UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K/A

(Amendment No. 1)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the Fiscal Year Ended December 31, 2021

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission file number 001-35416

U.S. Silica Holdings, Inc.
(Exact name of registrant as specified in its charter)

Delaware **(State or other jurisdiction of Incorporation or Organization)**	**26-3718801** **(IRS Employer Identification No.)**

24275 Katy Freeway, Suite 600
Katy, Texas 77494
(Address of Principal Executive Offices) (Zip Code)

(281) 258-2170
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Securities Act:

Title of each class:	Trading Symbol	Name of each exchange on which registered
Common Stock, par value $0.01 per share	SLCA	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Securities Act: None

Indicate by a check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15 (d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of “large accelerated filer,” “accelerated filer,” “smaller reporting company,” and “emerging growth company” in Rule 12b-2 of the Exchange Act.

Large accelerated filer	☒	Accelerated filer	☐
Non-accelerated filer	☐	Smaller reporting company	☐
		Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management’s assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the outstanding common stock held by non-affiliates of the registrant as of June 30, 2021, the last business day of the registrant’s most recently completed second fiscal quarter, was $814,478,897 based on the closing price of $11.56 per share, as reported on the New York Stock Exchange, on such date.

As of September 30, 2022, 75,616,067 shares of common stock, par value $0.01 per share, of the registrant were outstanding.

Auditor Firm ID: 248 Auditor Name: Grant Thornton LLP Auditor Location: Houston, Texas

EXPLANATORY NOTE

U.S. Silica Holdings, Inc. (the “company,” “U.S. Silica,” “we,” or “our”) is filing this Amendment No. 1 on Form 10-K/A (this “Amendment”) to amend our Annual Report on Form 10-K for the year ended December 31, 2021, which we filed with the Securities and Exchange Commission (the “SEC”) on February 25, 2022 (the “Original Filing”). The Original Filing is amended by this Amendment to: (i) amend and restate Item 2 of Part I in its entirety in response to comments received from the SEC staff with respect to the Original Filing; (ii) revise the disclosure on our disclosure controls and procedures in Part II, Item 9A to reflect management’s conclusion that our disclosure controls and procedures were not effective at December 31, 2021 due to the omission of required disclosures under subpart 1300 of Regulation S-K; and (iii) file an amended version of the Ottawa Site, LaSalle County, Illinois Technical Report Summary (which is filed herewith as Exhibit 96.1), Colado Site, Pershing County, Nevada Technical Report Summary (which is filed herewith as Exhibit 96.2) and Lamesa Site, Dawson County, Texas Technical Report Summary (which is filed herewith as Exhibit 96.3) (collectively, the “Technical Report Summaries”), all of which supersede their respective previously filed reports. The amendments to the Technical Report Summaries include updated economic feasibility models. Initially, the economic feasibility models in Section 19.0 of each Technical Report Summary included annualized data for 2021. Unless otherwise noted, the economic feasibility models have been revised to include actual 2021 data.

Other than the items referenced above, this Amendment does not attempt to modify or update the Original Filing. This Amendment does not reflect events occurring after the date of the Original Filing or modify or update those disclosures that may be affected by subsequent events. Such subsequent matters are or will be addressed in subsequent reports filed by the Company with the SEC. Accordingly, this Amendment should be read in conjunction with the Original Filing. Capitalized terms not defined in this Amendment have the meaning givens to them in the Original Filing.

Pursuant to Rule 12b-15 under the Securities Exchange Act of 1934 (the “Exchange Act”), this Amendment also includes as exhibits the certifications of the Principal Executive Officer and Principal Financial Officer of the Company pursuant to Section 302 of the Sarbanes-Oxley Act of 2002. The Company is not including certifications pursuant to Section 1350 of Chapter 63 of Title 18 of the United States Code (18 U.S.C. 1350) because no financial statements are filed with this Amendment.

TABLE OF CONTENTS

PART I

ITEM 2. PROPERTIES

Our Properties and Logistics Network

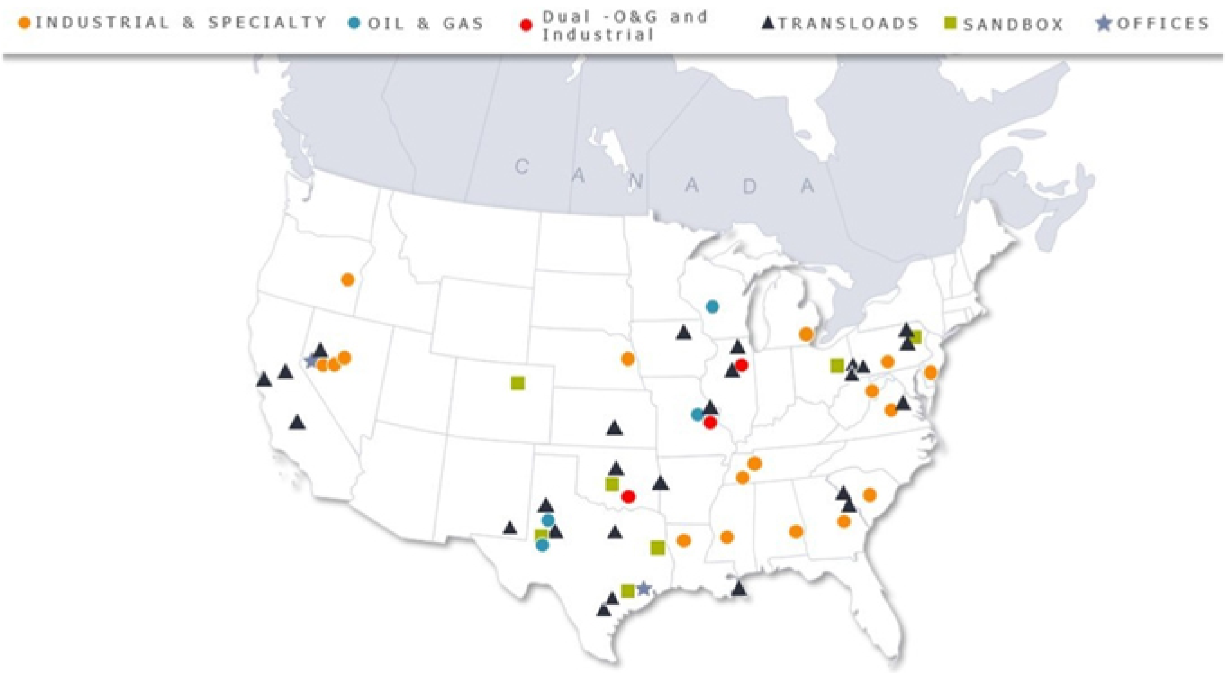
Our corporate headquarters is located in Katy, Texas. We also maintain a corporate support center and sales office in Reno, Nevada. Additionally, we operate corporate laboratories located in Berkeley Springs, West Virginia and Reno, Nevada. These locations provide critical technical expertise, analytical testing resources and application development to promote product value and cost savings. We generally own our principal production properties, although some land is leased. Substantially all of our owned assets are pledged as security under the Credit Agreement; for additional information regarding our indebtedness, see Note K—Debt to our Consolidated Financial Statements in Part II, Item 8. of the Original Filing. Corporate offices, including sales locations are leased. In general, we consider our facilities, taken as a whole, to be suitable and adequate for our current operations.

We continue to strategically position our supply chain in order to deliver sand according to our customers' needs, whether at a plant, a transload, or at the wellhead. We believe that our supply chain network and logistics capabilities are a competitive advantage that enables us to provide superior service for our customers and positions us to take advantage of opportunistic spot market sales. As of December 31, 2021, we had 27 transload facilities strategically located near all the major shale basins in the United States. All of our transloads are operated by third-party transload service providers via service agreements, which include both longer term contracts (generally 2 to 5 years) and month-to-month arrangements.

We lease a significant number of railcars for shipping purposes and for short-term storage of our products, particularly our frac sand products. As of December 31, 2021, we had a leased fleet of 5,300 railcars.

Our acquisition of SandBox extended our delivery capability directly to our customers' wellhead locations. SandBox provides last mile logistics to companies in the oil and gas industry, which increases efficiency and provides a lower cost logistics solution for our customers. SandBox has operations in the major United States oil and gas producing regions, including the Permian Basin, Eagle Ford Shale, Mid-Con, Rocky Mountains and the Marcellus/Utica Shale, where its largest customers are located. We expect we will continue to make strategic investments and develop partnerships with transload operators and transportation providers that will enhance our portfolio of supply chain services that we can provide to customers.

The map below shows the location of our production facilities, transload facilities, SandBox operation sites and Corporate offices:



Summary Overview of Mining Operations

Information concerning our mining properties in this Amendment has been prepared in accordance with the requirements of subpart 1300 of Regulation S-K, which first became applicable to us for the fiscal year ended December 31, 2021. As used in this Amendment, the terms “mineral resource,” “mineral reserve,” “proven mineral reserve” and “probable mineral reserve” are defined and used in accordance with subpart 1300 of Regulation S-K. As of December 31, 2021, the Company’s individually material mining properties, as determined in accordance with subpart 1300 of Regulation S-K, were the Lamesa, TX site (the “Lamesa site”), the Ottawa, IL site (the “Ottawa site”) and the Lovelock/Colado, NV site (the “Colado site”).

The information that follows related to the Lamesa site, the Ottawa site and the Colado site is derived, for the most part from, and in some instances is an extract from, the technical report summaries (“TRSs”) related to such properties prepared in compliance with Item 601(b)(96) and subpart 1300 of Regulation S-K. Portions of the following information are based on assumptions, qualifications and procedures that are not fully described herein. Reference should be made to the full text of the TRSs, filed as exhibits to this Amendment.

As of December 31, 2021, we had 28 operating mines and processing facilities and two exploration stage properties, as summarized below. Note that this list includes three processing facilities (Blair, NE, Lovelock/Colado, NV Processing Plant, included in the description of Lovelock/Colado, NV, and Millen, GA), but excludes mines and processing facilities that have been closed, none of which has any mineral resources or reserves.

Berkeley Springs, West Virginia

We, through U.S. Silica Company, operate surface mines and a silica sand processing plant in Berkeley Springs, Morgan County, West Virginia. The Berkeley Springs site includes a total of 4,435 acres that are owned outright by U.S. Silica. This ownership includes subsurface mineral and water rights. The site has no leased property and pays no royalties.

Our surface mines at the Berkeley Springs facility use hard rock mining methods to produce high-purity sandstone. The plant uses natural gas, propane, fuel oil and electricity to make whole grain, ground and fine ground silica. Berkeley Springs also produces a synthetic magnesium-silica product called Florisil. The reserves are part of the Ridgeley Sandstone Formation along the Warm Springs Ridge in eastern West Virginia. The processing plant allows the Berkeley Springs facility to meet a wide variety of focused specifications from customers producing specialty epoxies, resins and polymers, geothermal energy equipment and fiberglass. As such, the Berkeley Springs facility services multiple end markets, such as glass, building products, foundry, chemicals and fillers and extenders.

Berkeley Springs operates under 13 different operating permits and complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Blair, Nebraska *[processing plant only]*

EP Engineered Clay, our indirect subsidiary, operates a perlite processing plant located near the town of Blair, Washington County, Nebraska. The site sits on a 0.5-acre leased parcel that is a portion of a 35-acre lot owned by Blair Ag., LLC. The site has a mobile office, expander building, a compressor room and three storage silos.

Our Blair facility uses natural gas, electricity and perlite raw ore from our open-pit Popcorn, Nevada mine that has been initially processed at our Lovelock, Nevada process facility, then shipped by rail to Blair. After unloading, the ore goes through an expander. At temperatures over 1,600-degrees Fahrenheit, perlite expands to almost 15 times its size. The expanded perlite is then sized, packaged or sent to storage silos for bulk shipment to customers. Perlite products are used as a filter media in the manufacturing of bio-fuels, food grade oils, beverages and pharmaceuticals.

The Blair plant operates under one operating permit and complies with other state and federal regulations that do not require a specific permit. The required permit is secured, and the site is operating in full compliance.

Clark, Nevada

EPM operates the Clark, Nevada mine and DE processing plant located 20 miles east of the city of Reno, Nevada. The Clark processing plant is located on approximately 447 acres of private land. The Clark mine consists of approximately 1,123 acres of private land and 292 acres of federal land. EPM maintains two mineral claim leases, with EPM holding 71% ownership. The leases consist of 19 mineral claims, 15 of which are placer claims and four of which are mill-site claims.

Our Clark open pit, ramp and bench mine uses mechanical, hard-rock mining methods to extract the DE ore strata. The DE mined at the Clark mine is part of the Miocene-aged Truckee Formation, comprised of up to 200-ft thick, lacustrine DE deposits with interbedded, gravels, sands and volcanic tuffs. The Clark processing plant utilizes a rotary kiln to produce granular DE products utilized in the soil amendment, absorbent and carrier markets. In addition, a flash dryer process is utilized in producing natural DE powders in support of the functional additive and natural insecticide and animal feed markets.

The Clark mine operates under four permits, while the Clark processing plant must abide by eight separate operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Columbia, South Carolina

We, through U.S. Silica Company, operate a surface mine and silica sand processing plant in Columbia, Lexington County, South Carolina. The processing plant is situated on a 204-acre parcel of owned land. The active mine is located directly north of the plant and is comprised of a 648-acre parcel of leased land. Royalties in the amount of 5% of the total monthly sales revenue are paid to the lessor.

Our surface mines in Columbia use natural gas, fuel oil and electricity to produce whole grain, ground and fine ground silica. The reserves are part of the Tuscaloosa Formation in central South Carolina. The processing plant allows the Columbia facility to meet a wide variety of focused specifications on product composition from customers. As such, the Columbia facility services multiple end markets, such as glass, building products, fillers and extenders, filtration and oil and gas proppants.

The Columbia, South Carolina site actively maintains five regulatory and operating permits. The facility also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Crane County, Texas

We, through U.S. Silica Company, operate surface mines and a silica sand processing plant in Crane County, Texas. The Crane site includes a total of 3,200 acres that are owned by U.S. Silica. This ownership includes subsurface mineral and water rights. A royalty payment of $1.00/ton of sand sold is payable to the former owner. There are no associated leased lands at Crane.

Our Crane site uses natural gas and electricity to produce whole grain silica through surface mining methods. The reserves contain windblown dune sand lying above ancient dunes of clayey sand, all quaternary in age. The Crane processing plant is a fully automated, state-of-the-art facility that features an approximately four million ton per year plant with a wet plant, intermediate stockpile, dry plant, screening plant and loadout. The site’s location in West Texas allows it to ship local in-basin sand by truck.

The Crane site maintains seven operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Dubberly, Louisiana

We, through U.S. Silica Company, operate a surface dredge mine and a silica sand processing plant near Dubberly, Louisiana. The land holdings include a total of 356 acres that are owned outright by the Company. The site pays an annual $200 royalty to the former land owner. Another 20 acres of land is leased for $8,500 per year to provide access to the site’s National Pollutant Discharge Elimination System water discharge point. The owned and leased tracts include subsurface mineral and water rights.

Our surface mines in Dubberly use natural gas and electricity to produce whole grain silica through dredge mining. The reserves are part of the Sparta Formation. The processing plant allows the Dubberly facility to meet a wide variety of focused specifications on product composition from customers. As such, the Dubberly facility services multiple end markets, such as glass, foundry and building products.

Dubberly maintains four operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Fernley, Nevada

EPM owns and operates a surface mine and DE processing plant near the town of Fernley, Nevada. The processing plant is located on a 39.9-acre parcel of private land. The Fernley mine property is comprised of 5,668 acres, which mostly consists of federal BLM land (142 active and owned placer mineral claims) and 72.2 acres of private land.

Portions of the private land are surface rights only, and related minerals rights are sub-leased from private land owners. There are no royalties associated with the private land holdings at Fernley. BLM land lease payments are around $23,000 annually.

Our Fernley facility surface-mines DE and has a rotary kiln for granular DE products. The processing plant utilizes electricity and recycled oil to manufacture granular products used in absorbent products, soil amendments, fertilizer and pet litter.

The Fernley mine operates under four operating permits. The Fernley processing plant operates under an additional six operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Festus, Missouri

We, through U.S. Silica Company, lease and have mineral rights for silica sand on 635 acres covering a limestone quarry that is owned and operated by Fred Weber, Inc. (“Fred Weber”). The processing plant was constructed on a 40-acre tract within this lease. Fred Weber mines a layer of sandstone in the quarry and delivers it to the processing plant on a price per ton basis. Any and all property ownership, leases and environmental permits related to the mine are the responsibility of Fred Weber.

The Festus facility uses natural gas and electricity to produce whole grain silica from a sandstone reserve that we lease, subject to the lease’s expiration on June 30, 2048. The ore is mined by a contractor using both surface and underground hard-rock mining methods. The reserves are part of the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. While the Festus facility’s production techniques and distribution model enable it to serve all major silica markets, the primary production has been frac sand for oil and gas proppants.

Fred Weber holds and maintains six operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Hazen Mine, Nevada

EPM operates the Hazen, Nevada DE mine that is located three miles southwest of the unincorporated town of Hazen, Churchill County, Nevada. The Hazen mine is located on approximately 1,255 acres of land, comprised of 120 acres of private land and 1,135 acres of federal BLM land. The BLM land is held by four different claim holders. The largest 640-acre parcel has an annual minimum payment of $24,000 and a $1/ton shipped royalty. The second 480-acre parcel has an annual minimum payment of $7,200 and a $1/ton shipped royalty. The next 13.5-acre parcel has a $1,650 annual payment and a $1/ton shipped royalty. The last 1.7-acre property has a fixed annual payment of $413. Additionally, EPM pays all of the annual mining claim fees at $165 per claim.

Our small open-pit surface mine at Hazen operates as a stand-alone, satellite mine that provides raw DE to several sites. Most of the raw ore is shipped by truck to the Company’s nearby DE processing plant at Clark, Nevada. To a lesser extent, raw ore is loaded and shipped by rail to Johns Manville’s processing plants in Fruita, Colorado and Grambling, Louisiana. Contracted mining campaigns take place every two to years and these are designed to build on-site stockpiles to meet shipping requirements. On average, 20,000 bank cubic yards of DE are shipped off site each year.

The Hazen mine operates under operating permits issued by federal and state agencies. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Hurtsboro, Alabama

We, through U.S. Silica Company, operate a silica sand mine and processing plant near Hurtsboro, Macon County, Alabama. The Hurtsboro processing plant is located on 117 acres of owned land. Mining occurs within 10 miles of the processing plant, on three separate leased land parcels that encompass a total of some 1,100 acres. The mineral leases include subsurface mineral rights, with royalties paid at $0.60 to $0.75 per ton mined.

Our surface mines in Hurtsboro use propane and electricity to produce whole grain silica. The reserves are mined from the Cusseta member of the lower Ripley Formation. The processing plant allows the Hurtsboro facility to meet a wide variety of focused specifications on product composition from customers. As such, the Hurtsboro site services multiple end markets, such as foundry, building products and recreation.

The Hurtsboro site maintains 11 separate mining and environmental permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Jackson, Mississippi

EPM operates a bentonite clay processing plant in the town of Jackson, Hinds County, Mississippi. The Jackson processing facility sits on 70 acres of private land leased from BASF, the former owner of the site. The annual lease rate for the plant is $157,000. EPM also owns a one-acre lot located next to the processing plant as an injection well site. The calcium bentonite raw ore supplied to the Jackson plant is mined at the Aberdeen / Fowlkes Mine, near the town of Aberdeen, Monroe County, Mississippi. The mine property is 648 acres, comprised of 502 acres of owned land and 146 acres of private leased land, split between three landowners. The total annual lease payment for the private property is $12,000.

Our Jackson facility uses natural gas, electricity, water and sulfuric acid to process calcium bentonite from our Fowlkes open-pit mine, located approximately 170 miles from the Jackson plant. Once the calcium bentonite is processed into finished product, the product is shipped to the animal feed, oleo bleaching/filtration or refinery catalyst/purification markets.

The Jackson plant operates under five separate operating permits. The Fowlkes Mine operates under two operating permits. Both sites also comply with other state and federal regulations that do not require a specific permit. All required permits are secured, and the sites are operating in full compliance.

Jackson, Tennessee

We, through U.S. Silica Company, operate a silica sand mine and processing plant near Jackson, Tennessee. The Jackson, Tennessee site includes 132 acres of owned land in two separate parcels. The processing plant is located on the smaller 27-acre parcel of owned land. The second parcel of 105 acres hosts a mined-out dredge pond. There are no leases, no royalties and no other associated payments specific to the Jackson, Tennessee land parcels.

Our surface mines in Jackson, Tennessee use natural gas and electricity to produce whole grain and ground silica. Sand is purchased from a local dredging company whose reserves are alluvial sands associated with an ancient river system. The processing plant allows the Jackson, Tennessee facility to meet a wide variety of focused specifications on product composition from customers. As such, the site services multiple end markets, such as fiberglass, building products, ceramics, fillers and extenders and recreation.

The Jackson, Tennessee site operates under three active permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Lamesa, Texas

In accordance with subpart 1300 of Regulation S-K, we have determined that the Lamesa site is a material mining property. Therefore, a description of the Lamesa site and its operations can be found below. See "—Lamesa, TX."

Lovelock/Colado, Nevada

In accordance with subpart 1300 of Regulation S-K, we have determined that the Colado site, which includes the Colado Processing Plant, in Lovelock, Nevada, is a material mining property. Therefore, a description of the Colado site and its operations can be found below. See "—Lovelock/Colado, NV."

Mapleton Depot, Pennsylvania

We, through U.S. Silica Company, operate surface mines and a silica sand processing plant near Mapleton Depot, Huntingdon County, Pennsylvania. The Mapleton Depot operation includes a total of 1,838 acres that are owned outright by U.S. Silica. This ownership includes subsurface mineral and water rights. An additional 345 acres of land is leased for mineral rights and access from three different land owners. The standard lease payment is $0.255 per ore ton mined on 260 acres of the lease land total. The remaining 85 acres have an annual lease amount of $98,000 for mine haulage route access.

Our surface mines in Mapleton Depot use natural gas, fuel oil and electricity to produce whole grain silica through hard rock mining. The reserves are part of the Ridgeley (sometimes called the Oriskany) Sandstone Formation in central Pennsylvania. The processing plant allows the Mapleton Depot facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mapleton Depot site services multiple end markets, such as glass, specialty glass, building products, recreation and oil and gas proppants.

Mapleton Depot operates under 21 different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Mauricetown, New Jersey

We, through U.S. Silica Company, own and operate a silica sand processing plant near the unincorporated community of Mauricetown, Cumberland County, New Jersey. The processing plant is located on the west side of Mauricetown and sits on 776 owned acres of private land. The dredge mining operation, almost six miles northeast near Port Elizabeth, is located on 816 acres of owned land. All property at both sites is owned outright by U.S. Silica. No royalties are paid for the mining of sand on the property.

Our surface mines near the Mauricetown facility use natural gas, fuel oil and electricity to produce whole grain silica through dredge mining. The reserves are mined from alluvial sands in the Maurice River Valley and are similar to those found in the Cohansey, Bridgeton and Cape May deposits. The processing plant allows the Mauricetown facility to meet a wide variety of focused specifications on product composition from customers. As such, the Mauricetown site services multiple end markets, such as foundry, filtration, building products and recreation.

Mauricetown operates under 25 separate permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Middleton, Tennessee

EPM owns and operates the Middleton, Tennessee site, comprised of some 1,154 acres located on both sides of the border between Tennessee and Mississippi. The bentonite clay processing plant sits on an owned, 131-acre parcel of land located five miles south of the town of Middleton, Hardeman County, Tennessee. Mining activities occur in both Tennessee and Mississippi. The Tennessee mines consist of 420 acres of owned land and 78 acres of leased land. The Company owns all mineral rights on the leased land, but the land will be transferred back to the owner after cessation of mining. There is no royalty or other fee associated with this lease. The Mississippi mines consist of 525 acres of owned land.

The Middleton facility surface-mines montmorillonite clay, a high calcium bentonite, and has two rotary kilns that have a capacity of roughly 150,000 tons per year. The facility uses natural gas, electricity and sulfuric acid to process ore. With on-site milling, screening and multiple packaging capabilities, the Middleton site serves several different industries including agriculture, sports fields and absorbents.

The Middleton mine operates under five separate operating permits. The Middleton processing plant operates under two additional state permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Mill Creek, Oklahoma

We, through U.S. Silica Company, own and operate the Mill Creek mine and processing plant, near the town of Mill Creek, Johnston County, Oklahoma. The Mill Creek operation consists of two silica sand processing plants separated by four miles. The South Plant sits on 369 owned acres and is the home to the ground silica milling, sizing and bagging operations. The North Plant is comprised of 1,501 owned acres and is home to the mine and the whole grain silica sand drying and shipping operations. There are two leased tracts at the North Plant totaling 71 acres; both tracts have been fully mined, but the acreage is still part of the active state mining permit. The purchase agreements for lands at the North Plant included provisions for royalty payments based on tons mined and sold from the individual tracts. Some of this property was purchased over 40 years ago, and the royalty rates are less than the $0.10 per ton.

Our surface mines in Mill Creek use natural gas and electricity to produce whole grain, ground and fine ground silica through hydraulic mining. The reserves are part of the Oil Creek Formation in south central Oklahoma. The processing plant enables the site to produce multiple whole grain and ground silica products through various methods. As such, the Mill Creek facility services multiple end markets, such as glass, foundry, fillers and extenders, building products and oil and gas proppants.

The North Plant and mine operate under eight separate operating permits. The South Plant must abide by six separate operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and both sites are operating in full compliance.

Millen, Georgia *[processing plant only]*

EP Engineered Clay, our indirect subsidiary, operates a cristobalite manufacturing plant located near the town of Millen, Jenkins County, Georgia. The site sits on 819 wholly owned acres, of which the processing plant covers approximately 50 acres.

Our Millen facility has a natural gas kiln that enables the production of specialty industrial products that require high temperature heat treatments. These products are sold to customers that produce finished goods for the building products and residential construction markets. The site can ship bulk or packaged material via truck and the Norfolk Southern railway.

There is only one operating permit of record for the Millen, Georgia Plant. The site also complies with other state and federal regulations that do not require a specific permit. The required permit is secured, and the site is operating in full compliance.

Montpelier, Virginia

We, through U.S. Silica Company, own and operate an aplite mine and processing plant near the unincorporated community of Montpelier, Hanover County, Virginia. The mine and processing plant are located on 824 owned acres, with full mineral rights. No leases or royalties are associated with the property.

Our surface mines in Montpelier use fuel oil and electricity to produce aplite through hard rock mining. The reserves are part of an igneous rock complex that is unique to this location. The processing plant allows the Montpelier facility to meet a wide variety of focused specifications on product composition from customers. As such, the Montpelier site services multiple end markets, such as glass, building products and recreation.

The Montpelier site maintains four different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Ottawa, Illinois

In accordance with subpart 1300 of Regulation S-K, we have determined that the Ottawa site is a material mining property. Therefore, a description of the Ottawa site and its operations can be found below. See "—Ottawa, IL."

Pacific, Missouri

We, through U.S. Silica Company, own and operate a silica sand mine and production facility near the town of Pacific, St. Louis County, Missouri. The mine and processing plant are located on 524 wholly owned acres, with full sub-surface mineral and water rights. No leases, royalties or other specific payments are associated with the property.

Our surface mines at the Pacific facility use natural gas and electricity to produce whole grain, ground and fine ground silica through a variety of mining methods, including hard rock and hydraulic mining. The reserves are part of the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. The processing plant allows the Pacific facility to meet a wide variety of focused specifications on product composition from customers. As such, the Pacific site services multiple end markets, such as glass, foundry, fillers and extenders and oil and gas proppants.

The Pacific site maintains nine different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Popcorn, Nevada

EPM operates a stand-alone, satellite perlite mine located 18 miles south of the town of Fallon, Churchill County, Nevada. The mine is located on 196.27 acres of leased federal BLM land, and is comprised of 10 lode mineral claims. The mineral claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $1,650.

There are no buildings or facilities on this mine site. The only equipment is an owned service front-end loader that is used to muck from blasted ore stockpiles and to load over-the-road haul trucks. The mine operates seasonally (typically for only 30-days per year) in order to build ore stockpiles for shipping. The average annual mine production from the Popcorn mine is around 10,000 stockpile cubic yards.

The raw perlite ore is trucked as needed throughout the year to the Lovelock processing plant, some 80 miles away. At the Lovelock processing plant, the perlite ore is crushed, sized and passed through a flash dryer. At this point, it is either loaded into railcars for shipment to the Blair, Nebraska facility or it is further processed at the Lovelock plant.

The Popcorn mine maintains three different operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Rockwood, Michigan

We, through U.S. Silica Company, own and operate a silica sand production facility within the city of Rockwood, Wayne County, Michigan. The site is comprised of two land parcels, totaling 872 wholly owned acres with full sub-surface mineral and water rights. One land parcel hosts the processing plant; the other land parcel is a drill-proven, undeveloped future mining reserve. No leases, royalties or other specific payments are associated with the Rockwood property.

Our Rockwood facility uses natural gas and electricity to produce whole grain silica. Rockwood's own surface mining reserves are part of the Sylvania Formation and are notable for their low iron content, making them particularly valuable to customers producing specialty glass for architectural or alternative energy applications. Currently, sandstone ore is purchased from a local construction material company from that company's surface mining operation. The processing plant allows the Rockwood facility to meet a wide variety of focused specifications on product composition from customers. As such, the Rockwood site services multiple end markets, such as glass, building products, oil and gas proppants and chemicals.

The Rockwood facility maintains five operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Sanders, Arizona

EPM operates a calcium bentonite clay mine near the town of Sanders, Apache County, Arizona. There is no clay processing plant at Sanders, just an open pit mine. The mine property consists of some 10,240 acres comprised of private lands leased from Newmont Realty Company. The lease is based on a royalty structure, with an advanced annual royalty of $20,000 and a production royalty of $0.72/ton of dry clay or $1.01/ton of overburden sand (both of which are deducted from the royalty advance). Sand from the site is sold to a third-party, Silica Services. The royalty unit values are annually adjusted based on the Consumer Price Index ("CPI"). No additional fees are associated with the property as Silica Services manages transportation logistics and associated fees with BLM and the Navajo Indian Nation.

Mine operations include two open pits, and a seasonal mechanized bench mining strategy is employed. Overburden waste is mined and removed to access the bentonite clay ore horizon during the wet, winter months. The ore is typically mined and stockpiled in the dry summer periods so that the clay has minimal interaction with water. Mining is completed by a third-party contractor.

Due to the Sanders mine's location on tribal lands within the Navajo Indian Nation's Reservation, there are no permits required from any regulatory authority for mining. Regardless, our operation still abides by the requirements captured in the Company's Corporate Environmental Management Plan.

Sequoya, Nevada

The Sequoya, Nevada property is an advanced greenfield DE exploration property in Churchill County, Nevada. It is strategically located along a major highway only seven miles northwest of our Fernley, Nevada Plant and 34 miles southeast from our Lovelock, Nevada processing plant. The site is accessible by exploration and gravel roads that connect back to the I-80 exit at Jessup. EPM owns 42 placer claims that cover 840 acres of public land. The mineral claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $6,930.

There are no buildings or facilities on site, only a couple of open surface test puts where a bulk samples had been obtained for plant process testing.

The site is currently permitted only for exploration and is in full compliance. No operating permits are required since the site is not developed for operations.

Siskiyou, California

The Siskiyou, California site is a greenfield DE exploration property in Siskiyou County, California and it is located approximately 23 miles south of Klamath Falls, Oregon. EPM controls 152 placer claims (146 owned, 6 leased) that cover some 2,240 acres of public land. The owned claims are renewed with the BLM on an annual basis at a cost of $165/claim, with a total annual cost of $24,090. The leased claims are renewed annually at a cost of $7,920.

The property is comprised mostly of undeveloped, high-plains ranch lands with suitable access for exploration drilling provided by pre-existing ranch roads. There are no buildings or facilities on this exploration property.

The site is currently permitted only for exploration and is in full compliance. No operating permits are required since the site is not developed for operations.

Sparta, Wisconsin

We, through U.S. Silica Company, own and operate a silica sand dredge mine and production facility within the town of Sparta, Monroe County, Wisconsin. The site is comprised of 614 wholly owned acres, with full sub-surface mineral and water rights. No leases, royalties or other specific payments are associated with the Sparta site.

Our facility at Sparta uses natural gas and electricity to produce whole grain silica products. The reserve geology is that of high purity alluvial sands, with the primary erosional source being the Wonewoc Formation, known for its round, coarse grains and superior crush strength properties, which makes it an ideal substrate for oil and gas proppants. We mine sand through dredging, where the sand is extracted from the ground with water without the use of any chemicals. The sand is then transported as slurry via pipeline to the processing facility where it is sorted and dried in a no-emissions manner with vibratory screens that use gravity and clean-burning natural gas dryers.

The Sparta site maintains seven operating permits. The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Vale, Oregon

EPM owns and operates a DE mine and processing plant near the town of Vale, Malheur County, Oregon. The processing plant is on 300 owned acres located seven miles southwest of Vale. The Vale mine is located 50 miles southwest of Vale, near Juntura, Oregon. The mine consists of some 12,640 acres of land that is a combination of private, state and federal lands. There are 1,680 acres of private land, 1,280 acres of Oregon state land, 8,080 acres (186 mineral claims) of BLM land and 1,600 acres of land patented under the Stock Raising Homestead Act (“SRHA”) with private surface estate and federal mineral estate (320 acres of which are owned by EPM). Annual lease and royalty payments are made to the Diatomite Products Company ($15,000 minimum plus $10.60/ton sold), the State of Oregon ($10,000 minimum plus $3.16/ton sold) and the federal government of the United States ($165/claim fee). The royalty unit values are adjusted annually based on the CPI.

Our Vale open pit, ramp and bench mine uses mechanical, hard-rock mining methods to extract the DE ore strata. The DE ore strata are part of the Miocene-aged, Juntura Formation. At the processing plant, two kilns can produce calcined and flux-calcined DE for use as filter aids, functional additives and low iron brewing grades of filter aids. It has an annual capacity of approximately 120,000 tons and uses DE ore from the open-pit celatom mine, natural gas, electricity and soda ash.

The Vale site maintains eight operating permits (four plant and four mine). The site also complies with other state and federal regulations that do not require a specific permit. All required permits are secured, and the site is operating in full compliance.

Summary of Annual Production

The table below shows annual mined volumes (in thousands) at our mining properties for the fiscal years ended December 31, 2021, 2020 and 2019:

Mine / Location	Product Type	Tons Mined 2021	Tons Mined 2020	Tons Mined 2019
Berkeley Springs, WV	Silica Sand	301	275	285
Blair, NE(1)	Perlite	—	—	—
Clark, NV	Diatomaceous Earth	63	68	100
Columbia, SC	Silica Sand	398	346	462
Crane County, TX	Silica Sand	3,263	697	2,370
Dubberly, LA	Silica Sand	138	106	106
Fernley, NV	Diatomaceous Earth	67	46	90
Festus, MO	Silica Sand	1,567	1,290	868
Hazen, NV	Diatomaceous Earth	9	11	21
Hurtsboro, AL	Silica Sand	196	125	138
Jackson, MS	Bentonite Clay	84	74	54
Jackson, TN(2)	Silica Sand	—	—	—
Lamesa, TX	Silica Sand	4,692	3,271	4,774
Lovelock/Colado, NV(3)	Diatomaceous Earth	166	151	144
Mapleton Depot, PA	Silica Sand	308	265	315
Mauricetown, NJ	Silica Sand	166	155	152
Middleton, TN	Bentonite Clay	198	216	326
Mill Creek, OK	Silica Sand	1,544	1,235	2,045
Millen, GA(4)	Silica Sand	—	—	—
Montpelier, VA	Aplite	163	196	169
Ottawa, IL	Silica Sand	2,967	1,953	3,720
Pacific, MO	Silica Sand	942	922	874
Popcorn, NV(5)	Perlite	—	9	—
Rockwood, MI(6)	Silica Sand	—	—	—
Sanders, AZ	Bentonite Clay	14	13	8
Sequoya, NV(7)	Diatomaceous Earth	—	—	—
Siskiyou, CA(8)	Diatomaceous Earth	—	—	—
Sparta, WI(9)	Silica Sand	2,025	—	2,162
Vale, OR	Diatomaceous Earth	117	105	99

(1) Blair, NE is a perlite processing plant. There are no tons mined on site.
(2) Jackson, TN purchases raw sand from a third party. There are no tons mined on site.
(3) Includes the Colado processing plant.
(4) Millen, GA is a silica sand processing plant. There are no tons mined on site.
(5) Popcorn, NV mining is campaigned every two to three years. Raw ore is processed at Blair, NE and/or Lovelock/Colado, NV processing plant.
(6) Rockwood, MI purchases raw sand from a third party. There are no tons mined on site.
(7) Sequoya, NV is an advanced greenfield exploration property. No mining besides a small (~300 tons) bulk sample has been completed on this site.
(8) Siskiyou, CA is a greenfield exploration property. To date, no tons have been mined on site.
(9) Sparta, WI was idled in 2020.

Summary of Mineral Resources and Reserves

As used in this Amendment, the terms “mineral resource,” “measured mineral resource,” “indicated mineral resource,” “inferred mineral resource,” “mineral reserve,” “proven mineral reserve” and “probable mineral reserve” are defined and used in accordance with subpart 1300 of Regulation S-K.

Except for that portion of mineral resources classified as mineral reserves, mineral resources do not have demonstrated economic value. Inferred mineral resources are estimates based on limited geological evidence and sampling and have a too high of a degree of uncertainty as to their existence to apply relevant technical and economic factors likely to influence the prospects of economic extraction in a manner useful for evaluation of economic viability. Estimates of inferred mineral resources may not be converted to a mineral reserve. It cannot be assumed that all or any part of an inferred mineral resource will ever be upgraded to a higher category. A significant amount of exploration must be completed in order to determine whether an inferred mineral resource may be upgraded to a higher category. Therefore, no assumption can be made that all or any part of an inferred mineral resource exists, that it can be the basis of an economically viable project, or that it will ever be upgraded to a higher category. Likewise, there can be no assurances that all or any part of measured or indicated mineral resources will ever be converted to mineral reserves.

The estimates of proven and probable reserves at our three material mining properties in this Amendment have been prepared by the qualified persons referred to herein, and in accordance with the technical definitions established by the SEC under subpart 1300 of Regulation S-K:

- Proven mineral reserves are the economically mineable part of a measured mineral resource and can only result from conversion of a measured mineral resource.
- Probable mineral reserves are the economically mineable part of an indicated and, in some cases, a measured mineral resource.

Our mineral reserve estimates were prepared by our employees and have a basis in geologic block modeling conducted in-house using our SURPACTM mine design software. Our mineral reserve estimates and Westward Environmental, Inc.’s (“Westward”) reserve audit studies are based on many factors, but most importantly, all recoverable ore must have a mining plan and the mining area must be covered by a valid operating permit. Other site specific mine design criteria such as geotechnical slope stabilities in rock or unconsolidated overburden; waste-to-ore stripping ratios; safety catch bench designs; pit haul road access; pit dewatering sumps and ultimate pit floor elevations; tailings ponds and waste rock dump designs; infrastructure set-backs (roads, electrical lines, gas lines, property boundaries, etc.); reclamation plans; and any buffers needed to protect environmental features such as navigable waters or wetlands. For a description of risks relating to our estimates of mineral reserves, see Item 1A. Risk Factors of the Original Filing.

In accordance with subpart 1300 of Regulation S-K, management engaged Westward as the qualified person to prepare technical report summaries for the disclosure of mineral resources and reserves at our three material mining properties: Lamesa, TX, Ottawa, IL and Lovelock/Colado, NV.

Set forth in the tables below are our estimates as of December 31, 2021 of measured, indicated and inferred resources (exclusive of proven and probable reserves) and proven and probable reserves. Certain figures in the tables, discussions and notes have been rounded. Additionally, amounts may not foot as each figure is rounded independently.

The reference point for the mineral resources and reserves is in situ material.

Summary Mineral Resources for the fiscal year ended December 31, 2021(1)

	Measured Mineral Resources	Indicated Mineral Resources	Measured + Indicated Mineral Resources	Inferred Mineral Resources
Silica Sand(2)				
United States				
Berkeley Springs, WV	—	—	—	7,950,000
Columbia, SC	—	—	—	3,666,000
Crane, TX	—	—	—	27,300,000
Dubberly, LA	—	—	—	1,959,000
Festus, MO	—	—	—	—
Hurtsboro, AL	—	—	—	—
Jackson, TN(3)	—	—	—	—
Lamesa, TX	—	—	—	—
Mapleton Depot, PA	—	—	—	—
Mauricetown, NJ	—	—	—	4,000,000
Mill Creek, OK	—	—	—	16,361,000
Millen, GA(4)	—	—	—	—
Ottawa, IL	—	—	—	—
Pacific, MO	—	—	—	—
Rockwood, MI(5)	—	—	—	—
Sparta, WI	—	—	—	13,500,000
Total Silica Sand	**—**	**—**	**—**	**74,736,000**
Diatomaceous Earth(6)				
United States				
Clark, NV	—	—	—	1,258,000
Fernley, NV	—	—	—	4,727,000
Hazen, NV	—	—	—	—
Lovelock/Colado, NV(7)	—	—	—	—
Sequoya, NV	—	—	—	1,978,000
Siskiyou, CA	—	—	—	3,656,000
Vale, OR	—	—	—	19,780,000
Total Diatomaceous Earth	**—**	**—**	**—**	**31,398,000**
Bentonite Clay(8)				
United States				
Jackson, MS	—	—	—	—
Middleton, TN	—	—	—	11,806,000
Sanders, AZ	—	—	—	—
Total Bentonite Clay	**—**	**—**	**—**	**11,806,000**
Perlite(8)				
United States				
Blair, NE(9)	—	—	—	—
Popcorn, NV	—	—	—	—
Total Perlite	—	—	—	—

Table of Contents

	Measured Mineral Resources	Indicated Mineral Resources	Measured + Indicated Mineral Resources	Inferred Mineral Resources
Aplite[8]				
United States				
Montpelier, VA	—	—	—	—
Total Aplite	—	—	—	—

(1) Item 1303(b)(3)(ii) of Regulation S-K requires disclosure of mineral resources to be exclusive of mineral reserves. Unless otherwise noted, properties with no resources reported represent a 100% conversion of currently known geologic resources to mineable ore reserves.
(2) Mineral resources are based on the 2021 average price of $38 per ton of silica sand.
(3) Jackson, TN purchases raw sand from a third party.
(4) Millen, GA is a silica sand processing plant. There are no tons mined on site.
(5) Rockwood, MI purchases raw sand from a third party.
(6) Mineral resources are based on the 2021 average price of $560 per ton of DE.
(7) Includes the Colado processing plant.
(8) Mineral resources are based on the 2021 average price of $259 per ton of other minerals. Other minerals include bentonite clay, perlite and aplite.
(9) Blair, NE is a perlite processing plant. There are no tons mined on site.

Table of Contents

Summary Mineral Reserves for the fiscal year ended December 31, 2021

	Proven Mineral Reserves (tons)[1]	Probable Mineral Reserves (tons)[1]	Total Mineral Reserves (tons)[1]
Silica Sand[2]			
United States			
Berkeley Springs, WV	7,822,000	—	7,822,000
Columbia, SC	7,260,000	1,556,000	8,816,000
Crane, TX	116,408,000	47,500,000	163,908,000
Dubberly, LA	3,949,000	—	3,949,000
Festus, MO	12,594,000	7,411,000	20,005,000
Hurtsboro, AL	689,000	92,000	782,000
Jackson, TN[3]	—	—	—
Lamesa, TX[4]	85,678,000	6,800,000	92,478,000
Mapleton Depot, PA	1,102,000	2,100,000	3,202,000
Mauricetown, NJ	11,082,000	—	11,082,000
Mill Creek, OK	14,908,000	—	14,908,000
Millen, GA[5]	—	—	—
Ottawa, IL[6]	66,926,671	33,002,024	99,928,695
Pacific, MO	10,436,000	7,994,000	18,430,000
Rockwood, MI[7]	7,600,000	—	7,600,000
Sparta, WI	18,742,000	2,740,000	21,482,000
Total Silica Sand	**365,199,000**	**109,196,000**	**474,394,000**
Diatomaceous Earth[8]			
United States			
Clark, NV	1,711,000	1,799,000	3,510,000
Fernley, NV	1,085,000	4,776,000	5,861,000
Hazen, NV	342,000	84,000	426,000
Lovelock/Colado, NV[9]	1,100,000	3,361,000	4,461,000
Sequoya, NV	111,000	755,000	866,000
Siskiyou, CA[10]	—	—	—
Vale, OR	16,357,000	27,420,000	43,777,000
Total Diatomaceous Earth	**20,706,000**	**38,195,000**	**58,901,000**
Bentonite Clay[11]			
United States			
Jackson, MS	—	1,147,000	1,147,000
Middleton, TN	2,608,000	12,949,000	15,557,000
Sanders, AZ	—	584,000	584,000
Total Bentonite Clay	**2,608,000**	**14,680,000**	**17,288,000**
Perlite[11]			
United States			
Blair, NE[12]	—	—	—
Popcorn, NV	4,331,000	1,790,000	6,121,000
Total Perlite	**4,331,000**	**1,790,000**	**6,121,000**

Table of Contents

	Proven Mineral Reserves (tons)(1)	Probable Mineral Reserves (tons)(1)	Total Mineral Reserves (tons)(1)
Aplite(11)			
United States			
Montpelier, VA	—	12,245,000	12,245,000
Total Aplite	—	**12,245,000**	**12,245,000**

(1) Ore reserves are stated as "mineable" reserves (after mining losses) and prior to plant processing recovery and sales.
(2) Unless otherwise stated, mineral reserves are based on the 2021 average price of $38 per ton of silica sand.
(3) Jackson, TN purchases raw sand from a third party. There are no tons mined on site.
(4) Pricing data based on 2021 sales data for whole grain silica sand of $18 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of mine.
(5) Millen, GA is a silica sand processing plant. There are no tons mined on site.
(6) Pricing data based on 2021 sales data for whole grain silica of $29.30 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of the mine.
(7) Rockwood, MI purchases raw sand from a third party.
(8) Unless otherwise stated, mineral reserves are based on the 2021 average price of $560 per ton of DE.
(9) Includes the Colado processing plant. Pricing data based on 2021 sales data for DE of $566 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of the mine.
(10) Siskiyou, CA is a greenfield exploration property. As such, there are no mineral reserves to report.
(11) Mineral reserves are based on the 2021 average price of $259 per ton of other minerals. Other minerals include bentonite clay, perlite and aplite.
(12) Blair, NE is a perlite processing plant. There are no tons mined on site.

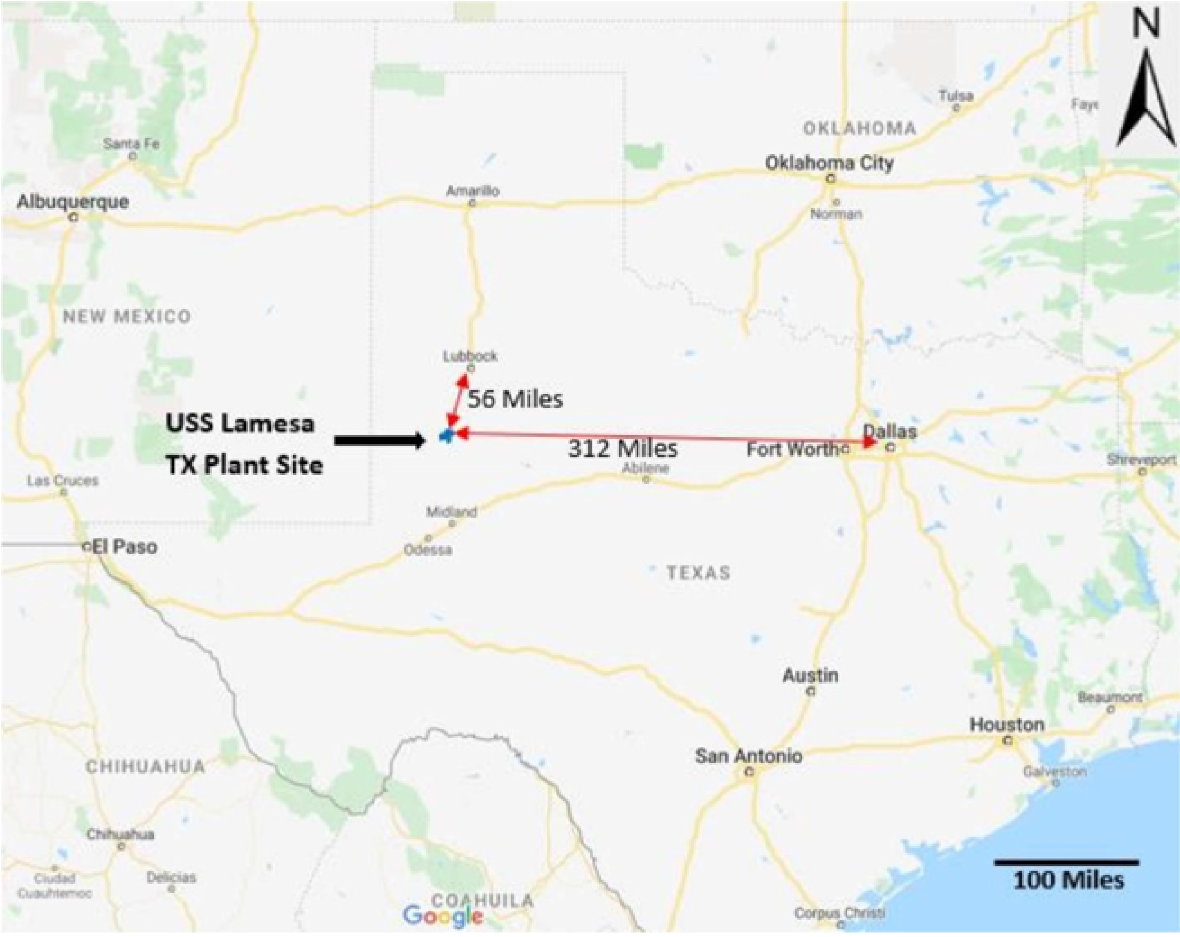
MATERIAL SITE DESCRIPTIONS

Lamesa, TX

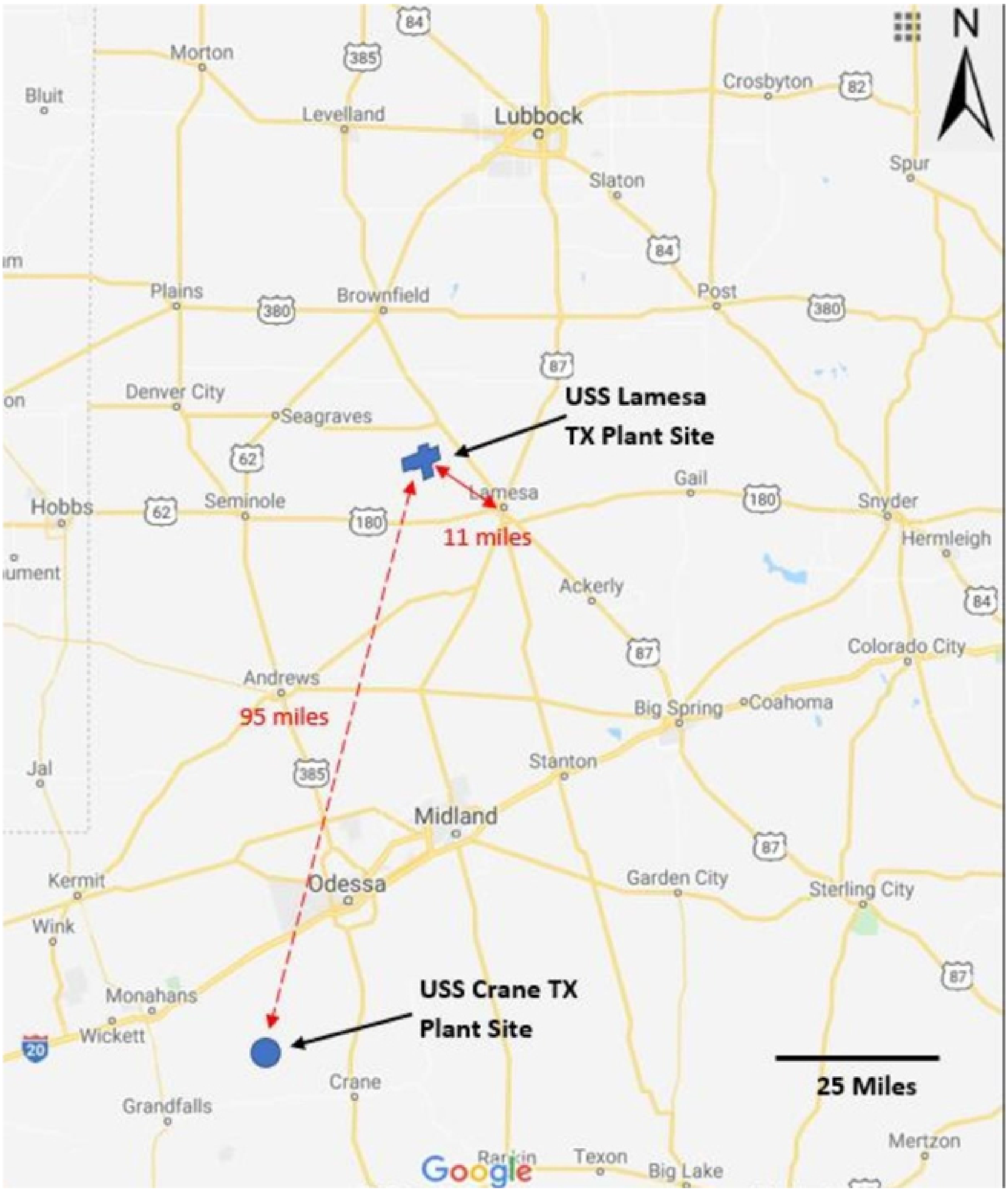
We purchased approximately 3,500 acres of ranch land in July 2017, on which the Lamesa site was built and became operational during the third quarter of 2018. The site primarily produces a range of API/ISO certified silica sand grades. In 2017, we purchased both the land and mineral rights to the Lamesa site. As such, there are no leases, no royalties or other associated payments specific to the mine.

The Lamesa site is a fully-automated, state-of-the-art facility with a wet plant, intermediate stockpile, dry plant, screening plant and loadout. The facility uses natural gas and electricity to produce whole grain silica through surface mining methods. The reserves at Lamesa contain windblown dune sand lying above ancient dunes of clayey sand, all quaternary in age. The facility is located in Dawson County, approximately 312 miles west of Dallas, Texas, 57 miles north of Midland, Texas, 56 miles south of Lubbock, Texas, approximately 95 miles from our Crane plant site and approximately 11 miles northwest of Lamesa. U.S. Route 87 runs through Lamesa and directly leads north to Lubbock and south to Midland. The front gate entrance to the mine is located at coordinates 32.806256, -102.126062.

The following image is a general location map of the Lamesa site:



The following image is a location map of the Lamesa site:



The site is accessible by roads maintained as private roads as well as by county and state roads. The Lamesa site is connected to the local electrical and natural gas distribution systems. Lamesa has four on-site water wells and contracts in place with third parties which cover the life of the mine and provide for adequate access to processing water. The site has offices holding administrative, engineering and operations staff. Additionally, there are several buildings that house the plant maintenance and support facilities.

At Lamesa, we mine silica sand from a deposit that is made up of two identifiable units. The first is classified as "Eolian dune sands" (13 to 46 ft. thick) and the second is a "Clayey Cover Sand" (0 to 25 ft. thick). They are part of a large regional geologic unit covering northwest Texas and northeast New Mexico. Eolian dune sand is a known source of silica sands, which are recognized geologic units not only in Texas but also in Utah, along the shore of Lake Michigan, the shores of British Columbia and the Northwest Territories.

The ore deposit at the Lamesa site sits at the surface, making it very amenable to open pit, mechanized mining methods utilizing heavy mobile mining equipment. At the mine, the unconsolidated sand is extracted directly from the open pit wall / mining face by front-end loader or by excavator and loaded into 40-ton or 60-ton articulated haul trucks. A fleet of haul trucks then delivers the mined sand ore to the processing plant.

At the processing plant, raw sand is sent through a static grizzly deck and vibratory dry scalping screen to remove any coarse debris. The sand and other material that passes the dry scalping screen is conveyed to the wet processing plant, where it is washed, creating a sand slurry. The underflow sand slurry then passes through a series of de-sliming cyclones and attrition scrubber cells that remove any free interstitial clays and grain-coating clays. The de-slimed sand slurry is then de-watered by another series of cyclones and de-water screens as it is conveyed to the drain pad stockpile. Once on the drain pad, gravity helps to naturally drain. This damp sand is then conveyed into one of the dry processing plant's three rotary dryers. The dry sand that is discharged from the rotary dryer is then conveyed up to the dry sizing tower feed bin. From here, the sand is split between a series of eight multi-deck, Rotex-brand mineral separators. These units mechanically screen out any oversize waste from the good sand, which is then screen-sized into finished API grade 40/70 and 100-Mesh products. The finished products are then directed to the designated product silos for dry storage until shipped by truck.

We are the first landowner to mine silica at the Lamesa site. Since purchasing the Lamesa property in 2017, we have invested funds to increase the efficiency and expand the capacity of the Lamesa site. All buildings were constructed in 2018. We contract for the loading and hauling portion of the operations at Lamesa. No U.S. Silica equipment is currently dedicated to the mine operations. Similarly, we primarily use leased mobile equipment in the processing plant. We believe that the Lamesa site and its operating equipment are maintained in good working condition. The total net book value of the Lamesa site's real property and fixed assets as of December 31, 2021 was $164.0 million.

Due to the presence of pre-existing oil production infrastructure on the property, the land is subject to easements for roads, storage areas, pipelines, power lines and pump jack stations. A 100-ft. wide, "no mining" buffer is in place around the property boundary and there are several "no mining" buffer zones around pump jacks, pipelines and power lines on the property. The sand that lies within these buffer zones and "no mining" pillars was excluded from the Lamesa ore reserve calculation.

The Lamesa site is primarily environmentally regulated by Texas Commission on Environmental Quality (the "TCEQ"). However, the State of Texas does not require a mining permit to extract material. The Lamesa site has secured and is operating in compliance with all required licenses, registrations and permits.

A summary of Lamesa's silica sand mineral reserves as of December 31, 2021 is shown below. Based on information provided, collected and reviewed by the qualified person, the resources as determined by the qualified person in Section 11.0 of the Lamesa TRS 100% convert to mineable ore reserves. For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Lamesa TRS.

Lamesa, TX—Summary of Mineral Reserves

Reserve Area	December 31, 2021 Amount(1)(2)(3)	December 31, 2020 Amount(1)(2)(3)	Amount Change 2021 vs. 2020	Percent Change 2021 vs. 2020
Proven Reserves				
Total Proven Reserves	85,678,000	88,750,000	(3,072,000)	(3)%
Probable Reserves				
Total Probable Reserves	6,800,000	6,800,000	—	— %
Total Reserves				
Total Reserves(4)	92,478,000	95,550,000	(3,072,000)	(3)%

(1) Ore reserves are stated as "mineable" reserves (after mining losses) and prior to plant processing recovery and sales. Lamesa's mine recovery rate is 90% and process recovery rate is 85%, resulting in an overall site recovery of 77%.

(2) Only one commodity (silica sand) is mined, processed and sold. The end use can result in multiple products based on customer need. Silica sand is sold by the ton, regardless of product type and no "average grade" applies to the mineable reserve.

(3) Pricing data based on 2021 sales data for silica sand of $18 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of mine.

(4) Based on the lateral geologic continuity of Lamesa's sand dune deposits, Proven Ore is defined within 1/4-mile radius of a drill hole. Probable ore extends out to 1/2-mile radius from a drill hole. No P+P ore is considered outside the "dune line" where dunes are absent.

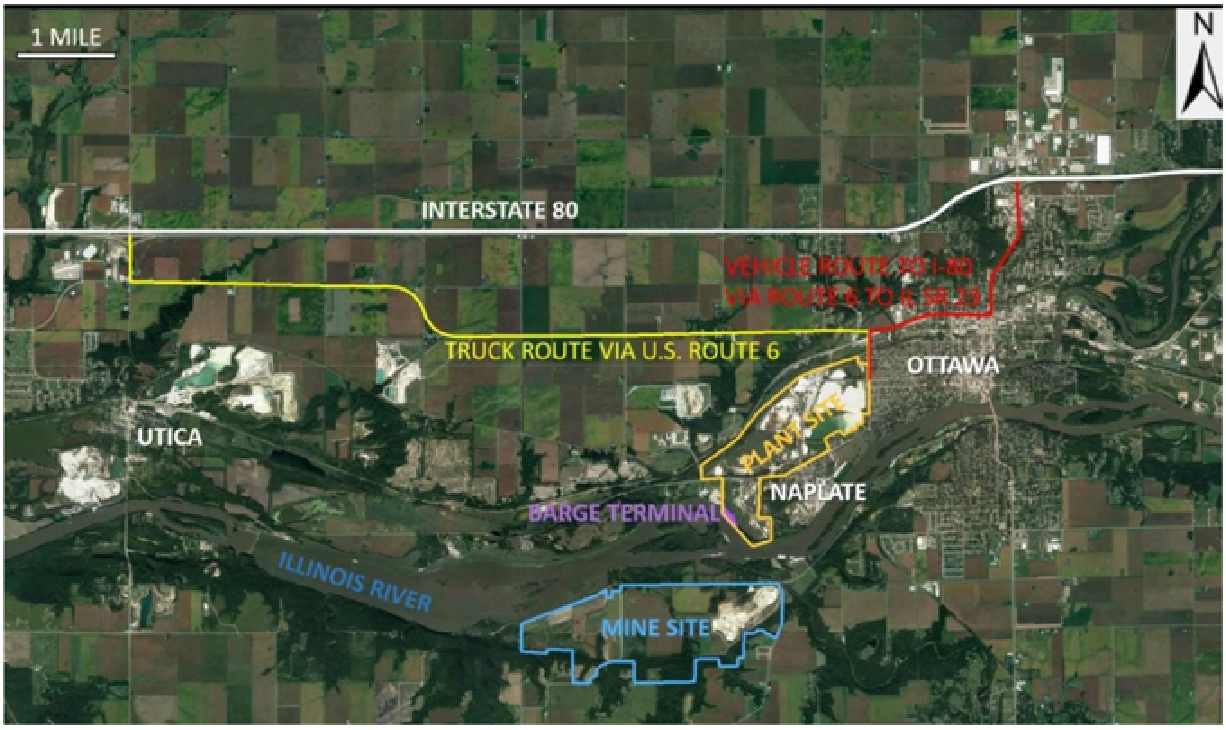
The decrease from 2021 to 2020 is attributed to depletion by mining of approximately 4.7 million tons and some net positive adjustments due to block model changes and ore reserve re-calculations at December 31, 2021.

Key assumptions and parameters relating to the mineral resources and reserves at the Lamesa site are discussed in Sections 11.0 and 12.0, respectively, of the Lamesa TRS. Only material that can be economically, safely and legally extracted is contained in these ore reserve estimates. Other key assumptions include the lateral geologic continuity of the mineable dune sand ore strata; ore block model construction criteria; mine design elements (stable pit slope geometries, mining bench height, pit floor limitations, pit dewatering, etc.); infrastructure setbacks (from property boundaries, power, natural gas, and water utility lines, oil well infrastructure; and ore quality.

Ottawa, IL

Our surface mines in Ottawa produce a variety of silica products through different mining methods, including hard rock mining, mechanical mining and hydraulic mining. The reserves belong to the St. Peter Sandstone Formation that stretches north-south from Minnesota to Missouri and east-west from Illinois to Nebraska and South Dakota. The Ottawa site is in LaSalle County, approximately 75 miles southwest of Chicago, IL and approximately 60 miles northeast of Peoria, IL. The site is accessible by major highways including U.S. Interstate 80. The plant entrance is located at coordinates 41.346512, -88.865274.

The following image is a location map of the Ottawa site:



The Ottawa site includes approximately 2,100 acres that we own outright. The North Ottawa site and former mine site covers 890 acres, the South Ottawa mine includes 900 acres, and the former Mississippi Sands tract is 310 acres. We purchased both the land and mineral rights at Ottawa. As such, there are no leases, no royalties or other associated payments specific to the mine.

The site is accessible by roads maintained by the city, county and state as well as by two railroads. Our Ottawa site has an extensive rail-car loading, storage and handling facility. Additionally, we have access to a privately-owned barge terminal that leases property from us. The Ottawa site is connected to the local electrical and natural gas distribution systems. Potable water is provided to the plant location by the City of Ottawa's public water system. Additionally, we have a private well at the mine site. The site has offices holding administrative, engineering and operations staff. In addition, there are several buildings that house the processing facilities plant maintenance and support facilities.

We acquired the Ottawa site in 1987 by merger with the Ottawa Silica Company, which historically used the property to produce whole grain and ground silica for customers in industrial and specialty products end markets. Since acquiring the facility, we renovated and upgraded its production capabilities to enable it to produce multiple products through various processing methods, including washing, hydraulic sizing, grinding, screening and blending. These production techniques allow the Ottawa site to meet a wide variety of focused specifications on product composition from customers. As such, the Ottawa site services multiple end markets, such as glass, building products, foundry, fillers and extenders, chemicals and oil and gas proppants. In November 2009, we expanded the silica sand capacity by 500,000 tons. During the fourth quarter of 2011, we completed a follow-on expansion project that added an additional 900,000 tons of silica sand capacity. None of Ottawa's mining equipment is more than 15 years old. We believe that the Ottawa facility and its operating equipment are maintained in good working condition. The total net book value of the Ottawa facility's real property and fixed assets as of December 31, 2021 was $77.5 million.

We mine silica sand from an open pit located approximately two and one-half miles southeast of the processing facility. The mineable material comes exclusively from the St. Peter Sandstone Formation. The current mineable property, the South Ottawa Pit, is situated south of the Illinois River. We use a hybrid combination of mechanical and hydraulic mining methods.

The first step in the mining process is the removal of the alluvial cover material, or "overburden," from the sandstone layer. This is completed by a third-party contractor who uses a tracked excavator and articulated haul trucks. Next, blast holes are drilled into the sandstone and charged with a blasting agent. A front-end loader loads the sand into articulated haul trucks that carry the sand to a stockpile located on the pit floor. A bulldozer pushes sand from the stockpile to a high-pressure water cannon, or "monitor," that uses recycled water from the plant. The water stream breaks up larger chunks of sand and creates a sand-water slurry that flows to a pump. The pump transfers the slurry to the processing plant.

At the processing plant, the sand slurry is fed to a washer that removes some of the ultrafines, which are pumped to tailings. From the washer, the slurry is pumped to hydrosizers that separate the sand into coarse and fine particle size fractions. From this point forward, the two streams are processed in dedicated, parallel circuits. Both streams are wet screened to remove oversized material, which is pumped to an abandoned pit. The screened sand is then thickened and dewatered by vacuum filter belts before being fed to the four fluidized bed dryers. Dried fine sand from the dryers reports to a sizing system where screening units sort the sand by grain size and store it in dedicated bins. A system of blending conveyors then produce sands, which are then loaded into bulk railcars or trucks or bagged for specific end-use markets. Separate streams from the sizing operation feed the fine sand plant and grinding mills.

The fine sand processing plant was built in the 1950's and consists of a screening system and sixteen product bins. The bagging processing plant is automated and includes a warehouse for packaged product. Truck loading was upgraded in 1998. Whole grain products are shipped primarily to the foundry, glass and hydraulic fracturing industries. The milling processing plant was commissioned in the 1940's. Whole grain sand is pulverized in dry ball mills using ceramic grinding balls to minimize product contamination. The mill discharge is air-classified, and the product is transported to storage bins for bulk loading or packaging. The oversize grains are rejected by the classifiers and return to the mill feed for re-grinding in a closed loop.

The land is subject to easements for roads. A minimum of a 100-ft. wide, "no mining" buffer was designed to be left in place around both sides of a county road that separates the South Ottawa properties. The sand that lies within these areas was excluded from the Ottawa ore reserve calculation.

To operate active mining operations on the property, the Illinois Department of Natural Resources, Department of Mines and Minerals required an approved Land Reclamation Plan. Additional restrictions on the use of lands are included in other permits that are required by various Illinois state agencies to operate the mine and plant. The Ottawa site has secured necessary permits and is operating in compliance with all required licenses, registrations and permits.

A summary of Ottawa's silica sand mineral reserves as of December 31, 2021 is shown below. Based on information provided, collected and reviewed by the qualified persons, the resources as determined by the qualified persons in Section 11.0 of the Ottawa TRS 100% convert to mineable ore reserves. For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Ottawa TRS.

Ottawa, IL—Summary of Mineral Reserves

Reserve Area	December 31, 2021 Amount(1)(2)(3)	December 31, 2020 Amount(1)(2)	Amount Change 2021 vs. 2020	Percent Change 2021 vs. 2020
Proven Reserves				
Total Proven Reserves	66,926,671	91,172,000	(24,245,329)	(27)%
Probable Reserves				
Total Probable Reserves	33,002,024	26,932,000	6,070,024	23%
Total Reserves				
Total Reserves(4)	99,928,695	118,104,000	(18,175,305)	(15)%

(1) Ore reserves are stated as "mineable" reserves (after mining losses) and prior to plant processing recovery and sales. Ottawa's mine recovery rate is 90% and process recovery rate is 85%, resulting in an overall site recovery of 77%.

(2) Only one commodity (silica sand) is mined, processed and sold. The end use can result in multiple products based on customer need. Silica sand is sold by the ton, regardless of product type and no "average grade" applies to the mineable reserve.

(3) Pricing data based on 2021 sales data for silica sand of $29.30 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of mine.

(4) The St. Peter Sandstone occurs as a massive, thick sandstone stratum that is well defined geologically and well understood from historical mining. As such, "reasonable" drill hole spacing in conjunction with mine exposures are used to define Proven Ore. Probable Ore has a more widely spaced drill pattern in the same geologically continuous strata but absent of any mine development exposure.

The decrease from 2021 to 2020 is attributed to depletion by mining of approximately 3.0 million tons and a verified, material downward adjustment of approximately 15.2 million tons resulting from changes in the resource model indicated by Westward's independent re-calculations of the Proven and Probable reserves based on our methods.

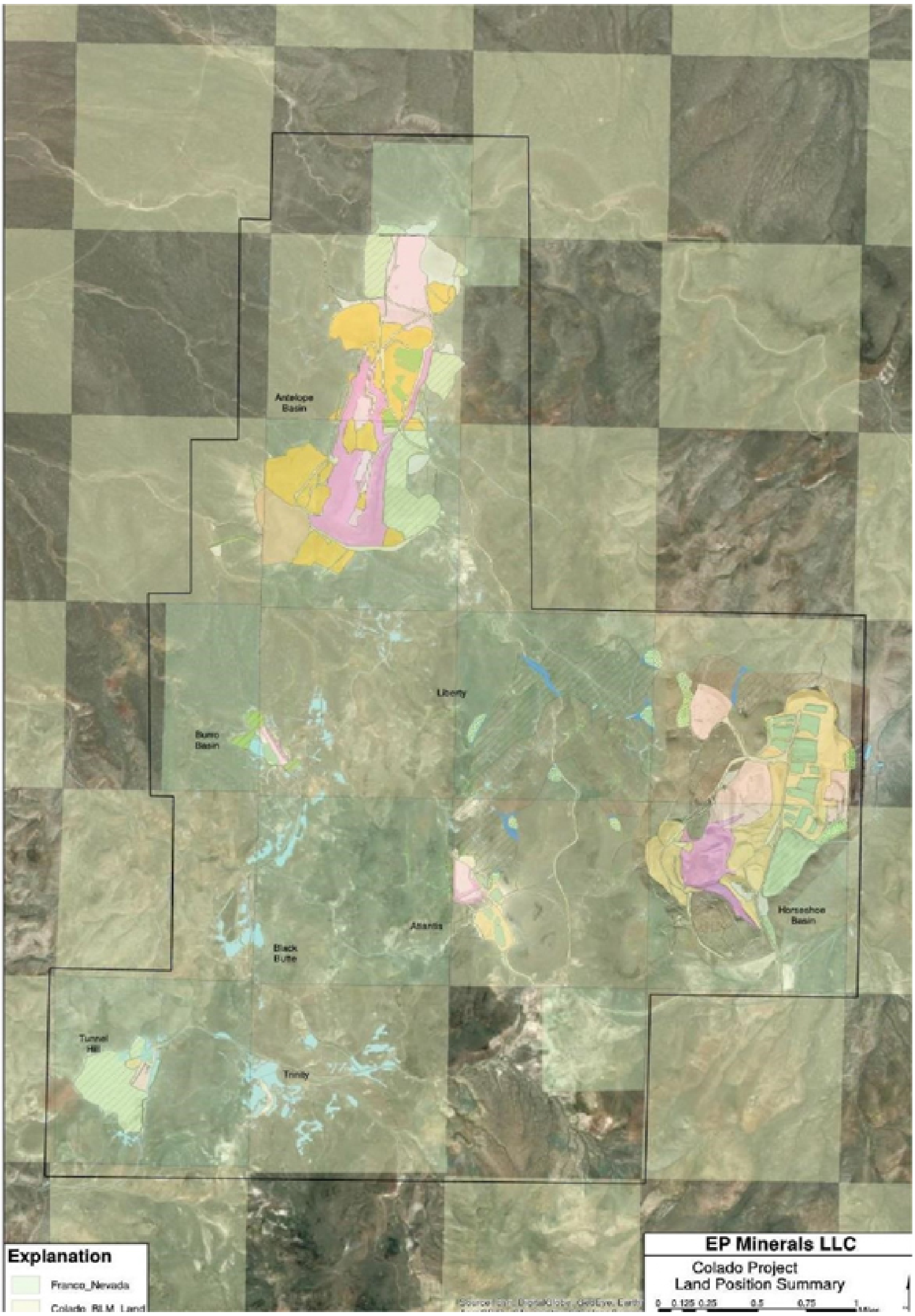
Key assumptions and parameters relating to the mineral resources and reserves at the Ottawa site are discussed in Sections 11.0 and 12.0, respectively, of the Ottawa TRS. Only material that can be economically, safely and legally extracted is contained in these ore reserve estimates. Other key assumptions include the lateral geologic continuity of the ubiquitous St. Peter Sandstone ore strata; ore block model construction criteria; mine design elements (stable pit slope geometries, mining bench height, ground control, pit dewatering, etc.); infrastructure setbacks (from property boundaries, power, natural gas, and other utility lines); and ore quality.

Lovelock/Colado, NV

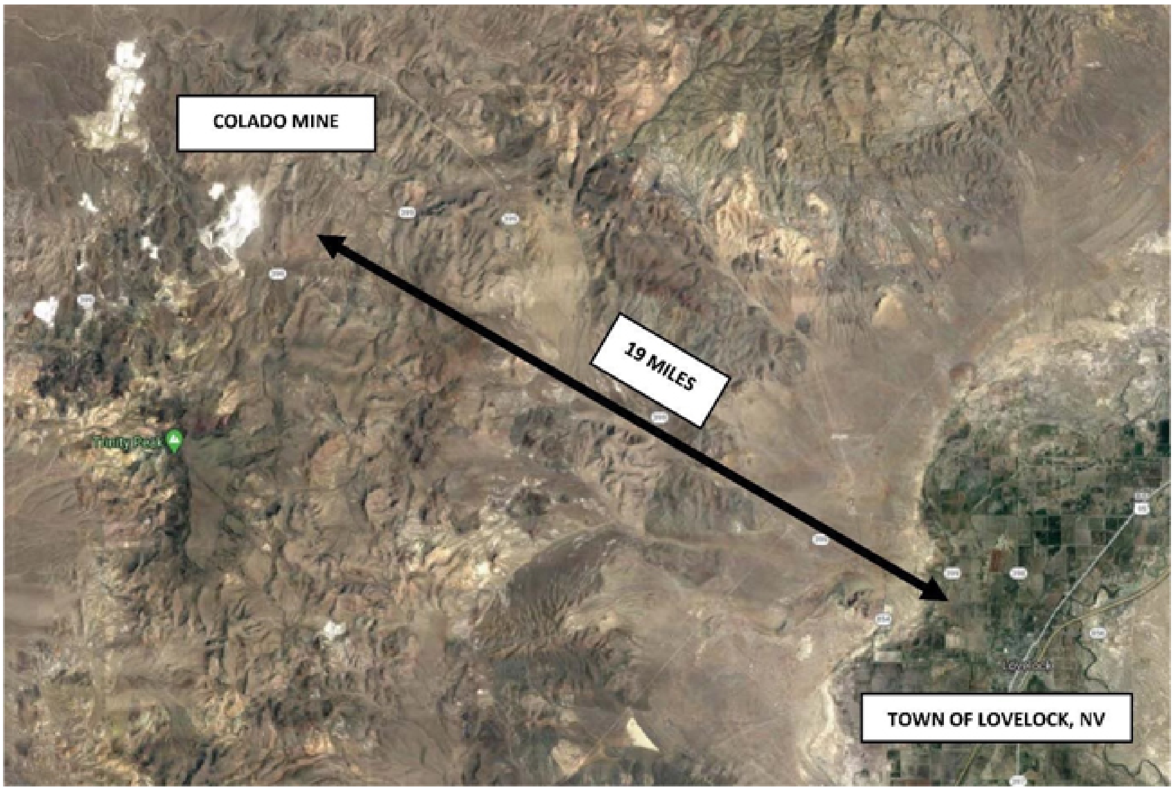
The Colado site, northeast of Lovelock, Nevada, is a DE processing operation owned and operated by EP Minerals, LLC, our indirect subsidiary. The site uses DE ore from the open pit Colado mine, soda ash, natural gas and electricity to manufacture multiple products used as filtration media across many industries including brewing, corn wet milling, oil and gas, wineries, potable water swimming pools and petrochemicals. The site is currently in the production phase although there is concurrent exploration in order to replace and expand the reserve base.

The Colado mine is located about 19 miles northwest of the town of Lovelock, NV, in west central Pershing County. The mine is accessible by a paved road, the 7 Troughs Rd. (CR 399). Due to the mine site's remote location, there is no official address associated with it. The front entrance to Colado is located at coordinates 40.274948, -118.727916. The Colado processing plant is located about 7 miles northeast of Lovelock, NV. The plant address is 150 Coal Canyon Rd, Lovelock, NV 89419.

The following image is a location map of the Colado mine:



The following image is a location map of the Colado mine relative to the processing plant in Lovelock, NV:



The Colado site consists of approximately 10,798+/-acres that is a combination of private, state and federal lands as follows: approximately 3,773 acres of owned private land and private leased land and approximately 7,025 acres of leased federal land (administered in tandem by the Bureau of Land Management in Winnemucca, NV and Nevada Division of Environmental Protection in Carson City, NV).

We hold land leases with the Franco-Nevada U.S. Corporation and the federal government of the United States. The land lease with Franco-Nevada is for 3,719 acres and is renewed annually. Additionally, we hold 176 mineral claims on federal, Bureau of Land Management land. Of the 176 mineral claims, 146 are active and classified as placer claims. Mineral claims are renewed on an annual basis. The Franco-Nevada U.S. Corporation leases are based on a royalty-type structure that considers the tons of product sold during the lease period and how material used for the product tons sold was mined from each lease area. The leases also include a minimum annual amount to ensure a minimum annual payment to the landowners. The royalty unit values are adjusted based on the Consumer Price Index, a statistical index that is calculated and published annually by the U.S. Bureau of Labor Statistics. As for the federal land lease, the Bureau of Land Management publishes a mining claim fees schedule on an annual basis.

The Colado site is remote with few improved roads and installed mine-related infrastructure. The site is accessible by roads maintained as private roads and by state roads. Energy is provided primarily by diesel powered equipment. Water requirements are primarily for dust suppression which is supplied by a municipal water source that is trucked by tanker to the Colado mine. The only onsite buildings are a maintenance shelter used to service the mine equipment and a small portable office. The existing infrastructure is adequate for current production levels and for the ramp-up of operations to full capacity.

The Colado site was initially commissioned in 1959. We acquired Colado in connection with the completion of the acquisition of EP Minerals, LLC in May 2018. Significant exploration had been undertaken by EPM (and affiliates) prior to our acquisition of the property in 2018. Despite Colado's long history, none of the site's mining equipment is more than 50 years old. We believe that the Colado's facility and its operating equipment are maintained in good working condition. The total net book value of Colado's real property and fixed assets as of December 31, 2021 was $25.3 million. The total net book value for the mine excludes the reserves because during purchase accounting we did not allocate the reserves by mine and they are included at the corporate level.

The Colado mine utilizes conventional open pit mining methods, averaging approximately 600,000 cubic yards of stockpiled DE production yearly. The quantities of overburden and interburden waste are backfilled into the pit as a part of the mine reclamation plan. The raw ore is delivered by truck to the Colado processing plant northeast of Lovelock, approximately 19 miles away.

At the plant, ore is fed into a crusher, where the ore is appropriately sized. The ore is fed into feed silos and then introduced into a flash dryer. There the ore is heated and pneumatically transferred through the wet end of the process. Grit or heavy particles are classified and separated from the process as waste (about 10% of material), while all other material continues through the process. The classified ore is fed to a variable-speed natural gas rotary kiln, where it is processed up to temperatures of 2,000 degrees Fahrenheit. Depending on the final product to be made, soda ash can be added to the kiln, in a process called flux-calcining. The final product from the kiln is then fed to a series of classifiers to further sort the product into different size ranges. Material that is oversized is fed to a hammer mill to be grinded, and then to be re-processed; material that is undersized is sent to the fine filler circuit, and everything else is sent to corresponding bins for the last step, packaging and shipping.

No significant encumbrances exist at the mine site. State and federal permits are required to mine the DE and operate the processing plant. Surface disturbance is permitted as needed in accordance with state regulations. Major modifications to the permit are made as needed. We submitted a major modification application during 2021 to address unpermitted disturbance, reclamation of erosion areas and proposed expansions for continued DE mining operations. We expect final approval of this application during 2022, however, its pending status does not negatively impact current mine operations.

A summary of Colado's DE mineral reserves as of December 31, 2021 is shown below. Based on information provided, collected and reviewed by the qualified persons, the resources as determined by the qualified persons in Section 11.0 of the Colado TRS 100% convert to mineable ore reserves. For more information on our resources and reserves, please refer to Sections 11.0 and 12.0 of the Colado TRS.

Table of Contents

Lovelock, NV—Summary of Mineral Reserves

Reserve Area	December 31, 2021 Amount(1)(2)(3)	December 31, 2020 Amount(1)(2)	Amount Change 2021 vs. 2020	Percent Change 2021 vs. 2020
Proven Reserves				
Total Proven Reserves	1,100,000	2,396,000	(1,296,000)	(54)%
Probable Reserves				
Total Probable Reserves(4)	3,361,000	2,298,000	1,063,000	46%
Total Reserves				
Total Reserves(5)	4,461,000	4,694,000	(233,000)	(5)%

(1) Ore reserves are stated as "mineable" reserves (after mining losses) and prior to plant processing recovery and sales. Colado's mine recovery rate is 85% and process recovery rate is 80%, resulting in an overall site recovery of 68%.

(2) Only one commodity, DE, is mined, processed and sold. The end use can result in multiple products based on customer need. DE is sold by the ton, regardless of product type and no "average grade" applies to the mineable reserve due to the distinctive chemical and physical characteristics needed in each product.

(3) Pricing data based on 2021 sales data for DE is $566 per ton. Sales prices are projected to increase at 2% per annum thereafter for the life of mine.

(4) The DE ore at Colado occurs as layered, basin-controlled, lacustrine sedimentary deposits interbedded with volcanic ash deposits. As such, tighter drill hole spacings are required to delineate ore reserves. Proven Ore is defined by drill hole spacings of less than 200-ft. and containing at least 5-ore intercepts. Probable Ore is defined by drill hole spacing of less than 400-ft. and containing at least 3-ore intercepts.

(5) Only ore blocks with P+P reserves greater than 100,000 tons were considered material and are contained in this reserve estimate. P+P reserve blocks not meeting this tonnage threshold are not included in this estimate.

The decrease from 2021 to 2020 is primarily attributed to the exclusion of all small (less than 100,000 tons) non-material Proven and Probable ore blocks.

Key assumptions and parameters relating to the mineral resources and reserves at Colado are discussed in Sections 11.0 and 12.0, respectively, of the Colado TRS. Among them are assumptions with respect to geologic continuity of the ore; specific chemical and physical characteristics of the DE deposits; mine design criteria defining safe, efficient and "mineable" geometries (stable pit designs, mining bench height, ground control, economic overburden stripping ratios, haul road design, pit floor design, waste mining and backfill requirements; and ore stockpile management).

Internal Controls Disclosure

The modeling and analysis of our reserves has been developed by our personnel, audited by Westward and reviewed by several levels of internal management. This section summarizes the internal control considerations for our development of estimations, including assumptions, used in resource and reserve analysis and modeling.

When determining resources and reserves, as well as the differences between resources and reserves, management developed specific criteria, each of which must be met to qualify as a resource or reserve, respectively. These criteria, such as demonstration of economic viability, repeatable geologic continuity and meeting generally accepted quality specifications, are specific and attainable. Westward and our management agree on the reasonableness of the criteria for the purposes of estimating resources and reserves. Calculations using these criteria are reviewed by Westward. For all these sites, Westward's team took a 2-step approach to validate our reserve calculation process: 1) Data Verification—whereby all available exploration, geology and assay data inputs to the block model were independently verified, and 2) Process Verification—whereby an independent geological block model was created using only the verified inputs, standard design criteria and mining method assumptions to verify the total reserve. All calculations were conducted independently by Westward, then compared to our internal numbers and found to be within acceptable variance.

Estimations and assumptions were developed independently for each material mineral location. All estimates require a combination of historical data, key assumptions and parameters. When possible, resources and data from generally accepted industry sources, such as governmental resource agencies, were used to develop these estimations.

Geographical modeling and mine planning efforts serve as a base assumption for reserve estimates at each location. These outputs have been prepared by both our personnel and third-party consultants, and the methodology is compared to industry best practices. Mine planning decisions, such as mining bench height, execution of mining processes and ground control, are determined and agreed upon by our management. Management adjusts forward-looking models by reference to historic mining results, including reviewing performance versus predicted levels of production from the mineral deposit, and if necessary, re-evaluating mining methodologies if production outcomes were not realized as predicted. Ongoing mining and interrogation of the mineral deposit, coupled with product quality validation pursuant to industry best practices and customer expectations, provides further empirical evidence as to the homogeneity, continuity and characteristics of the mineral resource. Ongoing quality validation of production also provides a means to monitor for any potential changes in ore-body quality.

Management also assesses risks inherent in mineral resource and reserve estimates, such as the accuracy of geological data that is used to support mine planning, identify hazards and inform operations of the presence of mineable deposits. Also, management is aware of risks associated with potential gaps in assessing the completeness of mineral extraction licenses, entitlements or rights, or changes in laws or regulations that could directly impact the ability to assess mineral resources and reserves or impact production levels. Risks inherent in overestimated reserves can impact financial performance when revealed, such as changes in amortization that are based on life of mine estimates. Quarterly, and as part of our SOX compliance guidelines, a review meeting is held with senior leadership from operations, finance, mine planning and environmental to review the overall ore reserve changes and any potential impacts to our site asset retirement obligations or site financial metrics.

A detailed description of the methodology used to calculate mineral reserves is provided in the TRSs filed as exhibits to this Amendment.

PART II

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2021. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Our management concluded at the time of the Original Filing that our disclosure controls and procedures were effective as of December 31, 2021. Solely as a result of the changes we had to make to our mining disclosures as described elsewhere in this Amendment, our Chief Executive Officer and Chief Financial Officer have re-performed an evaluation and have concluded that the Company's disclosure controls and procedures were not effective as of December 31, 2021. Because the omitted disclosures do not affect our financial statements, there is no change to our conclusion of the effectiveness of our internal control over financial reporting as of December 31, 2021 set forth in the Original Filing.

Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable, and not absolute, assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

Management's Annual Report on Internal Control over Financial Reporting

Our management, under the direction of our Chief Executive Officer and Chief Financial Officer, is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Exchange Act Rule 13a-15(f).

Our system of internal control over financial reporting is designed to provide reasonable assurance to our management and Board of Directors regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles in the United States of America.

Our management conducted an evaluation of the effectiveness of our internal control over financial reporting using the framework in 2013 *Internal Control-Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). As noted in the COSO framework, an internal control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance to management and the Board of Directors regarding achievement of an entity's financial reporting objectives. Based upon the evaluation under this framework, management concluded that our internal control over financial reporting was effective as of December 31, 2021.

Our independent registered public accounting firm has audited the effectiveness of our internal control over financial reporting as of December 31, 2021, as stated in its report below.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting identified in management's evaluation pursuant to Rules 13a-15(d) or 15d-15(d) of the Exchange Act during the quarter ended December 31, 2021 that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Shareholders
U.S. Silica Holdings, Inc.

Opinion on internal control over financial reporting

We have audited the internal control over financial reporting of U.S. Silica Holdings, Inc. (a Delaware corporation) and subsidiaries (the "Company") as of December 31, 2021, based on criteria established in the 2013 *Internal Control-Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on criteria established in the 2013 *Internal Control-Integrated Framework* issued by COSO.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated financial statements of the Company as of and for the year ended December 31, 2021, and our report dated February 25, 2022 expressed an unqualified opinion on those financial statements.

Basis for opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and limitations of internal control over financial reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that: (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ GRANT THORNTON LLP

Houston, Texas
February 25, 2022

Table of Contents

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

The following exhibits are filed with this Amendment.

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
2.1#	Agreement and Plan of Merger, dated as of March 22, 2018, by and among EP Acquisition Parent, Inc. US Silica Company, Tranquility Acquisition Corp., EPMC Parent LLC, as the Stockholders' Representative, and solely for the purposes of Section 11.17, Golden Gate Private Equity, Inc.	10-Q	001-35416	2.1	April 24, 2018
3.1	Third Amended and Restated Certificate of Incorporation of U.S. Silica Holdings, Inc., effective May 4, 2017.	8-K	001-35416	3.1	May 10, 2017
3.2	Third Amended and Restated Bylaws of U.S. Silica Holdings, Inc., effective May 4, 2017.	8-K	001-35416	3.2	May 10, 2017
4.1	Specimen Common Stock Certificate.	S-1/A	333-175636	4.1	December 7, 2011
4.2	Description of the Registrant's Securities Registered Pursuant to Section 12 of the Exchange Act	10-K	001-35416	4.2	February 25, 2020
10.1+	Third Amended and Restated 2011 Incentive Compensation Plan.	8-K	001-35416	10.1	May 14, 2021
10.2+	Form of Nonqualified Stock Option Agreement	S-1/A	333-175636	10.17	August 29, 2011
10.3+	Form of Indemnification Agreement.	S-1/A	333-175636	10.20	December 29, 2011
10.4+	Letter Agreement, dated as of December 27, 2011, by and between William J. Kacal and U.S. Silica Holdings, Inc.	S-1/A	333-175636	10.24	December 29, 2011
10.5+	Letter Agreement, dated April 27, 2012, by and between Peter Bernard and U.S. Silica Holdings, Inc.	8-K	001-35416	10.1	May 1, 2012
10.6+	Omnibus Amendment dated February 18, 2016 to Award Agreements.	8-K	001-35416	10.3	February 23, 2016
10.7+	Form of Nonqualified Stock Option Agreement.	10-K	001-35416	10.21	February 25, 2015
10.8+	Amendment dated February 18, 2016 to Employment Agreement by and between U.S. Silica Holdings, Inc. and Bryan Shinn.	8-K	001-35416	10.2	February 23, 2016
10.9+	Omnibus Amendment dated November 3, 2016 to Award Agreements.	10-K	001-35416	10.22	February 23, 2017
10.10+	Letter Agreement, effective August 15, 2017, by and between Diane Duren and U.S. Silica Holdings, Inc.	8-K	001-35416	10.1	August 18, 2017

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
10.11	Third Amended and Restated Credit Agreement, dated as of May 1, 2018, by and among U.S. Silica Holdings, Inc., through its subsidiaries, USS Holdings, Inc., as guarantor, and U.S. Silica Company, as borrower, and certain of U.S. Silica's subsidiaries as additional guarantors and BNP Paribas, as administrative agent and the lenders named therein.	8-K	001-35416	10.1	May 2, 2018
10.12	Consent and Amendment Agreement, dated as of August 23, 2019, among U.S. Silica Company and BNP Paribas, as administrative agent and the lenders named therein, amending that certain Third Amended and Restated Credit Agreement, dated as of May 1, 2018.	10-Q	001-35416	10.1	October 30, 2019
10.13+	Form of Performance Share Unit Agreement (Adjusted Cash Flow) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.1	May 1, 2019
10.14+	Form of Performance Share Unit Agreement (Relative TSR) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.2	May 1, 2019
10.15+	Form of Restricted Stock Agreement Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.3	May 1, 2019
10.16+	Form of Restricted Stock Unit Agreement, pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan.	10-Q	001-35416	10.1	May 1, 2020
10.17+	U.S. Silica Holdings, Inc. Amended and Restated Change in Control Severance Plan, as amended and restated April 29, 2020.	10-Q	001-35416	10.2	May 1, 2020
10.18+	Form of Performance Share Unit Agreement (Relative TSR) Pursuant to the Amended and Restated U.S. Silica Holdings, Inc. 2011 Incentive Compensation Plan	10-Q	001-35416	10.1	April 30, 2021
10.19+	Letter Agreement, effective September 21, 2021, by and between Sandra Rogers and U.S. Silica Holdings, Inc.	10-K	001-35416	10.19	February 25, 2022
21.1	List of subsidiaries of U.S. Silica Holdings, Inc.	10-K	001-35416	21.1	February 25, 2022
23.1*	Consent of Independent Registered Public Accounting Firm.				
23.2*	Consent of Qualified Person				
23.3*	Consent of Third Party Qualified Person				
23.4*	Consent of Third Party Qualified Person				
31.1*	Rule 13a-14(a)/15(d)-14(a) Certification by Bryan A. Shinn, Chief Executive Officer.				
31.2*	Rule 13a-14(a)/15(d)-14(a) Certification by Donald A. Merril, Chief Financial Officer.				

Exhibit Number	Description	Incorporated by Reference			
		Form	File No.	Exhibit	Filing Date
32.1	Section 1350 Certification by Bryan A. Shinn, Chief Executive Officer.	10-K	001-35416	32.1	February 25, 2022
32.2	Section 1350 Certification by Donald A. Merril, Chief Financial Officer.	10-K	001-35416	32.2	February 25, 2022
95.1	Mine Safety Disclosure.	10-K	001-35416	95.1	February 25, 2022
96.1*	Technical Report Summary, Ottawa Site, LaSalle County, Illinois				
96.2*	Technical Report Summary, Colado Site, Pershing County, Nevada				
96.3*	Technical Report Summary, Lamesa Site, Dawson County, Texas				
101	101.INS XBRL Instance—the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document	10-K	001-35416	101	February 25, 2022
	101.SCH XBRL Taxonomy Extension Schema				
	101.CAL XBRL Taxonomy Extension Calculation				
	101.LAB XBRL Taxonomy Extension Labels				
	101.PRE XBRL Taxonomy Extension Presentation				
	101.DEF XBRL Taxonomy Extension Definition				
104*	Cover Page Interactive Data File (embedded within the Inline XBRL document)				

Schedules have been omitted pursuant to Item 601(b)(2) of Regulation S-K. We will furnish the omitted schedules to the Securities and Exchange Commission upon request by the Commission.
+ Management contract or compensatory plan/arrangement
* Filed herewith

We will furnish to any of our stockholders a copy of any of the above exhibits upon the written request of such stockholder and the payment to U.S. Silica Holdings, Inc. of the reasonable expenses incurred in furnishing such copy or copies.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this Amendment to be signed on its behalf by the undersigned, thereunto duly authorized, this 21st day of October, 2022.

U.S. Silica Holdings, Inc.

By:	/s/ Bryan A. Shinn
Name:	Bryan A. Shinn
Title:	Chief Executive Officer
By:	/s/ Donald A. Merril
Name:	Donald A. Merril
Title:	Executive Vice President, Chief Financial Officer

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We have issued our report dated February 25, 2022, with respect to the consolidated financial statements and internal control over financial reporting included in the Annual Report of U.S. Silica Holdings, Inc. on Form 10-K for the year ended December 31, 2021, as amended by a Form 10-K/A to which this consent is an exhibit. We hereby consent to the incorporation by reference of said report in the Registration Statements of U.S. Silica Holdings, Inc. on Forms S-8 (333-179480, 333-204062, 333-238198, 333-256389 and 333-265119) and Form S-3ASR (333-258323).

/s/ Grant Thornton LLP

Houston, Texas
October 21, 2022

Exhibit 23.2

CONSENT OF QUALIFIED PERSON

I, Mr. Terrance N. Lackey, Mining Director at U.S. Silica Holdings, Inc., in connection with the annual report on Form 10-K for the fiscal year ended December 31, 2021 and any amendments or supplements and/or exhibits thereto (collectively, the "Form 10-K"), consent to:

☐ the filing and use of the technical report summaries titled "Technical Report Summary, Ottawa Mine, LaSalle County, Illinois," "Technical Report Summary, Colado Site, Pershing County, Nevada" and "Technical Report Summary, Lamesa Site, Lamesa, Dawson County, Texas," (collectively the "Technical Reports"), with an effective date of December 31, 2021, amended as of September 30, 2022, as a exhibits to and referenced in the Form 10-K;

☐ the use of and references to my name, including my status as an expert or "qualified person" (as defined in Subpart 1300 of Regulation S-K promulgated by the Securities and Exchange Commission), in connection with the Form 10-K and the Technical Reports; and

☐ the information derived, summarized, quoted or referenced from the Technical Reports, or portions thereof, that was prepared by me, that I supervised the preparation of and/or that was reviewed and approved by me, that is included or incorporated by reference in the Form 10-K.

I was responsible for authoring, and this consent pertains to, the following Sections of the Technical Reports:

1.0 Executive Summary
16.0 Market Studies and Contracts
18.0 Capital and Operating Costs
19.0 Economic Analysis

I also consent to the incorporation by reference in Registration Statements on Form S-8 (Nos. 333-265119, 333-256389, 333-238198, 333-204062, 333-179480) and Form S-3ASR (No.333-258323) of U.S. Silica Holdings, Inc. of the above items as included in the Form 10-K.

/s/ Terrance N. Lackey
Terrance N. Lackey
BSc. Eng, MSc. Eng
Mining Director
U.S. Silica Holdings, Inc.
SME Member # 04312151

Dated this October 21, 2022

Westward Environmental, Inc.
4 Shooting Club Road
Boerne, Texas, USA 78006

CONSENT OF THIRD-PARTY QUALIFIED PERSON

Westward Environmental, Inc. (“Westward”), in connection with the annual report on Form 10-K for the fiscal year ended December 31, 2021 and any amendments or supplements and/or exhibits thereto (collectively, the “Form 10-K”), consents to:

☐ the filing and use of the technical report summaries titled “Technical Report Summary, Ottawa Mine, LaSalle County, Illinois,” “Technical Report Summary, Colado Site, Pershing County, Nevada” and “Technical Report Summary, Lamesa Site, Lamesa, Dawson County, Texas,” (collectively the “Technical Reports”), with an effective date of December 31, 2021, amended as of September 30, 2022, as a exhibits to and referenced in the Form 10-K;

☐ the use of and references to our firm name, including our status as an expert or “qualified person” (as defined in Subpart 1300 of Regulation S-K promulgated by the Securities and Exchange Commission), in connection with the Form 10-K and the Technical Reports; and

☐ the information derived, summarized, quoted or referenced from the Technical Reports, or portions thereof, that was prepared by us, that we supervised the preparation of and/or that was reviewed and approved by us, that is included or incorporated by reference in the Form 10-K.

Westward was responsible for contributing to, and this consent pertains to, the following Sections of the Technical Reports:

1.0 Executive Summary
2.0 Introduction
3.0 Property Description
4.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography
5.0 History
6.0 Geologic Setting, Mineralization and Deposit
7.0 Exploration
8.0 Sample Preparation, Analyses and Security
9.0 Data Verification
10.0 Mineral Processing and Metallurgical Testing
11.0 Mineral Resource Estimates
12.0 Mineral Reserve Estimates
17.0 Environmental Studies, Permitting, Plans, Negotiations or Agreements with Local Individuals or Groups
20.0 Adjacent Properties

21.0 Other Relevant Data and Information
22.0 Interpretations and Conclusions
23.0 Recommendations
24.0 References
25.0 Reliance on Information Provided By The Registrant

Westward also consents to the incorporation by reference in Registration Statements on Form S-8 (Nos. 333-265119, 333-256389, 333-238198, 333-204062, 333-179480) and Form S-3ASR (No.333-258323) of U.S. Silica Holdings, Inc. of the above items as included in the Form 10-K.

Westward Environmental, Inc.

/s/ Thomas O. Mathews

Thomas O. Mathews, PG, REM
President
Westward Environmental, Inc., a Qualified Third-Party Firm

Dated this October 21, 2022

8050 Freedom Ave. NW
North Canton, Ohio 44720

CONSENT OF THIRD-PARTY QUALIFIED PERSON

Q4 Impact Group, LLC (“Q4”), in connection with the annual report on Form 10-K for the fiscal year ended December 31, 2021 and any amendments or supplements and/or exhibits thereto (collectively, the “Form 10-K”), consents to:

- ☐ the filing and use of the technical report summaries titled “Technical Report Summary, Ottawa Mine, LaSalle County, Illinois,” “Technical Report Summary, Colado Site, Pershing County, Nevada” and “Technical Report Summary, Lamesa Site, Lamesa, Dawson County, Texas,” (collectively the “Technical Reports”), with an effective date of December 31, 2021, amended as of September 30, 2022, as a exhibits to and referenced in the Form 10-K;
- ☐ the use of and references to our firm name, including our status as an expert or “qualified person” (as defined in Subpart 1300 of Regulation S-K promulgated by the Securities and Exchange Commission), in connection with the Form 10-K and the Technical Reports; and
- ☐ the information derived, summarized, quoted or referenced from the Technical Reports, or portions thereof, that was prepared by us, that we supervised the preparation of and/or that was reviewed and approved by us, that is included or incorporated by reference in the Form 10-K.

Q4 was responsible for contributing to, and this consent pertains to, the following Sections of the Technical Reports:

1.0 Executive Summary
13.0 Mining Methods
14.0 Processing and Recovery Methods
15.0 Infrastructure
21.0 Other Relevant Data and Information
22.0 Interpretations and Conclusions
23.0 Recommendations
24.0 References
25.0 Reliance on Information Provided By The Registrant

Q4 also consents to the incorporation by reference in Registration Statements on Form S-8 (Nos. 333-265119, 333-256389, 333-238198, 333-204062, 333-179480) and Form S-3ASR (No.333-258323) of U.S. Silica Holdings, Inc. of the above items as included in the Form 10-K.

Q4 Impact Group, LLC

/s/ Robert Archibald

Robert Archibald CEO
Q4 Impact Group, LLC a Qualified Third-Party Firm

Dated this October 21, 2022

Exhibit 31.1

CERTIFICATION

I, Bryan A. Shinn, certify that:

1. I have reviewed this Amendment No. 1 to the Annual Report on Form 10-K of U.S. Silica Holdings, Inc. (the "Company") for the year ended December 31, 2021;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions)):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: October 21, 2022

/s/ BRYAN A. SHINN
Name: Bryan A. Shinn
Title: Chief Executive Officer

Exhibit 31.2

CERTIFICATION

I, Donald A. Merril, certify that:

1. I have reviewed this Amendment No. 1 to the Annual Report on Form 10-K of U.S. Silica Holdings, Inc. (the "Company") for the year ended December 31, 2021;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions)):

    a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: October 21, 2022

/s/ DONALD A. MERRIL
Name: Donald A. Merril
Title: Executive Vice President and Chief Financial Officer

TECHNICAL REPORT SUMMARY

OTTAWA SITE
OTTAWA, LASALLE COUNTY, ILLINOIS

Submitted to: U.S. Silica Holdings, Inc.

Prepared By:

WESTWARD
Environmental. Engineering. Natural Resources.
Boerne, Texas
830-249-8284
Date: September 30, 2022
Project No. 10711-025-013
-ML-

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This Technical Report Summary ("Technical Report" or "TRS") updates the previously submitted Ottawa, Lasalle County, Illinois TRS included as Exhibit 96.1 to U.S. Silica Holdings, Inc's ("U.S. Silica") Form 10-K for Fiscal Year Ended December 31, 2021, filed with the U.S. Securities and Exchange Commission (the "SEC") on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by Westward Environmental, Inc. ("WESTWARD") and Q4 Impact Group ("Q4") who has conducted an audit of the proven and probable reserves at the Ottawa, Illinois mine (the "Ottawa Site") as of December 31, 2021. This audit was performed in conjunction with the U.S. Silica's Mine Engineering and Geology staff and was prepared in accordance with Subpart 1300 and Item 601(b)(96) of Regulation S-K promulgated by the SEC.

1.1 Background

The Ottawa Site is the company's largest blended operation, supplying various grades of silica sand to both the oil and gas and the industrial and specialty markets. The Ottawa quarrying and sand processing facilities are located approximately 75 miles southwest of Chicago in Ottawa Township, LaSalle County, Illinois. Silica sand is mined from the St. Peter Sandstone Formation which developed in the Ordovician age. The surface mine in Ottawa uses natural gas and electricity to produce whole grain and ground silica sand products through a variety of mining methods, including mechanical mining and hydraulic mining.

1.2 Product

The Ottawa Site produces a wide range of silica sand products that serve U.S. Silica's Oil and Gas, and Specialty Minerals business units. The Ottawa operation supplies high-silica sand into every major market segment including glassmaking, chemical, foundry, building products, American Society for Testing and Materials ("ASTM") testing sand, and the oil and gas sectors. This location's proppant sands consist of the sands commonly known as "Northern White," which is silica sand exhibiting higher crush strength grading from 20/40 to 100 mesh and micro proppants.

1.3 History of Acquisition

The Ottawa Silica Company was founded in March 1900 by Edmund B. Thornton. Mining commenced on the property west of the city of Ottawa shortly thereafter. By the 1920's, the company had taken over most of the silica production in the Ottawa area.

The Thornton family owned and operated the Ottawa Silica Company until 1986, expanding the plant, improving product quality, and acquiring additional reserves. In 1986, the Thornton family sold Ottawa Silica Company to Rio Tinto Zinc ("RTZ"), a large mining conglomerate based in London. In January 1987, RTZ formed U.S. Silica Company, merging the Ottawa Silica Company with Pennsylvania Glass Sand Company.[1]

1.4 Mineral Rights

Being wholly owned and possessing both land and mineral rights, there are no leases, no royalties, and no other associated payments specific to the Ottawa Site parcels.

1.5 Location

The Ottawa Site is in LaSalle County, approximately 75 miles southwest of Chicago, IL and approximately 60 miles northeast of Peoria, IL. The plant and mine are accessible by major highways including U.S. Interstate 80. (Figure 1.1). The Ottawa mine site is located on IL State Route 71 and is approximately 2.5 miles south southwest of the plant site. (Figure 1.2).

1 U.S. Silica Internal Report Dated December 31, 2021.

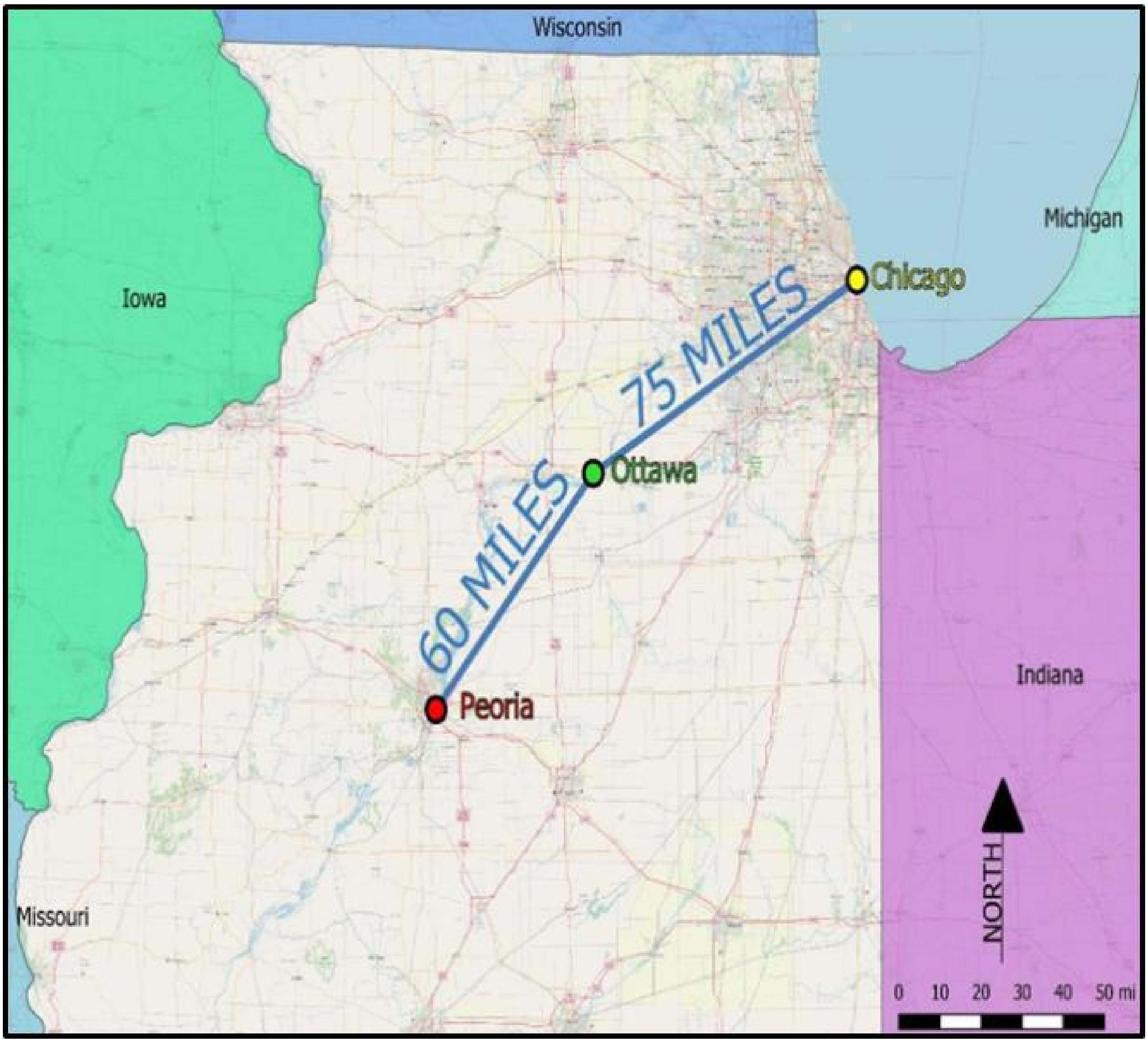


Figure 1.1 Regional map of Ottawa mine and plant location.

Figure 1.2 Ottawa Mine and Plant Site Map.

1.6 Geology

The sandstone deposit mined at the Ottawa Site is known as the St. Peter Sandstone. The formation is present at varying depths across the entire state of Illinois. The St. Peter Sandstone is generally described as a fine-grained, well-sorted, well-rounded, friable to weakly cemented, non-fossiliferous, nearly pure quartz sandstone, essentially free of clay, carbonates, and heavy minerals.

1.7 Exploration

Core drilling is conducted periodically to verify the presence, thickness, and quality of the sandstone formation. To date, 116 exploratory holes have been drilled on the South Ottawa and Mississippi Sands tracts (collectively known as the "South Ottawa Pit"). Core sections are logged noting the location (hole number), lithography (general rock type) and color.[2]

1.8 Testing

The cores are split and sampled for chemical contamination by x-ray fluorescence and particle size distribution using a U.S. Mesh standard sieve stack. This analysis is performed at the U.S. Silica Corporate Lab in Berkeley Springs, West Virginia. Half of the core is retained for future use.

1.9 Mineable Ore Estimate

Information used in the preparation of this mineable ore estimate includes data collected from drilling over 320 borings and available lab results. Of those total borings drilled, 116 were drilled on the South Ottawa Pit tracts. For more information on the modeling and methodology used in preparing the estimates listed below, please refer to Section 11.0 Mineral Resource Estimates and Section 12.0 Mineral Reserve Estimates.

2 U.S. Silica internal report dated December 31, 2021.

Table 1.1 shows the mineral resources at the Ottawa Site as of December 31, 2021. Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

Deposit Classification	In-Situ, Recoverable Ore Tons
Measured Resource	66,926,671
Indicated Resource	33,002,024
TOTAL	**99,928,695**

Table 1.1 U.S. Silica Recoverable Ore Resources.

Table 1.2 shows the mineral reserves at the Ottawa Site as of December 31, 2021.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	66,926,671
Probable Reserve	33,002,024
TOTAL	**99,928,695**

Table 1.2 U.S. Silica Recoverable Ore Reserves.

1.10 Mining Methods

The Ottawa Site mine is a silica sandstone mine which has been active for over 100 years. U.S. Silica mines a thickness of St. Peter Sandstone between 100 and 200 ft. by conventional surface mining methods. Overburden material is removed and placed back into the pit as part of the mine reclamation plan. Blasted St. Peter Sandstone is hauled to a location in the pit where it is further processed by hydraulic mining and mixed with water to produce a slurry product for pumping to the processing plant some two and a half miles to the northeast of the mine. The mine has the capacity to meet the full production requirements of the processing plant and currently produces approximately 4.0 M tons per year. Expansion of the pit is to the west with adjacent areas of similar lithology to the existing pit. Mining methods will remain the same in these expansion areas.

1.11 Processing and Recovery Methods

The processing plant receives a silica sand slurry pumped from the mine. The plant uses wet and dry processing methods to produce Oil and Gas products and Specialty minerals products. Finished goods are either whole grain silica products or ground silica products. Total demand and product mix varies relative to economic cycles of end users and the competitive environment. The Ottawa Site runs 365 days per year, and it operates 24 hours per day. The combined wet-plant and dry-plant has a capacity of 10.2 K tons per day. The Ottawa Site ships by rail, by barge and by truck bulk carrier and also produces a bagged product.

1.12 Infrastructure

The Ottawa Site has been operating in a generally mixed community of industrial and suburban geography. The infrastructure required for the ongoing operations is generally in place at Ottawa. Several infrastructure capital expenditures are required for replacement and expansion projects to maintain mining and processing capacity. The physical address of the Site is as follows:

U.S. Silica Company–Ottawa Site
701 Boyce Memorial Drive
Ottawa, Illinois 61350
Main Office: 1-(815) 434-0188

The mine and plant are accessible by roads maintained by the city, county and state as well as by two railroads. Road access is critical for the delivery of materials used in the production of finished goods and for shipment of finished goods to U.S. Silica customers. Similarly, the rail infrastructure is a critical component for the transportation of the finished goods from the Ottawa

Site. U.S. Silica has an extensive rail-car loading, storage, and handling facility at Ottawa. Additionally, the Ottawa Site has access to a privately-owned barge terminal that leases property from U.S. Silica for its operation.

The Ottawa Site has excellent access to reliable electric power and supplies of natural gas. Water is a critical component in both transporting and processing the silica sand. The Ottawa Site has an abundance of recycled slurry water and processing water available. Potable water is provided by a municipal supply. The Plant routinely discharges excess water through permitted National Pollutant Discharge Elimination System ("NPDES") locations.

Tailings handling and settling capacity is a critical element for long-term viability of the Ottawa Site. U.S. Silica utilizes a series of settling ponds to remove waste from the process water and must construct new pond facilities from time to time to store the waste that will be produced over life of the mine. Historically, the Ottawa Site has used mined-out portions of the property for the settling and storage of the waste produced. Additional areas are available for potential storage. Certain capital and expense projects are planned over the life of the mine to meet these needs.

1.13 Permitting

The Ottawa Site maintains several permits, licenses, and sets of rules that need to be approved and followed, most of which are set to be renewed on a five-year basis. As of the date of this report, the Ottawa Site operates under valid material permits.

1.14 Capital and Operating Costs

In 2020 and 2021 total operating costs were $53,662,000 and $47,635,000 and total capital costs were $2,182,000 and $1,441,000 respectively (Table 18-1). The higher than average capital spend in 2020 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

The Ottawa Site maintains a five-year capital forecast for planned capital expenditures to support current production. A summary of foreseen capital expenditures through 2026 is provided on Table 18-2. As shown on Table 18-2, total estimated capital expenditure through 2026 is $16,565,000. Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy.

2.0 INTRODUCTION

This Technical Report Summary updates the previously submitted Ottawa, Lasalle Country, Illinois TRS included as Exhibit 96.1 to U.S. Silica's Form 10-K for Fiscal Year Ended December 31, 2021, filed with the SEC on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by WESTWARD who has conducted an audit of the proven and probable reserves at the Ottawa Site as of December 31, 2021. This audit was performed in conjunction with U.S. Silica's Mine Engineering and Geology staff and was prepared in accordance with Subpart 1300 and Item 601(96) of Regulation S-K promulgated by the SEC. U.S. Silica common stock is traded on the New York Stock Exchange (the "NYSE") under the symbol "SLCA".

WESTWARD'S third-party reserves analysis (Section 11.0 and Section 12.0 of this report), completed on February 11, 2022, that is presented in this TRS was prepared for public disclosure by U.S. Silica in filings made with the SEC in accordance with the requirements set forth in the SEC rules and regulations. Any capitalized terns used herein, but not defined herein, shall have the meaning ascribed to such term in Item 1300 of Regulation S-K.

2.1 Sources of Information

Information used in the preparation of this report includes:

- Internal reports and records

- Third-party evaluation – JT Boyd Valuation Report, 2006
- Google Earth images and maps
- Core hole drilling and data analysis using various 3-D mine planning software packages
- "The White Cliffs of Ottawa", 2005, Illinois State Geology Survey
- Illinois State Geological Survey Fieldtrip Guidebook 1971 and 1972
- United States Geological Survey ("USGS") publications
- USGS Mineral Commodity Summary 2021
- St. Peter Sandstone Mineral Resource Evaluation, Missouri, USA, Justin G. Davis, Arizona Geological Survey Special Paper 9 Chapter #6, Proceedings of the 48th Annual Forum on the Geology of Industrial Minerals Scottsdale, Arizona | April 30—May 4, 2012
- U.S. Silica information published on the U.S. Silica website Tailings Deposition Comparison, Rev. 1, U.S. Silica Ottawa, 1/19/2017, Barr Engineering Co. study

2.2 Personal Inspections

Michelle M. Lee, PG (TX #6071, SME Registered Member #4130340RM) with WESTWARD performed a site visit to the Ottawa Site on May 28, 2021. During this site visit, the Plant Manager gave Ms. Lee a tour of pertinent parts of the mine including water wells, ponds, pit areas, reserve areas (historic and recent), and property perimeter. The main processing facility was also toured.

Rob Vogel (MMSA #01504QP) and Robert Archibald, PE (VA #0402023235, SME Registered Member #00082450RM) with Q4 visited the Ottawa Site on September 30, 2021. During this site visit, the Plant Manager gave Messrs. Vogel and Archibald a tour of the mine including water wells, ponds, pit areas, reserve areas (historic and recent), and property perimeter. The main processing facility and packing plant were also toured.

3.0 PROPERTY DESCRIPTION

3.1 Location

The Ottawa Site is located in LaSalle County, IL approximately 75 miles southwest of Chicago, IL and approximately 60 miles northeast of Peoria, IL. The Site is accessible by major highways including U.S. Interstate 80. (Figure 3.1). The mine site is located on Illinois State Route 71 and is approximately 2.5 miles south southwest of the Ottawa Site.

The Site is accessible by interstate, city, county and state roads as shown in Figure 3.1. The most direct route from the I-80 Ottawa/Dekalb (Exit 90) interchange is to proceed southbound approximately 3.7 miles on Illinois State Route 23 to Route 6. Turn onto U.S. Route 6 West and travel 1.3 miles before turning southbound on Boyce Memorial drive. Continue traveling 0.5 miles south on Boyce Memorial Drive and the plant entrance (coordinate 41.346512, -88.865274) will be on the west side of the road appearing to be a continuation of Madison Street to the east.

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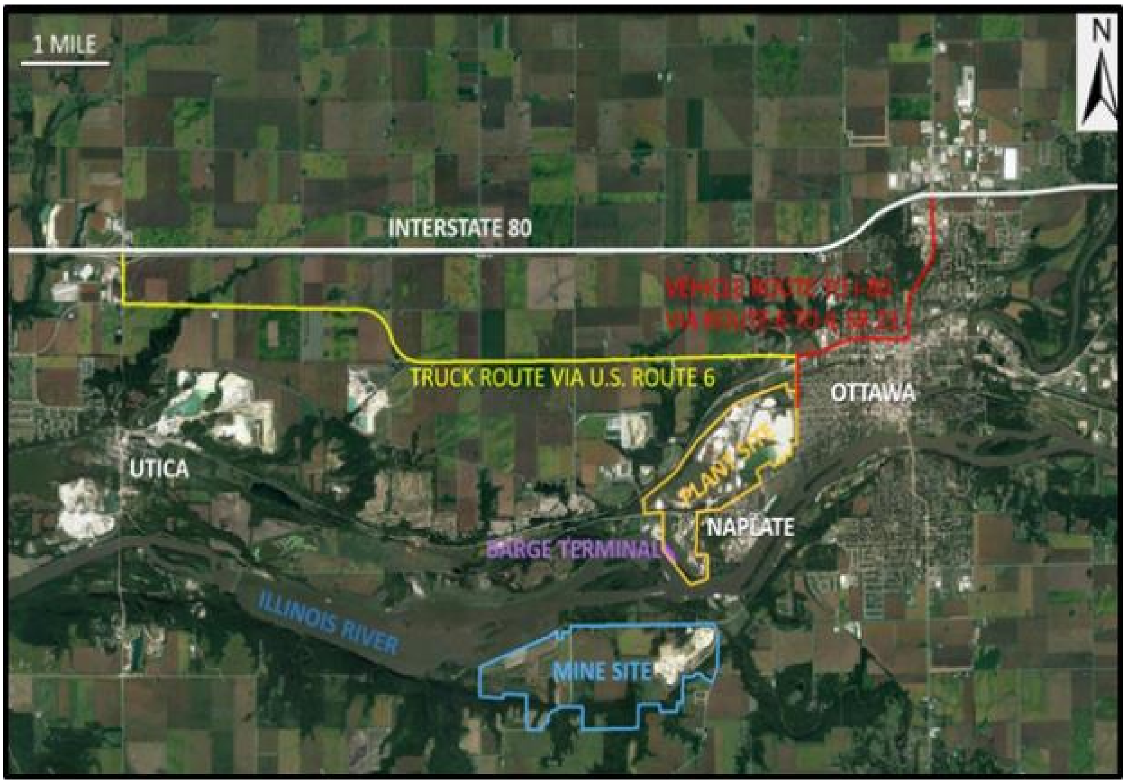

Figure 3.1 Location map of the Ottawa Site.

An alternate route is from the Interstate 80 Utica (Exit 81) interchange with Illinois Route 178. Turning onto Illinois 178 South proceed for 0.5 miles to the intersection with U.S. Route 6. Turn onto U.S. Route 6 East and continue for 7.8 miles to Boyce Memorial Drive. Turn South onto Boyce Memorial Drive and the plant entrance is on the west side of the road appearing to be a continuation of Madison Street to the east. This is shown as the truck route in yellow in Figure 3.1. The Ottawa Site is also served by rail and barge.

3.2 Area

The Ottawa Site includes approximately 2,100 acres that are owned outright by U.S. Silica or its consolidated subsidiaries. The North Ottawa Site and former mine site covers 890 acres, the South Ottawa mine includes 900 acres, and the Mississippi Sands tract is 310 acres.

3.3 Leases, Royalties and Mineral Rights

Being wholly owned and possessing both land and mineral rights, there are no leases, no royalties, and no other associated payments specific to the Ottawa, IL land parcels.

3.4 Encumbrances

To operate active mining operations on the property, the Illinois Department of Natural Resources, Department of Mines and Minerals requires an approved Land Reclamation Plan. Reclamation Permits consist of 15 parts that includes, but is not limited to, information such as Mining Operations Plans, Geological Information, Drainage Control, Streams & Wetlands, Fish and Wildlife, and Reclamation Plans.[3] Additional restrictions on the use of lands are included in other permits that are required by various Illinois State agencies to operate the mine and plant.

A minimum of a 100-ft. wide, “no mining” buffer was designed to be left in place around both sides of a county road that separates the South Ottawa properties. The sand that lies within these areas was excluded from the Ottawa ore reserve calculation. Wetlands or Navigable Waters of Illinois that are planned to not be mitigated or relocated, are designed with a 50-ft. wide “no disturbance” buffer along the perimeter. These buffer areas are shown in Figure 3.2.

[3] U.S. Silica Internal Report.

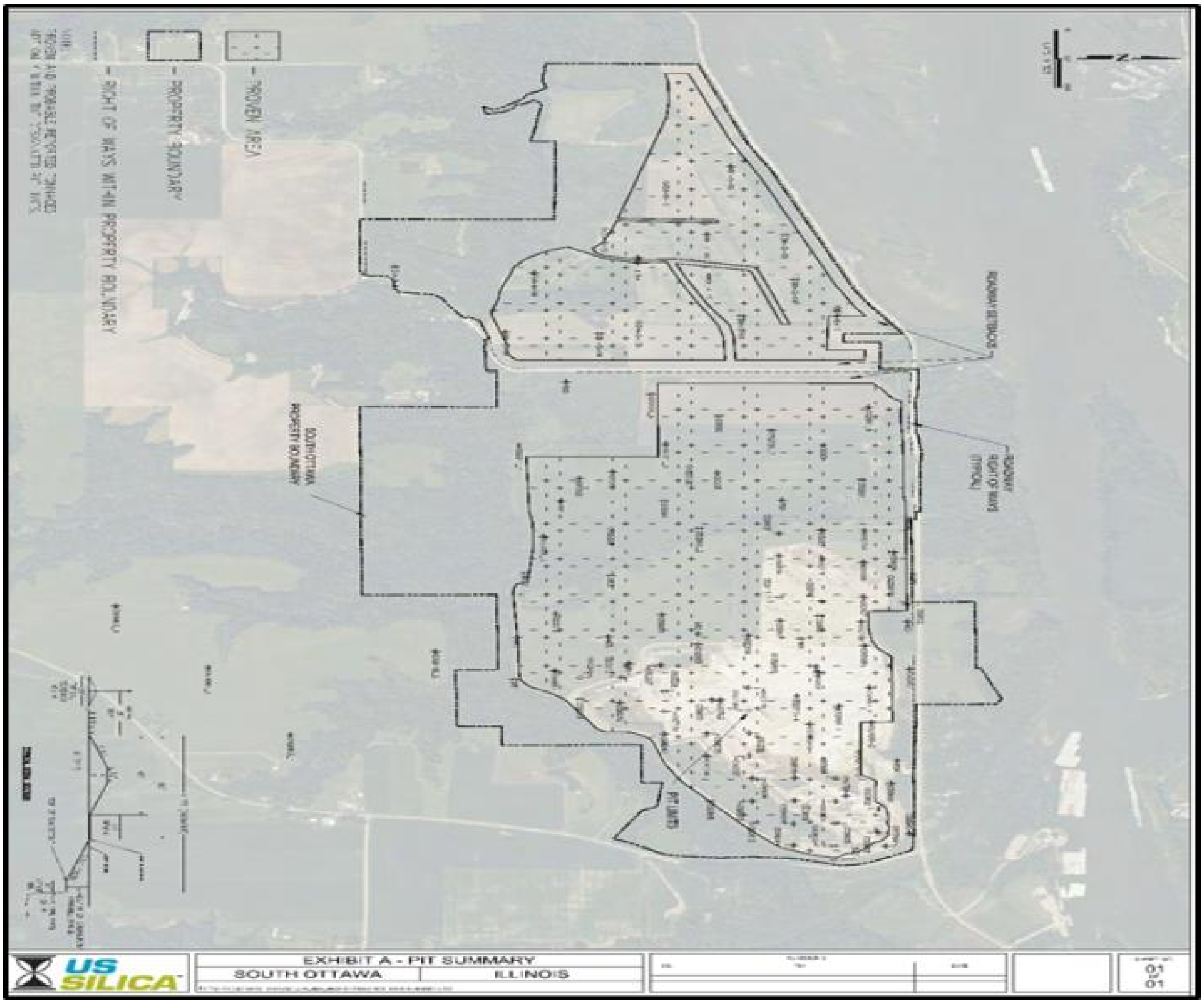

Figure 3.2 Encumbrances in the South Pit mining area.

Currently the Ottawa Site has several encumbrances in place that preclude mining (Figure 3.2) in certain areas. At the time of this report, the encumbrances are as follows:

- County Roads – west of current mining operations
- Catlin Salt Marsh – west of current mining operations
- Ernat Salt Marsh – west of current mining operations
- Browns Brook – west of current mining operations
- High overburden areas – located to the southwest, south and southeast of current mining areas
- Wetlands and jurisdictional waters – west of the current mining operations

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Topography

The Ottawa Site is located on both sides of the Illinois River in Ottawa, IL which runs roughly east to west in the vicinity of the Site. The topography is gently sloping toward the river which has an approximate surface elevation of 457 ft. above mean sea level (“AMSL”).[4] On the south side of the river where active mining is ongoing, the topography rises to the south and reaches a maximum elevation of approximately 611 ft. AMSL in the southwestern corner.

4.2 Means of Access

The Ottawa Site is accessible by major highways including U.S. Interstate 80. The Ottawa, IL mine site is located on IL State Route 71 and is approximately two and a half miles south-southwest of the Plant. The mine complex straddles the Illinois River and has barge/boat access as well as rail access on the north side of the river.

4 Google Earth.

4.3 Climate

As determined by the Köppen climate classification system[5], the Ottawa Site is located in a humid continental climate zone. This region typically has four distinct seasons typified by large seasonal temperature changes. Annual precipitation averages are 37" of rain and 21" of snow. The mining season continues all year long, despite freezing winter temperatures, in order to provide mine feed so the processing plant can produce various sand products year-round.

4.4 Infrastructure

The Ottawa Site location has been operating in a generally mixed community of industrial and suburban geography. The infrastructure required for the ongoing operations is generally in place at Ottawa. Several infrastructure capital expenditures are required for replacement and expansion projects to maintain mining and processing capacity.

The site is accessible by roads maintained by the city, county, and state as well as by two railroads. Road access is critical for the delivery of materials used in the production of finished goods and for the shipment of finished goods, both bulk and packaged to U.S. Silica customers. Similarly, the rail infrastructure is a critical component for the transportation of the finished goods from the Ottawa Site. U.S. Silica has an extensive rail-car loading, storage, and handling facility at Ottawa. Additionally, the Ottawa Site has access to a privately-owned barge terminal that leases property from U.S. Silica for its operation.

5 Köppen climate classification—Wikipedia.

The Ottawa Site has excellent access to reliable electric power and suppliers of natural gas. Water is a critical component in both the transporting and processing of the silica sand. The Ottawa Site has an abundance of recycled slurry water and processing water available. Potable water is provided by a municipal supply. The location routinely discharges excess water through permitted NPDES locations.

Tailings handling and settling capacity is a critical element for long-term viability of the Ottawa Site. U.S. Silica utilizes a series of settling ponds to remove waste from the process water and, from time to time, must construct new pond facilities from to store the waste that will be produced over life of the mine. Historically, the Ottawa Site has used mined-out portions of the property for the settling and storage of the waste produced. Additional areas are available for potential storage. Certain capital and expense projects are planned over the life of the mine to meet these needs.

5.0 HISTORY

The Ottawa Silica Company was founded in March 1900 by Edmund B. Thornton[6]. Mining commenced on the property west of the city of Ottawa shortly thereafter. By the 1920's, the company had taken over most of the silica production in the Ottawa area. The Thornton family owned and operated the Ottawa Silica Company until 1986, expanding the plant, improving product quality, and acquiring additional reserves. In 1986, the Thornton family sold Ottawa Silica Company to RTZ a large mining conglomerate based in London. In January 1987, Pennsylvania Glass Sand Company merged with the Ottawa Silica Company forming the U.S. Silica Company.

Exploration data reviewed for the TRS consisted of drilling information conducted from 2000 to 2014 for the South Ottawa Pit. There is no record of any exploration being performed prior to 2000 in the area of the South Ottawa Pit. No other exploration data for the mined-out areas in the U.S. Silica property north of the river were reviewed for this report.

6 U.S. Silica Internal Report.

6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT

The sandstone deposit mined at the Ottawa facility is known as the St. Peter Sandstone Formation. It is of Ordovician age and was deposited approximately 450 Ma[7]. The formation is present at varying depths across the entire state of Illinois. The following geologic history and detailed descriptions of the Ottawa sandstone deposit are used with permission from the Illinois State Geological Survey tour guidebook "The White Sands of Ottawa."[8] A generalized stratigraphic column of the region is provided in Table 6.1 below.[9]

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7 The White Cliffs of Ottawa The St. Peter Sandstone and North America's Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

8 The White Cliffs of Ottawa The St. Peter Sandstone and North America's Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

9 Kay, R.T., and Bailey, C.R., 2016, Hydrogeologic Framework of Lasalle County, Illinois; U.S. Geological Survey Scientific Investigations Report 2016-5154, 97 p., http://dx.doi.org/10.3133/sir20165154.

Generalized Stratigraphic Column of LaSalle County, Illinois

System	Group	Formation	Regional hydrogeologic designation	County hydrogeologic designation		Thickness (feet)	Description
Quaternary			Sand and gravel aquifers and till, silt, and clay confining units	Sand and gravel aquifers and till, silt, and clay confining units		0–400	Glacial-till: alluvial silt, sand, gravel
Pennsylvanian		Mattoon Bond Shelburn-Patoka Carbondale Tradewater	Semiconfining unit	Semiconfining unit		0–500	Mainly shale, some sandstone, limestone, coal
Devonian						0–40	Limestone
Silurian			Silurian aquifer	Silurian aquifer		0–500	Dolomite, silty at base
Ordovician	Maquoketa	Neda Brainard Fort Atkinson Scales	Semiconfining unit	Semiconfining unit		0–170	Shale, locally argillaceous dolomite or limestone
	Galena		Cambrian-Ordovician aquifer system	Yields water where at bedrock surface; part of confining unit where overlain by Maquoketa deposits		0–300	Dolomite
	Platteville						
	Ancell	Glenwood		Ancell aquifer		0–285	Sandstone, shale at top
		St. Peter					Sandstone can be poorly consolidated in upper part
	Prairie du Chien	Shakopee		Middle semiconfining unit	Semiconfining unit in most of county; yields water where at bedrock surface	0–200	Dolomite
		New Richmond			Aquifer	0–160	Sandstone
		Oneota			Typically semiconfining unit; can yield water where fractured	150–200	Dolomite
		Gunter				14–25	Sandstone
Cambrian		Eminence Potosi				200–300	Dolomite and sandstone
		Franconia				110–200	Dolomite, sandstone, and shale
		Ironton		Ironton-Galesville aquifer		160–225	Sandstone
		Galesville					
		Eau Claire	Lower semiconfining unit	Lower semiconfining unit		350–450	Shale, siltstone, dolomite
			Mount Simon aquifer	Mount Simon aquifer		2,000–2,500	Sandstone (Elmhurst Member)
		Mount Simon					Sandstone

Kay, R.T. and Bailey, C.R., 2016, Hydrogeologic Framework of LaSalle County, Illinois: U.S. Geological Survey Scientific Investigations Report 2016-5154, 97 p., http://dx.doi.org/10.3133/sir20165154.

Table 6.1 Generalized stratigraphic column of the Ottawa area.

The St. Peter Sandstone Formation is generally a fine-grained, well-sorted, well-rounded, friable to weakly cemented, non-fossiliferous, nearly pure quartz sandstone, essentially free of clay, carbonates, and heavy minerals.[10] The deposit has a minimum silica (SiO_2) content of 99%. The controlling attributes are grain crush strength, iron (Fe_2O_3) content and grain size distribution. Iron is concentrated near the surface, where orange iron staining is evident and increases where the bottom contact becomes concentrated in iron pyrite. Maximum average full-face iron content is 0.045%. The deposit tends to exhibit a coarser grain size distribution in the top half of deposit.

6.1 Historical Geology

The ultimate source of the St. Peter Sandstone is quartz grains derived from pre-Cambrian crystalline rocks of the Canadian Shield that were eroded to form Ordovician and Cambrian sandstones approximately 450 Ma The transportation of the sand to the deposition site by the prevailing northerly winds eroded the profile of the individual angular sand grains into a nearly round shape and wore away much of the contamination on the surface of the grain, leaving a scuffed or “frosted” surface.

A sheet of this windblown sand was deposited in clear, shallow water near the shoreline of an ancient sea. Through time, the level of the sea rose and receded several times across what was to become the North American midcontinent. The repeated cycles of marine erosion and reworking concentrated and sorted the quartz-rich sands, giving the St. Peter Sandstone its distinctive composition, grain size, and grain shape.

As the sea transgressed continually northward, waves and currents deposited the clean, white sand over parts of Missouri, Illinois, Indiana, Nebraska, Iowa, Minnesota, Wisconsin, and Michigan. The St. Peter Sandstone is generally described as a fine-grained, well-sorted, well-rounded, friable to weakly cemented, non-fossiliferous, nearly pure quartz sandstone, essentially free of clay, carbonates, and heavy minerals.[11]

10 U.S. Silica Internal Report.

11 The White Cliffs of Ottawa The St. Peter Sandstone and North America’s Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

6.2 Structural Geology

The St. Peter Sandstone at Ottawa is exposed near the crest of one of the major structural features in the Illinois Basin, the La Salle Anticlinorium. In the Ottawa area, this folded basement bedrock pushed upward as much as 2,500 ft. and is responsible for the St. Peter Sandstone occurring near the current ground surface. Following the uplift, late glacial floodwaters carved the upper reaches of the Illinois River Valley, removing nearly 100 ft. of overburden and leaving the sandstone near the land surface as an exposed bedrock bench that can be clearly seen in photos and on topographic maps.[12]

6.3 Economic Geology

Grain size is generally uniform on a regional basis and normally grades from medium to medium-coarse in the upper section to medium to fine-grained in the lower section. As a rule, the lower portion of the formation is fine-grained with iron, alumina and carbonate contamination increasing with depth.

Iron content and size distribution drive the mine planning. Iron tends to be concentrated near the surface and is visible in orange staining. Iron also increases at the bottom sandstone contact, occurring mostly as pyrite. The deposit is coarser in its top half. Where the upper part of the formation is eroded, mining must accommodate multiple faces to ensure adequate coarse sand is available to meet product specifications.[13] Simplified cross sections of the South Ottawa Pit mine area is shown below in Figure 6.1 and Figure 6.2.

12 U.S. Silica Internal Report.
13 U.S. Silica Internal Report.

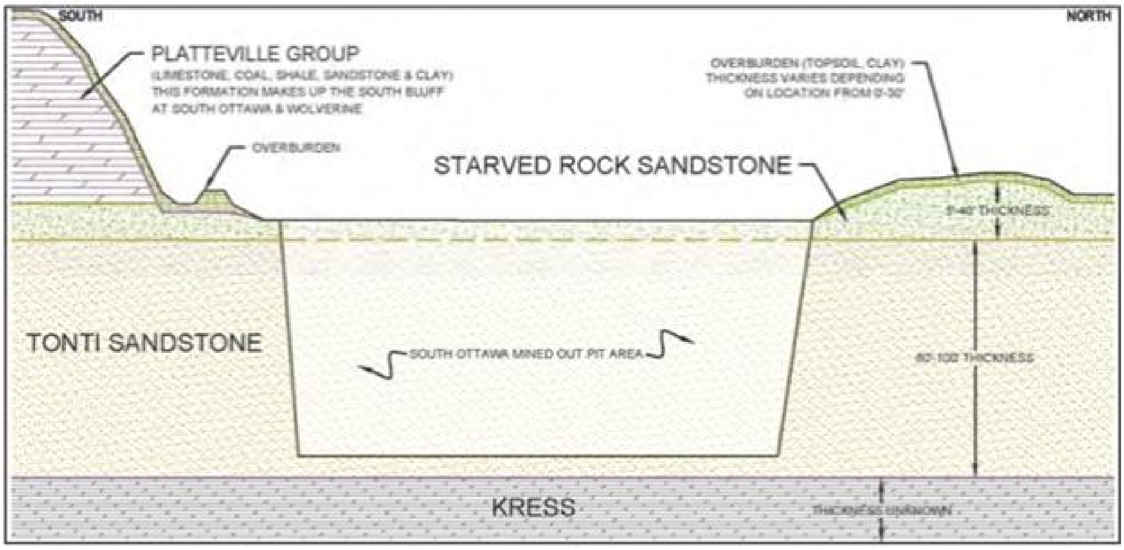

Figure 6.1 Cross section of the St. Peters (Tonti) Sandstone at the U.S. Silica South Ottawa Pit.

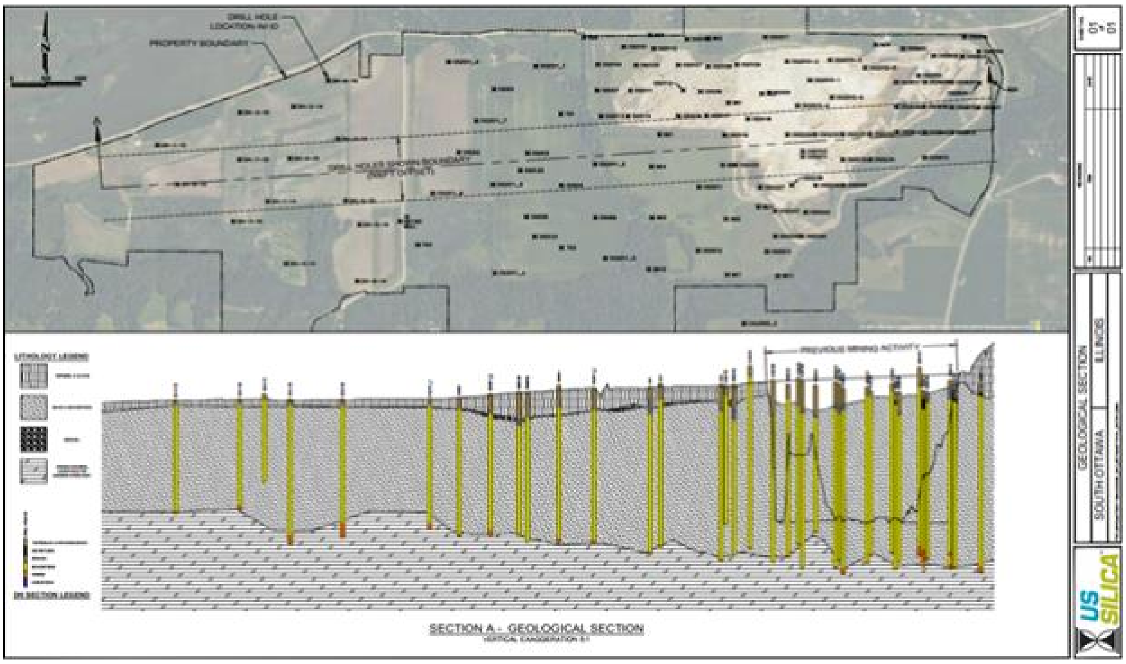

Figure 6.2 Cross section of drilled borings at the U.S. Silica South Ottawa Pit. West is on the left side of the graphic.

7.0 EXPLORATION

Based on review of the geologic database provided by U.S. Silica, over 300 borings have been drilled in one manner or another at both the North Ottawa Pit and South Ottawa Pit.[14] The U.S. Silica database includes lithology information such as boring identification, specific interval depths and total depth. Actual drilling logs, coordinates, drilling method or date drilled were not available for most of the borings listed in the database. This is due to the older records belonging to borings that were drilled in the North Ottawa Pit area, which is not part of this report, and older handwritten records that could not be located.

According to the plant manager, mining was completed in the North Ottawa Pit in 2010 but exploration of the South Ottawa Pit began in 2000.[15] Based on the site visit performed by the QP, geologic knowledge of the formation, lack of geologic structure that would alter the thickness of the deposit, and the number of available drilling records from 2000 to 2014 in the South Ottawa Pit area, there is sufficient drilling data available to meet the requirements of this section.

Some boring logs were available for review by WESTWARD of the drilling performed in the South Ottawa Pit. Sixty-three logs were provided by U.S. Silica that covered drilling events from 2000 to 2014 in the South Ottawa Pit area which includes the Mississippi Sands tract. A Boring Location Map is provided in Figure 7.1 below. From the logs, information such as drilling method, driller, lithology, and total depth was found. Boring locations that did not have individual boring logs did have sandstone interval data available for review in the database.

14 U.S. Silica's Shared Drive geologic database, June 2021.
15 Pat Smelko, Plant Manager, site visit on 5.28.21.

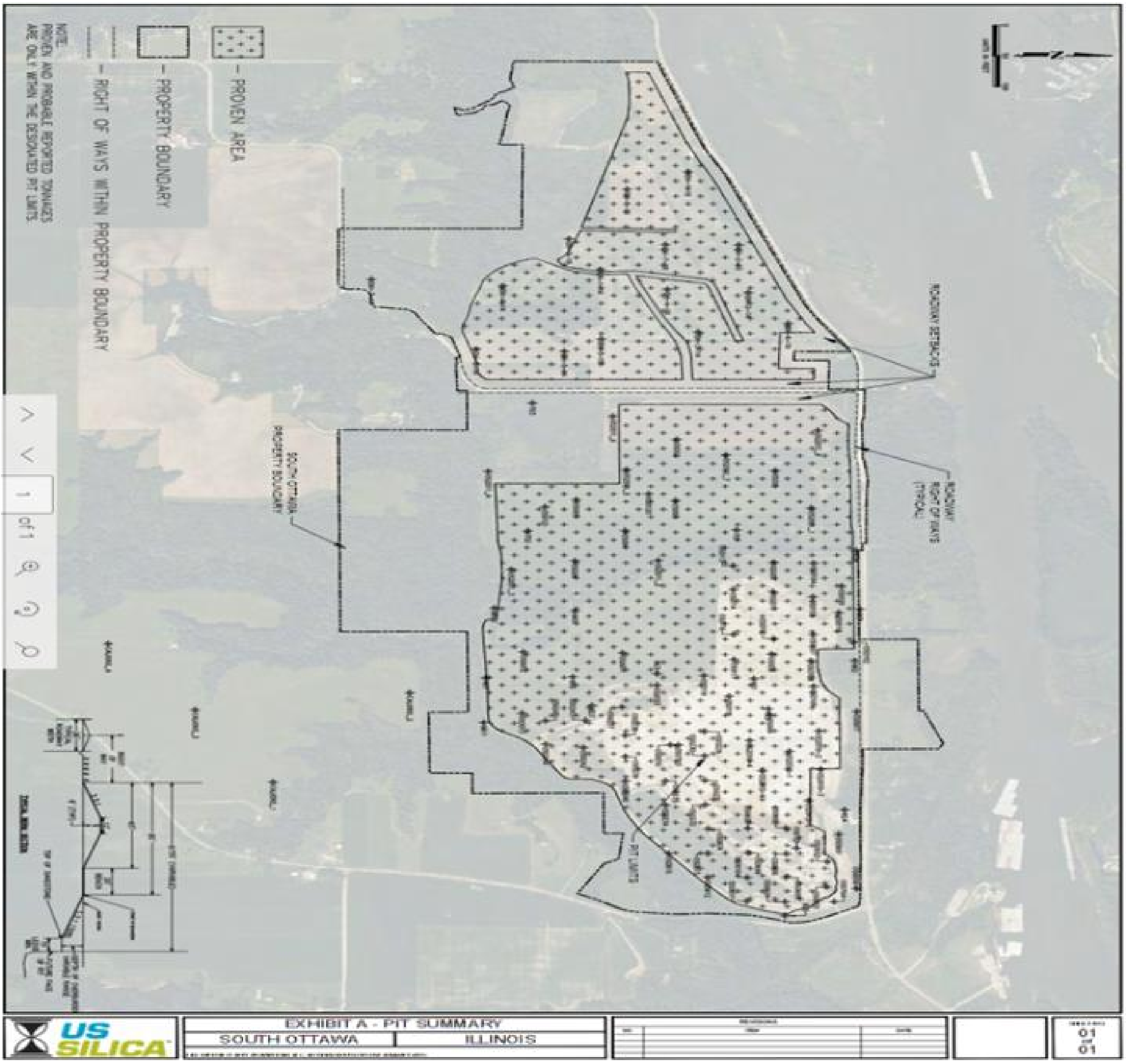

Figure 7.1 Boring Location Map for South Ottawa.

The information in the database was reviewed to include borings in the South Ottawa Pit that had no log available for review. Information regarding the interval thickness of the St. Peter Sandstone in the database was consistent with the data provided in the available boring logs. A table of pertinent drilling data for the South Ottawa Pit is provided in Table 7.1 below.

PHASE	DATE	DRILLER	BORINGS	METHOD	TD RANGE (ft.)
I	2000	Raimonde	SO00-1 to SO00-17	NQ Core	108 – 148.5
II	2001	Raimonde	OS0101 to OS0122	NQ Core	108.1 – 143.1
III	2010	Boart Longyear	DDH-1-10 to DDH-8-10	Sonic & HQ Core	87 – 114
IV	2011	Boart Longyear	OS2011-1 to OS2011-9	Unknown	72 - 135
V	2014	Wang Engineering	DH-1-14 to DH-7-14	Rotary coring	69 - 138

Table 7.1 South Ottawa Pit Exploration Summary From 2000 – 2014.

To collect representative samples, coring is the most effective way to drill this kind of deposit. Sonic drilling can create too much vibration in the core barrel, breaking up the material, which can result in the material to fall out of the bottom. Coring produces a solid piece of core, in most instances, that illustrates the physical condition of the deposit in the subsurface in better detail. The NQ and HQ reference in the table above indicates the size of the core barrel used. Same methodology, just a different diameter of core collected. HQ core samples have a larger diameter than NQ cores.

Borings logs reviewed for the South Ottawa Pit showed the vertical extent of the deposit was defined. The underlying formation was observed in each of the boring logs reviewed. This allows for more accurate reporting of volumes but also aids in mine planning in determining a final floor elevation for the pit. Figure 7.2 below shows what a typical section of St. Peter Sandstone looks like.

Figure 7.2 Typical Section of St. Peters Sandstone.

8.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

All samples collected during exploration phases in 2000, 2001, and 2011 were tested internally by U.S. Silica at the Katy, Texas and Berkeley Springs, West Virginia laboratories. Samples from the 2010 exploration event were tested by Bowser Morner in their Dayton, Ohio lab. There is no documentation of sample security, transport or preservation available for review for this site. Based on the physical nature of the sandstone, specific preservation methods, such as temperature, acid preservation, airtight container, etc., would not have been necessary. Since coring was the predominant exploration method from 2000 on, samples would have likely been placed into cardboard or wooden boxes. It is recommended that U.S. Silica prepare sample collection protocol, which includes photographs, for future exploration events.

U.S. Silica does have written laboratory procedures in place that adhere to International Organization for Standardization ("ISO") 9001 / Quality System criteria.[16] U.S. Silica uses the Approved American National Standards Institute ("ANSI") and American Petroleum Institute ("API") approved "Measurement of Properties of Proppants used in Hydraulic Fracturing and Gravel-packing Operations, ANSI/API Recommended Practice 19C, First Edition, May 2008; ISO 13503-2.2006 (Identical), Petroleum and natural gas industries – Completion Fluids and Materials Part 2: Measurement of Properties of Proppants Used in Hydraulic Fracturing and Gravel Packing Operations" as part of the laboratory testing documentation.

Other protocols reviewed as part of this report include the U.S. Silica Company ISO 9001 / Quality System – Process Washing: CAP605 ("corporate analytical procedure") and the U.S. Silica Company ISO 9001 / Quality System – Attrition Scrubbing documents. Both documents were signed by David Weller, Technology Director, ISP in 2016 and distributed internally. These documents detail the change history, scope, safety, equipment and procedure instructions for each test. It is the QP's opinion that the procedures and protocols for laboratory sample preparation and analytical procedures currently in place are adequate. It is recommended that a chain of custody protocol be developed for samples arriving at the lab from the field.

9.0 DATA VERIFICATION

The internal U.S. Silica labs located in Berkeley Springs, West Virginia and Katy, Texas were used to evaluate most of the material sampled during drilling performed at the site. Lab testing procedures for Bowser Morner who performed the 2010 testing were not available for review. Based on the review of U.S. Silica results, overall contiguous nature of the deposit, and large volume of sales of customer specific products, this is not considered to be material.

16 Terry Lackey email of 9.24.21.

The U.S. Silica labs follow the same protocols for testing samples from the Ottawa Site and for the Lamesa Site which both produce one commodity, silica sand. There is no known certification of the U.S. Silica laboratory from any recognized testing entity. Written statements from U.S. Silica indicate that the internal labs follow all protocols discussed here.[17] It is the QP's opinion that the data reviewed in preparation of this Technical Report is adequate and appropriate for the commodity being produced.

The Ottawa Site makes multiple finished silica sand products for numerous customers. Not all finished products adhere to a published set of product specifications. Silica sand used for proppant does have the API RP 19C criteria as guidelines for use as frac sand. However, it must be noted that the API criteria are merely guidelines and not an absolute specification requirement. It is the QP's opinion that all data reviewed in preparation of this Technical Report is adequate and appropriate for the commodity being produced

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

The mining of the South Ottawa Pit began sometime in 2006.[18] The St. Peter Sandstone in the Ottawa area exhibits horizontal stratigraphy and reasonably consistent elevation and thickness (Figure 6.1 above). The thickness of the St. Peter Sandstone in Illinois is commonly 100 ft. to 200 ft.[19] Observation of the overburden thickness of approximately 10 ft. to 20 ft. is corroborated by U.S. Silica drilling information showing 5 ft. to 25 ft. of overburden thickness. This type of lithology favors surface mining by conventional methods.

17 Terry Lackey email of 9.24.21.
18 Google Earth Imagery.
19 The White Cliffs of Ottawa The St. Peter Sandstone and North America's Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

Testing has two main components: mineralogy and grain size. Once the mineralogy (minerals present in the sample) is adequately delineated, additional mineralogy testing is on an as need basis. Mineralogy testing indicates the other minerals present in the deposit are usually attritioned, or washed off, away during processing. This means that the individual grains are not coated with minerals that could possibly require removal with the use of acid or other similar treatment.

Testing is performed on the entire sandstone interval as noted in Table 8.1. Note the relative even distribution of minerals detected during testing. This information helps with development of product specifications and processing methodology.

WASH

	OS-01-08				OS-01-09						
Top	10	30	60	90	9	18	28	58	77	97	109
Bottom	30	60	90	119	18	28	58	77	97	109	119
SiO_2	99.68	99.44	99.55	99.21	99.66	99.74	99.52	99.52	99.56	99.28	99.16
Fe_2O_3	0.0341	0.0239	0.0384	0.1119	0.0164	0.0254	0.0270	0.0289	0.0293	0.0939	0.1642
Al_2O_3	0.1300	0.2840	0.2040	0.3400	0.1490	0.0960	0.2240	0.2170	0.2100	0.3160	0.3070
TiO_2	0.0150	0.0280	0.0170	0.0300	0.0160	0.0120	0.0260	0.0190	0.0200	0.0260	0.0270
CaO	0.0100	0.0082	0.0091	0.0100	0.0078	0.0073	0.0082	0.0091	0.0085	0.0100	0.0110
MgO	0.0054	0.0048	0.0069	0.0043	0.0035	0.0034	0.0047	0.0063	0.0063	0.0064	0.0110
Na_2O	0.0026	0.0031	0.0026	0.0035	0.0023	0.0021	0.0023	0.0021	0.0024	0.0040	0.0037
K_2O	0.0050	0.0090	0.0210	0.0250	0.0050	0.0050	0.0080	0.0180	0.0170	0.0180	0.0340
L.O.I.	0.12	0.20	0.15	0.27	0.14	0.11	0.18	0.18	0.15	0.25	0.28

Scrub

	OS-01-08				OS-01-09						
Top	10	30	60	90	9	18	28	58	77	97	109
Bottom	30	60	90	119	18	28	58	77	97	109	119
SiO_2	99.86	99.83	99.81	99.64	99.84	99.85	99.81	99.79	99.81	99.64	99.54
Fe_2O_3	0.0217	0.0178	0.0225	0.0847	0.0128	0.0149	0.0183	0.0205	0.0220	0.0745	0.1479
Al_2O_3	0.0390	0.0530	0.0550	0.1030	0.0400	0.0300	0.0480	0.0590	0.0590	0.1180	0.1100
TiO_2	0.0091	0.0120	0.0110	0.0150	0.0096	0.0083	0.0130	0.0130	0.0140	0.0140	0.0130
CaO	0.0082	0.0068	0.0070	0.0079	0.0070	0.0062	0.0071	0.0070	0.0071	0.0077	0.0084
MgO	0.0038	0.0030	0.0034	0.0044	0.0030	0.0021	0.0035	0.0037	0.0042	0.0040	0.0054
Na_2O	0.0025	0.0023	0.0021	0.0029	0.0023	0.0019	0.0021	0.0019	0.0022	0.0034	0.0033
K_2O	0.0030	0.0040	0.0060	0.0060	0.0030	0.0030	0.0030	0.0060	0.0070	0.0060	0.0090
L.O.I.	0.06	0.07	0.08	0.14	0.08	0.08	0.09	0.10	0.07	0.13	0.16

Table 10.1 Mineralogy test results for borings OS-01-08 and OS-01-09.

Silica sand grain size testing is also important to know so the material can be sized properly in the plant for use in multiple finished products. It is common that similar deposits may have areas with a coarser grain size or the finer silica sand grains are located at a certain depth. Grain size testing helps identify those areas. Sieve analysis, particle size distribution or gradations are common names for this type of testing. Table 8.2 below illustrates a typical gradation analysis for a sample collected during the 2001 exploration event. Note how the entire sandstone interval is tested.

Drill Hole #:	**OS-01-05**			
Top	**8**	**38**	**60**	**82**
Bottom	**38**	**60**	**82**	**106**
Slimes	2.3	3.8	2.1	4.6
+16 Mesh	0.3	0.1	2.7	1.7
Product	097	096	095	094
Sieve	**% Retained**	**% Retained**	**% Retained**	**% Retained**
20	0.1	0.0	0.1	0.0
30	5.9	0.6	1.0	1.8
40	40.7	13.7	25.9	9.2
50	29.6	38.9	45.9	23.1
70	13.0	24.4	19.0	28.9
100	6.7	12.6	6.2	23.2
140	2.7	7.2	1.4	10.4
200	1.1	2.1	0.3	2.9
270	0.2	0.4	0.1	0.5
pan	0.1	0.1	0.1	0.0
Total	100.0	100.0	100.0	100.0
GFN	**41.2**	**51.9**	**42.4**	**58.5**

Sieve	% Cum	% Cum	% Cum	% Cum
20	0.1	0.0	0.1	0.0
30	6.0	0.6	1.1	1.9
40	46.7	14.4	27.0	11.0
50	76.3	53.2	72.9	34.2
70	89.3	77.7	91.9	63.0
100	95.9	90.3	98.1	86.2
140	98.7	97.5	99.5	96.6
200	99.8	99.5	99.8	99.4
270	99.9	99.9	99.9	100.0
pan	100.0	100.0	100.0	100.0

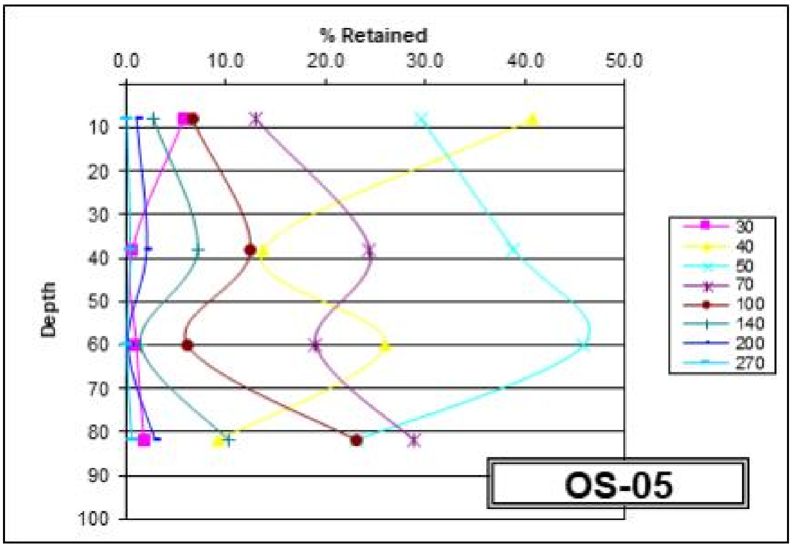

Table 10.2 Typical sieve analysis test result from boring OS-01-05.

Based on review of laboratory reports provided, testing performed on samples collected is appropriate for this type of deposit and end uses. Furthermore, individual customers also run their internal quality assurance and quality control to determine if the product is acceptable. The high volume of sales at this location and longevity of this operation are good indicators that the sand is of sufficient quality.

Internal testing was performed for grain size distribution and mineralogy by U.S. Silica at the Berkely Springs, West Virginia and Katy, Texas laboratories. No results for testing under the API RP-19C protocol were available for review. However, proppant is one of the products created from this deposit and has been sold as such for many years.

U.S. Silica performs internal testing according to API RP 19C protocol on the samples collected during exploration events. API RP 19C frac sand testing parameters include roundness, sphericity, turbidity, acid solubility and crush resistance.

Roundness measures how smooth the sand grain is whereas sphericity measures how closely the sand shape resembles a sphere. Grains with sharp edges will crush (fail) under less pressure and will create fines. The more spherical a grain then the more pressure it can withstand during the frac process. The more pressure a grain can withstand, the deeper underground, or in higher pressure plays, it can be used.

Turbidity testing is a measure of water clarity and how many suspended particles that are invisible to the naked eye may be present. Suspended materials include soil particles (clay, silt, and very fine sand), algae, plankton, microbes, and other substances. This value needs to be low so that the ingredients in the fracking fluids do not react with the suspended particles and cause a reduction in the effectiveness of the frac.

Acid solubility testing indicates if grains may be coated with other minerals that are not readily washed off during processing. If the solubility numbers are high, then this indicates that the sand may react with the acids present in fracking fluids creating fines that may lower the effectiveness of the frac.

Crush resistance testing shows how much pressure the grains can endure before crushing or failing. The crush value (“K-value”) varies depending on the size and shape of the grains. The higher the crush value, the higher the durability of the sand. High crush values are preferred when using sand for fracking.

U.S. Silica did not have any internal density testing data at the time of this report. Terracon provided the density value of the sand.[20] This value is used to convert BCY to tons. The Terracon reported specific gravity/density of the material from the Ottawa mine is 135 lbs./ft.^{3} This value is in line with other reported density values from the St. Peters Sandstone.[21]

11.0 MINERAL RESOURCE ESTIMATES

Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

11.1 U.S. Silica Methodology

U.S. Silica reports its in-situ resources and reserves in "Recoverable Tons." As such, a geologic "Resource" that is identified by exploration drilling is further defined by several other key criteria before it can be considered "Recoverable Ore." The most important of these criteria are that the resource must have:

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20 U.S. Silica Internal Report.
21 Select Sands NI43-101 Report dated March 21, 2016.

Indicated Resource	Reasonable level of confidence of geometry and estimates
	Quantity and grade/quality are estimated on the basis of adequate geological evidence/sampling
	Information locations too widely or inappropriately spaced to confirm geological and/or grade
	Confidence sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of economic viability of the deposit
Measured Resource	High level of confidence of geometry and estimates
	Information locations are closely spaced enough to confirm geological and grade continuity
	Information gathered appropriately
	Confidence sufficient enough to allow the application of technical and economic parameters and to enable the evaluation of economic viability that has a greater degree of certainty

Core drilling was conducted periodically to verify the presence, thickness, and quality of the sandstone formation. The data and lab results from each core hole are entered into a database for geologic block modeling using GEOVIA SURPAC modeling and mine design software. The intercepts of stratigraphic changes are then triangulated between drill holes to build a block model based strictly off lithology.

Once the sandstone unit is identified within the block model, the results logged in the database are then applied within certain parameters to fill quality data within the sandstone unit. The Ottawa ore body has been filled in with the additional core data and lab results using the nearest neighbor method. The data is then examined by U.S. Silica's Mining Team to determine recoverable limits and build a recoverable body of ore meeting certain criteria. Once the sandstone deposit is delineated and characterized, the following mine design criteria are used to refine the estimate of recoverable resources:

- Slopes of 33% in topsoil, clay, gravel, or unconsolidated materials.
- Slopes of 70° in ore and rock.
- A minimum of a 10-ft wide safety bench is left at the alluvium/rock and rock/sand contacts.
- A minimum of a 25-ft wide safety bench is left at approximately 425' (AMSL).
- The bottom of recoverable resources is a variable elevation by pit design to allow proper drainage with the maximum depth at 378' (AMSL).

A minimum of a 100-ft. wide, "no mining" buffer was designed to be left in place on the west side of the active mine area and a 200 ft. buffer on the west side of a county road that separates the South Ottawa properties. The sand that lies within these areas was excluded from the Ottawa ore resource calculation. The wetlands or navigable waters in those areas are planned to not be mitigated or relocated and are designed with a 50-ft. wide 'no disturbance' buffer along the perimeter. These buffer areas are shown in Figure 11.1 below.

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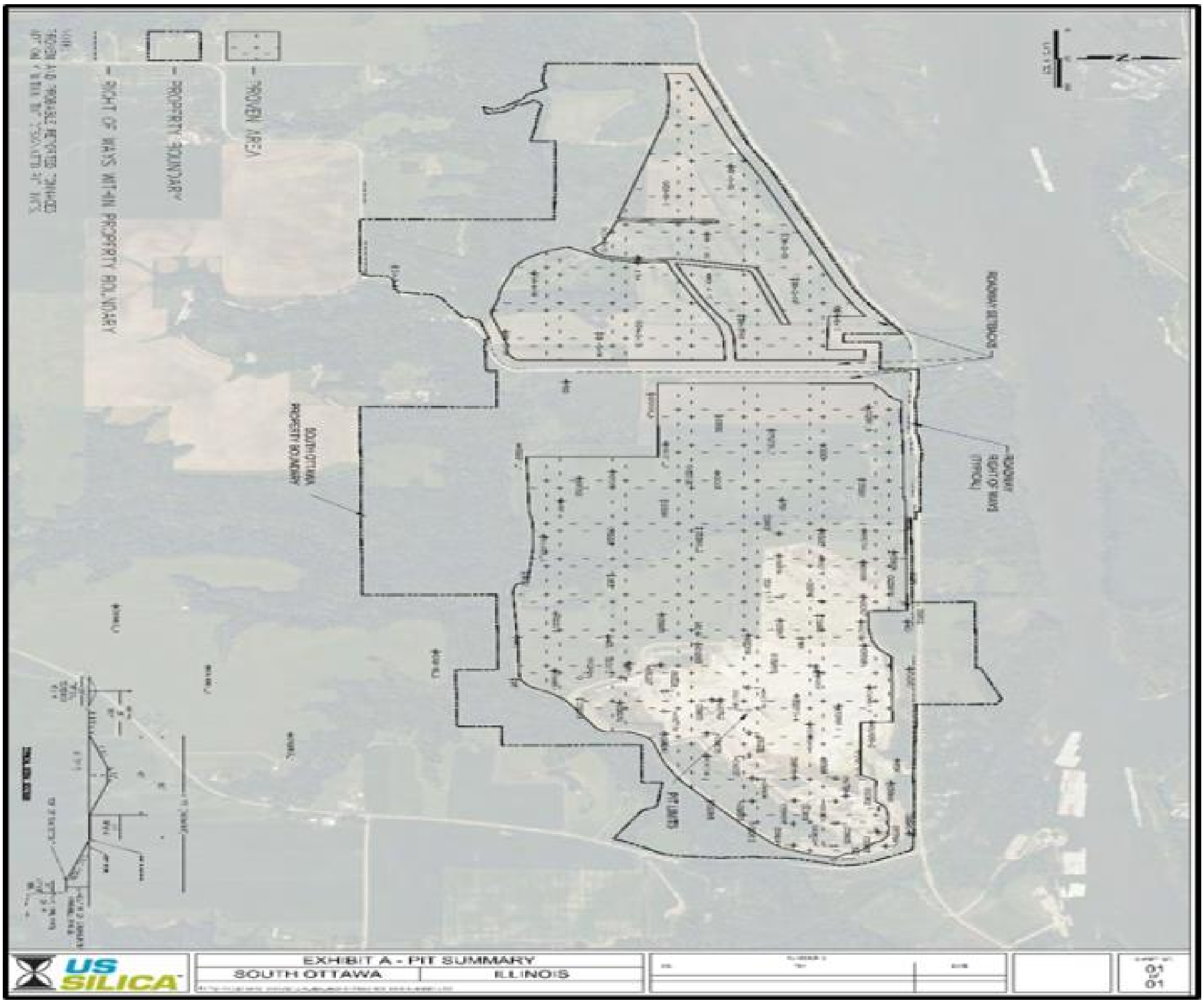

11.1 Existing Mine Buffers.

To determine final “Measured and Indicated” Resources, the in-situ volume of the identified ore located within the designed pit limits was calculated using GEOVIA SURPAC software. A standard bulk density factor of 135 pounds per cubic ft. (Tetra Tech) was then applied to yield total tons of measured, in-situ ore resources.

Next, site-specific mining recovery factors are applied to the calculated in-situ ore tonnage to allow for absent, poor quality, unrecoverable or uneconomic ore areas. Mining recoveries applied may vary across a given site or project; at South Ottawa, a 90% mining recovery was used across the property to allow for areas where sand may not be recoverable. The mechanical mining process allows the mine to be more selective and avoid areas of potentially low-quality sand while a 100% hydraulic mining operation recovers the entire sandstone layer essentially eliminating the selective mining process. Mining process losses include undesired waste material (tailings) that are pumped to the plant with the sand, good sand lost during the separation of the waste material, and any product spillage that sometimes occurs in the quarry, plant process and loading areas.

This same methodology was applied during the evaluation of the Mississippi Sands property in 2016. The Technical Memorandum summarizing this work was reviewed by WESTWARD.

11.2 Data Verification Methodology

WESTWARD coordinated with U.S. Silica personnel to compile copies of all available exploratory field logs, gradational test results, and a database of the geologic model inputs. Once compiled a spreadsheet was developed including a list of all exploratory boings from the model, their locations, elevations, and exploration depths. If supporting documentation was available, it was indicated on the spreadsheet next to the associated boring.

To address whether model inputs matched supporting documentation, spot checking was used. Spot checking was conducted randomly for both lithological and gradational data inputs. Spot checking was performed on at least 10% of available data sets.

11.3 Process Verification Methodology

WESTWARD developed an independent geologic model of the South Ottawa Pit deposit from the provided U.S. Silica data inputs, setbacks, and mining assumptions. RockWorks21 modeling software was used to develop the independent model with the Inverse Distance Weighting algorithm and a 40x40x1 ft. model resolution.

Volumetric estimates of in-situ raw material for each mine block were extracted from the model. Reductions for overburden and highwall design were not incorporated into the model. Overburden was assumed to be one ft. thick across the entire site and a pit slope reduction was calculated for each mine block based on the mine block perimeter, average modeled thickness, and cross-sectional area assuming a 3 horizontal to 1 vertical (3H:1V) highwall slope.

The in-situ volumes were reduced by the assumed overburden volume, and the calculated highwall volume estimate. A 10 % reduction for extraction loss was then applied resulting in a Net Recoverable Ore volume. A unit weight of 135 pounds per cubic ft. was applied to calculate Net Recoverable Ore tons which is the value compared against U.S. Silica estimates.

11.4 Results

There was sufficient data available for review to classify the deposit at the Ottawa Site as having both measured and indicated resources. The difference between the model run by U.S. Silica and WESTWARD to calculate resources differed by approximately 2%. This is an acceptable value. Resource estimates of in-situ silica sand as reported by U.S. Silica are shown in Table 11.1 below.

11.5 In-Situ, Recoverable Ore Resources

Resource estimates of in-situ silica sand at the Ottawa Site as of December 31, 2021 reported by U.S. Silica are shown in Table 11.1 below. Resources are presented **inclusive** of reserves, **not** in addition to reserves.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Measured Resource	66,926,671
Indicated Resource	33,002,024
TOTAL	**99,928,695**

Table 11.1 U.S. Silica In-Situ, Recoverable Ore Resources Estimate.

11.6 Cut Off Grade

Cut-Off grade is the minimum grade required for a mineral or metal to be economically mined (or processed). At the Ottawa Site, material is considered to be economically recoverable when the cost to extract, process and then sell the material results in a profit. There is no single “cut-off grade” for the total recoverable ore resource estimation at a mine site because the direct-shipping grades are fixed by the sale contract and tailored to each customer’s specific particle sizing and physical characteristic requirements.

Additionally, U.S. Silica optimizes the utilization of its ore reserves by using various raw ore blending strategies at both its mines and processing facilities. Through blending, sub-optimal raw materials that would typically be excluded using a traditional cut-off grade approach can be blended with high-quality reserves to produce a product that meets a particular customer’s specification range. There is no single size, or physical specification that fits all customer requirements. Therefore, it is not practical or possible to apply a single “cut-off grade” or “quality” criteria to the total recoverable ore resource estimation at a mine site. Please refer to Section 19.0 Economic Analysis for pricing information.

12.0 MINERAL RESERVE ESTIMATES

12.1 Introduction

For the in-situ silica deposit at the Ottawa Site, indicated resources were converted to probable resources due to larger spacing distances between drill holes than what is in the measured resources areas. It is likely that there is geologic continuity across these areas with regard to a silica sand deposit, but the spacing between borings in these areas is greater than what is in the measured resource areas. Measured resources were converted to proven reserves based on the criteria discussed in Section 11.0 Mineral Resource Estimates in conjunction with several modifying factors.

Modifying factors such as required and sustainable infrastructure (Section 15), market studies (Section 16), environmental considerations and permitting (Section 17), capital and maintenance costs (Section 18) and economic analysis (Section 19) have been completed or are in place. This allows for unencumbered mining and processing at the Ottawa Site. A robust need for silica sand in this part of Illinois and extended high sales volumes make the mine viable. These factors demonstrate the economic viability of the in-situ silica sand deposit at the Ottawa Site.

12.2 In-Situ Recoverable Ore Reserves

There was sufficient data available for review to convert the Measured and Indicated Mineral Resources, as discussed above, at the Ottawa Site to Proven and Probable Mineral Reserves. Reserve estimates of in-situ silica sand as of December 31, 2021 reported by U.S. Silica are shown in Table 12.1 below.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	66,926,671
Probable Reserve	33,002,024
TOTAL	**99,928,695**

Table 12.1 U.S. Silica In-Situ, Recoverable Ore Reserves Estimate.

12.3 Cut Off Grade

Cut-Off grade is the minimum grade required for a material to be economically mined (or processed). Please refer to section 11.6 Cut Off Grade for the discussion pertaining to the Ottawa Site.

13.0 MINING METHODS

U.S. Silica mines silica sand from an open pit located approximately two and one-half miles southeast of the processing facility in Ottawa, IL. The mineable minerals come exclusively from the St. Peter Formation. The current mineable property is situated south of the Illinois River and is known as the South Ottawa Pit (Figure 3.1). The formation being mined is designated commercially as silica sand[22] and is recognized in at least nine states surrounding Illinois.[23,24]

Mining of the St. Peter has been commercially viable for many years, beginning as early as the 1860's.[25] The Illinois State Geologic Survey classifies the formation as "world famous as a glass sand, but it is also used as molding sand (foundry sand), as an abrasive, in the manufacture of

22 Typical Rocks And Minerals In Illinois, George E. Ekblaw And Don L. Carroll, 1931, State Of Illinois Department Of Registration And Education State Geological Survey.

23 USGS, National Geologic Map Database, Geolex — Unit Summary, https://ngmdb.USgs.gov/Geolex/Units/StPeter_3945.html.

24 St. Peter Sandstone Mineral Resource Evaluation, Missouri, USA, Justin G. Davis, Arizona Geological Survey Special Paper 9 Chapter #6, Proceedings of the 48th Annual Forum on the Geology of Industrial Minerals Scottsdale, Arizona | April 30 - May 4, 2012.

25 The White Cliffs of Ottawa The St. Peter Sandstone and North America's Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

silica brick, ceramic glazes; and ferro-silicon, and for a score of other uses."[26] Other uses include the production of proppants, or fracturing sand (frac sand) for use in the oil and gas industry.[27]

Figure 13.1 - An overview of the sandstone mining operations at the U.S. Silica Ottawa Site showing the St. Peter sandstone face and pit loading and hauling.

26 Illinois State Geological Survey, Guide Leaflet 1971-D, La Salle, Bureau, and Putnam Counties, David L. Reinertsen and Myrna M. Killey, September 11, 1971, and May 20, 1972.

27 Ibid.

The St. Peter in the Ottawa area exhibits horizontal stratigraphy and reasonably consistent elevation and thickness (Figure 13.1). The thickness of the St. Peter in Illinois is commonly 100 to 200 ft.[28] Observation of the overburden thickness of approximately 10 ft. to 20 ft. is corroborated by U.S. Silica drilling information showing 5 ft. to 25 ft. of overburden thickness. This type of lithology favors surface mining by conventional methods.

13.1 Clearing, Grubbing and Overburden Removal

The future mining areas are either farmland or farmland buffer with tree cover. The terrain is gently undulating and easily accessible. U.S. Silica utilizes contractors to clear and grub the desired acreage and contractors to remove the overburden materials. Overburden is alluvial sand, gravel and clays and a thin limestone cap rock.[29] A tracked excavator and articulated haul trucks are used to move the overburden material to mined-out areas of the pit where it is utilized for reclamation purposes. Figure 13.2 shows the St. Peter sandstone "bench"[30] after clearing, grubbing and overburden removal.

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28 The White Cliffs of Ottawa The St. Peter Sandstone and North America's Largest Silica Production Facility, Karan S. Keith and Tim J. Kemmis, with contribution from U.S. Silica, June 13, 2005.

29 Caprock or cap rock is a harder or more resistant rock type overlying a weaker or less resistant rock type. Kearey, Philip (2001). *Dictionary of Geology*, 2nd ed., Penguin Reference, London, New York, etc., p. 41, ISBN 978-0-14-051494-0.

30 A "bench" is a mining term referencing the economic resource in its natural state before removal by mining.

Figure 13.2 - A bench of St. Peter sandstone after clearing and grubbing has prepared the sandstone for drilling and blasting.

13.2 Mining Process

When the St. Peter has been exposed, U.S. Silica uses conventional drilling and blasting to loosen the formation in preparation for hydraulic mining of the silica sand. The St. Peter sandstone, in the Ottawa area, is poorly cemented together. Blasting provides the ability to easily load the material into trucks to be hauled to a common location for the next stage of mining. A blast hole drill is used to provide vertical holes for the placement of ammonium nitrate and fuel oil ("ANFO"), a common and cost-effective blasting agent. Both drilling and blasting are accomplished through third-party contractors.

Figure 13.3 - A front-end loader loading blasted sandstone into an articulating haul truck.

After the rock is fragmented by blasting, hydraulic mining techniques are used to further fragment the blasted rock and move the silica sand to the processing plant. This process begins as front-end loaders load the shot rock into articulated haul trucks (Figure 13.3). The trucks carry the shot rock to a stockpile located on the pit floor. A bulldozer pushes the stockpiled rock to a location where a water “monitor” can further break up the silica sand (Figure 13.4).

A monitor is a high-pressure water cannon similar to the nozzles mounted on firetrucks used by firefighters. The high pressure and high volume of water from the monitor is used to create a slurry of water and sand for pumping to a wet-screen house to remove any oversized material. From the wet screen house, the slurry begins the journey to the processing plant, two and a half miles to the north north-east of the pit. All water used to pump the slurry is recycled water from the processing plant.

Figure 13.4 - Hydraulic mining utilizing a monitor to produce silica sand slurry for pumping to the processing plant.

The slurry pumped to the processing plant and the water returning to the pit for use in producing fresh slurry is moved through a series of high-density polyethylene ("HDPE") pipes connected to several pump stations. The pipes are positioned under the roadways to the north of the pit and under the Illinois River through lines drilled by directional boring methods. Booster pump stations along the slurry line allow the sand to stay in suspension in the slurry to maintain the process. This is an efficient method of transporting the raw silica sand to the plant for further processing.

13.3 Pit Repair and Maintenance

Regular maintenance of pit equipment owned by U.S. Silica is performed by U.S. Silica personnel located at the Ottawa facility. Any activity provided by contractors such as clearing and grubbing, drilling and blasting, etc. is provided by the contractor. Major component rebuilds, not within the capability of the U.S. Silica personnel, are contracted to local repair facilities. This is a common industry practice.

13.4 Mine Equipment

U.S. Silica uses a combination of owned and leased mobile equipment in the pit. A list of the pit equipment currently utilized at Ottawa is shown in Table 13.1. Initial lease terms are generally 36 months. The decision of lease versus purchase is made by the corporate financial group. Repair and maintenance activity is a combination of U.S. Silica personnel and outside contractors. Pit equipment mechanical availability generally averages about 85-percent. This availability is high enough to maintain the production requirements represented in the Economic Analysis portion of this report (Section 19.0).

Ottawa Mine Equipment

Quantity	Model	Type	Manufacturer	Year	Owned/ Leased
1	D8	Dozer	Caterpillar	2008	Leased
1	1050	Dozer	John Deere	2016	Leased
4	460E	Haul Truck	John Deere	2019	Owned
1	772	Motor Grader	John Deere	2011	Owned
1	444	Front End Loader	John Deere	2008	Leased
2	350F	Front End Loader	Volvo	2017	Leased
1	480EC	Tracked Excavator	Volvo		Leased

Table 13.1 Equipment currently utilized in the Ottawa pit.

13.5 Mine Planning and Production Scheduling

U.S. Silica employs personnel responsible for mine planning and production scheduling. Mine planners provide direction and support to the operating group to ensure proper sequencing of mining activities. These activities include permit compliance, removal of adequate amounts of overburden, planned sequencing of areas to me mined, and other production needs of the operating group.

With a horizontally bedded sandstone such as this location, the mine planner sequences specific areas, or "blocks" of sandstone to be moved. Mining advances through these blocks, advancing the active mining "face,"[31] in the direction prescribed by the planners. Figure 13.5 shows the overburden thickness overlain on an aerial map. The Figure shows the approximate location of the current mining faces as of November 2021. The mining will advance westward, progressing to the pit limit on the north, west, and south (magenta line). Some infrastructure will be required to reach these limits. Infrastructure is discussed further in Section 15.

Detailed mine planning activity at Ottawa has occurred in the past but is currently out-of-date. According to U.S. Silica personnel: "Current studies underway regarding Brown's Brook will impact [mine] design changes and until those are completed a full complete life-of-mine plan for South Ottawa and West Ottawa will [be] unable to [be] developed."[32,33]

The impact to the life-of-mine relating to Brown's Brook is the area required to be left in-place to allow for a natural flow of Brown's Brook and for access to the "West Pit" from the "South Ottawa Pit." Figure 13.5 shows a representation of the area set aside in this report to allow for development of the "West Pit" resource block of silica sand. This set aside reduces the potential reserves of silica sand and this reduction is estimated and accounted for in the life-of-mine Economic Analysis in this report.

31 A mining "face" is the vertical wall of rock which will be blasted for excavating the rock.
32 Email response from Matt Crofoot. (U.S. Silica) to Rob Vogel (Q4 Impact Group) on November 8, 2021.
33 South Ottawa and West Ottawa are divisions of the mining area referenced in Figure 5 in the direction of mining.

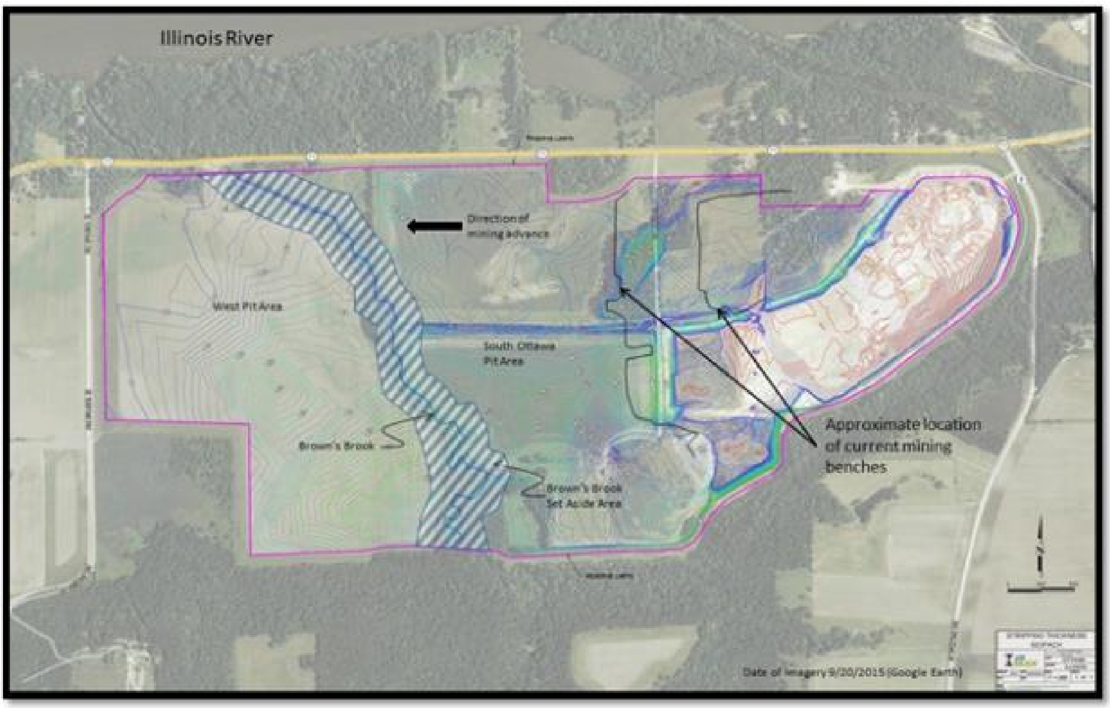

Figure 13.5 – Overburden thickness isopach map showing the approximate location of the current mining benches and the mining limits (reserve limits).

The deposit at Ottawa is a relatively simple deposit to mine as the entire vertical block is minable as ore. Consequently, the mine planning is basic. The risk of intrusive mineralization may be near the top or bottom of the deposit due to contamination from water carrying undesirable mineralization. This has proven to be easily avoidable with proper overburden removal practices and appropriate control of blast hole depth. For these reasons, a short-term lack of a detailed mine plan does not negatively impact the ultimate recovery of the resource and, it does not hinder the day-to-day mining activity at Ottawa.

The annual production schedule is determined based on the forecasted sales demand provided by the sales and marketing group. This production schedule is adjusted to produce the targeted annual mining volume by factoring in losses for waste, in-pit uses, etc. Production schedules are then developed to assure adequate feed is provided to the processing plant to meet the finished-goods demand in a timely manner. Table 13.2 shows the estimated production for the next five years.[34] This is achievable with current equipment and personnel. A projection consistent with this analysis for mine production levels is included for the life-of-mine in the Economic Analysis section of this report (Section 19.0).

Year	Forecast Finished Goods Sales (MMT)	Annual Mining Volume (MMT)
2018	3.5	4.5
2019	2.8	3.7
2020	1.5	1.9
2021 Forecast	2.3	3.0
2022 Projection	3.1	4.0
2023 Projection	3.1	4.0
2024 Projection	3.1	4.0
2025 Projection	3.1	4.0
2026 Projection	3.1	4.0

Table 13.2 - Projected sales volume and production schedule required to meet finished goods requirements for the next five years.

34 Email from Terry Lackey, U.S. Silica, of November 9, 2021.

13.6 Manning

The Ottawa Site has a stable workforce with low turnover that currently totals 145 people. The average workforce age is approximately 48-years[35] old and 17% of the workforce is above 60-years old.[36] The hourly workforce comprises 82% of the location census and is represented by the United Steelworkers of America. Table 13.3 shows the manning at Ottawa.

Classification	Census
Mine Operations	36
Plant Operations	59
Maintenance	24
Salaried	26
Total	145

Table 13.3 Manning Table for the Ottawa, IL Plant.

Figure 13.6 below shows the final pit design for the South Ottawa Pit provided by U.S. Silica.

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35 The average age of the U.S. workforce was 42 years in 2020 (U.S. Bureau of Labor Statistics, Employment projections).
36 About 14 percent of the U.S. workforce is over age 60 (Household Data Annual Average for 2020 from the U.S. Bureau of Labor Statistics).

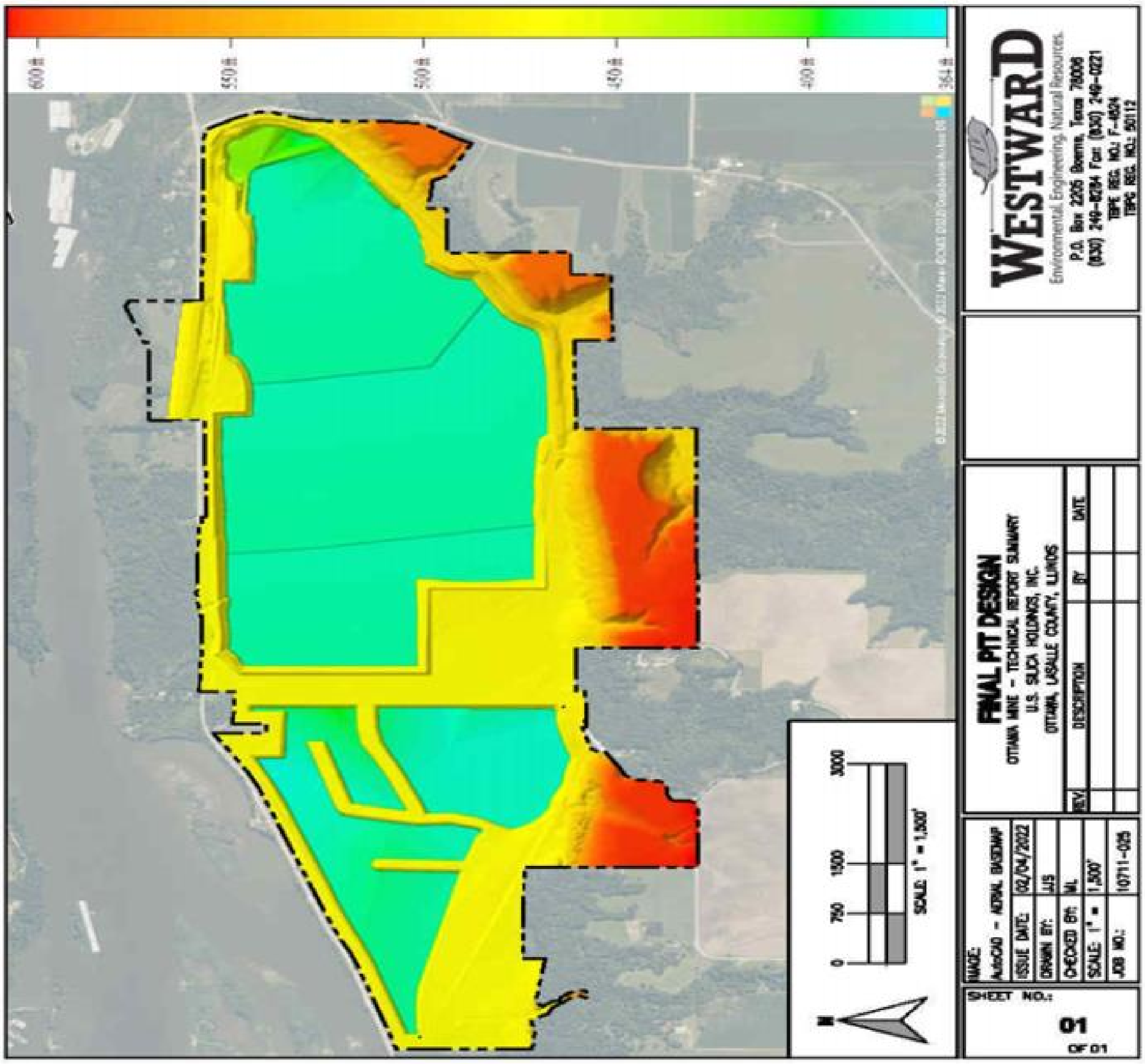

Figure 13.6 South Ottawa Pit Final Pit Design.

14.0 PROCESSING AND RECOVERY METHODS

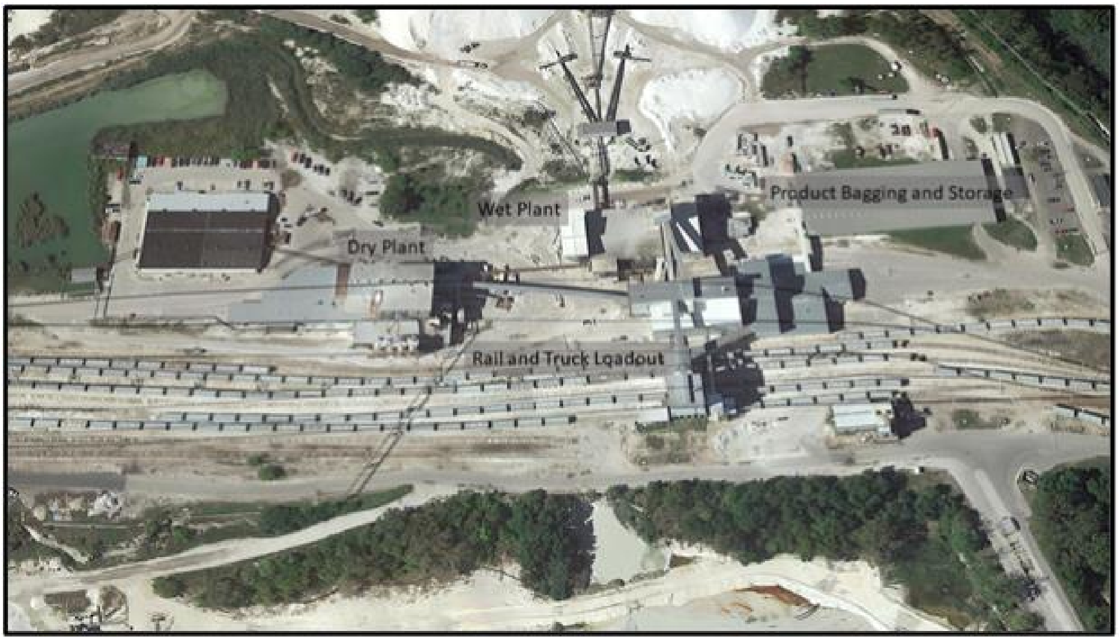

Figure 14.1 The Ottawa, IL plant overview.

The processing plant in Ottawa is U.S. Silica's largest blended operation.[37] Purchased in 1987, the plant has been upgraded since that time.[38] The production of finished goods begins when the plant receives a silica sand slurry from the mine located south of the processing plant. From this slurry, multiple products are generated through various processing methods. U.S. Silica utilizes both wet and dry processing in producing over thirty products for sale to two customer groups: Oil and Gas production companies and the Specialty Minerals industry. An overview of the processing plant is shown in Figure 14.1 above.

37 U.S. Silica internal report.

38 Locations | U.S. Silica (ussilica.com)..

The annual production of finished goods at the Ottawa facility is a function of customer demand and the production capacity, by size fraction, of the plant. Total demand and product mix varies relative to economic cycles of end users and the competitive environment. The plant operating personnel periodically coordinate with the sales group to produce finished goods to meet a sales forecast. The plant at Ottawa has high flexibility in relation to the sand size required and the mix between individual wet and dry products by varying the equipment configuration.[39]

The plant at Ottawa can run 365 days per year and it operates twenty-four hours per day. The combined wet-plant and dry-plant has a nameplate[40] capacity of 10.2 K tons per day. The plant capacity is limited by the ability to separate the fine silica sand and by permitted drying capacity. U.S. Silica indicates a reasonable 85-percent mechanical availability for their plant.[41] Table 13.2 shows the yearly production history and a forecast for the next five years for the combined production from the Wet Plant and the Dry Plant.

Based on finished goods production from prior years, this plant production is achievable with current equipment and personnel. A projection consistent with this analysis for total sales volume is included for the life-of-mine in the Economic Analysis section of this report (Section 19.0).

14.1 Wet Processing Plant

The wet plant was originally built in 1975 and underwent expansions in 2009 and 2011. The plant receives its feed through the slurry pumping system from the mine that discharges to the wet plant. Figure 14.2 shows a simplified process flow from the mine to the product distribution and Table 14.1 shows the main processing equipment used in the Wet Processing Plant. [42] The slurry from the mine is processed through a material washer to remove the very fine size

39 Email from Terry Lackey, U.S. Silica, of November 9, 2021.
40 Nameplate is a term for the theoretical maximum capacity for a piece of equipment. For a plant it is the theoretical maximum capacity a plant can run at 100-percent mechanical availability.
41 Email from Terry Lackey, U.S. Silica, of November 9, 2021 and November 11, 2021.
42 Conveyors, pumps, bins, and other numerous pieces of equipment are omitted for clarity in Table 4.

fractions which are too small to produce salable products. These very fine particles, or tailings, are separated from the plant feed and are sent to mine settling ponds where the water is recovered and recycled back to the plant and pit as process water. The silica sand plant feed is still a slurry at this point, and it moves to a bank of hydrosizers, hydro-cyclones, and vacuum filters to remove excess water. This water is also reclaimed for future use. At this point in the process, the sand has been separated into two portions, coarse and fine particle size fractions (see Figure 14.2).

From this point forward, the two streams are processed in dedicated, parallel coarse and fine circuits based on the sizes of their intended final use. The wet silica sand streams are then dried in four fluidized bed dryers where the dried silica sand is processed as whole grain silica in the Sizing and Fine Sand Plant or sent to the Grinding Mill for production of ground silica products. One dryer is dedicated to the coarse-sand stream and three to the fine-sand stream (see Figure 14.2).

14.2 Dry Processing Plant – Whole Grain Silica

Whole grain products are shipped primarily to the foundry, glass, and hydraulic fracturing industries. The Fine Sand Plant was built in the 1950’s. Dry processing of whole grain silica begins by taking a split of a dried portion of the coarse-sand stream and the dried fine stream from the Wet Plant where a series of screens separate the fine sand into size fractions. Figure 14.2 shows a schematic of this circuit and Table 14.1 shows the main processing equipment used in the Dry Processing Plant, which includes the Fine Sand Plant and the Sizing Plant of Table 4.[43] The finished product is prepped for shipment by either a bulk carrier (rail or truck) or is loaded into bags in the bagging plant and warehoused for specific end-use markets (see Figure 14.2).

43 Ibid.

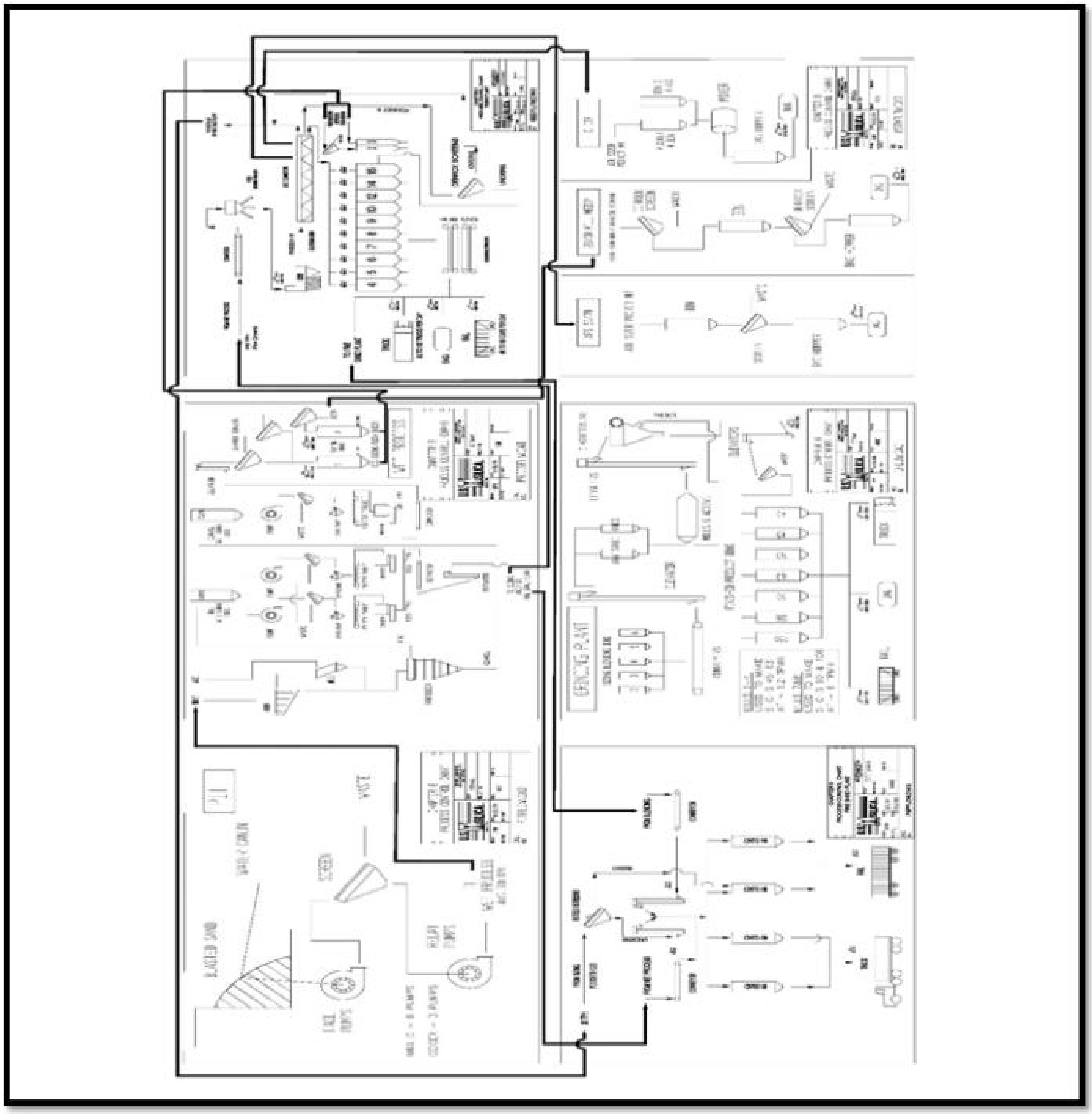

Figure 14.2 – Processing Plant flow sheet for Ottawa, IL.

Plant	Description	Quantity
Slurry Delivery	Mine-side wet screen	1
Wet Plant	Wet Plant 10X20 coarse Hydrosizer	2
	Wet Plant 8X8 coarse Hydrosizer	1
	Wet-Plant-silo Hydrocyclone	3
	Wet-plant wet screen	4
	Wet-plant pre-filter cyclone	4
	Vacuum filter belt	4
	Fluid bed dryer	4
	Bucket elevator	5
	Primary dry Derrick screens	6
	Secondary dry Derrick screens	6
Fine Sand Plant	Rotex screen	2
	Bucket elevators	2
Grinding Plant	Hummer screens	3
	Ball mills	6
	Bucket elevators	9
	Air classifiers	4
	Vibrating screen	6
Sizing Plant	Rotex screen	10
	Bucket elevator	7
	20/40 scalping screen	2

Table 14.1 - Main processing equipment used in the Ottawa Site.

14.3 Dry Processing Plant – Ground Silica

The grinding mills are fed by material produced from the coarse-sand stream of materials or from the Fine Sand Plant. The Grinding Plant was built in the 1940’s and utilizes dry ball mills to reduce whole-grain silica sand into ground-silica products for the specialty and composite glass, fused silica, adhesives and countertop markets. It is also used as a filler and extender for a range of applications including paints and coatings, sealants, ceramics, and epoxy.[44]

Whole grain sand is pulverized dry in ball mills using ceramic grinding balls to minimize product contamination. The mill discharge is classified into size fractions using air classifiers. The products produced are moved into storage bins for bulk loading or packaging. The oversize grains are rejected by the classifiers and return to the mill feed for re-grinding in a closed circuit (see Figure 14.2). Table 14.1 shows the main processing equipment used in the Grinding and Sizing Plant.[45] The products produced as ground silica carry the trademark Sil-Co-Sil™.

15.0 INFRASTRUCTURE

The U.S. Silica Ottawa Site has been operating in this location since before the turn of the 20th century. Expansions and upgrades have occurred to allow both the mine and the plant to adequately supply the markets they serve and to maintain a social license to operate in the Ottawa community.

This requires periodic updates and expansions to the infrastructure required to maintain a sustainable presence in this generally mixed community of industry and suburban geography. The infrastructure required for the ongoing operations is generally in place at Ottawa. Certain capital expenditures are required to replace depreciating assets. Other expansion capital (including additional incremental investment to maintain capacity, such as additional pump

44 https://www.ussilica.com/products/sil-co-silr.
45 Conveyors, pumps, bins, and other numerous pieces of equipment are omitted for clarity in Table 14.1.

houses and settling capacity) is provided and commented on below and in Section 18. Figures 15.1 and 15.2 illustrate critical infrastructure for the Ottawa Site.

Figure 15.1 Critical Infrastructure for the Ottawa Site.

Figure 15.2 Electrical Power Lines for the South Ottawa Pit.

15.1 Road and Truck Access

The site is accessible roads maintained by the City, County and State. Road access is critical for the delivery of materials used in the production of finished goods and for shipment of finished goods to U.S. Silica customers. The plant and pit have access to roadways rated for the loads to be shipped to and from the facility. Bulk finished goods are loaded into bulk hopper trucks at several locations, depending upon the product grade. Truck loading capacity is limited by the permitted hours and by the rate at which the existing equipment can load trucks.

15.2 Rail

The rail infrastructure is a critical component for the transportation of the finished goods from the Ottawa Site. The Illinois Railway, LLC (the "IR") is a short line railroad owning about 113 miles of former BNSF trackage in Illinois. It is owned by OmniTRAX.[46] The IR handles the loaded rail cars and returns the empties to the plant. It interchanges with the CSX, a Class 1 railroad,[47] at Ottawa, IL just north of the U.S. Silica plant.

The IR also connects with the BNSF (a Class 1 railroad) railroad north of Oswego, IL and south at Streator, IL. Two additional Class 1 railroads, the Union Pacific and Norfolk Southern, can be accessed by truck transloading. U.S. Silica has an extensive rail-car loading, storage, and handling facility at Ottawa. The main track and switches are maintained by the IR. Ottawa Site personnel maintain all plant trackage with the help of an outside contractor. Routine inspections occur from time to time by the IR and the CSX.

Bulk product is loaded into covered hopper cars in a partially enclosed building adjacent to the rail yard. All cars are leased by U.S. Silica. Switching in the plant area is accomplished by Company owned Trackmobile Railcar Movers.[48] Rail loading capacity is limited by the permitted hours and by the rate at which the existing equipment can load rail cars.

46 OmniTrax is a privately owned transportation and transportation infrastructure company out of Denver, CO.

47 Railroad classes are determined by the revenue received by the railroad. The Surface Transportation Board adjusts the threshold annually for each class of railroad. Class 1 railroads are the largest and primary movers of goods over long distances. There are seven Class 1 railroads. (https://railroads.dot.gov/rail-network-development/freight-rail-overview).

48 A Trackmobile is a flexible rail car moving vehicle with both steel rail wheels and rubber tires. It is capable of traveling either on rail or on a roadway and is efficient for the movement of multiple rail cars.

15.3 Barge

Located on the Illinois River, the Ottawa Site also has access to a privately-owned barge terminal that leases property from U.S. Silica for its operation. The facilities are available to U.S. Silica if they are needed. The barge terminal is maintained by others.

15.4 Electric Power

The Ottawa Site uses electric power supplied by Ameren Illinois.[49] Power is delivered by an above-ground network of pole lines generally running along the CSX rail corridor on the north side of the property and terminating at a substation on the west side of the plant, south of the Dry Plant. Distribution to the processing plant from the substation is through a combination buried power lines and overhead poles. The Ottawa Pit uses power supplied by Cornbelt Energy Corporation.[50] U.S. Silica has a history of reliable electric power supply.

15.5 Natural Gas

Natural gas is used as a fuel for drying the silica sand in the plant. The gas is currently supplied by NiCor.[51] The natural gas is delivered to the plant via underground pipeline generally running along the CSX rail corridor. Gas is distributed into the plant through various underground pipelines. Nicor is a reliable supplier of natural gas.

15.6 Water

U.S. Silica's Ottawa Site uses vast amounts of water. Most of the consumption is for transporting mined silica sand as a slurry from the mine to the plant and for the processing of the

49 Ameren Illinois is part of Ameren Corporation; a Fortune 500 company that trades on the New York Stock Exchange under the symbol AEE.
50 Corn Belt Energy Corporation is an energy coop in 18 counties in Illinois. Their energy is supplied by Wabash Valley Power Alliance, a generation and transmission cooperative based in Indianapolis, IN. Wabash provides wholesale electricity to 28 distribution systems in Indiana, Illinois, Michigan, and Missouri.
51 NiCor is a subsidiary of Nicor Inc., publicly traded on the NYSE as GAS. They are the largest natural gas supplier in Illinois.

sand in the plant itself. Potable water is provided to the plant location by the City of Ottawa's public water system. The company has a private well at the mine site for any sanitary needs of the employees there.

Water is a critical component to the transportation of the mined silica sand and in the handling and classification of wet sand in the processing plant. The distribution of slurry and process water relies on pump stations and a network of HDPE pipelines on the property. Maintenance of pumps, pump stations, and pipelines is a vital component in the process of producing finished goods and cost control.

Ottawa maintenance personnel routinely monitor the mechanical health of the slurry distribution system and recycle water lines. They perform routine maintenance as required. The HDPE slurry lines are regularly rotated to provide efficient transportation of the silica sand from the mine to the plant and to extend the life of the slurry pipelines. The investment in pipeline replacement, pump and pipeline repair, and construction of additional pipeline and pumphouses is an ongoing expense and capital cost for the plant.

The Ottawa Site has an abundance of recycled slurry water and processing water available. The facility captures precipitation in the active mine and tailings ponds which provides for a natural source of additional process water. The mined-out areas also are a source for ground water as it migrates through the exposed formations.

The location routinely discharges excess water through permitted NPDES locations. There is no record of the Ottawa Site having to purchase water for sand slurry use or processing use in the last 10 years." U.S. Silica believes any risk of the lack of water could be mitigated by the permitting and construction of high-capacity wells.

15.7 Tailings Handling and Disposal

Tailings handling and settling capacity is a critical element for long-term viability of the Ottawa Site. The mined silica sand contains components that are unable to be sold and are therefore considered a byproduct, or "waste," from the production of finished goods. This waste is largely fine silica sand and non-silica mineralization contained within the St. Peter Sandstone formation. This waste is removed from the production streams as fine sand and silt suspended in the process water. The Ottawa Site removes the waste from the process water and recycles the water back to the mine and plant for use as slurry water and process water as needed.

The method U.S. Silica utilizes to remove the waste from the recycled water is an industry standard method of "settling" the fines out of the water. A series of settling ponds have been used by U.S. Silica for this purpose for the life of the plant. The very fine particles in the water are allowed to settle by gravity, thereby clarifying the water carrying the particles. The ponds must have a large enough surface area to allow for the time necessary for settlement. The depth of the pond allows for storage of the sediment. [52] Therefore, U.S. Silica must provide for ongoing construction of new pond surface area and depth for the ponds to maintain the required storage area for the waste that will be produced over life of the mine.

Historically, the Ottawa Site has used mined-out portions of the property for the settling and storage of the waste produced. Figure 15.3 below shows the locations historically utilized for waste storage: A-Pit, B-Pit (North) and B-Pit (South). U.S. Silica must maintain a "fresh" water pond so that water can be stored after processing through the settling ponds. Currently this is provided by S-Pit in Figure 8 where clarified water is recovered for reuse. D-Pit, in Figure 8, is a large area that is partially suitable for tailings storage (approximately five years' worth of volume[53]).

52 Erosion and Sediment Control Handbook, Steven J. Goldman, Katharine Jackson, and Taras A. Bursztynsky, McGraw-Hill, 1986, pp. 8-13.
53 Draft – Tailings Deposition Comparison, Rev. 1, U.S. Silica Ottawa, 1/19/2017, Barr Engineering Co. study.

Figure 15.3 - Possible tailings storage pond locations in the plant area.

The remainder of D-Pit must be kept free from tailings storage due to the current and future use of the area for slurry lines and pump houses. B-Pit (South) is the current settling pond for deposition of waste. B-Pit (South) has limited storage capacity, insufficient for the life of the mine. Additional areas are available for potential storage in the current mining location. These are identified in Figure 13.5 as the South Ottawa Pit and the West Pit. When the South Ottawa Pit is mined out, and mining progresses west into the West Ottawa Pit (Figure 13.5), there will be sufficient storage capacity for tailings to meet life-of-mine expectations.

The need for additional capacity has been anticipated. A capital and expense project are in the early stages of implementation. A sequence of pond construction, higher dam construction, and additional pumps and slurry lines is being developed by U.S. Silica to provide for increased settling pond surface area and storage in areas previously utilized for storage: A-Pit, B-Pit (North) and B-Pit (South) as part of the mine planning efforts commented on in Section 13.

In the future, U.S. Silica plans to construct additional storage in area in the South Ottawa Pit south of the Illinois River. A projection of adequate capital spending and operating cost impacts, consistent with this analysis for mine production and plant processing levels is included for the life-of-mine in Section 18.0 Capital and Operating Costs and in Section 19.0 Economic Analysis of this report. U.S. Silica projects the implementation of these projects will provide tailings-storage capacity for the next 10 years. After that the plan is to deposit tailings in the South Ottawa Pit area (Figure 15.4), which is estimated to have capacity for the duration of the West Ottawa Pit operations and the capacity to accept tailings from the production from the Mississippi Sands Pit located west of the West Ottawa Pit if needed.

Figure 15.4 - Possible tailings storage pond locations in the South Ottawa and West Pit areas.

In addition to the capital and expense projects related to tailings storage capacity, U.S. Silica is utilizing and is exploring operational tactics to create space. When the fine sand demand increases, the operations group historically has been able to recycle some of the deposited tailings, thus creating additional storage capacity. Additionally, solid tailings can be stacked - providing more storage capacity without raising impoundments.

15.8 Buildings

The Ottawa mine and plant has undergone various modifications in its 100-year plus history. The existing buildings are adequate for the purposes of which they are utilized. The facility employs an office building holding engineering, financial, and administrative staff. Several buildings house the plant processing machinery and support (see Figure 14.1). These include wet and dry processing, bagging, warehousing, loadout, employees, and maintenance activities. There are several miscellaneous buildings on the plant site, some fully utilized and some vacant. The mine site has a maintenance building, administrative space, and an employee building. All utilized structures appear to be well maintained.

15.9 Comments on Infrastructure

In the opinion of the QP, the current infrastructure is adequate to maintain the historical levels of finished goods production except for the current capacity of tailings storage. U.S. Silica is planning to create additional storage volume and is underway with the planning process. In the opinion of the QP, the capital required to provide the necessary tailings storage capacity and allow U.S. Silica to maintain the current levels of production and product quality to support the life-of-mine plan are represented in the Economic Analysis in this report.

16.0 MARKET STUDIES AND CONTRACTS

U.S. Silica's Ottawa operation supplies high-silica sand into every major market segment including glassmaking, chemical, foundry, building products, ASTM testing sand, and the Oil and Gas sectors.

16.1 General Marketing Information

The Ottawa Site is the company's largest blended operation, supplying various grades of silica sand to both the Oil and Gas and the Industrial and Specialty markets. The Ottawa Silica Company was founded in March 1900 by Edmund B. Thornton. In 1986, the Thornton family sold Ottawa Silica Company to RTZ. In January 1987, the Pennsylvania Glass Sand Company merged with the Ottawa Silica Company forming the U.S. Silica Company.

U.S. Silica's Ottawa operation supplies high-silica sand into every major market segment including glassmaking, chemical, foundry, building products, ASTM testing sand, and the Oil and Gas sectors.

The Ottawa Site produces a wide range of silica products that serve U.S. Silica's Oil and Gas, and Specialty Minerals business units:

- The Oil and Gas proppants are used in hydraulic fracturing petroleum-bearing rock layers. They are highly crush-resistant, and the industry specifies different grades depending on the requirements of the individual rock formations.
- The F-Grade sands are used primarily in foundry casting. The grade numbers represent the American Foundry Society Grain Fineness Number; the sand increases in fineness as the GFN increases. The Fine and Standard Melt grades are used in glassmaking.

- 200-Mesh ground silica is used as an additive to cement that is injected into a well to bond the steel well casing to the rock wall of the drillhole.
- Sil-Co-SilTM is produced by grinding whole-grain sand into fine, bright white powder. The grade numbers indicate the maximum grain size in the product expressed in microns. The various grades are used in fiberglass, specialty glass, countertops, and ceramics.
- Particularly noteworthy are the Ottawa's ASTM products. U.S. Silica has the distinct advantage of supplying the well-known, highly respected original "Ottawa Silica" that is used for cement and abrasion testing. Ottawa remains the only supplier of fully ASTM-compliant sands in the world.

U.S. Silica has an annual production capacity of 3.6 M tons at this location. Through the renovated and upgraded facilities it can produce multiple products through various processing methods, including washing, hydraulic sizing, grinding, screening, and blending.

16.1.1 Silica Sand Market

In the late 1990's and early 2000's the market saw a dramatic increase in the use of sand for hydraulic fracturing tight shale formations. The widespread development of the Marcellus Shale in 2008 triggered several expansions by silica sand producers, including U.S. Silica. In 2009, Ottawa's frac sand capacity underwent a 500 K ton expansion followed by a 900 K ton expansion in 2011. Beginning in 2018, however, the proppant sand market in the region began to contract. This change was fueled primarily by three factors:

(1) Many regional sand mines were commissioned near the large Oil and Gas play in the Permian Basin in west Texas and southeastern New Mexico. Oil and Gas drilling operations is this area are nearly exclusively supplied by this newly developed resource; displacing sand previously supplied by mines in the upper Midwest including Ottawa.

(2) The energy service companies have shifted toward the use of finer grades of proppant sand such as 40/70 and 100 Mesh. The demand for coarser grades produced by Ottawa and nearby competitors has declined.

(3) Relatively low crude oil prices have curtailed drilling in the Bakken (North Dakota) and the Marcellus (Ohio River Valley) shale deposits. The Bakken was impacted by the high cost of completing a well in the region combined with limited available infrastructure (pipelines and rail). Environmental concerns over the hydraulic fracturing process also resulted in the idling or scale back of numerous proppant sand mines.

Oil and Gas demand, as well as whole silica demand generally, dropped in 2020 as compared to 2019 due to the COVID-19 pandemic. However, recovery began in the fourth quarter of 2020 and continued throughout 2021. The QP believes the whole grain silica end segment should see growth through 2026. The QP believes the compound annual growth rate (“CAGR”) for Container Glass is 2% and the CAGR for Solar Glass is 9% through 2026. A fair estimate of future reserve consumption is between 2.5 and 3.0 M tons of raw sand annually.

In 2020, the average selling price (“ASP”) was $36.90 per ton. In 2021, the ASP dropped to $29.30 per ton. Given the projected growth in the whole gain silica end segment, the QP believes it is reasonable to assume that pricing will sustain and appreciate at 2% per annum thereafter for the life-of-mine. Consequently, in the long-term, the QP believes that price forecast will increase from an ASP of $29.90 per ton in 2022 to $35.00 per ton in 2030. See Table 19.1 for the projected ASP over the life-of-mine.

16.2 Material Contracts Required for Production

There are no material contracts required for production.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, PLANS, NEGOTIATIONS OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Existing Environmental Permits, Plans, and Authorizations

WESTWARD was contracted by US Silica to provide third party review of environmental plans, permits, and requirements of the Ottawa Site. A summary of findings is included below based on current regulatory research and documents provided by U.S. Silica. Table 17.1 summarizes the current permitting status at the Ottawa Site.

Item	Regulatory Authority	Status
SPCC Plan	EPA	Complete
NWP 12	IDNR/USACE	Approved
Surface Mining Permits	IDNR	Approved
Mine Refuse Disposal Permit	IDNR	Approved
NPDES General Permit ILG840203	ILEPA	Approved
NPDES Individual Permit IL0001325	ILEPA	Approved
Air Permit #95060046	ILEPA	Approved
VSQG Hazardous Waste	ILEPA	Approved
Radioactive Material License	IEMA	Approved
Floodplain Development Permit #2014-12	LaSalle County	Approved
Floodplain Development Permit 2015-20	LaSalle County	Approved
Floodplain Variance Resolution 12-21	LaSalle County	Approved
Public Water System	State/County Health Departments	Approved

Table 17.1 Permitting Summary for Ottawa.

17.2 Federal Requirements

US Silica maintains a Spill Prevention, Controls and Countermeasure (“SPCC”) Plan at the Ottawa location to address requirements of the federal Oil Pollution Prevention Regulations (40 CFR Part 112). The SPCC plan establishes oil spill preparedness, prevention, planning, response, and notification procedures per the federal regulations and addresses state-specific oil spill reporting notification and response requirements as administered by the Illinois Emergency Management Agency (“IEMA”).

U.S. Silica currently utilizes a pipeline that extends underneath the Illinois River from the South Ottawa mine to the North Ottawa processing plant. The purpose of the pipeline is to transport sand slurry material from the South Ottawa pit(s) to the processing plant at the North Ottawa location. Construction of the pipeline project was authorized by the U.S. Army Corps of Engineers (“USACE”) and Illinois Department of Natural Resources (“IDNR”) as a Nationwide Permit 12 (CEMVR-OD-P-2006-53). In May of 2017 US Silica received approval from IDNR to replace the existing sand slurry pipeline within their easement under Statewide Permit No. 8 which authorizes the construction of underground pipeline and utility crossings.

17.3 State Requirements

U.S. Silica retains a Surface Mining Permit (#1862-12) and associated reclamation bond through the IDNR for authorization of mining. A surety bond was issued to IDNR in the amount of $344,000.00 for approximately 80 acres of surface mining reclamation. The bond may be released by IDNR upon completion of surface mining and approved reclamation plan within three years of completion. An additional Surface Mining Permit (#1866-22) and approved reclamation plan for approximately 45 acres (D Pit) within the North Ottawa Site, located north of Dee Bennett Road is also maintained by U.S. Silica.

The permit includes a conservation and reclamation plan which outlines slope and vegetation establishment. U.S. Silica holds three additional Surface Mining Permits which authorizes the ongoing mining activity at the South Ottawa tract (#1743-15, 1776-17, and 1825-19) with associated reclamation bonds. Reclamation bond records (and amounts) were requested from IDNR by U.S. Silica (Todd Lindblad). Though the aforementioned records were unavailable at the time of review, it is WESTWARD's understanding that should permit coverage areas or bond amounts require an update based on the mine footprint, U.S. Silica is able to do so by administrative update with IDNR.

IDNR authorized a Mine Refuse Disposal Permit 1947-SP for the slurry refuse disposal area within an approximately 43-acre inactive pit ("A Pit") located at the North Ottawa Site. The permit includes a description of proposed reclamation activities following disposal activities, including grading and seeding specifications. Costs associated with reclamation activities are provided in Section 19.0 Economic Analysis.

U.S. Silica is permitted to discharge stormwater from the Mississippi Sands tract (South Ottawa) under NPDES General Permit No. ILG840203. No mining disturbance has been initiated by US Silica at the former Mississippi Sands tract as of the date of this report.

Individual Permit No. IL0001325 as approved by the ILEPA authorizes discharge of wastewater from the North and South Ottawa Sites. Sampling and reporting requirements include three grab samples monthly reported using the Discharge Monitoring Report ("DMR") system, quarterly visual monitoring, semi-annual monitoring and reporting of metals, arsenic, cyanide and total phenols, and an annual inspection report.

Air emissions resulting from the processing plant at Ottawa are authorized under the ILEPA Clean Air Act Permit Program ("CAAPP") Permit #95060046. Provisions of the permit include maintenance and calibration of monitoring devices and monthly opacity visible emissions observations.

Project review of the Mississippi Sands tract by the Illinois Department of Natural Resources (IDNR; as requested by ILEPA for NPDES authorization), identified three Illinois Natural Areas Inventory (“INAI”) sites within one mile of the project area. IDNR determined that adverse events to the INAI sites due to mining of the tract are unlikely to occur. IDNR recommended that a discharge point should be placed downstream of the Ernat’s Marsh INAI to avoid the possibility of adversely modifying the water quality in the Marsh.

The Ottawa Site is classified under RCRA Subtitle C as a Very Small Quantity Generator (“VSQG”) of Hazardous Waste (EPA ID #ILD155166952), generating less than or equal to 100 kilograms per month of non-acute hazardous waste. Waste classifications handled at the site include D001 Ignitable waste, D002 Corrosive waste, and D009 Mercury. U.S. Silica personnel maintain an Illinois Radioactive Material License (#IL-01709-01) through the Illinois Emergency Management Agency (“IEA”).

17.4 Other

U.S. Silica maintains a LaSalle County Floodplain Development Permit #2014-12 for construction of an earthen berm within a regulated Special Flood Hazard Area (flood zone AE) of the Illinois River watershed basin. U.S. Silica received approval from the state and county health departments to deepen an existing well for potable drinking water (non-community public water system) at the Ottawa Site in 2018.

U.S. Silica has not engaged in any agreements pertaining to hiring or local procurement.

17.5 Mississippi Sands Authorizations

The following authorizations issued to Mississippi Sands, LLC during their previous ownership of the Mississippi Sands tract were reviewed as part of the feasibility study:

- Special Use Permit 11-24 SU authorized Mississippi Sands, LLC to convert portions of the Mississippi Sands tract from farmland to mining use by letter dated February 1, 2012, from the LaSalle County Clerk. Conditions of the Special Use permit include, but are not limited to, the following:
  - Well agreements with neighboring property owners
  - Specified blasting surveys, timeline, maximum charge per day, and notifications
  - Neighboring homeowners' property agreements
  - Landscape and buffer plan review by the City of Ottawa
  - No excavation shall take place above the 490 ft. level
  - Compliance with transportation plans (not more than 22 truckloads of aggregate product transported through the City of Ottawa per day), and
  - The County may hire a third-party consultant in the event the owner/operator is assigned any corrective action by any federal, state, or county agency.

17.6 Additional Studies

Previous archaeological study of the South Ottawa Site revealed an area of potential archaeological significance (Archaeological Site 11LS953) which led to U.S. Silica entering a Declaration of Preservation Covenant with the Illinois Historic Preservation Agency ("IHPA") in March 2005. It was determined upon Phase II Testing of the site by SCI Engineering in the fall of 2011 that the archaeological site did not require a preservation covenant as it was unlikely to be recorded in the National Register of Historic Places. The IHPA approved of the Phase II Test Report, determined that no Phase III Archaeological Mitigation Plan was required, and released the deed covenant on July 17, 2012.

17.7 Pending Expansion

U.S. Silica has engaged the IMEG company to complete a wetlands assessment, archaeological study, and aquifer testing and impacts analysis of the Catlin Salt Marsh to determine the feasibility of mining the former Mississippi Sands Property.

18.0 CAPITAL AND OPERATING COSTS

Capital and operating costs discussed in this section were developed utilizing current and historic cost data from continuous and ongoing operation of the facility, first principles, vendor and contractor quotations, and similar operation comparisons.

18.1 Operating Cost

Total operating costs incurred at the Ottawa Site from 2020 through 2021 are provided in Table 18.1. Costs include but are not limited to mining equipment, plant/shipping, wages and premiums, maintenance materials, and power.

The average cost of sales was $29.50 per ton in 2020 and $20.80 per ton in 2021. Headcount has remained fairly stable over the period with 104 hourly and 35 salaried employees in 2020 and 119 hourly and 26 salaried employees in 2021.

Capital Costs	
2020	$ 2,182,000
2021	$ 1,517,000
Operating Costs	
2020	$53,662,000
2021	$47,928,000

Table 18.1 Summary of Capital and Operating Costs: 2020-2021.

18.2 Capital Costs

The average annual capital expenditure since 2020 at the Ottawa Site is $1,849,500, with $2,182,000 in 2020 and $1,517,000 in 2021 (Table 18.1). The higher than average capital spend in 2020 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

A summary of foreseen capital expenditures through 2026 is provided in Table 18.2. As shown in Table 18.2, total estimated capital expenditure through 2026 is $16,565,000 and primarily includes routine maintenance and continuous improvement projects to drive cost and capacity efficiencies.

Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy. There are risks regarding the current capital costs estimates through 2026, including escalating costs of raw materials and energy, equipment availability and timing due to either production delays or supply chain gaps.

Projected Capital Expenditures		
2022	$	6,000,000
2023	$	4,000,000
2024	$	2,135,000
2025	$	2,213,000
2026	$	2,217,000

Table 18.2 Summary of Projected Capital Site Expenditures: 2022-2026.

18.3 Assumptions

The capital projects are assumed to be constructed in a conventional Engineering, Procurement and Construction Management (“EPCM”) format. U.S. Silica routinely retains a qualified contractor to design projects and act as its agent to bid and procure materials and equipment, bid and award construction contracts, and manage the construction of the facilities.

18.4 Accuracy

The accuracy of this estimate for those items identified in the scope-of work is estimated to be within the range of plus 15% to minus 15%; i.e., the cost could be 15% higher than the estimate or it could be 15% lower. Accuracy is an issue separate from contingency, the latter accounts for undeveloped scope and insufficient data (e.g., geotechnical data).

19.0 ECONOMIC ANALYSIS

19.1 Operating Costs

An economic model was created for the Ottawa Facility to provide validation of the economic viability of the estimated reserve for the life of mine until 2052. The following are the key assumptions for the base case scenario:

- Proven and Probable Tons of 99,928,695 as of December 31, 2021
- Revenue Growth of 2%
- Tons Growth of 0.5%
- Costs of Goods Sold Growth of 2%
- Selling, General, and Administrative Expenses Growth of 2%
- Capital Expenditures Growth of 2%
- Inflation Rate of 2%
- Tax Rate of 26%
- Discount Rate of 8%
- Net Working Capital Reinvestment Rate of 25%
- Site Yield of 77%

The QP used budgeted 2021 operating costs as the benchmark for which to model operating costs throughout the life of mine and applied future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

The QP based the ASP for 2022 on the ASP in 2021 and anticipated market dynamics. The QP then applied a 2% per annum increase from the 2021 ASP through the life of mine. Based on average selling price trends from 2018 through 2021, the QP believes that 2% per annum growth rate is a reasonable method for a base case scenario. For additional information on the ASP, see “Section 16.1.1— Silica Sand Market.”

19.2 Capital Costs

As an ongoing project that is in production and profitable, the QP established a going forward capital expenditure based on the running average capital costs at the mine from 2020 and 2021. The QP then applied a 2% per annum increase to the capital costs through the life of mine.

19.3 Economic Analysis

The financial evaluation of the project comprises the determination of the net present value (“NPV”) at a discount rate of 8%, the internal rate of return (“IRR”) and payback period (time in years to recapture the initial capital investment). Annual cash flow projections are estimated over the life of the mine based on the estimates of capital expenditures and production cost and sales revenue.

Review of the base case model indicates that the project has an IRR of 17%, a payback period of 0.10 years, and an NPV of $64,534,000. The Economic Feasibility Model (Table 19.1.1) was modeled on the basis of historical operational costs and future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

19.4 Sensitivity Analysis

The QP assessed sensitivity of key variables, including reduction in expected selling price, increased capital expenses and associated depreciation, and operating costs. To assess these variables, the QP created moderate and upside models where the following variables were increased by the percentages listed in Table 19.2:

- Average Selling Price Growth
- Tons Growth
- Costs of Goods Sold Growth
- Selling, General, and Administrative Expenses Growth
- Capital Expenditures Growth
- Inflation Rate
- Inflation Adjusted Discount Rate
- Site Yield

The NPV of the project is null when the 2022 average selling price is reduced to approximately $25.51/ ton.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Reserve Balance Tons (000)		115,725	99,928	96,961	93,981	90,987	87,980	84,959	81,925	78,877	75,815	72,739	69,650	66,547	63,429	60,298
Mined Tons (000)		2,379	2,967	2,980	2,994	3,007	3,021	3,034	3,048	3,062	3,076	3,089	3,103	3,117	3,131	3,145
Sold Tons (000)		**1,820**	**2,304**	*2,280*	*2,290*	*2,301*	*2,311*	*2,321*	*2,332*	*2,342*	*2,353*	*2,363*	*2,374*	*2,385*	*2,395*	*2,406*
R/S Ratio		1.6%	2.3%	3.1%	3.2%	3.3%	3.4%	3.6%	3.7%	3.9%	4.1%	4.2%	4.5%	4.7%	4.9%	5.2%
ASP (Selling Price)		*$ 36.9*	*$ 29.3*	*$ 29.9*	*$ 30.5*	*$ 31.1*	*$ 31.7*	*$ 32.3*	*$ 33.0*	*$ 33.7*	*$ 34.3*	*$ 35.0*	*$ 35.7*	*$ 36.4*	*$ 37.2*	*$ 37.9*
ACS (Cost of Sale)		*$ 29.5*	*$ 20.8*	*$ 21.2*	*$ 21.6*	*$ 22.1*	*$ 22.5*	*$ 23.0*	*$ 23.4*	*$ 23.9*	*$ 24.4*	*$ 24.9*	*$ 25.4*	*$ 25.9*	*$ 26.4*	*$ 26.9*
Rev		**$ 67,191**	**$67,494**	$68,137	$69,812	$71,529	$73,288	$75,090	$76,936	$78,828	$80,766	$82,752	$84,787	$86,872	$89,008	$91,197
Cost of Sale		**$ 53,662**	**$47,928**	$48,384	$49,574	$50,793	$52,042	$53,322	$54,633	$55,977	$57,353	$58,763	$60,208	$61,689	$63,206	$64,760
CM		**$ 13,530**	**$19,566**	**$19,752**	**$20,238**	**$20,735**	**$21,245**	**$21,768**	**$22,303**	**$22,851**	**$23,413**	**$23,989**	**$24,579**	**$25,183**	**$25,803**	**$26,437**
Change in CM		$ —	$ 6,036	$ 186	$ 486	$ 498	$ 510	$ 522	$ 535	$ 548	$ 562	$ 576	$ 590	$ 604	$ 619	$ 634
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$ 13,530**	**$19,566**	**$19,752**	**$20,238**	**$20,735**	**$21,245**	**$21,768**	**$22,303**	**$22,851**	**$23,413**	**$23,989**	**$24,579**	**$25,183**	**$25,803**	**$26,437**
D&A		**$ 10,165**	**$ 8,621**	$ 9,393	$ 9,007	$ 9,200	$ 9,104	$ 9,152	$ 9,128	$ 9,140	$ 9,134	$ 9,137	$ 9,135	$ 9,136	$ 9,136	$ 9,136
EBIT		**$ 3,365**	**$10,944**	**$10,359**	**$11,231**	**$11,535**	**$12,142**	**$12,616**	**$13,175**	**$13,712**	**$14,280**	**$14,852**	**$15,444**	**$16,047**	**$16,667**	**$17,301**
Taxes		$ 875	$ 2,846	$ 2,693	$ 2,920	$ 2,999	$ 3,157	$ 3,280	$ 3,426	$ 3,565	$ 3,713	$ 3,862	$ 4,015	$ 4,172	$ 4,333	$ 4,498
Operating Income		**$ 2,490**	**$ 8,099**	**$ 7,666**	**$ 8,311**	**$ 8,536**	**$ 8,985**	**$ 9,336**	**$ 9,750**	**$10,147**	**$10,567**	**$10,991**	**$11,428**	**$11,875**	**$12,334**	**$12,803**
Plant Capex		**$ (2,182)**	**$ (1,517)**	$ (6,000)	$ (4,000)	$ (2,135)	$ (2,213)	$ (2,217)	$ (2,260)	$ (2,283)	$ (2,317)	$ (2,346)	$ (2,378)	$ (2,409)	$ (2,442)	$ (2,474)
Total Capex		**$ (2,182)**	**$ (1,517)**	**$ (6,000)**	**$ (4,000)**	**$ (2,135)**	**$ (2,213)**	**$ (2,217)**	**$ (2,260)**	**$ (2,283)**	**$ (2,317)**	**$ (2,346)**	**$ (2,378)**	**$ (2,409)**	**$ (2,442)**	**$ (2,474)**
Change in NWC		$ —	$ (1,509)	$ (47)	$ (121)	$ (124)	$ (127)	$ (131)	$ (134)	$ (137)	$ (140)	$ (144)	$ (147)	$ (151)	$ (155)	$ (159)
Net Income		$ 308	$ 5,073	$ 1,619	$ 4,189	$ 6,277	$ 6,644	$ 6,988	$ 7,356	$ 7,726	$ 8,110	$ 8,501	$ 8,903	$ 9,315	$ 9,737	$10,170
FCF	**$ (86,400)**	**$ 10,473**	**$13,694**	**$11,012**	**$13,196**	**$15,477**	**$15,748**	**$16,140**	**$16,484**	**$16,866**	**$17,243**	**$17,638**	**$18,038**	**$18,451**	**$18,873**	**$19,306**

In Thousand (000)	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Reserve Balance Tons (000)	57,153	53,993	50,820	47,632	44,429	41,213	37,981	34,736	31,475	28,200	24,910	21,606	18,286	14,952	11,603	8,238	4,859	1,464
Mined Tons (000)	3,159	3,174	3,188	3,202	3,217	3,231	3,246	3,260	3,275	3,290	3,305	3,319	3,334	3,349	3,364	3,380	3,395	1,464
Sold Tons (000)	*2,417*	*2,428*	*2,439*	*2,450*	*2,461*	*2,472*	*2,483*	*2,494*	*2,505*	*2,517*	*2,528*	*2,539*	*2,551*	*2,562*	*2,574*	*2,585*	*2,597*	*1,120*
R/S Ratio	5.5%	5.9%	6.3%	6.7%	7.2%	7.8%	8.5%	9.4%	10.4%	11.7%	13.3%	15.4%	18.2%	22.4%	29.0%	41.0%	69.9%	100.0%
ASP (Selling Price)	*$ 38.7*	*$ 39.4*	*$ 40.2*	*$ 41.0*	*$ 41.8*	*$ 42.7*	*$ 43.5*	*$ 44.4*	*$ 45.3*	*$ 46.2*	*$ 47.1*	*$ 48.1*	*$ 49.0*	*$ 50.0*	*$ 51.0*	*$ 52.0*	*$ 53.1*	*$ 54.1*
ACS (Cost of Sale)	*$ 27.5*	*$ 28.0*	*$ 28.6*	*$ 29.1*	*$ 29.7*	*$ 30.3*	*$ 30.9*	*$ 31.5*	*$ 32.2*	*$ 32.8*	*$ 33.5*	*$ 34.1*	*$ 34.8*	*$ 35.5*	*$ 36.2*	*$ 36.9*	*$ 37.7*	*$ 38.4*
Rev	$93,440	$95,737	$98,092	$100,504	$102,975	$105,507	$108,102	$110,760	$113,483	$116,274	$119,133	$122,063	$125,064	$128,140	$131,290	$134,519	$137,827	$ 60,616
Cost of Sale	$66,352	$67,984	$69,656	$ 71,369	$ 73,124	$ 74,922	$ 76,764	$ 78,652	$ 80,586	$ 82,567	$ 84,598	$ 86,678	$ 88,809	$ 90,993	$ 93,231	$ 95,523	$ 97,872	$ 43,044
CM	**$27,087**	**$27,753**	**$28,436**	**$ 29,135**	**$ 29,851**	**$ 30,586**	**$ 31,338**	**$ 32,108**	**$ 32,898**	**$ 33,707**	**$ 34,536**	**$ 35,385**	**$ 36,255**	**$ 37,146**	**$ 38,060**	**$ 38,996**	**$ 39,955**	**$ 17,572**
Change in CM	$ 650	$ 666	$ 682	$ 699	$ 716	$ 734	$ 752	$ 771	$ 790	$ 809	$ 829	$ 849	$ 870	$ 892	$ 913	$ 936	$ 959	$(22,383)
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$27,087**	**$27,753**	**$28,436**	**$ 29,135**	**$ 29,851**	**$ 30,586**	**$ 31,338**	**$ 32,108**	**$ 32,898**	**$ 33,707**	**$ 34,536**	**$ 35,385**	**$ 36,255**	**$ 37,146**	**$ 38,060**	**$ 38,996**	**$ 39,955**	**$ 17,572**
D&A	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136
EBIT	**$17,952**	**$18,618**	**$19,300**	**$ 19,999**	**$ 20,716**	**$ 21,450**	**$ 22,202**	**$ 22,972**	**$ 23,762**	**$ 24,571**	**$ 25,400**	**$ 26,249**	**$ 27,119**	**$ 28,011**	**$ 28,924**	**$ 29,860**	**$ 30,819**	**$ 8,436**
Taxes	$ 4,667	$ 4,841	$ 5,018	$ 5,200	$ 5,386	$ 5,577	$ 5,772	$ 5,973	$ 6,178	$ 6,388	$ 6,604	$ 6,825	$ 7,051	$ 7,283	$ 7,520	$ 7,764	$ 8,013	$ 2,193
Operating Income	**$13,284**	**$13,777**	**$14,282**	**$ 14,799**	**$ 15,330**	**$ 15,873**	**$ 16,429**	**$ 17,000**	**$ 17,584**	**$ 18,182**	**$ 18,796**	**$ 19,424**	**$ 20,068**	**$ 20,728**	**$ 21,404**	**$ 22,096**	**$ 22,806**	**$ 6,243**
Plant Capex	$ (2,507)	$ (2,540)	$ (2,574)	$ (2,608)	$ (2,643)	$ (2,678)	$ (2,714)	$ (2,750)	$ (2,786)	$ (2,824)	$ (2,861)	$ (2,899)	$ (2,938)	$ (2,977)	$ (3,016)	$ (3,057)	$ (3,097)	$ (3,138)
Total Capex	**$ (2,507)**	**$ (2,540)**	**$ (2,574)**	**$ (2,608)**	**$ (2,643)**	**$ (2,678)**	**$ (2,714)**	**$ (2,750)**	**$ (2,786)**	**$ (2,824)**	**$ (2,861)**	**$ (2,899)**	**$ (2,938)**	**$ (2,977)**	**$ (3,016)**	**$ (3,057)**	**$ (3,097)**	**$ (3,138)**
Change in NWC	$ (163)	$ (167)	$ (171)	$ (175)	$ (179)	$ (184)	$ (188)	$ (193)	$ (197)	$ (202)	$ (207)	$ (212)	$ (218)	$ (223)	$ (228)	$ (234)	$ (240)	$ —
Net Income	$10,615	$11,070	$11,537	$ 12,016	$ 12,508	$ 13,011	$ 13,528	$ 14,057	$ 14,600	$ 15,157	$ 15,728	$ 16,313	$ 16,913	$ 17,528	$ 18,159	$ 18,806	$ 19,469	$ 3,104
FCF	**$19,750**	**$20,206**	**$20,673**	**$ 21,152**	**$ 21,643**	**$ 22,147**	**$ 22,663**	**$ 23,193**	**$ 23,736**	**$ 24,293**	**$ 24,863**	**$ 25,449**	**$ 26,049**	**$ 26,664**	**$ 27,295**	**$ 27,942**	**$ 28,605**	**$ 12,240**

Table 19.1.1: Economic Feasibility Base Model.

1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.3 above, there are no royalties or other associated payments specific to Ottawa.
2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Reserve Balance Tons (000)		115,725	99,928	96,961	93,967	90,947	87,899	84,824	81,721	78,590	75,431	72,243	69,027
Mined Tons (000)		2,379	2,967	2,994	3,021	3,048	3,075	3,103	3,131	3,159	3,187	3,216	3,245
Sold Tons (000)		**1,820**	**2,304**	*2,380*	*2,401*	*2,423*	*2,445*	*2,467*	*2,489*	*2,511*	*2,534*	*2,557*	*2,580*
R/S Ratio		1.6%	2.3%	3.1%	3.2%	3.4%	3.5%	3.7%	3.8%	4.0%	4.2%	4.5%	4.7%
ASP (Selling Price)		*$ 36.9*	*$ 29.3*	*$ 30.5*	*$ 31.7*	*$ 33.0*	*$ 34.3*	*$ 35.6*	*$ 37.1*	*$ 38.6*	*$ 40.1*	*$ 41.7*	*$ 43.4*
ACS (Cost of Sale)		*$ 29.5*	*$ 20.8*	*$ 21.4*	*$ 22.1*	*$ 22.7*	*$ 23.4*	*$ 24.1*	*$ 24.8*	*$ 25.6*	*$ 26.4*	*$ 27.1*	*$ 28.0*
Rev		**$ 67,191**	**$67,494**	$72,520	$76,100	$79,856	$83,798	$87,934	$92,275	$96,829	$101,609	$106,624	$111,887
Cost of Sale		**$ 53,662**	**$47,928**	$51,002	$53,005	$55,087	$57,250	$59,498	$61,835	$64,263	$ 66,786	$ 69,409	$ 72,135
CM		**$ 13,530**	**$19,566**	**$21,518**	**$23,095**	**$24,770**	**$26,548**	**$28,436**	**$30,440**	**$32,567**	**$ 34,822**	**$ 37,215**	**$ 39,752**
Change in CM		$ —	$ 6,036	$ 1,952	$ 1,577	$ 1,675	$ 1,778	$ 1,888	$ 2,004	$ 2,126	$ 2,256	$ 2,393	$ 2,537
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$ 13,530**	**$19,566**	**$21,518**	**$23,095**	**$24,770**	**$26,548**	**$28,436**	**$30,440**	**$32,567**	**$ 34,822**	**$ 37,215**	**$ 39,752**
D&A		**$ 10,165**	**$ 8,621**	$ 9,393	$ 9,007	$ 9,200	$ 9,104	$ 9,152	$ 9,128	$ 9,140	$ 9,134	$ 9,137	$ 9,135
EBIT		**$ 3,365**	**$10,944**	**$12,125**	**$14,088**	**$15,570**	**$17,444**	**$19,284**	**$21,312**	**$23,427**	**$ 25,689**	**$ 28,078**	**$ 30,617**
Taxes		$ 875	$ 2,846	$ 3,153	$ 3,663	$ 4,048	$ 4,536	$ 5,014	$ 5,541	$ 6,091	$ 6,679	$ 7,300	$ 7,960
Operating Income		**$ 2,490**	**$ 8,099**	**$ 8,973**	**$10,425**	**$11,521**	**$12,909**	**$14,270**	**$15,771**	**$17,336**	**$ 19,010**	**$ 20,778**	**$ 22,657**
Plant Capex		**$ (2,182)**	**$ (1,517)**	$ (6,000)	$ (4,000)	$ (2,135)	$ (2,213)	$ (2,283)	$ (2,360)	$ (2,438)	$ (2,519)	$ (2,602)	$ (2,688)
Total Capex		**$ (2,182)**	**$ (1,517)**	**$ (6,000)**	**$ (4,000)**	**$ (2,135)**	**$ (2,213)**	**$ (2,283)**	**$ (2,360)**	**$ (2,438)**	**$ (2,519)**	**$ (2,602)**	**$ (2,688)**
Change in NWC		$ —	$ (1,509)	$ (488)	$ (394)	$ (419)	$ (445)	$ (472)	$ (501)	$ (532)	$ (564)	$ (598)	$ (634)
Net Income		$ 308	$ 5,073	$ 2,485	$ 6,031	$ 8,968	$10,251	$11,516	$12,910	$14,367	$ 15,927	$ 17,578	$ 19,334
FCF	**$ (86,400)**	**$ 10,473**	**$13,694**	**$11,878**	**$15,038**	**$18,168**	**$19,355**	**$20,668**	**$22,038**	**$23,506**	**$ 25,061**	**$ 26,715**	**$ 28,469**

In Thousand (000)	2032	2033	2034	2035	2036	2037	2038	2039	2040
Reserve Balance Tons (000)	65,782	62,508	59,204	55,870	52,507	49,113	45,689	42,234	38,747
Mined Tons (000)	3,274	3,304	3,334	3,364	3,394	3,424	3,455	3,486	3,518
Sold Tons (000)	*2,603*	*2,627*	*2,650*	*2,674*	*2,698*	*2,722*	*2,747*	*2,772*	*2,797*
R/S Ratio	5.0%	5.3%	5.6%	6.0%	6.5%	7.0%	7.6%	8.3%	9.1%
ASP (Selling Price)	*$ 45.1*	*$ 46.9*	*$ 48.8*	*$ 50.7*	*$ 52.8*	*$ 54.9*	*$ 57.1*	*$ 59.4*	*$ 61.7*
ACS (Cost of Sale)	*$ 28.8*	*$ 29.7*	*$ 30.6*	*$ 31.5*	*$ 32.4*	*$ 33.4*	*$ 34.4*	*$ 35.4*	*$ 36.5*
Rev	$117,410	$123,205	$129,287	$135,668	$142,365	$149,392	$156,766	$164,504	$172,624
Cost of Sale	$ 74,968	$ 77,912	$ 80,971	$ 84,151	$ 87,455	$ 90,890	$ 94,459	$ 98,168	$102,024
CM	**$ 42,442**	**$ 45,294**	**$ 48,316**	**$ 51,518**	**$ 54,910**	**$ 58,502**	**$ 62,307**	**$ 66,336**	**$ 70,600**
Change in CM	$ 2,690	$ 2,851	$ 3,022	$ 3,202	$ 3,392	$ 3,593	$ 3,805	$ 4,029	$ 4,265
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$ 42,442**	**$ 45,294**	**$ 48,316**	**$ 51,518**	**$ 54,910**	**$ 58,502**	**$ 62,307**	**$ 66,336**	**$ 70,600**
D&A	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136
EBIT	**$ 33,306**	**$ 36,158**	**$ 39,180**	**$ 42,382**	**$ 45,774**	**$ 49,367**	**$ 53,171**	**$ 57,200**	**$ 61,465**
Taxes	$ 8,660	$ 9,401	$ 10,187	$ 11,019	$ 11,901	$ 12,835	$ 13,825	$ 14,872	$ 15,981
Operating Income	**$ 24,647**	**$ 26,757**	**$ 28,993**	**$ 31,363**	**$ 33,873**	**$ 36,531**	**$ 39,347**	**$ 42,328**	**$ 45,484**
Plant Capex	$ (2,778)	$ (2,870)	$ (2,965)	$ (3,063)	$ (3,165)	$ (3,270)	$ (3,378)	$ (3,490)	$ (3,606)
Total Capex	**$ (2,778)**	**$ (2,870)**	**$ (2,965)**	**$ (3,063)**	**$ (3,165)**	**$ (3,270)**	**$ (3,378)**	**$ (3,490)**	**$ (3,606)**
Change in NWC	$ (673)	$ (713)	$ (755)	$ (800)	$ (848)	$ (898)	$ (951)	$ (1,007)	$ (1,066)
Net Income	$ 21,197	$ 23,175	$ 25,273	$ 27,499	$ 29,860	$ 32,363	$ 35,018	$ 37,831	$ 40,812
FCF	**$ 30,333**	**$ 32,310**	**$ 34,409**	**$ 36,635**	**$ 38,996**	**$ 41,499**	**$ 44,153**	**$ 46,967**	**$ 49,948**

In Thousand (000)	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Reserve Balance Tons (000)	35,230	31,680	28,099	24,486	20,840	17,161	13,449	9,704	5,925	2,112
Mined Tons (000)	3,549	3,581	3,613	3,646	3,679	3,712	3,745	3,779	3,813	2,112
Sold Tons (000)	*2,822*	*2,847*	*2,873*	*2,899*	*2,925*	*2,951*	*2,978*	*3,004*	*3,031*	*1,679*
R/S Ratio	10.1%	11.3%	12.9%	14.9%	17.7%	21.6%	27.8%	38.9%	64.4%	100.0%
ASP (Selling Price)	*$ 64.2*	*$ 66.8*	*$ 69.4*	*$ 72.2*	*$ 75.1*	*$ 78.1*	*$ 81.2*	*$ 84.5*	*$ 87.9*	*$ 91.4*
ACS (Cost of Sale)	*$ 37.6*	*$ 38.7*	*$ 39.9*	*$ 41.1*	*$ 42.3*	*$ 43.6*	*$ 44.9*	*$ 46.2*	*$ 47.6*	*$ 49.0*
Rev	$181,145	$190,086	$199,469	$209,315	$219,646	$230,488	$241,865	$253,803	$266,331	$153,394
Cost of Sale	$106,030	$110,194	$114,521	$119,018	$123,692	$128,550	$133,598	$138,844	$144,297	$ 82,309
CM	**$ 75,115**	**$ 79,892**	**$ 84,948**	**$ 90,296**	**$ 95,954**	**$101,938**	**$108,267**	**$114,959**	**$122,035**	**$ 71,085**
Change in CM	$ 4,514	$ 4,778	$ 5,055	$ 5,349	$ 5,658	$ 5,984	$ 6,329	$ 6,692	$ 7,075	$ (50,949)
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$ 75,115**	**$ 79,892**	**$ 84,948**	**$ 90,296**	**$ 95,954**	**$101,938**	**$108,267**	**$114,959**	**$122,035**	**$ 71,085**
D&A	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136
EBIT	**$ 65,979**	**$ 70,756**	**$ 75,812**	**$ 81,160**	**$ 86,818**	**$ 92,803**	**$ 99,131**	**$105,823**	**$112,899**	**$ 61,949**
Taxes	$ 17,155	$ 18,397	$ 19,711	$ 21,102	$ 22,573	$ 24,129	$ 25,774	$ 27,514	$ 29,354	$ 16,107
Operating Income	**$ 48,824**	**$ 52,360**	**$ 56,101**	**$ 60,059**	**$ 64,245**	**$ 68,674**	**$ 73,357**	**$ 78,309**	**$ 83,545**	**$ 45,843**
Plant Capex	$ (3,725)	$ (3,849)	$ (3,976)	$ (4,108)	$ (4,244)	$ (4,385)	$ (4,530)	$ (4,681)	$ (4,836)	$ (4,996)
Total Capex	**$ (3,725)**	**$ (3,849)**	**$ (3,976)**	**$ (4,108)**	**$ (4,244)**	**$ (4,385)**	**$ (4,530)**	**$ (4,681)**	**$ (4,836)**	**$ (4,996)**
Change in NWC	$ (1,129)	$ (1,194)	$ (1,264)	$ (1,337)	$ (1,414)	$ (1,496)	$ (1,582)	$ (1,673)	$ (1,769)	$ —
Net Income	$ 43,971	$ 47,317	$ 50,861	$ 54,613	$ 58,587	$ 62,793	$ 67,245	$ 71,956	$ 76,940	$ 40,846
FCF	**$ 53,106**	**$ 56,453**	**$ 59,996**	**$ 63,749**	**$ 67,723**	**$ 71,929**	**$ 76,380**	**$ 81,092**	**$ 86,076**	**$ 49,982**

Table 19.1.2: Economic Feasibility Moderate Model.

1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.3 above, there are no royalties or other associated payments specific to Ottawa.
2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Reserve Balance Tons (000)		115,725	99,928	96,961	93,954	90,906	87,818	84,687	81,514	78,299	75,040	71,737	68,389	64,996	61,558	58,073
Mined Tons (000)		2,379	2,967	3,007	3,048	3,089	3,130	3,173	3,216	3,259	3,303	3,348	3,393	3,439	3,485	3,532
Sold Tons (000)		**1,820**	**2,304**	*2,481*	*2,514*	*2,548*	*2,583*	*2,618*	*2,653*	*2,689*	*2,725*	*2,762*	*2,799*	*2,837*	*2,875*	*2,914*
R/S Ratio		1.6%	2.3%	3.1%	3.2%	3.4%	3.6%	3.7%	3.9%	4.2%	4.4%	4.7%	5.0%	5.3%	5.7%	6.1%
ASP (Selling Price)		*$ 36.9*	*$ 29.3*	*$ 31.1*	*$ 32.9*	*$ 34.9*	*$ 37.0*	*$ 39.2*	*$ 41.6*	*$ 44.1*	*$ 46.7*	*$ 49.5*	*$ 52.5*	*$ 55.6*	*$ 59.0*	*$ 62.5*
ACS (Cost of Sale)		*$ 29.5*	*$ 20.8*	*$ 21.8*	*$ 22.9*	*$ 24.1*	*$ 25.3*	*$ 26.6*	*$ 27.9*	*$ 29.3*	*$ 30.7*	*$ 32.3*	*$ 33.9*	*$ 35.6*	*$ 37.4*	*$ 39.2*
Rev		**$ 67,191**	**$67,494**	$77,046	$82,772	$88,922	$95,530	$102,629	$110,255	$118,449	$127,250	$136,706	$146,865	$157,779	$169,503	$182,099
Cost of Sale		**$ 53,662**	**$47,928**	$54,195	$57,673	$61,374	$65,313	$ 69,505	$ 73,965	$ 78,712	$ 83,763	$ 89,139	$ 94,859	$100,947	$107,425	$114,319
CM		**$ 13,530**	**$19,566**	**$22,851**	**$25,098**	**$27,548**	**$30,217**	**$ 33,125**	**$ 36,291**	**$ 39,737**	**$ 43,487**	**$ 47,568**	**$ 52,006**	**$ 56,832**	**$ 62,078**	**$ 67,780**
Change in CM		$ —	$ 6,036	$ 3,285	$ 2,247	$ 2,450	$ 2,669	$ 2,907	$ 3,166	$ 3,446	$ 3,751	$ 4,080	$ 4,438	$ 4,826	$ 5,246	$ 5,702
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$ 13,530**	**$19,566**	**$22,851**	**$25,098**	**$27,548**	**$30,217**	**$ 33,125**	**$ 36,291**	**$ 39,737**	**$ 43,487**	**$ 47,568**	**$ 52,006**	**$ 56,832**	**$ 62,078**	**$ 67,780**
D&A		**$ 10,165**	**$ 8,621**	$ 9,393	$ 9,007	$ 9,200	$ 9,104	$ 9,152	$ 9,128	$ 9,140	$ 9,134	$ 9,137	$ 9,135	$ 9,136	$ 9,136	$ 9,136
EBIT		**$ 3,365**	**$10,944**	**$13,458**	**$16,091**	**$18,348**	**$21,114**	**$ 23,973**	**$ 27,163**	**$ 30,597**	**$ 34,354**	**$ 38,431**	**$ 42,871**	**$ 47,696**	**$ 52,943**	**$ 58,644**
Taxes		$ 875	$ 2,846	$ 3,499	$ 4,184	$ 4,770	$ 5,490	$ 6,233	$ 7,062	$ 7,955	$ 8,932	$ 9,992	$ 11,146	$ 12,401	$ 13,765	$ 15,248
Operating Income		**$ 2,490**	**$ 8,099**	**$ 9,959**	**$11,908**	**$13,578**	**$15,624**	**$ 17,740**	**$ 20,100**	**$ 22,642**	**$ 25,422**	**$ 28,439**	**$ 31,724**	**$ 35,295**	**$ 39,178**	**$ 43,397**
Plant Capex		**$ (2,182)**	**$ (1,517)**	$ (6,000)	$ (4,000)	$ (2,135)	$ (2,213)	$ (2,391)	$ (2,532)	$ (2,708)	$ (2,882)	$ (3,075)	$ (3,276)	$ (3,493)	$ (3,723)	$ (3,969)
Total Capex		**$ (2,182)**	**$ (1,517)**	**$ (6,000)**	**$ (4,000)**	**$ (2,135)**	**$ (2,213)**	**$ (2,391)**	**$ (2,532)**	**$ (2,708)**	**$ (2,882)**	**$ (3,075)**	**$ (3,276)**	**$ (3,493)**	**$ (3,723)**	**$ (3,969)**
Change in NWC		$ —	$ (1,509)	$ (821)	$ (562)	$ (612)	$ (667)	$ (727)	$ (791)	$ (862)	$ (938)	$ (1,020)	$ (1,110)	$ (1,206)	$ (1,312)	$ (1,425)
Net Income		$ 308	$ 5,073	$ 3,138	$ 7,346	$10,830	$12,744	$ 14,622	$ 16,777	$ 19,072	$ 21,602	$ 24,344	$ 27,339	$ 30,596	$ 34,143	$ 38,002
FCF	**$ (86,400)**	**$ 10,473**	**$13,694**	**$12,531**	**$16,353**	**$20,030**	**$21,847**	**$ 23,773**	**$ 25,904**	**$ 28,212**	**$ 30,736**	**$ 33,481**	**$ 36,474**	**$ 39,732**	**$ 43,279**	**$ 47,138**

In Thousand (000)	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Reserve Balance Tons (000)	54,541	50,961	47,333	43,656	39,929	36,152	32,324	28,445	24,513	20,527	16,489	12,395	8,246	4,042
Mined Tons (000)	3,580	3,628	3,677	3,727	3,777	3,828	3,880	3,932	3,985	4,039	4,093	4,149	4,205	4,042
Sold Tons (000)	*2,953*	*2,993*	*3,034*	*3,075*	*3,116*	*3,158*	*3,201*	*3,244*	*3,288*	*3,332*	*3,377*	*3,423*	*3,469*	*3,334*
R/S Ratio	6.6%	7.1%	7.8%	8.5%	9.5%	10.6%	12.0%	13.8%	16.3%	19.7%	24.8%	33.5%	51.0%	100.0%
ASP (Selling Price)	*$ 66.2*	*$ 70.2*	*$ 74.4*	*$ 78.9*	*$ 83.6*	*$ 88.6*	*$ 94.0*	*$ 99.6*	*$ 105.6*	*$ 111.9*	*$ 118.6*	*$ 125.7*	*$ 133.3*	*$ 141.3*
ACS (Cost of Sale)	*$ 41.2*	*$ 43.3*	*$ 45.4*	*$ 47.7*	*$ 50.1*	*$ 52.6*	*$ 55.2*	*$ 58.0*	*$ 60.9*	*$ 63.9*	*$ 67.1*	*$ 70.5*	*$ 74.0*	*$ 77.7*
Rev	$195,631	$210,168	$225,786	$242,564	$260,589	$279,953	$300,756	$323,106	$347,116	$372,910	$400,621	$430,391	$462,373	$471,120
Cost of Sale	$121,655	$129,462	$137,771	$146,612	$156,021	$166,034	$176,689	$188,028	$200,094	$212,936	$226,601	$241,143	$256,618	$259,006
CM	**$ 73,976**	**$ 80,706**	**$ 88,015**	**$ 95,952**	**$104,568**	**$113,920**	**$124,068**	**$135,078**	**$147,021**	**$159,974**	**$174,020**	**$189,248**	**$205,755**	**$212,114**
Change in CM	$ 6,195	$ 6,730	$ 7,309	$ 7,937	$ 8,616	$ 9,352	$ 10,148	$ 11,010	$ 11,943	$ 12,953	$ 14,046	$ 15,228	$ 16,507	$ 6,359
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$ 73,976**	**$ 80,706**	**$ 88,015**	**$ 95,952**	**$104,568**	**$113,920**	**$124,068**	**$135,078**	**$147,021**	**$159,974**	**$174,020**	**$189,248**	**$205,755**	**$212,114**
D&A	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136	$ 9,136
EBIT	**$ 64,840**	**$ 71,570**	**$ 78,879**	**$ 86,816**	**$ 95,432**	**$104,784**	**$114,932**	**$125,942**	**$137,885**	**$150,838**	**$164,884**	**$180,112**	**$196,619**	**$202,978**
Taxes	$ 16,858	$ 18,608	$ 20,509	$ 22,572	$ 24,812	$ 27,244	$ 29,882	$ 32,745	$ 35,850	$ 39,218	$ 42,870	$ 46,829	$ 51,121	$ 52,774
Operating Income	**$ 47,981**	**$ 52,962**	**$ 58,371**	**$ 64,244**	**$ 70,620**	**$ 77,540**	**$ 85,050**	**$ 93,197**	**$102,035**	**$111,620**	**$122,014**	**$133,283**	**$145,498**	**$150,204**
Plant Capex	$ (4,231)	$ (4,510)	$ (4,807)	$ (5,124)	$ (5,462)	$ (5,823)	$ (6,207)	$ (6,616)	$ (7,053)	$ (7,518)	$ (8,014)	$ (8,542)	$ (9,106)	$ (9,707)
Total Capex	**$ (4,231)**	**$ (4,510)**	**$ (4,807)**	**$ (5,124)**	**$ (5,462)**	**$ (5,823)**	**$ (6,207)**	**$ (6,616)**	**$ (7,053)**	**$ (7,518)**	**$ (8,014)**	**$ (8,542)**	**$ (9,106)**	**$ (9,707)**
Change in NWC	$ (1,549)	$ (1,683)	$ (1,827)	$ (1,984)	$ (2,154)	$ (2,338)	$ (2,537)	$ (2,753)	$ (2,986)	$ (3,238)	$ (3,511)	$ (3,807)	$ (4,127)	$ (1,590)
Net Income	$ 42,202	$ 46,769	$ 51,736	$ 57,135	$ 63,003	$ 69,379	$ 76,306	$ 83,828	$ 91,997	$100,864	$110,489	$120,934	$132,266	$138,908
FCF	**$ 51,338**	**$ 55,905**	**$ 60,872**	**$ 66,271**	**$ 72,139**	**$ 78,515**	**$ 85,442**	**$ 92,964**	**$101,132**	**$110,000**	**$119,625**	**$130,069**	**$141,401**	**$148,043**

Table 19.1.3: Economic Feasibility Upside Model.

1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.3 above, there are no royalties or other associated payments specific to Ottawa.
2) The Book Value in the Economic Feasibility Model is as of December 2020.

Drivers	Base	5% Moderate	10% Upside
		Case	
Average Selling Price Growth	2%	4%	6%
Tons Growth	0.5%	1%	1%
Costs of Goods Sold Growth	2%	3%	5%
Selling, General, and Administrative Expenses Growth	2%	5%	10%
Capital Expenditures Growth	2%	5%	10%
Inflation Rate	2%	3%	4%
Inflation Adjusted Discount Rate	10%	11%	12%
Site Yield	77%	80%	83%

Case	Payback	IRR	NPV
Base	0.10 Years	17%	$ 64,534,000
Moderate	0.10 Years	21%	$117,544,000
Upside	0.10 Years	24%	$143,056,000

Table 19.2 Sensitivity Analysis.

20.0 ADJACENT PROPERTIES

There are no other silica sand mining operations adjacent to the Ottawa mine. The areas to the east are mostly residential and light commercial development. To the north, south and west is vacant land primarily used for agricultural purposes.

21.0 OTHER RELEVANT DATA AND INFORMATION

There is no additional data or information to include in this section.

22.0 INTERPRETATIONS AND CONCLUSIONS

22.1 Comments on Exploration

Based on the review of U.S. Silica provided exploration data for the South Ottawa Pit, it is the QP's opinion there is sufficient drilling data available and the spacing of the borings drilled is acceptable for this report.

22.2 Comments on Data Verification

It is the QP's opinion that it is reasonable to rely on laboratory testing procedures provided by U.S. Silica. Based on the review of provided lab documentation provided by U.S. Silica, it is the QP's opinion that the testing procedures and results presented herein are acceptable for the purpose of this report.

22.3 Comments on Mineral Processing and Metallurgical Testing

Based on review of the lab procedures provided by U.S. Silica, the overall relative homogenous mineralogy of the deposit, it is the QP's opinion that the procedures and laboratory testing reviewed are acceptable for the purposes of this report.

22.4 Comments on Mineral Resource Estimates

It is the QP's opinion that currently, there are no foreseeable factors likely to influence or preclude the economic extraction of silica sand at the Ottawa Site.

22.5 Comments on Mineral Reserve Estimates

It is the QP's opinion that currently, there are no foreseeable risk factors that would materially affect the in-situ reserves reported for the Ottawa Site.

22.6 Comments on Mining Methods

In the opinion of the QP, detailed mine planning has not been accomplished to adequately delineate the surface area required to describe the resources left in-place[54] from the areas known as "South Ottawa" and the "West Pit" to maintain the buffer around Brown's Brook.

22.7 Comments on Processing and Recovery Methods

In the opinion of the QP, the current facilities dedicated to Processing and Recovery Methods will allow U.S. Silica to maintain the current levels of production and product quality to support the life-of-mine plan represented by the Economic Analysis in this report (Section 19.0).

22.8 Comments on Infrastructure

In the opinion of the QP, the current infrastructure is adequate to maintain the historical levels of finished goods production except for the current capacity of tailings storage. U.S. Silica is planning to create additional storage volume and is underway with the planning process. In the opinion of the QP, the capital required to provide the necessary tailings storage capacity and allow U.S. Silica to maintain the current levels of production and product quality to support the life-of-mine plan are represented in the Economic Analysis (Section 19.0) in this report.

22.8.1 Electricity

In the opinion of the QP the risk of material interruption of the supply of electric power is low. The highest risk relative to electric power is real cost escalation of the power without a long-term contract.

54 A block of St. Peter Sandstone to be left in-place to allow for the natural course of Brown's Brook to remain in a natural state and the necessary construction of a bridge over Brown's Book. See the Infrastructure discussion in Section 15.

22.8.2 Natural Gas

In the opinion of the QP the risk of material interruption of the supply of natural gas is low. The highest risk relative to natural gas is real cost escalation of the gas supply without a long-term contract.

22.9 Comments on Permitting

It is the opinion of the QP that the existing permits and plans for the active mine and processing plant operations adequately address environmental compliance and permitting requirements and that U.S. Silica can reasonably anticipate that they will be able to obtain the future authorizations needed to complete the mine plan.

Based on review of previous permit documents, history of the site, the mine plan, and the regulatory requirements it is the opinion of WESTWARD that it is highly likely U.S. Silica would be able to obtain authorizations to develop the reserves as classified herein. It is the opinion of the QP that the current authorizations held by Mississippi Sands can likely be transferred to U.S. Silica or, in the event that transfer is not an option, it is reasonable anticipated that U.S. Silica would receive new authorizations for the above-listed permits and agreements.

23.0 RECOMMENDATIONS

The primary recommendation of this report is to design and implement a third-party sampling and testing program to provide outside quality control for U.S. Silica's internal testing program. The program should be written with detailed instructions on proper collection methods; sample containers, preservation, labeling, chain of custody, security, and transport; and testing. Anticipated cost for this program is estimated to be up to $7,000 - $10,000 annually depending on the number of tests conducted and which parameters are run.

24.0 REFERENCES

All references used are cited in each individual section as footnotes.

25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This Technical Report has been prepared by the QPs for U.S. Silica. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to the QPs at the time of preparation of this Technical Report.
- Assumptions, conditions, and qualifications as set forth in this Technical Report.
- Data, reports, and other information supplied by U.S. Silica and other third-party sources.

For the purpose of this Technical Report, the QPs have relied on ownership information and market studies included in Section 3.0. The QPs have not researched property title or mineral rights for U.S. Silica as we consider it reasonable to rely on U.S. Silica's personnel who are responsible for maintaining this information.

The QPs have relied on U.S. Silica for general marketing information and market studies included in Section 16.0 and referenced in Section 19.0. The QPs consider it reasonable to rely on U.S. Silica for this information as it has considerable experience in these areas.

This report titled “Technical Report Summary, Ottawa Site, Lasalle County, Illinois” (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons. Terrance N. Lackey, Mining Director at U.S. Silica Holdings, Inc., prepared or contributed to the following sections:

1.0 Executive Summary

16.0 Market Studies and Contracts

18.0 Capital and Operating Costs

19.0 Economic Analysis

U.S. Silica Holdings, Inc.

/s/Terrance N. Lackey	09/30/2022
Terrance N. Lackey	Date

BSc. Eng, MSc. Eng
Mining Director
U.S. Silica Holdings, Inc.
SME Member # 04312151

This report titled "Technical Report Summary, Ottawa Site, Lasalle County, Illinois" with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Westward Environmental, Inc. Westward's QPs prepared or contributed to the following sections:

1.0 Executive Summary

2.0 Introduction

3.0 Property Description

4.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.0 History

6.0 Geologic Setting, Mineralization and Deposit

7.0 Exploration

8.0 Sample Preparation, Analyses and Security

9.0 Data Verification

10.0 Mineral Processing and Metallurgical Testing

11.0 Mineral Resource Estimates

12.0 Mineral Reserve Estimates

17.0 Environmental Studies, Permitting, Plans, Negotiations or Agreements With Local Individuals Or Groups

20.0 Adjacent Properties

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Westward Environmental, Inc.

/s/ Thomas O. Mathews — 09/30/2022
Thomas O. Mathews, PG, REM — Date

President
Westward Environmental, Inc.

This report titled "Technical Report Summary, Ottawa Site, Lasalle County, Illinois" (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Q4 Impact Group, LLC. Q4 Impact Group's QPs prepared or contributed to the following sections:

1.0 Executive Summary

13.0 Mining Methods

14.0 Processing and Recovery Methods

15.0 Infrastructure

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Q4 Impact Group, LLC

/s/ Robert Archibald
Robert Archibald
CEO
Q4 Impact Group, LLC

09/30/2022
Date

LIST OF FIGURES

LIST OF TABLES

ACRONYM	DESCRIPTION
AMSL	Above Mean Sea Level
ANFO	Ammonium Nitrate and Fuel Oil
ANSI	Approved American National Standard
API	American Petroleum Institute

ASP	Average Selling Price
CAAPP	Clean Air Act Permit Program
CPI	Consumer Price Index
CSX	Class 1 Railroad
DMR	Discharge Monitoring Report
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EPCM	Engineering, Procurement and Construction Management
HDPE	High Density Polyethylene
FT	Feet/Foot
IDNR	Illinois Department of Natural Resources
IEMA	Illinois Emergency Management Agency
IHPA	Illinois Historic Preservation Agency
IR	Illinois Railway, LLC
IRR	Internal Rate of Return
ISO	International Organization for Standardization
K	Thousand
M	Million
Ma	Million Years Ago
MSL	Mean Sea Level
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present Value
NYSE	New York Stock Exchange
QP	Qualified Person
Q4	Q4 Impact Group
RCRA	Resource Conservation and Recovery Act

RTZ	Rio Tinto Zinc
SEC	Securities and Exchange Commission
SLCA	U.S. Silica ticker symbol
SME	Society for Mining, Metallurgy, & Exploration
SPCC	Spill Prevention, Controls and Countermeasure
TRS	Technical Report Summary
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
U.S. Silica	U.S. Silica Holdings, Inc.
VSQG	Very Small Quantity Generator
YD^3	Cubic Yards

TECHNICAL REPORT SUMMARY

COLADO SITE
LOVELOCK, PERSHING COUNTY, NEVADA

Submitted to: U.S. Silica Holdings, Inc.

Prepared By:

Environmental. Engineering. Natural Resources.
Boerne, Texas
830-249-8284

Date: September 30, 2022
Project No. 10711-025-013
-ML-

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This Technical Report Summary ("Technical Report" or "TRS") updates the previously submitted Colado TRS included as Exhibit 96.2 to U.S. Silica Holding Inc.'s ("U.S. Silica") Form 10-K for Fiscal Year Ended December 31, 2021, filed with the U.S. Securities and Exchange Commission (the "SEC") on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by Westward Environmental, Inc. ("WESTWARD") and Q4 Impact Group ("Q4") who have conducted an audit of the proven and probable reserves at the Colado, Pershing County, Nevada ("NV") mine as of December 31, 2021. This report also discusses the processing plant located northeast of Lovelock, NV where the mined material is processed. The Colado Site as referenced herein includes the mining area located northwest of Lovelock, NV (the "Colado mine") and the Lovelock / Colado processing plant (the "Colado plant" or "plant").

This audit was performed in conjunction with U.S. Silica's Mine Engineering and Geology staff and was prepared in accordance with Subpart 1300 and Item 601(b)(96) of Regulation S-K promulgated by the SEC

There are numerous individual pits at the Colado Site that have been mined over the years to various degrees. Not all are actively being mined as of the writing of this report. Only pits that are currently designated with proven or probable reserves equal to, or greater than, 100,000 tons were considered material by U.S. Silica for this report. It must be noted that there are several other pits with measured and indicated resources as well as proven or probable reserves that were not included in the Recoverable Ore estimates provided in this report. The overall volume of recoverable DE is greater than what is presented herein.

1.1 Background

EP Minerals, LLC ("EPM"), an indirect subsidiary of U.S. Silica, operates four different diatomaceous earth ("DE") operations. The Colado Site in northwestern Nevada, northeast of the town of Lovelock, is one of these operations. There are two more operations in Nevada, one close to the city of Reno and one close to the city of Fernley, with the fourth facility located in Oregon, near the towns of Drewsey and Juntura. All four operations consist of at least one Mining Complex and an associated DE Processing Plant. DE products are used in hundreds of marketing applications by thousands of customers in the global industrial minerals' marketplace.

The Colado plant is owned and operated by EPM and is located about seven (7) miles northeast of the town of Lovelock, NV and sits on approximately 493 acres. The plant address is 150 Coal Canyon Road, Lovelock, NV 89419.

1.2 Product

DE, also known as Kieselguhr or Diatomite, is a sedimentary mineral with physical properties that are like soil.[1] In Nevada, diatomite is the silica skeletons of billions of single-celled algae organisms deposited millions of years ago at the bottom of freshwater lakes. The remains of these single celled organisms create a soft, siliceous material with some unique chemical and physical properties. When dried, DE contains over 80% voids by volume.[2]

1.3 History of Acquisition

In late 1950's Eagle-Picher Industries, Inc. submitted a Plan of Operations to conduct DE mining in the Colado District. Since then, the company has undergone several name and ownership changes:

1. November 1986: Eagle-Picher Industries (Minerals Division) became Eagle-Picher Minerals, Inc. a wholly owned subsidiary of Eagle-Picher Industries, Inc.
2. April 2003: The parent company Eagle-Picher Industries became Eagle Picher, Inc., and Eagle-Picher Minerals, Inc. was renamed Eagle Picher Filtration & Minerals, Inc.
3. March 2006: Eagle Picher Filtration & Minerals, Inc. was renamed EP Minerals, LLC.
4. August 1, 2011: EPM Minerals, LLC was acquired by Golden Gate Capital.

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1 U.S. Silica Internal Report Colado, December 31, 2020.
2 U.S. Silica Internal Report Colado, December 31, 2020.

5. May 1, 2018: EPM Minerals, LLC was acquired by U.S. Silica.

U.S. Silica's corporate headquarters are in Katy, TX and Reno, NV (the former EPM headquarters). EPM is a fully owned indirect subsidiary of U.S. Silica and is licensed to operate the Colado Site.

1.4 Mineral Rights

U.S. Silica, through EPM, holds land leases with the Franco-Nevada U.S. Corporation, and the United States Federal Government. The land lease with Franco-Nevada is for 3,718 acres and is renewed annually. Additionally, U.S. Silica, through EPM, holds 176 mineral claims on Federal, Bureau of Land Management ("BLM") land. Of the 176 mineral claims, 146 are active and are classified as placer claims. Mineral claims are renewed on an annual basis, with the annual maintenance fee due on or before September 1st.

The Franco-Nevada U.S. Corporation leases are based on a royalty-type structure that considers the tons of product sold during the lease period and how material used for the product tons sold was mined from each lease area. The leases also include a minimum annual amount, to ensure a minimum annual payment to the landowners. The royalty unit values are adjusted based on the Consumer Price Index ("CPI"), a statistical index that is calculated and published annually by the U.S. Bureau of Labor Statistics. Regarding the Federal land lease, BLM publishes a mining claim fees schedule on an annual basis. The Colado Site permit & claim map below (Figure 1.1) illustrates where the leases are:

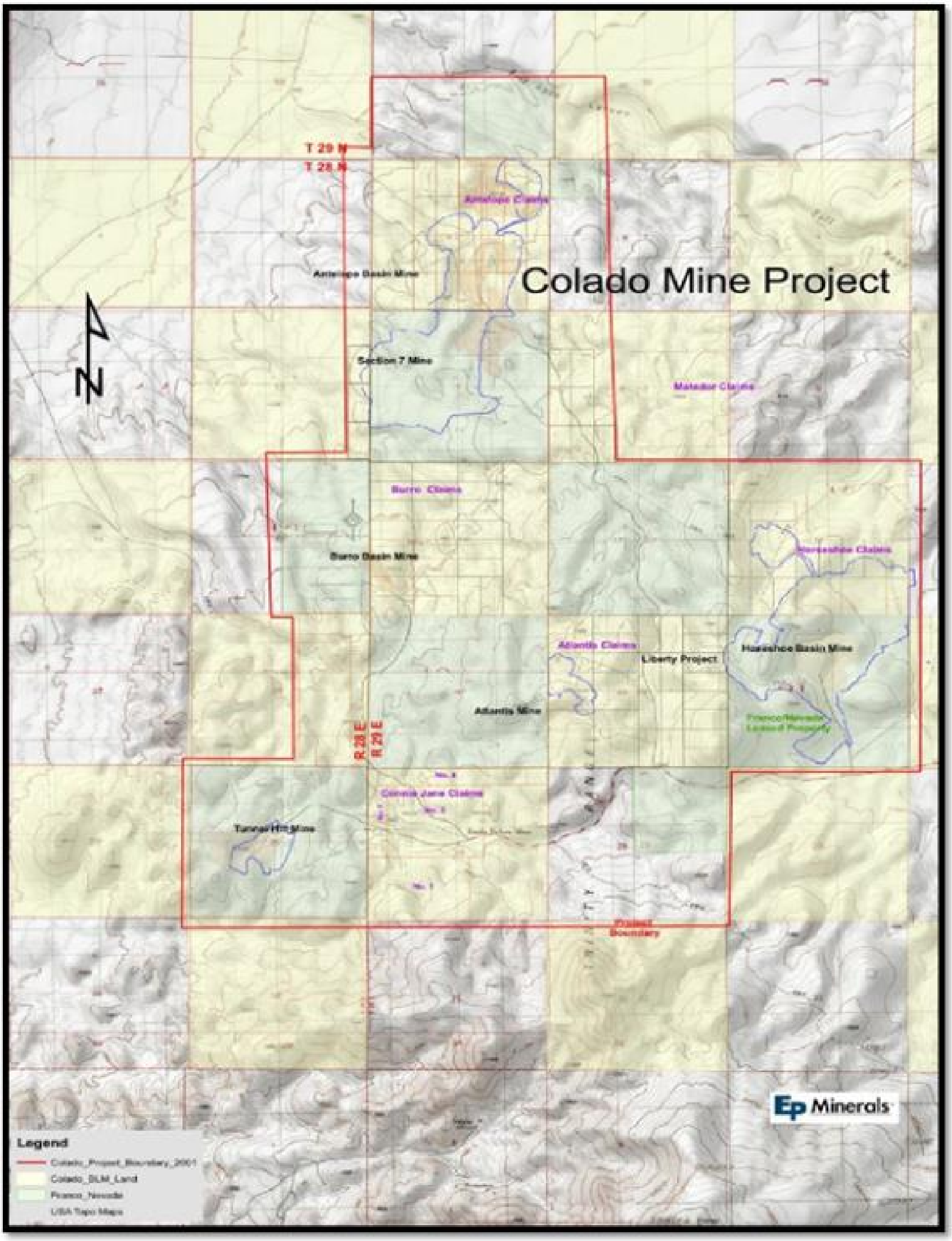

Figure 1.1 U.S. Silica Mine Permit and Claim Map.

An aerial view of Colado and overall boundaries is provided in Figure 1.2 below:

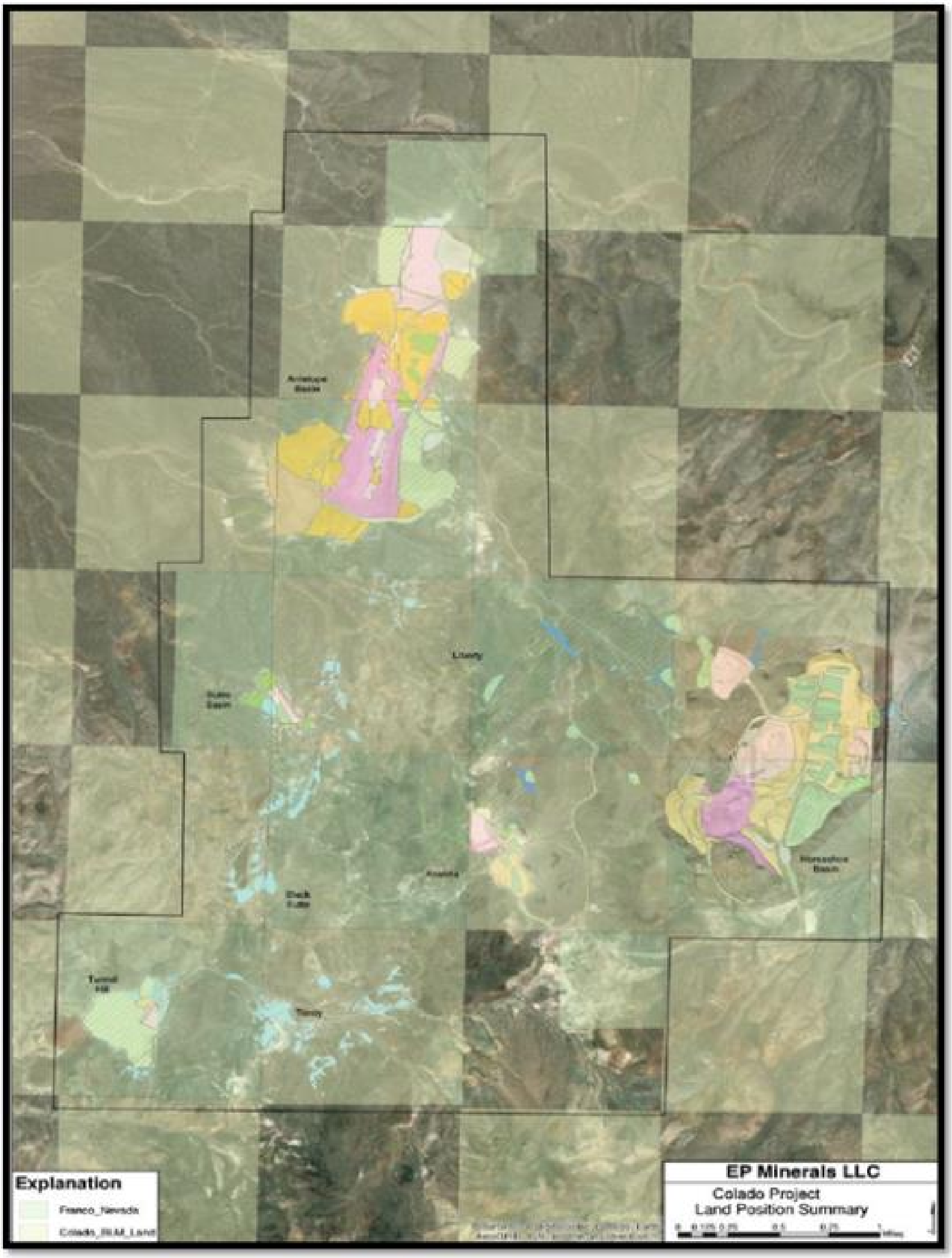

Figure 1.2 Colado Site.

In particular, the Franco-Nevada U.S. Corporation lease is based on a $45,000 minimum amount, with an above minimum payment of $0.77 per ton shipped adjusted by an increase in price (current price $5.32 plus 2.5% surcharge).[3] For 2021, the maintenance fees for existing mineral claims were set to $165 per claim. The 2021 land lease payments were $242,687.04 for the Franco-Nevada U.S. Corporation lease, and $28,380.00 for the BLM lease. Lease and royalty payments for the last-4 years are listed in Table 1.1 below:[4]

YEAR	FRANCO NEVADA	BLM
2021	$ 242,687.04	$28,380
2020	$ 141,908.87	$28,380
2019	$ 248,756.27	$28,380
2018	$ 135,695.31	$26,660

Table 1.1 Colado Site lease and royalty payments.

1.5 Location

The Colado mine is located approximately 19 miles to the northwest of the town of Lovelock, NV, in central-west Pershing County (Figure 1.3). Specifically, active operations are in Sections 16, 20, and 21 in Township 28N Range 29E in Pershing County (Figure 1.1). The mine is accessible solely by a paved road, CR 399 (also known as 7 Troughs Rd.). Due to the mine site's remote location, there is no official address associated with it (Figure 1.3).

3 U.S. Silica Internal Report dated December 31, 2020.
4 U.S. Silica email date January 2022 from Terry Lackey.

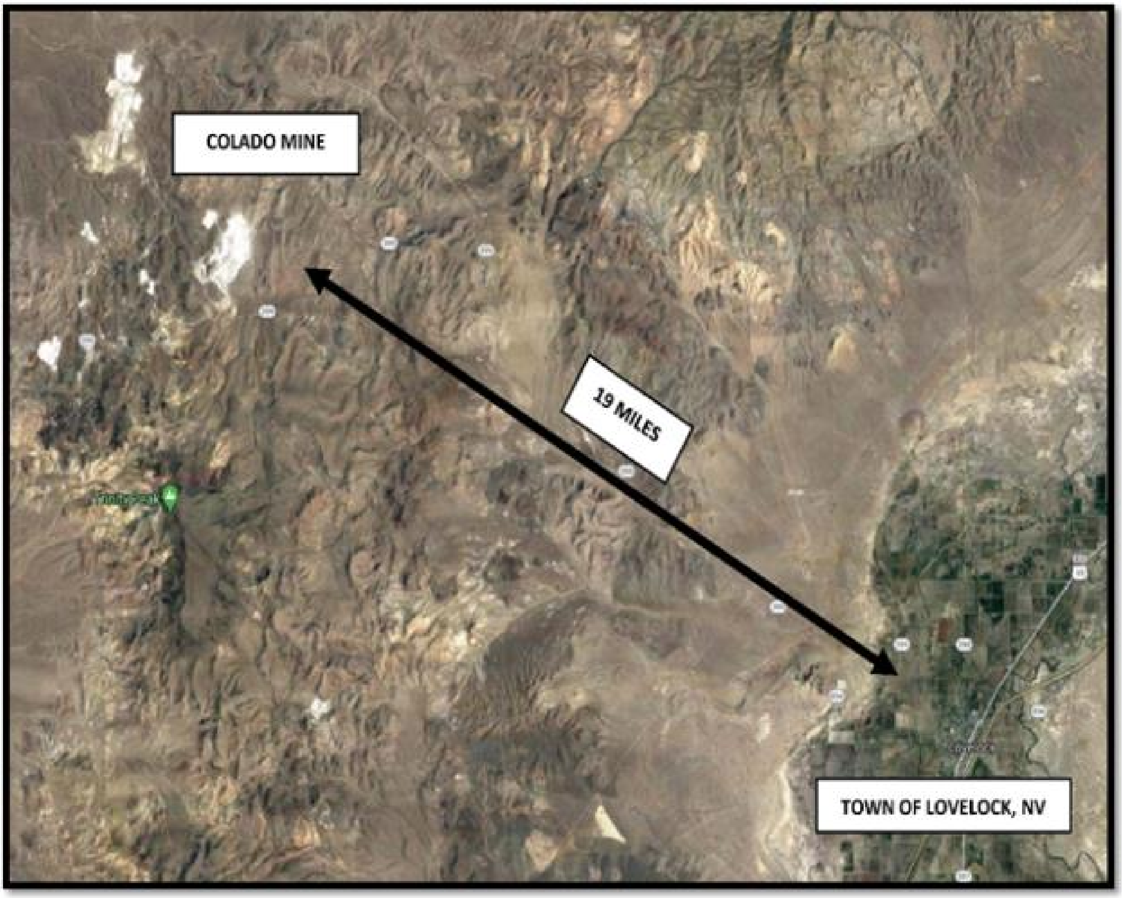

Figure 1.3 Aerial location of the Colado Site and town of Lovelock, NV.

The Colado plant is located about seven (7) miles northeast of the town of Lovelock, NV and sits on approximately 493 acres (Figure 1.4). The plant address is 150 Coal Canyon Road, Lovelock, NV 89419 and is accessible by vehicles from Interstate 80, State Route 396 (Coal Canyon Road) and Business Highway 95 (Upper Valley Road).

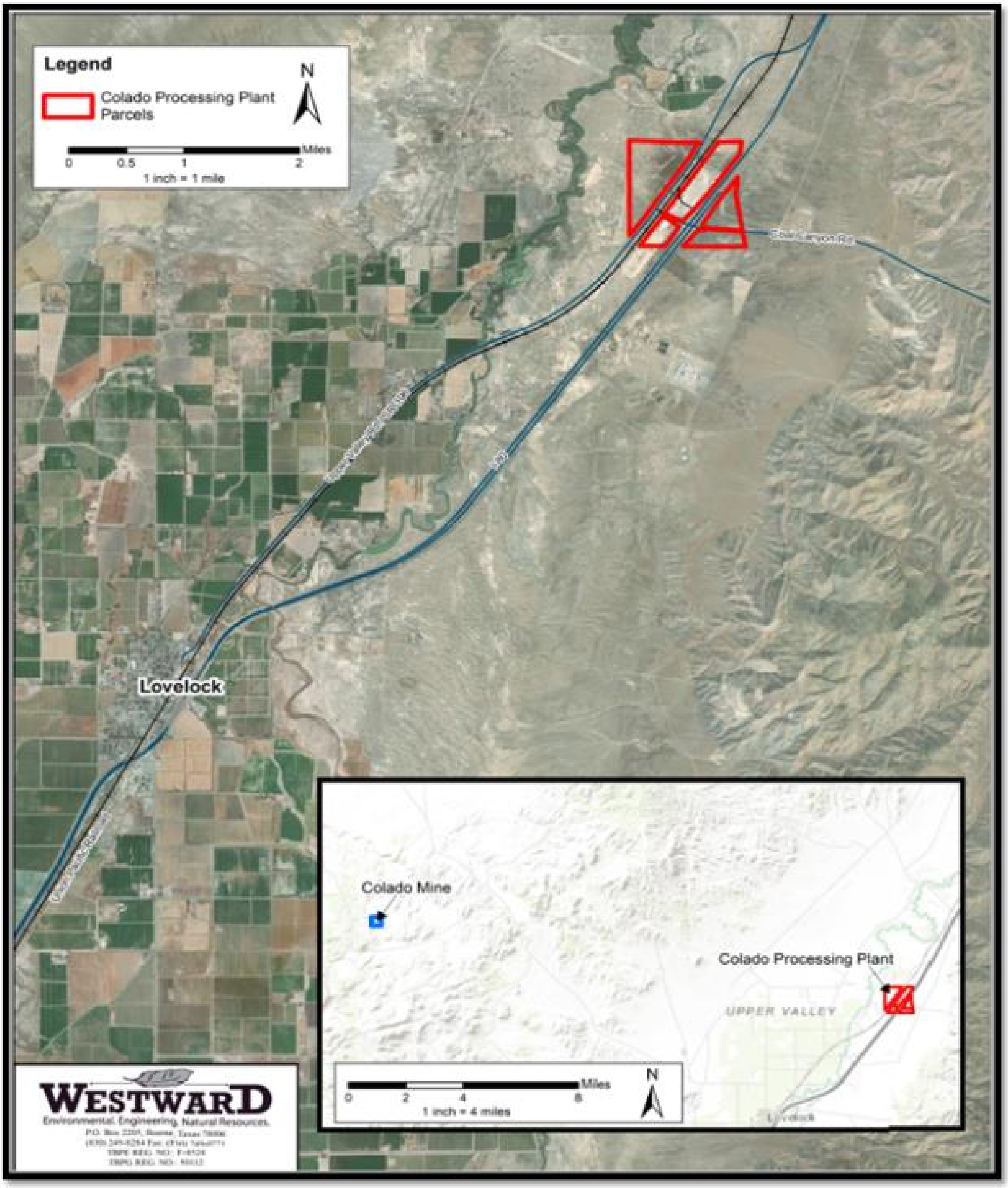

Figure 1.4 Location map of the Colado plant and mine.

1.6 Geology

The Colado Site is in an area known as the Great Basin. A region comprising nearly the entire state of Nevada, western Utah, and small portions of southwest Idaho, southern Oregon, and eastern California. The Great Basin is marked most significantly by crustal extension where large scale basins and ranges predominate, however smaller scale structural features, in the form of grabens, concentrate in and around the variably aged lacustrine sediments.[5]

DE sequences are both spatially and temporally related to these grabens and are present throughout the Great Basin ranging in age from 16 to 40 Ma (“million years ago”). Stratigraphic thicknesses of DE present in Colado range from inches to 50 ft. thick and are separated by friable tuffaceous units that are typically light gray in color.

Welded and lithic tuff units overlie the DE strata, with Tertiary aged basalts forming capping units that have protected the underlying strata from erosion over millions of years. Bi-modal volcanics form the substrate on which the diatomite sequences reside; these volcanics are rhyolitic, basaltic andesite, and basaltic in composition.

1.7 Exploration

Exploration activities in the Colado Site region have been ongoing since the 1960’s, with variable phases incorporating geologic mapping, field sampling, three-dimensional analysis, drilling, and survey techniques. Drilling methods have included rotary, reverse circulation, sonic and diamond core techniques to investigate subsurface geology. Over 600 drill holes have been performed in the region to date.[6] Locations of drill holes are illustrated in Figure 1.5 below.

5 USGS The Basin and Range Province in Utah, Nevada and California, 1943.
6 U.S. Silica Internal Report dated December 31, 2020.

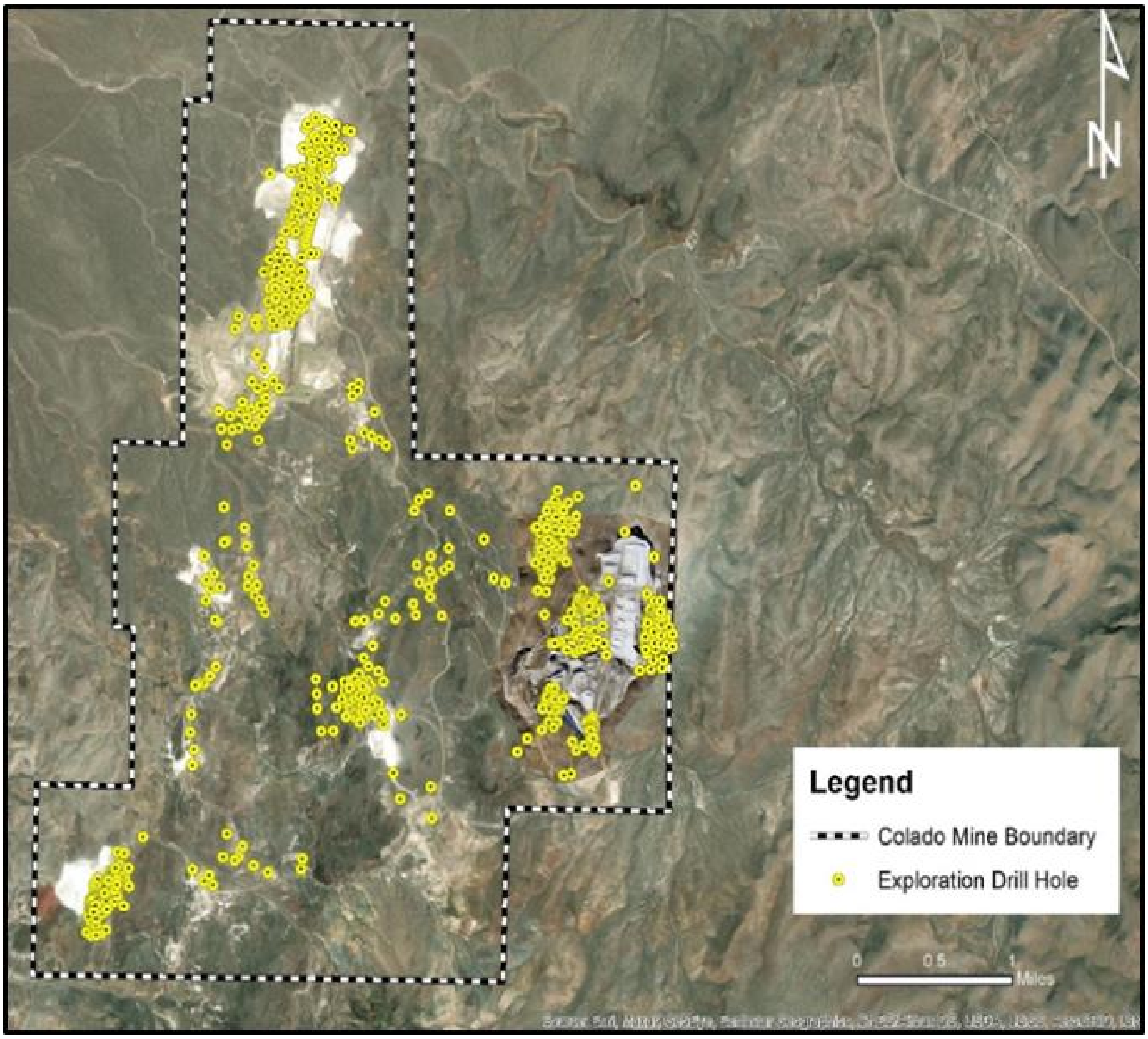

Figure 1.5 Boring Location Map.

1.8 Testing

All ore samples from the drilling operations are transferred to the U. S. Silica dry lab located at the Vale Plant in Oregon. Testing in the dry lab is performed by lab technicians under the direction of the lab manager and lab supervisor. Sample drying, preparation and groups of chemical and physical tests are conducted on each of the drill samples.

The primary tests for diatomite ore are determinations of wet bulk density, permeability, and brightness on both natural and muffle burned samples. Post-muffle burn lab tests are conducted by the dry lab technician to determine soluble metal concentrations. A standard group of tests are set as a work instruction for testing of filter aid products of white and pink ore, as well as a group of tests made for natural filler products. Non-routine tests of samples are completed in the research and development lab in Reno, Nevada, and include x-ray fluorescence, used to determine chemical analyses of samples, centrifuge wet density tests, x-ray diffraction mineralogical testing and scanning electron microscope evaluations to determine diatom genus.

1.9 Recoverable Ore Estimate

The ore volume that is measured in the SURPAC module's block model is reported in cubic ft. This volume is converted to bank cubic yards ("BCY"). A mining recovery ranging from 75% to 90% is assigned to account for ore losses resulting from extraction of the in-situ deposit to stockpiles located in designated areas of the Colado Site. The mining recovery used for the deposits in the Colado mine is most commonly 85%.

The recoverable ore is converted to a value of stockpile cubic yards ("SCY") by multiplying the amount of extracted ore by 110% which is a swell factor. This is determined from how the volume of DE increases due to moving the ore with loader and truck from the mine bench to the stockpile area. Next the SCY is converted to a dry ore ton using a factor of 3:1.

The resource tons are equal to the dry ore tons and are reported as the recoverable ore tons and reported to the SEC in U.S. Silica's annual reports. Recoverable ore tons also meet the requirements of having a completed mine plan and obtaining an operational mine permit from the BLM and the State of Nevada Bureau of Regulation and Reclamation ("BMRR").

Table 1.2 shows the mineral resources at the Colado Site as of December 31, 2021. Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Measured Resource	1,100,000
Indicated Resource	3,361,000
Total	**4,461,000**

**Tons rounded down to the nearest 1,000*

Table 1.2 U.S. Silica Recoverable Ore Resources.

Reserve estimates present in Table 1.3 show only the reserves at the Colado Site from material pits that are considered proven and probable as of December 31, 2021. Other deposits at the Colado Site that are currently classified as measured, indicated or inferred resources are not included in this report.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	1,100,000
Probable Reserve	3,361,000
Total	**4,461,000**

**Tons rounded down to the nearest 1,000*

Table 1.3 U.S. Silica Recoverable Ore Reserves.

1.10 Mining Methods

The Colado Site consists of multiple DE mine properties, four of which are currently active.[7] A summary of mine areas is provided in Table 1.4 below.

MINE AREA	STATUS
Horseshoe Basin	Active
Horseshoe Basin - East Pit Extension	Active
Horseshoe Basin – South Knob	Idle
Tarp Stand	Idle
Antelope Basin	Idle
Burro Basin	Idle
Black Butte	Idle
Atlantis	Active
Liberty	Idle
Quivera	Active
Tunnel Hill	Idle

Table 1.4 Individual mine areas at the Colado Site.

The mine utilizes conventional open pit mining methods averaging approximately 600,000 cubic yards (“yd^3”) of stockpiled DE production yearly, operating about 200 days per year. The mine has a full production capacity of 3.0 million (“M”) yd^3 of DE per year. The quantities of overburden and interburden waste are backfilled into the pit as a part of the mine reclamation plan. Expansion of mining into the additional three properties will proceed as the current pits are depleted. Other than stockpiling the mined ore, no processing of raw DE is performed at Colado. The raw ore is delivered by truck to the U.S. Silica plant northeast of Lovelock, NV approximately 19 miles away.

7 Terry Lackey email dated February 8, 2022.

1.11 Processing and Recovery Methods

The Colado plant receives raw DE ore from one of the stockpiles at the Colado mine. The plant uses dry processing methods to refine the raw DE into saleable products to meet customer demand. As required, soda ash is introduced into the process stream to enhance the salability of the final DE product as necessary. Cellulose is blended with a portion of the final DE product as required. The Colado plant runs 365 days per year, and it operates 24 hours-per-day. The plant capacity is approximately of 160 K tons-per-year. The plant ships by over the road ("OTR") truck and rail. Products are sold as bulk or bagged in Super Sacks or bagged and palletized.

1.12 Infrastructure

The Colado mine is remote with few improved roads and installed mine-related infrastructure. The mine site is accessible by roads maintained as private roads and by State roads. Energy for the mine site is provided primarily by diesel powered equipment. Water requirements for the mine are primarily for dust suppression or drinking and is supplied either with an on-site well or municipal supply.

The Colado plant has been operating in its present location for over 60 years and is supplied with reliable and sufficient power and natural gas from regional utility companies. Water for the Colado plant comes from municipal sources, supplemented by a well at the plant site. Waste disposal and handling capacity and capability is sufficient for the current production level and for the ramp-up of operations to full capacity for the life of the Colado mine reserves. Any needed investment in required infrastructure has been accounted for in capital and expense projects estimated over the life of the mine to meet infrastructure needs.

1.13 Permitting

As of the effective date of this report, the Colado Site has the necessary permits and plans in place to mine the DE deposit as discussed in this report. However, the Colado plant does not have a current stormwater permit or Stormwater Pollution Prevention Plan ("SWPPP") in place.

Please refer to Section 17.0 for further information regarding permitting. A summary of permits/plans is provided in Table 1.5 below.

Item	Regulatory Authority	Area Covered	Status
Reclamation Permit	NDEP & BLM	Mines	Major Mod in Review
Stormwater Permit	NDEP	Processing Plant	Needed
Best Practice Plan	N/A	Mines	Complete
Class I Air Quality Operating Permit	NDEP	Processing Plant	Approved
Class II Surface Area Disturbance Permit	NDEP	Mines	Approved
Class III Landfill Waiver	NDEP	Mines & Processing Plant	Approved
Hazardous Materials Permit	NSFM	Mines	Approved
Hazardous Materials Permit	NSFM	Processing Plant	Approved
Hazardous Materials Permit	NSFM	Shop	Approved
Groundwater Use Permit	NDWR	Mines/Processing Plant	Approved
Spill Prevention Control and Containment (SPCC) Plan	EPA	Processing Plant	Complete
Stormwater Discharge Evaluation	NDEP	Processing Plant	Complete

Table 1.5 Colado Site Permit Summary.

1.14 Capital and Operating Costs

In 2020 and 2021 total operating costs were $37,799,000 and $48,367,000 and total capital costs were $1,731,000 and $4,670,000 respectively (Table 18.1). The higher than average capital spend in 2021 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

The Colado Site maintains a five-year capital forecast for planned capital expenditures to support current production. A summary of foreseen capital expenditures through 2026 is provided on Table 18.2. As shown on Table 18.2, total estimated capital expenditure through 2026 is $16,070,000. Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy.

1.15 Recommendations

The primary recommendations of this report include performing third party laboratory testing and consider revising the way recoverable ore tonnage values are reported. Additionally, it is recommended that U.S. Silica obtain a Nevada Industrial Multisector General Stormwater Permit (NVR050000) and prepare a SWPPP to be in compliance. Please refer to Section 22.0 Recommendations for additional information.

2.0 INTRODUCTION

This TRS updates the previously submitted Colado, Pershing County, Nevada TRS included as Exhibit 96.2 to U.S. Silica's Form 10-K for Fiscal Year Ended December 31, 2021, filed with the SEC on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by WESTWARD who has conducted an audit of the proven and probable reserves present at the Colado Site, Pershing County, Nevada mine as of December 31, 2021. This audit was performed in conjunction with the U.S. Silica's Mine Engineering and Geology staff and was prepared in accordance with Subpart 1300 and Item 601(b)(96) of regulation S-K promulgated by the SEC. U.S. Silica common stock is traded on the New York Stock Exchange under the symbol "SLCA".

WESTWARD'S third-party reserves audit (Section 11.0 & Section 12.0 of this report), completed on February 11, 2022, presented in this TRS, was prepared for public disclosure by U.S. Silica in filings made with the SEC in accordance with the requirements set forth in the SEC regulations. Any capitalized terms used herein, but not defined herein, shall have the meaning ascribed to such term in Item 1300 of Regulation S-K.

2.1 Sources

- U.S. Silica
- United States Geological Survey
- Google Earth
- Bureau of Land Management
- Nevada Bureau of Mines and Geology
- Nevada Division of Environmental Protection
- Nevada Division of Water Resources
- Nevada State Fire Marshall
- Nevada Department of Water Resources

2.2 Personal Inspection

Michelle M. Lee, PG (TX #6071, SME Registered Member 413034RM) performed site visits to the Colado mine on May 25, 2021, and September 15, 2021. During these site visits, a tour of pertinent parts of the mine was conducted by the plant manager that included each mine area, staging areas, stockpile areas, pit areas, reserve areas, and property perimeter. Although a general walk about of the processing plant area was performed in May, the facility was not toured in depth as plant processing is out of the Qualified Person's ("QP") expertise.

Robert Archibald, PE (VA 0402023235) with Q4 performed a site visit to the Colado plant on August 9, 2022. During the visit, an inspection of all plant and infrastructure facilities was conducted. In addition, key management personnel were interviewed and numerous aerial photographs, flow sheets and reports were examined.

2.3 Previous Technical Reports

This TRS updates the previously submitted Colado, Pershing County, Nevada TRS included as Exhibit 96.2 to U.S. Silica's Form 10-K for Fiscal Year Ended December 31, 2021, filed with the SEC on February 25, 2022.

3.0 PROPERTY DESCRIPTION

3.1 Location

The Colado Site is located about 19 miles northwest of the town of Lovelock, NV, in west central Pershing County (Figure 1.3). Specifically, active operations are in Section 16, Section 20, and Section 21 in Township 28N Range 29E in Pershing County. The mine is accessible by a paved road, the 7 Troughs Rd. (CR 399). Due to the mine site's remote location, there is no official address associated with it.

The Colado Site consists of approximately 10,798+/- acres (Figures 3.1 and 3.2 below) that is a combination of private, state and federal lands as follows: approximately 3,773 acres of owned private land and private leased land, and approximately 7,025-acres of leased Federal land (administered in tandem by the BLM in Winnemucca, NV and NDEP in Carson City, NV. The front entrance to Colado is located at approximately 40.274948, -118.727916. Figure 3.1 shows the overall Colado Site.

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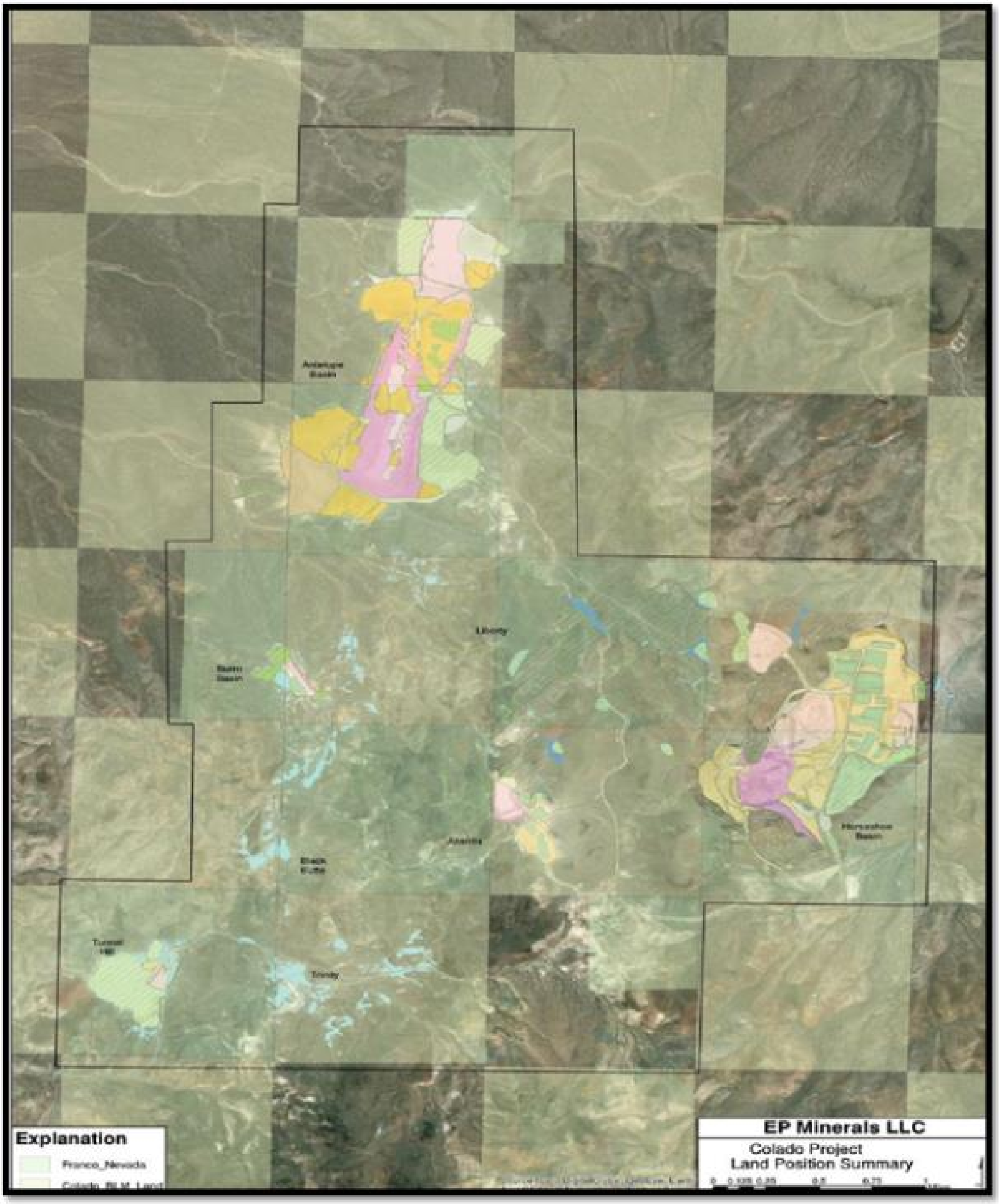

Figure 3.1 Overall Colado Site Map.

The Colado plant is located about seven (7) miles northeast of the town of Lovelock, NV. The physical address is 150 Coal Canyon Road, Lovelock, NV 89419. The plant and processing facilities occupy approximately 493 acres across five (5) separate parcels. Figure 3.2 shows both the processing plant and mine areas.

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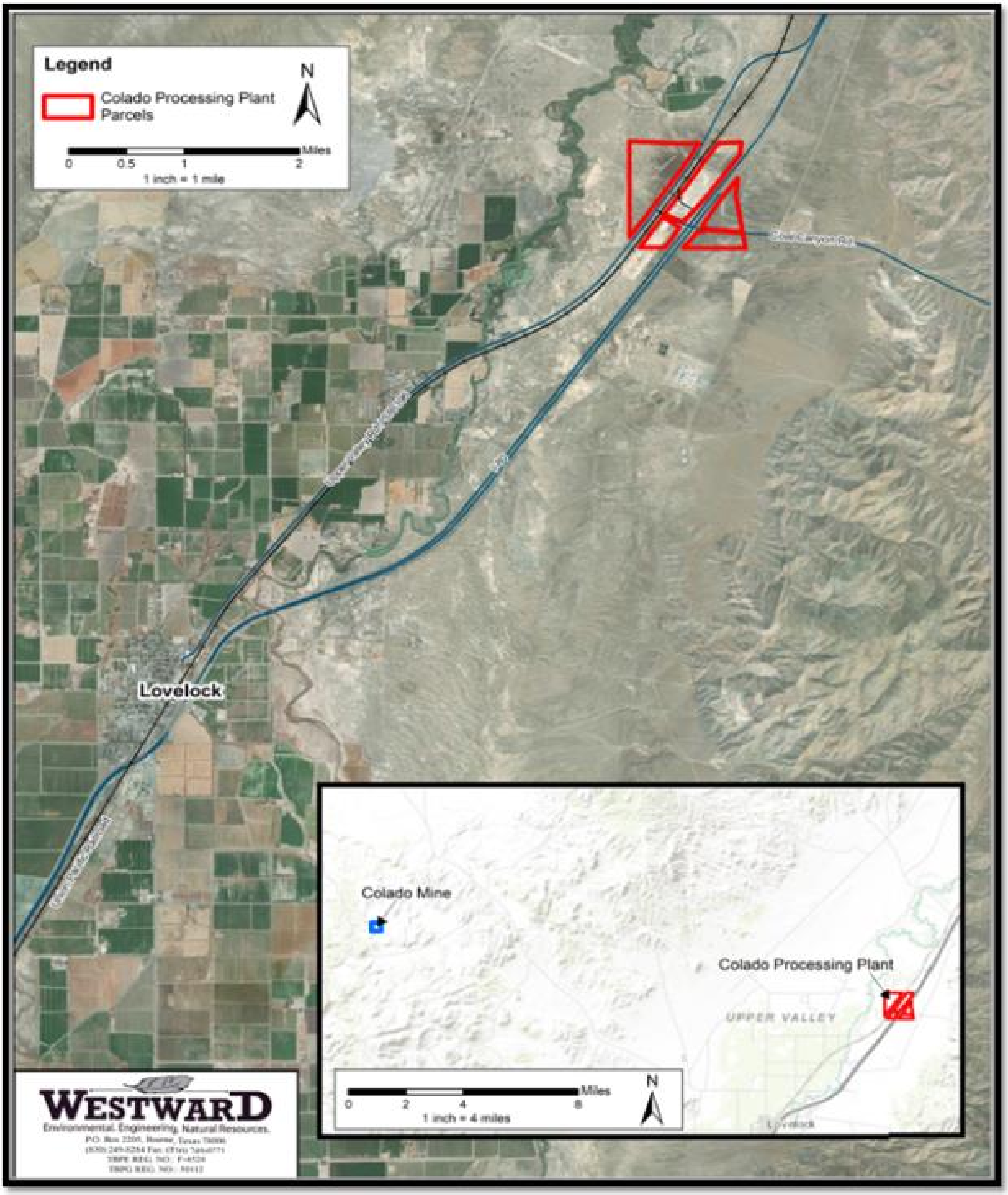

Figure 3.2 Colado mine and plant locations.

3.2 Leases/Royalties

U.S. Silica holds land leases with the Franco-Nevada U.S. Corporation, and the United States Federal Government.[8] The land lease with Franco-Nevada is for 3,719 acres and is renewed annually. Additionally, U.S. Silica holds 176 mineral claims in BLM land. Of the 176 mineral claims, 146 are active and are classified as placer claims. Mineral claims are renewed on an annual basis, with the annual maintenance fee due on or before September 1st.

The Franco-Nevada U.S. Corporation leases are based on a royalty-type structure that considers the tons of product sold during the lease period, and how material used for the product tons sold was mined from each lease area. The leases also include a minimum annual amount, to ensure a minimum annual payment to the landowners. The royalty unit values are adjusted based on the CPI, a statistical index that is calculated and published annually by the U.S. Bureau of Labor Statistics.

In particular, the Franco-Nevada U.S. Corporation lease is based on a $45,000 minimum amount, with an above minimum payment of $0.77 per ton shipped adjusted by an increase in price (current price $5.32 plus 2.5% surcharge).[9] For 2021, the maintenance fees for existing mineral claims were set to $165 per claim. The 2021 land lease payments were $242,687.04 for the Franco-Nevada U.S. Corporation lease, and $28,380.00 for the BLM lease. For the past few years, non-federal lease and royalty payments are listed in Table 3.1 below:[10]

8 U. S. Silica Internal Report dated December 31, 2020.
9 U.S. Silica Internal Report dated December 31, 2020.
10 Terry Lackey email dated January 24, 2022.

YEAR	Franco Nevada	BLM
2021	$ 242,687.04	$28,380.00
2020	$ 141,908.87	$28,380.00
2019	$ 248,756.27	$28,380.00
2018	$ 135,695.31	$26,660.00

Table 3.1 Colado Site lease and royalty payments.

U.S. Silica issued a payment of $28,380.00 that was received by the BLM on August 9, 2021, for the 2022 maintenance fees on 146 active mine claims.

The Colado plant property is owned outright and there are no royalty or lease payments associated with this facility.

3.3 Encumbrances

No significant encumbrances exist at the mine site. Topography and the presence of overburden limit the accessibility of the ore in certain areas but there are no known pipelines, easements, jurisdictional areas or other related restrictions to prevent mining at the Colado Site.

3.4 Permitting

State and federal permits are required to mine the DE. Surface disturbance is permitted as needed in accordance with state regulations. Major modifications to the permit are made as needed. As of the writing of this report, U.S. Silica has all the necessary permits in place to mine the DE. However, the Colado plant is missing a stormwater permit and SWPPP. Please refer to Section 17.0 for detailed information regarding permitting at the Colado Site.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Topography

The topography at the Colado mine varies significantly. The Site is located in a Basin – Range province region that is marked by abrupt changes in topography. Steep mountains give way to low lying, flat valleys in alternating patterns across the region. Vegetation is sparse due to lack of rainfall in the region. Refer to Figure 13.1.

4.2 Means of Access

The Colado Site is located about 19 miles northwest of the town of Lovelock, NV, in west-central Pershing County (Figure 4.1). Specifically, active operations are in Sections 16, 20, and 21 Township 28N Range 29E in Pershing County. The mine is accessible by a paved road CR 399. This is the only means of access to the Colado Site. Due to the mine site's remote location, there is no official address associated with it. The Colado plant is accessible by Interstate 80, Coal Canyon Road (State Route 396) and Upper Valley Road (Hwy 95).

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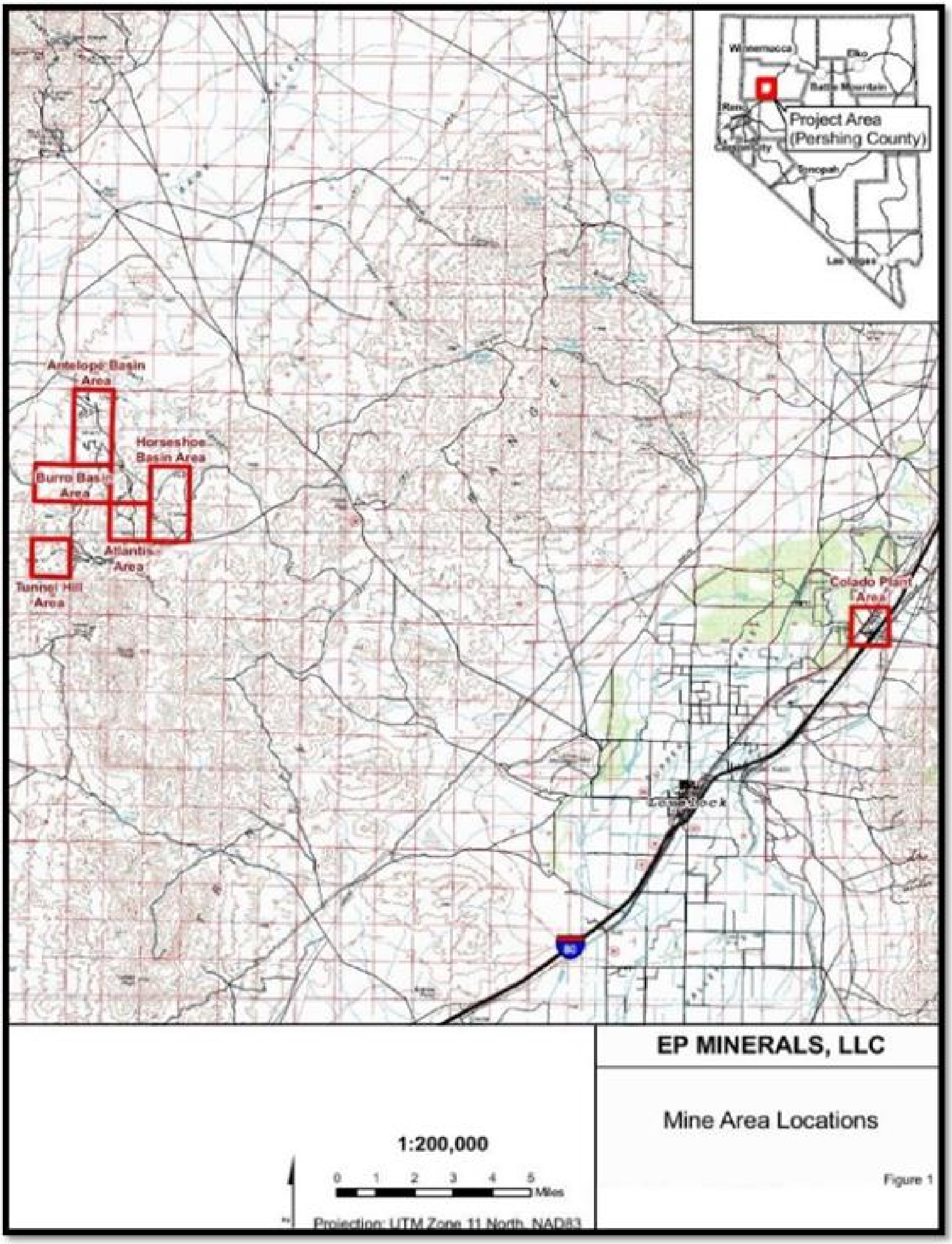

Figure 4.1 Regional Map of the Colado Mine and Plant Areas.

4.3 Climate and Operating Season

According to the Köppen climate classification system[11], the Colado Site is located in an arid climate region. Annual precipitation averages less than 7" annually which meets the definition of a dessert.[12]

The Colado mine operates year-round with ore mining activity starting in early spring and concluding sometime in the late fall when either sufficient ore has been stockpiled, or when inclement weather makes ore mining too costly or difficult. The April to November time frame provides optimum working conditions; moreover, the dry hot weather aids the natural drying of the ore in the stockpiles. Colder winter months are used for stripping operations and reclamation projects.

4.4 Infrastructure

The Colado mine has the necessary infrastructure in place to operate the mine. Solar and diesel provide power for onsite operations and water is trucked in from Lovelock, NV. The Colado plant is supplied with reliable and sufficient power and natural gas from regional utility companies. Water for the plant comes from municipal sources, supplemented by a municipal water source. Please refer to Section 15.0 for more information regarding infrastructure for both locations.

5.0 HISTORY

In the late 1950's, Eagle-Picher Ind., Inc. submitted a Plan of Operations to conduct DE mining in the Colado District. Since then, the company has undergone several name and ownership changes:

1. November 1986 - Eagle-Picher Industries, Inc. (Minerals Division) became Eagle-Picher Minerals Inc. a wholly owned subsidiary of Eagle-Picher Industries, Inc.

11 Koppen climate classification system – Wikipedia, Köppen climate classification - Wikipedia.
12 Koppen climate classification system – Wikipedia, Köppen climate classification - Wikipedia.

2. April 2003 - The parent company Eagle-Picher Industries became Eagle Picher, Inc., and Eagle-Picher Minerals Inc. was renamed Eagle Picher Filtration & Minerals Inc.
3. March 2006 - Eagle Picher Filtration & Minerals, Inc. was renamed EP Minerals, LLC.
4. August 1, 2011 – EP Minerals, LLC was acquired by Golden Gate Capital.
5. May 1, 2018 – EP Minerals, LLC was acquired by U.S. Silica.

U.S. Silica's corporate headquarters are in Katy, TX and Reno, NV (the former EPM headquarters). EPM is a wholly owned, indirect subsidiary of U.S. Silica and is licensed to operate the Colado mine and plant.

Significant exploration has been undertaken by EPM (and affiliates) prior to the acquisition by U.S. Silica in 2018. Most of the information has been entered into an exploration database from which geologic and reserve models have been built from. U.S. Silica has undertaken an effort to convert the numerous handwritten boring logs into digital format but has not yet completed this task. Records from before 2012 are in the process of being digitized.

6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT

The Colado Site near Lovelock, NV is in the Great Basin, a region comprising nearly the entire state of Nevada, western Utah, and small portions of southwest Idaho, southern Oregon, and eastern California. The Great Basin is marked most significantly by crustal extension where large scale basins and ranges predominate, however smaller scale structural features in the form of grabens concentrate variably aged lacustrine sediments.[13]

DE sequences are both spatially and temporally related to these grabens and are present throughout the Great Basin ranging in age from 16 to 40 Ma. Stratigraphic thicknesses of DE present in the Colado mine area range from inches to 50 ft. thick and are separated by friable tuffaceous units that are typically light gray in color. Welded and lithic tuff units overlie the DE

13 USGS The Basin and Range Province in Utah, Nevada and California, 1943.

strata, with Tertiary basalts forming capping units that have protected the underlying strata from erosion for millions of years. Bi-modal volcanics form the substrate on which the diatomite sequences reside; these volcanics are rhyolitic, basaltic andesite, and basaltic in composition.[14] A general stratigraphic column of the region is provided in Figure 6.1 below.

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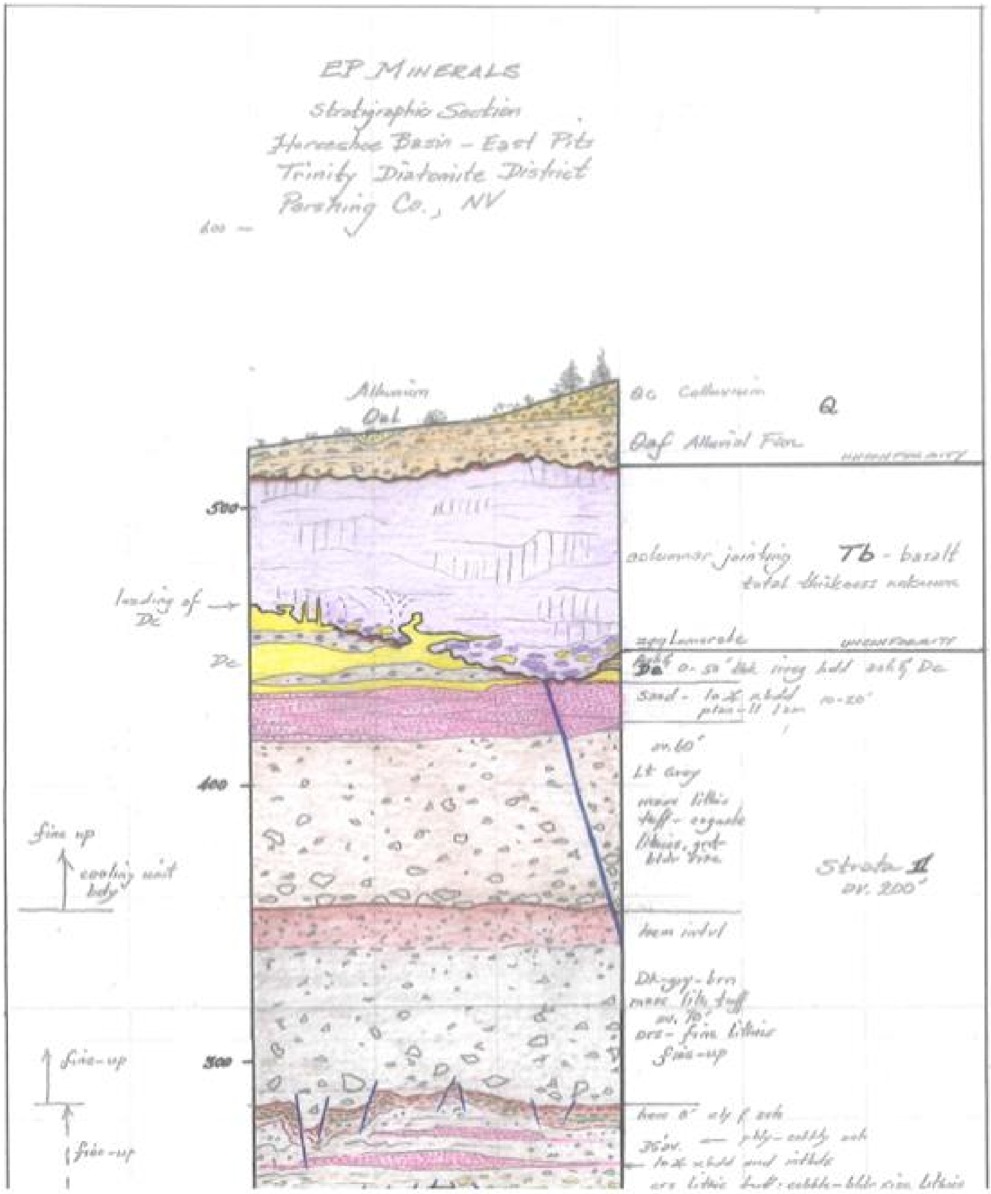
14 USGS The Basin and Range Province in Utah, Nevada and California, 1943.


EP MINERALS
Stratigraphic Section
Horseshoe Basin – East Pits
Trinity Diatomite District
Pershing Co., NV
Alluvium
Qal
Qc Colluvium
Q
Qaf Alluvial Fan
500
columnar jointing
Tb - basalt
total thickness unknown
agglomerate
Dc
400
Lt Gray
fine up
Strata II
av. 200'
300
fine-up

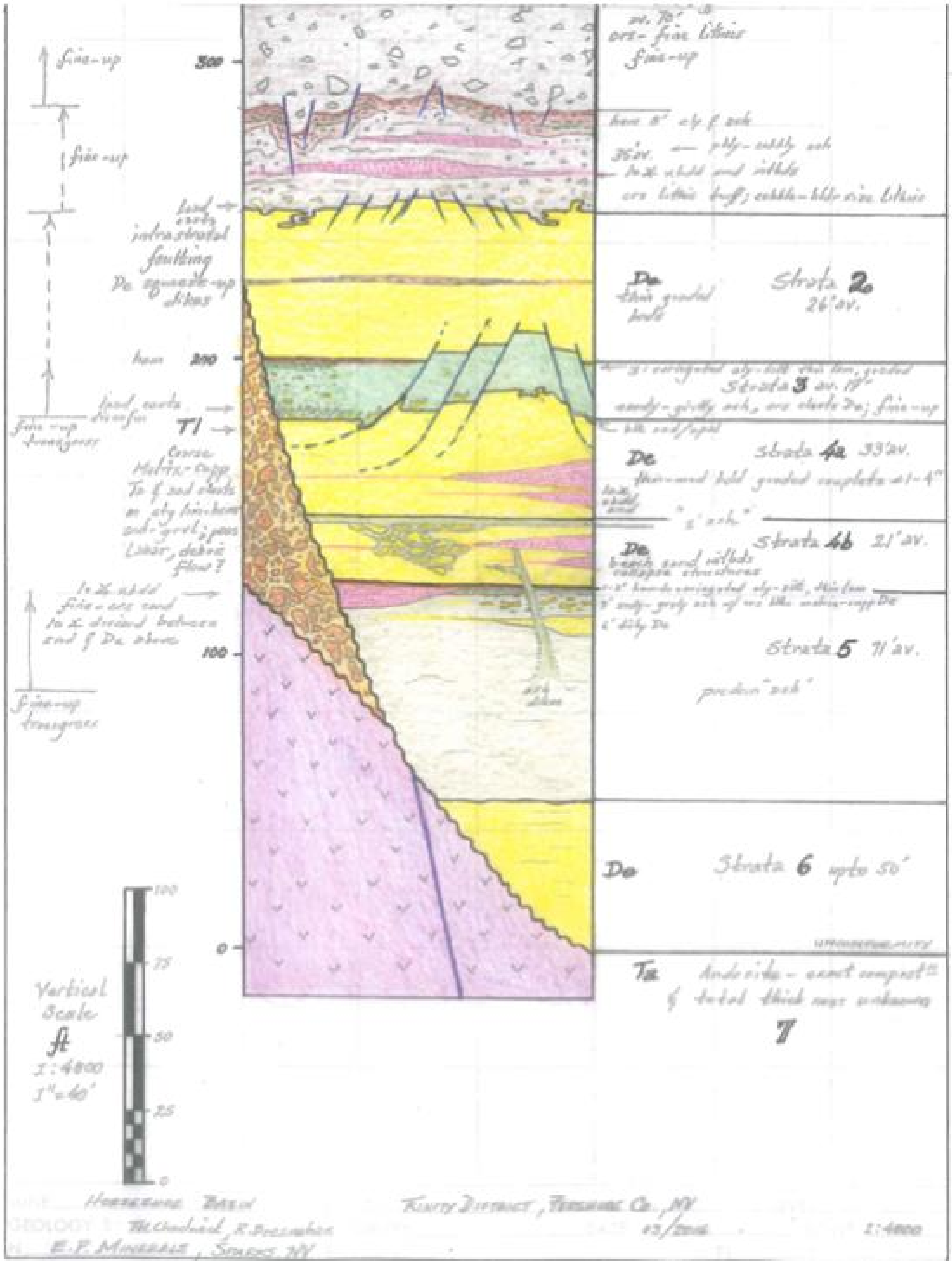


Figure 6.1 General Stratigraphic Column of the Colado mine.

Figures 6.2 and 6.3 illustrate some of the geology in the pit highwalls at Colado.

Figure 6.2 View to the north from the Atlantis Pit.

Figure 6.3 View to the southwest from the Quivera Pit.

7.0 EXPLORATION

7.1 Exploration

As shown in Figures 7.1 and 7.2 below, to date more than 600 borings have been drilled at the Colado Site.[15]

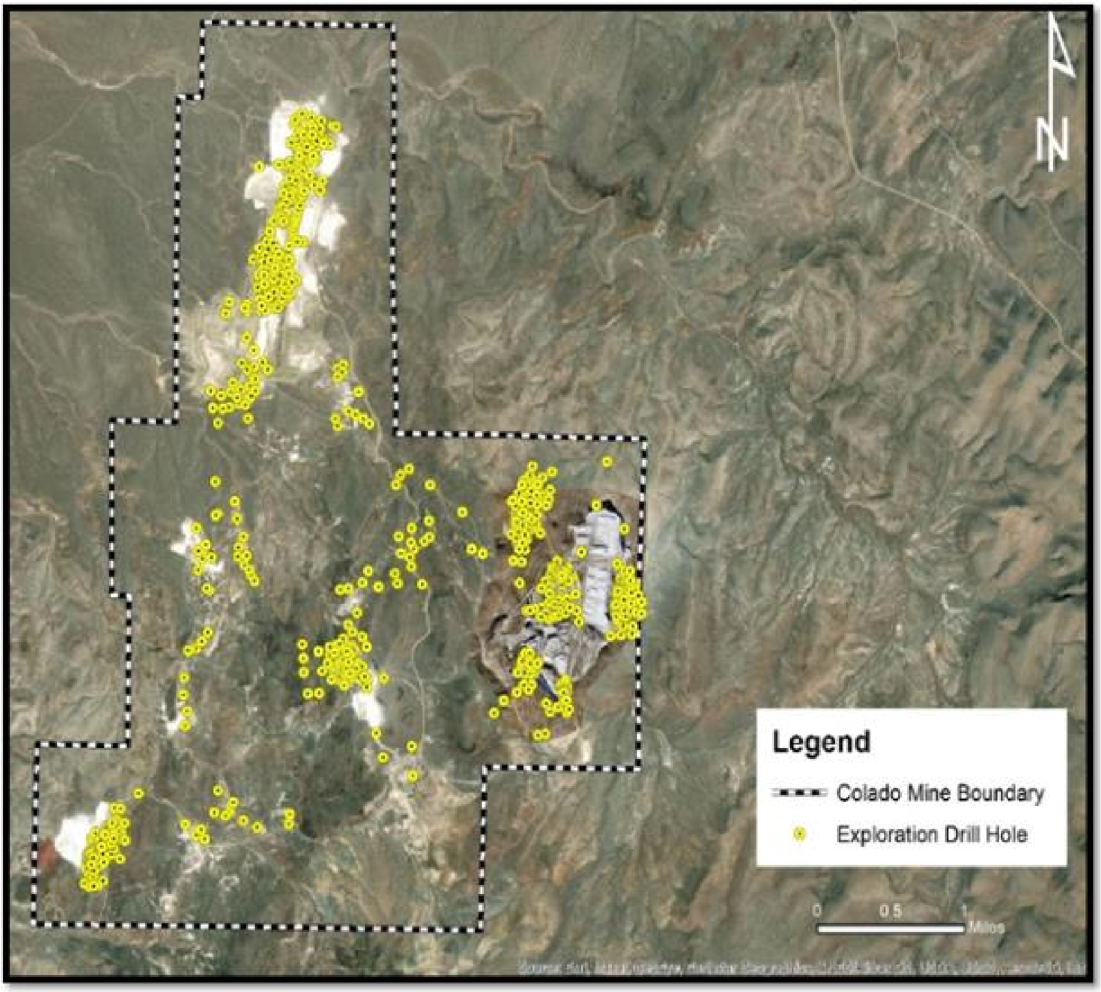


Figure 7.1 Boring Location Map I Colado Site.

15 U.S. Silica Internal Report 2020.

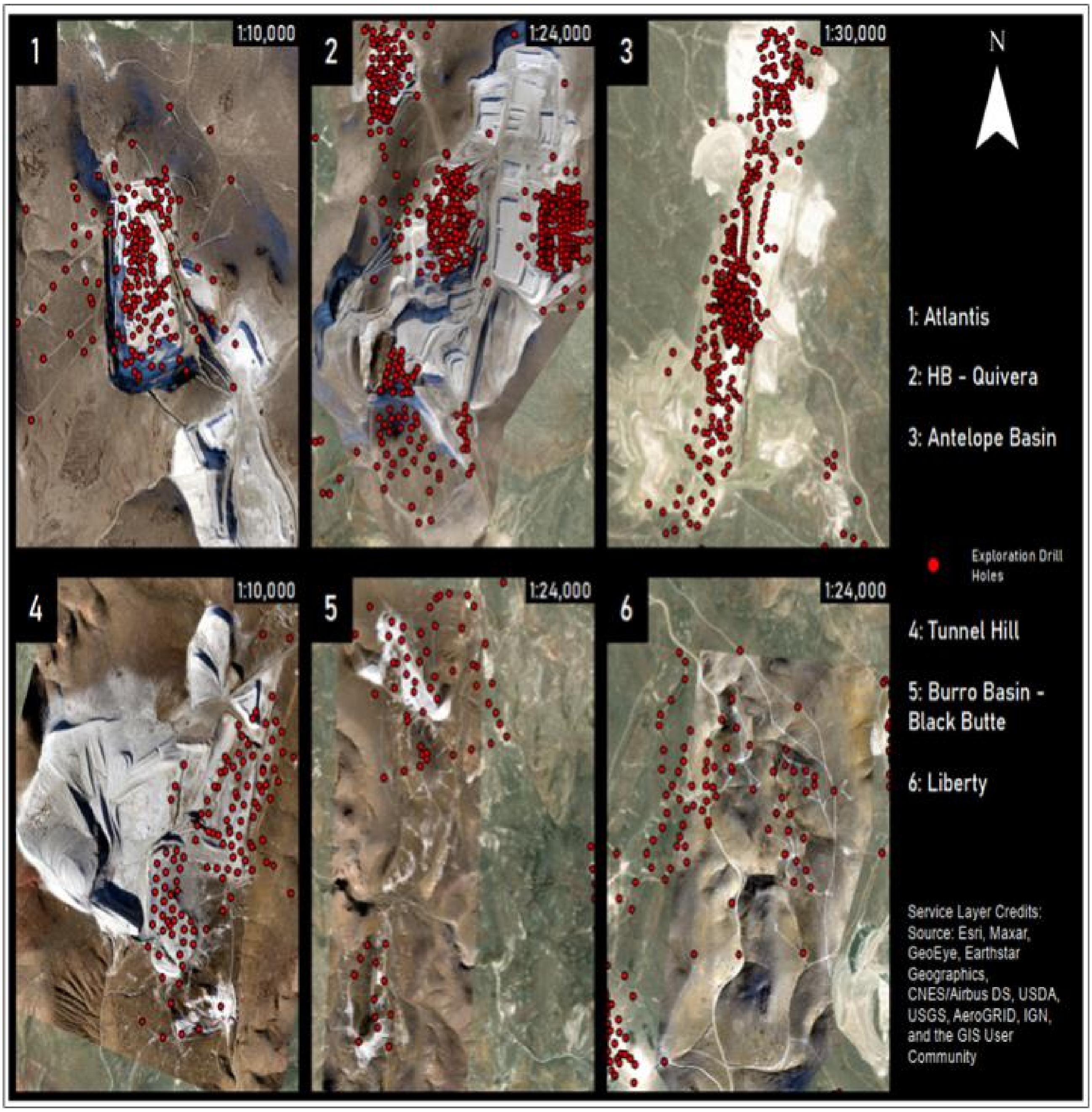


Figure 7.2 Boring Location Map II Colado Site.

Based on discussions with U.S. Silica[16], drilling was performed using sonic, air rotary and coring methods. The predominant method was air rotary as it was the most cost effective to determine thicknesses of the DE across the multiple pit areas. Sonic drilling resulted in very poor recoveries as the material was either pulverized or too broken up to retain. Coring was used much less frequently, due to cost, and only in instances when specialized testing was required or a sample was needed for future reference.

Drilling recovery information was not available for review. The predominant drilling method is air rotary. This method breaks up the material into chips and uses air to blow the chips back to the surface. Sample recovery cannot reasonably be measured using this method. Based on the QP's experience with this drilling method, overall homogeneous geologic nature of the DE, the lack of this information does not materially affect the accuracy and reliability of the exploration results reviewed.

Once the DE is extracted, it is spread out and stockpiled in a designated area to dry out. The DE is not separated based on grade but only by location. The DE is loaded into trucks and transported to the processing plant located in Lovelock approximately 19 miles away. Any separation due to quality occurs at the plant and not at the Colado mine.

Geologic mapping and outcrop sampling were made on a district scale using exposures within each of the mine areas and areas peripheral to the mine pits. The variable physical and chemical character of the field samples were lab tested and the locations of DE grade quality DE confirmed through additional field sample collection and follow up lab test work. Mapping and drilling have identified distinct deposits of DE stratigraphic sequences. DE in these deposits is of variable thicknesses up to 50 ft. thick. A cross section representing a typical diatomite section in the Colado mine area is shown in Figure 7.3, and the location of this cross section is shown in Figure 7.4 below.

16 Ryan Bresnahan meeting, May 24, 2021.

Figure 7.3 Horseshoe Basin cross section location map.

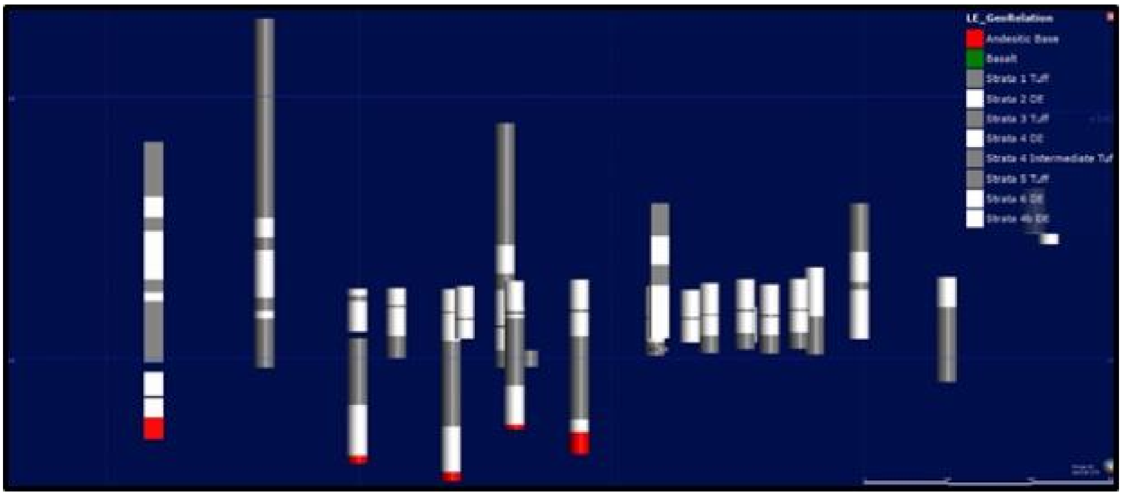


Figure 7.4 Cross section of DE intervals from the Horseshoe Basin pit - south is on the left of the illustration.

Some very limited trenching was performed in the prospecting stage to identify potential DE at the surface on certain claims. However, samples were not collected from these trenches.

The DE is deposited as a dried-up lake in relatively homogeneous structural deposits. Post depositional events, such as extreme faulting that is associated with being in a Basin and Range Province geological setting, have moved the blocks of DE from their original position. The DE has remained intact as a lacustrine deposit that is evident in the white colored nature of the DE. Other materials, such as volcanic ash and basalt, are distinctly different in physical nature and color that the DE is easily recognizable in drill cuttings. This is why using a rotary drill to do exploration is acceptable for determining interval thicknesses.

7.2 Hydrogeology

There are no natural surface water features at, or near, the Colado Site. There are no water wells at the Colado Site. Water used for mine activities/dust suppression is derived from municipal water wells near Lovelock and is trucked to the mine site. A desktop hydrogeological study was performed by Hydro Resources Aquifer Imaging Group ("Hydro") in 2012 to conduct a groundwater-availability study in order to provide background information needed to optimize the design of a geophysical aquifer-imaging survey with the Aqua Gem system on the Lovelock mine property.

Hydro conducted a two-township water well search in the mine area which did not reveal any publicly available water well records in the NDWR database. Hydro proposed several geophysical testing transects across the Colado Site around known fault lines in order to locate an optimal location for a proposed groundwater well. The study was not performed. There has been no analysis or testing of groundwater performed at the Colado Site.

8.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

No documentation showing sample collection or security measure undertaken for transport was available at the time of this report. Based on review of the U.S. Silica Internal Laboratory procedure documents[17], all ore samples from the drilling operations are transferred to the dry lab located at the Vale Plant in Oregon. Testing in the dry lab is performed by lab technicians under the direction of the lab manager and lab supervisor. Sample drying, preparation and groups of chemical and physical tests are conducted on each of the submitted samples.

The primary tests for diatomite ore are determinations of wet bulk density, permeability, and brightness on both natural and muffle burned samples. Post-muffle burn lab tests are conducted by the dry lab technician to determine soluble metal concentrations. A standard group of tests are set as a work instruction for testing of filter aid products of white and pink ore, as well as a group of tests made for natural filler products.

Non-routine tests of samples are completed in the research and development lab in Reno, Nevada. Such non-routine tests include x-ray fluorescence, used to determine chemical analyses of samples, centrifuge wet density tests, x-ray diffraction mineralogical testing and scanning electron microscope evaluations to determine diatom genus.

U.S. Silica does have numerous written laboratory procedures in place that adhere to International Organization for Standardization (“ISO”) 9001 / Quality System criteria. Other protocols reviewed as part of this report include the U.S. Silica Company ISO 9001 / Quality System – Process Washing: CAP605 (“corporate analytical procedure”) and the U.S. Silica Company ISO 9001 / Quality System – Attrition Scrubbing documents. Both documents were signed by David Weller, Technology Director, ISP in 2016 and distributed internally. These documents detail the change history, scope, safety, equipment, and procedure instructions for each test.

17 Lab procedures provide by U.S. Silica.

Written statements from U.S. Silica indicate that the internal labs follow all protocols discussed here.[18] Based on the QP review, there is sufficient data in the documents reviewed to show laboratory procedures are adequate. There is no documentation of sample transport and/or security measures taken for sample delivery. It is recommended that procedures be drafted to address this task. It is also recommended that U.S. Silica develop a third-party laboratory testing program to validate in house testing procedures and results. It is the QP's opinion that the procedures and protocols for laboratory sample preparation and analytical procedures currently in place are adequate. It is recommended that a chain of custody protocol be developed for samples arriving at the lab from the field.

9.0 DATA VERIFICATION

Only exploration samples are tested at the Colado Site for basic mineralogical parameters. Since the DE is made into numerous different finished products, each individual customer has internal quality requirements and quality control/quality assurance ("QA/QC") methods to verify the quality of the finished product.

Available laboratory reports were reviewed for content. The reports showed the concentrations of up to 60 individual minerals/compounds that were selected for analysis. However, not every sample was tested for the same parameters. The primary testing parameter used is mineralogy. The mineralogical makeup of finished DE products varies significantly from customer to customer which is market driven. The purity of the DE varies slightly from one pit to another with the Atlantis pit having the highest level of purity according to U.S. Silica.

18 Terry Lackey email dated 9.24.21.

Please refer to Section 12.2 Data Verification Methodology and Section 12.3 Process Verification below for further detail. It is the QP's opinion that the data reviewed in preparation of this Technical Report is adequate and appropriate for the commodity being produced.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

The DE is extracted from the ground and then placed into stockpiles to dry. A stockpile may be worked on occasion to turn over the ore to enhance drying. Moisture content testing is performed routinely until the DE reaches a certain level of dryness before it is transported to the processing plant. The DE is then loaded into trucks and transported approximately 19 miles to the Colado plant. No other processing or testing is performed at the mine.

All testing is performed internally at U.S. Silica labs. Testing is only performed on the samples collected during exploration. Basic mineralogical testing is adequate for the samples collected during exploration. Since the DE is used to make multiple finished products for numerous different customers, it is not reasonable to conduct other testing at the exploration stage. The results of the testing performed do not include material that has been processed at the Colado plant. Only the raw ore is extracted at the Colado mine.

Table 10.1 shows partial results from a sample collected from the exploration performed at the Atlantis pit. The actual table is too large to fit into this report format. The selection of results presented below shows the results of 18 of the 26 individual parameters noted in the spreadsheet.

Hole ID	Sample ID_B	From	To	Moisture	GCOA %	CWD (lb/ft	(Y)	Assemblag	L*	a*	b*	blue	SiO2 (%)	Al2O3 (%)	CaO (%)	MgO (%)	Na2O (%)	K2O (%)	Fe2O3 (%)	MnO (%)	TiO2 (%)	P2O5 (%)	Cr2O3 (%)	LOI (%)	Sum (%)	Sb (PPM)	As (PPM)	Ba (PPM)	Cu (PPM)
ATL1407A	1	216	220	1.5	128	30.1	79.34		91.39	0.4	3.63	74.92	91.85	2.88	0.43	0.41	0.2	0.13	0.96	0.01	0.11	0.02	0.001	3	100	7	2	121	11
ATL1303	10	125	130	1.6	143	24	79.87		91.63	0.04	5.15	73.55	91.36	3.04	0.52	0.36	0.26	0.24	1.19	0.02	0.11	0.03	0.001	2.79	100	33	1.5	163	10
ATL1303	11	130	135	1.4	141	26	83.81		93.37	0.06	4.67	77.9	93.3	2.03	0.34	0.22	0.24	0.16	0.69	0.01	0.07	0.02	0.001	2.82	100	14	1.5	129	8
ATL1303	12	135	140	1.9	125	26	76.32		90.01	0.14	7.53	67.4	87.25	4.65	0.76	0.52	0.31	0.26	2.52	0.02	0.24	0.03	0.001	3.35	100	37	9	166	12
ATL1303	1	61	65	1.5	169	22.7	81.64		92.42	0.16	6.05	74.12	93.39	1.87	0.44	0.22	0.29	0.21	0.88	0.02	0.08	0.02	0.001	2.49	100	23	1.5	151	11
ATL1303	2	65	70	1.6	156	23.1	83.3		93.15	-0.09	5.25	76.68	92.45	2.24	0.65	0.28	0.29	0.2	1.07	0.02	0.11	0.04	0.001	2.53	100	21	2	152	11
ATL1303	3	70	75	1.5	177	21.9	85.76		94.21	-0.04	4.39	80.12	94.96	1.33	0.33	0.19	0.18	0.09	0.5	0.02	0.04	0.02	0.001	2.23	100	1.5	1.5	131	7
ATL1303	4	75	80	1.5	171	22.3	83.27		93.13	-0.18	5.79	75.97	92.92	2.08	0.51	0.31	0.26	0.2	1.03	0.02	0.07	0.02	0.001	2.48	100	23	1.5	150	7
ATL1303	5	80	85	1.6	180	20.5	81.88		92.52	-0.26	5.64	74.84	92.99	1.93	0.5	0.32	0.22	0.14	1.14	0.03	0.06	0.02	0.001	2.54	100	8	1.5	140	14
ATL1303	6	105	110	1.6	143	23.6	81.36		92.29	-0.2	5.27	74.82	91.54	2.53	0.77	0.27	0.34	0.34	1.06	0.02	0.09	0.11	0.001	2.85	100	54	1.5	177	10
ATL1303	7	110	115	1.4	153	23.1	82.24		92.68	-0.08	4.89	76.12	92.32	2.45	0.52	0.26	0.29	0.23	0.79	0.02	0.09	0.03	0.001	2.9	100	31	1.5	160	9
ATL1303	8	115	120	1.4	156	23.1	84.21		93.54	-0.08	4.12	78.97	92.86	2.28	0.39	0.23	0.25	0.28	0.61	0.02	0.09	0.02	0.001	2.86	100	41	1.5	166	7
ATL1303	9	120	125	1.6	126	26.6	79.02		91.24	-0.26	5.06	72.85	88.69	4.06	0.71	0.47	0.37	0.45	1.65	0.02	0.14	0.04	0.001	3.27	100	74	4	201	12
ATL1306	17	95	100	1.9	154	19.5	76.72		90.19	0.3	9.97	64.98	87.43	3.51	0.71	0.4	0.31	0.24	2.31	0.03	0.2	0.03	0.001	4.75	100	36	31	149	13
ATL1306	18	100	105	2.8	143	25.5	77.01		90.32	0.25	8.22	67.24	84.5	4.75	1.08	0.58	0.38	0.28	2.85	0.03	0.22	0.1	0.001	5.16	100	43	12	148	13
ATL1308	1	25	30	1.8	177	29.7	85.77		94.21	-0.43	5.55	78.62	91.82	2.09	0.7	0.31	0.2	0.11	1.08	0.01	0.08	0.02	0.002	3.47	100	6	1.5	127	11
ATL1308	2	30	35	2.7	138	24.5	79.47		91.45	-0.53	6.12	71.99	84.34	5.22	1.1	0.84	0.43	0.38	2.36	0.04	0.18	0.04	0.003	5.1	100	65	3	207	15
ATL1308	3	35	40	1.9	190	19.8	83.6		93.28	-0.34	5.03	77.23	91.43	2.36	0.56	0.36	0.19	0.14	1.14	0.01	0.09	0.03	0.002	3.7	100	10	2	130	7
ATL1308	7	55	60	4.4	110	27.1	70.45		87.21	0.31	9.26	60.14	81.61	6.24	1.25	0.92	0.39	0.27	3.49	0.02	0.26	0.06	0.005	5.5	100	40	7	159	14
ATL1308	8	60	65	3.4	91	29.7	72.78		88.34	0.19	7.88	63.75	77.26	8.19	1.99	1.01	0.62	0.37	3.25	0.02	0.44	0.06	0.003	6.87	100	46	8	180	17
ATL1308	9	110	115	3	54	37.8	63.63		83.77	0.76	7.67	55.61	84.05	5.3	1.21	0.75	0.35	0.23	2.31	0.02	0.22	0.09	0.01	5.31	100	21	6	145	16

Table 10.1 Partial mineralogy test results from samples collected during exploration performed at the Atlantis pit.

11.0 MINERAL RESOURCE ESTIMATES

Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

11.1 U.S. Silica Methodology

U.S. Silica reports its in-situ resources and reserves in "Recoverable Tons." As such, a geologic "Resource" that is identified by exploration drilling is further defined by several other key criteria before it can be considered "Recoverable Ore." The most important of these criteria are that the resource must have:

Indicated Resource	Reasonable level of confidence of geometry and estimates
	Quantity and grade/quality are estimated on the basis of adequate geological evidence/sampling
	Information locations too widely or inappropriately spaced to confirm geological and/or grade
	Confidence sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of economic viability of the deposit
Measured Resource	High level of confidence of geometry and estimates
	Information locations are closely spaced enough to confirm geological and grade continuity
	Information gathered appropriately
	Confidence sufficient enough to allow the application of technical and economic parameters and to enable the evaluation of economic viability that has a greater degree of certainty

Resources for the Colado Site are estimated using SURPAC mine software and routine block modeling methods. The drill log information and analytical lab data are used to construct three dimensional models to constrain volumetric calculations and estimates of recoverable ore reserves.

Drill hole data is extracted from a GeoSequel database and is examined for quality purposes. The data checks include ensuring correct drill collar coordinates and correct drill hole azimuth and dip record. The physical and chemical data sets are each reviewed for values that do not appear reasonable. If a discrepancy is noted, it is resolved by consulting the plant laboratory and the data set is corrected. A judgment call is made whether to isolate and ignore suspect data from historic, pre-2010 records.

Three dimensional geologic solid models are created using Leapfrog software and the lithologic data contained in the drill hole database. The solid models generated for a deposit include at least one diatomite ore solid but may contain as many as four or more solid layers for diatomite ore. Geologic solid models are also constructed for ash seams interbedded in a diatomite ore deposit, soil and alluvium that occurs as waste overburden, and volcanic units that form the bottom of the ore zones.

Assay data is composited as 5 ft. sample lengths constrained within the ore solids. Composite grades are assigned as length weighted values. As a conservative model step, grade estimations include all sample values, and no high values are capped. Use of a cap to treat an anomalous high value would result in an inappropriate downgrading of the high value to be used in the estimation. Lab values reported as ‘below detection limit’ are set as a value of one-half of the detection limit. There are no cases where the reported lab values exceed an upper detection limit.

The block dimensions are routinely assigned as 25 ft. (x) by 25 ft. (y) by 5 ft. (z) as the smallest minable unit (“SMU”) for an individual deposit. A search ellipse orientation is selected based on the strike and dip of the stratigraphic sequence determined from geologic mapping, or it is interpreted using cross sections of the diatomite deposit. The search ellipse uses a 10:10:1 anisotropy as the major: semi-major: minor ellipse axes, respectively, in order to honor the layered character of the deposits formed in the lacustrine depositional environment.

An ore model block is considered as measured if it is contained in a 200 ft. search ellipse and an ore model block is considered as indicated if it is contained within a 400 ft. search ellipse. The 200 ft. and 400 ft. search distances are used because a close agreement is demonstrated between estimated in-situ ore quality and the grade quality of mined ore production as determined in stockpile sampling evaluations reported as certificate of analysis. To be designated as measured, an ore model block is further required to have at least five composite grade values within the 200 ft. search ellipse. To be designated as indicated, an ore model block is further required to have at least three composite grade values within the 400 ft. search ellipse. In all cases the maximum number of eight samples is used to estimate a block grade.

The block model grade estimations use an inverse distance cubed (“ID3”) interpolation method. Sets of block grade estimation using nearest neighbor, varying powers of inverse distance, and ordinary kriging methods were evaluated in a block model validation study. The ID3 interpolation was selected because this produced the most reasonable result for block model estimation in the validation study. The ID3 block models are validated by a combination of comparing block statistics with composite drill hole grade statistics and comparing graphical, cross sectional, displays of estimated block grades with composite drill hole grade values.

The ore volume that is measured in the SURPAC module’s block model is reported in cubic ft. This volume is converted to BCY. A mining recovery ranging from 75% to 90% is assigned to account for ore losses resulting from mining transitions from waste to ore and ore to waste horizons. The mining recovery used for the deposits in the Colado Mine is most commonly 85%. The recoverable ore is calculated by multiplying the in-situ ore volume by the recoverable ore factor. The recoverable ore is converted to a value of SCY by multiplying by 110% (swell factor) determined as the volume increases due to moving the ore with loader and truck from the mine bench to the stockpile. Next the SCY is converted to a dry ore ton using a factor of 3:1. The Resource tons are equal to the dry ore tons and are reported as the recoverable ore tons and reported to the SEC in U.S. Silica’s annual reports. Recoverable ore tons also meet the requirements of having a completed mine plan and obtaining an operational mine permit from the BLM and the BMRR.

WESTWARD utilized two approaches in confirming U.S. Silica's internal Colado Site reserve estimates: data verification and process verification. The purpose of data verification was to address whether data incorporated in the U.S. Silica's models was supported by documentation and that the model inputs matched those documents. The purpose of process verification was to address whether U. S. Silica's results could be replicated using identical data sets.

11.2 Data Verification Methodology

WESTWARD coordinated with U.S. Silica personnel to compile copies of all available exploratory field logs, gradational test results and a database of the geologic model inputs. Once compiled a spreadsheet was developed including a list of all exploratory boings from the model and their locations, elevations, and exploration depths. If supporting documentation was available, it was indicated on the spreadsheet next to the associated boring.

To address whether model inputs matched supporting documentation, field logs were checked against lithological inputs to the Atlantis deposit model. At least 30% of modeled borings were checked against field logs.

11.3 Process Verification Methodology

WESTWARD developed an independent geologic model of the Atlantis deposit from the provided U.S. Silica data inputs, setbacks, and mining assumptions. RockWorks21 modeling software was used to develop the independent model with the Inverse Distance Weighting algorithm and a 40x40x1 ft. model resolution. Volumetric estimates of in-situ raw material for each mine block were extracted from the model. Reductions were made for reported production based on the provided topo date resulting in a bank cubic yard volume of ore. This value was compared against U.S. Silica estimates.

11.4 Results

During the data verification process, WESTWARD determined that supporting documentation was not available for every boring incorporated into the U.S. Silica geologic models. This is primarily due to the vintage of some of the drilling performed by EP Minerals prior to being purchased by U.S. Silica. Handwritten logs were not converted into electronic documents. Where performed, WESTWARD'S process verification resulted in a less than four (4) percent difference between the U. S. Silica and WESTWARD bank cubic yard ore estimates. This is acceptable.

11.5 In-Situ Recoverable Ore Resources

There are numerous individual pits at the Colado Site that have been mined over the years to various degrees. Not all are being actively mined as of the date of this report. Only pits that are currently designated with proven or probable reserves equal to, or greater than, 100,000 tons were considered material by U.S. Silica for this report. It must be noted that there are several other pits with indicated and measured resources as well as proven or probable reserves that were not included in the recoverable ore estimates provided in this report. The overall volume of recoverable DE is higher than what is presented herein. As of December 31, 2021, the mineral reserves of the Colado Site are reported as follows:

Deposit Classification	In-Situ, Recoverable Ore Tons*
Measured Resource	1,100,000
Indicated Resource	3,361,000
Total	**4,461,000**

* *Tons rounded down to the nearest 1,000*

Table 11.1 U.S. Silica In-Situ, Recoverable Ore Resources Estimate.

11.6 Cut Off Grade

Cut-Off grade is the minimum grade required for a mineral or metal to be economically mined (or processed). At the Colado Site, material is considered to be economically recoverable when the cost to extract, process and then sell the material results in a profit. There is no single “cut-off grade” for the total recoverable ore resource estimation at a mine site because the direct-shipping grades are fixed by the sale contract and tailored to each customer’s specific particle sizing and physical characteristic requirements.

Exploration and testing are performed to determine where the recoverable/saleable material is located. Only areas that meet the criteria for being economic are mined. The recoverable material is defined in individual mine blocks that are created based on exploration results. Only blocks with economic deposits of DE are modeled. Please refer to Section 19.0 Economic Analysis for pricing information.

12.0 MINERAL RESERVE ESTIMATES

12.1 U.S. Silica Methodology

For the in-situ DE deposit at the Colado Site, indicated resource areas were converted to probable reserve areas due to fewer available drill logs or locations and larger spacing distances between drill holes than what is in the measured resource areas. The deposit varies in location and thickness due to faulting and a higher degree of drilling is required to adequately define the limits of economically recoverable DE in these areas.

Measured resource areas were converted to proven reserve areas based on a sufficient number of drill holes with adequate spacing in conjunction with several modifying factors.

Modifying factors such as required and sustainable infrastructure (Section 15), market studies (Section 16), environmental considerations and permitting (Section 17), capital and maintenance costs (Section 18) and economic analysis (Section 19) have been completed or are in place. This allows for unencumbered mining and processing at the Colado Site. A robust need for DE and extended high sales volumes make the mine viable. These factors demonstrate the economic viability of the in-situ DE deposit at the Colado Site.

12.2 In-Situ Recoverable Ore Reserves

There was sufficient data available for review to convert the Measured and Indicated Mineral Resources, as discussed above, at the Colado Site to Proven and Probable Mineral Reserves. Reserve estimates of in-situ DE as of December 31, 2021 reported by U.S. Silica are shown in Table 12.1 below.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	1,100,000
Probable Reserve	3,361,000
Total	**4,461,000**

* *Tons rounded down to the nearest 1,000*

Table 12.1 U.S. Silica In-Situ, Recoverable Ore Reserves Estimate.

12.3 Cut-Off Grade

Cut-Off grade is the minimum grade required for a material to be economically mined (or processed). Please refer to section 11.6 Cut Off Grade for the discussion pertaining to the Colado Site.

13.0 MINING METHODS

U.S. Silica mines DE approximately 19 miles northwest of the town of Lovelock, NV. The mine provides raw DE ore to the plant located in Lovelock, NV which is approximately 19 miles to the southeast. The Colado mine encompasses approximately 1,456 acres of a total of approximately 7,025 acres of land U.S. Silica has under lease. Figure 1.1 in Section 1.0 Executive Summary, shows the Colado boundaries, and the mining locations identified by U.S. Silica.

13.1 Mining Environment

The thicknesses of economically viable DE deposits in the Colado mine area range from a few inches to 50 ft. The DE deposits vary slightly in physical characteristics. This variation is useful to U. S. Silica in blending products at the Colado plant to tailor final products for specific customers. The mining horizons are separated by a waste product called volcanic tuff.[19] Tuff is a common material in the basin and range geologic setting in Pershing County, NV.[20] Tuff varies in thickness depending on its distance from the volcanic vent. In addition to the interbedded[21] tuff material and basalt,[22] layers may overlay the other deposits. If present, this basalt layer and any overlying organics and dirt (all called overburden) must be removed before mining the DE.

Colado is in topography known as basin and range. The surface is a mix of gentle undulating landforms to small scale uplifts forming small cliffs. From a mining standpoint, this type of surface irregularity does not provide unwieldy difficulty. Figure 13.1 shows the typical topography at the Colado Site. The DE mining horizons at Colado are relatively shallow and are moderately dipping.[23] These traits favor surface mining by conventional methods. Where the DE is relatively friable,[24] it is considered mineable. The friability of the deposit, a limited amount of overburden, and the relatively shallow dip of the deposit are the characteristics which designate the deposit as mineable.

19 Tuff is a common name of a pyroclastic rock made up of volcanic ash which was ejected from a volcano, likely through a vent or hole in the side of the volcano. (https://geology.com/rocks/tuff.shtml and https://www.mindat.org/min-48591.html).

20 "Geologic units in Pershing County, Nevada, "USGS, https://mrdata.usgs.gov/geology/state/fipsunit. php?code=f32027.

21 Interbedded implies the mineral may occur between other units of the geologic column; when mined it is called "interburden."

22 Basalt is a fine-grained igneous rock that is the most common rock under the earth's surface which usually forms as a flow of molten rock (https://geology.com/rocks/basalt.shtml).

23 Dipping refers to a deposit that is not horizontal and the plane of the deposit is inclined to the horizontal plane.

24 Friable is "a rock or mineral that crumbles naturally or is easily broken, pulverized, or reduced to powder, …; "Illinois State Geological Survey, https://isgs.illinois.edu/outreach/geology-resources/friable.

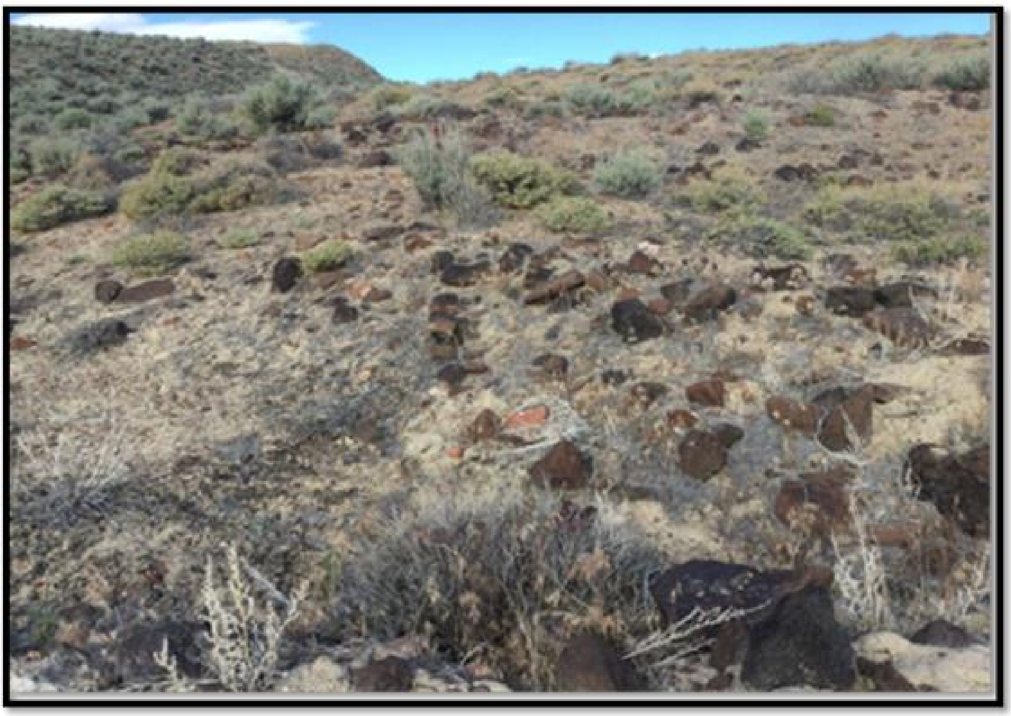


Figure 13.1 Typical rolling landform and vegetation at Colado.

There are nine open pit mining locations at Colado. These pits are named Atlantis, Horseshoe Basin, Quivera, Antelope Basin, Tunnel Hill, Burro Basin, Black Butte, Tarp Stand and Liberty (Figure 13.2).[25] Currently, active mining is occurring in only two of these pits Atlantis and Horseshoe Basin-Quivera. Figure 13.3 shows the arrangement of these production areas. Colado operates under a 2001 Plan,[26] which provided approval for disturbance and operation on 968.7 acres. In 2018, an "as built"[27] reconciliation was performed to determine the extent of unauthorized disturbance. The amount of surface disturbance was found to be 1,372.9 acres, exceeding the permitted acreage by some 404.2 acres. The BLM and the State of Nevada

25 Email from Terry Lackey from December 2, 2021, on geotechnical.

26 The term "2001 Plan" is used here without specificity to represent the Plan of Operations and permits required by the Bureau of Land Management and the State of Nevada in place to allow ongoing operations of Colado in 2001.

27 The term "as-built" refers to a revision of the plan based on the essential completion of initial construction parameters and the actual surface disturbance of the project upon the on-set of operations.

allowed the bond to be increased to account for the additional disturbance.[28] In October 2021, a Minor Modification for 55 acres was approved by the State for additional surface disturbance on private lands in the new South Knob (Horseshoe Basin) mine area.

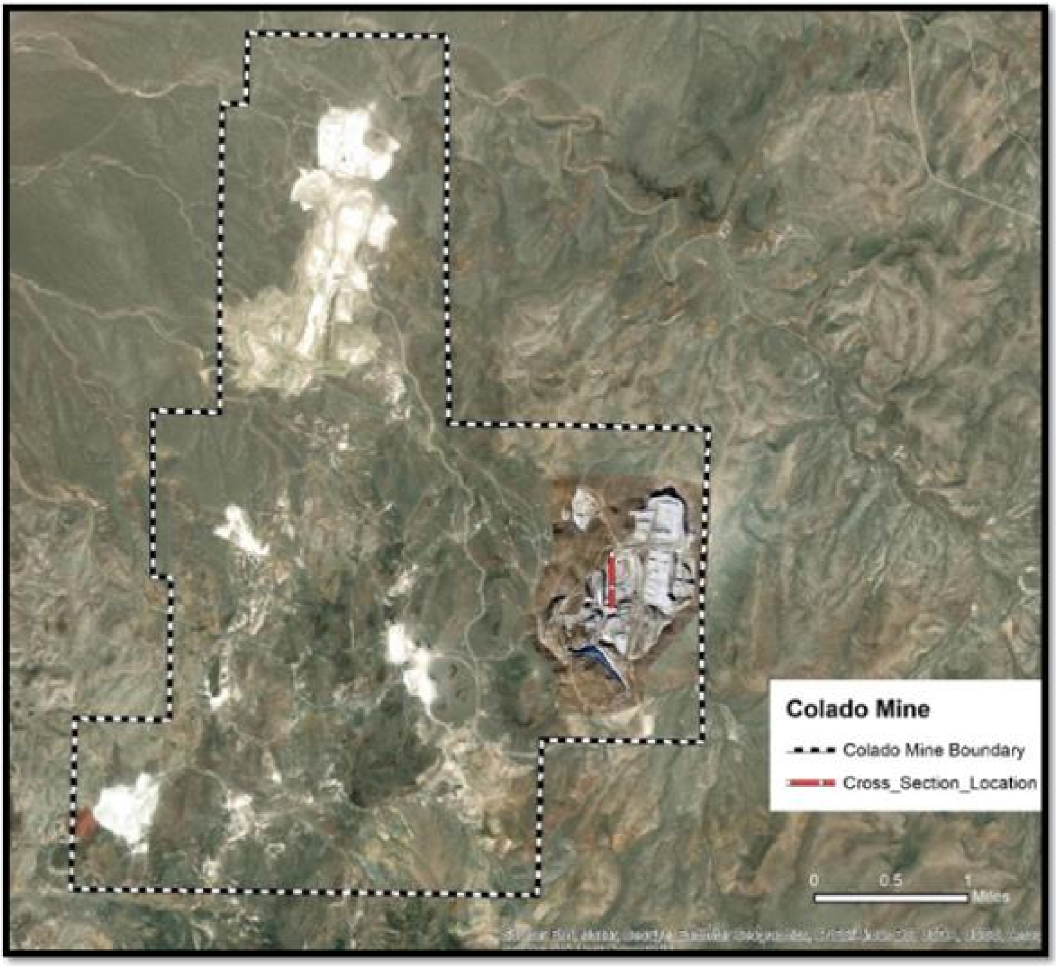


Figure 13.2 Colado Layout.

28 EP Minerals, LLC Colado Mine Project, Mine Plan of Operations, NVN-065329/ Nevada Reclamation Permit No. 0182, Major Modification submittal of November 2021, EM Strategies for EP Minerals, LLC.

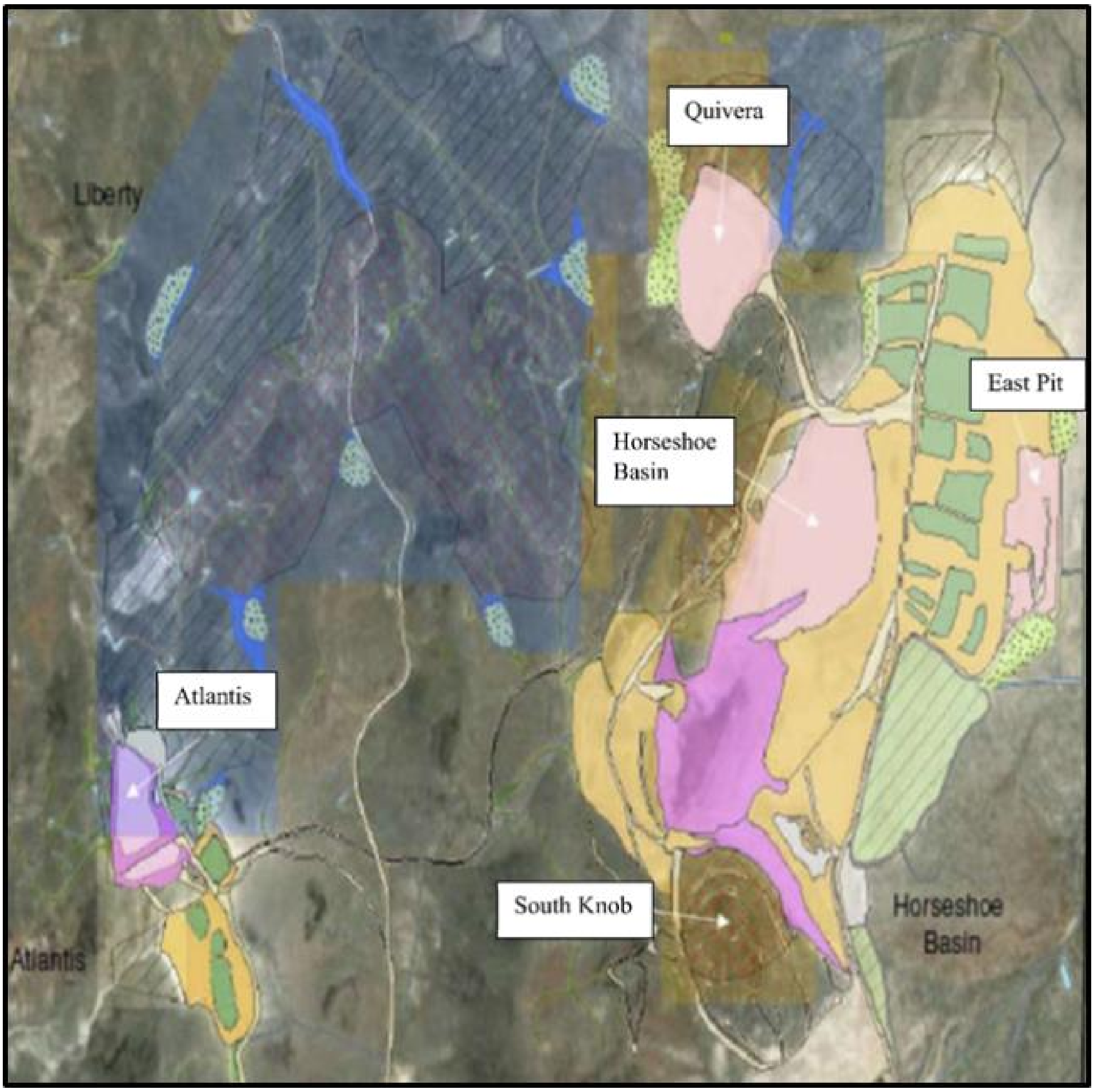


Figure 13.3 Current mining areas at Colado.

The mine capacity is approximately 3.0 MM yd^3 of stockpiled DE ore. The average annual production for the last five years has been approximately 600 K yd^3 of stockpiled DE. Colado schedules mining approximately 200 days per year.[29] Figure 13.4 shows a typical cross section of the various benches at Colado. The DE deposit is the light-tan-colored lenticular deposits in the benches. Individual pits will vary.

Figure 13.4 Typical cross section of different mining benches.

Mining has been ongoing at the Colado Site since 1986. U.S. Silica acquired the right to mine in May of 2018 with the acquisition of EPM. No site visit was made by the mining QP. The information presented in this section is based on a review of previous technical reports available for the Colado Site, discussions with U.S. Silica's team and site photos from the WESTWARD site visits. Opinions herein are based on those reports provided to the QP by U.S. Silica, literature search of available information, and interviews of available U.S. Silica personnel.

29 Email from Terry Lackey of November 14, 2021, on equipment and capacity.

13.2 Overburden and Interburden Waste Handling

The vegetation on the future mining areas on the Colado property is classified as either "Salt Desert Scrub" or "Sagebrush Steppe."[30] This type of vegetation is sparse and relatively easily cleared. The typical vegetative cover and basalt overburden is shown in Figure 13.5. The practice at Colado is to remove the organic material and brush as part of the basalt overburden removal process. Organic soils are nonexistent to less than 1 ft. across the property. Drilling and experience have shown the anticipated depth of the overburden will remain in the range where U.S. Silica believes the organic and other deleterious materials can be removed in this manner throughout the life of the mine.[31]

Figure 13.5 Typical vegetative scrub and basalt cap rock in the overburden overlying the mining horizon at Colado.

30 "An annotated checklist of the bryophytes of Nevada, with notes on collecting history in the state," https://www.researchgate.net/publication/228360582_An_annotated_checklist_of_the_bryophytes_of_Nevada_with_notes_on_collecting_history_in_the_state.

31 Email from Terry Lackey of December 2, 2021, email from Terry Lackey on geotechnical.

The basalt overburden and the tuff interburden are waste products produced as U.S. Silica removes the DE ore. The quantity of waste material moved is dependent upon the local lithology and the quantity of DE needed for the raw DE stockpile. The waste is mined separately from the ore by conventional open pit methods using excavators and other conventional mining equipment. Blasting may be required to fragment the basalt cap rock and the less friable tuff interburden from time to time.[32] Drilling and blasting are performed by a contractor.[33] The tuff interburden layers between the primary ore strata are mined in 15-to-20-ft. benches. Colder winter months are reserved for overburden removal operations and reclamation projects.[34]

The tuff waste and other non-basaltic waste are subject to erosion from wind and water. In July of 2021, Golder Associates Inc. ("Golder") authored a report[35] addressing the construction of certain waste dumps in a manner which complies with the objectives set forth in the Modified Plan of Operation, submitted by U.S. Silica in November of 2020. The Modified Plan of Operation and subsequent Golder report requires segregation of the waste so the basalt overburden can be used to cap the erodible interburden material in a manner which protects the waste materials from wind and water erosion and establishes vegetation appropriate for the life zone of the surrounding area.

In their report Golder developed mining and blasting recommendations for the basalt to provide the synergistic use of the material for reclamation purposes. U.S. Silica has a procedure in place to mine, segregate, and place the waste materials in a manner consistent with industry best practices and the Golder July 2021 report. This procedure is part of their November 2, 2021, Major Modification submission.[36] The QP believes the plan in place to handle the overburden and interburden is a best practice.

32 Terry Lackey email of November 11, 2021, on face heights.
33 IT Service Desk - RE_ SK1300 - Mine Info.msg, email of September 21, 2021, from Joe Petersen.
34 Internal U.S. Silica document, "Reserve Report: Colado Complex – Lovelock, NV," 200714 - Colado Mine NV - FINAL - USS Internal Reserve Report.
35 "Basalt Overburden Closure Cover Evaluation, U.S. Silica Colado Mine," Golder Associates Inc., July 8, 2021.
36 Email from Terry Lackey of December 2, 2021, on geotechnical.

13.3 Mining Process

Mine engineering design factors, and current operational practices are critical in defining mine-bench parameters. The objective is an ultimate overall 45-degree highwall slope with substantial safety benches. This is the standard design constraint used on all current and active U.S. Silica mine designs.

Each pit has its own local geologic characteristics. The DE bench heights are reported to be between 20 and 25 ft.[37] depending on the pit and the location within a given pit. U.S. Silica reports the constraining factors for bench height are mining equipment limitations and engineering design controlled by the rock mechanics.[38] Excavation depth, for the benches in the diatomaceous earth, is limited to approximately 10 ft. due to the limitations of the tracked excavator. Two passes on each bench are required to mine the total height of the bench. No blasting is required due to the friable nature of the DE deposit.

Once exposed by removal of overburden and interburden waste rock, the DE is loaded into articulating haul trucks by a tracked excavator. Using haul roads within the mine, the haul trucks move the DE ore to raw ore stockpiles near the pit. The Colado Site operates year-round with ore mining activity starting in early spring and concluding sometime in the late fall when either sufficient ore has been stockpiled, or when inclement weather makes ore mining too costly or difficult. The April to November timeframe provides optimum working conditions. Dry hot weather aids the natural drying of the ore in the stockpiles.[39]

37 Email from Terry Lackey of December 2, 2021, relative operational practices.
38 Email from Terry Lackey of December 2, 2021, relative operational practices.
39 Internal U.S. SILICA document, “Reserve Report: Colado Complex – Lovelock, NV,” 200714 - Colado Mine NV - FINAL - USS Internal Reserve Report.

13.4 Mine Ore Stockpiles

Mining is seasonal, but the Colado plant operates year-around to meet market demand. As a result, a large stockpile of raw DE is required to act as a buffer for processing-plant feed when the mine is not operating. Mined ore is placed in one of several stockpiles based upon the grade of the ore and the current needs of the plant. Stockpiles of ore are constructed in the vicinity of the pit where the ore was mined to maximize the utilization of the mining haul trucks. Stockpile areas are constructed with appropriate drainage for storm water runoff.

Raw ore is allowed to dewater in the stockpile and usually remains at the Colado Site for approximately 1 year. U. S. Silica maintains control of the stockpiles to segregate the raw ore into stockpiles of similar physical characteristics. This allows blending of the various stockpiles to provide a specific blended product at the plant to meet customer needs.

The most efficient logistics, from the mine stockpiles to the processing plant northeast of Lovelock, NV is by standard over-the-road semi-tractor trailer haul trucks. The semi-truck hauling from the pit stockpile to the processing plant operates 365 days per year and 24 hours per day. The location of the processing plant, relative to the mine sites, is shown in Figure 3.2, northeast of Lovelock along Interstate 80.

13.5 Pit Repair and Maintenance

The loading and hauling are performed on a contract basis and, therefore, the mobile equipment repair and maintenance is handled by a contractor. The costs thereof are part of the fee paid by U.S. Silica during the duration of the contract period.

13.6 Mine Equipment

The mine uses hydraulic excavators as the primary loading equipment in the pit. Hauling is performed by articulating haul trucks with approximately 40-ton capacity. Miscellaneous mining and support equipment include dozers, motor grader, water truck, service trucks, etc. The equipment is largely owned by U.S. Silica with a few pieces leased. The buy versus lease decision is a financial one and made at the time of acquisition of a piece of capital equipment. The mobile equipment used for mining is shown in Table 13.1.

13.7 Colado Plant Raw Ore Movement

Stockpiled raw DE ore is moved from the mine pit location to the plant northeast of Lovelock, NV using semi tractors and trailers. This equipment is owned by U.S. Silica. The buy versus lease decision is a financial one and made at the time of acquisition of a piece of capital equipment. The mobile equipment used for stockpiled material transport is shown in Table 13.2.

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Manufacturer	Type	Model	Year	Owned/ Leased
Caterpillar	Dozer	D9R	1997	Leased
Caterpillar	Dozer	D9R	1996	Owned
Caterpillar	Motor Grader	14H	2003	Owned
Caterpillar	Front-End Loader	996C	1975	Owned
Caterpillar	Front-End Loader	996C	1975	Owned
Volvo	Articulated Haul Truck	A35D	2001	Owned
Volvo	Articulated Haul Truck	A35D	2001	Owned
Volvo	Articulated Haul Truck	A35D	2001	Owned
Volvo	Articulated Haul Truck	A40D	2004	Owned
Volvo	Articulated Haul Truck	A40D	2004	Owned
Volvo	Articulated Haul Truck	A40D	2004	Owned
Volvo	Articulated Haul Truck	A40D	2004	Owned
Volvo	Articulated Haul Truck	A40F	2012	Owned
Kawasaki	Front-End Loader	95Z	2006	Owned
Volvo	Front-End Loader	150C	1996	Owned
Volvo	Front-End Loader	180E	2006	Owned
Volvo	Front-End Loader	180F	2010	Owned
Hitachi	Excavator	EX1200	2013	Leased
Hitachi	Excavator	2ZX600	2004	Leased
Komatsu	Excavator	PC1250	2004	Owned
	Forklift		1980	Owned
Volvo	Excavator	EC750EL	2018	Leased
Komatsu	Excavator	PC1250	2019	Leased
Volvo	Articulated Haul Truck	A60H	2017	Leased
Volvo	Articulated Haul Truck	A60H	2017	Leased
Volvo	Articulated Haul Truck	A60H	2017	Leased
Volvo	Articulated Haul Truck	A60H	2019	Leased
Komatsu	Dozer	D275AX	1991	Leased
Caterpillar	Front-End Loader	980M	2018	Leased
Volvo	Articulated Haul Truck	A40G	2018	Owned

Table 13.1 Mining equipment currently employed by U.S. Silica at the Colado mine.

Manufacturer	Type	Year	Owned/ Leased
Peterbilt	Semi Tractor	1996	Owned
Peterbilt	Semi Tractor	2001	Owned
Peterbilt	Semi Tractor	2012	Owned
Peterbilt	Semi Tractor	2015	Owned
Peterbilt	Semi Tractor	2015	Owned
Peterbilt	Semi Tractor	2020	Owned
Peterbilt	Semi Tractor	2020	Owned
International	Semi Tractor	2001	Owned
Peterbilt	Semi Tractor	1996	Owned
Kenworth	Semi Tractor	1994	Owned
N/A	Water Truck	1975	Owned
Star Semi	Trailer	2008	Owned
Star Semi	Trailer	2009	Owned
Star Semi	Trailer	2009	Owned
Star Semi	Trailer	2011	Owned
Star Semi	Trailer	2011	Owned
Star Semi	Trailer	2011	Owned
Star Semi	Trailer	2011	Owned
Trinity Eagle Bridge	Trailer	2020	Owned
Trinity Eagle Bridge	Trailer	2020	Owned

Table 13.2 Mobile equipment used for stockpile material transport.

13.8 Mine Engineering, Planning, and Production Scheduling

The Colado Site reserves are mined by open pit methods. The operations require engineering design and monitoring for various aspects of the mining process (mine engineering). This engineering work includes, but is not limited to, rock mechanics, mine planning, environmental, safety, electrical engineering, mechanical engineering, civil engineering, etc. U.S. Silica either employs personnel responsible for these disciplines or U.S. Silica hires consulting experts to assist with the engineering needs at the mine.

A review of the mine planning and mine engineering activities demonstrates U.S. Silica exercises industry standard practices in its approach to mine engineering. In that review, the QP looked at limited examples of operational matters and the corresponding engineering and operational responses.[40,41] The QP is satisfied that U.S. Silica generates a practical response, implements the necessary material actions, and exercises reasonable care to meet the standards of industry standard practices in such matters.

U.S. Silica submitted a "Modification to Plan of Operations NVN-065329/Nevada Reclamation Permit ("NRP") No. 0182" to the BLM and the NDEP on or about November 2, 2021. This submittal was in response to a request by the BLM in January of 2021. The modification was requested to address "the unauthorized disturbance, reclamation of erosion areas, and proposed expansions for continued DE mining and processing operations at the Colado Mine Project (Project)."[42]

The mining at the Colado Site is sufficiently complicated that a moderate level of detailed is required in mine planning activity. This activity is normally performed by the engineering function, assisted in the field by the operations staff. The deposit of DE is reasonably uniform with no unusual risk of intrusive mineralization. However, the lithology is such that sequencing overburden and interburden removal requires sufficient coordination and appropriate planning. Regular communication between engineering staff and operating staff is necessary as mining advances.

40 See email from Terry Lackey of December 2, 2021, on response to highwall stability.
41 See email from Terry Lackey of December 2, 2021, on response to geotechnical questions.
42 EM Strategies cover letter for the submittal of "EP Minerals LLC's Colado Mine Project; Pershing County, Nevada – Resubmittal of Major Modification to Plan of Operations NVN-065329/Nevada Reclamation Permit (NRP) No. 0182" of November 2, 2021.

The annual production schedule is determined based on the forecasted sales demand provided by the sales and marketing group. This production schedule is adjusted to produce the targeted mining volume by factoring in losses for waste, in-pit uses, etc. Production schedules are then developed to assure adequate feed is provided to the processing plant to meet the finished-goods demand in a timely manner. Table 13.3 shows the estimated production through 2030.[43] This is achievable with current contractual arrangements in the pit, U.S. Silica equipment, and U.S. Silica personnel. A projection consistent with this analysis for mine production levels is included for the life of mine in the Economic Analysis section of this report.

Year	Forcast DE Finished Goods Sales (KT)	Annual Mining Volume (KT)
2020 Actual	115	138
2021 Actual	120	145
2022 Projection	122	148
2023 Projection	125	151
2024 Projection	127	154
2025 Projection	130	157
2026 Projection	133	160
2027 Projection	135	163
2028 Projection	138	166
2029 Projection	141	169
2030 Projection	143	173

Table 13.3 Historical and projected sales volumes and production schedule required to meet finished goods requirements through 2030.

43 SEC_Economic_Analysis_Model_LM_LL_OT_FYATS_20220819 provided by U.S. Silica.

As of December 31, 2021, the Colado Site employed 134 people. 35 work in the production of mining and stockpiling raw DE ore at the individual pits. 99 work at the Colado plant. Table 13.4 shows the current manning at the Colado location.

MINE OPERATIONS	QUANTITY
Mine Operators	16
Mine Maintenance	4
Shop Maintenance	2
TOTAL Mine Operations	**22**
LOGISTICS OPERATIONS	**QUANTITY**
Load and Haul	7
SALARY STAFF	**QUANTITY**
Mine Supervision	4
Logistics Supervision	1
Mine Maintenance	1
TOTAL Salaried Staff	6

Table 13.4 Manning table for the Colado mine.

Figures 13.6, 13.7, and 13.8 below are the final pit design maps for the Antelope, Atlantis and Horseshoe Basin pits, respectively.

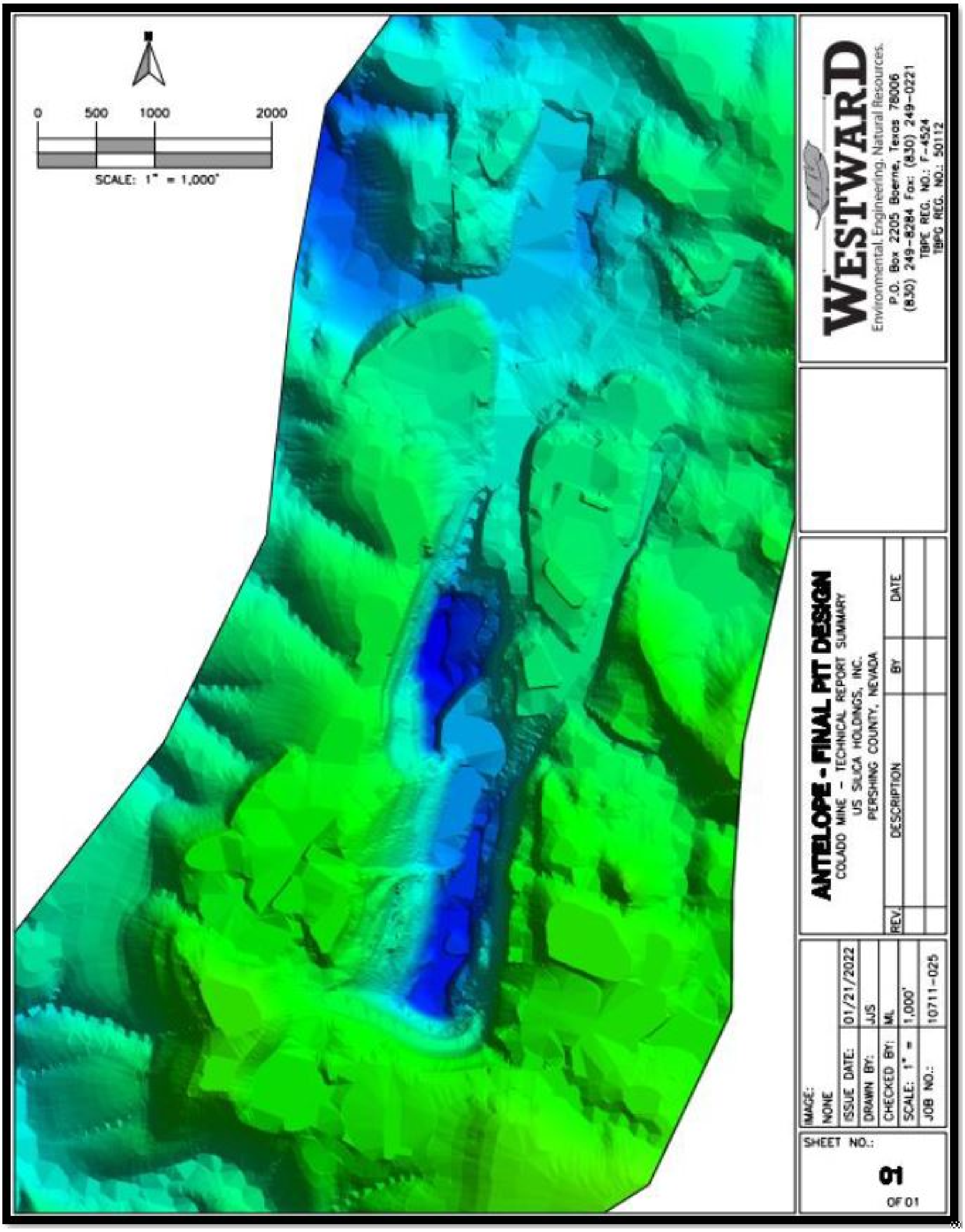

Figure 13.6 Final pit design for Antelope pit.

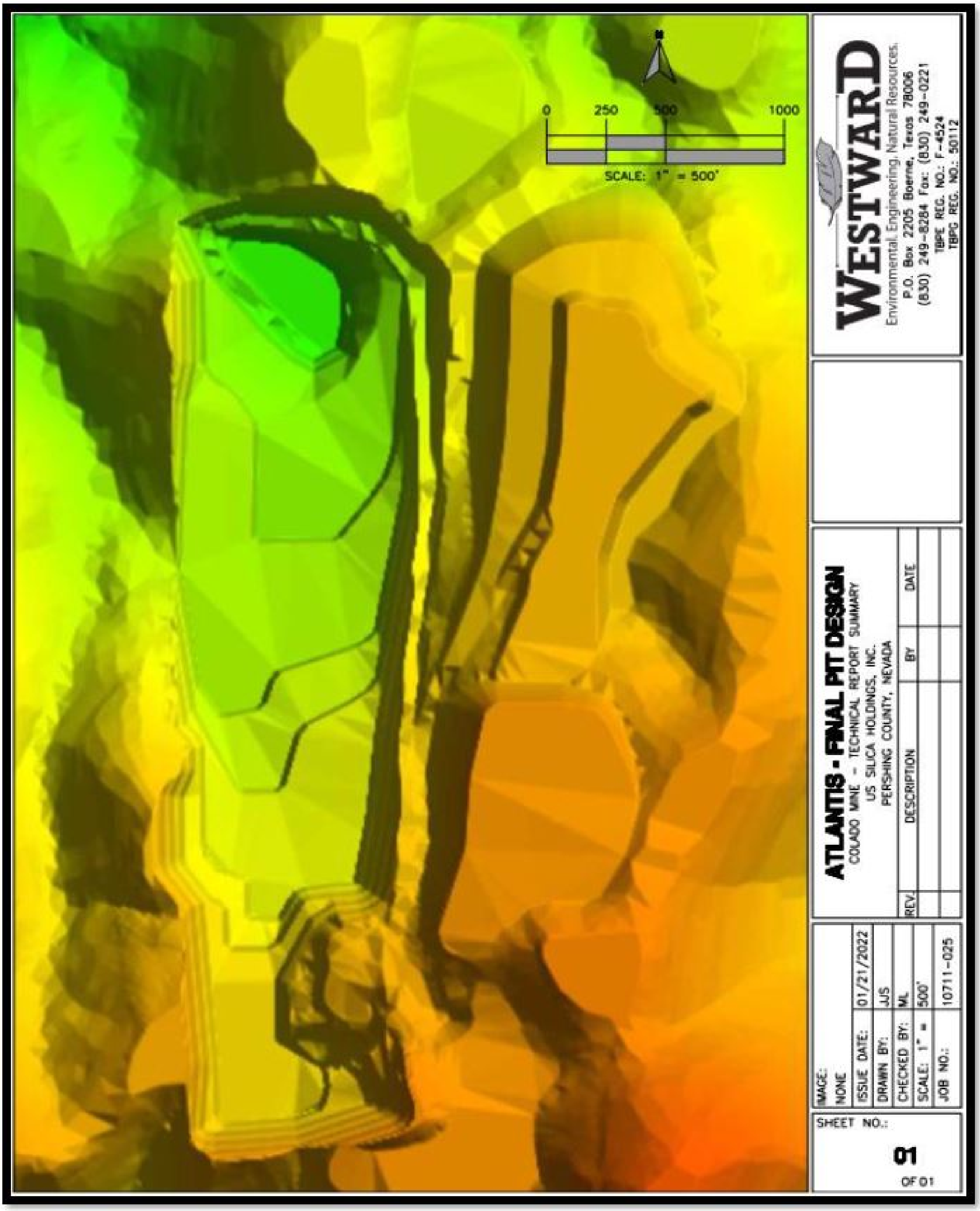

Figure 13.7 Final pit design for Atlantis.

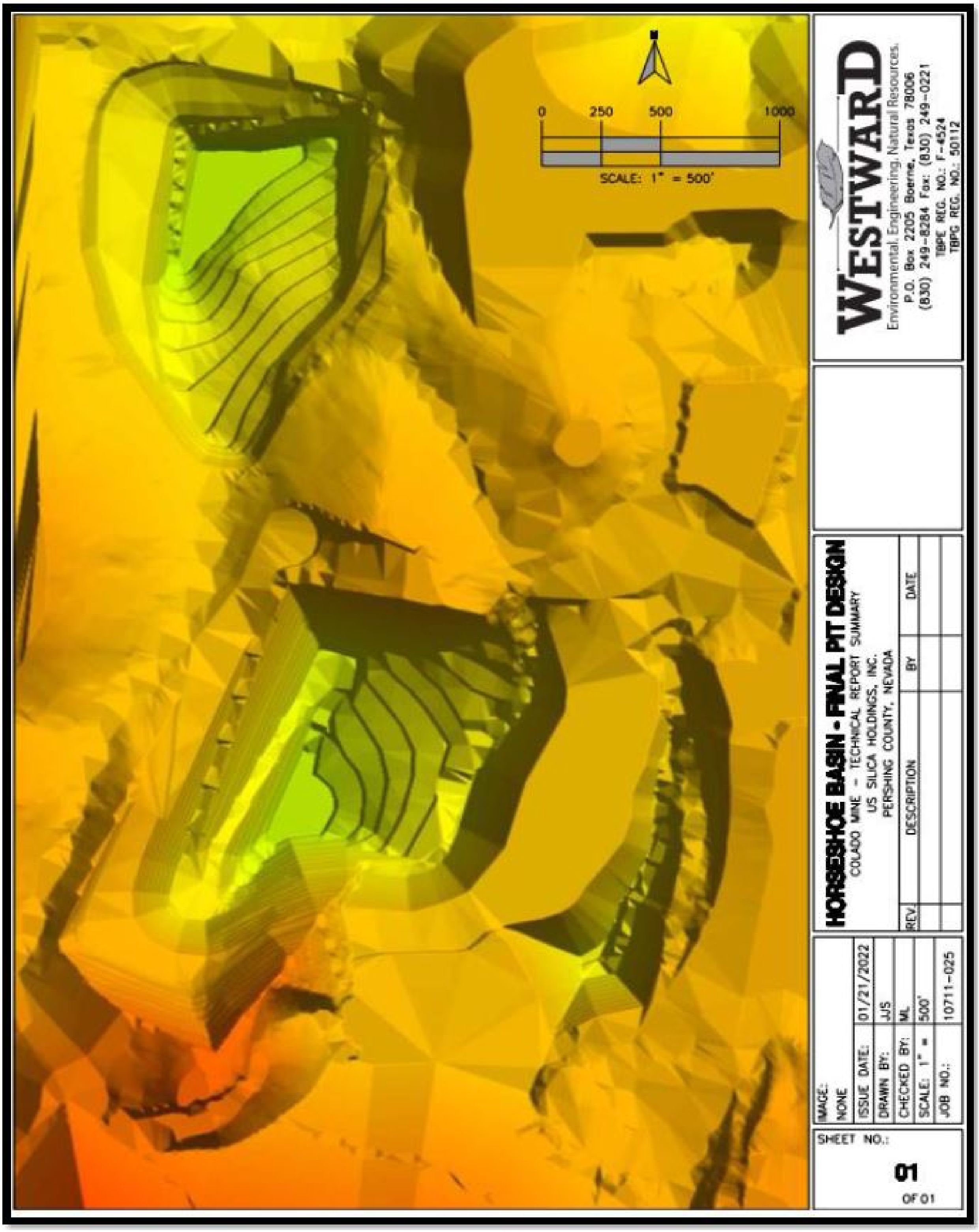

Figure 13.8 Final pit design for Horseshoe Basin.

14.0 PROCESSING AND RECOVERY METHODS

Once the DE is extracted, it is placed in a designated stockpile area to dry. Occasionally the material will be turned with a dozer or other piece of mechanized equipment to facilitate drying at the mine site. No beneficiation[44] of the DE is performed at the Colado mine. The DE is loaded into over-the-road trucks and is transported to the processing plant located in Lovelock approximately 19 miles to the east from the mine utilizing private, county, and state public roads. The plant is located about seven (7) miles northeast of the town of Lovelock, NV. Figure 14.1 shows the relative location of the Colado mine and the processing plant and the approximate haul route in red. The one-way haul to the plant from the mine site is approximately 24 miles.

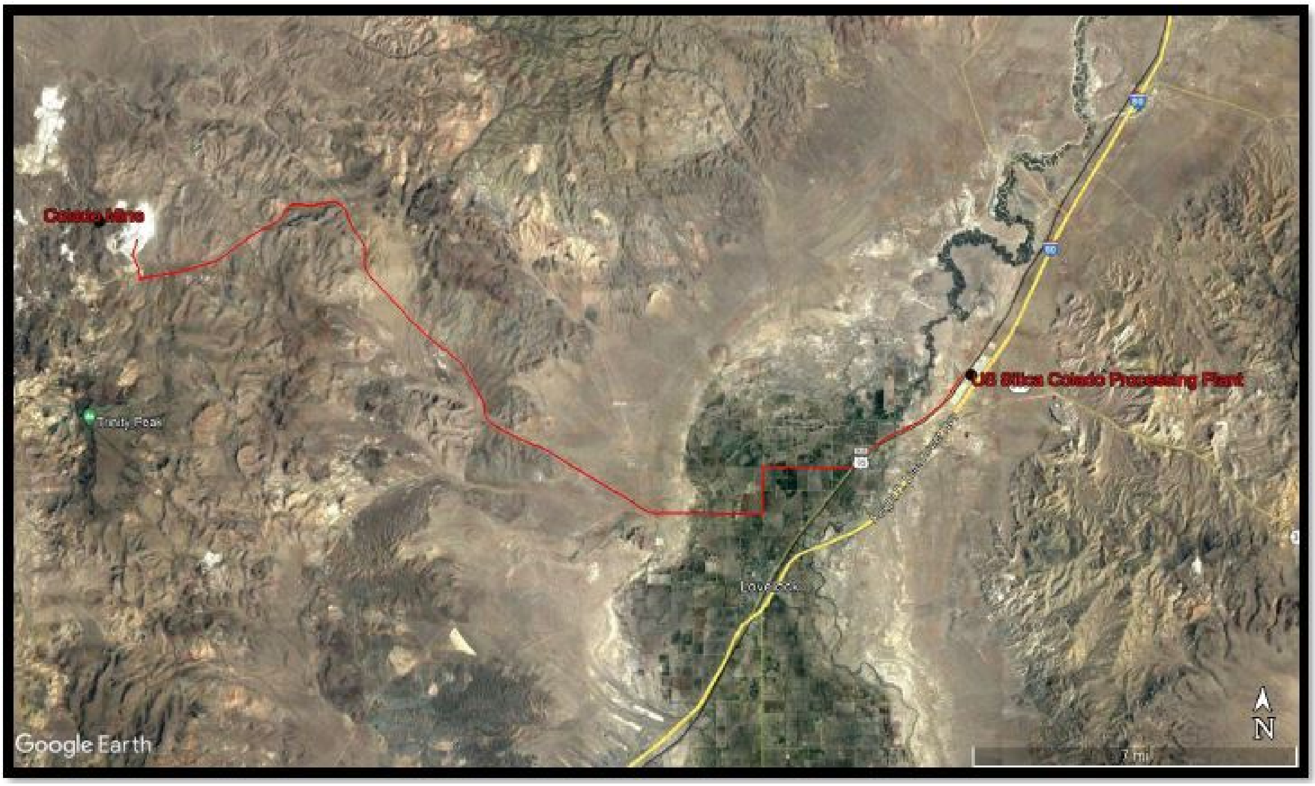

Figure 14.1 Haul route from the Colado mine to the plant located in Lovelock, NV.

44 Beneficiation is the treatment of raw material (such as diatomaceous earth) to improve physical or chemical properties of the raw ore to improve the economic value of the ore.

The Colado plant was initially built in 1959 and acquired by U.S. Silica in connection with the completion of the acquisition of EP Minerals in May 2018.[45] The DE products produced here are sold under the name Celatom®[46] and have numerous industrial and commercial applications, primarily as filtration and fine-filler products. U. S. Silica also blends the DE produced at the plant with cellulose fibers (Pre-co-Floc®), produced by U. S. Silica elsewhere, as a pre-blended filer aid called Dialose®.[47]

The Colado plant is the largest DE processing facility in the world.[48] The plant normally operates 365 days per year, and twenty-four hours per day. The DE production capacity is approximately 162 K tons annually of finished goods.[49] DE production capacity is ultimately limited by the nature of the raw feed and the capacity of plant processing equipment. U.S. Silica indicates a reasonable 82-percent mechanical availability for their plant.[50]

The annual production of finished goods at the plant is a function of customer demand and plant capacity. Total demand and product mix varies relative to economic cycles of end users and the competitive environment. The plant operating personnel periodically coordinate with the sales group to produce finished goods to meet a sales forecast.

Table 13.3 shows the yearly production history and a forecast for the production of DE products through 2030. Based on finished goods production from prior years, this plant production is achievable with current equipment and personnel. A projection consistent with this analysis for total sales volume is included for the life-of-mine in the Economic Analysis section of this report (Section 19.0).

45 Form 10-K U.S. Silica Holdings, Inc., Annual report [Section 13 and 15(d), not S-K Item 405] 2021-02-26
46 https://epminerals.com/minerals
47 https://epminerals.com/products/dialose
48 https://www.ussilica.com/locations/lovelock-nv
49 Austin Campbell Email of August 26, 2022.
50 Ibid.

14.1 DE Processing Description

The mine at Colado operates seasonally during non-freezing months. The seasonal nature of the mining operation and the required full-year operation of the Colado plant requires the raw ore at the mine to be stockpiled at the mine and moved to the plant to meet market demand. This stockpiling has the benefit of allowing the mined ore to partially dry as it sits at the mine. Various grade-segregated stockpiles are maintained at the Colado-mine-site pits for blending of different grades of DE ore mined at Colado to optimize the feed to the plant.

Stockpiled ore from the Colado mine is hauled to the plant by OTR trucks and dumped into a raw-ore feed hopper at the plant. The raw ore is conveyed into a crusher where it is sized appropriately for the DE-plant processes. The crushed ore is carried by bucket elevator into one of two crude-ore bins for storage until needed in the processing plant. There are three separate DE production lines. Two of the lines share crude-ore feed but diverge from that point into unique DE production lines. As needed, crude ore from the bins is metered into the pneumatic conveying system which dries the material with hot air as it is conveyed.

Various mills and cyclones beneficiate the in-process ore before introduction as feed into one of three horizonal rotary kilns. After calcining in the rotary kilns, the DE undergoes milling and sizing to produce the desired finished goods. Prior to entering one of the three kilns, U. S. Silica introduces soda ash as a flux to help in the process and to assist with coloration characteristics.

When there is demand, U. S. Silica blends cellulose to previously packaged DE products and then repackages the blended material to produce Dialose. The final DE products are either bagged and palletized, loaded into bulk bags[51], or loaded into rail cars. The process produces approximately 20.5% waste.[52] Figure 14.2 shows the layout of the Colado plant and Figure 14.3 is a general representation of the DE production circuits at the processing plant and does not

51 Also known commonly as “Super Sacks.”
52 Sec_Economic_Analysis_Model_LM_LL_OT_FYATS_20220819 provided by U. S. Silica.

show all the equipment in a given line. U. S. Silica owns the majority of the plant processing, packaging, and shipping equipment. Rail cars utilized for shipping to customers are leased by U.S. Silica.[53]

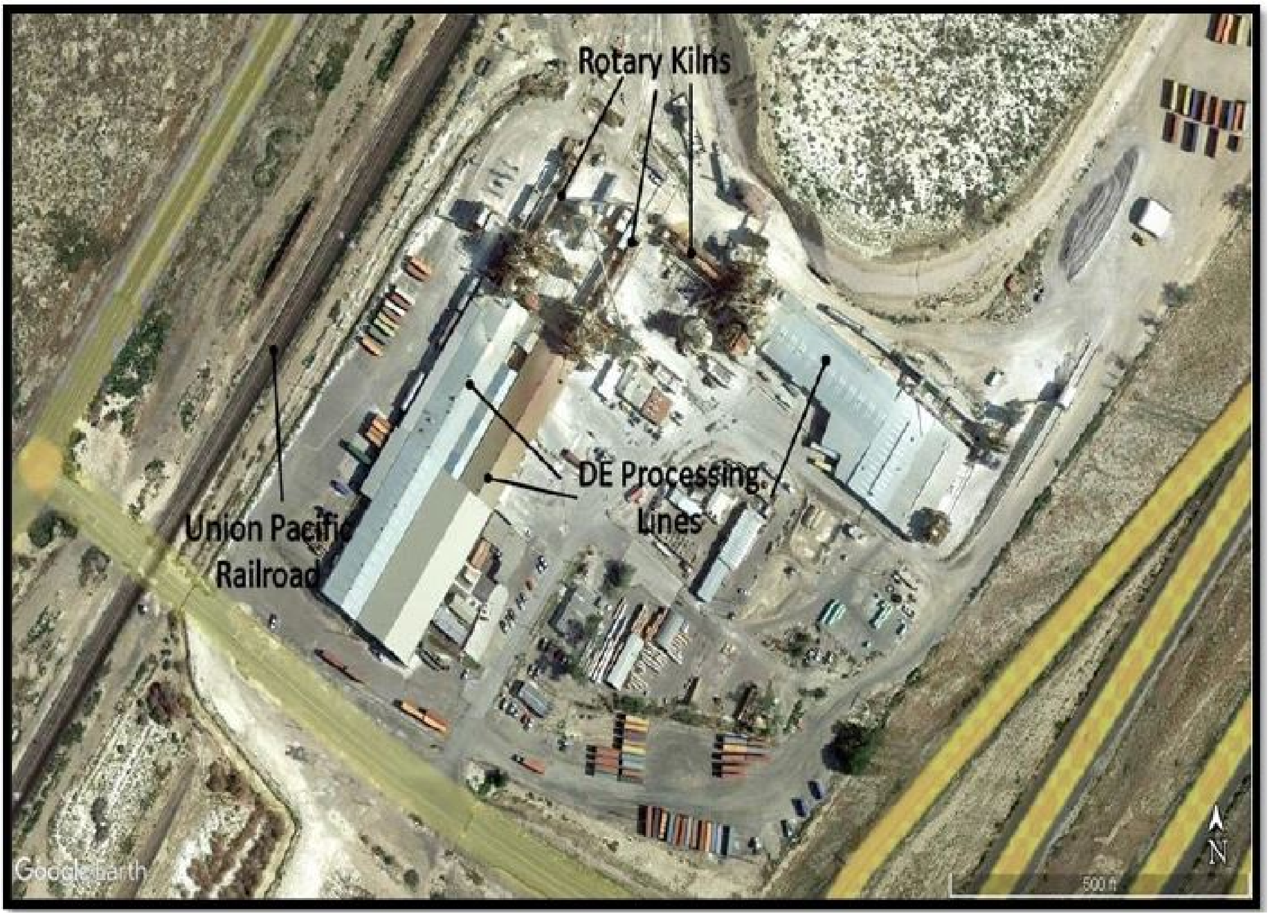

Figure 14.2 Colado plant layout.

53 Email of August 25, 2022 from Joe Petersen.

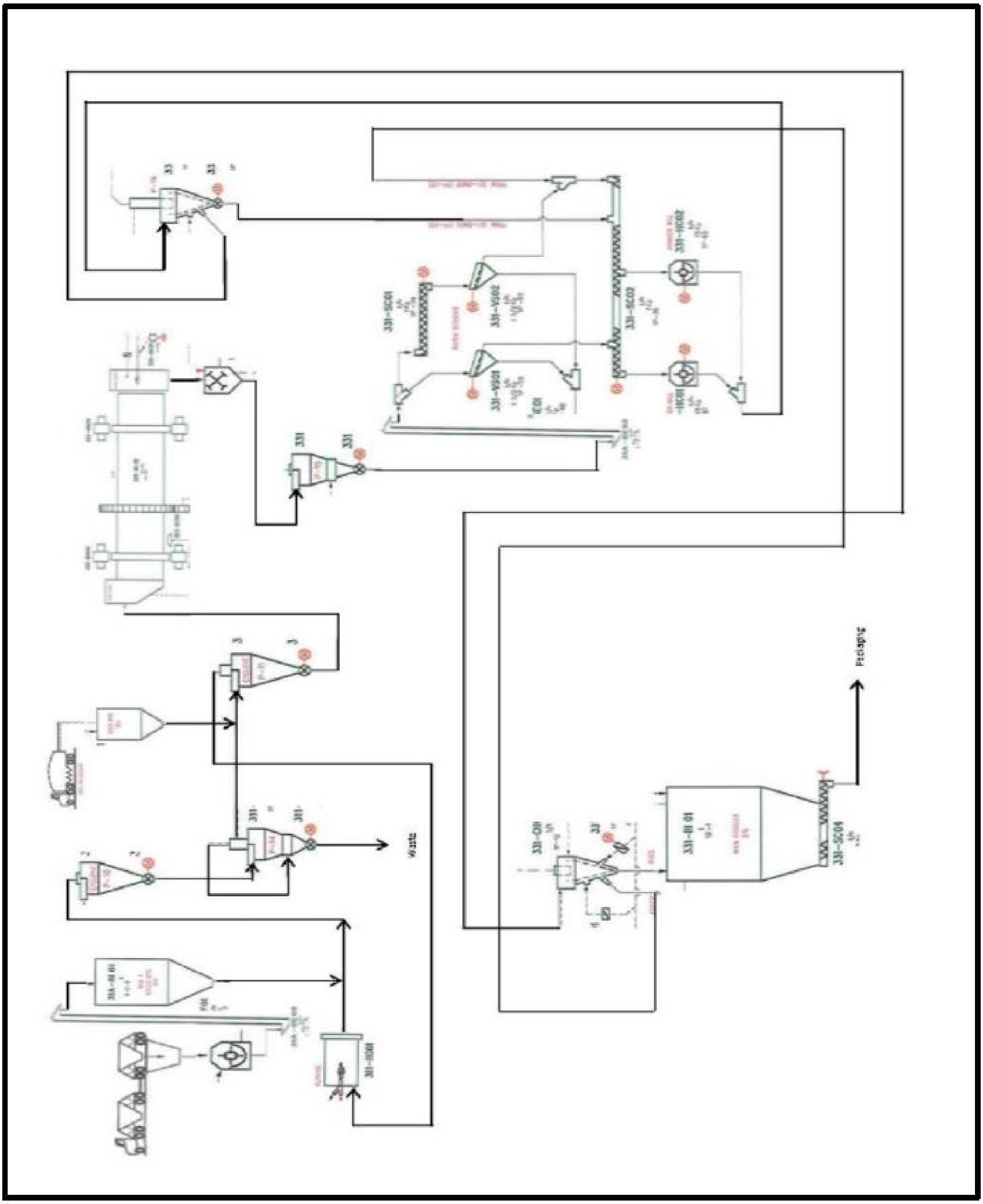

Figure 14.3 Generalized representation of a DE processing line at the plant.

14.2 Plant Manning

The plant employees 99 people. Table 14.1 shows the census of the employees by high-level job function and the division of labor between plant production, maintenance, and the packaging and shipping functions. The salaried workforce numbers five (5) and there is a quality control department which employs eight (8) people.

COLADO PLANT FUNCTION	QUANTITY
Plant Operations	18
Plant Maintenance	20
Packaging	27
Shipping	21
Quality Control	8
TOTAL Plant Operations	**94**
Salaried Staff	5
TOTAL Colado Plant	**99**

Table 14.1 Manning table for the Colado plant.

15.0 INFRASTRUCTURE

The Colado Site has been operating in this location for many years. The mine is located in a remote area with mountainous topography with few improved roads and installed infrastructure. The required infrastructure has generally been provided by the mine operator. Historically, the Colado operator has been able to meet the demand for raw ore with the existing infrastructure. The plant, about seven (7) miles northeast of the town of Lovelock is rural and remote from development. The infrastructure required to maintain a sustainable presence in this generally rural local community is in place. The overall infrastructure required for the future ramp-up of operations to nameplate[54] capacity is in place. Capital is commented on in Section 18.0.

54 Nameplate is a term for the theoretical maximum capacity for a piece of equipment. For a mine it is the theoretical maximum capacity of the lowest producing unit operation such as loading, the haul ft., etc.

15.1 Road and Truck Access

The mine and the plant are accessible by private road, or by roads maintained by the State. Road access is critical for the delivery of materials used in the mining and beneficiation of raw ore, materials blended with finished goods, and for shipment of finished goods to U.S. Silica customers. The mine has access to roadways rated for the loads to be shipped to and from the facility. Figure 14.1 shows the access to the Colado mine using CR 399 (7 Troughs Road) that connects to Interstate 80 east of the Colado Site. The plant has access to Business Highway 95 (Upper Valley Road), which provides access to Interstate 80, just east of the plant. These roads are rated for the loads to be shipped to and from the facility. Truck loading capacity is limited by the rate at which the existing equipment can load trucks. Minimal updates are necessary to the road infrastructure. Figure 14.2 shows the plant and roadway configuration.

15.2 Rail

The Union Pacific Railroad (UP) roughly follows Interstate-80 along the Humboldt River and serves the processing plant (Figure 15.1). The rail infrastructure is a critical component for the transportation of the finished goods from the plant and for the receipt of goods used in the processing of DE. The UP owns and maintains the rail outside the property owned by U. S. Silica. U. S. Silica owns, and contractors maintain, the rail infrastructure on the U. S. Silica property. The UP picks up loaded rail cars and returns the empties to the plant off of the mainline. U. S. Silica handles the in-plant switching using a Trackmobile Railcar Movers.[55] Routine inspections occur from time to time by the UP.

55 A Trackmobile is a flexible rail car moving vehicle with both steel rail wheels and rubber tires. It is capable of traveling either on rail or on a roadway and is efficient for the movement of multiple rail cars.

U.S. Silica maintains rail-car loading, storage, and handling facilities at Lovelock. Bulk product is loaded into covered hopper cars in one of three locations. Two of these locations are partially enclosed. All cars are leased by U.S. Silica. Rail loading capacity is limited by the permitted hours and by the rate at which the existing equipment can load rail cars.

15.3 Electric Power

The Colado Site is powered primarily by diesel powered equipment. Shop and office requirements for electric power is provided by diesel generators and solar power. The plant uses electric power supplied by Nevada Energy.[56] Nevada Energy has a long history of power supply in Nevada and currently serves over 2.3 million customers in Nevada. Nevada Energy is owned by Berkshire Hathaway Energy.[57] Power is delivered by an above-ground network of pole lines running across Interstate 80 from the east and into the plant substation. Distribution to the processing plant from the substation is through a combination buried power lines and overhead poles. The Colado plant has a history of reliable electric power supply.

15.4 Natural Gas

Natural gas is a critical input to the plant process as it is used as a fuel for drying the crude DE ore and for firing the kilns used in the DE beneficiation process in the plant. The gas is currently supplied by Southwest Gas through Paiute Pipeline Company.[58] Southwest Gas is a reliable supplier of natural gas. The natural gas is delivered to the plant via underground pipeline and is distributed into the plant through various underground pipelines.

56 https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/about-nvenergy/our-company/territory/NVEnergy_Service_area_map.pdf
57 https://www.nvenergy.com/about-nvenergy/our-company/history
58 Paiute Pipeline Company is owned by Southwest Gas company. Southwest Gas Company is a publicly owned utility (NYSE: SWX).

15.5 Water

Water is used primarily for dust suppression at the Colado mine. Water for the mine is supplied by a municipal water source and is trucked by tanker to the Colado Site. Water for use at the Colado plant is provided by a municipal water source and is supplemented by a well on site. Potable water is provided by the municipal source.

15.6 Waste Handling and Disposal

The waste produced by processing raw DE ore into a finished product at the plant is collected and hauled back to the Colado mine where it is deposited. This waste consists primarily of opalite,[59] basalt, sand and clay. The waste is of a nature that it can be incorporated into the reclamation plan for the Colado Site. There is adequate available waste incorporation area available at the Colado mine to incorporate the waste produced at Lovelock.

15.7 Buildings

The Colado mine building is a maintenance shelter used to service the mine equipment and small office portable. The shelter is adequate for the servicing equipment and for light maintenance.

The buildings at the Colado plant have undergone various modifications in its history and are adequate for the purposes of which they are utilized. The Colado plant employs an office building holding financial and administrative staff. Several buildings house the plant processing machinery and support (see Figure 14.2). These include the three lines of DE processing equipment, bagging, warehousing, loadout, employee facilities, and maintenance activities. There are several miscellaneous buildings on the plant site. All utilized structures appear to be well maintained.

59 An impure form of opal.

16.0 MARKET STUDIES AND CONTRACTS

U.S. Silica's Colado plant in Lovelock, NV is a DE processing operation owned and operated by EPM, an indirect subsidiary of U.S. Silica. DE, also known as Kieselguhr or Diatomite, is a sedimentary mineral with physical properties that are like soil.

16.1 General Marketing Information

The Colado Site consists of approximately 1,456 acres of surface disturbance in the Project Area. The average annual production for the last 5 years has been approximately 600,000 SCY. Mine operations include eight separate open pits with four active operating areas, utilizing open pit mining methods, ore stockpiles, waste rock repositories, access roads, a staging area, a field maintenance shop, exploratory drill holes and reclaimed areas.

The Colado Site operates year-round with ore mining activity starting in early spring and concluding sometime in the late fall when either sufficient ore has been stockpiled, or when inclement weather makes ore mining too costly or difficult. The April to November timeframe provides optimum working conditions; moreover, the dry hot weather aids the natural drying of the ore in the stockpiles. Colder winter months are used for stripping operations and reclamation projects.

The final products produced in the Colado plant are mainly marketed as filtration products (filter-aids) and filler products (fine-fillers). Food grade products sold into the filtration markets are used extensively to filter out contaminants from fruit juices, wine, beer, sugar, bio-diesel fuel, high fructose corn syrup, and water. Fine-filler products are used as additives in paints, rubber, paper, and plastics. A third final product category is aggregate products, which are used primarily as industrial absorbents, catalysts, and carriers for pesticides. The aggregate volume products are significantly smaller compared to the filtration and filler products.

16.1.1 DE Market

The total annual global DE market is about 1 M tons. The prices that are considered during the market study process are driven by supply and demand. In 2021 and continuing into 2022, the QP expects demand to outpace the U.S. Silica's ability to process and ship material to the market due to rebound coming out of the COVID-19 pandemic as well as international logistics and labor issues brought on by the pandemic. When it comes to contracts pricing, the Colado Site utilized both spot-based and contractual prices. The contractual prices have an average timeframe of 2 years.

In 2020, the average selling price ("ASP") of DE was $492.00 per ton. In 2021, the ASP rose to $566.00 per ton. DE is utilized in the food and beverage industry and the pool and recreation industry amongst others. The QP believes the projected compound annual growth rate for these industries is in the range of 3% for the food and beverage industry and 6% for the pool and recreation industry. Therefore, it is reasonable to assume that pricing will sustain and appreciate at 2% per annum thereafter for the life of mine. Consequently, in the long-term, we believe that price forecast will increase from an ASP of $577.00 per ton in 2022 to $676.00 per ton in 2030. See Table 19.1 for the projected ASP over the life of mine.

16.2 Material Contracts Required for Production

There are no material contracts required for production.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, PLANS, NEGOTIATIONS OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

WESTWARD was contracted to provide third party review of environmental plans, permits, and requirements of the Colado mine and the Colado plant. A summary of findings is included below in Table 17.1 based on current regulatory research and documents provided by U.S. Silica.

Item	Regulatory Authority	Area Covered	Status
Reclamation Permit	NDEP & BLM	Mines	Major Mod in Review
Industrial Stormwater Permit	NDEP	Processing Plant	Needed
Best Practice Plan	N/A	Mines	Complete
Class I Air Quality Operating Permit	NDEP	Processing Plant	Approved
Class II Surface Area Disturbance Permit	NDEP	Mines	Approved
Class III Landfill Waiver	NDEP	Mines & Processing Plant	Approved
Hazardous Materials Permit	NSFM	Mines	Approved
Hazardous Materials Permit	NSFM	Processing Plant	Approved
Hazardous Materials Permit	NSFM	Shop	Approved
Groundwater Use Permit	NDWR	Mines/Processing Plant	Approved
Spill Prevention Control and Containment (SPCC) Plan	EPA	Processing Plant	Complete
Stormwater Discharge Evaluation	NDEP	Processing Plant	Complete

Table 17.1 Colado Site Permit Summary.

17.1 Federal Requirements

US Silica maintains a Spill Prevention, Controls and Countermeasure (“SPCC”) Plan at the plant to address requirements of the federal Oil Pollution Prevention Regulations (40 CFR Part 112). The SPCC plan establishes oil spill preparedness, prevention, planning, response, and notification procedures per the federal regulations and addresses state-specific oil spill reporting notification and response requirements as administered by the Nevada State Emergency Response Commission (NSERC).

The Colado mine operates under the Mine Plan of Operations NVN-065329/Nevada Reclamation Permit No. 0182 for mining of DE within private and BLM land. U.S. Silica received initial approval for 968.7 acres of surface disturbance in 2001. U.S. Silica has updated the plan and permit over the course of mining as surface disturbance has increased. Most recently, U.S. Silica has received approval from the Nevada Division of Environmental Protection ("NDEP") and the Bureau of Land Management ("BLM") in fall of 2021 for minor amendments to their existing permit, including the addition of 55 acres of disturbance in the new South Knob mine area. The surety bond amount for reclamation activities in favor of BLM was increased to $17,664,227.00 per BLM requirements. U.S. Silica has since conducted an audit of as-built disturbances, resulting in the submittal of a major modification application to NDEP and BLM for review to bring their plan into full compliance with the total existing and proposed disturbed area of 1,795 acres.

The major modification application package addresses unpermitted disturbance, reclamation of erosion areas, and proposed expansions for continued DE mining operations. Compliance with the permit/plan includes submitting an annual report to the BLM and NDEP BMRR, a division of NDEP, on/before April 15th documenting surface disturbance locations, types of disturbance, and any completed concurrent reclamation that occurred in the previous calendar year.

Waste materials are placed as pit backfill and graded per the slope angle requirements specified in the plan. Basaltic material is stockpiled throughout the active operational areas to be used as the final reclamation cover for mine area features, prior to placement of salvaged growth media and hydroseeding, to encourage vegetative cover growth. The reclamation cost estimate (used to calculate reclamation surety bond) associated with the major modification package is being developed and will be submitted to the appropriate agencies for review in 2022. It is expected that approval of the major modification application will be granted in 2022.

U.S. Silica utilizes a Best Practice Plan for to prevent and respond to potential spills of fuels, lubricants, and used oil that are kept at the mine equipment service shop, Horseshoe Basin, and Section 7 Mine. As stated in the plan, there are no permanent streams or ponds within the vicinity of these operations, and mining to date has not encountered any significant groundwater. Therefore, U.S. Silica management believes that there is no reasonable likelihood of a petroleum product spill reaching waters of the state from the Lovelock mines.

17.2 State Requirements

U.S. Silica holds an air permit for the Colado Site authorized by NDEP including a Class I Air Quality Operating Permit #AP1499-3768 and a NDEP Class II Surface Area Disturbance Permit #AP1499-0862.04. The Class I Air Permit requires annual reports to the director including, but not limited to, throughput, production, and emissions. The Surface Area Disturbance Permit requires annual reports to the director including the status of the areas where surface disturbance is active/proposed.

NDEP has authorized a Class III Landfill Waiver (#SWW314) for the Colado Plant/Mill and (#SWW1713) to the Colado Mine allowing U.S. Silica (in EPM's name) to dispose of wastes in on-site landfills according to their Operations Plan. Hazardous materials and liquids are not allowed to be disposed of at either site.

U.S. Silica maintains the following Hazardous Materials Permits in EPM's name through the Nevada State Fire Marshal:

- Hazardous Materials Permit (#95886) for hazardous materials/fuels located at the mine
- Hazardous Materials Permit (#95888) for hazardous materials/fuels located at the mine shop
- Hazardous Materials Permit (#101676) for hazardous materials/fuels located at the plant

Permits #95886 and #95888 expired in February 2022 and will require renewal from the Nevada State Fire Marshal. WESTWARD does not see any reason that these permits could not be obtained for this facility in a reasonable amount of time.

U.S. Silica is authorized by a Nevada Division of Water Resources for annual use of up to 1,052.44 acre-feet of groundwater (Permit 87089; Permit 18091, Certificate 5238; Permit 24074, Certificate 7558). Monthly reporting and meter installation requirements are specified in the respective permit approvals. This permit is associated with the processing plant which is not included in this report. Water is trucked into the mine sites for use as dust suppression from municipal sources in Lovelock.

Per a November 2004 stormwater drainage evaluation sealed by a registered professional engineer, the Colado plant was exempt from requirement of a Stormwater Discharge permit because the plant's stormwater runoff does not discharge into waters of the state. The report states, "A stormwater permit is not required for a site that has drainage capacity for a 2 year, 24-hour storm." However, this pertained only to the construction phase of the project.

Although this exemption may have been compliant with 40 CFR 122.26 and Nevada's Construction Stormwater Multi Sector General Permit (NVR10000) requirements, the plant is now a permanent fixture and construction is complete therefor this permit no longer applies. WESTWARD recommends US Silica obtain coverage under the Nevada Industrial Stormwater Multisector General Permit (NVR050000) and prepare a Stormwater Pollution Prevention Plan to remain in compliance. WESTWARD does not see any reason that this permit could not be obtained for this facility in a reasonable amount of time.

17.3 Other Requirements

U.S. Silica contracted Hydro Resources Aquifer Imaging Group in 2012 to conduct a groundwater-availability study to provide background information needed to optimize the design of a geophysical aquifer-imaging survey with the Aqua Gem system at the Colado Site. Hydro conducted a two-township water well search in the mine area which did not reveal any water well records in the State of Nevada Division of Water Resources database. Hydro proposed several geophysical testing transects across the site around known fault lines in order to locate an optimal location for a proposed groundwater well.

The reclamation permit is issued by NDEP and BLM. Requirements for reclamation are detailed in permit reviewed by the QP. Costs associated with reclamation activities are provided in Section 19.0 Economic Analysis.

U.S. Silica does not maintain any agreements or procurement contracts with local individuals or groups for the Colado mine or Colado plant. U.S. Silica has not engaged in any agreements pertaining to hiring or local procurement.

The Colado mine and Colado plant are outside the jurisdiction of the nearest city and no local/municipal regulations apply to either site.

18.0 CAPITAL AND OPERATING COSTS

Capital and operating costs discussed in this section were developed utilizing current and historic cost data from continuous and ongoing operation of the facility, first principles, vendor and contractor quotations, and similar operation comparisons.

18.1 Operating Cost

Total operating costs incurred at the Colado Site from 2020 through 2021 are provided in Table 18.1. Costs include but are not limited to mining equipment, plant/shipping, wages and premiums, maintenance materials, and power.

The average cost of sales was $329.00 per ton in 2020 and $403.00 per ton in 2021. There were 134 total salaried and hourly employees in 2021.

Capital Costs	
2020	$ 1,731,000
2021	$ 4,670,000
Operating Costs	
2020	$37,799,000
2021	$48,367,000

Table 18.1 Summary of Capital and Operating Costs: 2020-2021.

18.2 Capital Costs

The average annual capital expenditure since 2020 at the Colado Site is $3,201,000, with $1,731,000 in 2020 and $4,670,000 in 2021 (Table 18.1). The higher than average capital spend in 2021 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

A summary of foreseen capital expenditures through 2026 is provided in Table 18.2. As shown in Table 18.2, total estimated capital expenditure through 2026 is $16,070,000 and primarily includes routine maintenance and continuous improvement projects to drive cost and capacity efficiencies.

Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy. There are risks regarding the current capital costs estimates through 2026, including escalating costs of raw materials and energy, equipment availability and timing due to either production delays or supply chain gaps.

Projected Capital Expenditures	
2022	$ 2,938,000
2023	$ 3,424,000
2024	$ 2,918,000
2025	$ 3,401,000
2026	$ 3,389,000

Table 18.2 Summary of Projected Capital Site Expenditures: 2022-2026.

18.3 Assumptions

The capital projects are assumed to be constructed in a conventional Engineering, Procurement and Construction Management ("EPCM") format. U.S. Silica routinely retains a qualified contractor to design projects and act as its agent to bid and procure materials and equipment, bid and award construction contracts, and manage the construction of the facilities.

18.4 Accuracy

The accuracy of this estimate for those items identified in the scope-of work is estimated to be within the range of plus 15% to minus 15%; i.e., the cost could be 15% higher than the estimate or it could be 15% lower. Accuracy is an issue separate from contingency, the latter accounts for undeveloped scope and insufficient data (e.g., geotechnical data).

19.0 ECONOMIC ANALYSIS

19.1 Operating Costs

An economic model was created for the Colado Site to provide validation of the economic viability of the estimated reserve for the life of mine. The following are the key assumptions for the base case scenario:

- Proven and Probable Tons of 4,461,000 as of December 31, 2021
- Revenue Growth of 2%

- Tons Growth of 2%
- Costs of Goods Sold Growth of 2%
- Selling, General, and Administrative Expenses Growth of 2%
- Capital Expenditures Growth of 2%
- Inflation Rate of 2%
- Tax Rate of 26%
- Discount Rate of 8%
- Net Working Capital Reinvestment Rate of 25%
- Site Yield of 68%

The QP used budgeted 2021 costs as the benchmark for which to model operating costs throughout the life of mine and applied future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

The QP based the ASP for 2022 on the ASP trends in 2021. The QP then applied a 2% per annum increase from the 2021 ASP through the life of mine. Based on ASP trends of 2021, the QP believes that 2% per annum growth rate is a reasonable method for a base case scenario. For additional information on the ASP, see "Section 16.1.1 - DE Market."

19.2 Capital Costs

As an ongoing project that is in production and profitable, the QP established a going forward capital expenditure based on the running average capital costs at the mine from 2020 and 2021. The QP then applied a 2% per annum increase to the capital costs through the life of mine. The QP included optional capital expenditures that will be deployed as required to increase or maintain the capacity of the plant.

19.3 Economic Analysis

The financial evaluation of the project comprises the determination of the net present value ("NPV") at a discount rate of 8%, the internal rate of return ("IRR") and payback period (time in years to recapture the initial capital investment). Annual cash flow projections are estimated over the life of the mine based on the estimates of capital expenditures and production cost and sales revenue.

Review of the base case model indicates that the project has an IRR of 46%, a payback period of 0.10 years, and an NPV of $104,145,000. The Economic Feasibility Model (Table 19.1.1) was modeled on the basis of historical operational costs and future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

19.4 Sensitivity Analysis

The QP assessed sensitivity of key variables, including reduction in expected selling price, increased capital expenses and associated depreciation, and operating costs. To assess these variables, the QP created moderate and upside models where the following variables were increased by the percentages listed in Table 19.2:

- Average Selling Price Growth
- Tons Growth
- Costs of Goods Sold Growth
- Selling, General, and Administrative Expenses Growth
- Capital Expenditures Growth
- Inflation Rate
- Inflation Adjusted Discount Rate
- Site Yield

The NPV of the project is null when the 2022 average selling price is reduced to approximately $433.63/ ton.

In Thousand (000)	Book Value	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reserve Balance Tons (000)		4,026	4,461	4,295	4,126	3,953	3,777	3,597	3,414	3,227	3,036	2,842
Mined Tons (000)		169	166	169	173	176	180	183	187	191	194	198
Sold Tons (000)		**115**	**120**	*115*	*117*	*120*	*122*	*125*	*127*	*130*	*132*	*135*
R/S Ratio		2.9%	2.7%	3.9%	4.2%	4.5%	4.8%	5.1%	5.5%	5.9%	6.4%	7.0%
ASP (Selling Price)		***$ 492***	***$ 566***	*$ 577*	*$ 589*	*$ 601*	*$ 613*	*$ 625*	*$ 637*	*$ 650*	*$ 663*	*$ 676*
ACS (Cost of Sale)		***$ 329***	***$ 403***	*$ 411*	*$ 419*	*$ 427*	*$ 436*	*$ 445*	*$ 454*	*$ 463*	*$ 472*	*$ 481*
Rev		**$56,544**	**$67,948**	$66,461	$69,146	$71,940	$74,846	$77,870	$81,016	$84,289	$87,694	$91,237
Cost of Sale		**$37,799**	**$48,367**	$47,309	$49,221	$51,209	$53,278	$55,430	$57,670	$60,000	$62,424	$64,945
CM		**$18,745**	**$19,580**	**$19,152**	**$19,926**	**$20,731**	**$21,568**	**$22,439**	**$23,346**	**$24,289**	**$25,271**	**$26,291**
Change in CM		$ —	$ 835	$ (428)	$ 774	$ 805	$ 838	$ 871	$ 907	$ 943	$ 981	$ 1,021
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$18,745**	**$19,580**	**$19,152**	**$19,926**	**$20,731**	**$21,568**	**$22,439**	**$23,346**	**$24,289**	**$25,271**	**$26,291**
D&A		**$ 7,058**	**$ 7,439**	$ 7,248	$ 7,343	$ 7,296	$ 7,320	$ 7,308	$ 7,314	$ 7,311	$ 7,312	$ 7,312
EBIT		**$11,687**	**$12,142**	**$11,904**	**$12,582**	**$13,435**	**$14,248**	**$15,132**	**$16,032**	**$16,978**	**$17,958**	**$18,980**
Taxes		$ 3,039	$ 3,157	$ 3,095	$ 3,271	$ 3,493	$ 3,705	$ 3,934	$ 4,168	$ 4,414	$ 4,669	$ 4,935
Operating Income		**$ 8,648**	**$ 8,985**	**$ 8,809**	**$ 9,311**	**$ 9,942**	**$10,544**	**$11,197**	**$11,864**	**$12,564**	**$13,289**	**$14,045**
Plant Capex		**$ (1,731)**	**$ (4,670)**	$ (2,938)	$ (3,424)	$ (3,244)	$ (3,401)	$ (3,389)	$ (3,463)	$ (3,494)	$ (3,548)	$ (3,592)
Total Capex		**$ (1,731)**	**$ (4,670)**	**$ (2,938)**	**$ (3,424)**	**$ (2,918)**	**$ (3,401)**	**$ (3,389)**	**$ (3,463)**	**$ (3,494)**	**$ (3,548)**	**$ (3,592)**
Change in NWC		$ —	$ (209)	$ —	$ (193)	$ (201)	$ (209)	$ (218)	$ (227)	$ (236)	$ (245)	$ (255)
Net Income		$ 6,918	$ 4,106	$ 5,871	$ 5,694	$ 6,823	$ 6,934	$ 7,591	$ 8,174	$ 8,834	$ 9,496	$10,198
FCF	**$(29,000)**	**$13,976**	**$11,544**	**$13,119**	**$13,037**	**$14,119**	**$14,253**	**$14,898**	**$15,488**	**$16,145**	**$16,808**	**$17,510**

In Thousand (000)	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Reserve Balance Tons (000)	2,643	2,441	2,235	2,024	1,809	1,590	1,367	1,139	907	669	428	181
Mined Tons (000)	202	206	211	215	219	223	228	232	237	242	247	181
Sold Tons (000)	*138*	*140*	*143*	*146*	*149*	*152*	*155*	*158*	*160*	*160*	*160*	*123*
R/S Ratio	7.7%	8.5%	9.4%	10.6%	12.1%	14.0%	16.7%	20.4%	26.2%	36.1%	57.7%	100.0%
ASP (Selling Price)	*$ 690*	*$ 704*	*$ 718*	*$ 732*	*$ 747*	*$ 762*	*$ 777*	*$ 792*	*$ 808*	*$ 824*	*$ 841*	*$ 858*
ACS (Cost of Sale)	*$ 491*	*$ 501*	*$ 511*	*$ 521*	*$ 532*	*$ 542*	*$ 553*	*$ 564*	*$ 575*	*$ 587*	*$ 599*	*$ 611*
Rev	$94,923	$98,758	$102,748	$106,899	$111,217	$115,710	$120,385	$125,249	$129,322	$131,909	$134,547	$105,552
Cost of Sale	$67,569	$70,299	$ 73,139	$ 76,094	$ 79,168	$ 82,367	$ 85,694	$ 89,156	$ 92,056	$ 93,897	$ 95,775	$ 75,136
CM	**$27,354**	**$28,459**	**$ 29,608**	**$ 30,805**	**$ 32,049**	**$ 33,344**	**$ 34,691**	**$ 36,093**	**$ 37,266**	**$ 38,012**	**$ 38,772**	**$ 30,417**
Change in CM	$ 1,062	$ 1,105	$ 1,150	$ 1,196	$ 1,245	$ 1,295	$ 1,347	$ 1,402	$ 1,174	$ 745	$ 760	$ (8,355)
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$27,354**	**$28,459**	**$ 29,608**	**$ 30,805**	**$ 32,049**	**$ 33,344**	**$ 34,691**	**$ 36,093**	**$ 37,266**	**$ 38,012**	**$ 38,772**	**$ 30,417**
D&A	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312
EBIT	**$20,042**	**$21,147**	**$ 22,297**	**$ 23,493**	**$ 24,737**	**$ 26,032**	**$ 27,379**	**$ 28,781**	**$ 29,955**	**$ 30,700**	**$ 31,460**	**$ 23,105**
Taxes	$ 5,211	$ 5,498	$ 5,797	$ 6,108	$ 6,432	$ 6,768	$ 7,119	$ 7,483	$ 7,788	$ 7,982	$ 8,180	$ 6,007
Operating Income	**$14,831**	**$15,649**	**$ 16,500**	**$ 17,385**	**$ 18,306**	**$ 19,264**	**$ 20,261**	**$ 21,298**	**$ 22,166**	**$ 22,718**	**$ 23,281**	**$ 17,098**
Plant Capex	$ (3,641)	$ (3,689)	$ (3,738)	$ (3,788)	$ (3,838)	$ (3,889)	$ (3,941)	$ (3,994)	$ (4,047)	$ (4,101)	$ (4,155)	$ (4,210)
Total Capex	**$ (3,641)**	**$ (3,689)**	**$ (3,738)**	**$ (3,788)**	**$ (3,838)**	**$ (3,889)**	**$ (3,941)**	**$ (3,994)**	**$ (4,047)**	**$ (4,101)**	**$ (4,155)**	**$ (4,210)**
Change in NWC	$ (266)	$ (276)	$ (287)	$ (299)	$ (311)	$ (324)	$ (337)	$ (350)	$ (293)	$ (186)	$ (190)	$ —
Net Income	$10,924	$11,684	$ 12,474	$ 13,298	$ 14,156	$ 15,051	$ 15,983	$ 16,954	$ 17,826	$ 18,431	$ 18,935	$ 12,887
FCF	**$18,236**	**$18,995**	**$ 19,785**	**$ 20,610**	**$ 21,468**	**$ 22,362**	**$ 23,294**	**$ 24,266**	**$ 25,138**	**$ 25,743**	**$ 26,247**	**$ 20,199**

Table 19.1.1 Economic Feasibility Base Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. For further information regarding royalties and government levies applicable to Colado, please refer to Section 3.2 above.
(2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029
Reserve Balance Tons (000)		4,026	4,461	4,295	4,122	3,943	3,756	3,562	3,360	3,150	2,931
Mined Tons (000)		169	166	173	180	187	194	202	210	218	227
Sold Tons (000)		**115**	**120**	*123*	*127*	*133*	*138*	*143*	*149*	*155*	*160*
R/S Ratio		2.9%	2.7%	4.0%	4.4%	4.7%	5.2%	5.7%	6.3%	6.9%	7.7%
ASP (Selling Price)		***$ 492***	***$ 566***	*$ 589*	*$ 612*	*$ 637*	*$ 662*	*$ 689*	*$ 716*	*$ 745*	*$ 774*
ACS (Cost of Sale)		***$ 329***	***$ 403***	*$ 415*	*$ 427*	*$ 440*	*$ 453*	*$ 467*	*$ 481*	*$ 495*	*$ 510*
Rev		**$ 56,544**	**$ 67,948**	$ 72,141	$ 78,028	$ 84,395	$ 91,282	$ 98,730	$ 106,787	$ 115,500	$ 123,919
Cost of Sale		**$ 37,799**	**$ 48,367**	$ 50,859	$ 54,480	$ 58,359	$ 62,514	$ 66,965	$ 71,733	$ 76,840	$ 81,648
CM		**$ 18,745**	**$ 19,580**	**$ 21,282**	**$ 23,548**	**$ 26,036**	**$ 28,768**	**$ 31,765**	**$ 35,054**	**$ 38,660**	**$ 42,271**
Change in CM		$ —	$ 335	$ 1,702	$ 2,266	$ 2,488	$ 2,731	$ 2,998	$ 3,288	$ 3,606	$ 3,610
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$ 18,745**	**$ 19,580**	**$ 21,282**	**$ 23,548**	**$ 26,036**	**$ 28,768**	**$ 31,765**	**$ 35,054**	**$ 38,660**	**$ 42,271**
D&A		**$ 7,058**	**$ 7,439**	$ 7,248	$ 7,343	$ 7,296	$ 7,320	$ 7,308	$ 7,314	$ 7,311	$ 7,312
EBIT		**$ 11,687**	**$ 12,142**	**$ 14,034**	**$ 16,205**	**$ 18,740**	**$ 21,448**	**$ 24,457**	**$ 27,740**	**$ 31,349**	**$ 34,958**
Taxes		$ 3,039	$ 3,157	$ 3,649	$ 4,213	$ 4,872	$ 5,576	$ 6,359	$ 7,212	$ 8,151	$ 9,089
Operating Income		**$ 8,648**	**$ 8,935**	**$ 10,385**	**$ 11,991**	**$ 13,868**	**$ 15,871**	**$ 18,098**	**$ 20,528**	**$ 23,199**	**$ 25,869**
Plant Capex		**$ (1,731)**	**$ (4,670)**	$ (3,034)	$ (3,588)	$ (3,477)	$ (3,709)	$ (3,772)	$ (3,928)	$ (4,043)	$ (4,184)
Total Capex		**$ (1,731)**	**$ (4,670)**	**$ (3,034)**	**$ (3,588)**	**$ (3,150)**	**$ (3,709)**	**$ (3,772)**	**$ (3,928)**	**$ (4,043)**	**$ (4,184)**
Change in NWC		$ —	$ (209)	$ (426)	$ (566)	$ (622)	$ (683)	$ (749)	$ (822)	$ (902)	$ (903)
Net Income		$ 6,918	$ 4,106	$ 6,926	$ 7,837	$ 10,096	$ 11,480	$ 13,577	$ 15,778	$ 18,254	$ 20,782
FCF	**$ (29,000)**	**$ 13,976**	**$ 11,544**	**$ 14,174**	**$ 15,180**	**$ 17,392**	**$ 18,799**	**$ 20,884**	**$ 23,091**	**$ 25,565**	**$ 28,094**

In Thousand (000)	2030	2031	2032	2033	2034	2035	2036	2037	2033	2039
Reserve Balance Tons (000)	2,704	2,468	2,222	1,967	1,701	1,425	1,137	838	527	204
Mined Tons (000)	236	246	256	266	276	287	299	311	323	204
Sold Tons (000)	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*145*
R/S Ratio	8.7%	10.0%	11.5%	13.5%	16.2%	20.2%	26.3%	37.1%	61.3%	100.0%
ASP (Selling Price)	*$ 805*	*$ 838*	*$ 871*	*$ 906*	*$ 942*	*$ 980*	*$ 1,019*	*$ 1,060*	*$ 1,102*	*$ 1,146*
ACS (Cost of Sale)	*$ 526*	*$ 541*	*$ 558*	*$ 574*	*$ 592*	*$ 609*	*$ 628*	*$ 646*	*$ 666*	*$ 686*
Rev	$ 128,876	$ 134,031	$ 139,392	$ 144,967	$ 150,766	$ 156,797	$ 163,069	$ 169,591	$ 176,375	$ 165,937
Cost of Sale	$ 84,098	$ 86,621	$ 89,219	$ 91,896	$ 94,653	$ 97,492	$ 100,417	$ 103,429	$ 106,532	$ 99,264
CM	**$ 44,778**	**$ 47,410**	**$ 50,173**	**$ 53,072**	**$ 56,114**	**$ 59,305**	**$ 62,652**	**$ 66,162**	**$ 69,843**	**$ 66,673**
Change in CM	$ 2,507	$ 2,632	$ 2,763	$ 2,899	$ 3,042	$ 3,191	$ 3,347	$ 3,510	$ 3,681	$ (3,170)
SG&A	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA	**$ 44,778**	**$ 47,410**	**$ 50,173**	**$ 53,072**	**$ 56,114**	**$ 59,305**	**$ 62,652**	**$ 66,162**	**$ 69,843**	**$ 66,673**
D&A	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312
EBIT	**$ 37,466**	**$ 40,098**	**$ 42,861**	**$ 45,760**	**$ 48,802**	**$ 51,993**	**$ 55,340**	**$ 58,850**	**$ 62,531**	**$ 59,361**
Taxes	$ 9,741	$ 10,426	$ 11,144	$ 11,898	$ 12,688	$ 13,518	$ 14,388	$ 15,301	$ 16,258	$ 15,434
Operating Income	**$ 27,725**	**$ 29,673**	**$ 31,717**	**$ 33,862**	**$ 36,113**	**$ 38,475**	**$ 40,952**	**$ 43,549**	**$ 46,273**	**$ 43,927**
Plant Capex	$ (4,319)	$ (4,464)	$ (4,611)	$ (4,765)	$ (4,923)	$ (5,086)	$ (5,254)	$ (5,429)	$ (5,609)	$ (5,795)
Total Capex	**$ (4,319)**	**$ (4,464)**	**$ (4,611)**	**$ (4,765)**	**$ (4,923)**	**$ (5,086)**	**$ (5,254)**	**$ (5,429)**	**$ (5,609)**	**$ (5,795)**
Change in NWC	$ (627)	$ (658)	$ (691)	$ (725)	$ (760)	$ (798)	$ (837)	$ (878)	$ (920)	$ —
Net Income	$ 22,779	$ 24,550	$ 26,415	$ 23,373	$ 30,430	$ 32,591	$ 34,860	$ 37,243	$ 39,744	$ 38,133
FCF	**$ 30,091**	**$ 31,862**	**$ 33,727**	**$ 35,635**	**$ 37,742**	**$ 39,903**	**$ 42,172**	**$ 44,555**	**$ 47,056**	**$ 45,445**

Table 19.1.2 Economic Feasibility Moderate Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. For further information regarding royalties and government levies applicable to Colado, please refer to Section 3.2 above.

(2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	Book Value	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Reserve Balance Tons (000)		4,026	4,461	4,295	4,119	3,933	3,735	3,525	3,303	3,068	2,818	2,553	2,273	1,976	1,661	1,327	972	597	199
Mined Tons (000)		169	166	176	187	198	210	222	235	250	265	280	297	315	334	354	375	398	199
Sold Tons (000)		**115**	**120**	*130*	*138*	*146*	*155*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*160*	*148*
R/S Ratio		2.9%	2.7%	4.1%	4.5%	5.0%	5.6%	6.3%	7.1%	8.1%	9.4%	11.0%	13.1%	15.9%	20.1%	26.7%	38.6%	66.6%	100.0%
ASP (Selling Price)		***$ 492***	***$ 566***	*$ 600*	*$ 636*	*$ 674*	*$ 714*	*$ 757*	*$ 803*	*$ 851*	*$ 902*	*$ 956*	*$ 1,013*	*$ 1,074*	*$ 1,139*	*$ 1,207*	*$ 1,279*	*$ 1,335*	*$ 1,438*
ACS (Cost of Sale)		***$ 329***	***$ 403***	*$ 423*	*$ 444*	*$ 466*	*$ 490*	*$ 514*	*$ 540*	*$ 567*	*$ 595*	*$ 625*	*$ 656*	*$ 689*	*$ 723*	*$ 760*	*$ 798*	*$ 837*	*$ 879*
Rev		**$ 56,544**	**$ 67,948**	$ 78,109	$ 87,763	$ 98,611	$110,799	$121,171	$128,442	$136,148	$144,317	$152,976	$162,155	$171,884	$182,197	$193,129	$204,716	$216,999	$212,087
Cost of Sale		**$ 37,799**	**$ 48,367**	$ 55,076	$ 61,300	$ 68,227	$ 75,936	$ 82,261	$ 86,374	$ 90,693	$ 95,228	$ 99,989	$104,988	$110,238	$115,750	$121,537	$127,614	$133,995	$129,726
CM		**$ 18,745**	**$ 19,580**	**$ 23,033**	**$ 26,464**	**$ 30,384**	**$ 34,863**	**$ 38,910**	**$ 42,067**	**$ 45,455**	**$ 49,089**	**$ 52,987**	**$ 57,166**	**$ 61,646**	**$ 66,147**	**$ 71,591**	**$ 77,102**	**$ 83,004**	**$ 82,361**
Change in CM		$ —	$ 835	$ 3,453	$ 3,431	$ 3,921	$ 4,479	$ 4,047	$ 3,157	$ 3,300	$ 3,634	$ 3,898	$ 4,179	$ 4,480	$ 4,801	$ 5,144	$ 5,511	$ 5,902	$ (643)
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$ 18,745**	**$ 19,580**	**$ 23,033**	**$ 26,464**	**$ 30,384**	**$ 34,863**	**$ 38,910**	**$ 42,067**	**$ 45,455**	**$ 49,089**	**$ 52,987**	**$ 57,166**	**$ 61,646**	**$ 66,447**	**$ 71,591**	**$ 77,102**	**$ 83,004**	**$ 82,361**
D&A		**$ 7,058**	**$ 7,439**	$ 7,248	$ 7,343	$ 7,296	$ 7,320	$ 7,308	$ 7,314	$ 7,311	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312	$ 7,312
EBIT		**$ 11,687**	**$ 12,142**	**$ 15,785**	**$ 19,120**	**$ 23,088**	**$ 27,543**	**$ 31,602**	**$ 34,754**	**$ 38,144**	**$ 41,777**	**$ 45,675**	**$ 49,854**	**$ 54,334**	**$ 59,135**	**$ 64,230**	**$ 69,790**	**$ 75,693**	**$ 75,049**
Taxes		$ 3,039	$ 3,157	$ 4,104	$ 4,971	$ 6,003	$ 7,161	$ 3,217	$ 9,036	$ 9,918	$ 10,862	$ 11,876	$ 12,962	$ 14,127	$ 15,375	$ 16,713	$ 18,146	$ 19,680	$ 19,513
Operating Income		**$ 8,648**	**$ 8,985**	**$ 11,681**	**$ 14,149**	**$ 17,085**	**$ 20,382**	**$ 23,386**	**$ 25,718**	**$ 28,227**	**$ 30,915**	**$ 33,800**	**$ 36,892**	**$ 40,207**	**$ 43,760**	**$ 47,567**	**$ 51,645**	**$ 56,013**	**$ 55,536**
Plant Capex		**$ (1,731)**	**$ (4,670)**	$ (3,194)	$ (3,869)	$ (3,885)	$ (4,264)	$ (4,482)	$ (4,810)	$ (5,111)	$ (5,457)	$ (5,812)	$ (6,198)	$ (6,605)	$ (7,042)	$ (7,506)	$ (8,001)	$ (8,529)	$ (9,092)
Total Capex		**$ (1,731)**	**$ (4,670)**	**$ (3,194)**	**$ (3,869)**	**$ (3,558)**	**$ (4,264)**	**$ (4,482)**	**$ (4,810)**	**$ (5,111)**	**$ (5,457)**	**$ (5,812)**	**$ (6,198)**	**$ (6,605)**	**$ (7,042)**	**$ (7,506)**	**$ (8,001)**	**$ (8,529)**	**$ (9,092)**
Change in NWC		$ —	$ (209)	$ (863)	$ (858)	$ (900)	$ (1,120)	$ (1,012)	$ (789)	$ (847)	$ (909)	$ (974)	$ (1,045)	$ (1,120)	$ (1,200)	$ (1,206)	$ (1,378)	$ (1,476)	$ —
Net Income		$ 6,918	$ 4,106	$ 7,624	$ 9,422	$ 12,547	$ 14,998	$ 17,892	$ 20,118	$ 22,269	$ 24,550	$ 27,013	$ 29,649	$ 32,482	$ 35,518	$ 58,775	$ 42,266	$ 46,008	$ 46,445
FCF	**$ (29,000)**	**$ 13,976**	**$ 11,544**	**$ 14,872**	**$ 16,766**	**$ 19,843**	**$ 22,318**	**$ 25,200**	**$ 27,432**	**$ 29,580**	**$ 31,862**	**$ 34,325**	**$ 36,961**	**$ 39,794**	**$ 42,830**	**$ 46,087**	**$ 49,578**	**$53,320**	**$ 53,757**

Table 19.1.3 Economic Feasibility Upside Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. For further information regarding royalties and government levies applicable to Colado, please refer to Section 3.2 above.

(2) The Book Value in the Economic Feasibility Model is as of December 2020.

Drivers	Base	5% Moderate	10% Upside
	Case		
Average Selling Price Growth	2%	4%	6%
Tons Growth	2%	4%	6%
Costs of Goods Sold Growth	2%	3%	5%
Selling, General, and Administrative Expenses Growth	2%	5%	10%
Capital Expenditures Growth	2%	5%	10%
Inflation Rate	2%	3%	4%
Inflation Adjusted Discount Rate	10%	11%	12%
Site Yield	68%	71%	74%

Case	Payback	IRR	NPV
Base	0.10 Years	46%	$104,145,000
Moderate	0.10 Years	51%	$135,821,000
Upside	0.10 Years	54%	$132,494,000

Table 19.2 Sensitivity Analysis.

20.0 ADJACENT PROPERTIES

Adjacent properties to the Colado Site are undeveloped. There is no other known DE mine operation in Pershing County at the time of this report.

21.0 OTHER RELEVANT DATA AND INFORMATION

There is no additional data or information to include in this section.

22.0 INTERPRETATIONS AND CONCLUSIONS

22.1 Comments on Exploration

It is the opinion of the QP that the amount of exploration and methodology performed at the Colado Site is acceptable for the purposes of this report.

22.2 Comments on Mineral Processing and Metallurgical Testing

Based on review of the lab procedures provided by U.S. Silica, the overall relative homogenous mineralogy of the deposit, it is the QP's opinion that the procedures and laboratory testing reviewed are acceptable for the purposes of this report.

22.3 Comments on Mineral Resource Estimates

The Recoverable Ore Estimate provided in this report only includes tonnages for material pits as designated by U.S. Silica. The actual recoverable ore at the Colado Site is more than what is reported herein. WESTWARD was able to confirm the data and process methods used by U.S. Silica to calculate BCY volumes. It is the QP's opinion that the only potential risk factor identified that could possibly alter the mineable ore estimates provided herein is if the reserve estimating methodology is changed to report all reserves as wet, in-situ tons or as dry, recoverable ore. It is also the QP's opinion that currently, there are no foreseeable factors likely to influence or preclude the economic extraction of DE at the Colado Site.

22.4 Comments on Mineral Reserve Estimates

The Recoverable Ore Estimate provided in this report only includes tonnages for material pits as designated by U.S. Silica. The actual recoverable ore at the Colado Site is more than what is reported herein. WESTWARD was able to confirm the data and process methods used by U.S. Silica to calculate BCY volumes. It is the QP's opinion that the only potential factor identified that could possibly alter the mineable ore estimates provided herein is if the reserve estimating methodology is changed to report all reserves as wet, in-situ tons or as dry, recoverable ore. It is also the QP's opinion that currently, there are no foreseeable risk factors that would materially affect the in-situ reserves reported for the Colado Site.

22.5 Comments on Mining Methods

In the opinion of the QP, the current mine planning, mining methods, manpower, mine equipment, and maintenance and repair practices dedicated to supplying the processing plant with DE will allow U.S. SILICA to maintain the projected levels of annual production and product quality to support the life-of-mine plan represented by the financial analysis in this report.

The QP believes U.S. Silica has plans in place to provide sustainable operations in the pit relative to pit stability, waste handling and erosion control. These plans are reflected in U.S. Silica’s current mine design and operational practices. The QP recommends a routine review process that addresses this effectiveness of the operational practices.

22.6 Comments on Infrastructure

In the opinion of the QP, the existing infrastructure is adequate for the projected production of finished goods through the life of mine. The current and planned maintenance-capital investment in infrastructure is adequate to maintain the projected levels of finished goods production and is represented by the financial analysis in this report.

22.7 Comments on Permitting

The QP recommends US Silica obtain coverage under the Nevada Industrial Stormwater Multisector General Permit (NVR050000) and prepare a Stormwater Pollution Prevention Plan to remain in compliance. Based on review of previous permit documents, history of the site, the mine plan, and the regulatory requirements it is the QP’s opinion that it is highly likely U.S. Silica would be able to obtain authorizations to develop the reserves as classified herein.

23.0 RECOMMENDATIONS

The primary recommendation of this report is to design and implement a third-party sampling and testing program to provide outside quality control for U.S. Silica's internal testing program. The program should be written with detailed instructions on proper collection methods; sample containers, preservation, labeling, security, and transport, and testing. Anticipated cost for this program is estimated to be up to $7,000 - $10,000 annually depending on how many tests are conducted and what testing parameters are run.

The QP also recommends that US Silica obtain coverage under the Nevada Industrial Stormwater Multisector General Permit (NVR050000) and prepare a SWPPP to remain in compliance.

24.0 REFERENCES

References are in each section as footnotes.

25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This Technical Report has been prepared by the QPs for U.S. Silica. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to the QPs at the time of preparation of this Technical Report.
- Assumptions, conditions, and qualifications as set forth in this Technical Report.
- Data, reports, and other information supplied by U.S. Silica and other third-party sources.

For the purpose of this Technical Report, the QPs have relied on ownership information and market studies included in Section 3.0. The QPs have not researched property title or mineral rights for U.S. Silica as we consider it reasonable to rely on U.S. Silica's personnel who are responsible for maintaining this information.

The QPs have relied on U.S. Silica for general marketing information and market studies included in Section 16.0 and referenced in Section 19.0. The QPs consider it reasonable to rely on U.S. Silica for this information as it has considerable experience in these areas.

This report titled "Technical Report Summary, Colado Site, Pershing County, Nevada" (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons. Terrance N. Lackey, Mining Director at U.S. Silica Holdings, Inc., prepared or contributed to the following sections:

1.0 Executive Summary

16.0 Market Studies and Contracts

18.0 Capital and Operating Costs

19.0 Economic Analysis

U.S. Silica Holdings, Inc.

/s/ Terrance N. Lackey	09/30/2022
Terrance N. Lackey	Date

BSc. Eng, MSc. Eng

Mining Director

U.S. Silica Holdings, Inc.

SME Member # 04312151

This report titled “Technical Report Summary, Colado Site, Pershing County, Nevada” with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Westward Environmental, Inc. Westward’s QPs prepared or contributed to the following sections:

1.0 Executive Summary

2.0 Introduction

3.0 Property Description

4.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.0 History

6.0 Geologic Setting, Mineralization and Deposit

7.0 Exploration

8.0 Sample Preparation, Analyses and Security

9.0 Data Verification

10.0 Mineral Processing and Metallurgical Testing

11.0 Mineral Resource Estimates

12.0 Mineral Reserve Estimates

17.0 Environmental Studies, Permitting, Plans, Negotiations or Agreements With Local Individuals Or Groups

20.0 Adjacent Properties

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Westward Environmental. Inc.

/s/ Thomas O. Mathews
Thomas O. Mathews, PG, REM

09/30/2022
Date

President
Westward Environmental, Inc.

This report titled "Technical Report Summary, Colado Site, Pershing County, Nevada" (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Q4 Impact Group, LLC. Q4 Impact Group's QPs prepared or contributed to the following sections:

1.0 Executive Summary

13.0 Mining Methods

14.0 Processing and Recovery Methods

15.0 Infrastructure

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Q4 Impact Group, LLC

/s/ Robert Archibald	09/30/2022
Robert Archibald	Date

CEO

Q4 Impact Group, LLC

LIST OF TABLES

LIST OF FIGURES

ACRONYM	DEFINITION
ASP	Average Selling Price
BCY	Bank Cubic Yard
BLM	Bureau of Land Management
CPI	Consumer Price Index
DE	Diatomaceous Earth
EPM	EP Minerals, LLC
FT	Feet/Foot
ID3	Inverse Distance Cubed
IRR	Internal Rate of Return
ISO	International Organization for Standardization
EPCM	Engineering, Procurement and Construction Management
K	Thousand
M	Million
Ma	Million Years Ago
NDEP	Nevada Division of Environmental Protection
NDWR	Nevada Division of Water Resources
NPV	Net Present Value
NSFM	Nevada State Fire Marshall
Q4	Q4 Impact Group
QA/QC	Quality Assurance/Quality Control
QP	Qualified Person
SCY	Stockpile Cubic Yard
SEC	Securities and Exchange Commission
SMU	Smallest Minable Unit
SWPPP	Stormwater Pollution Prevention Plan
TRS	Technical Report Summary
USGS	United States Geological Survey
U.S. Silica	U.S. Silica Holdings, Inc.
VSOG	Very Small Quantity Generator
yd^3	Cubic Yards

TECHNICAL REPORT SUMMARY

LAMESA SITE
LAMESA, DAWSON COUNTY, TEXAS

Submitted to: U.S. Silica Holdings, Inc.

Prepared By:

WESTWARD
Environmental. Engineering. Natural Resources.

Boerne, Texas
830-249-8284
Date: September 30, 2022
Project No. 10711-025-013
-ML-

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This Technical Report Summary ("Technical Report" or "TRS") updates the previously submitted Lamesa, Dawson County, Texas TRS included as Exhibit 96.3 to U.S. Silica Holdings Inc.'s ("U.S. Silica") Form 10-K for Fiscal Year Ended December 31, 2021, filed with the U.S. Securities and Exchange Commission (the "SEC") on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by Westward Environmental, Inc. ("WESTWARD") and Q4 Impact Group ("Q4") who has conducted an audit of the proven and probable reserves at the Lamesa, Texas mine ("Lamesa Site") as of December 31, 2021. This audit was performed in conjunction with the U.S. Silica's Mine Engineering and Geology staff and was prepared in accordance with Subpart 1300 and Item 601(b)(96) of Regulation S-K promulgated by the SEC.

1.1 Background

U.S. Silica operates two regional hydraulic fracturing sand ("frac sand") production facilities in the West Texas Permian Oil Basin region.[1] The Lamesa Site was built from 2018 through 2019 and became operational in the third quarter of 2018 with a designed annual production capacity of six (6) million tons ("MT"). The Lamesa Site is comprised of a large, mechanized surface mining operation that supplies raw ore to a fully automated, state-of-the-art processing plant. The facility's substantial on-site products storage silo capacity, and its strategic in-basin location allows shipment of regional sands by truck making the Lamesa Site a prime low-cost supplier of proppant sand to customers.

1.2 Product

The Lamesa Site produces proppant sand (commonly referred to as "frac sand") which is used in the hydraulic fracturing process, a completion method used by oil and gas companies to extract natural gas, natural gas liquids, and oil from unconventional, low permeability reservoirs such as shale. Two fine-grained frac sand products are manufactured at the Lamesa plant: an American

1 U.S. Silica's website – December 2021, Home | U.S. Silica (ussilica.com).

Petroleum Institute ("API") standard 40/70 sized silica sand product, and a non-API 100-Mesh (50/140) sized silica sand product. However, the end use of the sand is not strictly as proppant; it may also fit specifications for other industrial sand products.

1.3 History of Acquisition

U.S. Silica purchased 3,523-acres (five and a half sections) of undeveloped land from the Medlin Ranch in Dawson County, TX in July 2017. The Lamesa Site is located approximately 11 miles northwest of the town of Lamesa, Dawson County, Texas. The property acquisition was undertaken in mid-May 2017 after U.S. Silica's Mine Planning Department completed a two-phased exploration program that delineated a continuous sand dune deposit containing greater than 100 MT of Proven and Probable ore reserves.

1.4 Mineral Rights

The Lamesa Site is wholly owned by U.S. Silica. Because U.S. Silica also purchased both land and mineral rights, there are no leases, no royalties, and no other associated payments specific to the Lamesa land parcel.

1.5 Location

The mine is in remote West Texas with a history of agriculture being the predominant industry. As a result, there is very little urbanization in the area. There is a significant amount of oil and gas activity in the region and specifically near Big Springs, TX which located approximately 45 miles to the southeast. The Lamesa plant is the closest source of mined sand to the oil and gas activity in this part of Texas. Dallas, TX is located approximately 312 miles to the east, San Antonio approximately 360 miles to the southeast, and Midland, TX is approximately 60 miles to the southwest. The mine is located approximately 75 to approximately 85 miles to the northeast of numerous other sand mines located near Kermit and Monahans, TX.

1.6 Geology

The formation being mined at Lamesa is comprised of Quaternary aged wind-blown sand deposits. This sand formation is present across the surface of the site and most of Winkler County in the form of sheets, dunes, and dune ridges.

Most of the surface at Lamesa is a loosely consolidated sand with some silt and caliche. The subsurface is a cover sand that has clay and silt that is underlain by a very stiff, red silty clay. This basal unit in the mine area is made up of a mixture of fine-grained, clay-rich Playa deposits that predominately form a hard, red clay horizon of unknown thickness. Exploration drill holes completed during the initial property assessment and ore reserve delineation at Lamesa did not attempt to find the thickness of this basal clay unit. It is believed that any sand layers lying below this red clay horizon would be very heavily contaminated with clays and carbonates–making it unfit for economic extraction or production.

1.7 Exploration

The Lamesa Site was evaluated with a two-phase sonic exploration program referred to as “Project Thunderhead” in early 2017 and a third phase of sonic drilling in 2018. The 2017 drilling was comprised of a total of 16 borings that were drilled to depths ranging from 25 ft. to 65 ft. The 2018 exploration effort contained 18 additional borings drilled to depths ranging from 25 ft. to 80 ft. Borings were terminated in the underlying clay unit.

1.8 Testing

Testing of the sand was performed internally by U.S. Silica and results indicate that the material meets the recommended API guidelines. Individual customers may have other internal specifications that do not follow or meet the API suggested guidelines. The number of sales of the silica sand from Lamesa indicate the suitability of the material for multiple customers.

1.9 Mining Methods

U.S. Silica began mining operations at Lamesa in the third quarter of 2018. Lamesa Sites dune sand which lays in “sheets” of variable thickness and the less variable Clayey Cover Sands below the dune sand. At full capacity, the mine can deliver enough sand to supply the processing plant that has an annual nameplate capacity of six M tons. The nature of the sand deposits favors surface mining by conventional methods. The vegetation and other organics, generally around 1-ft. thick, are mined as part of the sand deposit therefore there is no overburden to remove. A contractor is employed to mine the sand. Front-end loaders and articulating haul trucks are used for mining. The contractor’s haul trucks deliver the mined sand to one of two large surge piles of raw sand, where it is available for processing through the Lamesa plant.

1.10 Processing and Recovery Methods

Constructed in 2018, the Lamesa processing plant is located east of the active mining area on the same property as the mine. The annual production of finished goods at the Lamesa facility is a function of customer demand and the production capacity, by size fraction, of the plant. Current shipments are approximately 3.6 M tons of finished goods. Raw sand is fed into the wet processing plant where it is cleaned, and some preliminary sizing is accomplished. From the wet plant the sand is moved to the dry plant after the water has had a chance to drain to below 10% moisture content. In the dry plant, the sand is dried in rotary dryers and then sized for sale as finished goods.

1.11 Infrastructure

The Lamesa location has been operating since 2018. The infrastructure required to maintain a sustainable presence in this generally rural local community is in place. Lamesa is accessible by roads maintained as private roads and by County and State roads. Road access is critical for the delivery of materials used in the production of finished goods and for shipment of finished goods to U.S. Silica customers.

The Lamesa location has excellent access to reliable electric power and supplies of natural gas. Water is a critical component in processing the silica sand. Lamesa has four on-site wells and there are water contracts in place with third parties which cover the life of the mine and provide for adequate access to processing water.

Tailings handling and settling capacity is a critical element for the long-term viability of the Lamesa location. U.S. Silica utilizes a series of settling ponds to remove waste from the process water and recycle this process water. Lamesa must construct new tailings pond facilities from time to time to store the waste that will be produced over life of the mine. Certain capital and expense projects are planned over the life of the mine to meet these needs.

1.12 Capital and Operating Costs

In 2020 and 2021 total operating costs were $32,593,000 and $36,815,000 and total capital costs were $3,510,000 and $159,000 respectively (Table 18.1). The higher than average capital spend in 2020 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

The Lamesa Site maintains a five-year capital forecast for planned capital expenditures to support current production. A summary of foreseen capital expenditures through 2026 is provided on Table 18.2. As shown on Table 18.2, total estimated capital expenditure through 2026 is $830,000. Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy.

1.13 In-situ, Mineable Ore Estimate

Information used in the preparation of this mineable ore estimate includes data collected from drilling 34 borings and associated lab results. For more information on the modeling and methodology used in preparing the estimates listed below, please refer to Section 11.0 Mineral Resource Estimates and Section 12.0 Mineral Reserve Estimates. Table 1.1 shows the mineral resources at the Lamesa Site as of December 31, 2021. Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Measured Resource	85,678,000
Indicated Resource	6,800,000
TOTAL	**92,478,000**

* *Tons rounded down to the nearest 1,000*

Table 1.1 U.S. Silica Recoverable Ore Resources.

Table 1.2 shows the mineral reserves at the Lamesa Site as of December 31, 2021.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	85,678,000
Probable Reserve	6,800,000
TOTAL	**92,478,000**

* *Tons rounded down to the nearest 1,000*

Table 1.2 U.S. Silica Recoverable Ore Reserves.

1.14 Permitting

As of the effective date of this report, the Lamesa Site has the necessary permits and plans in place to mine the silica sand deposit as discussed in this report.

1.15 Recommendations

The primary recommendation of this report includes the design and implementation of a third-party sampling and testing program to provide outside quality control on U.S. Silica's internal testing program.

2.0 INTRODUCTION

This TRS updates the previously submitted Lamesa, Dawson County, Texas TRS included as Exhibit 96.3 to U.S. Silica's Form 10-K for Fiscal Year Ended December 31, 2021, filed with the SEC on February 25, 2022. This TRS has been prepared at the request of U.S. Silica by WESTWARD who has conducted an audit of the proven and probable reserves at the Lamesa, Texas mine as of December 31, 2021. This audit was performed in conjunction with the U.S. Silica's Mine Engineering and Geology staff was prepared in accordance with Subpart 1300 and Item 601(b)(96) of Regulation S-K promulgated by the SEC. U.S. Silica common stock is traded on the New York Stock Exchange ("NYSE") under the symbol "SLCA".

WESTWARD'S third-party reserves analysis (Section 11.0 & Section 12.0 of this report), completed on February 11, 2022, presented in this TRS, was prepared for public disclosure by U.S. Silica in filings made with the SEC in accordance with the requirements set forth in the SEC rules and regulations. Any capitalized terms used herein, but not defined herein, shall have the meaning ascribed to such term in Item 1300 of Regulation S-K of the SEC Regulations.

2.1 Sources of Information

- U.S. Silica: reports, maps, models, correspondence, calls, website
- United States Geological Survey
- Bureau of Economic Geology
- Texas Commission on Environmental Quality
- Environmental Protection Agency
- Google Earth

2.2 Personal Inspection

Michelle M. Lee, PG (TX #6071, SME Registered Member #4130340RM) with WESTWARD performed a site visit to the Lamesa Site on May 3, 2021. During this site visit, the Plant

Manager gave Ms. Lee a tour of pertinent parts of the mine, including water wells, ponds, pit areas, reserve areas, and property perimeter. The processing facility and plant were not toured. The QP has spent a significant amount of time in the region working on projects with multiple other frac sand mines and greenfield sites. The silica sand deposit at this site is the geologically equivalent to other silica sand deposits in the region.

Robert Archibald, PE (VA 0402023235) with Q4 performed a site visit to the Lamesa Site on October 4, 2021. During the visit, an inspection of all mine, plant and infrastructure facilities was conducted. In addition, key management personnel were interviewed and numerous aerial photographs, flow sheets and reports were examined.

3.0 PROPERTY DESCRIPTION

3.1 Location

The Lamesa Site is in Dawson County, TX approximately 312 miles west of Dallas, TX; approximately 56 miles southwest of Lubbock, TX; approximately 57 miles north of Midland, TX; and approximately 11 miles northwest of Lamesa, TX (Figure 3.1). US Route 87 runs through Lamesa, TX and leads directly north to Lubbock, TX and south to Big Spring, TX (Figure 3.2).

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Figure 3.1 General Site Location Map.

The Lamesa Site is located 11 miles Northwest of the town of Lamesa, TX (Figure 3.2). The facility address is U.S. Silica – Lamesa Plant, 300 County Road 11, Lamesa, TX-79331.

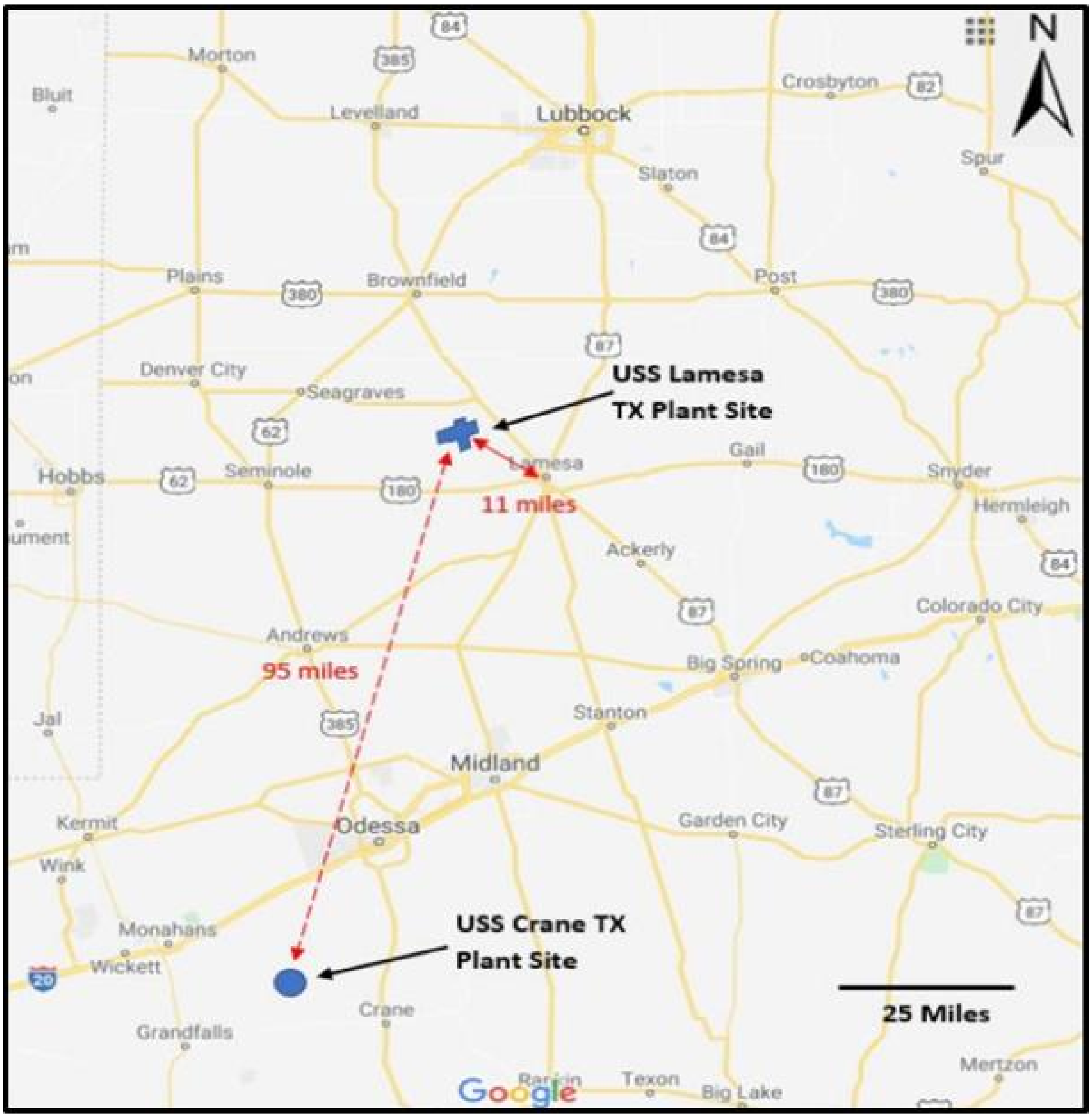

Figure 3.2 Lamesa Area Site Location Map.

The front gate entrance to the mine is approximately located at 32.806256, -102.126062.

The Lamesa, TX property was purchased in July 2017 and is comprised of 3,523-acres of undeveloped ranchland that is now wholly owned by U.S. Silica as outlined by the dark blue boundary line on Figure 3.3 below.

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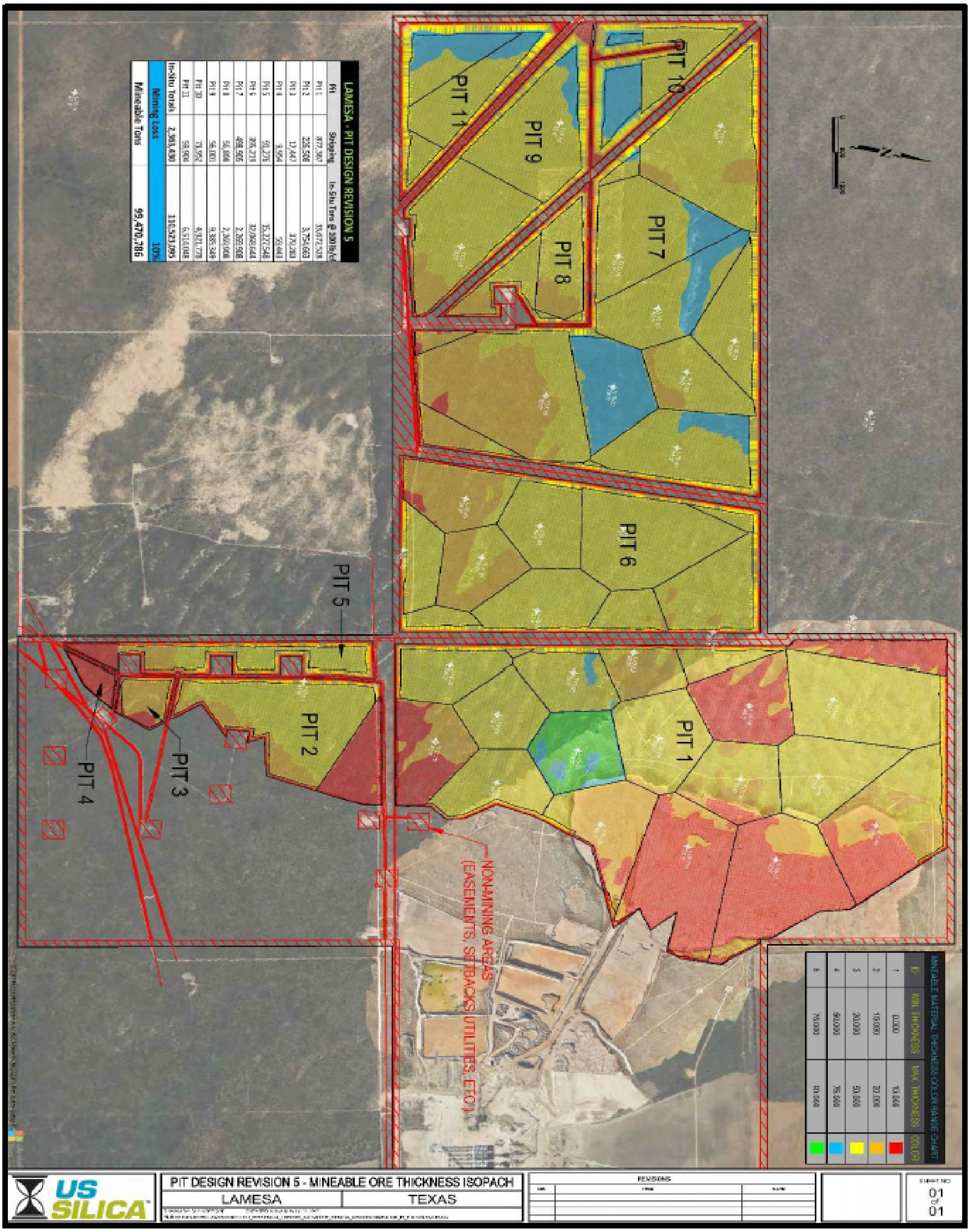

Figure 3.3 Main Mine Operation Map.

3.2 Leases/Royalties

U.S. Silica purchased both the land and mineral rights to the Lamesa Site property. As such, there are no leases, no royalties, or other associated payments specific to the mine.

3.3 Encumbrances

Due to the presence of pre-existing oil production infrastructure on the property, the land is subject to easements for roads, storage areas, pipelines and pump jack stations. A 100-ft. wide, “no mining” buffer is in place around the property boundary. There are no designated wetland areas or other environmental areas to be similarly buffered. Refer to Figure 3.3 for location of the known encumbrances.

One currently active oil well pumpjack site lies within the mining area on a 300-ft. x 300-ft. square pillar that was left in place to protect this well head. The access road and pipeline routes associated with this oil well, in addition to a pipeline easement located in the southwest corner of the Lamesa property, were also protected from mining by leaving a 200-ft. wide corridor in place. Additional pump jacks and associated infrastructure are located in the southern most area of the mine that also have similar setbacks and pillars surrounding the oil field equipment.

Similarly, a major oil transportation pipeline and a power line corridor run North-South across the property – each protected with a designed 200-ft. wide “no mining” pillar. These buffer zones and “no mining” pillars are shown in Figure 3.4. The sand that lies within these areas was excluded from the Lamesa ore reserve calculation.

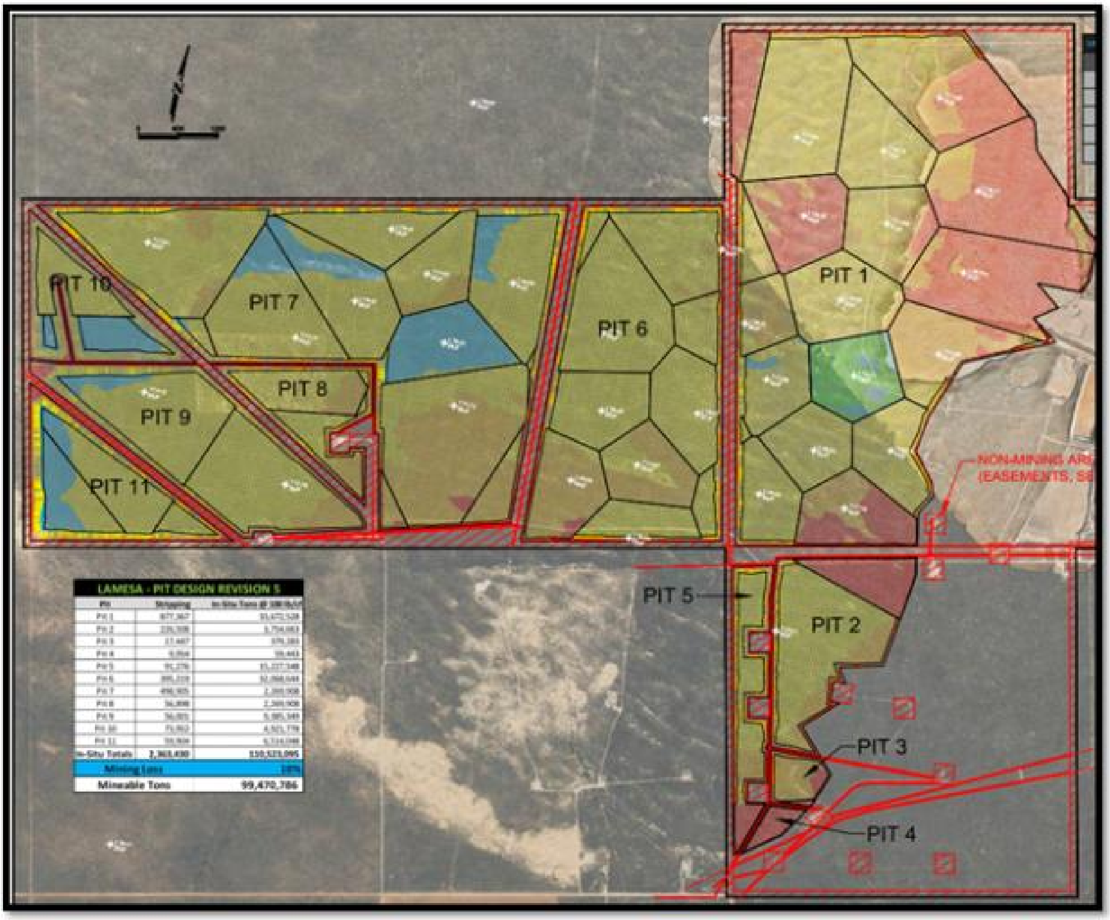

Figure 3.4 Known encumbrances.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Topography

The topography of the area is relatively flat and expressionless except for the wind-blown sand dunes in various locations. The land use in the region is primarily ranch and agricultural in nature and as a result, surface vegetation varies. Lamesa consists of rolling sand dunes with shinnery oak, grasses and other various scrub vegetation. Some of the younger sand dunes have no vegetative cover. Surface elevations at Lamesa range from approximately 3,188 ft. AMSL along the western perimeter to approximately 3,067 ft. AMSL in the southeastern corner.

4.2 Means of Access

Lamesa is well serviced and accessed by paved private, County and State roads as shown in Figure 15.1. The most direct route from the town of Lamesa, TX is to take State Road 137 North for eight (8) miles to County Road (CR) 1064 West; turn left on CR 1064 W travelling five (5) miles until the road merges with CR 11. Continue another one (1) mile on the newly paved (formerly gravel) road CR 11 to the plant entrance near the east property boundary.

An alternate route is to go west on US Route 180 W from the town of Lamesa, TX, and travel seven miles to County Road 829 North. Turn right on CR 829 N and travel north 7.5 miles on CR 829 N to the intersection and junction of CR 106 W and CR 11. Turn left, travelling one (1) mile on CR 11 to the plant entrance.

4.3 Climate

According to the Koppen climate classification system,[2] Lamesa is in a semi-arid climate. Summers are hot typically reaching 100º F and cold winter nights below freezing. The average rainfall for the region is approximately 17.6." As a result, the mine can operate year-round.

4.4 Infrastructure

Lamesa has free and clear access to all necessary utilities needed to operate.

Electrical Power for the Lamesa facility is provided by Lyntegar Power Utility. It is delivered by pole-lines running west along CR9 (1-mile north of the property) that then

2 Koppen climate classification system – Wikipedia, Köppen climate classification - Wikipedia.

turn south and run cross country to the north property boundary. The lines then follow the boundary back to the east, to a point where they turn south along CR E, to the substation located at the southeast corner of the property (Figure 4.1). Plant electricity is distributed by a combination of buried lines and overhead pole-lines, where appropriate, with the main distribution lines shown in Figure 4.1.

Natural Gas for the facility is provided by West Texas Gas Marketing Inc. It is also delivered from the east along CR 1064 to the southeast corner of the property, where a main control header/service shut-off valve has been established. Distribution into the plant is through buried lines that go to the burner end of the three (3) natural gas, rotary sand dryers (Figure 4.1).

Water for the Lamesa is not provided by any public utility. Instead, it is mostly provided by purchase agreements with two (2) local, neighboring farmers whereby non-potable process water is delivered by surface pipelines from their ranches (Figure 4.1). Also, there is one (1) on-site water well (South Well) that U.S. Silica drilled just west of the plant and south of CR 11. This well provides an additional 150-200 gallons per minute ("gpm") of non-potable process water–used for sand washing, sizing, tailings discharge, dust collection, grey-water sanitation, and general site clean-up activities. Potable drinking water for personnel is brought on-site in jugs and bottles using a local water vendor.

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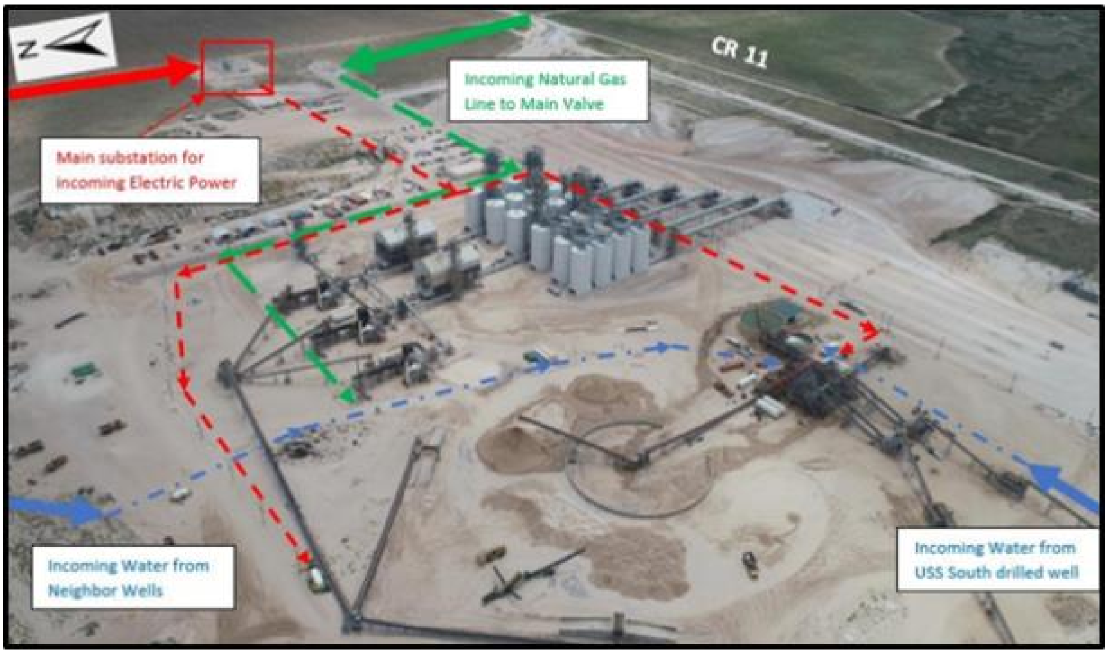

Figure 4.1 General location and distribution of site utility lines servicing the Lamesa sand plant and processing facility. Photo courtesy of Adam Rodriguez, April 29, 2020.

5.0 HISTORY

U.S. Silica is the first landowner to mine silica sand at this location. Except for agricultural activity in the far southeastern area of the property, the previous landowners have not developed the site. It is the understanding of the QP that no other exploration or development work has been undertaken at the mine.

6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT

The mine property lies within the Llano Estacado, a Southern High Plains extension of the Great Plains of North America that covers an area south of the Canadian River in northwest Texas and northeast New Mexico. The Llano Estacado is commonly called the Staked Plains (geologically interpreted as the “palisaded” plains) and it forms a vast elevated plain that has long been recognized as a distinct physiographic region.

The economic sand unit at the Lamesa Site is made up of unnamed windblown sand deposits. The bottom, basal unit in the mine area is made up of a mixture of fine-grained, clay-rich Playa deposits that predominately form a hard, red clay horizon of unknown thickness. Exploration drill holes completed during the initial property assessment and ore deposit delineation at Lamesa did not attempt to find the thickness of this basal clay unit. It is believed that any sand layers lying below this red clay horizon would be very heavily contaminated with clays and carbonates – making it unfit for economic frac sand production.

Lying on this basal clay unit is a clay-rich "cover sand" (Pleistocene Epoch sheet sands) which is exposed at the surface on the eastern third of the Lamesa Site. This cover sand is interpreted to be wind-blown dune sand that was stabilized over the last 30,000 years by vegetation and wet deposition of other minerals in an undrained desert basin, that sometimes acted like a shallow inland sea. From the geologic report by Fryberger, et.al., 1979,[3] "Sand sheets are sandy plains formed by wind that consist mainly of flat to low angle eolian stratification. They commonly exist on the margins of dune fields or between belts of dunes within a sand sea."

The sand deposit here is very similar in origin, content, structure and distribution as the sand deposits in and near the Kermit – Monahans – Crane area located approximately 90 miles to the southwest of the Lamesa that are currently being mined for frac sand. A general stratigraphic column of the region[4] is provided in Table 6.1 below.

3 McKee, Fryberger, Breed et al., 1979, A Study of Global Sand Seas, U. S. Geological Survey Professional Paper 1052.

4 Barnes, V.E., project director, 1976, Geology Atlas of Texas: The University of Texas at Austin, Bureau of Economic Geology, Hobbs Sheet, scale 1:250,000.

Generalized Stratigraphic Column				
Period	**Epoch**	**Rock Unit Name**	**Estimated Thickness (Ft.)**	**Description**
	Holocene	Alluvium		Floodplain and pediment deposits; includes low terrace deposits along streams, and bedrock locally in stream channels; pediment deposits of sandy silt locally modified by sheetwash action
		Eolian deposits		Sand, calcareous, mainly brown to grayish brown; mostly derived from and rests on lacustrine deposits; confined to New Mexico
Quaternary		Windblown Sand	5-10	Sand and silt in sheets
	Holocene and Pleistocene	Playa Deposits		Clay and silt, sandy, light to dark gray, in shallow depressions; those of Wisconsinan age usually covered by thin deposit of Recent sediment
		Caliche	0-10	Caliche stripped of covering materials mapped separately
		Alluvium and other Quaternary deposits		Intimately associated alluvium and Qao deposits undivided, in dissected areas in Texas
		Colluvial Deposits		Sand, silt, and gravel deposited by slopewash, and talus from Ogallala, red to gray; in part calichified, caliche 1 to 20 feet thick; may include weathered Gatuña Formation locally; rests mainly on Triassic and Permian rocks
	Pleistocene	Fluviatile terrace deposits		Gravel, sand, and silt; commonly with pebbles and cobbles of limestone, sandstone, and chert
		Pond deposits		Gastropod-bearing sandy silt and silty clay, gray to light gray, deposited in ponds and shallow swales
		Pleistocene surficial deposits undivided		Brown and grayish-brown silty sand and sandy silt deposited mainly by sheetwash action as broad, gently sloping sheets
		Other Quaternary deposits		Mostly boulders, cobbles, and pebb;es of Cretaceous limestone and chert, locally overlain by brown silt
		Gatuña Formation	0-400	Mostly sand, fine, friable, yellowish to reddish orange, red; some conglomerate, gypsum, limestone, and siltstone, gray, purplish, red, and shale, greenish; upper few feet calichified
		Tahoka Formation	0-25	Lacustrine clay, silt, sand, and gravel, locally calcareous, selenitic. Clay and silt, sandy, indistinctly bedded to massive, weakly coherent, various shades of light gray and bluish gray. Sand, fine- to coarse-grained quartz indistinctly bedded to massive, friable gray, grades to gravel at margins of deposits. Molluscan and vertebrate fossils (Wisconsinan)

Table 6.1 Abbreviated generalized stratigraphic column of the Lamesa area.

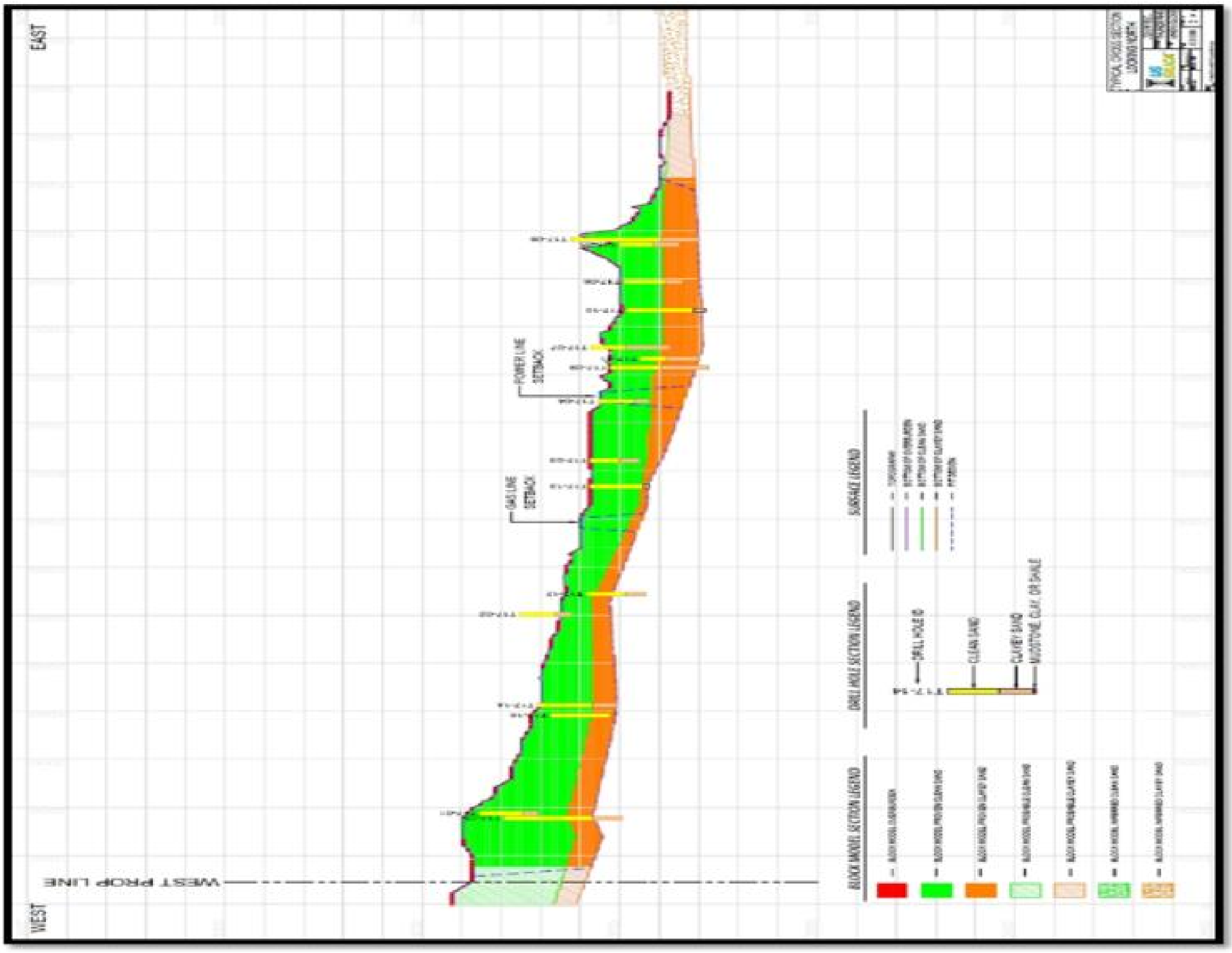

Figure 6.1 Generalized cross section at the Lamesa Site location.

Figure 6.2 View of the active pit area looking northwest.

Figure 6.2 above shows the current mining area at the Lamesa Site. Note the loose surficial sands. The eastern extent of the surface sand dune field is very abrupt, and it is in the eastern third of the Lamesa property as noted below as the “dune line” in Figure 6.3 below.

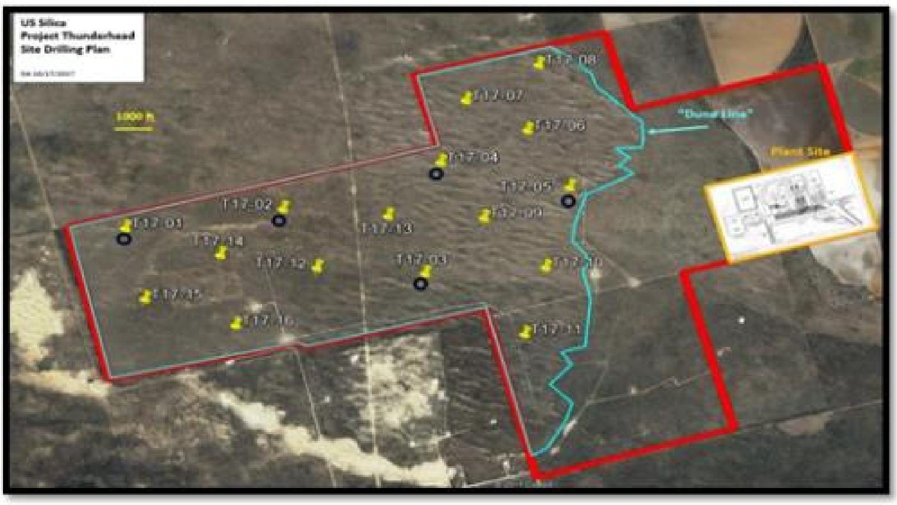

Figure 6.3 Dune field extent.

7.0 EXPLORATION

7.1 Drilling

Thirty-four (34) borings have been drilled to date at Lamesa utilizing sonic methods. Borings were drilled in three phases as follows in Table 7.1:

PHASE	DATE	DRILLER	METHOD	BORINGS	TD RANGE
I	March 2017	Unknown	Sonic	T17-1 through T17-5	30 ft. – 65 ft.
II	April 2017	Associated Environmental Ind.	Sonic	T17-6 through T17-16	30 ft. – 60 ft.
III	September 2018	Associated Environmental Ind.	Sonic	L18-15 through L18-33	25 ft. – 80 ft.

Table 7.1 Exploration drilling campaign history.

Geologic analysis of the 16 exploration drill holes drilled in 2017 showed that the mineable sand thickness ranged from 16 ft. to 65 ft. The main variation within the sand deposit is the amount of caliche, silt and clay which is consistent with observations at other mines in the region. Phase III drilling in 2018 included an additional 18 borings that were also drilled with sonic methods. Mineable sand thickness ranged from 10 ft. to 58 ft. Figure 7.1 shows the boring locations drilled to date.

Drilling recovery information was not provided for review. Based on the QP experience in the region, overall homogeneous geologic nature of the deposit, the lack of this information does not materially affect the accuracy and reliability of the exploration results reviewed.

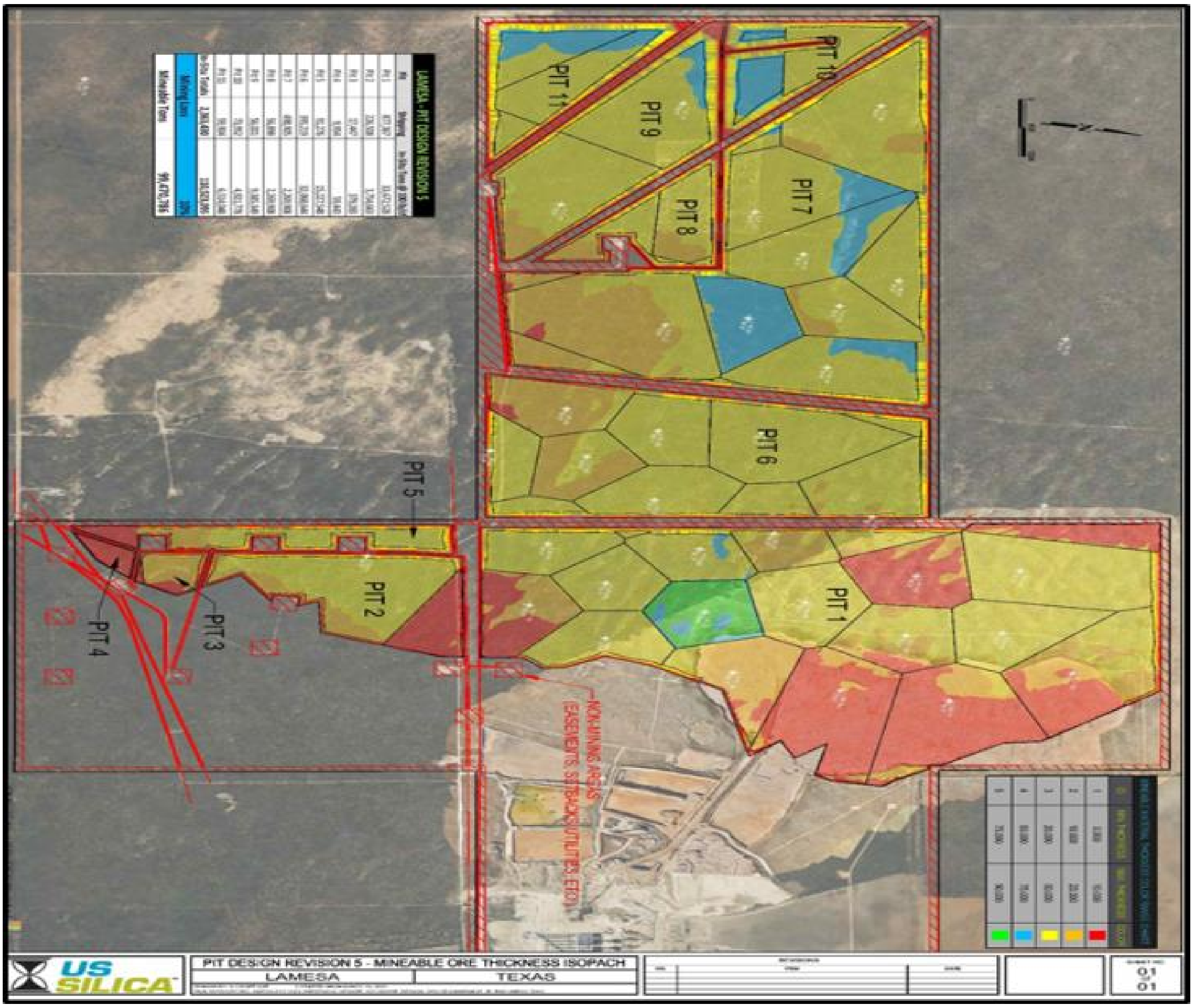

Figure 7.1 Boring Location Map.

Review of publicly available water well records in the immediate vicinity of Lamesa indicate that sand is absent in the subsurface at depths greater than those drilled during these exploration programs.

Visual inspection of the property indicated that the dividing line between surface exposures of sand sheets and the cover sand area extends roughly North-South just West of the area set aside for the plant. This dividing line will be referred to in this report as the "dune line" (shown in Figure 7.1). Discussions with local ranch and farm workers indicated that sand was deeper to the west of this line, and quite thin east of it. Shovel work identified that the cover sand east of the "dune line" was like the clayey sand seen at the bottom of the drillholes. Later, geotechnical shallow drilling for the plant foundation design confirmed that there is only 3 to 6 ft. of sand in the plant area, and it is assumed that everywhere East of the "dune line" there is only thin, clayey cover sand present which will not be considered for reserves. However, some of this material has been successfully mined and processed into final product – especially in the areas of recent tailings pond construction.

No other exploration method (such as geophysics or trenching) was employed to determine the presence or absence of the mineable deposit at Lamesa.

7.2 Hydrogeology

There are no natural surface water features at Lamesa. Water used for processing and other assorted mine activities is pumped from water wells located on or adjacent to the plant and some well water is purchased from water purveyors in the area. Groundwater that supplies the mine operation comes from wells completed into the Ogalala Formation. The wells in this formation for the general area are completed to depths ranging from 190 ft. to 230 ft.

8.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

All samples collected during the exploration phases in 2017 and 2018 were tested internally by U.S. Silica at their Katy, Texas laboratory. There is no documentation of sample security, transport, or preservation available for review for this site. It is recommended that internal procedures be drafted to include this step for future sample collection.

U.S. Silica does have written laboratory procedures in place that adhere to International Organization for Standardization (ISO) 9001 / Quality System criteria that were reviewed. U.S. Silica uses the Approved American National Standard Institute (ANSI) and API approved "Measurement of Properties of Proppants Used in Hydraulic Fracturing and Gravel-packing Operations, ANSI/API Recommended Practice 19C, First Edition, May 2008; ISO 13503-2.2006 (Identical), Petroleum and natural gas industries – Completion fluids and materials Part 2: Measurement of Properties of Proppants Used in Hydraulic Fracturing and Gravel Packing Operations" as part of the laboratory testing documentation.

Other protocols reviewed as part of this report include the U. S. Silica ISO 9001 / Quality System – Process Washing: CAP605 (corporate analytical procedure) and the U.S. Silica Company ISO 9001 / Quality System – Attrition Scrubbing documents. Both documents were signed by David Weller, Technology Director, ISP in 2016 and distributed internally. These documents detail the change history, scope, safety, equipment, and procedure instructions for each test.

It is the QP's opinion that adequate testing was performed to provide ample data to render an opinion to proceed with the construction of a multimillion-dollar processing plant. Additionally, the sand is continually being sold to multiple customers which supports the fact that the sand is of sufficient quality and demand. Written statements from U.S. Silica indicate that the internal labs follow all protocols discussed here.[5]

5 Terry Lackey email dated 9.24.21.

9.0 DATA VERIFICATION

In review of the laboratory protocols, discussions with U.S. Silica, and testing data provided, it is the QP's opinion that the data provided is sufficient for the purposes of this report. This determination is also based on the QP's extensive experience in this same sand deposit in the region.

Testing was performed by PropTester to determine the density of the processed sand.[6] This value is used to convert bank cubic yards to tons. The specific gravity/density of the material tested from the Lamesa wet plant is 91.5 lbs./cu ft. which equals 1.24 tons/cu. yd. This is not representative of the in-situ sand in the unmined deposit. It is likely that the density of the in-situ deposit is different from what was measured in the wet plant. Additional testing of the in-situ deposit should be performed to get a more accurate value. Please refer to Section 12.2 Data Verification Methodology and Section 12.3 Process Verification below for further detail.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

The mining of the deposit at Lamesa began in late 2018. The sand is generally a loosely consolidated surficial deposit and is easily extracted by means of front-end loaders. Because the deposit is primarily silica, there are no specific mineralogical processing or testing procedures required to deliver a finished product. The sand is mined, screened, washed, attritioned, dried, and sized before it is loaded into customer trucks.

Overburden has been determined to be roughly the top one ft. of vegetative material that is screened out prior to arrival at the wet plant. As a result, there is minimal processing of the material into a finished product. In some instances where caliche is present, additional attrition or screening may be required to remove the calcium carbonate. Based on review of laboratory reports provided, testing performed on samples collected is adequate for this type of deposit.

6 PropTester Report 101-19-11-97-24-B, dated November 22, 2019.

U.S. Silica performed internal testing according to API RP 19C protocol on the samples collected from the 2017 exploration event. The limited API RP 19C testing showed favorable results that meet the criteria set forth in these testing methods for roundness, sphericity, turbidity, acid solubility and crush resistance.

Roundness measures how smooth the sand grain is whereas sphericity measures how closely the sand shape resembles a sphere. Grains with sharp edges will crush (fail) under less pressure and will create fines. The more spherical a grain then the more pressure it can withstand during the frac process. The more pressure a grain can withstand, the deeper underground, or in higher pressure plays, it can be used.

Turbidity testing is a measure of water clarity and how many suspended particles, including those that are invisible to the naked eye, may be present. Suspended materials include soil particles (clay, silt, and very fine sand), algae, plankton, microbes, and other substances. This value needs to be low so that the ingredients in the fracking fluids do not react with the suspended particles and cause a reduction in the effectiveness of the frac.

Acid solubility testing indicates if grains may be coated with other minerals that are not readily washed off during processing. If the solubility numbers are high, then this indicates that the sand may react with the acids present in fracking fluids creating fines that may lower the effectiveness of the frac.

Crush resistance testing shows how much pressure the grains can endure before crushing or failing. The crush value (“K-value”) varies depending on the size and shape of the grains. The higher the crush value, the higher the durability of the sand. High crush values are preferred when using sand for fracking.

The Lamesa deposit is intended to be primarily, if not solely, used for Oil & Gas proppant (frac sand) sales. The scrubbed samples from the 2017 exploration event were therefore sent from the Berkeley Springs Lab to U.S. Silica’s Oil & Gas Lab in Katy, TX, for proppant testing. Key API parameters for all drillhole intervals are shown in Table 10.1:

Project Thunderhead - All Samples (weighted average by feet of core)	K-value 40/70	K-value 100M	Acid Solubility	Roundness	Sphericity	Turbidity
Min	5	6	0.8	0.5	0.5	11
Max	7	9	3.3	0.7	0.7	63
Average	6	8	2.3	0.6	0.6	26.9
Generally Accepted API Standard	Varies	Varies	≤ 3.0	≥ 0.6	≥ 0.6	≤ 250

Table 10.1 Selected Lamesa, TX sand physical test results.

Based on the favorable API testing from the 2017 exploration event, only grain size distribution testing (gradations or sieve analysis) was performed on the samples collected during the 2018 exploration event.

The specific gravity/density of the material tested by PropTester from the Lamesa wet plant is 91.5 lbs./cu ft. which equals 1.24 tons/cu. yd.

11.0 MINERAL RESOURCE ESTIMATES

Resources are reported **inclusive** of reserves. Resources presented herein are utilized for mine planning purposes, and subsequently, reserve estimates. Resources are **not** reported in addition to reserves. There are no resources exclusive of reserves included in this TRS.

11.1 U.S. Silica Methodology

U.S. Silica reports its in-situ resources and reserves in “Recoverable Tons.” As such, a geologic “Resource” that is identified by exploration drilling is further defined by several other key criteria before it can be considered “Recoverable Ore.” The most important of these criteria are that the resource must have:

Indicated Resource	Reasonable level of confidence of geometry and estimates
	Quantity and grade/quality are estimated on the basis of adequate geological evidence/sampling
	Information locations too widely or inappropriately spaced to confirm geological and/or grade
	Confidence sufficient to allow a qualified person to apply modifying factors in sufficient detail to support mine planning and evaluation of economic viability of the deposit
Measured Resource	High level of confidence of geometry and estimates
	Information locations are closely spaced enough to confirm geological and grade continuity
	Information gathered appropriately
	Confidence sufficient enough to allow the application of technical and economic parameters and to enable the evaluation of economic viability that has a greater degree of certainty

The 34 drill holes completed during exploration are sufficiently spaced to provide adequate coverage of the deposit. The sand strata logged in the borings drilled were categorized as “Clean Sand” Ore; “Clayey Sand” Ore; and “Overburden,” which is considered waste. Overburden was conservatively defined as the top one-ft. thickness of the entire surface topographic cover to allow for removal of inorganic surficial debris and organic contaminants such as sage brush and other grassy vegetation. Geologic continuity of the deposit was observed across the Lamesa Site.

Geologic block modeling was conducted inhouse using U.S. Silica’s SURPAC mine design software. The geologic block model was created using the ore and waste lithostratigraphic units and then the ore resource model was constructed using the nearest neighbor polygonal block method. The geologic criteria for “filling” the ore reserve polygons were: (1) the true thicknesses of economic ore units ("Clean Sand" and "Clayey Sand" ores) and (2) the associated interval analytical quality data (sieve analysis particle size data and grain crush strength). Based on the lateral geologic continuity of Lamesa's dune sand sheet deposits, "Measured Ore" resources were defined within a quarter-mile radius (1,320-ft.) of a drill hole. "Indicated Ore" resources were defined by that material that was outside the quarter-mile radius, but within a half-mile (2,640-ft) radius of the drill hole. The absence of dune sands on the east side of the property forms a strictly defined geologic limit to the ore resources on the Lamesa Site property (Figures 6.3 & 7.1).

A 100-ft. wide, "no mining" buffer was designed to be left in place around the property boundary. There are no wetland areas or other environmental areas to be similarly buffered. One currently active oil well pumpjack site lies within the mining area in a 300-ft. x 300-ft. square pillar was left in place to protect this wellhead. The access road and pipeline routes associated with this oil well were also protected from mining by leaving a 200-ft.-wide corridor in place. Similarly, a major oil transportation pipeline and a power line corridor run North-South across the property and are each protected with a designed 200-ft. wide "no mining" pillar. These buffer zones and "no mining" pillars are shown in Figure 11.1 below. The sand that lies within these areas was excluded from the Lamesa Site ore resource calculation.

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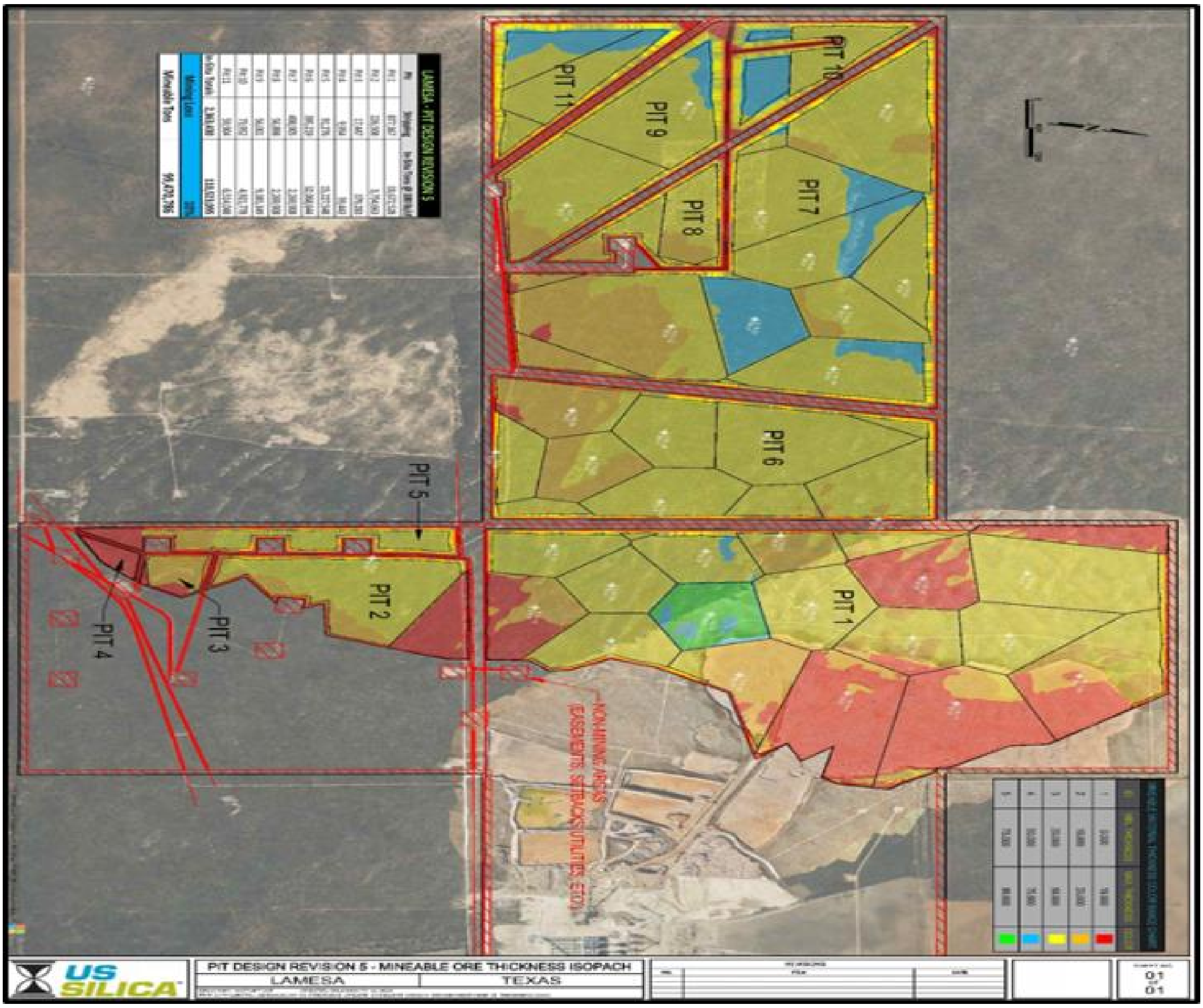

Figure 11.1 Mine Pit Locations.

U.S. Silica has assigned a 10% mining loss to reported in-situ reserve volumes. This waste occurs between the point of extraction and point of arrival of the material to the plant. Once the material is extracted it is no longer considered to be in-situ. Waste due to processing is not reflected in the in-situ volumes reported.

WESTWARD utilized two approaches in confirming U.S. Silica's internal Lamesa resource estimates: data verification and process verification. The purpose of data verification was to address whether data incorporated in the U.S. Silica models was supported by documentation and that the model inputs matched those documents. The purpose of process verification was to address whether U.S. Silica's results could be replicated using identical data sets.

11.2 Data Verification Methodology

WESTWARD coordinated with U.S. Silica personnel to compile copies of all available exploratory field logs, gradational test results and a database of the geologic model inputs. Once compiled, a spreadsheet was developed including a list of all exploratory boings from the model, their locations, elevations, and exploration depths. If supporting documentation was available, it was indicated on the spreadsheet next to the associated boring.

To address whether model inputs matched supporting documentation, spot checking was used. Spot checking was conducted randomly for both lithological and gradational data inputs. Spot checking was performed on at least 10% of available data sets.

11.3 Process Verification Methodology

WESTWARD developed an independent geologic model of the Lamesa deposit from the provided U.S. Silica data inputs, setbacks, and mining assumptions. RockWorks21 modeling software was used to develop the independent model with the Inverse Distance Weighting algorithm and a 40x40x1 ft. model resolution.

Volumetric estimates of in-situ raw material for each mine block were extracted from the model. Reductions for overburden and highwall design were not incorporated into the model.

After modeling was complete, additional data was input to verify volumes. Overburden was assumed to be one ft. thick across the entire site and a pit slope reduction was calculated for each mine block based on the mine block perimeter, average modeled thickness, and cross-sectional area assuming a 3 horizontal to 1 vertical (3H:1V) highwall slope.

11.4 Results

The in-situ volumes were reduced by the assumed overburden volume, and the calculated highwall volume estimate. A 10% reduction for mining loss was then applied resulting in a Net Recoverable Ore volume. As discussed in Section 10.0 Mineral Processing and Metallurgical Testing above, a unit weight of 91.5 pounds per cubic ft. was applied to calculate Net Recoverable Ore tons which is the value compared against U.S. Silica estimates.

There was sufficient data available for review to classify the silica sand deposit at the Lamesa Site as having both measured and indicated resources. The difference between the model run by U.S. Silica and WESTWARD to calculate resources differed by approximately 2%. This is an acceptable value. Over the life of the mine, this volume is minimal.

11.5 In-Situ, Recoverable Ore Resources

Resource estimates of in-situ silica sand at the Lamesa Site as of December 31, 2021 reported by U.S. Silica are shown in Table 11.1 below. Resources are presented **inclusive** of reserves, **not** in addition to reserves.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Measured Resource	85,678,000
Indicated Resource	6,800,000
TOTAL	**92,478,000**

* *Tons rounded down to the nearest 1,000*

Table 11.1 U.S. Silica In-Situ, Recoverable Ore Resources Estimate.

11.6 Cut Off Grade

Cut-Off grade is the minimum grade required for a mineral or metal to be economically mined (or processed). At the Lamesa Site, material is considered to be economically recoverable when the cost to extract, process and then sell the material results in a profit. There is no single "cut-off grade" for the total recoverable ore resource estimation at a mine site because the direct-shipping grades are fixed by the sale contract and tailored to each customer's specific particle sizing and physical characteristic requirements.

Additionally, U.S. Silica optimizes the utilization of its ore reserves by using various raw ore blending strategies at both its mines and processing facilities. Through blending, sub-optimal raw materials that would typically be excluded using a traditional cut-off grade approach can be blended with high-quality reserves to produce a product that meets a particular customer's specification range. There is no single size, or physical specification that fits all customer requirements. Therefore, it is not practical or possible to apply a single "cut-off grade" or "quality" criteria to the total recoverable ore resource estimation at a mine site. Please refer to Section 19.0 Economic Analysis for pricing information.

12.0 MINERAL RESERVE ESTIMATES

12.1 Introduction

For the in-situ silica deposit at the Lamesa Site, indicated resources were converted to probable resources due to larger spacing distances between drill holes than what is in the measured resources areas. It is likely that there is geologic continuity across these areas with regard to a silica sand deposit, but the spacing between borings in these areas is greater than what is in the measured resource areas. Measured resources were converted to proven reserves based on the criteria discussed in Section 11.0 Mineral Resource Estimates in conjunction with several modifying factors.

Additional modifying factors such as required and sustainable infrastructure (Section 15), market studies (Section 16), environmental considerations and permitting (Section 17), capital and maintenance costs (Section 18) and economic analysis (Section 19) have been completed or are in place. This allows for unencumbered mining and processing at the Lamesa Site. A robust need for silica sand in this part of Texas and extended high sales volumes make the mine viable. These factors demonstrate the economic viability of the in-situ silica sand deposit at the Lamesa Site.

12.2 In-Situ, Recoverable Ore Reserves

There was sufficient data available for review to convert the Measured and Indicated Mineral Resources at the Lamesa Site to Proven and Probable Mineral Reserves. Reserve estimates of in-situ silica sand as of December 31, 2021 reported by U.S. Silica are shown in Table 12.1 below.

Deposit Classification	In-Situ, Recoverable Ore Tons*
Proven Reserve	85,678,000
Probable Reserve	6,800,000
TOTAL	**92,478,000**

* *Tons rounded down to the nearest 1,000*

Table 12.1 U.S. Silica In-Situ, Recoverable Ore Reserves Estimate.

12.3 Cut Off Grade

Cut-Off grade is the minimum grade required for a material to be economically mined (or processed). Please refer to section 11.6 Cut Off Grade for the discussion pertaining to the Lamesa Site.

13.0 MINING METHODS

U.S. Silica mines frac sand from a 3,523-acre location in Dawson County, TX approximately 11 miles north-west of the town of Lamesa, TX. The overall deposit is made up of two identifiable units.[7] The first is classified as "Eolian dune sands"[8] (13 to 46 ft. thick) and the second is a "Clayey Cover Sand" (0 to 25 ft. thick). They are part of a large regional geologic unit covering northwest Texas and northeast New Mexico. Eolian dune sand is a known source of silica bearing sands which are recognized as occurring not only in Texas but also in Utah,[9] along the shore of Lake Michigan,[10] the shores of British Columbia,[11] and the Northwest Territories.[12]

U.S. Silica's Lamesa, TX operation began mining and processing finished goods in the third quarter of 2018. The maximum operating capacity of the processing plant is approximately 5.1 M tons per year[13] of finished goods that are destined for the oil and gas completion markets in the Permian Basin. To produce this volume of finished goods, the mine will consume about 6.0 M tons of sand reserves. The plant is well situated near the center of the Permian Basin. The dune sand mined at the Lamesa Site lays in "sheets" of variable thickness. The less variable Clayey Cover Sands are likely unconsolidated clean sands that have been contaminated with clay particles over time.

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7 See Section 6 – Geological Setting, Mineralization and Deposit and in Section 11 – Mineral Resource Estimates.

8 Eolian (or aeolian) sand is sand perceived to be deposited by wind at some time in the past.

9 AAPG Search and Discovery Article #90169©2013 AAPG Rocky Mountain Section 62nd Annual Meeting, Salt Lake City, Utah, September 22-24, 2013.

10 Sargent Sand Company, Ludington MI, https://www.sargentsand.com/about.html.

11 Hickin, A.S., Ferri, Fil, Ferbey, Travis, and Smith, I.R., 2010, Preliminary assessment of potential hydraulic fracture sand sources and their depositional origin, northeast British Columbia: British Columbia Ministry of Energy, Mines and Petroleum Resources Geoscience Reports 2010, p. 35–91.

12 Levson, Vic, Pyle, Leanne, and Fournier, Mike, 2012, Identification of potential silica sand deposits in the Northwest Territories: Northwest Territories Geoscience Office, Northwest Territories Open File 2012-6, p. 76.

13 Running 24 hours per day and 7 days per week and allowing for losses and downtime.

Figure 13.1 shows a typical cross section looking north through the property[14]. It illustrates the relationship of the economic underlying Clayey Cover Sand (orange color) and the economic horizon of Upper Clean Sand (green color). The overlying red color represents estimated waste or "overburden" thicknesses through this cross section. The horizontal nature of the sand deposit and the average thickness of the sand layers favors surface mining by conventional methods. Since the sand is unconsolidated, simple excavation by tracked excavator or front-end loader is sufficient to load haul trucks for transport to the processing plant.

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14 This is a cross section through the approximate middle of the Lamesa property from east to west (see Section 6 and Section 7 for detail).

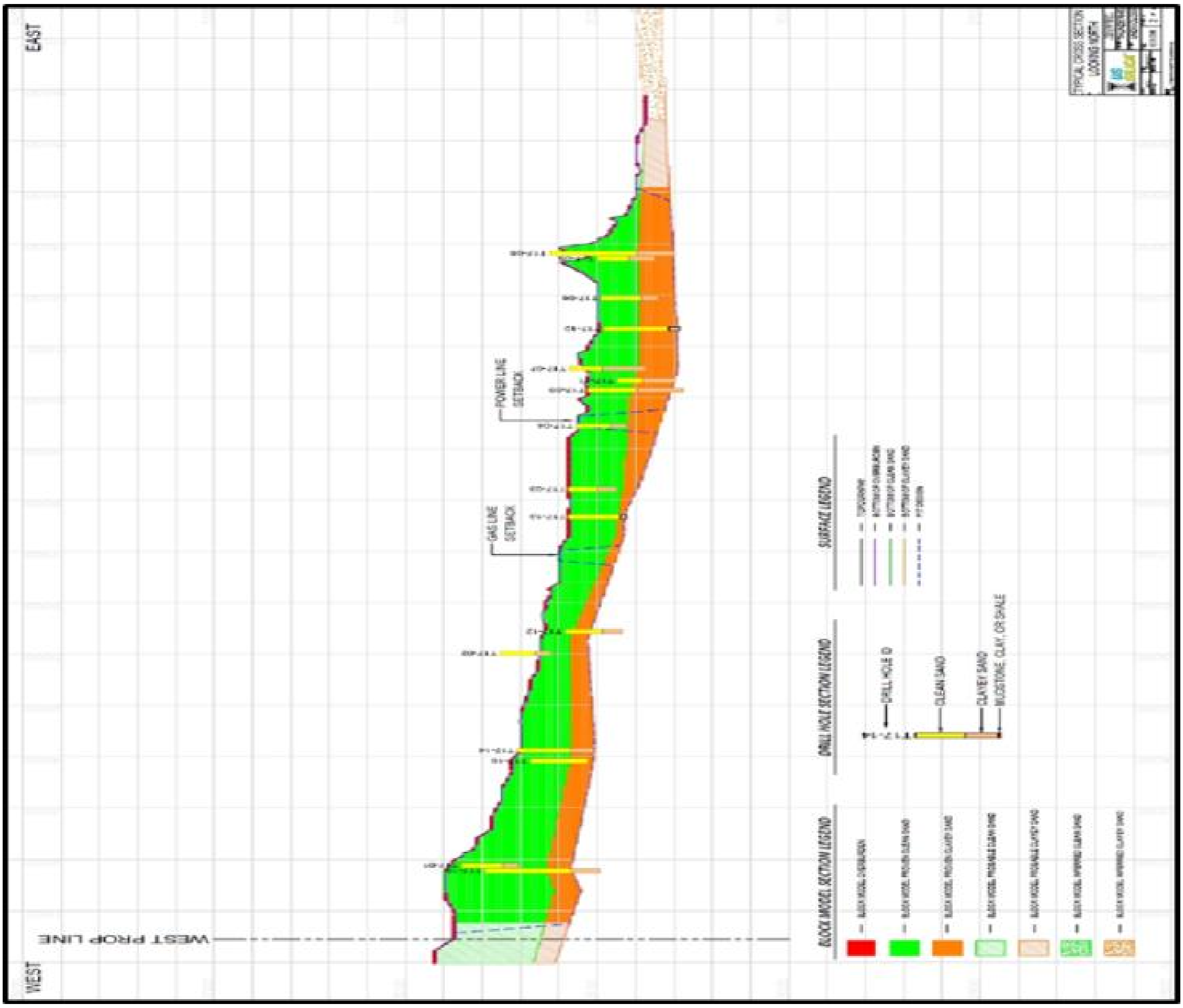

Figure 13.1 – Geologic cross section looking north at the approximate midpoint of the property at Lamesa, TX.

13.1 Clearing, Grubbing and Overburden Removal

The vegetation on the planned mining areas is classified as "Silver Bluestem – Texas Wintergrass Grassland.[15] This type of vegetation is sparse and easily cleared. The practice at Lamesa is to include the overburden and vegetation as part of the mining face with the deleterious portions being removed through processing. This is an efficient and cost-effective method of handling overburden so long as the thickness does not become too excessive. Overburden thicknesses average approximately 1 ft. across the property. Drilling indicates the depth of the overburden to remain in the range where U.S. Silica believes the organic and other deleterious materials can be efficiently removed through processing in the plant throughout the life of the mine.[16]

13.2 Mining Process

The terrain is gently undulating and easily accessible. U.S. Silica utilizes a contractor to excavate the overburden, Upper Clean Sand and the Clayey Cover Sand typically in one "bank."[17] Figure 13.2 shows the mining activity at Lamesa where a front-end loader is digging the sand "bank" and loading the overburden, Upper Clean Sand, and the Clayey Cover Sand into a haul truck for transport to the processing plant. If the total mining thickness exceeds 25 ft., a second bank/bench is developed below the first, and the remaining deposit is removed in a second pass down to the top of the hard, red sand layer pit floor. These two banks may be blended to maximize sand recovery and manage clay waste products transferred to the Wet Processing Plant. Figure 13.3 shows an overall view of the mining process at Lamesa.

The current mining contract runs through 2024 and is based on mining approximately 3,600 K bank-cubic-yards ("BCY") of raw sand annually.[18] However, the contract also allows for an

15 The Vegetation Types of Texas, Texas Parks & Wildlife Foundation, GIS Lab, TPWD, 1984.
16 Email from Terry Lackey of November 18, 2021.
17 A "bank" is a term referencing the economic resource in its natural state before removal by mining.
18 Raw sand includes the Upper Clean Sand, the Clayey Cover Sand, and the overburden when it is not removed separately and hauled to the raw sand stockpile as part of the mining process.

increase in mined volume to meet the demand of finished goods. The volume of bank yards relates to the volume of finished goods by adjusting the volume of finished goods for losses due to plant waste and normal mining losses. These "in-process" losses equate to about 15% of the mined volume hauled to the plant. A further, "swell" adjustment is necessary to get from the "loose" volume in a haul truck to the "bank" volume[19] of the raw sand in the pit. Various estimates for swell of dry sand exist in the literature. They range from 10% swell to 30% swell.[20] A reasonable factor for the material mined at Lamesa is on the low end at 10% due to the unconsolidated and dry nature of the deposit. U.S. Silica is projecting a contract mining rate increase every five years through the life of the mine. Table 13.1 shows the financial parameters for the contracted hauling at Lamesa.

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19 Bank refers to the in-situ volume of the undisturbed sand before it is loaded into the haul truck.

20 Open Pit Mine Planning and Design, John T. Crawford, III and William A. Hustrulid, 1979, p. 294, https://www.projectengineer.net/swell-factors-for-various-soils/, https://www.engineeringtoolbox.com/soil-rock-bulking-factor-d_1557.html, The Alaska DOT 1983 https://www.spikevm.com/calculators/excavation/bulking-swell-factors.php.

Year	Finished Goods Sales (K T)	Stockpiled Volume Hauled (K BYd³)	Mining Rate per Year (K T)	Contract Unit Cost ($/BYd³)	Additional Time and Materials ($ K)	Total Contract Value ($ K)
2018	286	262	354	—	—	—
2019	3,384	3,104	4,191	—	—	—
2020	3,187	2,923	3,947	$ 1.24	$ 500	$ 4,125
2021 Projected	3,618	3,319	4,480	$ 1.28	$ 500	$ 4,748
2022 Projected	3,618	3,319	4,480	$ 1.29	$ 500	$ 4,769
2023 Projected	3,618	3,319	4,480	$ 1.28	$ 500	$ 4,747
2024 Projected	3,618	3,319	4,480	$ 1.28	$ 500	$ 4,762
2025 Projected	3,618	3,319	4,480	$ 1.39	$ 500	$ 5,107
2026 Projected	3,618	3,319	4,480	$ 1.41	$ 500	$ 5,174
2027 Projected	3,618	3,319	4,480	$ 1.43	$ 500	$ 5,239
2028 Projected	3,618	3,319	4,480	$ 1.43	$ 500	$ 5,230
2029 Projected	3,618	3,319	4,480	$ 1.43	$ 500	$ 5,253
2030 Projected	3,618	3,319	4,480	$ 1.55	$ 500	$ 5,639
2031 Projected	3,618	3,319	4,480	$ 1.57	$ 500	$ 5,714
2032 Projected	3,618	3,319	4,480	$ 1.59	$ 500	$ 5,784
2033 Projected	3,618	3,319	4,480	$ 1.59	$ 500	$ 5,769
2034 Projected	3,618	3,319	4,480	$ 1.59	$ 500	$ 5,792
2035 Projected	3,618	3,319	4,480	$ 1.72	$ 500	$ 6,217
2036 Projected	3,618	3,319	4,480	$ 1.75	$ 500	$ 6,295
2037 Projected	3,618	3,319	4,480	$ 1.77	$ 500	$ 6,367
2038 Projected	3,618	3,319	4,480	$ 1.76	$ 500	$ 6,346
2039 Projected	3,618	3,319	4,480	$ 1.77	$ 500	$ 6,365
2040 Projected	3,618	3,319	4,480	$ 1.91	$ 500	$ 6,830
2041 Projected	3,618	3,319	4,480	$ 1.93	$ 500	$ 6,911
2042 Projected	1,224	1,123	1,516	$ 1.95	$ 169	$ 2,363

Table 13.1 Financial parameters for contract hauling.

The haul trucks utilized by the contractor are typically 40 T or 50 T articulating trucks which haul the sand approximately 4,400 ft. to the raw sand stockpiles at the processing plant. The trucks are loaded by front-end loader (8-15 cubic-yard capacity) as shown in Figure 13.2. The contractor currently maintains a fleet of 10 haul trucks which varies depending on the forecast volume to be delivered to the raw sand stockpiles. The contactor employs 15 hourly employees to operate haul trucks, front-end loaders, a water truck, a motor grader, and a dozer.

The contract with U.S. Silica requires the contractor to maintain a 30-day stockpile buffer of raw sand[21] to assure the Wet Processing Plant runs efficiently. The contract is set for renewal at the end of 2024. In the event U.S. Silica and the contractor cannot reach a reasonable renewal or new

21 Or, 400,000 yd³ whichever is smaller.

contract, U.S. Silica can assume the loading and hauling duties itself. The decision for U.S. Silica to buy or lease the required loading and hauling equipment is a financial one. The expertise to perform these unit operations is within the scope of U.S. Silica's expertise.

The move to "in-house" loading and hauling would require a lease or capital investment in equipment and the hiring of mining personnel. There is no material barrier for U.S. Silica to take over from the contractor. Since this type of arrangement is common in both the construction and mining industries, this choice will likely remain a financial one for U.S. Silica. The QP believes the assumption of a contractor arrangement for loading and hauling is a reasonable one for the life-of-mine financial analysis contained in this report.

At the Processing Plant, the contractor's haul trucks deliver the mined sand to one of two large surge piles of raw sand. Once in the raw sand is stockpiled, the mined sand is available for the Wet Processing Plant's front-end loaders to feed the Wet Processing Plant. Figure 13.2 shows the generalized flow of material from the sand bank into the finished goods bins, ready for shipment to the frac sand user.

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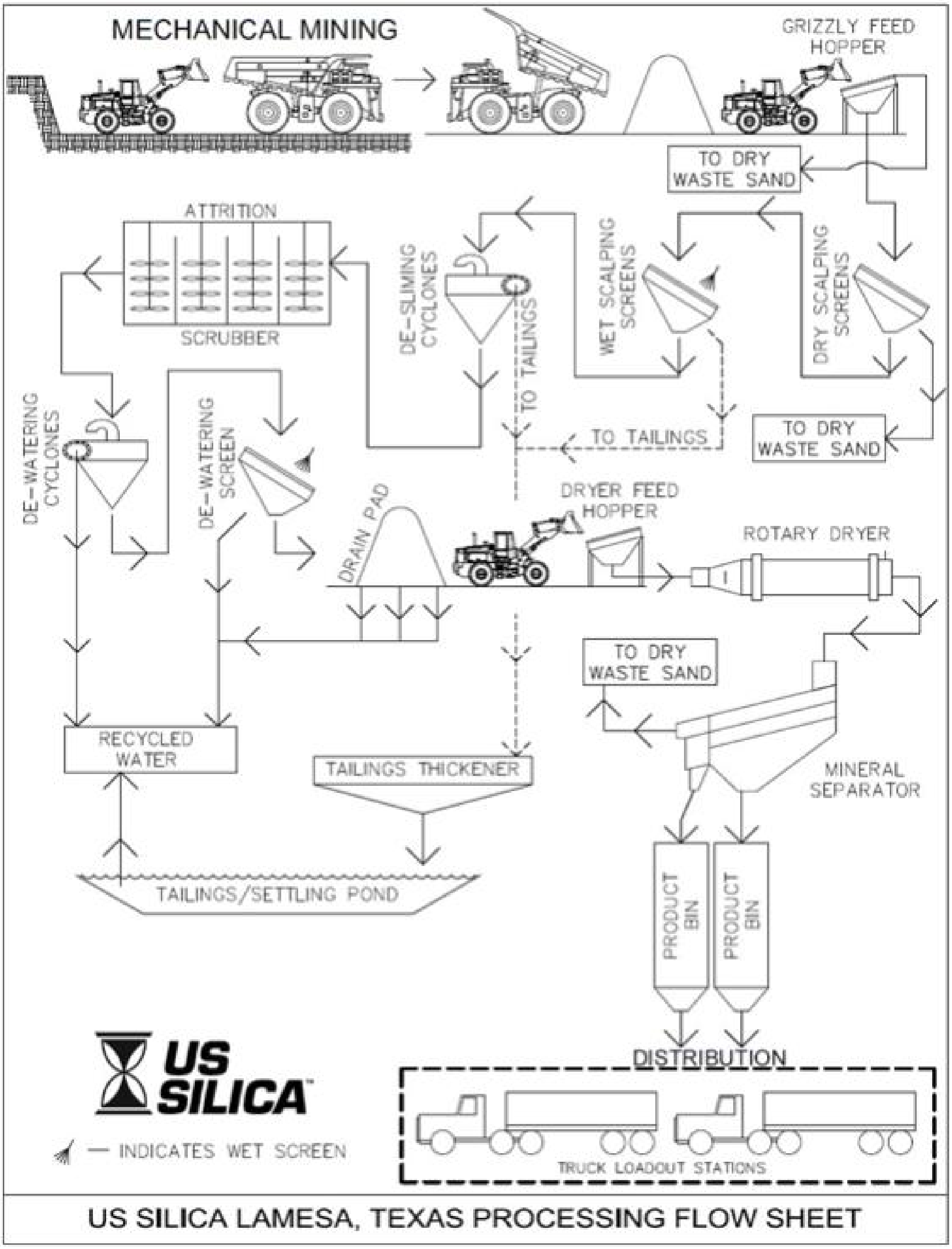

Figure 13.2 Generalized process flow for the Lamesa, TX facility.

Figure 13.3 – Typical mining operation at Lamesa showing a front-end loader excavating the full bank section of overburden, the "Upper Clean Sand," and the Clayey Cover Sand.

13.3 Pit Repair and Maintenance

The loading and hauling are performed on a contract basis and, therefore, the mobile equipment repair and maintenance is handled by the contractor. The costs thereof are included in the fee paid by U.S. Silica during the duration of the contract period.

13.4 Mine Equipment

U.S. Silica contracts for the loading and hauling portion of the operations at Lamesa, TX. No U.S. Silica equipment is currently dedicated to the mine operations. The contractor currently operates the mobile equipment shown in Table 13.2.

Manufacturer	Quanity	Type	Model
Catepillar	1	Front-End Loader	992
Caterpillar	1	Tracked Excavator	349F
Caterpillar	1	Tracked Excavator	349F
Catepillar	1	Dozer	D8T
Catepillar	1	Water Truck	730C
Catepillar	1	Motor Grader	120M
Catepillar	1	Haul Truck	745
Catepillar	1	Haul Truck	740B
Volvo	6	Haul Truck	A60H
Volvo	2	Haul Truck	A45G

Table 13.2 Equipment currently employed by the mining contractor.

13.5 Mine Planning and Production Scheduling

U.S. Silica employs personnel responsible for mine planning and production scheduling. Mine planners provide direction and support to the operating group to ensure proper sequencing of mining activities. These activities include permit compliance, planned sequencing of areas to be mined, preparation of tailings disposal areas and other production needs of the operating group. Mine planning has been undertaken based on the results of drilling and identified economic mining horizons as described in Sections 11.0 Mineral Resource Estimates and Section 12.0 Mineral Reserve Estimates, describing the mineral resources and reserves.

Figure 13.4 shows an overview of the property, mineral resource areas (Areas 1-3), and the existing plant. Figure 13.4 also shows the approximate mined-out area as of November 2021. East of Area 1 there is no Upper Clean Sand which is why the plant was located there.

Figure 13.4 Lamesa, TX location, property and mineable areas.

A high level of detail is not required in the mine planning activity at Lamesa. The deposit is reasonably uniform with no material unconformity or significant risk of intrusive mineralization. With a generally horizontal and unconsolidated sand deposits such as the deposit at this location, the mine planner sequences specific areas, or "blocks" of sand to be moved. Mining advances through these blocks, advancing the active mining bank in the direction prescribed by the planners. Figure 13.2 shows the general advance of the mining, in this case, away from the camera. Normally, the objective is to minimize the haul time.

The mining will continue to progress west, north, and south from the mined-out area in Area 1 to the property-line set-back boundaries (approximately 100 ft. of buffer). Area 2 (Figure 13.4) is separated from Areas 1 and 3 by "no-mining" buffers of 200 ft. due to an access road and a pipeline. On the south side of Area 3 a buffer of 300 ft. by 300 ft. is designated as buffer around a well head. In the southeast of Area 3, there is a diagonal exclusion for a pipeline that traverses the property. Set-backs and exclusions are detailed in Section 3.0 – Property Description and Section 11.0 Mineral Resource Estimates and Section 12.0 Mineral Reserve Estimates dealing with the resource and reserve quantities.

The annual production schedule is determined based on the forecasted sales demand provided by the sales and marketing group. This production schedule is adjusted to produce the targeted annual mining volume by factoring in losses for waste, in-pit uses, etc. Production schedules are then developed to assure adequate feed is provided to the processing plant to meet the finished-goods demand in a timely manner. Table 13.3 shows the estimated production for the next five years.[22] This is achievable with current contractual arrangements in the pit, along with U.S. Silica's equipment and personnel. A projection consistent with this analysis for mine production levels is included for the life-of-mine in the economic analysis section of this report.

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22 211026 – LOM Sustaining Capital Estimates.xlsx and 201130 – Lamesa TX – FINAL – Internal Report; both provided by U.S. Silica.

Year	Finished Goods Sales (K Tons)	Annual Mining Volume (K BYd^3)
2018	286	236
2019	3,384	2,794
2020	3,187	2,631
2021 estimated	3,966	3,274
2022 Projected	5,100	4,211
2023 Projected	6,900	5,697
2024 Projected	5,700	4,706
2025 Projected	6,500	5,366
2026 Projected	6,500	5,366

Table 13.3 Historical and projected mining volumes for Lamesa, TX.

14.0 PROCESSING AND RECOVERY METHODS

Figure 14.1 Aerial photo of the Lamesa, TX U.S. Silica plant.

The U.S. Silica Lamesa plant is located east of the active mining area on the same property as the mine. Construction of the plant began in early 2018 and the first finished goods were produced in late 2018. Figure 13.4 shows the spatial relationship of the mine and the plant. Figure 14.1 shows an aerial photograph of the overall plant area showing the processing plant area shown in Figure 13.4.

The annual production of finished goods at the Lamesa facility is a function of customer demand and the production capacity, by size fraction, of the plant. Total demand and product mix varies relative to economic cycles of end users, technology employed by the well completion companies, and the competitive environment. The plant operating personnel periodically coordinate with the sales group to target a production forecast. The plant at Lamesa has limited flexibility in adapting to fluctuations in the sand sizes which naturally occurs in the deposit. Therefore, the natural mix of sand sizes dictates the mix between individual product classifications produced. The finished goods are sold primarily as two products – 40/70 Mesh and 100-Mesh API / ISO quality frac sands.[23]

For the raw sand from the mine to become an economically salable product, it must be processed through two plants, a Wet Processing Plant and a Dry Processing Plant. After the contractor deposits sand in the raw sand stockpiles on the west side of the plant, it is stored there until it is processed through the Wet Processing Plant by U.S. Silica personnel.

14.1 Wet Processing Plant

To begin wet processing, sand from the raw sand stockpile is picked up by a front-end loader and dumped onto a static grizzly deck. The undersize from the static grizzly is conveyed onto a vibrating dry scalping screen to remove waste. This “dry sand waste” is composed of coarse debris greater than 6-inches in size such as rocks, gravel, clay agglomerates, and organic material from the overburden from the mine. It is stored in a stockpile on the mine site.

23 U.S. Silica Internal Report: Lamesa, TX., 2021.

The material that passes the dry scalping screen is conveyed to the wet scalping screen where wet processing begins. The silica sand material is washed on the screen and any material larger than quarter inch is removed and sent to the tailings circuit. The material finer than quarter inch is combined with water to produce a slurry, which can then be pumped through the remainder of the wet processing operation.

Once in a slurry, the silica sand passes through "desliming[24] cyclones[25]" and attrition scrubber cells. Attrition scrubber cells use a series of rotating paddles to create turbulence in the slurry thereby "scrubbing" or cleaning the silica particles while also liberating individual sand particles which may be agglomerated in "clusters." The action of the paddles removes surface clay, other film, coatings, or slimes from the silica grains. Once the slurry has passed through the scrubber cells, the water is removed by a set of cyclones and de-watering screens. The moisture content of the silica sand at this point is 12% to 20%, and it is moved to a drain pad stockpile where decantation further dries the sand to 5% to 10% moisture. The wet processing of the silica sand can be seen in the plant flow in Figure 13.3.

14.2 Dry Processing Plant

The dry process begins when front-end loaders pick up material from the drain-pad stockpile and load it into one of two dryer feed hoppers (Figure 13.2). From there it is conveyed into one of three rotary dryers, each with rated capacities ranging from 225 to 260 tons-per-hour. After drying, the material is sized across one of eight mineral separators. Oversize from the mineral separators is transported to the dry sand waste stockpile. The finished goods produced from the mineral separators moves to either the API grade 40/70-mesh product silos or the API 100-Mesh product silos until they are loaded into trucks for shipment to the end users.

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24 "Slimes" are fine particles that are detrimental to the recovery of the economic mineral from a mine. "Desliming" is the process of separating that fine detrimental material from the desired economic material. See also: "**ASM Gloss.; ASM Metals Handbook, v.1.** = American Society for Metals. Metals Handbook. Volume 1. Properties and Selection of Metals. Metals Park, Ohio, 8th ed., 1961, 1300 pp. Includes a glossary of Definitions Relating to Metals and Metal working, pp. 1-41."

25 A "cyclone" is a piece of equipment which uses a fluid (air or water) to "spin" particles and use the particle mass to separate the sizes of the particle by centrifugal force.

14.3 U.S. Silica Plant Equipment – Mobile

U.S. Silica uses primarily leased mobile equipment in the plant area. A list of the plant mobile equipment currently utilized at Lamesa is shown in Table 14.1. The decision to lease versus purchase is made by the corporate financial group. Repair and maintenance activity is accomplished by a combination of U.S. Silica personnel and outside contractors. Plant mobile equipment mechanical availability generally averages about 85 %. This availability is high enough to maintain the production requirements represented in the financial analysis portion of this report.

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Manufacturer	Type	Model	Year	Owned/ Leased	Monthly Lease Cost
Kenworth T880 Guzzler	Vacuum Truck	T880	2018	Leased	$ 10,072
International	Water Truck	7400	2018	Leased	$ 3,506
Genie	Scossor Lift	SX125D546		Leased	$ 4,604
Catepillar	Front-End Loader	988K	2018	Leased	$ 13,937
Catepillar	Track Loader	259D	2018	Leased	$ 605
Catepillar	Track Loader	259D	2018	Leased	$ 605
Catepillar	Front-End Loader	988K		Leased	$ 13,807
Catepillar	Front-End Loader	988K		Leased	$ 13,937
Catepillar	Front-End Loader	988K		Leased	$ 13,807
Catepillar	Front-End Loader	988K		Leased	$ 13,807
Caterpillar	Front-End Loader	938		Leased	$ 3,556
Caterpillar	Front-End Loader	988K		Leased	$ 20,931
Caterpillar	Front-End Loader	988K		Leased	$ 20,932
JLG	Boomlift	600SC		Leased	$ 2,960
JLG	Skytrak Forklift	10042		Leased	$ 3,164
JLG	Skytrak Forklift	10042	2017	Leased	$ 3,009
Catepillar	Articulated Haul Truck	745		Leased	$ 13,596
Catepillar	Articulated Haul Truck	745		Leased	$ 19,596
Volvo	Articulated Haul Truck	A40G	2014	Leased	$ 2,433
Catepillar	Front-End Loader	988H		Owned	
Genie	Manlift	S40		Owned	
Doosan	Forklift			Owned	
Takeuchi	Mini Excavator			Owned	

Table 14.1 Plant equipment at the U.S. Silica Lamesa, TX facility.

The Wet Processing Plant and the Dry Processing Plant capacities are designed to complement one another. Some limited volumes of “wet” products are currently manufactured for sale at Lamesa. The capacity of the processing plants at Lamesa is limited by drying capacity or screening capacity in the mineral separators. The plant can operate 365 days per year, and currently, it is operating 24 hours per day. Table 13.3 shows the yearly production history and a forecast for the next five years for the production at Lamesa. Based on finished goods production from prior years, this plant production is achievable with current plant equipment and plant personnel. A projection consistent with this analysis for total sales volume is included for the life of mine in the financial analysis section of this report.

14.4 Plant Manning

As of December 31, 2021, the U.S. Silica Lamesa hourly workforce totaled 98 hourly and 15 salaried employees.

15.0 INFRASTRUCTURE

The U.S. Silica Lamesa location has been operating in this location since 2018. The mine and plant have been capable of adequately supplying the markets they serve while maintaining a social license to operate in the Lamesa, TX community. The infrastructure required to maintain a sustainable presence in this generally rural local community is in place. The infrastructure required for current and limited future ramp-up of operations to nameplate capacity is in place. Certain capital expenditures are required as needed for replacements due to age of depreciating assets. Other expansion capital (including additional incremental investment to maintain capacity) is minimal. Capital expenditures are discussed below and in Section 18.

15.1 Roads

Lamesa is accessible by roads maintained as private roads and by County and State roads. Road access is critical for the delivery of materials used in the production of finished goods and for shipment of finished goods to U.S. Silica customers. The plant and mine have access to roadways rated for the loads to be shipped to and from the facility. Figure 15.1 shows the access to the Lamesa Site (red and green lines) for truck haulage of finished goods.

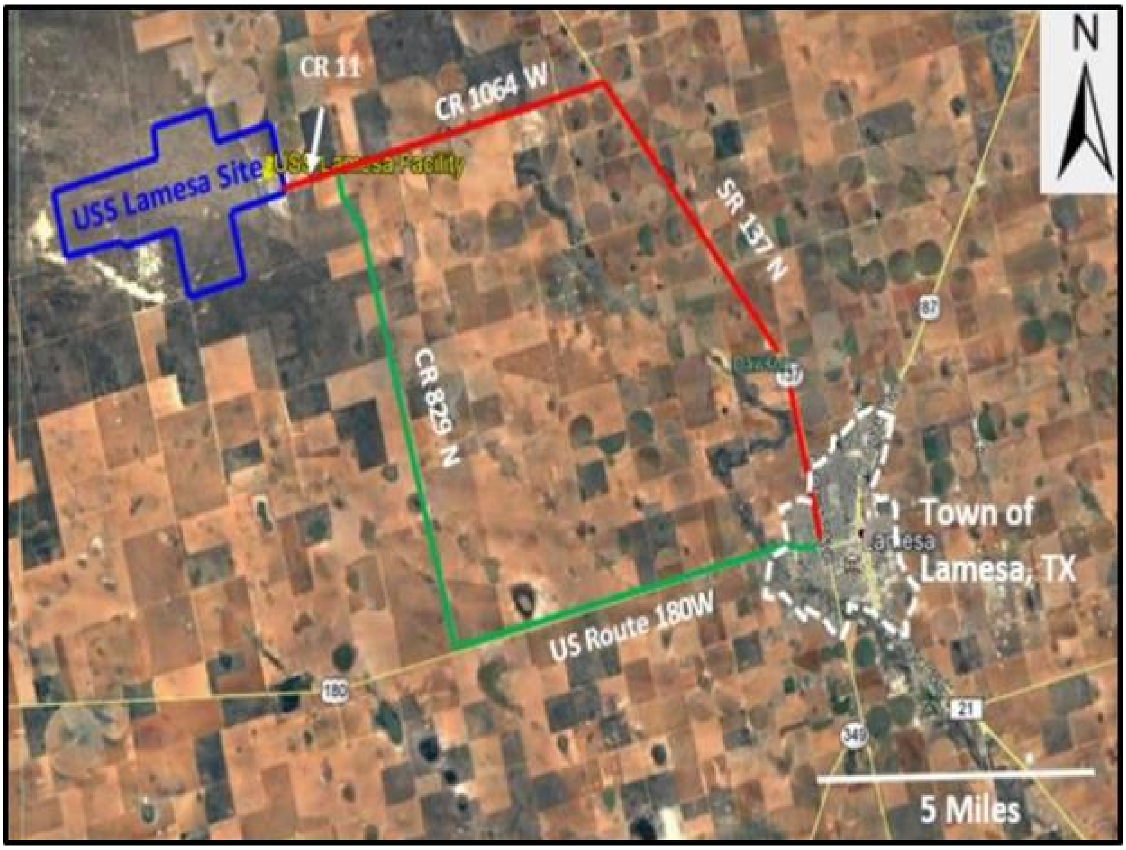

Figure 15.1 - Roadways linking the Lamesa, TX location to the end-user market.

15.2 Rail

There is no rail infrastructure at the Lamesa Site. The railroads currently serving the Permian Basin include BNSF Railway Co., Union Pacific railroad, Gardendale Railroad Inc., the Texas-New Mexico Railroad, Lubbock & Western (West Texas & Lubbock Railway) and Texas-Pacifico Transportation Ltd.[26] The nearest rail operations to the Lamesa Site are the Lubbock & Western in Brownfield, TX and the Plainsman Switching Company in either Post, TX or Lubbock, TX.[27] Any connection to rail would likely be by transload in Lubbock. There are currently no plans to connect to rail.

26 Progressive Railroading, December 2014, Rail News: Rail Industry Trends In the Permian Basin and Eagle Ford Shale, crude's boom is the overriding theme.

27 Texas Rail map of 2016.

15.3 Electric Power

The Lamesa plant uses electric power provided through Lyntegar Electric Cooperative, Inc.[28] Lyntegar is rural electric cooperative financed by the National Rural Utilities Cooperative Finance Corporation[29]. Further, Lyntegar is a member of Golden Spread Electric Cooperative, Inc.[30] Lyntegar receives transmission and other services from Golden Spread. Power is purchased by Lyntegar from Golden Spread. Lyntegar constructed the substation on the U.S. Silica property to be able to provide the electric power distribution to the plant.

Power is transmitted to the plant through an above-ground network of pole lines generally running along CR 9, about one mile north of the Lamesa property, and then south along County Road C to the plant substation on the east side of the property. From the substation, the electric power is distributed by a combination of buried and overhead lines.

Lyntegar is allowed to recover their costs for capital construction according to the Rate Schedule under which power is sold. Lyntegar is allowed to adjust its rates from time to time during the term of the agreement with U.S. Silica. The term ends in 2024. There is no automatic extension provision in the contract. U.S. Silica has a history of reliable electric power supply since the plant started operating in 2018. The contracted capacity exceeds the projected demand at peak frac sand production by eighty-two percent.[31]

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28 Lyntegar Power Utility is a Texas electric cooperative corporation distributing power in eleven counties in west Texas and Lyntegar.

29 The National Rural Utilities Cooperative Finance Corporation is a member-owned non-profit owned by an agglomeration of electric cooperatives in the United States. They provide financing to help promote rural development and support electric power infrastructure distribution systems.

30 Golden Spread Electric Cooperative, Inc. is a not-for-profit generation and transmission cooperative organized in 1984 to provide electric power to its 16 Member cooperatives.

31 U.S. Silica "Lamesa – Summary Statement – Electric Power," Adam Rodriguez, October 11, 2021.

15.4 Natural Gas

Natural gas is used as a fuel for drying the silica sand in the plant. The gas is currently supplied by West Texas Gas Marketing, Inc.[32] West Texas Gas delivers gas through its pipeline from the interconnect with Oneok WesTex Pipeline in Dawson County, Texas.[33] The term of the contract with West Texas Gas generally runs from year to year. Pricing is determined at the beginning of the term and has no limitations on quantity.

The natural gas is delivered to the plant via underground pipeline that runs along County Road 1064 (Figure 15.1). Gas is distributed into the plant through various underground pipelines. West Texas Gas Marketing, Inc. has been a reliable supplier of natural gas since the plant started operation in 2018. In the opinion of the QP the risk of material interruption of the supply of natural gas is low. The highest risk relative to natural gas is real cost escalation of the gas supply without a long-term contract.

15.5 Water

Water is a critical commodity for U.S. Silica's Lamesa plant. Water is used to wash the silica grains, sizing the sand, creating a slurry of the tailings discharge, dust control, grey-water sanitation, and site clean-up activities. Make-up water[34] is provided by purchase agreements with two local ranches and from four, U.S. Silica-owned, water wells. There is no public utility capable of providing water to the Lamesa location. Potable water for human consumption is provided by purchasing bottled water from a local vendor.

32 Texas Gas Marketing, Inc was formed in 1996 and is a downstream gas marketing company that aggregates natural gas supply and markets this supply through transportation agreements with other pipelines.
33 Oneok WesTex is a midstream service provider of natural gas accessing production areas in the Mid-Continent region.
34 Make-up water is water added to the recycled water to provide adequate quantity for the production of the finished goods.

Water is recycled from the processing plant through the thickener and the tailings pond settling process (Figure 14.1). Clarified water from the tailings pond is reintroduced into the process through a pump on the south side of the settling pond. The processing at Lamesa requires approximately 60 gallons of make-up water per ton per ton of finished goods sold. This equates to 600 to 700 gpm of make-up water required at a 6 M tons per year of finished goods production rate.[35] This make-up water requirement includes dust control, sanitation, and clean-up activities.

The distribution of slurry and process water relies on pump stations and a network of high density polyethylene ("HDPE") pipelines on the property. Maintenance of pumps, pump stations, and pipelines is a vital component in the process of producing finished goods and cost control. Lamesa maintenance personnel routinely monitor the condition of the slurry distribution system and recycle water lines. They perform routine maintenance as required.

Water rights in Texas depend on whether the water is groundwater or surface water. In most cases, groundwater belongs to the landowner and is governed by the rule of capture. Surface water belongs to the State of Texas. The rule of capture would grant U.S. Silica the right to pump and capture the water beneath its property, regardless of the effects of that pumping on neighboring wells. As a result, additional wells could be drilled to mitigate the risk of the loss of one of the contract agreements, so long as there is capacity to produce additional water from the ground water beneath the U.S. Silica property. U.S. Silica believes any risk of the lack of water could be mitigated by the permitting and construction of an additional high capacity well.

The four owned wells on the Lamesa Site have a combined capacity of 200 to 250 gpm, on average.[36] Between 450 and 500 gpm are then required from additional sources. U.S. Silica has contracted with J&G Hogg, LLC, and Jacob Teichroeb to provide up to 1,000 gpm, each, if necessary. The contracts for purchasing water provide for the supply of water from the wells so long as U.S. Silica remains operational. U.S. Silica is responsible for annual payment amounts, per-gallon fees, a portion of the electrical service fees, and 50% of the maintenance costs for the wells.

35 U.S. Silica "Lamesa – Summary Statement – Water," Adam Rodriguez, October 11, 2021.
36 U.S. Silica "Lamesa – Summary Statement – Water," Adam Rodriguez, October 11, 2021.

15.6 Tailings Handling and Disposal

The mined silica sand contains components that are unable to be sold and are therefore considered a byproduct, or “waste,” from the production of finished goods. This waste is largely the very fine silica sand particles and non-silica mineralization contained within the mined sand layers and the overburden. This waste is removed from the production streams as fine sand and silt suspended in the process water. Waste is removed from the process water which is then recycled back to the mine and plant for use as slurry water and process water as needed.

The method U.S. Silica utilizes to remove the waste from the process water is an industry standard method of “settling” the fines out of the water in a series of tailings (settling) ponds (Figure 14.1). The very fine particles in the water are allowed to settle by gravity, thereby clarifying the water carrying the particles. The ponds must have a large enough surface area to allow for the time necessary for settlement. The depth of the pond determines the capacity for storage of the sediment. [37] Therefore, U.S. Silica must provide for ongoing construction of new pond surface area and depth for the ponds to maintain the required storage area for the waste that will be produced over life of the mine.

U.S. Silica must maintain a “fresh” water pond so that water can be stored after processing through the tailings ponds. Currently this is provided by the westerly pond in Figure 14.1 where clarified water is recovered for reuse. Additional area is available for construction of additional storage either in the mined-out areas of the pit or on other property not suitable for mining or required for plant operations. A projection of adequate capital spending and operating cost impacts, consistent with pond construction and plant processing levels is included for the life of mine in the financial analysis section of this report.

37 Erosion and Sediment Control Handbook, Steven J. Goldman, Katharine Jackson, and Taras A. Bursztynsky, McGraw-Hill, 1986, pp. 8-13.

15.7 Buildings

The existing buildings are adequate for the purposes for which they are utilized. The facility has offices holding administrative, engineering, and administrative staff. Several buildings house the plant maintenance and support facilities (see Figure 14.1). All structures were new in 2018 and appear to be well maintained.

16.0 MARKET STUDIES AND CONTRACTS

U.S. Silica produces frac sand that is used in the hydraulic fracturing process – a completion method used by oil and gas companies to extract natural gas, natural gas liquids, and oil from unconventional, low permeability reservoirs such as shale.

Frac sand is a naturally occurring, high-purity crystalline silica (quartz) sand that is very hard, of uniform size, and has clean, well-rounded grain shapes. These mineral characteristics create a unique sand that is both durable and high strength – giving it resistance to being crushed. Pressure injection of frac sand into the fractures of a hydrocarbon-bearing shale formation act to "prop" open the rock micro-fractures after pressure is released – hence the name "proppant."

Two fine-grained frac sand products are manufactured at the Lamesa plant – an API standard 40/70 sized-product, and a non-API 100-Mesh (50/140) sized product.

16.1 General Marketing Information

U.S. Silica believes that the average annual US LAND consumption of frac sand is approximately 99 million tons. U.S. Silica owns and operates two regional, hydraulic fracturing sand production facilities in the West Texas, Permian Oil Basin. The largest of these two plants, the Lamesa, TX facility, became operational in the third quarter of 2018. The Lamesa facility has an annual production capacity of 6 million tons. The site is comprised of a large, mechanized surface mining operation that supplies raw ore to the fully automated, state-of-the-art processing plant.

U.S. Silica customers in the Oil & Gas Proppants end market include major Oilfield Services companies and Exploration and Production ("E&P") companies that are engaged in hydraulic fracturing. As of December 31, 2021, US, Silica has a range of minimum purchase supply agreements with customers in the Oil & Gas Proppants segment with initial terms spanning through 2034.

16.1.1 Frac Sand Market

U.S. Silica operates in a highly competitive market that is characterized by a small number of large, national frac sand producers and a larger number of small, regional, or local, privately-owned producers. Competition in the industry is based on price, consistency and quality of product, site location, distribution capability, customer service, reliability of supply, breadth of product offering and technical support. The Lamesa facility's substantial on-site product storage silo capacity and its strategic, in-basin location allows shipment of regional sands by truck. Because transportation costs are a significant portion of the total cost to customers of Oil & Gas Proppants, development of the Lamesa, TX plant as a regional frac sand facility in the Permian Oil Basin allows U.S. Silica to compete against frac sand products being shipped from distant states like Wisconsin, Illinois, and Missouri.

In 2020, the average selling price ("ASP") was $22.00 per ton. In 2021, the ASP dropped to $18.00 per ton. The QP believes the US LAND price forecast for U.S. Silica products will remain flat in the near-term. In the long-term, the QP believes that US LAND price forecast will increase from an average selling price of $18.00 per ton in 2021 to $22.10 per ton in 2030. Therefore, it is reasonable to assume that pricing will sustain and appreciate at 2% per annum thereafter for the life of mine. See Table 19.1 for the projected ASP over the life of mine.

16.2 Material Contracts Required for Production

There are no material contracts required for production.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, PLANS, NEGOTIATIONS OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Existing Environmental Permits, Plans, and Authorizations

The Lamesa Site is primarily environmentally regulated by Texas Commission on Environmental Quality (the "TCEQ"). However, the State of Texas does not require a mining permit to extract material. A third-party review of environmental plans, permits, and requirements of the Lamesa Site and processing plant was performed. A summary of findings is included below based on current regulatory research and documents provided by U.S. Silica.

Item	Regulatory Authority	Area Covered	Status
Phase I ESA	N/A	Lamesa Site	Complete
IHW Registration	TCEQ	Lamesa Site	Approved
PST Registration	TCEQ	Fuel Tank	Approved
Air Permit	TCEQ	Processing Plant	Approved
Stormwater Discharge Permit & SWPPP	TCEQ	Lamesa Site	Approved
APO Registration	TCEQ	Lamesa Site	Approved

Table 17.1 Permitting Summary for Lamesa.

A Phase I Environmental Site Assessment ("ESA") according to scope and limitations of ASTM Practice E2247-16 of the mine property dated March 31, 2017, was conducted by Talon LPE. The assessment included observation and/or historical records of one producing oil well, three separate crude pipelines, two separate natural gas pipelines with potential subsurface leaks, several plugged and abandoned oil and gas well locations, evidence of a historic oil and gas produced water pond, three abandoned water wells, four active water wells, and evidence of a historic release of crude oil within a pipeline adjacent to the property.

According to the environmental records search, no releases of hazardous substances or petroleum products had been reported at the property as of the date of the ESA report. The assessment revealed evidence of recognized environmental conditions in connection with the property, specifically, historical releases of petroleum and/or natural gas which pose a threat to the subsurface and groundwater, and historic land disposal of produced water which has the potential to impact groundwater. Talon LPE recommended further investigation to determine the extent of environmental concern.

17.2 State Requirements

U.S. Silica maintains an Industrial Hazardous Waste ("IHW") Solid Waste Registration (#97503) with the TCEQ which covers cleanup of hydraulic or lubricating oils from mobile equipment, including petroleum contaminated solids, and general plant and employee generated trash. A Petroleum Storage Tank ("PST") registration #89889 is held by O'Rourke Distribution Company, Inc. for a double walled fuel tank used to fuel mobile excavation equipment on site.

U.S. Silica received air permit authorization (Permit Number 151650) from the TCEQ on September 6, 2018, for air emissions from the processing plant and associated equipment. The special conditions of the permit allow for certain visible emissions at specific opacity. Annual and hourly throughput rates are listed as confidential, and the facility is authorized to operate up to 8,760 hours per year. Quarterly visible emissions and visible fugitive emissions determinations are required, and ambient air monitoring and/or other testing must be performed upon request of the TCEQ executive or regional director.

U.S. Silica maintains an annual Aggregate Production Operation ("APO") registration through the TCEQ.

In the State of Texas, reclamation and/or remediation is not required for aggregate surface mining operations. U.S. Silica has not developed a reclamation/remediation or mine closure plan. There are no existing agreements, plans, or negotiations between U.S. Silica and local individuals or groups.

17.3 Federal Requirements

Stormwater from the Lamesa Site is authorized to leave the site according to stipulations outlined in the Stormwater Multi-Sector General Permit (“MSGP”) TXR05EB75. U.S. Silica maintains a Stormwater Pollution Prevention Plan (“SWPPP”) as a requirement of the MSGP which outlines the treatment measures and best management practices used on site to maintain stormwater discharges within the permit limitations.

Per a determination made by Mark J. Krumenacher, P.G. of the GZA company dated September 4, 2018, there is no surface water mapped within approximately four miles of the plant and there is no feasible way for an oil release at the Lamesa Plant to reach a jurisdictional water of the US.

18.0 CAPITAL AND OPERATING COSTS

Capital and operating costs discussed in this section were developed utilizing current and historic cost data from continuous and ongoing operation of the facility, first principles, vendor and contractor quotations, and similar operation comparisons.

18.1 Operating Cost

Total operating costs incurred at the Lamesa Site from 2020 through 2021 are provided in Table 18.1. Costs include, but are not limited to, mining equipment, plant/shipping, wages and premiums, maintenance materials, and power.

The average cost of sales was $10.23 per ton in 2020 and $10.16 per ton in 2021. Headcount increased from 2020 to 2021 with 66 hourly and 11 salaried employees in 2020 and 98 hourly and 15 salaried employees in 2021.

Capital Costs	
2020	$ 3,510,000
2021	$ 159,000

Operating Costs	
2020	$32,594,000
2021	$38,061,000

Table 18.1 Summary of Capital and Operating Costs: 2020-2021.

18.2 Capital Costs

The average annual capital expenditure since 2020 at the Lamesa Site is $1,834,500, with $3,510,000 in 2020 and $159,000 in 2021 (Table 18.1). The higher-than-average capital spend in 2020 was associated with scheduled maintenance and continuous improvement projects to drive and maintain cost efficiencies.

A summary of foreseen capital expenditures through 2026 is provided in Table 18.2. As shown in Table 18.2, total estimated capital expenditure through 2026 is $829,000 and primarily includes routine maintenance and continuous improvement projects to drive cost and capacity efficiencies.

Listed expenditures are based on historic cost data, vendor/contractor quotations, and similar operation comparisons and are within +/-15% level of accuracy. There are risks regarding the current capital costs estimates through 2026, including escalating costs of raw materials and energy, equipment availability and timing due to either production delays or supply chain gaps.

Projected Capital Expenditures		
2022	$	161,000
2023	$	163,000
2024	$	166,000
2025	$	168,000
2026	$	171,000

Table 18.2 Summary of Projected Capital Site Expenditures: 2022-2026.

18.3 Assumptions

The capital projects are assumed to be constructed in a conventional Engineering, Procurement and Construction Management ("EPCM") format. U.S. Silica routinely retains a qualified contractor to design projects and act as its agent to bid and procure materials and equipment, bid and award construction contracts, and manage the construction of the facilities.

18.4 Accuracy

The accuracy of this estimate for those items identified in the scope-of work is estimated to be within the range of plus 15% to minus 15%; i.e., the cost could be 15% higher than the estimate or it could be 15% lower. Accuracy is an issue separate from contingency, the latter accounts for undeveloped scope and insufficient data (e.g., geotechnical data).

19.0 ECONOMIC ANALYSIS

19.1 Operating Costs

An economic model was created for the Lamesa Site to provide validation of the economic viability of the estimated reserve for the life of mine until 2037. The following are the key assumptions for the base case scenario:

- Proven and Probable Tons of 92,478,000 as of December 31, 2021

- Revenue Growth of 2%
- Tons Growth of 2%
- Costs of Goods Sold Growth of 2%
- Selling, General, and Administrative Expenses Growth of 2%
- Capital Expenditures Growth of 2%
- Inflation Rate of 2%
- Tax Rate of 26%
- Discount Rate of 8%
- Net Working Capital Reinvestment Rate of 25%
- Site Yield of 77%

The QP used budgeted 2021 costs as the benchmark for which to model operating costs throughout the life of mine and applied future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

The QP based the ASP for 2022 on the ASP trends in 2021. The QP then applied a 2% per annum increase from the 2021 ASP through the life of mine. Based on ASP trends of 2021, the QP believes that 2% per annum growth rate is a reasonable method for a base case scenario. For additional information on the ASP, see “Section 16.1.1— Frac Sand Market.”

19.2 Capital Costs

As an ongoing project that is in production and profitable, the QP projected capital expenditures to grow by 2% per annum based on the property’s age and recent major improvements. The QP included optional capital expenditures that will be deployed as required to increase or maintain the capacity of the plant.

19.3 Economic Analysis

The financial evaluation of the project comprises the determination of the net present value (“NPV”) at a discount rate of 8%, the internal rate of return (“IRR”) and payback period (time in years to recapture the initial capital investment). Annual cash flow projections are estimated over the life of the mine based on the estimates of capital expenditures and production cost and sales revenue.

Review of the base case model indicates that the project has an IRR of 16%, a payback period of 0.30 years, and an NPV of $69,688,000. The Economic Feasibility Model (Table 19.1.1) was modeled on the basis of historical operational costs and future site investment escalations that are consistent with demonstrated plant maintenance history and robust enough to cover future mine and production changes.

19.4 Sensitivity Analysis

The QP assessed sensitivity of key variables, including reduction in expected selling price, increased capital expenses and associated depreciation, and operating costs. To assess these variables, the QP created moderate and upside models where the following variables were increased by the percentages listed in Table 19.2:

- Average Selling Price Growth
- Tons Growth
- Costs of Goods Sold Growth
- Selling, General, and Administrative Expenses Growth
- Capital Expenditures Growth
- Inflation Rate
- Inflation Adjusted Discount Rate
- Site Yield

The NPV of the project is null when the 2022 average selling price is reduced to approximately $15.29/ ton.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Reserve Balance Tons (000)		94,634	92,478	87,786	83,000	78,119	73,139	68,061	62,880	57,596	52,207	46,709	41,102	35,382	29,548	23,598	17,528	11,337	5,022
Mined Tons (000)		4,166	4,692	4,786	4,882	4,979	5,079	5,180	5,284	5,390	5,497	5,607	5,720	5,834	5,951	6,070	6,191	6,315	5,022
Sold Tons (000)		**3,187**	**3,691**	*3,661*	*3,734*	*3,809*	*3,885*	*3,963*	*4,042*	*4,123*	*4,206*	*4,290*	*4,375*	*4,463*	*4,552*	*4,643*	*4,736*	*4,831*	*3,842*
R/S Ratio		3.4%	4.0%	5.5%	5.9%	6.4%	6.9%	7.6%	8.4%	9.4%	10.5%	12.0%	13.9%	16.5%	20.1%	25.7%	35.3%	55.7%	100.0%
ASP (Selling Price)		***$ 22***	***$ 18***	*$ 18.8*	*$ 19.2*	*$ 19.6*	*$ 20.0*	*$ 20.4*	*$ 20.8*	*$ 21.2*	*$ 21.6*	*$ 22.1*	*$ 22.5*	*$ 22.9*	*$ 23.4*	*$ 23.9*	*$ 24.3*	*$ 24.8*	*$ 25.3*
ACS (Cost of Sale)		***$ 10***	***$ 10***	*$ 10.5*	*$ 10.7*	*$ 10.9*	*$ 11.2*	*$ 11.4*	*$ 11.6*	*$ 11.8*	*$ 12.1*	*$ 12.3*	*$ 12.6*	*$ 12.8*	*$ 13.1*	*$ 13.3*	*$ 13.6*	*$ 13.9*	*$ 14.2*
Rev		**$69,644**	**$68,108**	$68,903	$71,686	$74,582	$77,595	$80,730	$83,992	$87,385	$90,915	$94,588	$98,410	$102,386	$106,522	$110,825	$115,303	$119,961	$97,319
Cost of Sale		**$32,594**	**$38,061**	$38,504	$40,060	$41,678	$43,362	$45,114	$46,937	$48,833	$50,806	$52,858	$54,994	$ 57,215	$ 59,527	$ 61,932	$ 64,434	$ 67,037	$54,384
CM		**$37,051**	**$30,048**	**$30,398**	**$31,626**	**$32,904**	**$34,233**	**$35,616**	**$37,055**	**$38,552**	**$40,110**	**$41,730**	**$43,416**	**$ 45,170**	**$ 46,995**	**$ 48,894**	**$ 50,869**	**$ 52,924**	**$42,935**
Change in CM		$ —	$ (7,003)	$ 350	$ 1,228	$ 1,278	$ 1,329	$ 1,383	$ 1,439	$ 1,497	$ 1,558	$ 1,620	$ 1,686	$ 1,754	$ 1,825	$ 1,899	$ 1,975	$ 2,055	$ (9,989)
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$37,051**	**$30,048**	**$30,398**	**$31,626**	**$32,904**	**$34,233**	**$35,616**	**$37,055**	**$38,552**	**$40,110**	**$41,730**	**$43,416**	**$ 45,170**	**$ 46,995**	**$ 48,894**	**$ 50,869**	**$ 52,924**	**$42,935**
D&A		**$18,463**	**$19,774**	$19,119	$19,446	$19,283	$19,365	$19,324	$19,344	$19,334	$19,339	$19,336	$19,338	$ 19,337	$ 19,337	$ 19,337	$ 19,337	$ 19,337	$19,337
EBIT		**$18,588**	**$10,274**	**$11,280**	**$12,180**	**$13,621**	**$14,869**	**$16,293**	**$17,711**	**$19,219**	**$20,771**	**$22,394**	**$24,079**	**$ 25,833**	**$ 27,658**	**$ 29,557**	**$ 31,532**	**$ 33,587**	**$23,598**
Taxes		$ 4,833	$ 2,671	$ 2,933	$ 3,167	$ 3,542	$ 3,866	$ 4,236	$ 4,605	$ 4,997	$ 5,400	$ 5,822	$ 6,260	$ 6,717	$ 7,191	$ 7,685	$ 8,198	$ 8,733	$ 6,135
Operating Income		**$13,755**	**$ 7,602**	**$ 8,347**	**$ 9,013**	**$10,080**	**$11,003**	**$12,057**	**$13,106**	**$14,222**	**$15,371**	**$16,572**	**$17,818**	**$ 19,117**	**$ 20,467**	**$ 21,872**	**$ 23,334**	**$ 24,854**	**$17,462**
Plant Capex		**$ (3,510)**	**$ (159)**	$ (161)	$ (163)	$ (166)	$ (168)	$ (171)	$ (173)	$ (176)	$ (179)	$ (181)	$ (184)	$ (187)	$ (190)	$ (193)	$ (195)	$ (198)	$ (201)
Total Capex		**$ (3,510)**	**$ (159)**	**$ (161)**	**$ (163)**	**$ (166)**	**$ (168)**	**$ (171)**	**$ (173)**	**$ (176)**	**$ (179)**	**$ (181)**	**$ (184)**	**$ (187)**	**$ (190)**	**$ (193)**	**$ (195)**	**$ (198)**	**$ (201)**
Change in NWC		$ —	$ —	$ (88)	$ (307)	$ (319)	$ (332)	$ (346)	$ (360)	$ (374)	$ (389)	$ (405)	$ (421)	$ (439)	$ (456)	$ (475)	$ (494)	$ (514)	$ —
Net Income		$10,245	$ 7,444	$ 8,098	$ 8,543	$ 9,595	$10,502	$11,540	$12,573	$13,671	$14,802	$15,985	$17,213	$ 18,491	$ 19,821	$ 21,205	$ 22,644	$ 24,142	$17,261
FCF	**$ (183,500)**	**$28,708**	**$27,218**	**$27,217**	**$27,989**	**$28,877**	**$29,867**	**$30,864**	**$31,917**	**$33,005**	**$34,141**	**$35,321**	**$36,550**	**$ 37,828**	**$ 39,158**	**$ 40,542**	**$ 41,981**	**$ 43,479**	**$36,598**

Table 19.1.1 Economic Feasibility Base Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.2 above, there are no royalties or other associated payments specific to Lamesa.

(2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Reserve Balance Tons (000)		94,634	92,478	87,786	82,906	77,831	72,554	67,065	61,356	55,419	49,245	42,824	36,145	29,200	21,977	14,465	6,652
Mined Tons (000)		4,166	4,692	4,880	5,075	5,278	5,489	5,709	5,937	6,174	6,421	6,678	6,945	7,223	7,512	7,813	6,652
Sold Tons (000)		**3,187**	**3,691**	*3,879*	*4,035*	*4,196*	*4,364*	*4,538*	*4,720*	*4,909*	*5,105*	*5,309*	*5,522*	*5,742*	*5,972*	*6,211*	*5,289*
R/S Ratio		3.4%	4.0%	5.6%	6.1%	6.8%	7.6%	8.5%	9.7%	11.1%	13.0%	15.6%	19.2%	24.7%	34.2%	54.0%	100.0%
ASP (Selling Price)		***$ 22***	***$ 18***	*$ 19.2*	*$ 20.0*	*$ 20.8*	*$ 21.6*	*$ 22.4*	*$ 23.3*	*$ 24.3*	*$ 25.3*	*$ 26.3*	*$ 27.3*	*$ 28.4*	*$ 29.5*	*$ 30.7*	*$ 32.0*
ACS (Cost of Sale)		***$ 10***	***$ 10***	*$ 10.6*	*$ 10.9*	*$ 11.3*	*$ 11.6*	*$ 12.0*	*$ 12.3*	*$ 12.7*	*$ 13.1*	*$ 13.5*	*$ 13.9*	*$ 14.3*	*$ 14.7*	*$ 15.1*	*$ 15.6*
Rev		**$69,644**	**$68,108**	$74,440	$80,514	$87,084	$94,191	$101,877	$110,190	$119,181	$128,906	$139,425	$150,802	$163,108	$176,417	$190,813	$168,976
Cost of Sale		**$32,594**	**$38,061**	$41,199	$44,132	$47,274	$50,640	$ 54,246	$ 58,108	$ 62,246	$ 66,677	$ 71,425	$ 76,510	$ 81,958	$ 87,793	$ 94,044	$ 82,481
CM		**$37,051**	**$30,048**	**$33,241**	**$36,382**	**$39,810**	**$43,550**	**$ 47,631**	**$ 52,081**	**$ 56,936**	**$ 62,229**	**$ 68,000**	**$ 74,292**	**$ 81,150**	**$ 88,624**	**$ 96,769**	**$ 86,495**
Change in CM		$ —	$ (7,003)	$ 3,193	$ 3,141	$ 3,428	$ 3,740	$ 4,080	$ 4,451	$ 4,854	$ 5,293	$ 5,771	$ 6,292	$ 6,858	$ 7,474	$ 8,145	$ (10,274)
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$37,051**	**$30,048**	**$33,241**	**$36,382**	**$39,810**	**$43,550**	**$ 47,631**	**$ 52,081**	**$ 56,936**	**$ 62,229**	**$ 68,000**	**$ 74,292**	**$ 81,150**	**$ 88,624**	**$ 96,769**	**$ 86,495**
D&A		**$18,463**	**$19,774**	$19,119	$19,446	$19,283	$19,365	$ 19,324	$ 19,344	$ 19,334	$ 19,339	$ 19,336	$ 19,338	$ 19,337	$ 19,337	$ 19,337	$ 19,337
EBIT		**$18,588**	**$10,274**	**$14,123**	**$16,936**	**$20,527**	**$24,186**	**$ 28,307**	**$ 32,737**	**$ 37,602**	**$ 42,890**	**$ 48,664**	**$ 54,954**	**$ 61,813**	**$ 69,287**	**$ 77,431**	**$ 67,158**
Taxes		$ 4,833	$ 2,671	$ 3,672	$ 4,403	$ 5,337	$ 6,288	$ 7,360	$ 8,512	$ 9,776	$ 11,151	$ 12,653	$ 14,288	$ 16,071	$ 18,015	$ 20,132	$ 17,461
Operating Income		**$13,755**	**$ 7,602**	**$10,451**	**$12,533**	**$15,190**	**$17,897**	**$ 20,947**	**$ 24,226**	**$ 27,825**	**$ 31,739**	**$ 36,011**	**$ 40,666**	**$ 45,741**	**$ 51,272**	**$ 57,299**	**$ 49,697**
Plant Capex		**$ (3,510)**	**$ (159)**	$ (167)	$ (175)	$ (184)	$ (193)	$ (202)	$ (213)	$ (223)	$ (234)	$ (246)	$ (258)	$ (271)	$ (285)	$ (299)	$ (314)
Total Capex		**$ (3,510)**	**$ (159)**	**$ (167)**	**$ (175)**	**$ (184)**	**$ (193)**	**$ (202)**	**$ (213)**	**$ (223)**	**$ (234)**	**$ (246)**	**$ (258)**	**$ (271)**	**$ (285)**	**$ (299)**	**$ (314)**
Change in NWC		$ —	$ —	$ (798)	$ (785)	$ (857)	$ (935)	$ (1,020)	$ (1,113)	$ (1,214)	$ (1,323)	$ (1,443)	$ (1,573)	$ (1,714)	$ (1,869)	$ (2,036)	$ —
Net Income		$10,245	$ 7,444	$ 9,486	$11,572	$14,150	$16,770	$ 19,725	$ 22,900	$ 26,389	$ 30,181	$ 34,322	$ 38,835	$ 43,756	$ 49,119	$ 54,964	$ 49,383
FCF	**$ (183,500)**	**$28,708**	**$27,218**	**$28,604**	**$31,019**	**$33,432**	**$36,134**	**$ 39,048**	**$ 42,244**	**$ 45,722**	**$ 49,520**	**$ 53,659**	**$ 58,172**	**$ 63,093**	**$ 68,456**	**$ 74,301**	**$ 68,720**

Table 19.1.2 Economic Feasibility Moderate Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.2 above, there are no royalties or other associated payments specific to Lamesa.

(2) The Book Value in the Economic Feasibility Model is as of December 2020.

In Thousand (000)	*Book Value*	2020A	2021A	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Reserve Balance Tons (000)		94,634	92,478	87,786	82,812	77,541	71,952	66,029	59,750	53,094	46,039	38,561	30,634	22,231	13,324	3,883
Mined Tons (000)		4,166	4,692	4,974	5,272	5,588	5,924	6,279	6,656	7,055	7,478	7,927	8,403	8,907	9,441	3,883
Sold Tons (000)		**3,187**	**3,691**	*4,103*	*4,349*	*4,610*	*4,887*	*5,180*	*5,491*	*5,820*	*6,170*	*6,540*	*6,932*	*7,348*	*7,789*	*3,203*
R/S Ratio		3.4%	4.0%	5.7%	6.4%	7.2%	8.2%	9.5%	11.1%	13.3%	16.2%	20.6%	27.4%	40.1%	70.9%	100.0%
ASP (Selling Price)		***$ 22***	***$ 18***	*$ 19.6*	*$ 20.7*	*$ 22.0*	*$ 23.3*	*$ 24.7*	*$ 26.2*	*$ 27.7*	*$ 29.4*	*$ 31.2*	*$ 33.0*	*$ 35.0*	*$ 37.1*	*$ 39.4*
ACS (Cost of Sale)		***$ 10***	***$ 10***	*$ 10.8*	*$ 11.4*	*$ 11.9*	*$ 12.5*	*$ 13.2*	*$ 13.8*	*$ 14.5*	*$ 15.2*	*$ 16.0*	*$ 16.8*	*$ 17.6*	*$ 18.5*	*$ 19.4*
Rev		**$69,644**	**$68,108**	$80,249	$90,168	$101,312	$113,835	$127,905	$143,714	$161,477	$181,435	$203,861	$229,058	$257,369	$289,180	$126,071
Cost of Sale		**$32,594**	**$38,061**	$44,422	$49,442	$ 55,028	$ 61,247	$ 68,167	$ 75,870	$ 84,444	$ 93,986	$104,606	$116,427	$129,583	$144,226	$ 62,283
CM		**$37,051**	**$30,048**	**$35,827**	**$40,726**	**$ 46,284**	**$ 52,588**	**$ 59,737**	**$ 67,843**	**$ 77,033**	**$ 87,449**	**$ 99,254**	**$112,631**	**$127,786**	**$144,954**	**$ 63,787**
Change in CM		$ —	$ (7,003)	$ 5,779	$ 4,899	$ 5,558	$ 6,304	$ 7,149	$ 8,106	$ 9,190	$ 10,416	$ 11,805	$ 13,377	$ 15,155	$ 17,168	$ (81,167)
SG&A		$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —	$ —
EBITDA		**$37,051**	**$30,048**	**$35,827**	**$40,726**	**$ 46,284**	**$ 52,588**	**$ 59,737**	**$ 67,843**	**$ 77,033**	**$ 87,449**	**$ 99,254**	**$112,631**	**$127,786**	**$144,954**	**$ 63,787**
D&A		**$18,463**	**$19,774**	$19,119	$19,446	$ 19,283	$ 19,365	$ 19,324	$ 19,344	$ 19,334	$ 19,339	$ 19,336	$ 19,338	$ 19,337	$ 19,337	$ 19,337
EBIT		**$18,588**	**$10,274**	**$16,708**	**$21,280**	**$ 27,001**	**$ 33,224**	**$ 40,414**	**$ 48,499**	**$ 57,699**	**$ 68,110**	**$ 79,918**	**$ 93,293**	**$108,449**	**$125,617**	**$ 44,450**
Taxes		$ 4,833	$ 2,671	$ 4,344	$ 5,533	$ 7,020	$ 8,638	$ 10,508	$ 12,610	$ 15,002	$ 17,709	$ 20,779	$ 24,256	$ 28,197	$ 32,660	$ 11,557
Operating Income		**$13,755**	**$ 7,602**	**$12,364**	**$15,747**	**$ 19,981**	**$ 24,585**	**$ 29,906**	**$ 35,889**	**$ 42,697**	**$ 50,402**	**$ 59,139**	**$ 69,037**	**$ 80,252**	**$ 92,956**	**$ 32,893**
Plant Capex		**$ (3,510)**	**$ (159)**	$ (175)	$ (192)	$ (211)	$ (232)	$ (256)	$ (281)	$ (309)	$ (340)	$ (374)	$ (411)	$ (453)	$ (498)	$ (548)
Total Capex		**$ (3,510)**	**$ (159)**	**$ (175)**	**$ (192)**	**$ (211)**	**$ (232)**	**$ (256)**	**$ (281)**	**$ (309)**	**$ (340)**	**$ (374)**	**$ (411)**	**$ (453)**	**$ (498)**	**$ (548)**
Change in NWC		$ —	$ —	$ (1,445)	$ (1,225)	$ (1,389)	$ (1,576)	$ (1,787)	$ (2,027)	$ (2,297)	$ (2,604)	$ (2,951)	$ (3,344)	$ (3,789)	$ (4,292)	$ —
Net Income		$10,245	$ 7,444	$10,745	$14,330	$ 18,380	$ 22,777	$ 27,863	$ 33,582	$ 40,091	$ 47,457	$ 55,814	$ 65,281	$ 76,011	$ 88,167	$ 32,345
FCF	**$ (183,500)**	**$28,708**	**$27,218**	**$29,864**	**$33,777**	**$ 37,663**	**$ 42,142**	**$ 47,187**	**$ 52,926**	**$ 59,425**	**$ 66,796**	**$ 75,150**	**$ 84,619**	**$ 95,348**	**$107,504**	**$ 51,683**

Table 19.1.3 Economic Feasibility Upside Model.

(1) The Cost of Sale line item includes royalties and government levies, when applicable. As stated in Section 3.2 above, there are no royalties or other associated payments specific to Lamesa.

(2) The Book Value in the Economic Feasibility Model is as of December 2020.

Drivers	Case Base	5% Moderate	10% Upside
Average Selling Price Growth	2%	4%	6%
Tons Growth	2%	4%	6%
Costs of Goods Sold Growth	2%	3%	5%
Selling, General, and Administrative Expenses Growth	2%	5%	10%
Capital Expenditures Growth	2%	5%	10%
Inflation Rate	2%	3%	4%
Inflation Adjusted Discount Rate	10%	11%	12%
Site Yield	77%	80%	83%

Case	Payback	IRR	NPV
Base	0.30 Years	16%	$ 69,688,000
Moderate	0.20 Years	19%	$100,599,000
Upside	0.20 Years	21%	$117,451,000

Table 19.2 Sensitivity Analysis.

20.0 ADJACENT PROPERTIES

Adjacent properties to the site are agricultural in nature. No other mining is being conducted in the area.

21.0 OTHER RELEVANT DATA AND INFORMATION

There is no additional data or information to include in this section.

22.0 INTERPRETATIONS AND CONCLUSIONS

22.1 Introduction

The QPs note the following interpretations and conclusions in their respective areas of expertise, based on the review of data provided for the Report.

22.2 Comments on Exploration

It is the QP’s opinion that the amount and type of exploration performed to date has acceptable spacing of drill holes to illustrate geologic continuity of the deposit.

22.3 Comments on Mineral Processing and Metallurgical Testing

Based on review of the lab procedures provided by U.S. Silica, the overall relative homogenous mineralogy of the deposit, it is the QP’s opinion that the procedures and laboratory testing reviewed are acceptable for the purposes of this report.

22.4 Comments on Mineral Resource Estimates

It is the QP’s opinion that the only potential risk factor identified that could possibly alter the mineable ore estimates provided herein is a change in density values. If future testing of the in-situ deposit indicates that the density is lower than the reported 91.5 lbs./cu. ft. value, the number of resources will be reduced proportionately. It is also the QP’s opinion that currently, there are no foreseeable factors likely to influence or preclude the economic extraction of silica sand at the Lamesa Site.

22.5 Comments on Mineral Reserve Estimates

It is the QP’s opinion that the only potential risk factor identified that could possibly alter the mineable ore estimates provided herein is a change in density values. If future testing of the in-situ deposit indicates that the density is lower than the reported 91.5 lbs./cu. ft. value, the number of reserves will be reduced proportionately. It is also the QP’s opinion that currently, there are no foreseeable risk factors that would materially affect the in-situ reserves reported for the Lamesa Site.

22.6 Comments on Mining Methods

The current mine planning, mining methods, manpower, mine equipment, and maintenance and repair practices dedicated to supplying the processing plant with silica sand will allow U.S. Silica to maintain the projected levels of annual production and product quality to support the life-of-mine plan represented by the financial analysis in this report.

22.7 Comments on Processing and Recovery Methods

The current facilities dedicated to Processing and Recovery Methods will allow U.S. Silica to maintain the current levels of production and product quality to support the life-of-mine plan represented by the financial analysis in this report.

22.8 Comments on Infrastructure

The existing infrastructure is adequate for the projected production of finished goods through the life of mine. The current and planned maintenance capital investment in infrastructure is adequate to maintain the projected levels of finished goods production and is represented by the financial analysis in this report. The greatest risk relative to infrastructure is the availability of water for processing raw sand into finished goods. With the contracts in place to purchase the required water, there is no additional infrastructure necessary for water supply. The risk of material interruption of the supply of electric power is low. The highest risk relative to electric power is real cost escalation of the electricity without a long-term contract.

22.9 Comments on Permitting

It is the QP's opinion that the plans, permits, registrations as mentioned above are adequate to address issues related to environmental compliance and permitting. Nothing was discovered during the permitting review that would preclude mining of the deposit at this time.

23.0 RECOMMENDATIONS

The primary recommendation of this report is to design and implement a third-party sampling and testing program to provide outside quality control for U.S. Silica's internal testing program. The program should be written with detailed instructions on proper collection methods; sample containers, preservation, labeling, security, and transport; and testing. Anticipated cost for this program is estimated to be up to $7,000 - $10,000 annually depending on how many tests are conducted and what testing parameters are run.

24.0 REFERENCES

References cited in this report are marked in each section as foot notes.

25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This Technical Report has been prepared by the QPs for U.S. Silica. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to the QPs at the time of preparation of this Technical Report.
- Assumptions, conditions, and qualifications as set forth in this Technical Report.
- Data, reports, and other information supplied by U.S. Silica and other third-party sources.

For the purpose of this Technical Report, the QPs have relied on ownership information and market studies included in Section 3.0. The QPs have not researched property title or mineral rights for U.S. Silica as we consider it reasonable to rely on U.S. Silica's personnel who are responsible for maintaining this information.

The QPs have relied on U.S. Silica for general marketing information and market studies included in Section 16.0 and referenced in Section 19.0. The QPs consider it reasonable to rely on U.S. Silica for this information as it has considerable experience in these areas.

This report titled "Technical Report Summary, Lamesa Site, Dawson County, Texas" (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons. Terrance N. Lackey, Mining Director at U.S. Silica Holdings, Inc., prepared or contributed to the following sections:

1.0 Executive Summary

16.0 Market Studies and Contracts

18.0 Capital and Operating Costs

19.0 Economic Analysis

U.S. Silica Holdings, Inc.

/s/ Terrance N. Lackey	09/30/2022
Terrance N. Lackey BSc. Eng, MSc. Eng Mining Director U.S. Silica Holdings, Inc. *SME Member # 04312151*	Date

This report titled “Technical Report Summary, Lamesa Site, Lamesa, Dawson County, Texas” (“Report”) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Westward Environmental, Inc. Westward’s QPs prepared or contributed to the following sections:

1.0 Executive Summary

2.0 Introduction

3.0 Property Description

4.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.0 History

6.0 Geologic Setting, Mineralization and Deposit

7.0 Exploration

8.0 Sample Preparation, Analyses and Security

9.0 Data Verification

10.0 Mineral Processing and Metallurgical Testing

11.0 Mineral Resource Estimates

12.0 Mineral Reserve Estimates

17.0 Environmental Studies, Permitting, Plans, Negotiations or Agreements With Local Individuals Or Groups

20.0 Adjacent Properties

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Westward Environmental, Inc.

/s/ Thomas O. Mathews	09/30/2022
Thomas O. Mathews, PG, REM President Westward Environmental, Inc.	Date

This report titled "Technical Report Summary, Lamesa Site, Dawson County, Texas" (Report) with an effective date of December 31, 2021, amended as of September 30, 2022, was prepared by multiple Qualified Persons within Q4 Impact Group, LLC. Q4 Impact Group's QPs prepared or contributed to the following sections:

1.0 Executive Summary

13.0 Mining Methods

14.0 Processing and Recovery Methods

15.0 Infrastructure

21.0 Other Relevant Data and Information

22.0 Interpretations and Conclusions

23.0 Recommendations

24.0 References

25.0 Reliance On Information Provided By The Registrant

Q4 Impact Group, LLC

/s/ Robert Archibald	09/30/2022
Robert Archibald CEO Q4 Impact Group, LLC	Date

LIST OF FIGURES

LIST OF TABLES

ACRONYMS & ABBREVIATIONS

AACE	American Association of Cost Engineers
ACS	Average Cost of Sale
ANSI	Approved American National Standard
API	American Petroleum Institute
API	American Petroleum Institute
API RP	American Petroleum Institute Recommended Practices
APO	Aggregate Production Operation
ASP	Average Selling Price
ASTM	American Society for Testing and Materials
BEG	Bureau of Economic Geology
BGS	Below Ground Surface
BCY	Bank Cubic Yards
CAP	Corporate Analytical Procedure
EIA	Energy Information Administration
EPCM	Engineering, Procurement and Construction Management
ESA	Environmental Site Assessment
FT	Feet/Foot
HDPE	High-Density Polyethylene
IHW	Industrial Hazardous Waste
IRR	Internal Rate of Return
ISO	International Organization for Standardization
M	Million
MA	Million Years Ago
MSGP	Multi Sector General Permit
MT	Million Tons
NPV	Net Present Value
PST	Petroleum Storage Tank
Q4	Q4 Impact Group
QP	Qualified Person
SEC	Securities and Exchange Commission
SG&A	Selling, General & Administrative
SWPPP	Stormwater Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
TRS	Technical Report Summary
USACE	U.S. Army Corps of Engineers
U.S. Silica	U.S. Silica Holdings, Inc.
USGS	United States Geological Survey
VSQG	Very Small Quantity Generator
YD3	Cubic Yards