



Industrial Silica Sands of Minnesota

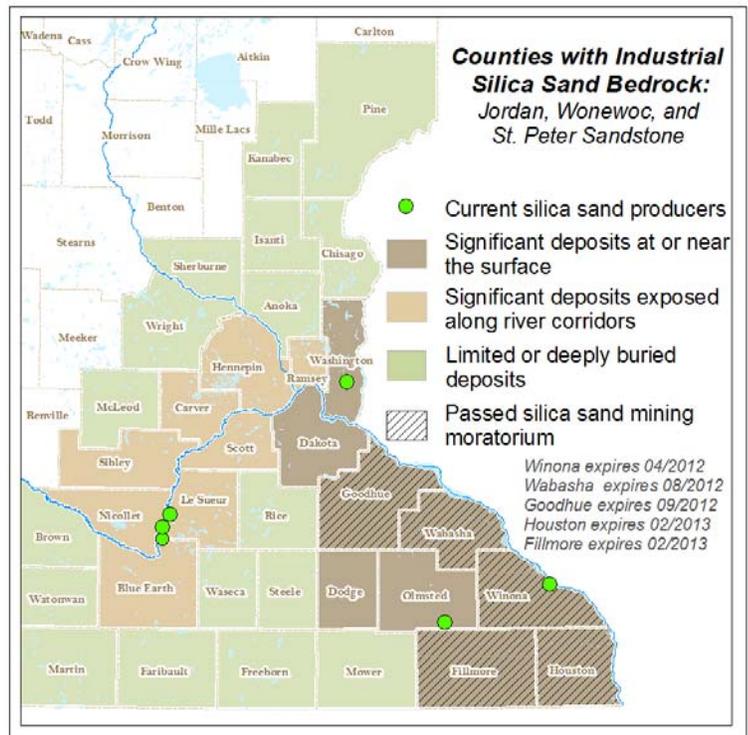
Frequently Asked Questions and Answers—March 2012

WHAT IS INDUSTRIAL SILICA SAND (FRAC SAND)? Industrial silica sand refers to sand having the composition and grain-size distribution required for industrial applications. Specifically, industrial silica sand consists of well-rounded, sand composed of almost pure quartz grains. Quartz, or silicon dioxide (SiO₂), is one of the most common minerals found on the Earth’s surface and is found in rocks like granite, gneiss, and sandstone. Industrial silica sand is a higher value product than sand and gravel used in the construction industry.

WHERE IS INDUSTRIAL SILICA SAND FOUND? Industrial silica sand is mined from sandstones occurring in portions of Minnesota, Wisconsin, Iowa, and Illinois. In Minnesota, glacial drift and other bedrock layers commonly exist on top of the sandstone. Three sandstone formations have potential for producing high quality industrial silica sand. The Jordan and Wonewoc sandstones are the most sought after sources followed by the St. Peter sandstone. Natural aggregates mined from sand and gravel deposits do not meet the specification for frac sand.*

WHAT IS THE CURRENT STATUS OF INDUSTRIAL SAND MINING IN MINNESOTA? Industrial silica sand is found in the southeastern portion of the state. Six mining operations are currently known to extract industrial silica sand. Mines may or may not process the sand on-site. Three off-site processing plants are currently known to receive silica sand from various mining operations in Minnesota and Wisconsin. To date, five counties, Winona, Goodhue, Wabasha, Houston, and Fillmore, passed moratoria on new permits for industrial silica sand mining.

HOW IS IT MINED? In Minnesota, all industrial silica sand mines operate as surface quarries. However, both surface quarries and underground mines exist in other states.



WHAT TYPES OF INDUSTRIES USE SILICA SAND? Industrial silica sand has been mined in the Upper Midwest for over a century. Uses for this resource include a variety of products and applications like glass-making, abrasives, golf course sand traps, and frac sand. Over the past decade, a sharp increase in demand for industrial silica sand corresponded with a rapid expansion of shale oil and gas development. An extraction method called hydraulic fracturing is used to produce oil and gas from shale bedrock and requires approximately 10,000 tons of industrial silica sand per well. Due to increased demand, permits for new industrial silica sand mines and expansion of existing mines are being submitted across the southeastern portion of Minnesota.

WHAT IS “FRACKING”? Fracking is slang for hydraulic fracturing. In the hydraulic fracturing process, a mixture of industrial silica sand (frac sand), water, and chemicals is injected under high pressures to maintain fractures in shale bedrock. The sand-filled cracks and fissures create conduits for fluids and gas to flow into an oil and gas well.

*Dustman, J.E., Gulbranson, B., Bell, P., Gregg, W., 2011: Characteristics of high quality frac sand, and where to find it in the upper Midwest., Geological Society of America Abstracts with Programs, Vol. 43, No 5.

Minnesota Department of Natural Resources– Division of Lands and Minerals

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IS FRACKING OCCURRING IN MINNESOTA? No. Sand used for hydraulic fracturing is mined and/or processed in Minnesota. The sand is then transported out of the state by rail or barge to oil and natural gas producing regions (e.g. Western North Dakota, Pennsylvania, and Texas).

WHY HERE? WHAT MAKES OUR SAND SO UNIQUE? Even though sand can be found all over the world, sandstones found in the Upper Midwest have several unique physical properties (listed below). It is one of a few places on Earth where this resource occurs, making it a globally desired commodity.

Composition: Sand usually contains many different rock types; however, industrial silica sand produced in this region consists of nearly 99% quartz.

Strength: Quartz is a very hard mineral and able to withstand high pressures produced during the hydraulic fracturing process without breaking.

Shape: The sand grains are shaped like little ball bearings which allow for oil and gas to flow between individual grains without clogging the fractured rock. It is very important that the round, unbroken grain shape is preserved throughout mining, processing and transporting the sand to the market.

Size: The sand grains are fairly uniform in size. When washed and screened, the sands meet a precise grain-size distribution required for frac sand (specified by the American Petroleum Institute, Recommended Practice 56):

NOTE: Ninety percent (by weight) of the total product must fall within the specified range of grain sizes. Washing significantly reduces silt and

PRODUCT	8/12	10/20	20/40	70/140
RANGE OF GRAIN SIZE DIAMETERS	2.38 to 1.68 millimeter	2.00 to 0.84 millimeter	0.84 to 0.42 millimeter	210 to 105 microns
AGGREGATE NAME	Fine Gravel to Coarse Sand	Very Coarse Sand to Coarse Sand	Coarse Sand to Medium Sand	Fine Sand to Very Fine Sand

clay sized particles (less than 62.5 microns in diameter) so to not exceed a turbidity threshold of 250 FTU (Formazin Turbidity Units).

WHO REGULATES INDUSTRIAL SILICA SAND MINING? Counties, townships, or municipalities are the responsible governmental unit (RGU) for administering permits to mine for industrial silica sand. Conditional land use permits, sometimes called special use permits, may be required from local planning and zoning offices.

WHO ARE THE OTHER REGULATING AUTHORITIES? Depending on size and scope, the proposed mining operation may be subject to the following state and federal permits and regulations:

Department of Natural Resources (DNR)- Water Appropriation Permit; Public Waters Work Permit; Burning Permit; and Endangered or Threatened Species Taking Permit.

US Army Corps of Engineers- Section 404 Permit (discharge of dredged or fill material or excavation within waters and wetlands may require approval of the US Army Corps of Engineers).

Environmental Quality Board (EQB): Requires environmental reviews in the form of an Environmental Assessment Worksheet (EAW) for operations excavating 40 or more acres of land at a mean depth of 10 feet and Environmental Impact Statement (EIS) for operations exceeding 160 acres.

Board of Water and Soil Resources (BWSR)- Wetland Conservation Act.

Pollution Control Agency (MPCA)- Section 401 Certification; Water Quality, and Air Quality Regulations. Additional resources related to industrial silica sand mining produced by MPCA can be viewed at:

<http://www.pca.state.mn.us/index.php/air/air-quality-and-pollutants/air-pollutants/frac-sand-mining.html>

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