City of North Branch
Agenda

Title:	City Council Work Session
Location:	City Council Chambers
Date:	April 17, 2014

Start	End	Time	Topic	Presenter
6:30 AM	6:31 AM	0:01	Pledge of Allegiance	
6:31 AM	7:16 AM	0:45	Chisago County Geological Atlas	Jerry Spetzman, Chisago County
7:16 AM	7:46 AM	0:30	Park Land Discussion	Sondrol
Total		**1:16**		

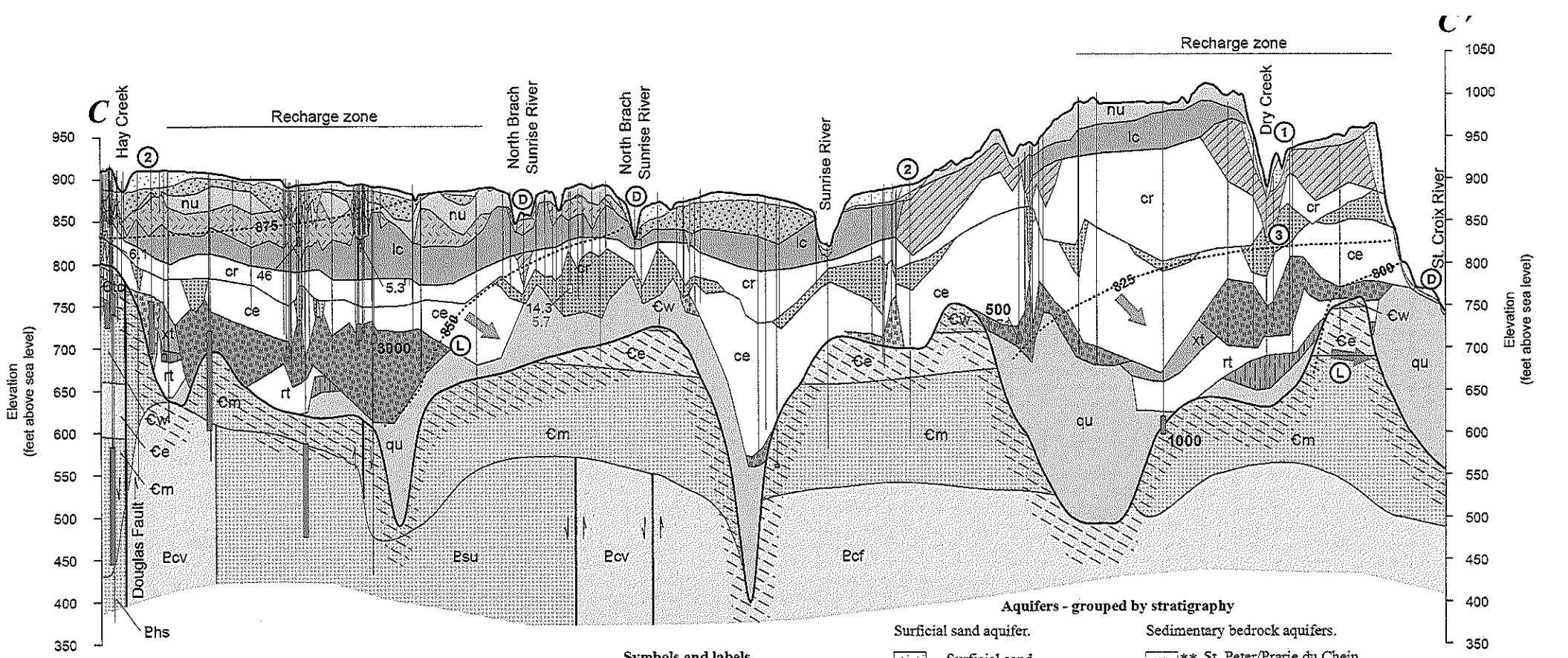
City of North Branch Memo

Prepared By: Bridgitte Konrad

Date: April 9, 2014

Subject: Hydrogeologic Atlas

Jerry Spetzman the Chisago County Water Resources Manager, John Barr the author of the atlas from the DNR and Craig Wills DNR Hyrdologist will be at the meeting to review the atlas and answer any questions.



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 bomb testing, 1958-1959 and 1961-1972 (15 or more tritium units [TU]).
- Recent—Water entered the ground since about 1953 (8 or more 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

- 21.1 — If shown, chloride concentration equals or exceeds 5 parts per million. Naturally occurring high chloride concentrations are noted 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 (^{14}C) isotope analysis.
- General direction of groundwater flow.
- ···· 925 ···· Approximate equipotential contour. Contour interval 25 feet.
- Geologic contact.
- Land or bedrock surface.
- Lake.
- Direction of fault movement. Arrow indicates relative movement.

Aquifers - grouped by stratigraphy

Surficial sand aquifer.

- Surficial sand

Buried sand and gravel aquifers.

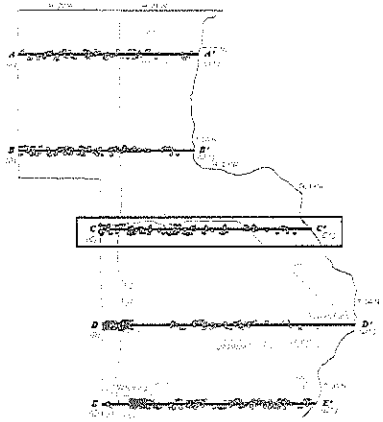
- sl
- se
- sc
- sx
- sr
- sp

Sedimentary bedrock aquifers.

- ** St. Peter/Prarie du Chein
- €j * Jordan
- €tc * Upper Tunnel City
- €w * Wonewoc
- €m * Mt. Simon
- Psu * Undifferentiated Mesoproterozoic
- Enhanced-permeability zone.
- * Primarily intergranular flow
- ** Primarily fracture flow

Bedrock non-aquifer units

- €sl St. Lawrence Formation
- €e Eau Claire Formation
- Pcf Clam Falls Volcanics
- Pcv Chengwatana Volcanics
- Pnb North Branch Volcanics



Groundwater conditions

① Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer.

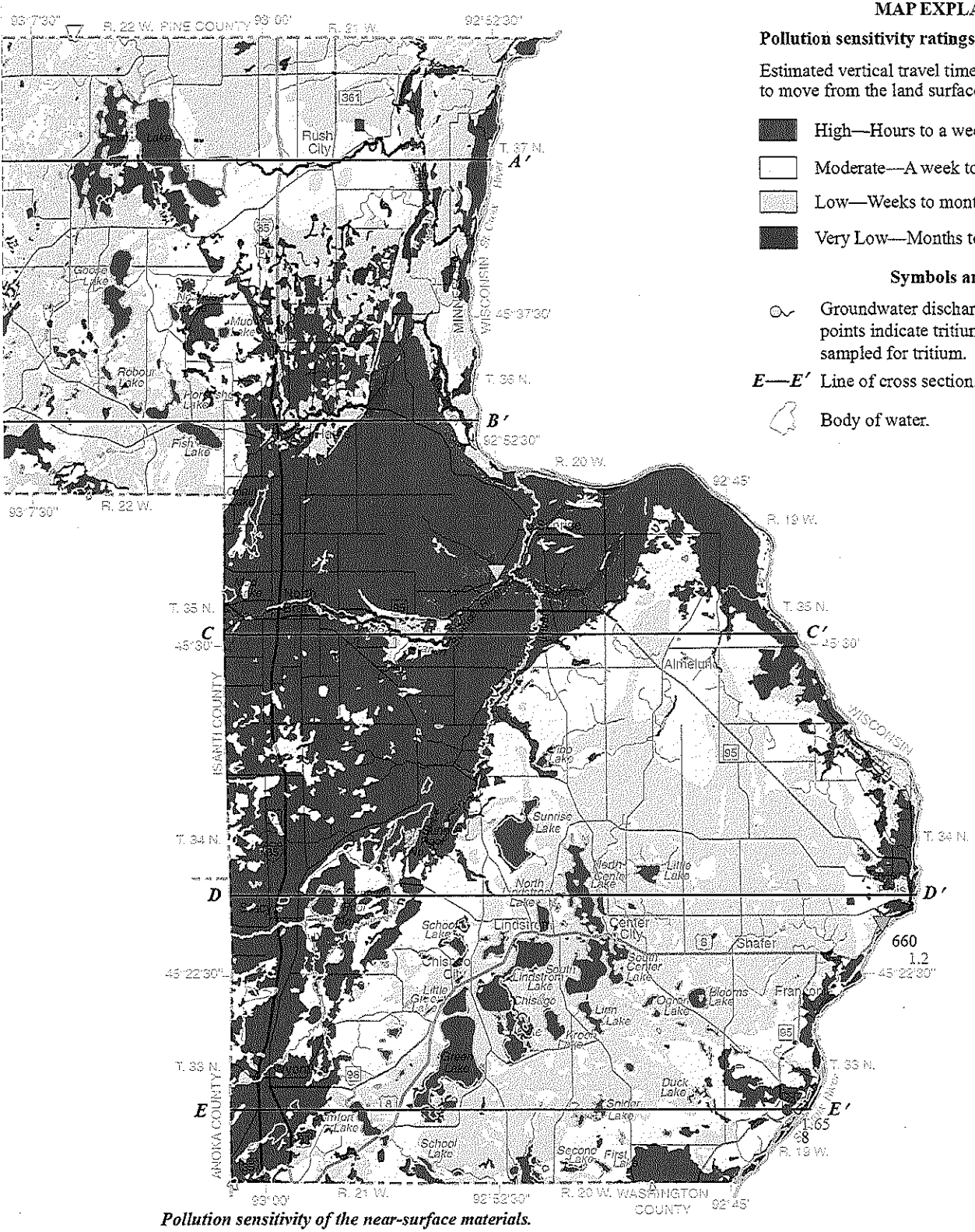
② Groundwater recharge from overlying surficial aquifer to buried aquifer.

③ Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer.

④ Groundwater leakage through multiple aquifers and fine-grained layers.

Ⓓ Groundwater discharge to surface-water body.

Ⓛ Lateral groundwater flow



Pollution sensitivity of the near-surface materials.

MAP EXPLANATION

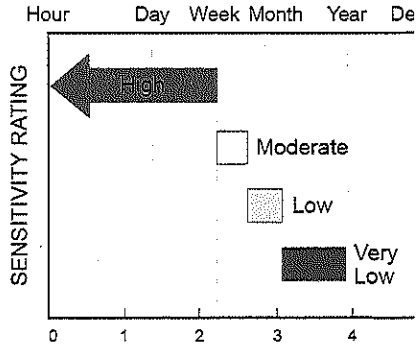
Pollution sensitivity ratings for near-surface materials

Estimated vertical travel time for water-borne contaminants to move from the land surface to a depth of 10 feet.

- High—Hours to a week.
- Moderate—A week to weeks.
- Low—Weeks to months.
- Very Low—Months to a year.

Symbols and labels

- Groundwater discharge location; Colored points indicate tritium age, gray points not sampled for tritium.
- *E—E′* Line of cross section.
- Body of water.



Geologic sensitivity rating for the near-su materials as defined by vertical travel

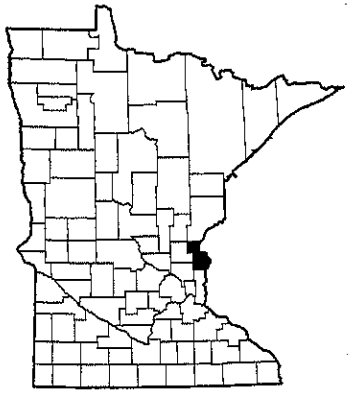
Ratings are based on the time range requir water at the land surface to travel vertica feet through the vadose zone to the water Because the water table is not well m everywhere, it is assumed to be at 10 feet land surface for this calculation.

TABLE 1. Transmission rates used to assess pollution sensitivity rating of near-surface r

[Dash marks (--) indicate no corresponding surficial geology unit].

NRCS Hydrologic Soil Group	Hydrologic Soil Group (0-3 feet) Transmission Rate [inches per hour]*	Geologic Texture (3 to 10 feet) Transmission Rate [inches per hour]*	Chisago County Surficial Geologic Unit (See Plate X, Part A)	Geologic Te Classifica
A, A/D	1	1	Qbg, Qci, Qni, Qno, Qwg, Qwl, Qwr, Qws	gravel, sa gravel, silty
		0.71	Qa, Qbs, Qe, Qf, Ql, Qns	sand, fine silty sar
B, B/D	0.50	0.50	Qcl, Cou**	silt, silty fine loamy sa
		0.28	Qcd, Qcs, Qct, Qna, Qnd, Qp	sandy loam
C, C/D	0.075	0.075	Qnm, Qnt	silt loam, l
		0.035	--	sandy clay
D	0.015	0.015	Qbc, Qcc, Qm Pmc**	clay, clay loa clay loam, sar silty cla

*Estimated transmission rate through the matrix of unsaturated material (DNR, 2013).



LOCATION DIAGRAM

Chisago County Cross Section Map Document

This map document was compiled to assist users with the characterization and scientific 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. Stratigraphic interpretation of unconsolidated Quaternary sediments was conducted by Gary Meyer of the Minnesota Geological Survey. Interpretation of bedrock surfaces and bedrock extent was conducted by Tony Runkel and Terrence Boerboom of the Minnesota Geological Survey. Hydrogeologic interpretation was conducted by John Barry of the Minnesota Department of Natural Resources.

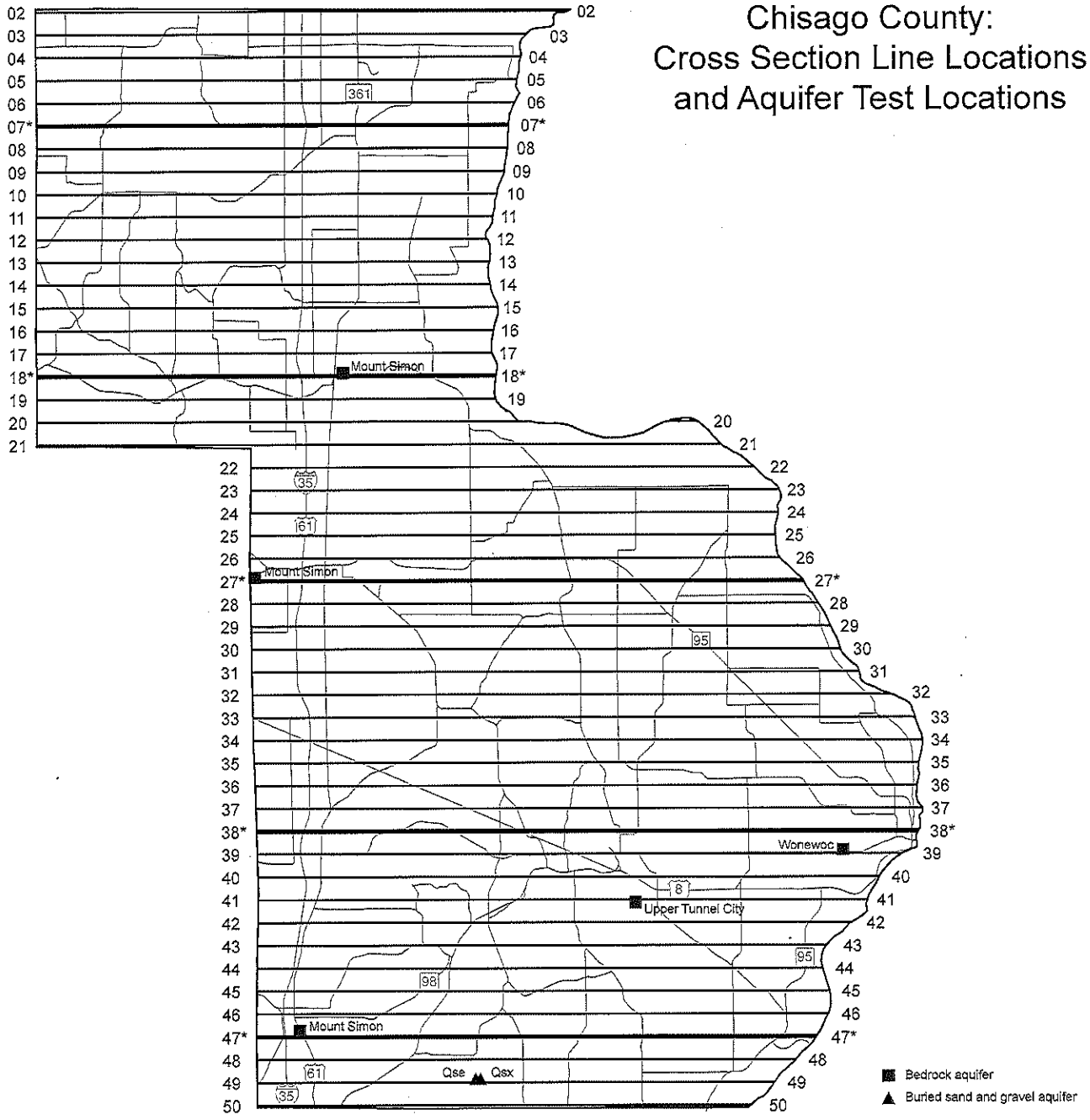
Included in this document is a plan view of the county that depicts hydrogeologic cross section line locations and aquifer test locations. Cross section lines are located at 0.6 mile (1 km) intervals; wells within 500 meters north and south of each line were used to determine the contacts between geologic units along the line. Cross sections are shown with a vertical exaggeration of 50x. Each cross section line shown in plan view is hyperlinked to a corresponding cross section. Cross sections include bold brightly colored lines that depict mapped buried sand and gravel aquifers, top profile lines of underlying bedrock units, well locations used to develop the cross section line, and road locations as land surface reference marks. Five of the cross sections included in this document were developed for the Chisago County Part B atlas. These select cross sections depict a more polished 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 unfeasible to offer all cross sections in this map document with the same level of detail.

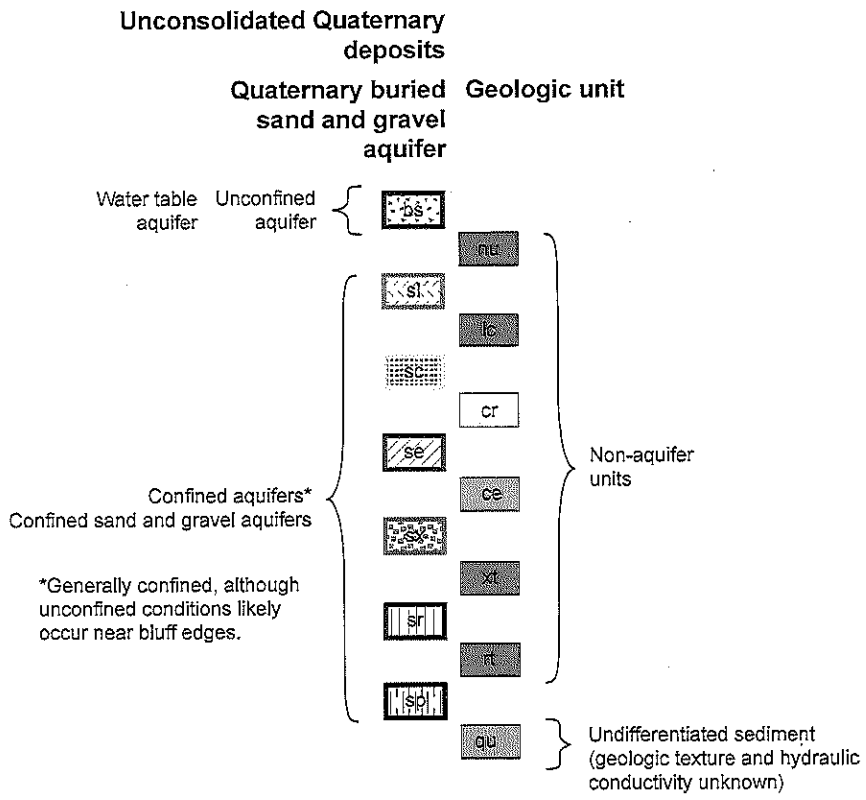
Also included in this map document is a figure that differentiates buried sand and gravel aquifer units from non-aquifer till units of the county and a figure that shows the sequence of bedrock geologic units, hydrogeologic units, and hydrogeologic unit properties present in the county. Table 1 lists 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. Because no large diameter wells are constructed in the surficial aquifer or Mesoproterozoic volcanic rock, pumping data for smaller diameter wells are included in Table 1. 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.

Minnesota
DEPARTMENT OF NATURAL RESOURCES

MINNESOTA GEOLOGICAL SURVEY 1872

Chisago County:
Cross Section Line Locations
and Aquifer Test Locations





Correlation of Quaternary buried sand and gravel aquifers, non-aquifer till units (shown as shades of solid gray), and undifferentiated Pleistocene sediment (shown in brown) in Chisago County.

Geologic Unit		Hydrogeologic Unit	Hydrogeologic Unit Properties
Jordan Sandstone		Jordan aquifer	Relatively high intergranular permeability.
			Confining unit.
St. Lawrence Formation			Confining unit.
Tunnel City Group	Mazomanie Formation	Upper Tunnel City aquifer	Relatively low intergranular permeability with high permeability bedding fractures.
	Lone Rock Formation		Confining unit. Not shown on cross sections; included with Ctc aquifer unit.
	Mazomanie Formation	Upper Tunnel City aquifer	Relatively low intergranular permeability with high permeability bedding fractures.
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Wonewoc Sandstone		Wonewoc aquifer	Moderate intergranular permeability.
Eau Claire Formation			Confining unit.
Mt. Simon Sandstone		Mt. Simon aquifer	Moderate intergranular permeability.
Mesoproterozoic Sedimentary Rock		Undifferentiated aquifer	Moderate intergranular permeability.
Mesoproterozoic Volcanic Rock		Non-aquifer unit	Very low to low permeability.

Aquifer.

Confining unit, generally low permeability.

Non-aquifer unit.

High permeability bedding fracture.

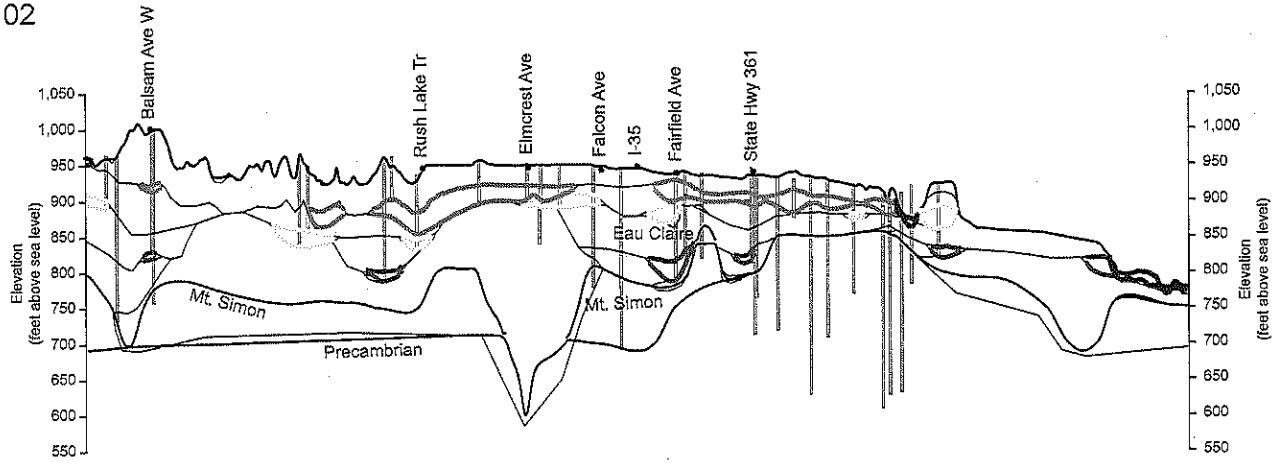
Sequence of bedrock geologic units, hydrogeologic units, and hydrogeologic unit properties in Chisago County.

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]

	Specific Capacity (gpm/ft)[1]					Transmissivity from Aquifer Test (gpd/ft)[2,3]				
Aquifer	Well Diameter (inches)	Mean	Minimum	Maximum	No. of Tests	Well Diamter (inches)	Mean	Minimum	Maximum	No. of Tests
Surficial sand[4]	8	20	11	30	2	--	--	--	--	--
Buried sand and gravel										
sl	--	--	--	--	--	--	--	--	--	--
sc	--	--	--	--	--	--	--	--	--	--
se	12	20	20	20	1	12	137,000	137,000	137,000	1
sx	12–18	7	4	11	2	12	142,000	142,000	142,000	1
qu	18	102	102	102	1	--	--	--	--	--
Bedrock										
St. Peter–Prairie du Chien–Mt. Simon[5]	12	20	20	20	1	--	--	--	--	--
Upper Tunnel City–Eau Claire[5]	16	35	35	35	1	--	--	--	--	--
Upper Tunnel City–Wonewoc[5]	14	9	9	9	1	16	40,000	35,000	45,000	1
Wonewoc	18	47	47	47	1	18	104,000	104,000	104,000	1
Wonewoc–Mt. Simon[5]	18	9	9	9	1	--	--	--	--	--
Mt. Simon	12–18	17	8	26	12	12–24	20,100	8,100	32,000	2
Mt. Simon–Hinckley[5]	24	28	28	28	1	24	40,000	40,000	40,000	1
Mesoproterozoic Volcanic Rock[4]	6	0.008	0.004	0.013	7	--	--	--	--	--

[1]Data adapted from the County Well Index.
[2]See the Chisago County: Cross Section Line Locations and Aquifer Test Locations figure for aquifer test locations.
[3]Data adapted from aquifer tests conducted by the Minnesota Department of Health.
[4]Less than 12" diameter wells constructed in surficial sand aquifer and Mesoproterozoic volcanic rock.
[5]Well(s) constructed across multiple aquifers.

02



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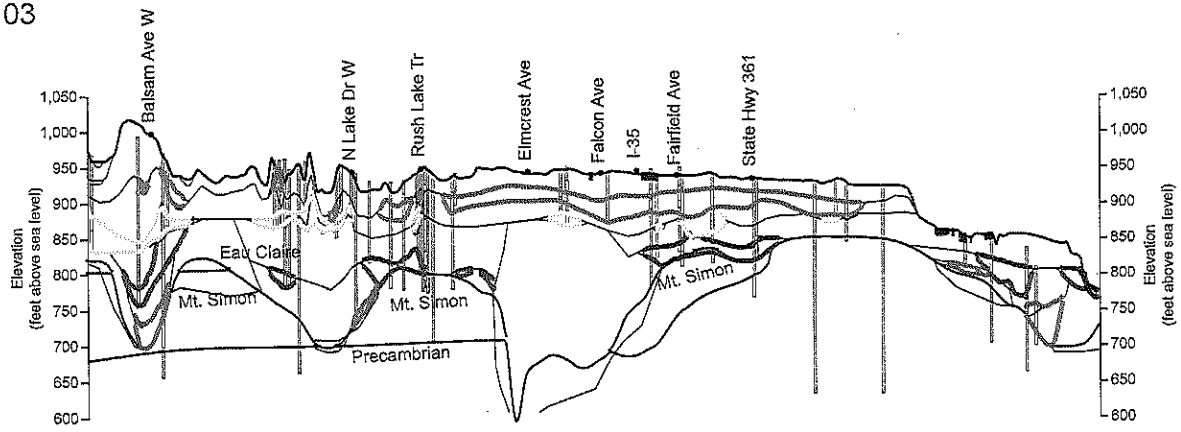

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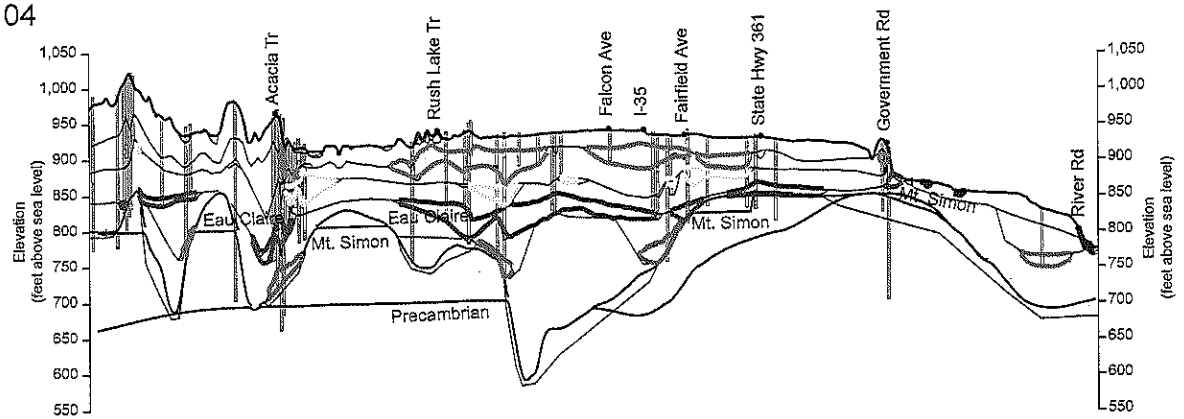

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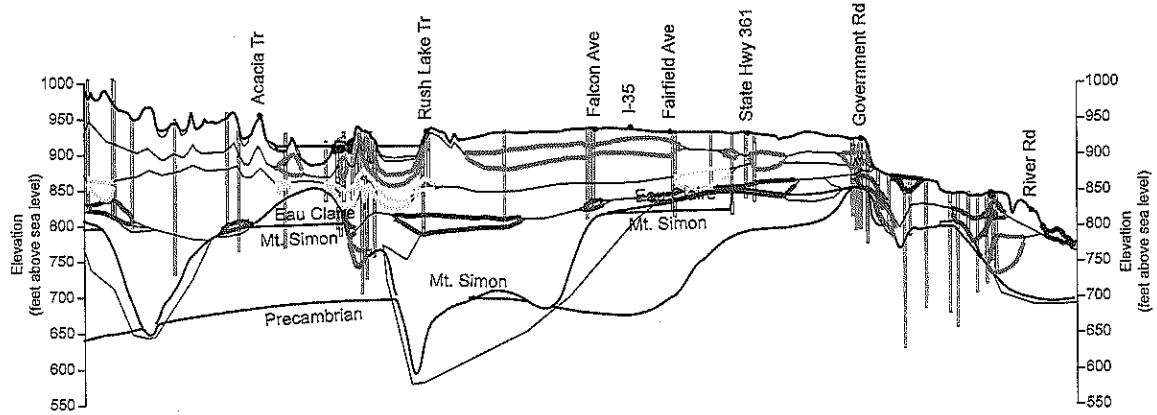

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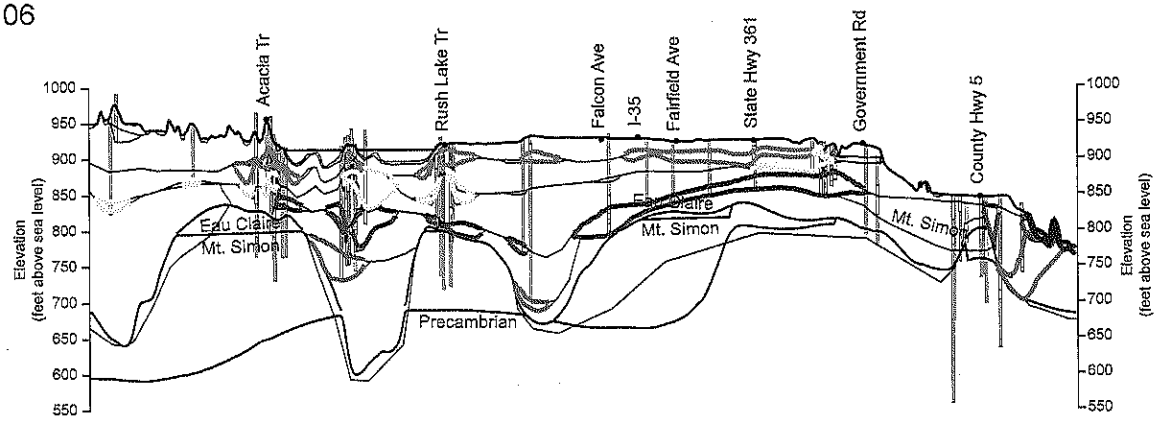

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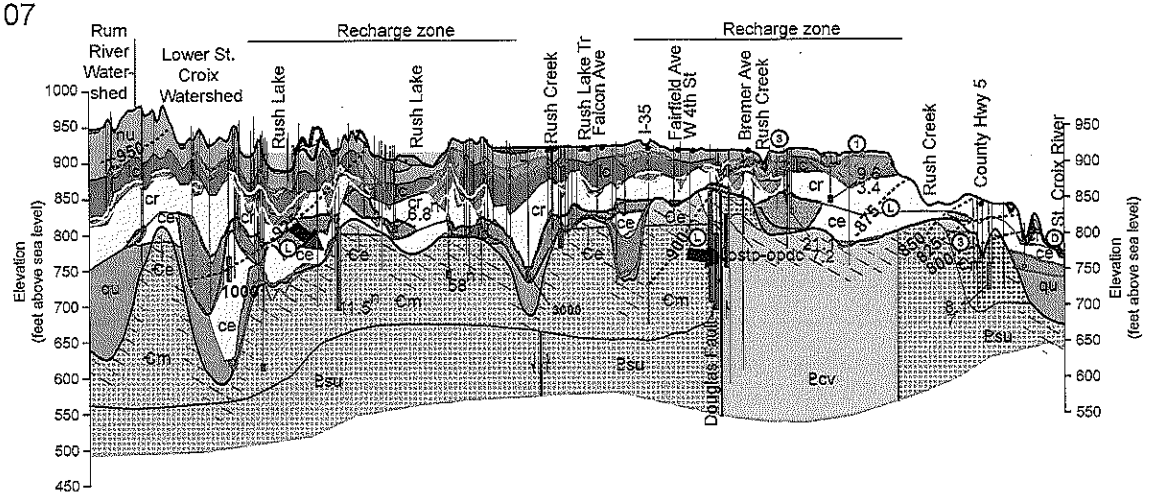

Tritium age

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925	Approximate equipotential contour. Contour interval 25 feet.
	Geologic contact.
	Land or bedrock surface.
	Lake.
	Direction of fault movement. Arrow indicates relative movement.

Aquifers - grouped by stratigraphy

Surficial sand aquifer.

Surficial sand

Buried sand and gravel aquifers.

sl

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Sedimentary bedrock aquifers.

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Cj * Jordan

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Cw * Wonewoc

Cm * Mt. Simon

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Enhanced-permeability zone

* Primarily intergranular flow

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Groundwater conditions

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer.
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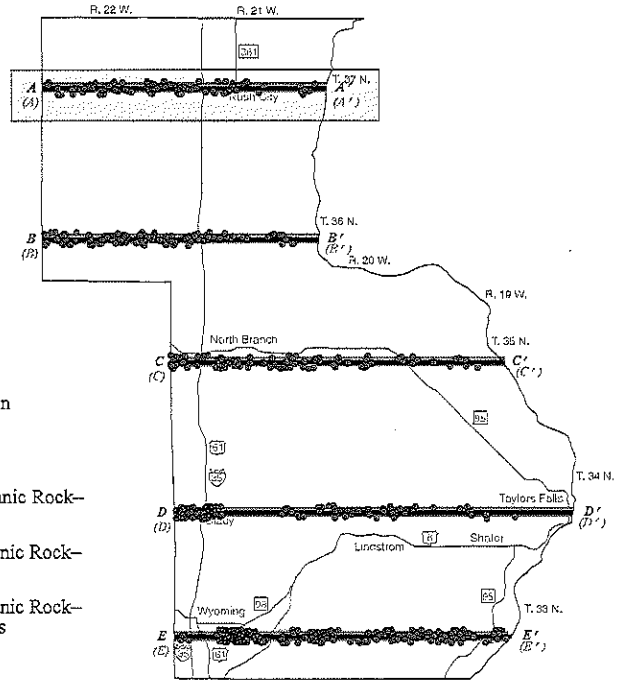
- L. Lateral groundwater flow.
- ⊙ Groundwater movement out of cross section.



Bedrock non-aquifer units

Csl St. Lawrence Formation

Ce Eau Claire Formation

Pcf Mesoproterozoic Volcanic Rock–Clam Falls Volcanics

Pcv Mesoproterozoic Volcanic Rock–Chengwatana Group

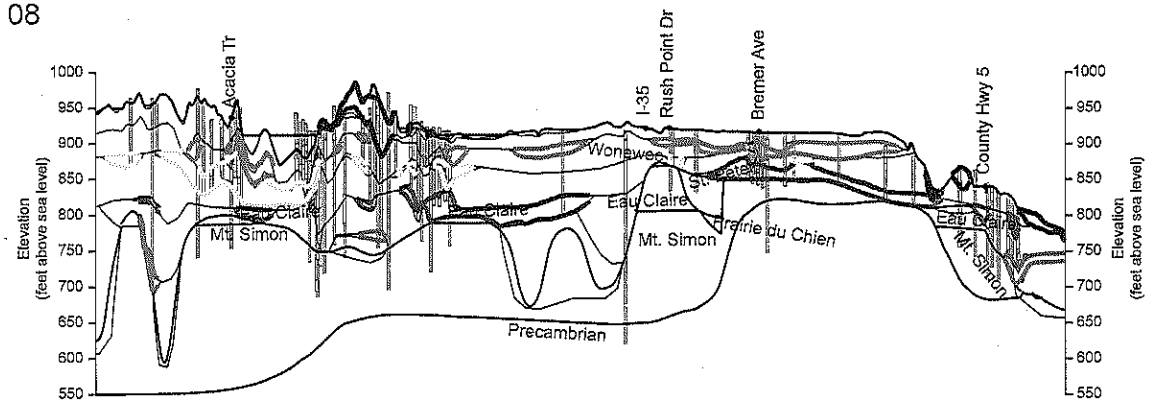
Pnb Mesoproterozoic Volcanic Rock–North Branch Volcanics

Aquitards grouped by texture ranging from highest to lowest sand content.

Percent sand*	Color code	Geologic unit code
> 60		cr, ce, rt
> 40 and ≤ 50		nu
> 30 and ≤ 40		lc, xt
Texture unknown		Undifferentiated Pleistocene sediment (qu). Relative hydraulic conductivity unknown.

*Percent sand indicates relative hydraulic conductivity.

08



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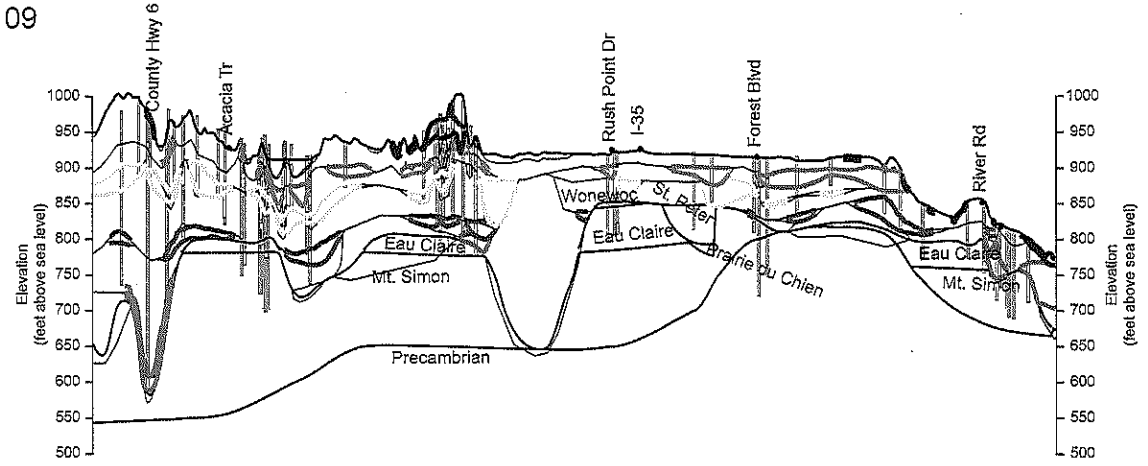

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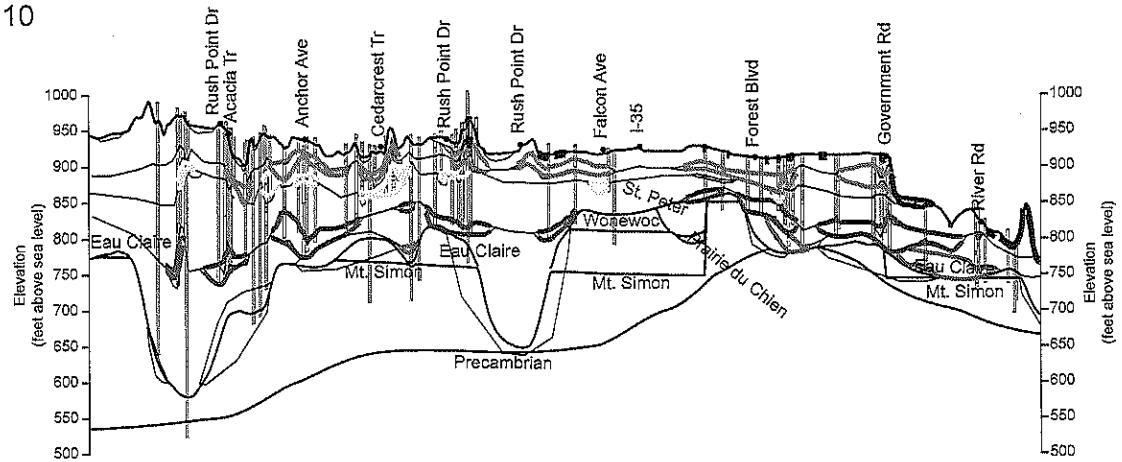

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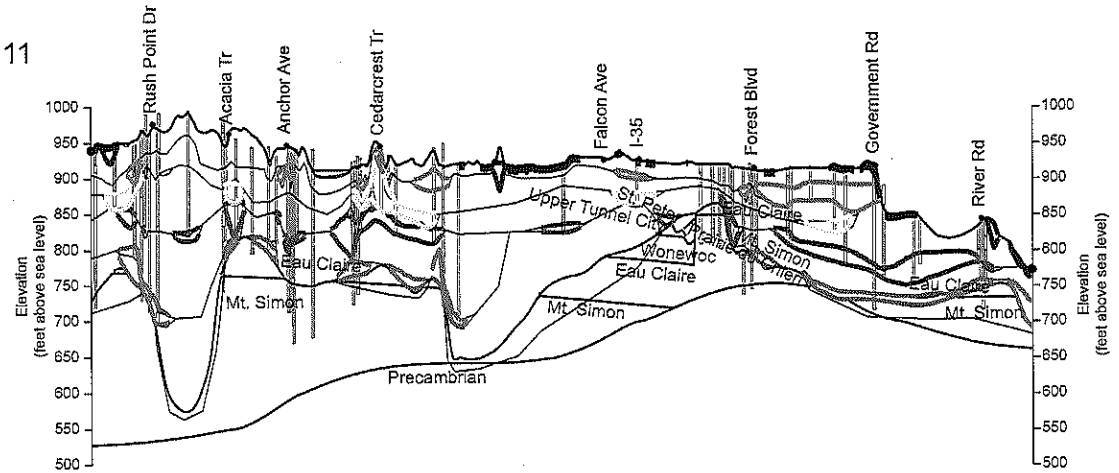

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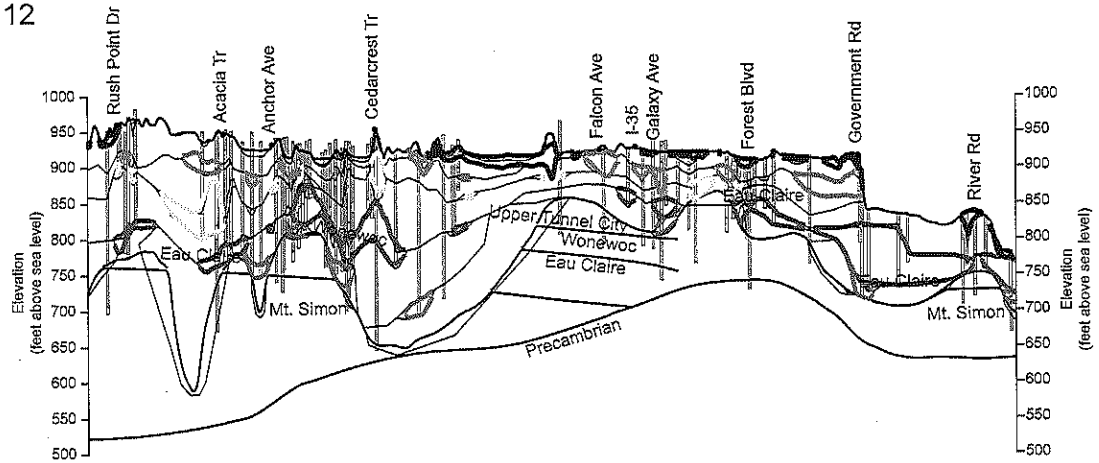

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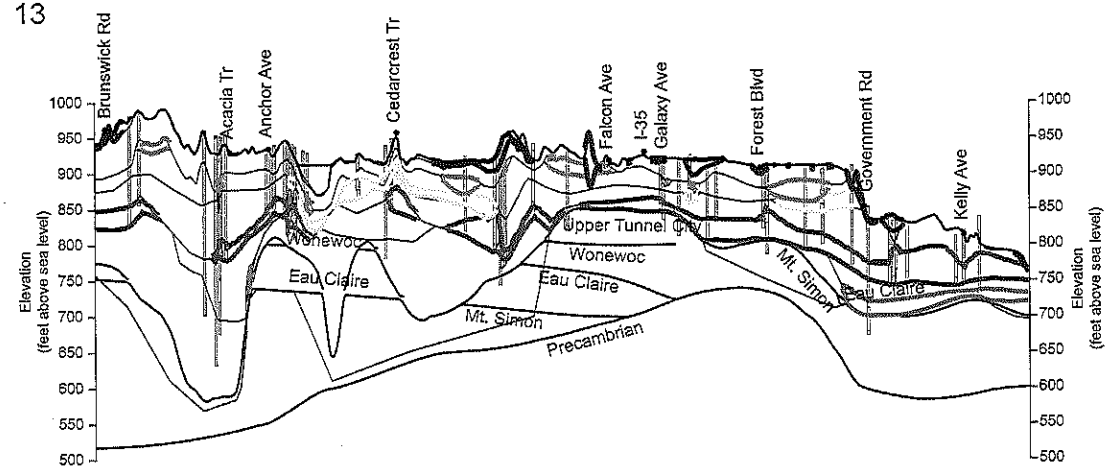

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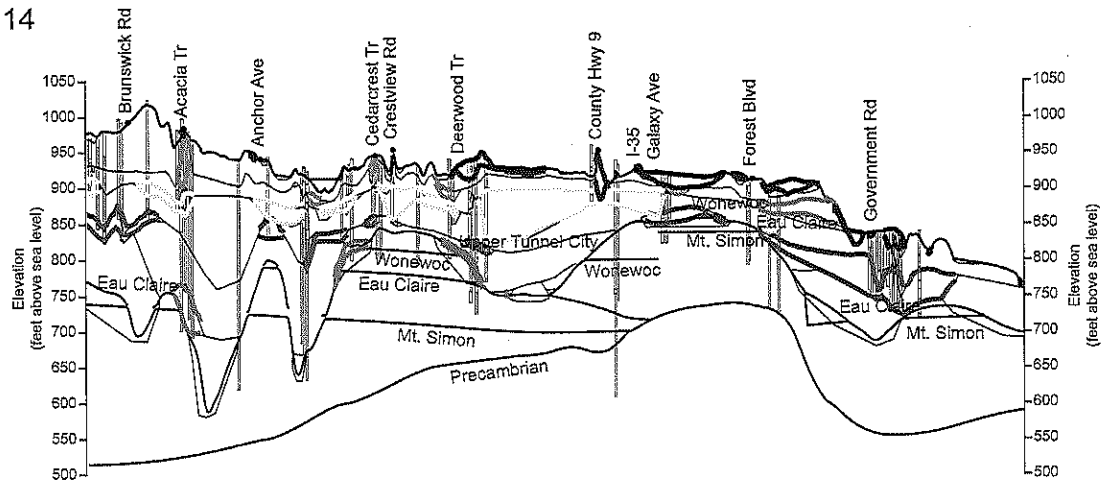

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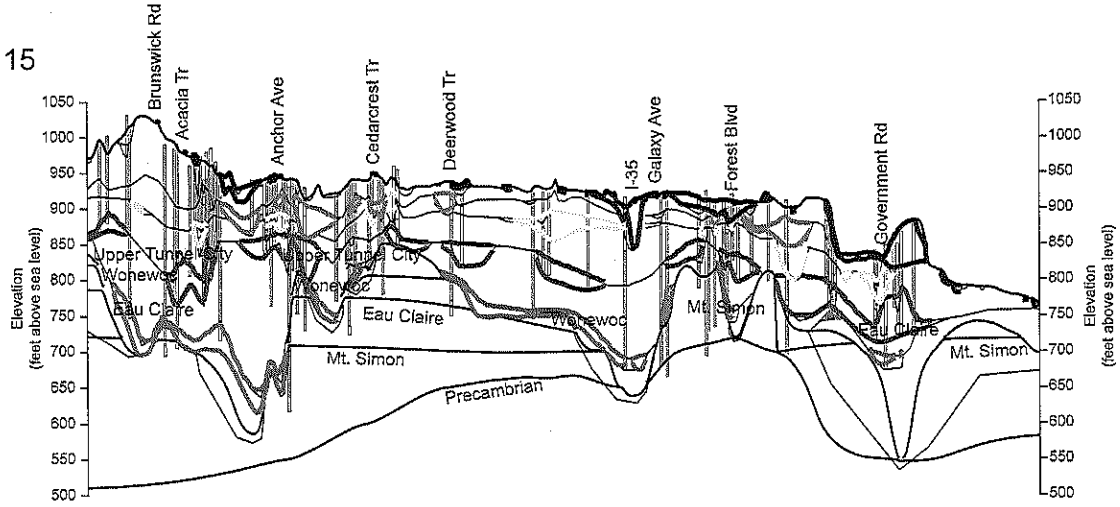

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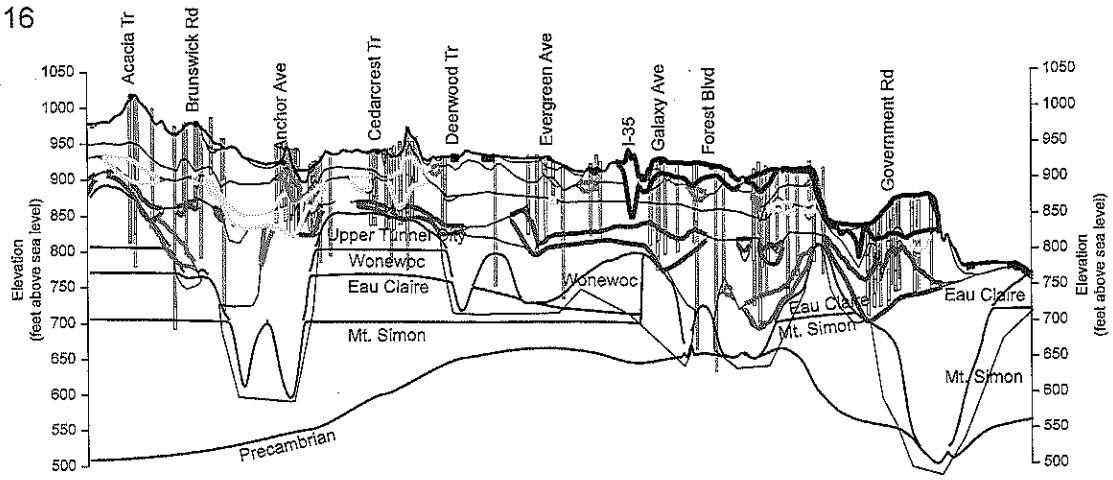

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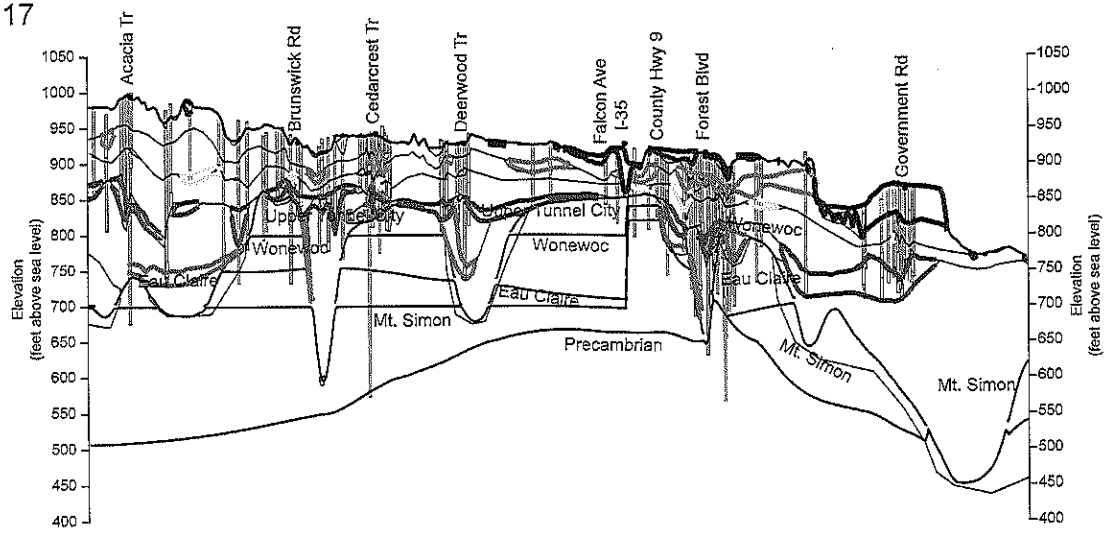

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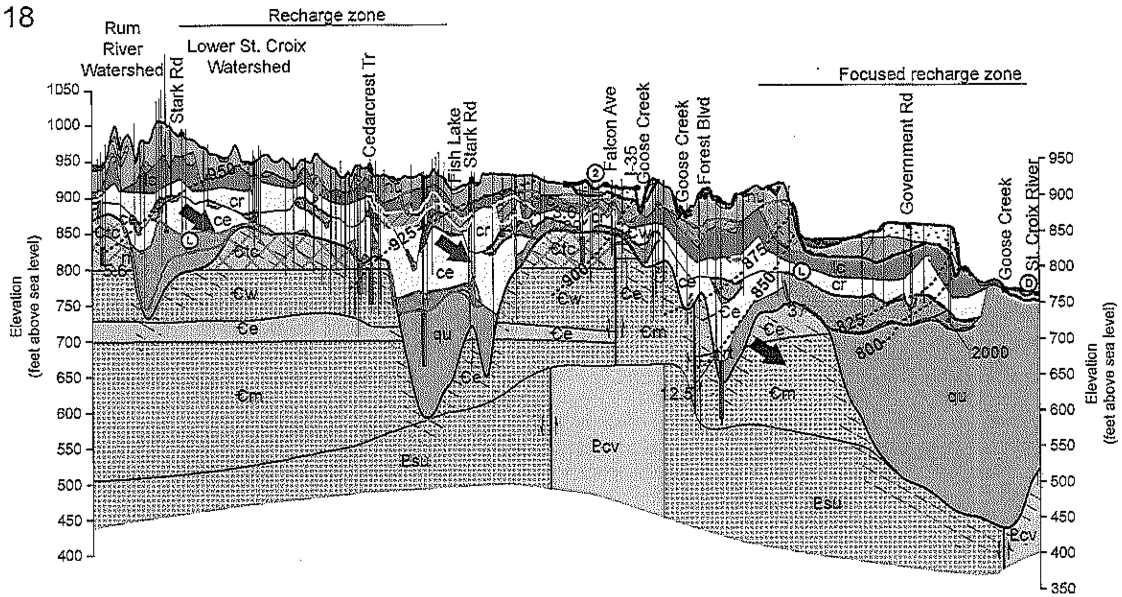
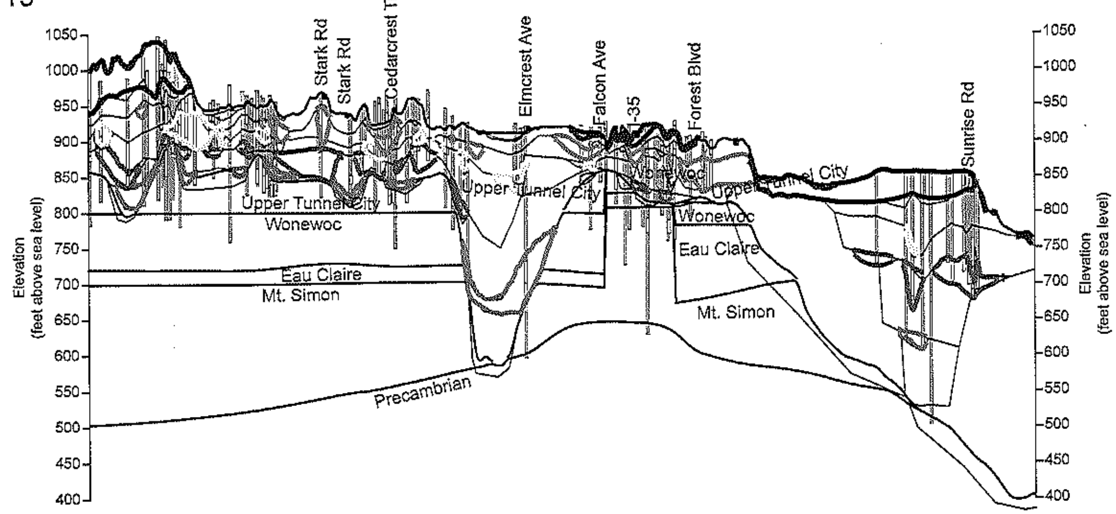

Rum River Watershed
Lower St. Croix Watershed
Recharge zone
Focused recharge zone
Stark Rd
Cedarcrest Tr
Fish Lake
Stark Rd
Falcon Ave
I-35
Goose Creek
Goose Creek
Forest Blvd
Government Rd
Goose Creek
St. Croix River
Elevation (feet above sea level)
Ecv
qu
2000

19


Stark Rd
Stark Rd
Cedarcrest Tr
Elmcrest Ave
Falcon Ave
I-35
Forest Blvd
Sunrise Rd
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Elevation (feet above sea level)

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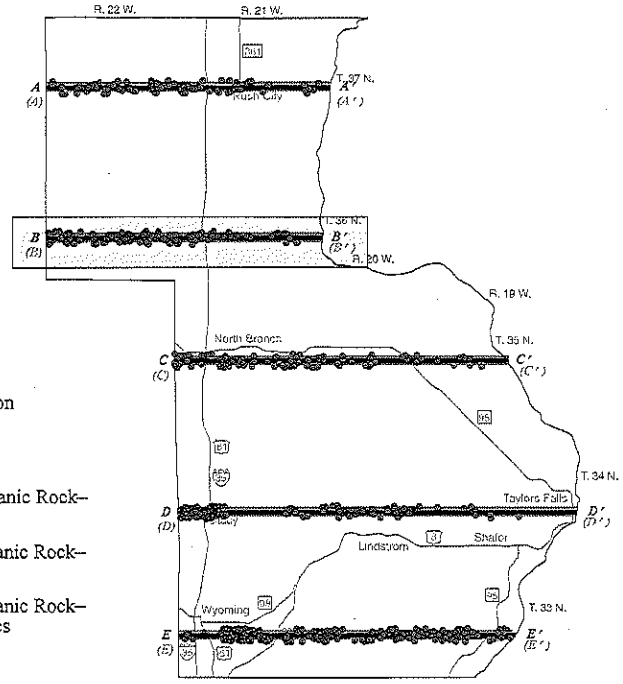
- (D) Groundwater discharge to surface-water body.
- (L) Lateral groundwater flow.
- ⊙ Groundwater movement out of cross section.



Bedrock non-aquifer units

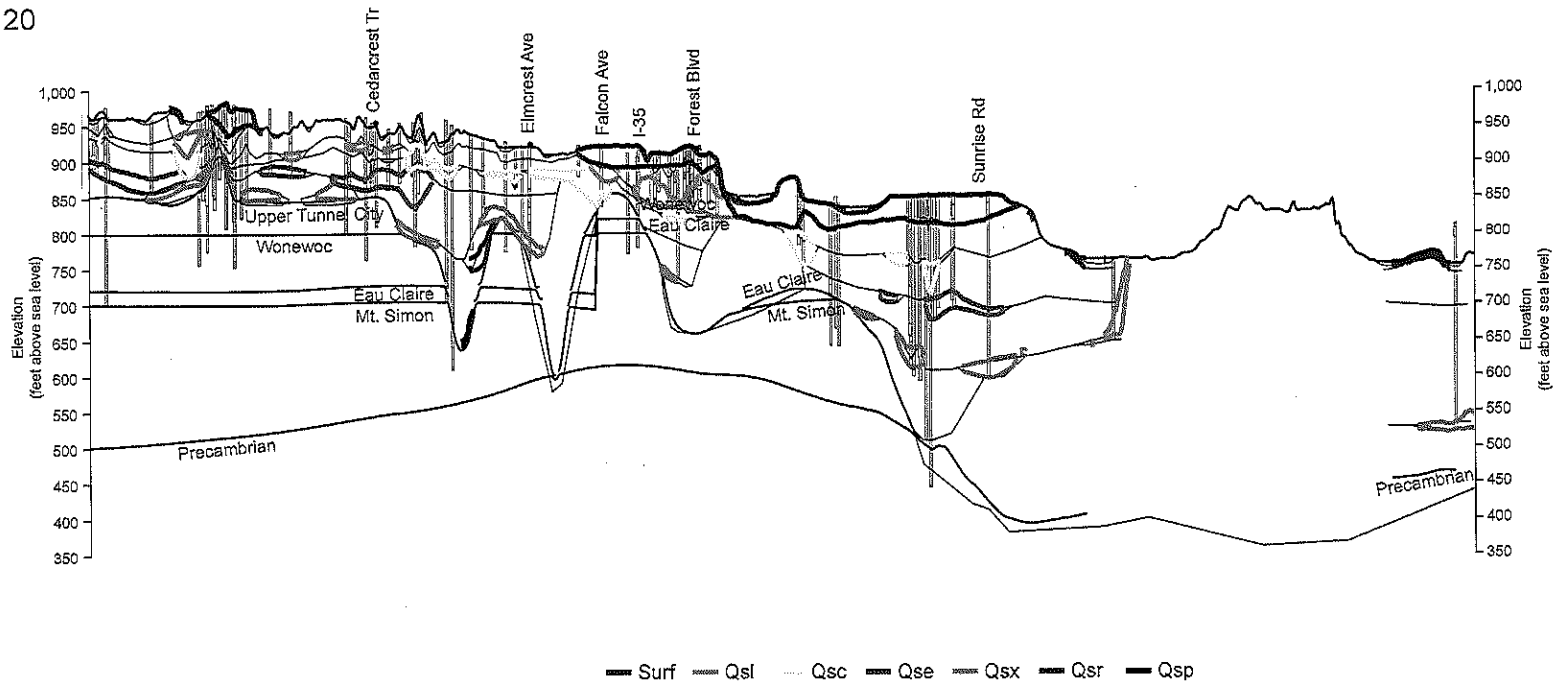
- Csl — St. Lawrence Formation
- Ce — Eau Claire Formation
- Pcf — Mesoproterozoic Volcanic Rock–Clam Falls Volcanics
- Pcv — Mesoproterozoic Volcanic Rock–Chengwatana Group
- Pnb — Mesoproterozoic Volcanic Rock–North Branch Volcanics

Aquitards grouped by texture ranging from highest to lowest sand content.

Percent sand*	Color code	Geologic unit code
> 60		cr, ce, rt
> 40 and ≤ 50		nu
> 30 and ≤ 40		lc, xt
Texture unknown		Undifferentiated Pleistocene sediment (qu). Relative hydraulic conductivity unknown.

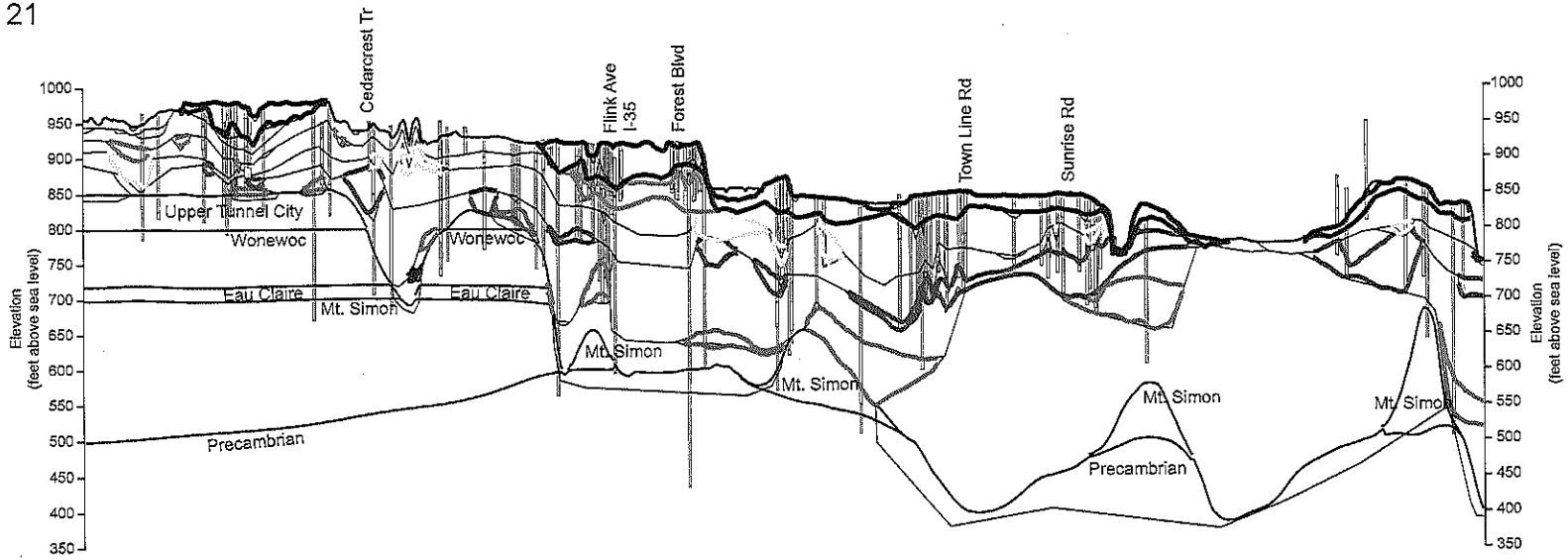
*Percent sand indicates relative hydraulic conductivity.

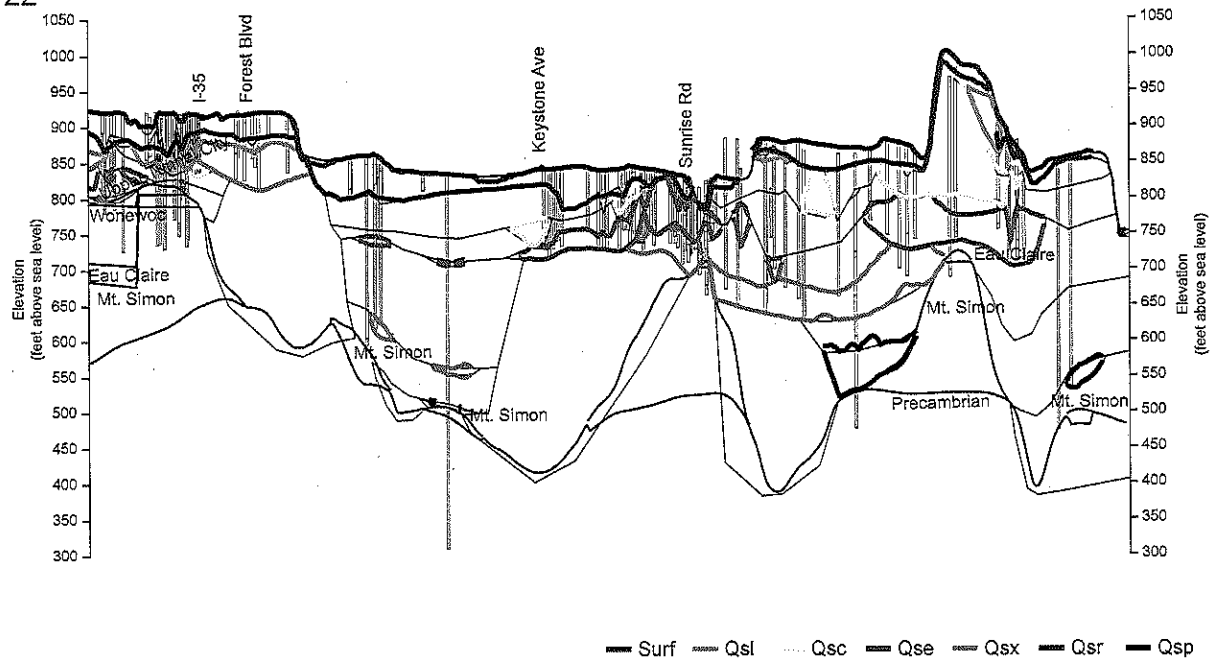
20

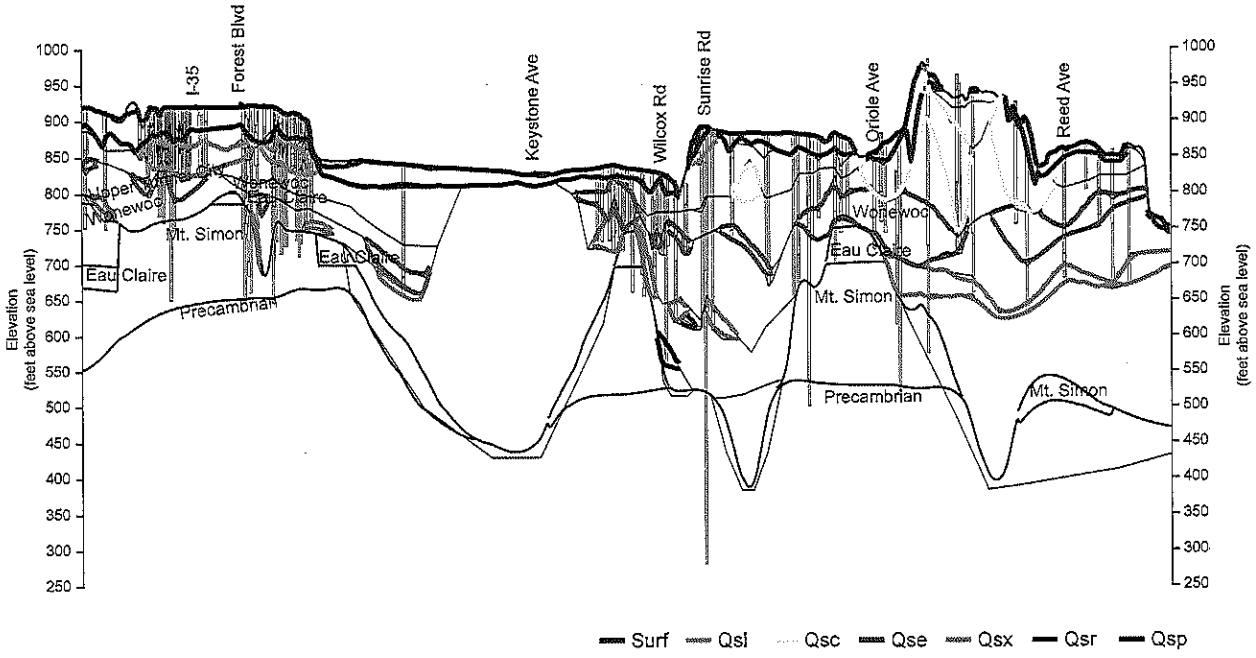


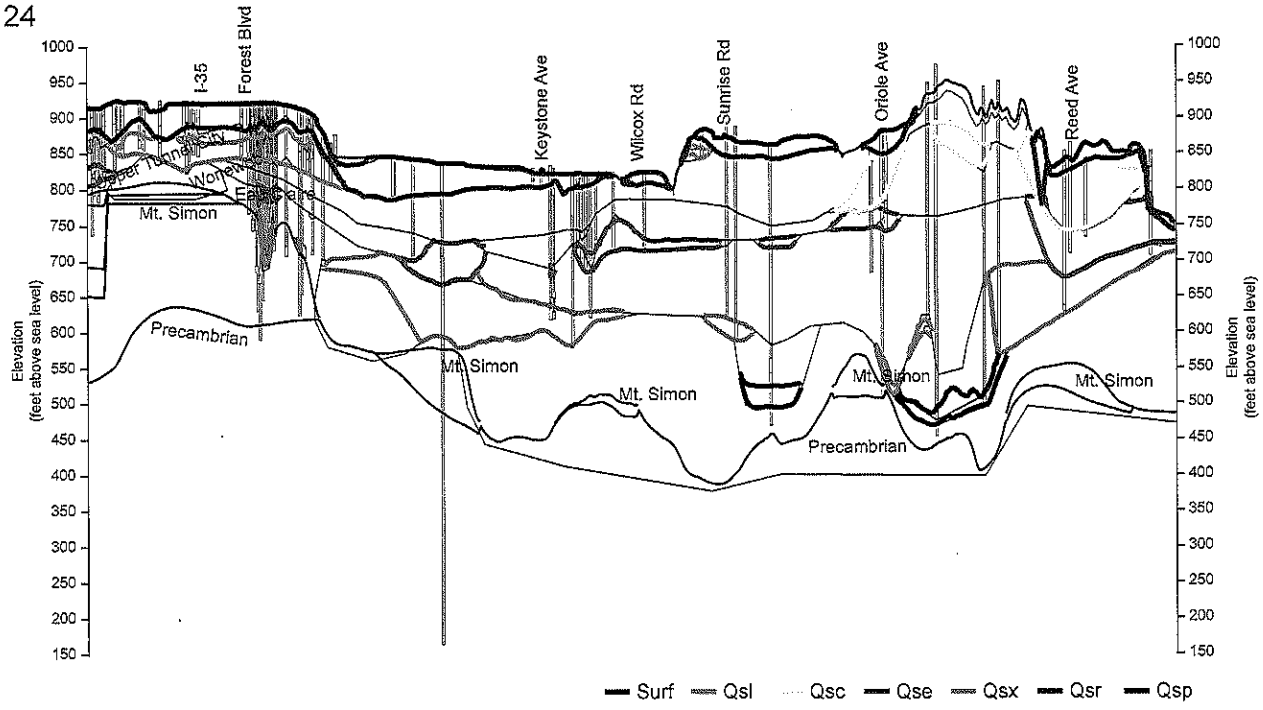
Surf Qsl Qsc Qse Qsx Qsr Qsp

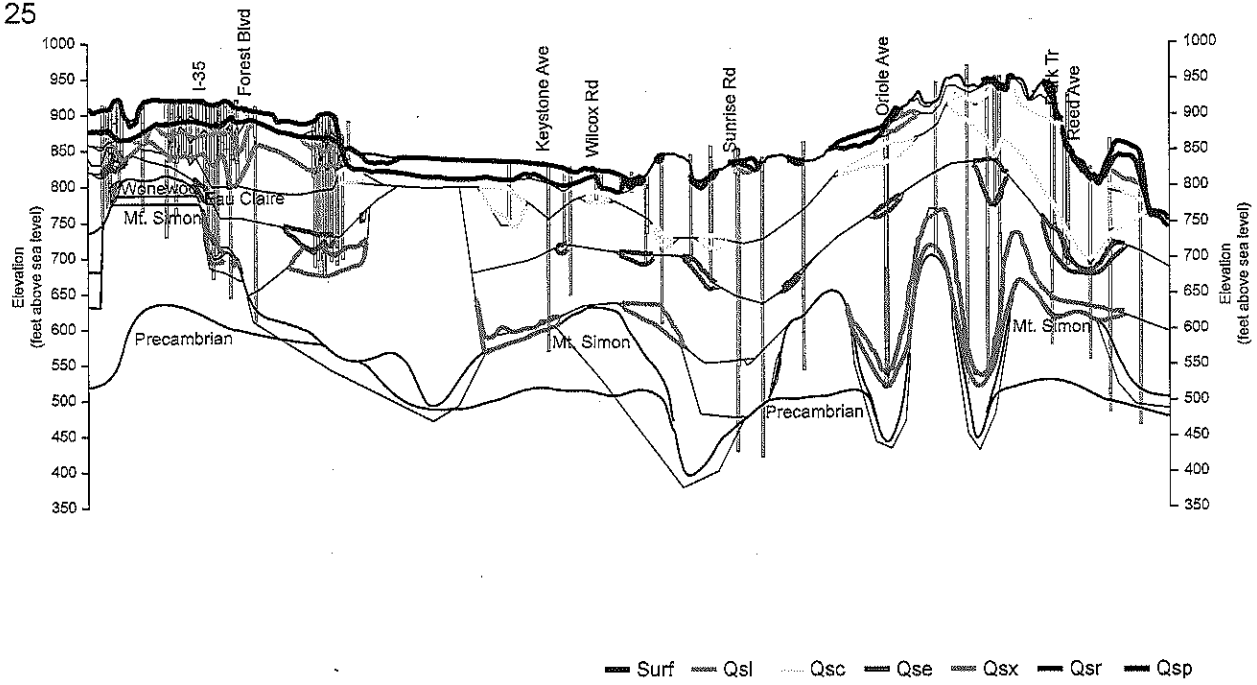
21

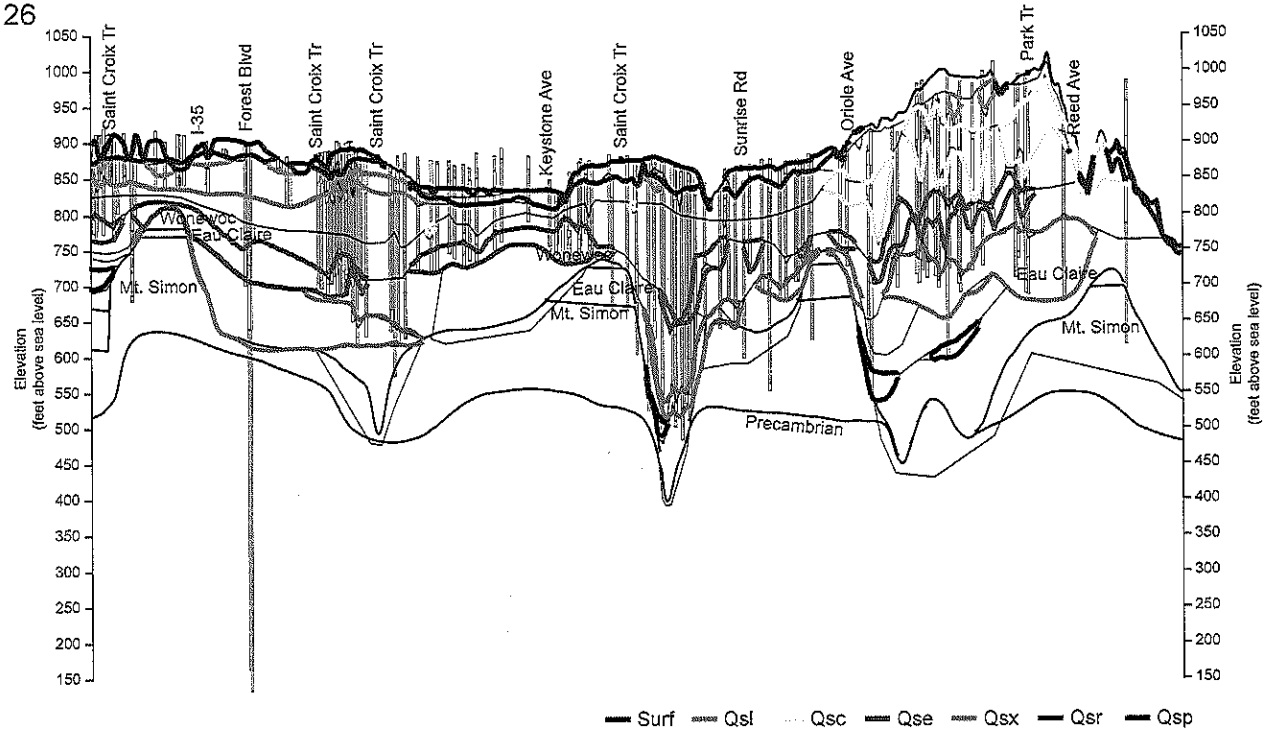


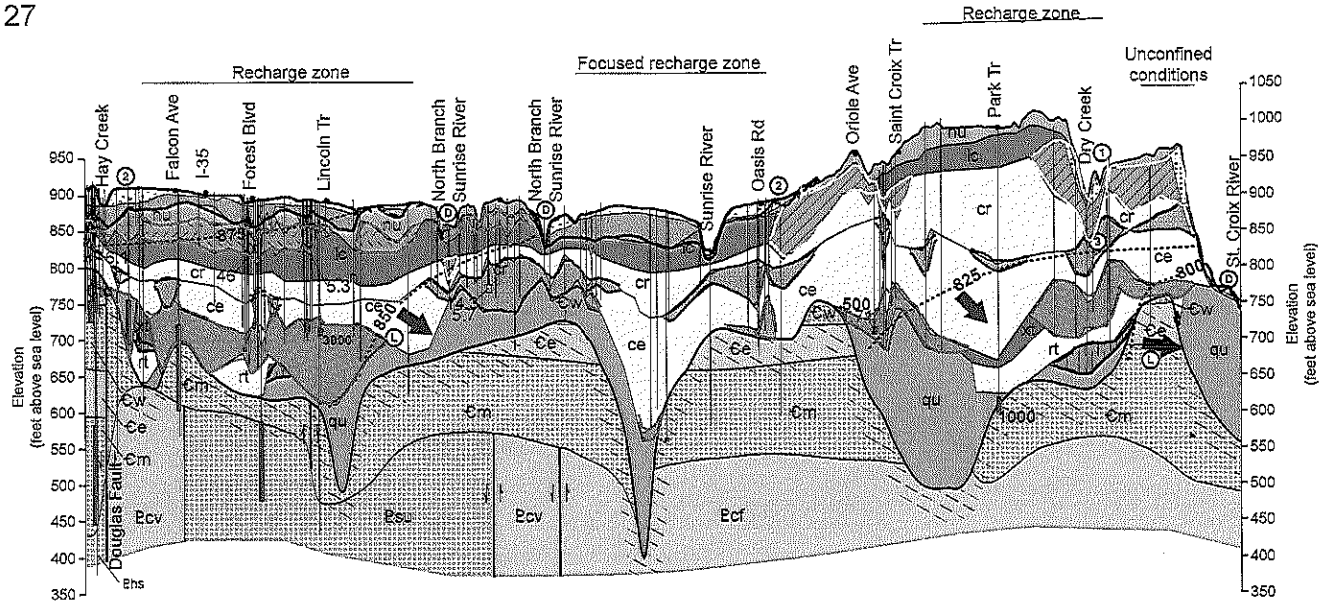

1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
Elevation (feet above sea level)
I-35
Forest Blvd
Keystone Ave
Sunrise Rd
Wonewoc
Eau Claire
Mt. Simon
Mt. Simon
Mt. Simon
Eau Claire
Mt. Simon
Precambrian
Mt. Simon
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd
Keystone Ave
Wilcox Rd
Sunrise Rd
Oriole Ave
Reed Ave
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Elevation
(feet above sea level)
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd
Keystone Ave
Wilcox Rd
Sunrise Rd
Oriole Ave
Reed Ave
Upper Hinckley
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Mt. Simon
Mt. Simon
Mt. Simon
Precambrian
Mt. Simon
Elevation (feet above sea level)
Elevation (feet above sea level)
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


1000
950
900
850
800
750
700
650
600
550
500
450
400
350
Elevation (feet above sea level)
I-35
Forest Blvd
Keystone Ave
Wilcox Rd
Sunrise Rd
Oriole Ave
Park Tr
Reed Ave
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Mt. Simon
Precambrian
Mt. Simon
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


Saint Croix Tr
I-35
Forest Blvd
Saint Croix Tr
Saint Croix Tr
Keystone Ave
Saint Croix Tr
Sunrise Rd
Oriole Ave
Park Tr
Reed Ave
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Elevation (feet above sea level)
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


Recharge zone
Focused recharge zone
Recharge zone
Unconfined conditions
Hay Creek
Falcon Ave
I-35
Forest Blvd
Lincoln Tr
North Branch Sunrise River
North Branch Sunrise River
Sunrise River
Oasis Rd
Oriole Ave
Saint Croix Tr
Park Tr
Dry Creek
St. Croix River
Douglas Fault
Elevation (feet above sea level)
Elevation (feet above sea level)
qu
cr
ce
cw
cm
rt
Ecv
Esu
Ecv
Ecf
Ehs
1000
500
3800
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350

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 bomb testing, 1958-1972 (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.

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 (^{14}C) isotope analysis.

General direction of groundwater flow.

-- 925 ---- Approximate equipotential contour. Contour interval 25 feet.

Geologic contact.

Land or bedrock surface.

Lake.

Direction of fault movement. Arrow indicates relative movement.

Aquifers - grouped by stratigraphy

Surficial sand aquifer.

Surficial sand

Buried sand and gravel aquifers.

sl

sc

se

sx

sr

sp

Sedimentary bedrock aquifers.

** St. Peter/Prairie du Chien

Cj * Jordan

Ctc ** Upper Tunnel City

Cw * Wonewoc

Cm * Mt. Simon

Csu * Undifferentiated Mesoproterozoic

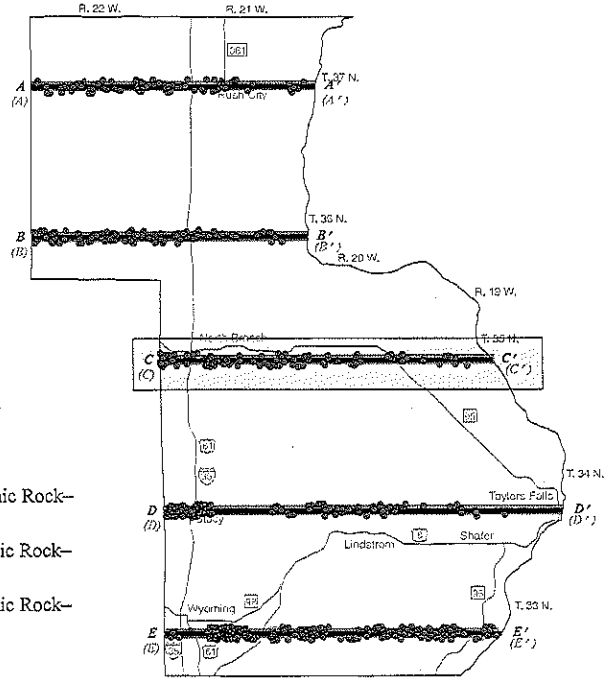
Enhanced-permeability zone

* Primarily intergranular flow

** Intergranular and fracture flow

Groundwater conditions

1. Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer.
2. Groundwater recharge from overlying surficial aquifer to 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.
D. Groundwater discharge to surface-water body.
L. Lateral groundwater flow.
⊙ Groundwater movement out of cross section.



Bedrock non-aquifer units

Csl St. Lawrence Formation

Ce Eau Claire Formation

Ecf Mesoproterozoic Volcanic Rock–Clam Falls Volcanics

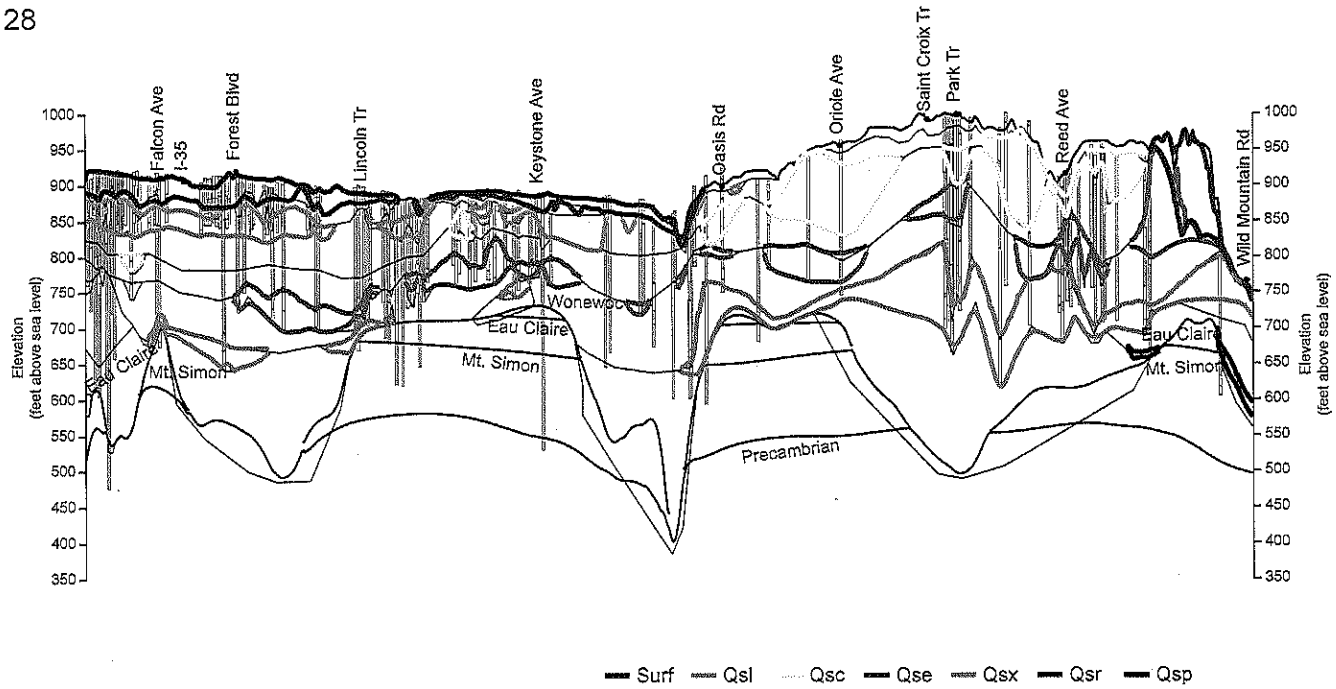
Ecv Mesoproterozoic Volcanic Rock–Chengwatana Group

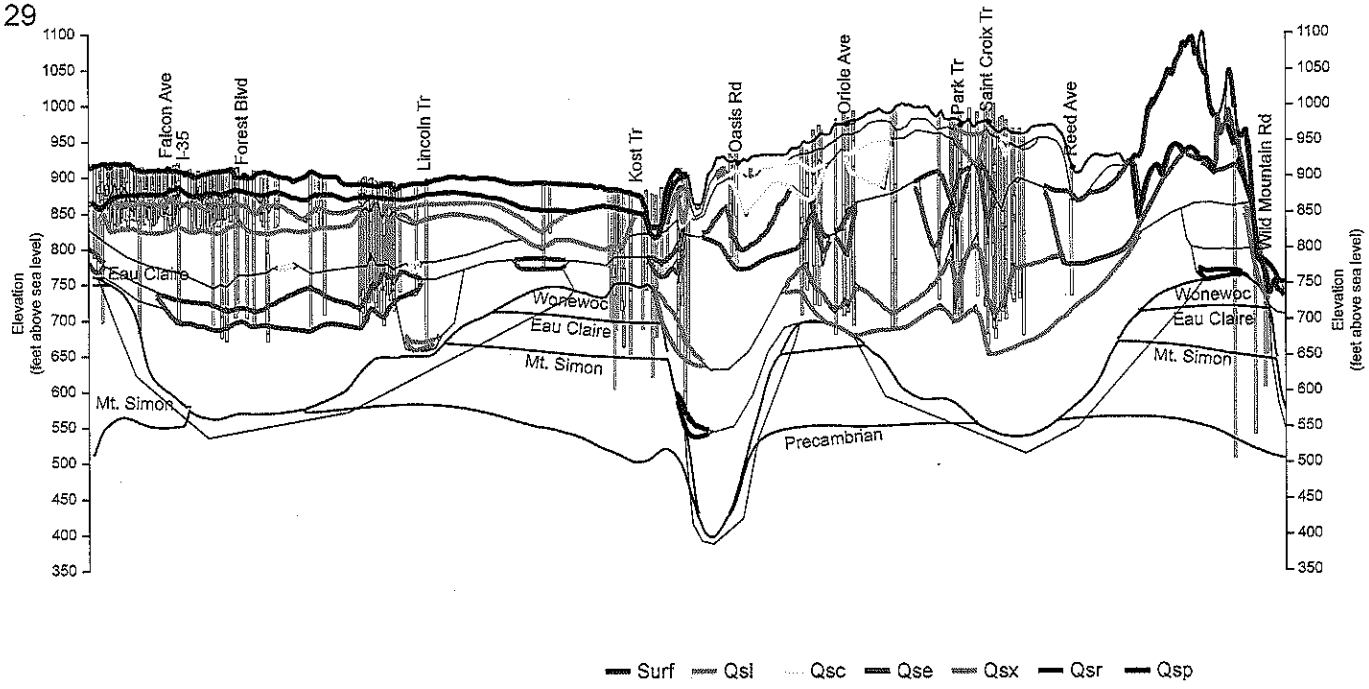
Enb Mesoproterozoic Volcanic Rock–North Branch Volcanics

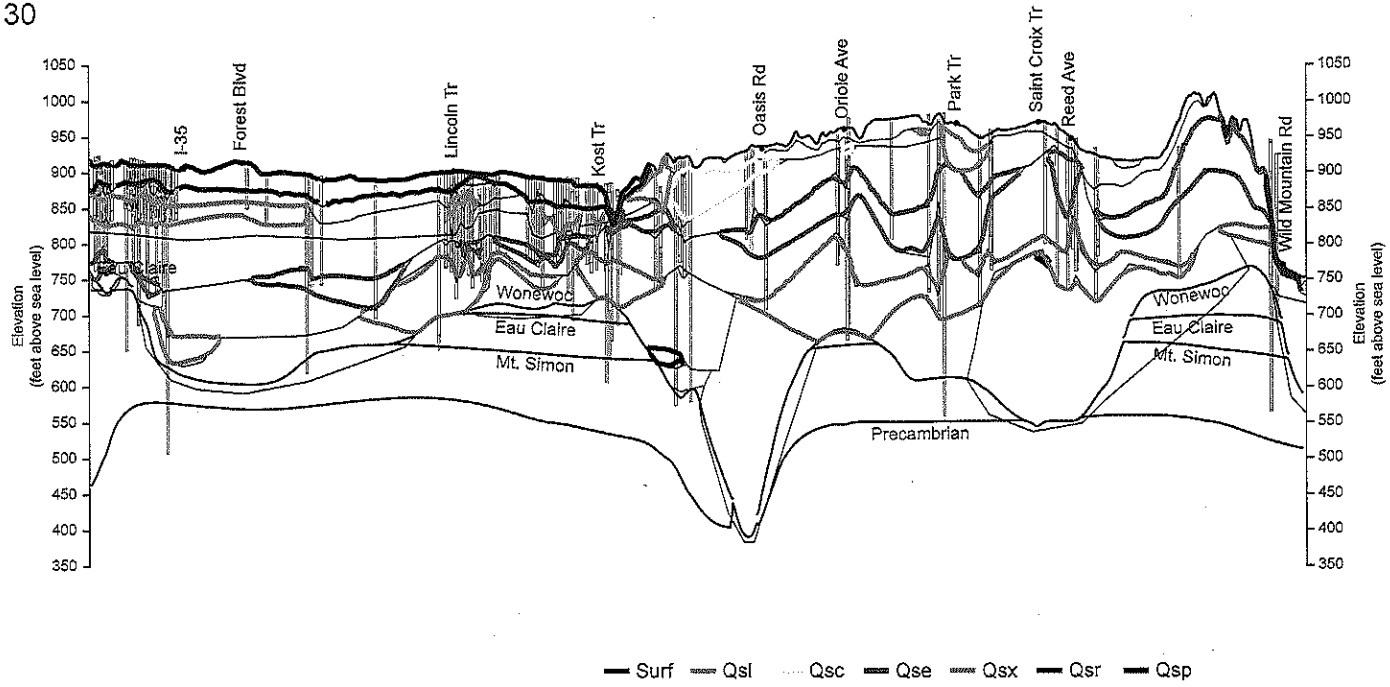
Aquitards grouped by texture ranging from highest to lowest sand content.

Percent sand*	Color code	Geologic unit code
> 60		cr, ce, rt
> 40 and ≤ 50		nu
> 30 and ≤ 40		lc, xt
Texture unknown		Undifferentiated Pleistocene sediment (qu). Relative hydraulic conductivity unknown.

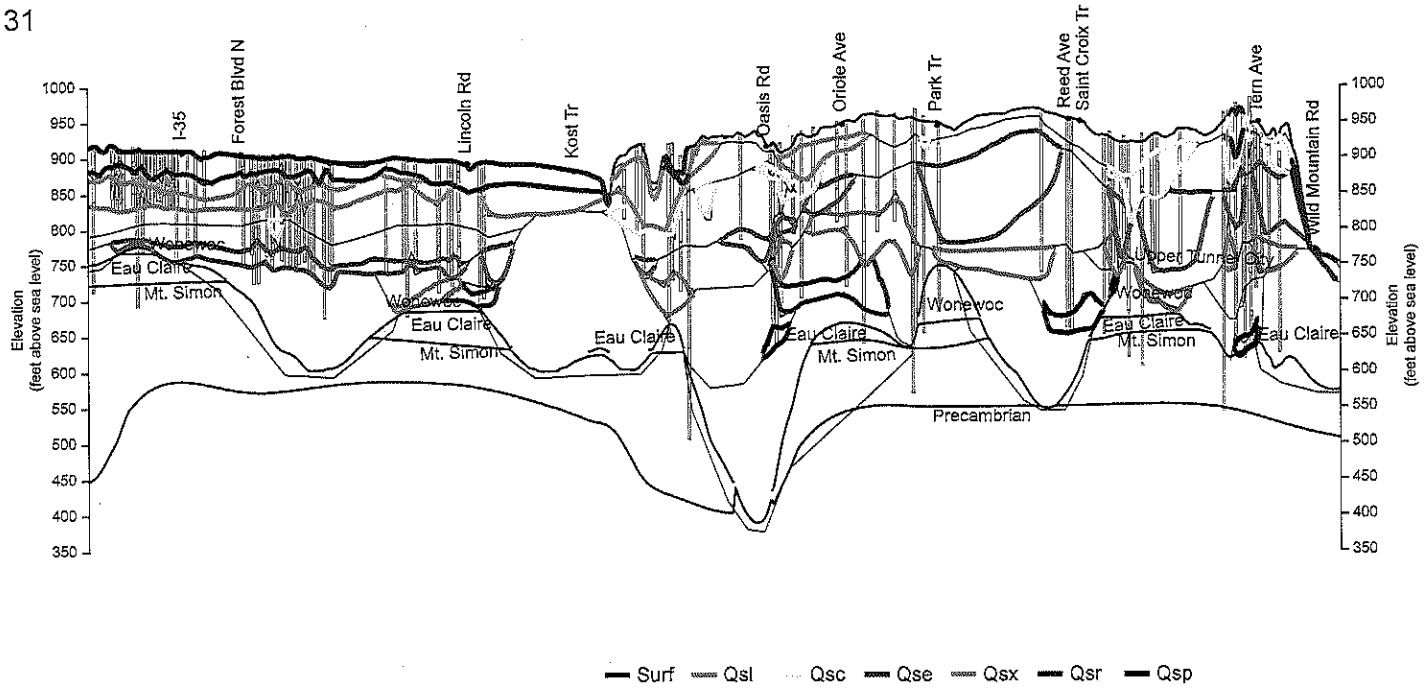
*Percent sand indicates relative hydraulic conductivity.


Falcon Ave
I-35
Forest Blvd
Lincoln Tr
Keystone Ave
Oasis Rd
Oriole Ave
Saint Croix Tr
Park Tr
Reed Ave
Wild Mountain Rd
Elevation (feet above sea level)
Eau Claire
Mt. Simon
Wonewoc
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

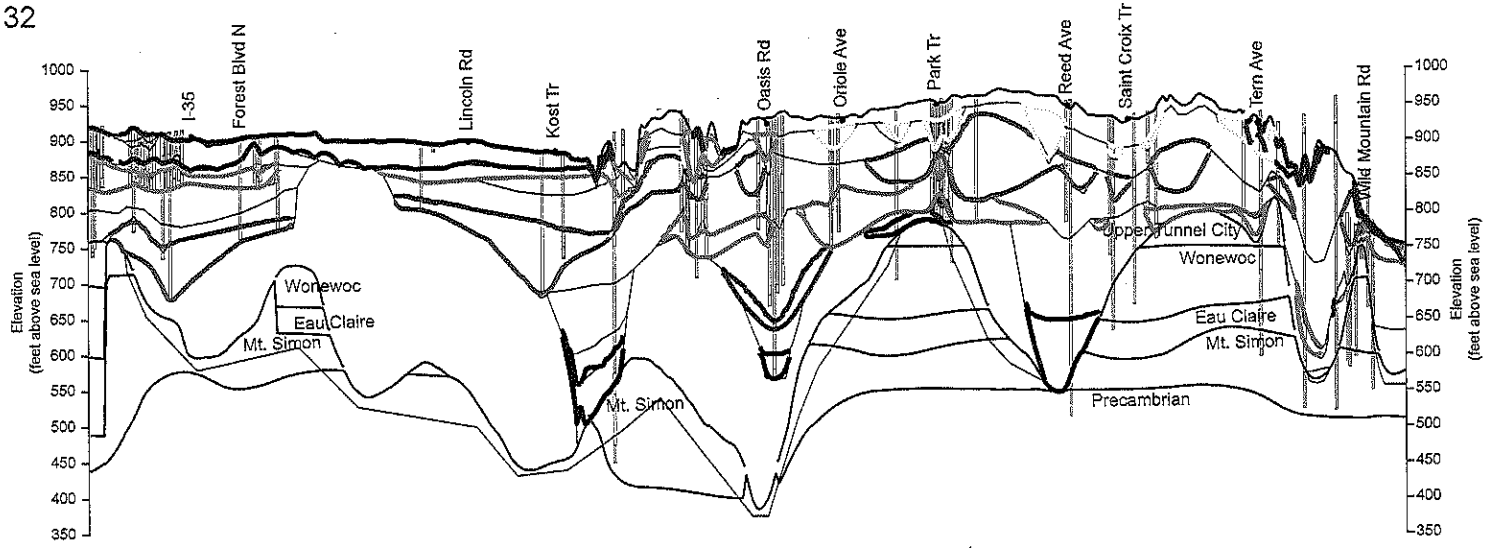

Elevation (feet above sea level)
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
Falcon Ave I-35
Forest Blvd
Lincoln Tr
Kost Tr
Oasis Rd
Oriole Ave
Park Tr
Saint Croix Tr
Reed Ave
Wild Mountain Rd
Eau Claire
Wonewoc
Eau Claire
Mt. Simon
Mt. Simon
Precambrian
Wonewoc
Eau Claire
Mt. Simon
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

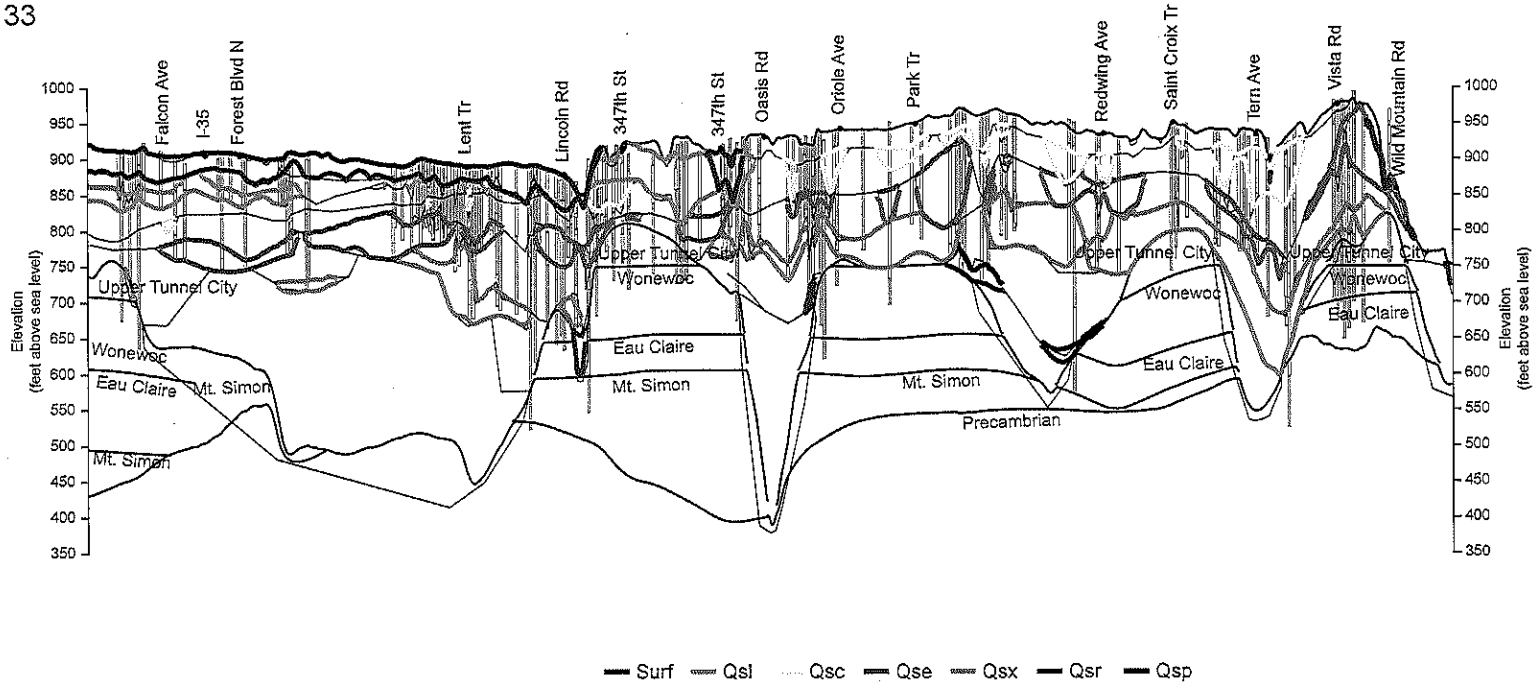

1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
Elevation (feet above sea level)
I-35
Forest Blvd
Lincoln Tr
Kost Tr
Oasis Rd
Oriole Ave
Park Tr
Saint Croix Tr
Reed Ave
Wild Mountain Rd
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

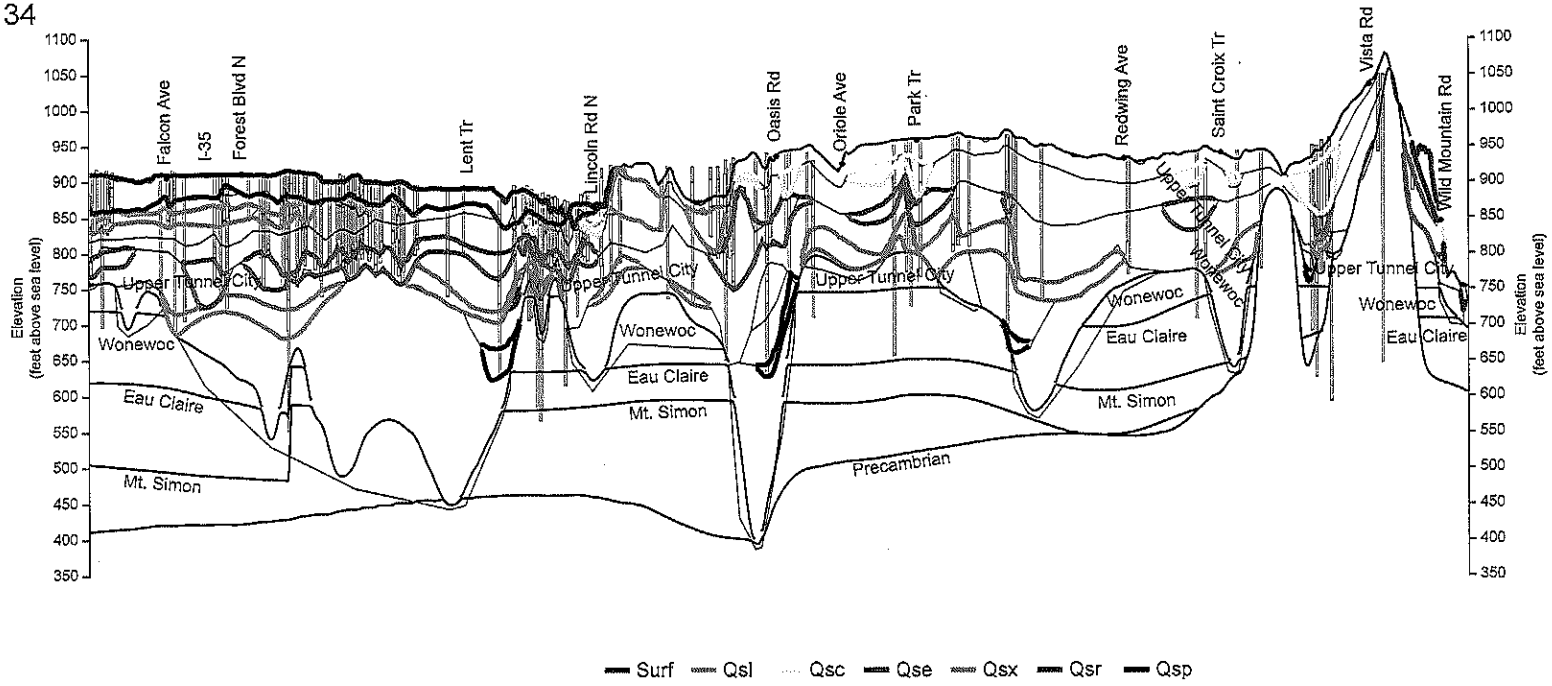
31

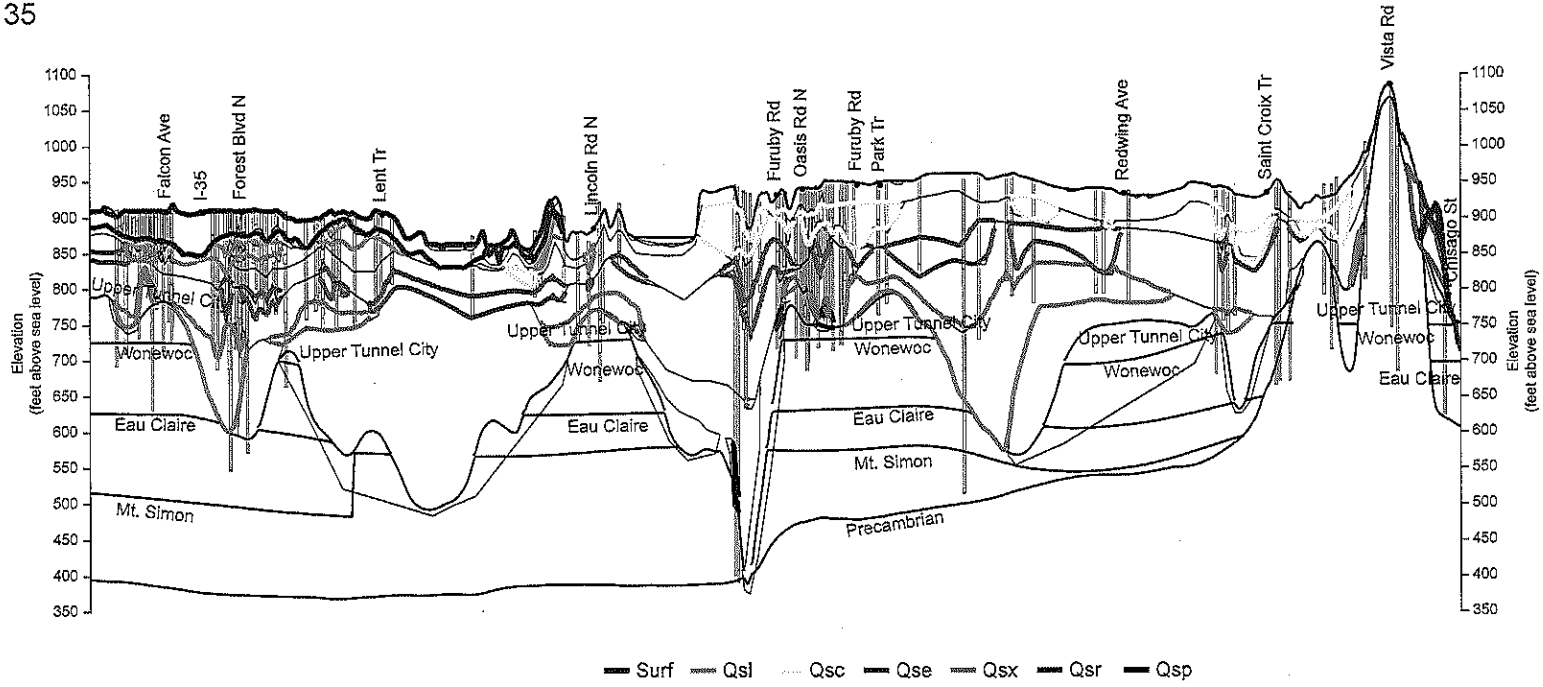

I-35
Forest Blvd N
Lincoln Rd
Kost Tr
Oasis Rd
Oriole Ave
Park Tr
Reed Ave
Saint Croix Tr
Tern Ave
Wild Mountain Rd
Elevation (feet above sea level)
Wonewoc
Eau Claire
Mt. Simon
Upper Tunnel City
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

32

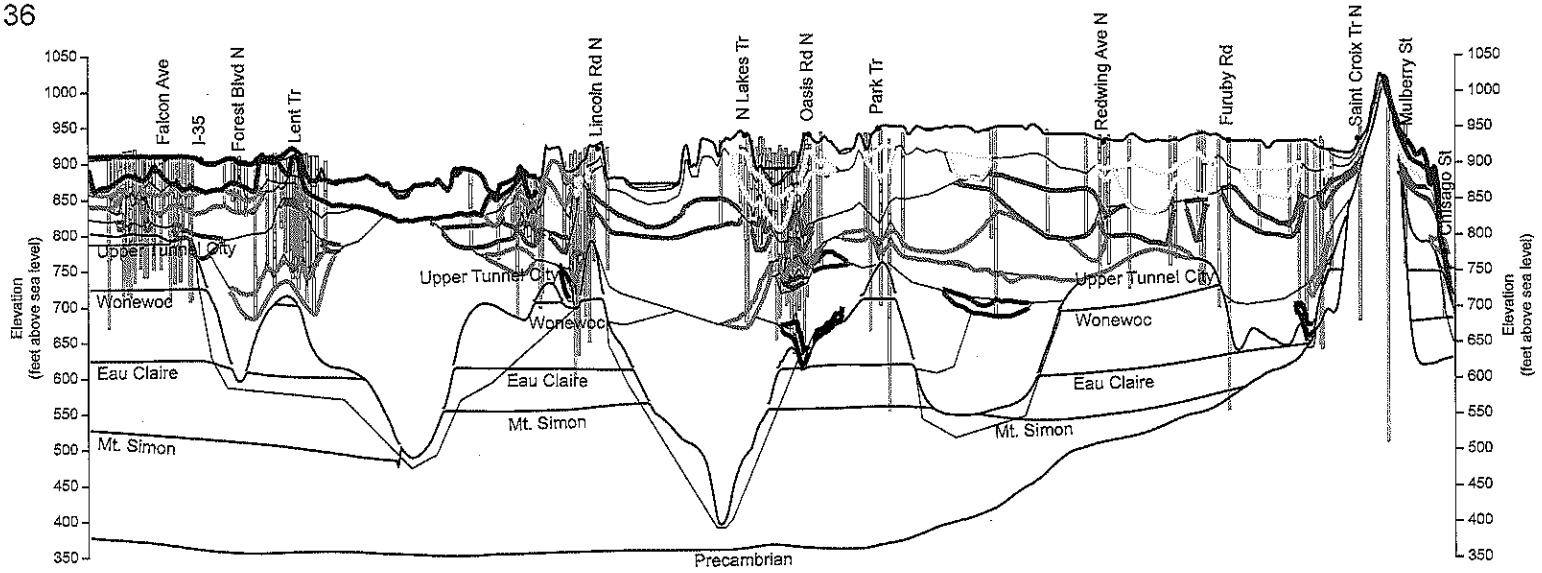

I-35
Forest Blvd N
Lincoln Rd
Kost Tr
Oasis Rd
Oriole Ave
Park Tr
Reed Ave
Saint Croix Tr
Tern Ave
Wild Mountain Rd
Elevation (feet above sea level)
Wonewoc
Eau Claire
Mt. Simon
Upper Tunnel City
Precambrian


Falcon Ave
I-35
Forest Blvd N
Lent Tr
Lincoln Rd
347th St
347th St
Oasis Rd
Oriole Ave
Park Tr
Redwing Ave
Saint Croix Tr
Tern Ave
Vista Rd
Wild Mountain Rd
Elevation (feet above sea level)
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


Falcon Ave
I-35
Forest Blvd N
Lent Tr
Lincoln Rd N
Oasis Rd
Oriole Ave
Park Tr
Redwing Ave
Saint Croix Tr
Vista Rd
Wild Mountain Rd
Elevation (feet above sea level)
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

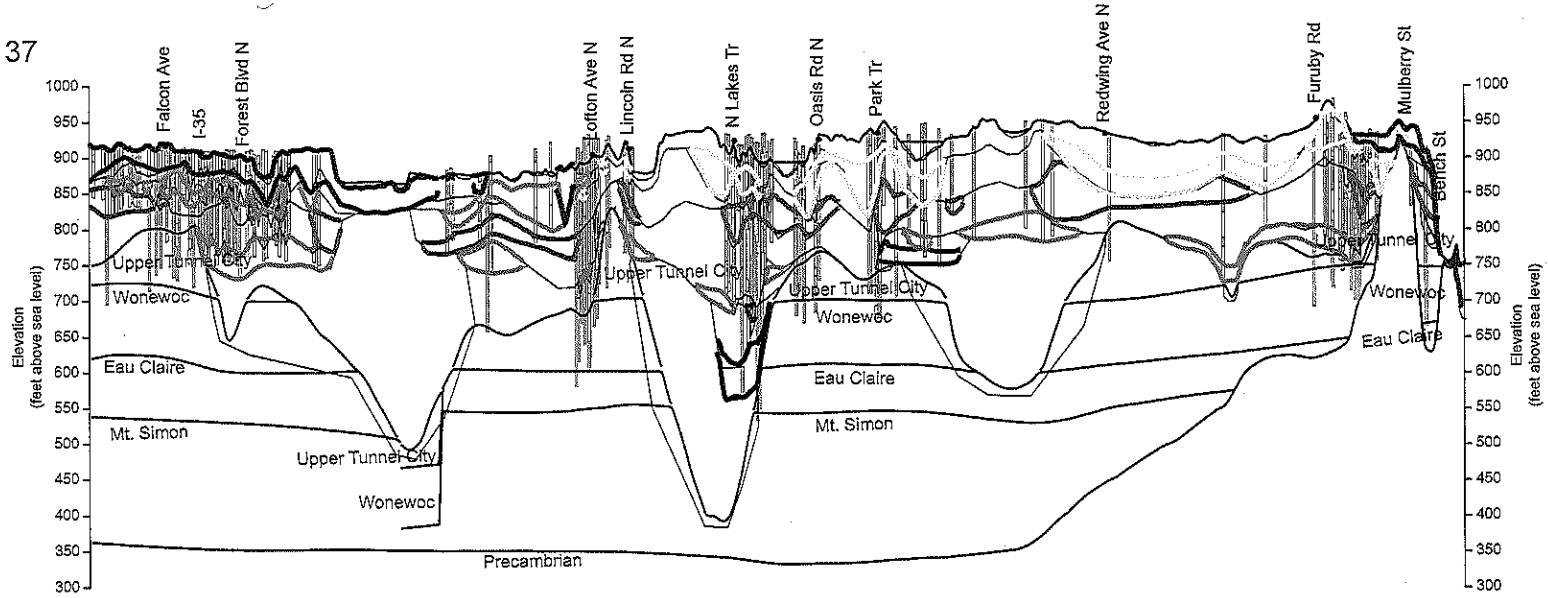

Falcon Ave
I-35
Forest Blvd N
Lent Tr
Lincoln Rd N
Furuby Rd
Oasis Rd N
Furuby Rd
Park Tr
Redwing Ave
Saint Croix Tr
Vista Rd
Chippewa St
Elevation (feet above sea level)
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp

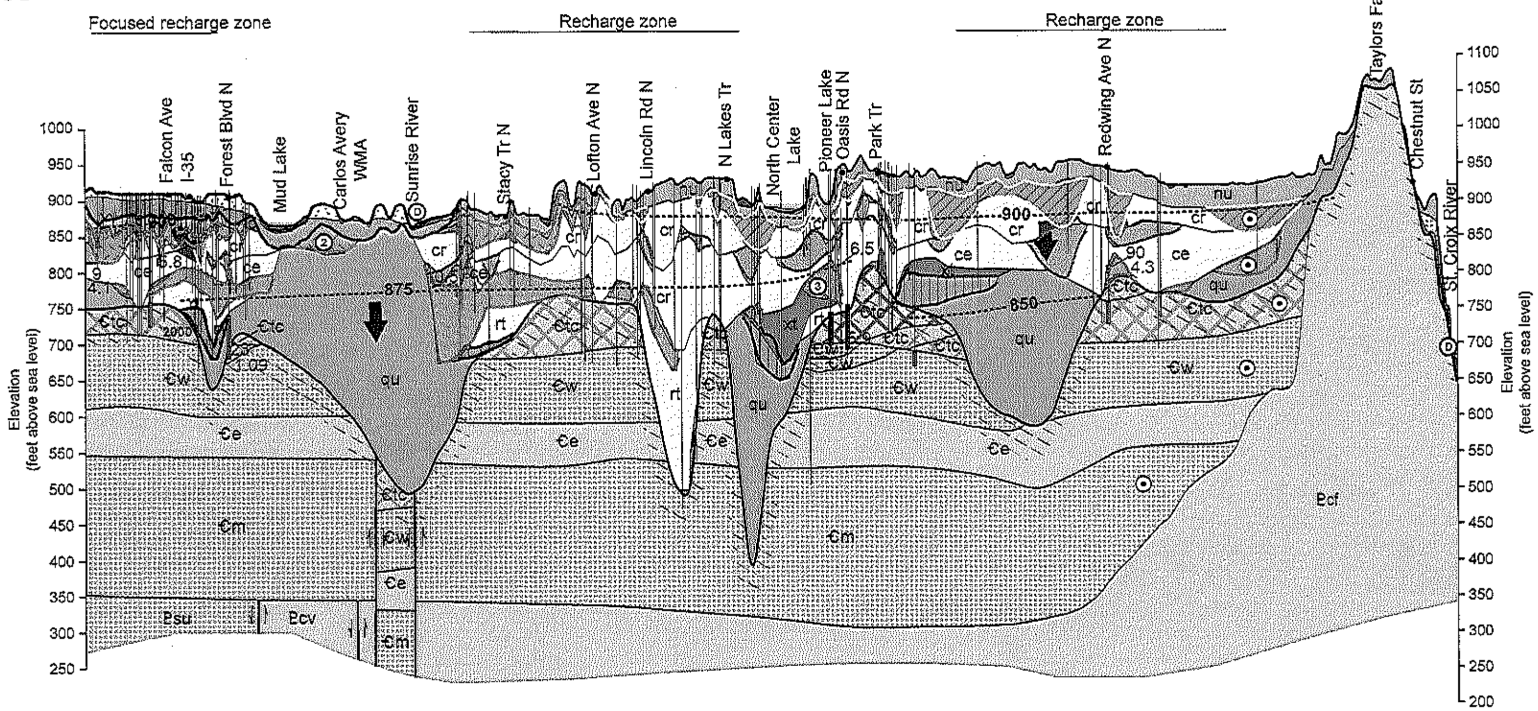
36



Surf Qsl Qsc Qse Qsx Qsr Qsp

37




Focused recharge zone
Recharge zone
Recharge zone
Falcon Ave
I-35
Forest Blvd N
Mud Lake
Carlos Avery WMA
Sunrise River
Stacy Tr N
Lofton Ave N
Lincoln Rd N
N Lakes Tr
North Center Lake
Pioneer Lake
Oasis Rd N
Park Tr
Redwing Ave N
Taylors Falls
Chestnut St
St. Croix River
Elevation (feet above sea level)
Elevation (feet above sea level)

Tritium age

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

General direction of groundwater flow.

---- 925 ---- Approximate equipotential contour. Contour interval 25 feet.

Geologic contact.

Land or bedrock surface.

Lake.

Direction of fault movement. Arrow indicates relative movement.

Aquifers - grouped by stratigraphy

Surficial sand aquifer.

Surficial sand

Buried sand and gravel aquifers.

sl

sc

se

sx

sr

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

Groundwater conditions

① Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer.

② Groundwater recharge from overlying surficial aquifer to buried aquifer.

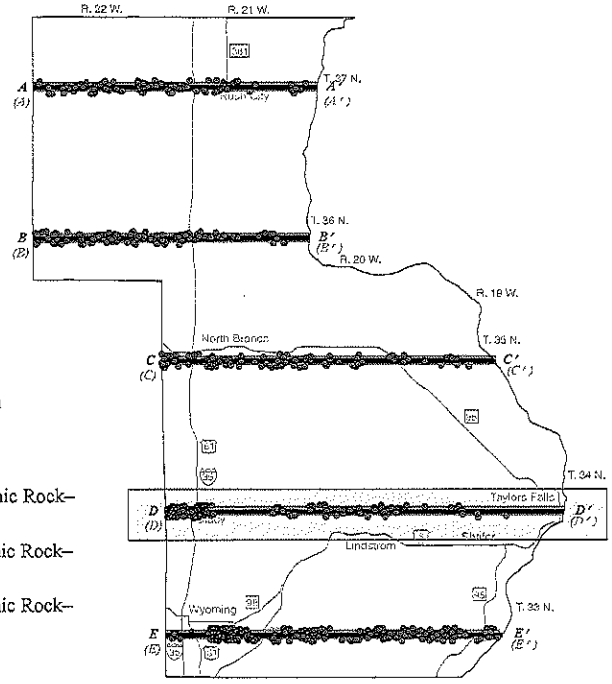
③ Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer.

④ Groundwater leakage through multiple aquifers and fine-grained layers.

Ⓓ Groundwater discharge to surface-water body.

Ⓛ Lateral groundwater flow.

⊙ Groundwater movement out of cross section.



Bedrock non-aquifer units

Csl St. Lawrence Formation

Ce Eau Claire Formation

Pcf Mesoproterozoic Volcanic Rock–Clam Falls Volcanics

Pcv Mesoproterozoic Volcanic Rock–Chengwatana Group

Pnb Mesoproterozoic Volcanic Rock–North Branch Volcanics

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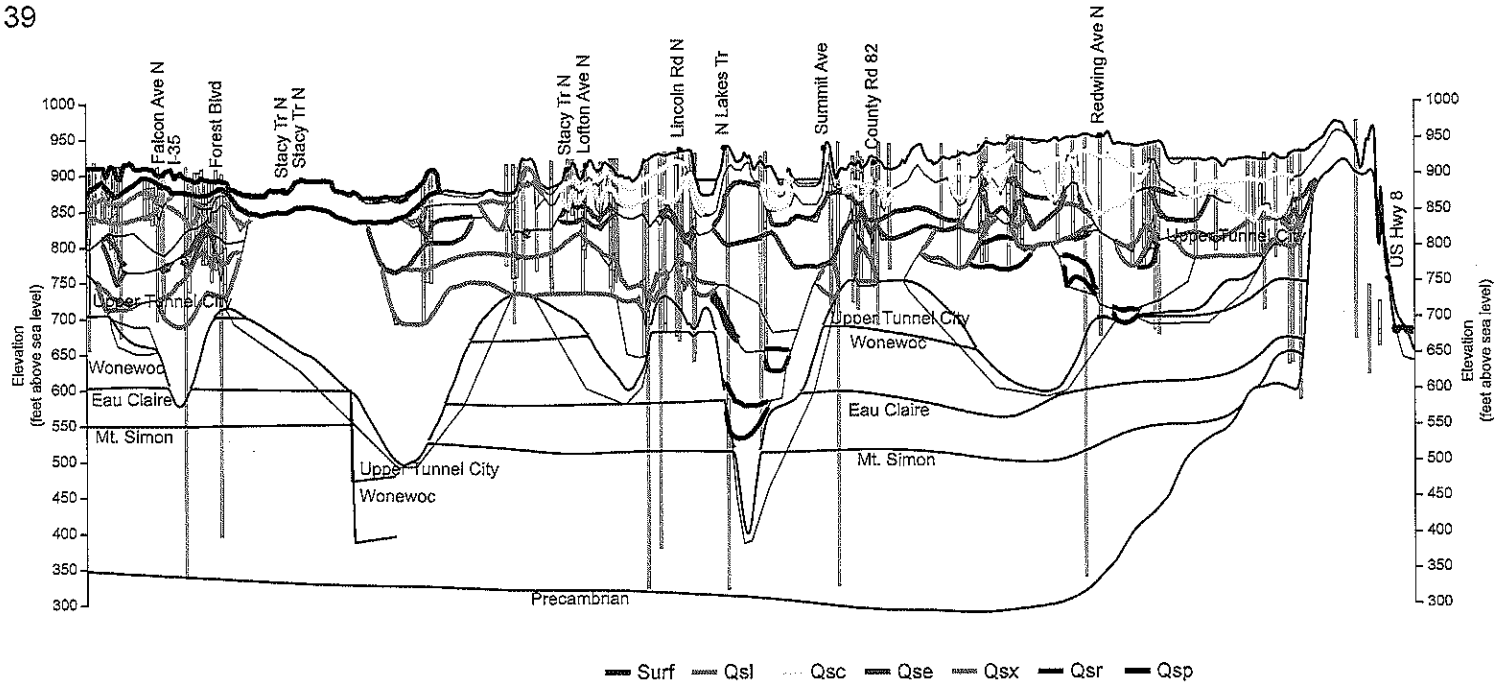
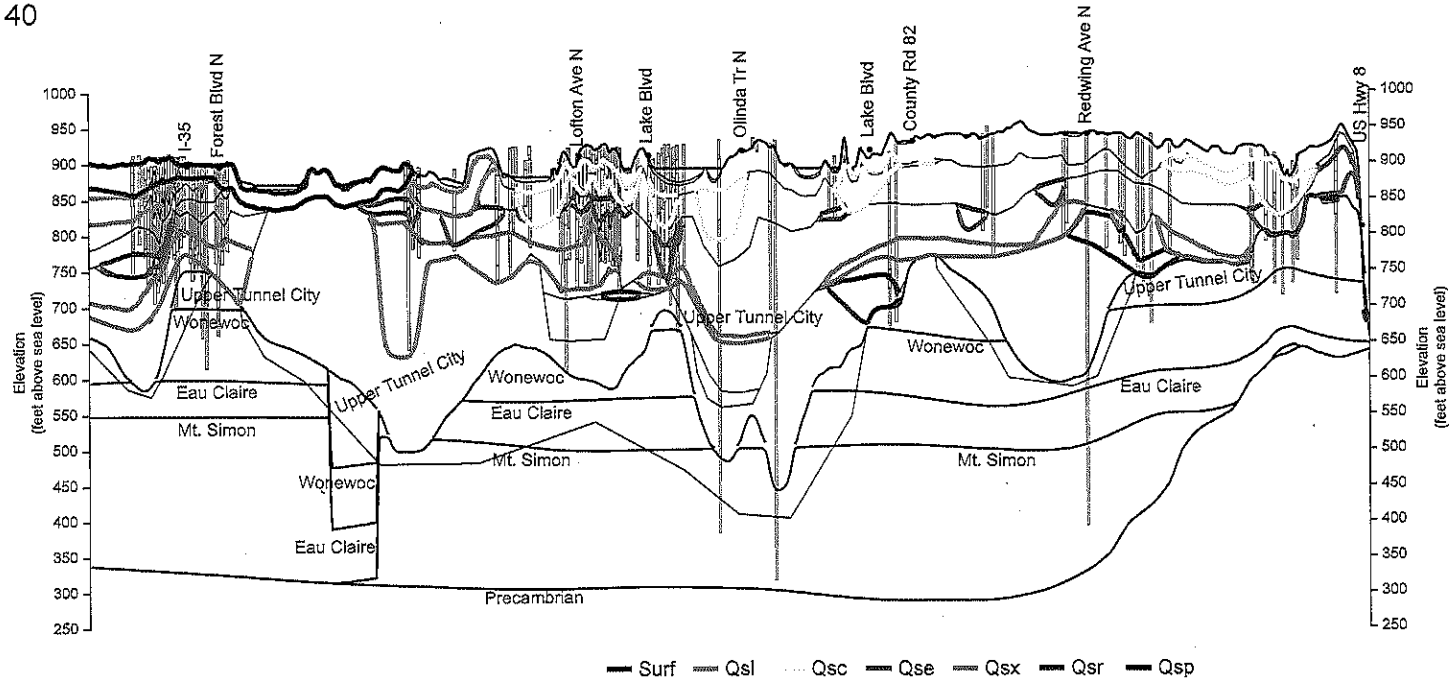
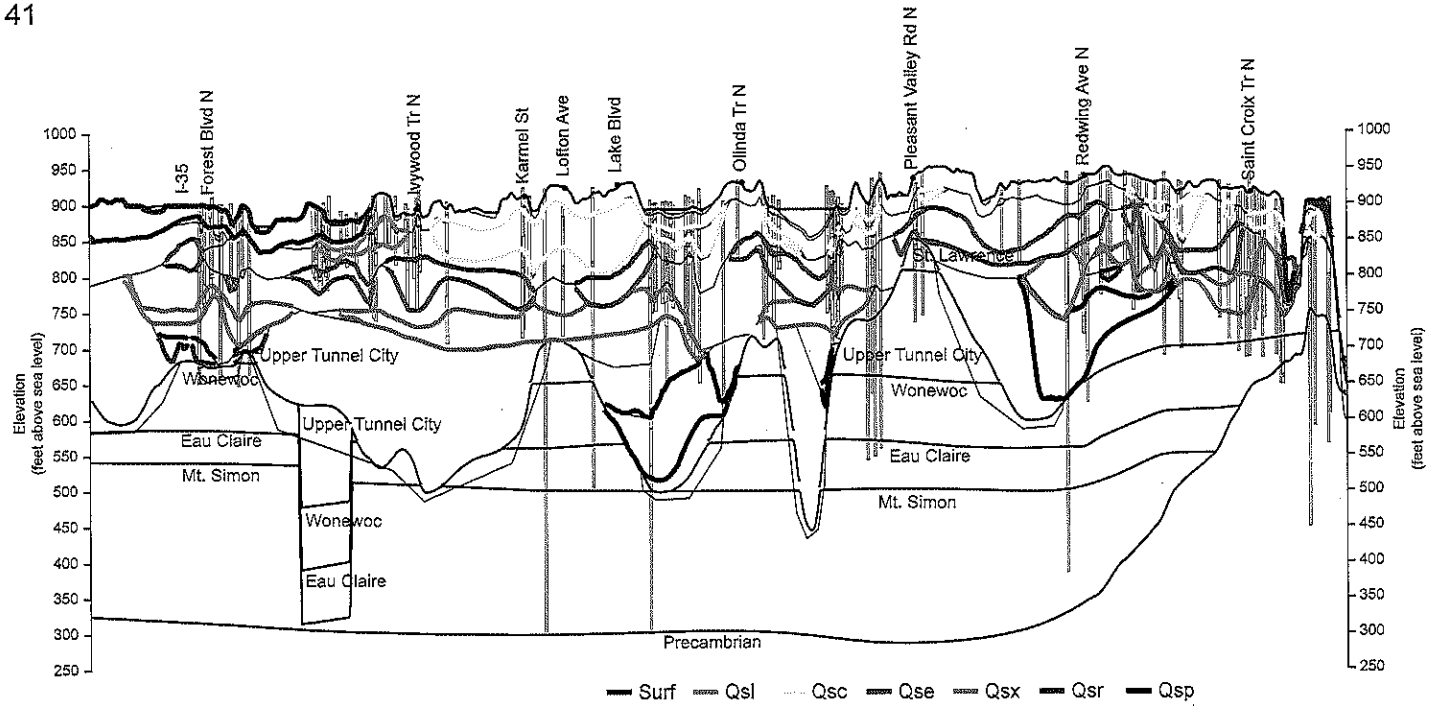
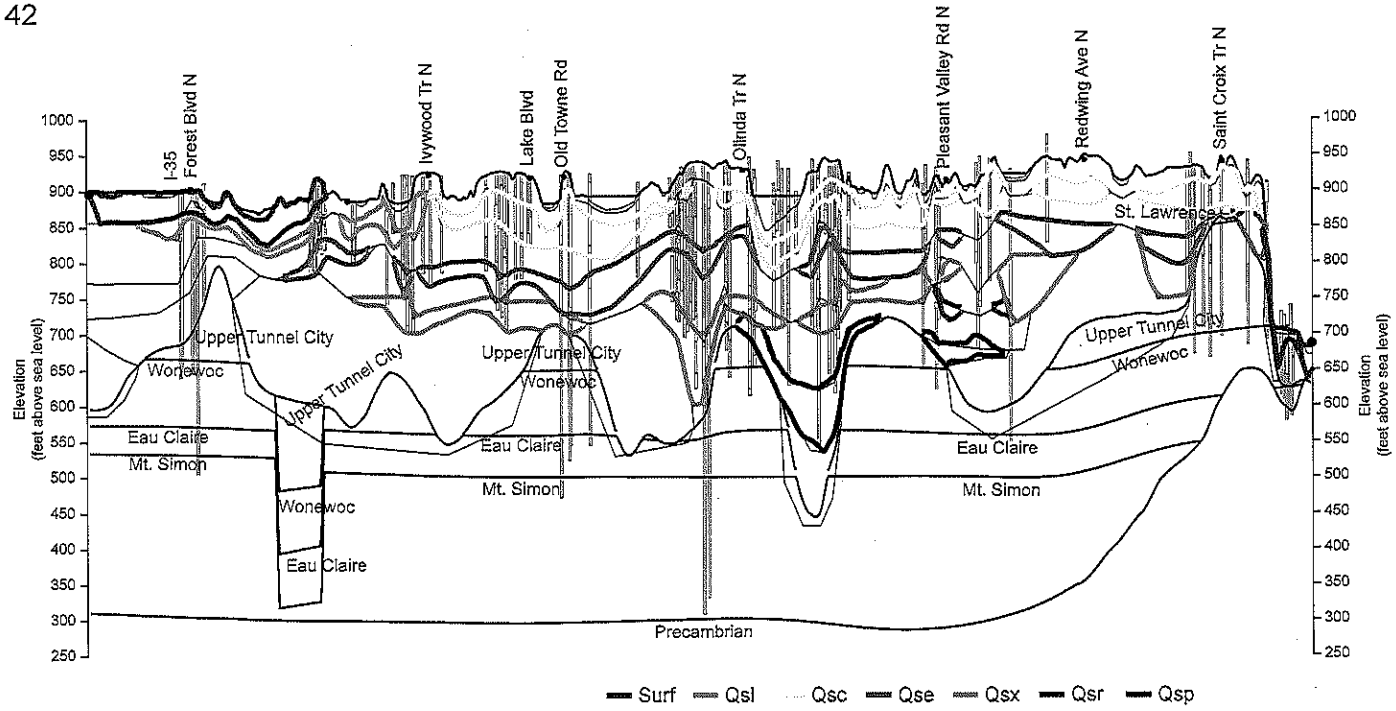
Texture unknown		Undifferentiated Pleistocene sediment (qu). Relative hydraulic conductivity unknown.

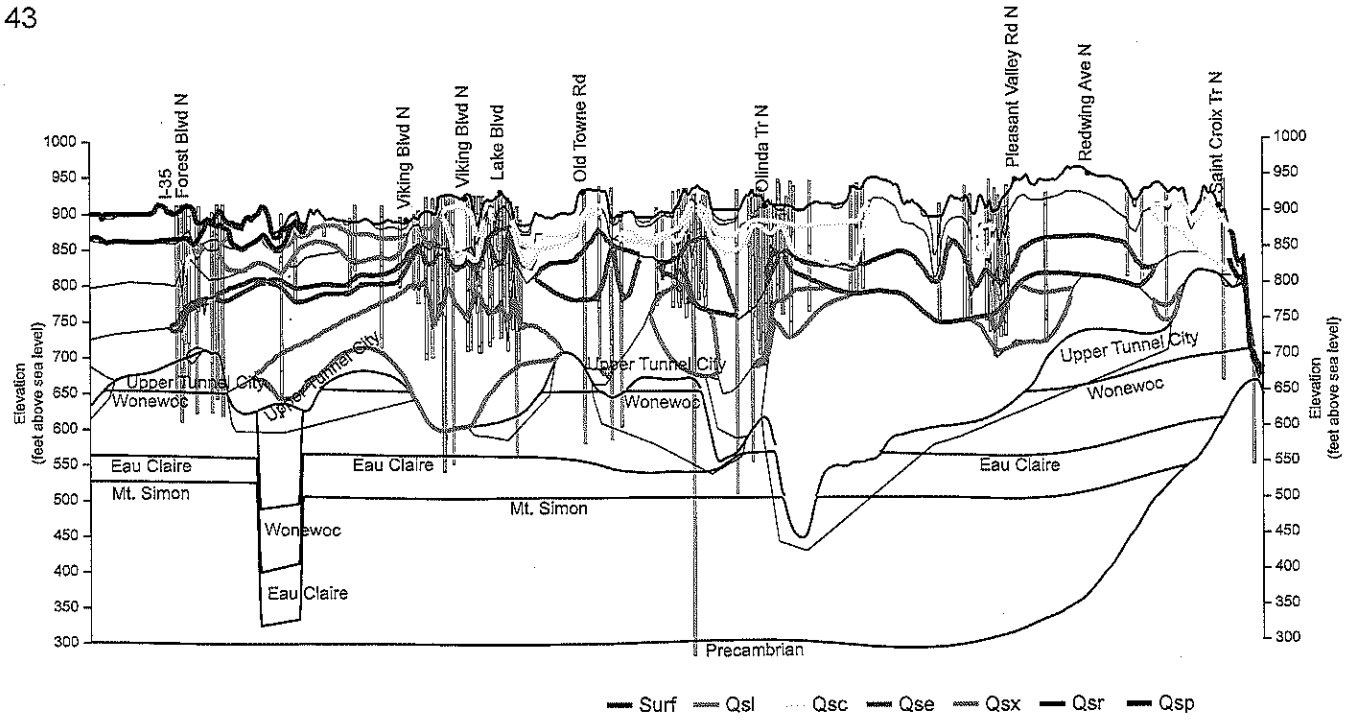
*Percent sand indicates relative hydraulic conductivity.


Falcon Ave N
I-35
Forest Blvd
Stacy Tr N
Stacy Tr N
Stacy Tr N
Lofton Ave N
Lincoln Rd N
N Lakes Tr
Summit Ave
County Rd 82
Redwing Ave N
US Hwy 8
Elevation (feet above sea level)
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd N
Lofton Ave N
Lake Blvd
Olinda Tr N
Lake Blvd
County Rd 82
Redwing Ave N
US Hwy 8
Elevation (feet above sea level)
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd N
Ivywood Tr N
Karmel St
Lofton Ave
Lake Blvd
Olinda Tr N
Pleasant Valley Rd N
Redwing Ave N
Saint Croix Tr N
Elevation (feet above sea level)
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
St. Lawrence
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd N
Ivywood Tr N
Lake Blvd
Old Towne Rd
Olinda Tr N
Pleasant Valley Rd N
Redwing Ave N
Saint Croix Tr N
Elevation (feet above sea level)
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Upper Tunnel City
Wonewoc
Eau Claire
Mt. Simon
St. Lawrence
Precambrian
Surf
Qsl
Qsc
Qse
Qsx
Qsr
Qsp


I-35
Forest Blvd N
Viking Blvd N
Viking Blvd N
Lake Blvd
Old Towne Rd
Olinda Tr N
Pleasant Valley Rd N
Redwing Ave N
Saint Croix Tr N
Elevation (feet above sea level)
Upper Tunnel City
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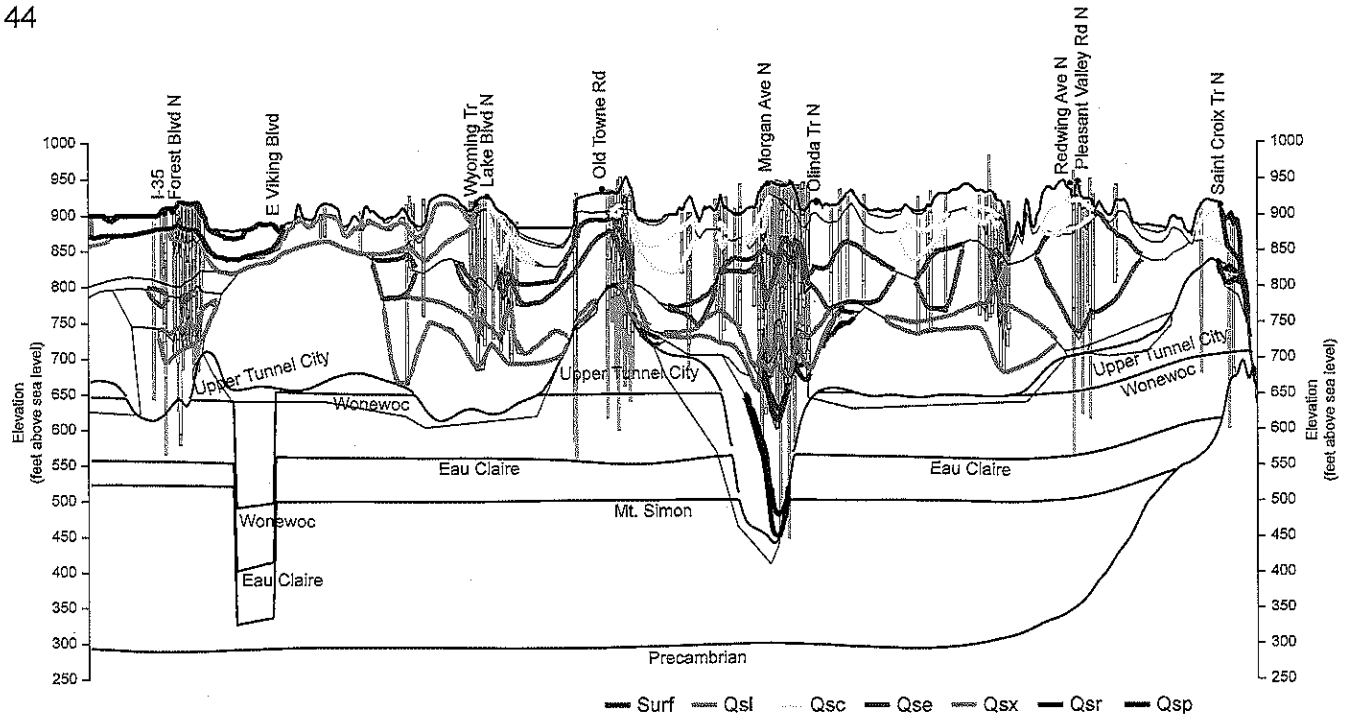
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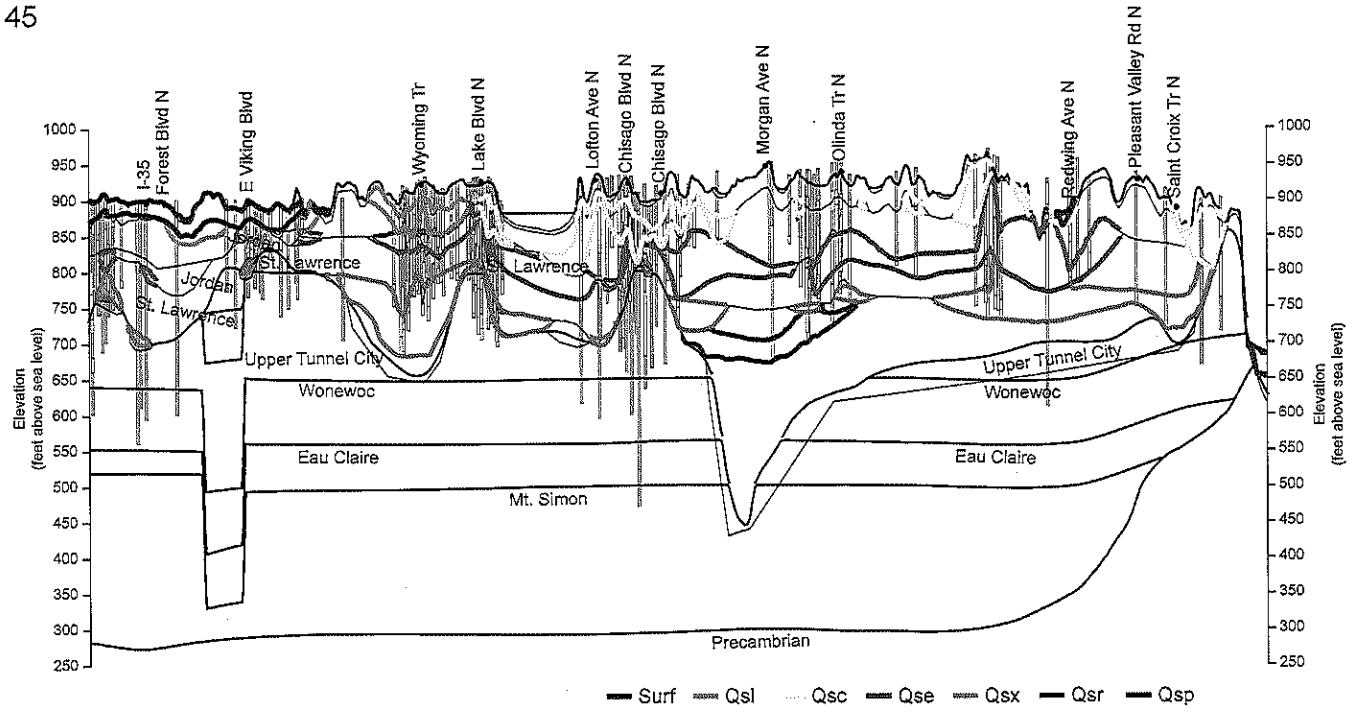
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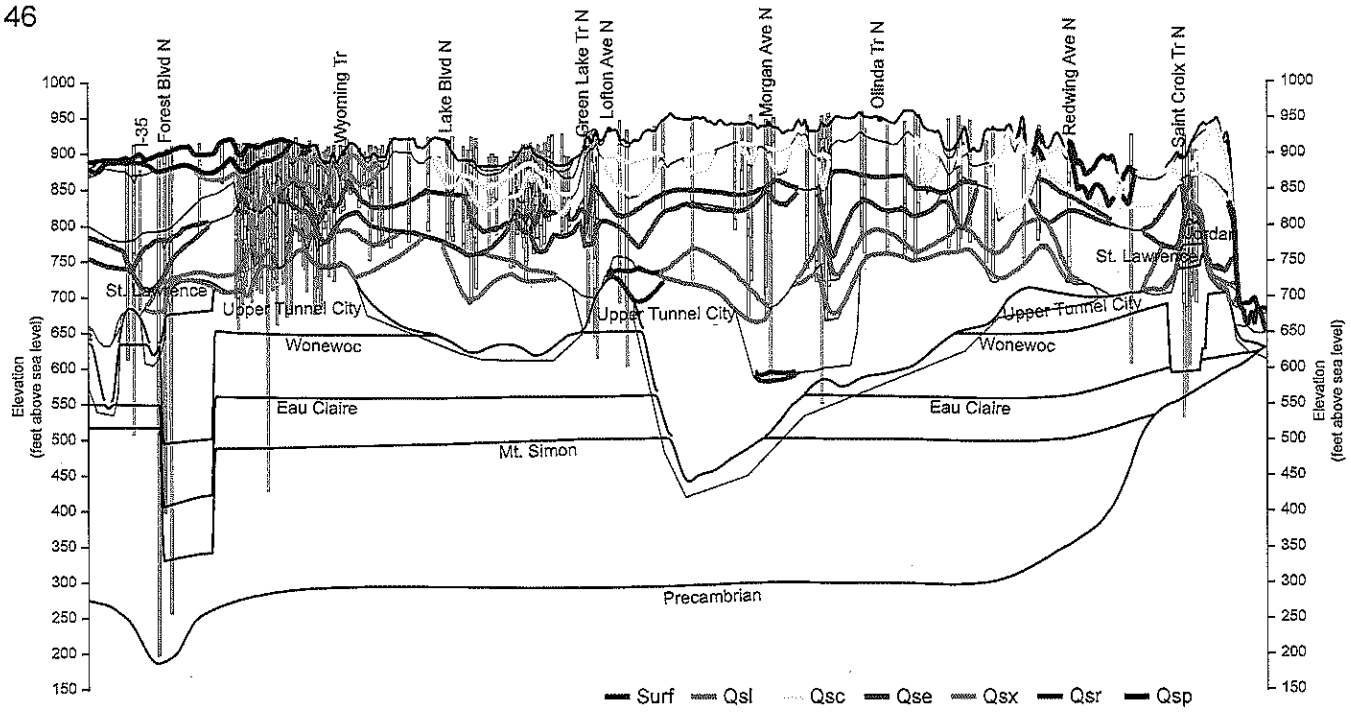
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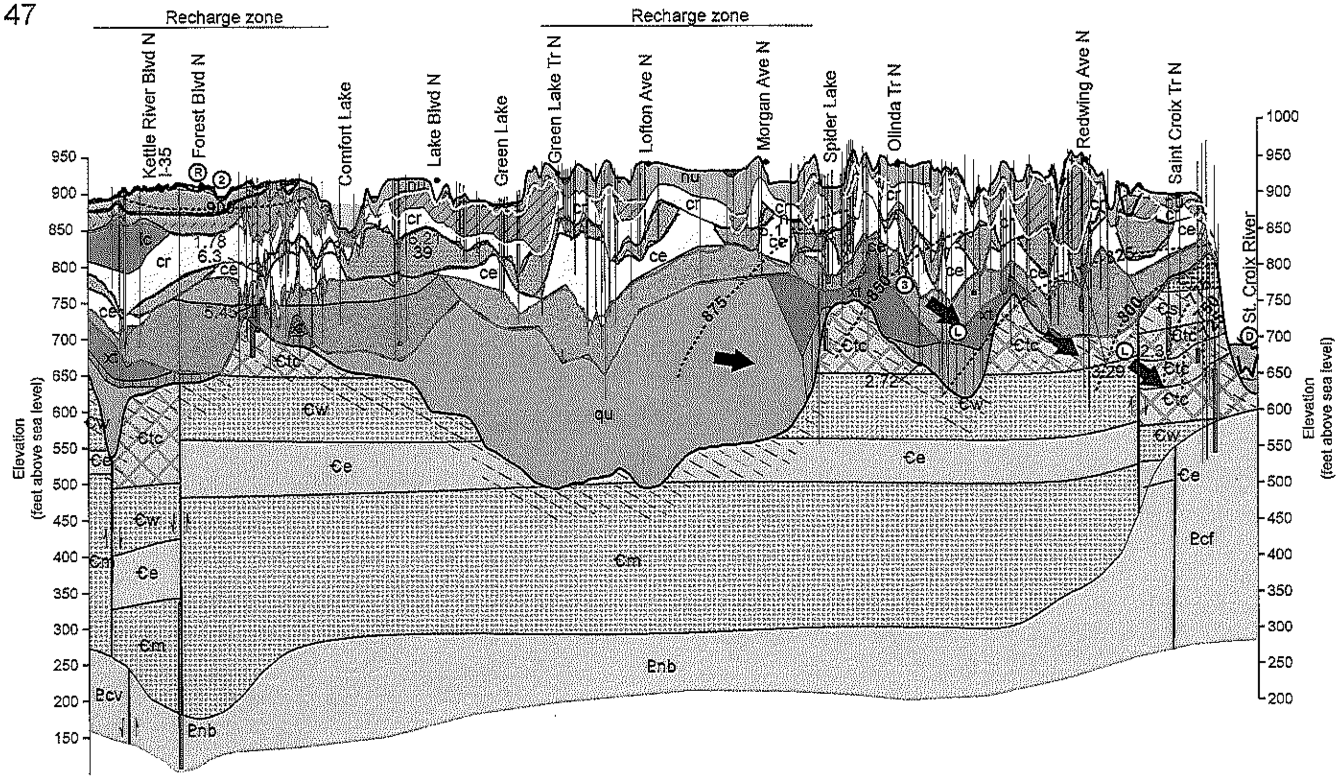
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Tritium age

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 bomb testing, 1958-1972 (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.

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 (^{14}C) isotope analysis.

General direction of groundwater flow.

---- 925 ---- Approximate equipotential contour. Contour interval 25 feet.

Geologic contact.

Land or bedrock surface.

Lake.

Direction of fault movement. Arrow indicates relative movement.

Aquifers - grouped by stratigraphy

Surficial sand aquifer.

Surficial sand

Buried sand and gravel aquifers.

sl

sc

se

sx

sr

sp

Sedimentary bedrock aquifers.

** St. Peter/Prairie du Chien

€j * Jordan

€tc ** Upper Tunnel City

€w * Wonewoc

€m * Mt. Simon

Pscu * Undifferentiated Mesoproterozoic

Enhanced-permeability zone

* Primarily intergranular flow

** Intergranular and fracture flow

Groundwater conditions

① Infiltration through a thin layer of overlying, fine-grained material to an underlying aquifer.

② Groundwater recharge from overlying surficial aquifer to buried aquifer.

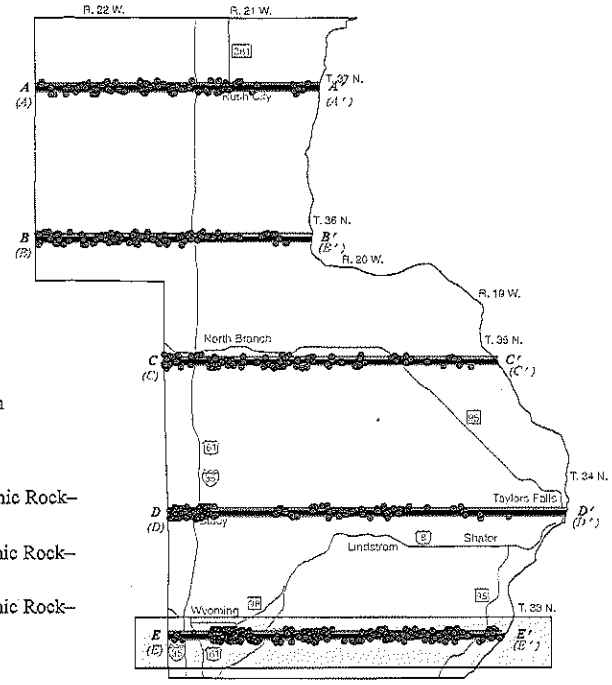
③ Groundwater leakage from an overlying buried aquifer to an underlying buried aquifer.

④ Groundwater leakage through multiple aquifers and fine-grained layers.

Ⓓ Groundwater discharge to surface-water body.

Ⓛ Lateral groundwater flow.

⊙ Groundwater movement out of cross section.



Bedrock non-aquifer units

€sl St. Lawrence Formation

€e Eau Claire Formation

Pcf Mesoproterozoic Volcanic Rock–Clam Falls Volcanics

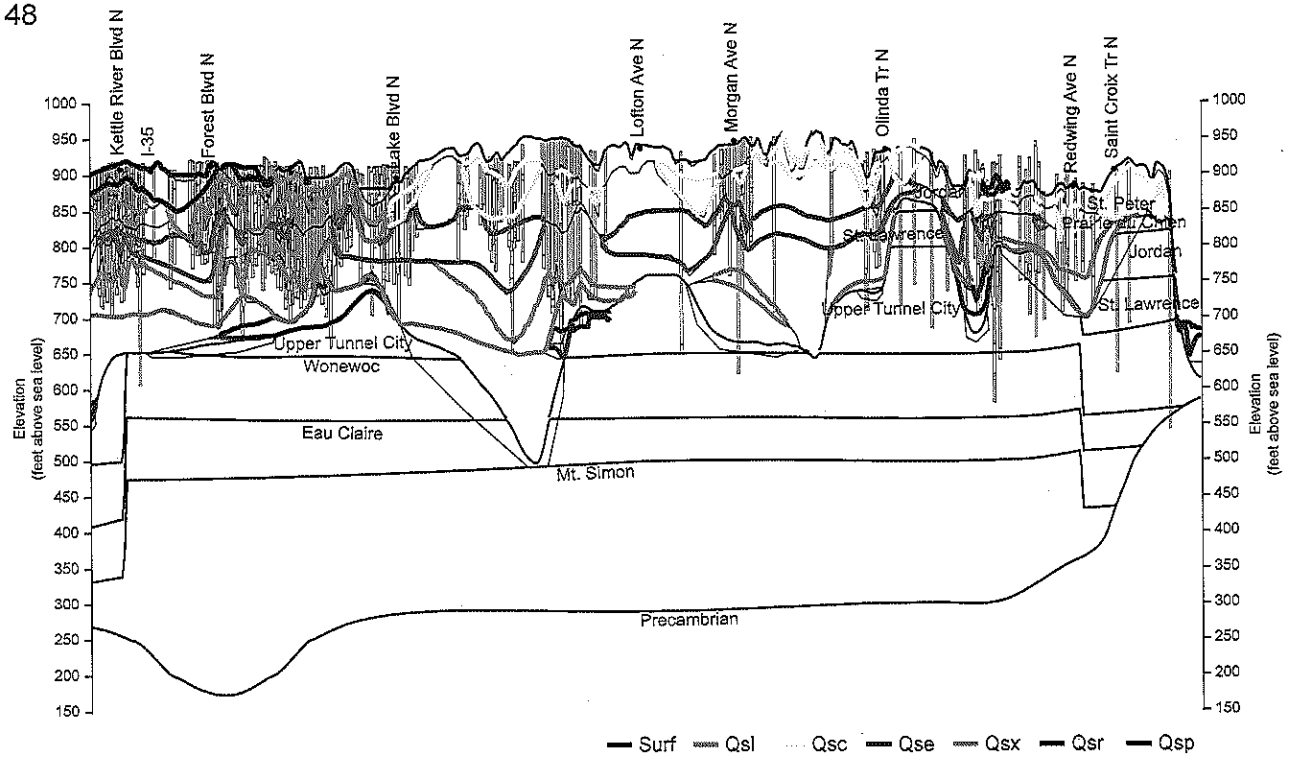
Pcv Mesoproterozoic Volcanic Rock–Chengwatana Group

Pnb Mesoproterozoic Volcanic Rock–North Branch Volcanics

Aquitards grouped by texture ranging from highest to lowest sand content.

Percent sand*	Color code	Geologic unit code
> 60		cr, ce, rt
> 40 and ≤ 50		nu
> 30 and ≤ 40		lc, xt
Texture unknown		Undifferentiated Pleistocene sediment (qu). Relative hydraulic conductivity unknown.

*Percent sand indicates relative hydraulic conductivity.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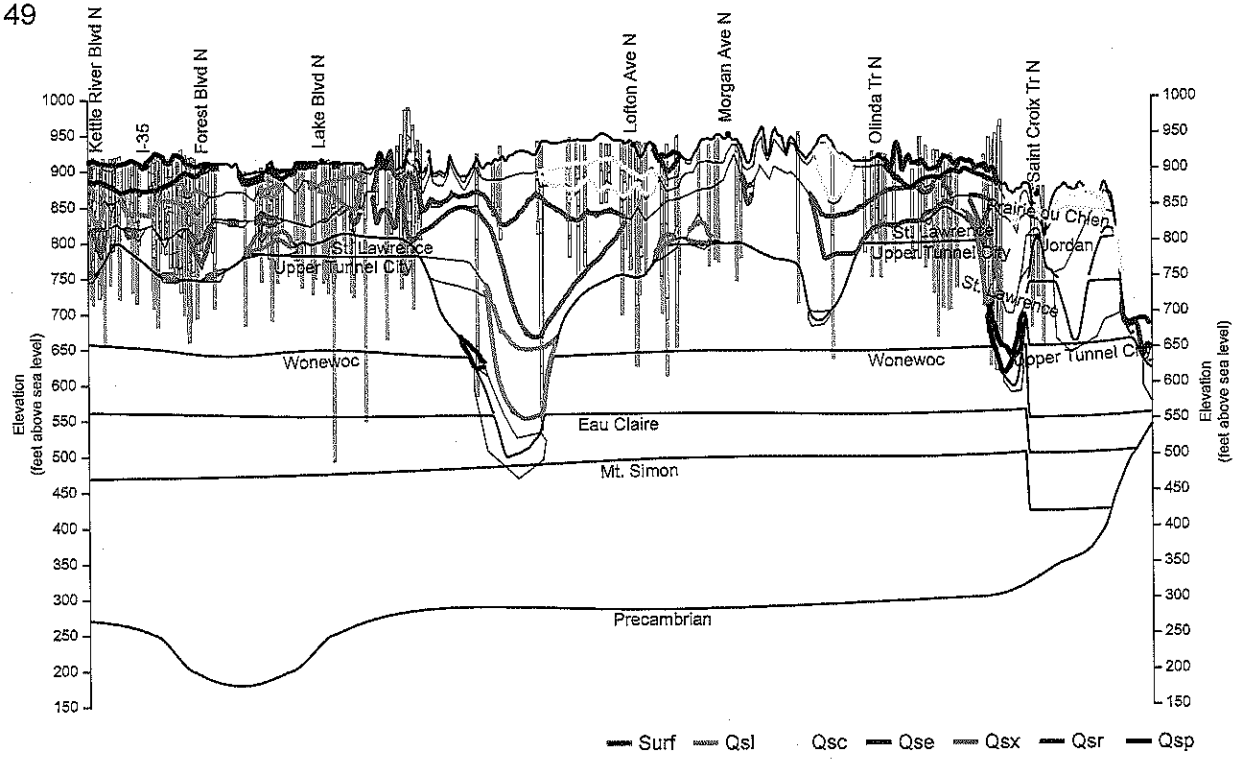
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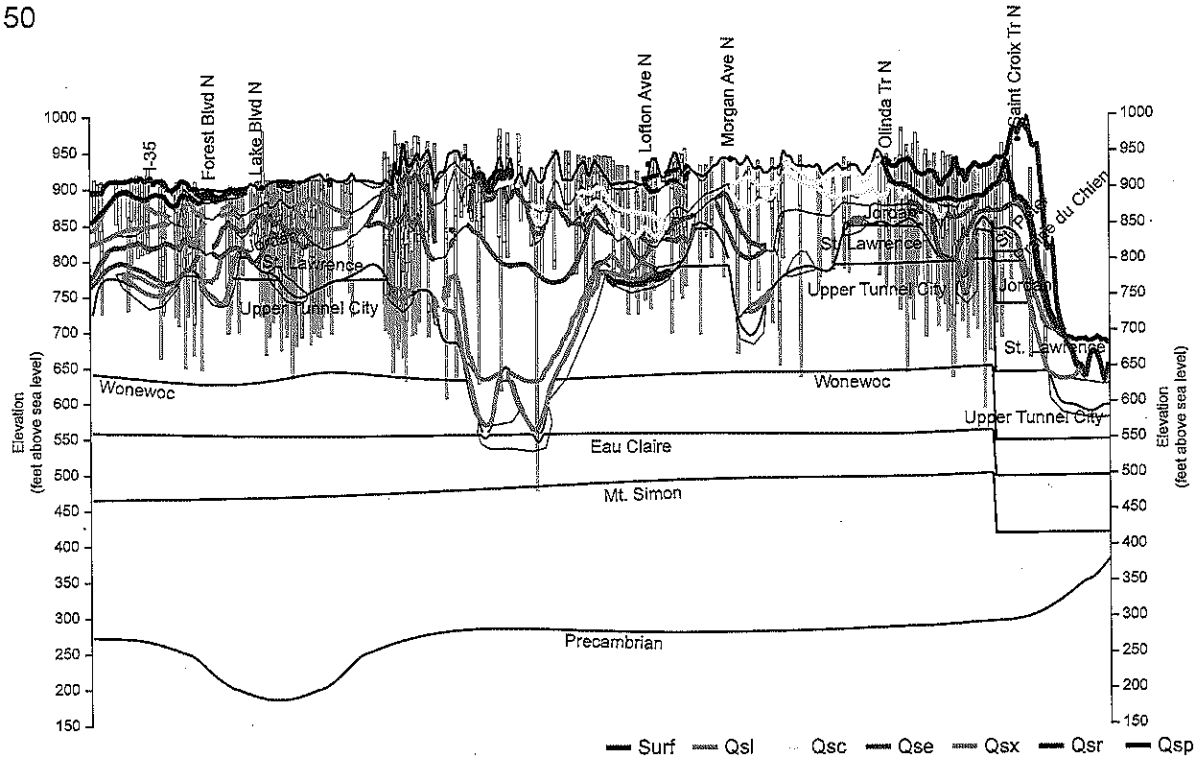
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City of North Branch Staff Report

Prepared By: Nate Sondrol, GIS Planning Specialist

Date: April 17, 2014

Subject: Comprehensive Parks, Trails and Open Space Plan Update

Background Information:

The PTOS Commission discussed the need to review and update the existing Comprehensive Parks, Trails and Open Space plan over the past year. The existing Comprehensive Plan was last updated and approved by the City Council on April 27, 2009.

The PTOS Commission discussed the amount of park dedication fees to be charged and whether or not to accept land in lieu of fees with the City Council at the August 15, 2013 work session. This discussion led to City Council recommending the PTOS Commission to review the existing City owned park land facilities and to prioritize the development of them.

At their September 3, 2013 meeting, the PTOS Commission directed staff to put together a list and map of existing city owned park land facilities for discussion and review of the current and future park and recreation facility needs of the community.

The PTOS Commission reviewed the existing city owned park land sites and identified a list of park improvements and other sites to further explore the possibility of selling to generate additional revenue to improve other park sites. See Attached. Note that some of the city owned park lands may serve as storm water retention areas. The PTOS Commission also recommended contacting the City Attorney to research whether or not the city has the ability to sell the lands, based on how they were acquired at the February 2, 2014 meeting.

Other Pertinent Information:

- ***Advantages*** – Updating the Comprehensive Parks, Trails and Open Space Plan will help guide future park, trail, and recreational opportunities in North Branch.
- ***Disadvantages*** – None

Financial/Budget Impacts (If Any):

- ***Funding Sources*** – To be determined
- ***Long-Term & Short-Term Costs*** -

Deadline: None

Requested Action:

The PTOS Commission is requesting the Council to authorize contacting the City Attorney to determine the options the City has for selling existing park lands.

Staff Recommendation:

Staff recommends the Council contact the City Attorney to determine what options the City has for selling existing park lands if the council chooses to move ahead with this.

Voting Requirements:

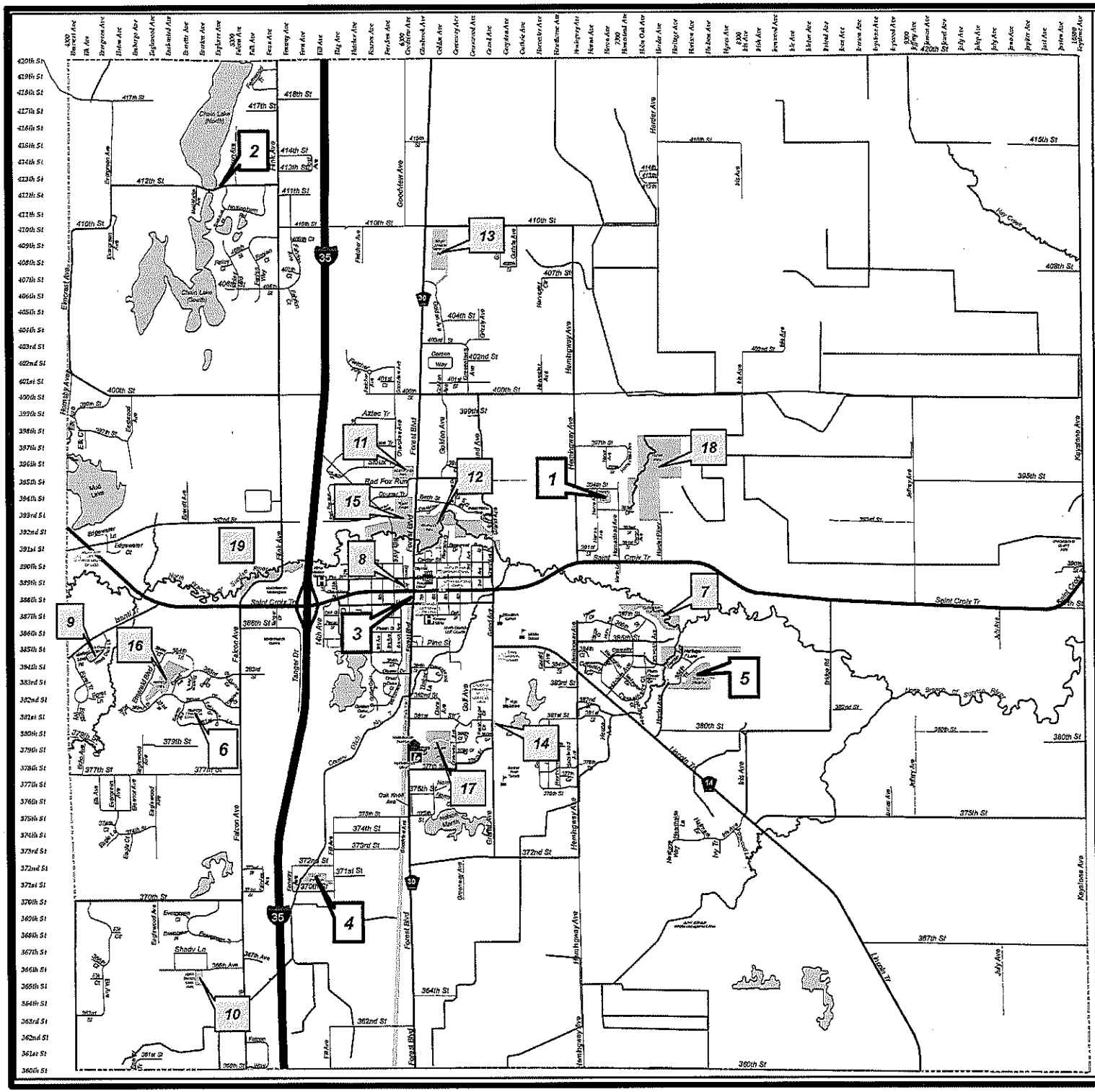
State Law or City Code requires a simple majority, of those present.

Attachments:

1)City Owned Park Lands Improvements/Further Review Table
2) City Owned Park Lands Map

City Owned Park Lands Improvements/Further Review Table

Site	Name	Address	How Acquired	Further Review	Review Considerations	Future Improvements
1	Branch Acres Park	7451 394th Street	Subdivision Park Dedication	Yes	Contact Adjacent Property Owners	
2	Chain Lake Park	5200 412th Street	Subdivision Park Dedication	Yes	Contact Adjacent Property Owners	
3	Chilson Park		Purchased	Yes	Exisitng Trail/ Parking Lot, Stormwater Retention Area	
4	Kate's Preserve	37080 Fill Avenue	Dedication	Yes	L7 & L8 - B7 - Buildable?	
5	Luch'ts Preserve	7925 384th Trail	Subdivision Park Dedication	Yes	Portion of Outlot F	Trail Development, Playground
6	Wildridge Preserve	5005 382nd Drive	Subdivision Park Dedication	Yes	Contact Adjacent Property Owners	
7	Casselberry Preserve	38577 Tamworth Ave	Subdivision Park Dedication	No	NA	Trail Development
8	Central Park	6250 Main Street	Purchased	No	NA	Playground Equipment; Restroom Conversion?
9	Duck Creek Park	4552 392nd Street	Dedication	No	NA	Shelter
10	North Branch Oaks Park	5035 366th Street	Dedication	No	NA	Trail Development
11	Northwood Park	39581 Cherokee Ave	Subdivision Park Dedication	No	NA	Tennis Court resurfacing, Irrigation, Shelter Maintenance
12	Riverwalk Park	39181 Forest Blvd		No	NA	Trail Development, Ampitheatre, Campground Sites, Parking Lot, Bridge
13	Roger Johnson Memorial Park	6547 410th Street	Subdivision Park Dedication	No	NA	Parking Lot, Additional Soccer Fields, Trail reconstruction
14	Skateboard Park	38175 Grand Ave	School Property - MOU	No	NA	Expansion
15	Tower Fields	6211 Cougar Trail	Subdivision Park Dedication	No	NA	Ballfield fencing, parking lot, shelter, irrigation, trail development
16	Wildridge Park	4840 382nd Drive	Subdivision Park Dedication	No	NA	2 soccer fields, parking lot, skating rink with warming house
17	Williams Park	6400 379th Street	Subdivision Park Dedication	No	NA	ballfields, playground, skating and hockey rink w/warming house, parking lot, community center
18	Harder Park	39260 Harder Pkwy			NA	Parking Lot Expansion, Trail Development, Ballfield Development, Expansion - Carlson Property
19	Marketplace Preserve		Dedication	No	NA	Trail Development



CITY OF NORTH BRANCH

6408 ELM ST
NORTH BRANCH, MN 55056
Phone: (651) 674-8113/ Fax: (651) 674-8262
Hours: 8:00 am - 4:30 pm (Monday - Friday)
http://www.ci.north-branch.mn.us

City Owned Parklands

Site	Name	Address	How Acquired	Further Review
1	Branch Acres Park	7451 394th Street	Subdivision Park Dedication	Yes
2	Chain Lake Park	5200 412th Street	Subdivision Park Dedication	Yes
3	Chilson Park		Purchased	Yes
4	Kate's Preserve	37080 Fill Avenue	Tax Forfeit/Ded	Yes
5	Luch's Preserve	7925 384th Trail	Subdivision Park Dedication	Yes
6	Wildridge Preserve	5005 382nd Drive	Subdivision Park Dedication	Yes
7	Casselberry Preserve	38577 Tamworth Ave	Subdivision Park Dedication	No
8	Central Park	6250 Main Street	Purchased	No
9	Duck Creek Park	4552 392nd Street	Dedication	No
10	North Branch Oaks Park	5035 366th Street	Dedication	No
11	Northwood Park	39581 Cherokee Ave	Subdivision Park Dedication	No
12	Riverwalk Park	39181 Forest Blvd		No
13	Roger Johnson Memorial Park	6547 410th Street	Subdivision Park Dedication	No
14	Skateboard Park	38175 Grand Ave	School Property - MOU	No
15	Tower Fields	6211 Cougar Trail	Subdivision Park Dedication	No
16	Wildridge Park	4840 382nd Drive	Subdivision Park Dedication	No
17	Williams Park	6400 379th Street	Subdivision Park Dedication	No
18	Harder Park	39260 Harder Pkwy	Subdivision Park Dedication	No
19	Marketplace Preserve			No

0 1,000 2,000 4,000 6,000 8,000 Feet

Scale: 1:50000

Date: 10-APR-2014