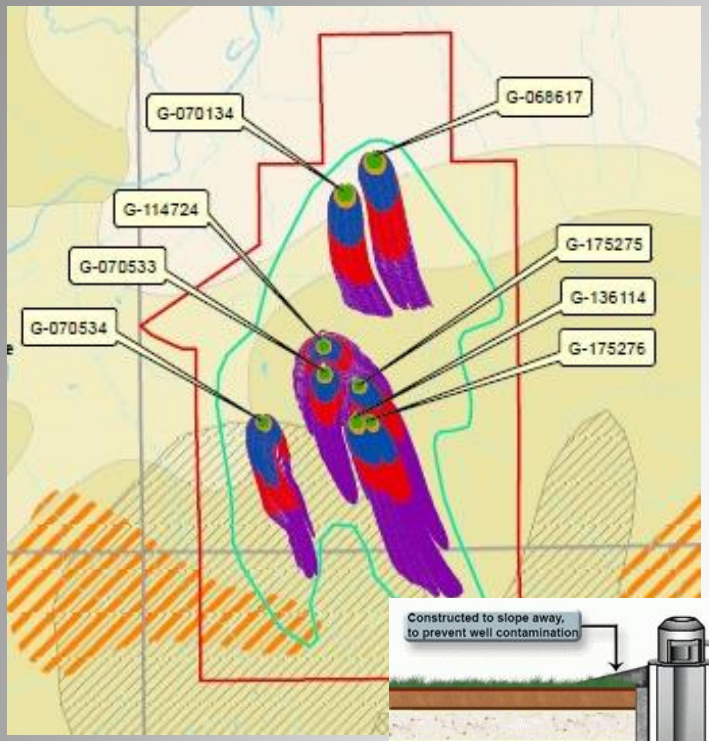
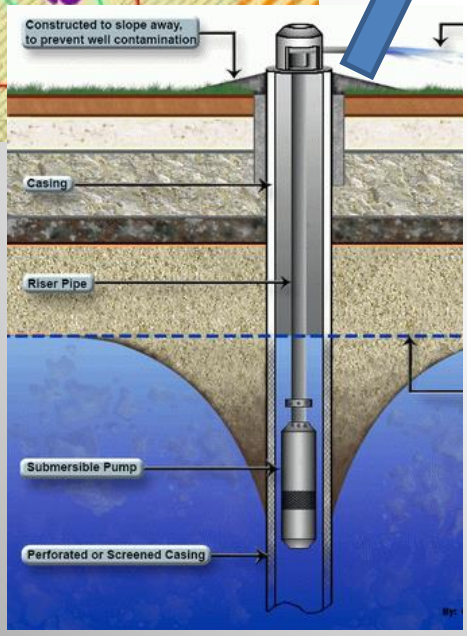
From Tower to Tap
Where does Waverly get Water?

David L. Miesbach, PG
Nebraska Dept. of Environment and Energy





Water Tower
Creates water pressure

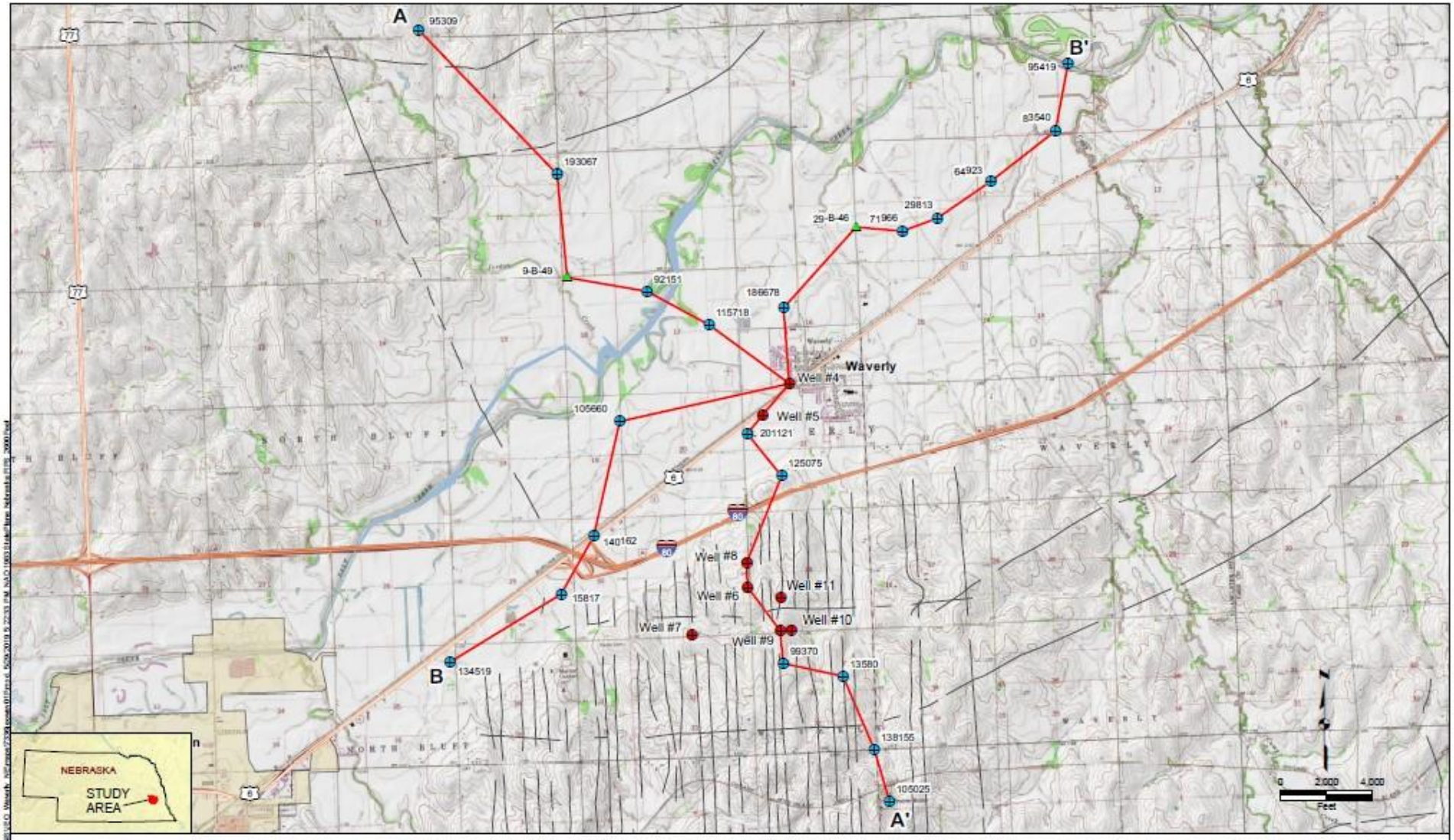
Homes & Businesses
Drink and use water

Waste Management Facility
Rids water of debris and toxins

Salt Creek

Waverly Well Field

Let's talk Geology



Municipal Well
Registered Nebraska Well on Cross Section
Conservation Survey Division Test Boring
Hydrogeologic Cross Section Location
Aerial Electromagnetic (AEM) Data Flight Line

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WAVERLY WHP ASSESSMENT
WAVERLY, NEBRASKA

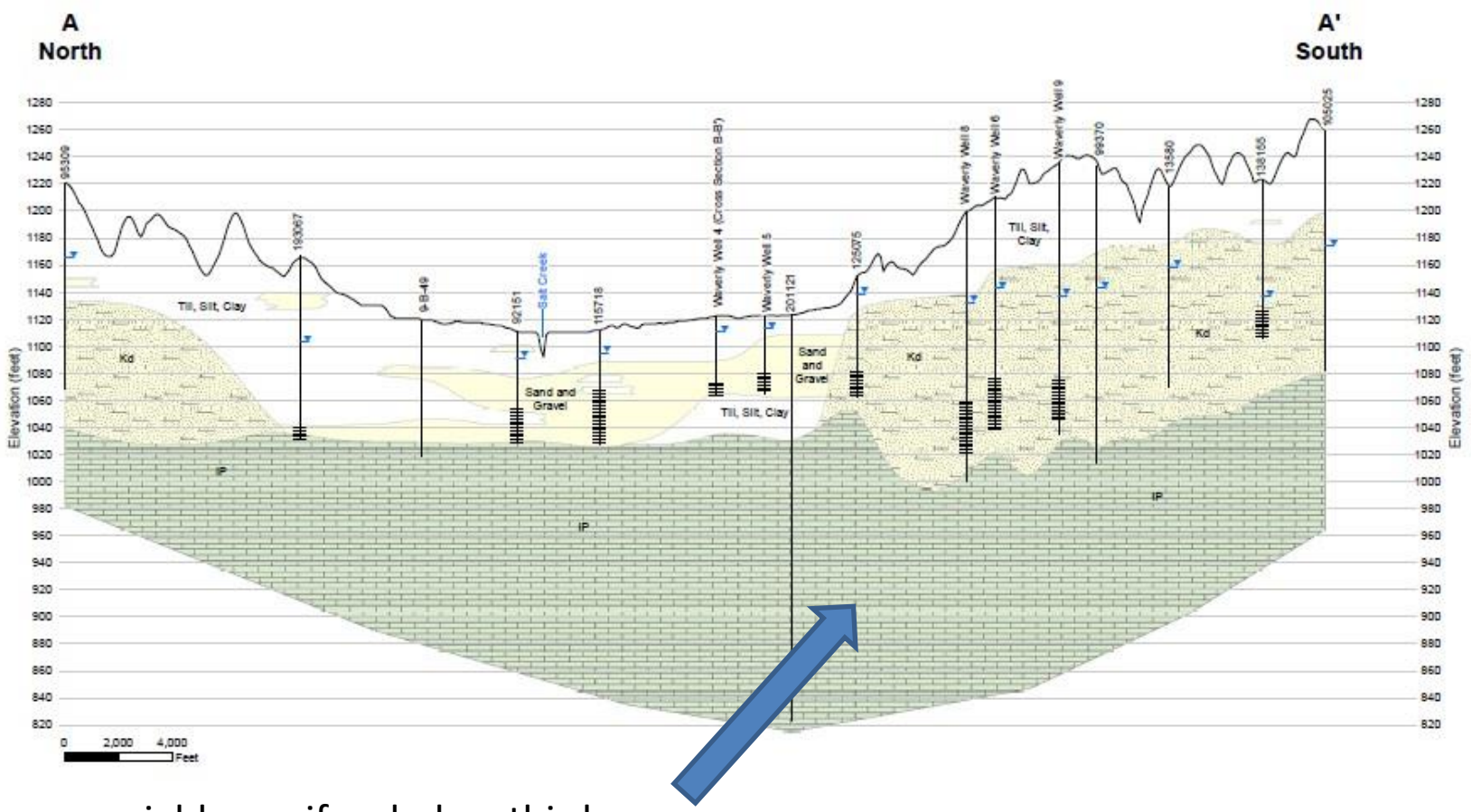
PREPARED FOR

The City of Waverly and JEO Consulting Group, Inc.

FIGURE 3

SITE FEATURES, AEM DATA LINES, AND HYDROGEOLOGIC CROSS SECTION LOCATIONS

Geologic Cross Section N to S



There are no viable aquifers below this layer.

1 inch = 4000 feet horizontal
1 inch = 80 feet vertical

Screened Interval

193067 → Unique Well ID

Static Water Level (Install water level from well log)

Till, Silt, Clay

Sand and Gravel

Kd Dakota Formation (Cretaceous)

IP Pennsylvanian

Drawn: 5/29/2019

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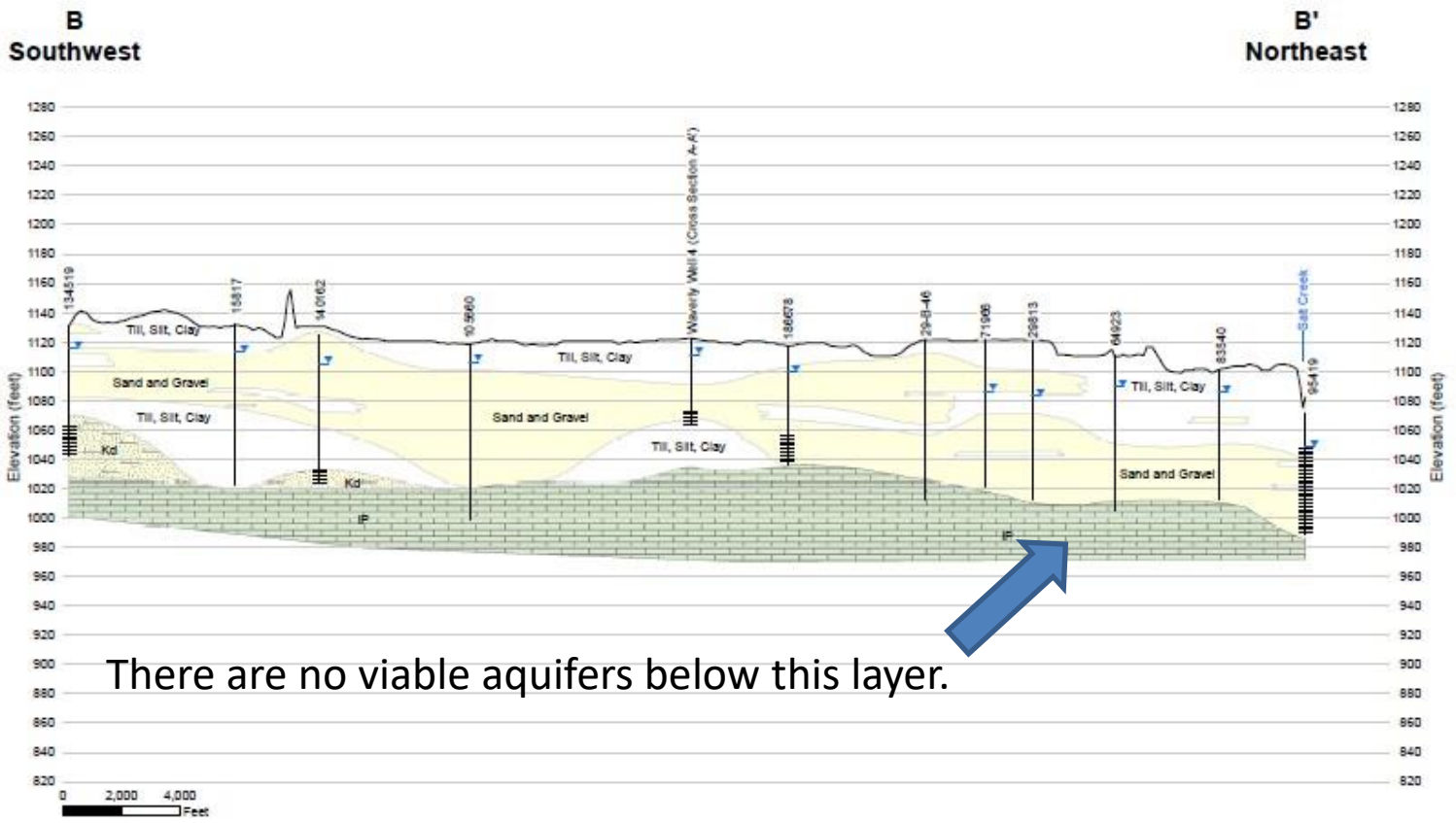
FIGURE 4

HYDROGEOLOGIC CROSS SECTION A-A'

Geologic Cross Section SW to NE



There are no viable aquifers below this layer.

1 inch = 4000 feet horizontal
1 inch = 80 feet vertical

Screened Interval

140162 → Unique Well ID

Static Water Level (Install water level from well log)

Till, Silt, Clay

Sand and Gravel

Dakota Formation (Kd)

Pennsylvanian (IP)

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FIGURE 5

HYDROGEOLOGIC CROSS SECTION B-B'

Generalized Geologic and Hydrostratigraphic Framework of Nebraska 2011, ver. 2

J.T. Korus and R.M. Joeckel, Conservation and Survey Division, SNR, UN-L

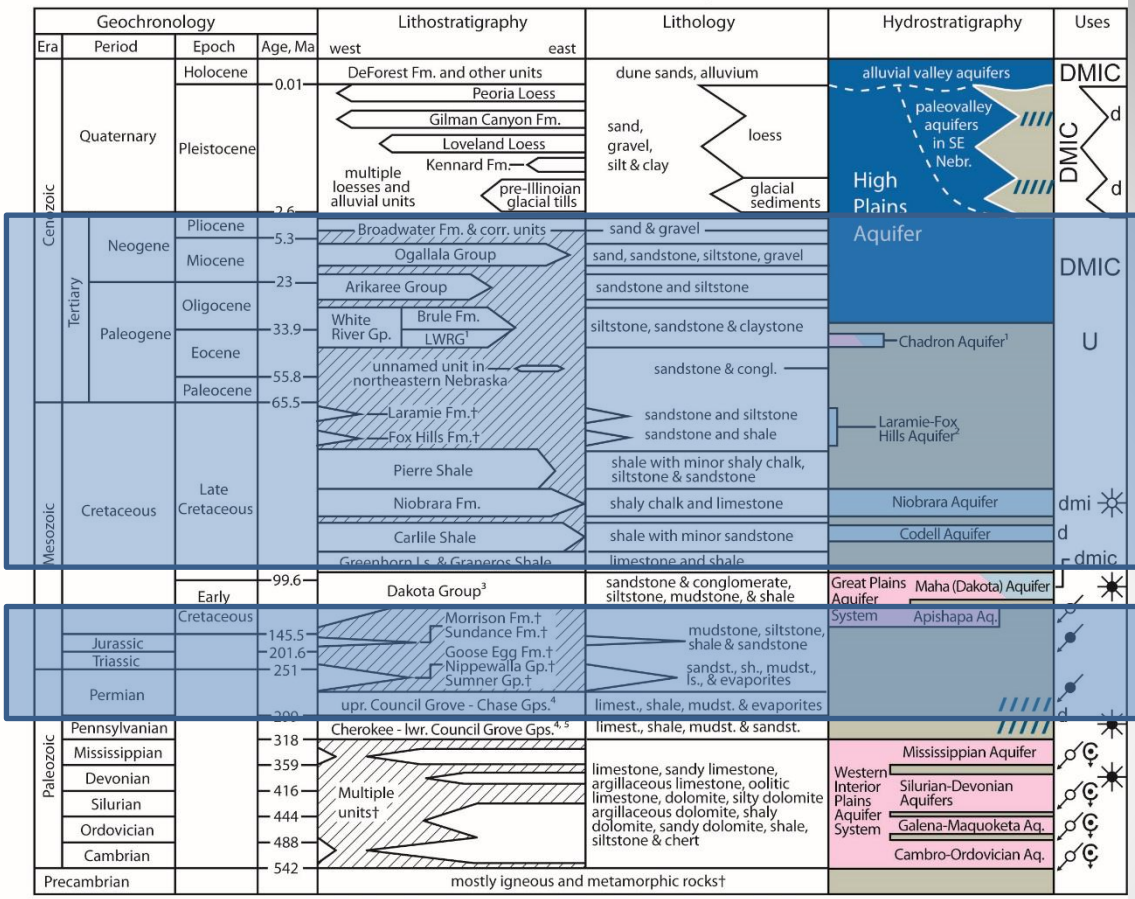


Diagram is not to scale relative to geologic time and stratigraphic thicknesses.

Hydrostratigraphic characteristics and water quality

- primary aquifers with good quality water
- secondary aquifers with good quality water
- secondary aquifers with generally poor quality water
- aquitards with local low-yield aquifers
- aquitards

[1] lower White River Group - includes Chamberlain Pass and Chadron Formations according to some authors; "Chadron Aquifer" historically refers to aquifer in lower White River Group

[2] important aquifer in Colorado, but present in Nebraska only in extreme southwestern Panhandle

[3] Dakota Formation in adjacent states

[4] includes correlative units with different names in northwest Nebraska

[5] Cherokee, Marmaton & Pleasanton Groups are not exposed in Nebraska

†present only in subsurface

Groundwater uses and related aspects

- D major domestic use / d minor domestic use
- I major irrigation use / i minor irrigation use
- M major municipal use / m minor municipal use
- C major commercial/industrial use / c minor commercial/industrial use
- units used for wastewater injection
- units with potential use for wastewater injection
- U unit mined for uranium by in-situ leaching (Dawes Co.)
- unit with potential use for carbon sequestration
- unit producing petroleum or natural gas
- unit with natural gas potential

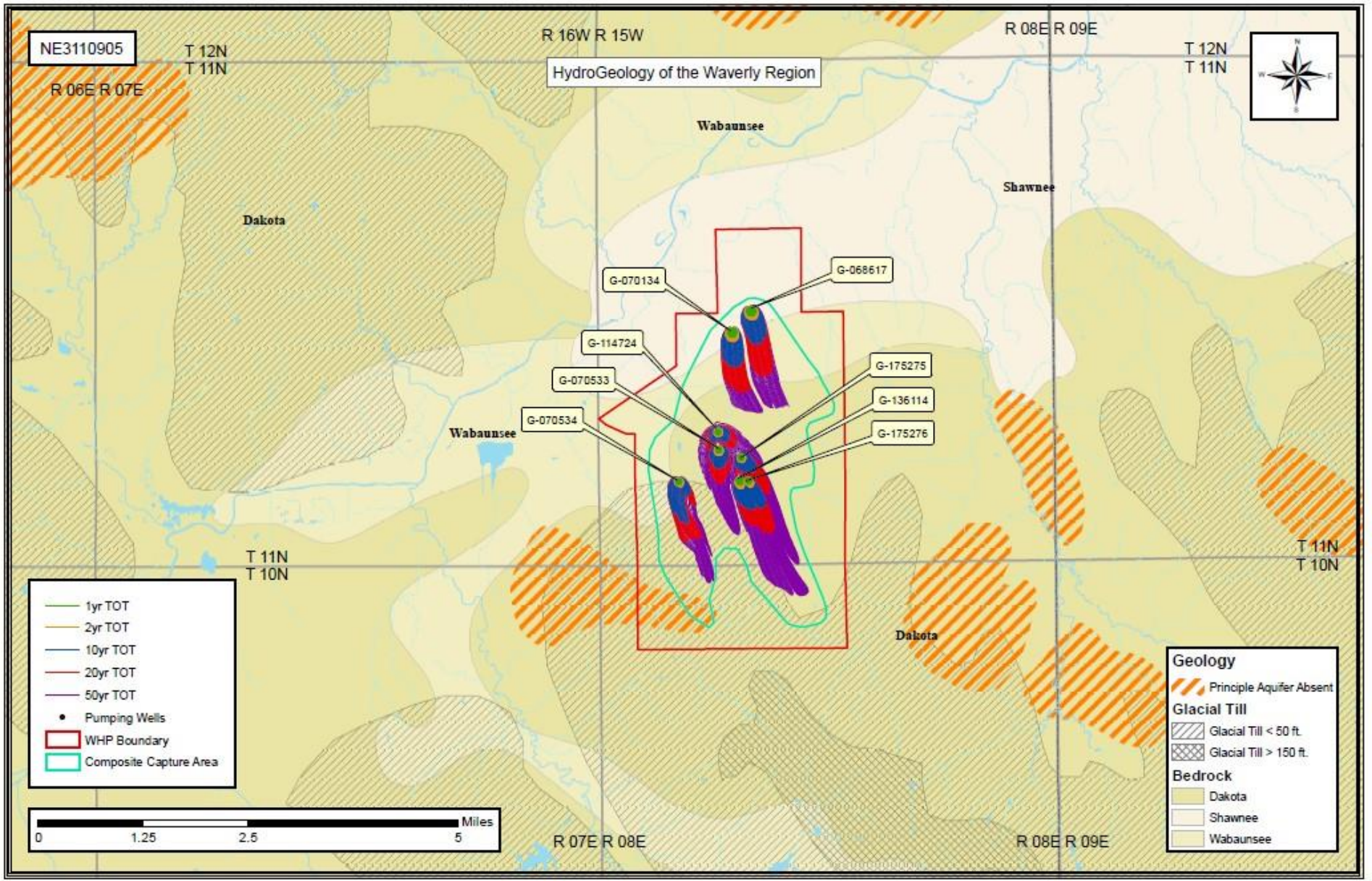
Cite as: Korus, J.T., and Joeckel, R.M., 2011. Generalized geologic and hydrostratigraphic framework of Nebraska 2011, ver. 2. Conservation and Survey Division, School of Natural Resources, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln. Geologic Maps and Charts (GMC) 38.

University of Nebraska Lincoln

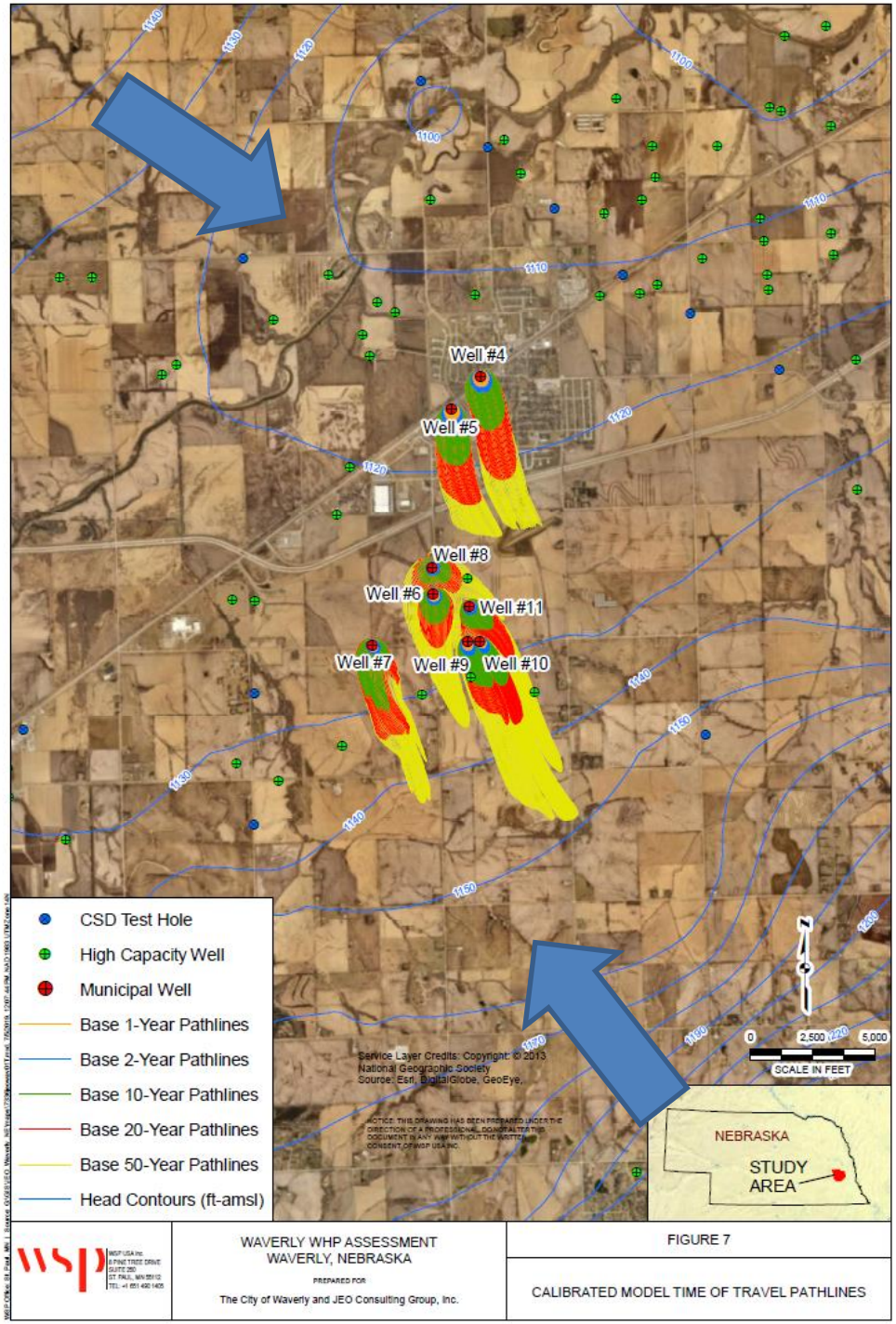
Eroded Away

Aquifers beneath your feet. (no Ogallala)

Where is the groundwater coming from? (once it's in the Aquifer)

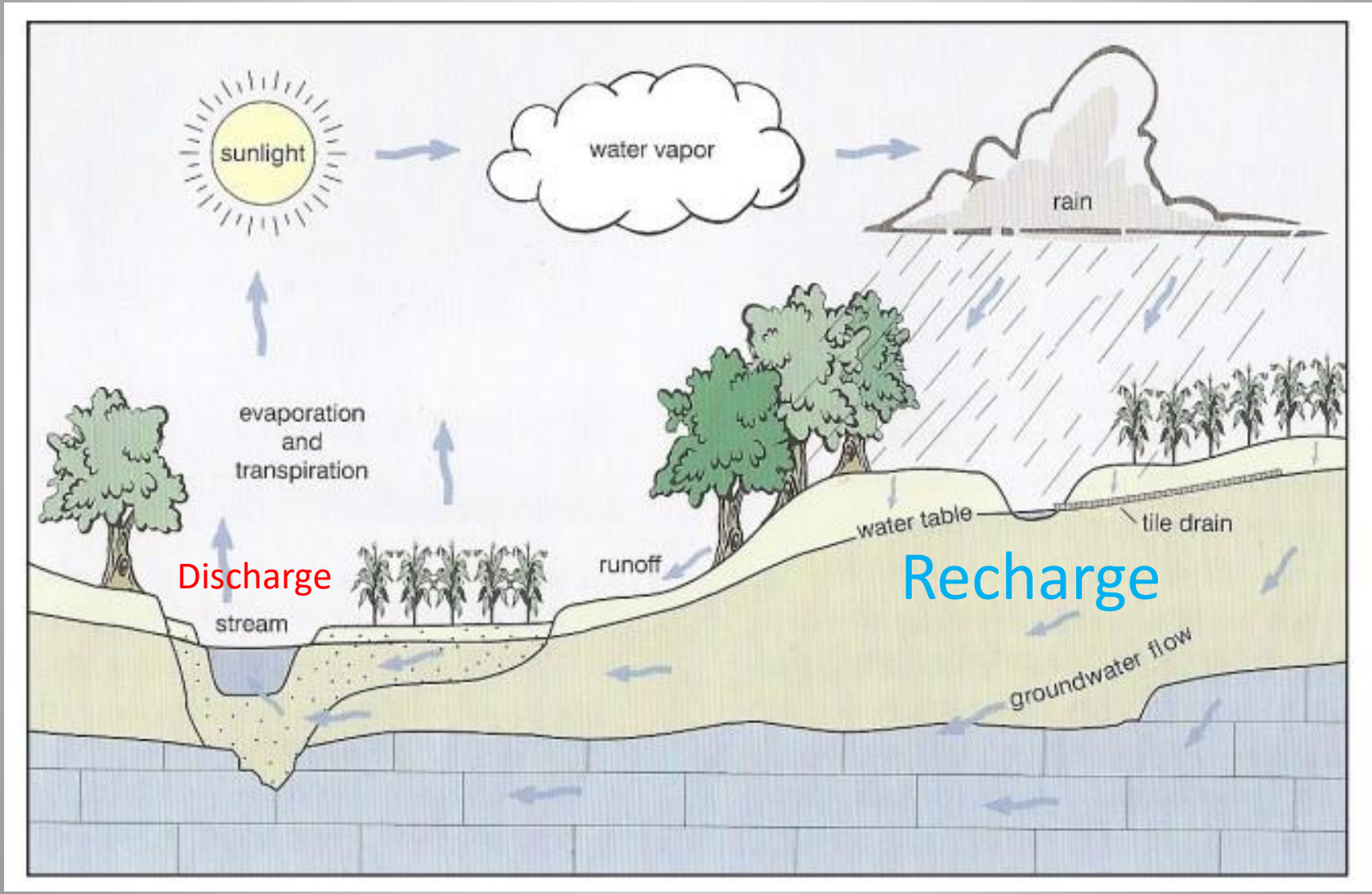


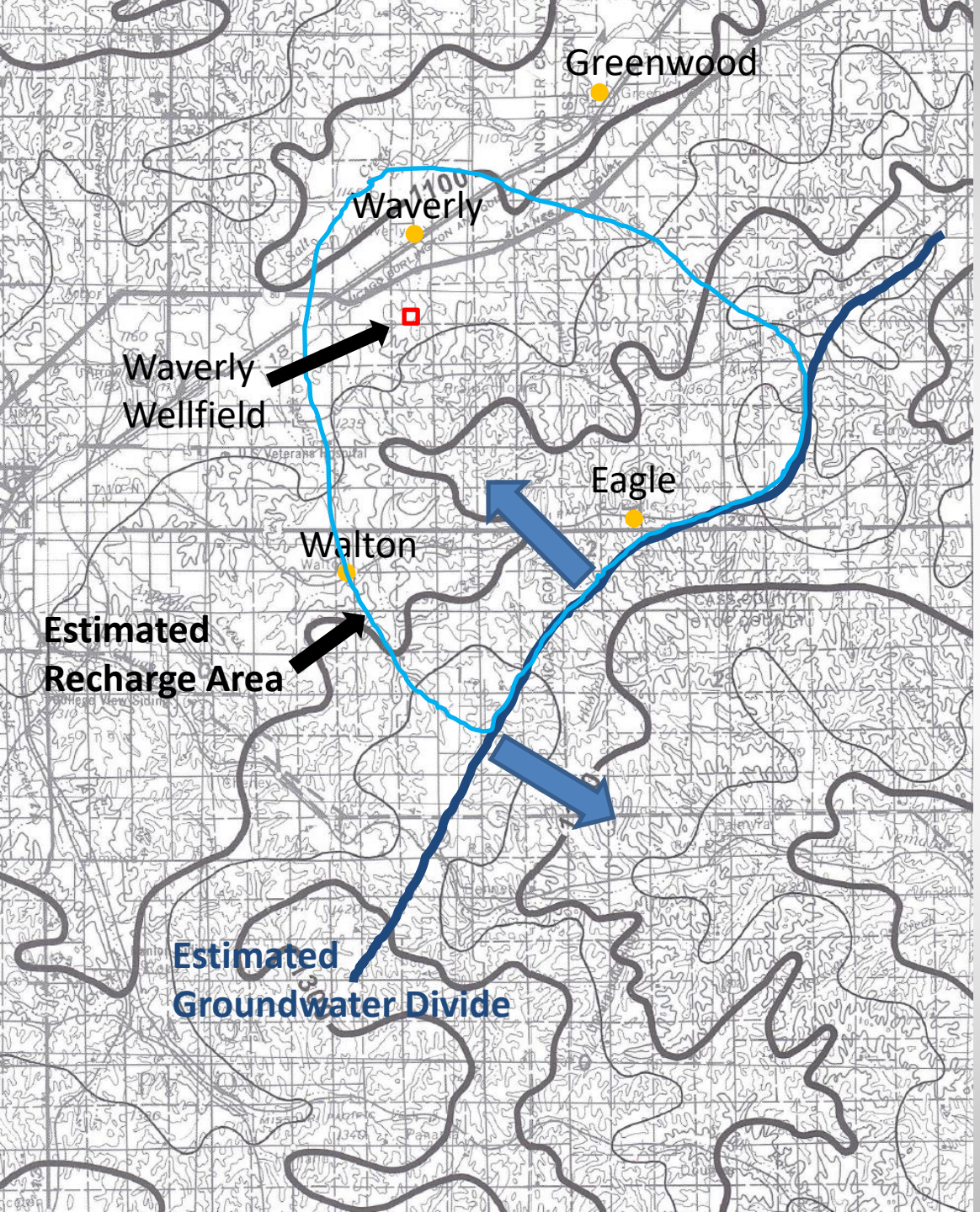
How fast does groundwater move?



Groundwater in Waverly's wellfield moves between 110 and 160 feet/year. (0.3 to 0.4 feet/day)

How does water get to the Aquifer?



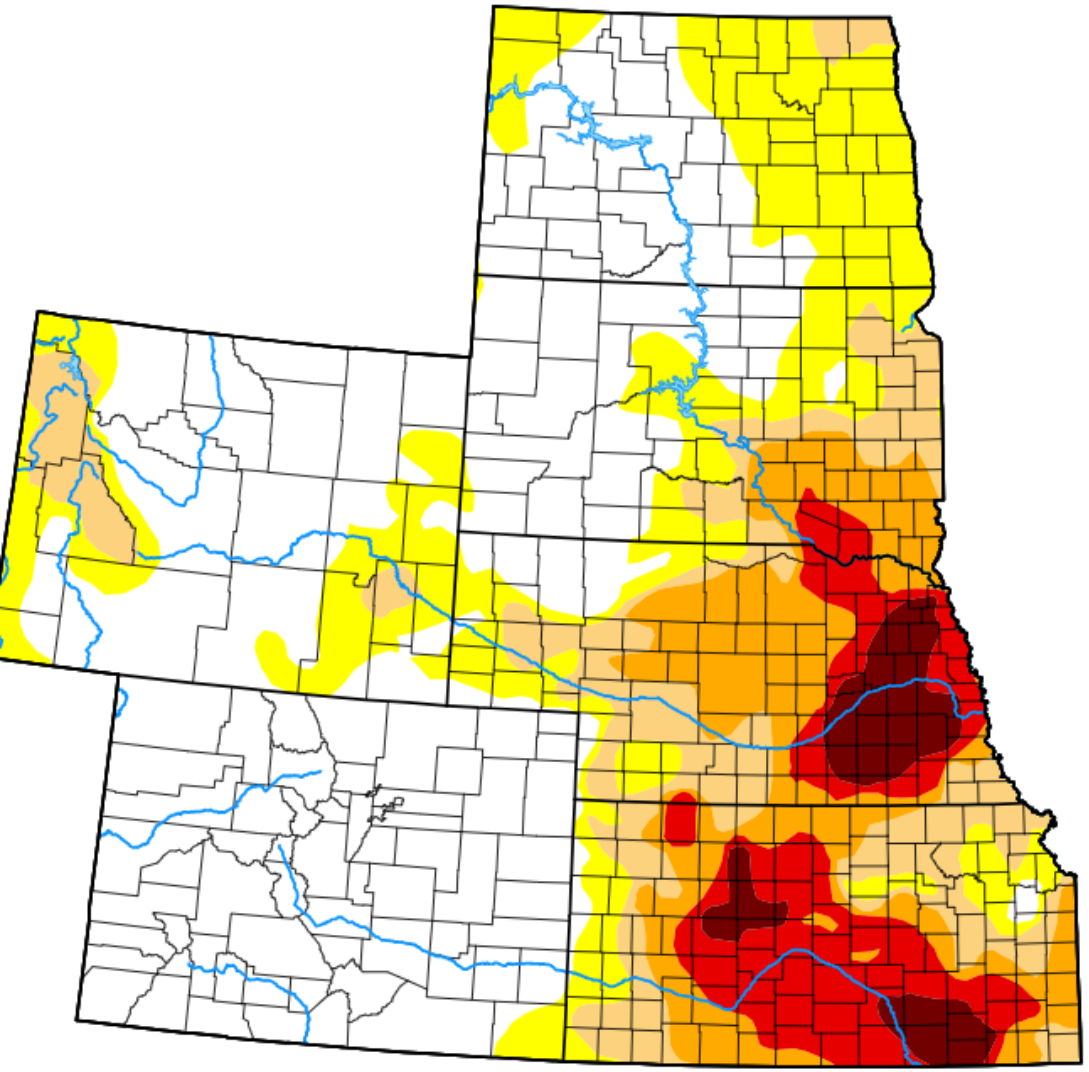


Where does the Aquifer get recharged?

Eastern Nebraska estimated recharge rate is 2.3 inches per year. (The Groundwater Atlas of Lancaster County, CSD-UNL)

Configuration of the Water Table, Circa 1995 (CSD-UNL)

Why is the Aquifer not recharging?



Map released: Thurs. June 29, 2023

Data valid: June 27, 2023 at 8 a.m. EDT

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

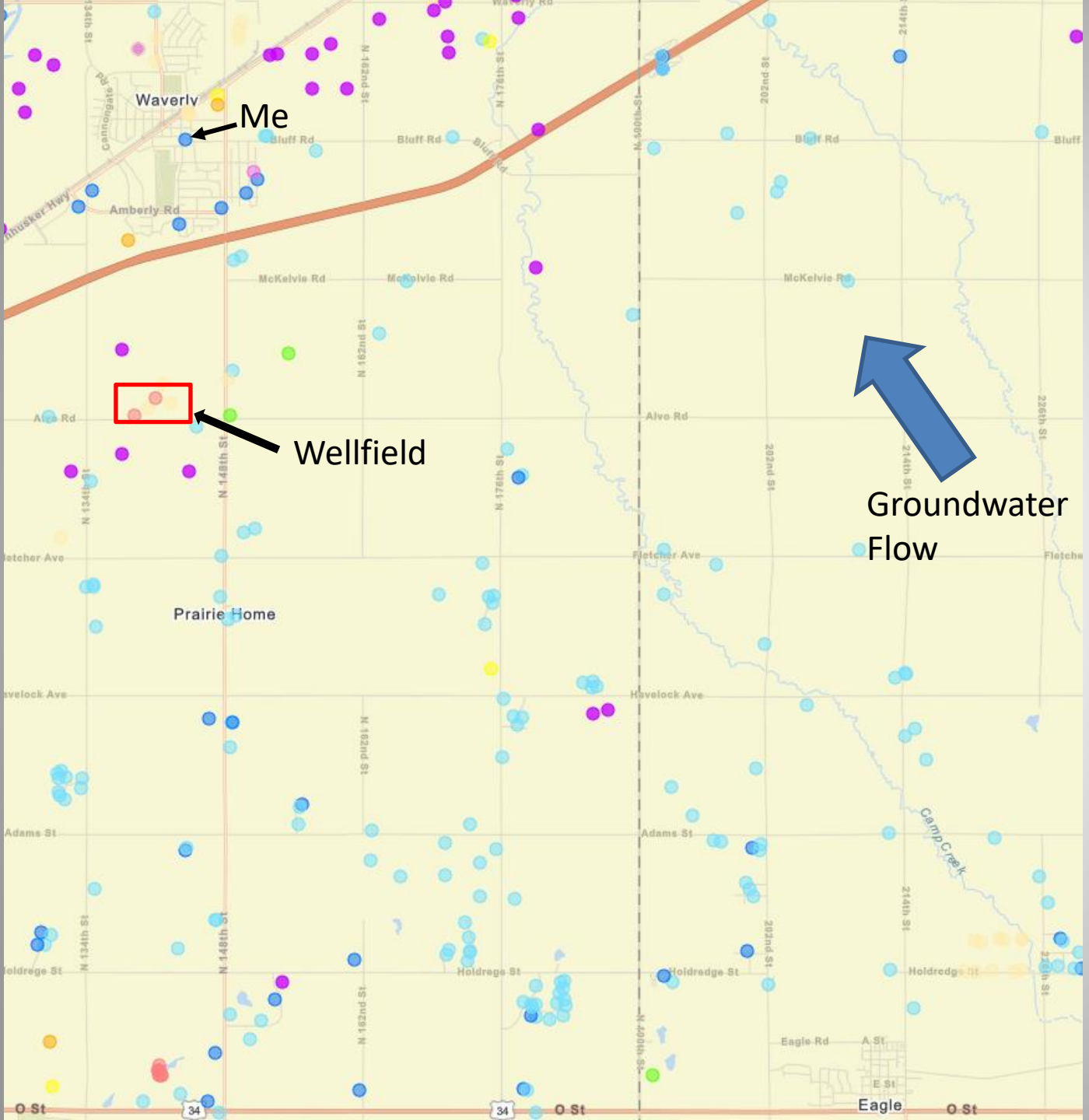
Authors

United States and Puerto Rico Author(s):

Curtis Riganti, National Drought Mitigation Center

Pacific Islands and Virgin Islands Author(s):

Richard Tinker, NOAA/NWS/NCEP/CPC



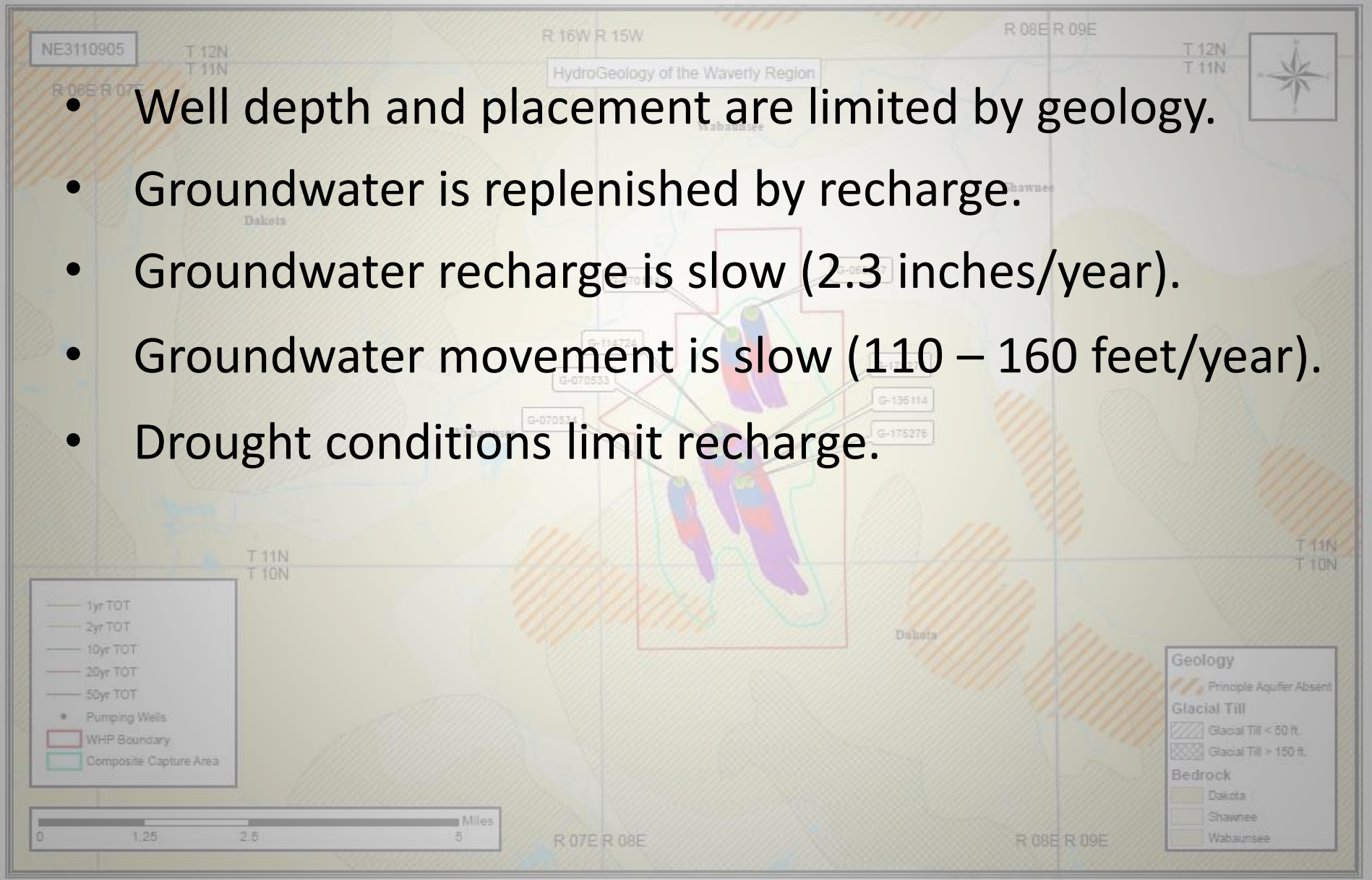
Who else uses the Aquifer?

Types of Wells

- Domestic
- Irrigation
- Closed Loop
- Livestock

Facts to Remember

- Well depth and placement are limited by geology.
- Groundwater is replenished by recharge.
- Groundwater recharge is slow (2.3 inches/year).
- Groundwater movement is slow (110 – 160 feet/year).
- Drought conditions limit recharge.



Questions?

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