BLAST MONITORING PLAN

APRIL 24, 2012

GREAT PLAINS SAND, LLC

PROPOSED MINING OPERATION
LOUISVILLE AND SAND CREEK TOWNSHIPS,
SCOTT COUNTY, MN

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BLAST MONITORING PLAN

1.0 INTRODUCTION

Blasting of the sandstone will be necessary as some layers of the Jordan Sandstone are tightly cemented and to insure viable recovery using a dragline, dredge or backhoe, blasting will be necessary. The blasting is performed to provide just enough energy to break the cemented sand grains apart to facilitate removal with the mining equipment. Blasting is commonly used in the metropolitan area in association with limestone quarries. In Scott County, limestone quarries with active blasting are located in Louisville and Jackson Townships. All blasting creates some vibration and noise. However, these effects have been studied for over 100 years and safe levels established. The purpose of this Blast Monitoring Plan is to:

1.1 Describe the anticipated blast process;

1.2 Discuss industry standards in terms of acceptable limits of ground vibrations and air blasts established to provide protection to infrastructure and structures;

1.3 Establish a monitoring program for the project that will provide the framework for documentation of the existing condition of adjacent structures, set forth blasting standards protective of structures and infrastructure adjacent to the Great Plains Sands Site, establish monitoring as a means to collect ground vibration and air blast data, establish a schedule for submission of independent experts analysis and their expert opinions on the process that can be submitted to the County and the Great Plains Sand Advisory Committee for review; develop contingency actions to be followed in the event a blasting standard is not achieved.

2.0 BLASTING PROCESS

The Jordan Sandstone varies from a loosely cemented to tightly cemented deposit. Geologic investigation and past mining of the Site has determined that there are layers of tightly cemented sandstone at this location that will require blasting. After overburden has been removed, sandstone will be blasted as necessary. Blasting will be required in the sandstone both above and below the water table. Blasting will be performed approximately 3-4 times per week depending upon the location and geology encountered in the active phase of the mining operation. A typical blast may last roughly 1.5 seconds, making the total blasting impacts from the site only a few seconds a week.

The purpose of the blasting is to fracture the sandstone through the use of explosives to facilitate rock removal with conventional mining equipment. Holes are drilled into the rock, carefully loaded with explosives by trained blasters from an independent blasting company. A timing sequence is engineered to progressively detonate the explosives loaded in the holes, this timing sequence, reduces overall vibration, reduces noise impacts and improves fracturing the sandstone. These sequences are engineering by professionals with experience in many similar operations. The actual blasting is then conducted and tracked with data collected by the seismographs and adjusted as necessary for any changing quarry conditions. The blast immediately fractures the rock and the explosives are consumed.

Blasting causes ground vibrations as the energy from the blasts travels through the ground and eventually dissipate. Blasting also creates an air blast or impulse noise. Both ground vibrations and air blasts have been studied by the Office of Surface Mining and the United States Bureau of Mines to establish safe levels which will not cause damage to adjacent receptors. Ground vibrations and air blasts are measured during each blast so that the blasting program can be adapted to the changing geologic condition, the location of the blast in the mine, as well as changes such as location relative to receptors. For example, larger blasts in the central portion of the mine may be modified by increasing the number of blast holes or changing the timing sequence, these actions help to minimize the number of total blasts required. However as the mining reaches the perimeter of the facility and is in closer proximity to adjacent buildings adjustments are also made to reduce the overall vibration levels near those buildings.

Blasting is accomplished by first drilling a series of holes, typically 3-5 inches in diameter into the rock. A small booster charge and blasting cap is placed in the hole followed by the blasting agent. A booster provides just enough energy to detonate the blasting agent. Boosters in each hole are detonated individually by the blasting caps that have built in time delay. Using delays just thousands of a second apart is enough to greatly disperse the energy released by the total amount of explosives involved. To an observer, a blast seems to happen instantaneously. What actually takes place, however, is a rapid progression of smaller explosions. The blasting agent is a mixture of ammonium nitrate and fuel oil (ANFO) or a manufactured emulsion product that is non-water sensitive for areas of underwater mining. Careful engineering goes into determining a precise pattern for these holes and the timing sequence, taking in to account the distance to the nearest structures, since this is a major factor in achieving desirable results.

The three environmental effects that can result from blasting include; ground vibration, airblast and flyrock. The majority of energy in a well-designed blast is absorbed as it fractures and moves the rock away from the mine face into a pile for loading. . This efficiency is achieved by adjusting the amount of explosives to match the amount of rock to be broken and utilizing the per delay intervals, to control ground vibration and frequency of the blast. Ground vibration is measured in inches per second and is a measure of the vibration of individual rock particles. Structural damage can occur when particles vibrate at levels greater than current blasting standards. Ground vibrations decrease by a mathematical formula and very rapidly as the distances from the source increase.

Seismographs placed on mine property, closer to the blast than adjoining properties measure ground vibration and air blast. This information allows professional blasting engineers to calculate vibration at neighboring structures. This information is used to verify blasting design expectations, adjust or modify subsequent blasts if required and verify that ground vibrations at the structures are within nationally recognized standards for safe blasting. These standards have been tested and proven to be safe for structures, pipelines and transportation systems. Several decades of research by the United States Bureau of Mines and the Office of Surface Mining have resulted in the establishment of ground vibration standards that are protective of nearby structures.

“Airblast” is a term that describes air movement (pressure change) created by the breaking and movement of the rock through the expansion of the blasting agents. This pressure change travelling through the air transmits noise from a blast, although most of the energy is below the frequency range of human hearing. Airblast is measured in decibels. Although the airblast may not be audible, it may be felt. The lower frequency air pressure may cause windows to rattle, which is then a sound that is noticed by the receptor.

"Fly rock" is a term used to describe pieces of rock that could be ejected from the blast area. Fly rock is controlled by properly engineering the blast design, proper explosive volume per volume of rock to be moved and , providing sufficient stemming materials, (rock fill located in the top of the drill holes to contain the blast).

3.0 BLASTING STANDARDS:

3.1 Ground Vibration: Blasting standards have been developed by the United States Bureau of Mines and the Office of Surface Mining (OSM), based on decades of research, to establish acceptable levels of ground vibration and airblasts that offer protection of nearby structures. Research has verified that at lower blast vibration frequencies the thresholds at which cosmetic damage may begin to occur (with appropriate safety factors) are lower than higher blast vibration frequencies. This is because structural resonance (a condition in which a response is amplified) is associated with low frequency vibrations.[1] As a result, blasting standards are frequency dependent.

Chart 1, from the OSM Blasting Performance Standards, Airblast limits, in Code 30 of Federal Regulations, illustrates the allowable ground vibration particle velocities at various frequencies that have been established to provide protection of structures. Ground vibration is measured as the peak particle velocity. Seismographs will record the particle velocity of each blast performed on the Great Plains Sand site. Particle velocity will be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity shall be the vector sum of the three. In all blasting operations, the maximum ground vibration shall not exceed the values indicated in the blasting-level Chart 1 below at adjacent structures. A stricter standard will be used for historic structures of 0.5 in/sec for low frequencies (less than 40Hz) and 2.0 for in/sec for higher frequencies (40 Hz or greater).

[1] Konya, Calvin J. 1995 Blasting Control at Meridian Aggregates. Precision Blasting Services Montville, OH 44064

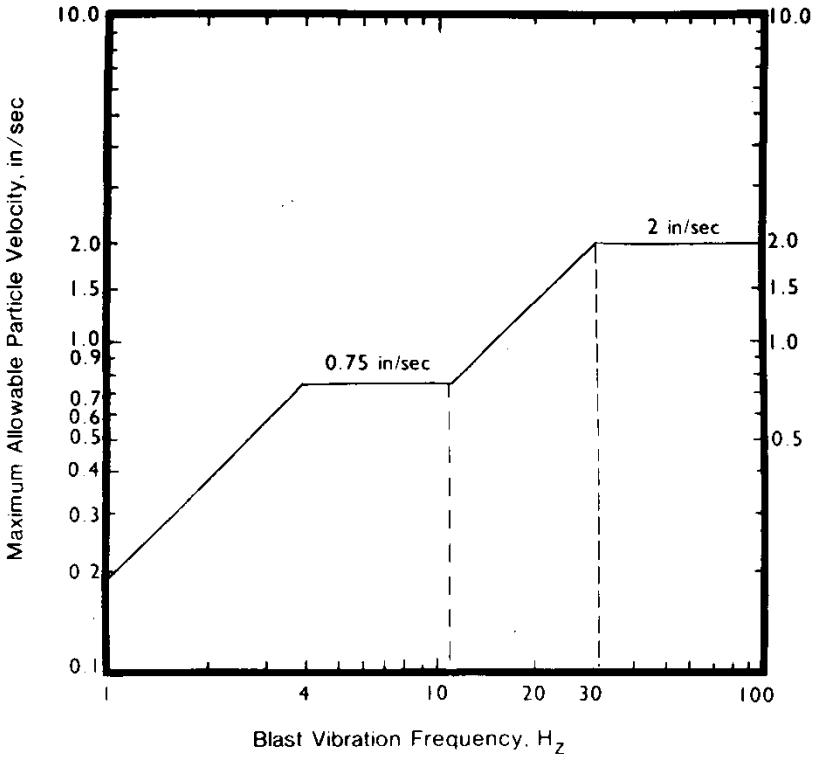

Chart 1. BLASTING LEVEL CRITERIA

OSM Blasting Performance Standards, Airblast limits, in Code 30 of Federal Regulations
Source: Modified from figure B1, Bureau of Mines RI 8507)

3.2 Airblast: shall not exceed the maximum limits listed below at the location of any dwelling, public building, school, church, or community or institutional building, or historic structures outside the project boundary.

Lower frequency limit of measuring system, in Hz (+/- 3 dB)	Maximum level, in dB
2 Hz or lower--flat response	133 peak

3.3 Flyrock: Flyrock shall be controlled by blasting design

4.0 MONITORING PROGRAM

Great Plains Sand has developed the following blast monitoring program to be followed throughout the mining operation.

4.1 Pre-Blast Surveys: Pre-blast surveys will be conducted to document the existing condition of nearby structures and log any pre-mining defects and structural issues to establish a starting

point for independent professional review should any damage be claimed. Pre-Blast surveys will be conducted by an independent contractor. Owners of structures located within 0.5 miles of the proposed blasting limits, and additional properties requested by the County and listed in Appendix 1 hereto and Exhibit "t" of the Interim Use Permit issued to Great Plains Sand by the County, will be contacted by Great Plains Sand at least 20 days prior to initial blasting operations with instructions as to how a pre-blast survey may be conducted. Survey requests received more than 10 days before the initiation of blasting will be conducted before blasting begins. Those received less than 10 days before the initiation of blasting will be conducted within 30 days of receipt of a survey request. Pre-Blast surveys will be conducted by an independent contractor on those structures where property owners grant permission. The pre-blast survey inspects the exterior and interior of a structure, including basements and foundations. These surveys provide documentation of the pre-blast condition of the structure. A copy of the pre-blast survey will be provided to the property owner and one will be kept in the offices of Great Plains Sand.

Operator shall perform additional pre-blast structural surveys for newly constructed buildings or additions, and remodels that involve structural modification to an existing structure within one-half mile of the Subject Property during the operation of the mine in accordance with the procedures outlined in the Developers agreement.

4.2 General: Blasting will be conducted to prevent injury to persons, damage to public or private property outside the permit area.

4.3 Hours: Blasting will be limited to the hours of 10 am to 6 pm Monday through Saturday.

4.4 Blasting will be performed by an independent blasting specialist.

4.5 Monitoring: at least two seismographs will be utilized to record each blast. The seismographs will be placed at a location between the nearest structure and the blast site and a location roughly 90 degrees to that orientation. Seismographs will record the airblast and particle velocity. Locations of monitoring points will change as mining progresses to provide comprehensive monitoring of all adjacent structures.

4.6 Records: Records will be maintained of each blasting event. The records will record:

1. Date and time of blast;

2. Type of explosive used;

3. Blast hole layout and time intervals of delay;

4. Pounds of explosives per each delay of eight milliseconds or more;

5. Total pounds of explosives;

6. Monitoring locations and results

7. Meteorological conditions, including temperature inversions, wind speed, and directions as can
be determined from the U. S. Weather Bureau, and ground-based observations;

4.7 Maximum acceptable levels: The results of each blast will be reviewed for compliance with the standards outlined in Section 3.0 above.

4.8 Results will be subject to an annual independent professional review. The report will be submitted to the County and the advisory committee on an annual basis.

4.9. In the event that a blast exceeds the standards outlined above, the county will be notified within seven days and results of the next three blasts will be submitted for review.

4.10 Any complaints related to blasting at the Great Plains Sand site will be addressed through the advisory committee.

5.0: CONTINGENCY ACTIONS:

In the event that seismograph monitoring indicates that a blast at the neighboring structures has exceeded the standards identified in Section 3.0 above, the Great Plains Sand Mining Review Committee, Louisville and Sand Creek Townships and Scott County will be notified within 7 days.

5.1 Ground Vibration: If the ground vibration standard is exceeded, one or more of the following contingency actions will be implemented at the next blast. The monitoring results of the this blast will be analyzed and reported to the Great Plains Sand Mining Review Committee, Louisville and Sand Creek Townships and Scott County within seven days of the blast. These contingency actions will continue to be implemented as required to until the blasting is in compliance with OSM standards.

1) reduce pounds of explosive per delay period

2) adjust/change timing sequence

3) adjust size of shots

4) adjust size of drill holes

5) log drill holes

If after three subsequent blasts to the first exceedance, the contingency actions 1-5 fail to reduce the vibration at the structures to the OSM standards, one of the following additional contingency actions will be undertaken.

6) expert outside review

7) change blasting vendor

5.2 Air Blast: If the air blast standard is exceeded, one or more of the following contingency actions will be implemented at the next blast. The monitoring results of the blast will be analyzed and reported to the Great Plains Sand Mining Review Committee, Louisville and Sand Creek Townships and Scott County within seven days of the blast. These contingency actions will continue to be implemented until the blasting is in compliance with OSM standards.

1) utilize crushed rock stemming

2) increase stemming depth

3) change timing sequence

4) change hole size

5) utilize stemming plugs

In after three subsequent blasts to the first exceedance, contingency actions 1-5 fail to reduce the Airblast to OSM standards, one of the following additional contingency actions will be undertaken.

6) expert outside review

7) change blasting vendor

April 24 2012

Appendix 1

Properties with structures located outside of the 0.5 mile radius of blasting limits
Structure Testing – Additional Properties

Note: Mailing Address may be different from property address

1. Troy Boegeman
   2771 150 St. W
   Shakopee, MN 55379

2. Joseph Mullin
   2775 150 St. W
   Shakopee, MN 55379

3. Vernon J and Cynthia A Pieper
   2661 150 St W
   Shakopee, MN 55379

4. Bruce A and Kathy Fahrenkamp
   2651 150 St W
   Shakopee, MN 55379

5. Jack W and Maureen J Freund
   2571 150 St W
   Shakopee, MN 55379

6. James A and Carole A Boegeman
   2495 150 St W
   Shakopee, MN 55379

7. Waldo R and Arlene J Fahrenkamp
   2556 150 St W
   Shakopee, MN 55379

8. Kristin Grommesch
   2640 150 St W
   Shakopee, MN 55379

9. Chad L and Denise L Weber
   2736 150 St W
   Shakopee, MN 55379

10. James A and Deborah G Fath
    2760 150 St W
    Shakopee, MN 55379

11. Gary J and Donna M Marten
    2820 150 St W
    Shakopee, MN 55379

12. Wallace D and Joanne E Bakken
    2796 150 St W
    Shakopee, MN 55379

13. Thomas D and Mary M Koskovich
    14726 Old Brick Yard Rd
    Shakopee, MN 55379

14. Hilarion E Mechtel
    15220 Old Brick Yard Rd
    Shakopee, MN 55379

15. Timothy L and Sandra L Breeggemann
    2256 145 St W
    Shakopee, MN 55379

16. Marion Frank
    16172 Overlook Dr
    Shakopee, MN 55379

17. Herbert Deroma
    16190 Overlook Dr
    Shakopee, MN 55379

18. Gerald and Mary Lou Fry
    16465 Pueblo Blvd
    Jordan, MN 55352