

AGGREGATE RESOURCES

DODGE COUNTY, MINNESOTA

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AGGREGATE POTENTIAL: For the purpose of this project, aggregate potential is defined as an assessment of the relative probability that an aggregate deposit exists within a given area, with almost all emphasis placed upon geologic evidence, parameters, and interpretation at the reconnaissance level, rather than upon economic feasibility evaluation or other parameters. This assessment does not imply that economic aggregate deposits exist everywhere within a given map unit designated as "Potential Sand and Gravel Resources" or "Potential Crushed Stone Resources." Rather, that within such a map unit, geologic processes were active that could have created aggregate deposits at specific sites. Geologic measurements of aggregate deposits remain constant, but economic criteria and environmental permitting vary across time and place. Important site-specific factors such as ownership, zoning, protected waters and wetlands, environmental permitting, distance to markets, royalties, and individual site characteristics, such as access, all contribute to the final "potential" of a specific parcel; however, these factors were not included in this study.

POTENTIAL SAND AND GRAVEL RESOURCES: Geologic units that are inferred to contain sand and gravel. These units exhibit the geologic characteristics that typically produce sand and gravel deposits. Existing gravel pit and MNDOT aggregate sources lying within these units indicate identified or known resources. The geologic units having potential for sand and gravel include alluvial features (flood plains, terraces, fans) and glacial outwash features (channels and terraces). These units typically contain sorted sand and gravel with little silt or clay.

HIGHLY DESIRABLE SAND AND GRAVEL DEPOSITS: Fluvial deposits, such as alluvium, alluvial fans, and floodplains, and glaciofluvial deposits, such as outwash terraces and channels. These deposits are moderately large to very large in areal extent. These deposits consist of sand and gravel with thicknesses typically ranging from 20 to 50 feet with less than 5 feet of overburden. The probability that a potential sand and gravel deposit exists within this unit is high to very high. The textural characteristics of these deposits are moderately good to good. The quality ranges from moderately high to high relative to all deposits within Dodge County.

MODERATELY DESIRABLE SAND AND GRAVEL DEPOSITS: Fluvial deposits, such as alluvial terraces and floodplains, and glaciofluvial deposits, such as outwash terraces and channels. These deposits are moderate to large in areal extent with sand and gravel thicknesses typically ranging from 10 to 50+ feet with less than 10 feet of overburden. The probability that a potential sand and gravel deposit exists within this unit is moderately high to high. The textural characteristics of these deposits are moderately good to good with the quality ranging from moderately high to high.

LESS DESIRABLE SAND AND GRAVEL DEPOSITS: Glaciofluvial features, such as fans, deltas, channels, and terraces; ice-contact features, such as eskers and lake plains; and alluvial features such as flood plains, terraces, and fans. These deposits are moderately small to very large in areal extent and consist of sand and fine sand with thicknesses ranging from 0 to 25 feet with overburden thicknesses between 0 to 25 feet. The probability that a potential sand and gravel deposit exists within this unit is moderate to very high. The textural characteristics of these deposits are moderately poor to moderately good with the quality ranging from moderate to high.

POTENTIAL CRUSHED STONE RESOURCES: Limestone bedrock formations suitable for producing crushed stone. These units are inferred to be thick (20 to 100+ feet), with overburden thickness of less than 40 feet. Quarries located within these units indicate identified or known resources.

HIGHLY DESIRABLE CRUSHED STONE DEPOSITS: Limestone bedrock units that are identified as Prosser/Stewartville members of the Galena Formation. These units are greater than 40 feet thick, with overburden thickness of less than 20 feet. The quality of these units is good, with mostly massive bedding containing very thin to thin shale partings every 6 inches to 2 feet.

MODERATELY DESIRABLE CRUSHED STONE DEPOSITS: Limestone bedrock units that are identified as Prosser/Stewartville members of the Galena Formation. These units are greater than 40 feet thick, with overburden thickness ranging from 20 to 30 feet. The quality of this unit is good, with mostly massive bedding containing very thin to thin shale partings every 6 inches to 2 feet.

LESS DESIRABLE CRUSHED STONE DEPOSITS: Limestone bedrock units that are identified as Prosser/Stewartville and Cummingsville members of the Galena Formation. The Prosser/Stewartville member ranges from 0 to 40+ feet thick, with overburden thickness ranging from 30 to 40 feet. The quality of this unit is good, with mostly massive bedding containing very thin to thin shale partings every 6 inches to 2 feet. The Cummingsville member is no greater than 75 feet thick, with overburden thickness ranging from 0 to 20 feet. The quality of this limestone is moderately poor because it contains beds of shale that are 2 inches to 2 feet thick.

LIMITED POTENTIAL FOR AGGREGATE RESOURCES: Units that generally have little or no potential for significant aggregate resources. These units exhibit geologic characteristics that are typically not consistent with significant aggregate deposits. The geologic units having limited potential include glacial lake plains, moraines, small alluvial deposits, or bedrock with overburden thicknesses greater than 50 feet. These units typically contain clay, silt, fine sand, unsorted sediments (fill), or very thin layers of sand and gravel. These units may include aggregate deposits that are too small to map.

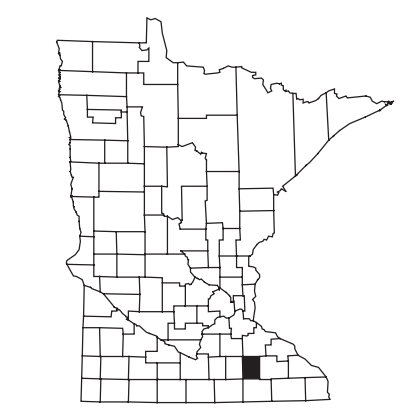
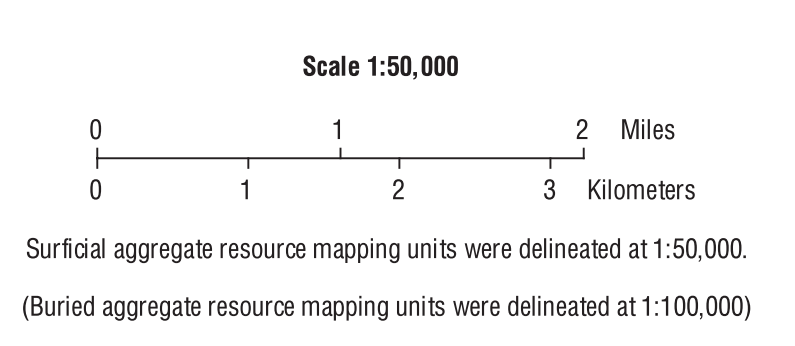
LIMITED POTENTIAL FOR AGGREGATE DEPOSITS: Units that include glacial features such as collapsed glaciofluvial channels, till plains, moraines, glacial lake beds, and small alluvial features such as flood plains and streams. The probability that a potential aggregate deposit exists within this unit is very low to moderate. The aggregate deposits occurring in this unit are moderate to very small in areal extent and typically consist of finer material (sand with some gravel). The thickness of these aggregate deposits are typically less than 25 feet, with overburden thicknesses sometimes reaching over 100 feet. The textural characteristics are poor to moderate with the quality ranging from low to moderate. These units also contain bedrock units with an overburden thickness of greater than 50 feet.

IDENTIFIED AGGREGATE RESOURCES: Areas where aggregate resources (sand, gravel, and/or crushed stone) have been or are currently being mined. Pit and quarry locations have been gathered from several different sources, including topographic maps, aerial photographs, county records, county highway department maps, soil surveys, MNDOT files, fieldwork, gravel operators, and other miscellaneous sources. The pits and quarries range in size from less than 1 acre to greater than 50 acres and may be active, inactive, depleted, or reclaimed. Some quarries near the Mantorville area started as gravel pits and expanded as quarries. The aggregate quality of the pits varies.

- **Gravel Pits:** Locations were gathered from several different reference sources. Any given pit may be active, inactive, depleted, or reclaimed. The color indicates the relative size of the pit.
 - Large - larger than 10 acres.
 - Medium - larger than a few acres.
 - Small - less than an acre.
- **Gravel Pits - MNDOT files:** Locations gathered from the Minnesota Department of Transportation's Aggregate Source Information System (ASIS) listing of aggregate sources. Test hole logs, sieve, and quality test data are available. The color indicates the relative size of the pit.
 - Large - larger than 10 acres.
 - Medium - larger than a few acres.
 - Small - less than an acre.
- ★ **Quarries:** Limestone quarries. Any given quarry may be active, inactive, depleted, or reclaimed.

- OTHER FEATURES:**
- **WETLANDS:** Wetland area.
 - **WATER:** Lakes or rivers.

¹ Areal Extent - the size, horizontal extent, or distribution of a unit (e.g., area in acres).
² Probability - the degree of certainty that aggregate exists within an mapping unit.
³ Textural Characteristics - particle size distribution - the percent of gravel or sand vs. silt or clay (e.g., sieve analysis).
⁴ Quality - the characteristics of the material - soundness (e.g., magnesium sulfate test), durability (Los Angeles rather test), and mineral makeup (percent deleterious material such as shale, iron oxide, and unsorted chert).



Base map data sources:
 Lakes, wetlands, and rivers from National Wetland Inventory, U.S. Fish and Wildlife Service, compiled at 1:24,000 from aerial photography (1979-1988) and spot field checked.
 Public Land Survey - PLS Project, 2001, Minnesota Department of Natural Resources, Division of Lands and Minerals.
 Roads were obtained from Dodge County in September of 2002.
 Civil Townships and Municipal Boundaries from MNDOT BaseMap 2001 - Data layers Createp and Muni, Minnesota Department of Transportation, BaseMap Development Group, Surveying and Mapping Section.

GIS database design and cartography by Renee Johnson. Database assistants by Erika Rowe.
 Field and drilling assistance by Rico Rihikoma, Doug Rosna, Al Duzak, Mike Ellett, and Pat Geseleman.

Aggregate Resources:
 Aerial photograph interpretation, field work, and delineation of mapping units by Heather E. Anderson, 2001-2002, County Aggregate Mapping Program, Division of Lands and Minerals, Minnesota Department of Natural Resources. Source information included aerial photographs from NAPP (National Aerial Photography Program), 1991-1992, 9" x 9" color infrared photos at 1:40,000; Digital Orthophoto Quads (DOQs) at 1:24,000 from USGS (United States Geological Survey); Digital Raster Graphics at 1:24,000 from USGS; 7.5-minute USGS topographic quadrangles at 1:24,000 (dating from 1962-1982); and a digital version of the Soil Survey of Dodge County, 1961, from the USDA-NRCS (United States Department of Agriculture - National Resources Conservation Service), imported into the Soil Survey Information System (SSIS) format by the University of Minnesota, Department of Soil, Water, and Climate.