Silica Sand Mining Moratorium Report 5-25-12

Background to Moratorium and Study Report

In summer of 2011 the Citizens Against Frac Sand Mining (later changed to the Save the Bluffs organization) made a request to the Goodhue County Board asking that the county adopt a one year moratorium on the issuance of any conditional use permit for a new silica/frac sand mining operation (Mineral Extraction Facility). The purpose of the moratorium was to allow the County time to study, hold hearings, and develop steps and measures to effectively regulate potential large scale/numerous mineral extraction facilities in Goodhue County. This request was a response to Windsor Permian LLC, an oil and natural gas drilling company based out of Midland, Texas, purchasing land in the Hay Creek and Frontenac areas, apparently for the purpose of a sand mining operation.

In July, this same citizens group asked the Red Wing City Council to support the citizen's request to the County Board for a one year moratorium. Since the site for the sand mining operation was close to the Red Wing City limits and the City Council was concerned about potential environmental and health impacts that could arise from mining operations, the Red Wing City Council adopted a motion on August 22nd to support the adoption of a one year moratorium by Goodhue County related to silica/frac sand mining. A letter of support was sent to the Goodhue County Board dated August 26, 2012. The Goodhue County Board adopted a one year moratorium at their meeting held on September XX, 2011.

Since the City Council had concerns about the potential environmental and health impacts of silica/frac sand mining, the Red Wing Advisory Planning Commission and the Red Wing Sustainability Commission were asked whether the City should adopt a similar moratorium so that the City could study the issue and consider changes to its regulations related to these operations. The two commissions recommended that the City adopt a moratorium based on the fact that the City did not have existing regulations written specific to Resource Extraction or more specifically for silica/frac sand mining; and it appeared from an initial review that there were many issues of concern about these types of mining operations. Issues of concern included: impact to water quality and water levels, air quality, potential health impacts on employees and nearby residents, hours of operation, noise, truck traffic on city and county roads, silica dust, setbacks from residential uses, stockpiles, and fiscal impacts. There were also general concerns about the potential impacts on air, water, roads, and scenic resources. Both

commissions recommended that the City adopt a moratorium ordinance and on October 10, 2011, the Red Wing City Council did adopt Ordinance No. 20, Fourth Series, establishing a one year moratorium on the location and establishment of new silica/frac sand mining operations (resource extraction land use) within the City of Red Wing. The Ordinance was published on October 15, 2011 and will expire on October 14, 2012.

Red Wing's Advisory Planning Commission and Sustainability Commission have been meeting jointly to study the issues and develop recommendations concerning the various processes related to silica/frac sand mining. This jointly developed report is organized to provide the Red Wing City Council with an understanding about how this industry could impact on the community and provides a set of recommendations aimed at addresses these impacts so that community health and safety are preserved. The report has six sections: Section 1 is an introduction that helps us understand what Silica/Frac Sand is, where it is located in Red Wing and the region, and a discussion of the various processes that are involved with mining operations. This is an industry that is growing rapidly as a result of the natural gas and oil industry method of extraction called hydraulic fracturing or fracking and much of the local citizenry is learning about what silica/frac sand mining is and how it operates for the first time. Section 2 provides a description of the potential environmental, social/economic and health impacts of Silica/Frac Sand mining operations. There is a need to understand the potential impacts of the industry in order to determine if Red Wing's current regulatory framework is in place adequately to address these concerns. In Section 3, the report summarizes the pertinent chapters and plan amendments to the City of Red Wing's Comprehensive Plan that provide community leaders with land use guidance related to this topic. The Comprehensive Plan serves to establish a set of policies geared at ensuring that the City moves forward toward its long range vision. Section 4 of the report is a compilation of the existing regulatory framework that is currently in place. There are a many federal, state, and local regulations currently in place that the industry must follow and this is important to a discussion about any additional local regulations that the City Council may want to put in place. In Section 5, the report sets forth some alternative regulatory approaches that the City could establish. Here there is a discussion of banning the mining operation altogether; limiting mining and processing operations to more restrictive areas within the City based upon Comprehensive Plan policy direction; and establishing additional special provisions related to the land use that ensure that best management practices are put into place and monitored so that the public health and safety needs are met. Section 6 of the report lists the two commission's recommendations to the City Council.

Section 1
Introduction

1.1 What is Silica/Frac Sand?

Silica/Frac Sand is silicon dioxide (SiO2), also referred to as quartz. Silica sand has been mined for thousands of years and has many uses including paving roads, use in foundries and coal burning boilers, silica filters for oil and water, sand finishes in paints and coatings, and many others. Silica sand is also used in the hydrofracking process; fluid pressure fractures the rock and opens natural fractures and pores that would normally be closed due to the weight of the overlying rock, the sand grains are then carried into these fractures and prop them open after the fluid pressure is released. Not all silica sand is used for hydrofracking. Frac sand is a type of sand perfect for fracking. Characteristic of frac sand include: spherical shape, high silica (quartz) content, hardness (can withstand high pressure), uniform particle shape and size. 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. There are three sandstone formations with the best potential for high quality silica/frac sand: the Jordan and Wonewoc sandstones are the most highly sought after sources, followed by the St. Peter sandstone.

In March of 2012, there were six industrial silica sand mining operations in Minnesota in Washington County, Winona County, Olmsted, County, and LeSueur County. Some mines also process the sand on-site; three off-site processing plants were known to receive silica sand from various mining operations in Minnesota and Wisconsin. As of February of 2012, Wisconsin had about 60 frac sand operations with another 40 being proposed.

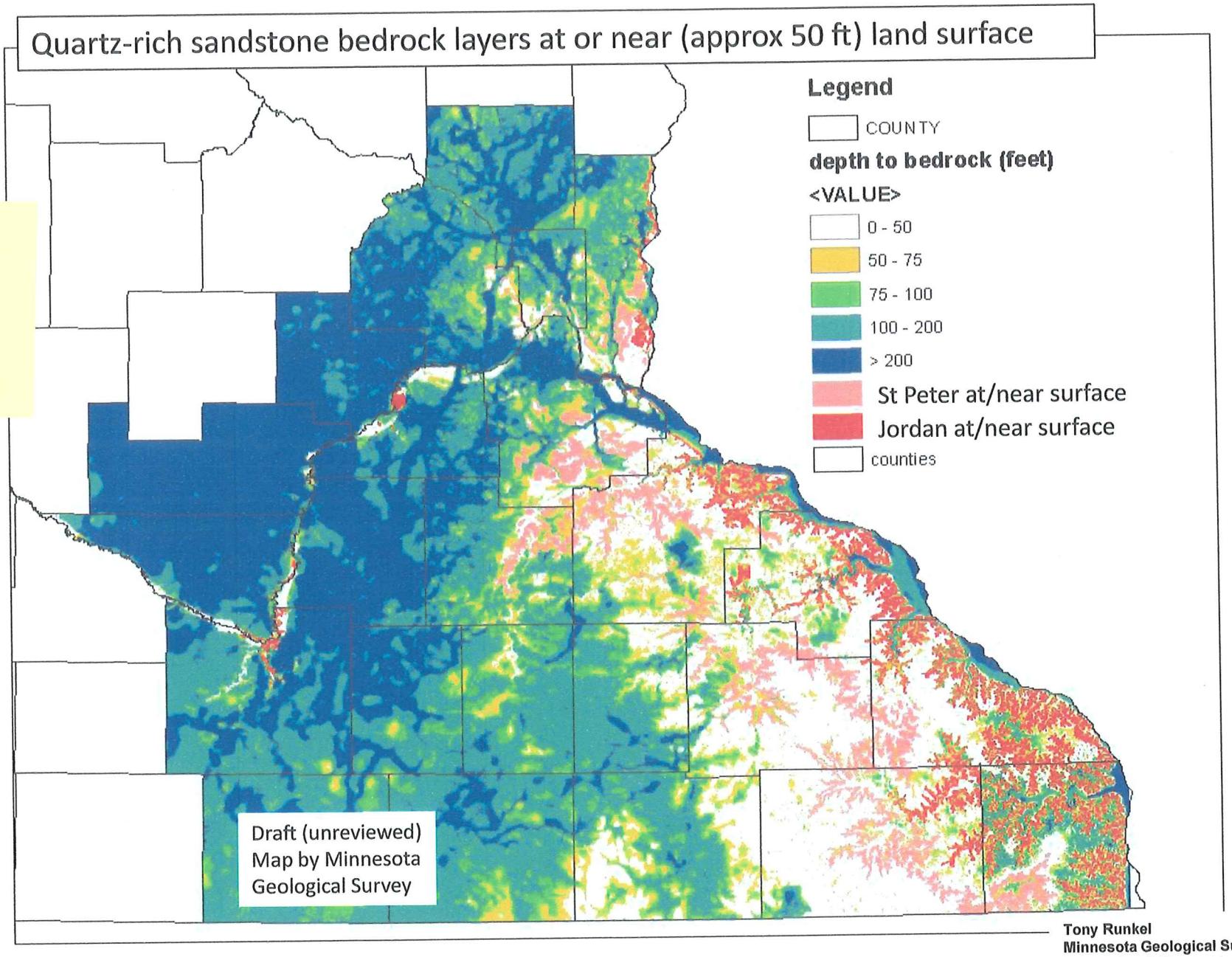
1.2 Location of Frac Sand in Red Wing

Tony Runkel with the Minnesota Geological Survey of the University of Minnesota made a presentation to the Goodhue County Mining Committee that included information illustrating the location of the Jordan and St. Peter Sandstone located near the surface in Southeastern Minnesota and Goodhue County. Map 1, shows Quartz-rich sandstone bedrock layers at or near (approximately 50 ft.) land surface in Southeastern Minnesota. The map illustrates the fact that the highly sought after Jordan Sandstone is found in this region near the Mississippi River Valley. A closer look at Goodhue County (See Map 2) shows the geological bedrock formations for Goodhue County through a section of the county that stretches from the Mississippi River at Red Wing to the Southwestern corner of the county in the Kenyon area. Jordan Sandstone near land surface is again shown in the valleys and bluff lands near the Mississippi River. St. Peter

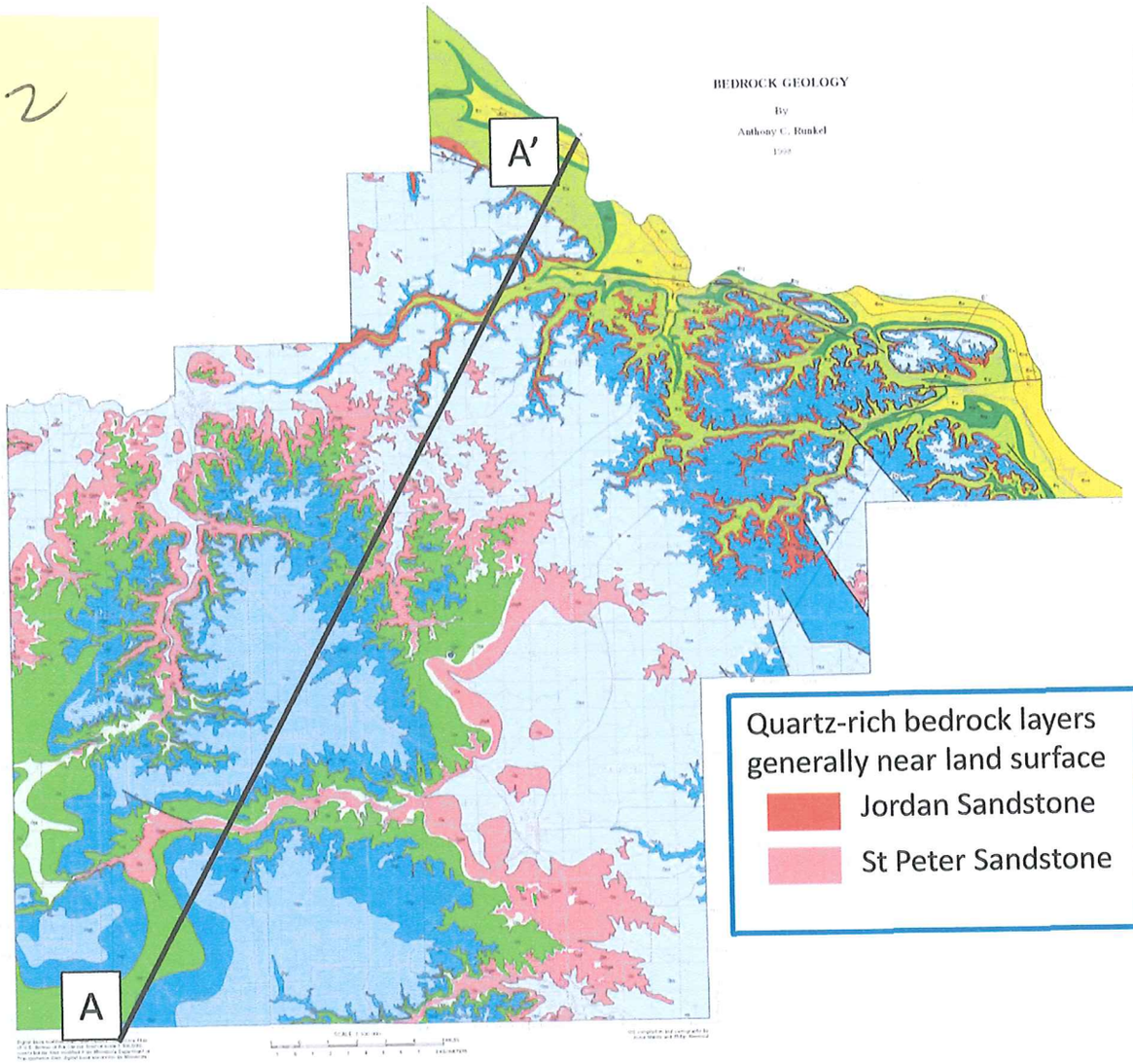
Sandstone near the surface is largely found outside of Red Wing in the Central and East-central regions of Goodhue County. Map 3, is a look at this same information for the City of Red Wing and shows how the Jordan Sandstone layers that are close to the surface in Red Wing relate to the urbanized area. Illustration XX, is a Google Earth view of Red Wing's Memorial Park area showing how the Jordan Sandstone layer is located on a commonly known landscape feature (typical of the bluffs of Red Wing). Clearly, the resource is naturally occurring in the Red Wing area and there is potential for mining interests.

Once the sand is extracted from the earth, it needs to be processed and can either be transported to on-site processing plants or off-site processing plants. Once processed, the sand is loaded onto trucks, barges or rail cars and sent to other states for use in the hydraulic fracturing process. Red Wing has truck routes, barge terminals, and railways that could potentially be used for transporting sand. There are also land areas that could potentially be used for processing plants in Red Wing or nearby. In May of 2012, the Red Wing Port Authority was contacted by its terminal operator of the Little River barge terminal near the Xcel Energy Steam Plant about the possibility of transporting Silica/Frac Sand. Clearly, there is a real potential that that companies could have an interest in locating parts of the processing and transportation elements of the mining industry in or near Red Wing in addition to the potential for the sand extraction use.

Map 1

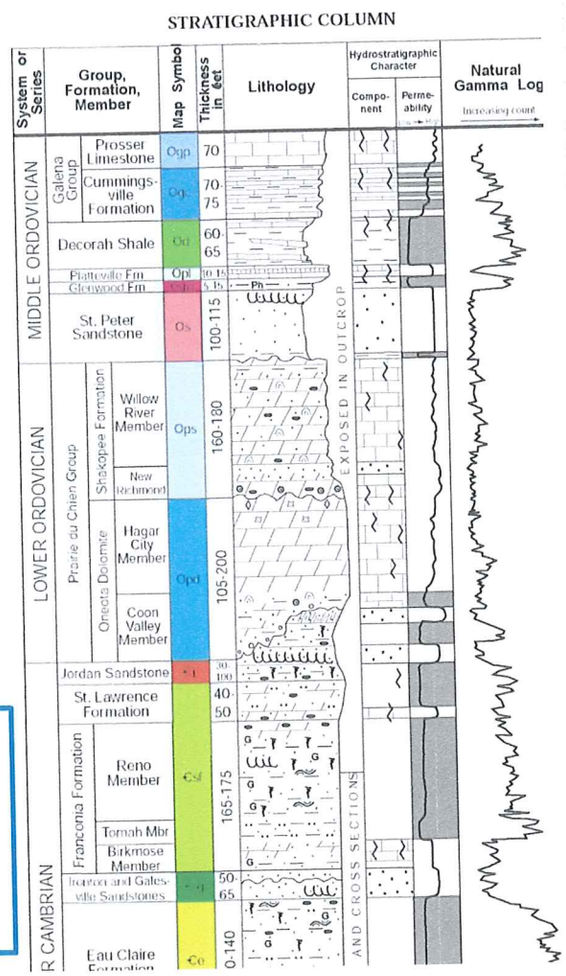

Quartz-rich sandstone bedrock layers at or near (approx 50 ft) land surface
Legend
COUNTY
depth to bedrock (feet)
<VALUE>
0 - 50
50 - 75
75 - 100
100 - 200
> 200
St Peter at/near surface
Jordan at/near surface
counties
Draft (unreviewed)
Map by Minnesota
Geological Survey
Tony Runkel
Minnesota Geological Survey
University of Minnesota

Map 2



Quartz-rich bedrock layers generally near land surface

- Jordan Sandstone
- St Peter Sandstone



Tony Runkel
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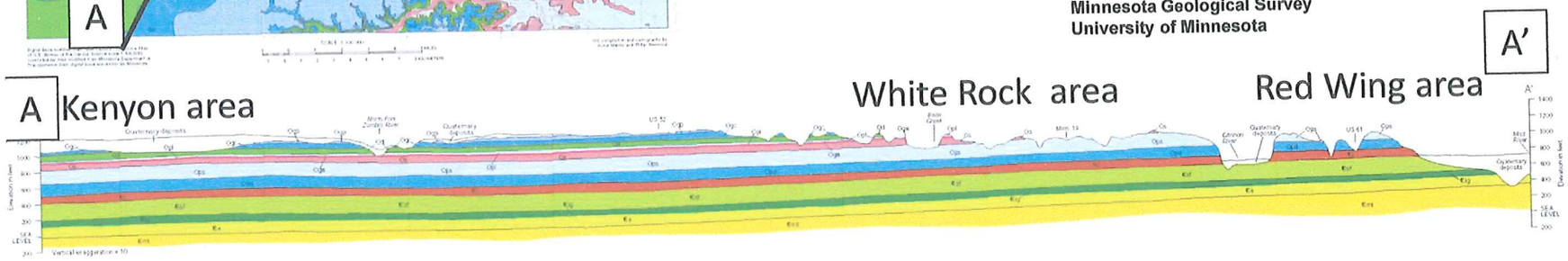
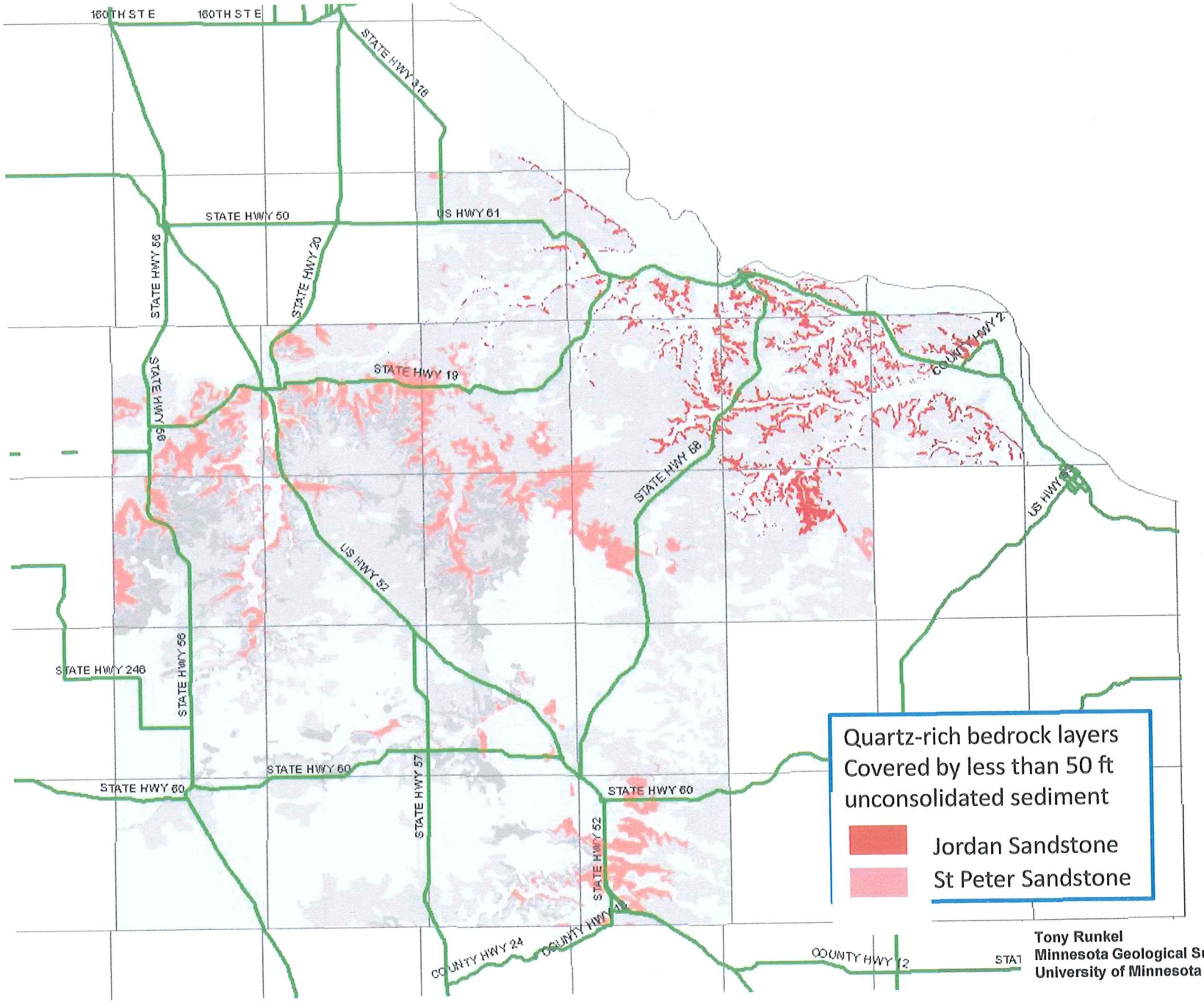



160TH ST E
160TH ST E
STATE HWY 316
STATE HWY 50
US HWY 61
STATE HWY 56
STATE HWY 20
STATE HWY 18
COUNTY HWY 2
STATE HWY 59
STATE HWY 68
US HWY 52
STATE HWY 246
STATE HWY 56
STATE HWY 60
STATE HWY 60
STATE HWY 60
STATE HWY 57
STATE HWY 52
COUNTY HWY 24
COUNTY HWY 12
Quartz-rich bedrock layers
Covered by less than 50 ft
unconsolidated sediment
Jordan Sandstone
St Peter Sandstone
Tony Runkel
Minnesota Geological Survey
University of Minnesota

Quartz-Rich Bedrock Layers in the Red Wing Area

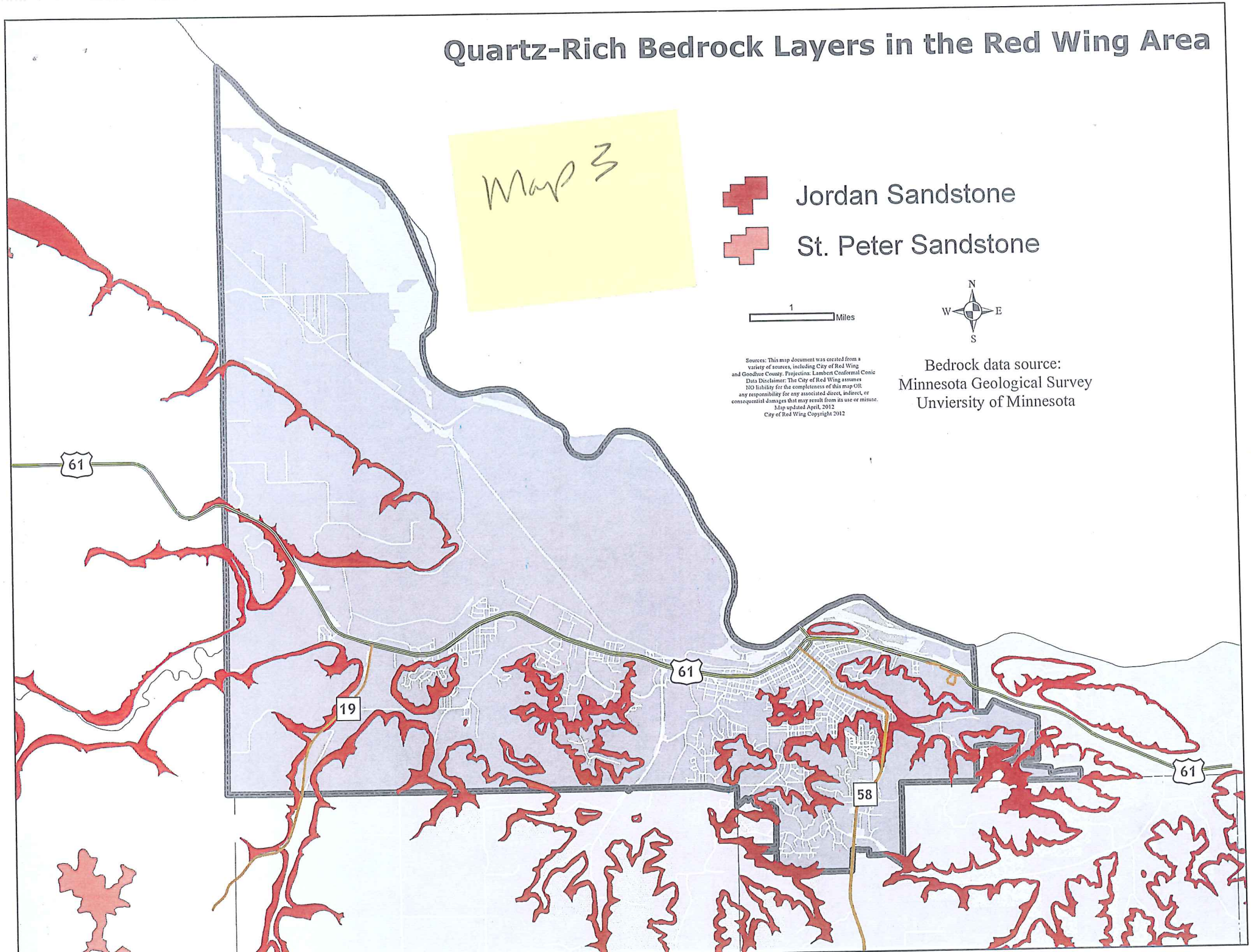
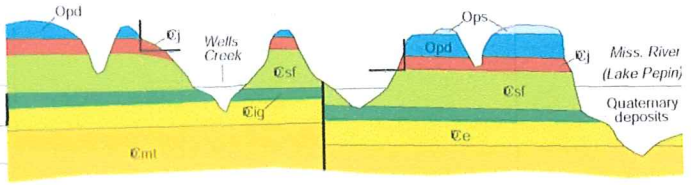


Illustration
XX



Tony Runkel
Minnesota Geological Survey
University of Minnesota

1.3 What does a typical sand mine operation look like?

All of the current industrial silica sand mines in Minnesota are surface quarries rather than underground mines. However, underground mines do exist in other States including Wisconsin. What followings is a general description of a typical mining operation that provides some information about the general steps involved with the most commonly used sand mining process involving surface mining.

1.3.1 Overburden removal/excavation

It is necessary to remove the overburden from the top of the sand formation. The overburden is top soil or subsoil that is mainly composed of silt, loam, clay, or combinations of all three. The Overburden thickness is variable and is removed by scrapers or tracked excavators and off-road haul trucks. The overburden is often hauled to the perimeter of the mining site and piled into berms. Top soil is kept separated and used on top of the berms once they have reached their final height. Berms should be seeded and mulched. The berms provide storage for the overburden until the mine is reclaimed; they provide visual screens between the active mining operation and roads and adjoining properties; they screen light pollution if there is night operation; and they act as noise barriers.

1.3.2 Excavation

Once the overburden is removed the sand is excavated. Blasting may be used depending on the geological formation. Excavation is usually done by large tracked excavators or rubber-tired front end loaders. The excavated material may be taken directly to the washing process, stockpiled on site for later processing trucked to a processing facility or trucked to a rail load-out where it is taken to a processing plant. Stockpiles are formed by conveyors or trucks deposit the material and it is moved by dozer or rubber-tired loader in which case the sand will gradually build a large pile that the trucks drive on top to deposit more sand.

1.3.3 Blasting

In some situations blasting is needed in order to loosen the sand and make it easier to remove. Blasting can result in noise, vibration, and fugitive dust emissions. Blasting frequency is variable and can happen every day or only once every few months. The use of blasting is extremely variable depending on the mining operation and the geological formation. Blasting does result in noise, air blast pressure, dust and vibration. Several best management practices can be put in place to mitigate blasting impacts. Rules by the Federal Mine Safety and Health Administration (MSHA) require the use of water injection when drilling and blasting holes in order to control

drilling dust. Prior to drilling, sand mine operators usually remove overburden in order to lessen the amount of fine material that can become airborne by blasting. Water may be sprayed onto the blast areas to minimize fugitive dust emissions.

Impacts to nearby neighbors can be reduced by using proper blasting techniques, notifying neighbors of blasts, and limiting blasting to daylight hours. A Kasota quarry site in Le Sueur County is limited to blasting between 10 AM and 6 PM. Blasting can also be monitored by professionally developed seismic monitoring programs utilizing best management practices from the United States Bureau of Mines and the federal Office of Surface Mining. These programs use computerized blasting seismographs and software programs and provide all the necessary data to insure compliance with applicable standards.
(Refer here to any MN State Rules)

1.3.4 Crushing

If blasting is required, the material will then need to be crushed to reduce the size of the particles for handling. After blasting, the sand is in a mix of rocks and boulders on the floor of the mine and is often referred to as shot rock. A crushing unit is brought to the mine and placed close to the shot rock. Larger mines may have a permanently placed crushing plant. Crushing plants are usually composed of a primary crushing unit and a secondary crusher with a screen plant powered by a large diesel engine or by a generator. The shot rock is picked up by a front end loader and carried to the primary crusher. The primary crusher breaks the shot rock which is then conveyed to the secondary crusher where it is further broken down. The material is fed to a screen plant where it is sorted by size. Smaller particles of a certain size are carried away to a stockpile and larger particles are fed back into the plant and crushed and screened until it has reached the desired size.

1.3. 5 Processing

Sand used for hydrofracking usually needs to undergo further processing that involves washing, drying, sorting, and storing the sand. Washing is done to remove fine particles and is done by spraying the sand with water as it is carried over a vibrating screen. Fine particles are washed off the sand and the coarse particles are carried along the screen by the vibration. Some processing plants also use an up flow clarifier to wash the sand. This is a tank where water and sand are continuously directed into the tank. The water washes the sand and the overflow water along with the fine particles overflow the tank while the washed sand falls by gravity to the bottom of the tank and is sent for further processing.

Once washed, the sand is sent to a surge pile where most of the water adhering to the sand particles infiltrates back into the ground. In Minnesota, the wet portion of the operation typically operates from April to November and the drying portion of the operation can operate all year round. Therefore, stockpiling can occur so that the washed sand can be dried during the winter months.

From the surge pile the sand is sent to the dryer and screening operation. The sand is dried either by feeding it into large rotating drum or a newer drying technology involves a fluidized bed dryer. Once the sand is dried, it is cooled and may be further sorted by screening. Some specialized processing plants may further treat the sand by applying a resin coating to the sand particles. Processing plants may be located at the mining site or in some cases located separate from the mine and so the sand must be transported to the processing plant by dump trucks or tractor-trailer units.

1.3.6 Transportation

Transportation of the material can take several forms depending on the location of the mine, processing plant and destination for the material. Within the mine, sand may be transported by front end loaders, large open-topped off-road trucks, or dump trucks. Open-topped dump trucks and closed gondola compartmentalized trucks (similar to grain trucks) are often used to transport sand directly to rail spurs for shipment or to processing plants.

Truck transportation is currently occurring in Red Wing.....

Rail is often the preferred method of transporting sand from the mine or processing plant to the location of final use. Most of the rail cars are open-topped; some are compartmentalized bottom unloading gondola type cars. Another option is trucking processed sand to barge terminals where it is transported down the Mississippi River. There is currently and interest in this method of transportation at the Red Wing Port Authority's barge loading terminal on the Little River.

1.3.7 Reclamation

(Is there MN Law regarding reclamation in MN Counties?)

Large frac sand mines are designed to be mined and reclaimed in phases and so there can be on-going reclamation at the same time that mining operations are continued. Land reclamation generally involves grading the site so that slopes do not exceed 3:1. These slopes generally are covered with top soil and seeded and mulched. In some instances, mining sites are converted to

building sites or a farming operation. Typically, jurisdictions establish the need for a bond or some other form of financial assurance as a condition of a permit that ensures that if the operator fails to fulfill their obligation under a reclamation plan; there will be sufficient funding available to complete the reclamation activities.

1.3.8 Underground Mines

Chippewa Falls, Wisconsin

Section 2
Potential Environmental Impacts

2.0 Potential Air Impacts

Silica sand operations have two types of air emissions that include dust from the mining and handling of sand and the second are various pollutants emitted from the equipment used to mine, handle, process, and transport the sand. Each mine and/or processing plant can be different, but can involve equipment related to blasting, backfilling, crushing, washing, drying, screening, stockpiling, conveying, and loading/unloading. Below is a list of the type of air emissions that can take place and potential regulations that apply to these phases of the operation.

2.01 Construction Impacts

- Fugitive dust during construction; diesel emissions
- BMP include paving or placing gravel on access roads and watering down roads or work areas with tanker trucks as needed.

2.02 Blasting Impacts

- Air pollution is generally considered insignificant and controlled by several BMPs.
- Should require a fugitive dust prevention plan
- Can also require study of anticipated effects of air blast pressure and vibrations caused by blasting.
- Can require a noise Study to address the effect of noise on nearby sensitive receptors.

2.03 Overburden Removal, Excavation and Crushers

- Fugitive dust and combustion emissions
- Minimized by routine maintenance of equipment; water trucks may be used to eliminate fugitive dust concerns. Water bars or other wetting techniques may be used to minimize dust from crusher units.
- Soil stockpiles can be seeded and mulched as soon as the seasons work is complete.

2.04 Pumps and Washing

- Very minimal air pollutants associated with this operation

2.05 Stockpiles

- Coarse sand is stockpiled at the mining site or processing site to be washed.
- Fugitive dust is the main concern
- Need to have a fugitive dust prevention plan in place

2.06 Loading/Unloading at the Mine

- Can include transferring raw material into trucks or railcars for transport. Unloading operations at a mine may include dumping of fines/reject sand brought from processing plants. Loading operations may or may not be within an enclosed structure.
- Activities need to follow a fugitive dust prevention plan.
- Activities can have significant dust impact and can be further regulated by specific emission limitations.

2.07 Mobile Equipment on Mining Sites

- Mines and processing plants will have a collection of front-end loaders, trucks, etc. that can create dust and emissions.
- Fugitive Dust Plan
- Paving Roadways
- Spraying of water on dusty roads or sweeping
- Wheel wash or tire bath
- Posting and maintenance of speed limits

2.08 Conveyors

- Used to convey sand from mine to processing or to stockpiles
- If conveyed dry, there is a need for a fugitive dust prevention plan

2.09 Dryers

- After sand is washed, and prior to being sized and stored as a final product it goes through drying.
- Air pollution resulting from this operation includes combustion emissions and particulate.
- Emissions and sand particulates are largely controlled by the use of a cyclone or baghouse. Collected materials in the baghouse are disposed of at the mine site as fines or rejected material.

2.010 Screening

- Sand is transfer to vibrating screens.
- Resulting particulate from the screening process is typically controlled by the use of a cyclone or baghouse. Some facilities enclose the screening operation within a building.
- Need to follow a fugitive dust emissions plan

2.011 Loading/Unloading at the Processing Plant Operation

- Processing plant at the mine will not have unloading operations; processing plant off-site will have truck or rail unloading of raw material. Processing plant will have loading operations regardless of the site.
- Air pollution resulting from processing plant includes stack and particulates
- Control of dust particulates can take place by use of a cyclone or baghouse, or unloading process through underground or covered conveyor systems.
- May require fugitive dust prevention plan for fugitive emissions.

2.012 Inhalation Risk and Non-Carcinogenic Effect for Hazardous Air Pollutant Emissions

- Can require an air quality impact assessment.

2.1 Water Resources

Water resources can be impacted by silica sand mining operation is several ways. The mine may be located near a river or stream or wetland; or groundwater may be encountered as the site is being mined. Water may also be used during the mining and processing stages. Washing may require the installation of a high capacity well. Storm water needs to be managed on a mining or processing site and if there are buildings, there may be a need for water for cleaning, cooking, drinking, or sanitation.

2.11 Groundwater- Process Water

2.12 Groundwater – Dewatering Water

2.13 Groundwater – Drinking Water

2.14 Surface Water Management

2.15 Wetlands

2.16 Cannon River Watershed

2.17 Wastewater

2.18 Erosion Control

2.2 Fisheries

- Trout stream impacts
- Sedimentation in streams and rivers
- Thermal impacts (warm water settling ponds on cold water resources)
- High capacity well impact on stream flows

2.3 Solid Waste Management

- Solid waste management and handling spills

2.4 Recreation and Managed Lands

- State owned managed lands
- Red Wing Wildlife League Property
- Conservation Easement Lands
- City Park and Open Space Lands
- Cannon Valley Trail
- Noise, Dust, Lighting, Traffic, Air Quality, Forest, Scenic Qualities
- Scenic Qualities

2.5 Endangered and Threatened Species and Habitats

- Natural Communities
- Map of Endangered Plant and Animal
- Animals and Plants federally listed as Endangered or Threatened
- Audubon Important Bird Areas (IBAs)

2.6 Archeological and Historic Impacts

- Historic and Archeological Resources

- Minnesota Cemetery Statute

2.7 Socio-Economic

- Impact on neighboring properties: noise, increase in traffic, road deterioration, visual impacts, lighting, and property value impacts.
- Economic benefits include: new jobs, support of secondary jobs such as transportation, construction and equipment, infrastructure investment, added tax base

2.8 Transportation

- Vehicular traffic on local roads will have an impact on the service life and condition of the roads, dependent on the amount of traffic
- Several Counties and Cities have required Road Maintenance Agreements including Woodbury, Chippewa County, (Olmstead County – considering)

Section 3

Red Wing Comprehensive Plan Guidance

3.0 Comprehensive Plan

The City's Comprehensive Plan

3.1 2007 Comprehensive Plan References

3.2 Open Space Preservation Plan

Section 4
Existing Regulatory Framework

a. State and Federal Regulations and Permits
   i. US Army Corp of Engineers Section 404 Water Act Permit
   ii. US Army Corp of Engineers Discharge Permit (Water Quality Permit)
   iii. MPCA NPDES/SDS Construction Activity Permit
   iv. MPCA NPDES/SDS Permit – Construction Sand & Gravel, Rock Quarrying & Hot Mix Asphalt Production
   v. MPCA Section 401 Water Quality Certification
   vi. MNDNR Water Appropriations Permit
   vii. MNDNR Individual Public Waters Permit
   viii. MN Department of Health Drilling/Sealing Wells

b. Environmental Assessment Process
   i. Mandatory EAW
   ii. EIS
c. City's Existing Zoning Regulations
   i. Conditional Use Permit
   ii. Performance Standards

Section 5
Alternative Regulatory Approaches

a. Prohibit Frac Sand Mining/Processing
b. Limit Frac Sand Mining/Processing to Agriculture and I-2 Zoning Districts
c. Limit Mining from Open Space Preservation Priority areas and Sensitive Areas
d. Establish new Special Provisions Section of Zoning Code with the following elements
    i. Purpose
    ii. Application
    iii. Definitions
    iv. Minimum Standards
    v. Annual Reporting
    vi. Inspection and Enforcement
    vii. Financial Assurance and Mining Agreement
    viii. Submission Requirements
    ix. Etc.
e. Establish Licensing Provisions

Section 6
Recommendations