

# Environmental Considerations of Proppant Frac Sand Mining and Processing

ASMR Conference  
Oklahoma City, OK

June, 2014



# Introduction & Background

# New Energy Boom





**Lower 48 states shale plays**

This map illustrates the distribution of shale plays across the Lower 48 states of the United States. The map uses color-coding to distinguish between current and prospective plays, and line styles to indicate the depth/age of stacked plays. Basins are outlined in pink. Key shale plays include the Bakken, Niobrara, Permian, Eagle Ford, Haynesville-Bossier, Fayetteville, Woodford, Barnett, and Marcellus. The map also shows the Appalachian Basin, Devonian (Ohio), Utica, and various basins in the West and Midwest. A scale bar indicates distances up to 400 miles, and a north arrow is provided.

**Shale plays**

- Current plays (Red)
- Prospective plays (Orange)

**Stacked plays**

- Shallowest/ youngest (Blue line)
- Intermediate depth/ age (Green line)
- Deepest/ oldest (Purple line)

**Basins**

- Mixed shale & chalk play (\*)
- Mixed shale & limestone play (\*\*)
- Mixed shale & tight dolomite-siltstone-sandstone play (\*\*\*)

Updated: May 9, 2011



# Frac Sand Basics

## ► Proppant

- Silica Sand
- High Crush
- Spherical
- Acid Resistance

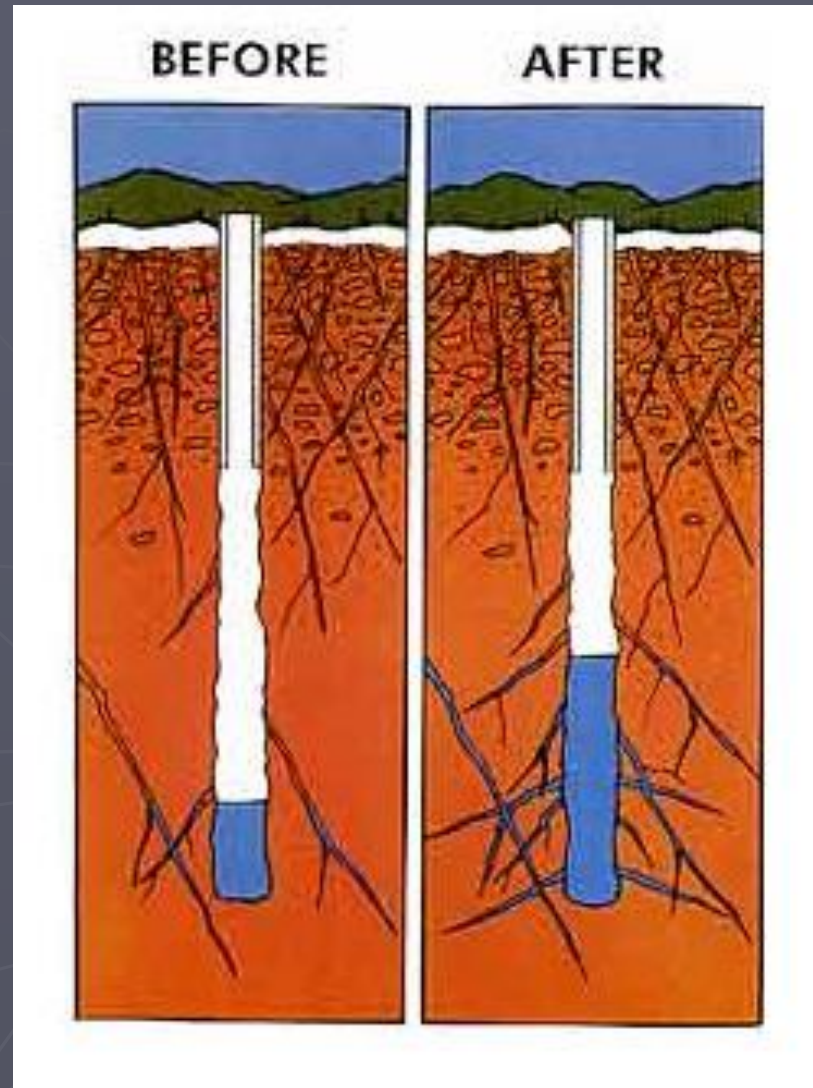


20/40 White Sand

## ► Mesh Sizes

- 20/40
- 30/50
- 40/70
- 70/140

# Well Stimulation



# Frac Sand Mines

- ▶ Multi-billion Dollar Industry
- ▶ Locations
  - Arkansas, \*Wisconsin, Illinois, Oklahoma, Texas, Minnesota, Louisiana, Mississippi
- ▶ Mine Types - Primarily
  - Surface
  - Dredging
  - Quarry

# Typical Frac Sand Operations

## ► Mine

- Material Excavation
- Stockpile



## ► Wet Plant

- Initial Screening
- Washing Process



## ► Dry Plant

- Direct Heat Application
- Final Screening
- Storage





# Site Challenges – Frac Sand Mine

- ▶ Location
  - Population / Cities
- ▶ Water Resources
  - Surface / Groundwater
- ▶ Traffic
  - Trucks / Rail
- ▶ Utilities
  - Gas / Power
- ▶ Topography
  - Mountains / River

Mining & Reclamation  
Plan Development

# Frac Sand Mine Environmental Concerns

## ► Air Quality

- Blasting / Excavating Emissions
- Road Emissions
- New PM2.5 Standard
- NOx Regulations



# Frac Sand Mine Environmental Concerns

## ► Water Quality

- SEDIMENT!
- Wet Plant Treatment Chemicals





# General Permitting Requirements

- ▶ Quarry/Mining Permit – Reclamation Requirements
- ▶ Air Quality Permit
- ▶ Individual State NPDES Water Permit
- ▶ Construction SW3P
- ▶ Industrial SW3P
- ▶ Field Determination of USACE Jurisdiction
- ▶ Nation-Wide Permit (s)
- ▶ Driveway Permit

# Frac Sand Mining Plans

- ▶ 1) – Assess Quality of Deposit
- ▶ 2) - Reserve Analysis
- ▶ 3) – Site Location Review
- ▶ 4) – Environmental Considerations
- ▶ 5) – Design of Operation

# Frac Sand Mine Reclamation Plans

## ► Typical Features

- Utilization of Buffers
- Permanent Water Lake / Ponds
- Replacement of Overburden Stockpiles & Grade to Predetermined Contours
- Revegetation of Exposed Soils W/ Native Plants

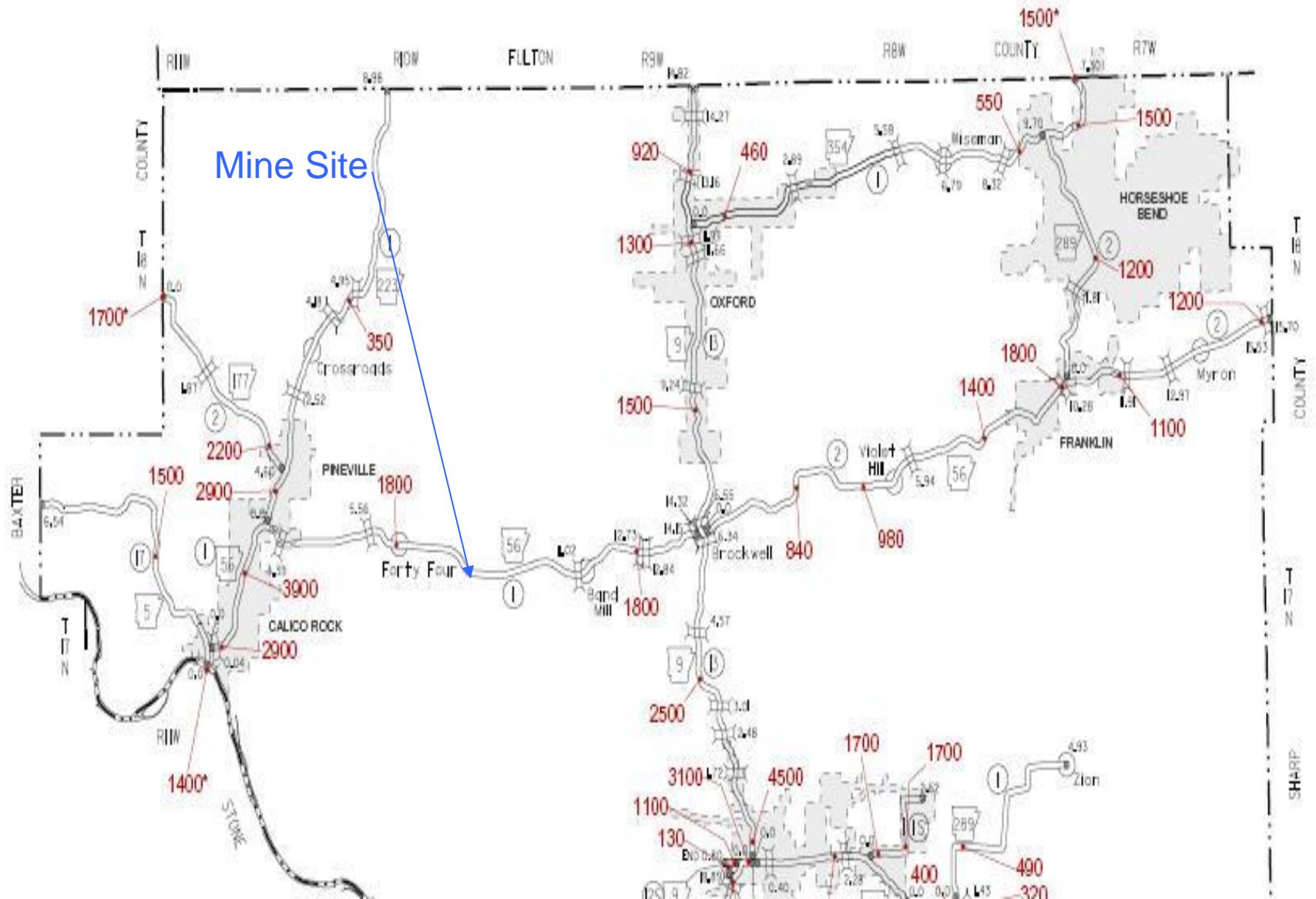


# Case Study

(Evergreen Processing - Calico Rock, AR)

- ▶ Approx. 1300 Acres On the South Side of Hwy 56
- ▶ Proposed Fractionation Sand and Limestone Quarry
- ▶ Wet/Dry Processing Plants for Fractionation Sand
- ▶ Overburden – Limestone
- ▶ Sandstone – Requires Blasting / Crushing

# Evergreen Location



# Site Photos



Sandstone Quarry Area



Sandstone Outcrop



# Site Photos



Bailey Creek  
Low Water Crossing

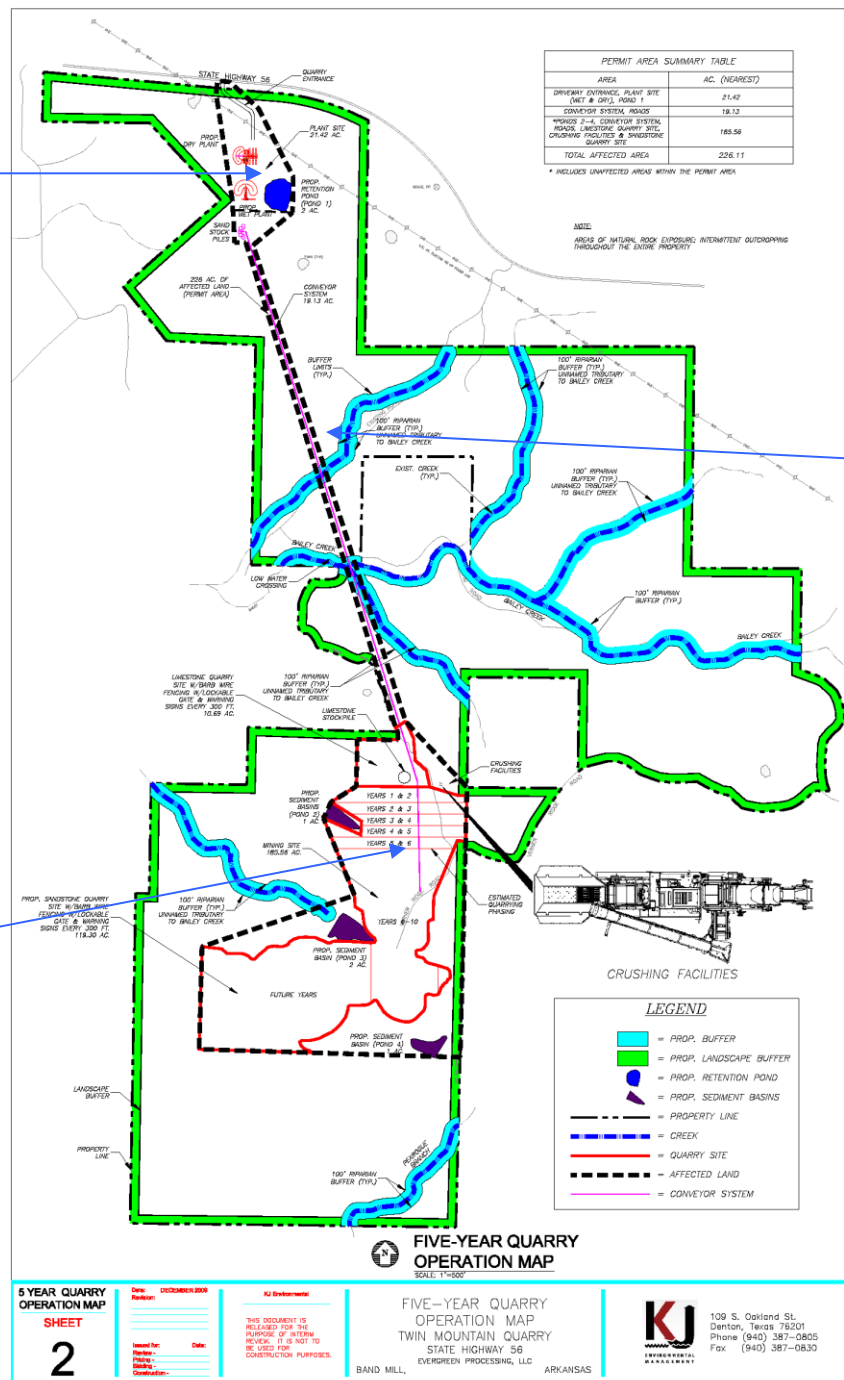


Pearoque Branch

## Processing Plants

## Conveyor to Plants

## 5 Year Quarry Plan

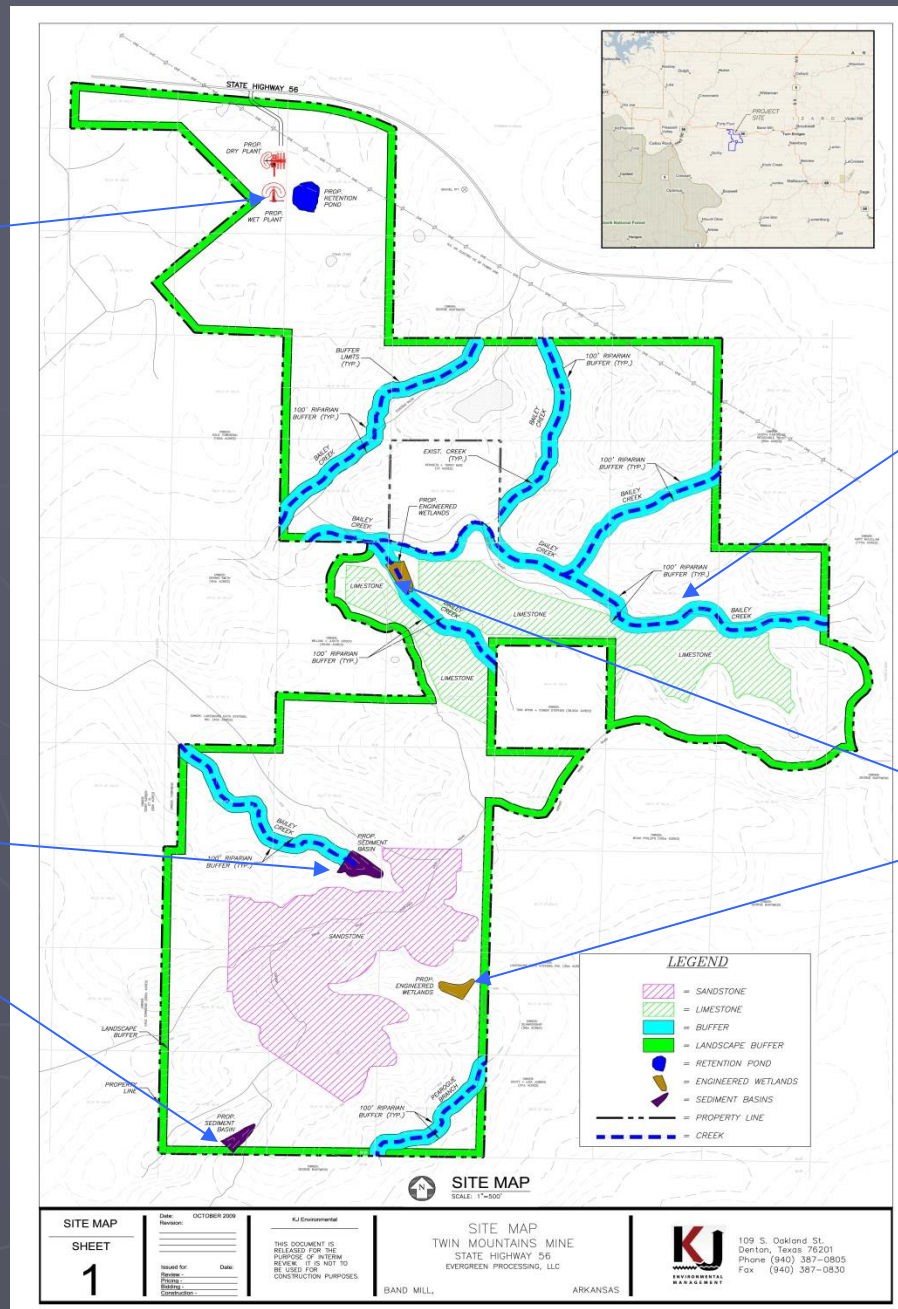


**Retention  
Pond for  
Water Re-use  
and Water  
Quality**

**Riparian Buffers  
for Stream and  
Habitat Protection**

**Sediment Basins  
for Water Quality**

**Proposed  
Engineered  
Wetlands for  
Biological  
Sediment  
Filtration**





# Environmental Protection Measures

- ▶ **Engineered wetlands:** removes sediment and other pollutants from the water.
- ▶ **Settling ponds/Retention ponds:** fine particles are removed from the water by force of gravity. These particles then do not enter nearby streams.
- ▶ **Riparian Buffers:** 100-foot buffers on each side of stream to protect water quality, prevent erosion, and preserve habitat.
- ▶ Increased frequency of **water quality sampling** above required standards.
- ▶ **Erosion control** when building roads and fractionation sand plant.
- ▶ **Tree buffer** around entire property.

[illegible]

# Case Study

(Northern Frac Sand – Dawes Creek, WI)

- ▶ Proposed Sand Mine – Surface Excavation
- ▶ 10-15' Soil Overburden
- ▶ Glacial Deposit – Ottawa Sand



## NOTES

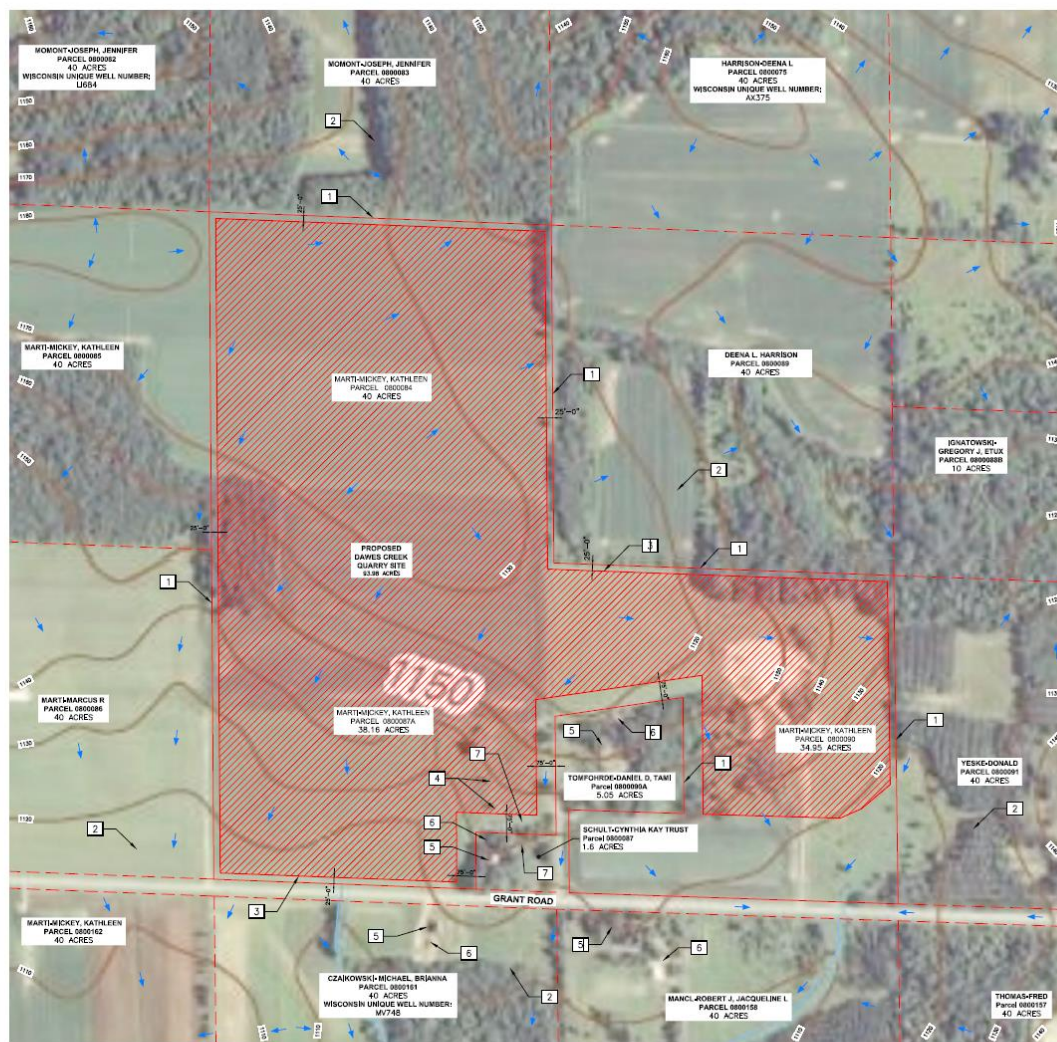
1. THE USGS LAKE COITIES/ARRN 2010, 7.5' QUADRANGLE MAPS, WERE USED AS UNDERLAY IMAGES FOR THIS MAP.
2. THERE ARE NO KNOWN THREATENED OR ENDANGERED SPECIES LOCATED WITHIN THE PROPERTY TO BE MINED.
3. THERE ARE NO KNOWN CULTURAL OR HISTORICAL RESOURCES LOCATED WITHIN THE PROPERTY TO BE MINED.
4. THERE ARE NO KNOWN FLOODPLAIN OR SHORELINE SETBACKS LOCATED WITHIN THE PROPERTY TO BE MINED.
5. ELEVATION BENCHMARK INFORMATION:

### BENCHMARK #1

DESIGNATION: RICHFIELD E GPS  
 PID: DK4888  
 STATE/COUNTY: W/WOOD  
 USGS QUAD: ARRN 1979  
 CURRENT SURVEY CONTROL:  
 NAD 83 (2007) - 44°31'33.37679" (N), 90°04'32.94001" (W)  
 @ 1202.3'

### BENCHMARK #2

DESIGNATION: HANSEN W GPS  
 PID: DKA887  
 STATE/COUNTY: W/WOOD  
 USGS QUAD: LAKE COITIES 1984  
 CURRENT SURVEY CONTROL:  
 NAD 83 (2007) - 44°28'46.57848" (N), 90°02'21.40735" (W)  
 @ 1082.2'



## LEGEND

- STORMWATER DRAINAGE ARROW
- EXTENT OF MINING ACTIVITY

## KEY NOTES

1. PROPERTY BOUNDARY
2. 300' OFFSET FROM SITE BOUNDARY
3. EXTENT OF PROPOSED MINING OPERATIONS
4. EXISTING STRUCTURE (ABANDONED 15' DIA. GRAIN SLO)
5. EXISTING STRUCTURE (RESIDENCE)
6. EXISTING STRUCTURE (BARN)
7. EXISTING STRUCTURE (1 1/2' DIA. GRAIN BIN)


NO.	REVISION	DESCRIPTION	DATE

CONSULTANT	SEAL



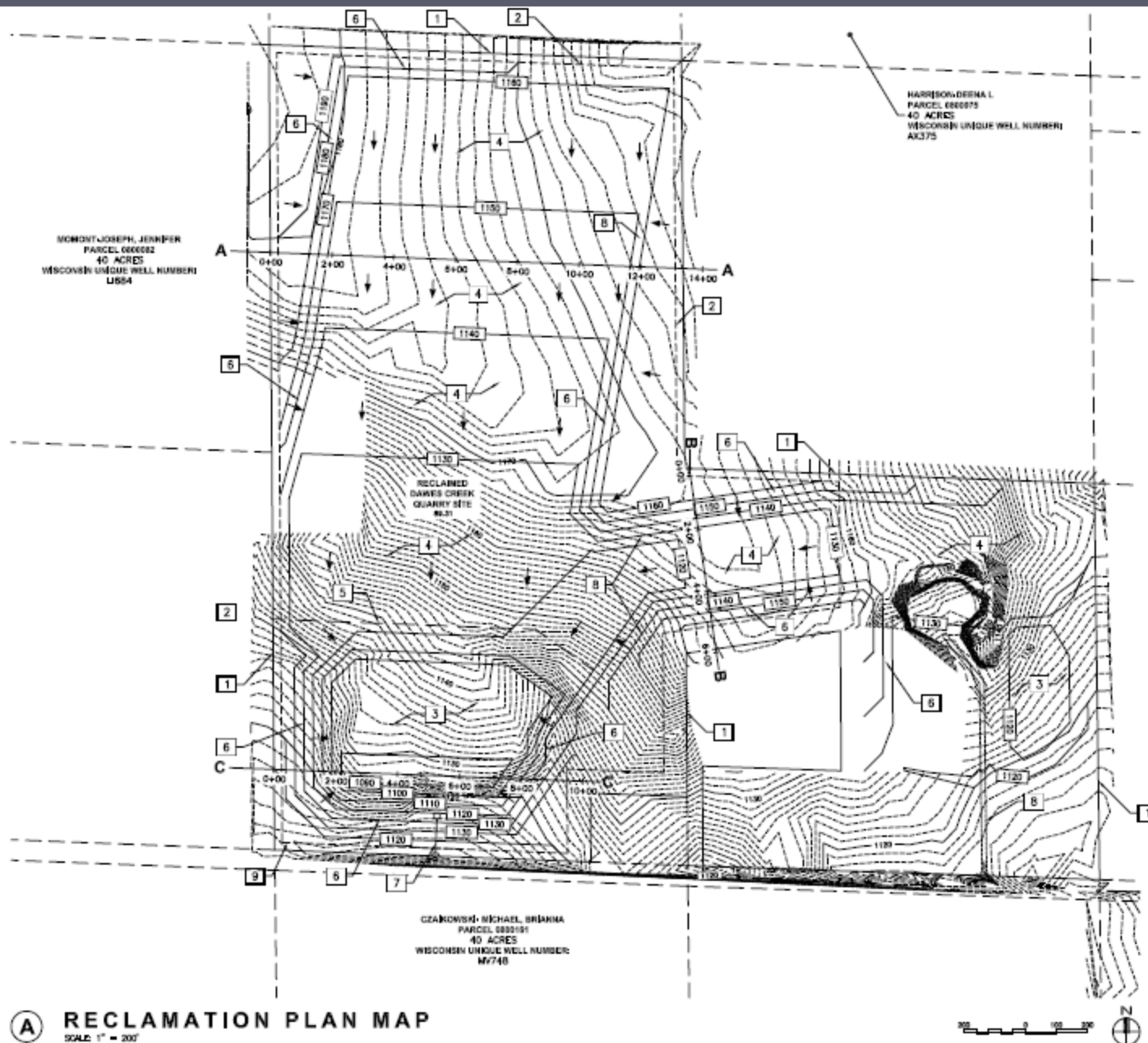
109 South Oakland Street  
 Denton, TX 76201  
 (840)-387-2835 Phone  
 (840)-387-0830 Fax

**NORTHERN FRAC SAND, LLC**  
**DAWES CREEK QUARRY**

**MINE SITE MAP I**  
**LAND PARCEL / USGS TOPO MAP**

DATE:	05/09/2012	SHEET:	
DRAWN BY:	JMC		
CHECKED BY:	-		
SCALE:	AS NOTED		

**01**



## KEY NOTES

- 1 PROPERTY BOUNDARY
- 2 PROPOSED MINING SETBACK, AND FINAL MINE SITE BOUNDARY
- 3 PROPOSED STORM WATER DETENTION POND
- 4 PROPOSED ROW CROP, 10"-24" SANDY LOAM / SILT LOAM TOPSOIL BACKFILL
- 5 PROPOSED PERENNIAL GRASS REVEGETATION BUFFER
- 6 3:1 SLOPE, 12"-24" SANDY LOAM / SILT LOAM BACKFILL WITH HYDROSEED AND BONDED FIBER WATER MULCH REVEGETATION
- 7 PROPOSED OUTFLOW STRUCTURE IN LINE WITH DITCH SOUTH OF GRANT ROAD
- 8 PROPOSED DRIVEWAY ACCESS

NO.	REVISION	DESCRIPTION	DATE
CONSULTANT:	SEAL:		



# Typical Wisconsin Sand Mine

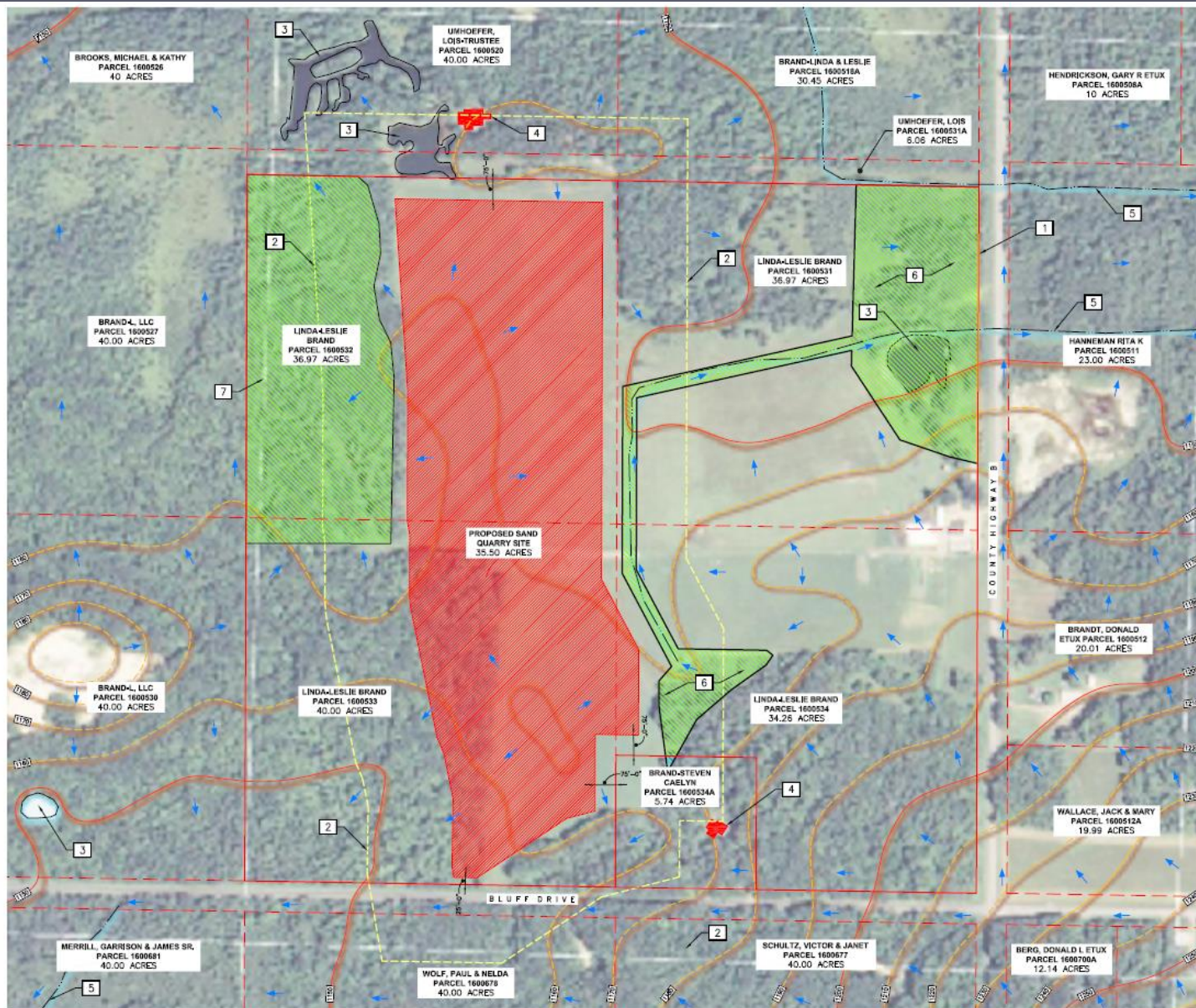


# Case Study

(Completion Industrial Minerals– Pittsville, WI)

- ▶ Proposed Sand Mine – Surface Excavation
- ▶ 5-10' Soil Overburden





## KEY NOTES

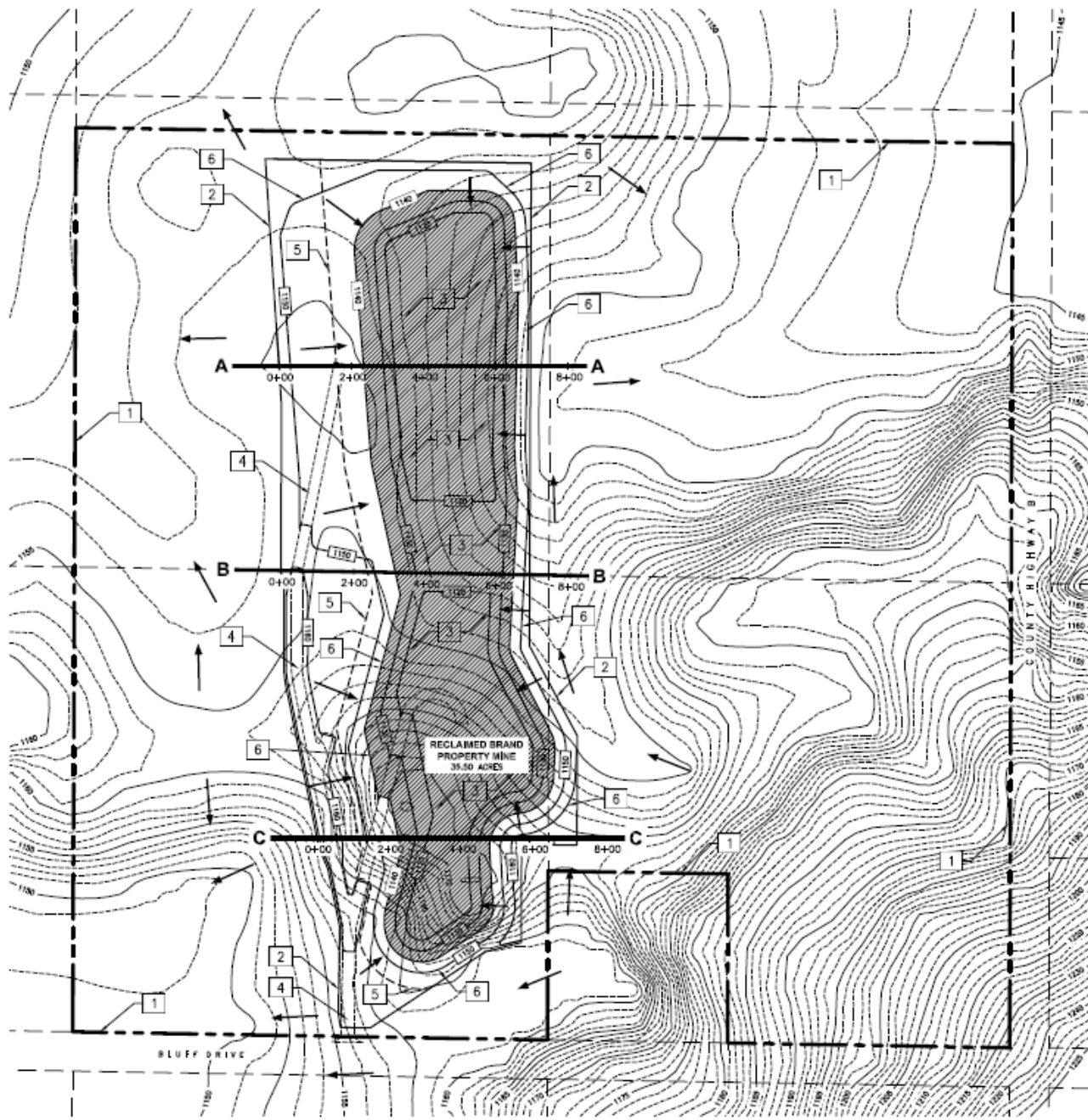
- 1 PROPERTY BOUNDARY
- 2 300' OFFSET FROM SITE BOUNDARY
- 3 EXISTING LAKE
- 4 EXISTING STRUCTURE (RESIDENCE)
- 5 UNNAMED STREAM
- 6 EXISTING WETLAND I, 12.72 ACRES
- 7 EXISTING WETLAND II, 14.67 ACRES

NO.	REVISION	DESCRIPTION	DATE
CONSULTANT:		SEAL:	



# KEY NOTES

- 1 PROPERTY BOUNDARY
- 2 PROPOSED MINING SETBACK, AND FINAL MINE SITE BOUNDARY
- 3 PROPOSED LAKE
- 4 PROPOSED LAKE ACCESS ROAD
- 5 PROPOSED PERENNIAL GRASS REVEGETATION BUFFER
- 6 3:1 SLOPE, 12"-24" SANDY LOAM / SILT LOAM BACKFILL, WITH HYDROSEED AND BONDED FIBER MATRIX MULCH REVEGETATION.



**(A) RECLAMATION PLAN MAP**  
SCALE: 1" = 200'

200 0 100 200



NO.	REVISION	DESCRIPTION	DATE

# Lessons

- ▶ Frac sand mines are expanding
- ▶ Water resources are limiting availability
- ▶ Environmental protection will continue to be a priority
- ▶ Reclamation will be driven by stakeholders and available resources

# The End





# Questions & Thanks!!

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