Chisago County Cross Section Supplement

This supplement assists users with the visualization of aquifer units present in Chisago County, Minnesota. It was compiled using data developed for the Part A and Part B Geologic Atlases of Chisago County, Minnesota (C-22). Stratigraphic interpretation of unconsolidated Quaternary sediments by Gary Meyer of the Minnesota Geological Survey of the University of Minnesota (MGS). Interpretation of bedrock surfaces and extent by Tony Runkel and Terrence Boerboom of the MGS. Hydrogeologic interpretation John Barry of the Minnesota Department of Natural Resources (DNR). GIS, cartography, and graphic design by Holly Johnson of the DNR.

This document includes a map of the county depicting hydrogeologic cross section line locations and aquifer test locations. Cross section lines are located at 0.6 mile (1 km) intervals. Wells within 500 meters north and south of each line were used to determine the contacts between geologic units along the line. Cross sections are shown with a vertical exaggeration of 50x. Bold brightly colored lines depict mapped buried sand and gravel aquifers. Bold black lines depict the top of bedrock and geologic contacts of underlying bedrock units (ignore the thin brown stratigraphic boundary lines that are below the top of bedrock). The cross sections also show the well locations used to develop the cross sections and road locations to be used as land surface reference marks. Click on a cross section number to jump to the corresponding cross section.

Five of the cross sections were developed for the Chisago County Part B atlas. These select cross sections depict a more detailed final product and include a legend to allow the user to interpret additional information such as groundwater residence time and groundwater flow direction. Published cross sections are denoted in plan view with an asterisk next to the cross section line number. It is not feasible to offer all cross sections in this supplement with the same level of detail.

Figure 1 differentiates buried sand and gravel aquifer units from non-aquifer till units and Figure 2 shows the sequence of bedrock geologic units, hydrogeologic units, and hydrogeologic unit properties present in the county. Table 1 lists specific capacity and transmissivity values for aquifers in the county. Specific capacity data were determined from short-term pumping or well development tests performed when the well was drilled. Values listed in the table are from information listed in the County Well Index and include data for all wells with a casing diameter greater than or equal to 12 inches. Pumping data for smaller diameter wells are included in Table 1 because no large diameter wells are constructed in the surficial aquifer or Mesoproterozoic volcanic rock. Wells included in Table 1 were pumped for at least four hours and had a pumping water level a minimum distance of at least two feet above the well screen and inside the casing. Transmissivity data were calculated from longer-term aquifer tests conducted for the Minnesota Department of Health.

This document can be found at http://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/chiscga.html.
Chisago County:
Cross Section Line Locations
and Aquifer Test Locations

Click the cross section line number to jump to that cross section line in the document.
**Figure 1.** Quaternary buried sand and gravel aquifers are shown as patterns, aquitard units are shown as shades of gray, and undifferentiated Pleistocene sediment is shown in brown. Aquitards are low-permeability till and other fine-grained units that restrict groundwater movement. Buried sand and gravel aquifers are outlined in the color shown on the cross sections.

**Figure 2.** Sequence of bedrock geologic units, hydrogeologic units, and hydrogeologic unit properties in Chisago County.
Table 1. Specific capacity from well development tests and transmissivity from aquifer tests for selected large-capacity wells.
[gpm/ft, gallons per minute per foot; gpd/ft, gallons per day per foot; dash marks (--) indicate no data available]

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Specific Capacity (gpm/ft)</th>
<th>Transmissivity from Aquifer Test (gpd/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Diameter (inches)</td>
<td>Mean</td>
</tr>
<tr>
<td>Surficial sand</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Buried sand and gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sl</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>sc</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>se</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>sx</td>
<td>12–18</td>
<td>7</td>
</tr>
<tr>
<td>qu</td>
<td>18</td>
<td>102</td>
</tr>
<tr>
<td>Bedrock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Peter–Prairie du Chien–Mt. Simon</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Upper Tunnel City–Eau Claire</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Upper Tunnel City–Wonewoc</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Wonewoc</td>
<td>18</td>
<td>47</td>
</tr>
<tr>
<td>Wonewoc–Mt. Simon</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Mt. Simon</td>
<td>12–18</td>
<td>17</td>
</tr>
<tr>
<td>Mt. Simon–Hinckley</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>Volcanic rock</td>
<td>6</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Wells selected for inclusion in the table were pumped for at least four hours and had a pumping water level a minimum distance of at least two feet above the well screen and inside the casing.

1Data adapted from the County Well Index.
2Data adapted from aquifer tests conducted for the Minnesota Department of Health.
3Less than 12-inch diameter wells constructed in surficial sand aquifer or Mesoproterozoic volcanic rock.
4Well constructed across more than one aquifer.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

7.2 Land surface

Bedrock contact

Stratigraphic boundary

Well location

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sc
- sr
- sp

Aquifers grouped by stratigraphy

EXPLANATION FOR CROSS SECTION

Surficial sand

Buried sand and gravel

Elevation (feet above sea level)

Symbols and labels

Well location

Land surface

Stratigraphic boundary

Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

Recent: water entered the ground since about 1953 (8–15 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.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sc
- sx
- sr
- sp

Aquifers grouped by stratigraphy

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.
**Chisago County Cross Section Supplement**

**EXPLANATION FOR CROSS SECTION**

**Aquifers grouped by stratigraphy**
- Surficial aquifer
  - Surficial sand
- Buried sand and gravel aquifers
  - sl
  - sx
  - sc
  - sr
  - se
  - sp

**Symbols and labels**
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact
- 21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
- 7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000 If shown, groundwater residence time in years, estimated by carbon-14 (\(^{14}\)C) isotope analysis

**Tritium age**
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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.

See next page for complete explanation.
Aquifers grouped by stratigraphy

- **Surficial aquifer**
  - Surficial sand
  - Buried sand and gravel aquifers
  - Surficial sand
  - Scarp
  - Surficial gravel

- **Buried sand and gravel aquifers**
  - Surficial sand
  - Scarp
  - Surficial gravel

- **Sedimentary bedrock aquifers**
  - Jordan
  - Upper Tunnel City
  - Wonewoc
  - Mt. Simon
  - Undifferentiated Mesoproterozoic
  - Enhanced-permeability zone
  - Primarily intergranular flow
  - Intergranular and fracture flow

- **St. Peter/Prairie du Chien**
- **Eau Claire Formation**
- **Mesoproterozoic Volcanic Rock–Clam Falls Volcanics**
- **Mesoproterozoic Volcanic Rock–Chengwatana Group**
- **Mesoproterozoic Volcanic Rock–North Branch Volcanics**

EXPLANATION FOR CROSS SECTIONS
7 (A), 18 (B), 27 (C), 38 (D), AND 47 (E)

**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.

- **Cold War era**: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- **Recent**: water entered the ground since about 1953 (8–15 TU).
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- **Vintage**: water entered the ground before 1953 (less than or equal to 1 TU).
- **Mixed**: water is a mixture of recent and vintage waters (greater than 1 TU to less than 8 TU).
- **Well was not sampled for tritium.**

Symbols and labels
- If shown, chloride concentration equals or exceeds 5 parts per million.
- If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Tritium age
- **Recent**: water entered the ground since about 1953 (8–15 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).

**Quaternary aquitards grouped by texture**

- **Aquitard Percent sand**
  - **cr, ce, rt** > 60
  - **nu** > 40 and ≤ 50
  - **lc, xt** > 30 and ≤ 40
  - **qu** Undifferentiated Pleistocene sediment, texture and relative hydraulic conductivity unknown

**Groundwater conditions**

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer
2. Groundwater recharge from an overlying surficial aquifer to a buried aquifer
3. Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer
4. Groundwater leakage through multiple aquifers and fine-grained layers
5. Groundwater discharge to surface-water body
6. Lateral groundwater flow
7. Groundwater movement out of cross section
EXPLANATION FOR CROSS SECTION

Aquifers grouped by stratigraphy

- Surficial aquifer
  - surficial sand

- Buried sand and gravel aquifers
  - sl
  - sc
  - sx
  - sr
  - se
  - sp

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (¹⁴C) isotope analysis

Tritium age

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.
Symbols and labels

- **Well location**
- **Land surface**
- **Stratigraphic boundary**
- **Bedrock contact**

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Tritium age

- **Cold War era**: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- **Vintage**: water entered the ground before 1953 (less than or equal to 1 TU).
- **Well not sampled for tritium**.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

7.2

Land surface
Bedrock contact
Stratigraphic boundary
Well location

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

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**Tritium age**

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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.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

7.2 Land surface
Bedrock contact
Stratigraphic boundary
Well location
21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
3000 If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Aquifers grouped by stratigraphy
- Surficial aquifer
- Buried sand and gravel aquifers
  - sl
  - sc
  - sx
  - sr
  - sp

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- 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.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sx
- sc
- sr
- se
- sp

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.
If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Surficial aquifer
- sur

Buried sand and gravel aquifers
- sl
- sx
- sc
- sr
- se
- sp

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- 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.
**Aquifers grouped by stratigraphy**

<table>
<thead>
<tr>
<th>Type of Aquifer</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surficial aquifer</td>
<td>Interpreted tritium age is indicated by background color</td>
</tr>
<tr>
<td>Buried sand and gravel aquifers</td>
<td>Interpreted tritium age is indicated by pattern color</td>
</tr>
</tbody>
</table>

- **Surficial sand**
  - St. Peter/Prairie du Chien
  - Jordan
  - Upper Tunnel City
- **Buried sand and gravel aquifers**
  - St. Lawrence Formation
  - Eau Claire Formation
  - Mesoproterozoic Volcanic Rock–Clam Falls Volcanics
  - Mesoproterozoic Volcanic Rock–Chengwatana Group
  - Mesoproterozoic Volcanic Rock–North Branch Volcanics

**Symbols and labels**

- 21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
- Naturally occurring high chloride concentrations are shown with a superscript n.
- 7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis
- General direction of groundwater flow
- Approximate equipotential contour
- Geologic contact
- Land or bedrock surface
- Lake
- Direction of fault movement, arrows indicate relative movement

**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.

- **Cold War era**: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- **Recent**: water entered the ground since about 1953 (8–15 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**.

**Bedrock aquitards**

- **CSl**: St. Lawrence Formation
- **Ce**: Eau Claire Formation

**Bedrock nonaquifer units**

- **Ecf**: Mesoproterozoic Volcanic Rock–Clam Falls Volcanics
- **Ecv**: Mesoproterozoic Volcanic Rock–Chengwatana Group
- **Enb**: Mesoproterozoic Volcanic Rock–North Branch Volcanics

**Quaternary aquitards grouped by texture**

<table>
<thead>
<tr>
<th>Aquitard</th>
<th>Percent sand*</th>
</tr>
</thead>
<tbody>
<tr>
<td>cr, ce, rt</td>
<td>&gt; 60</td>
</tr>
<tr>
<td>nu</td>
<td>&gt; 40 and ≤ 50</td>
</tr>
<tr>
<td>lc, xt</td>
<td>&gt; 30 and ≤ 40</td>
</tr>
<tr>
<td>qu</td>
<td>Undifferentiated Pleistocene sediment, texture and relative hydraulic conductivity unknown</td>
</tr>
</tbody>
</table>

*Relative hydraulic conductivity

**Groundwater conditions**

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer
2. Groundwater recharge from an overlying surficial aquifer to a buried aquifer
3. Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer
4. Groundwater leakage through multiple aquifers and fine-grained layers
5. Groundwater discharge to surface-water body
6. Lateral groundwater flow
7. Groundwater movement out of cross section
Aquifers grouped by stratigraphy

- Surficial aquifer
  - surficial sand
- Buried sand and gravel aquifers
  - sl
  - sc
  - sx
  - sr
  - se
  - sp

EXPLANATION FOR CROSS SECTION

**Symbols and labels**

- 21.1: If shown, chloride concentration equals or exceeds 5 parts per million.
- 7.2: If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000: If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis.

**Tritium age**

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well was not sampled for tritium.
Aquifers grouped by stratigraphy
- Surficial aquifer
  - Surflicial sand
- Buried sand and gravel aquifers
  - sl
  - sc
  - se
- Bedrock contact
  - sr
  - sp

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age
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- Well was not sampled for tritium.

EXPLANATION FOR CROSS SECTION
- If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- If shown, chloride concentration equals or exceeds 5 parts per million.
- If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.

Surficial aquifers
- Surficial sand

Buried sand and gravel aquifers
- sl
- sx
- sg
- se
- sp

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.
If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

7.2 Land surface
Bedrock contact
Stratigraphic boundary
Well location

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

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- Well not sampled for tritium.
Aquifers grouped by stratigraphy

- Surficial aquifer
  - Surflcial sand

Buried sand and gravel aquifers
- Sl
- Sc
- Se
- Sr
- Sp

EXPLANATION FOR CROSS SECTION

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well was not sampled for tritium.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis.
See next page for complete explanation
Aquifers grouped by stratigraphy

Interpreted tritium age is indicated by background color
Interpreted tritium age is indicated by pattern color

Surficial aquifer
- Surficial sand
- Buried sand and gravel aquifers
  - sl
  - sc
  - se
  - sx
  - sr

Buried sand and gravel aquifers
- sp

Sedimentary bedrock aquifers
- St. Peter/Prairie du Chien
- Jordan
- Upper Tunnel City
- Wonewoc
- Mt. Simon
- Undifferentiated Mesoproterozoic
- Enhanced-permeability zone
- Primarily intergranular flow
- Intergranular and fracture flow

Symbols and labels

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

General direction of groundwater flow
Approximate equipotential contour
Geologic contact
Land or bedrock surface
Lake
Direction of fault movement, arrows indicate relative movement

2.1 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.

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.

EXPLANATION FOR CROSS SECTIONS
7 (A), 18 (B), 27 (C), 38 (D), AND 47 (E)

Bedrock aquitards
- St. Lawrence Formation
- Eau Claire Formation

Bedrock nonaquifer units
- Mesoproterozoic Volcanic Rock–Clam Falls Volcanics
- Mesoproterozoic Volcanic Rock–Chengwatana Group
- Mesoproterozoic Volcanic Rock–North Branch Volcanics

Quaternary aquitards grouped by texture
Aquitard
- Percent sand*
- cr, ce, rt
- nu
- lc, xt
- qu

Undifferentiated Pleistocene sediment, texture and relative hydraulic conductivity unknown

*Relative hydraulic conductivity

Groundwater conditions

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer
2. Groundwater recharge from an overlying surficial aquifer to a buried aquifer
3. Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer
4. Groundwater leakage through multiple aquifers and fine-grained layers
5. Groundwater discharge to surface-water body
6. Lateral groundwater flow
7. Groundwater movement out of cross section
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis
Aquifers grouped by stratigraphy

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Well location
Land surface
Stratigraphic boundary
Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
3000 If shown, groundwater residence time in years, estimated by carbon-14 (¹⁴C) isotope analysis

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

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Well was not sampled for tritium.
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Symbols and labels

Well location

Land surface

Stratigraphic boundary

Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (¹⁴C) isotope analysis

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

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Vintage: water entered the ground before 1953 (less than or equal to 1 TU).

Well was not sampled for tritium.
Aquifers grouped by stratigraphy
- Surficial aquifer
- Buried sand and gravel aquifers

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact
- 21.1: If shown, chloride concentration equals or exceeds 5 parts per million.
- 7.2: If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000: If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- Well was not sampled for tritium.
Aquifers grouped by stratigraphy
- Surficial aquifer
- Buried sand and gravel aquifers

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact
- Chloride concentration (if shown)
- Groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.
Aquifers grouped by stratigraphy

**Symbols and labels**

- **Well location**
- **Land surface**
- **Stratigraphic boundary**
- **Bedrock contact**

**Tritium age**

- **Cold War era:** water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- **Recent:** water entered the ground since about 1953 (8–15 TU).
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- **Vintage:** water entered the ground before 1953 (less than or equal to 1 TU).
- **Well was not sampled for tritium.**

**EXPLANATION FOR CROSS SECTION**

- **If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.**
- **If shown, chloride concentration equals or exceeds 5 parts per million.**
- **If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.**

**3000**

If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis.
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

Symbols and labels

Well location

Land surface

Stratigraphic boundary

Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

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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 was not sampled for tritium.
Aquifers grouped by stratigraphy

- Surficial aquifer
- Buried sand and gravel aquifers

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- 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 was not sampled for tritium.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.
EXPLANATION FOR CROSS SECTION

Aquifers grouped by stratigraphy
- Surficial aquifer
- Buried sand and gravel aquifers

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Well was not sampled for tritium.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

Symbols and labels

Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

EXPLANATION FOR CROSS SECTION

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.
See next page for complete explanation
Aquifers grouped by stratigraphy

<table>
<thead>
<tr>
<th>Aquifer Type</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surficial aquifer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surficial sand</td>
<td></td>
<td><strong>St. Peter/Prairie du Chien</strong></td>
</tr>
<tr>
<td>Buried sand and gravel aquifers</td>
<td></td>
<td><strong>Jordan</strong></td>
</tr>
<tr>
<td><strong>Upper Tunnel City</strong></td>
<td></td>
<td><strong>St. Lawrence Formation</strong></td>
</tr>
<tr>
<td><strong>Wonewoc</strong></td>
<td></td>
<td><strong>Eau Claire Formation</strong></td>
</tr>
<tr>
<td><strong>Mt. Simon</strong></td>
<td></td>
<td><strong>Mesoproterozoic Volcanic Rock–Clam Falls Volcanics</strong></td>
</tr>
<tr>
<td><strong>Undifferentiated Mesoproterozoic</strong></td>
<td></td>
<td><strong>Mesoproterozoic Volcanic Rock–Chengwatana Group</strong></td>
</tr>
<tr>
<td><strong>Primarily intergranular flow</strong></td>
<td></td>
<td><strong>Mesoproterozoic Volcanic Rock–North Branch Volcanics</strong></td>
</tr>
</tbody>
</table>

Symbols and labels

- 21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
- 7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000 If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

**Groundwater Leakage from an Overlying Buried Aquifer to an Underlying Buried Aquifer**

**Groundwater Leakage through Multiple Aquifers and Fine-Grained Layers**

**Groundwater Movement Out of Cross Section**

**Groundwater Recharge from an Overlying Surficial Aquifer to a Buried Aquifer**

**Groundwater Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer**

**Groundwater Discharge to Surface-Water Body**

**Lateral Groundwater Flow**

**Explanations for Cross Sections**

- **Interpreted tritium age is indicated by background color**
- **Interpreted tritium age is indicated by pattern color**

**Groundwater conditions**

- **Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer**
- **Groundwater leakage through multiple aquifers and fine-grained layers**
- **Groundwater movement out of cross section**
- **Groundwater movement out of cross section**
- **Groundwater movement out of cross section**
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Tritium age
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.
Aquifers grouped by stratigraphy

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sc
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Symbols and labels

**Tritium age**
- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.

**Well location**
- Land surface

**Stratigraphic boundary**
- Bedrock contact

**Clay**
- If shown, chloride concentration equals or exceeds 5 parts per million.

**Nitrate-nitrogen**
- If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

**Groundwater residence time**
- If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis

**Tritium age**
- 3000
Aquifers grouped by stratigraphy

Surficial aquifer
- surficial sand

Buried sand and gravel aquifers
- sl
- sx
- sc
- sr
- sp

EXPLANATION FOR CROSS SECTION

Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

Symbols and labels

If shown, chloride concentration equals or exceeds 1 part per million.
- 21.1

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 7.2

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis
- 3000

Tritium age

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- 8.6

Recent: water entered the ground since about 1953 (8–15 TU).
- 1

Mixed: water is a mixture of recent and vintage waters (greater than 1 TU to less than 8 TU).
- 3

Vintage: water entered the ground before 1953 (less than or equal to 1 TU).
- 4

Well was not sampled for tritium.
- 5
Aquifers grouped by stratigraphy

- Surficial aquifer
- Buried sand and gravel aquifers
  - sl
  - sc
  - se
  - sx
  - sr
  - sp

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact
- 200: Elevation (feet above sea level)
- 3000: Groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

EXPLANATION FOR CROSS SECTION

- Tritium age
  - Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
  - Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.

- If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- If shown, chloride concentration equals or exceeds 5 parts per million.
- If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
Aquifers grouped by stratigraphy
- Surficial aquifer
  - Surficial sand
- Buried sand and gravel aquifers
  - sl
  - sc
  - se
  - sx
  - sr
  - sp

EXPLANATION FOR CROSS SECTION

Symbols and labels
- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact
- Tritium age

well was not sampled for tritium.

Elevation (feet above sea level)

EXPLANATION FOR CROSS SECTION

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

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Vintage: water entered the ground before 1953 (less than or equal to 1 TU).

Well was not sampled for tritium.
Aquifers grouped by stratigraphy

- Surficial aquifer
  - surficial sand
- Buried sand and gravel aquifers
  - sl
  - sx
  - sc
  - sr
  - se
  - sp

EXPLANATION FOR CROSS SECTION

Symbols and labels

- Well location
- Bedrock contact
- Stratigraphic boundary
- Land surface

Tritium age

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- Well was not sampled for tritium.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 ($^{14}$C) isotope analysis.
Aquifers grouped by stratigraphy

- Surficial aquifer
  - Surficial sand

- Buried sand and gravel aquifers
  - sl
  - sc
  - se
  - sx
  - sr
  - sp

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

- 21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
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- Well was not sampled for tritium.
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- sr
- sp

Symbols and labels

Well location
Land surface
Stratigraphic boundary
Bedrock contact

21.1 If shown, chloride concentration equals or exceeds 5 parts per million.

7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

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Vintage: water entered the ground before 1953 (less than or equal to 1 TU).

Well was not sampled for tritium.
See next page for complete explanation
Aquifers grouped by stratigraphy

Interpretation of tritium age is indicated by background color.

**Surficial aquifers**
- **Surficial sand**
  - **Sc**
  - **Se**
  - **Sx**
  - **Sr**
- **Buried sand and gravel aquifers**
  - **Sl**
  - **Sc**
  - **Se**
  - **Sx**
  - **Sr**
- **Sedimentary bedrock aquifers**
  - **Cj**
  - **Cw**
  - **Cm**
  - **Psu**
- **Enhanced-permeability zone**
- **Primarily intergranular flow**
- **Intergranular and fracture flow**

**Symbols and labels**

- 21.1 If shown, chloride concentration equals or exceeds 5 parts per million.
- 7.2 If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.
- 3000 If shown, groundwater residence time in years, estimated by carbon-14 (¹⁴C) isotope analysis.

**Tritium age**

- **Cold War era**: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
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- **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 was not sampled for tritium.**

EXPLANATION FOR CROSS SECTIONS

7 (A), 18 (B), 27 (C), 38 (D), AND 47 (E)

Bedrock aquitards
- **Csl**: St. Lawrence Formation
- **Ce**: Eau Claire Formation
- **Bcf**: Mesoproterozoic Volcanic Rock–Clam Falls Volcanics
- **Bcv**: Mesoproterozoic Volcanic Rock–Chengwatana Group
- **Enb**: Mesoproterozoic Volcanic Rock–North Branch Volcanics

Bedrock nonaquifer units
- **Eau Claire Formation**
- **St. Peter/Prairie du Chien**
- **Upper Tunnel City**
- **Wonewoc**
- **Mt. Simon**
- **Undifferentiated Mesoproterozoic**
- **Enhanced-permeability zone**
- **Primarily intergranular flow**
- **Intergranular and fracture flow**

Quaternary aquitards grouped by texture

<table>
<thead>
<tr>
<th>Aquitard</th>
<th>Percent sand*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cr, Ce, Rt</strong></td>
<td>&gt; 60</td>
</tr>
<tr>
<td><strong>Nu</strong></td>
<td>&gt; 40 and ≤ 50</td>
</tr>
<tr>
<td><strong>Lc, Xt</strong></td>
<td>&gt; 30 and ≤ 40</td>
</tr>
<tr>
<td><strong>Qu</strong></td>
<td>Undifferentiated Pleistocene sediment, texture and relative hydraulic conductivity unknown</td>
</tr>
</tbody>
</table>

*Relative hydraulic conductivity

Groundwater conditions

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer
2. Groundwater recharge from an overlying surficial aquifer to a buried aquifer
3. Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer
4. Groundwater leakage through multiple aquifers and fine-grained layers
5. Groundwater discharge to surface-water body
6. Lateral groundwater flow
7. Groundwater movement out of cross section
Aquifers grouped by stratigraphy

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- sl
- sc
- se
- sx
- sr
- sp

EXPLANATION FOR CROSS SECTION

Symbols and labels

Well location
Land surface
Stratigraphic boundary
Bedrock contact

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

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Vintage: water entered the ground before 1953 (less than or equal to 1 TU).

Well was not sampled for tritium.

If shown, chloride concentration equals or exceeds 5 parts per million.

If shown, nitrate-nitrogen concentration equals or exceeds 1 part per million.

If shown, groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis.

Tritium age

800
950
650
1000
150
350
850
550
200
600
300
500
750
700
450
250
900
400
150
11.3
1.2
21.1
7.2
3000

Kettle River Blvd N
Forest Blvd N
Lake Blvd N
Prairie du Chien
Morgan Ave N
Morgan Ave N
Redwing Ave N
Saint Croix Tr N
Lofton Ave N
Olinda Tr N
Kettle River Blvd N

EXPLANATION FOR CROSS SECTION
Aquifers grouped by stratigraphy
- Surficial aquifer
- Bedrock contact
- Stratigraphic boundary
- Land surface
- Chloride concentration
- Nitrate-nitrogen concentration
- Groundwater residence time
- Tritium age

EXPLANATION FOR CROSS SECTION

- Well location
- Bedrock contact
- Stratigraphic boundary
- Land surface
- Chloride concentration
- Nitrate-nitrogen concentration
- Groundwater residence time
- Tritium age

Surficial aquifer
- Surficial sand

Buried sand and gravel aquifers
- Sl
- Sc
- Sr
- Sp

Well was not sampled for tritium.

Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).

Recent: water entered the ground since about 1953 (8–15 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).
Aquifers grouped by stratigraphy

<table>
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<th>Surficial aquifer</th>
<th>Sl</th>
<th>Sc</th>
<th>Se</th>
<th>Sr</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buried sand and gravel aquifers</td>
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</tr>
</tbody>
</table>

Symbols and labels

- Well location
- Land surface
- Stratigraphic boundary
- Bedrock contact

- Chloride concentration
- Nitrate-nitrogen concentration
- Groundwater residence time in years, estimated by carbon-14 (14C) isotope analysis

Tritium age

- Cold War era: water entered the ground during the peak period of atmospheric tritium concentration during nuclear bomb testing, 1958–1959 and 1961–1972 (greater than 15 tritium units [TU]).
- Recent: water entered the ground since about 1953 (8–15 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 was not sampled for tritium.