Minnesota Department of Natural Resources
County Geologic Atlas Program
mndnr.gov/groundwatermapping

Hydrogeologic Cross Sections

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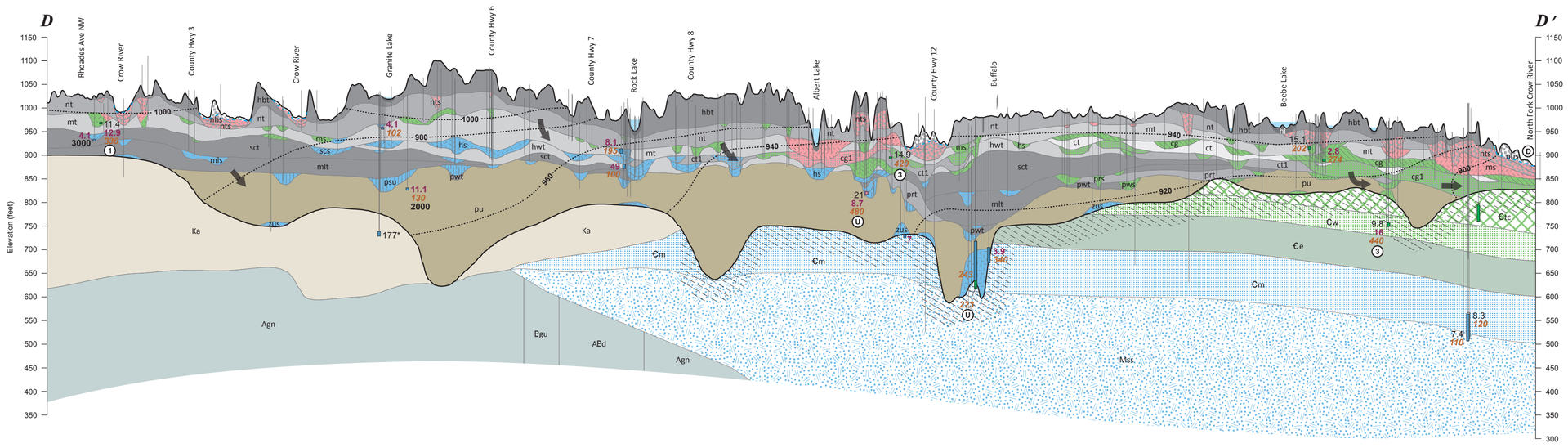
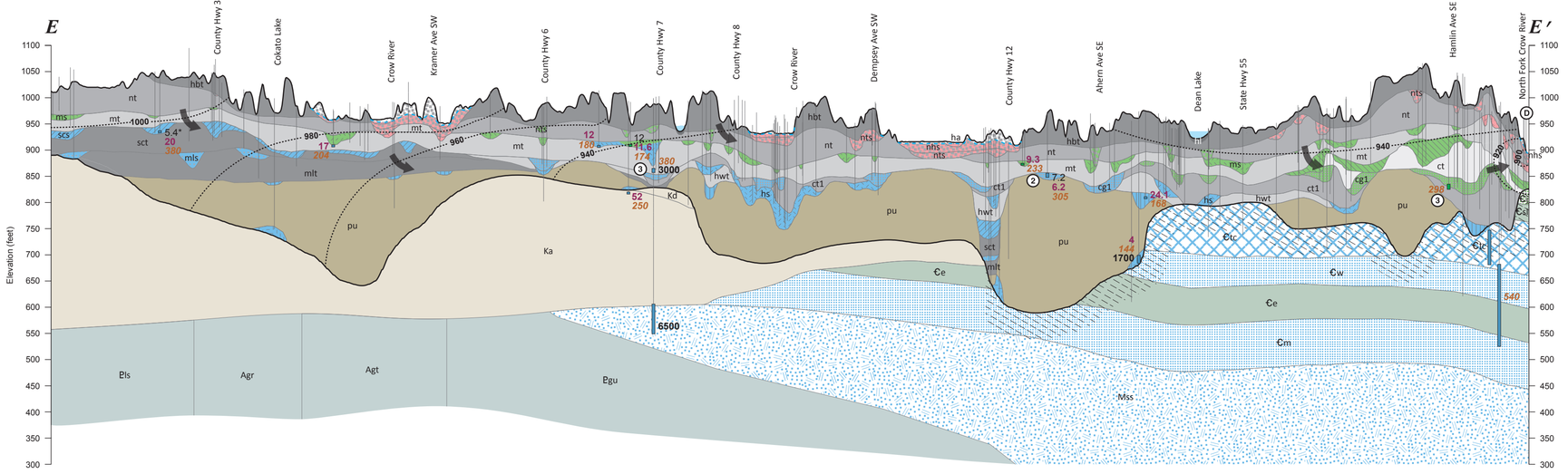
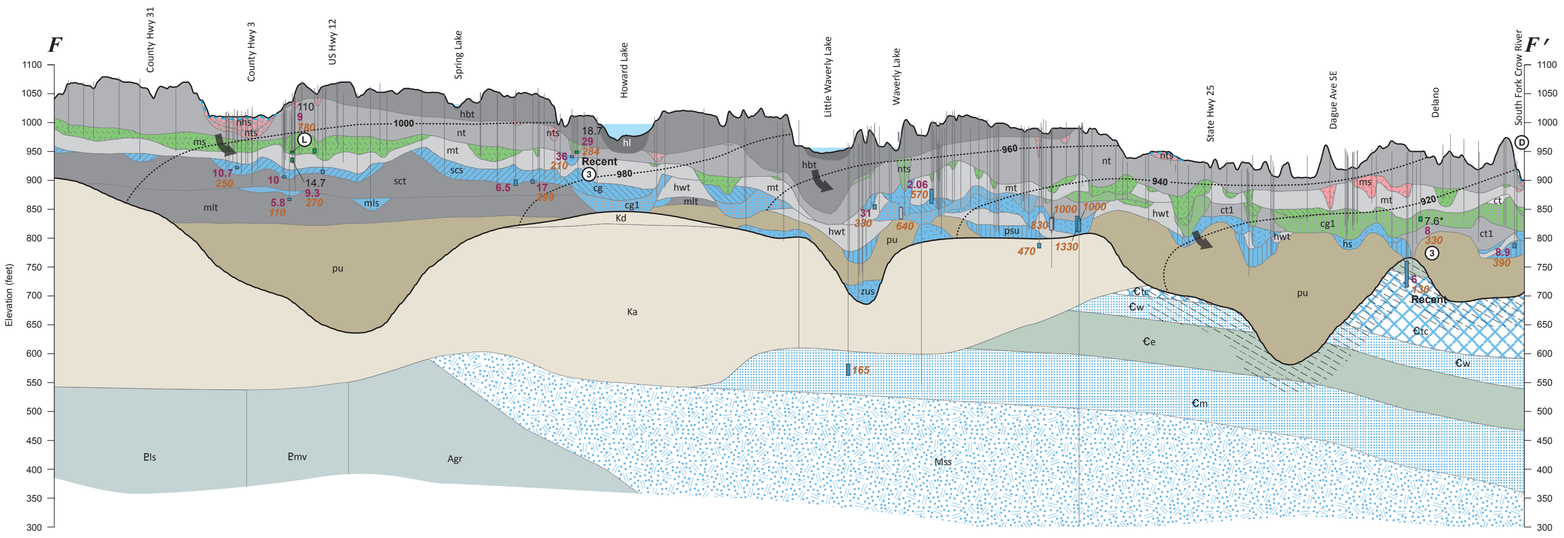
2018

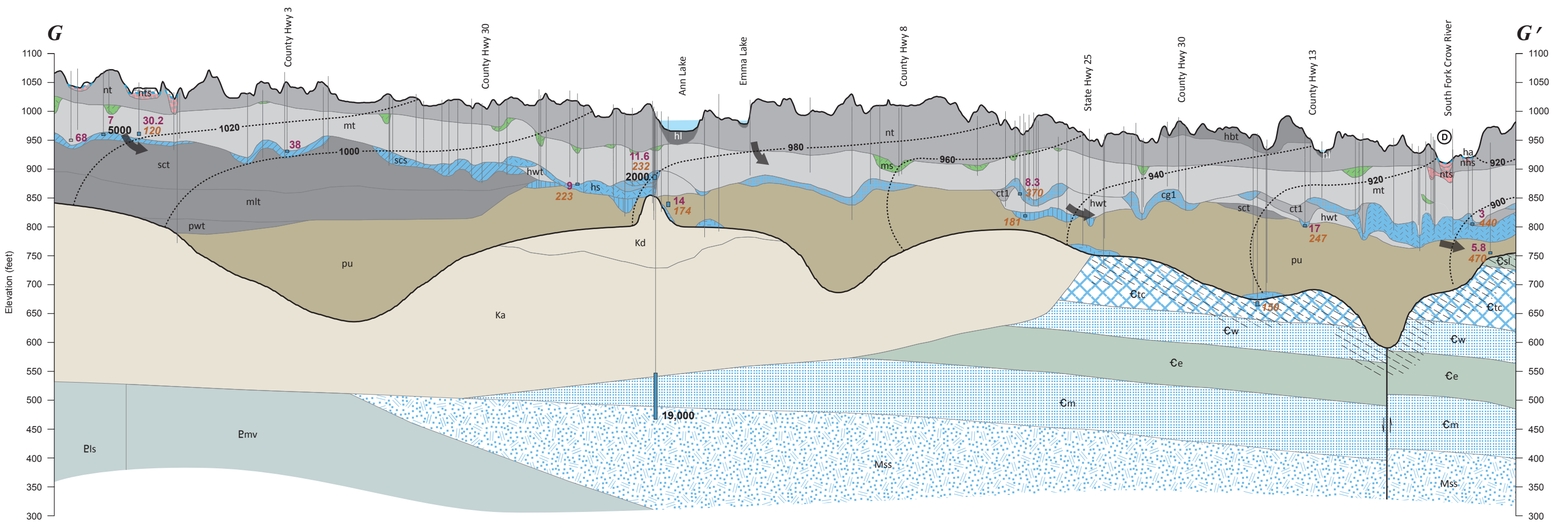
Geologic Atlas of Wright County
County Atlas Series C-30, Part B
Plate 9 of 9
Hydrogeologic Cross Sections
D–D′ through G–G′

To accompany the atlas Report, Plate 7, and Plate 8.









Cross Section D–D′

Loam till is the dominant geologic material at the land surface except in three areas located in the west, central, and east portions of the cross section, where coarse-textured deposits allow recent tritium-age water to migrate from the surface to underlying shallow buried sand aquifers. Aquifers are connected at these locations, with few or no intervening till layers to impede vertical migration of water. Recharge along the rest of the cross section is more limited, as the loamy tills of the Heiberg Member (hbt) and Villard Member (nt) at the land surface have relatively low hydraulic conductivity. Vintage tritium-age water was present in the west and central regions at depths of approximately 100 to 150 feet below the land surface. Water collected from a buried sand aquifer (scs) near Rhoades Avenue NW had a calculated carbon-14 residence time of 3,000 years. Another sample from a buried sand aquifer (psu) collected east of Granite Lake had a calculated carbon-14 residence time of 2,000 years.

In the east, recent and mixed tritium-age signatures were found in buried sand aquifers and upper bedrock aquifers at depths of approximately 150 to 175 feet below the land surface. In general, vintage tritium-age water was present at depths greater than 200 feet below the land surface. Mixed tritium-age water was found roughly 350 feet below the land surface in the Buffalo area that is inconsistent with the tritium ages determined from surrounding wells; its result is unclear.

Groundwater flow depicted as equipotential lines is both vertically downward and east toward the regional groundwater discharge zone, the North Fork Crow River. Local groundwater flow is toward lakes such as Albert and Beebe lakes and toward smaller streams.

Cross Section E–E′

Three areas of coarse-textured sediments near Kramer Ave SW, and County Highways 8 and 12, appear to allow recent tritium-age water to migrate from the surface to underlying shallow buried sand aquifers. Aquifers are connected in these locations, with little or no intervening till to impede vertical migration of water. Recharge and connectivity to the land surface along the rest of the cross section is more limited, as the loamy tills of the Heiberg Member (hbt) and Villard Member (nt) have relatively low hydraulic conductivity. Vintage tritium-age water was present in the west and central regions at depths of approximately 100 to 150 feet below the land surface. Water was collected from two vintage tritium-age wells near County Highway 7. The buried sand aquifer (cg1) in this location had a calculated carbon-14 residence time of 3,000 years and a well completed in the Mesoproterozoic bedrock aquifer (Mss) had a calculated carbon-14 residence time of 6,500 years.

In the east, mixed tritium-age groundwater was found in buried sand aquifers at depths ranging between 80 and 160 feet below the land surface. In general, vintage tritium-age water was present at depths greater than 200 feet below the land surface. Water collected west of Dean Lake with vintage tritium age had a calculated carbon-14 residence time of 1,700 years.

Groundwater flow depicted as equipotential lines is both vertically downward and east toward the regional groundwater discharge zone, the North Fork Crow River. Local groundwater flow is toward lakes such as Dean Lake and toward smaller streams.

Cross Section F–F′

Loam till is the dominant geologic material at the land surface along this cross section. However, in two small areas near County Highway 3 and State Highway 25, coarse textured deposits allow recent tritium age-water to migrate from the surface to underlying shallow buried sand aquifers. Near County Highway 3, aquifers are connected, with no intervening till to impede vertical migration of water. Recharge along the rest of the cross section is more limited, as the loamy tills of the Heiberg Member (hbt) and Villard Member (nt) at the land surface have relatively low hydraulic conductivity.

In general, vintage tritium-age water was present across the cross-section line below the Moland Member (mt) till at depths of approximately 100 to 150 feet below the land surface. Some exceptions occur: vintage tritium-age water was found above the mt till in the Howard Lake area and mixed tritium-age water was found below the mt till near Delano. Carbon-14 residence time was calculated from two wells: <100 years (recent) for the nts buried sand aquifer in the Howard Lake area, and <100 years (recent) for an Upper Tunnel City aquifer from the east side.

Groundwater flow depicted as equipotential lines is both vertically downward and east toward the regional groundwater discharge zone, the South Fork Crow River. Local groundwater flow is toward lakes such as Howard and Waverly lakes and toward smaller streams.

Cross Section G–G′

Loam till is the dominant geologic material at the land surface along this cross section. However, near the South Fork Crow River, recent tritium-age water can migrate from the surface to an underlying shallow buried aquifer. The aquifers are connected in this location, with no intervening till to impede vertical movement of water. Recharge along the rest of the cross section is more limited, as the loamy till of the Heiberg Member (hbt) and Villard Member (nt) at the land surface have relatively low hydraulic conductivity. No recent or mixed tritium-age water was sampled along this line. Vintage tritium-age water was present at depths of approximately 100 to 150 feet below the land surface. A buried sand aquifer (scs) sample near the west edge had a calculated carbon-14 residence time of 5,000 years, highlighting the limited recharge through the tills in the west portion of the county. Two vintage tritium-age wells west of Ann Lake were tested for carbon-14 analysis, resulting in 2,000 years for the buried sand aquifer (cg) and 19,000 years for the Mt. Simon aquifer.

Groundwater flow depicted as equipotential lines is both vertically downward and east toward the regional groundwater discharge zone, the South Fork Crow River. Local groundwater flow is toward lakes such as Ann Lake and toward smaller streams.

CROSS SECTION EXPLANATION

Aquifers and aquitards grouped by stratigraphy

Interpreted tritium age is indicated by background color

Interpreted tritium age is indicated by pattern color

Quaternary unconsolidated sediment
(see Figure 6 in the report for geologic unit correlation)

Surficial sand and gravel
- ha

Buried aquifers and aquitards
- hl*
- hbt*
- nhs, nts
- nt*
- ms
- mt*
- cg
- ct*
- cg1
- ct1*
- hs
- hwt*
- scs
- sct*
- mls
- mlt*
- prs
- prt*
- pws
- pwt*
- psu
- pu
- zus

*aquitard

Quaternary aquitards

Grouped by texture ranging from highest to lowest sand content indicating relative hydraulic conductivity.

Geologic unit code	Percent sand
ct	>60%
hwt, mt	>50% and ≤60%
ct1, nt, prt	>40% and ≤50%
hbt, pwt, sct, mlt	>30% and ≤40%
hl	≤30%

Bedrock
- Kd Dakota
- Ka Unnamed
- Cj Jordan
- Csl St. Lawrence Formation*
- Ctc Upper Tunnel City
- Cw Wonewoc
- Ce Eau Claire Formation*
- Cm Mt. Simon
- Mss Mesoproterozoic (includes Hinckley, Fond du Lac, and Solor Church)
- Precambrian crystalline bedrock (includes Agn, Agr, Agt, APd, Pgu, Pls, Pmv)

*aquitard

Tritium age

Darker color in small vertical rectangle (well screen symbol) indicates tritium age of water sampled in well. Lighter color indicates interpreted age of water in aquifer.
- Recent: water entered the ground since about 1953 (8 to 15 tritium units [TU]).
- Mixed: water is a mixture of recent and vintage waters (greater than 1 TU to less than 8 TU).
- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.

Symbols and labels
- 7.2 Chloride: if shown, concentration is ≥5 ppm. (* indicates naturally elevated values)
- 29 Arsenic: if shown, concentration is ≥2 ppb.
- 250 Manganese: if shown, concentration is ≥100 ppb.
- 5000 Carbon-14 (^{14}C): if shown, estimated groundwater residence time in years.
- General groundwater flow direction
- ···· 900 ···· Approximate equipotential contour; contour interval 20 feet
- Geologic contact
- Land or bedrock surface
- Water table
- Direction of fault movement, arrows indicate relative movement
- Enhanced-permeability zone

Groundwater conditions
- (1) Water from the surface moves through a thin layer of overlying fine-grained material to an underlying aquifer.
- (2) Groundwater moves from an overlying surficial aquifer to a buried aquifer.
- (3) Groundwater moves from an overlying buried aquifer to an underlying buried aquifer.
- (L) Groundwater flows laterally.
- (U) Groundwater flowpath is unknown.
- (D) Groundwater discharges to a surface-water body.

SCALE 1:100 000
VERTICAL EXAGGERATION X 50
1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 6 7 8 9 KILOMETERS

This map was compiled and generated in a geographic information system. Digital data products are available on the DNR County Geologic Atlas Program page (mndnr.gov/groundwatermapping).

This map was prepared from publicly available information. Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based. However, the DNR does not warrant the accuracy, completeness, or any implied uses of these data. Users may wish to verify critical information. Sources include both the references in the report and information on file in the offices of the Minnesota Geological Survey and the DNR. Every effort has been made to ensure the interpretation shown conforms to sound geologic and cartographic principles. This map should not be used to establish legal title, boundaries, or locations of improvements.

Base modified from Minnesota Geological Survey, Wright County Geologic Atlas, Part A, 2013.

Universal Transverse Mercator projection, zone 15N, North American Datum of 1983. North American Vertical Datum of 1988.

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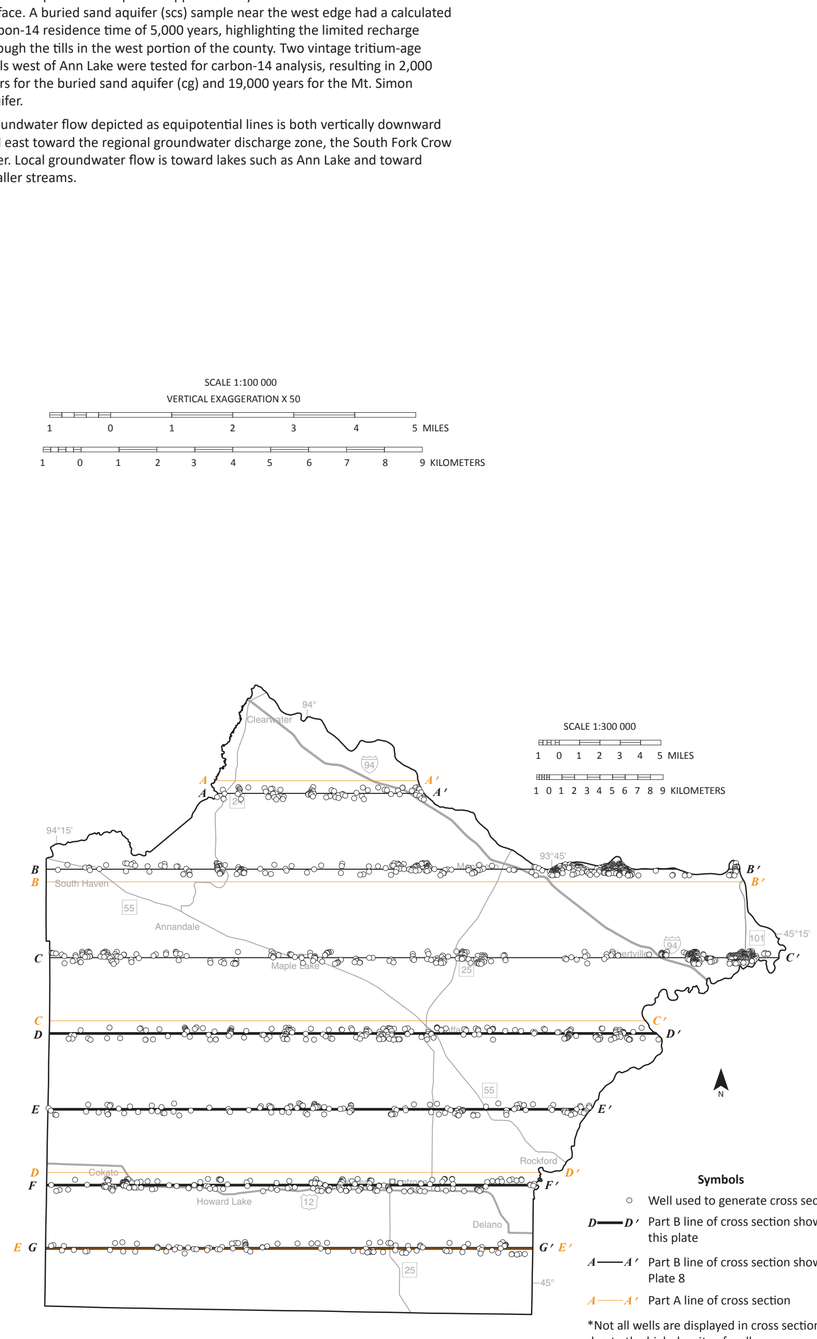

Prepared and published with the support of
the Minnesota Environment and Natural Resources Trust Fund and the Clean Water, Land and Legacy Amendment