
Photo by Minnesota Geological Survey

INDUSTRIAL SILICA SAND MINING IN MINNESOTA

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DIVISION OF LANDS AND MINERALS

PRESENTATION FOR CITY OF WINONA
JUNE 20, 2012

Frequently Asked Questions and Answers

What is Industrial Silica Sand?

Industrial silica sand is well-rounded, well-sorted, sand consisting of almost pure quartz, or silicon dioxide (SiO_2)

Silica is one of the most common minerals found on the earth surface

Silica is major component of many different kinds of rocks (like granites and gneiss) and come in many different varieties

Minnesota Department of Natural Resources, 2012

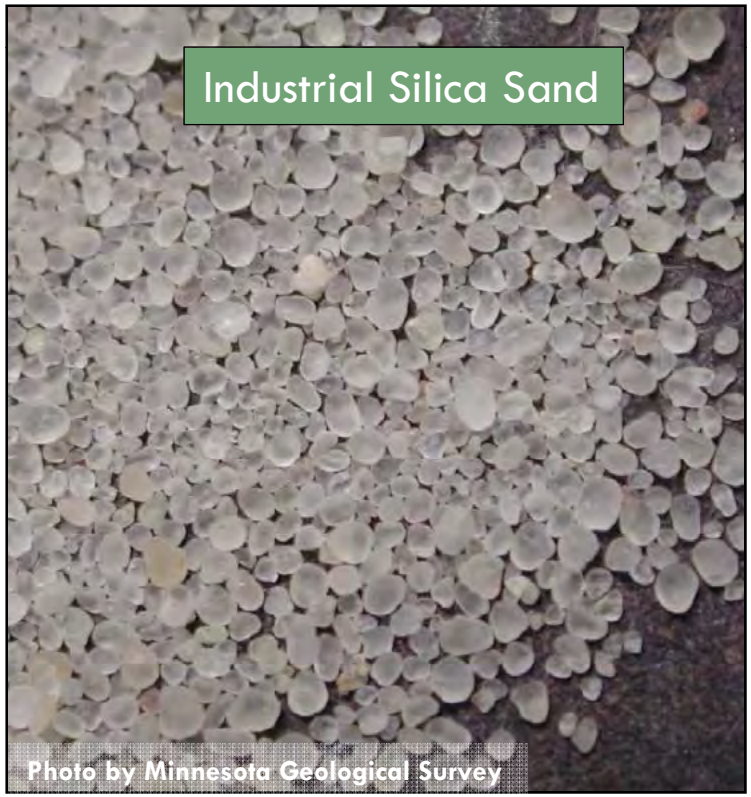
How is Silica Used?

- Crystalline silica – defined crystal structure (10 forms)
  - Glass making
  - Optical fibers
  - Abrasives
  - Paints
  - Glues
  - Golf/Equestrian
  - Oil Industry
  - Agriculture
  - Electronics
- Amorphous silica – no crystal structure (glass)
  - Fumed silica (manufacured)
    - Thickening agent in food (milkshakes)
    - Cosmetics
    - Light abrasive (toothpaste)

What's the Difference between Construction and Industrial Sand?

Construction sand and gravel, mined in Minnesota's glaciated terrain, consists of many different rock types

Photographs taken at different scales



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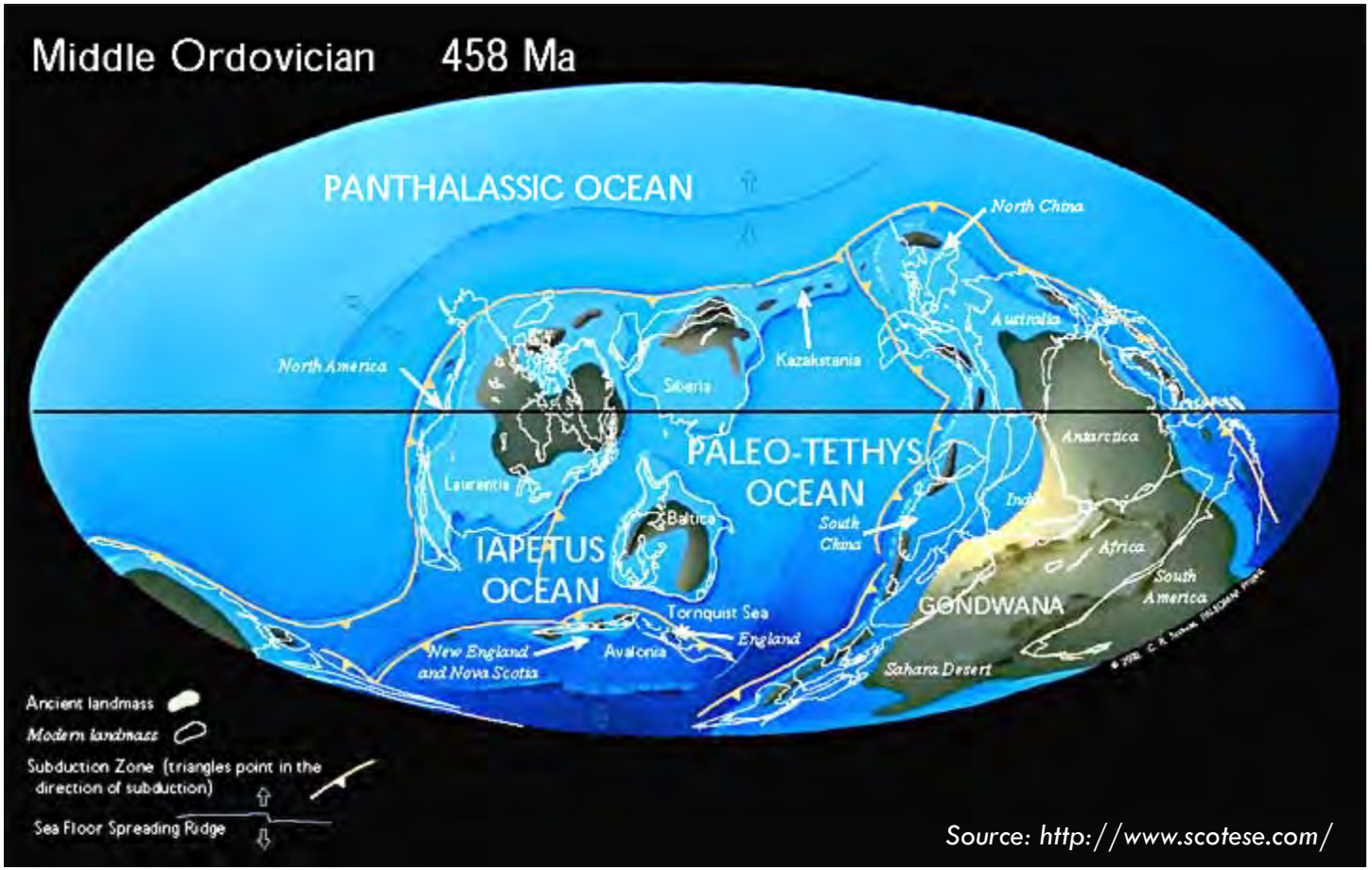
How was Silica Sand Deposited?



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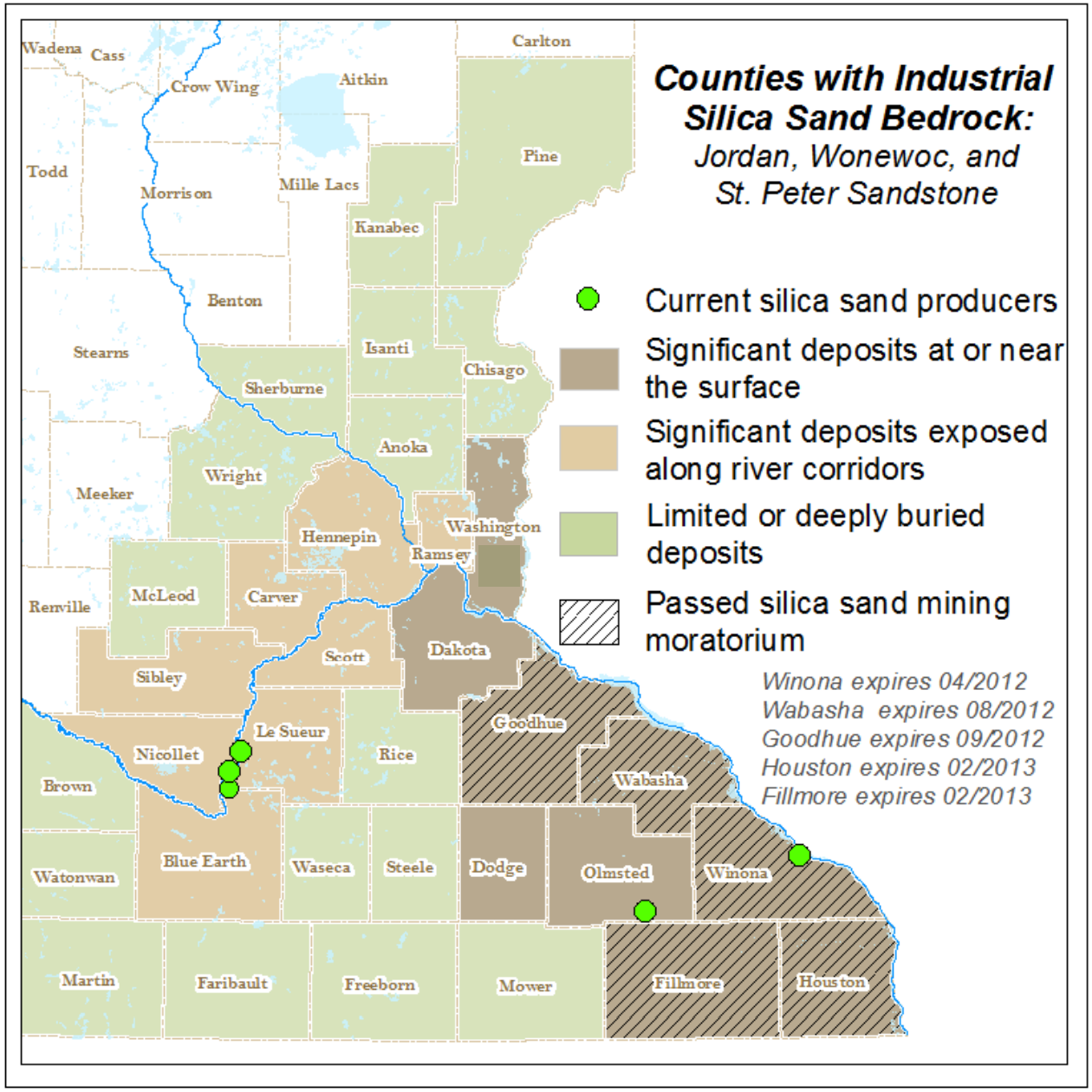
Where is Silica Sand Found in MN?

What is the Current Status of Silica Sand Mining?



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Which Sandstones are of Interest?

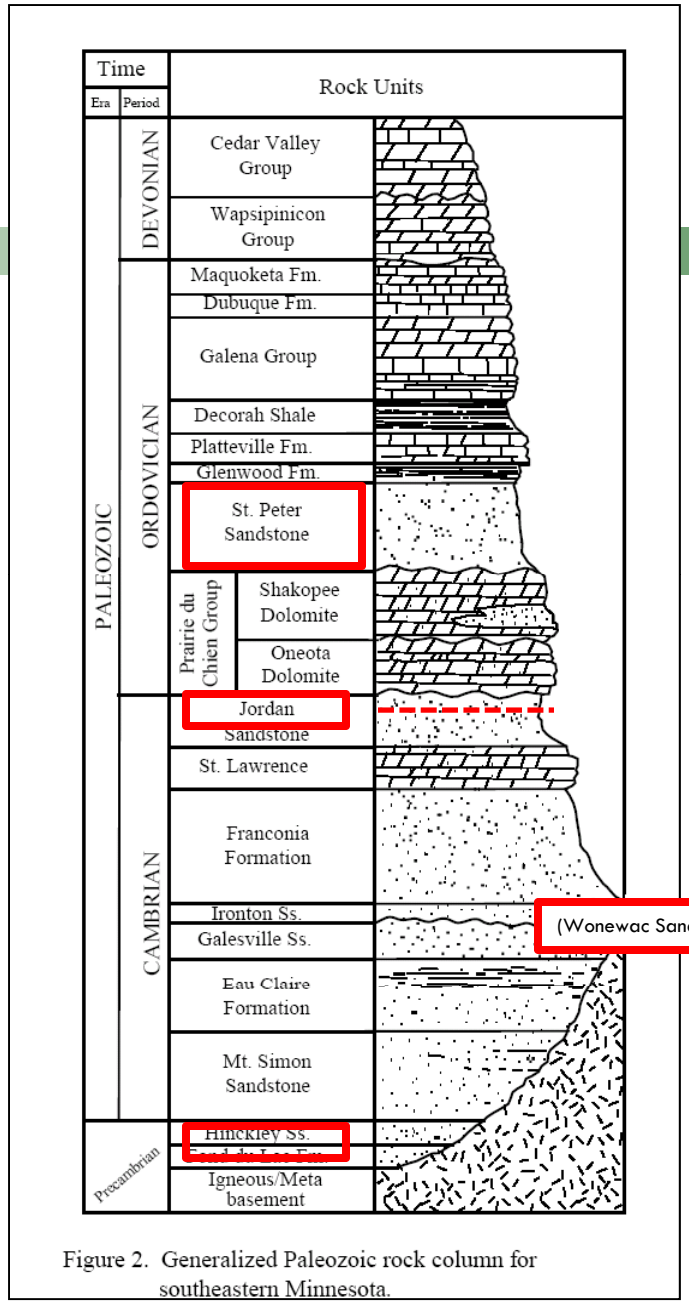
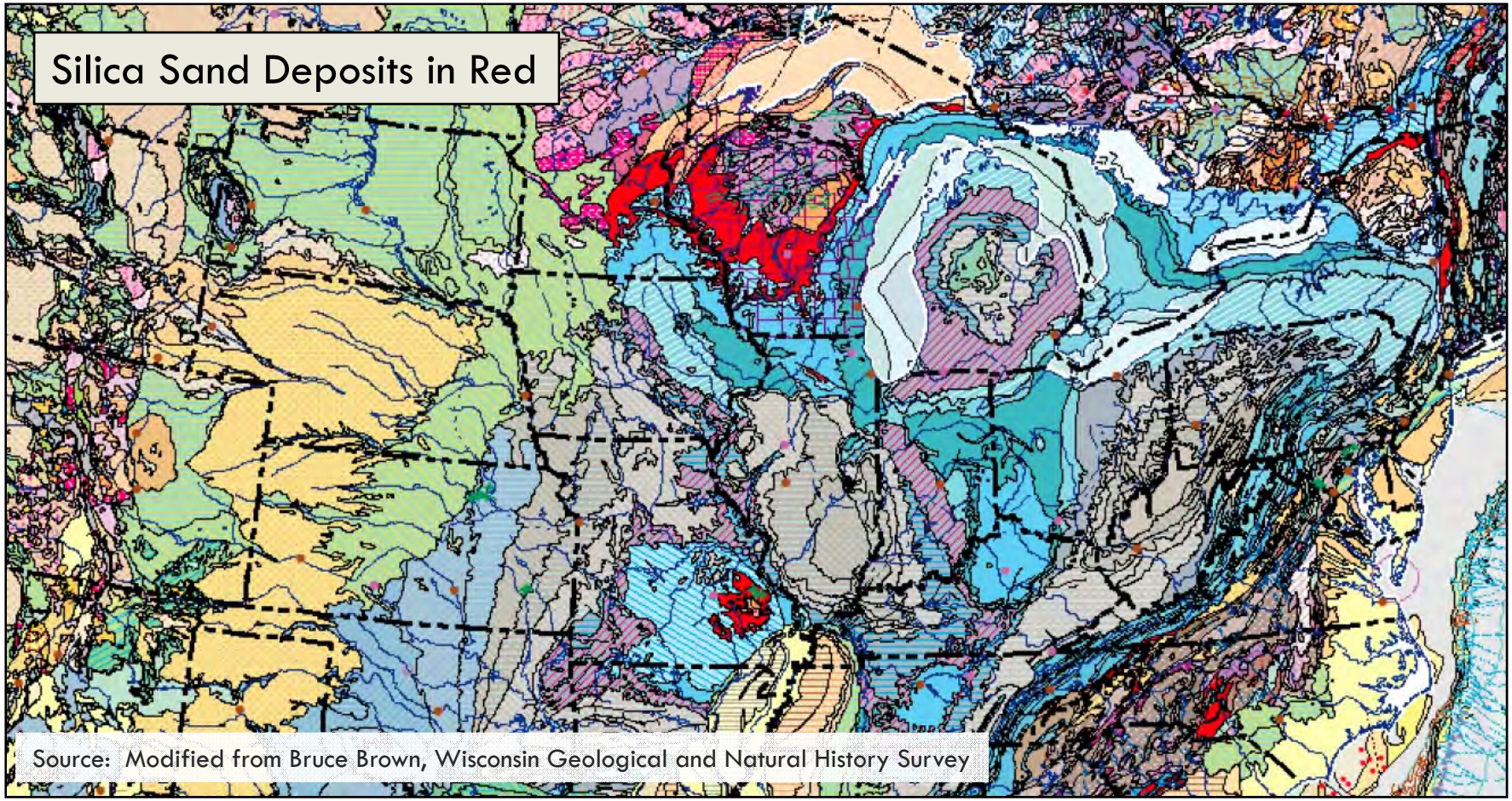


Figure 2. Generalized Paleozoic rock column for southeastern Minnesota.

Source of Stratigraphic Column: Minnesota Geological Survey

Where is Silica Sand Found Nationally?



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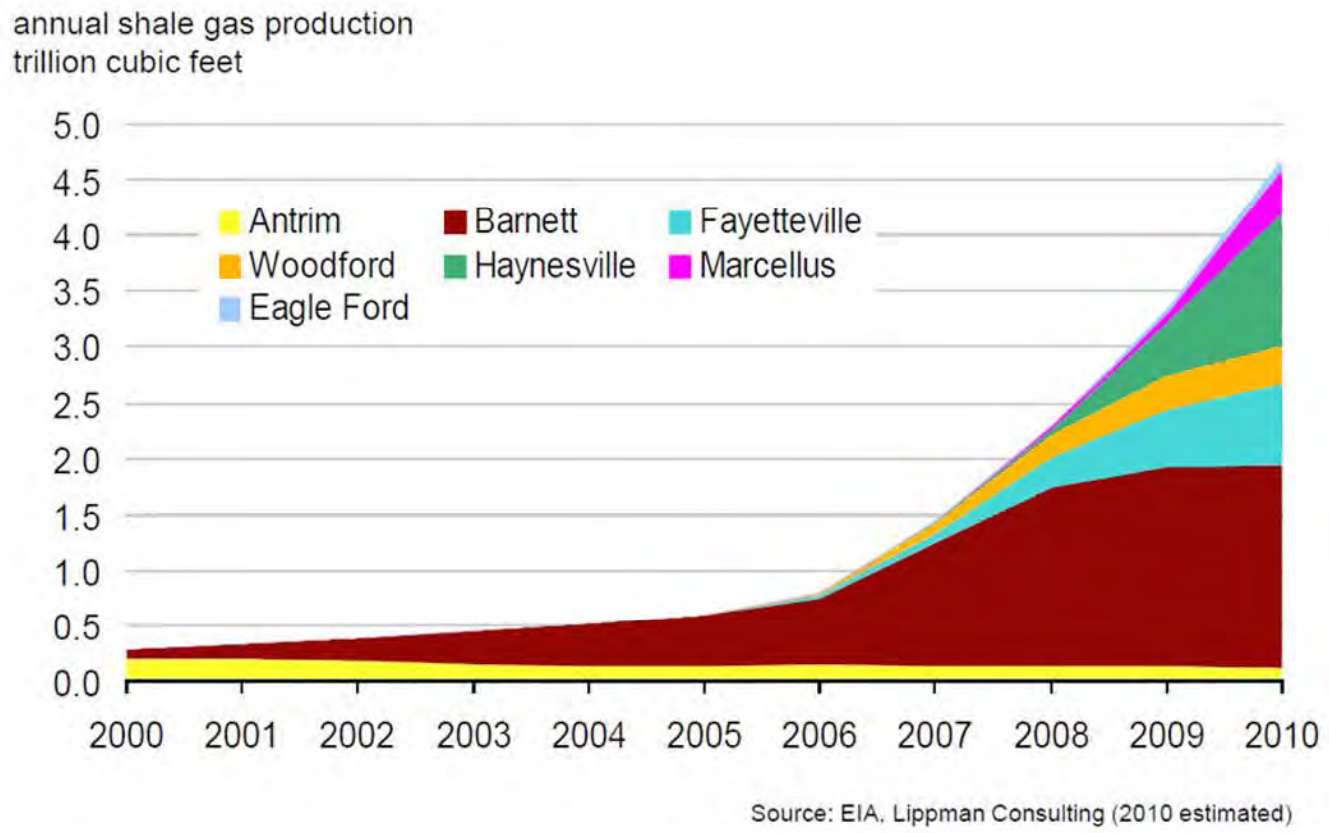
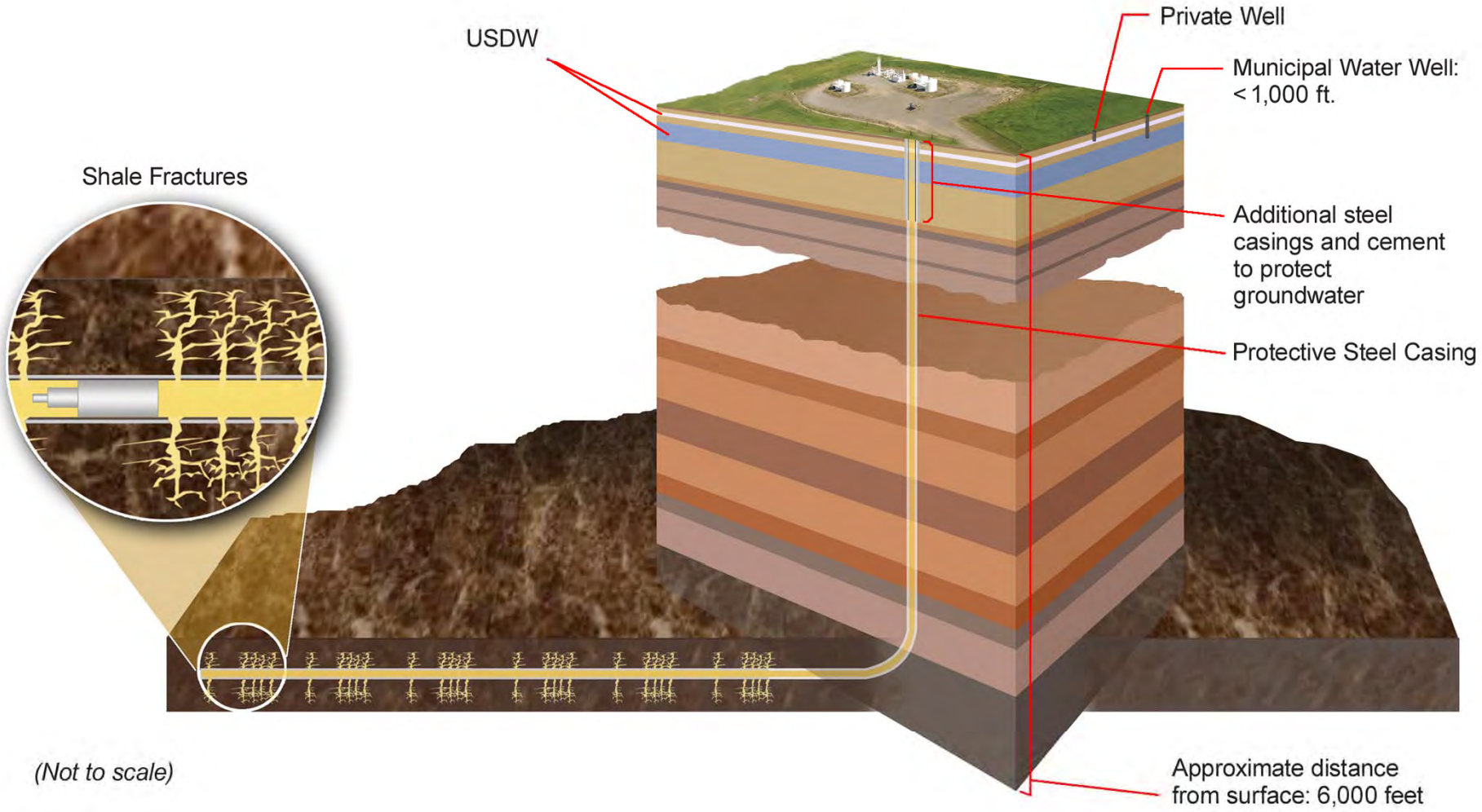
What is Driving the Demand for Silica Sand?



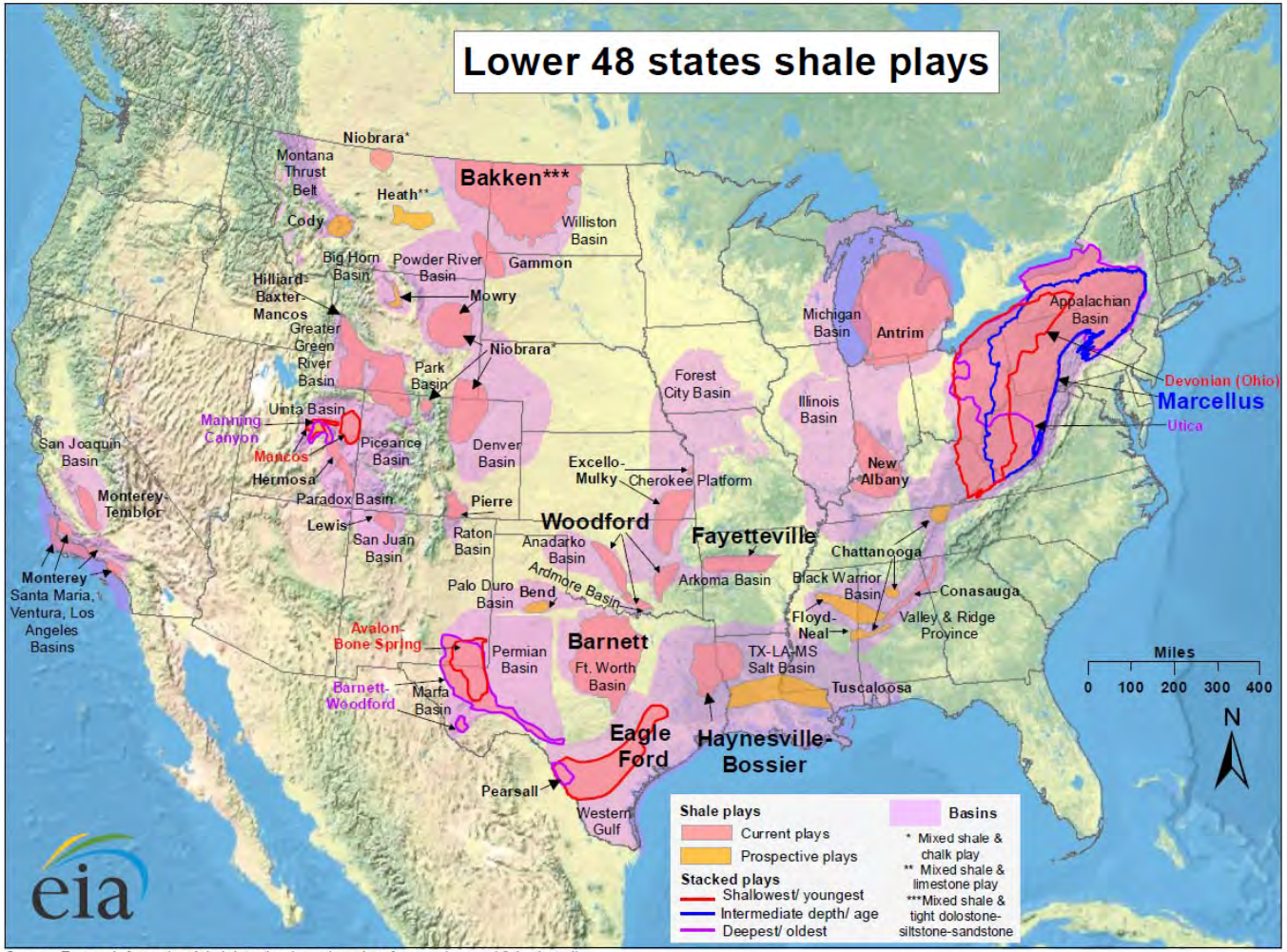
SOURCE: http://www.netl.doe.gov/technologies/oil-gas/publications/brochures/Shale_Gas_March_2011.pdf

What is Hydraulic Fracturing (Fracking)?



SOURCE: http://www.netl.doe.gov/technologies/oil-gas/publications/brochures/Shale_Gas_March_2011.pdf

Is Hydraulic Fracturing Occurring in MN? Where is the Silica Sand Going?



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

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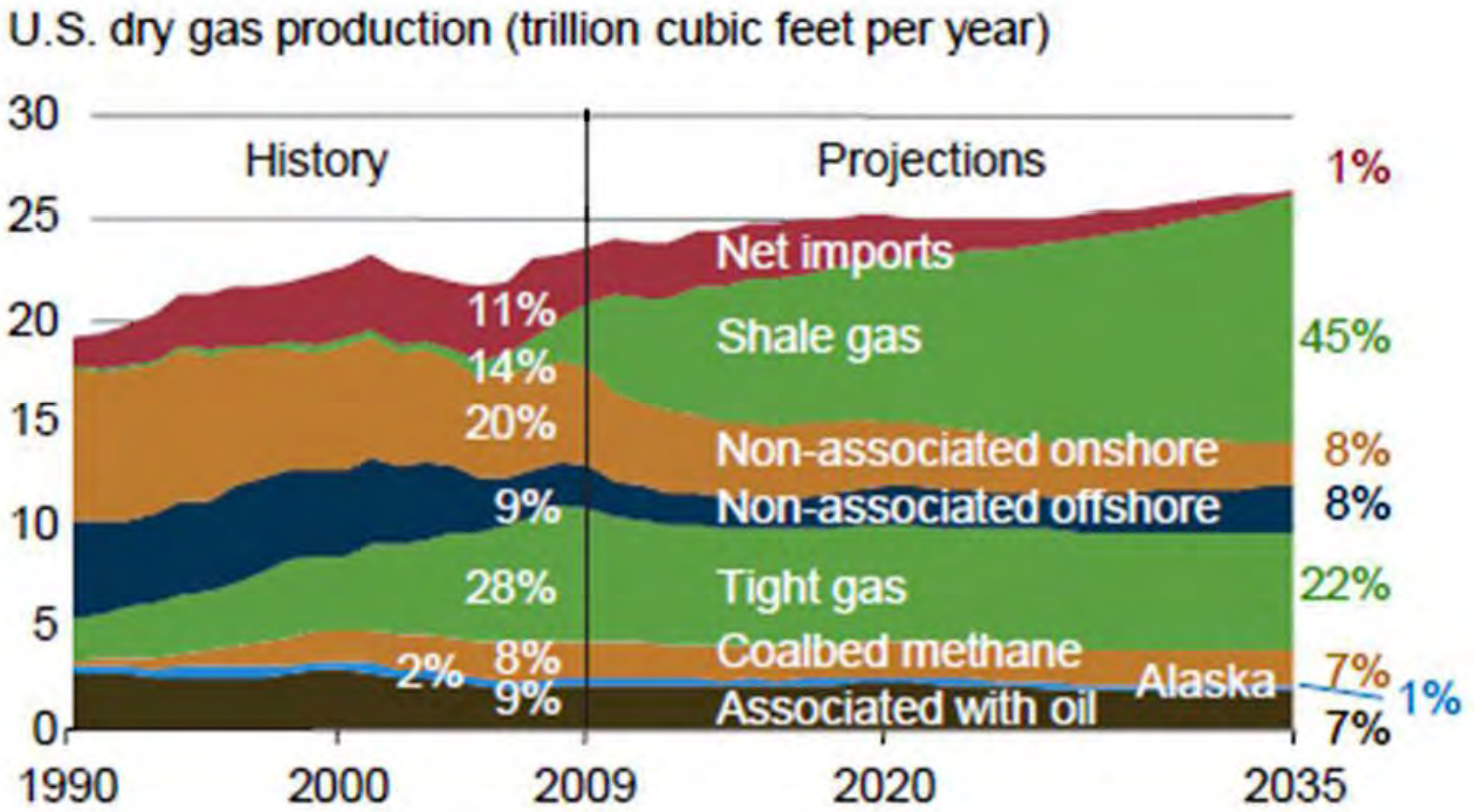
How Long will the Gas Boom Last?



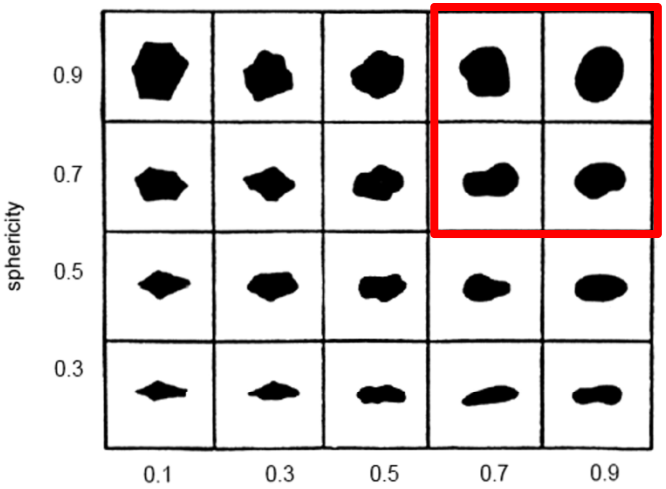
SOURCE: http://www.netl.doe.gov/technologies/oil-gas/publications/brochures/Shale_Gas_March_2011.pdf

What are the Specifications for Frac Sand?

GRAIN SIZE

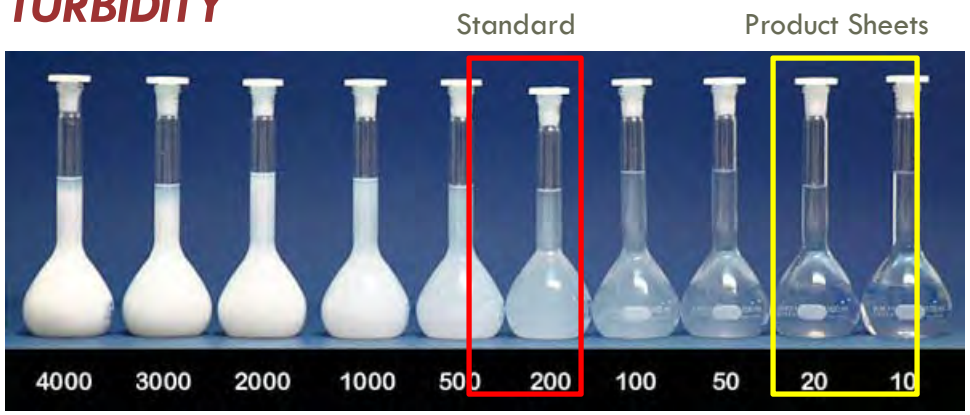
PRODUCT	8/12	10/20	20/40	70/140
Grain Size (Diameter)	2.38 to 1.68 millimeter	2.00 to 0.84 millimeter	0.84 to 0.42 millimeter	210 to 105 microns
Sediment	Fine Gravel to Coarse Sand	Very Coarse Sand to Coarse Sand	Coarse Sand to Medium Sand	Fine Sand to Very Fine Sand

SHPERICITY AND ROUNDNESS



Krumbein and Sloss, 1955

TURBIDITY



Silt and clay sized particles (<62.5 microns) must not exceed a 250 turbidity threshold of 250 FTU (Formazin Turbidity Units). However, processing significantly removes silts and clays.

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How does Silica Sand Mining Compare to Sand and Gravel Mining?

	CONSTRUCTION SAND & GRAVEL	INDUSTRIAL SILICA SAND
SAME	☐ Surface mining: backhoes, bulldozers, excavators, screens, and conveyors	☐ Surface mining: backhoes, bulldozers, excavators, screens, and conveyors
DIFFERENT	☐ No underground mining ☐ Washing plants tend NOT use flocculants ☐ Does NOT require blasting	☐ Underground mines and bench mining ☐ Washing plants may use flocculants ☐ May require blasting

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Blasting and Crushing for Silica Sand: How does it compare to other types of mining in Minnesota?

OBJECTIVE OF BLASTING/CRUSHING FOR HARDROCK MINING

(e.g. Taconite, Granite, and Quartzite)

Blasting and crushing are used to fracture and break rocks into smaller, manageable pieces

Which produce angular, freshly broken rock faces

Minnesota Department of Natural Resources, 2012

Blasting and Crushing for Silica Sand: How does it compare to other types of mining in Minnesota?

Photo by Minnesota Geological Survey

SILICA SAND MINING

Blasting and the use of crushers are used to loosen weakly cemented sandstone, while keeping the individual, round grains intact

When the grains break, it lowers the performance for use as frac sand

After processing, much of the silt and clay is removed and very few grains would have freshly exposed surfaces

What do the Alternatives to Silica Sand Entail?

Duluth Shipping News

Moezelborg discharges propant ...

December 4, 2011 · 4 COMMENTS

... loaded in Ust Luga, a relatively new Russian port, close to St. Petersburg. The ***Moezelborg*** arrived in Duluth at 1:57 am on Sunday morning, December 4, 2011.

Tagged as: Moezelborg

Notable Asides

US Inland Oil Boom Leading To Rail Car Shortage

Published: Sep 16, 2011

By Ben Lefebvre
Of DOW JONES NEWSWIRES

THE WALL STREET JOURNAL.

AUTOS April 13, 2011

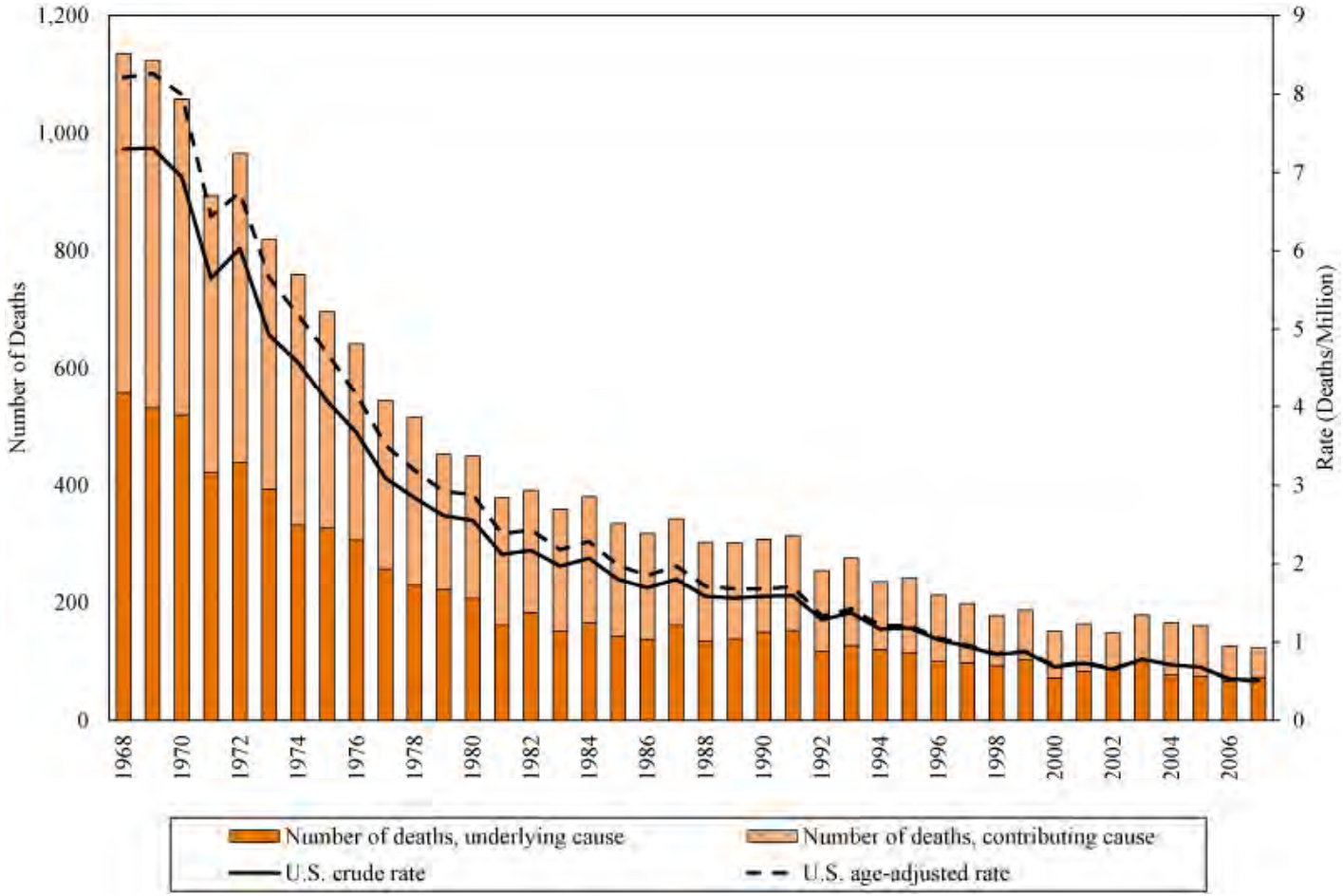
Rail Woes Hit Auto Deliveries

Fairgrounds, Storage Lots Fill as Freight Car Shortages Stall Detroit Shipments

Trends in Silicosis Mortality

National Institute for Occupational Safety and Health (NIOSH)

http://www2a.cdc.gov/drds/worldreportdata/SectionDetails.asp?ArchiveID=1&SectionTitleID=3



126 people died of silicosis in 2006

1.7 Million workers are exposed to respirable crystalline silica

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Who Regulates Industrial Silica Sand Mining?

Similar to sand and gravel 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.

What is the Aggregate Tax (*Minnesota Statute* 298.75)? How does it related to silica sand?

- Local option tax – can be turned on and off
- 21.5 cents per cubic yard or 15 cents per ton (some exceptions)
- Intended to reimburse communities for the cost of hosting aggregate or silica sand mining
- Applied when transportation is by highway, road, or street
- Money is distributed

  ~42.5% to the county road/bridge fund

  ~42.5% to host city, town, or county

  ~15% for reclamation or environmental needs

LESUEUR COUNTY: Mined 3,945,390 tons,

Collected $626,481 in aggregate tax*

* *Obtained from the MN Department of Revenue*

Who are 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.

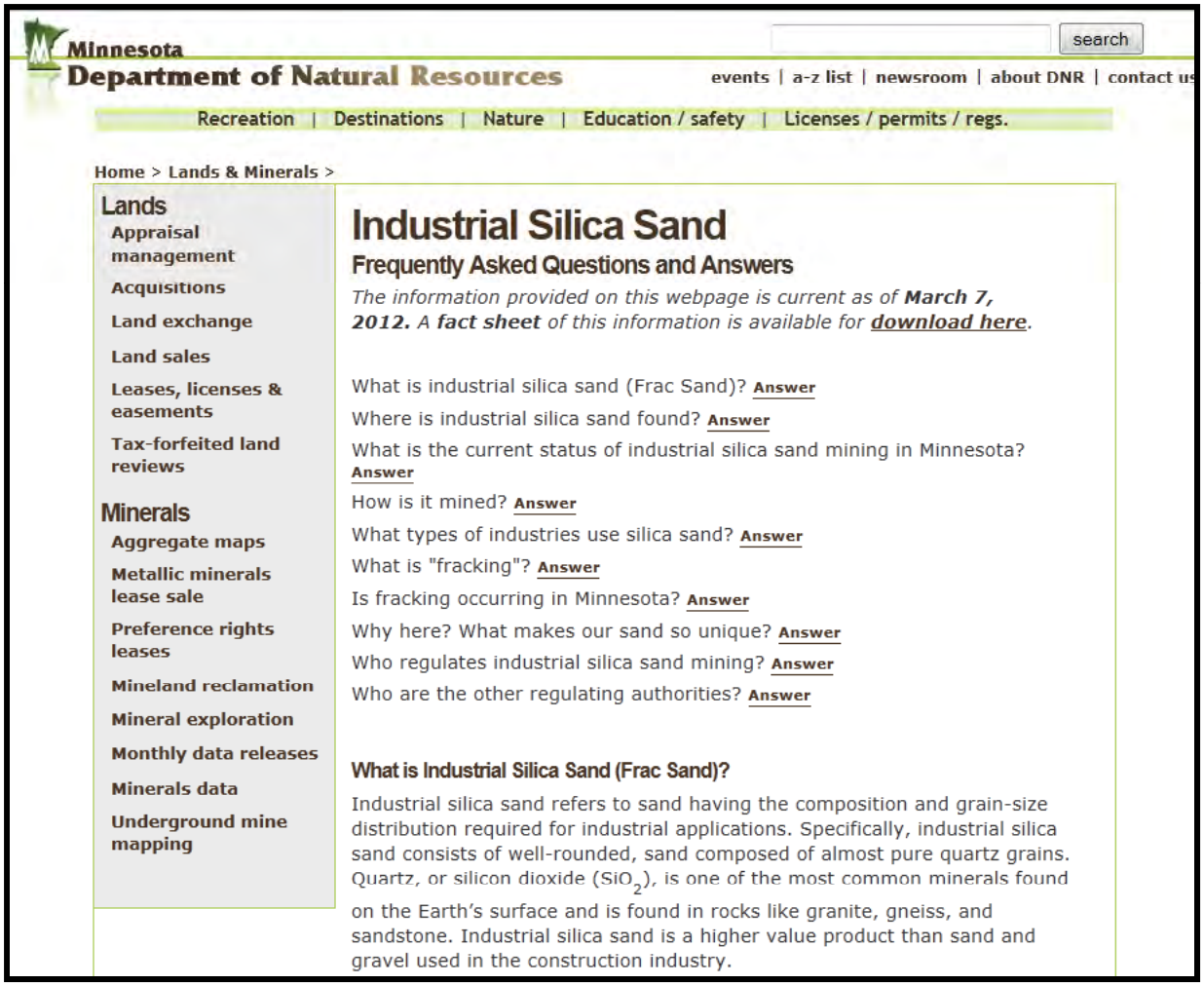
US Army Corps of Engineers- Section 404 Permit (discharge of dredged or fill material or excavation within waters and wetlands may require approval of the US Army Corps of Engineers).

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:

www.dnr.state.mn.us/lands_minerals/silicasand.html



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Industrial Silica Sand

Frequently Asked Questions and Answers

*The information provided on this webpage is current as of **March 7, 2012.** A **fact sheet** of this information is available for **download here**.*

What is industrial silica sand (Frac Sand)? **Answer**

Where is industrial silica sand found? **Answer**

What is the current status of industrial silica sand mining in Minnesota? **Answer**

How is it mined? **Answer**

What types of industries use silica sand? **Answer**

What is "fracking"? **Answer**

Is fracking occurring in Minnesota? **Answer**

Why here? What makes our sand so unique? **Answer**

Who regulates industrial silica sand mining? **Answer**

Who are the other regulating authorities? **Answer**

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 (SiO_2), 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.

THANK YOU

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