Broadlands Mineral Advisory Services Ltd.
EIN: 27-0182628

ECONOMIC ANALYSIS OF THE BY-PRODUCT SAND INDAGO OIL SAND PROPERTY UINTAH COUNTY, UTAH

10 FEBRUARY 2022

PREPARED FOR:

PETROTEQ ENERGY, INC.

PREPARED BY:

BROADLANDS MINERALS ADVISORY SERVICES LTD.
9213 LAS MANAITAS AVENUE, #401
LAS VEGAS, NEVADA 89144

9213 Las Manaitas Avenue, #401, Las Vegas, NV 89144 +1.303.809.4265
guarnera@broadlandsadvisoryltd.com

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ABBREVIATIONS, ACRONYMS, DEFINITIONS, AND MEASUREMENTS

AFE	Authorization for Expenditure.
Anti-cline	A ridge-shaped fold of stratified rock in which the strata slope in a downward direction from the crest.
bbl	A barrel of oil consisting of 42 U.S. gallons.
Bitumen	A tar-like substance resulting from the evaporation of oil.
Broadlands	Broadlands Mineral Advisory Services, Ltd., the entity undertaking the estimation of value.
CIMVAL Code	The Canadian Institute of Mining Mineral Valuation Code, which is statutory for publicly-reporting companies in Canada.
COGEH	Canadian Oil and Gas Evaluation Handbook.
Core Drilling	Drilling that involves cutting a continuous section of rock in open circular pipe.
Cretaceous Age	A period of geologic time spanning 145 million to 65 million years before the present time noted for the prolific vegetation and dinosaurs.
Fair Market Value	The price a willing buyer would pay a willing seller in cash or its equivalent for an asset, each having the access to the same information and neither being under compulsion to buy or sell.
FEED Study	Front End Engineering and Design Study.
Fracking	A process where fine-grained sand with a high silica content is injected under pressure into a formation hosting oil to enable a higher production rate from an oil well.
Goodrich	The Goodrich Mud Company, a supplier of drilling fluids (mud) and fracking sand to the Uintah Basin.
Indago	The parcel leased by Petroteq for extraction of the oil from the host rock.
Material of Economic Interest	When used in the context of mineral resource determination, includes mineralization, including dumps and tailings, mineral brines, and other resources extracted on or within the earth's crust.
Orogeny	A process in which a section of the Earth’s crust is folded and deformed by compression to form a mountain range.
Petroteq	Petroteq Energy, Inc, the owner of the lease for the Indago oil sands property and commissioner of this valuation estimate.

Pre-Feasibility Study	A comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a qualified person has determined (in the case of surface mining) a pit configuration, and in all cases has determined an effective method of mineral processing and an effective plan to sell the product. 1. A pre-feasibility study includes a financial analysis based on reasonable assumptions, based on appropriate testing, about the modifying factors and the evaluation of any other relevant factors that are sufficient for a qualified person to determine if all or part of the indicated and measured mineral resources may be converted to mineral reserves at the time of the reporting. The financial analysis must have the level of detail necessary to demonstrate at the time of the reporting, that extraction is economically viable. 2. A pre-feasibility study is less comprehensive and results in a lower confidence level than a feasibility study. A pre-feasibility is more comprehensive and results in a higher level of confidence than an initial assessment.
Q4	Q4 Impact Group, LLC. A professional firm specialized in aggregates and specialized sand products.
Sandstone	A clastic sedimentary rock composed of grain-sized silica-rich minerals.
SEC	The United States Securities and Exchange Commission.
Sedimentary Rocks	A type of rock formed from the accumulation or deposition of mineral or organic particles on the surface of the Earth.
Shale	A fine-grained sedimentary rock primarily composed of solidified mud.
Silica Flour	Fine-grained silica used an additive in soaps, skin care products, toothpastes, paints, and pharmaceuticals.
S-K 1300	A template and code for the reporting on mineral properties in the United States established by the U.S. SEC, which is statutory for publicly-reporting U.S. companies.
STB	Stock tank barrels are oil in the tank at a temperature of 60 degrees Fahrenheit and a pressure of 14.7 pounds per square inch.
tpd	Tons per day. Each ton consisting of 2,000 pounds.
Valkor LLC	The firm that developed the process for extracting the oil from the ore and constructed the pilot plant demonstrating its efficacy.

i. SUMMARY OF FINDINGS

Broadlands Mineral Advisory Services, Ltd. (Broadlands) was engaged by Petroteq Energy, Inc. (Petroteq) to provide an economic analysis of sands produced as a by-product of the extraction of petroleum products from oil sands at the Asphalt Ridge deposit in Uintah County, Utah. The by-products consist of sands said to be suitable for use as silica flour, fracking, and aggregates including road base.

Petroteq plans to complete a plant capable of producing 5,000 barrels per day (bbl) of high-grade oil from the Indago Property at Asphalt Ridge. That production rate would result in approximately 6,000 tons per day (tpd) of sand, which Petroteq plans to sell on the open market. The Indago lease comprises 3,458 acres in Sections 22, 23, 24, 26, 27, and 32, Township 4 South - Range 20 East, Uintah County, Utah. The lease is slightly southwest of Vernal, a city approximately 150 miles east of Salt Lake City. The lease has experienced previous oil and core drilling, which verified the presence of bitumen-rich sandstone. Broadlands' understanding is that the lease covers the first 400 feet of depth from the surface and carries a royalty of 8 percent.

The Indago lease is within an area known as the Book Cliffs due to clearly seen repetitive layers of sedimentary rocks. The bitumen-bearing formation at the Indago lease and Asphalt Ridge is part of the Cretaceous-age Mesa Verde Group of sedimentary rocks. Within the Mesa Verde Group is the Asphalt Ridge Sandstone that lies between shale formations that present a seal to retain the oil within the formation.

Petroteq and Valkor, LLC have constructed a pilot plant that has reportedly successfully produced a saleable petroleum project at a rate of approximately 240 bbl per day. Essentially, after mining, the bitumen-bearing rock is crushed, and solvent and heat are used to liquify the bitumen and extract the petroleum product. After extraction of the bitumen, the sand is cleaned and dried to remove all traces of the solvents used in the process. Broadlands' professionals visited the pilot plant and viewed piles of the clean sand mined from another property.

A 5,000 bbl per day plant will produce almost 1.9 million tons of sand waste per year. Broadlands has been advised that Petroteq will be selling only the crude raw dried sand to the market and not be producing any of the final products. A sales price of $60 per ton was stated based on what was said to be a sale to the Goodrich Mud Company (Goodrich). Broadlands has not seen any receipt verifying this transaction.

An economic analysis consisting of various cash flows was utilized to assess the potential economic contribution of clean sands produced as a by-product from the extraction of the bitumen at the Petroteq Indago Tar Sands Lease. Broadlands has not been able to independently verify the quality of the clean sands produced by bitumen extraction or their suitability for use as a fracking sand and has relied upon the representations made by the Petroteq. We would note that the test work on the clean sands, reportedly completed by Petroteq, was performed on clean sands from their Temple Mountain pilot plant and not from the Indago Lease. The Indago Lease is situated approximately 5 miles from and within the same geologic formation as the Temple Mountain Leases and likely will have characteristics similar to those of the sands produced from the Temple Mountain Lease, although there will in all probability be a slight variation in bitumen and sand content.

In compliance with SEC regulation S-K 1300, Broadlands considers the sands at the Indago Lease to be Material of Economic Interest, as defined by that regulation. S-K 1300 requires Broadlands to note that as such there is no assurance that the sands at the Indago Lease will be converted to saleable material.

A 22-year cash flow model was developed that encompasses 2 years for construction and startup of the extraction plant and sands processing facility and infrastructure and 20 years of sand sales and operations.

Cash flow analyzes were run on a pre-income tax for three scenarios at various discount rates ranging from 0 percent to 15.0 percent. The results are shown in Table i-1 for all three cases. This resulted in potential incremental economic benefit to the Indago Project of between $139 million to $545 million, assuming a discount rate of 15 percent. The base case cash flow uses a selling price of $40 per ton for unprocessed dry clean by-product sand from the bitumen extraction. Broadlands would note that the economic model and base case utilizes numbers that may not be realized as they are not supported by a pre-feasibility or feasibility study which is customary industry practice.

TABLE i-1
NET PRESENT VALUE AT VARIOUS DISCOUNT RATES

Discount Rate (%)	NPV ($ Million)		
	Pessimistic	Base	Optimistic
0.0	$542	$1,285	$2,030
7.5	$250	$602	$956
15.0	$139	$341	$545

1.0 INTRODUCTION

Broadlands Mineral Advisory Services, Ltd. (Broadlands) was engaged by Petroteq Energy, Inc. (Petroteq) to provide an economic analysis of sands produced as a by-product of the extraction of petroleum products from oil sands at the Asphalt Ridge deposit in Uintah County, Utah. The by-products consist of sands said to be suitable for use as silica flour, fracking, and aggregates including road base.

Petroteq plans to complete a plant capable of producing 5,000 barrels (bbl) of high-grade oil per day from the Indago Property at Asphalt Ridge. That production rate would result in approximately 6,000 tons per day (tpd) of sand, which Petroteq plans to sell on the open market.

Broadlands' report and economic analysis focuses on the markets available for the sale of the three by-products. In preparing this estimate Broadlands is relying reports prepared for Petroteq by other parties, discussions with Petroteq and Valkor LLC (Valkor), reviews of publicly available information, and information gathered during a visit to the oil sands around Vernal, Utah on December 21, 2021. Due to illness on the part of the individual we were to meet, the visit was perfunctory and limited in scope. The pilot plant was visited and stockpiles of raw material examined.

Accordingly, this analysis is based upon assumptions that full production of 5,000 bbl per day of petroleum products will be achieved and that certain positive market assumptions of sand sales will be met. We would note that failure for the markets for the sand products to be achieved would lessen the revenues to Petroteq but would not necessarily affect the profitability of oil production from the plant.

This economic analysis is based on information orally conveyed to Broadlands and no testing of sands from the Indago Lease have been performed by Broadlands, and to our understanding, Petroteq. Broadlands has prepared this analysis in general accordance with acceptable mineral industry standards. Technical issues reported on herein are in accordance with the standards of SEC S-K 1300. In compliance with SEC regulation S-K 1300, Broadlands considers the sands at the Indago Lease to be Material of Economic Interest, as defined by that regulation. S-K 1300 requires Broadlands to note that as such there is no assurance that the sands at the Indago Lease will be converted to saleable material.

1.1 PROFESSIONAL TEAM

Broadlands has assigned three professionals, each a Qualified Professional in the economic analysis of mineral properties, to undertake this estimate of value.[1]

> **Bernard J. (Barney) Guarnera** is a Certified Mineral Appraiser and a Qualified Professional in geology, ore reserves, and mineral property valuations. He has degrees in Geological Engineering (Mining emphasis) and Economic Geology and more than 40 years of experience in the establishing the technical and economic viability and the value of mineral deposits and mining companies. He has prior experience in the evaluation of oil sands properties and has previously been to Asphalt Ridge and has been involved in reserve estimates at the nearby gilsonite property. He also is experienced in aggregate and fracking sands evaluation.
>
> **Robert Cameron, Ph.D.** – Dr. Cameron is a mining engineer with over 40 years of experience. He is a Qualified Professional/Registered Professional in mining engineering and ore reserve estimation and has taught courses in geostatistics, mineral resource estimation, mine planning, mine

[1]A Qualified Professional/Person (QP) is an internationally recognized designation of a professional with more than 10 years of experience in the subject with 5 years of experience with the type and style of the mineral deposit.

systems analysis, mine valuation and engineering economics at the Colorado School of Mines and South Dakota School of Mines and Technology. He routinely reviews and audits ore reserve statements and estimates and their forward-looking cash flow projection. His Ph.D. dissertation involved the economic evaluation of oil shale and tar sand for the State of Utah and has been involved in reviewing reserve estimates at the McKittrick project in California, American Gilsonite, and various aggregate operations.

Q4 Impact Group, LLC – Broadlands engaged Q4 Impact Group (Q4) to provide the required information on markets and prices for the sand products. Q4 professionals have extensive operating experience in the aggregate and fracking sand industries. The principal of the firm, Mr. Robert Archibald, has worked with Messrs. Guarnera and Cameron on other projects in the past.

None of the professionals have any commercial or other interest in Petroteq, Valkor, or the Indago Lease and accordingly are not conflicted in any manner in undertaking this assignment. The professionals are paid an hourly fee for this effort.

2.0 THE INDAGO OIL SAND LEASE

The Indago lease comprises 3,458 acres in Sections 22, 23, 24, 26, 27, and 32, Township 4 South - Range 20 East, Uintah County, Utah. The lease is slightly southwest of Vernal, a city approximately 150 miles east of Salt Lake City. Access is by US 40/US 191 from Salt Lake City and Provo, Utah. The lease has experienced previous oil and core drilling, which verified the presence of bitumen-rich sandstone. Broadlands' understanding is that the lease covers the first 400 feet of depth from the surface and carries a royalty of 8 percent. Figure 2-1, below, from the Chapman report presents an outline of the sections leased.

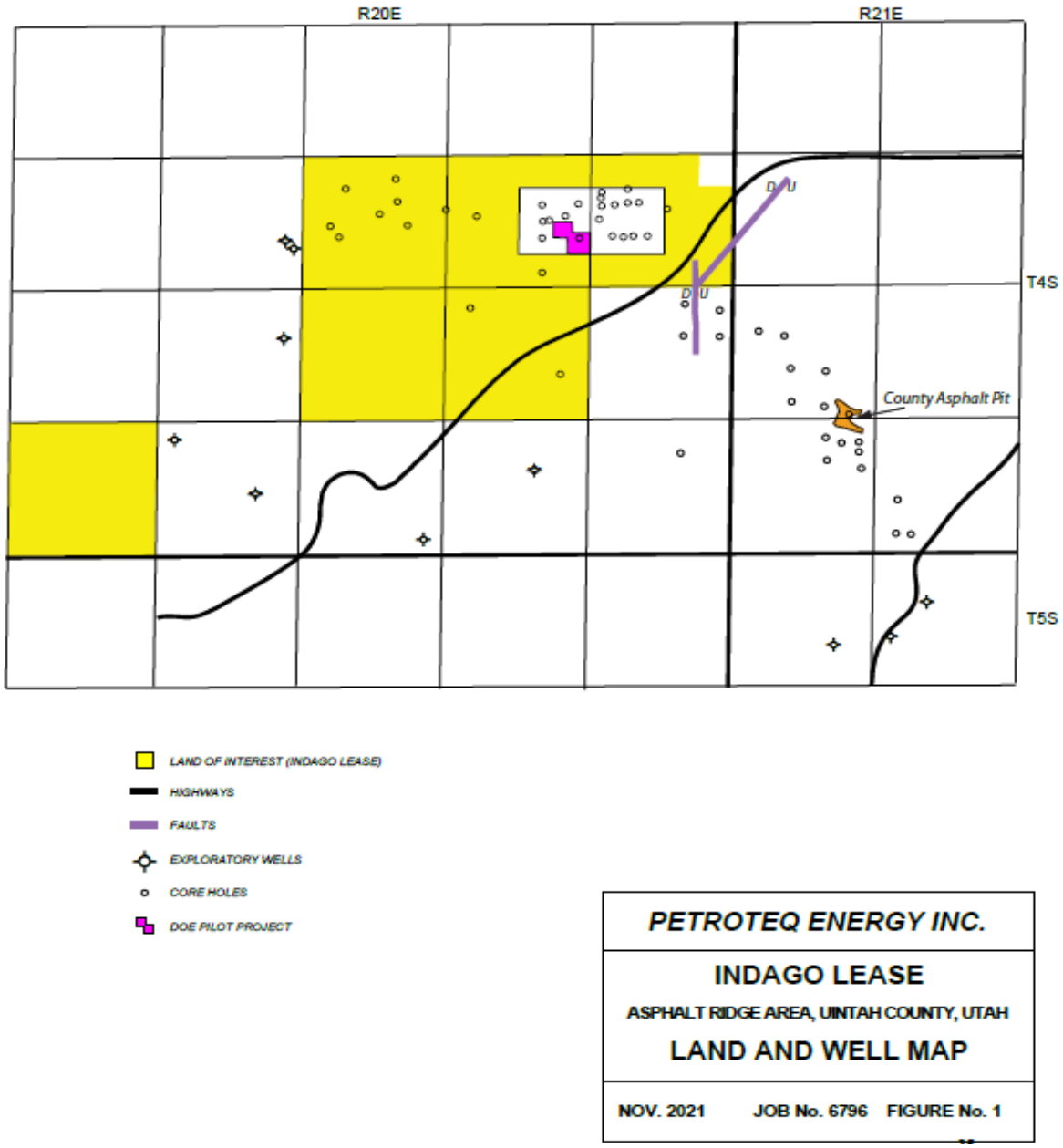

Figure 2-1 Indago Lease – Asphalt Ridge Area, Uintah County, Utah – Land and Well Map
Source: Chapman Petroleum Engineering Ltd., November 30, 2021

2.1 PERMITS AND ENVIRONMENTAL FACTORS

A permit to mine will be required by the State of Utah prior to development of the Indago oil sands project. Broadlands requested copies of any permits held by Petroteq and was provided with copies of prior permits issued for the Company's Temple Mountain facilities.

The Company's in-house attorney was requested by Broadlands to advise on the status of permits for the Indadgo property and if he was reasonably confident that the required permits would be issued. In a letter dated February 9, 2022, the attorney noted:

> *"We anticipate that similar permits will be obtained from the State of Utah for the new commercial facility as well."*[2]

As such, Broadlands has relied upon the attorney's opinion for this report.

Broadlands would note that the Non-Governmental Organization (NGO) – Utah Tar Sands Resistance, has historically opposed all tar sands development in Utah including one of Petroteq's projects. In Broadlands' opinion, it is likely that they will raise objections to the development of the Indago Lease at the public hearings required by Utah state law. We believe this poses a low level of risk to the project based on Petroteq's past success in obtaining the required permits.[3]

[2]Letter from James D. Hurly, see Appendix 2.0.
[3]Ibid.

3.0 GEOLOGY OF THE INDAGO LEASE

The Indago lease is within an area known as the Book Cliffs due to clearly seen repetitive layers of sedimentary rocks. The bitumen-bearing formation at the Indago lease and Asphalt Ridge is part of the Cretaceous-age Mesa Verde Group of sedimentary rocks. Within the Mesa Verde Group is the Asphalt Ridge Sandstone that lies between shale formations that present a seal to retain the oil within the formation.

Approximately 60 million years ago during what is known as the Laramide Orogeny, two tectonic plates collided with the result being an upswelling of the geologic formations already present producing what is called an anti-cline (San Rafael Swell). Faulting, tectonic activity, and erosion over the eons resulted in the anti-cline being breached exposing the oil-bearing formations to the elements. The exposure to the elements led to evaporation of the liquid petroleum and the formation of the bitumen deposits in the Asphalt Ridge Sandstone. Mr. Chapman notes in his report that

> *Along Asphalt Ridge, the bitumen deposit extends down dip in the subsurface for a distance ranging from one-third to two-thirds of a mile from the outcropping sandstones.*[4]

3.1 BITUMEN RESOURCES AND RESERVES AT THE INDAGO LEASE[5]

Mr. Chapman, on page 31 of his report, states that

> *Under COGEH all the criteria for reserve classification for bitumen projects have thus been met as follows:*
>
> *i) The required core holes drilled on and in the immediate vicinity of the indago (SIC) lease satisfy the criteria for both Proved and Probable Reserves.*
> *ii) The economics based on detailed design and cost criteria and actual yields from the Pilot operation demonstrates a commercial project with a high degree of certainty.*
> *iii) Plans for construction on the plant are for the near future, easily before five years.*
> *iv) An AFE for the plant construction has been generated and approved by the Company, as well as a Board resolution, demonstrating its commitment to progress aggressively to implement the project. Portions of the work has already been engaged i.e. the FEED report and other planning steps.*

In both the oil/gas and mining industry, the quality of a deposit is based on the degree of assurance. In the oil/gas industry, the highest degree of assurance is a Proved Reserve indicating a high degree of certainty of recoverability. Probable Reserves are those with less certainty of being recovered and are often combined as Proved and Probable Reserves. Possible Reserves have a significantly lower degree of certainty than Proved Reserves as well as less certainty than a Probable Reserve.

[4]Chapman Petroleum Engineering Ltd report, December 2021, page 30.
[5]This section is derived from and in places copied from the Chapman Petroleum Engineering, Ltd. Report, pages 31 to 33.

Mr. Chapman has estimated that Proved Reserves of 28,734,000 Stock Tank Barrels (STB) of oil exist on the Indago Lease. An additional 60,659,000 STB are present as Probable Reserves bringing the total to Proven + Probable Reserves of 89,393,000 STB. The measurement extends to a depth of 500 feet below the surface.[6]

3.2 SAND RESOURCES AND RESERVES AT THE INDAGO LEASE

Once the bitumen is processed, the remaining sand would normally be considered as waste. Petroteq has advised Broadlands that testing of the sand has indicated that potentially profitable products could be produced, namely silica flour, fracking sand, and bulk products for aggregates or road construction. However, Broadlands has not been provided with the results of any sand analysis from the Indago property by Petroteq. Accordingly, the reader is cautioned that the actual sands produced may differ in quality from those postulated in this economic analysis.

A plant producing 5,000 bbls of petroleum a day is proposed by Petroteq that would yield 6,000 tons of sand per day or 1,860,000 tons per year.[7, 8] Silica flour is postulated to be 15 percent of the saleable product, fracking quality sand 55 percent, and bulk sand 30 percent.[9]

Categorization of resources and reserves for the mining industry differs from that of the petroleum industry. Consensus in advanced countries, including the United States, has resulted in the adoption of a specific International Reporting Template published by the Committee for Mineral Reserves International Reporting Standards. The template is presented below as Figure 3-1. Similar to the petroleum industry, Proven and Probable Reserves are the highest level of confidence. Note, however, that the mining industry does not consider Possible Reserves; rather, there are three levels of Mineral Resources that are applied. Before a Mineral Resource is converted to a Mineral Reserve, the ten modifying factors listed must be met or there must be a reasonable certainty by the declarer of the reserve that the all the modifying factors will be met prior to production. The ten modifying factors are:

- Mining
- Processing
- Metallurgical
- Economic
- Marketing
- Legal
- Environmental
- Infrastructure
- Social
- Governmental

[6]However, the current lease only extends to a depth of 400 feet below the surface.
[7]Personal communication with John Potter, Valkor.
[8]The estimate is based on 310 operating days per year and operating 24 hours per day.
[9]Ibid.

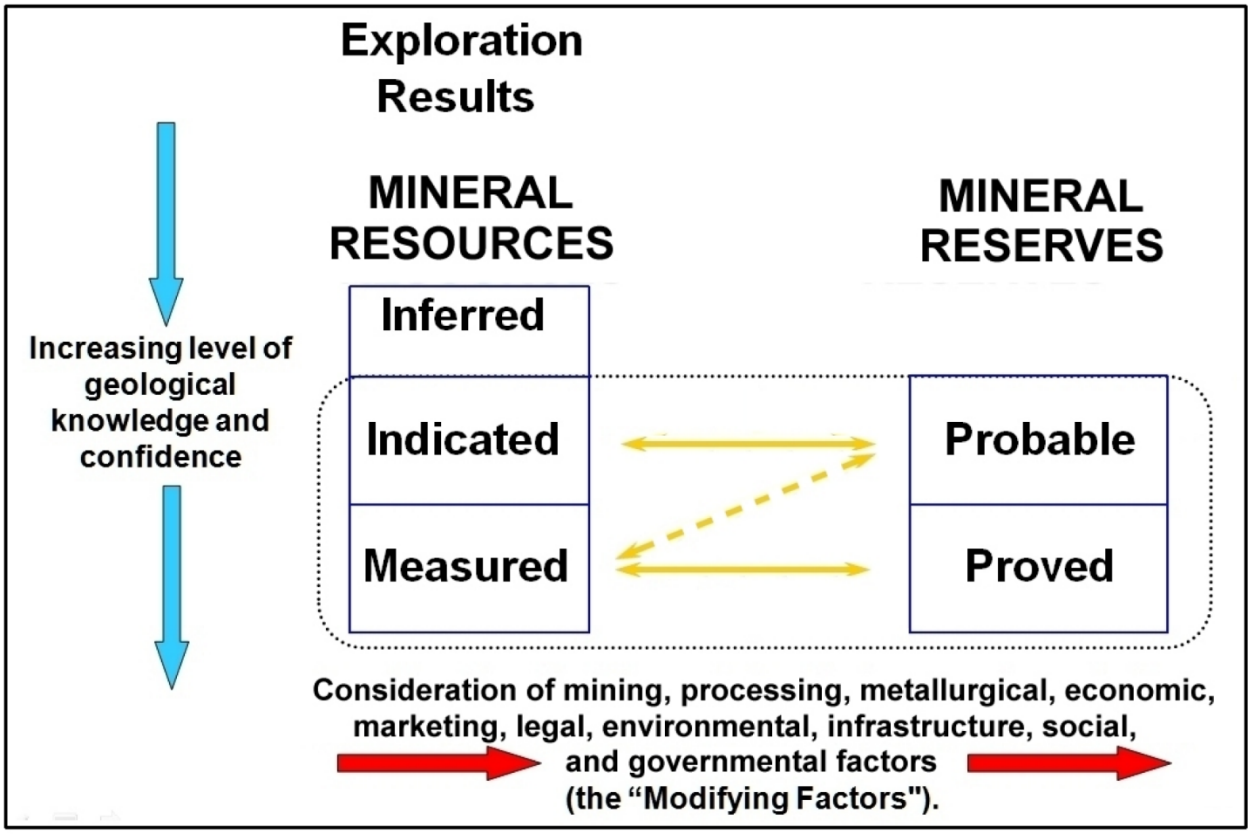

Figure 3-1 Mineral Resource/Reserve Template

SEC S-K 1300 requires that before a Mineral Reserve can be declared, a minimum of a Pre-feasibility Study must have been completed on the subject property.[10] At the time of this writing, significant uncertainties about market access and pricing exist. Nevertheless, Broadlands believes that the sand from the processing of the Indago Lease oil sands would be considered a by-product that could be sold to produce additional revenue for the proposed operation. Accordingly, Broadlands believes that under SEC S-K 1300, the sands would be considered Material of Economic Interest. S-K 1300 requires Broadlands to note that as such there is no assurance that the sands at the Indago Lease will be converted to saleable material.

[10]SEC S-K 1300 definitions.

4.0 PROCESSING PROCEDURE FOR THE BY-PRODUCT SANDS[11]

The pilot plant has reportedly successfully produced a saleable petroleum project at a rate of approximately 240 bbl per day. Essentially, after mining, the bitumen-bearing rock is crushed, and solvent and heat are used to liquify the bitumen and extract the petroleum product. After extraction of the bitumen, the sand is cleaned and dried to remove all traces of the solvents used in the process.

The sands will also require cleaning to meet State of Utah regulations and importantly to be marketable. During our site visit, Broadlands' professionals were advised that the sand required a second cleaning process to achieve marketable standards for fracking sand as well as silica flour. Broadlands was also advised that in the actual operating facility, the need for a second cleaning would be eliminated.

[11]Crosstrails FEED Study, Section 4, July 2021.

5.0 MARKET AND SALES

A 5,000 bbl per day plant will produce almost 1.9 million tons of sand waste per year. To assure timely delivery of this report, Broadlands requested the Q4 Impact Group, LLC (Q4), a firm with operating and management expertise in the sand industry, provide its opinions on the markets and prices achievable. Q4's assessment of the market available for Petroteq's fracking sand and construction sand is included as Appendix 1.0 to this document.

Broadlands has been advised that Petroteq will be selling only the crude raw dried sand to the market and not be producing any of the final products. A sales price of $60 per ton was stated based on what was said to be a sale to the Goodrich Mud Company (Goodrich). Broadlands has not seen any receipt verifying this transaction.

5.1 MARKETS FOR THE SANDS

There are three (3) products that Petroteq believes that can be produced from the bulk sands provided to Goodrich. These include a silica flour, bulk sands and aggregates, and fracking sand. An extension of the railroad connecting Vernal to Price and Salt Lake City would open additional markets for the products.

5.1.1 Silica Flour

Q4 noted that silica flour market is very specialized and dissimilar to the other two products. Broadlands' investigation found sales are primarily to the chemical, pharmaceutical, and cosmetics industries. The production of silica flour to the minus 40-mesh specification will require specialized processing and capital spending. Without a contract with a user, it is problematic to forecast revenues from silica flour.

5.1.2 Bulk Sand and Aggregates

Q4 cites annual consumption of construction sand and aggregates to be 10 tons to 12 tons per person per year.[12] Given the population of Uintah and Duchesne Counties (approximately 56,000 people), demand for construction sand and aggregates would be approximately 600,000 tons per year.[13]

Currently, there are ten active and four inactive pits providing bulk sand and aggregates in the relevant market area.[14] Ramsey Hill Exploration, LLC (RHEX) appears to be the most significant producer in the region. Q4 noted that this would be a very difficult market for Petroteq to enter on its own.[15]

5.1.3 Fracking Sand

Q4 opines that there is an opportunity, albeit limited, for fracking sand market due to activity in the Uintah Basin. RHEX would be the largest competitor and in 2020 that company received a permit from the state for a 1.3 million ton per year plant.[16] The Goodrich Mud Company, a supplier of fracking sand to the oil industry, reportedly has executed a contract with RHEX.[17]

[12]Q4 Report, page 3.
[13]Ibid, page 3.
[14]Ibid, pages 3 and 4.
[15]Ibid, page 6.
[16]Ibid, page 7.
[17]Ibid, page 10: Discussions with Q4 indicate the contract is for 1.1 million tons of sand per year.

Q4 has noted that the current price per ton for fracking sand in the market area is in the $66 to $73 range.[18] They estimate that the price would drop to the $34 to $49 range with new competition.[19]

If Petroteq endeavors to produce fracking sand itself, a minimum capital investment of $25 million would be required.[20] Q4 also notes the fact that permits for plants have met public opposition with one permit "tabled."[21]

[18]Ibid, page 13.
[19]Ibid, page 13.
[20]Telephone conference with Q4.
[21]Q4 Report, page 7.

6.0 ECONOMIC ANALYSIS FOR THE SAND BY-PRODUCTS

An economic analysis consisting of various cash flows was utilized to assess the potential economic contribution of clean sands produced as a by-product from the extraction of the bitumen at the Petroteq Indago Tar Sands Lease. Broadlands has not been able to independently verify the quality of the clean sands produced by bitumen extraction or their suitability for use as a fracking sand and has relied upon the representations made by Petroteq. We would note that the test work on the clean sands, reportedly completed by Petroteq, was performed on clean sands from their Temple Mountain pilot plant and not from the Indago Lease. The Indago Lease is situated approximately 5 miles from and within the same geologic formation as the Temple Mountain Leases and likely will have characteristics similar to those of the sands produced from the Temple Mountain Lease, although there will, in all probability, be a slight variation in bitumen and sand content.

In compliance with SEC regulation S-K 1300, Broadlands considers the sands at the Indago Lease to be Material of Economic Interest as defined by that regulation. S-K 1300 requires Broadlands to note that as such there is no assurance that the sands at the Indago Lease will be converted to saleable material.

A 22-year cash flow model was developed which encompasses 2 years for construction and startup of the extraction plant and sands processing facility and infrastructure and 20 years of sand sales and operations. Broadlands would note that actual sand sales would probably continue after 20 years but, the Net Present Value (NPV) of revenues after 20 years is small and we chose to limit the economic contribution to the first 20 years. While typically the NPV for an aggregate project would be determined on an after-income tax basis, all of the cash flows in this report are presented pre-income tax to conform with Chapman Petroleum Engineering's valuation of the oil reserves.

Broadlands analyzed three different cases. The primary differences are in the assumptions used for sales volumes and product pricing. These three cases are labeled:

1. Base Case
2. Pessimistic Case
3. Optimistic Case

6.1 SAND SALES VOLUMES

While three separate products can be produced from the clean sands, Broadlands has been advised that Petroteq will be selling only the crude raw dried sand to the market and not be producing any potential final products themselves. Therefore, Broadlands assumed for their Base Case that sand production would only total 1.5 million tons in the first year to account for plant startup and then approximately 1.86 million tons each year after that. For the Pessimistic Case, Broadlands assumed a twelve-month ramp up achieving 1.20 million tons in the first year and for the Optimistic Case, the first-year sales were estimated at 1.65 million tons. All cases assume full continuous production is achieved by the second year of operations. The annual sales volumes are summarized in Table 6-1.

TABLE 6-1 SALES VOLUME OF BULK SANDS (MILLION TONS)			
Year	**Pessimistic Case**	**Base Case**	**Optimistic Case**
2022 and 2023	0.00	0.00	0.00
2024	1.20	1.50	1.65
2025 +	1.86	1.86	1.86

6.2 OPERATING COSTS

Broadlands assumed an operating cost for storage silos, loadout, electricity, maintenance, and sales costs of $5.00 per ton for all cases, although actual operating costs are likely lower.

6.3 CAPITAL COSTS

A capital cost, varying between $3 million and $5 million, has been included to construct storage silos, loadout facility, and other required infrastructure associated with stockpiling and shipping the bulk by-product clean sand produced from the bitumen extraction plant.[22] The Base Case and Optimistic Case used capital costs of $3 million while the Pessimistic Case used $5 million.

6.4 CLOSURE AND RECLAMATION

Closure and reclamation costs were included as part of the bitumen valuation and so it was not included in this analysis.

6.5 ROYALTIES

The operation is located entirely on the State of Utah owned lands. These state leases require payment of a royalty of 8 percent from the sale of any oil production that has been included in the previously completed oil valuation. The sale of aggregates from state owned lands leased solely for aggregate production require a royalty payment negotiated with the state, which typically varies from $0.50 per cubic yard to $0.75 per cubic yard. As of the date of this report, the state has not provided an opinion to Broadlands as to whether an additional aggregate royalty would be required on the sand sales. Therefore, Broadlands has assumed the 8 percent royalty from bitumen production includes any aggregate sales that might also occur.

6.6 WORKING CAPITAL

A working capital requirement of $1 million was allocated to cover the costs of running the storage and loadout facilities for 60 days in all cases. No recovery of working capital was taken in the analysis.

6.7 SAND SALE PRICING

Broadlands has been advised that Petroteq will be selling only the crude raw dried sand to the market and not be producing any of the final products. A sales price of $60 per ton was stated based on what was said to be a sale to the Goodrich Mud Company (Goodrich). Broadlands has not seen any receipt verifying this

[22]Telephone conference with Q4.

transaction. Pricing utilized by Broadlands for the sale of the bulk sand is $20 per ton for the Pessimistic Case, $40 per ton for the Base Case, and $60 per ton for the Optimistic Case.

6.8 CASH FLOW RESULTS

The cash flow analysis was run on a pre-income tax for each case and at various discount rates ranging from 0 percent to 15.0 percent. The results are shown in Table 6-2 for all three cases. This resulted in potential incremental economic benefit to the Indago Project of between $139 million to $545 million assuming a discount rate of 15 percent. The base case cash flow uses a selling price of $40 per ton for unprocessed dry clean by-product sand from the bitumen extraction. Broadlands would note that the economic model and base case utilizes numbers may not be realized as they are not supported by a pre-feasibility or feasibility study, which is customary industry practice. The cash flow analysis spreadsheets are shown on the following pages.

TABLE 6-2
NET PRESENT VALUE AT VARIOUS DISCOUNT RATES

Discount Rate (%)	NPV ($ Million)		
	Pessimistic	Base	Optimistic
0.0	$542	$1,285	$2,030
7.5	$250	$602	$956
15.0	$139	$341	$545

Income Approach Analysis Potential Sand Sales - Indago Project
Prepared by: Broadlands Mineral Advisory Services, Ltd
January 2022
Cash Flow Model - Base Case

	Units	LOM Ave/Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Mining Schedule																								
		-																						
Revenue Calculations																								
Aggregate Sales																								
Bulk Sand and Aggregates																								
Tonnes Sold		36,840	-	-	1,500	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860
Selling Price			$0.00	$0.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00
Revenue		1,473,600	$0	$0	$60,000	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400	$74,400
Total Revenue		1,473,600	**$0**	**$0**	**$60,000**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**	**$74,400**
Operating Costs																								
Unit Operating Costs																								
Handling, screening, stockpiling, loading and rehandle			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bulk Sand and Aggregates	$/t		$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
Operating Costs																								
Bulk Sand and Aggregates	k$	184,200	-	-	$7,500	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300
Total Operating Costs	k$	184,200	-	-	$7,500	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300
		-																						
Income Before Interest, Taxes and Amortization		**$1,289,400**	-	-	**$52,500**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**
Capital Investments																								
Capital Costs																								
Development Capital	k$	$3,000	-	$3,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sustaining Capital	k$	-																						
Salvage (none expected)	k$	-																						
Working Capital	k$	$1,000		$1,000																				
Total Captial Investments	k$	**$4,000**	-	**$4,000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Flow																								
Net Cash Flow (Pre-Income Tax)	k$	**$1,285,400**	-	**($4,000)**	**$52,500**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**	**$65,100**
Net Present Value and Rate of Return																								
Present Value of Net Pre-Income Tax Cash Flow			**All Values Below are Present Values**																					
Discount Rate																								
0.0%	$k	$1,285,400	-	($4,000)	$52,500	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100	$65,100
7.5%	$k	$602,735	-	($3,721)	$45,430	$52,403	$48,747	$45,346	$42,182	$39,239	$36,502	$33,955	$31,586	$29,382	$27,333	$25,426	$23,652	$22,002	$20,467	$19,039	$17,710	$16,475	$15,325	$14,256
15.0%	$k	$341,327	-	($3,478)	$39,698	$42,804	$37,221	$32,366	$28,145	$24,474	$21,281	$18,505	$16,092	$13,993	$12,168	$10,581	$9,200	$8,000	$6,957	$6,049	$5,260	$4,574	$3,978	$3,459
		-																						

Values in Blue = User Input Values in green are imported from another sheet - Do Not Change

Income Approach Analysis Potential Sand Sales - Indago Project
Prepared by: Broadlands Mineral Advisory Services, Ltd
January 2022
Cash Flow Model - Pessimistic Case

	Units	LOM Ave/Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue Calculations																								
Aggregate Sales																								
Bulk Sand and Aggregates																								
Tonnes Sold		36,540	-	-	1,200	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860
Selling Price			$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Revenue		730,800	$0	$0	$24,000	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200	$37,200
Total Revenue		730,800	**$0**	**$0**	**$24,000**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**	**$37,200**
Operating Costs																								
Unit Operating Costs																								
Handling, screening, stockpiling, loading and rehandle			-	-	-	-	-	-	-	-	-	-	-							-	-	-	-	-
Bulk Sand and Aggregates	$/t		$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
Operating Costs																								
Bulk Sand and Aggregates	k$	182,700	-	-	$6,000	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300
Total Operating Costs	k$	182,700	-	-	**$6,000**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**	**$9,300**
		-																						
Income Before Interest, Taxes and Amortization		**$548,100**	-	-	**$18,000**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**
Capital Investments																								
Capital Costs																								
Development Capital	k$	$5,000	-	$5,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sustaining Capital	k$	-																						
Salvage (none expected)	k$	-																						
Working Capital	k$	$1,000		$1,000																				
Total Captial Investments	k$	**$6,000**	-	**$6,000**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Flow																								
Net Cash Flow (Pre-Income Tax)	k$	**$542,100**	-	**($6,000)**	**$18,000**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**	**$27,900**
Net Present Value and Rate of Return																								
Present Value of Net Pre-Income Tax Cash Flow			**All Values Below are Present Values**																					
Discount Rate																								
0.0%	$k	$542,100	-	($6,000)	$18,000	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900
7.5%	$k	$250,434	-	($5,581)	$15,576	$22,458	$20,892	$19,434	$18,078	$16,817	$15,644	$14,552	$13,537	$12,592	$11,714	$10,897	$10,136	$9,429	$8,771	$8,159	$7,590	$7,061	$6,568	$6,110
15.0%	$k	$139,154	-	($5,217)	$13,611	$18,345	$15,952	$13,871	$12,062	$10,489	$9,121	$7,931	$6,896	$5,997	$5,215	$4,535	$3,943	$3,429	$2,982	$2,593	$2,254	$1,960	$1,705	$1,482
		-																						

Values in Blue = User Input Values in green are imported from another sheet - Do Not Change

Income Approach Analysis Potential Sand Sales - Indago Project
Prepared by: Broadlands Mineral Advisory Services, Ltd
January 2022
Cash Flow Model - Optimistic Case

	Units	LOM Ave/Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue Calculations																								
Aggregate Sales																								
Bulk Sand and Aggregates																								
Tonnes Sold		36,990	-	-	1,650	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860
Selling Price			$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00
Revenue		2,219,400	$0	$0	$99,000	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600
Total Revenue		2,219,400	$0	$0	$99,000	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600	$111,600
Operating Costs																								
Unit Operating Costs																								
Handling, screening, stockpiling, loading and rehandle			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bulk Sand and Aggregates	$/t		$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00
Operating Costs																								
Bulk Sand and Aggregates	k$	184,950	-	-	$8,250	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300
Total Operating Costs	k$	184,950	-	-	$8,250	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300	$9,300
		-																						
Income Before Interest, Taxes and Amortization		$2,034,450	-	-	$90,750	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300
Capital Investments																								
Capital Costs																								
Development Capital	k$	$3,000	-	$3,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sustaining Capital	k$	-																						
Salvage (none expected)	k$	-																						
Working Capital	k$	$1,000		$1,000																				
Total Captial Investments	k$	$4,000	-	$4,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Flow																								
Net Cash Flow (Pre-Income Tax)	k$	$2,030,450	-	($4,000)	$90,750	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300
Net Present Value and Rate of Return																								
Present Value of Net Pre-Income Tax Cash Flow				All Values Below are Present Values																				
Discount Rate																								
0.0%	$k	$2,030,450	-	($4,000)	$90,750	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300	$102,300
7.5%	$k	$956,421	-	($3,721)	$78,529	$82,347	$76,602	$71,258	$66,286	$61,662	$57,360	$53,358	$49,635	$46,172	$42,951	$39,954	$37,167	$34,574	$32,162	$29,918	$27,831	$25,889	$24,083	$22,403
15.0%	$k	$544,597	-	($3,478)	$68,620	$67,264	$58,490	$50,861	$44,227	$38,458	$33,442	$29,080	$25,287	$21,989	$19,121	$16,627	$14,458	$12,572	$10,932	$9,506	$8,266	$7,188	$6,251	$5,435
		-																						

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APPENDIX 1.0
Q4'S ASSESSMENT OF MARKET AVAILABLE FOR
PETROTEQ'S FRACKING SAND AND CONSTRUCTION SAND

Market Study for Petroteq Byproducts
January 4, 2022

Q4 Impact Group, LLC

Background

Q4 Impact Group (Q4) has been asked to provide an opinion of product prices which may be realized for byproducts of a proprietary process for the oil sands in the Uinta Basin area of Utah. These byproducts have been assumed to be primary silica sand in the minus 40-mesh range. Q4 has assumed the product is clean from any bitumen, making it suitable for ready-mix concrete. Q4 has also assumed the byproducts are physically suitable for use in ready-mix concrete and as a frac sand. No processing analysis was performed by Q4, and the assumption of suitability is yet to be verified. Silica flour production is a third potential for the byproducts. This is a desk-top study, and no visit was made to the Vernal area to confirm the presence of potential competition. The information contained herein is the product of research and personal knowledge. It is Q4's opinion of a reasonable likelihood and the conclusions formed are advisory. This study should not be considered definitive to a great degree.

Summary

Actual product pricing is difficult to determine in this type of study. In addition, the cost of production, while not a best practice pricing method, should be considered in a pricing model as a floor for pricing. These byproducts will require additional processing to make them suitable for the markets intended. No study is available for the cost of production of any product considered for these byproducts. Due to these limitations, Q4 has analyzed the market potential on a relative basis. The byproducts, once properly processed, would compete as a substitute to the products being offered by the competition. Assuming the acceptance of a new entrant, the logistics cost will favor the low-cost producer. In Q4's opinion, the low-cost producer will prevail in a commodity market.

C-33 Concrete Sand

Due to the prevalence of C-33 concrete sand in the marketplace and the presence of multiple producers with strong logistical advantages to the Petroteq locations, Q4 does not believe the byproducts can be sold into the market as C-33 sand for the ready-mix market. The frac sand market is more attractive as a potential market.

Frac Sand

The options for frac sand are two-fold. The current market is for dry sand, and we estimate the total demand averages about 1.1 MM tons per year. However, there is movement toward wet sand use. If the market stays with dry sand, the presence of a competitor (RHEX), currently operating in the market with reportedly two dryers and a $12.00 per ton logistical advantage, is an impediment to price and volume for the Petroteq frac sand product offering. We believe the RHEX mine has a capacity of at least 1.0-MM tons per year of dry frac sand.

There will be a slight production cost advantage to Petroteq to offset a portion of the delivery cost, perhaps lowering the RHEX advantage to $9.00 per ton. In a dry sand market, if Petroteq installs adequate drying facilities, Petroteq product can compete in the market on price. With two in-basin competitors, the market price will fall from what Q4 believes to be a current price of approximately $66 to $73 per ton FOB the RHEX mine. Q4 believes, if Petroteq desires a market share in the range of 33-50 percent, the price FOB Petroteq would fall to around $51 to $68 per ton for RHEX and an initial entry price of $34 to $49 per ton for Petroteq, climbing to $42 to $59 after the shock of the competitive entry disperses.

If the market moves to wet sand, RHEX is in place to move into this market. Q4 believes the existing infrastructure and logistical advantage of RHEX and their relationship with Goodrich Mud Company will allow them to be market leaders. Petroteq can make a competitive entry for supply in the non-freezing months. The price is speculative as there is not a current market price for wet frac sand supply in the Uinta Basin. With a commodity of this sort, Q4 estimates the Petroteq price to be in the range of $26.00 to $37.00 per ton FOB the Petroteq facility initially, climbing to $32 to $44 per ton after the market-entry shock as abated.

Silica Flour

Silica flour is fine ground silica sand or flour produced from chemical processes. It is sold by brokers and producers. It is a specialty product, dissimilar to C-33 sand and frac sand, requiring certain specifications and the requisite sales acumen and support to go with that specialty format. Silica flour has unique packaging requirements relative to C-33 sand and frac sand. Q4's expertise in silica flour is not deep and we advise further study before any consideration is given to using silica flour as an upside to the Petroteq process. Q4 is not able to provide a price range for silica flour due to the limitations of this study.

Market Analysis – C-33 Sand

The population centers of Vernal and Roosevelt, in the counties of Uintah and Duchesne, are the target populations for Petroteq's byproducts to be used as construction aggregates. The populations of Uintah and Duchesne Counties are 35,620 and 19,596 respectively.[1] Using a demand multiplier of 10 to 12 tons per person,[2] the annual demand in this region would be approximately 600 K tons. Typically, the product mix for aggregates would break down in the range of: 25-35% road base materials, 35-45% coarse ready-mix and asphalt materials, 5-15% backfills and coarse fractions, and fine productions (including sand products) filling the balance at about 10-20% of the mix. This would suggest the market supply of sand would be in the range of 60-120 K tons per year to fill the demand of asphalt sands, C-33 sand for ready-mix use, and miscellaneous sands for backfill, etc. An estimate of the amount of C-33 sand for ready-mix can be determined by using a per-capita estimate of ready-mix consumption[3] of 1.1 yd3 and a factor of 26% C-33 sand per yard of ready-mix. This suggests C-33 sand demand at about 22 K tons per year in the target market for ready-mix.

Aggregate supply in Uintah and Duchesne Counties is produced from sand and gravel operations. This is not surprising as the basins, which contain the population centers of Vernal and Roosevelt, hold an alluvium of unconsolidated mud, silt, and sand mixed with windblown sand and silt.[4] Bedrock quarries would need to be outside the basins and in the mountains. Quarries in the mountains are present[5] and do supply sand into the market. They do not proliferate as suppliers as they are generally further away and are more expensive to develop and more costly in the production of aggregates. So long as the sand and gravel meets the needs of the local construction companies, sand and gravel will be the predominate material supply. Q4 has identified ten active aggregate suppliers in the target market.

[1] US Census bureau 2020 census figures.
[2] NSSGA estimate of per capita consumption of construction aggregates.
[3] READY-MIXED CONCRETE INDUSTRY STATISTICS YEAR 2018, US Demand, August 2019, EUROPEAN READY MIXED CONCRETE ORGANIZATION
[4] Utah Geological Survey, INTERIM GEOLOGIC MAP OF THE VERNAL 30' x 60' QUADRANGLE, UINTAH AND DUCHESNE COUNTIES, UTAH, AND MOFFAT AND RIO BLANCO COUNTIES, COLORADO by Douglas A. Sprinkel 2007.
[5] See the section on frac sand supply vis-à-vis RHEX sand mine.

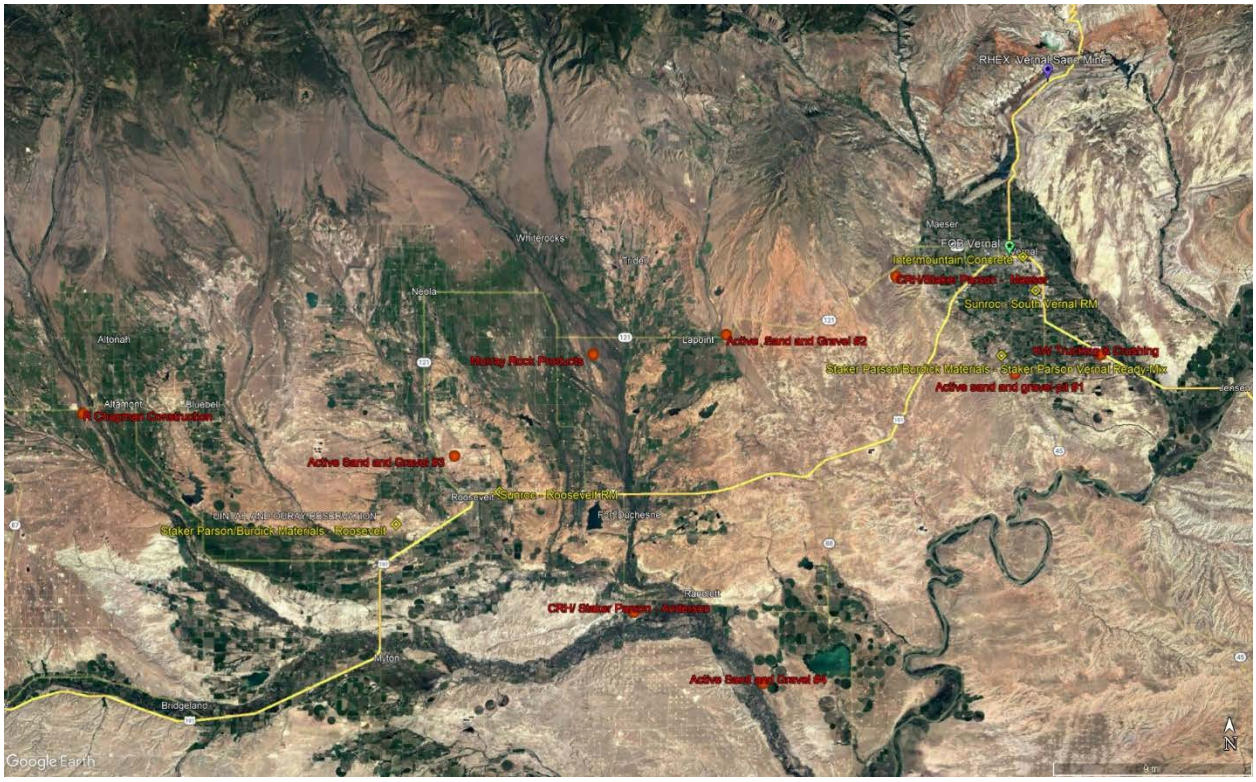

Figure 1 – Active aggregate and ready-mix producers.

There are additionally four non-active pits that appear to be used sporadically by portable equipment as the demand dictates. Figure 1 shows the general market area for construction aggregates and the location of several of the active aggregate producers and ready-mix customers.

Below is a synopsis of the major players in the marketplace. This market appears to Q4 as one that exhibits low barriers to entry for aggregates. The permitting requirements in Utah allow for a small source exemption further lowering the barriers. The presence of inactive pits with stockpiles of sand supports the low barrier to entry conjecture.

<u>Known Aggregate Suppliers</u>

Q4 has identified the following active aggregate suppliers in the market. We do not have an estimate of the market share of the approximately 600 K tons of demand each currently supplies.

- R Chapman Construction
- KW Trucking & Crushing
- CRH/Staker Parson – Maeser
- CRH/Staker Parson – Anderson
- Murray Rock Products
- RHEX Vernal Sand Mine
- Four additional identified active sand and gravel pits
- Four additional identified non-active sand and gravel pits

Ready-Mix Producers

The ready-mix producers would be the customers of the C-33 sand produced by Petroteq as a byproduct. Q4 cannot estimate the market share of each of the producers without a more intense study of the market. We have identified three companies with a total of five locations supplying the 60-120 K ton C-33 sand market in the area. What follows is a brief description of the ready-mix companies.

Sunroc

Sunroc is a division of the Clyde Companies, Inc. Clyde is a large privately held company, operating in the intermountain west and the great plains regions. Their main office is in Orem, Utah. The Clyde Companies include WW Clyde, Geneva Rock, Sunroc, Sunpro, IHC Scott, Bridgesource, Beehive Insurance Agency, and GWC Capital. Sunroc has regional offices in Northern Utah, Southern Utah / Nevada, Western Idaho, Eastern Idaho, and Wyoming. Sunroc could be a customer on the asphalt and ready-mix side; however, they have their own aggregates supply company, which they call Intermountain West. They produce ready-mix concrete, brick, block, pavers, and faux stone. They are also construction contractors. In Vernal and Roosevelt, it's likely they purchase aggregates from others. They have two ready-mix locations:

- Roosevelt – 1863 east Highway 40, Roosevelt, UT
- Tooele – 1150 East 1500, South Vernal, UT

Burdick Materials

Burdick Materials is now a CRH Company, and they operate as Staker Parson and seem to still carry the Burdick Materials name. They provide asphalt, asphalt paving, crushed aggregates, and earthmoving services. They have two aggregate locations in the area as well as two ready-mix locations. It is likely they self-supply their ready-mix. It's doubtful that other ready-mix suppliers would purchase from Staker Parson since they are competitors.

- Staker Parson - Vernal Redi-Mix – 4268 South Vernal Avenue, Vernal, UT
- Burdick Materials – 1368 3000 W, Roosevelt, UT (may be closed or idled)

Intermountain Concrete

Intermountain Concrete is an independent producer of ready-mix in Vernal.

- Intermountain Concrete Company – 625 E Main St Vernal, UT

Price Analysis

The market for C-33 sand is relatively small with a top-end estimate of 120 K tons per year. Sand and gravel is the aggregate supply in the market. Excess inventory of sand is likely as Q4 notes inactive sand and gravel locations with remaining piles of sand. The use of sand in ready-mix will also likely not

require 100-percent of the demand to meet a C-33 specification as private work is not as rigorous a requirement. Therefore, we can conclude that the market is not driven by shortages and price will be highly commoditized.

Table 1 shows an analysis of the logistics costs to serve the sub-markets of Vernal and Roosevelt, UT. The table has only the mines Q4 deemed as active. It is likely that the two CRH locations will supply the CRH ready-mix plants. The three other plants will be competitively supplied by the remaining seven locations. Figure 2 shows the Petroteq project in relation to the sub-markets. Project Point #1 and Project Point #2 were selected as possible plant locations for the Petroteq processing plant and the starting point for the logistic costs to supply Vernal and Roosevelt C-33 sand. Note that both project locations show a logistical disadvantage to the shown competitors of between $12.26 and $16.22 per ton. It is likely this exceeds the price of the sand. Q4's opinion is the supply of sand is heavily disadvantaged into either of the sub-markets. The chance of successfully displacing a current supplier, due to the logistic costs alone, precludes a recommendation of further investigation into an entry into the C-33 market in the Vernal area.

Table 1 - Aggregate supplier logistic economics

Location	Vernal FOB		Roosevelt FOB		Estimated Per-Ton Haul Rate Range to Vernal FOB Point			Estimated Per-Ton Haul Rate Range to Roosevelt FOB Point		
	Distance (mi)	Time (min)	Distance (mi)	Time (min)						
CRH/Staker Parson - Anderson	28.9	36	12.8	21	$4.32	to	$6.00	$2.52	to	$3.50
CRH/Staker Parson - Maeser	6.8	14	28.1	35	$2.50	to	$2.50	$4.20	to	$5.83
Murray Rock Products	22.9	31	12.7	23	$3.72	to	$5.17	$2.76	to	$3.83
R Chapman Construction	54.1	63	24.5	32	$7.56	to	$10.50	$3.84	to	$5.33
KW Trucking	7.0	10	351	43	$2.50	to	$2.50	$5.16	to	$7.17
Active pit #1	5.0	10	32.7	38	$2.50	to	$2.50	$4.56	to	$6.33
Active pit #2	15.8	20	17.9	22	$2.50	to	$3.33	$2.64	to	$3.67
Active pit #3	32.9	40	3.3	8	$4.80	to	$6.67	$2.50	to	$2.50
Active pit #4	27.8	39	20.6	34	$4.68	to	$6.50	$4.08	to	$5.67
Project Point #1	140.0	156	111	123	$18.72	to	$26.00	$14.76	to	$20.50
Project Point #2	103.0	165	105	144	$19.80	to	$27.50	$17.28	to	$24.00

Frac Sand

The Petroteq project location is centrally located within the Uinta Basin (Figure 3). Demand in the basin is estimated to be approximately 1.1 MM tons per year.[6] There is no in-basin production of frac sand, although there is a permit for a producer north of Vernal. There are both truck and rail options for importing sand into the Uinta Basin. Northern White Sand (NWS) is trucked directly in from terminals in Craig, CO and Rock Springs, WY and brought in my rail into Wellington, UT where it is transloaded into trucks. The Wellington location is the Price River Terminal location on the west side of Figure 3.

[6] Infill Thinking, ""Uniquely Utah" – Frac Logistics Here Face Some Of The Most Difficult Scenarios In The Lower 48," 2019

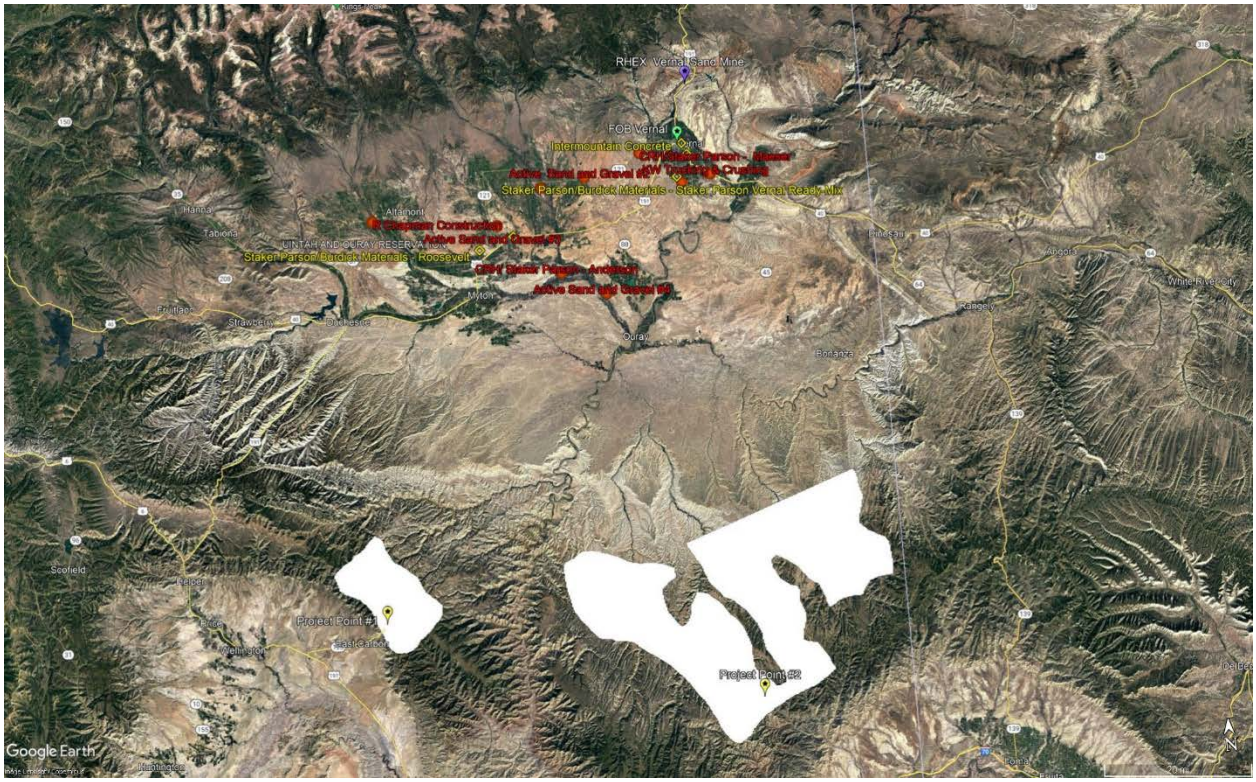

Figure 2 - Possible Petroteq project plant locations

In-Basin Sand Supply

Permits for in-basin sand production have met resistance. A proposed Uinta Basin Sand, LLC location has been tabled for now because of public outcry. The area is popular as a tourist destination, and public awareness with a bias against land disturbance is high. One exception has been RHEX (Ramsey Hill Exploration, LLC) which started with an operating wet sand mine north of Vernal, UT and has progressed to producing dry frac sand. The wet mine became active beginning the second half of 2019 when it began operating under a small source exemption from the state of Utah. The small source exemption appeared to preclude the use of a dryer and only wet sand was produced.[7] In June of 2020, RHEX responded to Utah Division of Oil, Gas and Mining with responses to the State's initial review of the application.[8] On February 18, 2020, a new air permit application for the RHEX mine in Vernal was initiated for dry production of 1.3 MM ton per year.[9] A tentative approval was given to RHEX on August 27, 2020.[10] Q4 believes the plant is operational and currently has two rotary dryers.[11]

The RHEX plant reportedly produces two grades, about 66-percent will be 100 mesh and 34-percent of production will be 40/70, although it will vary with the mining process.[12] Figure 3 shows the RHEX Sand Mine property location and its proximity about 5 miles north of Vernal, UT. Figures 4 and 5 are photos of the RHEX frac sand plant at Vernal.

[7] Infill Thinking, "First (And Now Only) Utah Local Sand Project Crosses Into New Terrain," February 18, 2020
[8] Response to Initial Review of Notice of Intention to Commence Large Mining operations, Ramsey Hill Exploration, LLC, RHEX Mine, M/047/0123, Uintah County, Utah received on May 28, 2020
[9] Infill Thinking, "First (And Now Only) Utah Local Sand Project Crosses Into New Terrain," February 18, 2020
[10] State of Utah, "Tentative Approval to Commence Large Ming Operations, Ramsey Hill Exploration< LLC, RHEX Mine, M/047/0123, Uintah County, Utah," August 27, 2020.
[11] This information is from a local plant operator, contacted by Q4, who worked at the mine.
[12] Ibid.

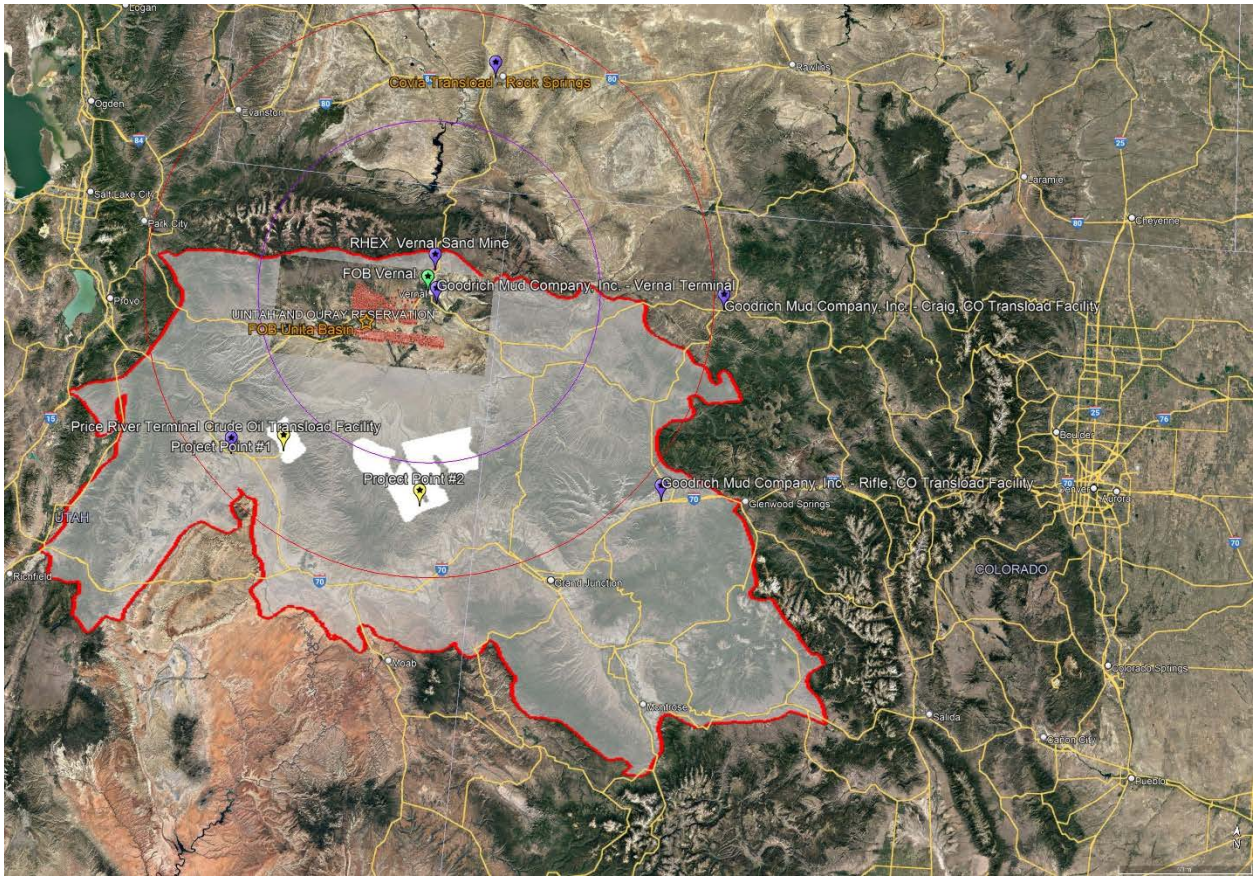

Figure 3 - Uinta Basin map showing a 60-mile radius (purple) and a 100-mile radius (red) from Vernal.

Direct-to-Basin Truck Haul and Transloading

There is opportunity for out-of-basin frac sand suppliers to source with direct-to-basin hauling and through a transloading facility for rail-to-truck supply in the basin. The direct-to-basin truck hauls are some of the longest hauls in any US basin. The roads to and from the basin are mountainous and subject to closure in the winter, causing longer detours. There are two transloading facilities in the basin, a rail-based transload in Wellington, UT and a truck-to-silo facility in Vernal. There have been reports of "surge" pricing impacting sand buyers in 2019 in the Uinta Basin that were 2 – 3 times market pricing.[13] It is likely this surge pricing will not continue with local supply in Vernal.

Price River Terminal, in Wellington, UT, makes the following claim: "Price River Terminal is the only facility capable of receiving inbound unit trains of frac sand to support the Uinta Basin drilling activities." This claim appears to be accurate. Price River is served by both the BNSF and the UP. Figure 6 shows and aerial of the terminal from the company's website. Superior Silica Sands, a subsidiary of Emerge Energy Services,[14] produces in San Antonio, TX, Clinton, WI, and New Auburn, WI. They utilize the Price River Transload facility in Wellington, UT. The Wisconsin NWS is supplied to the Uinta Basin.

[13] Infill Thinking, ""Uniquely Utah" – Frac Logistics Here Face Some Of The Most Difficult Scenarios In The Lower 48," 2019
[14] Emerge Energy Services is a diversified energy services company with two main business units: Sand and fuel processing and distribution.

Figure 4 - Processing plant at the RHEX plant in Vernal, UT.

Figure 5 - Fully enclosed processing plant at the RHEX frac sand plant in Vernal, UT.

Unimin and Fairmount-Santrol merged in 2018 creating a new company, Covia. Covia operates the Fairmont-Santrol transload in Rock Springs, WY off the UP railroad (Figure 6). The sand distributed there is NWS from Wisconsin. They can provide direct-to-basin hauling and they use the Price River Terminal transload facility in Wellington.

The Goodrich Mud Company, Inc. has a terminal in Vernal, UT, a transload facility in Craig, CO, and a transload facility in Rifle, CO. Figures 8 and 9 show the Vernal, UT location of the Goodrich Mud

Figure 6 - Price River Terminal Transloading facility.

Figure 7 - Covia Corporation's transload facility in Rock Springs, WY.

terminal and layout of the terminal in Vernal. Goodrich serves frac sand demand in Northeastern Utah, Western Colorado and Southwestern Wyoming. They have signed a contract with RHEX to distribute the sand from the RHEX Vernal mine[15] and advertise the RHEX product on the Goodrich website without mentioning the RHEX name.

Wet Frac Sand

There is a trend in the market toward utilization of wet or damp frac sand[16] during the completion of a well. PropX has tested the process in Oklahoma with success.[17] The test suggests that savings is in the range of $2 to $10 per ton, annually saving more than a quarter-billion dollars using wet sand in the Permian Basin alone. The use of wet sand has advantages for the well completion companies other than

[15] Infill Thinking, ""Uniquely Utah" – Frac Logistics Here Face Some Of The Most Difficult Scenarios In The Lower 48," 2019
[16] Defined as a moisture content of between 1 – 10 percent water.
[17] https://jpt.spe.org/just-add-water-why-us-shales-next-big-supply-chain-revolution-wet-sand

Figure 8 - The Goodrich Mud Company terminal in Vernal, UT.

Figure 9 - Aerial photograph of the Goodrich Mud Company terminal in Vernal, UT.

price. It is greener, using less energy, producing less CO_2 by eliminating the drying process. Wet sand does not produce as much dust, lowering the adverse health concerns with silica. There is a downside to wet sand in freezing environments. The use of wet sand may be a warm-weather only process in the

Uinta Basin if it is adopted.

Since economics drive most decisions, Q4 believes the Uinta Basin will see a mix of wet and dry sand utilization in the coming years. The Vernal area sees freezing weather from November to April, about five months of the year. Q4 believes there will be enough incentive for the well completion companies to consider two completion processes in the basin. Once the processes are sorted out, the economics will drive around 640 K tons of wet frac sand to be utilized per year in the Uinta Basin. That leaves about 460 K tons of NWS to be supplied by a combination of RHEX, a Petroteq entry, or handled through the transload facility in Wellington, UT. The infrastructure in place at Wellington is supported by two commodities, petroleum and dry NWS frac sand inbound. With the sunk cost of the installed infrastructure at Wellington and suffering the current loss of inbound frac sand due to the RHEX entry, their economics will not materially change. The transload facilities will not be able to meet the local pricing of the wet sand due to both the operating cost of production of the wet sand (+/- $6.00 per ton advantage) and the logistical advantage of local sand supply.

There will likely be several competitors for the 700 K tons of wet, in-basin, frac sand demand. The most advantaged competitor will be the RHEX mine north of Vernal, and they have an existing distribution agreement with Goodrich Mud Company. Goodrich is a known supplier in the basin and will be advantaged with prior relationships. A wet sand market is a small completion-well engineering and frac sand plant modification step away for the existing RHEX facility.

The multiple smaller construction and ready-mix sand producers may also be able to market a competitive product from their locations. However, Q4 speculates the alluvial deposits may prove to be more challenging from a consistency standpoint than the deposit being mined at RHEX from the Entrada and Carmel Sandstones. Regardless, there will be competition, in-basin, for the wet sand supply. This will commoditize the pricing and produce favorable economics for the well completion companies as they pit sand suppliers against each other for the wet sand.

Price Analysis

Frac sand demand is estimated at about 1.1 MM tons per year on average. Most of the drilling rigs working in the state are located within 60 miles of Vernal (see purple arc in Figure 3). In the future, the Uinta completions will move the demand to within 100 miles drive distance from Vernal (red ring in Figure 3).

As with any basin, the Uinta price is driven by logistics. Table 2 shows a comparison of Q4's estimates of the total logistics costs of various combinations of shipping scenarios to the same point in the basin (Uinta Basin FOB). The Uinta Basin FOB point is also shown in Figure 3 near the centroid of the well locations (the mass of red triangles in the upper center of the basin in Figure 3). Uinta Basin FOB point is about 24 miles southwest of Vernal and well within the projected 60-mile radius of demand from Vernal.

With the RHEX/Goodrich in-basin supply, the FOB well-head price is currently competitive between Goodrich Mud (the RHEX mine) in Vernal, at approximately $9.00 logistics costs, and Price River's terminal in Wellington, at approximately $78.50 logistics costs. Since the total price will be what the market can bear, Q4 assumes sales from the Wellington location happens only if RHEX cannot supply at the well head.

Table 2 - Logistics costs to a central Uinta Basin location.

	Location	To Goodrich Mud Vernal		To Unita Basin FOB Point		Freight - NWS Mine to Transload ($/ton)	Transload Rail to Silo Costs ($/ton)	Transload Truck to Silo Costs ($/ton)	Transload Silo to Truck Costs ($/ton)	Estimated Per-Ton Haul Rate Range to Goodrich Vernal Terminal			Estimated Per-Ton Haul Rate Range to Unita Basin FOB Point			Total Logistics This Location to Unita Basin FOB ($/ton)
		Distance (mi)	Time (min)	Distance (mi)	Time (min)											
Direct to Basin	Goodrich - Craig, CO	115	110	149	156	$50.00	$2.00		$2.00	$13.20	to	$18.33	$18.72	to	$26.00	$76.36
	Goodrich - Rifle, CO	144	149	178	195	$52.86	$2.00		$2.00	$17.88	to	$24.83	$23.40	to	$32.50	$84.81
	Covia - Rock Springs, WY			137	161	$52.14	$2.00		$2.00				$19.32	to	$26.83	$79.22
	RHEX Vernal Sand Mine			39	49				$2.00				$5.88	to	$8.17	$9.02
	Project Point #1			115	139				$2.00				$16.68	to	$23.17	$21.92
	Project Point #2			98	145				$2.00				$17.40	to	$24.17	$22.78
Transload	Goodrich Vernal Terminal			34	47			$2.00	$2.00				$5.64	to	$7.83	$80.50
	Price River Terminal Transload			97	121	$57.14	$2.00		$2.00				$14.52	to	$20.17	$78.49

Rystad Energy[18] speculates that prices for Northern White sand will bounce between $20 per ton to $25 per ton through 2024, FOB producing site. The spot market is over $30 per ton. Prices for in-basin Permian sand from West Texas are projected to range from $19 per ton to $23 per ton during the same period. Using these economics, we would estimate the price FOB the well head for NWS was between $103 and $110 per ton in the Uinta Basin. Entry pricing for RHEX was favorable because they partnered with an existing supplier in Goodrich. Some discount from NWS pricing certainly ensued as pushback by the completion companies to "share" the logistical savings with the in-basin supplier occurred. Q4 would estimate FOB well head Petroteq pricing for dry frac sand to be around $75 to $92 per ton for the RHEX/Goodrich partnership. This translates to a FOB RHEX mine price of about $66 to $85 per ton.

RHEX/Goodrich enjoys a $12.00 to market logistical advantage over a Petroteq entry. They will take full advantage of this if there is a commodity fight on price. This $12.00 logistics advantage will be tempered by some operational cost advantage Petroteq will enjoy as the sand is a byproduct (+/- $3.00 cost advantage). Q4 believes that the capital investment would be similar for both companies if the market stays with dry sand. RHEX will remain the low-cost provider, regardless of price and a capacity of at least 1.0-MM tons per year of dry frac sand. [19]

If Petroteq moves into an existing market with a competitive entry there will be a shock to pricing as Petroteq takes market share away from RHEX/Goodrich. Prices will fall as Petroteq buys market share. If we estimate a desired market share in the range of 33-50 percent, the price FOB Petroteq would likely adjust downward for both companies due to the competitive entry. For Petroteq, the price would adjust downward further for the lack of a known distributor in the market and for the logistical disadvantage. The lack of a distributor disadvantage would dissipate over a short period of time (+/- 2 years) as Petroteq proves its product quality and dependability. As a result of the dry frac sand entry, Q4 estimates the price to fall to around $51 to $68 per ton for RHEX and suggests an initial entry price of $34 to $49 per ton for Petroteq, climbing to $42 to $59 after the shock of the competitive entry disperses.

[18] An energy research and business intelligence company (https://www.rystadenergy.com/newsevents/news/press-releases/Frac-sand-market-still-growing-but-prices-likely-to-stay-flat/).

[19] Note that the estimate here is broad and should be verified on site. This is a doubling of initial permit tonnage based on a local report of a second dyer installed.

If the movement to wet sand happens, the economics will drive wet sand demand in the Uinta Basin. Those economics turn in the favor of the well completion companies as more competitors become viable in the basin. Q4 believes however wet sand will not be used exclusively as dry sand will be required in the freezing months. The limited use of wet sand creates an operating inefficiency for the dry sand producer(s) in the basin. This comes from only 42-percent drying circuit utilization each year (5 months out of 12 months). This raises overall ownership costs.

Prices will look for an equilibrium and the drying options will only be needed in the winter months. RHEX has the infrastructure in place to take advantage of the wet sand market. Since they have an existing relationship with Goodrich Mud Company, the RHEX/Goodrich partnership will be the market leaders. Initially, the wet sand price will be lower than the dry sand price. The completion companies will cite the need to prove new technology. Q4 estimates the initial pricing at about 75% of the dry sand pricing as a starting place. That puts it at $38 to $51 per ton for RHEX FOB the mine site. This would translate to $26 to $37 per ton initially, FOB the Petroteq production facility, eventually climbing to $32 to $44 per ton for wet sand.

APPENDIX 2.0
LETTER FROM ATTORNEY

PETROTEQ ENERGY INC.

February 9, 2022

MEMORANDUM

TO: Vladimir Podlipskiy
Chief Executive Officer

FROM: James D. Hurley
Legal & Regulatory Affairs

SUBJECT: Environmental Overview - Petroteq's Proprietary Clean Extraction Technology

As you know, Petroteq owns and controls a proprietary oil sands extraction and remediation technology (the "PQE Technology") that is based on and supported by claims set forth in patents that have been issued to the Company in the U.S., Canada and the Russian Federation. The PQE Technology deploys a solvent-based closed loop system that enables the extraction and recovery of heavy oil and bitumen from oil sands deposits and reservoirs and in related mineable deposits. Petroteq is in the planning and design stages for the development of a commercial oil processing plant - having a throughput and production capacity of approximately 5,000 barrels/day - that it plans to construct and operate in the Asphalt Ridge area of Utah, located generally on the northern cusp of the ancient Uintah Basin.

The PQE Technology is considered a "clean technology" and is an environmentally safe and sustainable technology. While the PQE Technology can be applied to both "water-wet" (Canada) and "hydrocarbon wet" (Utah) oil sands sediments, deposits and materials, the technology does not utilize water in its processing operations and thus there is no requirement to build and manage large tailings ponds and wastewater treatment and disposal systems and facilities. The special solvents utilized in the operation of the technology are generally recovered, although certain solvents also be used as a feedstock that will enable the technology to "craft" the characteristics of the crude oil extracted and produced at oil processing facilities that deploy the PQE Technology.

In the Asphalt Ridge area of eastern Utah located on the northern edges of the Uintah Basin - which is where the Company is currently focused with its mineral leases and an existing plant (originally designed and built as a pilot and demonstration facility) - the hydrocarbons contained in oil sands deposits have a very low sulfur content, in many cases lower than the sulfur specification in West Texas Intermediate (WTI) crude oil. Through application of the Petroteq Technology, the Company (through its operating subsidiaries in Utah) is able to produce a relatively sweet heavy crude oil from the Asphalt Ridge oil sands deposits without generating wastewater that otherwise would require wastewater treatment and disposal facilities that create potential harm to the environment. In addition, the Petroteq Technology, during and in its extraction and processing operations, leaves a clean residual sand that can be returned to the environment or marketed as an industrial sands (examples potentially including road and highway construction and oil and gas hydraulic fracturing in conventional shale oil drilling and production).

During the 2016-2019 period, Petroteq received a large mine permit from the Utah Division of Oil, Gas and Minerals (UDOGM) as well as various environmental permits (including the State of Utah's approval of a "small source" exemption for its plant based on the low level of emissions. We anticipate that similar permits will be obtained from the State of Utah for the new commercial facility as well.

15315 Magnolia Blvd, Suite 120
Sherman Oaks, CA 91403