

CONDITIONAL USE PERMIT  
APPLICATION

Minnehaha County  
Office of Planning and Zoning  
Administration Building, 415 N. Dakota Ave.  
Sioux Falls, SD 57104  
Phone: 605-367-4204  
Website: www.minnehahacounty.gov/dept/pl/pl.php

Petition #: \_\_\_\_\_  
Date: \_\_\_\_\_  
Filing Fee: \_\_\_\_\_  
Receipt #: \_\_\_\_\_

FILING FEE IS NON-REFUNDABLE

I/We, the undersigned, do hereby petition for approval of a conditional use permit on the following described property and authorize representatives of Minnehaha County to enter the property for inspection purposes.

Legal description (please print or type): See information on next page

Parcel Size \_\_\_\_\_262.24 acres\_\_\_\_\_

Address or General Location \_\_48231 259TH ST\_\_\_\_\_

Existing Zoning District \_\_A1/I1\_\_\_\_\_

Purpose \_\_Expansion of existing hard rock quarry\_\_\_\_\_

Petitioner (Print) Sweetman Construction Co. (dba Knife River)

Signature

Date 6/26/25 Phone (605) 336-5776

Address 1500 N Sweetman PL

Sioux Falls SD 57107

City State Zip

Email colin.chatterton@kniferiver.com



Owner (Print)

If different than above

Signature

Date Phone

Address

City State Zip

Office use only

Location \_\_\_\_\_

Checked By \_\_\_\_\_

Given Signs \_\_\_\_\_

Site Plan \_\_\_\_\_

Add'l Reports \_\_\_\_\_

PC Date \_\_\_\_\_

PC Action \_\_\_\_\_

CC Date \_\_\_\_\_

CC Action \_\_\_\_\_

Effective Date \_\_\_\_\_

Purpose

www.kniferiver.com

1500 N Sweetman Place  
PO Box 84140  
Sioux Falls, SD 57117-4140  
(605) 336-5760  
(605) 334-6221 FAX

June 26, 2025

Minnehaha County  
Office of Planning & Zoning  
Administration Building, 415 N. Dakota Ave.  
Sioux Falls, SD 57104

RE: Knife River Conditional Use Permit Application, East Corson, Parcels 13848, 13942, 55302, 55303, 55304 and 55305

With this letter, please find the requirements of Additional Use Regulations for Rock, Sand, and Gravel Extraction, Section 12.08 of the Minnehaha County Zoning Ordinance. The following information is being provided to request expansion of a quartzite quarry on Knife River property. This property is adjacent to existing Knife River sand and gravel mining operations.

Knife River proposes the quarry encompass an additional 85.7 acres to the 39.7-acre area previously permitted for total quarry area of 125.4 acres. The legal description of the parcels to be impacted are:

SW1/4 (EX RY & H-1, H-2 & H-3) 14 102 48 BRANDON TOWNSHIP 102-48; PT NW1/4 NW1/4 LYING N OF TOWNSHIP ROAD 23 102 48 BRANDON TOWNSHIP 102-48; LOT 1 KUEHL'S ADDN NW1/4 23 102 48 BRANDON TOWNSHIP 102-48; TRACT 2 HUNTERS ADD NW 1/4 23 102 48 BRANDON TOWNSHIP 102-48; TRACT 3 HUNTERS ADD NW 1/4 23 102 48 BRANDON TOWNSHIP 102-48; ALL THAT PT NW1/4 LYING E OF RR ROW & E OF HY (EX HUNTERS ADD & EX KUEHL'S ADDN) 23 102 48 BRANDON TOWNSHIP 102-48

Operations at the site will see continuation of mining quartzite rock. Quartzite materials will be drilled and blasted. The resulting rock will be crushed and screened on site utilizing permanent infrastructure.

Thank you for your consideration. If you have any questions or require further information, please contact me at (605) 336-5776.

Colin Chatterton, CPESC, CPISM  
Environmental Manager

**1. Maps (attached):**

- Corson Quarry Mining Operations Plan Cover Page
- Corson Quarry Existing Conditions
- Corson Quarry Mined Conditions
- Corson Quarry Restoration

**2. Surface Land Use and Vegetation**

The area subject to this application is currently used for agricultural purposes (grazing or cropland). The subject parcels lie east of County Road 11 and north of 259<sup>th</sup> Street. The proposed quarry lies on 125 acres of parcels 13848, 13942, 55302, 55303, 55304 and 55305 east of the Burlington Northern (BN) rail line.

The site is located in the US EPA's Ecoregion 47a, Loess Prairies of Iowa and South Dakota, which is part of the Western Corn Belt Plains. This area is described as follows:

*The high agricultural productivity of the Western Corn Belt Plains ecoregion is due to its fertile soil, temperate climate, and adequate precipitation during the growing season. This ecoregion has a relatively homogeneous topography of level to gently rolling glacial till plains with areas of morainal hills and loess deposits. The original tallgrass prairie vegetation has been converted to intensive row-crop agriculture of corn, soybeans, and feed grains to support livestock production.*

*The Loess Prairies of Iowa and South Dakota surround the perimeter of the Des Moines lobe of the Late Wisconsinan glaciation. Of the two areas in South Dakota, the northern one is distinguished from neighboring regions by its rock-free soil and a paucity of wetlands. The southern area is more highly dissected, with deciduous woodland and brush on the steeper slopes and in the draws.*

There are two intermittent streams that bisect the site from east to west. These streams drain small watersheds with ultimate discharge to the Split Rock Creek. A Wetland Delineation was completed for the site (see Appendix A). Wetlands are found along the edges of the intermittent streams and Knife River is currently working through the individual permit process with the USACE to reroute the tributaries flowing through the future mine site (see Appendix B)

A Level III Cultural Resource Inventory was completed for the site (see Appendix C). The railroad, a railroad bridge and culvert were considered eligible for the National Register of Historic Places. All noted artifacts are outside of the project area and will not be adversely affected. A determination of no adverse effects to historic properties was recommended.

### 3. Hydrologic Study

The site is in the Split Rock Creek Watershed within the Central Big Sioux River Watershed. Natural drainage makes it way to Split Rock Creek and eventually the Big Sioux River. A Drainage Analysis was completed by Westwood Engineering (see Appendix D). From the hydrologic evaluation, it appears that the proposed Phase I mine development will not negatively impact Split Rock Creek since dewatering needs are expected at levels well below modeled 10-year flows that will travel through the creek diversion. For the floodplain evaluation, there will be no impact on 100-year flood levels based on HEC-RAS modeling that was performed. A floodplain development permit was obtained during this process as well.

A previous study by Barr evaluated potential groundwater inflow rates to the proposed mine pit (see Appendix E). From this study, it is predicted that between 21 and 136 gpm will enter the mine via groundwater flows (given quartzite as the dominant material), but with larger seeps the inflow may be closer to 500 - 800 gpm. As the mine is developed, it will be necessary to dewater the excavation with pumping, along with appropriate treatment. This dewatering discharge will be routed to Split Rock creek via either the tributary to the west or the newly constructed creek diversion.

Groundwater is estimated to be greater than 50 feet below grade in the mining area. No recorded wells (not owned by Sweetman) are identified as being within 300 feet of the area's boundaries. Surficial geology at the site shows 5 to 30 feet of glacial deposits overlay the Sioux Quartzite. Quartzite was present in all boreholes during exploratory drilling

### 4. Reclamation Plan

See attached maps. The overburden will be reclaimed to maximum slopes of 3:1. The quarry will be reclaimed in part, based on depth, water table, and terrain. Reclamation will not be possible until all mining is completed and may require limited construction of temporary features including ponds, basins, roads, safety, and drainage features. It is anticipated the surrounding land will be returned to agricultural land, likely for grazing, while the quarry area will become a water filled reservoir.

### 5. Development Criteria

- Buffer Areas

Buffer areas are shown on the Existing Conditions and Mining Conditions Maps. There are no residences (not owned by Sweetman Const. Co.) that will be in the 1,000-foot buffer area. Mining will stay at least 50 feet from township/county road rights of way. A minimum 10-foot-high berm will be placed along all sides of the new quarry extent and vegetated appropriately.

- Hours of Operation

Mining operations may occur on Monday through Friday from 7 A.M. to 6 P.M. and Saturday from 8 A.M. to 12 P.M. No operations will be allowed on legal holidays. Maintenance operations not creating off site noise may occur outside of the designated hours of operation.

- Visual Considerations

Actions to mitigate impacts to neighbors and highway travelers include:

- Berms will be placed and vegetated as necessary to alleviate visual concerns.
- Close coordination with Township, County, Municipal, and State agencies to identify and act to prevent problems.

- Blasting

All blasting will be done in compliance with U.S. Department of the Interior Office of Surface Mining standards. This will include monitoring ground vibration and air blast. An alert system is in place for impacted residents within 1 square mile of the current mine footprint (excluding some that have opted out). This alert is sent 24 hours prior to blasting occurring and will continue to be utilized moving forward.

- Noise

Noise levels will not exceed an average of 55 decibels recorded over a 10- minute period measured at the nearest residence of concern. Knife River will test and provide a noise survey if complaints arise.

- Air Quality

At the County's discretion, ambient air monitoring will occur according to State of South Dakota regulations. Impact on air quality will be minimized by following company procedures for controlling fugitive dust from mining and associated operations. Dust from traffic within the operational area will be controlled with water or applications of calcium chloride. Dust from the screening and conveying process is controlled by ensuring moisture is present in the material being processed. If visible dust can be observed leaving the crushing/conveying process, water is added to the aggregate material as it is fed into the process.

- Hydrology, Dewatering, and Drainage

See item 3 above. It is anticipated that dewatering will be required as mining progresses. This will be in accordance with SD DANR NPDES permitting and the site SWPPP. Drainage around the quarry area is routed as shown on the attached maps.

- Haul Roads

Materials from the quarry area will be conveyed south across land owned by Knife River. Quartzite material mined will be processed (crushed/screened) at the quarry. See attached maps for haul routes and proposed infrastructure. Material will be shipped from the Corson site utilizing existing truck and rail systems, with the addition of one new rail spur off the existing BNSF main line.

- Operator Surety

Sweetman Construction Co. (dba Knife River) will provide whatever surety is required by Minnehaha County.

- Reclamation

See item 4 above.

# Corson Quarry

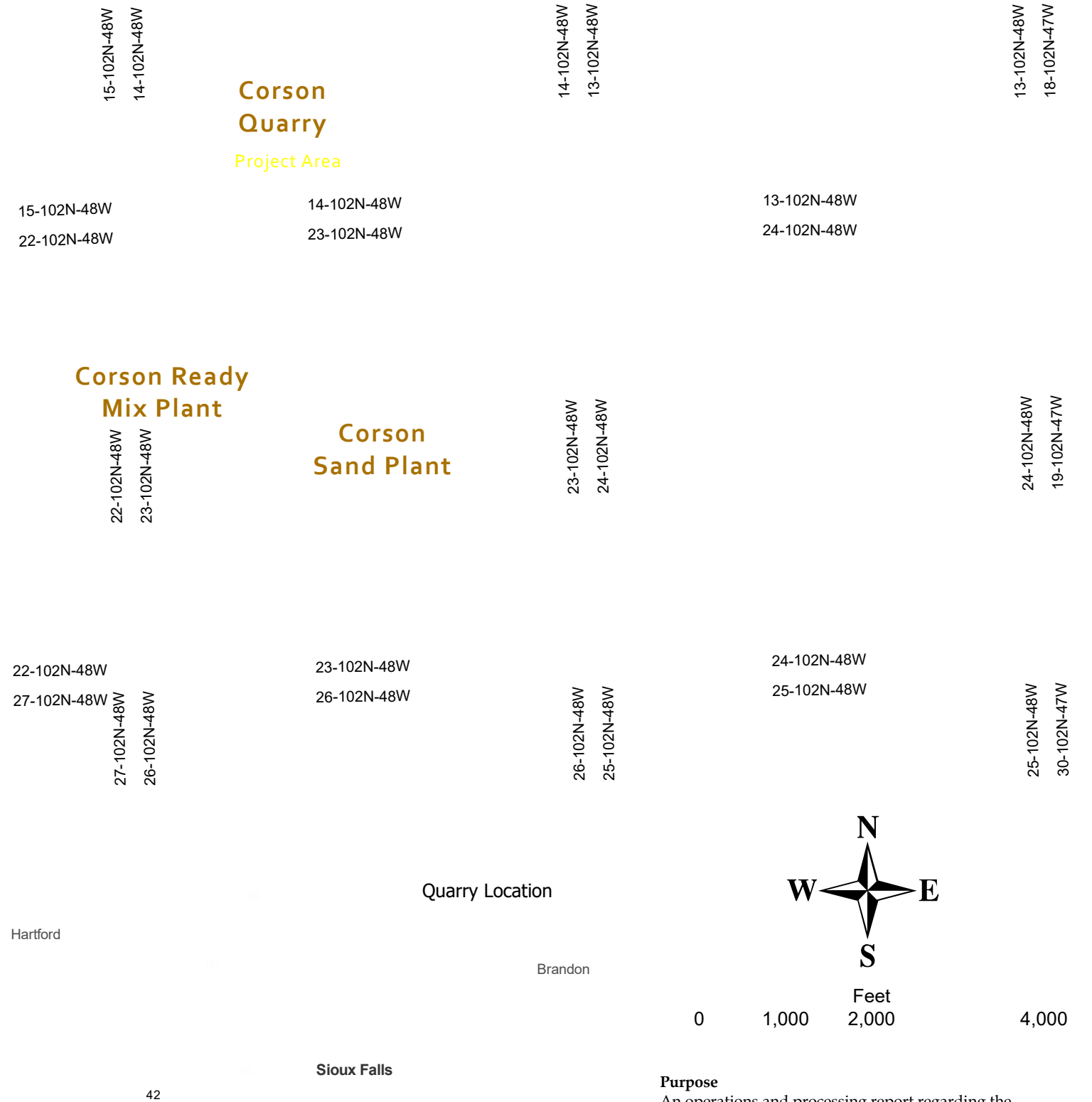
## MINING OPERATIONS PLAN

### COVER PAGE

Quarry site located in the Section 14 & 23 (T012N, R48W) Corson Minnehaha County, SD

## Legend

- Knife River Property
- Project Area
- Section Boundaries



**Corson Quarry**  
Project Area

**Corson Ready Mix Plant**

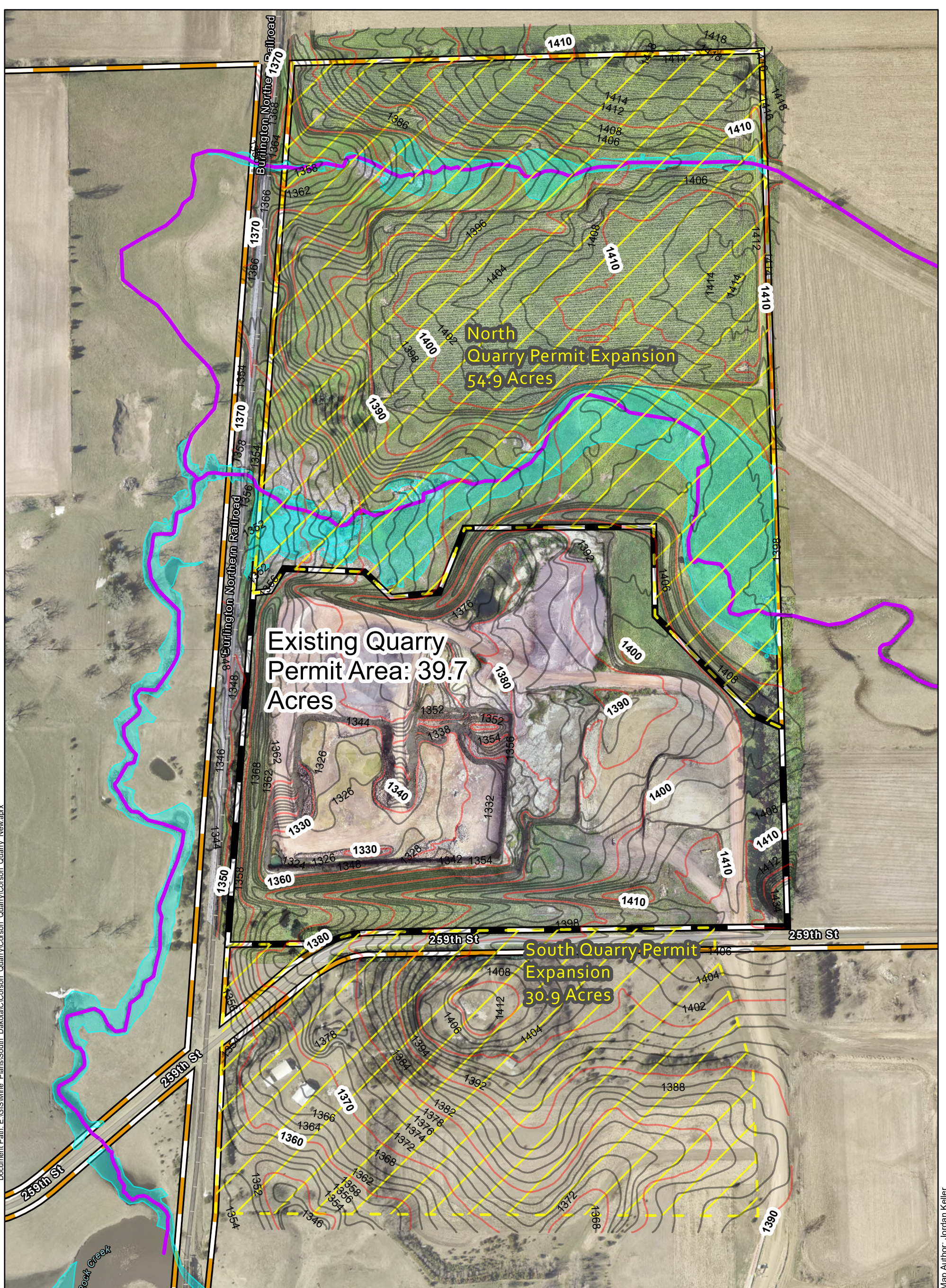
**Corson Sand Plant**

**Purpose**  
An operations and processing report regarding the aforementioned site location.  
From Knife River Corporation

Map Author: Jordan Keller

Service Layer Credits: World Street Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community  
USA\_Topo\_Maps: Copyright: © 2013 National Geographic Society, i-cubed  
World Imagery: Minnehaha County, SD  
Hybrid Reference Layer: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Document Path: E:\GIS\Mine Plans\South Dakota\Corsor Quarry\Corsor Quarry New.aprx



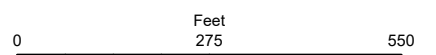
# Corson Quarry

## Existing Conditions (August 2024)

Sec 14 & 23  
T102N, R48W  
Corson SD

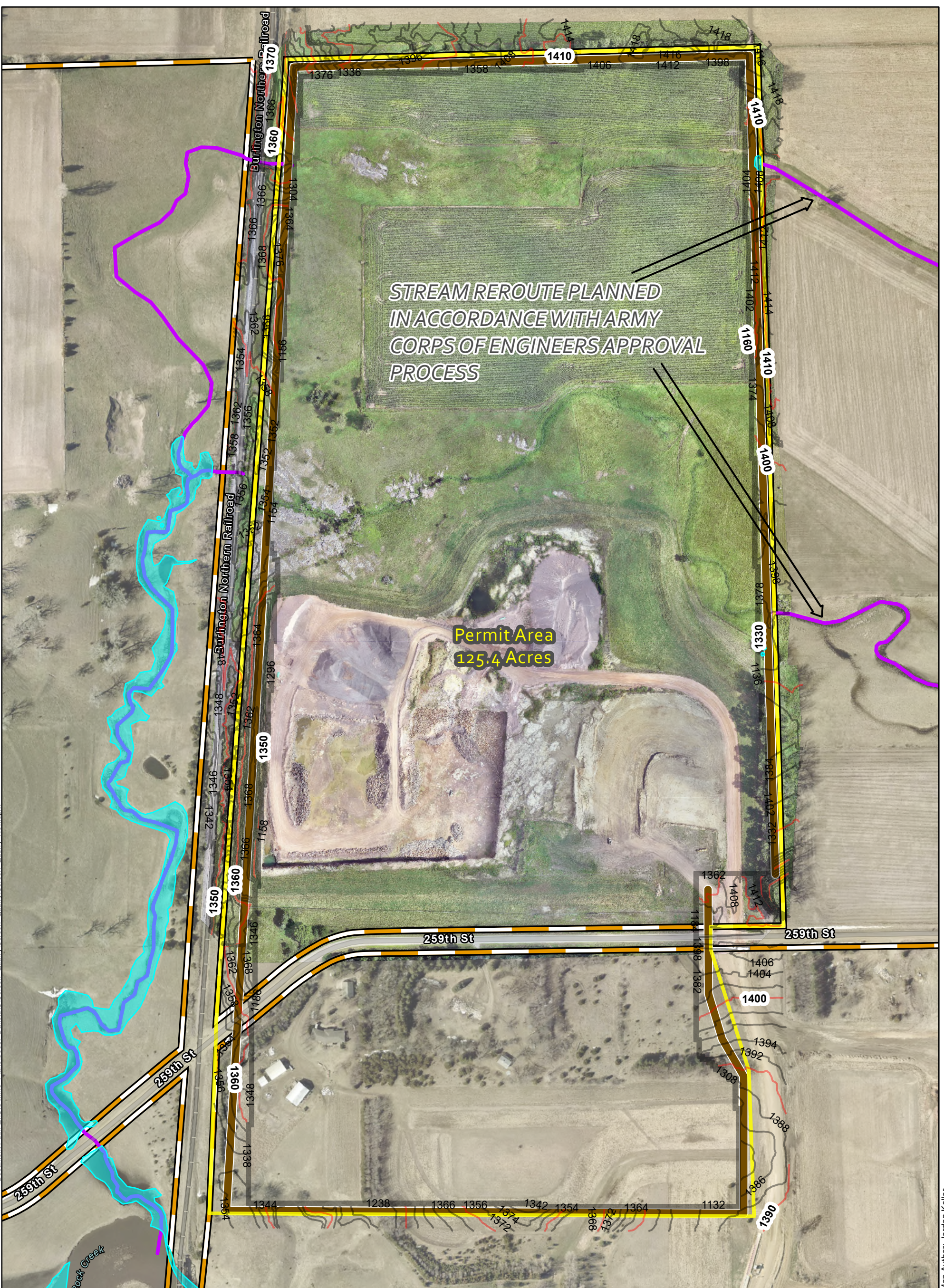
### Legend

- Existing Quarry Permit Area
- Streams
- Wetland (Sayre Delineation)
- Knife River Property
- Expansion Footprint
- 10' Contour
- 2' Contour



Map Author: Jordan Keller

Document Path: E:\GIS\Mine Plans\South Dakota\Corsor Quarry\Corsor Quarry\Corsor Quarry New.aprx










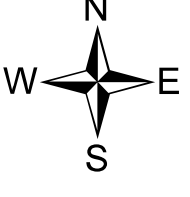
STREAM REROUTE PLANNED  
IN ACCORDANCE WITH ARMY  
CORPS OF ENGINEERS APPROVAL  
PROCESS

Permit Area  
125.4 Acres


**Corson Quarry**  
Mined Conditions

Sec 14 & 23  
T102N, R48W  
Corson SD

Legend	
	Wetland (Sayre Delineation)
	Expansion Footprint
	Berms
	Streams
	Knife River Property
	10' Contour
	2' Contour



0      Feet      550  
275



Map Author: Jordan Keller

Document Path: E:\GIS\Mine Plans\South Dakota\Corsor Quarry\Corsor Quarry New.aprx



# Corson Quarry Restoration

Sec 14 & 23  
T102N, R48W  
Corson SD

## Legend

- Wetland (Sayre Delineation)
- Open Water
- Knife River Property
- 10' Contour
- 2' Contour
- Streams



0 Feet 275 550



Map Author: Jordan Keller

## MEMORANDUM

Date: November 1, 2021

**Re: Corson Property**  
File 0033065.00

To: USACE Minnehaha County Project Manager

Cc: Ron Klinker, Knife River Corporation

From: Matthew Vollbrecht

With this Memo, Westwood Professional Services, on behalf of Knife River, requests the Omaha District of the US Army Corps of Engineers assign a Project Manager and issue an Official Approved Jurisdictional Determination for the Corson Pit Project.

The Project Site is located in Corson Township, Minnehaha County, South Dakota (**Exhibit 1**). The Site consists of 232.5 acres comprised of seven parcels. (PIN #'s 01-17-23-100-008-000, 01-17-23-100-004-000, 01-17-23-100-005-000, 01-17-23-100-006-000, 01-17-23-100-007-000, 01-17-14-300-001-000, 01-17-23-100-009-000).

The Project Area consists mostly of grazed pasture and cropland, with a quarry operation in the east-central portion of the property and two single-family residences in the southwestern quadrant. The Site is mostly surrounded by agricultural land with the exception of a gravel mining operation to the south. It is bordered to the south by Split Rock Creek and to the west by Highway 11. The Site is bisected east to west by 259<sup>th</sup> Street and north to south by a railroad easement.

The property was delineated by Westwood Professional Services from September 22 through October 1, 2021. The Delineation Report dated October 18, 2021, is included in this memo.

Westwood Professional Services requests the Omaha District of the US Army Corps of Engineers assign a Project Manager and issue an Official Approved Jurisdictional Determination for the Corson Pit Project. Site photos for the delineated features can be found in the attached Delineation Report. Westwood can also provide the delineated water feature data to the Omaha District in the Corps of Engineers Bulk Upload Spreadsheet or a summary Excel file. Please contact me if you have any questions or need any further information.

PREPARED FOR:  
Mr. Ron Klinker  
Environmental and Land Development Manager  
Knife River  
4787 Shadow Wood Drive NE  
Sauk Rapids, MN 56379

PREPARED BY:

Wetland Delineation Report

# Corson Quarry Project

Prepared for:  
Mr. Ron Klinker  
Knife River  
4787 Shadow Wood Drive NE  
Sauk Rapids, MN 56379

Prepared by:  
Westwood Professional Services  
12701 Whitewater Drive, Suite 300  
Minnetonka, MN 55343  
(952) 937-5150

Project Number: 0033065.00

Date: 10/18/2021

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## EXHIBITS

Exhibit 1: Project Location and USGS Topography

Exhibit 2: Water Resources

Exhibit 3: Soils

Exhibit 4: LiDAR Contours

Exhibit 5: Delineated Features

## APPENDICES

Appendix A: Wetland Delineation Data Forms

Appendix B: Wetland Delineation Photographs

Appendix C: Watercourse Data Forms and Photographs

## 1.0 PURPOSE

This report with the attached exhibits and appendices constitutes the wetland delineation report for the Corson Quarry Project (“Project” or “Site”), an approximately 232.5-acre area in Corson Township, Minnehaha County, South Dakota (PIN #'s 01-17-23-100-008-000, 01-17-23-100-004-000, 01-17-23-100-005-000, 01-17-23-100-006-000, 01-17-23-100-007-000, 01-17-14-300-001-000, 01-17-23-100-009-000). This report provides the required documentation for wetland boundary determinations in conformance with the United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory, Waterways Experiment Station, 1987) and the Regional Supplement to the USACE Wetland Delineation Manual: Midwest Region (U.S. Army Corps of Engineers, 2010).

## 2.0 SITE LOCATION AND DESCRIPTION

The Site is located in Sections 14 & 23, T102N, R48W, Corson Township, Minnehaha County, South Dakota (Exhibit 1). It consists mostly of grazed pasture and cropland, with a quarry operation in the east-central portion of the property and two single-family residences in the southwestern quadrant. The Site is mostly surrounded by agricultural land with the exception of a gravel mining operation to the south. It is bordered to the south by Split Rock Creek and to the west by Highway 11. The Site is bisected east to west by 259<sup>th</sup> Street and north to south by a railroad easement. The landscape slopes gently toward the central and southern portions of the Site, with the lowest elevations occurring near Split Rock Creek and an unnamed, south-flowing, tributary. Elevations range from 1,320 feet to 1,410 feet above mean sea level (msl).

## 3.0 FIELD DELINEATION METHODOLOGY

### 3.1 Mapping

Prior to delineating wetland boundaries in the field, the National Wetlands Inventory (NWI) mapping (Exhibit 2), the National Hydrography Dataset (NHD) (Exhibit 2), the Minnesota Department of Natural Resources (MN DNR) Public Waters and Wetlands Inventory (PWI) (Exhibit 2), and the Natural Resource Conservation Service (NRCS) Soil Survey Geographic database (SSURGO2) for Minnehaha County (Exhibit 3) were reviewed. Elevation mapping was completed using LiDAR contours (Exhibit 4).

### 3.2 Wetland Delineation Methodology

The field delineation was conducted from September 22 through October 1, 2021, by a wetland delineator from Westwood using a level two routine determination method set forth in the USACE Wetland Delineation Manual and the supplemental methods set forth in the Regional Supplement to the USACE Wetland Delineation Manual: Midwest Region. Wetland data forms from the delineation are included in Appendix A. Wetland photographs from the delineation are included in Appendix B. Watercourse data forms and photographs are included in Appendix C.

Wetlands, if present, were classified according to Wetlands of the United States (U.S. Fish and Wildlife Service Circular 39; Shaw and Fredine; 1971) and Wetlands and Deepwater Habitats of the United States (FWS/OBS Publication 79/31; Cowardin et. al. 1979). Common and scientific names for vegetation identified in this report and on the attached data forms generally correspond with the nomenclature used in the 2018 National Wetland Plant List (Lichvar 2018). Wetland boundaries were located using a Trimble GPS unit capable of sub-meter accuracy.

### 3.3 Watercourse Delineation Methodology

Drainages within the Project were considered non-wetland Waters of the U.S. (WOTUS), as they may not exhibit all parameters required for wetlands (i.e. predominance of hydrophytes, hydric soils, and jurisdictional hydrology). Accordingly, their boundaries were delineated in the field by documenting their Ordinary High-Water Marks (OHWMs), as determined according to the USACE Regulatory Guidance Letter No. 05-05 (U.S. Army Corps of Engineers 2005). USACE regulations set forth at 33 CFR 328.3(e) defines the OHWM for purposes of Clean Water Act lateral jurisdiction which means that line on the shore established by the fluctuations of water and indicated by physical characteristics including:

- Natural line impressed on the bank
- Changes in the character of soil
- Presence of litter and debris
- Vegetation matted down, bent, or absent
- Leaf litter disturbed or washed away
- Deposition
- Bed and banks
- Change in plant community
- Shelving
- Destruction of terrestrial vegetation
- Wracking
- Sediment sorting
- Scour
- Multiple observed flow events
- Water staining

## 4.0 RESULTS

### 4.1 Mapping

A total of ten (10) NWI polygons are mapped within the Site; wetlands include freshwater emergent and riverine wetlands (Exhibit 2). A total of five (5) NHD flowlines, Split Rock Creek and four unnamed tributaries, are also mapped on the Site. The NHD and NWI datasets significantly overlap one another.

The NRCS SSURGO2 for Minnehaha County indicates that the soils listed in Table 4.1 are mapped within the Delineation Area (Exhibit 3). Based on the NRCS Web Soil Survey Hydric

Rating, four soil types are classified as predominantly hydric, and the remaining soil types are non-hydric.

Table 4.1. Soil Summary Table

Map Symbol <sup>1</sup>	Map Unit Name <sup>2</sup>	Rating <sup>2</sup>	Percent Hydric Soil <sup>3</sup>
AcB	Alcester silty clay loam, cool, 2 to 6 percent slopes	Non-hydric	0
BcA	Benclare-Corson complex, 0 to 2 percent slopes	Predominantly Non-hydric	5
Bo	Bon loam, 0 to 2 percent slopes, occasionally flooded	Predominantly Non-hydric	9
Ch	Chaska loam, channeled, 0 to 3 percent slopes, frequently flooded	Predominantly Hydric	93
CrD	Crofton-Nora complex, 9 to 15 percent slopes	Predominantly Non-hydric	6
DgD	Delmont-Talmo complex, 9 to 15 percent slopes	Non-hydric	0
FaB	Flandreau loam, 2 to 6 percent slopes	Non-hydric	0
Lb	Lamo silty clay loam, channeled	Predominantly Hydric	87
IrE	Ihlen-Rock outcrop complex, 4 to 35 percent slopes	Non-hydric	0
MnB	Moody-Nora complex, 2 to 6 percent slopes	Predominantly Non-hydric	2
NcC	Nora-Crofton complex, 6 to 9 percent slopes	Predominantly Non-hydric	3
Ob	Obert silty clay loam, 0 to 1 percent slopes	Predominantly Hydric	99
Wk	Whitewood silty clay loam, 0 to 2 percent slopes	Predominantly Hydric	85

<sup>1</sup> – Soils determined using GIS geospatial query clipping the NRCS Soil Survey Geographic (SSURGO2) spatial data by Project boundaries.

<sup>2</sup> – As indicated in the SSURGO2 database

<sup>3</sup> - Where percentages are small (e.g. < 15 %) the hydric soil is likely an inclusion that is not recognized in the map unit name. The absence of a value does not necessarily indicate the absence of hydric soils, but that the relative percentages of included minor soils have not been determined.

## 4.2 Antecedent Precipitation

Antecedent precipitation data was evaluated for the 3 months prior to the site visit using AgACIS WETS Station: Sioux Falls Foss Field, South Dakota. Table 4.2 constitutes the “NRCS Method/3-Month Prior Method” using the Precipitation Documentation Worksheet from the Minnesota Climatology Working Group. Antecedent precipitation was determined to be wet for the three months prior to the field delineation.

Table 4.2. Precipitation Documentation Worksheet (Score using 1981-2010 time period)

<b>values are in inches</b>	first prior month:	second prior month:	third prior month:
A 'R' following a monthly total indicates a provisional value derived from radar-based estimates.	<b>September 2020</b>	<b>August 2020</b>	<b>July 2020</b>
<b>estimated precipitation total for this location:</b>	<b>3.21</b>	<b>6.29</b>	<b>4.9</b>
<b>there is a 30% chance this location will have less than:</b>	1.69	1.93	1.73
<b>there is a 30% chance this location will have more than:</b>	3.36	3.67	3.76
<b>type of month: dry normal wet</b>	<b>normal</b>	<b>wet</b>	<b>wet</b>
monthly score	<b>3*2=6</b>	<b>2*3=6</b>	<b>1*3=3</b>
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)		<b>15 (WET)</b>	

### 4.3 On-Site Wetland and Watercourse Delineation Results

From September 22 through October 1, 2021, Westwood delineated eight wetlands, two ponds, and seven watercourses within the Project Area. Summaries of each wetland's characteristics are provided in Table 4.3. Summaries of each watercourse's characteristics are provided in Table 4.4. Exhibit 5 is a map showing delineated wetland and watercourse boundaries. Data forms documenting wetland and upland characteristics are located in Appendix A. Photos of delineated wetlands and non-wetland sample points are located in Appendix B. Watercourse data forms and photographs are located in Appendix C.

Table 4.3. Delineated Wetlands

Wetland Name	Acres	Mapped on NWI	Circular 39	Cowardin Classification
WB-01	2.27	Yes	Type 2	PEM1B
WB-02	2.02	Yes	Type 2	PEM1B
WB-03	0.09	No	Type 2/ Type 5	PEM1B/ PUBx
WB-05	0.16	No	Type 2	PEM1B
WB-06	0.92	Yes	Type 2/ Type 3	PEM1B/ PEM1C
WB-07	0.67	No	Type 2/ Type 3	PEM1B/ PEM1C
WB-08	0.39	No	Type 7	PSS1B
WB-10	8.39	Yes	Type 2/ Type 3/ Type 5	PEM1B/ PEM1C/ PUBx
PO-01	1.58	No	N/A	PUBx
PO-02	0.54	No	N/A	PUBx

Table 4.4. Delineated Watercourses

Watercourse Name	Length (Linear Feet)	Area (acres)	Mapped on NWI	Mapped on NHD	NHD Name	Flow Characteristics
WC-01	886.9	0.02	Yes	Yes	Unnamed tributary	Intermittent
WC-02	3,372.9	0.04	Yes	Yes	Unnamed tributary	Perennial
WC-03	2,217.4	2.48	Yes	Yes	Split Rock Creek	Perennial
WC-04	483.0	0.01	Yes	No	Unnamed tributary	Intermittent
WC-05	423.3	0.03	No	No	Unnamed tributary	Intermittent
WC-06	2,654.5	0.30	Yes	Yes	Unnamed tributary	Intermittent
WC-07	705.8	0.02	No	No	Unnamed tributary	Intermittent

### Other Areas

Non-Wetland Sample Point NWB-01 was taken in an excavated basin located in the northeast portion of the Site. The dominant vegetation was smooth brome (*Bromus inermis*, FACU). Neither hydric soil or wetland hydrology indicators were observed.

Non-Wetland Sample Point NWB-02 was taken in a swale feature approximately 150 feet north of WB-02 and is mapped on the NWI dataset as R4SBC. Dominant vegetation was a mix of smooth brome and quackgrass (*Elymus repens*, FACU). Hydric soil may be present, a horizon that would confirm an A12 indicator, if present, was too deep to sample while on-site. No hydrology indicator other than geomorphic position was met. Non-Watercourse Sample Points NWC-01 and NWC-02 (Appendix C) were also taken along this swale and provide further evidence that the area does not meet watercourse OHWM criteria or wetland indicator criteria.

Non-Wetland Sample Point NWB-03 was taken in a concave area in a swale north of WB-05. This area was dominated in quackgrass and did not meet hydrophytic vegetation criteria, however a small amount of sedge and rush species were present in the vicinity. Soils met the redox dark surface indicator. No hydrology other than geomorphic position was observed.

## 5.0 CONCLUSIONS

Westwood delineated eight wetlands and two ponds totaling 17.03 acres, and seven watercourses totaling 10,743.8 linear feet and 3.44 acres within the Corson Quarry Project. Westwood requests that the USACE review and process this report and provide written concurrence that the extent of potentially jurisdictional water resources have been accurately identified.

## 6.0 CERTIFICATION

I certify that, to the best of my knowledge and belief, the wetland delineation completed for this Site is consistent with current wetland delineation practices and guidelines. I have the specific qualifications, education, training, and experience to complete wetland delineations and determinations in accordance with federal and state requirements.

Sincerely,

WESTWOOD PROFESSIONAL SERVICES

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LEVEL III  
CULTURAL RESOURCE INVENTORY  
OF THE  
CONCRETE MATERIALS COMPANY  
CORSON QUARRY EXPANSION

Minnehaha County, South Dakota

T102N, R48W, Sections 14 & 23

By Jeffrey D. Larson, RPA

Lance Rom, editor

*Quality Services, Inc. Project #SD3916030*

November 25, 2016



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## Abstract

October 25 through 27, 2016, *Quality Services, Inc.* conducted Level III cultural resource inventory for the Concrete Materials Company Corson Quarry Expansion project in Minnehaha County, South Dakota. Concrete Materials Company proposes to expand mining operations, construct a plant and associated parking and roads, divert and protect streams, possibly realign a road and build bridge over a railroad, and possibly regrade areas near the railroad. A total of 280 acres were pedestrian surveyed covering the proposed project activities.

Cultural resources records search with the South Dakota State Historical Society revealed three known cultural resource sites in the area of potential effects. Road bridges MH00001648 and MH00001649 were considered *not eligible* for the National Register of Historic Places (NRHP). They have since been removed and replaced with new structures. .

During the Level III pedestrian inventory seven additional cultural resources were located, recorded, and evaluated for the National Register of Historic Places. Historic period surface artifact scatter 39MH0334 is recommended *not eligible* and will not need protective measures. The Great Northern Railroad, 39MH2013, has been previously determined *eligible* for the NRHP by the SHPO. Corn crib MH00002386 and railroad masonry culvert MH00002387 are recommended *not eligible*. Railroad culvert MH00002388 is recommended *eligible*. Railroad structures MH00002389 and MH00002390 are both recommended *not eligible*.

Railroad 39MH2013, railroad bridge MH00000902, and railroad culvert MH00002388 are considered *eligible* for the NRHP and recommended to be **avoided** by project activities.

### **A determination of no adverse effect to historic properties is recommended.**

In the unlikely event that cultural resources are located during construction activities, it is recommended that the South Dakota State Historic Preservation Office and *Quality Services, Inc.* be contacted immediately.

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### Introduction & Project Description

Concrete Materials Company proposes to expand an existing quarry approximately 0.8 mi. north of Corson, South Dakota in the Lower Big Sioux archeological region. Activities will occur in four quadrants based on the location of the existing railroad and 259th Street.

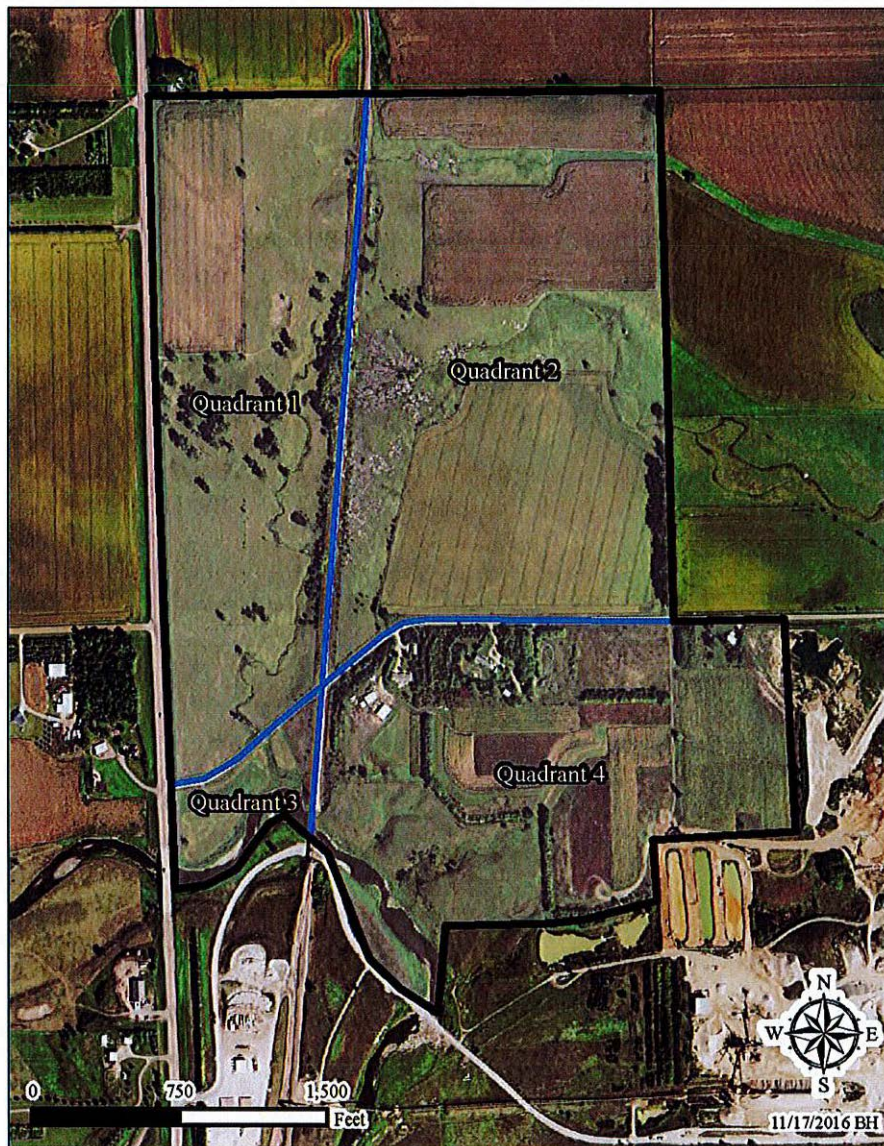


Figure 1. Quadrants for proposed project activities.

Project activities include:

- Quadrant #1: the realignment of 259th Street and minor changes to the drainage.
- Quadrant #2: excavation of all surface area and diversions to the intermittent streams.
- Quadrant #3: minor changes to the drainage and grading along the railroad.
- Quadrant #4: grading and the construction of a plant, railway spur and sidings, roads, parking areas, utilities, and drainageways and basins.

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The proposed project’s Area of Potential Effect (APE) is considered to be the area directly impacted by mining and construction activities for this project.

**Quality Services, Inc. (QSI)** was contracted to conduct a cultural resource investigation for the project area in order to fulfill the requirements of Section 106 of the National Preservation Act of 1966 (P.L. 89-665) as amended and 36 CFR part 800, which serves to implement the Act. The project research design was to determine if any cultural resources would be impacted by the developments and to provide appropriate data to Federal, State, and Local review agencies. Federal agencies involved include the U.S. Army Corps of Engineers (USACE), the USDA Natural Resources Conservation Service (NRCS), and the U.S. Environmental Protection Agency (EPA). State and Local government involvement include the South Dakota Department of Environmental and Natural Resources (DENR), South Dakota Department of Transportation (DOT), Minnehaha County Planning, Minnehaha County Road Department, Brandon Township Board, and the City of Brandon.

**Location & Acres Surveyed**

280 acres were Level III inventoried.

Table 1. Legal location of the project area

County	Township	Range	Sections	Meridian
Minnehaha	102N	48W	14 & 23	Fifth

USGS 7.5’ Garretson West, South Dakota topographic quadrangle 1962, Photorevised 1976.

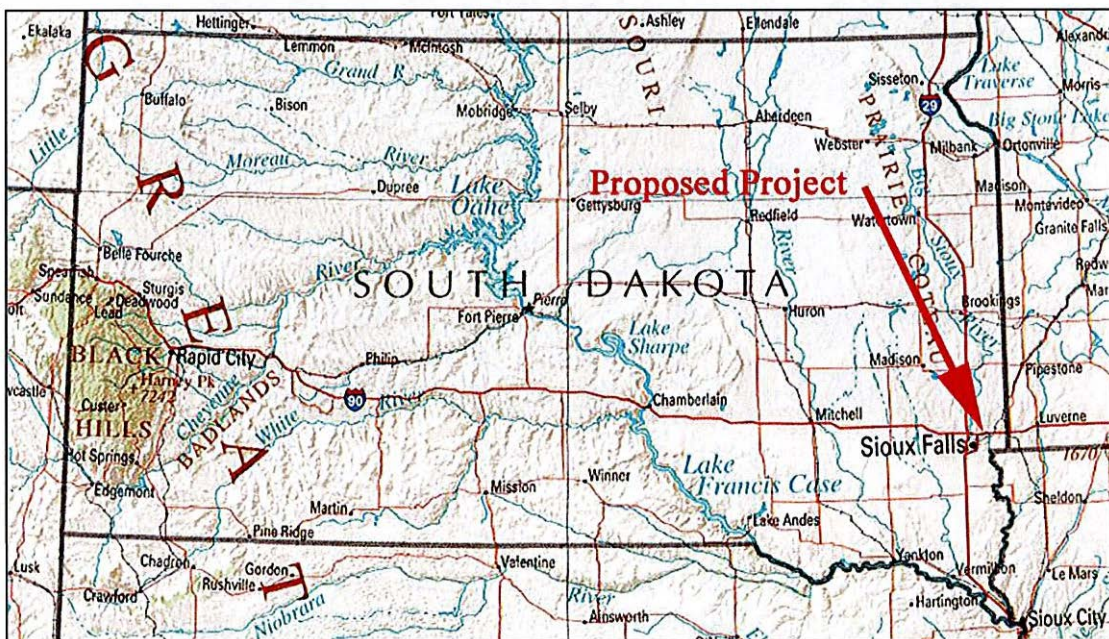


Figure 2. General location of proposed project within South Dakota.

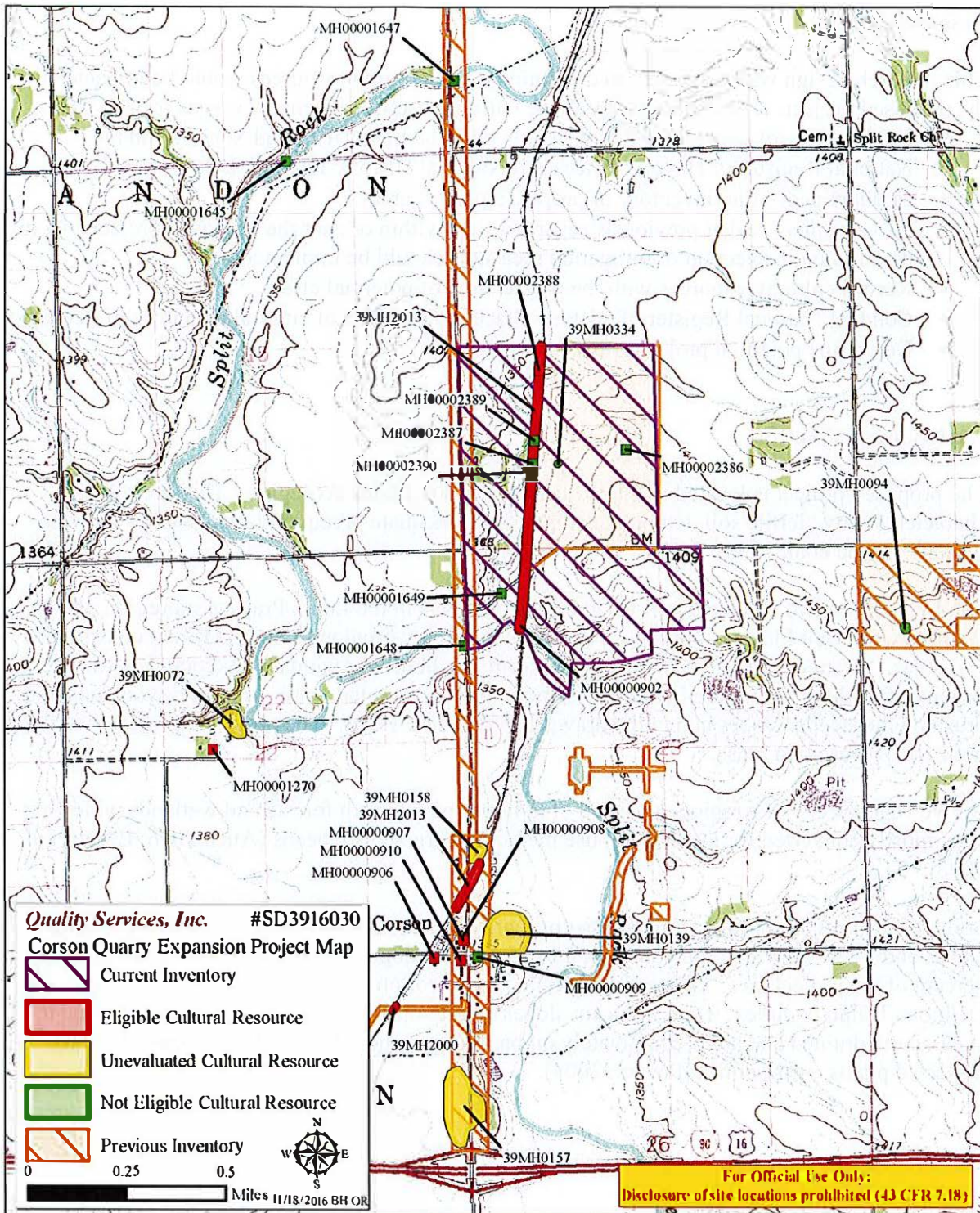


Figure 3. Corson Quarry Expansion Project Map.  
 T102N, R48W, Sections 14 & 23  
 USGS 7.5' Garretson West, South Dakota topographic quadrangle 1962, Photorevised 1976

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## **Research Design**

This research design was developed to determine if any cultural resources would be impacted by the proposed project. The methodology of the cultural resource inventory was as follows:

- Conduct record search of the project area with the State Historical Society and the National Register of Historic Places and National Historic Landmark databases.
- Conduct pedestrian inventory of proposed project areas.
- As warranted, revisit previously recorded sites within or near the proposed project area to determine if protection or mitigation measures should be implemented.
- Record cultural resources with the project area of potential effect.
- Conduct National Register of Historic Places evaluations of cultural resources, if needed.
- Determine potential project effects.

## **Environmental Setting**

The proposed project is located in the Western Corn Belt Plains ecoregion. This ecoregion is characterized by “fertile soil, temperate climate, and adequate precipitation during the growing season” (Bryce et al. 1998).

Subdivided into two localized regions, the project area is in the Loess Prairies subregion of the Western Corn Belt Plains ecoregion. The Loess Prairies subregion in South Dakota consists of two areas, “the northern one is distinguished from neighboring regions by its rock-free soil and a paucity of wetlands. The southern areas is more highly dissected, with deciduous woodland and brush on the steeper slopes and in the draws” (Bryce et al. 1998). The proposed project is in the northern of these two areas.

Native vegetation in the region consisted of tallgrass prairie with forests and wetlands which has been mostly converted for agricultural use including corn and soybeans (Auch 2016; Bryce et al. 1998).

Soils for the proposed project area consist primarily of Moody-Nora complex, 2 to 6 percent slopes and Ihlen-Rock outcrop complex, 4 to 35 percent slopes making up approximately 50 percent of the project area. Other soils include Nora-Crofton complex, 6 to 9 percent slopes and Delmont-Talmo complex, 9 to 15 percent slopes among others. These soils are well-drained to excessively drained and are predominately on backslopes, shoulders, and footslopes of plains, dissected plains, or moraines (Preston 2004).



Figure 4. Typical mixed grass survey areas facing north.  
J. Larson 10/25/2016.



Figure 5. Typical cultivated field in inventory area facing south.  
J. Larson 10/25/2016.



Figure 6. Rock outcrop in survey area facing north.  
 J. Larson 10/27/2016.

### **Culture History**

The lower reaches of the Big Sioux River drainage basin in southeastern South Dakota provide the geographic setting for the Lower Big Sioux Archeological Region #22. Portions of Union, Lincoln, Turner, McCook, and Minnehaha counties are contained in this region (Winham and Hannus 1991). The Big Sioux River valley, bluffs, and adjacent plains comprise the general topography of the area (Winham and Hannus 1991). Out of the plains, the Newton Hills in Lincoln County offer local relief. Precambrian age Sioux quartzite is the bedrock types predominate in this region (Winham and Hannus 1991). Although no pre-ceramic material have been reported in this area, as of May 2005, there are many unconfirmed reports of deeply buried cultural strata eroding out of the cutbanks of the Big Sioux River. Geomorphologic investigations in this region could help develop predictive statements regarding contextual locations of deeply buried pre-ceramic aboriginal sites and locales (Winham and Hannus 1991).

### ***The First Americans c. 15,000 B.P.***

Between 25,000 to 11,000 years ago, bitter cold temperatures during the late Wisconsin glaciation caused water to become trapped in advancing ice sheets. The result was a drop in world sea levels that effectively exposed low-lying landmasses, and the original immigrants to the Americas are believed to have arrived by means of an exposed land bridge connecting Siberia with Alaska.

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The pathway for further migration south is still under debate. Since the 1950s, conventional understanding was that an “ice-free corridor” existed between the Cordilleran and Laurentide ice sheets as they retreated north when warmer temperatures returned around 15,000 years ago. Without this pathway, many scholars felt that migration into the New World would have been impossible due to the existing glaciers. However, a “growing body of evidence indicates that pathway between the great glaciers of the Last Ice Age was closed – in fact, the way south may have been blocked until the centuries after the dawn of Clovis” (Dixon and Heaton 2000).

Another popular hypothesis is that Early Americans migrated to the New World via a Pacific Ocean coastal route. Work by archeologists and paleontologists has shown that the Northwest coast of North America was not always covered by ice as once thought (Dixon 2000; Dixon and Heaton 2000). In fact, there is evidence that ancient life existed along this coast for tens of thousands of years. Jim Dixon and Tim Heaton’s excavation of the coastline has uncovered a continuous record of caribou, fox, and bear bones dating back 50,000 years (Dixon and Heaton 2000). Furthermore, the western coastline was likely more extensive during ice ages. Sea levels were significantly lowered as much of the earth’s water was trapped in glacial ice. This, along with the isostatic effects on land masses from the weight of the glaciers, would have exposed substantial tracts of land along coastline providing a route further south.

Archeological sites dating to such antiquity are extremely rare, and only a handful of these sites exist in the Americas. The most notable and intensely investigated site is the Monte Verde site in Chile, South America (Dillehay 1997). This site contained wooden huts, hearths, a wish-bone-shaped structure, and several bone and stone artifacts that date to between 14,050 and 13,600 years ago [cal]. Other sites include the Chesrow Complex in Southeastern Wisconsin (Overstreet 1993, 2000), the La Sena and Jensen site in central Nebraska (Holen 1994, 1995; Holen and May 2002), the Meadowcroft Rockshelter site in southwestern Pennsylvania (Adovasio et al. 1978; Adovasio and Page 2002), sites from the Old Crow Basin in Canada’s Yukon Basin (Bonnichsen 1979; Irving et al. 1989), and the Cactus Hill Site in southern Virginia (Dixon 1999; Monastersky 2000; Adovasio and Page 2002).

Although many of these sites have not received complete scientific acceptance, the archeological evidence appears to support regional adaptation underway 12,000 years ago, and the Early Americans emphasized the local environments for subsistence, which included both a variety of floral and faunal resources (Dixon 1999). Furthermore, both genetic and linguistic studies are providing mounting evidence that there were multiple migrations of people, and they were not of a shared, single biological or cultural stock (e.g. Schurr and Wallace 1999; Nichols 1990). In other words, the first Americans were likely made up of several people and cultures that migrated from the Old World, and they adapted to many different environments in several different ways.

### ***Clovis, Folsom, & Paleo-Indian c. 13,400[cal]-7600 B.P.***

Towards the end of the Wisconsin glaciation, the Plains environment harbored big-game species such as the mammoth and Ice-age bison adapted to the periglacial environment and the seasonal extremes of the times. During this time a new culture, named Clovis after the early archeological excavations in Clovis, New Mexico, began in the Americas. Based on the lack of any definite

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occurrence of the Clovis material culture, such as the Clovis projectile point, north of the ice sheets or in the Arctic, Clovis is believed to be the first truly indigenous North American culture.

The Clovis tradition people likely lived in highly mobile small bands of people armed with a shared tool kit that included the diagnostic fluted lanceolate Clovis point, gravers, a variety of end scrapers, and a blade-technology with cutting and scraping tools made out of the blades. The discovery of kill sites in the western United States has tended to emphasize a life-way based on specialized hunting of now extinct Ice-age big-game animals such as mastodons and mammoths. Martin (1967) even argued that the success of Clovis hunters largely contributed to the megafaunal extinction. However, more recent research has convincingly demonstrated that this type of subsistence was not a widespread important role in Clovis subsistence, and the Clovis people appear to have emphasized a variety of flora and fauna (Anderson and Sassaman 1996; Griffin et al. 1988; Bryan 1991).

Archeological manifestations associated with the Clovis time period are rare and usually consist of isolated surface-find projectile points. No Clovis sites have been found in the Lower Big Sioux archeological region as of May 2005. Well known in Plains archeology, the Lange-Ferguson site in Shannon County is the only Clovis site to be investigated in the state as of May 2005 (Hannus 1994). This Clovis site is mammoth kill/butchery locality with direct evidence for the use of mammoth bone tools in the butchering process.

The Younger Dryas cold snap characterized by a worldwide cold interval followed Clovis times and lasted between 11,000 and 9650 B.C. [ca]. As a drier climatic regime resulted in the retreat of spruce forest and the expansion of grassland on the northern plains, many of the Ice-age megafauna died. Bison, however, became well adapted to this environment and the size and mobility of the herds likely increased significantly. Similar to the landscape today, in the Black Hills proper pine forests characterized this area while grasslands surrounded the Hills at the lower elevations.

During this time period, the Folsom complex emerged. This complex is identified by well-made lanceolate points fluted entirely up to their tips, and the people relied heavily on the bison herds and other big game for subsistence. Bamforth (1988) hypothesizes that as bison herds grew in size; this food resource became more predictable. Folsom groups reacted by using regular and preferred locations, engaging in communal hunts, and concentrating into larger social groups. As evidenced by their specialized point production, this may have led to greater social complexity from Clovis to Folsom.

Like Clovis, Folsom archeological remains are rare and are typically surface finds. Within the Lower Big Sioux region no Folsom sites have been reported or recorded as of May 2005.

Following and partly overlapping the Folsom period around 10,500 to 9000 B.P. in addition to a climatic shift more similar to modern times, many regional adaptations appeared in North America. Many Plains archeologists refer to this period as the Middle Paleo-Indian period (see Frison 1991). This period includes the Alberta, Hell Gap, and Agate Basin cultural complexes. These groups continued to emphasize a subsistence based on bison hunting and were involved in massive bison drives that probably required intimate knowledge of the landscape and several people. Beginning at about 9000 B.P. and continuing on to about 8000 B.P., it appears that

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Plains groups began to develop a hunting/gathering subsistence mode that was focused on a more generalized resource base. This period is referred to as the Late Paleo-Indian period (9000-8000 B.P.) and several variations of parallel-oblique flaked, unfluted, lanceolate point forms existed including the Jimmy Allen, Frederick Allen, Pryor Stemmed, Lovell Constricted, Angostura, Lusk, and many others. In addition, the Cody complex dates to the Late Paleo-Indian period and consists of finely made stemmed spear points such as the Scottsbluff and Eden types. The use of local stones for tool manufacture and the limited distribution of the projectile point types relative to earlier times may suggest that cultural boundaries also were present to some degree.

Reports of deeply buried strata eroding from the Big Sioux River cutbank indicates that pre-ceramic cultures were occupying the area (Winham and Hannus 1991). Investigations at the Chalk Rock Site 39BK1000 on Big Sioux in Brookings County have uncovered artifacts in association with mammoth bone. Deeper strata also contain the potential for older deposits and this possible multi-component site may offer important information on Paleo-Indian presence in Eastern South Dakota.

### *Plains Archaic c. 7600 B.P. to 1500 B.P.*

The Plains Archaic is defined by a marked subsistence focus on broad based hunting and gathering whereas the preceding Paleo-Indian period is thought to have been focused primarily on big game hunting. A marked increase of groundstone tools such as manos and metates used for processing and grinding food material is evident in the archeological record and reflects a major subsistence shift to a more generalized subsistence base (Frison 1998). While this lifeway existed to some degree in the late Paleo-Indian times, it was not as widespread. Frison (1998) writes that the term 'Archaic,' in one sense of the word, is meant to denote an adaptation dominated by hunting and gathering rather than a cultural time period. In fact, many Plains groups continued the Archaic lifestyle well into historic times, and Archaic temporal periods are defined much more by changes in projectile point styles rather than significant changes in lifeways.

### *Early Plains Archaic c. 7600 to 5000 B.P.*

The Early Plains Archaic coincides with an extremely warm and dry climatic episode known as the Hypsithermal or Altithermal. Though the effects of this episode on plants, animals, and people are still debated, Frison (1998) suggests that severe droughts caused plant communities to shift to higher elevations; and, as a result, many Early Plains Archaic people occupied foothill-mountain areas. Frison (1998) points to the presence of several Early Archaic sites in low elevation intermountane settings in addition to Early Plains Archaic bison kill sites in the Wyoming Black Hills as mounting evidence for this hypothesis on the human response to the Altithermal. In addition, very few Early Archaic sites have been found on the plains proper and bison remains dramatically decrease in Altithermal aged deposits, reflecting the almost desert like conditions that were thought to exist on the plains during the Early Archaic (Frison 1998). Size diminution of bison has been a gradual process throughout the Holocene, and there is some indication of a slight acceleration of this trend through the Altithermal (Frison 1998).

Habitation features, known as pit house features, also first appear during this time (Frison 1991). They date toward the end of the Late Archaic period and extend into the Middle Archaic. These

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features “usually appear as deep, circular stains; sometimes with central post molds ... others are oval with multiple post molds along the long axis” (Sundstrom 1996). Cache pits, fire pits, and grinding stone are commonly found in the pit houses. Most of these features are found in the intermountain basins of the northern plains. The presence of these fairly significant habitation features may be associated with some level of sedentism.

Relative to the Paleo-Indian times, Early Archaic bison kill sites are typically small consisting of only 10-20 bison. Hunting strategies included the use of arroyo traps and jumps (much later in the period) and probably required small groups or bands to accomplish. However, many sites such as the Spring Creek site in south-central Nebraska and the Coffey site in northern Kansas contain much more small game and plant remains than large herbivores. Certainly this is an indication of the more generalized resource base.

Other than groundstone implements, the Early Archaic also included the arrival of a new type of projectile point. These projectile points are distinctly side-notched although there are many regional variations of this form. The technological innovation of notching offered a much stronger binding to the foreshaft of a spear while reducing the bonding mass at the same time (Howard 1995).

#### *Middle Plains Archaic c. 4900 to 3000 B.P.*

The end of the Altithermal and the return to modern climatic condition marks the beginning of the Middle Archaic Period. Bison populations again proliferated (Frison 1998). In addition to a refinement in bison hunting strategies, the Middle Plains Archaic period witnessed an even greater emphasis on plant foods. Reused sandstone plant grinders as well as roasting pits are common at sites dating to this time period. While small bison kill sites are the most typical of the period, Middle Archaic people continued to use bison jumps. One noteworthy innovation by Middle Archaic hunters was the use of bison corrals like that seen at the Scoggin Site in Wyoming. This strategy is very different in that it likely needed much fewer people to operate relative to the other strategies. Overall, Middle Archaic groups developed a carefully planned scheduling of economic activities based on seasonal plants and movements of game.

During this time period, the Plains also witnessed the widespread appearance of stone circles. The features typically measure between 13 and 23 feet in diameter. Although the function of them has been debated, it is generally agreed that most represent a circular anchor “to hold down the cover of a conical (or some other type) lodge” (Frison 1998).

The McKean Complex is the most notable Plains Middle Archaic archeological manifestation, and McKean sites have an extremely wide distribution across the Plains. These site types are most readily recognized by the lanceolate McKean point with an indented base and convex blade edges. However, there are many variations of the McKean point and include side-notched and stemmed forms.

Common Middle Archaic site types are bison kills, open occupations, and cave/rock shelters. Usually, Middle Archaic sites are far more common than preceding periods; however, only three Middle Archaic sites were listed on the South Dakota Archaeological Research Center database within the Lower Big Sioux region (39LN2, 39LN7, and 39LN19). Site 39LN7, is the only site

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of the three that has a definite McKean association. The other two sites are typed as general Middle Archaic.

#### *Late Plains Archaic 3000 to 1500 B.P.*

The Late Plains Archaic is marked by the appearance of corner-notched points on the Plains. This notching technique produced flared edges with sharp points where the base and edge intersect. In general, Late Archaic people appeared to shift back to a focus on large, upland game (Deaver and Deaver 1988), although other resources were certainly exploited to some extent.

The earliest Late Archaic manifestations are the Pelican Lake and the Yonkee phases (see Frison 1991). However, these archeological complexes are typically found in the northwestern Plains; and within the Lower Big Sioux study unit, no Late Archaic sites have been assigned to the Yonkee complex (Hanenberger et al. 2004).

Problematic in identifying Pelican Lake presence toward eastern South Dakota is the observation that corner-notched points virtually identical to the Pelican Lake point are identified with the more recent early Plains Woodland manifestations throughout eastern South Dakota (Sundstrom 1996). As a result, no sites have been assigned to the Pelican Lake cultural complex within the Lower Big Sioux region as of May 2005.

Six sites have been assigned to the Late Archaic period within the Lower Big Sioux region. Most of these are typed as small artifact scatters.

#### *The Late Prehistoric 1500 B.P. to 16th Century A.D.*

The Middle Missouri witnessed significant changes during the Late Prehistoric Period on the Central Plains. The innovation of the bow and arrow as indicated by small delicate projectile points was introduced around this time. Yet, while many essentially continued Archaic-based lifestyles with a strong emphasis on bison hunting aided by the widespread use of the bow and arrow, others around the Missouri River Valley and eastern South Dakota began horticulture in the Dakotas and probably developed more complex societies.

Besant and Avonlea phases are typically associated with the continuation of a general Archaic-based lifestyle. Besant represented a highly sophisticated bison hunting culture. Bison kill sites associated with this phase often consist of complicated, skillfully constructed bison corrals similar to modern cattle corrals. The use of these corrals would have required great knowledge and understanding of stampeding animals (Fagan 2000). At the Ruby site along the Powder River in Wyoming, a structure at the southern end of this bison corral site is interpreted to be a ceremonial structure. If this is true, this could represent the importance of ritual at communal hunts similar to the rituals documented in historical accounts. Ceramics also occasionally appear at Besant sites.

One Besant site has been recorded within the Lower Big Sioux region as of May 2005. Site 39MH69 is listed as an artifact scatter associated with a single Besant projectile point. .

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Around A.D. 1, the Avonlea phase began on the Plains and continued well into the Late Prehistoric Period. Avonlea points are typically side-notched points with slightly concave bases. Based on their smaller sizes, it is believed that the Avonlea people were the first to use the bow and arrow on the Plains. Avonlea ceramic styles include net impressed, spiral channeled and smooth surfaces (Dyck 1983).

No Avonlea sites have been recorded within the Lower Big Sioux region as of May 2005.

Nascent horticulture groups are associated with the Woodland Tradition. As the name implies, the introduction of horticulture likely spread from the east. These Woodland groups are characterized by fixed settlements, more complex societies, seed horticulture, pottery/ceramic production, and the construction of burial mounds. The Woodland Tradition is generally subdivided into Early, Middle, and Late Woodland periods as well as other phases and cultures. These further divisions are mainly identified through ceramic types, geographic locales, and temporal ranges.

The South Dakota Archaeological Research Center database indicated that a total of seven sites in the Lower Big Sioux study unit have been assigned to the Woodland period as of May 2005. Most of the seven sites are recorded as mounds; however, artifact scatters and occupations are also in the database.

The Plains Village period supplanted or continued the Woodland culture in the Middle Missouri around A.D. 900 and extended throughout the eastern Plains. The transition is generally marked by larger villages (sometimes with fortifications) and greater horticulture produce including corn, beans, squash, and sunflowers. This period is typically divided into “sub-traditions” and variants based on dates, ceramics, house types, and other characteristics. This includes, in order of antiquity, the Initial (IMM), Extended (EMM), and Terminal (TMM) Middle Missouri Variants and the Initial (IC), Extended (ExC), Post-Contact (PCC), and Disorganized Coalescent Variants.

The State Historical Society database indicates that the Lower Big Sioux region contains 13 Plains Village sites. Of these sites, eight are listed as Great Oasis, two as Oneota, two as Initial Middle Missouri, and one as a general Plains Village site. In addition, six sites are listed as general Late Prehistoric sites. A total of 27 Late Prehistoric sites have been recorded within the Lower Big Sioux archeological region.

### ***The Protohistoric or Contact Period c.1600-1804***

The Protohistoric Period marks the beginning of even greater change on the Plains. The term Protohistoric is associated with the onset of Euro-American presence on the Plains, even though this does not imply there was full-scale or even frequent direct contact with Euro-Americans. Certainly the greatest impact was the arrival of trade goods including horses and firearms. Horses were provided indirectly by the Spanish from the southwest, and firearms came later indirectly from the French, English, and American fur-traders from the northeast. Both trade goods greatly increased the ease of bison hunting and also influenced other once semi-sedentary horticulture groups from the east such as the Cheyenne, Crow, and the Lakota/Dakota to become Plains equestrian nomadic Bison hunters. The Mandan, Hidatsa, and Arikara along the Missouri River also became central providers of firearms to tribes further west.

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Many of the Protohistoric Plains groups were highly mobile focusing intensely on bison hunting with only a supplemental emphasis on other resources, although others certainly continued village farming. The need to cover large migration ranges of bison coupled with the influx of other groups competing for the same resource created much competition between tribes. As a result intertribal conflict became more common, and the power of tribes as well as individuals became defined by the accumulation of European trade goods.

Protohistoric sites are recognized by the occurrence of both native artifacts such as stone tools mixed in with European trade goods such as gun parts, trade beads, metal projectile points, and other metal items.

The South Dakota Archaeological Research Center database indicates that there is only one site within the Lower Big Sioux region that can be assigned to the Proto-Historic period as of May 2005. Site 39LN2 is a proto-historic Oneota village.

### *The Historic Period 1800-1950*

Although smaller trading operations under the control of the Missouri Company were present in the Dakotas and the Middle Missouri during the late 18<sup>th</sup> century, the purchase of the Louisiana Territory in 1803 and arrival of Lewis and Clark in 1804 signaled the beginning of the Historic Period and full-scale interaction between Native American groups and Euro-Americans. Euro-American fur traders and trappers were the first to enter the region after Lewis and Clark, and the Missouri River became an increasingly important trading locale.

In the early half of the 19<sup>th</sup> century, permanent settlements of forts and trade posts began to be set up along the Missouri River. The first trading fort was set up by the Missouri Company in 1794 and focused on trapping beaver and otter; this industry did not shift focus to buffalo robes until around 1815 (Hananberger et al. 2004). By 1840, buffalo were the most sought after skins in the fur trading business (Hananberger et al. 2004).

Certainly, the expansion of America into the west was accomplished at the expense of the Plains tribes. Though tribal boundaries and reorganization had already taken place in protohistoric times, European diseases decimated Native American populations and continued this trend. The Arikara, who once occupied the Middle Missouri in the Dakotas, fell to several outbreaks of smallpox during the mid to late 18<sup>th</sup> century, greatly diminishing their numbers. By the 19<sup>th</sup> century, the Dakota “were in clear control of the Missouri River Valley” (Hananberger et al. 2004).

Conflicts between the tribes and Euro Americans also escalated. Although once considered “Indian Territory,” the United States looked to the west for expansion and settlement. During the 1800s, several treaties aimed at acquiring these Indian lands. While lands cessations were small at first, these could not keep up with the influx of migrants to these areas. Hoping to curtail the growing hostilities between the Northwestern tribes and the American frontier, the Fort Laramie Treaty of 1851 was signed between the United States and the Lakota, Arapaho, Cheyenne, Crow, Assiniboine, Mandan, Arikara, and Shoshone.

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This “Great Treaty” and others, however, did little to assuage the conflicts since they were often breached or altogether ignored. In the 1860s, several tribes declared war on the Americas. The United States reacted by establishing several forts in the region.

The second “Great Treaty,” the Fort Laramie Treaty of 1868, established the Great Sioux reservation in central South Dakota, and all lands east of the Missouri River were ceded and officially opened for settlement. The separate Lower Brule reservation was also established around the White River near present day Oacoma.

Only a few years later, expansion ambitions to the west of the Missouri River again threatened tribal lands. Political attempts focused at breaking up the Great Sioux Reservation. Two key events accomplished this. The General Allotment Act of 1887, or Dawes Act, allotted 160 to 320 acres to tribal families. The tracts of land were intended to “encourage” the Native Americans to take up farming in order to assimilate them into American economy and society. Surplus reservation lands were then available to be sold to non-Indian settlers. Under fear and broken promises, the state of South Dakota also officially divided the Great Reservation in the five present-day reservations of Standing Rock, Lower Brule, Rosebud, Pine Ridge, and Cheyenne River. Following this, these areas to the west were now opened for settlement.

These events deeply impacted the Dakota. The result was a loss of 42 percent of their lands (Hanenberger et al. 2004). The shortsightedness of the Dawes Act had no means of sufficiently providing for the family heirs of the small tracts of lands and the government was slow in providing the promised compensations and rations to the tribes. Understandably angered at their situation, some Dakota again turned to open conflict with the United States. National Historic Landmark Wounded Knee in the White River Badlands is the site of the last armed conflict between Native Americans and United States government troops, fought on December 29, 1890.

Ranchers, Farmers, Miners, and entrepreneurs from all over the U.S. began to settle South Dakota in the late 19<sup>th</sup> century. Most sites that are assigned to the historic period are associated with ranching, farming, railroad, and/or industrial activities. There are 100+ sites dating to the historic period in the Lower Big Sioux region. These site types include dumps, well/cisterns, depressions, foundations, farmsteads, non-farm ruins, artifact scatters, railroads, cabins, burials, earthworks, industrial sites, and roads.

### **Cultural Resources Records Review**

Nathan A. Barton of Wasteline, Inc. requested records search data for previous inventories, and archeological and historic period architectural resources from the South Dakota State Historical Society on October 7, 2016. Records search was conducted by Jane P. Watts October 11, 2016. **QSI** historian and GIS Specialist Brian Huot checked the National Register of Historic Places (NRHP) and National Historic Landmark databases on October 21, 2016. Results are listed in the tables below.

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Table 2. Cultural resources within one mile of the project area.

ID#	Name/Type	NRHP	Potential Effect, Relationship to Project, & Recommendations
39MH0072	Native American Artifact Scatter	<i>Unevaluated</i>	<b>No Effect</b> – Out of APE
39MH0094	Native American Isolated Find	<i>Not Eligible</i>	<b>No Effect</b> – Out of APE
39MH0139	Native American Artifact Scatter	<i>Unevaluated</i>	<b>No Effect</b> – Out of APE
39MH0157	Constance Site Native American Artifact Scatter	<i>Unevaluated</i>	<b>No Effect</b> – Out of APE
39MH0158	Native American Artifact Scatter	<i>Unevaluated</i>	<b>No Effect</b> – Out of APE
39MH2000	Burlington Northern Railroad	<i>Eligible</i>	<b>No Effect</b> – Out of APE
39MH2013	Great Northern Railroad	<i>Eligible</i>	<b>No Adverse Effect</b> – In APE - <b>Avoid</b>
MH00000902	Railroad Bridge over Split Rock Creek	<i>Eligible</i>	<b>No Adverse Effect</b> – In APE - <b>Avoid</b>
MH00000906	Forman Ford	<i>Eligible</i>	<b>No Effect</b> – Out of APE
MH00000907	Ray's Motel	<i>Eligible</i>	<b>No Effect</b> – Out of APE
MH00000908	Community/Township Hall	<i>Not Eligible</i>	<b>No Effect</b> – Out of APE Out of APE
MH00000909	Bank House	<i>Not Eligible</i>	<b>No Effect</b> – Out of APE
MH00000910	Fauske-Christopherson House	<i>Eligible</i>	<b>No Effect</b> – Out of APE
MH00001270	Thomas Rovang Farm	<i>Eligible</i>	<b>No Effect</b> – Out of APE
MH00001645	Bridge 50-279-140	<i>Not Eligible</i>	<b>No Effect</b> – Out of APE
MH00001647	Bridge 50-280-139	<i>Not Eligible</i>	<b>No Effect</b> – Out of APE
MH00001648	Bridge 50-280-152	<i>Not Eligible</i>	<b>Removed and Replaced</b>
MH00001649	Bridge 50-281-151	<i>Not Eligible</i>	<b>Removed and Replaced</b>

Table 3. Previous inventories within one mile of the project area.

Resource#	Author(s)	Year	Title
AMH-0018	Winham, R.	1986	An Intensive Cultural Resource Survey of a Proposed Quarry Area Near Corson, in Minnehaha County, South Dakota
AMH-0031	Haberman, T.	1987	Cultural Resource Survey of a Materials Pit in Section 24, T102N, R48W, Minnehaha County, South Dakota.

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Resource#	Author(s)	Year	Title
AMH-0057	Fosha, M.	1990	An Intensive Cultural Resources Survey of the Proposed Material Pit Near the City of Corson, Minnehaha County, South Dakota.
AMH-0108	Braun, K.	1994	An Intensive Cultural Resource Survey on a Highway SD11 from I-90 to the North Side of Corson in Minnehaha County, SD
AMH-0165	Vaillancourt, D.	2003	A Level III Cultural Resource Letter Report for a Surface Pipeline and Cross Fencing Project for Jarrod Johnson, T102N, R48W, Section 23, Minnehaha County, South Dakota.
AMH-0179	Messerli, T.	2003	An Intensive Cultural Resources Survey of SDDOT Small Road Project No. P-PH 0011(05)81, PCEMS 6229, Minnehaha County, South Dakota
AMH-0265	Miller, P.	2009	An Intensive Cultural Resources Survey for SDDOT Emergency Erosion Repair Project PCN 00Z2, for SD Highway 11, Minnehaha County, South Dakota
AMH-0266	Lueck, E.	2009	A Level III Cultural Resources Survey of the Proposed Corson Water Main, T102N, R48W, Section 27, Minnehaha County, South Dakota
ESD-0001	Sigstad, J.	1973	An Archaeological Survey of the Proposed Watertown, South Dakota-Moville, Iowa 345 KV Transmission Line 1973, Brookings, Codington, Deuel, Lincoln, Minnehaha, Moody and Union Counties, South Dakota.
ESD-0154	Gillen, T. et al.	1994	An Intensive Cultural Resources Survey of Proposed Sioux Valley Electric Projects in Eastern South Dakota.

### Survey Methods & Results

**QSI** archeologist and historian Jeffrey D. Larson, archeologist and architectural historian Mark Carpenter, and archeologist Emily Rodgers conducted Level III cultural resources inventory of the project area October 25 through 27, 2016. The average temperature was 55 degrees Fahrenheit and the ground was dry other than in the drainages. The project area was located using a global positioning system (GPS) application, aerial and topographic maps, and project information provided by the client. Field investigation consisted of visual inspection, photography, and subsurface testing.

Pedestrian inventory was conducted in transects less than 30 meters apart covering the 280 acre survey area. Ground cover varied from mixed grasses, recently harvested crops, unharvested corn crops, manicured lawns, and rock outcroppings. Ground surface visibility ranged from 5 to 100 percent, averaging about 15 percent for most of the project area. The majority of the project area was on hillslopes near Split Rock Creek and an unnamed intermittent stream. Topography ranged from level terrain to 40 percent slopes for most of the project area.

Existing disturbance from agricultural activities and construction of railroad, roads, and houses and other structures was evident in the project area. Cultural resources located during the survey

include the railroad, three railroad bridges, one railroad masonry culvert, one corn crib, and one historic artifact scatter. Additionally, a 70 ft. by 50 ft. earthen dam was located; however, this was constructed in 1991 according to records obtained from the South Dakota Department of Environment and Natural Resources (DENR). A washing machine used for target practice, as evidenced by bullet holes, and a wood and metal livestock trough were located during the inventory as well but were not recorded as cultural resources based on input from Jane Watts of the State Historical Society.

Considering the project is by Split Rock Creek and within 5 mi. of several recorded mounds - Split Rock Creek Mounds 39MH0006, East Brandon Burial Mounds 39MH0010, Beaver Creek Mounds 39MH0011, and the Graft Mound 39MH0021, among others near Split Rock Creek - there was potential to locate mounds in the current inventory area. Although no mounds were identified in the records review within one mile of the project area, the area was closely inspected for the presence of intact mounds and mounds which could have been destroyed. However, no evidence of mounds was identified.

One subsurface test was conducted on a bench along Split Rock Creek. Ground surface visibility was below 30 percent in this portion of the survey area. No cultural resources were located on the surface and no subsurface cultural deposits were located in this test.

Table 4. Subsurface Test #1.

<b>Location:</b> UTM Zone 14 E/696073 N/4833520 <b>Size &amp; Depth:</b> 54x58x95cm
<b>Stratigraphy:</b> 0-95cm 7.5YR 3/1, very dark gray, silty clay loam
<b>Contents:</b> Small rodent bone and piece of shell at 65cm; no cultural materials located
<b>Screen Sizes:</b> 1/4" <b>Liners:</b> No <b>Backfilled:</b> Yes

**Previously Recorded Cultural Resources**

Three previously recorded bridges were identified in the project area during the record search. Two **not eligible** road bridges MH00001648 and MH00001649 had been removed and replaced with new concrete structures prior to the current inventory.

**MH00000902 – Railroad Bridge over Split Rock Creek**

This **eligible** railroad bridge was recorded in 1995 as a steel Warren truss bridge over Split Rock Creek with piers made of stone on concrete footings. The structure was noted as being constructed around 1910 since Warren trusses were popular after that date; however, it could have been constructed earlier or later. Considering the railroad was constructed in 1888 and the Warren truss was patented in 1848, it is possible this bridge was constructed before 1910.

In the quadrants where this bridge is located, Concrete Materials proposes to do grading along the railroad and add a spur line and sidings. The addition of a spur line and sidings are not expected to impact this bridge because it is an active railroad and the addition of spur lines and sidings are common on active railroads. There will be **no adverse effect** to this structure.



Figure 7. View of MH00000902 facing west-southwest.  
 J. Larson 10/27/2016.

### ***39MH0334 – Outcrop Artifact Scatter***

#### *Site Description & Contents*

This site consisted of several thick clear, cobalt blue, and light green glass fragments, a few fragments of thick white ceramics, as well as a small a cobalt blue Vicks Vaporub bottle and a small clear glass bottle. On the base of the Vaporub bottle is a single triangle with “Vicks Vaporub” embossed around it. Embossed letters were on the base of the small clear glass bottle in two rows with the first row reading “DES” and the second row reading “REG.”. A vertical ribbed design is on each of the corners of this bottle. The site was primarily in two concentrated areas 10 ft. apart on bedrock outcroppings with mixed grasses in between.

#### *Evaluation/Collection Methods*

The artifact scatter was located during pedestrian inventory spaced less than 30 meters apart. Mixed grasses around the site were closely inspected for additional components of the site; however, no additional resources were located. No cultural resources were collected and no shovel tests were conducted.

#### *Site Interpretation*

The single triangle on the base of the Vicks Vaporub bottle indicates it was manufactured between the 1930s and the 1970s. Between 1912 and the 1930s, Vicks Vaporub bottles typically had two triangles in the center and by the 1970s plastic bottles replaced glass ones.



Figure 8. Overview of 39MH0334.  
Note site is between the rock outcroppings on bedrock. E. Rodgers 10/27/2016.



Figure 9. View of 39MH0334 concentration one.  
E. Rodgers 10/27/2016.

Based on size and design, the clear glass bottle appears to be an Owens-Illinois Glass Company Duo-Ovals Model A-5139 pharmaceutical and proprietary bottle. Unfortunately, the base does not include a maker's mark or other information to help date the bottle, other than "DES REG.". "DES REG." may refer to a Design Registration, a term commonly used in other countries such

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as the United Kingdom and Spain instead of the U.S. equivalent Design Patent. Although no information was located to date the bottle definitely, the bottle design appears in a 1933 Owens-Illinois bottle catalog indicating the bottle could have been manufactured around that time (Owens-Illinois Glass Company 1933).



Figure 10. View of 39MH0334 concentration two.  
 E. Rodgers 10/27/2016.

A previous inventory (AMH-0018) from 1986 in this area identified “historic/recent debris” in the vicinity of the site indicating that the materials were deposited here before that inventory (Winham 1986). No additional information was provided in the inventory report and the site was not recorded by the archeologists who performed that inventory.

It is likely that the materials located were dumped in this location by either a nearby resident or a traveler. With the Great Northern Railway tracks located approximately 330 ft. west of the site, it is possible these materials were deposited by passengers or crew members as trains passed through this area.

#### *National Register of Historic Places Eligibility*

This site is recommended **not eligible** for the NRHP. It retains five of the seven aspects of integrity, excluding design and association since there is no apparent conscious decision to the way these materials are scattered and they are not known to have been associated with an important individual or event.

The artifact scatter is not associated with a significant person or event making it **not eligible** under Criterion A and B. The materials located are commonly found in historic dumps and do not appear to have been made by a master craftsman; therefore, it is considered **not eligible**

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under Criterion C. Considering the site is located on bedrock outcropping and contained common materials, it is not likely to yield information important in history and is, therefore, considered *not eligible* under Criterion D.

### *Management Recommendations*

No protection measures are necessary for the site.

## ***39MH2013 – Great Northern Railroad***

### *Environmental Description*

The site is located on a downslope with an unnamed intermittent stream crossing underneath the railroad in one location and Split Rock Creek crossing in another location. North of 259th Street, rock outcroppings are located east of the railroad with a few outcroppings to the west. South of 259th Street, a shelterbelt is located east of the railroad and a slope with mixed grasses is to the west. This segment of the railroad is located near the top of a downslope for most of its length. The approximately 15 meter wide railroad grade is covered in ballast fill with the ties and rails on top of the ballast. In the 7.5 meters on each side of the grade that make up the railroad right-of-way, there are mixed grasses, rock outcrops, and occasionally trees, primarily near the drainages.



Figure 11. View of 39MH2013 and MH00002388 facing east-southeast. Photograph taken at north end of site. J. Larson 10/25/2016.

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### *Site Description & Contents*

This is an active segment of the Great Northern Railway, now operated by Burlington Northern Santa Fe. This segment runs roughly north-south through the project area and is visible from most of the project area with some areas obscured by topography and vegetation. One *eligible* railroad bridge, three previously unrecorded bridges, and a previously unrecorded masonry culvert were located along this segment of railroad. Several large pieces of wood were in the northwest corner where 259th Street crosses the railroad, and are likely used to replace the wood slats at that railroad crossing. No other features or materials were identified from visual inspection of the railroad.



Figure 12. View of 39MH2013 where it crosses 259th Street, facing southwest. Note wood slats used for railroad crossing. Photograph taken at south end of site. J. Larson 10/25/2016.

### *Evaluation/Collection Methods*

The segment of railroad in the proposed project area of potential effect was recorded. It was located on topographic maps, confirmed in the field through visual inspection and photography. No cultural resources were collected and no shovel tests were conducted.

### *Site Interpretation*

Constructed in 1888, this segment of the Great Northern Railroad served as a connection from Sioux Falls, South Dakota to the port city of Duluth, Minnesota. This connection allowed for transportation of goods and people between eastern South Dakota and the Great Lakes Region.

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Over the course of its history, the Great Northern Railway expanded into the Midwest and the Pacific Northwest, having begun in the Twin Cities area of Minnesota. The railway operated in ten states from Wisconsin to Oregon and two Canadian provinces. James J. Hill, founder of the Great Northern Railway, understood that if the railroad was going to prosper, the region serviced by the railroad would need to prosper. This understanding guided the Great Northern railroads development throughout its history (Great Northern Railway Company 1958).

Formed in 1889 from several railroads in the region, the Great Northern Railroad expanded westward from Minnesota to provide a northern route from the eastern cities to Seattle, Portland, and other cities in the northwest (Great Northern Railway Company 1958). A rail route through South Dakota was overlooked for routes in neighboring states North Dakota and Nebraska; therefore, the extent of the Great Northern Railway in South Dakota is limited to three routes: to Aberdeen, to Watertown and Huron, and to Sioux Falls and Yankton (Hufstetler and Bedeau 2007). This segment is part of the latter and is still in active use. By 1970, the Great Northern joined Burlington Northern Railroad which in 1995 became the Burlington Northern Santa Fe Railroad (Hufstetler and Bedeau 2007), which still operates this railroad segment today.

### *National Register of Historic Places Eligibility*

The Great Northern Railway, like other railroads in South Dakota, allowed for quicker and safer transportation of freight and passengers in and out of South Dakota and encouraged increased settlement into the area.

This site meets all seven aspects of integrity. The railroad appears to retain its historic design and is in a rural agricultural setting as it would have been during its early operation. However, some changes to the setting have occurred, including mining, road construction, and residences dating mostly to the 1980s. It is also following its historic route and, therefore, retains integrity of location. Wood materials and metal rails, although repaired and replaced over time, are similar to those used during construction and reflect the standard workmanship of railroad construction. Since the site's historical setting is largely intact, it retains integrity of feeling and association.

Considering its significance in state transportation and settlement, the Great Northern Railroad is considered *eligible* under Criterion A. It is also considered *eligible* under Criterion B due to its association with the founder of the Great Northern Railway James J. Hill. This segment of railroad is considered *eligible* under Criterion C due to the original route being maintained and the majority of the materials reflecting those that were used during railroad construction in 1888, excluding one bridge which has been replaced by a concrete bridge. Considering the railroad maintains a standard design for railroads in this time period, it is not likely to yield any significant or unusual subsurface data; therefore, it is considered *not eligible* under Criterion D.

### *Management Recommendations*

The proposed project would result in **no adverse effect** to the Great Northern Railroad. While, the current setting will change as a result of the project, the setting has already been altered from its historic 1888 setting. An existing mine south of the project area, a highway and other roads, as well as multiple residences and other structures primarily built in the 1980s are in the vicinity

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of the project and have altered the historic setting. Additionally, mining and construction will not destroy or reroute the well-maintained, active railroad. The proposed project will add a spur line and sidings to the existing railroad; however, spur lines and sidings are commonly added to active railroads and will not impact the historicity of the existing railroad. As long as the railroad is not impacted by mining or construction, there will be **no adverse effect**.

#### ***MH00002386 – Two Fields Corn Crib***

Two Fields Corn Crib consists of a 16 ft. by 16 ft. concrete foundation with a circular metal cage and a metal roof. Tension bolts are present in each corner with braided metal wire attached from the roof to the bolts in two of the corners. Wood plan flooring is used inside the structure with fence materials now stored inside. Text stamped in the roof reads “MODEL 54 GROUP 1 ROOF NO. 2 BDL. 1 BDL. REQ.”.

Two Fields Corn Crib is recommended **not eligible** for the NRHP due to its typical gazebo style with no indication of association with important persons or events. It is also not the work of a master craftsman nor is it likely to yield subsurface finds. No protection measures are recommended for this structure.



Figure 13. View of MH00002386 facing south.  
J. Larson 10/27/2016.

#### ***MH00002387 – Railroad Masonry Culvert***

This is a masonry culvert in good condition under the railroad. It consists of brick and mortar on the top and sides with ballast, ties, and rails on top. There appears to be a metal platform between the bricks and ballast for support. This culvert is recommended **not eligible** for the NRHP with no protection measures.



Figure 14. View of MH00002387 facing west.  
J. Larson 10/27/2016.

***MH00002388 – Railroad Bridge at Mile Post 134.1.***

Railroad Bridge at Mile Post 134.1 is a small timber trestle bridge in good condition that is currently active. It has four central supports that allow for a drainage and a narrow cattle passage under the bridge. Pasture is on each side of the bridge with corn crops nearby as well as an active mine to the south.



Figure 15. View of MH00002388 facing southeast.  
J. Larson 10/25/2016.

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The bridge is recommended **eligible** for the NRHP under Criterion A and C for its importance in South Dakota transportation history and because it reflects elements of railroad engineering in the late 19th Century. Although the bridge has received regular maintenance including replacing ties, timber supports, and hardware, the bridge retains integrity of location, setting, design, materials, workmanship, feeling, and association. According to South Dakota's Railroads Historic Context (Hufstetler and Bedeau 2007), original materials do not need to survive to meet design, materials, and workmanship integrity.

Although mining is planned on the east side of the railroad and the stream under the railroad bridge may be diverted, there will be **no adverse effect** if project activities **avoid** impacting the bridge.

#### ***MH00002389 – Railroad Bridge at Mile Post 134.26***

Railroad Bridge at Mile Post 134.26 is a small concrete bridge in good condition that is currently active. It consists of concrete spans with one concrete leg in the center. Ballast, ties, and rails run on top of the bridge with metal fencing on the west side of the tracks for the length of the bridge. A small waterfall is present beneath the bridge. While there are no markings on the bridge, its location between bridges at Mile Post 134.1 and 134.3 indicates that this bridge is at Mile Post 134.26. Pasture is on each side of the bridge with corn crops nearby as well as an active mine to the south.



Figure 16. View of MH00002389 facing east.  
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When the railroad was constructed in 1888, there was likely a timber truss bridge in this location which has since been replaced with a concrete bridge providing more stability over the intermittent stream. This concrete bridge has undergone regular maintenance such as replacing the ballast, ties, and rails and was likely constructed in the 1980s or 1990s.

The bridge is recommended *not eligible* for the NRHP. Although the bridge maintains integrity of location and setting, the concrete bridge did not serve during the historic period of early travel and commerce within South Dakota and does not reflect the historic engineering of the railroad bridge that would have historically been in this location.

**MH00002390 – Railroad Bridge at Mile Post 134.3**

Railroad Bridge at Mile Post 134.3 is a small timber bridge in good condition that is currently active. It consists of creosote soaked timber supports laid horizontally at each end of the bridge to allow for the drainage to pass under the railroad. Pasture is on each side of the bridge with corn crops nearby as well as an active mine to the south.



Figure 17. View of MH00002390 facing northwest.  
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The bridge is recommended *not eligible* for the NRHP; therefore, no protection measures are recommended.

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### Management Recommendations & Conclusions

Cultural resources records search with the South Dakota State Historical Society revealed three known cultural resource sites in the area of potential effects. Road bridges MH00001648 and MH00001649 were considered *not eligible* for the National Register of Historic Places (NRHP). They have since been removed and replaced with new structures. .

During the Level III pedestrian inventory seven additional cultural resources were located, recorded, and evaluated for the National Register of Historic Places. Historic period surface artifact scatter 39MH0334 is recommended *not eligible* and will not need protective measures. The Great Northern Railroad, 39MH2013, has been previously determined *eligible* for the NRHP by the SHPO. Corn crib MH00002386 and railroad masonry culvert MH00002387 are recommended *not eligible*. Railroad culvert MH00002388 is recommended *eligible*. Railroad structures MH00002389 and MH00002390 are both recommended *not eligible*.

Railroad 39MH2013, railroad bridge MH00000902, and railroad culvert MH00002388 are considered *eligible* for the NRHP and recommended to be **avoided** by project activities.

Table 5. Summary of results of cultural resources inventory.

ID#	Name/Type	NRHP	Potential Effect & Recommendations
39MH0334	Historic Artifact Scatter	<i>Not Eligible</i>	No Effect
39MH2013	Great Northern Railroad	<i>Eligible</i>	No Adverse Effect – <b>Avoid</b>
MH00000902	Railroad Bridge	<i>Eligible</i>	No Adverse Effect – <b>Avoid</b>
MH00002386	Two Fields Corn Crib	<i>Not Eligible</i>	No Effect
MH00002387	Railroad Masonry Culvert	<i>Not Eligible</i>	No Effect
MH00002388	Railroad Bridge at Mile Post 134.1	<i>Eligible</i>	No Adverse Effect – <b>Avoid</b> Do not impact railroad bridge.
MH00002389	Railroad Bridge at Mile Post 134.26	<i>Not Eligible</i>	No Effect
MH00002390	Railroad Bridge at Mile Post 134.3	<i>Not Eligible</i>	No Effect

**A determination of no adverse effect to historic properties is recommended.**

In the unlikely event that cultural resources are located during construction activities, it is recommended that the South Dakota State Historic Preservation Office and *Quality Services, Inc.* be contacted immediately.

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# Appendix G

## *Planset*

## Technical Memorandum

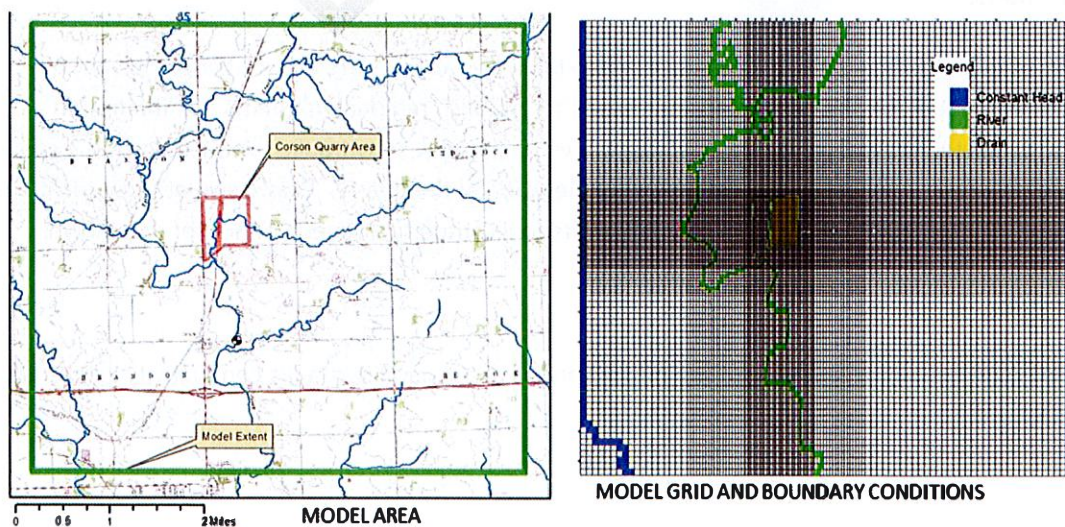
**To:** Billy Pollema, Concrete Materials  
**From:** Ray Wuolo  
**Subject:** Results of Corson Quarry Screening-Level Groundwater Inflow Modeling  
**Date:** January 11, 2017  
**Project:** 42491007.00  
**C:** Brian Anderson, Barr Engineering Co.

### Introduction

This Technical Memorandum summarizes the methods and findings of groundwater-flow modeling of the proposed Corson Quarry near Sioux Falls, SD. The purpose of the model is to develop initial estimates of groundwater inflows into the quarry at various proposed mining depths, using estimated ranges of hydraulic conductivity of the Sioux Quartzite, which is the proposed mined material. This model and the results of the modeling, are at a "screening level", using available data and employing assumptions to expedite estimates of inflows. It uses ranges of hydraulic conductivity, as interpreted from the South Pit mine area and it does not employ vertical or lateral homogeneity. If more precise estimates are required, the model would need modifications and site-specific data would need to be collected. However, for planning-level purposes, the model results are reliable because they employ likely ranges of hydraulic conductivity, use the planned mine depths and extent, and incorporate regional surface-water features.

### Methodology

A single-layer, two-dimensional groundwater flow model was constructed using the USGS's MODFLOW-2000 code in the graphical user interface Groundwater Vistas. The areal extent of the model is shown on Figure 1.



**Figure 1 Model Location, Grid, and Boundary Conditions**

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The model employs a finite-difference grid over the model domain, with grid cells equal to 100 x 100 meters in the far-field and 25 x 25 meters in the vicinity of the proposed quarry. For purposes of this screening-level evaluation, the model's base elevation was set at 1,138 feet MSL (mean sea level), which is approximately 20 feet below the proposed maximum depth of the quarry. The model's top elevation was set above regional ground surface to ensure unconfined conditions in the model simulations. Constant-head cells were used to define the model's boundary conditions to the east and west using estimates of groundwater elevation and to induce a general northeast to southwest flow gradient, as described in Lindgren and Niehus (1991) for the Sioux Quartzite in Minnehaha County, SD. These boundaries were located approximately 2.5 miles away from the quarry to minimize boundary condition artifacts on the model results. These constant-head boundaries are surrogates for regional flow and the effects of infiltrating precipitation (as recharge). Split Rock Creek and a portion of the Big Sioux River were represented as River Package cells in the model and were the primary discharge zones. Secondary streams are primarily ephemeral and were not explicitly modeled.

A base condition was established for the model by simulating groundwater flow and water-table elevation over the model domain without the presence of a quarry. The quarry was sequentially added into the model to represent proposed mine phases and years of mining using the Drain Package in MODFLOW. The modeled elevations range from 1,365 feet MSL to a minimum elevation of 1,160 feet, MSL. Elevation changes were modeled in approximately 50-foot increments, accounting for expansions of the quarry footprint as proposed for the various years of operations.

Hydraulic conductivity is the primary variable controlling inflows into the quarry. All other conditions being unchanged, greater rates of groundwater inflow would be expected with higher values of hydraulic conductivity (i.e. permeability). Because values of hydraulic conductivity can be quite variable, a range of two orders of magnitude was evaluated. Based on previous modeling work at the South Pit, a mean value of 0.3 feet/day was assumed for the bulk hydraulic conductivity of the Sioux Quartzite. Values of 0.03 feet/day and 3.0 feet/day were used to evaluate sensitivity and to provide an approximate range of expected inflows.

In addition to quarry inflow rates, estimates of water-table drawdown were also obtained. Given the structure of the model (i.e. the use of constant heads to establish regional gradients and infiltration effects, the predicted drawdown is relatively insensitive to changes in hydraulic conductivity in the model. Drawdown, however, is sensitive to the dewatering elevation in the quarry. Drawdown at three locations from the quarry were extracted from the model results to illustrate the general effects of drawdown.

### **Model Results**

The predicted groundwater inflows into the pit for various depths and hydraulic conductivity values are shown on Figure 2.

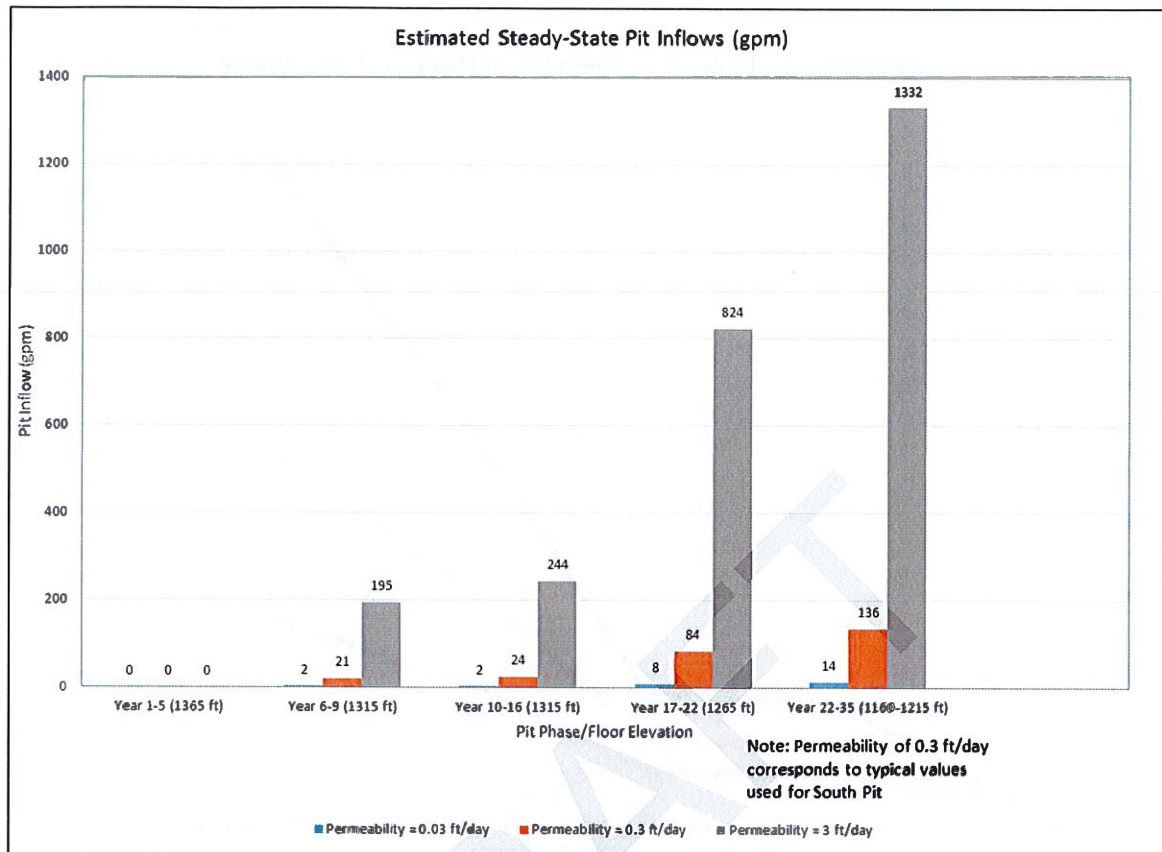
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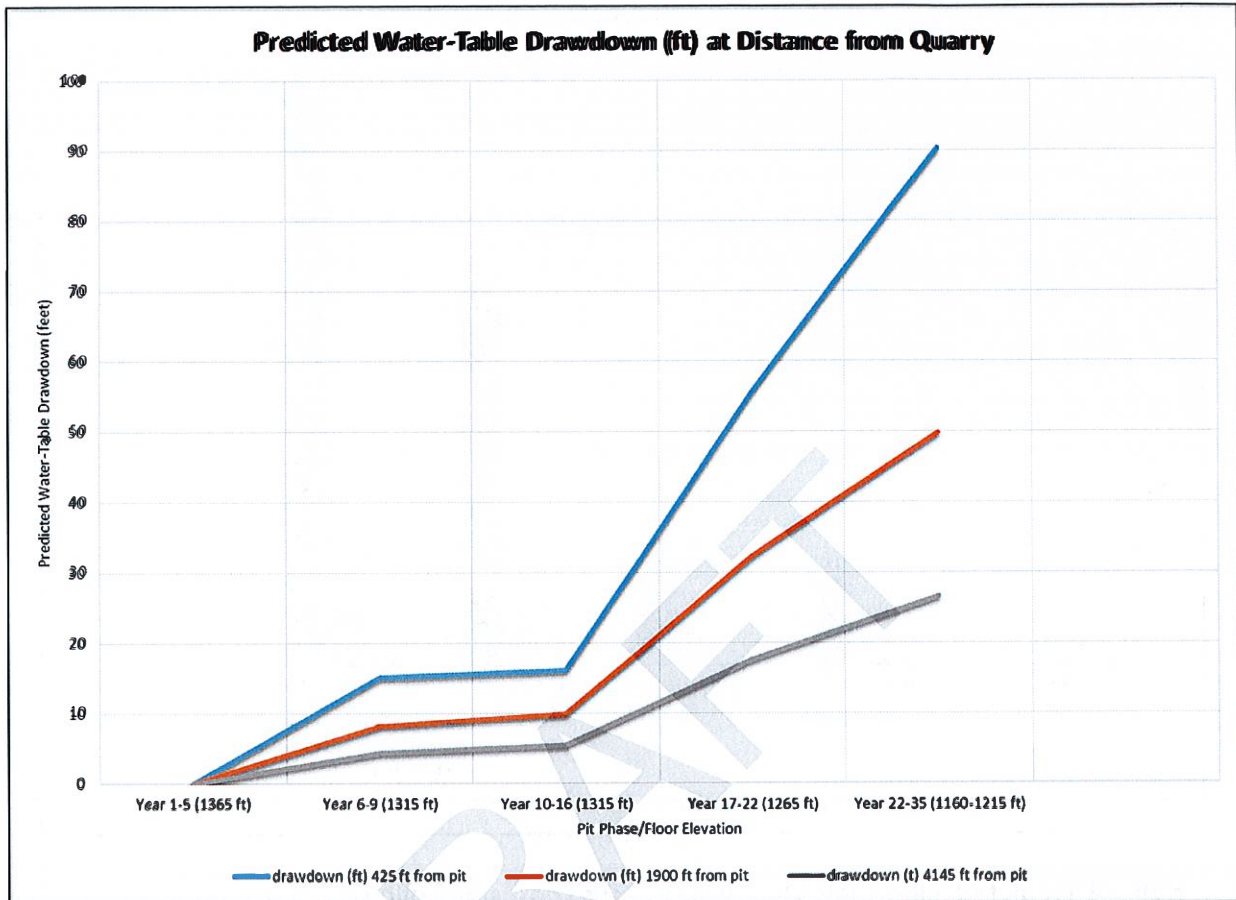


**Figure 2 Predicted Inflows into Quarry for Various Phases, Elevations, and Hydraulic Conductivity Values**

Inflows into the quarry will likely be more representative of the higher permeability (hydraulic conductivity) values for shallow floor depths and more representative of the lower values as the quarry deepens. This is because secondary porosity features, such as fractures and weathering in the quartzite, are more prevalent and interconnected at shallow depths and tend to become less frequent, smaller, and less connected with depth. The model results should be used to bracket the range in water-handling needs for the quarry operations.

Dewatering of the quarry will result in the lowering of the water table in the vicinity of the quarry. As the quarry deepens, the extent and magnitude of water-table lowering (i.e. "drawdown") will likely increase. The model was used to predict the approximate amount and extent of drawdown of the water table at three distances from the quarry. These are shown on Figure 3. Drawdown may not be uniform in all directions, due to aquifer heterogeneity and the seepage effects of rivers.

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**Figure 3 Predicted Water-Table Drawdown at Distance form Quarry**

### Summary

A groundwater-flow model was used as a screening-level tool to obtain estimates of groundwater inflows into the proposed Corson Quarry and the approximate amount of drawdown of the water table at various distances from the quarry. These results may be used for planning purposes in assessing the water handling needs of the quarry and the potential for water-table drawdown. Inflows into the quarry are dependent upon the water-transmitting characteristics of the Sioux Quartzite, as represented by hydraulic conductivity. For purposes of this screening-level evaluation, the value of hydraulic conductivity was varied by two orders of magnitude. Drawdown is less dependent on hydraulic conductivity, given the structure of the model.

If more precise and accurate estimates of the hydrologic effects of quarrying are required, it is likely that a more detailed and comprehensive model would be necessary, as well as site specific hydrologic data.

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Much of the necessary data to develop a better estimate for both inflows and drawdown can be collected once mining commences and monitoring of the effects of dewatering can be performed.

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