initial bench will be thin, but will increase in volume as the land surface rises and the natural dip of the graphite mineralization progresses to greater depths. It is noted that the topsoil extracted from this zone will be saved for later cover of the reclaimed mine area.

Initially the material extracted from Bench 1 will be stockpiled near or adjacent to Bench 1 at a site defined as suitable by geotechnical testing. Generally, this stockpile is located as close to the initial cut as possible to minimize trucking costs. It is noted that as the initial phases of Bench 1 are in an area with a relatively thin layer of overburden, this stockpile will be of minimal size. As mining progresses, the material extracted below the topsoil and above Lode 1 will be trucked to the previously mined area below Bench 4 and the material dumped back into the existing open cut.

Bench 2: This bench entails the mining of the graphite material identified within Lode 1. Over the course of mining the thickness of the bench will vary within the vertical dimensions of the graphite mineralization body, but will not increase or decrease in any progressive pattern. As such, the truck and shovel methodology proposed offers the optimal mining process to effectively extract the material without including significant dilution from the non-graphite bearing overburden or interburden. The material extracted from Bench 2 will be trucked to the mineral processing area for further treatment.

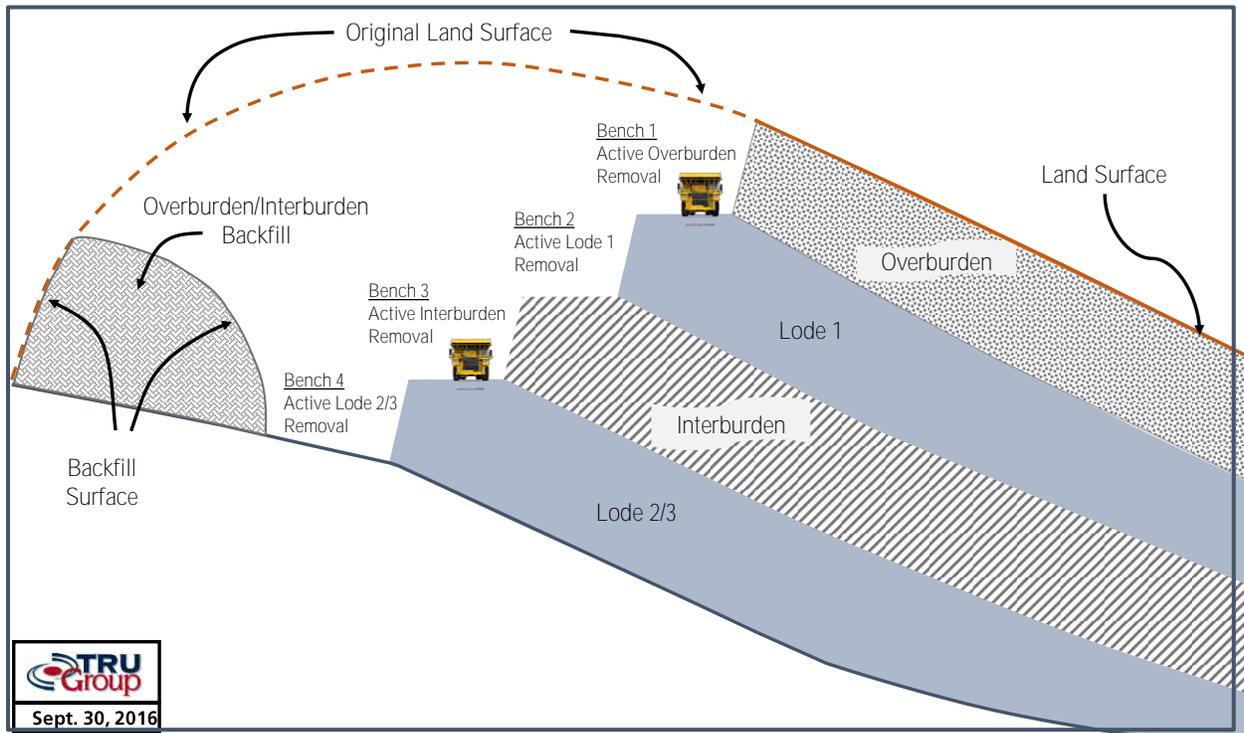


Figure 16-3: Schematic cross-section of conceptual mine plan near center of indicated resource identified in Figure 16-1.

Bench 3: This bench will entail the extraction of the non-graphite bearing interburden between the bottom of Lode 1 and the top of Lode 2. As noted in the Resource modeling performed in Section 14, the thickness of this interburden zone is variable. As a result, the boundary between the bottom of Lode 1 and the top of Lode 2 will need to be carefully defined by the mine staff and care must be taken to assure that the extraction of the barren interburden material does not include significant extraction of the graphite bearing material from the top of Lode 2. Material from this bench will be trucked to a previously mined area below Bench 4 and the material dumped back into the existing open cut.

Bench 4: This bench (See Figure 16-3) entails the mining of Lodes 2 and 3 as a single unit. As noted before, the non-graphite bearing inter-burden between these two lodes is quite small and variable and, as such, does not lend itself to a dedicated mining horizon. During the mining of Bench 4 it is expected that the mine staff will identify larger zones of non-graphite bearing rock within the bench cut and extract this material for disposal rather than including it in the mill feed extracted from the bench. The non-graphite bearing material will be trucked to a previously mined area below Bench 4 and the material dumped back into the existing open cut (see Figure 16.2). The graphite-bearing material extracted from Bench 4 will be trucked to the mineral processing area for further treatment.

16.2.2 Mining Methodology

To effectively follow the mine plan outlined above, the optimal method of surface mining will be to conduct what is termed a “truck and shovel” type operation. This method of mining is characterized by its flexibility in mining mineralized bodies of variable thickness and its ability to operate in a multi-pit situation. The material to be moved (whether mill feed material or waste rock) is first blasted to loosen and break up the material. The loosened material is then scooped up by large volume shovels and deposited in large trucks, which transport the material to the mill feed treatment area or to the waste rock dump area.

Planning and production estimates are based on simultaneous production from the four benches described above. Grades of graphite mineralization would be closely monitored during production drilling, and production rates in the individual benches would be adjusted to meet operational and mill-feed requirements. The basic mine concept presumes that each of the four benches outlined above will have a large shovel and at least two trucks available for material haulage.

One of the benefits of the truck and shovel operation is that all the equipment can be moved between benches to facilitate timely and cost-effective material handling depending upon the needs of any particular area. As noted above, Bench 1 will require only minimal hauling in the early portions of the mine process, but will require the movement of significantly larger volumes of material as mining progresses in the down dip (down slope) direction. It is quite feasible for the machines operating in a pit requiring less material movement, i.e. Bench 3, to move to Bench 1 for extended periods of time. Effective mine planning will allow the optimal utilization of the existing equipment without the cost of purchasing machines that will not be fully utilized.

Pit optimizations do not include individual benches or ramp design. For the pit size, production requirements, and recommended equipment fleet, TRU considers mining of 10 to 12 m benches in two cuts and development of an 18 m wide ramp, including ditches and safety berm, to be appropriate for the open pit operations. The ramp should be designed with a maximum 10% gradient with the exit appropriately located to minimize transport distances to the mill and the waste rock dumps. Industry average pit slope angles are assumed at this stage of planning.

16.2.3 Mining Waste to Mineralization Strip Ratio

The mining strip ratio is a number which relates the volume of the non-graphite bearing material (waste) moved during the mining process to the volume of the graphite mineralization (mill feed) and is generally expressed as a 3:1, 8:1 or 12:1 value, with the non-bearing material volume noted first and the mineralized volume noted second. It is noted that the “overburden” number includes the material located above the mineralized body (overburden), non-graphite bearing material between the mineralized Lodes (interburden), and non-graphite bearing material within the mineralization.

A comprehensive engineering study quantifying the overburden ratio for the proposed mine was not carried out for the preparation of this report. An estimate of the overburden ratio was generated by analyzing the cross sections generated during the modelling process, and estimating the final pit slope angle. Based upon these assessments it is estimated that the overburden ratio for this project ranges between 2:1 and 4:1. For all subsequent discussion, a value for the overburden ratio was selected to be a conservative 3:1.

16.2.4 Production Output and Schedule

The graphite mineralization, as modelled in Section 14, is calculated to include in excess of 40 million tonnes of inferred resources. The mining plan outlined above proposes mining of graphite mineralized material at an ultimate rate of 3,090 tpd (1,018,000 tpy), as summarized in Table 16-1 and illustrated in Figure 16-4.

Table 16-1 Planned Production Unit Capacities by Period in tpy

UNIT PRODUCTION INPUT-OUTPUT	PLANNED CAPACITY						
	tpy						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Years 7+
Mineral Processing Plant							
Plant Feed Input	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000
Graphite Concentrate Output	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Tailings Output	287,400	383,200	479,000	766,400	862,200	958,000	958,000

Sources & notes -
TRU Estimates

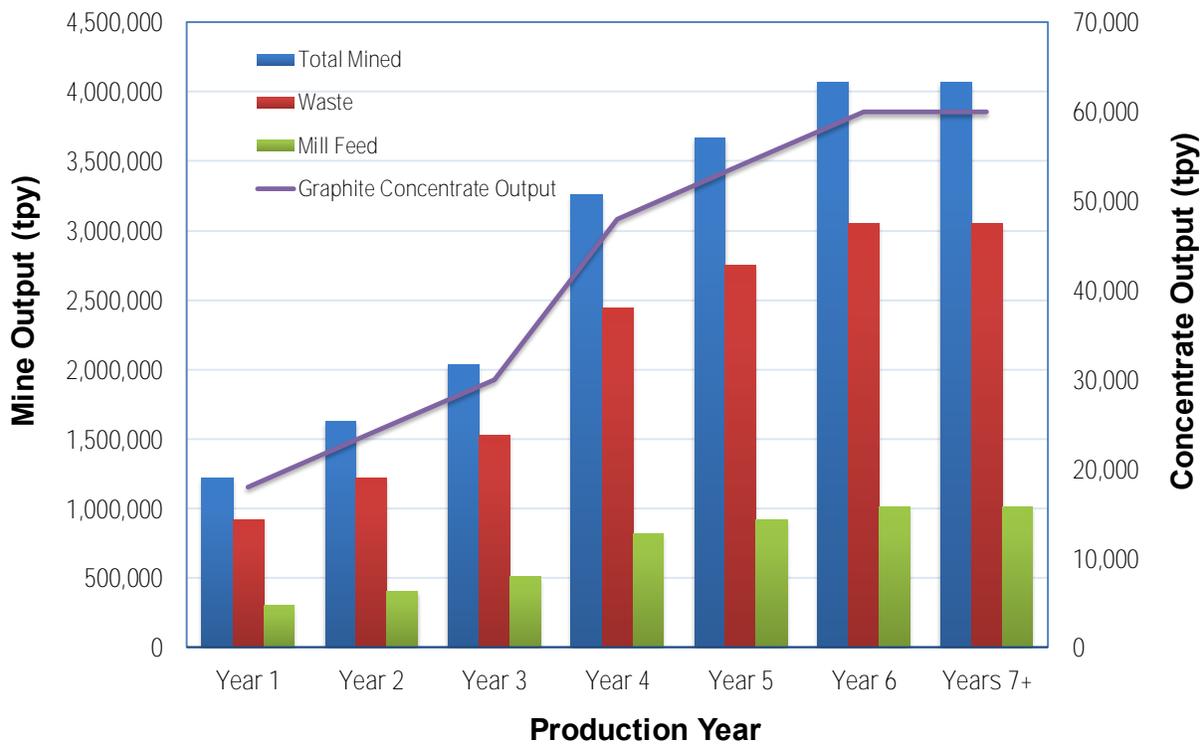


Figure 16-4 Planned production unit capacities in tonnes per year.

Based on the modelled portion of the graphite mineralization at 7% Cg, the inferred resources could conceivably sustain the proposed mining rate for 20 years and up to 40 years. Additional graphite material has also been identified outside the modelled area indicating that mining could possibly be conducted at a higher rate or longer period. This would be dependent upon additional assessments of the graphite mineralization outside the modelled area. Conclusive determinations on the extended lifespan of the project can only be made with additional infill drilling to upgrade the classification of inferred and projected resources (outside the exploration area) and further evaluation of pertinent economic criteria.

16.3 Facilities Location

The location of the mine itself will correspond to the outcrop of the graphite-bearing rock formation defined previously and will overlay the area defined within the resource estimation performed in Section 14.8 Mineral Resource Estimates. The actual size and final footprint of the mine will be greatly dependent upon the extraction rates (tpy) and the number of years that the mine operates. It has been previously noted that there exists the excellent potential for additional resources outside the defined resource estimation area, which would be dependent upon future delineation and definition drilling.

The location of the support facilities and material processing mill will be largely determined by future geotechnical studies, which will define those areas best suited for safe construction. While no specific location for these facilities is provided here, there are several factors which will be combined with the geotechnical data to determine the optimal facility location.

One of the more critical factors in placement of the mill will be to locate the processing facility as close to the mine as possible. A proximal location will reduce the travel time for the haulage trucks, which saves on operational costs as well as maintenance. Additionally, a proximal location allows the use of smaller trucks which will cycle faster thus again reducing operational costs as well as initial capital expenditures. Finally, while it is necessary to place the facility where the geotechnical testing dictates, if the mill can be located at a nearby location that is topographically lower than the mine, this will also reduce truck operations costs by having the loaded trucks moving downhill and the empty trucks moving uphill.

The location of the mine support facility should likewise be located as proximal to the mine as is feasible. While a close location of the facility is not as critical as the mill, there are definite operational advantages to reducing the distance between the mine and the support facility. Among these advantages is the nearby location of the maintenance shop and refueling depot. The reduction of travel time for the equipment between these facilities will serve to minimize the mine costs. Additionally, having a proximate location from which to stage the equipment and mine operations will serve to make the mine run more efficiently.

The infrastructure that is being currently proposed for the Graphite Creek Mine site includes:

- Process plant
- Access and site roads
- Power generation
 - Substation
 - Distribution to various parts of the site

- Mining/processing water distribution/storage facility
- Tailings pond
- Water treatment facility
- Camp with admin offices
- Sewage treatment facilities
- Communications towers/equipment
- Storage facilities

16.4 Mine Equipment, Facilities & Personnel

To conduct the mining operations described above the following equipment and, personnel would be necessary:

Equipment Estimates

Hydraulic Shovel 2m ³	4	Front End Loader 5m ³	4
Rear Dump Truck 50 t	8	Rotary Drills	4
Bulldozer D9	6	Road Grader	3
Water Tanker	3	Service/Tire Truck	5
Light Plants	16	Water Pumps	5
Pickup Truck	10		

Mine Service Buildings

Office	Maintenance Shop
Dry Storage	Warehouse
Worker Barrack	Worker Rec/Dining Facility

Hourly Personnel/per Shift

Category	Day Shift	Night Shift
Driller/Blasters	8	--
Truck Drivers	8	4
Mechanics	6	6
Excavator Operator	8	4
Equipment Operator	8	4
Labourer/Maintenance	16	8

Salaried Personnel

Manager	1	Foreman	4
Superintendent	1	Supervisor	4
Geologist	1	Clerk/Sec	2
Engineer	1		

16.4.1 Mining Capital and Operating Costs

A summary of projected capital expenditures for mining-related facilities is provided in Table 16-2 below. Operating costs related to mining operations are summarized in Table 16-3. These costs are examined in Section 21 Capital Costs and Operating Costs. Total capital cost for mining operations is estimated at \$43.1 million. Operating costs for mining are estimated at \$27.25 per tonne of delivered plant feed.

Table 16-2 Mining Capital Cost Estimate by Category and Item (US\$ millions)

CAPITAL COST CATEGORY & ITEM	COST \$ million
Mining Equipment & Facilities Costs:	\$40.0
<i>Mining Equipment</i>	26.5
<i>Mine Services Buildings</i>	4.9
<i>Site Roads and Preliminary Earthwork</i>	6.9
<i>Pre-production Stripping</i>	1.7
Indirect Costs	\$3.1
<i>Engineering</i>	3.1
TOTAL CAPITAL COST - MINING	\$43.1

Sources & notes -
TRU Estimates

Table 16-3 Mining Operating Cost Estimate at full capacity -US\$

MAJOR OPERATING COST ITEM	Mining OPEX	
	\$/year	\$/t Plant Feed
Salaried Labour	\$1,730,600	\$1.70
Hourly Labour	\$20,156,400	\$19.80
Equipment Operation	\$2,799,500	\$2.75
Supplies/Materials	\$1,781,500	\$1.75
Miscellaneous	\$1,272,500	\$1.25
Total Operating Cost	\$27,740,500	\$27.25

Sources & notes -
TRU Estimates

16.4.2 Other Mine Infrastructure

This sub-section refers to infrastructure directly designed and installed to support mining operations. Other, non-mining related infrastructure is discussed in Section 18.

DEWATERING

Dewatering wells will be drilled peripheral to the ultimate open pit footprint. Locations of the dewatering wells will be determined after further hydrogeological studies have been completed. Water from the dewatering wells as well as runoff water pumped from the pit will probably need to be processed in the water treatment plant before being released into the environment. The nature of the well water and pumped runoff water will need to be studied and characterized before a final determination of water handling procedures may be determined.

The current proposed pit outline straddles the Graphite Creek watercourse, a seasonal stream flowing northwest across the property into the Imuruk Basin. This water will need to be diverted away from the pit area. Further environmental and engineering studies will be required to determine the most economical and least environmentally disruptive method of accomplishing this.

EXPLOSIVES & DETONATORS

Detonators and explosives will be stored in approved explosives magazines. They will be located at a safe distance from the mining operations. The explosives and detonators magazines will be located away from the open pit, far enough from buildings and working areas to meet safety standards. Suppliers will deliver explosives and detonators directly into dedicated magazines for storage until use.

17 RECOVERY METHODS

The Graphite One project has been conceived as the vertically-integrated manufacturing of high grade coated spherical graphite. The concept is illustrated in the following Figure 17-1. It is framed as an American interstate project with

1. Mining and mineral processing at the Graphite Creek property in Alaska
2. Purification and value-added graphite processing performed at the Product Manufacturing Plant at developed brownfield site in the proximity of a port.

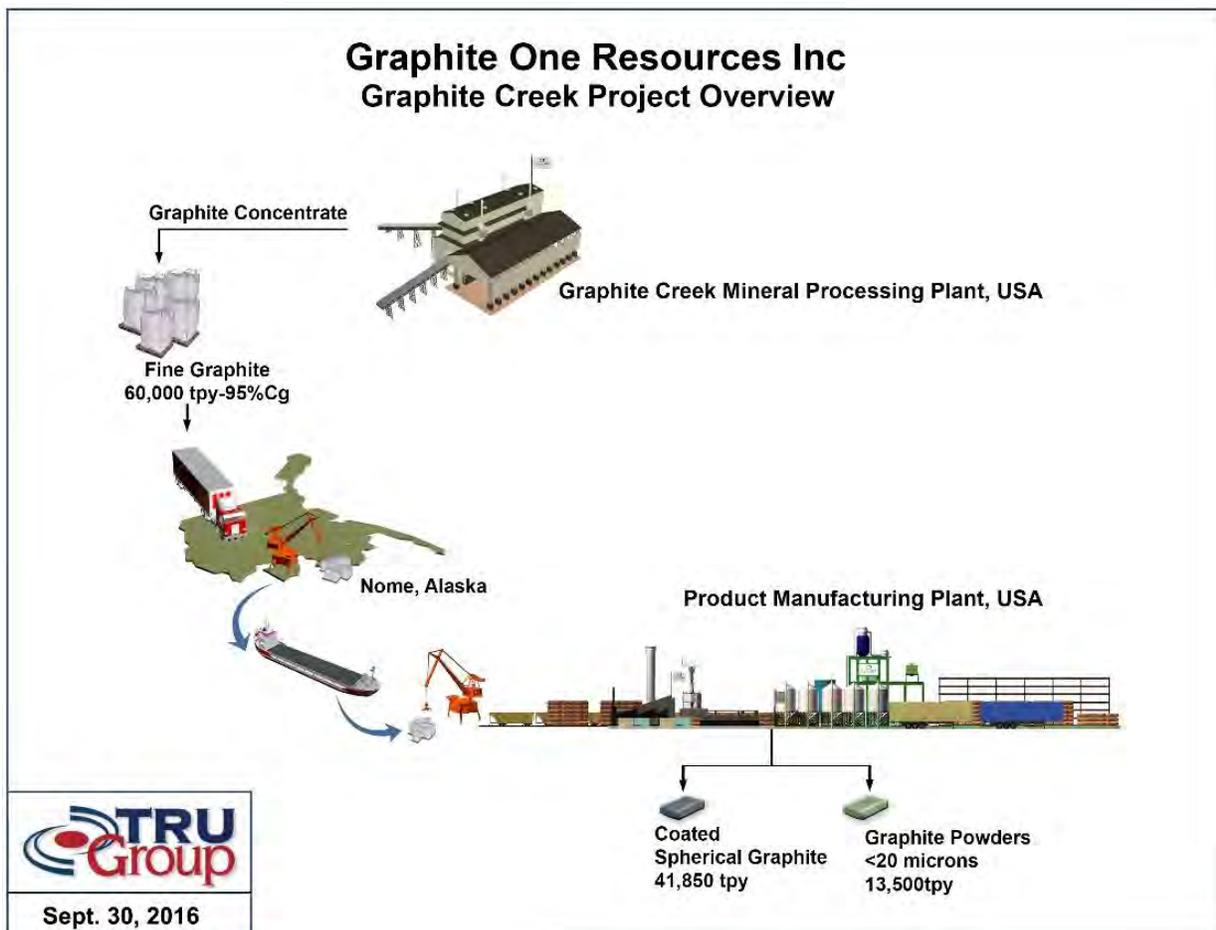


Figure 17-1: Concept for Graphite One Project at full production

Key considerations for this choice are -

- ▶ Minimizing the amount of material requiring transport out of Alaska with consequent reduction in expenditures for costly barge transport
- ▶ The proposed location for the Product Manufacturing Plant has the low-cost hydro-electric power needed for the energy-intensive purification processing and products manufacturing and is a good strategic geographic location for marketing finished products.

When the Project reaches full production capacity, open pit mining will deliver 1,018,000 tpy of graphite mineralization to the Mineral Processing Plant for the extraction and recovery of graphite into 60,000 tpy concentrate grading 95% graphite (Cg). The single concentrate is transported to the port of Nome from where it is shipped to a coastal location in proximity to Product Manufacturing Plant. The sequence of processing at the Product Manufacturing Plant includes: thermal purification of the concentrate to 99.95%+ Cg; mechano-chemical processing (spheronization) of the refined product and classification processed material into spherical graphite and reject fractions; coating the spherical graphite; and heat treatment of the ‘green’ surface coated spherical graphite. The plant is designed to deliver 41,850 tpy of high-grade coated spherical graphite for lithium-ion battery applications along with 13,500 tpy of refined, sub 20-micron graphite powder for various end-uses, Figure 17-2.

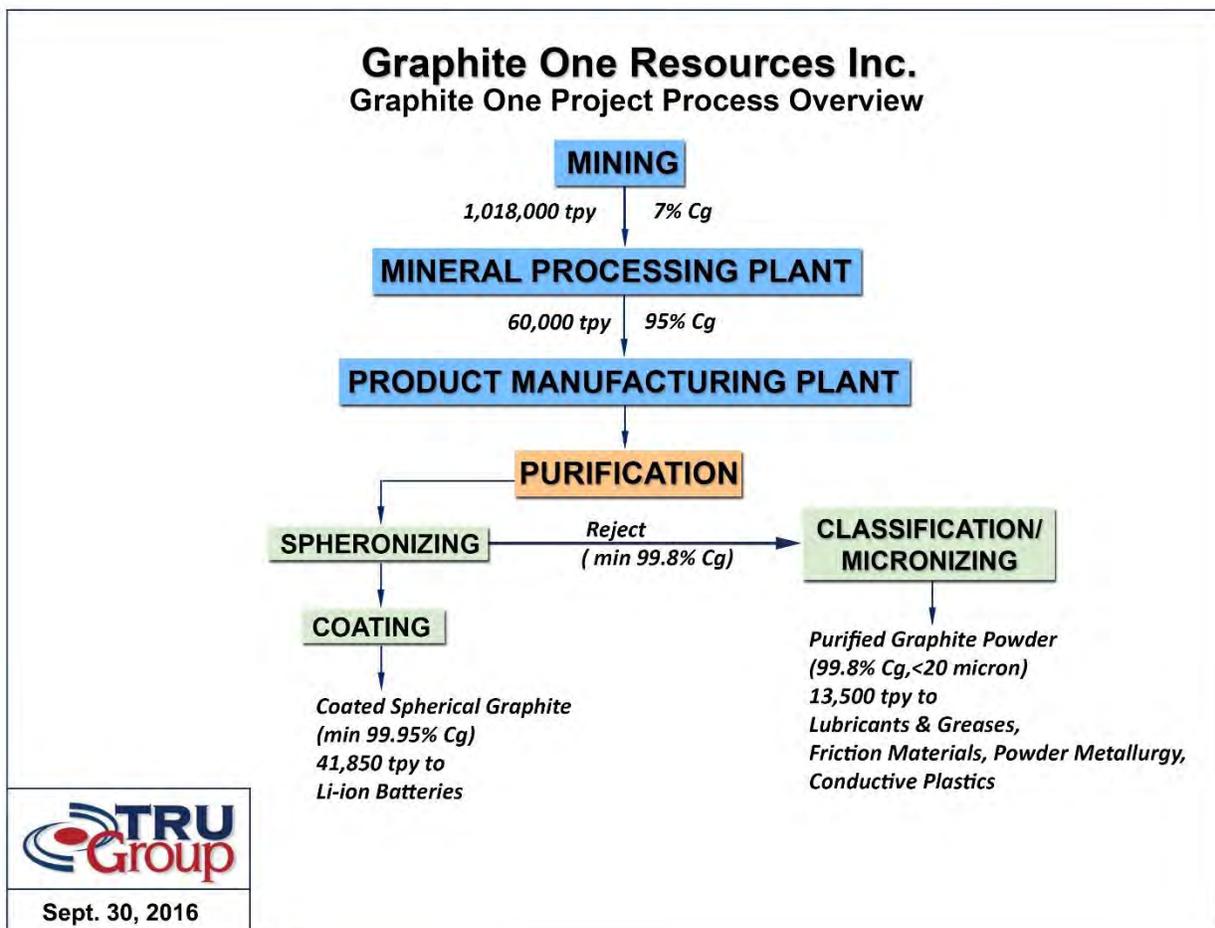


Figure 17-2: Process outline of the integrated Graphite One Project

17.1 Alaska Mineral Processing Plant

TRU's summary outline of the proposed processing of graphite mineralization at the Mineral Processing Plant at the Graphite Creek property is seen in Figure 17-3.

It is assumed that the delivered STAX Graphite mineralization has been mined at a nominal grade of 7% Cg, is crushed and beneficiated in close proximity to the mine.

Once received at the Mineral Processing Plant, the graphite mineralization is processed through the following unit operations:

- ▶ Two stages of crushing
- ▶ Initial grinding followed by conventional cell rougher flotation and cleaner flotation
- ▶ Multiple sequences of grinding/polishing with column flotation to progressively upgrade the concentrate to 95% Cg that is pressure filtered and pneumatically dried

At full project design capacity, the Plant feed is 1,018,000 tpy of mined mill feed material that yields 60,000 tpy of graphite concentrate. The concentrate is packaged in one tonne super sacks and placed in 20 t shipping containers in preparation for overland truck transport to the Port of Nome, Alaska. The containers are loaded onto barges during the seasonal shipping window and delivered to the Products Manufacturing Plant.

Mineral processing testwork indicated that the apparent coarse fraction of graphite was either low or sufficiently fragile to disintegrate or dissociate under mechanical stress. Exploratory product development testwork demonstrated that purification and mechano-chemical processing of the entire size distribution of a non-classified graphite concentrate (coarse and fine flake) resulted in recovery of spherical graphite of which nearly 75% was suitable for EV lithium-ion batteries. This supports the design decision to produce one concentrate stream for integrated processing to spherical graphite.

The Mineral Processing Plant is designed to run on a year-round (12 month) schedule. Consideration of a six-month schedule to roughly coincide with the Alaska-Washington shipping window was dropped due to the higher capital expenditures and operating costs incurred with running at a higher processing intensity and which negatively impacted the project economics.

Road clearance during winter months will ensure year-round access to the mill for labour rotations, resupply of operations and transport of concentrate to a storage area near the port of Nome, which will begin at the end of the winter season. A contracted truck transport fleet will move concentrate from the mill and will also be used to deliver fuel to the Graphite Creek Project site on the return trip. A habitation unit with living quarters and communal facilities will be established for the on-site work force.

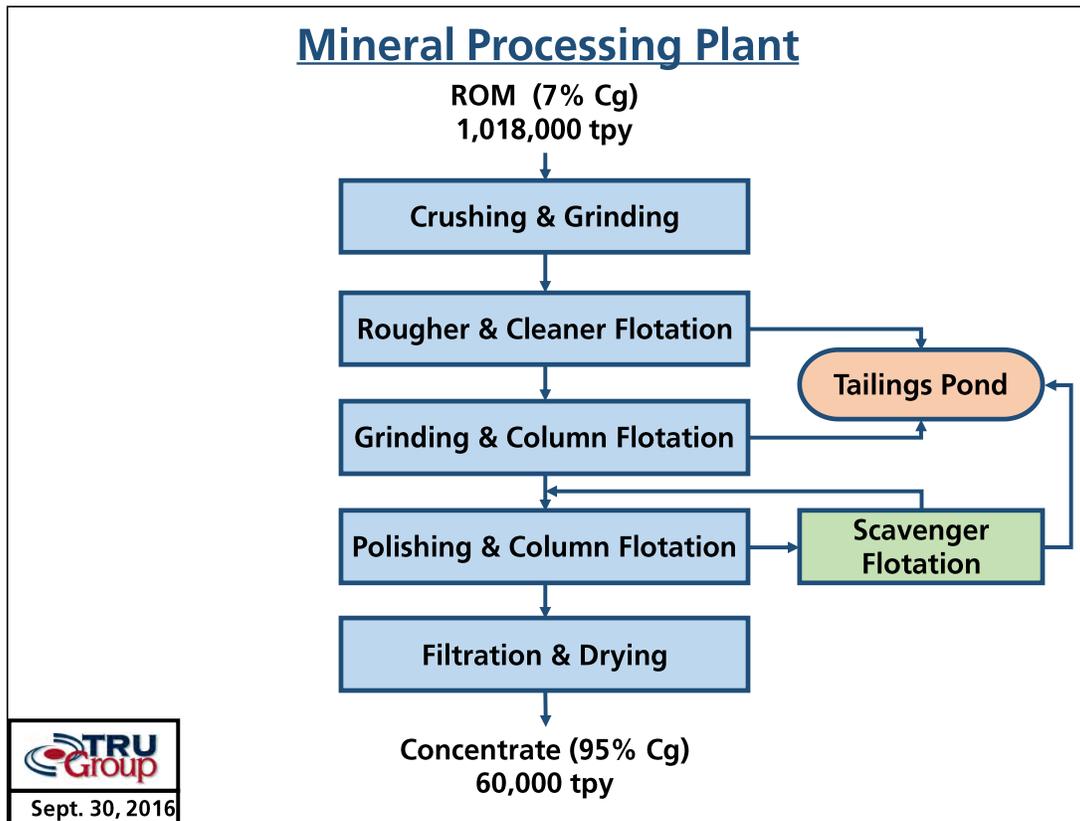


Figure 17-3: Graphite Creek Mineral Processing Plant process outline

17.1.1 Design Basis

The Mineral Processing Plant has been designed on the basis of producing 60,000 tpy graphite concentrate grading 95% Cg (graphite content). The annual feed rate of run-of-mine material grading 7% Cg to the Plant is 1,018,000 tpy. Recovery of graphite during mineral processing is assumed under optimized conditions to reach 80%. The Plant is designed to operate 330 days per year.

Table 17-1 Mineral Processing Plant design basis

Mineral Processing Plant Parameter	Value
Feed Rate	1,018,000 tonnes per year
Feed Grade	7 %Cg
Graphite Recovery	80 %
Concentrate Grade	95 %Cg
Operation	330 days per year
Concentrate Output	60,000 tonnes per year

TRU has also opted for a design that uses five parallel circuits (at full design capacity) of smaller-scaled equipment rather than incorporating one or two larger-scale equivalents in a single series for mineral beneficiation. This design will allow for better flexibility on production and improve graphite recovery. The rendered flowsheet, appearing in Figure 17-4, is one line of the entire circuit. The plant reaches full capacity (60,000 tpy concentrates) in the sixth year of operation.

17.1.2 Crushing and Grinding

Run of Mine (ROM) mineralized rock grading 7% Cg is delivered by truck to the mill where the load is deposited into dump hoppers positioned above grizzly feeders for removal of plus 500 mm material. The undersize falls through the grizzly and is fed to the primary jaw crusher to reduce the particle size from 400 mm to less than 100 mm (4 inch). Vibrating screening of the jaw crusher discharge ensures that oversize is recirculated to the jaw crusher while the undersize fraction proceeds to secondary crushing where hammer mill crushers comminute the material to 20 mm ($\frac{3}{4}$ inch). Screening of hammer crusher discharges ensures that oversize is recycled while the undersize proceeds to storage bins as feed inventory to primary grinding. There will be three crushing circuits operating in parallel when the Alaska Mineral Processing Plant is at full capacity.

Crushed material from the storage bins is conveyed to the primary grinding circuit which at full capacity will consist of five rod mills operating in parallel. The rod mill is in closed circuit with cyclones where the oversize, the cyclone underflow is returned to the mill. The cyclone overflow at a particle size P80 of 150 mesh (100 microns) flows by gravity to the rougher flotation feed conditioning tank where flotation reagents are added to the pulp in preparation for flotation. Each grinding circuit will be coupled to a flotation circuit; at full plant capacity there will also be five flotation circuits in parallel.

17.1.3 Rougher and Cleaner Flotation

Conditioned pulp is sent to the rougher cell bank consisting of four conventional impeller-agitated flotation cells, each of twelve cubic meter volume and arranged in series. The rougher flotation concentrate proceeds to a cleaner cell bank consisting of four conventional impeller-agitated flotation cells, each of five cubic meter volume and arranged in series. Graphite recovery of 95% is expected in an initial cleaner concentrate grading 45%C to 50%C in about 20% mass pull. This concentrate is directed to the column flotation circuit for further upgrading while tailings from both rougher and initial cleaner stages are pumped to tailings impoundment.

17.1.4 Column Flotation

Upgrading of the initial cleaner concentrate is carried out in four stages of column flotation. Each cleaning stage is preceded by grinding/polishing of the feed pulp.

Initial cleaner concentrate pulp is directed to the first regrind ball mill for incremental size reduction with steel balls and then fed to the first flotation column for upgrading. Successive column cleaner stages use different mills and grinding media to ready the feed; cleaner column two is preceded by attrition milling of the pulp; cleaner columns three and four are preceded by friction milling of the pulp with high density media.

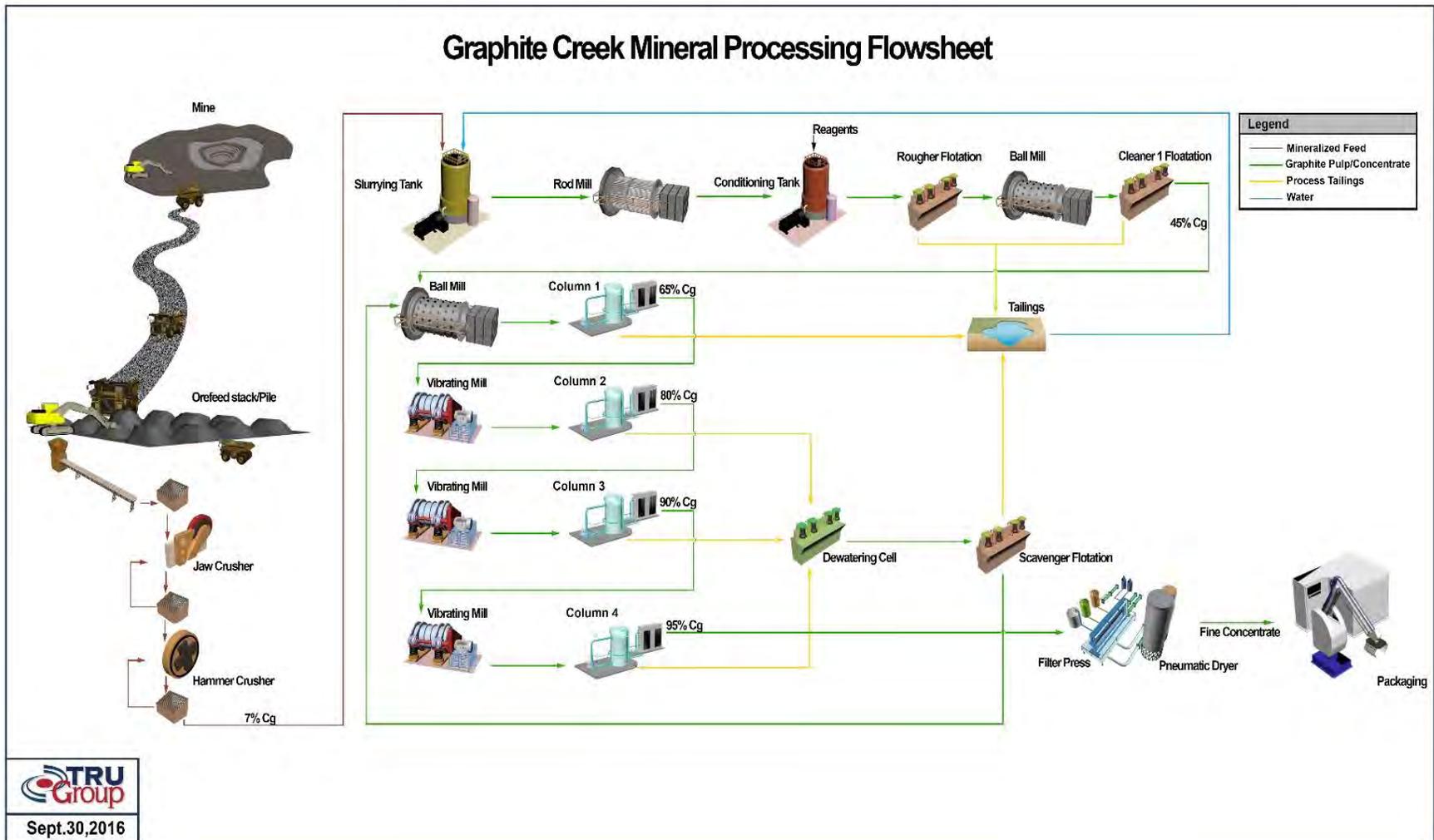


Figure 17-4: TRU Group rendering of the Graphite Creek Mineral Processing Plant conceptual flowsheet.

The progressive upgrading of the initial cleaner concentrate at 45% C during successive column cleaning is: 75% C in cleaner column one; 85% C in column cleaner two; 93% C column cleaner three to the final column cleaner four which produces concentrate at a grade of 95% C at an overall recovery of 80%. Tailings from cleaner column one are pumped with the rougher tails to impoundment while the underflow from cleaner columns two, three and four is directed to dewatering cells ahead of scavenger flotation for additional graphite recovery. The dewatered pulp is processed in four conventional impeller-agitated flotation cells, each of five cubic meter volume and arranged in series. Scavenger concentrate is recirculated to the attrition mill preceding cleaner column two; scavenger tailings are sent to tailings impoundment.

17.1.5 Drying and Packaging

The final concentrate overflow from cleaner column four is dewatered in plate and frame filter presses. The filter cake is then conveyed to pneumatic dryers to remove remaining moisture. The final product is pneumatically conveyed to bulk bag fillers where it is bagged in one tonne super sacks.

17.1.6 Tailings

Tailings from rougher flotation, initial cleaner flotation, column one cleaner and the scavenger circuit will be pumped to a tailings pond on the Graphite Creek Project site where there will be natural settling of rejected gangue. Process water will be pumped from the tailings pond and recycled as process water. Detailed study of the tailings will be investigated in the future. In the event that neutralization is required, there are large outcrop of limestone and marble at the site.

17.1.7 Reagents

Process reagents required at the Mineral Processing Plant for flotation are namely Flotanol and kerosene. It has not been determined if pH modifiers will be needed for conditioning the slurry ahead of rougher flotation or for the flotation tailings slurry that will be impounded.

17.1.8 Utilities Consumption

Most electric power in northwestern Alaska is produced by community cooperatives operating diesel fueled generators. These plants are sized to the community needs and there is little if any excess electrical power generation that could benefit the Mineral Processing Plant. In addition, the remote location of the Graphite Creek Project site and distance to any established electrical infrastructure would make it impractical or costly to install additional capacity at an existing plant and run high voltage cables back to the site. Therefore, the electricity will be generated by an on-site diesel power plant to satisfy operational requirements for the mine, Plant and those of ancillary and support facilities

A six-megawatt power plant (three two-MW diesel generators) operating at 80% of nominal capacity will generate the annual requirement of 37 MWh of electricity. Annual diesel fuel consumption is estimated at 9,000 m³ when production at the Mineral Processing Plant reaches full capacity of 60,000 tpy-concentrate. Diesel fuel is imported from Washington State and stored at leased facilities; a three-month inventory of fuel is maintained at the Plant site.

Annual process water requirements are similarly estimated at 500,000 m³. Pending the results of water sampling and flow measurements on the major streams and Cobblestone River, it is assumed that process water will be drawn from on-site resources although recovered water from the tailings pond will be recirculated to minimize fresh water additions.

17.1.9 Equipment List

Major equipment items at the Mineral Processing Plant are summarized below:

MAJOR EQUIPMENT ITEM	NUMBER OF UNITS
Crushing and Grinding Circuit	
Feed Grizzly	3
Jaw Crusher	3
Primary Vibrating Screen	3
Hammer Crusher	3
Secondary Vibrating Screen	3
Rod mill	5
Flotation Circuit	
Conditioning Tank	5
Ball Mill	5
Rougher Flotation Cell Bank	5
Cleaner Flotation Cell Bank	5
Cleaner Column One Ball Mill	5
1st Cleaner Flotation Column	5
Cleaner Column 2 Friction Mill	5
2nd Cleaner Flotation Column	5
Cleaner Column 3 Friction Mill	5
3 rd Cleaner Flotation Column	5
Cleaner Column 4 Friction Mill	5
4 th Cleaner Flotation Column	5
Dewatering Cell	3
Scavenger Flotation Cell Bank	3
Drying and Packaging	
Plate Filter-presses	30
Pneumatic Dryer	4
Bulk Bag Packaging Station	1

17.2 Product Manufacturing Plant

The process outline for the Product Manufacturing Plant appears in Figure 17-5. The Plant receives 60,000 tpy of concentrate grading 95% Cg from the Graphite Creek Mineral Processing Plant in 20-foot shipping containers. All received concentrate is thermally purified. State-of-the-art (electric-powered) thermal purification has been selected over acid chemical purification to position Graphite One to increase throughput and minimize or eliminate acid effluents. Purification is performed at extremely high temperature under an inert atmosphere. The fine graphite concentrate received contains STAX morphology which is highly amenable for the efficient production of the coated spherical graphite (CSG) product.

Purifying all the concentrate will yield higher quality product offerings in line with the core Graphite One strategy to produce only up-market high quality products –

- ▶ CSG, 41,850 tpy for lithium-ion battery end-use applications
- ▶ Purified sub-20 micron powders, 13,500 tpy for varied end-use applications including lubricants, friction products, conductive polymers, specialty powder and metallurgical additives

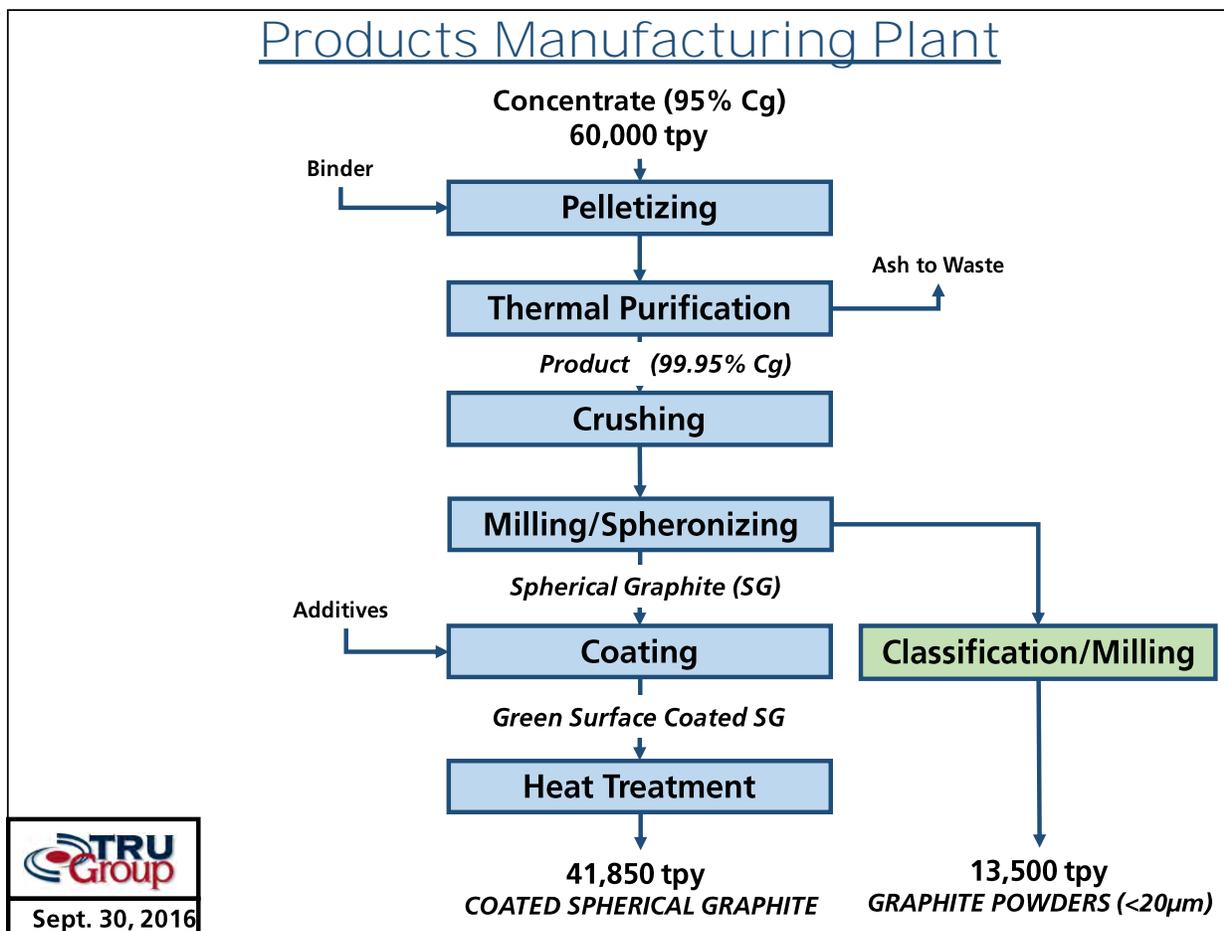


Figure 17-5: Product Manufacturing Plant process outline

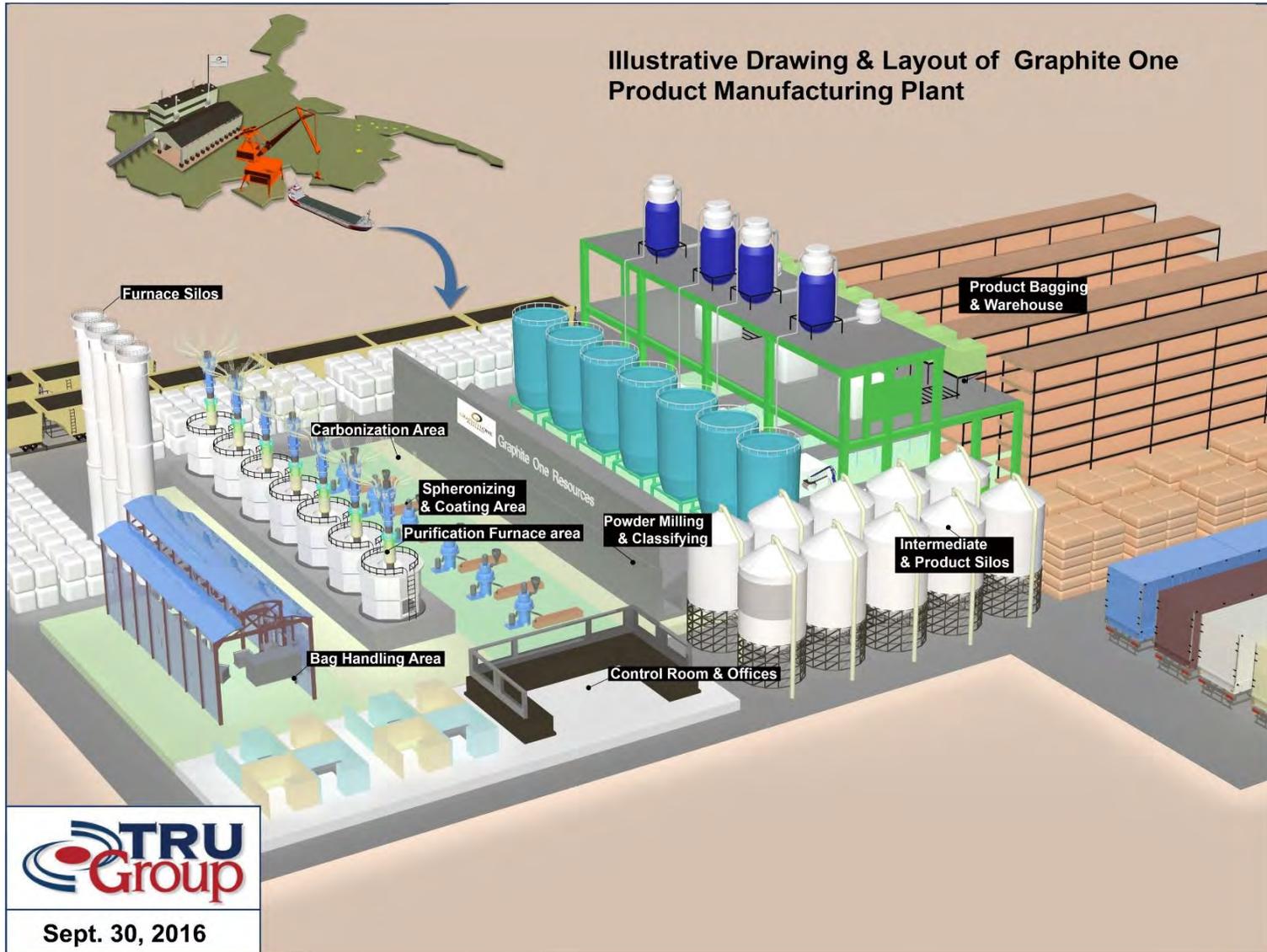


Figure 17-6: Illustration depicting the Product Manufacturing Plant

17.2.1 Raw Material Handling and Storage

Graphite concentrate packaged in one-tonne super sacks and stacked in 20-foot shipping containers are deposited at the unloading station of at the Products Manufacturing Plant. The super sacks are removed by forklift and loaded onto bulk bag discharging systems fitted with containment devices to minimize dusting while emptying their contents. The graphite is conveyed to storage silos (4) each of 125 m³ capacity that are fitted with 70-degree inverted cones. Each cone is equipped with a gyrating live bottom bin activator, slide valve, air slides, and pneumatic/screw discharge conveyors. The graphite concentrate grading 95%Cg will be fed to the graphite purification furnaces feed pelletizers.

17.2.2 Graphite Purification

Final upgrading of the graphite concentrate produced at the Mineral Processing Plant is proposed to be performed at the Product Manufacturing Plant. Minimum purity requirements of the graphite feedstock for spherical graphite production is 99.95% C, which is also constrained by threshold limits on certain metallic impurities that would otherwise be problematic for EV lithium-ion battery end use.

Thermal purification of static samples at high temperature under a halogen atmosphere successfully achieved and surpassed target graphite purity while also achieving a lowering of problematic metallic impurities to below threshold limits. Despite this success, the process operates in batch mode and requires lengthy retention times. High volume purification of graphite concentrate for spherical graphite manufacturing is performed in electrically-heated furnaces operating under dynamic fluidizing conditions with an inert atmosphere at high temperature. The purification furnaces are designed as high throughput, low residence time units that achieve high rate purification by exposure of individual flakes to high temperature under turbulent fluid mixing conditions.

Fine material is pelletized in drum pelletizers to meet the furnace operating specifications for minimum particle size then fed into the furnace feed hopper elevated above the furnace. and the pellets are top fed to the multi-story cylindrical furnace. The graphite pellets descend and circulate through a heat affected zone eventually settling in a chilled zone at the furnace bottom where the purified graphite is also discharged. The furnace operates as a fluidized bed with bottom-feeding of the inert gas. The heat to maintain the furnace at high temperatures (2,500 to 3,000 °C) is created by an electrical arc between the graphite electrode and the graphite lined walls of the furnace. Due to the operating and maintenance schedule, nine furnaces are dedicated to treating the concentrate at a daily rate of 238 tpd. Each furnace draws about 1 MW of electrical power. The purified material discharges from the furnace cooling system and is passed through rolls crushers to break up the pellets, then transferred to storage silos to be further processed to coated spherical graphite and graphite powder.

Exposure of the graphite to high temperature volatilizes impurities, which exit from the top of the furnace where they are condensed and collected for disposal. The cooled, purified graphite flakes are conveyed to the furnace discharge storage silos ahead of spheronization.

At full scale production, eleven (11) purification furnaces are required, ten operating at a throughput of one tonne graphite per hour and one unit on standby.

17.2.3 Graphite Spheronization and Coating

Natural graphite flake with specific properties suitable for lithium ion battery anode applications is jet milled to specific particle size (about 20 microns). The graphite flake may need to be pre-milled to feed the jet mill; this depends on the feed particle distribution and requirement of the jet mill. Once ground, the graphite undergoes further shaping and classification processes to produce potato (spheroidal) shaped particles known as spherical graphite. Current industry standard product yields are 30-40% spherical graphite from the process. The balance is considered reject and is used for other products. Exploratory product development tests indicated that almost 75% of spheronized product was acceptable for EV battery applications. This result was achieved without any prior jet milling, i.e., direct spheronization, of the purified graphite, used the entire size distribution of the graphite feed, and required half the residence time with one third of the energy input to the spheronizing mill compared to conventional Chinese flake graphite.

Other size fractions suitable for other (non-EV) lithium-ion batteries end-use increases the recovery to 91%. This is an acceptable assumption at the conceptual level. Pilot scale equipment is available from vendors, which will be necessary to define the yield and number of circuits required for the Graphite Creek concentrates. Those size fractions (8% by weight) that fall outside the acceptable range for lithium-ion battery applications are directed to the fine powders circuit for further micronization and/or classification by end-use application. This fraction is fed to jet mills with internal classifiers to produce different graphite powders in the size range of about 1 to 20 μm .

Spheronizing and coating is carried out on a batch basis. Purified graphite powder is first spheronized and classified into various size fractions. Spherical graphite size fractions suitable for lithium-ion batteries are combined with coating precursor and recycled to the spheronizing mill. The 'green' surface coated graphite product is collected and heat treated at about 1000°C for a specified time in kiln type furnaces to remove volatiles and harden the coating. The coated spherical graphite product discharge from the furnace through a cooler then transferred to product storage.

All products are automatically bagged, robotically palletized and stored in a warehouse on site.

When the Plant reaches full scale production, eleven (11) spheronizing-coating systems and four carbonization furnaces are required. Future investigations on optimizing the spheronization process and customizing the surface coating process may alter the final number of installed units.

17.2.4 Ancillary

Specialty gas is required for both graphite powder purification and spherical graphite coating graphitization. A nitrogen plant is installed at the site of the Products Manufacturing Plant to produce the required quantities of high purity inert gas. Modular expansion of the nitrogen plant takes place in year 6 of operations ahead of the Plant moving to full scale production.

17.2.5 Utilities Consumption

Electric power is assumed to be sourced from the existing grid. The major consumer of electricity are the electric-powered purification furnaces that have an electrical rating of 1 MW. Annual power consumption of the full capacity plant is estimated at 54.4 GWh.

17.2.6 Consumables

The main consumables in the operation of the Products Manufacturing Plant are:

1. Graphite replacement electrodes used for heating the purification furnaces.
2. Petroleum pitch that is pre-cursor source of carbon that is applied to spherical graphite size fractions recovered for lithium-ion battery end-use. The pitch was assumed to be sourced from a Europe-based manufacturer and supplier.

17.2.7 Equipment List

Major equipment item that form the basis of the capital cost estimates for the Product Manufacturing Plant are summarized below.

MAJOR EQUIPMENT ITEM	NUMBER OF UNITS
Thermal Purification	
Bag (1t) Unloading Station	4
Furnace Feed Storage Silos	4
Thermal Purification Furnace	11
Specialty Gas Plant	2
Manufacturing	
Purified Graphite Storage Silos	4
Hybrid Spheronizing/Coating System	11
Carbonization Furnace	4
Powder Mills and Classifier System	4
Product Handling	
Product Storage Silos	12
Automated Bagging System and Robotic Palletizer	2

The manufacturing arrangements on the factory floor will be designed and engineered to optimize productivity. The following Figure 17-7 below is an illustrative floorplan layout (based on the plant overview earlier depicted in Figure 17-6 above) –

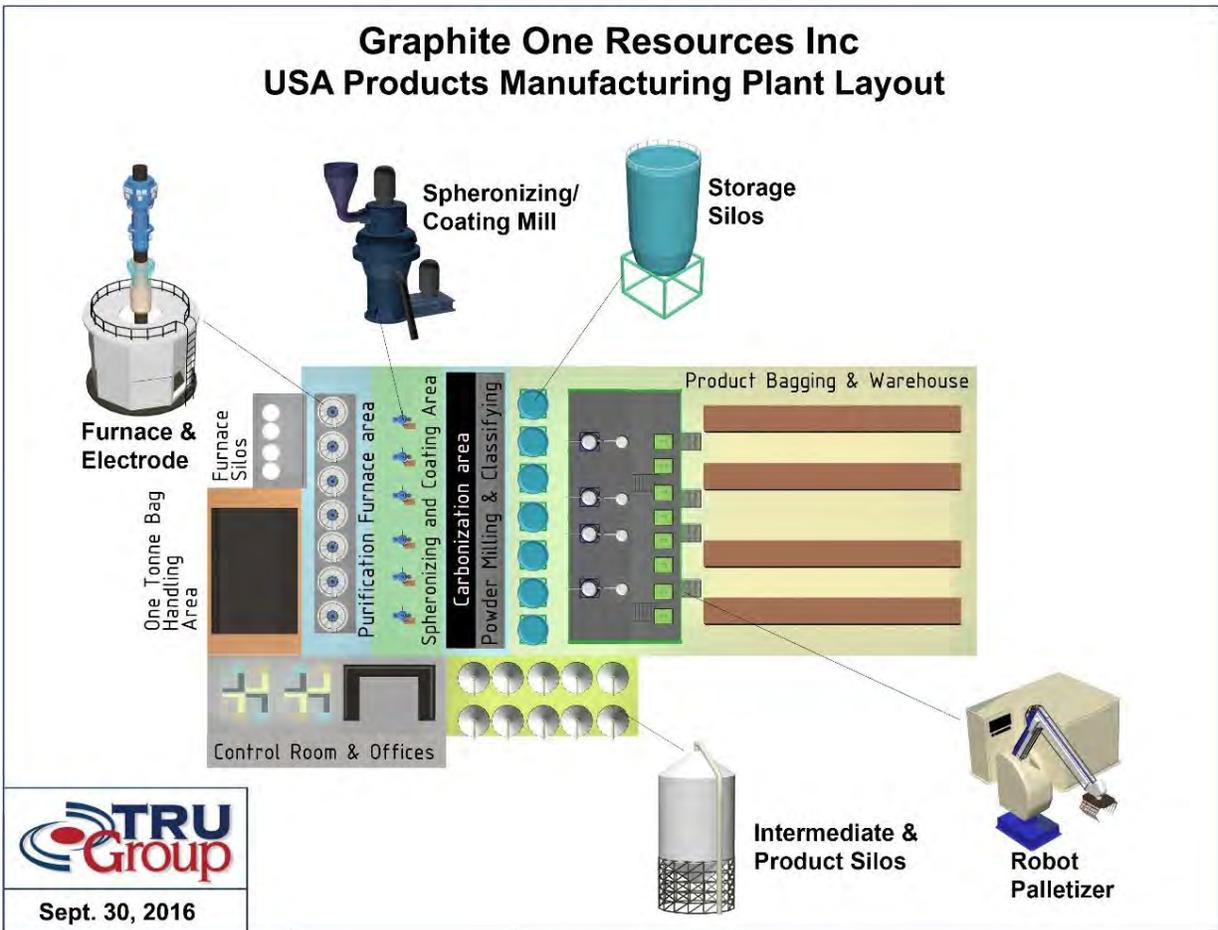


Figure 17-7: Illustrative floorplan of the Product Manufacturing Plant

Several operational parameters (manpower, energy, etc) for both the Mineral Processing Plant and Product Manufacturing Plant are detailed in Section 21 CAPITAL INVESTMENT AND OPERATING COSTS

18 PROJECT INFRASTRUCTURE

18.1 Infrastructure – Mine & Mineral Processing Plant

There are no permanent structures on the Graphite Creek Property. Some historical features that are still discernable, such as some trails/roads from the early 20th century, are present but have been largely reclaimed by the environment. There are two minor archaeological sites, found at the State Historic Preservation Site (SHIPO), and these will be undisturbed by the mine activity.

18.1.1 Site Layout

The infrastructure that is being currently proposed for the Graphite Creek site includes:

- Process plant
- Access and site roads
- Power generation
 - Substation
 - Distribution to various parts of the site
- Mining/processing water distribution/storage facility
- Tailings pond
- Year-round site access via 36 km connecting road to Nome-Teller Highway
- Water treatment facility
- Camp with admin offices
- Sewage treatment facilities
- Communications towers/equipment
- Storage facilities
- On-site assay laboratory

18.1.2 Process Plant

The proposed mineral processing plant at Graphite Creek includes the following operations and their requisite space, power, water, and equipment:

- Crushing
- Milling and flotation
- Classification
- Filtration
- Drying

There will be a further area of the plant or at the camp proper, where some quantitative analyses and quality system work can be performed.

18.1.3 Site Access and Site Roads

HDR of Anchorage completed for Graphite One a desktop wetlands study of the road options and provided a preliminary road route scoping design from the Teller highway to the mine site. This road, as shown in Figure 18-1, would be some 35 km in length, intersecting the Teller

Highway at approximately Milepost 54.6, and would be serviceable for 12 months of the year, allowing truck delivery of the graphite mill product to Nome, and then on to the processing plant via seagoing barge transport.

18.1.4 Power Generation

Power options include diesel, LNG, wind, and tidal/basin discharge channel hydroelectric turbines. The current thinking is that power will be diesel generated, and will be eventually supplemented/supplanted by renewables if and when the technology of choice offers an economic argument for adoption.

The power requirement for the Graphite Creek Project is anticipated to be 4MW initially, and ramping to 6MW after five years of operation, based on the preliminary equipment list that has been generated. The power is supplied, at least at the start of the venture, by 2 diesel generators at 2MW each, with a third added to scale up at the five-year point.

18.1.5 Fuel Storage

Fuel storage and handling facilities have been accounted for in the CAPEX discussion (see Section 21 of this Assessment). This is anticipated to include tanks with sufficient capacity to operate the power generation equipment for three months, as mitigation of any supply risk.

18.1.6 Buildings

It is expected that at the Alaska site, there will be habitable buildings for personnel living quarters, as well as various smaller semi-permanent buildings to house equipment and to provide storage. The larger industrial buildings include:

- A 14,000 m² building to house:
 - Crushing
 - Grinding
 - Flotation
 - Filtration
 - Drying and bagging
 - Administration offices, maintenance areas, and control room(s)
- A storage area/platform for the product awaiting shipment to the Product Manufacturing Plant

18.1.7 Tailings and Waste Rock Management

At the assumed strip ratio (3:1), between 3 and 4 million tonnes of waste rock per year will be moved to the waste rock storage area. A number of locations have been identified as potentially suitable for waste rock storage, though no firm decisions in this regard have been made.

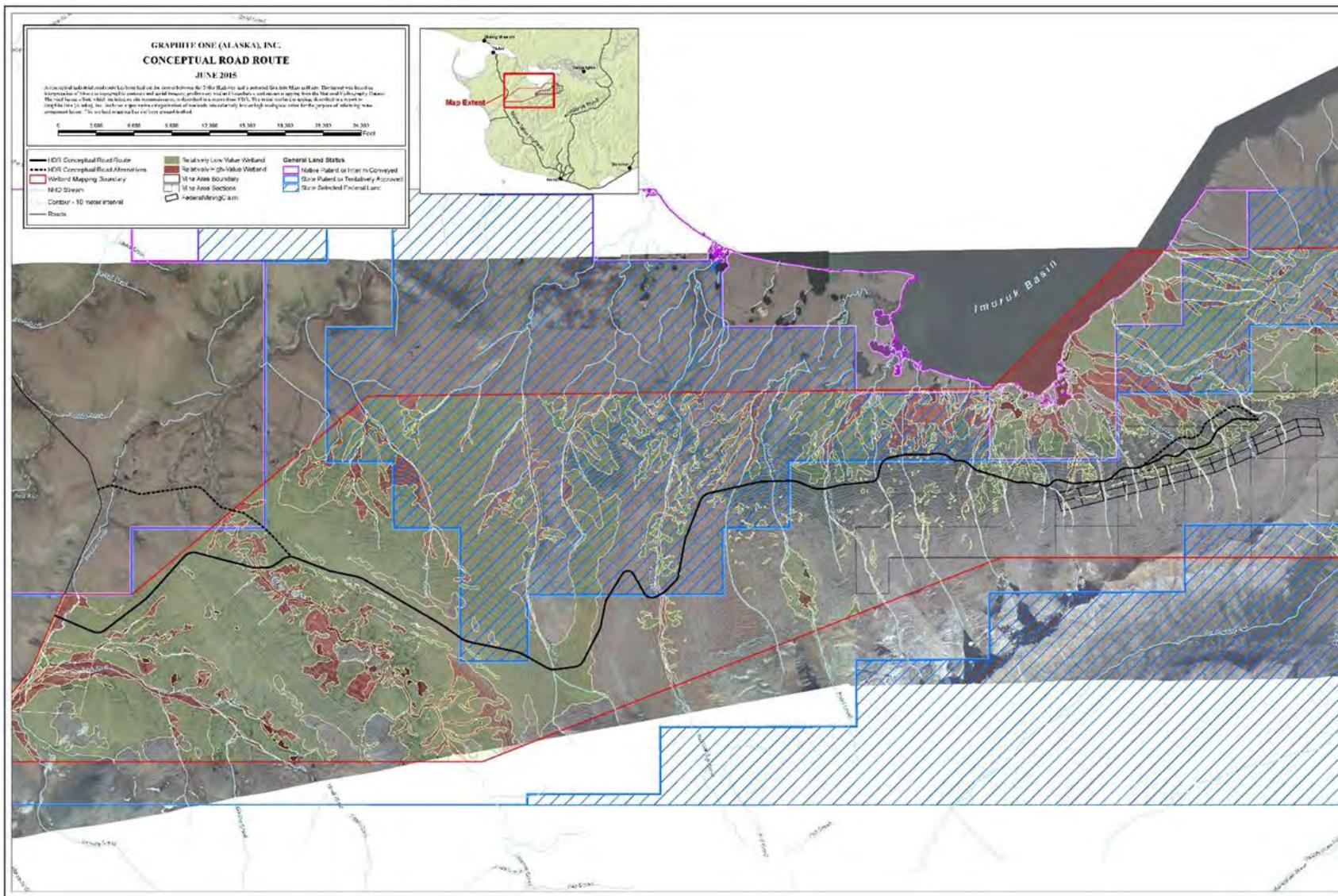


Figure 18-1: Conceptual road route: Graphite Creek Mine site to Nome-Teller Highway

18.1.8 Sewage and Refuse Management

Sewage disposal consists of a portable sewage treatment plant. The waste product can be incinerated, or de-watered and composted, depending on the nature and technology of the plant. It is expected that the camp waste other than sewage will be incinerated in accordance with best practice.

18.1.9 Communications

Intra-site communications at the Alaska site will include VHS radio, a voice-over-internet-protocol (VOIP) telephone system. Off-site communications will be necessarily satellite-based, as will the television system service provided for in the accommodations.

18.1.10 Process/Potable Water

Potable water is expected to be supplied via well. A purification (UV and filtration system, or chlorination system) will also be provided if deemed necessary.

18.2 Infrastructure – Product Manufacturing Plant

The Product Manufacturing Plant is assumed to be situated at a brownfield industrial site that is serviced by public utilities with developed road and rail infrastructure. Criteria relevant to deciding the location of such facilities include power cost and supply, availability of industrial zoned land, proximity to tidewater and port facilities, and infrastructure that supports both the workforce and delivery logistics for input materials, services and finished products.

18.2.1 Buildings

The main building at the manufacturing site is a processing plant with a plot area of 70 m × 65 m in size. The following unit operations/activities are located in the plant:

- Bag handling
- Pelletizing
- Spheronizing
- Carbonization
- Powder milling and classifying
- Bagging and warehousing
- Administration and control

Further, the following storage structures are included:

- Several silos for incoming, intermediary, and finished products
- A 70 m × 70 m structure to warehouse the finished product awaiting transport to customer facilities.

18.2.2 Power Supply and Distribution

Power will be negotiated with and supplied by the municipality.

18.2.3 Communications

Communications will be selected according to best cost/benefit based upon services available at the site.

18.2.4 Process/Potable Water

It is assumed that the water will be drawn from municipal sources

18.2.5 Solid Waste Management

Waste management will be performed in accordance with best practice within the municipality.

18.2.6 Sewage and Refuse Management

Sewage and waste management will be done in accordance with the bylaws and practices laid out by the municipality.

19 MARKET STUDIES AND CONTRACTS

This section provides an overview of the graphite market sufficient in detail to provide the reader with an understanding of the market factors that have shaped the conceptual marketing and competitive strategies that have been developed thus far for the Graphite Creek Project. This section considers materials from various sources²¹ as noted in the text, especially to construct an historic perspective. This section is an update of, and extraction from, the mid-2015 TRU internal study for Graphite One.²² The current summary market situation and projection through 2021 is essentially a current independent assessment by TRU using the data sources noted in the text, although much of the original material is excluded as proprietary. The Graphite One plan to focus primarily on the sale of coated spherical graphite for lithium-ion battery anodes falls out of the previous work reviewing the market, and this strategy is reflected once again in this update of the graphite market. Over ninety per cent of output from the planned Product Manufacturing Plant will be in this form and the remainder as purified graphite powders sub-20 microns (a byproduct of spheronizing reject).

19.1 Graphite Market Overview

19.1.1 Market Environment

GLOBAL DEMAND MEDIUM TERM OUTLOOK BY END-USE

Global demand for all types of graphite (natural and synthetic) was about 2.4 million t in 2011 and expected to grow at a modest 4% per annum to reach 2.8 million t in 2016. Table 19-1 provides data on global markets for graphite demand by end-use application segment for 2011, 2016 and TRU's five-year illustrative forecast through 2021 when total consumption will reach 3.4 million t.

The natural graphite market is quite mature with overall growth of around 3-4% per annum. Some segments are expected to trend higher than the average: Notably the use of graphite in lithium-ion (Li-ion) batteries as electric vehicle (EV) adoption accelerates. Our estimate of the global demand for natural graphite concentrate for 2021 is 1.5 million t-conc²³ with refractories use continuing to very much determine the overall trend.

In addition, it is expected that advances in natural graphite technology, and increased Western supply, to provide the natural graphite market with an opportunity to gain share in EV battery anodes and other synthetic graphite segments in some applications.

²¹ Underlying raw historic data 2011 extracted from Roskill Information Services Ltd, 2012. "Natural and Synthetic Graphite: Global Industry and Markets Outlook 2012"

²² TRU Group Inc, April 6, 2016. "Stage B Report: Conceptual Feasibility of the Alaska Graphite Creek Project". 105 pages.

²³ Roskill Presentation, Suzanne Shaw, 2015 estimated the 2020 natural graphite concentrate market at 1.2 million t-conc. "Natural Graphite: Raw Material Trends"

**Table 19-1 Global graphite demand outlook by end-use application
2011-2021 in t-concentrate**

Target Application	2011	% total	2016	% total	2021	% total	Growth % pa	
							2011-16	2016-21
Graphite One Segments	368,000	15%	500,000	18%	800,000	33%	6%	10%
batteries - all types	85,000	4%	160,000	6%	400,000	12%	13%	20%
lubricants / friction	186,000	8%	220,000	8%	260,000	8%	3%	3%
other natural specialty	97,000	4%	120,000	4%	140,000	4%	4%	3%
All Other Uses	2,042,000	85%	2,320,000	82%	2,630,000	77%	3%	3%
TOTAL ALL USES	2,410,000	100%	2,820,000	100%	3,430,000	100%	3%	4%
<i>Natural Graphite in t-conc:</i>	<i>930,000</i>	<i>39%</i>	<i>1,200,000</i>	<i>43%</i>	<i>1,581,400</i>	<i>46%</i>	<i>5%</i>	<i>6%</i>
<i>Synthetic Graphite in t:</i>	<i>1,480,000</i>	<i>61%</i>	<i>1,620,000</i>	<i>57%</i>	<i>1,848,600</i>	<i>54%</i>	<i>2%</i>	<i>3%</i>

Sources and notes -

September 6, 2016

1 Roskill data 2011 with 2016 from various sources and estimates by TRU

2 Forecasts are illustrative TRU estimates subject to detailed study

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CHINA AND UNITED STATES POSITION IN THE MARKET

The following is quoted from the US Geologic Survey (USGS), 2016: “During 2015, China produced 66% of the world’s graphite and consumed 35%. North America produced 5% of the world’s graphite supply, with production only in Canada and Mexico.”²⁴ USGS tabulation of natural graphite production statistics by country appears in Table 19-2:

China continues to be a major exporting force in the global graphite market through 2015, its major geographic markets being Japan (25% in 2015), Korea (16%), United States and Germany (each 8%) as shown in Figure 19-1.

²⁴ U.S. Geological Survey, Mineral Commodity Summaries, January 2016. Graphite (Natural)

Table 19-2 Global graphite mine production by country in t

Country	Mine Production		Reserves million t
	2014	2015	
United States	0	0	0
Brazil	80000	80000	72
Canada	30000	30000	incl*
China	780000	780000	55
India	170000	170000	8
Korea, North	30000	30000	incl*
Madagascar	5000	5000	0.9
Mexico	22000	22000	3
Norway	8000	8000	incl*
Russia	15000	15000	incl*
Sri Lanka	4000	4000	incl*
Turkey	29000	32000	90
Ukraine	5000	5000	incl*
Zimbabwe	7000	7000	incl*
Other countries	1000	1000	incl*
World total	1,186,000	1,189,000	230

incl* is included in total

Source: U.S. Geological Survey, Mineral Commodity Summaries, January 2016. Graphite (Natural)

China Exports of Natural Graphite Flakes & Powder by Destination

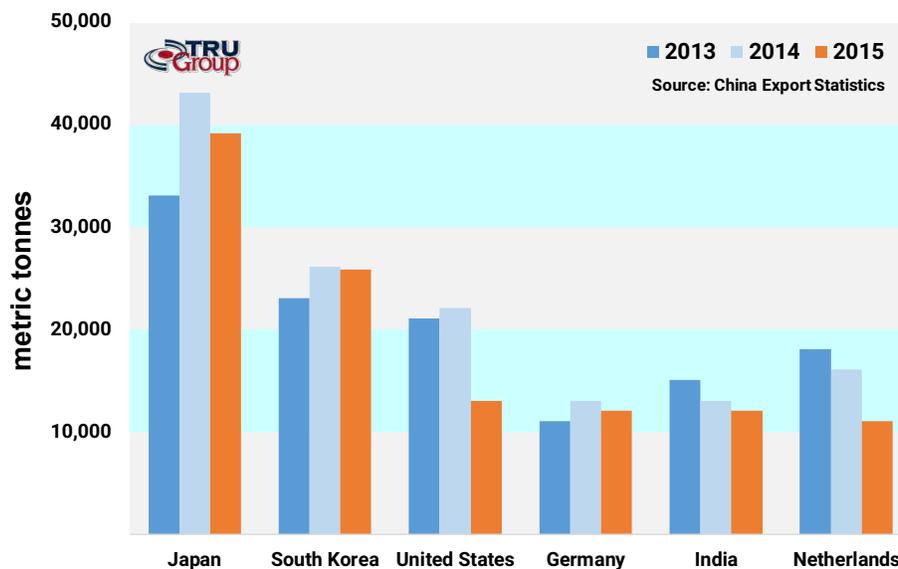


Figure 19-1: China exports of natural graphite flakes and powder by destination

● **USGS Graphite Annual Report:**

According to the USGS²⁵: Although natural graphite was not produced in the United States in 2015, approximately 90 U.S. firms, primarily in the Northeastern and Great Lakes regions, consumed 54,400 tonnes valued at \$50.7 million. The major uses of natural graphite in 2015 were brake linings, foundry operations, lubricants, refractory applications, and steelmaking. During 2015, U.S. natural graphite imports were 65,900 tons, which were 65% flake and high-purity, 34% amorphous graphite, and 1% lump and chip”. The USGS data for the natural graphite industry for the United States is presented in Table 19-3.

Table 19-3 USGS reported salient data for the USA natural graphite

Natural Graphite Parameter		Year					
		2010	2011	2012	2013	2014	2015
Production, mine	t	0	0	0	0	0	0
Imports for consumption	t	65000	72000	57000	61000	64000	66000
Exports	t	6000	6000	6000	9000	12000	12000
Apparent Consumption	t	59,000	66,000	51,000	52,000	53,000	54,000
Price, imports (average dollars per t at foreign ports):							
	Flake \$ per t	\$720	\$1,180	\$1,370	\$1,330	\$1,270	\$1,240
	Lump and chip (Sri Lankan) \$ per t	\$1,700	\$1,820	\$1,960	\$1,720	\$1,870	\$1,890
	Amorphous \$ per t	\$257	\$301	\$339	\$375	\$360	\$370

Sources & notes -

US Geological Survey, Mineral Commodity Summaries, Jan 2016. Graphite (Natural)
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Principal import sources of natural graphite were, in descending order of tonnage, China, Mexico, Canada, Brazil, and Madagascar, which combined, accounted for 97% of the tonnage and 91% of the value of total imports. Mexico provided all of the amorphous graphite, and Sri Lanka provided all of the lump and chippy dust variety. China, Canada, and Madagascar were, in descending order of tonnage, the major suppliers of crystalline flake and flake dust graphite.

Although no production of natural graphite was reported in the United States, two companies were exploring for and developing graphite projects in the United States. Alabama Graphite Corp. is developing the Coosa Graphite Project in Alabama, and Graphite One Resources Inc. is developing the Graphite Creek Project in Alaska. Advances in thermal technology and acid-leaching techniques that enable the production of higher purity graphite powders are likely to lead to development of new applications for graphite in high-technology fields.

²⁵ U.S. Geological Survey, Mineral Commodity Summaries, January 2016. Graphite (Natural)

● The Tesla Motors Factor

Tesla Motors, Inc of Palo Alto, CA is building a large plant to manufacture lithium-ion electric vehicle batteries. Industrial Minerals data provided a perspective of the requirement in its December 2014 presentation at the Berlin graphite conference²⁶ and summarized in Table 19-4:

Table 19-4 Industrial Minerals data presented in December 2014

DEMAND FROM TESLA PLANT*	126,000 tpa
SPHERICAL GRAPHITE DEMAND	50,000 tpa
TOTAL FLAKE GRAPHITE SUPPLY 2013:	375,000 tonnes
%INCREASE ON TODAY'S GRAPHITE DEMAND	152%
%INCREASE ON TODAY'S TOTAL FLAKE GRAPHITE DEMAND	34%

***TESLA WILL BE PURCHASING BATTERY GRADE GRAPHITE NOT FLAKE GRAPHITE**

Benchmark Mineral Intelligence states that “If Tesla is able to reach a production total 300,000 vehicles a year all with batteries ranging from 60kWh to 90kWh in capacity, its annual demand for spherical graphite in vehicles in 2021 will be over 26,000 tonnes a year”.²⁷

● US Competitor Situation

The USGS states in their January 2016 Mineral Commodities Summary “Although no production of natural graphite was reported in the United States, two companies were exploring for and developing graphite projects in the United States. Alabama Graphite Corp. was developing the Coosa Graphite Project in Alabama, and Graphite One Resources Inc. was developing the Graphite Creek Project in Alaska.”²⁸

Graphite One would of course be manufacturing graphite end-use products from a resource located in the United States, and it is expected that this would represent a significant marketing advantage in the battery arena. There are four main existing well-established producers (some of which have interests in resources outside of the USA) are referenced below²⁹.

Asbury Carbons, Asbury, NJ (asbury.com)

“Asbury Carbons is a manufacturer and trader of graphite and carbon products including granular and powdered natural and synthetic graphite, petroleum and metallurgical cokes, anthracite coal and carbon black. It operates no mines in the USA and relies solely on imported

²⁶ IM Graphite Conference Berlin, December 2014, Roskill presentation: “Flake graphite market trends and pricing patterns”

²⁷ Benchmark Mineral Intelligence website, April 7, 2016. <http://benchmarkminerals.com/Blog/tesla-will-need-a-lot-of-graphite-lithium-but-china-will-need-more/>

²⁸ U.S. Geological Survey, Mineral Commodity Summaries, January 2016. Graphite (Natural)

²⁹ Summarized from information in Roskill Information Services Ltd, 2012. “Natural and Synthetic Graphite: Global Industry and Markets Outlook 2012”

material; in 1972, it became the first company in the USA to import natural graphite from China. Asbury Carbons sells domestically and also exports its products.

The company operates seven processing plants in the USA and Canada through its subsidiaries which carry out milling, screening and blending; they have a combined capacity of over 300,000 tpy.

The company's graphite and carbon products are used in friction materials, lubricants, fuel cells, cast metals, drilling paints, coatings and backfill. The company also provides admixed graphite and carbon powders to the powdered metal industry".

GrafTech International Holdings Inc, Parma, OH (graftech.com)

"GrafTech International has been producing carbon and graphite products for over 120 years. It produces natural graphite products, synthetic graphite products and carbon electrodes, as well as other carbon-based products. The company imports 100% of its natural graphite needs for processing".

According to the company website its "products, which include graphite electrodes, advanced carbon and graphite materials, and flexible graphite, are manufactured on four continents and sold to customers in over 70 countries". The company has thirteen manufacturing locations in the United States of which three are stated to be processing natural (flexible and super fine grain) graphite products.

Poco Graphite Inc, Decatur, TX (poco.com)

"Poco Graphite has been producing graphite products for over 40 years, specialising in coatings and treatments that help to reduce wear. It manufactures graphite and silicon carbide products for use in electrical discharge machining (EDM), glass-making, semiconductors, crucibles and biomedical applications. It also produces carbon-graphite foam. Poco Graphite is based in Texas, with branches in Limonest, France and Shanghai, China. Poco Graphite was acquired by Entegris of the USA in August 2008".

According to their website "Poco materials are used in many diverse applications and industries. Poco products are produced for the following major markets: Semiconductor and general industrial products, biomedical, glass industry products and electrical discharge machining".

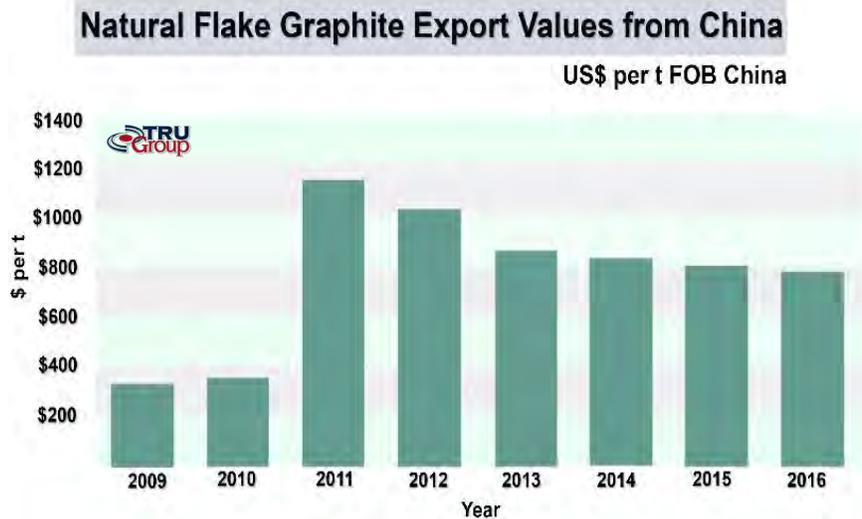
Superior Graphite, Chicago, IL (superiorgraphite.com)

"Founded in 1917, Superior Graphite operates graphite processing and manufacturing facilities at three locations in the USA, as well as others offshore. Its main products are synthetic graphite electrodes and synthetic graphite powders, but it also produces a range of natural graphite products, including amorphous graphite (60-85% C), flake graphite (80-99% C), vein graphite (90-99% C), purified flake and purified vein graphite (99.7-99.9% C), and expandable graphite (99.0% C minimum). Superior Graphite also produces lubricants, silicon carbide and ceramic products, and speciality carbon and graphite shapes".

The company website classifies product offerings as Graphite Electrodes, Graphite & Carbon Powders, Lubricants, Silicon Carbide & Ceramic Armor Tile, Specialty Carbon & Graphite Shapes.

GRAPHITE CONCENTRATE PRICE HISTORY

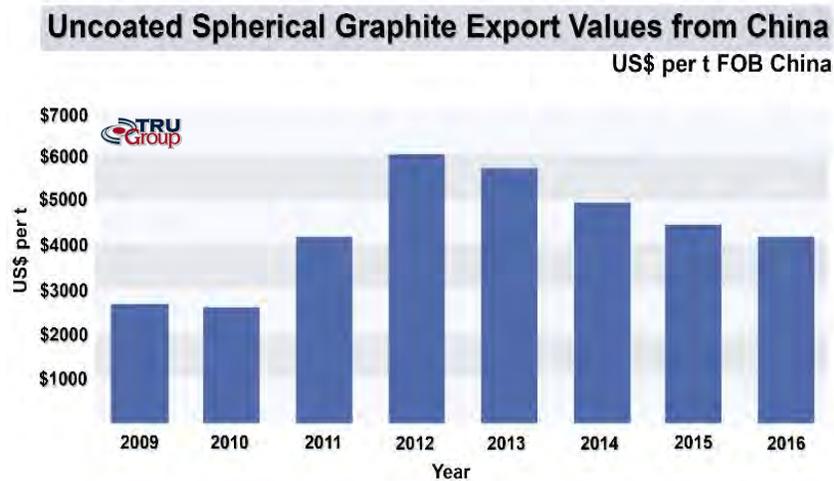
Figure 19-2 and Figure 19-3 provide respective 2016 first quarter updates of pricing for natural flake graphite and spherical graphite based on the US\$ value of China export data. Also illustrated in these charts are the trends in the annual price since 2009. Data is in US\$ per t average FOB (free on board) world exports for Natural Flake and Spherical Graphite –



Sources & notes –

1. Value \$791 per t for 2016 estimate is based on first quarter 2016
 2. Commodity "Natural graphite in flakes" trade code 25041010
 3. Global Trade Atlas
- TRU Group Inc

Figure 19-2: Natural flake graphite export prices from China FOB in US\$ per t



Sources & notes –

1. Value \$4,150 per t for 2016 estimate is based on year-to-date May 2016
 2. Commodity "Spherical Graphite" trade code 25041091
 3. Global Trade Atlas
- TRU Group Inc

Figure 19-3: Spherical (uncoated) graphite export prices from China FOB in US\$ per t

The prices negotiated between buyer and seller are based on a number of factors including carbon content, presence of ash, level / type of impurities, flake (particle) size, as well as quantity purchased. This would explain some of the value per t variations by country of destination of China exports shown for 2016 in Table 19-5.

Table 19-5 Graphite export value US\$ per t FOB China year-to-date May 2016

Harmonized HS Code	GRAPHITE EXPORT PRODUCT	Destination FOB China US\$ per t				
		World	USA	Germany	Japan	Korea
25041010	Natural graphite in flakes	\$791	\$750	\$1,010	\$930	\$810
25041091	Spherical graphite	\$4,150	\$1,700	\$2,200	\$3,310	\$5,110
25041099	Other natural graphite, in powder of in flakes	\$420	\$400	\$550	\$390	\$720
25049000	Other natural graphite, not in flakes / powder	\$220	-	\$680	\$290	\$180
38011000	Artificial graphite	\$880	\$830	\$630	\$1,050	\$990

Sources & notes:

Exports to the US year-to-date 2016 was only 75 t and not a good reflection of prices
China trade statistics

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The average dollar value for China exports to all countries year-to-date May 2016 was \$794 per t for natural graphite flake and \$4150 per t for spherical graphite.

Export values from China to the United States were \$750 and \$1700 per t respectively for flake and uncoated spherical graphite³⁰. However, only 75 t of uncoated spherical graphite was shipped to the United States and the export value therefore would not be a suitable indicator of the market price for uncoated spherical graphite in the USA due to the insignificant volume.

For the domestic US market, the average dollar value per t for US imports of natural flake at foreign ports was \$1,240 for year 2015.³¹ US latest year-to-date April 2016 data import statistics provide further insight on the current US domestic graphite price environment, Table 19-6.

³⁰ China export data, 2016. Natural flake HS code 25041010 and Uncoated Spherical Graphite code 25041091.

³¹ U.S. Geological Survey, Mineral Commodity Summaries, January 2016

Table 19-6 US graphite custom import values US\$ per t year-to-date April 2016

Harmonized HS Code	GRAPHITE IMPORT PRODUCT	Source USA US\$ per t CV				
		World	Canada	China	Brazil	Mexico
2504101000	Natural Graphite Crystalline Flake Excpt Flake Dust	\$1,300	\$1,240	\$1,250	\$2,310	-
2504105000	Natural Graphite In Powder Or Flakes, Nesoi	\$1,290	\$1,580	\$2,090	\$2,014	\$380
2504900000	Natural Graphite Except Powder Or Flakes	\$790	-	\$2,910	-	\$330
38011000	Artificial graphite	\$1,660	\$1,250	\$810	\$7,340	\$1,350

Sources & notes:

CV = Custom Import Value, price actually paid excluding import duties, freight, insurance, and other charges.

Global Trade Statistics

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19.1.2 Graphite One's Market & Competitive Positioning

This section expands on the market analysis in the segments Graphite One will be targeting, and which will competitively position the project for the future. It is proposed that Graphite One's underlying strategy should take optimal advantage of the unique STAX Graphite focusing on growth upscale segments where it could be the lead supplier.

TARGET PRODUCT/MARKET SCOPE

At full capacity, the Product Manufacturing Plant will deliver 55,350 tpa of graphite finished products for sale. Approximately three quarters of sales or 41,850 t is Coated Spherical Graphite (CSG) suitable for li-ion batteries, Table 19-7.

Table 19-7 Graphite One projected sales volume by material segmentation and end-use tpy at full capacity

PRODUCTION SEGMENTATION By Graphite Material		Target End-Use		TOTALS	
		Li-ion Battery ¹	Lubes Frict Other High ²	tpy	%
Coated Spherical Graphite	99.9%	41,850	0	41,850	76%
Graphite Powders <20 microns	99.8%	0	13,500	13,500	24%
TOTALS BY END-USE		41,850	13,500	55,350	100%
<i>% of total</i>		76%	24%	100%	

Sources & notes -

1 Other uses for spherical graphite include as an additive in specialty plastics & lubricants

2 Other high grade target uses include conductive plastics and powder metallurgy

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Note that all of the CSG is expected to be of purity aiming at meeting or exceeding the requirements for EV battery anodes. However, variations of this product may be quite suitable for all li-ion batteries (for electronics, power tools etc.) and other non-battery uses such as an additive in specialty plastics and lubricants. These end-use segments may prove profitable as target markets for Graphite One.

About 13,500 t per year of the reject material, the by-product of spheronizing, is sold as purified graphite powders of less than 20 microns for lubricants, friction products, high-end conductive plastics and specialty powder metallurgy additives.

COATED SPHERICAL GRAPHITE

● Coated Spherical Graphite Specifications & Description

This section focuses on the specifications for graphite suitable for electric vehicles. This is a “superior grade” graphite: variations of this grade could also be used in li-ion batteries designed for a wide range of uses (such as power storage, power tools, consumer electronics etc.).

Metal contaminants are particularly deleterious for electro-chemical applications such as li-ion batteries. Inductively coupled plasma atomic emission spectroscopy can provide a quantitative breakdown of the trace there is likely to be a progressive transition from synthetics to natural graphites.

TRU has defined a target product specification for Graphite One EV Grade CSG as described in Table 19-8.

Table 19-8 TRU target EV battery natural graphite specifications

PROPERTY (Units)	Value
D ₁₀ (µm)	> 7
D ₅₀ (µm)	< 25
D ₉₀ (µm)	< 40
D _{max} (µm)	≤ 50
d ₀₀₂ (nm)	< 0.336
g-index	> 0.93
Moisture (wt %)	< 0.1
Fixed Carbon (wt %)	> 99.95
Bulk density (g/cc)	> 0.45
Tap Density (g/cc)	> 0.75
True Density (g/cc)	2.2
Scott Density (g/cc)	0.8
BET Surface Area (m ² /g)	< 1.85
First Cycle Efficiency FCE (%)	≥94
Specific Capacity (mAh/g)	≥365
Ash Content (wt %)	< 0.05
Each Contaminant in Ash (ppm)	Minimized¹
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Sources & notes -

1 Deliterious metal contaminants particulary minimized

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● **Coated Spherical Graphite Market Positioning for Graphite One**

In the earlier market review, global demand for all graphite use in batteries was estimated at 160,000 t-conc for 2016 growing at a rate of 20% through 2021 to about 400,000 t-conc. Not all of this was spherical graphite. China, the largest current producer, exported 28,600 t of uncoated spherical graphite in 2015 to five top countries as shown in Figure 19-4.

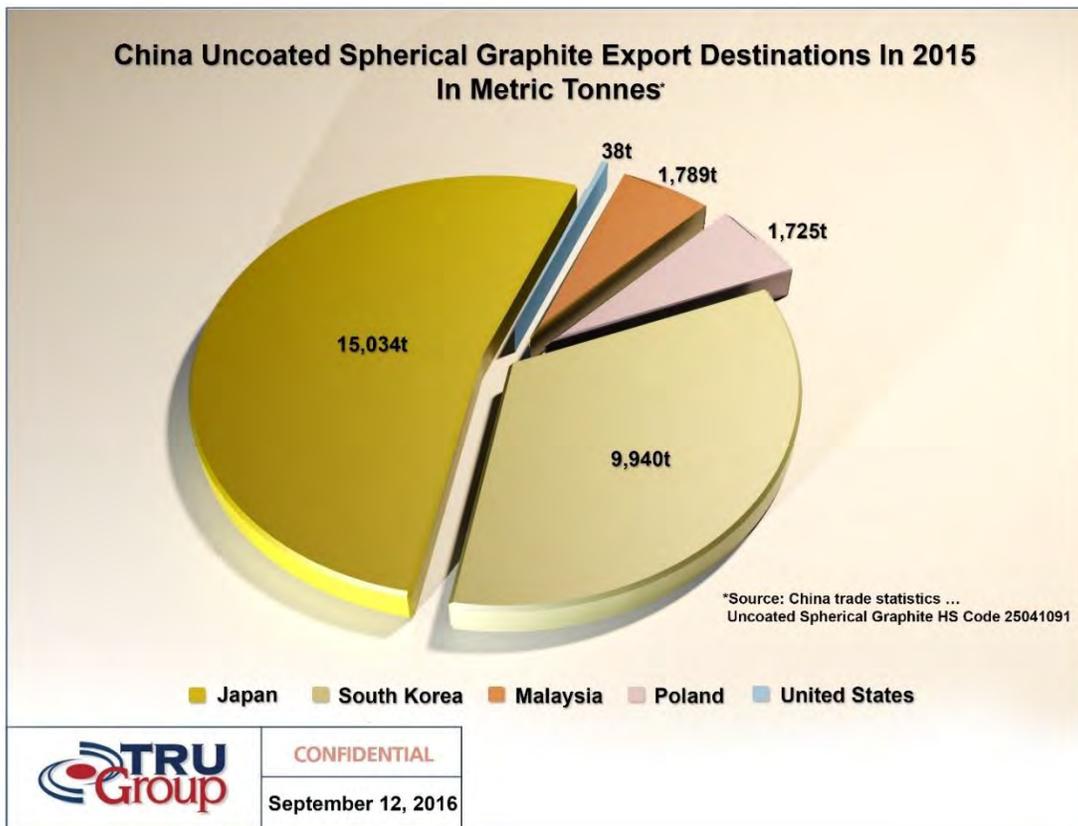


Figure 19-4: China uncoated spherical graphite export destinations 2015

Typically, a high-grade battery manufacturer, such as in Japan or Korea, would apply their own coating onto imported spherical graphite product. These two countries reportedly still monopolize the global coated spherical graphite market in 2016.

“Benchmark Mineral Intelligence forecasts the anode market – which is nearly exclusively served by naturally sourced spherical graphite and synthetically produced graphite – to increase from 80,000 t in 2015 to at least 250,000 t by the end of 2020 while the market could be as large as 400,000 tpy in the most bullish of cases with no supply restrictions. Benchmark estimates that over 360,000 tonnes of medium flake graphite will be needed as a feedstock source for the spherical material by 2020. This is nearly a doubling of the flake concentrate market in 2015 should the natural-to- synthetic demand proportions remain the same in 2020”³².

TRU have not been able to find a reliable source of data on the coated spherical graphite market as it exists today nor a well-constructed forecast of demand for the product. This PEA assumes that demand for coated spherical (natural) graphite to reach over 200,000 t by 2021; however, this number has a high error and is subject to revision based on a detailed market study of this use. Indeed, a comprehensive study of all market parameters is considered essential as current market data is totally inadequate considering the important strategic decisions at play.

³² Benchmark Mineral Intelligence, Q2 2016.

Graphite One’s strategy is to first focus on markets in the United States and then Japan and Korea. In 2016, demand for spherical graphite in the United States is currently limited but expectations for market growth are high – much of it based on the Tesla Motors plan to complete its Li-ion battery plant in Nevada. Other developments in the field of power storage also expected to contribute to demand growth. With respect to the latter, Alevio Group of Switzerland announced in October 2014 that it will deploy and commission production lines in Concord NC, USA for the manufacture of its innovative battery technology and GridBanks (banks of batteries that can be attached to the power grid). When the manufacturing facility is at full capacity it has the potential to produce 16 GWh of Alevio batteries per annum. According to the company, it “currently has one production line that is fairly well automated and capable of producing 600h MW and 300 MWh annually for both the utility-scale projects as well as smaller commercial and industrial customer installations”³³.

The United States is already home to 8,925 MWh per year or 20% of global EV Li-ion battery capacity and will have about one-third of the total in the short term, Table 19-9.

Table 19-9 Global automotive lithium-ion battery manufacturing capacity by stage (MWh per Year)

Global Automotive Lithium-Ion Battery Manufacturing Capacity (MWh-y) by Stage

Country	OPERATING			% of Total	PLANNED	
	Fully	Partially	Total		Begun	Announced
United States	8,925	8,750	17,675	32%	26,250	150
Foreign Countries	34,735	3,038	37,773	68%	16,244	120
<i>China</i>	<i>11,152</i>	<i>3,038</i>	<i>14,190</i>	<i>26%</i>	<i>16244</i>	<i>0</i>
<i>Japan</i>	<i>13,623</i>	<i>0</i>	<i>13,623</i>	<i>25%</i>	<i>0</i>	<i>0</i>
<i>Korea</i>	<i>6,570</i>	<i>0</i>	<i>6,570</i>	<i>12%</i>	<i>0</i>	<i>0</i>
<i>European Union</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0</i>
<i>Rest of World</i>	<i>3,390</i>	<i>0</i>	<i>3,390</i>	<i>6%</i>	<i>0</i>	<i>120</i>
Global Capacity in MWh-y	43,660	11,788	55,448	100%	42,494	270

Sources & notes -

1 Clean Energy Manufacturing Analysis Centre, April 2016 "Automotive Lithium-ion Cell Manufacturing: Regional Cost Structures and Supply Chain Considerations"

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³³ Forbes Magazine. Peter Kelly-Detwiler, May 10, 2016. “Alevio, The Other Energy Storage Gigafactory, Begins To Stir”

Over 26,000 MWh per year of new capacity is currently under construction in the United States. While there is current over capacity of EV batteries, if such large battery US plants do in fact reach their design capacities, it will be a positive development for domestic Li-ion battery commercialization. Assuming adoption of an accelerated development program, Graphite One could be producing an estimated 16,600 t of CSG or around 8% of global demand in this segment by 2021. Potentially, a significant proportion could be sold domestically but strategically Japan and Korea would be considered accessible markets given the advantageous location of the Graphite One Product Manufacturing Plant. Within this time frame Graphite One could potentially become the dominant, if not the only American producer, of high grade CSG that is integrated with a domestic graphite resource.

GRAPHITE POWDERS LESS THAN 20 MICRONS

● Graphite Powder Specifications & Description

The Graphite One spheronizing reject by-product material is expected to find application in a range of end uses. Table 19-10 shows TRU target specifications for four applications that would fit the strategy of focusing sales in high-end market segments.

Table 19-10 Graphite powders specifications by category

CATEGORY \ End-Use SPECIFICATION PROPERTY	Additive in Lubricants & Greases	Friction Materials & Powder Metallurgy		Conductive Additives
	Colloidal Graphite Suspension	Sintered Metal Brake Linings	High-end Powder Metallurgy	Plastics & Rubbers
Flake Size (µm)	1-3	5-20	4-20	4-20
Purity (%)	99.5-99.9	> 99.0	99.7-99.9	99.9
Ash (%)	0.1-0.5	1	0.1-0.3	0.1
Surface Area (m ² /g)	10-25 [†]	-	-	≥ 9 [†]
Density-Scott (g/cm ³)	0.04-0.13 [*]	-	-	0.05-0.08 [†]
Electrical Resistivity (Ω cm)	-	-	-	0.04-0.08

Sources and notes -

† Based on TIMCAL TIMREX PP10 and LSG 10 Natural flake

* Based on Micrograf (HC30, 99507 UJ) from Nacional de Grafite

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Larger flakes are best used for making high-value converted products while finer powder is best applied as additives. Since thermal material purification up to 99.9% will be done prior to spheronizing the reject byproduct will be immediately applicable to, and will compete with synthetics for, lubricants, conductive polymers and powder metallurgy end uses. This may require milling and micronization to an appropriate particle size distribution.

● Graphite Powders Market Positioning for Graphite One

Production of about 13,500 t per year of the reject material, the by-product from spheronizing, is a significant volume; however, it has potentially a wide range of uses such as in lubricants, friction products, high-end conductive plastics and specialty powder metallurgy additives. This opinion is subject to further testwork on the Graphite One material and a more detailed market study.

In concentrate terms, the global natural graphite demand projected for these uses in 2021 is about the same volume for that projected for batteries in 2021 – 400,000 t-conc. In the markets where natural graphite is well established – lubricants and friction products – the projected demand represents two-thirds of this. For powder metallurgy, “high-purity” graphite of around 96-99% Cg is preferred, with a particle size of around 5µm³⁴ and thus the Graphite One material would be particularly well suited. However, the powder metallurgy segment requires further assessment once more technical data is known about the Graphite One by-product material.

19.1.3 Graphite One Product Pricing and Sales Revenue

PROJECT AT FULL CAPACITY OF 55,350 TPY-PRODUCT

The average price of the Graphite One manufactured output products is projected to be around \$5054 per t ex plant on a 2016 constant US dollar basis. The average reflects TRU estimates for the likely achievable price for the individual products after examining various sources of data and China export value per t data. The price estimates are shown in Table 19-11

Table 19-11 Graphite One sales segmentation by product – volume t & value 2016\$US ex-plant at full capacity

Graphite One Sales Segmentation by Product - Volume & Value Ex Plant

Graphite Product Segment	Volume ¹ tpy	Price ² US\$ per t	SALES	
			US\$million	%
Coated Spherical Graphite ³	41,850	\$6,200	\$259	93%
Purified Graphite Powders <20 microns	13,500	\$1,500	\$20	7%
- <i>standard powders</i>	6,750	\$1,000	\$6.8	
- <i>niche-segment powders</i>	6,750	\$2,000	\$13.5	
TOTAL SALES	55,350	\$5,054	\$280	100%

Sources & notes -

1 Volume segmentation TRU estimates for plant at full capacity

2 Prices are TRU estimates in 2016 US\$ per t ex plant subject to detailed market study

3 Coated spherical graphite price based on China export value for uncoated plus coating charge

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³⁴ Roskill Information Services Ltd, 2012. “Natural and Synthetic Graphite: Global Industry and Markets Outlook 2012”

Graphite One aims to achieve market price leadership given that several potential competitors have announced plans to build such a facility in the United States. Alabama Graphite Corp is the only US based graphite junior saying it plans to produce coated spherical graphite from graphite sourced in the US.

TRU price estimates are reasonable considering the state of development of the market and the size of the proposed large volume operation. The CSG price of \$6,200 per t ex plant is based on China export value for uncoated plus a coating charge: the coating charge considers the cost-of-coating variations & risks, margin targets and the competitive environment as it exists in 2016. On the latter consideration, it is noted that Graphite One must be competitive with captive coaters. TRU judgement is that the error in the US\$6,200 estimate is about $\pm 30\%$ (between \$4,340 and \$8,060). Using the China export value per tonne FOB (free on board China port) at this stage as the foundation of the target price for the Product Manufacturing Plant's primary production provides some assurance of Graphite One's potential for price competitiveness in both domestic and Asian regional markets.

Benchmark Mineral Intelligence, UK has estimated a price range for coated spherical graphite in the range of \$7,000 - \$12,000 per t although without any explicit basis. Graphite One pricing assumptions for CSG are not a deliberate undercutting strategy but rather a more realistic projection of the attainable selling point inside a contained and controlled market.

Project economics is most sensitive to product selling prices than any other variable analyzed in Section 22.3 Sensitivity Analysis of this report. That analysis shows that a price assumption for coated spherical graphite of \$8,060 per t rather than the \$6,200 base case would result in an IRR of 35 % compared to the projected 27 %.

ANNUAL GRAPHITE SALES PROJECTION

TRU expects sales revenue to reach US\$280 million at full capacity with CSG dominating output accounting for 93% or US\$259.5 million, of the total. Purified Graphite Powders account for the balance with sales of \$20 million. Fast-paced capacity expansion is aimed at quickly gaining a dominating share of the global market by the sixth year of production, Table 19-12.

GRAPHITE ONE STRATEGIC POSTURE & COMPETITIVE STRATEGY

By far the most important competitive advantage to be relied upon will be Graphite One's anticipated ability to manufacture very high quality spherical coated graphite with comparative ease with a favourable (low) level of powder by-product production. In the laboratory setting the STAX graphite spheronizes much more efficiently (compared to industry norms), coats well and exhibits outstanding electrical properties. Trials on commercial equipment are planned to determine whether these advantages transfer to the plant environment. It is realized also that a significant R&D and product development effort is required due to the uniqueness of the Graphite Creek (STAX) graphite to be processed³⁵.

³⁵ Exploratory product development testwork based on graphite recovered from selective surface graphite mineralization sample set achieved almost 75% conversion of the recovered graphite flakes to spherical graphite.

**Table 19-12 Graphite One ten-year sales projection
2016\$millions**

Graphite One Sales Projection based on Capacity
Start-up and Expansions 2016-US\$millions

Year	Volume t	Revenue US\$million	Expansion Rate % pa
1	16,605	\$84	-
2	22,140	\$112	33%
3	27,675	\$140	25%
4	44,280	\$224	60%
5	49,815	\$252	13%
6	55,350	\$280	11%
7	55,350	\$280	0%
8	55,350	\$280	0%
9	55,350	\$280	0%
10	55,350	\$280	0%

Sources & notes -

1 Ave price per t 2016 constant US\$ ex plant \$5,054

Graphite One could be a globally prominent producer of premier CSG for use in EV Li-ion battery anodes within the planned production horizon targeting markets in the United States, Japan, Korea and Europe.

The coated spherical market is in a developing stage with rapid changes occurring. Graphite One strategy remains flexible and would consider options such as selling uncoated spherical graphite, toll and customized coating, as well as making Li-ion anodes in-house to lock-in a portion of the coated output.

19.1.4 Contracts Required for Property Development

Distribution of the manufactured output products is expected to be largely direct to anode and Li-ion battery manufacturers. Graphite One Resources is in conversation with such potential customers and is arranging in due course to send product samples to some for their evaluation.

20 ENVIRONMENT, PERMITTING, SOCIAL IMPACT

20.1 Environmental Studies

This section characterizes the existing environmental baseline data that has been collected for the PEA and makes further suggestions for additional studies that would be beneficial for Graphite Creek Project planning, design, and future permitting efforts. Furthermore, a summary is presented of anticipated permits that may be required, and describes social and community engagement to date.

20.1.1 Baseline Studies Completed and Ongoing

Graphite One is conducting and planning to conduct a number of baseline studies to examine the potential impact of the Project on the environment and on land and water use by Alaska Native communities. These studies and their status are summarized in Table 20-1 and are discussed below. To the knowledge of the QP, there are no outstanding environmental liabilities to which any portion of the Project is subject.

Table 20-1 Graphite One baseline environment studies and current execution status

BASELINE ENVIRONMENTAL STUDY	STATUS
Hydrology and Water Quality	Sampling of streams on Graphite Creek Property- 2014, 2015, 2016 Additional studies planned
Wetlands	Desktop completed. Additional studies planned
Aquatic Life and Fisheries	Initial desktop and field surveys completed in 2014. Anadromous species in Cobblestone River. No fish species documented in Graphite Creek, Ptarmigan Creek, Ruby Creek, Trail Creek. Additional aquatic life and fisheries studies planned
Metal Leaching and Acid Base Accounting	Acid leach studies of different rock types and mineralogies – Planned
Archeology	Planned
Hydrogeology	Planned
Meteorology, Air Quality	Planned
Noise and Visual Impacts	Planned
Wildlife	Planned

HYDROLOGY AND WATER QUALITY

The Graphite Creek Deposit lies on the north side of the Kigluaik Mountains in a watershed that drains to the north via several small creeks that flow into Imuruk Basin. A larger watershed is located to the east that drains via the Cobblestone River, an anadromous waterway which also drains into the Imuruk Basin.

Hydrology and surface water quality sampling efforts began in 2014 with the establishment of nine sample stations including the Cobblestone River, Graphite Creek, Ptarmigan Creek, Ruby Creek, Trail Creek and Christophosen Creek. The 2014 sampling effort was conducted in three sampling periods; early June, late July, and mid-September in an effort to capture three runoff regimes; high flow post breakup, summer base flow, and mid to high fall storm discharge. Several stations in the upper reaches of the drainages were unable to be sampled in June due to high amounts snow and frozen site conditions. Discharge was taken at each station using the incremental velocity-area method (Buchanan and Somers, 1969).

Hydrology and water quality sampling continued in 2015 with nine sites being sampled in mid-October. Freeze up had not yet occurred, but varying amounts of ice was present in all of the creeks including large ice bergs in the Cobblestone River.

There were two sample events in 2016 with the first sample event occurring in late May. As in 2014, the upper stations were covered in deep snow and several of the original upper sample stations were inaccessible. Alternate sample stations were established further down the valley where liquid water was observed and sampled for both hydrology and water quality. Summer base flows were also collected in August and the number of sample stations were expanded from nine to 16 including stations on Canyon Creek, Falls Creek, Hotsprings Creek, White Creek, and Pond Creek.

Water quality analysis includes common field parameters such as water temperature, electrical conductivity, pH, dissolved oxygen, and turbidity. Samples are collected and sent to a lab for chemical analysis including total and dissolved metals, total and dissolved organic carbon, total suspended solids, hardness, acidity, ammonia, and nitrates.

WETLANDS

A desktop wetlands analysis was prepared in 2014 by HDR Inc., using guidelines set forth by the U.S. Army Corps of Engineers. The survey included regional familiarity with plant species, high resolution 1-meter satellite imagery, topographic information, U.S. Fish and Wildlife Service National Wetland Inventory, U.S. Geologic Survey National Hydrology Dataset, and LANDFIRE vegetation mapping. A total of 53,000 acres were delineated using two scales of detail. The areas including mineral claims, potential transportation corridors, and the Tisuk Camp were mapped at of 1:3,000, while the rest of the delineation was done at a scale of 1:12,000. Areas were classified as “uplands”, “high-value wetlands”, and “low-value wetlands”. Of the 53,000 acres delineated, approximately 23,000 were classified as uplands, 23,000 acres were low-value wetlands, and 7,000 acres were high-value wetlands (HDR, 2015). The results of the delineation will be used in Graphite Creek Project planning for the siting of facilities and transportation. A ground survey will be required for permitting purposes.

AQUATIC LIFE

A survey of aquatic resources was conducted in 2014. The survey consisted of an initial desktop survey of known aquatic resources, as well as a field survey conducted in late July. The desktop survey determined that there are documented anadromous species including sockeye salmon, pink salmon, chum salmon, Dolly Varden char, and an unspecified whitefish (ADF&G, 2006, 2008) in the Cobblestone River. No fish species are documented in Graphite Creek, Ptarmigan Creek, Ruby Creek, Trail Creek, and an unnamed tributary near the Graphite Creek Project area. To the west of the Graphite Creek Project area, Canyon Creek supports pink salmon, chum salmon, and Dolly Varden char (ADF&G, 2004, 2006). Imuruk Basin, a brackish shallow waterbody to which all creeks and rivers in the Graphite Creek Project area drain, is known to contain at various times of the year; sockeye salmon, chum salmon, pink salmon, grayling, northern pike, whitefish herring, flounder, Dolly Varden char, and burbot (Raymond-Yakoubian, 2013).

The field survey did not sample Canyon Creek, or the Cobblestone River, however salmon were observed while conducting water sampling in the Cobblestone later that fall. The survey did include placing traps in Graphite Creek, Ptarmigan Creek, Glacier Canyon Creek, Trail Creek, and two unnamed creeks. No fish were captured in 541 total hours of the traps being set in the various creeks (TetraTech, 2014a).

ADDITIONAL BASELINE STUDY RECOMMENDATIONS

DISCIPLINE	RECOMMENDED STUDIES
Metal Leaching and Acid Base Accounting	Static test work of lithogeochemical domains within and adjacent to the proposed pit as well as eventual kinetic test work including humidity cells and onsite leaching barrels.
Archeology	Assessment of known cultural sites and on the ground fieldwork to investigate potential additional sites.
Aquatic Life	Expanded aquatic life surveys of the waterbodies in and adjacent to the Graphite Creek Project area including spawning, presence/absence, macroinvertebrates, and habitat.
Fisheries	Analysis of the known fisheries and potential impacts due to mining.
Hydrogeology	Installation of groundwater monitoring wells at various locations in and adjacent to the

DISCIPLINE	RECOMMENDED STUDIES
	Graphite Creek Project area to determine the groundwater quality and quantity.
Hydrology	Expanded water quality sampling and hydrologic studies are needed to support development of a Graphite Creek Project plan and eventual permitting.
Meteorology	Installation of one or several meteorological stations and modeling of the data to ADEC standards. Background air pollution data collection and modeling should also be done if required by ADEC.
Noise and Visual Impacts	A noise and visual impacts survey of background conditions should be conducted in support of permitting activities.
Wildlife	Avian, large mammal, subsistence, and threatened and endangered species should be conducted for the Graphite Creek Project area and adjacent migratory locations.

20.2 Permitting

20.2.1 Exploration Permits

Graphite One Resources conducts mineral exploration under the State of Alaska Annual Hardrock Exploration (AHEA) Permit #2299. The AHEA covers drilling activities, water usage, temporary camps and small land disturbances. In addition, Graphite One participates in the BLM and State reclamation bonding pools.

20.2.2 Mining Permits

Many state and federal permits will be required to conduct mining operations at the Graphite Creek Project area. A full list will not be determined until after a Feasibility has been conducted and a Plan of Operations has been developed. Absent that plan, Graphite One has provisionally identified ten federal and twenty-four state permits/certificates that could be required to undertake mining on the Graphite Creek Property.

AGENCY	AUTHORIZATION
FEDERAL	
Environmental Protection Agency (EPA)	Spill Prevention Containment and Contingency (SPCC) Plan
U.S. Army Corps of Engineers (USACE)	River and Harbors Act (RHA) Section 10 (structures in navigable waters)
	RHA Section 9 (dams and dykes in navigable waters – interstate commerce)
U.S. Coast Guard	RHA Section 9 Construction Permit (bridge across navigable waters)
Bureau of Alcohol, Tobacco, and Firearms	License to Transport Explosives
	Permit and License for Use of Explosives
Federal Aviation Administration	Notice of Landing Area Proposal (existing airstrip)
	Notice of Controlled Firing Area for Blasting
U.S. Department of Transportation	Hazardous Materials Registration
U.S. Fish and Wildlife Service	Section 7 of the Endangered Species Act, Consultation requiring a Biological Assessment or Biological Opinion
STATE	
Division of Mining, Land, and Water	Plan of Operations
	Reclamation Plan Approval
	Mining License
	Land Use Permits and Leases
	Right-of-Ways, Easements, Material Sales, etc.
	Certificate of Approval to Construct a Dam
	Certificate of Approval to Operate a Dam
	Temporary Water Use Permit
	Water Rights Permit/Certificate to Appropriate Water
State Historic Preservation Office	Section 106 Historical and Cultural Resources Protection Act clearance

AGENCY	AUTHORIZATION
Office of Habitat Management and Permitting	Fish Habitat Permit
	Culvert/Bridge Installation Permit
Division of Water	Section 401 Water Quality Certification (CWA 402 permit)
	Wastewater Disposal Permits
	Non-Domestic Wastewater Disposal Permit
	Storm Water Discharge Pollution Prevention Plan
	Domestic Wastewater Disposal Permit
	Approval to Construct and Operate a Public Water Supply System
Division of Environmental Health	Solid Waste Disposal Permits
	Food Sanitation Permit
	Class III Municipal Solid Waste Landfill Permit
Division of Air Quality	Air Quality Construction Permit (first 12 months)
	Air Quality PSD Title V Operating Permit (after 12 months)
	Air Quality permit to Open Burn

Subsequent to the completion of this PEA, a Feasibility Study will commence, wherein more detail regarding plans for mining and processing will be developed and presented. This will lead to a Plan of Operations to be developed for submission so that the National Environmental Policy Act (NEPA) review process can begin. Many of the permits above, and some more minor permits not included in the above table, will be part of the NEPA process.

20.3 Social/Community Impact

The objective of Graphite One’s Community Relations Program is to foster relations with the local population through regular, open dialogue and information sharing to ensure that all stakeholders have a voice in the Project’s planning, exploration and development phases.

To date, the program has focused on building the company’s relationship with the Inupiaq communities closest to the Property (Teller, Brevig Mission and Mary’s Igloo) as well as the City of Nome. There is a high level of interest in the Project and the possibility that it could bring economic and employment benefits to the region. There are also concerns that the project might disrupt the region’s subsistence way of life.

Over the last two years, Graphite One has held numerous meetings with residents of the communities of Teller, Brevig Mission, Mary's Igloo and the City of Nome. Each governing entity within these communities has been included in these meetings. In addition, meetings have been regularly held with regional organizations and governing bodies such as Kawerak, Inc. and Bering Straits Native Corporation.

In meetings held to date, Graphite One has described the exploration program, generally introduced the Project and answered questions from the participants. The company has assisted the Inupiaq communities in establishing Subsistence Advisory Councils to, among other things, advise the Project on matters related to the Alaska Natives hunting and gathering issues. Once the Preliminary Economic Assessment is completed and provides more detail on the project, Graphite One will review the document with each of the communities.

Uqaqti Consulting, LLC from Fairbanks, AK assists Graphite One in coordinating its Community Relations Program. Uqaqti's principal consultant is an Alaska Native, has lived in remote villages for fifteen years and has a comprehensive understanding of Alaska native social, economic, political and cultural issues.

21 CAPITAL COSTS AND OPERATING COSTS

21.1 Project Summary

21.1.1 Graphite One Project Capital Investment Summary

The order-of-magnitude capital cost estimates presented herein for the mining at the Graphite Creek property, the Mineral Processing Plant and the Graphite Products Manufacturing Plant were developed from the equipment lists for major equipment based on the designs described in Sections 16, 17, and 18, Mining Methods, Recovery Methods and Project Infrastructure, respectively. Quotations for certain project-specific items, higher-cost equipment, as well as TRU in-house data were employed in the generation of the estimates. The plant capital expenditures were spread over three years and ramp up to full production at 60,000 tonnes per year (tpy) of graphite concentrate at the Mineral Processing Plant is six years. The Product Manufacturing Plant design has the plant reaching full capacity at 55,350 tpy of graphite products in Year 6.

The order-of-magnitude capital cost (CAPEX) for mining operations, the Mineral Processing Plant and the Product Manufacturing Plant and infrastructure was estimated at \$363 million. No contingency is included for the two Plants. Indirect costs for the two Plants were assumed to be 33% of the direct costs: 20% for EPCM (engineering, procurement, construction & management), 10% for freight and capital spare parts, and 3% for commissioning and start-up costs. A summary of the CAPEX estimates is shown in Table 21-1.

Table 21-1 Mining and Plant capital cost summary 2016 \$million

Summary of Capital Cost Estimate

OPERATIONS CATEGORY	CAPITAL COST US\$ millions
Graphite Creek Mine & Mineral Processing	\$233
<i>Mining</i>	\$43
<i>Mineral Processing</i>	\$158
<i>Infrastructure</i>	\$32
Product Manufacturing Plant	\$130
TOTAL ALL OPERATIONS	\$363

21.1.2 Graphite One Project Operating Costs Summary

The order-of-magnitude operating cost (OPEX) for the entire project at full capacity inclusive of Graphite Creek mining, Alaska Mineral Processing Plant and Infrastructure, and the Product Manufacturing Plant is estimated at \$98 million per year. On a plant input/output basis, the total project OPEX translates to US\$96/t-Mineral Processing Plant Feed or \$1,774 per t of Product Manufacturing Plant graphite product. The OPEX estimates are shown in Table 21-2.

Table 21-2 Mine and Plants operating cost summary 2016\$

Operating Cost Estimates, Mine and Plants at full capacity -US\$

MAJOR OPERATING COST ITEM	Graphite Creek		Product Manufacturing	Graphite One Integrated Project
	Mining	Mineral Processing		
	\$	\$		
Labour	\$21,887,000	\$12,170,000	\$7,270,000	\$41,327,000
Energy (Power and Diesel) ¹		\$9,900,000	\$14,900,000	\$24,800,000
Equipment Operation	\$2,799,500			\$2,799,500
Consumables		\$3,300,000	\$7,100,000	\$10,400,000
Maintenance & Supplies	\$1,781,500	\$2,700,000	\$3,600,000	\$8,081,500
Miscellaneous	\$1,272,500			\$1,272,500
Concentrate Shipping		\$1,800,000	\$7,698,000	\$9,498,000
Total Operating Cost	\$27,740,500	\$29,870,000	\$40,568,000	\$98,178,500
Operating Cost/t Mineral Processing Plant feed	\$27	\$29	\$40	\$96
Operating Cost/t Concentrate	\$462	\$498	\$676	\$1,636
Operating Cost/t Graphite Product	\$501	\$540	\$733	\$1,774

Sources & notes -

¹ The mining energy cost is included in Alaska Plant cost

TRU Estimates

21.2 Basis of Estimates

The mining/milling/manufacturing process for the proposed graphite products was developed by TRU based on the set of assumptions illustrated in Sections 16,17 and 18. The operating and capital costs were developed by TRU for:

- the Graphite Creek mine in Alaska;
- the Mineral Processing Plant located at the mine site;
- the Mineral Processing Plant Infrastructure; and
- the Products Manufacturing Plant located at brownfield site with developed infrastructure and access to low cost electric power³⁶.

Production is based on a resource of 44 million tonnes at 7% Cg and a project life of 40 years.

³⁶ TRU Group has only reviewed Washington State as a potential site for the Product Manufacturing Plant for the PEA because it readily satisfies the economic, logistical and infrastructure criteria. Graphite One will also be reviewing potential sites in the State of Alaska.

21.2.1 Mining at Full Capacity

The estimated costs for development of the mine have been based upon certain technical assumptions and approximations. A more refined capital cost (CAPEX) will be developed once many of these assumptions are resolved for site-specific factors.

The proposed mine plan is for a “truck and shovel” open-pit operation mining four (4) en echelon benches, initiating along the physical outcrop of the graphite bearing zone. These pits will mine, in succession, the overburden above Lode 1 (Bench 1), the graphite-bearing Lode 1 (Bench 2), the non-graphite bearing inter-burden below Lode 1 (Bench 3), and the graphite bearing Lodes 2 and 3 as a single unit (Bench 4). It is noted that there will be non-graphite mineralization bearing waste rock mined from Benches 2 and 4, which will be identified by the mine management team prior to blasting, which will be hauled away to the overburden waste area.

Electrical power for the mine operation will be generated by the on-site power plant, which is included in the Infrastructure costs.

Table 21-3 below summarizes the assumed design factors utilized in the mining CAPEX/OPEX development.

Table 21-3 Mine design criteria

Mining Design Criteria

DESIGN FACTOR	ASSUMPTION
Mine type	Surface mine
Strip ratio	3:1
Plant feed production, tpd	3,090
Waste production, tpd	9,270
Haul distance to Plant, km	1.5
Haul distance to Waste rock storage, km	1.5
Operating days/year	360
Hours/shift	12
Shifts/day	2
Number of shift crews	4
Shift schedule	14 days on/14 off
Operating benches	4

Sources & notes -

TRU Estimates

21.2.2 Plant Production at Full Capacity

The Project CAPEX/OPEX estimates and financial analysis were based on the initial rate of production and phased expansion of both the Mineral Processing Plant and the Product Manufacturing Plant as tabulated in Table 21-4. The phased rate of capacity expansion is based on market conditions with a projected uptick in graphite demand. The Mineral Processing Plant is designed to initially produce 18,000 tpy-concentrate and increase to full Plant production capacity of 60,000 tpy-concentrate by Year 6. The Product Manufacturing Plant is designed to initially produce 16,600 tpy-product and reach full capacity of 55,350 tpy-product by end of Year 6. It is assumed that the annual concentrate production can be shipped to the Product Manufacturing Plant during the 5-month operating window for barge transport.

Table 21-4 Plants production schedule capacities assumptions

Planned Production Unit Capacities by Period in tpy

UNIT PRODUCTION INPUT-OUTPUT	PLANNED CAPACITY						
	tpy						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Years 7+
Mineral Processing Plant							
Plant Feed	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000
Graphite Concentrate Output	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Products Manufacturing Plant							
Concentrate Feed from Alaska Mineral Processing	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Graphite Manufactured Products Output	16,605	22,140	27,675	44,280	49,815	55,350	55,350

Sources & notes -
TRU Estimates

21.2.3 General Financial Assumptions

The following are some of the general financial assumptions applied in the TRU analysis –

- All units are in metric
- Currency – **\$2016** constant dollars
- Sales Prices – market price FOB Product Manufacturing Plant
- Input costs – market prices adjusted for location delivered
- Chemical prices- published ICIS Prices provided benchmark USA prices for input chemicals
- Equipment costs are based on TRU files and experience on similar facilities and confidential budget quotations from major equipment vendors
- Projections are for 40 years but this is not a reflection of the mine or plant operations life and no terminal value is applied
- Exploration and feasibility study costs are not included; rather, all costs once production begins are included

- As a Conceptual-level Study all capital and main line operating cost estimates are at an accuracy of $\pm 45\%$, and the display of more detailed data is not intended to suggest a margin of accuracy other than the $\pm 45\%$
- Profitability is assessed on a Project Total Capital Cost only, and no estimation of possible financing structure has been made
- This financial analysis, given in Section 22, is subject to caution. Due to the elevated risk a higher discounting rate of 10% has been assumed in the Net Present Value (NPV) evaluation.

21.2.4 Exclusions to Capital Cost Estimates

Exclusions to the capital cost estimates include the following -

- Exploration drilling
- Metallurgical testwork
- Environmental impact studies
- Rock mechanics study
- Hydrogeology investigations
- Geotechnical investigations
- Pre-feasibility and Feasibility studies
- Land acquisition, leases, rights of way and water rights
- Port facilities at Nome
- Permits, fees and process royalties
- Project application and approval expenses
- Import duties and custom fees
- Project financing and interest charges
- Taxes
- Escalation of pricing

21.3 Capital Cost (CAPEX) Estimates

21.3.1 Open Pit Mining

The mining capital cost is estimated at \$43.2 million and is based on the Mineral Processing Plant operating at full capacity with the mine delivering 1,018,000 tpy (3,090 tpd) of feed to the plant. The mining strip ratio was estimated at 3:1 based on TRU assessment of available geological data. The indirect costs of \$3.1 million include Engineering (10% of the direct cost of the equipment and buildings). The capital cost breakdown is shown below in Table 21-5.

Table 21-5 Graphite Creek mining capital cost estimate 2016 \$million

Mining Capital Cost Estimate by Category and Item US\$ millions

CAPITAL COST CATEGORY & ITEM	COST \$ million
Mining Equipment & Facilities Costs:	\$40.0
<i>Mining Equipment</i>	26.5
<i>Mine Services Buildings</i>	4.9
<i>Site Roads and Preliminary Earthwork</i>	6.9
<i>Pre-production Stripping</i>	1.7
Indirect Costs	\$3.1
<i>Engineering</i>	3.1
TOTAL CAPITAL COST - MINING	\$43.1

Sources & notes -
TRU Estimates

MINING EQUIPMENT

The capital cost for the mining equipment is based on the equipment items listed in Table 21-6. Equipment pricing was based upon average available pricing from various vendors. The number of each equipment type was developed based on the design criteria listed in Table 21-3.

Table 21-6 Graphite Creek mining equipment list at plant full capacity

Mining Equipment

EQUIPMENT ITEM	NUMBER OF UNITS
Shovel - 2 cubic meter excavator	4
Front End Loader - 5 cubic meter	4
Rear Dump Truck - 50 tonne	8
Rotary Drill	4
Bulldozer -Caterpillar D9	6
Road Grader	3
Water Tanker	3
Service/Tire Truck	5
Light Plants	16
Water Pumps	5
Pickup Truck	10

Sources & notes -
TRU Estimates

MINE SERVICE BUILDINGS

The mine service buildings listed in Table 21-7 were included in the capital cost estimate. A cost of \$1500 per square-meter was used.

Table 21-7 Graphite Creek mining service buildings list

Mine Services Buildings

BUILDING	AREA m ²
Mine Office	100
Maintenance	2500
Storage/Warehouse	200
Worker Barrack/Rec/Dining Facility	700

Sources & notes -
TRU Estimates

SITE ROADS AND PRELIMINARY EARTHWORKS

Haul route distances of 1.5 km for each the plant feed and for the waste rock was used in the estimate.

PRE-PRODUCTION STRIPPING

Pre-production stripping would be minimal, as the graphite mineralization body outcrops at the surface. Removal of the overburden is incorporated in the first pit.

21.3.2 Mineral Processing Plant

The order-of-magnitude capital cost for the Mineral Processing Plant is estimated to be \$158 million without added contingency. Indirect costs were assumed as 33% of the plant direct costs; 20% for EPCM (engineering, procurement, construction & management), 10% for freight and capital spare parts, and 3% for commissioning and start-up costs. Further details of the capital cost estimate are shown in Table 21-8.

Table 21-8 Mineral Processing Plant capital cost estimate 2016 \$ million

Mineral Processing Plant Capital Cost

CAPITAL COST CATEGORY & ITEM	COST \$million
Equipment & Facilities Costs:	\$129
<i>Mineral Processing</i>	89.6
<i>Tailings Dam</i>	14.5
<i>Process Building</i>	22.0
<i>Concentrate Storage</i>	2.5
Indirect and Start-up Costs	\$30
<i>Freight & Insurance & Capital Spare Parts</i>	9.0
<i>Basic & EPCM</i>	17.9
<i>Commissioning & Startup</i>	2.7
<i>Owner's Cost</i>	0.0
TOTAL PLANT	\$158

Sources & notes -

TRU Estimates

MINERAL PROCESSING PLANT

The capital cost estimate for the Mineral Processing Plant was based on the major equipment list compiled for the design of the Plant described in Section 17, Recovery Methods. Estimates for high-cost equipment items were based on vendor quotations while other equipment costs were sourced from TRU in-house data. Equipment installation costs for civils and structural, piping, electrical, instrumentation and miscellaneous mechanical were developed by applying factors to the equipment cost.

TAILINGS DAM

The cost of the tailings placement in a dam was estimated to be \$2 per t-tails. By the time full production has been reached, the capital outlay is estimated to be \$7 million. An additional \$8 million was included for an added 4 years of storage for a total of 10 years of operation. The financial model includes working capital for tailings pond expansion after 10 years. Table 21-9 shows the estimated tailings output from the Mineral Processing Plant.

Table 21-9 Tailings output by year

Planned Production Unit Capacities with Tailings Output in tpy

UNIT PRODUCTION INPUT-OUTPUT	PLANNED CAPACITY						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Years 7+
Mineral Processing Plant							
Plant Feed Input	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000
Graphite Concentrate Output	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Tailings Output	287,400	383,200	479,000	766,400	862,200	958,000	958,000

Sources & notes -
TRU Estimates

MINERAL PROCESSING PLANT BUILDING

The Mineral Processing Plant building size was estimated to be approximately 14,000 square meters based on a preliminary plot plan for the major processing equipment, reagents storage, utilities, product packaging, control room and offices. The estimated capital cost of the plant at \$22 million was based on a northern industrial building cost from TRU in-house data (\$1600/m²).

CONCENTRATE STORAGE BUILDING

The Concentrate Storage building size was calculated based on storing six months of concentrate production (30,000 t) stored in one tonne bags. The capital cost was estimated to be \$2.5 million based on storing the bags concentrate in purchased 20-foot shipping containers, each holding about 18 tonnes. Approximately half of the containers would be stacked at site and the other half at the Port of Nome.

21.3.3 Mine and Plant Infrastructure

The capital cost estimate for the Graphite Creek site infrastructure was developed based on the major plant and mine requirements outlined in Section 18, Project Infrastructure. The capital cost for the Alaska site infrastructure was estimated to be \$32 million without added contingency. Further details of the capital cost estimate are shown in Table 21-10.

Table 21-10 Graphite Creek infrastructure capital cost estimate 2016 \$million

Capital Cost Estimate Infrastructure Mining & Mineral Processing

CAPITAL COST CATEGORY & ITEM	COST \$ million
<i>Site Access Road</i>	\$10
<i>Power Plant</i>	\$12
<i>Infrastructure (Camp, Port Storage)</i>	\$10
TOTAL INFRASTRUCTURE COST	\$32

Sources & notes -

TRU Estimates

SITE ACCESS ROAD

The length of the site access road to the Graphite Creek Property was estimated to be about 35 km from the highway. Road construction costs of \$275,000 per km (Total capital cost: \$10 million) were based on the average cost of road construction from preliminary quotations provided to Graphite One.

POWER PLANT

The electrical power requirement for the Mine, Plant and the Staff Accommodation facilities was estimated to be 6 MW once the operations are at full working capacity. The diesel power plant capital cost of \$12 million was based on TRU in-house data and includes fuel storage and handling facilities.

INFRASTRUCTURE (CAMP, PORT STORAGE)

This category includes miscellaneous items outside the scope of the Mine and Plant and is a capital cost allowance. On site roads, a habitation unit with living quarters and communal facilities for the on-site work force, and concentrate storage at the Port of Nome is included.

21.3.4 Product Manufacturing Plant

The order-of-magnitude capital cost for the Product Manufacturing Plant was estimated to be \$130 million without added contingency. Indirect costs were assumed to be 33% of the direct costs; 20% for EPCM (engineering, procurement, construction & management), 10% for freight, insurance, and capital spare parts, and 3% for commissioning and start-up costs. Further details of the CAPEX estimate are shown in Table 21-11.

Table 21-11 Product Manufacturing Plant capital cost estimate 2016 \$million

Product Manufacturing Plant Capital Cost Estimate

CAPITAL COST CATEGORY & ITEM	COST \$million
Equipment & Facilities Costs:	\$100
<i>Product Manufacturing</i>	90.1
<i>Ash Storage</i>	1.8
<i>Manufacturing Building</i>	6.0
<i>Concentrate Storage</i>	2.5
Indirect and Start-up Costs	\$30
<i>Freight & Insurance & Capital Spare Parts</i>	9.0
<i>Basic & EPCM</i>	18.0
<i>Commissioning & Startup</i>	2.7
<i>Owner's Cost</i>	0.0
TOTAL PLANT COST	\$130

Sources & notes -
TRU Estimates

PRODUCT MANUFACTURING

The capital cost estimate for the Graphite Products Manufacturing Plant was developed from an equipment list for major equipment based on the design described in Section 17, Recovery Methods. Estimates for high cost items were based on vendor quotations while other equipment costs were sourced from TRU in-house data. Equipment installation costs for civils and structural, piping, electrical, instrumentation and miscellaneous mechanical were developed by applying factors to the equipment cost.

ASH STORAGE

Ash is generated during thermal purification of the concentrate. The cost to store the ash was estimated to be \$40 per t-ash. Further study of the ash characteristics will determine whether it could be used for remediation efforts. By the time full production has been reached by the end of year 6, the capital outlay is estimated to be \$0.9 million. An additional \$0.9 million was included for an added 4 years of storage for a total of 10 years of operation. The financial model includes working capital for ash storage expansion after 10 years. Table 21-12 shows the estimated ash output from the Plant.

Table 21-12 Product Manufacturing Plant furnace feed input and ash output

Planned Production Unit Capacities with Furnace Ash Output in tpy

Unit Production Input-Output	Planned Capacity						
	year 1	year 2	year 3	year 4	year 5	year 6	years 7+
Product Manufacturing Plant							
Plant Feed Input	18,000	24,000	30,000	48,000	54,000	60,000	60,000
Furnace Ash Output	1,800	2,400	3,000	4,800	5,400	6,000	6,000

Sources & notes -
TRU Estimates

MANUFACTURING BUILDING

The Product Manufacturing Plant building size is estimated to be approximately 5,600 square meters based on a preliminary plot plan for the major processing equipment, reagents storage, utilities, product packaging, control room and offices. The estimated capital cost of the Plant at \$5.6 million was based on \$ per square meter (\$/m²) construction costs of \$1000.

CONCENTRATE STORAGE

The Concentrate Storage building size is estimated on the basis of storing 6 months of concentrate production (30,000 t) packaged in 1-tonne bags. The capital cost was estimated to be \$2.5 million based on storing the bags concentrate in purchased 20-foot shipping containers, each holding about 18 tonnes. The containers would be stacked at the Product Manufacturing Plant.

21.3.5 Product Manufacturing Plant Infrastructure

It is assumed that the Product Manufacturing Plant site will be situated in an industrial area at a coastal location with developed infrastructure, serviced by road and rail and has access to low cost electrical power.

21.4 Operating Costs

21.4.1 Open Pit Mining

The Graphite Creek mining cost is estimated to be \$27.7 million per year or on a plant input basis, \$27.25 per t-plant feed. The cost includes delivery to the Mineral Processing Plant. Table 21-13 shows the breakdown of the operating costs.

Table 21-13 Mining operating cost estimate 2016 US\$

Mining Operating Cost Estimate at Full Capacity

MAJOR OPERATING COST ITEM	Mining OPEX	
	\$/year	\$/t Plant Feed
Salaried Labour	\$1,730,600	\$1.70
Hourly Labour	\$20,156,400	\$19.80
Equipment Operation	\$2,799,500	\$2.75
Supplies/Materials	\$1,781,500	\$1.75
Miscellaneous	\$1,272,500	\$1.25
Total Operating Cost	\$27,740,500	\$27.25

Sources & notes -
TRU Estimates

These costs are based upon the best available factors known at the present time and account for year-round, multi-pit exploitation with careful control on graphite mineralization grade. The costs are conservative and include provisions for unknown geotechnical factors. Future planned studies will provide the requisite geotechnical information to remove uncertainty factors and allow for a detailed mine plan study with refined mining costs.

LABOUR

The cost of labour, salaried and hourly, was based on the labour loading shown below in Table 21-14. This labour loading was developed based on a plant feedrate of 3,090 tpd at a 3:1 mine strip ratio, operating 360 days/per year, two 12 hour shifts/day. The average labour cost for salaried and hourly personnel, based on the Alaska Department of Labor rates in remote areas and fully loaded (including living expenses while on site), is \$126,000 per annum.

EQUIPMENT OPERATION

The equipment operation cost of \$2.75 per t-plant feed is based on a 360 day per year operation for similar mining operations. This cost item includes the cost of diesel, tires, equipment repairs.

SUPPLIES AND MATERIALS

Supplies and materials cost of \$1.75 per t-plant feed is based on similar mining operations. This includes such consumable items as drilling and blasting supplies, as well as consumables necessary to support the work crew.

MISCELLANEOUS

A cost of \$1.25 per t-plant feed is an allowance for miscellaneous costs.

Table 21-14 Salaried and hourly mine labour loading

Mine Labour Loading

LABOUR CATEGORY	PERSONNEL
Management	14
<i>Mine Manager</i>	<i>1</i>
<i>Mining Engineer</i>	<i>1</i>
<i>Geologist</i>	<i>1</i>
<i>Superintendent</i>	<i>1</i>
<i>Foreman</i>	<i>4</i>
<i>Supervisors</i>	<i>4</i>
<i>Administrative Assistants</i>	<i>2</i>
Mine Labour	160
<i>Drillers/Blasters</i>	<i>16</i>
<i>Truck Drivers</i>	<i>24</i>
<i>Mechanics</i>	<i>24</i>
<i>Excavator Operator</i>	<i>24</i>
<i>Equipment Operator</i>	<i>24</i>
<i>Laborer/Maintenance</i>	<i>48</i>
Total	174

Sources & notes -
 TRU Estimates

21.4.2 Alaska Mineral Processing Plant

The Mineral Processing Plant operating cost is estimated at \$29.9 million per year, which translates to specific costs of \$29 per t-plant feed and \$498 per t-concentrate produced. The cost is based on mining and plant operations having reached full respective production capacities of 1,018,000 tpy feed and 60,000 tpy graphite concentrate. Table 21-15 shows the breakdown of the operating costs.

Table 21-15 Mineral Processing Plant operating cost estimate 2016\$

Operating Cost - Mineral Processing Plant at full capacity

MAJOR OPERATING COST ITEM	COST
	\$
Plant Labour	\$12,170,000
Energy (Diesel for Power)	\$9,900,000
Consumables	\$3,300,000
Maintenance & Supplies	\$2,700,000
Concentrate Trucking	\$1,800,000
Total Operating Cost	\$29,870,000
Operating Cost/t feed	\$29
Operating Cost/t Concentrate	\$498

Sources & notes -
TRU Estimates

LABOUR

The labour requirements are based on operating 365 days per year, 24 hours per day with two 12-hour shifts using four operating crews. Support staff is scheduled on a 5-day week on an 8-hour shift. The estimated plant people requirements are summarized below in Table 21-16.

Total workforce requirements at the Alaska-Mineral Processing Plant is estimated at 95 people. Head office and administration personnel are not estimated at this stage.

The average labour cost for salaried and hourly personnel, based on TRU in-house data and the Alaska Department of Labour rates in remote areas and fully loaded (including living expenses while on site), is \$128,000 per annum.

ENERGY

The power for the Alaska Mineral Processing Plant is provided by three (3) 2 MW diesel generators giving a total power capacity of 6 MW. The diesel fuel is transported to Nome from Seattle by barge in 20 t isotainers. The isotainers are transferred to the Mineral Processing Plant by the returning concentrate transport trucks. The fuel provision scenario that has been assumed requires advance bulk fuel purchases which are stored at leased facilities under a long-term contract. In this scenario, the overall delivered cost of ULS-1 diesel fuel has been estimated at \$1.10 per liter (\$4.17 per gallon).

Table 21-16 Mineral Processing Plant labour loading

Mineral Processing Plant Labour Loading

LABOUR CATEGORY	PERSONNEL
Management	15
<i>Plant Manager</i>	1
<i>Department Managers</i>	6
<i>Process Engineer</i>	2
<i>Day Supervisors</i>	2
<i>Shift Supervisors</i>	4
Plant Labor	80
<i>Plant Operators</i>	24
<i>Plant Helpers</i>	24
<i>Control Room Operators</i>	4
<i>Instrument Technicians</i>	4
<i>Laboratory</i>	8
<i>Mechanics</i>	8
<i>Warehouse</i>	8
Total	95

Sources & notes -
TRU Estimates

CONSUMABLES

The estimated input costs for consumables to the operating cost for the Mineral Processing Plant is summarized in Table 21-17. Input prices are market prices adjusted for delivered location, published ICIS Prices provided benchmark USA prices, in-house data or budget quotations. Reagent consumptions were calculated based on the mass balance and respective requirements. Grinding media consumption and mill liner replacement were based on in-house data. The diesel consumption was calculated based on estimated plant site operating power of 40,000 MWh per year (includes mining and infrastructure).

MAINTENANCE AND SUPPLIES

The maintenance and supplies category annual cost is based on 3% of the process plant direct capital cost of \$90 million.

Table 21-17 Input costs for consumables – Mineral Processing Plant 2016\$

Mineral Processing Plant - Consumable Input Costs

INPUT ITEM	Units	Unit costs US\$
Main Process Consumables		
Grinding and Flotation	t-feed	\$3.00
Energy & Utilities		
Diesel Fuel	L	\$1.10

Sources & notes -
TRU Estimates

CONCENTRATE TRUCKING

The graphite concentrate from Mineral Processing Plant is packaged into one tonne super-sacks, loaded into containers and transported by trucks approximately 102 km to the port at Nome, Alaska. TRU estimated the transport cost at \$30 per t-concentrate. A port facility proposed by Bering Straits Native Corporation at Port Clarence could be an alternative to the Port of Nome during the life of the Project and reduce the overland transportation distance from the mine site.

21.4.3 Product Manufacturing Plant Operations

The Product Manufacturing Plant operating cost is estimated at \$40.6 million per year or on an input/output basis \$676 per t-plant feed (concentrate) and \$733 per t-graphite product. The cost is based on the Graphite Creek Project operating at full production capacity with 60,000 tpy feed concentrate arriving from Alaska and being converted to 55,350 tpy of purified graphite product. Table 21-18 shows the breakdown of the operating costs.

Table 21-18 Product Manufacturing Plant operating cost estimate 2016 US\$

Operating Cost Product Manufacturing Plant at full capacity

MAJOR OPERATING COST ITEM	COST
	\$
Plant Labour	\$7,270,000
Energy (Power)	\$14,900,000
Consumables	\$7,100,000
Maintenance & Supplies	\$3,600,000
Concentrate Shipping	\$7,698,000
Total Operating Cost	\$40,568,000
Operating Cost/t feed (Conc.)	\$676
Operating Cost/t Product	\$733

Sources & notes -
TRU Estimates

LABOUR

The labour requirements are estimated for a plant operating basis of 365 days per year, 24 hours per day with three 8-hour shifts using up to four operating crews. Support staff is scheduled on a 5-day week on an 8-hour shift. Labour workforce requirements are summarized in Table 21-19.

Total workforce requirements at the Product Manufacturing Plant is estimated at 102 people. Head office and administration personnel are not estimated at this stage.

The average fully-loaded labour cost for salaried and hourly personnel based on Washington State statistics plus 30% fringe, is estimated at \$71,000 per annum.

Table 21-19 Product Manufacturing Plant labour loading

Product Manufacturing Plant Labour Loading

LABOUR CATEGORY	PERSONNEL
Management	14
<i>Plant Manager</i>	1
<i>Department Managers</i>	3
<i>Process Engineer</i>	2
<i>Day Supervisors</i>	4
<i>Shift Supervisors</i>	4
Plant Labor	88
<i>Plant Operators</i>	24
<i>Plant Helpers</i>	32
<i>Control Room Operators</i>	8
<i>Instrument Technicians</i>	4
<i>Laboratory</i>	8
<i>Mechanics</i>	8
<i>Warehouse</i>	4
Total	102

Sources & notes -
TRU Estimates

ENERGY

The electrical energy has been projected to be provided from the grid at a cost of US\$ 0.04 per kWh, which was provided by published data for Washington State. The energy consumption was calculated based on the equipment list and appropriate power draw per motor based on equipment type. Specialty gas for the thermal purification furnaces is supplied by an on-site plant. The electrical requirement for the specialty gas plant is also included in the cost.

CONSUMABLES

The estimated input costs for consumables to the operating cost for the Product Manufacturing Plant is summarized in Table 21-20. Input prices are market prices adjusted for location delivered, published ICIS Prices provided benchmark USA prices, in-house data or budget quotations. Consumptions were calculated based on the mass balance and respective requirements and in-house data.

Table 21-20 Input costs for consumables – Product Manufacturing 2016\$

Product Manufacturing Plant - Consumable Input Costs

INPUT ITEM	Units	Unit costs US\$
Main Process Consumables		
Coating Pre-cursor additive	t	\$2,100
Graphite (furnace electrode)	t-conc	\$42
Energy & Utilities		
Electricity grid	MWh	\$40

Sources & notes -
TRU Estimates

MAINTENANCE AND SUPPLIES

The maintenance and supplies category annual cost is based on 4% of the process plant direct capital cost of \$90 million.

CONCENTRATE SHIPPING

The cost of concentrate shipping from Nome AK to the Product Manufacturing Plant was included in the Product Manufacturing Plant operating cost. Concentrate will be stored in an enclosed shed until winter's end and the reopening of shipping lanes in northwestern Alaska. The containers are loaded onto barges and transported to the Product Manufacturing Plant located at or near a coastal site. A quotation of \$128.30 per t concentrate was provided to TRU and used in the model³⁷.

21.5 General & Administration, Research & Development

The General and Administration costs was estimated to be about \$3 per t-Alaska plant feed, \$3 million per year at full capacity and R&D, \$1 million/year. These categories are entered separately in the economic analysis as the cost includes both plant sites. These costs include head office management salaries, administration, and expenses for trips to the plant sites.

³⁷ TRU Group has only reviewed Washington State as a potential site for the Product Manufacturing Plant for the PEA because it readily satisfies the economic, logistical and infrastructure criteria. Graphite One will also be reviewing potential sites in the State of Alaska.

22 ECONOMIC ANALYSIS

The Company cautions that this PEA is preliminary in nature and is based on technical and economic assumptions that will be further investigated and established with greater confidence in future studies. The PEA is based on the current resource model (November 2016), which includes estimates of indicated and inferred resources. The current information is insufficient to convert mineral resources to mineral reserves; mineral resources that are not mineral reserves do not have demonstrated economic viability. As such, there is no certainty that PEA will be realized.

22.1 Financial Analysis Basis

The financial analysis was based on-

- An Indicated and Inferred resource of 44 million t at 7% Cg, 80% Cg recovery, and a project life of 40 years.
- Operating and capital costs developed in accordance with the conceptual designs for the Graphite Creek Mine and Mineral Processing Plant in Alaska and the Product Manufacturing Plant located a developed brownfield site with access to low cost electrical power.
- Ramping to a full capacity of 60,000 tpy graphite concentrate and 55,350 tpy graphite products by end Year 6. The analysis assumed that the total annual concentrate production was transported within the shipping windows to the Products plant and processed.
- Graphite product distribution at full capacity would be 41,850 tpy of CSG selling at US\$6,200 per t and 13,500 tpy purified graphite powders <20 micron selling at an average price of \$1500 per t.

The order-of-magnitude capital cost for the mine and both plants was estimated to be \$363 million without added contingency. The distributions of the capital cost between the mine and two plants are given in following Table 22-1. The operations at Graphite Creek account for 64% of the total capital outlay.

Table 22-1 Capital cost structure by operation 2016- \$ millions

Capital Cost Structure by Operation

CAPEX by CATEGORY	GRAPHITE CREEK			INTEGRATED OPERATIONS TOTAL
	Mining	Mineral Processing	Product Manufacturing	
Total Capital Cost 2016-US\$ millions	\$43	\$190	\$130	\$363
Percent of Total	12%	52%	36%	100%

Sources & notes -
TRU Estimates

Order-of-magnitude annual production costs for the first 10 years of the Project appear in following Table 21-2. These operating costs were used in determining the profitability of the Project. When at full capacity by end of year six, the cost to produce 55,350 tpy of graphite products is estimated at \$98 million or \$1,774 per t-product.

Table 22-2 Graphite One Plants cash operating costs by item

Graphite One Integrated Operations Annual Costs Plant Type and Item

US\$ 2016 Constant

DIRECT CASH COST BY ITEM	\$ Unit Cost	Units	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
Mineralization delivered to Mill			0	305,400	407,200	509,000	814,400	916,200	1,018,000	1,018,000	1,018,000	1,018,000	1,018,000
Mining Cost & Mineralization delivered to Mill	\$27.25	t	\$0	\$8,322,150	\$11,096,200	\$13,870,250	\$22,192,400	\$24,966,450	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500
Graphite Creek Graphite Concentrate Output		t	0	18,000	24,000	30,000	48,000	54,000	60,000	60,000	60,000	60,000	60,000
Concentrate Trucking to Nome	\$30	per t		\$540,000	\$720,000	\$900,000	\$1,440,000	\$1,620,000	\$1,800,000	\$1,800,000	\$1,800,000	\$1,800,000	\$1,800,000
Concentrate Barge Shipping	\$128	per t \$	-	\$2,309,400	\$3,079,200	\$3,849,000	\$6,158,400	\$6,928,200	\$7,698,000	\$7,698,000	\$7,698,000	\$7,698,000	\$7,698,000
Product Manufacturing Plant Output		t	0	16,605	22,140	27,675	44,280	49,815	55,350	55,350	55,350	55,350	55,350
Labor Costs:													
Direct Labor - Mineral Processing			\$2,434,000	\$6,693,500	\$6,693,500	\$6,693,500	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000	\$12,170,000
Direct Labor - Product Manufacturing			\$1,454,000	\$4,725,500	\$4,725,500	\$4,725,500	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000	\$7,270,000
Equipment Repairs/Maintenance - Mineral Processing			\$0	\$810,000	\$1,080,000	\$1,350,000	\$2,160,000	\$2,430,000	\$2,700,000	\$2,700,000	\$2,700,000	\$2,700,000	\$2,700,000
Equipment Repairs/Maintenance - Product Manufacturing			\$0	\$1,080,000	\$1,440,000	\$1,800,000	\$2,880,000	\$3,240,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000
Other Operating costs - Mining & Mineral Processing													
Diesel (Power)	\$1,100	m3		\$2,970,000	\$3,960,000	\$4,950,000	\$7,920,000	\$8,910,000	\$9,900,000	\$9,900,000	\$9,900,000	\$9,900,000	\$9,900,000
Other Operating costs - Product Manufacturing													
Power	\$40	MWh	\$0	\$4,470,000	\$5,960,000	\$7,450,000	\$11,920,000	\$13,410,000	\$14,900,000	\$14,900,000	\$14,900,000	\$14,900,000	\$14,900,000
Process Reagents - Mineral Processing													
Grinding media/ liners/reagents			\$0	\$990,000	\$1,320,000	\$1,650,000	\$2,640,000	\$2,970,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000
Process Reagents - Product Manufacturing													
Coating Pre-cursor	\$2,100	t	\$0	\$1,380,000	\$1,840,000	\$2,300,000	\$3,680,000	\$4,140,000	\$4,600,000	\$4,600,000	\$4,600,000	\$4,600,000	\$4,600,000
Graphite (furnace electrode)			\$0	\$750,000	\$1,000,000	\$1,250,000	\$2,000,000	\$2,250,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000
TOTAL INTEGRATED PRODUCTION COSTS			\$3,888,000	\$35,040,550	\$42,914,400	\$50,788,250	\$82,430,800	\$90,304,650	\$98,178,500	\$98,178,500	\$98,178,500	\$98,178,500	\$98,178,500
<i>Mining</i>			\$0	\$8,322,150	\$11,096,200	\$13,870,250	\$22,192,400	\$24,966,450	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500	\$27,740,500
<i>Mineral Processing Plant*</i>			\$2,434,000	\$12,003,500	\$13,773,500	\$15,543,500	\$26,330,000	\$28,100,000	\$29,870,000	\$29,870,000	\$29,870,000	\$29,870,000	\$29,870,000
<i>Products Manufacturing Plant**</i>			\$1,454,000	\$14,714,900	\$18,044,700	\$21,374,500	\$33,908,400	\$37,238,200	\$40,568,000	\$40,568,000	\$40,568,000	\$40,568,000	\$40,568,000
Cost per unit t of Graphite Product Out \$ per t				\$2,110	\$1,938	\$1,835	\$1,862	\$1,813	\$1,774	\$1,774	\$1,774	\$1,774	\$1,774

* Mineral Processing cost includes cost of concentrate shipments to Nome from Mill.

**Product Manufacturing cost includes cost of concentrate shipments from Nome to Product Manufacturing Plant

TRU Estimates

The summary distribution of operating costs, Table 22-3, shows that power (25%) and labour (42%) are the major contributors to the total costs of the integrated operation. The cost of electrical power at the Alaska Plant generated by a diesel power plant accounts for 33% of the plant operating costs. Electrical power for the Product Manufacturing Plant provided from the grid is 37% of the plant operating cost. Concentrate shipping from Nome, Alaska to the Product Manufacturing Plant is also a large cost item accounting for 19% of the latter's operating cost. Diesel supply, alternative power generation options and concentrate shipping require further investigation in future studies.

**Table 22-3 Summary operating cost structure by operation at full capacity
2016\$**

MAJOR OPERATING COST ITEM	GRAPHITE CREEK OPERATIONS				PRODUCT MANUFACTURING		INTEGRATED PLANTS TOTAL	
	MINING		MINERAL PROCESSING		\$	%	\$	%
	\$	%	\$	%				
Labour	\$21,887,000	79%	\$12,170,000	41%	\$7,270,000	18%	\$41,327,000	42%
Energy (Power and Diesel) ¹			\$9,900,000	33%	\$14,900,000	37%	\$24,800,000	25%
Equipment Operation	\$2,799,500	10%					\$2,799,500	3%
Consumables			\$3,300,000	11%	\$7,100,000	18%	\$10,400,000	11%
Maintenance & Supplies	\$1,781,500	6%	\$2,700,000	9%	\$3,600,000	9%	\$8,081,500	8%
Miscellaneous	\$1,272,500	5%					\$1,272,500	1%
Concentrate Shipping			\$1,800,000	6%	\$7,698,000	19%	\$9,498,000	10%
Total Operating Cost	\$27,740,500	100%	\$29,870,000	100%	\$40,568,000	100%	\$98,178,500	100%
- % of total :	28%		30%		41%		100%	

Sources & notes -

1 Mining energy cost included in Alaska Plant cost

TRU Estimates

The average price of the Graphite One manufactured output products at full design capacity of 55,350 tpy-product is projected to be \$3,920 per t, on a 2016 constant US dollar ex-plant basis. The average reflects TRU estimates for the likely achievable price for the individual products after examining various sources of data and China export value data on per t basis. The price estimates are shown in Section 19, Table 19-7 Graphite One projected sales volume by material segmentation and end-use.

22.2 Project Profitability

The Graphite One business model generates cash earnings of \$182 million per year on sales of \$280 million at full capacity with a consolidated operating margin (EBDIT) of 63% on sales. CSG dominates the output accounting for 93% or US\$259.5 million, of the total. Purified Graphite Powders account for the balance with sales of \$20 million. Sales figures are summarized in Table 19-11 Graphite One sales segmentation by product – volume t & value 2016\$US.

The required project total capital cash outlay over ten years is estimated at \$368 million, which includes working capital. The resultant Net Present Value (NPV) is \$1,037 million using a 10% discount rate and mine life of 40 years. The Internal Rate of Return (IRR) is 27% with payback in Year-4 from the start-up of production. The consolidated summary is given in following Table 22-4-

Table 22-4 Graphite One Project consolidated financial estimates 2016\$million

Graphite One Projected Consolidated Financial Estimates $\pm 45\%$ ³

US\$ millions Constant 2016

LINE ITEM	Year(-1)	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
TOTAL SALES REVENUE		\$0	\$84	\$112	\$140	\$224	\$252	\$280	\$280	\$280	\$280	\$280
Less Plant Operating Costs:		\$4	\$35	\$43	\$51	\$82	\$90	\$98	\$98	\$98	\$98	\$98
Plant Operating Profit		-\$4	\$49	\$69	\$89	\$141	\$161	\$182	\$182	\$182	\$182	\$182
- operating margin %			58%	62%	64%	63%	64%	65%	65%	65%	65%	65%
Less Company Overhead Costs:		\$2	\$5	\$5	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
Corporate and SG&A:			\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
Product Development R&D:		\$2	\$2	\$2	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
EARNINGS - EBDIT		-\$6	\$44	\$64	\$85	\$137	\$157	\$178	\$178	\$178	\$178	\$178
ANNUAL CAPITAL OUTLAY	\$164	\$164	\$38	\$2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Plant and Equipment Cost:	\$164	\$164	\$36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Working Capital:			\$2	\$2								
ANNUAL NET CASH FLOW	-\$164	-\$169	\$6	\$62	\$85	\$137	\$157	\$178	\$178	\$178	\$178	\$178
Cumulative Cash Flow:	-\$164	-\$333	-\$327	-\$265	-\$180	-\$43	\$114	\$292	\$469	\$647	\$825	\$1,002
PROFITABILITY ANALYSIS:												
EBDIT as % of Revenue			52%	57%	61%	61%	63%	63%	63%	63%	63%	63%
Net Present Value [NPV] at	\$1,037											
discounting rate 10%												
Internal Rate of Return [IRR]	27%											
Payback in Production Year	4											

Sources & notes:

1 EBDIT = earnings before depreciation, interest and taxes

2 NPV rate adjusted for elevated risk calculated for forty years operation with no terminal value

3 TRU estimates subject to error caution stated in the text of the report

TRU Group Inc

22.3 Post-Tax Financial Analysis

22.3.1 Assumptions

For purposes of this analysis, it is assumed that the vertically-integrated Graphite One Project is controlled and owned by a US-based entity and financed by 100% equity. The relevant tax jurisdictions for the purposes of this analysis are the United States federal government, the State of Alaska, and the State of Washington. The post-tax analysis includes consideration of the current US Federal Income Tax, State of Alaska Corporate Income Tax and Mining License Tax (including the production royalty on state lands that is calculated in the same manner), and State of Washington Business and Occupation Tax. The analysis assumes that taxes are paid in the year incurred.

Not considered in the analysis but which may apply are state or local sales, excise, use, and property taxes. Also not considered are tax incentives offered by the State of Washington, which may reduce the overall effective Business and Occupation tax rate, and any potential incentives or assistance extended by the State of Alaska. As development decisions are made in the future, Graphite One will seek expert accountancy and legal counsel to develop a corporate structure that optimizes the after-tax financial outlook for the project.

US FEDERAL INCOME TAX

● General Rate

The top marginal US federal corporate income tax rate currently is 35%. US federal income tax is imposed on gross income less allowable deductions, which generally include depreciation and amortization of capital investments, operating costs, depletion allowance, state and local taxes, royalties paid to third parties, and other deductible expenditures.

Depreciation Allowance

Straight line depreciation of all mining and mineral processing equipment against gross income has been assumed over the first seven years of production.

Straight line depreciation of all mining and mineral processing equipment against gross income has been assumed over the first seven years of production. Future assessments may choose a more tax advantageous depreciation methodology if one is available at the time.

Depletion Allowance

An owner of an economic interest in a mine is allowed a depletion deduction in computing taxable income for US federal income tax purposes. The amount of the depletion allowance for any taxable year is the greater of cost depletion, which is based on the cost of the minerals in place, and percentage depletion, which is calculated as a percentage of gross income from mining. Percentage depletion allowance is applicable to hard rock mineral bodies under certain circumstances. When applicable, percentage depletion is applied against gross income at varying rates according to the mineral or metal classification. Pursuant to 26 U.S.C. § 613, the percentage depletion rate for graphite from deposits in the United States is 22% of gross

income. It is subject to various limitations, including a limit of 50% of mining taxable income, and possible application of the Alternative Minimum Tax. A percentage depletion rate of 22% per year has been applied in the Post-Tax Analysis of the Graphite One Project.

DOMESTIC ACTIVITIES PRODUCTION DEDUCTION (DAPD)

The DAPD is a deduction provided to businesses that produce certain goods in the United States. It went into effect in 2005 and applies to both small and large businesses. The deduction is limited to up to half the amount of wages paid to workers engaged in domestic production during the taxable year and it cannot exceed the corporation's taxable income for the year. The applicable deduction is 9% of gross receipts from qualified production activities minus the cost of goods sold that are allocable to such receipts and other expenses, losses, and deductions that are properly allocable to such receipts. DAPD has been applied to Federal corporate taxable income. Alaska State corporate taxable income is based on Federal taxable income with certain adjustments, and the DAPD has been adopted by reference.

STATE OF ALASKA CORPORATE INCOME TAX (ACIT)

Alaska levies a corporate income tax on taxable income, which is based on federal taxable income with certain Alaska adjustments. The tax rates are graduated from 0% to 9.4%; the 9.4% rate applies to taxable income in excess of \$222,000. If taxable income exceeds \$222,000, the tax due would be \$10,830 plus 9.4% of the taxable income over \$222,000.

● Alaska Mining License Tax (AMLT)

The AMLT is calculated on a sliding scale based on net income from mining in Alaska.

Mining Net Income	Rate
\$0 - \$40,000	No Tax
\$40,001 - \$50,000	\$1,200 plus 3% over \$40,000
\$50,001 - \$100,000	\$1,500 plus 5% over \$50,000
Over \$100,000	\$4,000 plus 7% over \$100,000

An exemption from the AMLT is provided to new mining operations for a period of three and a half years (3.5 years) from the start of production.

In the calculation of the AMLT, both (i) payments made to other holders of economic interests in the involved property (e.g., royalty interests) and (ii) other tax payments (including the ACIT and sales, excise, use, and property taxes) are deductible.

The applicable rate for the Graphite One Project after 3.5 years of production is \$4,000 plus 7% of net income over \$100,000. As discussed below, exploration incentive tax credits can be applied against up to 50% of tax liabilities for up to 15 years.

● Alaska Production Royalty (APR)

The APR is payable on mineral production from state lands. It is anticipated and thus assumed that all of Graphite One's production will come from state lands. The APR is equal to three percent (3%) of net income as determined under the Alaska Mining License Tax Law (AS 43.65) and regulations (15 AAC 65). The 3.5-year exemption from the AMLT does not apply to the APR, thus the APR is payable from the commencement of production.

● Private Royalty Agreements

Several of the Graphite Creek properties have outstanding royalty agreements. In simplified terms, Graphite One has the option of buying out or buying down these royalties, such that the maximum royalty due on any property will be a 3% net smelter returns (NSR) royalty. It is assumed that Graphite One will exercise these options on the applicable mining claims in the target exploration area with payments of US\$4.5 million and CAD\$1 million.

For purposes of this analysis, annual royalties payable to third parties on Graphite One's properties thus will be assumed to be a maximum of three percent (3%) of the NSR, with NSR based on the arm's length sales price of flake graphite concentrate delivered to the manufacturing plant less all freight, warehouse, insurance, and other costs of transportation, storage, and shipping. TRU assumes an Alaska to Washington concentrate transfer price equal to the China export value 2016 for "Natural Graphite in Flakes" Commodity code 25041010 = US\$740 per t FOB China.

Further refinement of royalty payments will be made in future assessments once the proportion of production of the affected mining claims are calculated with greater accuracy from a detailed mining plan.

● Exploration Incentive Credit (EIC)

The EIC Program is authorized under AS 27.30.010-27.30.099 and provides credits for certain approved expenditures related to mineral exploration activities. Subject to certain limitations, these credits can be applied against tax liabilities arising under the AMLT and the ACIT, and against royalty obligations arising under the APR. The credit is limited to \$20 million and may be applied against 50% of tax liabilities over a 15-year period. Only expenditures that are incurred prior to the mine construction commencement date are eligible. The mine construction commencement date is the date most mining permits and other required permits have been issued and remaining permits are forthcoming.

WASHINGTON STATE BUSINESS AND OCCUPATION (B&O) TAX

The State of Washington does not have personal or corporate income tax. Rather a Business and Occupation tax is imposed upon the privilege of engaging in business and levied against gross receipts. This means there are no deductions from the B&O tax for labor, materials, taxes, or other costs of doing business. The B&O tax is measured by the application of rates against value of products, gross proceeds of sales, or gross income of the business. The B&O tax rate varies by business activity. The applicable B&O tax rate for manufacturing is 0.484% of the

value of the products manufactured in Washington. The wholesaling tax rate is 0.484% of the gross proceeds of sales in Washington, with a credit for any manufacturing tax paid.

In future assessments, the Project will consider whether a sale of concentrate to the plant owner or a tolling arrangement with the plant owner is the most tax advantageous arrangement.

WASHINGTON STATE TAX INCENTIVES

The State of Washington provides tax incentive on R&D expenditures and on new employment depending on location. Applicable incentives will be examined in future assessments following selection of the site for the Product Manufacturing Plant.

22.3.2 Post-Tax Economic Summary

The post-tax Graphite One Project financial highlights are summarized below in Table 22-5.

Table 22-5 Graphite One Project post-tax financial highlights

Parameter	Value
Earnings Post-Tax (Year-8 +)	\$118 million per year
NPV at 10% Discounting Rate	\$616 million
IRR	22 %
Payback	Production Year 4

The post-tax consolidated financial statement for the Graphite One integrated project appears in Table 22-6. Following the expansion of spherical graphite production to full capacity in Production Year 7.5 and the concurrent expiration of depreciation allowances and EIC credits, the Earnings Post-Tax stabilize at \$118 million per year with an operating margin of 42% in Production Year 8. The project NPV at a 10% discounting rate is calculated at \$616 million. Project IRR is 22% with payback achieved during Production Year 4.

Table 22-6 Graphite One Project post-tax financial estimates 2016\$million

Graphite One Financial Projections in Constant 2016 US\$ million

POST TAX

Graphite One Projected Consolidated Financial Estimates $\pm 45\%$ ²

US\$ millions Constant 2016

LINE ITEM	Year(-1)	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10
TOTAL SALES REVENUE		\$0	\$84	\$112	\$140	\$224	\$252	\$280	\$280	\$280	\$280	\$280
Less Plant Operating Costs:		\$4	\$35	\$43	\$51	\$82	\$90	\$98	\$98	\$98	\$98	\$98
Plant Operating Profit		-\$4	\$49	\$69	\$89	\$141	\$161	\$182	\$182	\$182	\$182	\$182
<i>- operating margin %</i>			58%	62%	64%	63%	64%	65%	65%	65%	65%	65%
Less Company Overhead Costs:		\$2	\$5	\$5	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4
<i>Corporate and SG&A:</i>			\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3
<i>Product Development R&D:</i>		\$2	\$2	\$2	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
TAXES, ROYALTIES												
Combined Federal, Alaska & Washington Taxes & Royalties		-\$0.1	\$5.0	\$6.8	\$16.8	\$31.7	\$39.8	\$45.8	\$47.8	\$59.4	\$59.4	\$59.4
<i>Federal Tax</i>			\$3.3	\$3.7	\$11.3	\$21.3	\$25.2	\$29.1	\$29.1	\$34.3	\$34.3	\$34.3
<i>Alaska State Tax</i>			\$0.6	\$1.3	\$2.0	\$3.7	\$4.4	\$5.1	\$7.1	\$11.8	\$11.8	\$11.8
<i>Washington B&O Tax</i>			\$0.4	\$0.5	\$0.7	\$1.1	\$1.2	\$1.4	\$1.4	\$1.4	\$1.4	\$1.4
<i>Production Royalties</i>			\$0.3	\$0.8	\$1.1	\$2.4	\$2.8	\$3.2	\$3.2	\$3.8	\$3.8	\$3.8
<i>NSR Royalties</i>			\$0.4	\$0.5	\$0.7	\$1.1	\$1.2	\$1.3	\$1.3	\$1.3	\$1.3	\$1.3
<i>Mining License Tax</i>			\$0.0	\$0.0	\$1.1	\$2.1	\$5.0	\$5.7	\$5.7	\$6.8	\$6.8	\$6.8
EARNINGS - Post Tax		-\$6	\$39	\$57	\$68	\$106	\$118	\$132	\$130	\$118	\$118	\$118
ANNUAL CAPITAL OUTLAY	\$164	\$169	\$38	\$2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Plant and Equipment Cost:	\$164	\$164	\$36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Working Capital:			\$2	\$2								
NSR Buyout/Buydown		\$5										
ANNUAL NET CASH FLOW	-\$164	-\$175	\$1	\$55	\$68	\$106	\$118	\$132	\$130	\$118	\$118	\$118
<i>Cumulative Cash Flow:</i>	-\$164	-\$338	-\$338	-\$282	-\$214	-\$108	\$9	\$141	\$271	\$389	\$507	\$625
PROFITABILITY ANALYSIS:												
Earnings Post-Tax as % of Revenue			46%	51%	49%	47%	47%	47%	46%	42%	42%	42%
1 Net Present Value [NPV] at	\$616											
<i>discounting rate 10%</i>												
Internal Rate of Return [IRR]	22%											
Payback in Production Year	4											

Sources & notes:

1 NPV rate adjusted for elevated risk calculated for forty years operation with no terminal value

2 TRU estimates subject to error caution stated in the text of the report

TRU Group Inc

22.4 Sensitivity Analysis

A sensitivity analysis of the pre-tax (EBDIT) consolidated financials was carried out to determine the effect of the following parameters on the NPV (at a 10% discount rate) and IRR.

- CSG product selling price
- Capital cost
- Operating cost
- Graphite (Cg) head grade, and
- Graphite (Cg) recovery

The following are the summary findings of the sensitivity analysis, also tabulated in Table 22-7:

- ▶ The product selling price had the greatest impact on the NPV and IRR. A 10% change in the selling price resulted in a change of about \$210 million in the NPV and 2.9% in the IRR.
- ▶ A 10% change in the operating cost resulted in an NPV and IRR change of \$80 million and 1.2%, respectively.
- ▶ A 10% change in the recovery resulted in an NPV and IRR change of about \$60 million and 1.4%, respectively.
- ▶ A 10% change in the head grade resulted in an NPV and IRR change of about \$50 million and 1.3%, respectively.
- ▶ A 10% change in the capital cost resulted in an NPV and IRR change of \$35 million and 1.8%, respectively.

Table 22-7 Impact of 10% variation in selected parameters on Graphite Creek Project NPV and IRR

VARIABLE PARAMETER (10%)	NPV IMPACT	IRR IMPACT
CSG Selling Price	\$210 million	2.9%
Operating Cost	\$80 million	1.2%
Recovery	\$60 million	1.4%
Head Grade	\$50 million	1.3%
Capital Cost	\$35 million	1.8%

The analysis was based on varying each parameter by reasonable plus and minus factors and running the economic analysis using the base case spreadsheet. The NPV at 10% discount rate and IRR results are shown below in Figure 22-1 and Figure 22-2 and Table 22-8, Table 22-9, and Table 22-10. The base case parameters and results are highlighted in the tables.

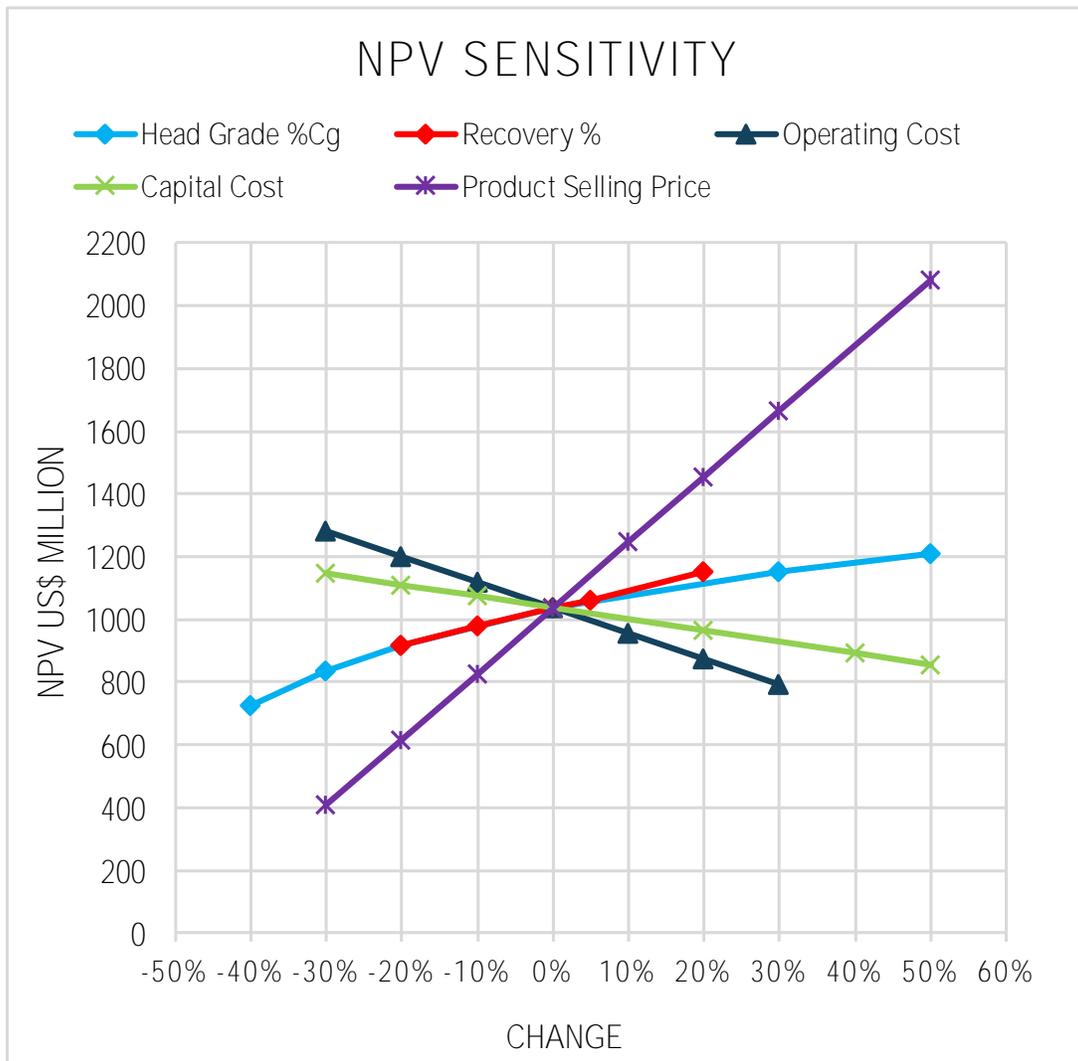


Figure 22-1: NPV Sensitivity Graph (before tax)



Figure 22-2: IRR Sensitivity Graph (before tax)

Table 22-8 NPV and IRR Results for CSG product selling price variations

COATED SPHERICAL GRAPHITE PRODUCT SELLING PRICE					
	PRICE	CHANGE	NPV	IRR	PAYBACK
	\$/t	%	\$million	%	Production Year
	3720	-40%	199	14	7
	4340	-30%	408	18	6
	4960	-20%	616	21	5
	5580	-10%	827	24	4
Base Case	6200	0%	1037	27	4
	6820	10%	1246	30	3
	7440	20%	1456	33	3
	8060	30%	1665	35	3
	9300	50%	2084	40	3

Sources & notes -
TRU Estimates
TRU Group Inc

Table 22-9 NPV and IRR results for factored capital cost and operating cost

	CAPITAL COST				OPERATING COST			
	COST	CHANGE	NPV	IRR	COST	CHANGE	NPV	IRR
	\$million	%	\$million	%	\$/t-Product	%	\$million	%
	254	-30%	1145	35	1242	-30%	1280	31
	291	-20%	1109	32	1419	-20%	1199	30
	327	-10%	1073	29	1596	-10%	1118	28
Base Case	363.5	0%	1037	27	1774	0%	1037	27
	436	20%	965	24	1951	10%	956	26
	509	40%	893	22	2129	20%	875	25
	545	50%	857	21	2306	30%	794	24

Sources & notes -
TRU Estimates
TRU Group Inc

Table 22-10 NPV and IRR results for factored head grade and recovery

	Cg HEAD GRADE				Cg RECOVERY			
	Cg	CHANGE	NPV	IRR	RECOVERY	CHANGE	NPV	IRR
	%	%	\$million	%	%	%	\$million	%
	4.2	40%	727	20.7				
	4.9	30%	836	22.8	64	-20%	915	24
	5.6	20%	915	24.4	72	-10%	981	26
Base Case	7	0%	1037	27.3	80	0%	1037	27
	9.1	-30%	1151	30.4	84	5%	1060	28
	10.5	-50%	1208	32	96	20%	1150	30

Sources & notes -

TRU Estimates
TRU Group Inc

The financial model was also run to determine the sensitivity of the NPV and IRR to the length of the mine operation. The results are shown in Table 22-11.

Table 22-11 NPV and IRR results for a reduced mine life

	MINE LIFE			
	YEARS	CHANGE	NPV	IRR
		%	\$million	%
	10	-75%	397	23.7
	15	-63%	654	26.4
	20	-50%	814	27.0
	28	-30%	953	27.2
Base Case	40	0%	1037	27.3

Sources & notes -

TRU Estimates
TRU Group Inc

23 ADJACENT PROPERTIES

The property location map appearing in Figure 4-1 on page 4-4 shows the current mineral claims in the Graphite Creek Project Property. The nearest claims of other projects relative to the Property are some 20 km or more to the east-southeast with other claims further distant. These claims are focused on commodities other than graphite, primarily gold and gold placer deposits. The Property is the only graphite specific exploration property and/or exploration company that is currently exploring in the region.

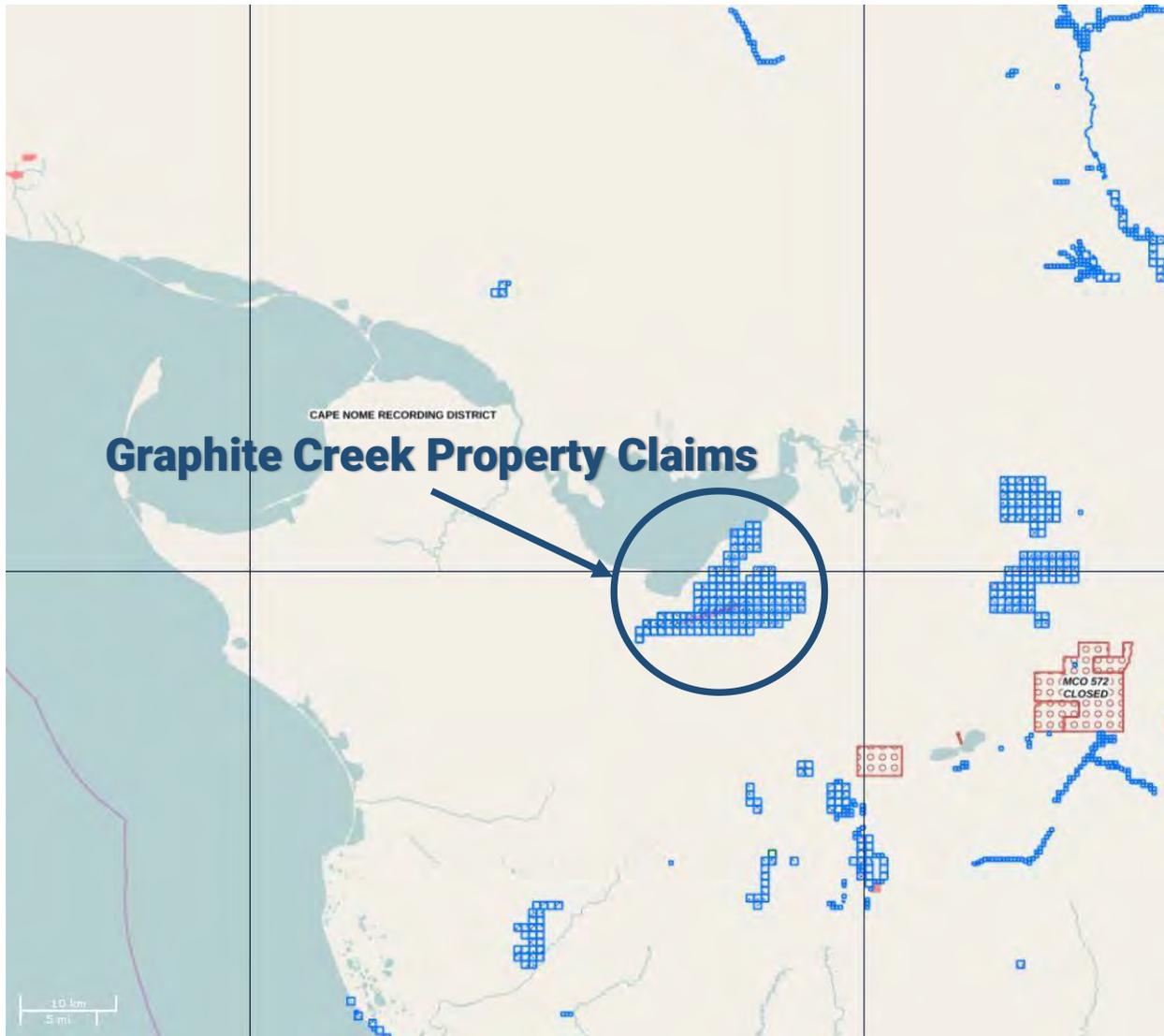


Figure 23-1: Graphite Creek Project Property claims relative to other mineral claims³⁸.

³⁸ Alaska Mining Claims Mapper – Alaska Department of Natural Resources 11/2016 (<http://akmining.info/>).

24 OTHER RELEVANT DATA AND INFORMATION

24.1 Project Timing and Schedule

A preliminary project schedule is presented in Figure 24-1 on page 24-2. The following are key time sensitive dependencies to meet the proposed schedule:

- Development of the Alaska site is dependent on the construction of the 35km site access road which will start the spring of 2018 on completion of feasibility studies and permitting.
- Long-lead process equipment must be identified at the beginning of the feasibility study stage (grinding mills, purification furnaces, specialty processing equipment).
- Outdoor construction will be minimized during the coldest part of the year so the site preparation and concrete work must be started in spring of 2019 at the respective sites of the Mineral Processing Plant and Product Manufacturing Plant.

The schedule assumes that Graphite One Resources Inc has financing in place to initiate the feasibility and other baseline studies in Q1 2017.

24.2 Risks and Opportunities

The following risks and opportunities have been identified as particularly impactful to the Graphite One Project:

24.2.1 Risks

The Alaska mining and mineral processing aspects of the Project are subject to common risks set as confronting other non-commodity mineral extraction-based operations, including:

- Accurate characterization of the deposit through modelling and drilling
- Access to sufficient resources and infrastructure to effectively and efficiently extract the resource from the ground
- Acceptance and cooperation from the local population, Alaska Natives groups, and municipal, state and federal governments
- Assurance that the Project will not harm the local and wider environment, and that remediation of the land after Project fulfillment is practicable

From the perspective of spherical graphite product manufacturing

- Market acceptance of a novel graphite material
- Market penetration and competitiveness in the face of China dominance in graphite primary production
- Research and development into value-added processing of graphite concentrate into spherical graphite by lithium-ion battery end-use segment to maximize use and revenue

These and other risks have been mitigated and resolved to various degrees thus far in the project life, and will continue to be addressed, as described elsewhere in this assessment.

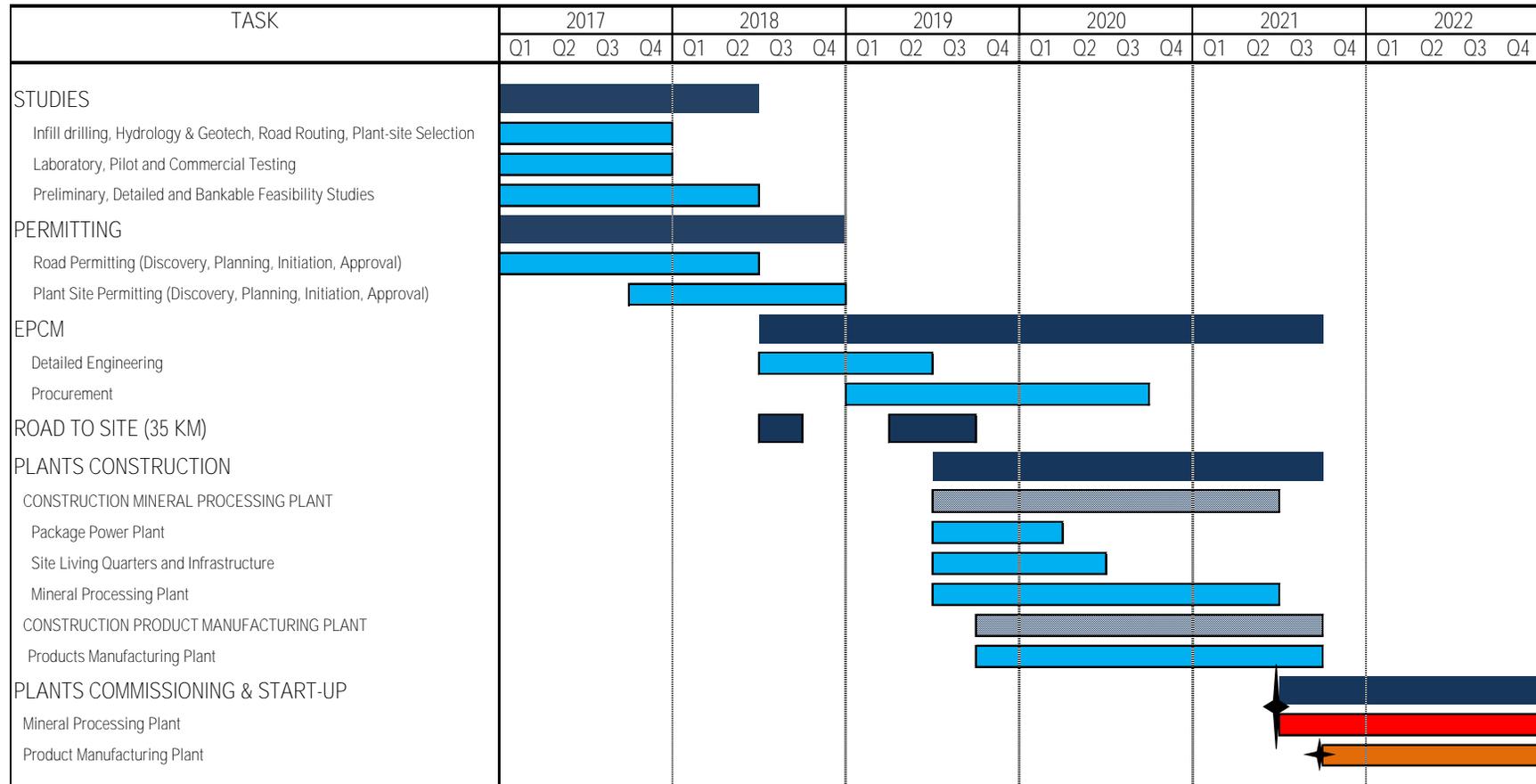


Figure 24-1: Preliminary schedule for Graphite One Project.

It is prudent to note risk associated with the reliance of the Project on the CSG product for electric vehicle batteries. This is the risk that there will not be sufficient market for the graphite volume produced by this project and its competitors. Also, there is a technology risk in that other battery technologies may be developed over time that replace lithium-ion chemistry. It would certainly seem that this risk is currently low as the technology has gained acceptance and share in both the consumer mind and in the automotive manufacturers' plans.

24.2.2 Opportunities

This project is responding to the opportunity created by the adoption of the li-ion battery for electric vehicle batteries but in addition the shift in battery production from offshore to the United States. As noted elsewhere in this report, over 26,000 MWh per year of new capacity is currently under construction in the United States. This is three times that existing in 2016 and will serve to further solidify its strong position as a producer of electric vehicle batteries.

There are other opportunities that have not been fully explored as yet, including market potential for the by-product graphite powders, which will be very pure, micronized powders with very small variability in sizing and composition. There may be some very lucrative application markets for these products, which will greatly enhance the economics of the Project. Further study is required.

25 INTERPRETATION AND CONCLUSIONS

Geology and Mineral Resources

The Graphite Creek graphite deposit is located on the north side of the Kigluaik Mountains (at about 230 m elevation). More specifically, the graphitic schist occurs on the upslope and footwall surface trace of the reactivated Kigluaik normal fault. The Kigluaik Fault generally strikes at approximately azimuth 250° and dips 75° to the north over a distance of approximately 35 km. Contemporary movement on this fault has uplifted the rugged and youthful Kigluaik Mountains to the south and down thrown the lowlands of the Imuruk Basin to the north (Hudson and Plafker, 1978).

There are two distinctive graphite-bearing schist intervals at Graphite Creek. The first is sillimanite-garnet-biotite-quartz schist that contains coarse, semi-massive and massive graphite segregations and disseminated graphite (Figure 7.2). The other interval unit is biotite-quartz schist that typically contains disseminated graphite. The sillimanite-garnet- biotite-quartz schist is the principal host to higher grade graphite and makes up two distinctive layers in the metasedimentary sequence along the north flank of the Kigluaik Mountains. A third potential horizon is defined by 'pods' of sillimanite-garnet- biotite-quartz schist (Figure 7.2). The position of these layers is most likely structurally controlled; that is a folded unit with the third pod-like layer forming in this style as uppermost erosional features (T. Hudson, personal communication, 2012). Hence, shallow-dipping erosional remnants of the southern-most third layer makes up a few discontinuous perched masses at higher elevations. The sillimanite-garnet-biotite-quartz schist layers strike obliquely to the mountain front and dip northwards at 40° to 78° .

The sillimanite-garnet-biotite-quartz schist typically is fine to coarse grained, weathers grey, has a wavy and crenulated schistosity, garnet porphyroblasts (up to 2 cm across), and augen-shaped quartz grains. Discontinuous segregations (lenses and streaks) of coarse high-grade graphite, from centimeters to a few meters thick, are common. These high-grade graphite lenses in the sillimanite-garnet-biotite-quartz-schist have up to 60% coarse, crystalline graphite and were no doubt the sources of hand sorted graphite produced in the early 1900's. Disseminated flakes of graphite, up to 1 mm or more across, make up several percent of the rock.

The biotite-quartz schist is fine-grained, weathers a rusty ochre colour and has regular layering with individual layers commonly 3 to 10 cm thick. Graphite occurs as disseminated flakes up to about 1 mm across and can make up several percent of the rock. Higher grade graphite-rich layers, varying from 3 to 25 cm in width are present, but are not as common as in the sillimanite-garnet-biotite-quartz schist.

Graphite occurs as high-grade massive to semi-massive segregations and disseminations within amphibolite facies metasedimentary rocks, primarily biotite-quartz schist with zones of sillimanite-garnet-biotite-quartz schist (Figure 7.2; Sainsbury, 1972). Based on their apparent association with the Kigluaik Fault, the graphite-bearing schist units strike subparallel to the mountain front and dip north between 40° and 75° . Historical graphite excavations and occurrences, and other mineral commodities around Graphite One's Graphite Creek property are shown on Figure 6.1. The only areas of historic graphite mining in the region occur within the property boundary, on Christophosen Creek and Graphite Creek. Other undeveloped

occurrences of graphite are documented at Windy Creek and Cobblestone River about 8-10 km southeast of the Property.

No work has been completed by the issuer or any other Qualified Person on the historic mining or historic reported deposits or mineral inventory in the area. Therefore, those deposits and resources are not considered modern mineral resources or mineral reserves.

Graphitic bedrock was first documented on the north side of the Kigluaik Mountains in the early twentieth century (Moffit, 1913). The graphite showings are known to crop out in incised creek valleys on the north side of the Kigluaik Mountains and it is from these exposures that the graphite showings have been described by various authors (e.g., Mertie, 1918; Coats, 1944; Cobb, 1972; Cobb and Sainsbury, 1972; Sainsbury, 1972; Weiss, 1973; Cobb, 1975; Hudson and Plafker, 1978; Hudson, 1981, 1998; Swainbank et al., 1995; Adler and Bundtzen, 2011; Nelson, 2011). From west to east these creek exposures include Christophosen Creek, Hot Springs Creek, Trail Creek, Glacier Canyon Creek, Ruby Creek and Graphite Creek. A general historical overview of each of the historical graphite showings is described in Duplessis et al. (2013).

The most recent exploration program on the property was carried out between September 21st, 2014 and November 5th, 2014. That program consisted of diamond drilling, collection of metallurgical samples, and the calculation of a new resource estimate. That program is described in detail in a technical report issued by Graphite One Resources in March, 2015 (Eccles et al., 2015).

The drill program was designed to both increase the confidence level and the extent of the resource. The program consisted of 20 holes totaling approximately 2,221 m logged and assayed, and 2 holes totaling 91.6 m used for metallurgical testing. A total of 2,354 samples were collected in the 2014 program, of which 2,274 were submitted for assay, and 80 retained for metallurgical test-work. The 2014 drill holes were collared on sections approximately 50 m apart and at least two holes were drilled on each section, in an effort to confirm continuity of the mineralization, both vertically and laterally. Once again, all holes encountered significant Cg mineralization.

Mr. Ronald James Robinson, P.Geol., a qualified Person as defined by National Instrument 43-101 carried out a review of the data analysis, modeling and resource estimation included in this report. The modeling, statistical analyses and estimation review were completed using Surpac™ modelling and resource software, v. 6.6.2, from Dassault Systemes Geovia (formerly Gemcom Software International Inc.), of Vancouver, BC. The work and results in this report are based on a review of the work of D. Roy Eccles and Steven Nicholls, both of APEX Geoscience Ltd. (APEX) (Eccles, et al, 2015).

The Indicated and Inferred Graphite Creek Resource estimate has been classified in accordance with guidelines established by the CIM “Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines” dated November 23rd, 2003 and CIM “Definition Standards for Mineral Resources and Mineral Reserves” dated May 10, 2014.

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 '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.

The Indicated and Inferred Graphite Creek Resource estimate was classified according to the CIM definition standards. The classification was based on geological confidence, data quality and grade continuity. The most relevant factors used in the classification process were:

- Drillhole spacing density;
- Level of confidence in the geological interpretation where the observed stratigraphic horizons are easily identifiable along strike and across the deposit, which provides confidence in the geological and mineralization continuity; and
- Estimation parameters (i.e., continuity of mineralization).

The Graphite Creek deposit contains 10.3 million tonnes classified as Indicated resource at a mining cut-off of 6% graphitic carbon and 71.2 tonnes of Inferred resource, also at a 6% mining cut-off grade. Table 25-1 and Table 25-2 respectively show the Indicated and Inferred resource at several different cut-off grades. A final mining cut-off grade of six percent graphitic carbon was selected as it would produce mill feed grading seven percent graphitic carbon. This has been determined to be the minimum grade required to support economically viable graphite production in western Alaska. The six percent cut-off information has been highlighted for clarity. The various factors supporting the selected mining cut-off value are described in the appropriate sections elsewhere in this report.

Table 25-1 Graphite Creek Deposit Indicated Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INDICATED	3.0	17.97	6.3%	1,134,000
	4.0	17.34	6.4%	1,111,000
	5.0	15.10	6.7%	1,009,000
	6.0	10.32	7.2%	744,000
	7.0	4.46	8.2%	367,000
	8.0	2.07	9.1%	189,000
	9.0	0.76	10.3%	78,000
	10.0	0.29	11.7%	34,000

<u>Notes to the Mineral Resource Estimate:</u>				
1. Mineral resources are not mineral reserves and do not have demonstrated economic viability. There is no guarantee that all or any part of the indicated or inferred mineral resource will be converted into a mineral reserve. 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.				
2. Values in the tables have been rounded. Totals may not tally due to rounding errors.				
3. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs				

Table 25-2 Graphite Creek Deposit Inferred Mineral Resource

MINERAL RESOURCE CLASSIFICATION	CUT-OFF GRADE (% Cg)	TONNAGE (MILLION TONNES)	GRAPHITE GRADE (% Cg)	CONTAINED GRAPHITE (TONNES)
INFERRED	3.0	154.44	5.7%	8,769,000
	4.0	121.62	6.2%	7,591,000
	5.0	105.81	6.5%	6,881,000
	6.0	71.24	7.0%	4,969,000
	7.0	22.24	8.2%	1,823,000
	8.0	8.79	9.3%	817,000
	9.0	3.45	10.8%	374,000
	10.0	1.52	12.6%	192,000

<u>Notes to the Mineral Resource Estimate:</u>				
1. Mineral resources are not mineral reserves and do not have demonstrated economic viability. 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.				
2. Values in the tables have been rounded. Totals may not tally due to rounding errors.				
3. Tonnage and contained graphite are given in metric tonnes. 1 tonne = 1,000 kg = 2,204.6 lbs				

Figure 14-2 shows the location of the diamond drill holes, the portions of the resource classified as Indicated and Inferred. This figure also shows the locations and relative positions of the nine mineralized lodes

Mining

- ▶ The area selected for modelling, and planned for mining is located along a relatively continuous 1500-meter outcrop and appears to be segregated into three separate zones of graphite mineralization, termed Lodes 1, 2 and 3. During the modelling process, it was determined that the barren rock zone between Lodes 2 and 3 appears to be highly variable in thickness ranging from zero to as much as 5 meters. The three Lodes dip gently to the north under an increasing amount of overburden.

- ▶ The mining methodology is planned as a truck and shovel operation mining along several contiguous, en-echelon, pits starting at the outcrop and progressing in the down dip direction.
- ▶ An estimate of the overburden ratio was generated by analyzing the cross sections generated during the modelling process. Based upon these assessments it is estimated that the overburden ratio for the Graphite Creek Project ranges between 2:1 and 4:1. For all subsequent assessments, a value for the overburden ratio was selected to be a conservative 3:1.
- ▶ The graphite mineralization, as modelled in Section 14, is calculated to possess in excess of 40 million tonnes of inferred resources. The mining plan outlined above is capable of producing graphite mineralization at a rate of 3,090 tpd (1,018,00 tpy), at which rate, the modelled portion of the graphite mineralization appears to be capable of sustaining mining operations for 40 years at that rate.

Mineral Processing

- ▶ At full project design capacity, plant feed is 1,018,000 tpy of mined graphite mineralization that yields 60,000 tpy of fine concentrate.
- ▶ The concentrate is packaged in one tonne super sacks and placed in 20 t shipping containers in preparation for overland truck transport to the port of Nome, Alaska. The containers are loaded onto barges at the Port of Nome, Alaska during the seasonal shipping window and shipped to the Products Manufacturing Plant. A port facility proposed by Bering Straits Native Corporation at Port Clarence could be a possible alternative to the Port of Nome during the life of the Project.
- ▶ Mineral processing testwork indicated that the apparent coarse fraction of graphite was either low or sufficiently fragile to disintegrate or dissociate under mechanical stress. Exploratory product development testwork demonstrated that purification and mechano-chemical processing of the entire size distribution of a non-classified graphite concentrate (coarse and fine flake) resulted in recovery of spherical graphite of which nearly 75% was suitable for EV lithium-ion batteries. This supports the design decision to produce one concentrate stream for integrated processing to spherical graphite.

Product Purification and Manufacturing

- ▶ Exploratory product development testwork determined that direct spheronization of non-milled, purified graphite achieved approximately 74.6 wt% yield of usable spherical product.
- ▶ Uncoated and coated spheronized graphite tested for their initial electrochemical properties in CR2016 coin cells both delivered near theoretical performance, which is promising for application in advanced lithium-ion battery systems.
- ▶ The Product Manufacturing Plant receives 60,000 tpy of concentrate grading 95% Cg from the Mineral Processing Plant. All received concentrate is thermally purified. State-of-the-art (electric-powered) thermal purification has been selected over acid chemical

purification to position Graphite One to increase throughput and minimize or eliminate acid effluents

- ▶ Purifying all the concentrate yields higher quality product offerings in line with the core Graphite One strategy to produce only up-market high quality products –
 - CSG, 41,850 tpy for lithium-ion battery end-use applications, principally for Electric Vehicles
 - Purified sub-20 micron powders, 13,500 tpy for varied end-use applications including lubricants, friction products, conductive polymers, specialty powder and metallurgical additives
- ▶ High volume purification of graphite concentrate for spherical graphite manufacturing is performed in electrically-heated furnaces operating under dynamic fluidizing conditions with an inert atmosphere at high temperature. The purification furnaces are designed as high throughput, low residence time units that achieve high rate purification by exposure of individual flakes to high temperature under turbulent fluid mixing conditions.
- ▶ Spheronizing and coating is carried out in Japanese-manufactured hybridized spheronizing and coating mill systems on a batch basis. Exploratory product development tests indicated that almost 75% of spheronized product was acceptable for EV battery applications. Other size fractions suitable for other (non-EV) Li-ion batteries end-use increases the recovery to 91%.
- ▶ Purified graphite powder is first spheronized and classified into various size fractions. Spherical graphite size fractions suitable for lithium-ion batteries are combined with coating precursor that is a soft petroleum pitch and recycled to the spheronizing mill. The resulting coated graphite product is collected and heat treated or carbonized at about 1000°C for a specified time in kiln type furnaces to remove volatiles and harden the coating. The CSG product discharges from the furnace through a cooler and is then transferred to product storage.

Project Financials

The Company cautions that this PEA is preliminary in nature and is based on technical and economic assumptions that will be further investigated and established with greater confidence in future studies. The PEA is based on the current resource model (November 2016), which includes estimates of indicated and inferred resources. The current information is insufficient to convert mineral resources to mineral reserves; mineral resources that are not mineral reserves do not have demonstrated economic viability. As such, there is no certainty that PEA will be realized.

- ▶ The financial analysis is based on-
 - A resource of 44 million t at 7% Cg, 80% Cg recovery, and a project life of 40 years.
 - Operating and capital costs developed in accordance with the conceptual designs for the Graphite Creek Mine in Alaska and on-site Mineral Processing Plant and the Products Manufacturing Plant.

- Ramping to a full capacity of 60,000 tpy graphite concentrate by Year 6 and 55,350 tpy graphite products by Year 7.5.
- Graphite product distribution at full capacity of 41,850 tpy of coated spherical graphite (CSG) selling at US\$6,200 per t and 13,500 tpy purified graphite powders <20 micron selling at an average price of \$1500 per t.
- ▶ The Graphite One business model generates cash earnings of \$182 million per year on sales of \$280 million at full capacity with a consolidated operating margin (EBDIT) of 63% on sales. Coated Spherical Graphite dominates the output accounting for 93% or US\$259.5 million, of the total. Purified Graphite Powders account for the balance with sales of \$20 million.
- ▶ The required Project total capital cash outlay over ten years is estimated at \$368 million. The resultant Net Present Value (NPV) is \$1,037 million using a 10% discount rate and mine life of 40 years. The Internal Rate of Return (IRR) is 27% with payback in Year-4 from the start-up of production.
- ▶ Post-tax financial results for the Project show the NPV at \$616 million using a 10% discount rate and mine life of 40 years. The IRR is 22% with payback in Year-4 from the start-up of production.
- ▶ A sensitivity analysis on the pre-tax (EBDIT) financials was carried out to determine the effect of the following parameters on the NPV (at a 10% discount rate) and IRR:
 - Coated spherical graphite product selling price
 - Capital cost
 - Operating cost
 - Graphite (Cg) head grade, and
 - Graphite (Cg) recovery
- Product selling price had the greatest impact on the NPV and IRR. A 10% change in the selling price resulted in a change of about \$210 million in the NPV and 2.9% in the IRR. For example, raising the CSG selling price to \$8060 per t resulted in an NPV of \$1,665 million and IRR of 35%.

Marketing Strategy

- ▶ At full capacity, the Product Manufacturing Plant produces 55,350 tpa of graphite finished products for sale. Approximately three quarters of sales or 41,850 t is CSG suitable for Li-ion batteries. Graphite One could be a globally prominent producer of premier coated spherical graphite for use in electric vehicle lithium-ion battery anodes within this horizon targeting the United States, Japan, Korea and Europe.
- ▶ About 13,500 t per year of the reject material, the by-product of spheronizing, is sold as purified graphite powders of less than 20 microns for lubricants, friction products, high-end conductive plastics and specialty powder metallurgy additives.
- ▶ Graphite One expects to maintain market price leadership in CSG (with a target price of \$6,200 per t) given that several potential competitors have announced plans to build such a facility in the United States. The price target for both the CSG and purified powders are robust and consider the planned large volume operation as well as the expected competitive environment.

26 RECOMMENDATIONS

Geology and Mineral Resources

Follow-up exploration and development at the Graphite Creek graphite deposit is recommended based on results from: 1) historic and recent (2011-2014) exploration and laboratory work; 2) the lateral continuity of at least nine mineralized graphitic schist lodes; 3) high-grade graphite situated at surface or near-surface in Lodes 1 and 2; 4) a newly reported Indicated Mineral Resource and a sizeable Inferred Mineral Resource as documented in this Technical Report; and 5) a potential open pit mining scenario that can be initiated by side-cutting into the northern slopes of the Kigluaik Mountains to reduce the strip ratio and maximize access to the high-grade graphitic schist.

The total cost to complete the next exploration program is estimated to be US\$5.4 million (Table 26-1). With a 10% contingency, the total budget becomes \$5.9 million. The next logical steps to advance the Project include:

1. Infill drilling program

- ▶ It is recommended that Graphite One continue with infill drilling within the Inferred resource portion of the Graphite Creek deposit to expand and upgrade the Indicated Mineral Resource.
- ▶ The infill drilling should include approximately 8,000 m of drilling, which is equivalent to roughly 65 drill holes drilled to depths of 120 m.
- ▶ The infill drilling should include a series of drill set-ups with at least two drillholes orientated at different dips to further define the strike and dip of the Kigluaik Fault, delineate local fault/offsets (including the Graphite Creek Fault), and further develop the mineralization model at the Graphite Creek Deposit.
- ▶ The next program should focus on several key areas of investigation. Firstly, it is important to develop a better understanding of the indicated resource trending northwards and adjacent to the Kigluaik fault. At present, the geological model assumes the Kigluaik Fault dips vertically. However, the Kigluaik Fault has been interpreted as dipping northwards at 75° (e.g., Hudson and Plafker, 1978). This has ramifications for the resource, as some Lodes in the model (e.g., high- grade, near surface Lode 1) are currently truncated by the assumed 'vertical' fault. If the Kigluaik Fault dips at a shallower angle to the north, then the lodes would not be cut off and the size of the lodes and resource could potentially increase down dip from the modeled fault. The second key focus should be to drill test directly east of the current Indicated Resource area between Graphite Creek and the Cobblestone watershed to potentially expand the Indicated Mineral Resource. Infill drilling between drill holes 14GCH020 and 12GC005 (approximately 150 m), for example, could increase the Indicated portion of the resource to about 15% of the overall drill-tested graphitic schist and Inferred Mineral Resource.
- ▶ The estimated cost of the infill drilling is about \$4.8 million.

2. Geotechnical Drilling Program

- ▶ It is recommended that Graphite One conduct a geotechnical drilling program to provide a basis for excavation stability analyses; optimal pit slope angles; and pit architecture for mine design purposes.
 - ▶ Key geotechnical aspects towards open pit mining include: slope stability of both the waste and graphite mineralization; rock mass strength; discontinuity orientation and strength; overburden characteristics and strength; hydrology and hydrogeology; and structural geology and fault strengths.
 - ▶ Six geotechnical drill holes are recommended for initial assessment at an estimated cost of \$500,000.
3. When the new drill data has been compiled, a new deposit model should be constructed, and a new resource estimate calculated. It is assumed that this work would cost in the order of \$50,000.

Table 26-1 Estimated cost breakdown for next phase of exploration

ITEM	DESCRIPTION	COST \$
Infill drilling	8,000 meters of infill drilling within the inferred resource portion of the Graphite Creek deposit to expand the indicated resource	\$4,800,000
Geotechnical drilling	Six pit well drill holes to provide an initial basis for excavation stability analyses; optimal pit slope angles; and pit architecture for mine design purposes	\$500,000
Update Resource Estimate and report	Update the deposit model and recalculate resource estimate based on new drill results	\$50,000
CONTINGENCY (10%)		\$535,000
	TOTAL ESTIMATED COST – NEW EXPLORATION	\$5,885,000

Mining

- ▶ Further refinement of the mining plan is required following a more detailed engineering study of the overburden ratio that has been conservatively estimated at 3:1
- ▶ Following above, develop an initial mining operations plan
- ▶ Perform hydrological and hydrogeological studies to identify potential drainage issues on the open pit operations
- ▶ Conduct a rock mechanics study in the context of proposed en-echelon mining strategy
- ▶ Refine the mining costs as per the results of the recommended studies

Mineral Processing

- ▶ Determine whether there is a relationship between drill core interval depth and mineral grade with observed variation in particle morphology and particle size distribution
- ▶ Assess possible separation of integral from pressed flake as actual quantification of integral vs aggregate graphite flake in the mineralized sample is complex
- ▶ Continue with ongoing test work that will validate the entire mineral processing flowsheet, which will also generate concentrate for the further product development test work.
- ▶ Assess the concentrate physical characteristics prior to further value-added processing

Product Purification and Manufacturing

- ▶ Identify particle types and morphologies that will survive the purification steps
- ▶ Verify the stated levels of performance with graphite recovered and spheronized from subterranean formations at Graphite Creek
- ▶ Examine friable fractions that are more amenable to milling and assess the suitability of large aspect ratio / pressed flakes for making foil and sheet production
- ▶ Confirm ease of spheronizing and recovery rates in commercial equipment
- ▶ Assess carbon coating performance in commercial equipment

Project Financials and Marketing Strategy

- ▶ The positive financials for vertically-integrated production of CSG at the projected unit pricing of \$6,200 per tonne merits that the Project proceed to a feasibility study (FS) to maintain an accelerated project schedule that would coincide with market demand in 2021. The scope activities related to FS includes:
 - Progressing through a PFS may be considered optional as mineral processing of the graphite mineralization is considered low risk
 - Upgrading the classification of the resource base including the definition of mineral reserves by additional infill drilling
 - Performing detailed engineering study on the overburden ratio
 - Performing rock mechanic, hydrogeological and hydrological studies pertaining to the proposed mine plan
 - Continuing environmental baseline studies
 - Identify preliminary sites for placement of the Alaska Mineral Processing Plant
 - Identify preliminary sites for the Product Manufacturing Plant
 - Pursue a robust R&D and pilot studies for optimizing and scaling mineral processing and spherical graphite production including -

- Optimizing milling, residence times and reagent use
 - Examine impact of upgrading concentrate to 98% Cg by mineral processing
 - Investigate leach characteristics of the process tailings
 - Examine the physical and electrochemical characteristics of spheronized graphite extracted from representative graphite mineralization
 - Examine characteristics of spheronizing rejects for end-use applications
 - Plot path to develop in-house thermal processing capabilities
- ▶ A detailed market study of the coated spherical and purified power graphite market be conducted to obtain a full understanding of the market characteristics, including market potential, customer requirements and the competitive landscape
 - ▶ Graphite One continue to pursue a robust product development program for both the coated spherical and purified power graphite, including customer trials, in readiness for start of commercial operations.

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28 AUTHOR/QP CERTIFICATES

28.1 Ronald James Robinson, P. Geo.

I, Ronald James Robinson, of Juneau, Alaska, USA as do hereby certify that:

- I am co-author of the Technical Report titled Preliminary Economic Analysis on the Graphite One Project
- I graduated with a Bachelor of Science in Geology from the University of British Columbia, Vancouver, BC, May, 1985.
- I am a Certified Professional Geologist and a member of the Association of Professional; Engineers and Geoscientists of British Columbia (License # 38912). My relevant experience in relation to this project is in economic mineral deposits, geological modeling and resource estimation.
- I am responsible for the preparation of Sections 6, 7, 8, 9, 10, 11, 12, 14, 15 and 16, and I have contributed to Sections 1, 2, 5, 25 and 26 of the Technical Report.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI43-101.
- I made a personal visit of the Graphite Creek property between October 13 and 15, 2015.
- I have not had prior involvement with the property.
- I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
- At the effective date of the technical report, November 28, 2016, to the best of my knowledge, information, and belief, the parts of the technical report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the technical report not misleading
- I am independent of the issuer applying all of the tests in Section 1.5 of the NI 43-101.

I consent to the public filing of the Technical Report in written and/or electronic format.

Signed on this 30th day of June 2017 at Juneau, Alaska USA

(Original Signed/Sealed) ***"Ronald James Robinson"***

R.J. (Jim) Robinson BSc., P. Geo.

28.2 Ioannis (John) Roumeliotis, Eng.

I, Ioannis (John) Roumeliotis, of Montreal, Quebec, Canada as do hereby certify that:

- I am co-author of the Technical Report titled Preliminary Economic Analysis on the Graphite One Project
- I graduated with a Bachelor of Engineering in Metallurgy from the Department of Mining & Metallurgical Engineering, McGill University, Montreal, QC Canada, June 1993. I obtained a Master of Engineering Degree in the Department of Mining, Metals & Materials Engineering at McGill University, Montreal, QC Canada, in June 1999.
- I am a Certified Engineer of member of the Ordre des ingénieurs du Québec (Permit # 122357). My relevant experience in relation to this project is in process engineering, metallurgical testing and project management with core competency in consulting to non-commodity materials projects as part of TRU Group.
- I am responsible for the preparation of Sections 1, 2, 3, 4, 5, 13, 17, 19, 20, 23, 25 and 26. I have contributed to Sections 16, 22, 24 of the Technical Report.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI43-101.
- I have not visited the Graphite Creek Property and relied on the information gathered by R.J. Robinson co-author of this Technical Report who made a personal visit of the Graphite Creek property between October 13 and 15, 2015.
- My prior involvement in the project was in the capacity of a representative of TRU Group Inc consulting to the project on technical and conceptual assessments.
- I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
- At the effective date of the technical report, November 28, 2016, to the best of my knowledge, information, and belief, the parts of the technical report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the technical report not misleading
- I am independent of the issuer applying all of the tests in Section 1.5 of the NI 43-101.

I consent to the public filing of the Technical Report in written and/or electronic format.

Signed on this 30th day of June 2017 at Montreal, Quebec, Canada

(Original Signed/Sealed) ***"Ioannis Roumeliotis"***

Ioannis Roumeliotis, Eng.

28.3 Maureen Paterson, P. Eng.

I, Maureen Paterson, of Perez Zeledon, Costa Rica (Canadian citizen), as do hereby certify that:

- I am co-author of the Technical Report titled Preliminary Economic Analysis on the Graphite One Project
- I graduated with a B.Sc Applied Science in Mining (Mineral Processing) from Queen's University, Kingston, ON, 1981
- I am a Certified Professional Engineer of Ontario of member of the Professional Engineers of Ontario (Licence #90291717). My relevant experience in relation to this project is in mineral processing, engineering and plant cost estimation.
- I am responsible for the preparation of Sections 18, 21, 22 and 24. I have contributed to Sections 1, 13, 17, 18, 21, 22, 24, 25, 26 of the Technical Report.
- I have read the definition of "qualified person" set out in National Instrument 43-101 (NI43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI43-101.
- I have not visited the Graphite Creek Property and relied on the information gathered by R.J. Robinson co-author of this Technical Report who made a personal visit of the Graphite Creek property between October 13 and 15, 2015.
- My prior involvement in the project was in the capacity of a representative of TRU Group Inc consulting to the project on technical and conceptual assessments.
- I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
- At the effective date of the technical report, November 28, 2016, to the best of my knowledge, information, and belief, the parts of the technical report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the technical report not misleading
- I am independent of the issuer applying all of the tests in Section 1.5 of the NI 43-101.

I consent to the public filing of the Technical Report in written and/or electronic format.

Signed on this 30th day of June 2017 at Perez Zeledon, Costa Rica

(Original Signed/Sealed) "**Maureen Paterson**"

Maureen Paterson P. Eng.

B.Sc. Applied Science