## Table of Contents

Introduction ..... 4
1.0 Site Information ..... 5
1.1 Site Location ..... 5
1.2 Topography and Drainage ..... 10
1.3 Geology ..... 10
1.4 Wetlands ..... 10
1.5 Structures ..... 11
1.6 Soil ..... 12
1.7 Groundwater ..... 14
1.8 Threatened and Endangered Species ..... 14
1.9 Landscape ..... 14
1.10 Cultural or Historical Resources ..... 14
2.0 Mine Plan ..... 15
2.1 Area and Setbacks ..... 15
2.2 Groundwater Management ..... 15
2.3 Surface Water and Storm Water Management ..... 16
2.4 Mineable Resource, Soil and Overburden Management ..... 19
2.5 Contemporaneous Reclamation ..... 22
2.6 Temporary Erosion Control Vegetation Plan ..... 22
2.7 Proposed Elevations ..... 22
2.8 Methods of Resource Removal ..... 23
2.9 Site Safety ..... 23
3.0 Post Mining Land Use ..... 23
3.1 Site Preparation ..... 23
3.2 Reclamation Measures ..... 24
3.3 Soil Re-establishment ..... 24
3.4 Stabilization Treatments ..... 24
3.5 Site Revegetation Plan ..... 25
3.5.1 Prairie Grassland Revegetation ..... 26
3.5.2 Woodland Revegetation ..... 27
3.6 Revegetation Standards ..... 27
3.7 Criteria for Successful Reclamation ..... 28
3.8 Landscape Restoration Costs ..... 28
3.9 Annual Reporting ..... 29

**Chart 1** Conceptual Mine Plan

**Tables**

Table 1 Property Owners
Table 2 Water Well Locations and Owners
Table 3 October 2014 Soil Survey Results
Table 4 Resource by Mine Phase
Table 5 Conceptual List of Cover and Forage Crop Species
Table 6 Conceptual List of Prairie Grass and Forbes Species
Table 7 Proposed Reclamation Financial Assurance

**Figures**

Figure 1 General Site Location Map
Figure 2 Site Topography
Figure 3 Existing Five-Foot Topographic Contours
Figure 4 Bedrock Geology
Figure 5 Pleistocene Geology
Figure 6 Test Boring Locations
Figure 7 Wetlands
Figure 7a Surface Water Data Viewer
Figure 8 Property Ownership and Wells
Figure 9 Soil
Figure 10 Groundwater Elevation
Figure 11 Conceptual Proposed Mine Plan
Figure 11a Conceptual Proposed Mine Plan Phase I
Figure 12 Conceptual Reclamation Contours
Figure 12a Conceptual Reclamation Contours Phase I
Figure 12b Conceptual Reclamation Contours Phase II
Figure 12c Conceptual Reclamation Contours Phase III
Figure 13 Generalized Cross-Section A–A’
Figure 14 Generalized Cross-Section B–B’
Figure 15 Generalized Cross-Section C–C’
Figure 16 Generalized Cross-Section D–D’
Figure 17 Conceptual Reclamation Revegetation Plan
Figure 17a Conceptual Reclamation Revegetation Plan Phase I
Figure 17b Conceptual Reclamation Revegetation Plan Phase II
Figure 17c Conceptual Reclamation Revegetation Plan Phase III

**Appendices**

| | |
|---|---|
| Appendix I | Chippewa County Nonmetallic Reclamation Mining Permit Application; List of Adjacent Property Owners |
| Appendix II | Natural Resource Conservation Service (NRCS) Custom Soil Survey; Well Construction Reports |
| Appendix III | Threatened and Endangered Species Log |
| Appendix IV | Storm Water Management Plan |
| Appendix V | Wisconsin Department of Natural Resources (WDNR) Conservation Practice Standards (NRCS Best Management Practices); Wisconsin Department of Transportation (WisDOT) Channel Erosion Control Matrix and Slope Erosion Control Matrix |
| Appendix VI | WisDOT Standard Specifications |
| Appendix VII | Reclamation Cost Estimates |
| Appendix VIII | Reclamation and Construction Inspection Report |

**HOWARD TOWNSHIP PROPERTIES**
**NONMETALLIC MINE RECLAMATION PLAN**
**NORTHERN SANDS, LLC**
**HOWARD TOWNSHIP**
**CHIPPEWA COUNTY, WISCONSIN**

**Site Operator:** Northern Sands, LLC
157 West Third Street, Suite B
Winona, Minnesota 55987
Contact: Paul Van Eijl (507) 313-6951

**Site Manager:** Red Flint Group, LLC
1 American Boulevard
Eau Claire, Wisconsin 54701
Contact: Cy Ingraham, PE (715) 855-7600

**Plan Preparer:** Summit Envirosolutions, Inc.
1217 Bandana Boulevard North
St. Paul, Minnesota 55108
Contact: John Dustman (612) 750-4024

## Introduction

This Nonmetallic Mine Reclamation Plan is prepared for the Northern Sands, LLC (Northern) project located in the Town of Howard, Chippewa County, Wisconsin. This plan has been prepared by Summit Envirosolutions, Inc. (Summit) on behalf of Northern in general accordance with Wisconsin Statute Chapter 295, Wisconsin Administrative Code Chapter NR 135, and Chippewa County's (County) Non-Metallic Mining Reclamation Ordinance Chapter 18. The Chippewa County Non-Metallic Mining Reclamation Permit Application is included in Appendix I.

Northern is proposing a nonmetallic mine in Howard Township, Wisconsin on parcels owned by eighteen property owners. The site consists of approximately 1310 acres, and the area of proposed excavation is approximately 466 acres over the total life of the mine. Three phases of mining will be conducted over the mine life with a total estimated production of 39 million tons of material.

Prior to contemporaneous mining, erosion control and storm water Best Management Practices (BMPs) will be installed. Once BMPs are in place, excavation and reclamation of the phases will be sequential.

As the mined area develops, sandstone material will be excavated from the site and transported by an elevated conveyor system to the Northern processing and transload facilities located adjacent to the Canadian National rail line. On-site processing will include a wet wash plant feeding a natural gas dry plant for material sizing. Product storage will be within silos or bunkers prior to rail car load out. Once in full production, 1.2 to 1.5 million tons of product is anticipated to be shipped via rail from this project annually, dependent on market conditions. After processing, the out of specification material will then be returned to the proposed mine site and utilized as reclamation material. The final site reclamation will include a gently rolling landscape of native prairie habitat with areas of woodlands.

A majority of the current property owners will continue to be the titled landowners; the sand resource on their properties has been leased by Northern. Other properties will be purchased outright by Northern in advance of the mine commencement. Northern has contracted with Red Flint Group, LLC (Red Flint) to manage the site operations.

The following site information and reclamation plan are submitted on behalf of Northern to supply information as required by the County's Non-Metallic Mining Ordinance.

## 1.0 Site Information

### 1.1 Site Location

Northern is the operator and reclamation plan permittee. Overall site management (including operations) will be handled by Red Flint. Many of the landowners will retain ownership of their property, leasing the sand resource to Northern. The current property owners with parcels inside of the project area are listed in Table 1; properties that will be purchased by Northern are noted with an asterisk.

The site occupies approximately 1310 acres, of which approximately 466 acres will be phased for excavation, harvesting the sandstone, and reclamation. The mine site is located in Howard Township, east of Colfax, Wisconsin. The site is located between approximately 80$^{th}$ and 110$^{th}$ Avenues, from the western boundary of Howard Township to approximately 30$^{th}$ Street, Chippewa County, Wisconsin; Township 29N Range 10W Sections 17, 19, 20, 29, and 30 (Figure 1).

Adjacent properties within one-quarter mile of the proposed mine site boundary are shaded in blue on Figure 8. A listing of the adjacent properties and owners is included in Appendix I.

**Table 1. Property Owners – 4 pages**

| Parcel ID | Last Name | First Name | Approximate Area (Acres) | Label (Figure 8) | Description |
|---|---|---|---|---|---|
| 22910-3033-00000000 | Kiesow | James R & Rebecca | 35.3 | 1 | SW ¼ of SW ¼, Section 30, T29N, R10W |
| 22910-3032-00000000 | Kiesow | James R & Rebecca | 34.8 | 2 | NW ¼ of SW ¼, Section 30, T29N, R10W |
| 22910-3023-00000000 | Jensen & Jensen | Lee D & James R | 34.6 | 3 | SW ¼ of NW ¼, Section 30 ,T29N, R10W |
| 22910-3021-03750000 | Dreger | Raymond | 26.6 | 4 | SE ¼ of NW ¼ LYING W OF 13TH ST EX CSM #2976, Section 30, T29N, R10W |
| 22910-3024-00020000 | Jensen & Jensen | Lee D & James R | 24.1 | 5 | NE ¼ of NW ¼ THE W 5/8, Section 30, T29N, R10W |
| 22910-3022-00000000 | Jensen & Jensen | Lee D & James R | 34.6 | 6 | NW ¼ of NW ¼, Section 30, T29N, R10W |
| 22910-1943-00020000* | Bethmann | John R & Nan Torgerson | 36.0 | 7 | SW ¼ of SE ¼ EX STRIP 120' WIDE FOR RR R/W PER DOC #692877, Section 30, T29N, R10W |
| 22910-3012-00020000* | Bethmann | John R & Nan Torgerson | 36.9 | 8 | NW ¼ of NE ¼ EX STRIP 100' wide for RR R/W across NE corner, Section 30, T29N, R10W |
| 22910-3013-01250000* | Bethmann | John R & Nan Torgerson | 2.6 | 9 | SW ¼ of NE ¼, COM @ NW corner, N 89 D E 814.33' to BEG; N 89 D E 462.90' to NE corner, S 272.30', N 83 D W 464.89', N 212.20' to POB; Section 30, T29N, R10W |
| 22910-3013-00020000* | Grossmeier | Alan M & Judith A | 35.0 | 10 | SW ¼ of NE ¼, EX COM @ NW corner, N 89 D E 814.33' to BEG; N 89 D E 462.90' to NE corner, S 272.30', N 83 D W 464.89', N 212.20' to POB; Section 30, T29N, R10W |
| 22910-3042-00210000* | Grossmeier | Alan M & Judith A | 19.0 | 11 | N ½ of NW ¼ of SE ¼, Section 30, T29N, R10W |
| 22910-3041-00000000* | Rasmussen Trust | Robert & Karla M | 39.4 | 12 | NE ¼ of SE ¼, Section 30, T29N, R10W |
| 22910-3044-00000000* | Rasmussen Trust | Robert & Karla M | 38.8 | 13 | SE ¼ of SE ¼, Section 30, T29N, R10W |

| Parcel ID | Last Name | First Name | Approximate Area (Acres) | Label (Figure 8) | Description |
|---|---|---|---|---|---|
| 22910-3043-00000000* | Rasmussen Trust | Robert & Karla M | 37.4 | 14 | SW ¼ of SE ¼, Section 30, T29N, R10W |
| 22910-2923-04000000* | Rasmussen Trust | Robert & Karla M | 20.9 | 15 | SW ¼ of NW ¼ lying SW OF RR R/W, Section 29, T29N, R10W |
| 22910-2923-00020000* | Lemler | Sherry L | 13.2 | 16 | SW ¼ of NW ¼ LYING NE OF RR R/W, Section 29, T29N, R10W |
| 22910-3014-00020000 | Rasmussen Trust | Robert & Karla M | 37.4 | 17 | SE ¼ of NE ¼ EX STRIP 100' wide across NE corner for RR R/W, Section 29, T29N, R10W |
| 22910-3011-06000000* | Rasmussen Trust | Robert & Karla M | 13.8 | 18 | NE ¼ of NE ¼, lying SW OF RR R/W & the W 3 RDS lying N OF RR R/W, Section 29, T29N, R10W |
| 22910-3011-00020000* | Lemler | Sherry L | 20.4 | 19 | NE ¼ of NE ¼, lying NE OF RR R/W EX the W 3 RDS, Section 29, T29N, R10W |
| 22910-2922-04700000* | Lemler | Sherry L | 1.0 | 20 | NW ¼ of NW ¼, PCL BEG 285' E & 600' S OF NW COR; S 208', E 208', N 208', W 208' TO POB. Includes easement, Section 29, T29N, R10W |
| 22910-2922-00020000* | Lemler | Sherry L | 25.7 | 21 | NW ¼ of NW 1/4 EX THE N 834' OF THE E 626.7', EX strip across the SW COR FOR RR R/W & EX PCL BEG 285' E & 600' S OF NW COR; S 208', E 208', N 208', W 208' TO POB, Section 29, T29N, R10W |
| 22910-2022-00000000 | Anderson | Ronald J et al | 39.2 | 35 | NW ¼ of NW ¼, Section 20, T29N, R10W |
| 22910-2021-00000000 | Anderson | Ronald J et al | 40.6 | 36 | NE ¼ of NW ¼, Section 20, T29N, R10W |
| 22910-1944-00000000 | Svee Trust | Olav & Gail C | 39.1 | 41 | SE ¼ of SE ¼, Section 19, T29N, R10W |
| 22910-1914-08880000 | Schwartz | Donald W & Colleen K | 4.1 | 43 | SE ¼ of NE ¼, the S 500' of the E 420', Section 19, T29N, R10W |
| 22910-1914-00020000 | Schwartz | Donald W & Colleen K | 34.7 | 44 | SE ¼ of NE ¼, EX the S 500' of the E 420', Section 19, T29N, R10W |
| 22910-1913-00000000 | Schwartz | Donald W & Colleen K | 39.7 | 45 | SW ¼ of NE ¼, Section 19, T29N, R10W |
| 22910-1912-00000000 | Christoffel | Robert G & Lana M | 40.3 | 46 | NW ¼ of NE ¼, Section 19, T29N, R10W |
| 22910-1921-00000000 | Christoffel | Robert G & Lana M | 39.8 | 47 | NE ¼ of NW ¼, Section 19, T29N, R10W |

| Parcel ID | Last Name | First Name | Approximate Area (Acres) | Label (Figure 8) | Description |
|---|---|---|---|---|---|
| 22910-1911-00020000 | Christoffel | Robert G & Lana M | 36.3 | 52 | NE ¼ of NE ¼, EX the N 347' of the E 414', Section 29, T29N, R10W |
| 22910-1733-00000000 | D R Acres LLC | Daniel R Rothbauer | 39.4 | 54 | SW ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1734-05010000 | D R Acres LLC | Daniel R Rothbauer | 20.1 | 55 | S ½ of SE ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1734-00210000 | Rothbauer | Daniel & Michelle M | 20.1 | 56 | N ½ of SE ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1743-00000000 | Anderson | Kenneth & Sue E | 40.2 | 57 | SW ¼ of SE ¼, Section 17, T29N, R10W |
| 22910-1731-05010000 | Geissler | Daniel J | 20.1 | 58 | S ½ of NE ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1731-00020000 | Geissler | Beverly J | 20.1 | 59 | N ½ of NE ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1732-05000000 | Geissler | Daniel J | 30.2 | 60 | S ¾ of NW ¼ of SW ¼, Section 17, T29N, R10W |
| 22910-1732-00020000 | Geissler | Beverly J | 10 | 61 | NW ¼ of SW ¼, EX the S ¾, Section 17, T29N, R10W |
| 22910-1723-02510000 | Geissler | Beverly J | 26.6 | 62 | SW ¼ of NW ¼, THE S 3/4 EX the N 150' of the W 500' & EX CSM #1562, Section 17, T29N, R10W |
| 22910-1724-02510000 | Geissler | Beverly J | 30.3 | 63 | S ¾ of SE ¼ of NW ¼, Section 17, T29N, R10W |
| 22910-1724-00210000 | Dreger | Harvey & Audrey | 10.1 | 64 | N ¼ of SE ¼ of NW ¼, Section 17, T29N, R10W |
| 22910-1713-00000000 | Dreger | Harvey & Audrey | 40.4 | 65 | SW ¼ of NE ¼, Section 17, T29N, R10W |
| 22910-1723-00210000 | Dreger | Harvey & Audrey | 9.9 | 66 | N ¼ of SW ¼ of NW ¼, Section 17, T29N, R10W |
| 22910-1721-05010000 | Dreger | Harvey & Audrey | 20.3 | 67 | S ½ of NE ¼ of NW ¼, Section 17, T29N, R10W |
| 22910-1941-00020000 | Svee Trust | Olav & Gail C | 36.4 | 69 | NE ¼ of SE 1/4 EX CSM #1899, Section 19, T29N, R10W |
| 22910-1934-00020000* | Bethmann | John R & Nan Torgerson | 12.7 | 70 | E 3/8 of SE ¼ of SW ¼ EX STRIP 100' WIDE FOR RR R/W across the NE corner, Section 30, T29N, R10W |

| Parcel ID | Last Name | First Name | Approximate Area (Acres) | Label (Figure 8) | Description |
|---|---|---|---|---|---|
| 22910-3021-00020000* | Bethmann | John R & Nan Torgerson | 12.4 | 71 | E 3/8 NE ¼ of NW ¼, EX THE S 1.5 rods, Section 30, T29N, R10W |
| 22910-3021-03330000* | Bethmann | John R & Nan Torgerson | 0.2 | 72 | NE ¼ of NW ¼, THE S 1.5 rods of the E 3/8 extending 18.5 rods E from TN RD into NW ¼ of NE ¼, Section 30, T29N, R10W |
| 22910-1722-05010000 | Dreger | Harvey & Audrey | 19.8 | 74 | S ½ of NW ¼ of NW, Section 17, T29N, R10 W |
| 22910-1934-06000000 | Jensen & Jensen | Lee D & James R | 5.3 | 76 | W 5/8 of SE ¼ of SW ¼, LYING S OF YOUNG ROAD, Section 30, T29N, R10W |
| 22910-1933-07000000 | Jensen & Jensen | Lee D & James R | 6.1 | 77 | SW ¼ of SW ¼, LYING S OF YOUNG ROAD , Section 17, T29N, R10W |
| 22910-1941-71899001* | Svee | Daniel E | 2.5 | 173 | NE ¼ of SE ¼, LOT 1 OF CERT SUR MAP #1899 IN V8 P134 DOC #606544 INC easement, Section 19, T29N, R10W |

*Properties that will be purchased by Northern.

## 1.2 Topography and Drainage

Currently, the proposed mine site is in agricultural fields and forested land. Figure 2 presents a topographic map showing the generalized existing surface water drainage patterns. The site is split by two watersheds of the Lower Chippewa River Basin: Phase I is located inside of the Muddy and Elk Creeks Watershed; Phases II and III are located inside of the Pine Creek and Red Cedar River Watershed and identified in the State of Wisconsin Surface Water Data Viewer. Figure 3 presents five-foot topographic contours of the site, based on the United States Geological Survey (USGS) National Elevation Dataset, as well as regional surface water flow patterns based on the topography.

## 1.3 Geology

According to the *Bedrock Geology of Wisconsin, West-Central Sheet*, originally published by the Wisconsin Geological and Natural History Survey, the local bedrock geology is comprised of Cambrian-aged sandstone consisting primarily of coarse-grained quartz arenite sandstones of the Wonewoc Formation, which is capped by the shaly sandstone of the Tunnel City and underlain by shaly sandstone, siltstone, and shale of the Eau Claire Formation. St. Lawrence and Jordan Formations are also represented. A generalized bedrock geology map adapted from the Bedrock Geology of Wisconsin, West-Central Sheet is presented on Figure 4.

According to *Pleistocene Geology of Chippewa County, Wisconsin*, originally published by the Wisconsin Geological and Natural History Survey, there are likely Pleistocene features within the mine area, including ground moraines and unpitted outwash plains. A map of the Pleistocene geology of the region is presented on Figure 5.

The geology of the mine site was assessed by the advancement of 18 test borings at the locations indicated on Figure 6. Based on the results of this assessment, the estimated sandstone resource is anticipated to be located within the Wonewoc Formation between an approximate elevation of 1,100 and 1,050 feet ASL. This deposit is known for its characteristics of size, shape, and strength to be an important material for use in oil and gas development for use as a proppant. Also, this product has uses within the glass, geothermal, water filtration, and agricultural industries.

## 1.4 Wetlands

There are four intermittent streams on the proposed mine site as well as wetlands that appear on the Wisconsin Department of Natural Resources (WDNR) Wetland Inventory, and Wetland Indicated Soils as described by the National Resource Conservation Service (NRCS). Locations

of potential wetland features on the site are presented on Figure 7. The WDNR Surface Water Data Viewer image of the site region is presented on Figure 7a.

Mining at the site will be limited to the higher elevations where desirable sandstone materials are present. A wetland delineation will be completed in advance of mining commencement on each phase. Northern will provide the County with a copy of wetland delineations upon their completion and concurrence with state and federal agencies. Potential wetlands will be avoided during mining; if wetlands cannot be avoided Northern will work with state and federal agencies to obtain appropriate permits for allowed wetland disturbances and will forward all permit paperwork to the County upon approval.

## 1.5 Structures

Houses, outbuildings, and farm buildings located on the proposed mine site will be isolated from mining activities and are generally within the buffer area.

An area water well inventory was completed using the WDNR Drinking Water System Well Construction Report database. According to this database, ten water wells are located within the proposed site and eight water wells are located on adjacent properties within 660 feet of the mine property boundaries. One additional water well is assumed to exist for the residence on Parcel 176, but search of the WDNR database did not discover an associated Well Construction Report. Water wells locations are presented on Figure 8 and are summarized in the table below. The associated Well Construction Reports are included in Appendix II.

Potable water from wells listed in Table 2 will be collected and analyzed prior to mine commencement with the consent of property owners. Water will be tested in accordance with the Town of Howard's Nonmetallic Mining Ordinance. Results of the potable water analyses will be included in the annual site report.

**Table 2. Water Well Locations and Owners**

| Unique Well No. | Parcel Number | Figure 8 Parcel ID | Well Owner | Owner Address |
|---|---|---|---|---|
| VK578 | 22910-0834-00000000 | 200 | Bernie Pagenkopf | 617 Westwood Dr., Chippewa Falls, WI 54729 |
| Not in WDNR database | 22910-1723-00210000 | 176 | Harvey and Audrey Dreger (owners of Parcel 176) | 10797 20th St., Colfax, WI 54730 |
| HO835* | 22910-1723-02510000 | 62 | Joe Dachel | Route 3, Colfax, WI 54730 |
| MF759 | 22910-1723-71562001 | 175 | Dale Geissler | 20th Ave., Colfax, WI 54730 |

(Table 2 continued)

| | | | | |
|---|---|---|---|---|
| QI548* | 22910-1732-05000000 | 60 | Daniel Geissler | 10015 County Hwy S., Chippewa Falls, WI 54729 |
| LF151* | 22910-1733-00000000 | 54 | Dave Rothbauer | 7075 State Hwy 40 N., Elk Mound, WI 54739 |
| IJ407* | 22910-1911-00020000 | 52 | Jack Christianson | Route 3, Colfax, WI 54730 |
| NI670* | 22910-1941-71899001 | 173 | Dan Svee | 704 Walnut St., Eau Claire, WI 54703 |
| QW215* | 22910-1941-00020000 | 69 | Olav Svee | Box 365, Colfax, WI 54730 |
| WH584 | Town of Colfax, Dunn County | 211 | Dan Jenson | 8298 – 994th St. N., Colfax, WI 54730 |
| MM859* | 22910-2922-01950000 | 22 | Ronald Dieger | 2284 State Hwy 40, Colfax, WI 54730 |
| TG543 | 22910-3024-72976001 | 159 | Randy Dreger | 8620 – 13th St., Colfax, WI 54730 |
| HJ286 | 22910-2941-00020000 | 151 | Beverly Michels | Route 3, Box 186B, Colfax, WI 54730 |
| TT255 | Dunn Co. | 215 | Randy DeMoe | 10050 – 810th Ave, Colfax, WI 54730 |
| LI 164 | 22910-3042-05010000 | 158 | Steve Surlak | 8287 – 13th St., Colfax, WI 54730 |
| ST268* | 22910-3042-00210000 | 11 | Alan Grossmeier | 8539 – 13th St., Colfax, WI 54730 |
| QL298 | 22910-3112-00020000 | 203 | Ron Halvorson | 1485 – 80th Ave., Colfax, WI 54730 |
| SP766 | 22910-3111-00000000 | 205 | Richard Lange | 7885 – 17th St., Colfax, WI 54730 |
| OL427 | 22910-3222-00020000 | 206 | Bruce Nierenhausen | 3309 Jill Ave, Eau Claire, 54701 |

*Located on proposed mining site: other wells are on properties adjacent to the site.

## 1.6 Soil

According to NRCS maps, 41 soil types are present on the site, as shown and listed on Figure 9. These types are described in Appendix II.

The NRCS descriptions indicate that these soils have A and B horizons comprised of silty or sandy loam with a total average thickness of ranging from six to twenty-four inches. Summit

conducted a limited soil survey to confirm the descriptions of the NCRS Soil Survey Report for this location. The survey was conducted by digging 17 test pits.

The A and B soil horizons were identified by their distinct characteristics, and depth of each horizon was recorded, along with its geographic coordinates. Test pits were made in soil types that represented a high percentage of soil on the site, and in locations that gave a representative coverage, within the limits to access to properties. In cases where topography could cause a change in soil depths, both extremes were examined and their results averaged. The soil survey results from October 2014 are presented in the table below. The results both confirm the results of the Soil Survey Report and provide more site-specific information regarding the amount of A and B soil horizons on-site.

**Table 3. October 2014 Soil Survey Results**

| Test Hole ID | NRCS Soil Series | A Horizon Depth (in.) | B Horizon Depth (in.) |
|---|---|---|---|
| TH-1 | EmF | 4 | 7 |
| TH-2 | EmD2 | 6 | 28 |
| TH-3 | EmD2 | 18 | 30 |
| TH-4 | EmE | 2 | 20 |
| TH-5 | BlA | 12 | 16 |
| TH-6 | BlB | 11 | 16 |
| TH-7 | KeB | 8 | 12 |
| TH-8 | PbC | 2 | 5 |
| TH-9 | MkB | 0 | 8 |
| TH-10 | MkB | 11 | 18 |
| TH-11 | ElC2 | 10 | 15 |
| TH-12 | BoE | 4 | 8 |
| TH-13 | MkC | 1 | 10 |
| TH-14 | ElB | 10 | 15 |
| TH-15 | BlB | 11 | 15 |
| TH-16 | PdD | 7 | 32 |
| TH-17 | PdD | 6 | 20 |

Volume estimates were calculated using data collected during the soil survey, along with the NRCS Soil Survey Report. The recorded field results were compared to Soil Survey Report and were confirmed to be within a reasonable range in each site-specific location. The acreage of each soil type was determined. The volumes of A and B soil horizons were calculated using depths from the field survey. Data from the Soil Survey Report were used for soil types not sampled in the field.

A and B soil horizon estimates only included site locations considered for mining. Setbacks and non-viable areas were removed from the volume estimates before calculation. Based on the soil survey results and the NCRS Soil Survey Report, it is estimated that there are approximately 496,000 cubic yards of A horizon soils and 256,000 cubic yards of B horizon soils.

## 1.7 Groundwater

The regional water table aquifer appears to be present beneath the site at an elevation of approximately 1000 feet to 1040 feet ASL, based on the Generalized Water-Table Elevation Map of Chippewa County, Wisconsin (Batten and Zaporozec, Miscellaneous Map 50, 2000), presented on Figure 10. See Section 2.2 for a discussion of groundwater quantity and quality monitoring.

## 1.8 Threatened and Endangered Species

An Endangered Resource Review (ERR) was conducted by the Bureau of Natural Heritage Conservation (WDNR) for the specific Northern site, described as Chippewa County 29N 10W 17, 29N 10W 18, 29N 11W 24, 29N 10W 20, 29N 11W 13, 29N 10W 19, 29N 10W 21, 29N 10W 30, 29N 10W 29. ERR Log # 14-474 (Appendix III) recorded no endangered resources from within the project area and the surrounding area.

## 1.9 Landscape

The site is located within the Western Coulees and Ridges Ecological Landscape (WDNR). The Western Coulees and Ridges Ecological Landscape in southwestern and west central Wisconsin supports forest, agricultural, and grassland areas. This is a highly-eroded unglaciated landscape with broad bedrock-controlled ridge tops and steep-sided river valleys.

The ecological landscape of the site is currently agricultural and deciduous forest, with four intermittent streams and associated wetlands.

## 1.10 Cultural or Historical Resources

The Wisconsin Historic Preservation Database (WHPD), which houses and allows users to access the most up-to-date information within the Wisconsin Historical Society's Archaeological Sites Inventory (ASI), Architecture and History Inventory (AHI), and the Bibliography of Archaeological Reports (BAR), was accessed on January 12, 2015 in order to research previously identified archaeological and architecturally historic cultural resources within or adjacent to the project area.

Based on the current ASI and AHI information, no archaeology sites or architecture history properties have been previously identified within or adjacent to the property area.

## 2.0 Mine Plan

### 2.1 Area and Setbacks

The site consists of approximately 1310 acres of which, contemporaneous mining and reclamation will take place on approximately 466 acres. There will be three separate phases, as presented on Figure 11 and on the enclosed large-scale Conceptual Mine Plan (Chart 1). Each phase is subdivided into a number of cells which identify the estimated operational sequence. Additionally, these cells are smaller manageable parcels that will isolate site disturbance at any one time. This approach is to accelerate the reclamation in a measured and managed manner for the life of the mine.

Phase I will consist of construction of the sand processing facilities, railroad transload facilities, rail car storage track system, and associated screening berms as presented on Figure 11a. After necessary construction is completed, mining will begin on approximately 53 acres in the Phase I area. Phase II will consist of approximately 136 acres and Phase III will consist of approximately and 277 acres. The remaining 828 acres include railroad and sand processing facility areas, setbacks, areas set aside for screening berms and storm water ponds, and areas without mineable resource.

Buffers and setbacks include: 50 feet from property boundaries; 83 feet from road center lines; 75 feet from WDNR indicated wetlands; 300 feet from USGS mapped streams; 75 feet from potential high tension power line; and 800 feet from residential buildings.

### 2.2 Groundwater Management

The regional water table aquifer is predicted to be present beneath the site at an elevation of approximately 1000 feet to 1040 feet ASL, based on the Generalized Water-Table Elevation Map of Chippewa County, Wisconsin (Lippelt, I.D. 1998). The regional groundwater table will remain at least 10 feet below the proposed mine floor.

Prior to the commencement of mining, baseline groundwater elevation and will be collected from a network of groundwater monitoring wells to be installed at the processing and mine site. A series of Life-of-Mine (LOM) wells will be installed throughout the three-phase project area; these wells will be installed prior to Phase I mine commencement and will remain on-site into the reclamation monitoring period following the conclusion of all mining activity on Phase I, II, and III project areas. A series of additional monitoring wells will be installed in the three phased

project areas prior to mining commencement within a given phase; each of these wells will be properly abandoned following the conclusion of mining in that phase. Proposed locations of LOM, Phase I, Phase II, and Phase III monitoring wells are shown on Figure 11.

Groundwater elevation data will be collected quarterly from the monitoring wells. Groundwater elevation data will be analyzed in order to effectively manage groundwater onsite, including water extracted from any high capacity wells. Pending analysis of data collected on-site, Northern will consider casing any high capacity wells through the Eau Claire Formation.

Groundwater samples will be collected and analyzed from monitoring wells on an annual basis in order to determine groundwater chemistry. Groundwater samples will be tested for pH, TDS, TSS, turbidity, acrylamide, aluminum, antimony, arsenic, bacteria, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, nitrate, potassium, selenium, silver, sodium, strontium, thallium, titanium, vanadium, and zinc. Results of the groundwater monitoring analysis will be included in the annual site report.

Groundwater chemistry will be analyzed for the above listed analytes for a period of two years. It is proposed that after the second year of testing (and in all subsequent years) Chippewa County will consider reducing the number of analytes tested and/or the frequency of testing based on the results of waste materials and groundwater testing performed over time. Strong consideration will be given to reducing groundwater testing for analytes for which: concentrations in waste materials and groundwater are under the detection limits of analysis; or concentrations in groundwater have not increased over time, and are below the Preventative Action Limit (PAL) as listed in Wis. Admin. Code Ch. NR 140. The Operator will test for analytes in accordance with a final list approved by the County.

## 2.3 Surface Water and Storm Water Management

A Storm Water Management Plan has been prepared by Cooper Engineering Company, Inc. to supplement this Reclamation Plan and is included as Appendix IV. Storm water designs for each operational cell will be submitted to the County for review and approval prior to their installation. The general approach to storm water management is summarized in the text below.

Storm water on the proposed project site is regulated by the WDNR and Chippewa County. Mine operations shall be conducted in a manner that assures compliance with applicable water quality and storm water management requirements. Erosion control and storm water management will be implemented in accordance with the conditions of the State Construction Site Storm Water Runoff General Permit No. WI-S067831-4 (or revised General Permit in place at the time of approval). Specific erosion control devices utilized will be determined by referencing the Channel Erosion Control Matrix and Slope Erosion Matrix from the Wisconsin

Department of Transportation Facilities Development Manual (Appendix V). Storm water discharge permits and runoff management will comply with NR 216 and NR 151, respectively.

Prior to clearing, construction, or mining within a drainage area, the offsite receiving areas will be protected by the installation and construction of the appropriate erosion control BMPs and storm water facilities. Erosion control BMPs and storm water ponds will be installed according to the guidelines provided in the current WDNR Conservation Practice Standards (Appendix V).

**General Storm Water Design Approach**

Storm water will be managed in a manner that mimics the natural pre-mining flow characteristics of the area. It is the intent of the Operator and Site Manager to maximize infiltration and evaporation of storm water on-site and to consider downstream resources when making decisions about discharge rates and timing. In order to maintain the integrity of the flow patterns and water budget, the site was divided into 14 sub-catchments along the major dividing line of the Red Cedar River watershed and the Elk Creek watershed. The major watershed divide will be honored and storm water will not be re-directed out of natural, major watersheds. Additionally, minor watersheds were delineated based on topography and with one small exception (the eastern one third of mine cell 3K), runoff will continue to flow to its current tributary.

Storm water management will adhere to NR 151 for total suspended solids removal and protective areas. Chippewa County's stricter requirement for peak discharge to contain the runoff from the 100-year, 24-hour event will be used and infiltration will be the preferred storm water treatment with wet pond pretreatment integrated into the storm water management plan.

Storm water ponds will be sited at lower elevations across the project and are not expected to penetrate the bedrock surface. Additionally, the ponds will be located a minimum of 500 feet from navigable waters.

**Mining Sites**

Storm water facilities will be built in advance of land disturbing activities. Diversion channels will be utilized to route off site storm water run-off away from the mine and storm water treatment where possible. Storm water treatment facilities will be constructed at approximately the lowest part of each sub-catchment that will enable runoff to flow into the facilities either through natural methods or via man-made swales to direct flow. Facilities will be sized considering the amount of land disturbed to accept and treat the runoff from the 100-year, 24-hour event. Infiltration basins will be the primary treatment with wet pond pretreatment integrated into the storm water management plan. The discharge from the wet ponds is proposed to be regulated through a two stage outlet. In small events, a pipe will allow small flows to leave the pond; therefore, not cutting off flow to the receiving stream, but also slowing down and

treating runoff for suspended solids. As events get larger, release rates will increase and a secondary weir will engage to allow flow to discharge to the infiltration basin.

Infiltration basins will also employ a staged outlet that slowly releases smaller storm events and gradually increases release rates through orifices, pipes, and weirs. The runoff for the 100-year, 24-hour event will pass safely through both the wet ponds and infiltration basins with freeboard. A staff gauge will be installed at each infiltration basin in order to monitor infiltration rates. Staff gauges will be inspected monthly and following precipitation events in order to record and calculate infiltration rates within each infiltration basin. In the event that the expected rate of infiltration in any given basin decreases, the Site Manager will work with the County to implement changes to increase the infiltration rates back to the original prescribed levels. This may include removal of sediment build-up in ponds, wiers, and piping. Records of measurements from staff gauges will be submitted to the County within the annual site report or upon request.

With a wet pond pretreatment and infiltration basin combination for storm water management, runoff is slowed down and treated, infiltration is provided, and flow is not cut off to the tributary streams. Erosivity of receiving waters will be factored into the release rates and adjustment made as necessary.

**Wash Plant and Transload Site**

The wash plant site will have a storm water facility with infiltration as the primary treatment with wet pond pretreatment integrated into the storm water management plan. Capturing the runoff from the 100-year, 24-hour event will be the objective, with a wet pond discharging through a staged outlet to an infiltration basin with another staged outlet similar to ponds that will be constructed for the mine sites. The wash plant will operate as a closed loop system; process water will not be discharged on-site.

**Conveyor Corridor**

The area between the mine site and the wash plant and transload site, immediately north and adjacent to the railroad tracks, will be used for conveyance of materials to the wash plant. An elevated conveyor will be used for this and land disturbing activities will be limited to an access road along the conveyor corridor in this area. Additional storm water planning and engineering, including storm water treatment plans, will be completed for the conveyor corridor in advance of its construction or use at the mine site. Storm water designs will be submitted to the County for review and approval prior to their installation. During construction, erosion control silt fencing will be installed.

Temporary erosion control measures employed at the site may include the following BMPs (WDNR Conservation Practice Standards are in parentheses and a copy can be found in Appendix V):

- Erosion bales and sediment logs will be placed as ditch checks in swales and ditches (Sediment Bale Barrier - 1055, Ditch Checks - 1062).
- Silt fence will be installed at the edges of berms and stockpiles and outside the active mine area where it is not protected by previously installed erosion control measures (Silt Fence - 1056).
- Seed and mulch will be applied on berms, permanent stockpiles, diversions, and channels, located outside the active mine area, and mine area that is no longer active (Seeding - 1059, Mulch - 1058).
- Temporary erosion control seeding is discussed in Section 2.6.
- Final reclamation seeding is discussed in Sections 3.4 and 3.5.
- Erosion mats will be placed in concentrated flow channels and on slopes greater than 4:1 (Channel Erosion Mat - 1053, Non-Channel Erosion Mat - 1052).
- Rock rip-rap will be placed where necessary as ditch checks, channel liners, and at inlet/outlet structures (Ditch Checks - 1062).
- Stone tracking pads will be used at the site access points. (Stone Tracking Pad - 1057).

Permanent erosion control measures employed at the site may include the following BMPs (WDNR Conservation Practice Standards are in parentheses and a copy can be found in Appendix V):

- Infiltration Basin (1003) along with Site Evaluation for Stormwater Infiltration (1002).
- Wet Detention Pond (1001).
- Vegetated Infiltration Swale (1005).

Erosion control BMPs will be inspected weekly and within 24 hours after rainfall events of one-half inch or greater until the drainage area has been either temporarily or permanently reclaimed. In the event of slope failures, failed seeding, or persistent erosion problems, additional BMPs will be assessed and applied where practicable. BMPs may include hydro seeding, silt fence, erosion control mats, turf reinforcement mats, water diversions, rock-lined chutes, slope breaks, soil stabilizers, and inlet protection.

## 2.4 Mineable Resource, Soil and Overburden Management

The total estimated resource volume for raw sandstone to be mined is approximately 39 million tons. The life of the mine is approximately 30 years. Sandstone thickness was estimated using data from the test boring information. A and B soil horizon volumes were estimated using thickness discussed in Section 1.6. Tonnage estimates of raw sand, resource, waste, and overburden for each proposed mine cell are summarized in Table 4.

**Table 4. Resource by Mine Phase**

| Mine Cell | Disturbed Area (acres) | Raw Sand (million tons) | Resource (Raw Sand x 0.7) (million tons) | Waste (Raw Sand x 0.3) (million tons) | Overburden (million tons) | Available for Reclamation (Waste + Overburden) (million tons) |
|---|---|---|---|---|---|---|
| 1a | 24.7 | 1.4 | 0.9 | 0.5 | 0.0 | 0.5 |
| 1b | 28.0 | 3.0 | 2.1 | 0.9 | 0.0 | 0.9 |
| 2a | 28.8 | 1.4 | 1.0 | 0.4 | 0.0 | 0.4 |
| 2b | 16.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.1 |
| 2c | 35.3 | 1.7 | 1.2 | 0.5 | 0.1 | 0.6 |
| 2d | 38.6 | 5.0 | 3.5 | 1.5 | 2.1 | 3.6 |
| 2e | 16.6 | 2.0 | 1.4 | 0.6 | 0.0 | 0.6 |
| 3a | 23.7 | 3.9 | 2.7 | 1.2 | 2.1 | 3.3 |
| 3b | 35.9 | 6.0 | 4.2 | 1.8 | 9.2 | 11.0 |
| 3c | 21.5 | 3.6 | 2.5 | 1.1 | 3.4 | 4.5 |
| 3d | 20.0 | 3.1 | 2.1 | 1.0 | 1.0 | 2.0 |
| 3e | 16.9 | 2.8 | 2.0 | 0.8 | 1.6 | 2.4 |
| 3f | 13.6 | 2.8 | 2.0 | 0.8 | 2.5 | 3.3 |
| 3g | 31.3 | 5.2 | 3.6 | 1.6 | 5.6 | 7.2 |
| 3h | 15.2 | 2.4 | 1.7 | 0.7 | 0.3 | 1.0 |
| 3i | 29.7 | 2.7 | 1.9 | 0.8 | 0.3 | 1.1 |
| 3j | 35.9 | 5.9 | 4.1 | 1.8 | 5.3 | 7.1 |
| 3k | 33.7 | 2.5 | 1.8 | 0.7 | 0.1 | 0.8 |
| **Total** | **465.8** | **55.6** | **38.9** | **16.7** | **33.6** | **50.3** |

In accordance with the County's Reclamation and Construction Inspection Plan, the County will be contacted two days prior to and site disturbances as outlined in the Reclamation and Construction Inspection Plan (Appendix VIII). Prior to beginning each cell, the timber (if present) on that area will be harvested. The slash material from timber harvest will be placed in composting windrows on site. Tree stumps will be ground and added to the composting material. This compost will be used as a soil supplement during the reclamation process.

Operations will begin by grading the site for A and B soil horizon removal and its storage and storm water management improvements. Storm water designs for each operational cell will be submitted to the County for review and approval prior to their installation. Excavation of the overburden and sandstone will begin once the storm water BMPs are installed and material storage areas are constructed. Generally, the sandstone resource will be excavated between elevation 1025 and 1100 feet ASL. All mining will take place above the water table. The base of the mine will extend to the depth of the available economic resource; however, a separation of 10 feet will be maintained between the mine base and groundwater in any given area.

The conceptual proposed mine plan is presented on Figure 11. Prior to mining commencement on each phase a detailed mining plan will be submitted to the County. Figure 11a presents the detail for Phase I of the project area.

Development of the Phase I area will begin with stripping A and B soils horizons in preparation of the construction of the storm water ponds, processing facilities, railroad transload facilities, and rail car storage track system. The A and B soil horizons will be isolated during the stripping operation and placed in separate berms. The berms will be labeled and stabilized with a protective starter vegetative cover. Mulch and tackifier will be sprayed on all berms and sown areas using either organic aggregates or applying sheet mulches, in accordance with of the Section 627 of the Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction (2013 Edition WisDOT Standards Specifications, Appendix VI).

Phase I mining activities will begin with removal of A and B soil horizons from Cell 1a; soils will be isolated for storage and used to create berms along the boundaries of Cell 1a. Berming of A and B soil horizons will act as both site screening and storage for reclamation. Overburden material from Cell 1a may be stored in berms to create additional site screening as necessary. Material will be stabilized with methods which may include discing, erosion mats, mulch, and seeding.

Sandstone material excavated from Cell 1a will be transported via an elevated conveyer to the processing facility. Non-marketable material will be returned to the site, stored, and utilized in the reclamation process of that phase.

The A and B soil horizons from Cell 1b will be excavated and temporarily stored while the overburden material is excavated. The overburden and non-marketable material from Cell 1b will be utilized to create the reclaimed surface of Cell 1a. The temporarily-stored A and B soil horizons from Cell 1b will then be placed onto Cell 1a, with the A horizon soils returned to the uppermost position. As needed, composite material will be blended with the B horizon to increase the organic matter content.

Sandstone material excavated from Cell 1b will be transported to the processing facility. Non-marketable material will be returned to the mine area and stored and combined with the bermed overburden material from Cell 1a to create the reclaimed surface of Cell 1b. Bermed A and B soil horizons from the Cell 1a will be placed onto Cell 1b, with the A horizon soils returned to the uppermost position.

Non-marketable materials that have been wet-treated in the processing operations will be tested annually for acrylamide, pH, total Kjedahl nitrogen, phosphorus, potassium, chloride, fluoride, sulfate, aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium,

silver, sodium, strontium, thallium, titanium, vanadium, and zinc. Test results will be included in the annual report.

## 2.5 Contemporaneous Reclamation

Phase I mining and reclamation processes will be independent from Phases II and III. Mining and reclamation of Phases II and III will continue in the general sequence as described above, where overburden material from each subsequent cell will be used with the non-marketable materials to create the reclaimed surface of the previous cell, and temporarily-stored A and B soil horizons from each cell will be layered by soil horizon onto the reclaimed surface of the previous cell. The use of equivalent areas of stripping for application of soils to reclaimed areas will be utilized to the greatest extent possible.

## 2.6 Temporary Erosion Control Vegetation Plan

A temporary stabilization seed mix will be used to provide erosion control where disturbed areas require vegetation and are not at final reclamation grade. Hay/straw mulch may be applied using a conventional blower and then seeded with a quick-cover annual grass. Seeding for each disturbed area will be performed using drill seeding or hand spreading and will follow procedures described in Section 630 of the WisDOT Standard Specifications (Appendix VI). The seed will be spread at a rate of up to 50 pounds per acre, consistent with the manufacturer's recommendations. Areas will be mulched following procedures described in Section 627 of the WisDOT Standard Specifications (Appendix VI).

## 2.7 Proposed Elevations

The mine floor elevation will be based on the depth of the available economic resource; a ten foot separation will be maintained between the mine base and groundwater in any given area. Non-marketable materials and overburden placement will create a final grade as modeled in Figures 12 and 12a-12c. Finish grade will be slightly sloping (1:10 to 1:20), and will be completed in a dendritic drainage pattern which will mimic pre-development site conditions and drainage. Placement of A and B soil horizons and planting will begin as final grading is complete. Initial grading of the washplant/transload area is intended to be the final grading of this area as it will be repurposed for commercial use post mining, as discussed in greater detail in Section 3.0 of this report.

Cross-section transects A-A', B-B', C-C', and D-D' are depicted on Figure 6. Figures 13 through 16 illustrate the original site surface, extent of mining, and proposed reclaimed surface concepts for these transects.

## 2.8 Methods of Resource Removal

Mining will be accomplished to the extent practical using earthmoving equipment such as excavators, dozers, front end loaders, conveyors and trucks. Machinery will utilize white noise back-up alarms. In general, conventional excavation will be used to facilitate the extraction of sandstone; however, blasting may be used in the mining process.

Blasting, if required, will be completed in compliance with federal, state and local laws and ordinances. Dust control will be implemented consistent with NR 415.075. Consistent with the fugitive dust control plan, we anticipate that a full-time on-site water truck will be utilized to control potential dust produced during mining operations.

## 2.9 Site Safety

Measures that address public safety, such as warning signs and fencing, will be implemented according to United States Department of Labor Mine Safety and Health Administration. The property lines of the site will be clearly identified and posted with warning signs at 50-foot intervals. The entrance will be posted and locked.

# 3.0 Post Mining Land Use

The final site reclamation will include a combination of commercial and passive recreational uses (Figures 17 and 17a-17c). The processing facilities will be for repurposed for continued commercial use; mine processing infrastructure and rail transload facilities will remain on-site. Cells excavated for sand will be reclaimed as gently rolling landscapes with native prairie habitats and areas of woodlands. Approximately eighty-five percent of the site will be reclaimed as prairie grasslands; approximately fifteen percent of the area will be reclaimed as woodland. Figures 17 and 17a- 17c depict the conceptual layout of post-mining land uses and revegetation. Areas used as storm water basins will remain as ponds, becoming part of the landscape. Mine area sidewalls will be reclaimed to a 3:1 (or more gradual) slope and the reclaimed surface will be graded to achieve a gently rolling landscape. High walls or other steep slopes will not be part of the reclamation effort. Post mining drainage patterns will be contoured to approximate pre-site-development drainage patterns where possible (Figure 12).

## 3.1 Site Preparation

Following the completion of mining activities, mine-related equipment and soil conveyor systems will be removed from the site. Structures included in the sand processing facilities, railroad transload facilities, and rail car storage track will remain on the site. These structures

and facilities will be converted for use as a commercial or agricultural materials business hub, potentially to include grain storage and transfer. The site would serve the agricultural business community and provide a commerce center for grain storage, fertilizers, and/or liquefied natural gas. The rail connection to the Canadian Pacific railroad is a valuable asset beyond the sand development activities. The elevated conveyer system will be dismantled and the property returned to its original use.

## 3.2 Reclamation Measures

As restoration efforts begin per cell, non-marketable and overburden material will be used for fill to reclaim the mine floor and to establish necessary grades. Off-site fill materials will not be used in reclamation. Overburden and non-marketable material will be worked using dozers, graders, and/or low impact equipment to achieve rough grades and final grades. Placement of A and B soil horizons will be done with skid loaders to reduce compaction. Water will be used as necessary to control dust and aid in compaction.

## 3.3 Soil Re-establishment

The A and B soil horizons will be returned to the reclaimed elevation with the A horizon soils returned to the uppermost position. The top of the reclaimed surface will be graded to a slightly rolling surface. A and B soil horizons will be placed, disced, and raked after final grading on each reclamation area. Side slopes will have a gradient no steeper than 3:1, and will be seeded, mulched, and protected from erosion using NRCS BMPs (Appendix V) and WisDOT Standard Specifications (Appendix VI).

A combination of non-channel erosion mat, channel erosion mat, silt fencing, sediment bale barriers and ditch checks will be placed around areas with newly-placed A soil horizon to help minimize loss of soil and to protect on-site surface water.

Soil banks will be treated as necessary to prevent the establishment of weeds. Prior to replacement, the overburden will be disced to an approximate depth of 12 inches prior to topsoil horizon B being placed. Soil horizon A will be placed on the upper most layer and the A and B profile will be tilled to reduce compaction, promote rooting depth, and create surface stability.

## 3.4 Stabilization Treatments

Soil within the A horizon will be tested for parameters such as pH, organic matter content, soil texture, and levels of nitrogen, potassium and phosphorous. Results of testing will determine whether plant food supplements will be necessary. Supplements may include the composted timber slash and ground stumps, as well as animal manure. Soil amendments, seeding, and planting will be carried out using local NRCS recommended technical guides.

Forage grasses, annual ryegrass, and native prairie plant seeding will be completed into graded, disked and cultipacked areas within 72 hours of reapplication of A soil horizon, prior to the next beneficial growing season. Mulch may be applied to all seeded areas in accordance with WisDOT Standards (Appendix VI). Sodding, rip-rap, or other appropriate measures may be used in drainage-ways or critical erosion areas. Stabilization treatments requiring ongoing maintenance (e.g. silt fence) will not be used during final reclamation activities.

At minimum, inspections will take place within 24 hours after every precipitation event that produces one-half inch of rain or more during a 24-hour period. Until vegetation is densely established the stabilization treatments will be inspected weekly during the growing season.

## 3.5 Site Revegetation Plan

Site revegetation will generally follow the procedure described below. The Operator and Site Manager will prepare a Soil Rehabilitation and Vegetative Management plan for each post mining land use and land cover type for each individual phase in advance of mining commencement for a given phase. The objective of the revegetation plan is to reclaim the environment to a gently rolling landscape of native prairie grasslands (approximately 85% of area) with areas of woodlands. The site will be reclaimed practicing progressive reclamation. Mulching, seeding, and planting of trees and shrubs will be done in accordance with appropriate WisDOT Standards (Appendix VI). Rocks and brush piles may be utilized in the revegetation plan. These structures will be used to create more of a natural diversity in habitats for wildlife.

Physical seedbed preparation measures (such as scarification, tilling or harrowing) and chemical measures such as amendments (fertilizer, lime or other) may be done prior to seeding.

Hay/straw mulch will be applied to supplement the biomass within the A soil horizon. Based on the suitability of the soil to assure viable seed germination and survivability, an organic mat of hay/straw will be applied prior to seeding. Typically, depending on the site conditions, up to 5 tons of mulch per acre could be used. Mulching operations will begin at the top of the slope and proceed downward. The mulch cover will be applied so as to be loose enough to allow some sunlight to penetrate yet thick enough to provide shade and protection from desiccation and raindrop impact and erosion.

Dual-control no-till drill seeding will be used to plant two different seed mixes in one pass. One seed mix, including Canada Wild Rye and forage grasses--Annual Rye Grass, Timothy, Clover, and Alfalfa—will be used throughout the reclamation area. The Canada Wild Rye will act as nurse crop in the first year to stabilize the site against erosion, to decrease competition from weeds, and to provide shade and cover for perennial seedlings. The forage grasses will act in years two through four to build the plant root structure and improve the soil profile.

**Table 5. Conceptual List of Cover and Forage Crop Species**

| Common Name | Scientific Name | Percent of Mixture by Weight |
|---|---|---|
| Canada Wild Rye | *Elymus Canadensis* | 10 |
| Annual Rye Grass | *Lolium multiflorum* | 30 |
| Timothy | *Phleum pretense* | 10 |
| Tall Fescue | *Festuca aundinaceae* | 10 |
| Alsike Clover* | *Trifolium hybridum* | 10 |
| Red Clover* | *Trifolium repens* | 10 |
| Alfalfa* | *Medicago sativa* | 10 |
| | | |

* Must be inoculated according to the seed provider's instruction prior to seeding.

A second seed mix, containing native prairie grasses and forbes, will be seeded at the same time in the prairie grassland revegetation areas. The native prairie species will benefit from the effect of the Canada Wild Rye and forage grasses for stabilization, weed competition and improved root structure soil profile, and will become more prevalent in subsequent years.

**Table 6. Conceptual List of Prairie Grass and Forbes Species**

| Common Name | Scientific Name | Percent of Mixture by Weight |
|---|---|---|
| Big Bluestem | *Andropogon gerardi* | 15 |
| Switchgrass | *Panicum virgatum* | 15 |
| Indiangrass | *Sorgastrum nutans* | 15 |
| Little Bluestem | *Schizachyrium scoparium* | 15 |
| Black-Eyed Susan | *Rudbeckia hirta* | 15 |
| New England Aster | *Aster novae-angliae* | 3 |
| Hoary Vervain | *Verbena stricta* | 3 |
| Showy Goldenrod | *Solidago speciose* | 3 |
| Stiff Goldenrod | *Solidago rigida* | 3 |
| Wild Bergamot | *Monarda fistulosa* | 3 |
| Golden Alexander | *Zizia aurea* | 3 |
| Purple Prairie Clover | *Dalea purpurea* | 3 |
| Butterflyweed | *Asclepias tuberosa* | 2 |
| Spiderwort | *Tradescantia ohiensis* | 2 |

### *3.5.1 Prairie Grassland Revegetation*

Areas with prairie grasslands as reclamation land use will be revegetated following the final grading by dual-control no-till drill seeding, planting both the cover/forage crop seed mix and the

prairie grass and forbes seed mixture. Seeding activities will be carried out in a manner to minimize soil compaction.

Seeded areas in the prairie grasslands will be mowed during the first three years of growth in order to encourage native prairie grass revegetation and discourage invasive weed species. Woody plants and invasive species removal will also be undertaken in the first two years. Controlled burns of the prairie grassland areas will be undertaken in Year 3 and possibly in Year 7 or 8 to promote prairie species seed germination, inhibit invasive species, and improve the soil profile. Years 4 through 10 will consist of erosion control monitoring and invasive species and woody plant removal.

### *3.5.2 Woodland Revegetation*

Areas with woodlands as the reclamation land use will be stabilized in the first year with a no-till drill seeding of the cover and forage crop mix, a conceptual list of which is in Table 5. Seeding activities will be carried out in a manner to minimize soil compaction. Seed areas will be mowed during the first year of growth discourage invasive weed species.

Woodland areas will be re-disced in Year 2 to promote germination of the forage grasses, which will act in years two through four to build the plant root structure and improve the soil profile. Also in Year 2 of woodland revegetation, deciduous and coniferous tree will be drill planted. Trees will be planted as bare root seedlings in early spring. In addition, native small tree and shrub seedlings will be planted at a higher rate interspersed between the tree seedlings. Seedlings will be kept moist while transported and stored, and submerged in water for two to four hours prior to planting.

Woodland areas will be monitored in Years 3 through 10 and invasive species removal will take place.

## 3.6 Revegetation Standards

In compliance with the NRCS Critical Area Planting Code 342, monitoring and management of revegetation establishment will be carried out for ten years to assure the project's objectives, and if necessary, adjust techniques in order to meet successful reclamation criteria. Specific sampling units on reshaped vegetated slopes and in open seeded areas will be identified and monitored yearly via seasonal field visits and using field forms and logged photo point documentation.

Monitoring will include establishment of sample plots on the site at the rate of one plot per 10 acres. Each plot will be a circular area with a radius of approximately one meter. Monitors will measure moist bulk density and soil strength of reconstructed soil. Testing of macro nutrients,

such as nitrogen, phosphorous, potassium, calcium, magnesium and sulfur, as well as trace elements including iron, manganese, copper and zinc will be performed.

If the inventory indicates soil compaction or a lack of nutrient concentrations that promote successful plant growth, incorporation of soil amendments such as deep tillage or ripping and application of necessary organic amendments such as manure, compost and mulch will be applied. Chippewa County will be notified prior to completion of monitoring events.

## 3.7 Criteria for Successful Reclamation

The Operator and Site Manger will work closely with the County in making the determination of reclamation success. Annual revegetation inspections will be conducted. In addition, seasonal, on-site inspections during years 1, 3 and 10 will be documented through reports and photo monitoring to evaluate the following protocols:

1. Species Cover (% of grasses). Overall percent of coverage expected within five years will be determined from the final plant list selected.
2. Soil Characteristics (Viability for prairie grasses and/or hardwood trees)
3. Greater than 85% viable vegetative cover.

The county may provide a broad listing of acceptable reclamation performance measures for each standardized post-mining land use and associate cover type. These performance measures will be applied in association with standardized evaluation criteria to systematically monitor, measure, and evaluate reclamation success.

## 3.8 Landscape Restoration Costs

Landscape restoration costs, calculated on per acre basis, are summarized in Table 7. Detailed descriptions of the timeline, materials, frequencies, conditions, and costs are included in Appendix VII.

Stored A and B soil horizons and overburden must be treated for weed control twice per year (June 1, August 1) to eliminate weed establishment prior to reclamation. A cost of $100 per acre should be assumed if truck mounted spraying is to be used.

## 3.9 Annual Reporting

An annual reclamation report and activities plan will be prepared and submitted 90 days from end of year. The report will be developed to meet the requirements of NR 135.36 and will include information to document:

- The extent of current mine development.
- The existing groundwater elevations, as recorded quarterly at the groundwater monitoring wells.
- The results of reclamation and storm water site inspections completed during the reporting period.
- The results of storm water discharge monitoring.
- Completed potable water well chemical analyses, groundwater sampling chemical analyses, staff gauge records for infiltration, and non-marketable materials chemical analyses.
- The reclamation and storm water management activities planned during the next calendar year.
- A daily record of the type, volume, and use of material brought to the mine for reclamation.
- Reevaluation of financial assurance based on past year's operation.

This report and activity plan will be used by the mine operator and regulatory authorities to systematically record, plan, and schedule construction activities that will be used to meet reclamation performance standards, schedule operational inspections and maintenance activities, and systematically document for the public site conditions and current compliance with permit conditions.

These proposed final post mine land uses comply with applicable current federal, state and local laws.

**Table 7. Proposed Reclamation Financial Assurance**

(Following pages)

## 4.0 Certification of Reclamation Plan

The owner hereby certifies that reclamation will be carried out in accordance with the reclamation plan and that the post mining land use complies with federal, state, and local laws in effect at the time of the submittal.

**Operator and Owner**

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Mike Schwarzmann, Northern Sands, LLC

**Site Manager**

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Paul Ayres
Red Flint Group, LLC

**Engineer**

On behalf of the Owner, Northern Sands, LLC; the Mine Operator, Red Flint Group, LLC; and geology consultant Summit Envirosolutions, Inc., I have reviewed this reclamation plan related to its compliance with NR 135, Wisconsin Administrative Code; and Chapter 30, Chippewa County Ordinances; and Appendices I and II to the County ordinance. I hereby approve the plan for submittal to Chippewa County.

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Bruce Markgren, P.E., WI E-25553
Cooper Engineering Company, Inc.