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**INDEPENDENT TECHNICAL  
& ECONOMIC REVIEW OF  
CANADA CARBON'S MINING PROJECT  
IN GRENVILLE-SUR-LA-ROUGE  
QUEBEC**

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## 1 INTRODUCTION

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Mining Watch Canada retained Kuipers & Associates to review and provide professional opinions concerning the economic evaluation of Canada Carbon's Miller Graphite Project, located in the municipality of Grenville-sur-la-Rouge, Quebec, Canada. Specifically, the client requested that we address the following main questions?

- Is the proposed project economically viable based on existing NI43-101 & PEA filings by the company, or any other professional judgments by the assessor?
- Is there a valid basis for \$96 million (Cdn) in compensation damages if it cannot proceed forward at this stage?
- Has the proponent met the requirements of Section 101 of the Quebec Mining Act?

## 2 QUALIFICATIONS

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I have an extensive background with more than 35 years involvement in mining metals and minerals including in the full-life cycle of exploration, project development, project permitting, construction, operations, reclamation, and closure. I graduated in 1983 with a B.S. in Mineral Processing from Montana School of Mines. In addition to growing up in a mining family and gaining practical experience prior to entering University, I have worked as a senior engineer, chief metallurgist, mill superintendent, mine manager, project manager, and consulting engineer. Since 1996 I have been the principal consulting engineer with Kuipers & Associates. My work during that time has focused on providing technical expertise to public interest groups, tribes and first nations, and governments concerning mining and environmental concerns. The primary areas of expertise I have provided have included site characterization, water quality predictions, mine planning and mitigations, tailing storage facilities, mine reclamation and closure, site investigations and remediation, water treatment, financial assurance, and economic evaluations.

I am a registered Professional Engineer in Mining in the U.S. States of Montana and Colorado. I have been qualified as an expert witness in mining and related matters in numerous administrative hearings in the U.S. and Canada, and have been qualified as an expert witness in U.S. Federal and State Courts. I have conducted numerous feasibility analysis and well as extensive reviews of similar analysis throughout my professional career. I am highly familiar with the NI 43-101 Guidelines<sup>1</sup> and meet the definition of a "qualified person" consistent with the guidelines. My professional resume is attached as Exhibit A.

## 3 DOCUMENTS AND OTHER INFORMATION RELIED UPON

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The primary documents I have reviewed in conducting this analysis were as follows:

- Tetrattech 2016 PEA. *Technical Report and Preliminary Economic Assessment for the Miller Graphite and Marble Property, Grenville Township, Quebec, Canada* by Tetra Tech to Canada Carbon Inc., March 4, 2016.
- SGS 2017. *NI 43-101 TECHNICAL REPORT for the Mineral Resources Estimation of the Miller Project, Grenville Quebec*, by SGS Mineral Services to Canada Carbon Inc., January 23, 2017.

In addition, I have relied on graphite commodity analysis performed by the United States Geological Survey (USGS) and other documents as referenced in this report.

## 4 SUMMARY OF PRIMARY DOCUMENTS

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The following sections summarize the Tetrattech 2016 P Preliminary Economic Assessment (PEA) and information contained in SGS 2017.

### 4.1 TETRATTECH 2016 PEA

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The results of the Tetrattech 2016 PEA are summarized in Table 4.1-1. The PEA is based on inferred mineral resources suggesting 25,200 tons<sup>2</sup> contained carbon as graphite, and 1.5 million tons of contained marble. Material from the Marble Pit would be mined during the first eight years of mine production with the Marble sold and the graphite material stockpiled for later processing. Material from the Graphite Pits would be mined and processed during the second through 11<sup>th</sup> years of mine production. Processing of stockpiled material would continue until sometime in production year 18, and the mine reclaimed in year 19.

Mining would be conducted by conventional open pit mining techniques including blasting with ore and waste removed by loader and truck haulage methods. Overall, approximately 2.1 million tons of graphite mill feed would be mined with a stripping ratio of 2.0:1 (waste:ore) together with 1.2 million tons of salable marble. Waste rock would be stored adjacent to the open pits. Processing would occur at an initial rate of approximately 200 tons per day (tpd) and increase to approximately 495 tpd once lower grade material is processed beginning in mine production year 12. Tailings from processing would be stored in a dry tailing facility on site. The mill would produce 21,014 tons of concentrate at a grade of approximately 95% carbon as graphite, which in turn would be refined by thermally upgrading to greater than 99% carbon as graphite. Production would range from an initial high of 1,515 tons per year (tpy) in production year 3 to 766 tpy beginning in mine production year 12.

The projected capital costs for the project are \$44.4<sup>3</sup> million which includes \$3.6 million in sustaining capital. Mining and Flotation capital costs are estimated at \$18.1 million and thermal upgrading facilities at \$22.7 million. Marble mining capital costs are estimated at \$3.6 million. Operating costs for graphite ore are \$76.11 per ton milled and \$8,327 per ton carbon as graphite produced. Marble operating costs are estimated at \$22.27 per ton.

The projected revenue from sales of graphite is estimated to be US\$13,000 per ton. Projected revenue from marble is estimated to be \$184 per ton. The PEA used an exchange rate of 0.75:1.00 (US dollar to Canadian dollar).

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<sup>2</sup> All units are metric unless otherwise noted.

<sup>3</sup> All dollar units are Canadian unless otherwise noted as United States (US).



TABLE 4.1-1

Canada Carbon's Miller Graphite Project Tetrattech 2016 PEA Summary<sup>4</sup>

<b>MINERAL RESOURCES</b>		Graphite	Graphite Pits	Inferred - 952,000 t @ 2.0% Cg% (19,000 contained t Cg)
			Marble Pit	Inferred - 1,180,000t @ 0.53% Cg% (6,200 contained t Cg)
		Marble	Marble Pit	Inferred - 1,519,000 t contained t Marble
<b>PRODUCTION</b>	<b>MINING</b>	Graphite	Graphite Pits	890,805 t @ 1.87% Cg%, 10y LOM, 1.8 waste:ore LOM
			Marble Pit	1,206,051t @ 0.53% Cg%, 8y LOM, 2.2 waste:ore LOM
		Marble	Marble Pit	1,182,037 t 8y LOM, 2.2 waste:ore LOM
	<b>PROCESSING</b>	Graphite	Mill Feed	2,096,855 t @ 1.10 Cg%, 73,000 - 177,500 tpy
			Concentrate	21,014 t @ 95% Cg%, 840-1,661 tpy
			Refined	19,164 t @+99% Cg, 766-1,515 tpy
<b>COSTS</b>	<b>CAPITAL COSTS</b>	Graphite	Mining/Flotation	\$18.1 m
			Thermal Upgrading	\$22.7 m
		Marble		\$3.6 m
		Sustaining		\$3.6 m
	Total		\$44.4 m	
	<b>OPERATING COSTS</b>	Graphite	Milled	\$76.11/t
			Total	\$8,327/t
Marble			\$22.27/t	
<b>REVENUE</b>	Graphite		US\$13,000/t	
			\$184/t	
	Marble			
	Exch Rate		0.75:1.00 USD:CAD	
<b>FINANCIAL RESULTS</b>	Pre-Tax	IRR	100.2%	
		Payback	1.9 years	
		NPV @8%DR	\$149.7 m	
	Post-Tax	IRR	85.0%	
		Payback	2.0 years	
		NPV @8%DR	\$110.0 m	

The PEA results suggested a pre-tax internal rate of return (IRR) of 100.2% with a payback period of 1.9 years and a net present value (NPV) of \$149.7 million. The PEA suggested a post-tax IRR of 100.2% with a payback period of 2.0 years and a NPV of \$110.0 million.

The PEA included a sensitivity analysis which suggested the NPV is most sensitive to exchange rate and, in decreasing order, graphite price, marble price, operating costs, and capital costs. The IRR is most sensitive to the capital costs followed by marble price, graphite price, exchange rate, and operating costs. The payback period is most sensitive to marble price followed by capital costs, graphite price, operating costs, and exchange rate.

<sup>4</sup> The text in red type highlights a discrepancy in the PEA between the quantity and grade shown as Inferred Graphite from the Marble Pit of 1,180,000 t @0.53% Cg and the quantity and grade of 1,206,051 t @0.53% Cg from the Marble Pit that is shown as being processed. Similar to what is shown for the graphite pits, the expectation would be that the amount of any resource actual mined would always be less than the amount of the resource, and that the grade of the resource mined might also be lower than indicated due to dilution that occurs during the mining process.

## 4.2 SGS 2017

SGS 2017 is a revised mineral resource estimate and does not include or revise the Tetrattech 2016 PEA. Based on additional exploration drilling the report revises the resource estimate for the project as shown in Table 4.2-1.

**Table 4.2-1 Canada Carbon’s Miller Graphite Project Tetrattech 2016 PEA and SGS 2017 Comparison**

MINERAL RESOURCES						
CATEGORY	TETRATTECH 2016 PEA			SGS 2017		
	Tonnage	Average Cg%	Graphite (t)	Tonnage	Average Cg%	Graphite (t)
INDICATED				2,645,000	0.80%	21,200
INFERRED	2,132,000	1.19%	25,294	7,557,000	0.77%	58,800
TOTAL	2,132,000	1.19%	25,294	10,202,000	0.78%	80,000

The revised mineral resource estimate moves a portion of the original inferred resources into the indicated category while at the same time increasing the inferred resources. The net result is to more than triple the previous resource estimate.

## 5 PROJECT ECONOMIC VIABILITY

Both the Tetrattech 2016 PEA and the SGS 2017 revised mineral resource estimate speak directly to this matter as follows:

- “Section 1.12 ECONOMIC ANALYSIS. A PEA should not be considered to be a prefeasibility or feasibility study, as the economics and technical viability of the Project have not been demonstrated at this time. The PEA is preliminary in nature and includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves. Furthermore, there is no certainty that the conclusions or results as reported in the PEA will be realized. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.” (underline added) (Tetrattech 2016 PEA)
- “Mineral Resources, which are not Mineral Reserves, do not have demonstrated economic viability.” (underline added)  
Current risks around the project are tonnage estimation may be off by as much as 50% and that the high-grade zones could not be followed from surface showings to drilling results “which makes them practically impossible to measure.” (SGS 2017)

As was noted in both reports, the Mineral Resource estimates were conducted following the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definitions Standards for Mineral Resources in accordance with NI 43-101 Standards of Disclosure for Mineral Projects. The CIM Definitions Standards specifically contain the following information with respect to indicated and inferred mineral resources.

### INFERRED MINERAL RESOURCE

An “Inferred Mineral Resource is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.

Due to the uncertainty that may be attached to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration. Confidence in the estimate is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Inferred Mineral Resources must be excluded from estimates forming the basis of feasibility or other economic studies. (underline added)

## INDICATED MINERAL RESOURCE

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An “Indicated Mineral Resource” is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.

Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Preliminary Feasibility Study which can serve as the basis for major development decisions.

## CONCLUSIONS

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- Both the Tetrattech 2016 PEA and SGS 2017 revised resource estimate relied on Mineral Resource estimates and properly informed the project owner as well as prospective investors that Mineral Resources do not have economic viability.
- The Tetrattech 2016 Preliminary Economic Assessment relied solely on “inferred” mineral resources. As according to the CIM Definitions inferred mineral resources must be excluded from estimates forming the basis of feasibility or other economic studies, the validity of the report is questionable; it does not meet the CIM definitions and standards.
- The SGS 2017 revised resource estimate changes a significant amount of the resource from “inferred” to “indicated.” While this change under CIM definitions might allow for a “preliminary feasibility study” versus a “feasibility study” as suggested in SGS 2017, the same qualification that “there is no certainty that the conclusions or results as reported in the PEA will be realized” would apply to any type of feasibility study based on the SGS 2017 revised mineral resource estimate as “Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.”
- Based on my own professional experience and knowledge the conduct of any type of feasibility analysis based on inferred and/or indicated resources, and not on verifiable mineral reserves, is both rarely performed as well as a questionable undertaking by a qualified person. Based on the information provided, the project has not demonstrated economic viability as per the standard of professional care required by accepted industry standards such as NI 43-101.

## 6 VALIDITY OF SUGGESTED COMPENSATION DAMAGES

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On March 2nd, 2018 Canada Carbon filed a \$96 million damages claim against the Village of Grenville-sur-la-Rouge (“GSLR”).<sup>5</sup> As the basis for this claim Canada Carbon is relying on projected after tax cash flow as suggested by Tetrattech 2016, which as previously has been noted, does not demonstrate economic viability.

We have previously been involved in the estimation of compensatory damages related to similar claims made relative to regulatory, public interest or private property issues. In my experience claims that are not based on a valid economic analysis are generally considered speculative and are often used as a “threat” in legal proceedings. The actual basis of any damages, in the rare cases where they are awarded, varies considerably. Where damages are awarded it is most common for the project owner to recoup their investment, but not be punitively awarded based on speculation. Based on Canada Carbon’s most recent public filing for 2Q2018, their invested exploration and evaluation assets for the Miller Property would be \$5,302,804

If damages were to be awarded, it would be in GSLR’s best interest to engage a party to conduct an independent analysis of the project, focusing on the major technical and financial risks identified and discussed in the following section of this report. Based on the information presented, such an analysis would show that there are a number of equally reasonable scenarios to that of the proposed project that could cause it to not be economically viable.

## 7 REQUIREMENTS OF SECTION 101 OF THE QUEBEC MINING ACT

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The applicant is required by Section 101 of the Quebec Mining Act<sup>6</sup> and a 2018 ministerial directive<sup>7</sup> to meet the following three criteria of Section 101 of the Act: (i) “...a report describing the nature, extent and probable value of the deposit, certified by an engineer or a geologist who meets the qualification requirements determined by regulation,” (ii) a project feasibility study,” (iii) “as well as a scoping and market study as regards processing in Québec.”

The first requirement is for “(i)...a report describing the nature, extent and probable value of the deposit, certified by an engineer or a geologist who meets the qualification requirements determined by regulation.” (underline added). The Tetrattech 2016 and SGS 2017 documents are “reports” certified by a qualified person as defined by CIM. However, as previously indicated, the reports clearly say “the economics and technical viability of the Project have not been demonstrated at this time.” As the reports do not demonstrate economic or technical viability, they cannot be used to suggest the “probable value” as required by Section 101 of the Quebec Mining Act.

The second requirement is for “(ii) a project feasibility study.” (underline added) As was previously noted, both the Tetrattech 2016 PEA and SGS 2017 revised resource estimate relied on mineral resource rather than mineral reserve estimates. According to the CIM Definitions inferred mineral resources must be excluded from estimates forming the basis of feasibility or other economic studies. Therefore, the Tetrattech 2016 PEA and SGS 2017 do not meet the requirements for “a project feasibility study” as required by Section 101 of the Quebec Mining Act.

The third requirement is for “(iii) as well as a scoping and market study as regards processing in Québec.” The Tetrattech 2016 PEA and SGS 2017 are not supported by such studies and instead primarily rely on information provided by the project owner and preliminary information provided by potential end users for both graphite and marble. Therefore, the requirement for a scoping and market study has not been met as required by Section 101 of the Quebec Mining Act.

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5 [https://www.canadacarbon.com/newsdetail?&newsfile=ccb\\_20180305.htm](https://www.canadacarbon.com/newsdetail?&newsfile=ccb_20180305.htm)

6 <http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/M-13.1>

7 [https://mern.gouv.qc.ca/english/publications/mines/rights/Directive-etude-faisabilite\\_2018.pdf](https://mern.gouv.qc.ca/english/publications/mines/rights/Directive-etude-faisabilite_2018.pdf)



## 8 MAJOR TECHNICAL AND FINANCIAL RISKS

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As previously noted, the PEA included a sensitivity analysis which suggested the project NPV is most sensitive to exchange rate and, in decreasing order, graphite price, marble price, operating costs, and capital costs. In addition to the financial risks, several major technical risks are present for the project as proposed including the production of suitable quality graphite and marble, and a viable market for the additional production of “nuclear graphite.” In addition, the project has thus far resulted in significant risk to its social license.

### 8.8 EXCHANGE RATE

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The Tetrattech 2016 PEA used an exchange rate of 0.75:1 US Dollar to Canadian Dollar. The approximate same exchange rate was applicable as of January 22, 2019. However, the past fifteen years have seen an exchange rate greater than 0.75:1 US Dollar to Canadian Dollar.<sup>8</sup> The proposed project is particularly affected because the graphite carbon market is based on US dollars, and based on the PEA estimate of \$13,000 US per ton, the market price would be \$17,333 Canadian per ton.

### CONCLUSION

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While the likelihood of future changes to the exchange rate are difficult to estimate, the impact on project economic viability would be significant, therefore the exchange rate represents a significant or high project risk.

### 8.2 GRAPHITE PRICE, SUITABILITY AND MARKET

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According to the PEA section on market studies and contracts (Section 19.0) the “*highly crystalline nature of the Miller graphite*” together with other properties makes “*Miller graphite suitable for demanding high-technology applications for which there is a very limited graphite supply, yielding high market valuations.*” The PEA goes on to add “*Canada Carbon will not compete with flake or amorphous graphite producers, but will instead focus on specialized niche markets where the highly desirable properties of the Miller graphite are expected to be both prized, and valued appropriately.*” The document then goes on to identify “*Nuclear Reactors and Nuclear Research Programs,*” “*Electronic Devices,*” and “*Energy Storage Devices*” in addition to “*Graphene*” as the most likely “*specialized niche markets*” for high-purity crystalline graphite. The PEA provides the following information specific to each market:

**Nuclear Reactors and Nuclear Research Programs.** “*Canada Carbon has received inquiries and sample requests from government and university funded researchers around the world, and is in the process of negotiating supply agreements. Pricing for purified graphite for nuclear applications is not yet confirmed by contract, but it is expected to be sold for USD18,000 to USD35,000/t.*”

**Electronic Devices.** “*The commercial processor responsible for the thermal upgrading of the Miller graphite to 99.9998% purity is an affiliate of a well-known international graphite corporation. Shortly after completing the upgrading trials for Canada Carbon, this international entity submitted a pricing letter stating that the ultra-high-purity Miller graphite was suitable for supplying to their clients in the specialty electronics industry. Assuming 10% market penetration into the stated market of 250 to 350 t/mo(nth), Canada Carbon could sell 300 to 420 t/a, at a price of USD12,000 to USD14,000/t.*”

**Energy Storage Devices.** “*Samples of the ultra-high-purity Miller graphite are currently being assessed for high-performance Li-ion battery capability. Suitable graphite will command a premium, and once shaped and coated, values of USD15,000 to USD25,000/t are anticipated for this niche battery market.*”

**Graphene.** “*Samples of the purified Miller graphite are being examined by graphene researchers around the world.*”

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8 <https://www.ofx.com/en-ca/forex-news/historical-exchange-rates/>

In addition, since the writing of the 2016 PEA, Canada Carbon has announced the “*signing of a non-binding Memorandum of Understanding (“MOU”) for the supply of the Company’s Miller nuclear purity graphite to Dunedin Energy Systems Ltd, an arm’s length Canadian developer of small modular nuclear reactors. The MOU terms are for the supply of 200 tonnes per annum of Miller nuclear purity graphite over a 10-year term, with a floor price of USD \$40,000 per tonne.*”

The company’s website (<https://www.dunedinenergy.ca/>) does not indicate that it has any current projects or needs for nuclear graphite as the company is based on the promotion of a perceived future market. According to their website “*Dunedin Energy Systems Ltd. was founded to present the many benefits of nuclear energy to markets that have traditionally been thought of as too small or too remote to be served by nuclear energy, particularly in the Canadian arctic. At Dunedin we recognize the need for a small, safe, clean and cost effective energy source to serve isolated or off grid industries and communities in Canada and around the world.*”

The United States Geological Survey (USGS) is considered to be an authoritative entity with respect to world-wide minerals commodity exploration, production, and distribution, including for graphite. The USGS produces an annual Mineral Commodity Summary for graphite, and as graphite has been identified as a critical mineral resource to the U.S., the USGS in 2017 also produced a professional paper on graphite titled *Chapter J of Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply*.<sup>9</sup>

The USGS 2017 study identifies four different graphite commodity types including amorphous, flake, lump or chip, and synthetic. Of the four types, the only one that is identified with the type of high-purity niche applications suggested by the 2016 PEA, is synthetic carbon. It is produced by heat treatment (graphitization) of, or chemical deposition from, hydrocarbon materials such as petroleum refinery coke above 2,100 °C. According to the report December 2011 prices (99.9 percent graphite) ranged from \$7,000 to \$20,000. The U.S. is identified as a major producer of synthetic graphite with 134,000 metric tons of synthetic graphite valued at an estimated \$1.07 billion reported to have been produced in the United States in 2010. The report also notes that “*Cost- and energy-efficient technologies that could reduce CO2 to synthetic graphite could lower CO2 emissions and produce inert graphite, providing an industrial option to sequester carbon from the atmosphere.*”

## CONCLUSIONS

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- The 2016 PEA valuation for graphite did not identify any type of off-take or sales agreement for its proposed production of high-purity crystalline graphite. This is unusual for any type of financial analysis presented as otherwise valid. In fact, the practice is noted in the following section on Marble (Section 19.2.3), where according to the 2016 PEA “*In the absence of an off-take agreement, Canada Carbon cannot currently assign any value to the tailings material.*” This further confirms that the project cannot be considered to be economically viable based on the 2016 PEA or SGS 2017.
- Since the 2016 PEA a “non-binding MOU” has been announced for the supply of 200 tonnes per annum over a ten-year term, with a floor price of USD \$40,000 per tonne, with a promoter of “small modular nuclear reactors” that does not have any identifiable projects. This compares with a proposed annual production rate of 766 – 1,515 tpy. The product would be intended to compete against the U.S. production of synthetic carbon of greater than 100,000 tpy. There is no apparent present market need for the proposed product and its primary application, for use in nuclear energy related applications. Therefore, the proposal must be considered highly speculative given the controversy surrounding such applications, whether from a safety standpoint or a carbon footprint standpoint.

### 8.3 MARBLE PRICE, SUITABILITY AND MARKET

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The 2016 PEA proposes to market marble products as three different commodities: blocks and slabs; waste from mining and quarrying, and contained in graphite mill flotation tailings. According to the 2016 PEA, Canada Carbon signed a comprehensive agreement to sell 75,000 t of architectural-quality marble material from its flagship Miller Project. The agreed base valuation for marble blocks or slabs is \$14/ft<sup>3</sup>, which is approximately \$184/t. The report also suggested the mining contractor is expected to pay a nominal amount of \$1/t to move aggregate materials arising from both graphite mining and marble quarrying operations off-site for use as aggregates. As previously noted, in the absence of an off-take agreement, the PEA did not assign any value to the process tailing material.

It is widely acknowledged that the market for decorative stone, aggregates, sand and similar commodities, outside of major cities, is dominated largely by local supply and demand economics, unless the material has exceptional qualities. The demand cycles according to construction requirements and the 2016 PEA basically assumes that a cycle where demand for those materials exists will coincide with a demand for high-purity graphite carbon.

Similar suggestions and in some cases actual efforts to put mining waste materials to beneficial use have been made at for other mines. While it is a laudable objective, the goal of significantly impacting the ultimate amount of waste stored at site has rarely if ever been achieved, however, the suggestion that these activities would take place has led to shortages in reclamation funding when the mine closes prematurely, having not removed the waste, under circumstances such as owner bankruptcy or abandonment.

Review of the summary of cash flows for the project shows the importance of marble to the project's potential economic validity. The sale of marble products accounts for the first initial year of cash flow of almost \$25 million and for the next seven years revenues of \$27.1-\$27.6 million per year are projected, versus graphite revenues of approximately \$26 million during the same time. Given the time value of money this makes the Miller Project a marble mine with graphite production being of secondary importance.

### CONCLUSIONS

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- The project economics for the proposed project are highly dependent on the cost-effective sale of architectural-quality marble. Additionally, the removal of excess waste rock is apparently assumed to reduce reclamation costs. The project as portrayed would require any need for either commodity to occur during the same time as initial graphite production in order not to significantly impact project economics.
- Architectural-quality marble revenue is a critical economic aspect of the proposed project and given the volatile nature of the potential market and the need for mining of both marble and graphite to coincide at the same time, the aspect represents a high risk to the ultimate technical and economic viability of the project.

### 8.3 OPERATING AND CAPITAL COSTS

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Operating and capital costs are significant factors for any mining and processing operation regardless of commodity. Even for well known tasks such as are proposed for this project for mining (open pit) and processing (grinding and flotation) have inherent risks associated with the estimation of capital and operating costs. For example, Export Development Canada<sup>10</sup> reported in 2015 that for mining projects capital costs were typically exceeded by 37%. Operating costs similarly are commonly under-estimated, and are particularly subject to fluctuating economic conditions. Perhaps most importantly, the proposed project relies on a “proprietary” thermal upgrading process for which only limited technical and financial information has been provided. Based on significant experience in high-purity materials upgrading including thermal upgrading processing, due to scale-up factors it is very difficult to accurately forecast capital and operating costs without actual prior operations at similar scale, and in many cases it is difficult to achieve the same results at larger scale, resulting in significant inherent risk with respect to both costs and technical feasibility.

### CONCLUSIONS

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- The project economics are dependent on achieving the projected capital and operating costs. Given that capital costs are frequently underestimated, and that the project is dependent on a proprietary process that apparently is not proven at scale, the project is at high risk of not achieving the economic results resulting from the 2016 PEA.

## 9 SUMMARY OF CONCLUSIONS

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After reviewing the primary technical and financial documents produced by the company Canada Carbon (Tetrattech 2016 PEA, SGS 2017), as well as graphite commodity analysis performed by the United States Geological Survey (USGS) and other documents as referenced in this report, we conclude the following for each of the main questions addressed by the client:

**Is the proposed project economically viable based on existing NI43-101 & PEA filings by the company, or any other professional judgments by the assessor?**

No. Because the results of the 2016 PEA and SGS 2017 are based on mineral resources rather than mineral reserves, consistent with CIM definitions and NI43-101, the information provided does not provide a basis for economic viability of the proposed project. The project is based upon assumptions concerning the market for “nuclear graphite” and marble that are speculative and do not demonstrate the economic viability of the proposed project.

**Is there a valid basis for \$96 million (Cdn) in compensation damages if it cannot proceed forward at this stage?**

No, there is no valid technical basis for estimation of compensatory damages relative to a project based on speculation and that has not demonstrated economic viability. In our experience, claims that are not based on a valid economic analysis are generally considered speculative and are often used as a “threat” in legal proceedings. Where damages are awarded it is most common for the project owner to recoup their investment, but not be punitively awarded based on a speculated value.

**Has the proponent met the requirements of Section 101 of the Quebec Mining Act?**

No, the applicant has not met the requirements of Section 101 of the Quebec Mining Act to date, which requires: (i) “...a report describing the nature, extent and probable value of the deposit, certified by an engineer or a geologist who meets the qualification requirements determined by regulation,” (ii) a project feasibility study,” (iii) “as well as a scoping and market study as regards processing in Québec.”

## **APPENDIX A**

James R. Kuipers P.E.,  
Professional Resume



## JAMES R. KUIPERS, P.E.

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### SUMMARY OF EXPERIENCE

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Over 35 years experience in mining and environmental process engineering design, operations management, regulatory compliance, waste remediation, reclamation and closure, and financial assurance. Over 20 years experience providing technical assistance to public interest groups and tribal, local, state and federal governments on technical aspects of mining and environmental issues.

### EDUCATION

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Montana College of Mineral Science and Technology, B.S. Mineral Process Engineering, 1983.

### PROFESSIONAL REGISTRATION

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Professional Engineer (PE Mining/Minerals): Colorado (No. 30262), Montana (No. 7809 & Corp. No. 197)

### PROFESSIONAL EXPERIENCE

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1996 to Present	Kuipers & Associates/J. Kuipers Engineering, Butte, MT.
1993 - 1995	Denver Mineral Engineers, Inc., Littleton, CO.
1991 - 1992	Western States Minerals Corp.
1986 - 1991	Western Gold Exploration and Mining Co. (WESTGOLD) / Minorco
1984 - 1985	Canyonlands 21 <sup>st</sup> Century Corporation
1983 - 1984	Cumberland Mining Corporation

### SOME RECENT PUBLICATIONS AND PRESENTATIONS

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- *Hardrock Mine Financial Assurance Training Workshop*, National Tribal Mining Workgroup, McCall, ID, October 11-12, 2017.
- *The Development of Remedial Design Options for the Questa Mine Waste Rock Piles using a Collaborative Approach*, Kuipers, J. et al, Tailings and Mine Waste 2017, Nov 5-8, Banff, Alberta, Canada
- *Mine Tailings Fundamentals: Current Technology and Practice for Mine Tailings Facilities Operations and Closure*, U.S. EPA Contaminated Site Clean-Up Information Webinar Series May 19-20, 2015
- *Financial Assurance Regulations and Cost Estimation at US Hardrock Mines*, U.S. Chile Mining Financial Assurance Seminar, US Office of Surface Mining and Environmental Protection agency and Chilean Ministry of Mining, Santiago, Chile, May 2012.
- *Mining Reclamation and Closure Regulations and Best Practices*, 2012 International Conference on Mining in Mindanao, Ateneo de Davao University, Davao City, Philippines, January 26-27, 2012.
- *Characterizing, Predicting, and Modeling Water at Mine Sites*, California Environmental Protection Agency, California Water Board Training Academy, May 18 - 21, 2009.