CONDITIONAL USE PERMIT APPLICATION
FILLMORE COUNTY

Applicants Portion

(This application must be fully completed before it can be processed. Failure to complete the form in its entirety will only result in further delays)

This Conditional Use Permit is for: Sand, Fill pit
(Feedlot, Rock Quarry, Telecommunications Tower, Other)

Name of Applicant K. Rodney Beer Phone #: 563-203-0822

Company Name Beer Farms

Mailing Address of Applicants: 18031 140th St. Preston MN 55965
Address *City* *State* *Zip*

Date: 11-30-22 Phone #: 563-203-0822

Provide a complete description of the project you are proposing. This must include a typed or written narrative of what you plan to do.

Provide a complete site development plan and building or structure plan. This must include:

1. Name, Address, North Arrow, and Date.
2. Aerial photograph of the site. *(Copies obtained at SWCD or Assessors Office)*
3. Soils maps of the site. *(Copies obtained at SWCD or Assessors Office)*
4. Setbacks from the centerline of all public roads and front, side and rear property lines.
5. Location and dimensions of all structures on the site. None on site
6. Driveways and accesses to the property.
7. Locations of any proposed new construction to include drawings of new structures. No structures
8. Parking Areas. *(In the case of campgrounds, all campsites)* None
9. Sinkholes and direction of water runoff.
10. Location of all wells on the property and tile inlets if on the site.
11. Location of any sewer systems located on the site. None
12. Locations of rivers, bluffs, trails and public roadways. None

Fee: $450.00
Late Fee: $500.00, if applicable

Signature of Applicant K. Rodney Beer Date: 11-30-22

CONDITIONAL USE PERMIT APPLICATION
FILLMORE COUNTY

Landowners Portion

(This application must be fully completed to be processed. Failure to complete the form in its entirety will result in further delays.)

This Conditional Use Permit is for: Sand, Fill pit
(Feedlot, Rock Quarry, Telecommunications Tower, Other)

(1)Name of all Landowners: K. Rodney Beer Phone #: 563-203-0822

Holly L. Beer Phone #: 563-203-0822

Phone #:

Mailing Address of Applicants: 18031 140th St.

City, State, Zip Preston MN 55965

Section: 21 (4) Township: 101 (5) Range: 012

Township Name: York Twp.

(2) Parcel Number: R27.0174.000 Permit #
To be filled out by the Zoning Office

(3) Legal Description *(from deed, abstract or Recorders Office)*:

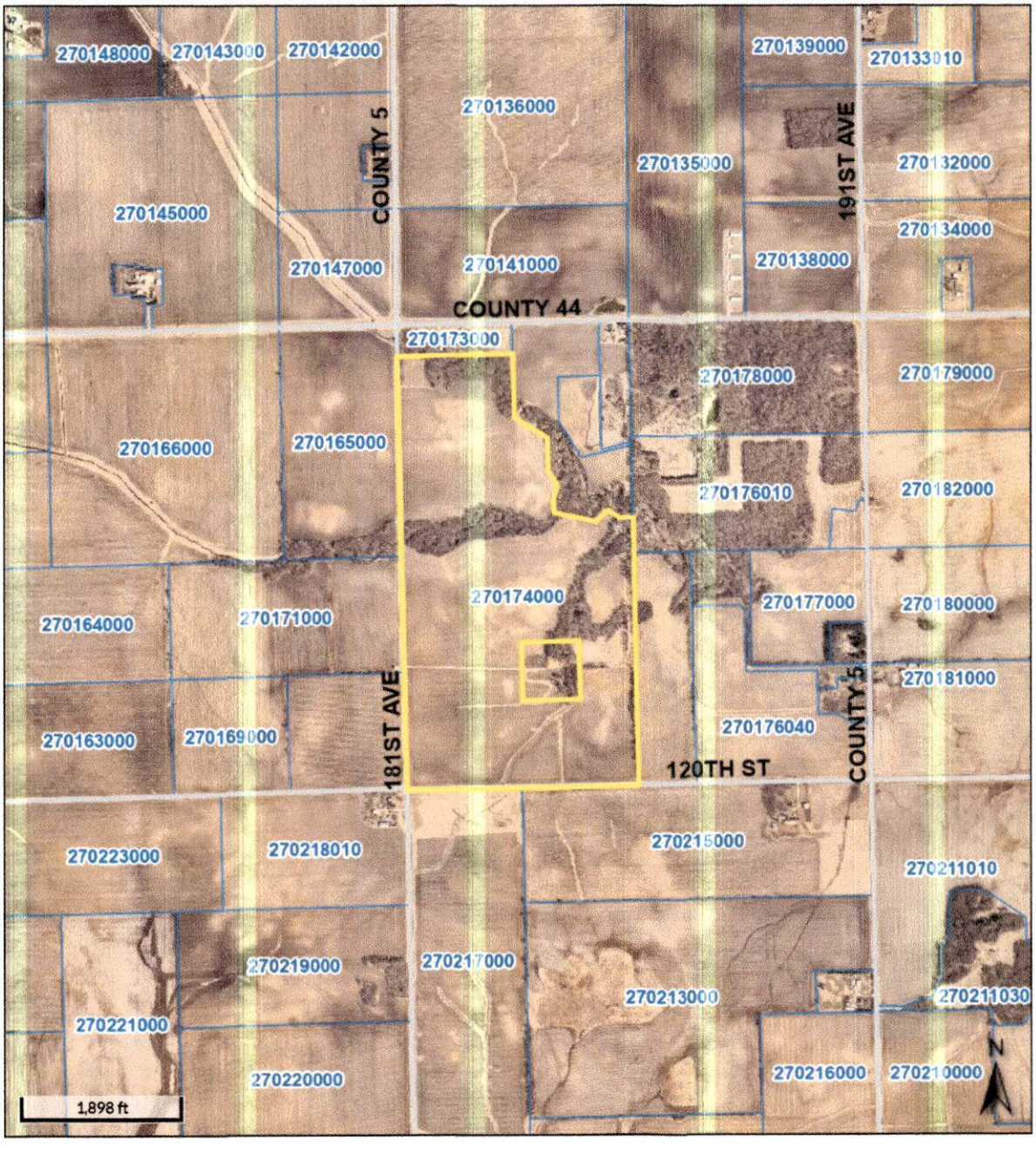
280.19 Ac NW 1/4 Exc 31.07 ac & SW 1/4 Exc 10 Ac in E 1/2 SW 1/4

(6) Signature of all Landowners: K. Rodney Beer Date: 11-30 22

Holly L Beer Date: 11-30 22

Date:

Beacon™ Fillmore County, MN



Overview

Legend

- Parcel Numbers
- Parcels
- Municipalities
- Road Centerlines

Date created: 11/30/2022
Last Data Uploaded: 11/29/2022 11:44:45 PM

Developed by Schneider GEOSPATIAL

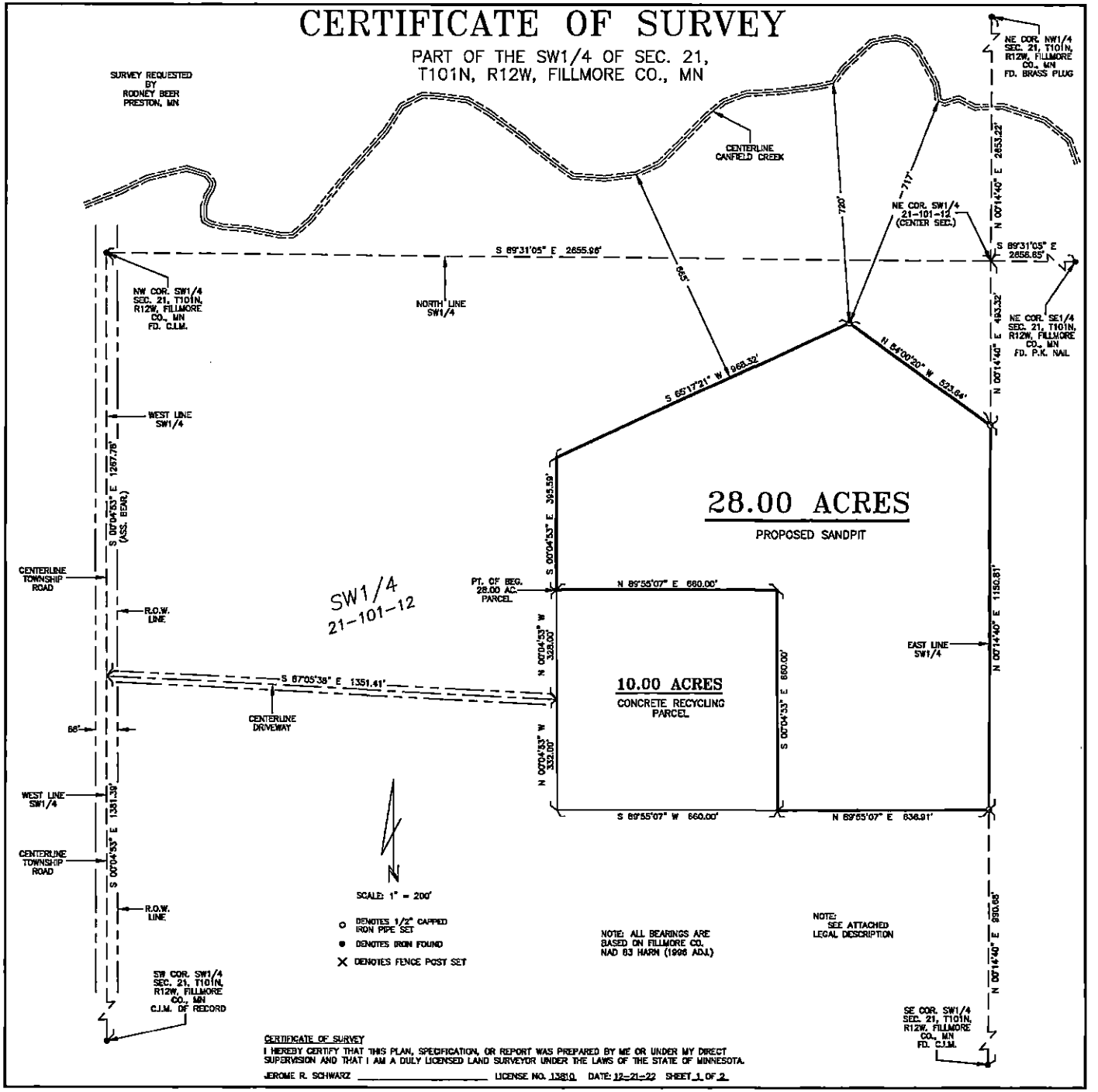
LEGAL DESCRIPTION - 28.00 Acres - Proposed Sandpit Area

That part of the Southwest Quarter (SW 1/4) of Section 21, Township 101 North, Range 12 West, Fillmore County, Minnesota, described as follows: Commencing at the Northwest Corner of said SW 1/4; thence South 00 degrees 04 minutes 53 seconds East (assumed bearing) along the West line of said SW 1/4, 1267.78 feet; thence South 87 degrees 05 minutes 38 seconds East, 1351.41 feet; thence North 00 degrees 04 minutes 53 seconds West, 328.00 feet to the point of beginning of the tract of land to be herein described; thence North 89 degrees 55 minutes 07 seconds East, 660.00 feet; thence South 00 degrees 04 minutes 53 seconds East, 660.00 feet; thence North 89 degrees 55 minutes 07 seconds East, 636.91 feet to the East line of said SW 1/4; thence North 00 degrees 14 minutes 40 seconds East along said East line, 1150.81 feet; thence North 54 degrees 00 minutes 20 seconds West, 523.64 feet; thence South 65 degrees 17 minutes 21 seconds West, 968.32 feet; thence South 00 degrees 04 minutes 53 seconds East, 395.59 feet to the point of beginning and containing 28.00 acres, more or less. Subject to any easements of record.


CERTIFICATE OF SURVEY
PART OF THE SW1/4 OF SEC. 21, T101N, R12W, FILLMORE CO., MN.
SURVEY REQUESTED BY RODNEY BEER PRESTON, MN
CENTERLINE CANFIELD CREEK
S 89°31'05" E 2655.96'
NW COR. SW1/4 SEC. 21, T101N, R12W, FILLMORE CO., MN FD. C.I.M.
NORTH LINE SW1/4
665'
720'
NE COR. SE1/4 SEC. 21, T101N, R12W, FILLMORE CO., MN FD. P.K. NAIL
N 54°00'20" W 523.64'
S 65°17'21" W 968.32'
WEST LINE SW1/4
S 00°04'53" E 1297.78' (ASS. BEAR.)
28.00 ACRES
PROPOSED SAND PIT
S 00°04'53" E 385.58'
CENTERLINE TOWNSHIP ROAD
R.O.W. LINE
SW1/4 21-101-12
PT. OF BEG. 28.00 AC. PARCEL
N 89°55'07" E 660.00'
N 00°04'53" W 328.00'
EAST LINE SW1/4
N 00°14'40" E 1150.81'
S 87°05'38" E 1351.41'
10.00 ACRES
CONCRETE RECYCLING PARCEL
CENTERLINE DRIVEWAY
66'
N 00°04'53" W 332.00'
S 89°55'07" W 660.00'
N 89°55'07" E 636.91'
WEST LINE SW1/4
CENTERLINE TOWNSHIP ROAD
R.O.W. LINE
SCALE: 1" = 200'
DENOTES 1/2" CAPPED IRON PIPE SET
DENOTES IRON FOUND
DENOTES FENCE POST SET
NOTE: ALL BEARINGS ARE BASED ON FILLMORE CO. NAD 83 HARN (1996 ADJ.)
NOTE: SEE ATTACHED LEGAL DESCRIPTION
SW COR. SW1/4 SEC. 21, T101N, R12W, FILLMORE CO., MN C.I.M. OF RECORD
SE COR. SW1/4 SEC. 21, T101N, R12W, FILLMORE CO., MN FD. C.I.M.
CERTIFICATE OF SURVEY
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MINNESOTA.
JEROME R. SCHWARZ _____ LICENSE NO. 13810 DATE: 12-21-22 SHEET 1 OF 2

CERTIFICATE OF SURVEY

PART OF THE SW1/4 OF SEC. 21,
T101N, R12W, FILLMORE CO., MN



CERTIFICATE OF SURVEY

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MINNESOTA.

JEROME R. SCHWARZ _____ LICENSE NO. 13810 DATE: 12-21-22 SHEET 1 OF 2

G-Cubed

ENGINEERING
SURVEYING
PLANNING

Karst Feature Assessment Report

For

The Barr Sand and Fill Pit

Project Owner:	**K. Rodney Beer and Holly L. Beer**
County:	**Fillmore County**
Legal Description:	**NE1/4 of SW1/4 in Section 21, T. 101 N. – R. 12 W. (York Township).**
Report By:	**G-Cubed Inc.**
Date:	**November 14, 2022**
Signature:	Stystar P. Lamb Nov 14, 2022

Table of Contents

Assessment Area .... (page 3)
- **Project Summary**
- **Scope of Work**

General Site Information.... (Page 3 and 4)
- **Landforms, Vegetation and Topography**
- **Soils**
- **Antecedent Precipitation**

Assessment Findings.... (Pages 4)
- **Conclusions**

Attachments
- **Attachment A – Project Map**
- **Attachment B – Geologic Atlas of Fillmore County – Sinkhole Probability Plate**
- **Attachment C – Geologic Atlas of Fillmore County – Geologic Resources Plate**
- **Attachment D – 1968 Aerial Photo**
- **Attachment E – NRCS Web Soil Survey**

Attachment A

Project Map

Assessment Area

Project Summary:
Rodney and Holly Beer have requested a Conditional Use Permit (CUP) for sand mining and fill pit activity in the SW1/4 of Section 21 of York Township. As a condition of this CUP review, an assessment for Karst features within the proposed mining/fill area is required by Fillmore County. This assessment was conducted in the field by G-Cubed Engineering on October 28, 2022. The area included in the assessment is located within the designated green parcels as shown in Attachment A – Project Map.

The karst feature assessment area has had a history of mining activity, including iron ore mining during the 1960's. As a result of previous mining activity(s), much of the assessment area has been disturbed due to grading and excavating. Closed depressions exist within the assessment area. None are associated with solution of the underlying bedrock (sinkholes). These features are associated with previous grading activities as indicated by disturbed soils within the depression basins. Each of these features were also inundated with water or exhibit seasonally saturated soil conditions indicating these basins are sealed and have no connection with the underlying bedrock. There are also several drainageways within the assessment area with surface water flow. The surface water originates from drainage tile outlets and not springs. Surface water flow within the drainageways exits the assessment area with no indication of disappearing into bedrock solution cavities. No indication of karst features was encountered within the assessment area.

Scope of Work:
G-Cubed Engineering has completed an assessment for karst features within the proposed Beer CUP for sand mining and fill pit activity, located in the SW1/4 of Section 21 of York Township. The scope of the karst assessment is shown in Attachment A – Project Map, specifically within the green polygons. The field assessment was conducted on October 28, 2022.

The karst assessment included identifying several features associated with the solution of the underlying soluble bedrock. These features include sinkholes, springs and disappearing streams.

General Site Information

Referencing the Geologic Atlas of Fillmore County, the Karst assessment area is identified has having a moderate to high probability for sinkholes as indicated by the Sinkhole Probability Map as shown in Attachment B. Areas with moderate sinkhole probability are described as having about one sinkhole per square mile. Immediately to the east of the assessment area sinkholes have been identified and this area is considered as a high probability with sinkhole densities of 5 to 20 per square mile.

The Karst assessment area is located within Fillmore County Iron District as indicated by the Geologic Resources plate of the Fillmore Geologic Atlas (see Attachment C). Boundaries of properties leased by iron ore companies border the assessment area. The aerial photo dated 1968 in Attachment D

indicates mining signatures within the assessment area. The haul road can be seen connecting the assessment area to mining activities in the York woods and properties to the north. This haul road as well as evidence of strip mining and overburden features can be seen today within the assessment area.

The NRCS Web Soil Survey (Attachment E) has identified 6 mapping units. Three units in the west and south quadrants are associated with sediment over basal till parent material. The photo signatures of Attachment A indicate that most of these mapping units are drained with sub-surface tile. Outlets for much of this tiling can be seen in drainageways that truncate the assessment area and provide base flow within these riverine features. The remaining mapping units to the north and east are associated with sediment over sand and gravel outwash and eolian sand. The mapping units identified by the Web Soil Survey are consistent with the geologic resources identified by the Fillmore County Geologic Atlas (see Attachment C – Geologic Resources Plate). The Atlas identifies glacial fluvial outwash adjacent to the assessment area.

Assessment Findings

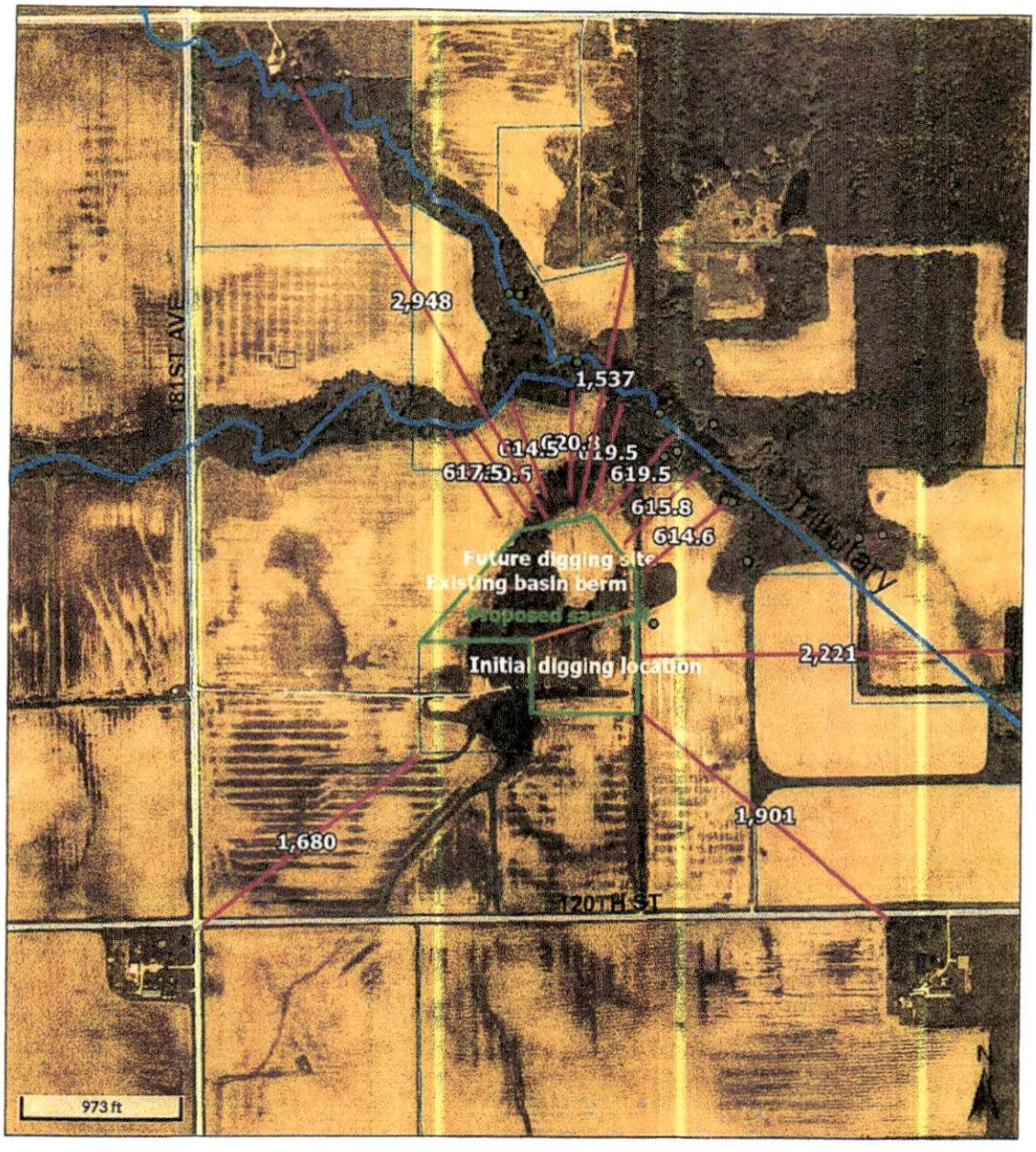
The karst field assessment has identified features throughout the assessment area associated with mining activities. Several closed depressions exist within wooded areas. Close examination of the basin areas and sideslopes indicate these features are the result of excavation and overburden stockpiling. Most were inundated with surface water the day of the assessment and (or) have redox features in the basin soil material. These features seem to be sealed with no evidence of a hydrologic connection with the bedrock below.

There are several drainage channels with an active base flow during the time of the assessment. The source of the surface water was traced to subsurface tile outlets located in the SW corner of the assessment area. No springs were encountered. The base flow of these drainageways interconnect with culverts with a positive gradient to the north. The outlet of the drainage channel exits the assessment area in the NE corner. There was no indication surface water within the drainageways flow into bedrock solution pits or crevices.

Conclusions:
Closed depressions, surface water flow and close proximity to identified sinkholes are characteristics of this assessment area. However, no obvious surface features were encountered that are associated with a direct connection of surface to groundwater. These observations are consistent with the Geologic Atlas of Fillmore County and evidence of historic mining operations occurring within and adjacent to the assessment area.

Beacon™ Fillmore County, MN

Beer Farms LLC sand pit



Overview

Legend

- Road Centerlines
- Parcels
- Sinkholes
- Stream Classifications

FEMA Flood Zone

- True
- False
- Floodplain - pre 8/15/19
- Lakes
- Streams and River (Large)
- Protected Waters and Wetlands

Date created: 6/15/2022
Last Data Uploaded: 6/14/2022 11:10:32 PM

Developed by Schneider GEOSPATIAL

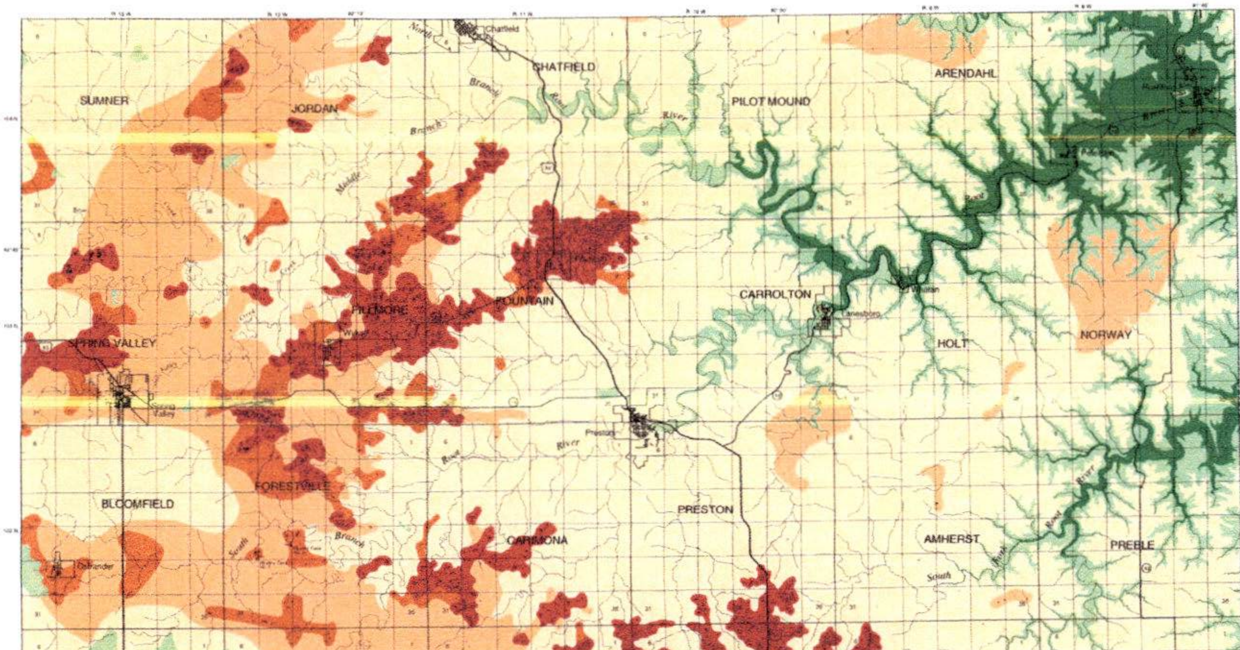
Material to be excavated will be fill sand.

Reclamation plan would be to cover area with black dirt and put into crop production.

Attachment B

Geologic Atlas of Fillmore County – Sinkhole Probability Plate

Prepared and Published with the Support of
THE MINNESOTA ENVIRONMENT AND NATURAL RESOURCES TRUST FUND



EXPLANATION

NO SINKHOLE PROBABILITY

LOW TO MODERATE PROBABILITY

HIGH PROBABILITY

LOW PROBABILITY

MODERATE TO HIGH PROBABILITY

SINKHOLE PLAINS

Sinkholes

Public Caves

SINKHOLES AND SINKHOLE PROBABILITY

By

Kathleen M. Witthuhn and E. Calvin Alexander, Jr.

1995

INTRODUCTION

KARST PROCESSES

SINKHOLES

ENVIRONMENTAL IMPACTS OF SINKHOLES

SUMMARY

REFERENCES

The DNR Information Center
Twin Cities: (612) 296-6157
MN Toll Free: 1-800-766-6000
Telecommunication Device for the Deaf
(612) 296-5484
MN Toll Free: 1-800-657-3929

GEOLOGIC ATLAS OF FILLMORE COUNTY, MINNESOTA

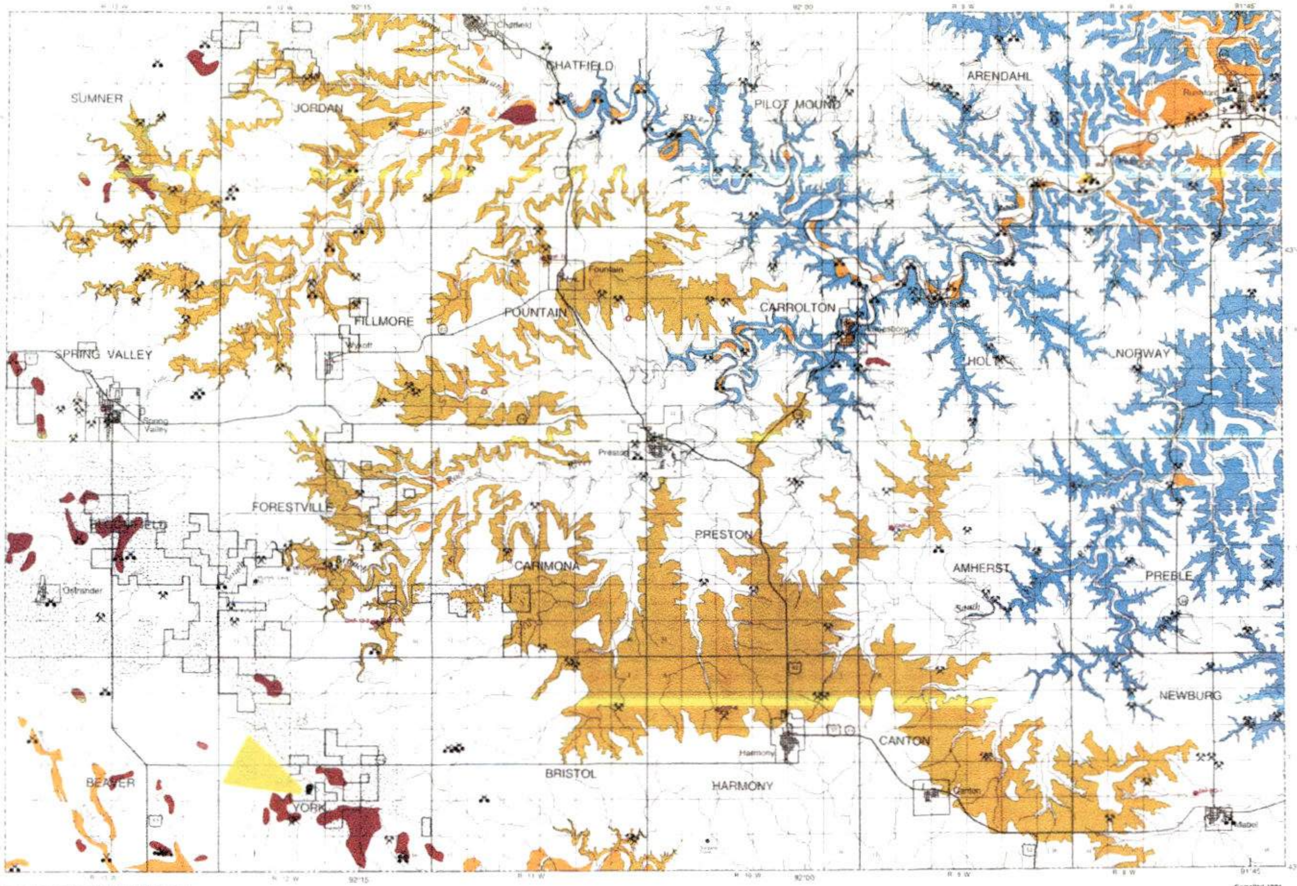
Attachment C

Geologic Atlas of Fillmore County – Geologic Resources Plate

UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
D.L. Southwick, Director

Prepared and Published with the Support of
THE FILLMORE COUNTY BOARD OF COMMISSIONERS, THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATERS, AND THE MINNESOTA ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

COUNTY ATLAS SERIES
ATLAS C-8, PART A
Plate 5, Geologic Resources



Digital base modified from 1990 Census TIGER/Line Files of U.S. Bureau of the Census [illegible]

SCALE 1:100 000

KILOMETERS

MILES

Compiled 1994

Cartography by Joyce Meints and Philip Heywood

Partial funding for this project approved by the Minnesota Legislature (M.L. 91, Ch. 254, Art. 1, Sec. 14, Subd. 4[f], and M.L. 93, Ch. 172, Sec. 14, Subd. 11[g]) as recommended by the Legislative Commission on Minnesota Resources from the Minnesota Environment and Natural Resources Trust Fund

GEOLOGIC RESOURCES

By

Anthony C. Runkel

1995

INTRODUCTION

Several geologic resources are utilized in Fillmore County. Carbonate rock quarries are scattered across the county, sand and gravel is extracted from pits along the Root River and its tributaries, and iron ore was once mined in the western half of the county. This plate describes these past and present resources and shows where there is the potential to extract new resources.

The map reflects only geologic criteria. Urban development and zoning regulations have a major impact on the availability of resources for mining. However, a map that takes these factors into account would soon be outdated.

CARBONATE ROCK RESOURCES

The most commonly utilized geologic resource in Fillmore County is carbonate rock, which typically is crushed and used as road aggregate or ground into agricultural lime. The geologic setting of Fillmore County is particularly well suited for the production of rock aggregate. The county has widely distributed thick units of carbonate rocks with resistant properties that make them suitable for road construction. The most commonly quarried units are the Oneota and Shakopee formations of the Prairie du Chien Group, and the Cummingsville, Prosser, and Stewartville formations of the Galena Group. The commonly thin overburden atop these units does not require major stripping, making quarrying more cost-effective.

The map shows where quarrying of carbonate rock may be economically feasible. Carbonate units are considered a primary economic resource if they are fairly resistant to abrasion (Table 1), are at least 30 feet thick, and have less than 10 feet of overburden. The Prairie du Chien and Galena Groups meet these criteria across much of the county. Other carbonate units, such as the Platteville Formation and the units above the Galena Group, are quarried locally but are not considered a primary resource, owing to their thinness, the presence of thin beds of shale, or other undesirable physical and chemical properties.

The map also shows the locations of both active and inactive quarries. Fillmore County ranks third statewide in the number of active carbonate-rock quarries, and it has more inactive rock quarries than any other county—over 200 (Nelson and others, 1990). The locations of many of the inactive quarries are based entirely on descriptions in the geologic literature; some have been reclaimed and are no longer obvious. Only those for which a reasonably precise location was determined are plotted on the map.

Other Potential Applications for Carbonate Rocks

The chemical composition of some carbonate units makes them suitable for uses other than as aggregate or agricultural lime (Niles and Morey, 1990). In adjoining southwestern Olmsted County, the Stewartville Formation contains intervals in which the dolomite to limestone ratio is nearly fifty-fifty, a mixture similar to that used by some taconite plants to produce fluxed pellets. Contaminant and sulfur content is low. Chemical analyses of the Stewartville Formation in Fillmore County indicates that such intervals may also be present in the western part of the county (H.B. Niles, Natural Resources Research Institute, unpub. data, 1994).

High-purity carbonate rock is used in the papermaking industry and as mineral filler in products like adhesives, sealants, plastics, and paints. In southwestern Fillmore County, an interval of the Stewartville Formation (sample DH F-13-1: 63.1–112.6 feet) is relatively pure dolomitic limestone with low insoluble residue (Table 2). The Oneota Dolomite in southeastern Fillmore County (sample DH BO-1) also has intervals of high-grade dolostone that contain few contaminants and little insoluble residue. The relative thickness of these intervals and their lack of contaminants suggest that it may be possible to extract substantial tonnages of similar material locally (Table 2).

In general, the Oneota Dolomite is a fairly pure dolostone having thick intervals in which total carbonate ranges from 93 to 98 percent. Four of the five sample locations in Fillmore County contained intervals of carbonate rock having moderate to high purity and low insoluble residue (Table 2).

SANDSTONE RESOURCES

The St. Peter and Jordan Sandstones locally are a source of sand for fill. These quartz-rich units also have slight potential for the production of industrial sand and glass sand (Thiel, 1957). The Jordan is less sorted than the St Peter for such uses because it commonly is rich in iron oxide.

SAND AND GRAVEL RESOURCES

Most deposits of sand and gravel in Fillmore County are along the Root River and its major tributaries. These deposits were laid down in the past few thousand years as deep valleys filled. Extensive, thick glacial outwash deposits, which are abundant and commonly used for aggregate in counties to the north and west, are a scarce resource in Fillmore County.

To be a primary resource, a sand and gravel deposit must be at least 20 feet thick, have less than 10 feet of overburden, and contain at least 35 percent gravel-size material. Secondary resources fail to meet one or more of the criteria for primary resources. Resources are identified only in areas having adequate outcrop and subsurface data. In Fillmore County information on the subsurface ranges from very good near some gravel pits to limited in rural areas where the only available information is contained in scattered well-drillers' logs.

The potential sand and gravel resources shown on the map are secondary resources, chiefly because they do not contain enough gravel-size material (less than 35 percent). Most deposits along the Root River and its tributaries are mined for sand for local use in asphalt and concrete products and as fill for road work.

Sand and gravel in Fillmore County customarily has been mined from four types of deposits. The most desirable are stream deposits (alluvium), commonly occupying a terrace position, of Wisconsinan and older age. Most of the sand and gravel is mined where these deposits lie at the surface or underlie a thin veneer of more recent stream deposits. The alluvium contains a higher percentage of gravel and is situated farther above the water table than more recent stream deposits.

The second type of sand and gravel deposit is glaciofluvial sediment, which was deposited by glacial meltwater. It includes outwash plains, terraces, and ice-contact features. Although this unit commonly contains a high percentage of gravel, it has several undesirable characteristics, including iron oxide cement, silt and clay interbeds, and clay-coated grains. The unit is also generally less than 20 feet thick.

Recent stream sediment, or alluvium, is the third type of deposit commonly mined for sand and gravel. It is not shown as a potential resource on the plate because it rarely contains 35 percent gravel-size material, and its position along river valleys where the water table is close to the land surface makes extraction of a thick (more than 20 feet) interval unprofitable without pumping or drag-line techniques.

The fourth type of deposit includes the Ordovician St. Peter Sandstone, which locally is a source of sand for fill, and Cretaceous-age gravels of the Ostrander Member of the Windrow Formation, which in the past were mined in western Fillmore County. Although the Ostrander commonly has a high percentage of gravel-size material, it is not a potential resource on this map owing to several undesirable properties, including a substantial component of iron oxide, silt and clay, and a high percentage of chert pebbles. It also is generally less than 20 feet thick.

IRON ORE

In addition to its aggregate resources, Fillmore County formerly had an iron-ore mining district. The ore bodies were mined by two companies from 1942 to 1968, during which time over 8 million tons of ore were produced (Bleifuss, 1972). More than 125 separate properties were worked. Many of the iron-ore bodies were exhausted, and the small remnants remaining probably do not have enough high-grade ore to make mining commercially viable.

Commercial iron ore bodies form the lower part of the Cretaceous Windrow Formation, and are most common where the Stewartville and Cedar Valley Formations crop out in the western half of Fillmore County and in extreme southwestern Olmsted County. Before depletion the bodies ranged in thickness from 3 to 30 feet; some contained more than 50,000 tons of ore. The thickest and most abundant deposits were in Bloomfield Township, south of the town of Spring Valley.

The iron ore is composed chiefly of the mineral goethite with minor amounts of hematite (Bleifuss, 1972). Two types of ore are distinguished: hard ore is a dense, hard, crystalline goethite; soft ore is more massive and has a soft, punky texture. The ore varies in color from bright yellow to tan, brown, dark brown, and crimson. Some ore bodies contain masses of siderite, which consists of fine-grained, interlocking, equigranular, anhedral crystals 5 to 25 microns in diameter. Chemical analysis (Table 3) indicates that the ore bodies have a consistent iron content, regardless of formation or locale. Most samples contain 50–60 percent iron and 0.5–2.5 percent manganese. The alumina content is as much as 3.85 percent and the silica content as much as 18 percent.

Bleifuss (1972) concluded that the chemical and physical characteristics of the iron ore are compatible with an origin through oxidation of primary marine siderite beds, which today form the Cedar Valley Formation. The beds were exposed during the Tertiary when siderite oxidized to goethite under normal temperate climatic conditions. Other workers (for example, Sloan, 1964) have suggested that the ores formed during the Cretaceous under tropical climatic conditions that promoted weathering of the underlying limestone, locally causing sedimentary concentration of iron.

LEAD-ZINC MINERALIZATION

A carbonate-hosted sulfide deposit was discovered in a quarry (sec. 7, T. 102 N., R. 8 W.) in the Oneota Dolomite during field investigations for this atlas. Most of the mineralization was deposited as open-pore filling, and, in order of decreasing abundance, consists of pyrite, marcasite, calcite, dolomite, chert, sphalerite, and galena. Earlier reports of similar mineralization at three locations in Fillmore County (Heyl and West, 1982) are also plotted on the map, but the locations could not be verified in the field.

Mineralization in the quarry apparently is restricted to a brecciated algal facies in the Lower Ordovician Oneota Dolomite about 16 feet below a regional unconformity that separates the Oneota from the overlying New Richmond Member of the Shakopee Formation. The mineralized zone is about 36 feet thick and can be traced along strike in the quarry for more than 230 feet. Mineralization may extend over a much wider area: goethite-rich brecciated rocks that may be the weathered equivalent of the mineralized zone crop out about 1640 feet from the quarry.

This deposit is similar to what are known as the "Mississippi Valley Type" mineral deposits, which have been mined for lead and zinc in Iowa and Wisconsin. The mineralized quarry in Fillmore County is near the northern part of a fold in the bedrock, called the Allamakee anticline, which trends southeastward into Iowa and Wisconsin. There it is associated with several old lead-zinc mines. Although preliminary assays of samples from the quarry show only slightly anomalous lead, copper, and zinc values (Table 4), many features typical of mineral deposits to the south, as well as the quarry's position along the Allamakee anticline, indicate a potential for the discovery of economic ore bodies in Minnesota, particularly in Fillmore County and adjoining Houston and Olmsted Counties.

DESCRIPTION OF MAP UNITS

SAND AND GRAVEL RESOURCES

Sand and gravel resources shown on the map are secondary resources, i.e., generally they contain less than 35 percent gravel, are less than 20 feet thick, or are in areas where the water table is less than 20 feet below the land surface.

Sand and gravel pit—Active; inactive

Alluvium (Pleistocene)—Dominantly sand and gravel of Wisconsinan and older streams; minor silt and clay beds. Mapped where at the land surface in a terrace position

Glaciofluvial deposits (Pleistocene)—Outwash, ice-contact, and terrace deposits composed chiefly of sand and gravel with minor beds of silt and clay. Strongly oxidized grains are coated with brown clay

CARBONATE RESOURCES

Carbonate resources shown on the map are primary resources, i.e., they are fairly resistant to abrasion, are at least 30 feet thick, and are estimated to be within 10 feet of the land surface.

Carbonate rock quarry—Active; inactive

Approximate location of sample collected for carbonate chemistry—Samples were collected in or on the periphery of quarries, or from a mineral exploration test hole. Data summarized in Table 2

Galena Group (Upper Ordovician)

Stewartville Formation—Fine-grained dolomitic limestone and dolostone having thin and crinkly beds. As much as 85 feet thick

Prosser Limestone—Fine-grained limestone having generally thin crinkly bedding with minor thin shale partings. As much as 51 feet thick

Cummingsville Formation—Fine-grained limestone in thin crinkly beds alternating with green-gray calcareous shale beds; chert nodules in lower part and above middle. As much as 63 feet thick

Prairie du Chien Group (Lower Ordovician)

Shakopee Formation

Willow River Member—Generally thin-bedded dolostone having thin shale partings and sandstone beds; gray chert nodules. As much as 35 feet thick

New Richmond Member—Fine-grained, sandy dolostone and dolomitic sandstone, 15–20 feet thick, overlain by quartzose sandstone as much as 40 feet thick. The New Richmond is included in the mapping unit but is not a carbonate resource

Oneota Formation—Generally thick-bedded to massive dolostone; some oolitic and sandy dolostone with interbedded sandstone and thin shale beds in the basal 20–30 feet. Chert close to the base and near upper contact. As much as 160 feet thick

FILLMORE COUNTY IRON DISTRICT

General distribution of the Windrow Formation (Cretaceous)—Iron-ore bodies are common in the lower part of the formation, although much of the ore has been extracted

Boundary of properties leased by mining companies where economic quantities of iron ore were extracted

LEAD-ZINC MINERALIZATION

Location of reported lead-zinc mineralization—Summary of chemical data given in Table 4

TABLE 1. Summary of Los Angeles Rattler (LAR)[1] tests of carbonate rock for aggregate in Fillmore County

(Data from the Minnesota Department of Transportation.)

Geologic Unit	Mean LAR Value	Quarries Sampled
GALENA GROUP		
Formation unknown	29.5	23
Prosser Limestone and/or Stewartville Formation	25.5	3
Cummingsville Formation and/or Prosser Limestone	27.2	1
Prosser Limestone	29.3	9
Cummingsville Formation	26.3	2
Platteville Formation	26.63	3
PRAIRIE DU CHIEN GROUP		
Shakopee Formation	38.72	10
Oneota Dolomite	37.81	10

[1] LAR is a standard method for testing resistance of aggregate to abrasion. [illegible]

TABLE 2. Chemical analyses of carbonate units in the Prairie du Chien and Galena Groups.

(Data from Niles and Mossler, 1990. Depth in feet measured from land surface. Constituent values given in weight percent. Sample locations shown on map. Intervals of moderate to high purity indicated in bold-face type. Geologic units: Oneota, Oneota Dolomite; Prosser, Prosser Limestone; Cummingsville, Cummingsville Formation; Stewartville, Stewartville Formation. Constituents: CaO, calcium oxide; MgO, magnesium oxide; LOI, loss on ignition; SiO_2, quartz; Al_2O_3, alumina; TiO_2, titanium oxide; Fe, total iron; MnO, manganese oxide; Na_2O, sodium oxide; K_2O, potassium oxide; P_2O_5, phosphate; S, sulfur; Cl, chloride.)

Depth (ft)	Thickness (ft)	Geologic unit	CaO	MgO	LOI	SiO_2	Al_2O_3	TiO_2	Fe	MnO	Na_2O	K_2O	P_2O_5	S	Cl
SAMPLE DH BO-1 (mineral exploration test hole) Sec. 22, T. 101 N., R. 8 W., Collar Elevation 1160 ft															
130.00–167.30	**37.30**	**Oneota**	**32.01**	**20.08**	**45.79**	**1.33**	**0.28**	**0.01**	**0.29**	**0.06**	**0.19**	**0.26**	**0.01**	**0.07**	**0.13**
167.30–186.00	18.70	Oneota	26.47	12.74	34.12	24.66	0.17	0.01	0.43	0.01	0.15	0.23	0.00	0.17	0.10
186.00–237.60	**51.60**	**Oneota**	**29.92**	**19.86**	**44.91**	**4.45**	**0.25**	**0.01**	**0.33**	**0.03**	**0.19**	**0.36**	**0.01**	**0.07**	**0.16**
237.60–244.00	6.40	Oneota	27.36	18.71	40.76	11.58	0.77	0.03	0.31	0.04	0.15	0.59	0.01	0.04	0.08
244.00–290.10	**46.10**	**Oneota**	**29.05**	**20.38**	**43.80**	**5.10**	**0.67**	**0.03**	**0.26**	**0.03**	**0.13**	**0.40**	**0.01**	**0.07**	**0.15**
290.10–292.30	2.20	Oneota	23.88	17.08	36.59	18.71	0.84	0.05	0.32	0.04	0.16	0.84	0.01	0.03	0.15
SAMPLE DH F-17 (Larson quarry near Fountain) Sec. 3, T. 103 N., R. 11 W., Collar Elevation 1225 ft															
0.00–40.67	**40.67**	**Prosser**	**48.59**	**1.80**	**40.40**	**5.89**	**1.10**	**0.06**	**0.33**	**0.03**	**0.05**	**0.74**	**0.07**	**0.10**	**0.09**
40.67–53.17	12.50	Prosser	40.43	1.74	32.59	17.70	3.02	0.12	0.78	0.04	0.07	1.70	0.15	0.53	0.08
53.17–74.00	20.83	Cummingsville	44.10	1.73	35.62	11.38	2.44	0.10	0.73	0.03	0.06	1.40	0.12	0.27	0.08
74.00–104.00	**30.00**	**Cummingsville**	**49.58**	**0.95**	**40.33**	**5.37**	**1.09**	**0.04**	**0.41**	**0.03**	**0.04**	**0.88**	**0.07**	**0.17**	**0.09**
SAMPLE DH F-13-1 (Riffle Hill quarry) Sec. 35, T. 102 N., R. 12 W., Collar Elevation 1310 ft															
63.08–112.58	**49.50**	**Stewartville**	**46.43**	**6.77**	**43.53**	**1.81**	**0.32**	**0.02**	**0.24**	**0.02**	**0.08**	**0.24**	**0.05**	**0.04**	**0.11**
112.58–136.83	**24.25**	**Stewartville**	**44.05**	**6.98**	**41.90**	**4.85**	**0.75**	**0.04**	**0.29**	**0.03**	**0.01**	**0.52**	**0.04**	**0.05**	**0.10**
136.83–158.17	21.34	Prosser	41.75	5.09	39.01	9.60	1.97	0.08	0.43	0.03	0.00	0.91	0.08	0.10	0.10
158.17–194.00	**35.83**	**Prosser**	**49.24**	**1.53**	**40.22**	**5.40**	**0.59**	**0.04**	**0.30**	**0.03**	**0.01**	**0.68**	**0.09**	**0.12**	**0.10**
SAMPLE DH F-13-2 (Riffle Hill quarry) Sec. 35, T. 102 N., R. 12 W., Collar Elevation 1210 ft															
0.00–15.33	**15.33**	**Stewartville**	**44.42**	**6.09**	**43.56**	**2.10**	**0.27**	**0.02**	**0.28**	**0.03**	**0.07**	**0.27**	**0.03**	**0.08**	**0.08**
15.33–44.00	**28.67**	**Stewartville**	**43.42**	**7.24**	**42.18**	**4.74**	**0.73**	**0.04**	**0.32**	**0.03**	**0.07**	**0.57**	**0.05**	**0.09**	**0.09**
44.00–64.00	20.00	Prosser	44.84	5.73	35.58	10.89	1.31	0.06	0.46	0.03	0.08	1.01	0.05	0.16	0.09
64.00–94.00	**30.00**	**Prosser**	**48.65**	**1.63**	**40.42**	**5.83**	**0.81**	**0.04**	**0.30**	**0.03**	**0.07**	**0.70**	**0.06**	**0.14**	**0.05**
SAMPLE DH F-5 (Big Springs quarry near Harmony) Sec. 9, T. 101 N., R. 10 W., Collar Elevation 1250 ft															
0.00–15.50	15.50	Prosser	43.32	4.08	38.42	10.71	1.32	0.06	0.44	0.03	0.06	0.85	0.08	0.11	0.09
15.50–44.50	**29.00**	**Prosser**	**49.49**	**1.78**	**40.81**	**5.41**	**0.78**	**0.03**	**0.27**	**0.02**	**0.03**	**0.55**	**0.06**	**0.11**	**0.10**

TABLE 3. Chemical analyses of iron ore from mines in the Spillville Formation and Galena Group.

(Data from Bleifuss, 1972; analyzed by V.B. Bye, Mines Experiment Station, University of Minnesota. Constituent values in weight percent. Constituents: Fe, total iron; Mn, manganese; SiO_2, quartz; Al_2O_3, alumina.)

Geologic Unit	Fe	Mn	SiO_2	Al_2O_3
HARD ORES				
Spillville Formation	39.74	0.83	4.41	0.24
	54.69	1.17	3.38	0.45
	60.01	2.44	1.50	0.07
	51.70	2.32	9.70	2.21
	54.08	0.35	6.60	0.25
	54.97	0.67	4.26	0.31
Galena Group	53.30	1.08	7.54	1.58
	54.48	1.22	4.13	0.57
	58.17	0.14	3.90	0.44
	52.28	0.31	9.68	1.46
	49.97	3.35	7.38	2.19
	55.30	0.77	5.08	0.29
	44.53	0.86	18.02	3.35
	53.54	0.52	5.68	0.92
SOFT ORES				
Spillville Formation	50.53	2.08	8.31	0.24
	58.25	2.07	3.00	0.42
	51.84	1.87	4.23	1.01
	52.83	8.50	9.27	1.00
	58.82	2.08	2.86	0.56
	56.50	1.58	3.71	1.04
	52.99	0.67	6.46	1.16
	55.22	0.33	6.60	0.68
	41.40	8.21	13.52	3.85

TABLE 4. Chemical analyses of mineralized carbonate from a quarry in the Oneota Dolomite, southeastern Fillmore County

(Quarry location: sec. 7, T. 102 N., R. 8 W. Abbreviations: ppm, parts per million; wt%, weight percent.)

Sample Number	Lead (ppm)	Zinc (ppm)	Copper (ppm)	Total Iron (wt%)
FO-60-1	234	17.9	9.7	29.0
FO-60-2	203	17.1	8.1	18.8
FO-60-3	32	11.3	6.6	2.1
FO-60-4	165	482	3.8	15.7
FO-60-5	5	13.8	3.8	2.07
FO-60-6	16	9.7	3.8	2.60
FO-60-7	11	6.5	4.2	.48
FO-60-8	7	5.3	6.0	.41
FO-60-9	5	20.6	2.4	.31
FO-60-10	36	16.3	7.3	2.14
FO-60-11	2	1.6	<.5	.18
FO-60-12	108	21.3	28.2	27.3

LOCATION DIAGRAM

[illegible]

REFERENCES CITED

Bleifuss, R.L., 1972, The iron ores of southeastern Minnesota, in Sims, P.K., and Morey, G.B., eds., Geology of Minnesota: A centennial volume: Minnesota Geological Survey, p. 498–505.

Heyl, A.V., and West, W.S., 1982, Outlying mineral occurrences related to the Upper Mississippi Valley Mineral district, Wisconsin, Iowa, Illinois, and Minnesota: Economic Geology, v. 77, p. 1803–1817.

Nelson, S.L., Olsenhelmer, M.N., Olson, D.J., 1990, Inventory of industrial mineral pits and quarries in Minnesota: Minnesota Department of Natural Resources, Division of Minerals Report 292, 2 vols.

Niles, H.B., and Mossler, J.H., 1990, Evaluation of the carbonate resources of southern Minnesota: University of Minnesota, Natural Resources Research Institute Technical Report NRRI/TR-90/08, 205 p.

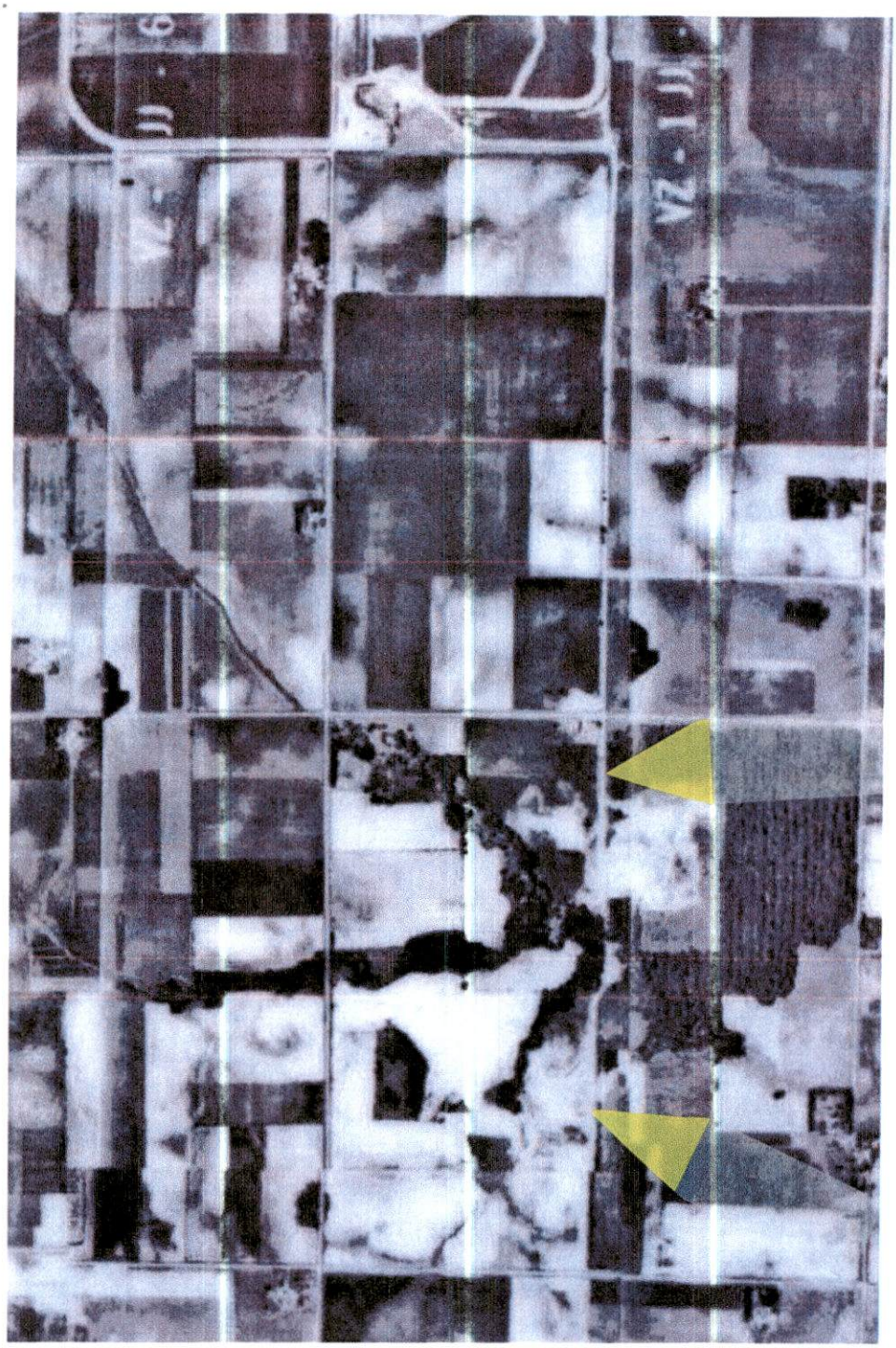
Sloan, R.E., 1964, The Cretaceous system in Minnesota: Minnesota Geological Survey Report of Investigations 5, 64 p.

Thiel, G.A., 1957, High silica sands of Minnesota: Minnesota Geological Survey Summary Report 9, 33 p.

GEOLOGIC ATLAS OF FILLMORE COUNTY, MINNESOTA

Attachment D

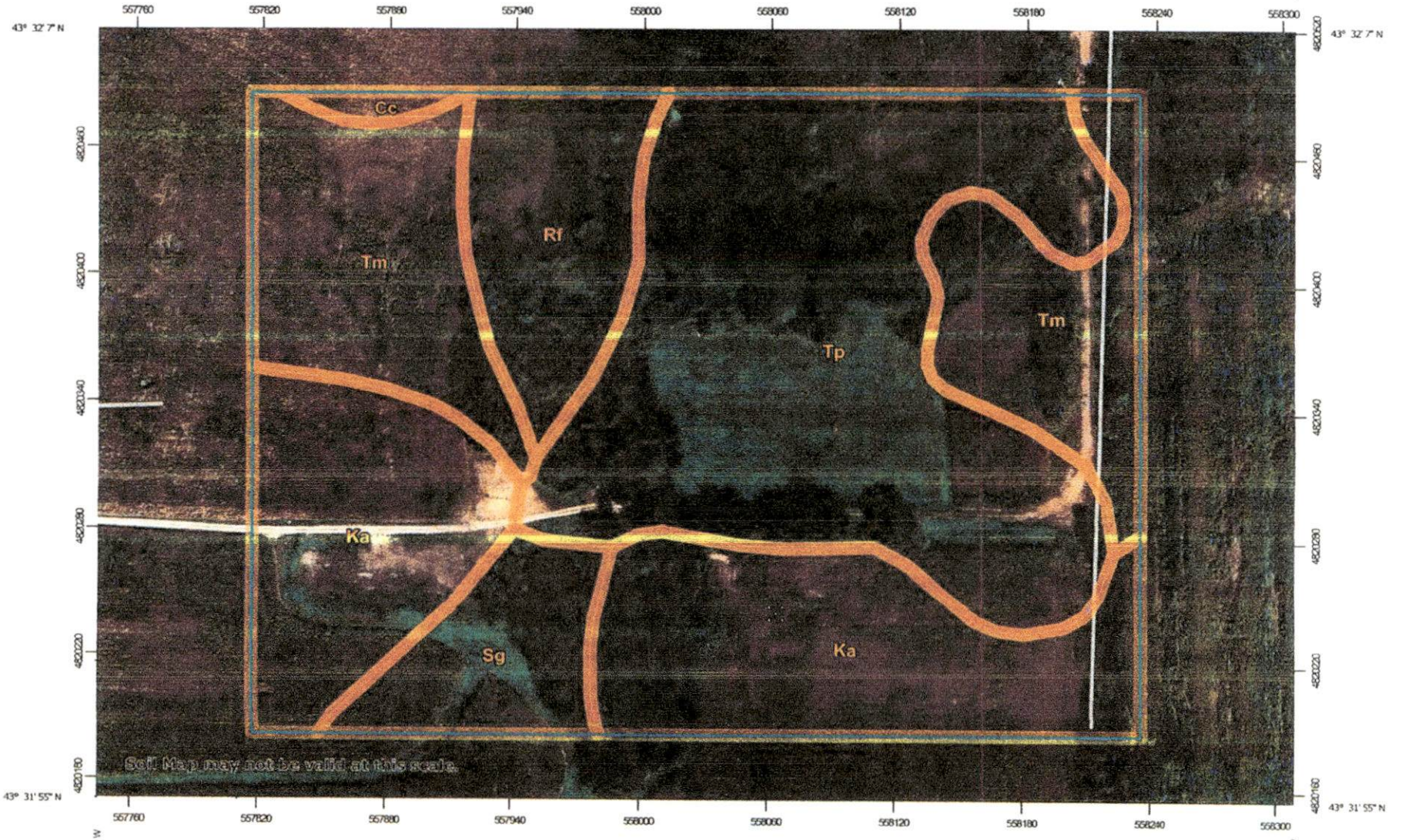
1968 Aerial Photo



Attachment E

NRCS Web Soil Survey

Soil Map—Fillmore County, Minnesota
(Proposed sand pit)



Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fillmore County, Minnesota
Survey Area Data: Version 17, Sep 10, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 5, 2021—Oct 15, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cc	Chelsea and Boone loamy fine sands, 2 to 6 percent slopes	0.2	0.7%
Ka	Kasson silt loam, 0 to 1 percent slopes	8.9	28.2%
Rf	Renova silt loam, 0 to 1 percent slopes	2.7	8.7%
Sg	Skyberg silt loam, 0 to 3 percent slopes	2.0	6.3%
Tm	Mantorville and Wykoff loams, 2 to 6 percent slopes	6.4	20.4%
Tp	Mantorville and Wykoff sandy loams, 2 to 6 percent slopes	11.3	35.7%
Totals for Area of Interest		**31.5**	**100.0%**

Proposed Tile
Name

0 0.13 0.25
miles

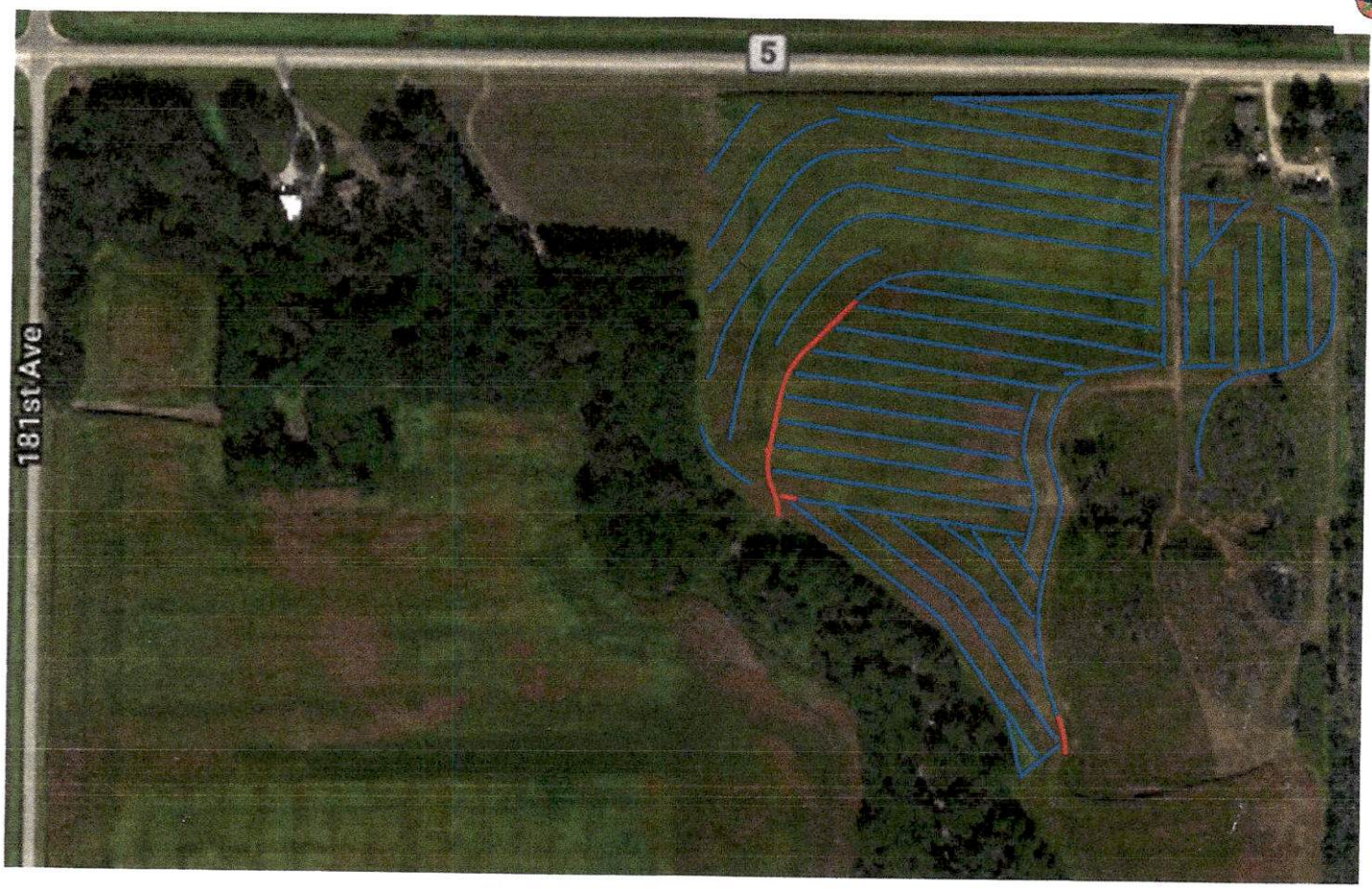
MEHMERT TILING INC
8635 Hwy. 9 Lime Springs, Iowa 52155-8070
Tele. (563) 547-5115
Or (641) 985-4076

Client: Beer Farms
Farm: York 21
Field: Proposed Tile
Name: Oct 2020
Start Date: 11/3/2020
End Date: 11/4/2020

- 4 Inch Tile
- 5 Inch Tile
- 6 Inch Tile
- 6 Non Perf Inch Tile
- 8 Inch Non Perf Tile
- PIPELINE !!!!!

Trimble

New Tile
Name



0 500 1000
feet

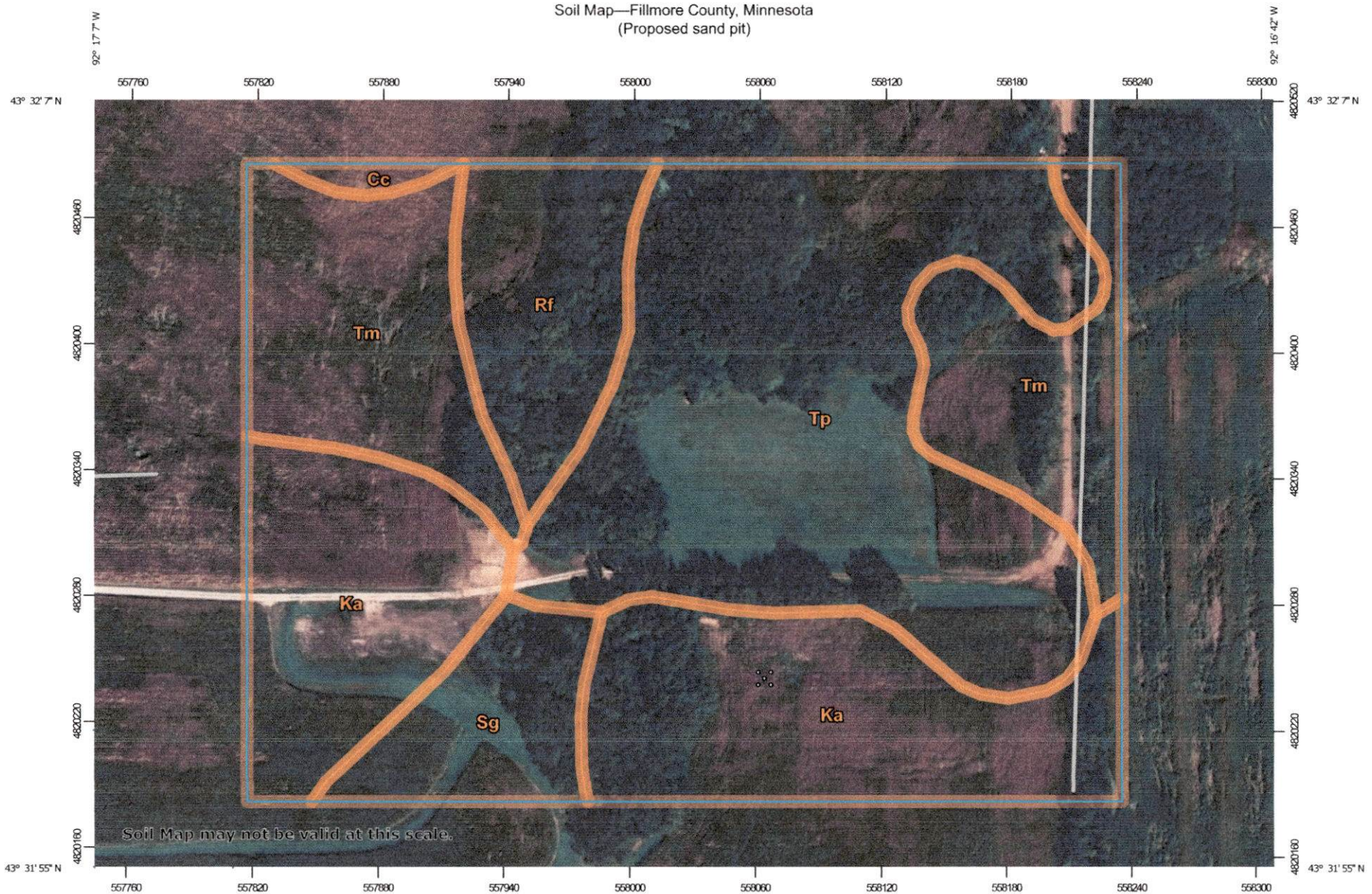
MEHMERT TILING INC
8635 Hwy. 9 Lime Springs, Iowa 52155-8070
Tele. (563) 547-5115
Or (641) 985-4076

Client: Wilson, Don
Farm: York 21 - Gehrking
Field: New Tile
Name: December 2015
Date: 12/31/2015

4 inch tile
5 inch tile

Trimble

Soil Map—Fillmore County, Minnesota
(Proposed sand pit)



Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 35 70 140 210

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fillmore County, Minnesota
Survey Area Data: Version 17, Sep 10, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 5, 2021—Oct 15, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cc	Chelsea and Boone loamy fine sands, 2 to 6 percent slopes	0.2	0.7%
Ka	Kasson silt loam, 0 to 1 percent slopes	8.9	28.2%
Rf	Renova silt loam, 0 to 1 percent slopes	2.7	8.7%
Sg	Skyberg silt loam, 0 to 3 percent slopes	2.0	6.3%
Tm	Mantorville and Wykoff loams, 2 to 6 percent slopes	6.4	20.4%
Tp	Mantorville and Wykoff sandy loams, 2 to 6 percent slopes	11.3	35.7%
Totals for Area of Interest		**31.5**	**100.0%**

Fillmore County, Minnesota

Tp—Mantorville and Wykoff sandy loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2ddrs
Elevation: 700 to 1,900 feet
Mean annual precipitation: 31 to 39 inches
Mean annual air temperature: 41 to 50 degrees F
Frost-free period: 120 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Mantorville and similar soils: 55 percent
Wykoff and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mantorville

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 7 inches: sandy loam
2Bw - 7 to 17 inches: sandy loam
2C - 17 to 60 inches: gravelly sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Forage suitability group: Unnamed (G105XS022MN)
Other vegetative classification: Unnamed (G105XS022MN)
Hydric soil rating: No

Description of Wykoff

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 7 inches: sandy loam
Bt1 - 7 to 17 inches: sandy loam
Bt2 - 17 to 30 inches: gravelly loamy sand
C - 30 to 60 inches: sand

Properties and qualities

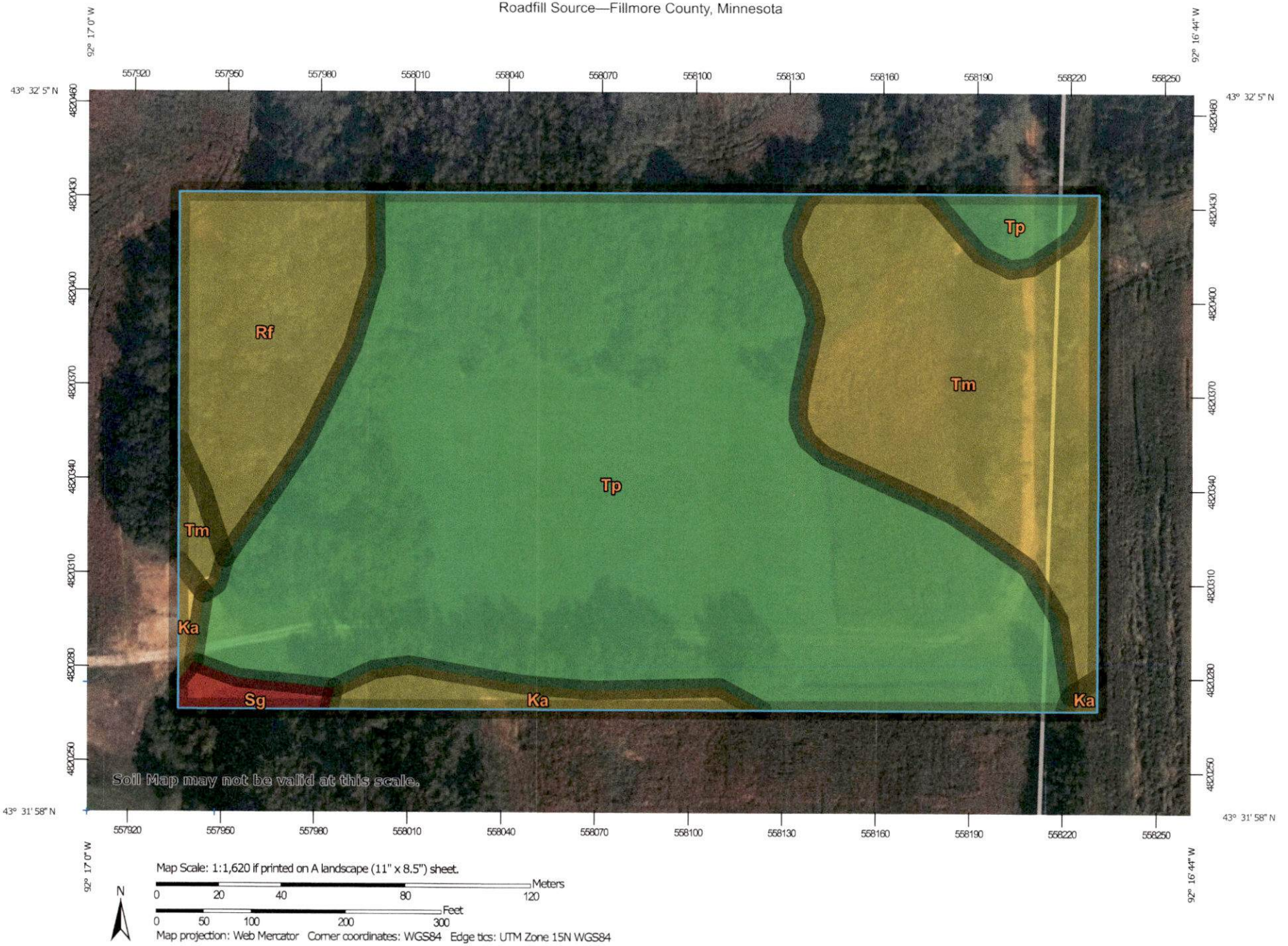
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Forage suitability group: Unnamed (G105XS022MN)
Other vegetative classification: Unnamed (G105XS022MN)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fillmore County, Minnesota
Survey Area Data: Version 17, Sep 10, 2021



Map Scale: 1:1,620 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Poor
- Fair
- Good
- Not rated or not available

Soil Rating Lines

- Poor
- Fair
- Good
- Not rated or not available

Soil Rating Points

- Poor
- Fair
- Good
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fillmore County, Minnesota
Survey Area Data: Version 17, Sep 10, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 5, 2021—Oct 15, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Roadfill Source

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Ka	Kasson silt loam, 0 to 1 percent slopes	Fair	Kasson (90%)	Low strength (0.22)	0.4	2.9%
				Wetness (0.53)		
				Dusty (0.79)		
				Shrink-swell (1.00)		
Rf	Renova silt loam, 0 to 1 percent slopes	Fair	Renova (90%)	Dusty (0.82)	1.3	10.7%
Sg	Skyberg silt loam, 0 to 3 percent slopes	Poor	Skyberg (95%)	Wetness (0.00)	0.1	1.0%
				Low strength (0.78)		
				Dusty (0.82)		
			Clyde (5%)	Wetness (0.00)		
				Dusty (0.79)		
				Shrink-swell (1.00)		
Tm	Mantorville and Wykoff loams, 2 to 6 percent slopes	Fair	Mantorville (55%)	Dusty (0.98)	2.4	20.2%
Tp	Mantorville and Wykoff sandy loams, 2 to 6 percent slopes	Good	Mantorville (55%)		7.8	65.2%
			Wykoff (45%)			
Totals for Area of Interest					**12.0**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Good	7.8	65.2%
Fair	4.1	33.9%
Poor	0.1	1.0%
Totals for Area of Interest	**12.0**	**100.0%**

Description

Roadfill is soil material that is excavated in one place and used in road embankments in another place. The soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments. The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The soils are rated "good," "fair," or "poor" as potential sources of roadfill. The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential). Normal compaction, minor processing, and other standard construction practices are assumed.

Numerical ratings between 0.00 and 0.99 are given after the specified features. These numbers indicate the degree to which the features limit the soils as sources of roadfill. The lower the number, the greater the limitation.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.