Evaluation of Sustainable Yield of the Trinity Aquifers

October 10, 2019

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Barton Springs/Edwards Aquifer
CONSERVATION DISTRICT

Definitions of Sustainable Yield

Safe Yield- the amount of water that can be withdrawn from an aquifer without producing an undesired result. -Todd, 1959

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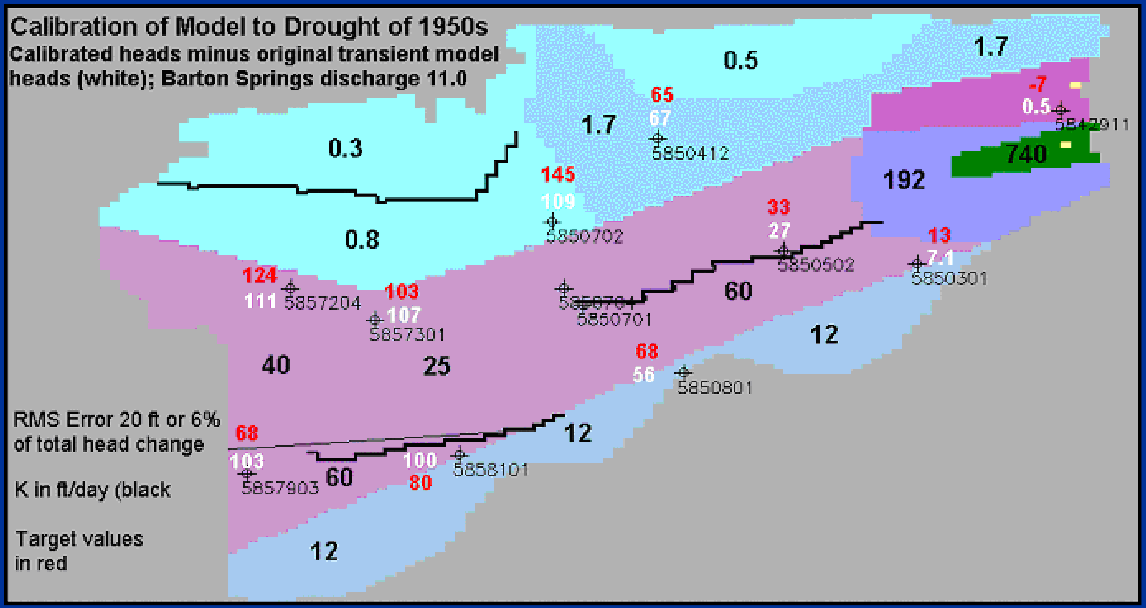
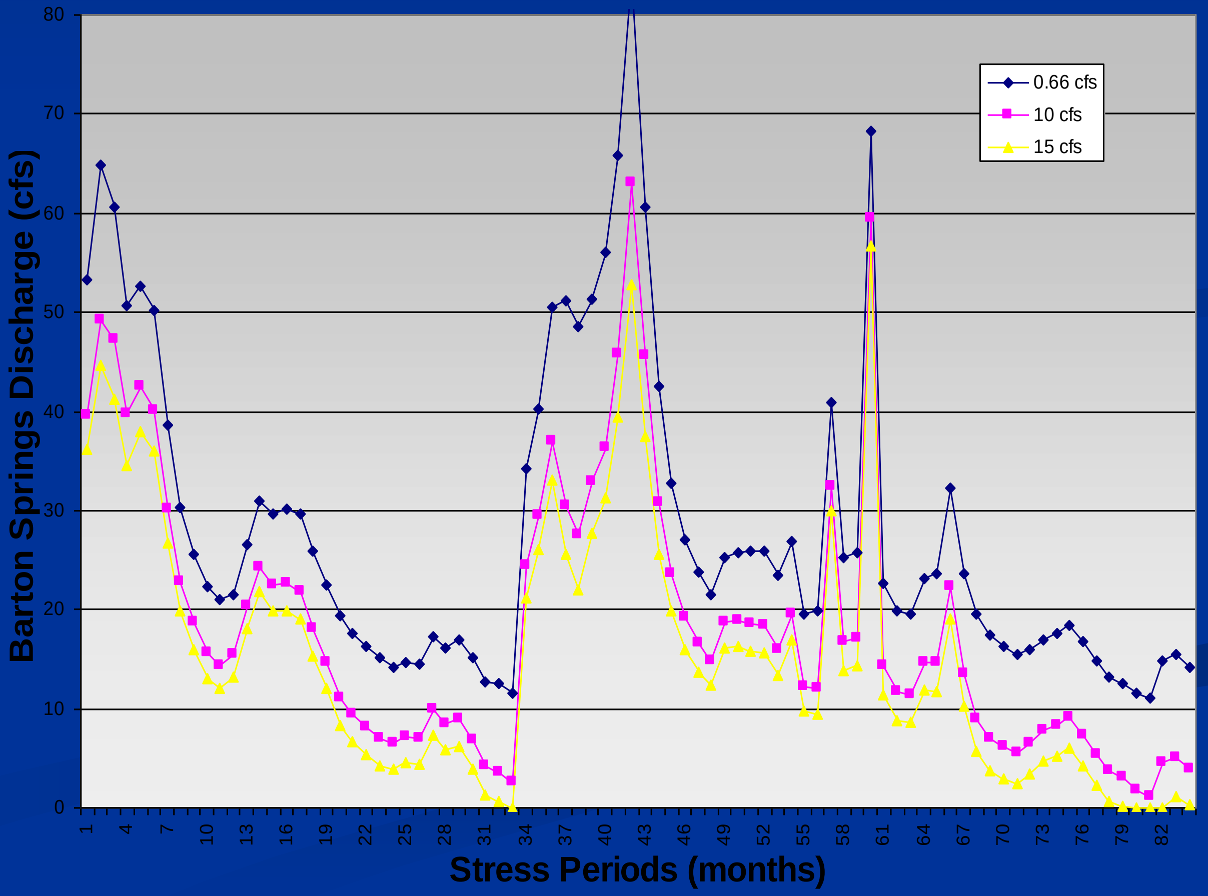
There is not a scientifically derived number(s) for the sustainable yield of an aquifer. It is a policy decision based on science.

Definitions of Sustainable Yield

Safe Yield- the amount of water that can be withdrawn from an aquifer without producing an undesired result. -Todd, 1959



2004 Sustainable Yield Study

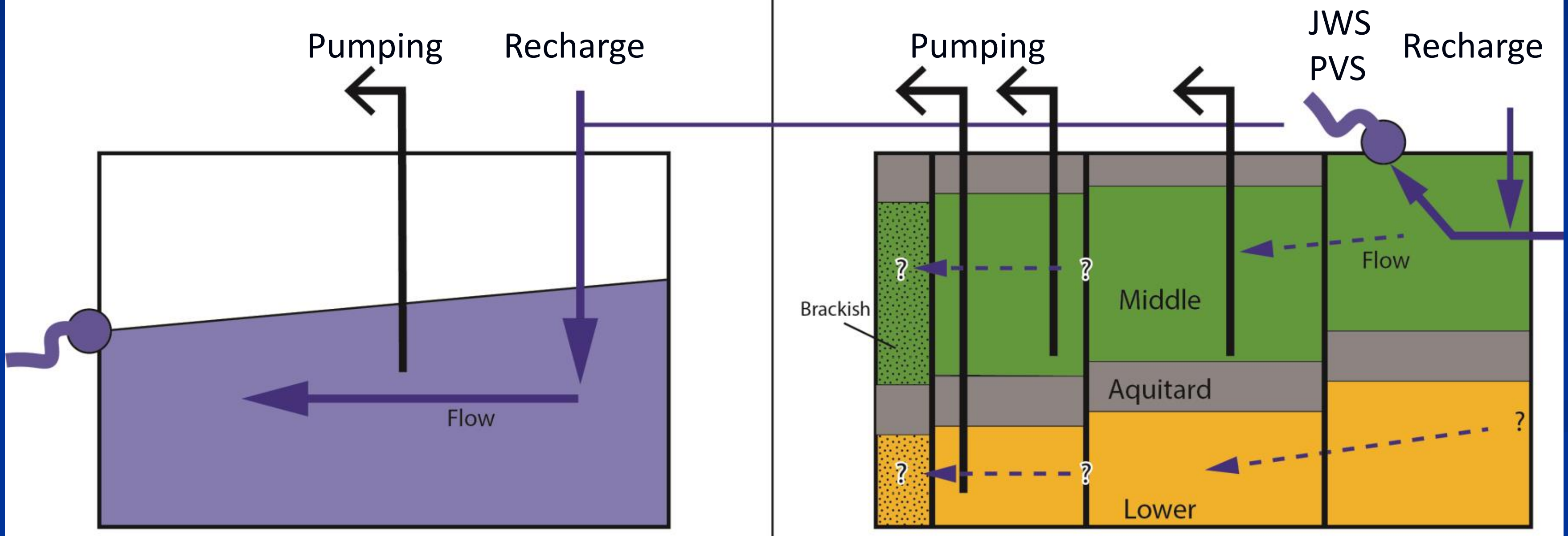


Barton Springs Edwards Aquifer Conservation District

Definitions of Sustainable Yield

2019- The amount of groundwater available for beneficial uses from an aquifer under a recurrence of drought of record conditions, or worse, without causing unreasonable impacts. An evaluation of sustainable yield will be based on historic data on groundwater storage, usage, recharge, water quality, and spring flow of the aquifer.

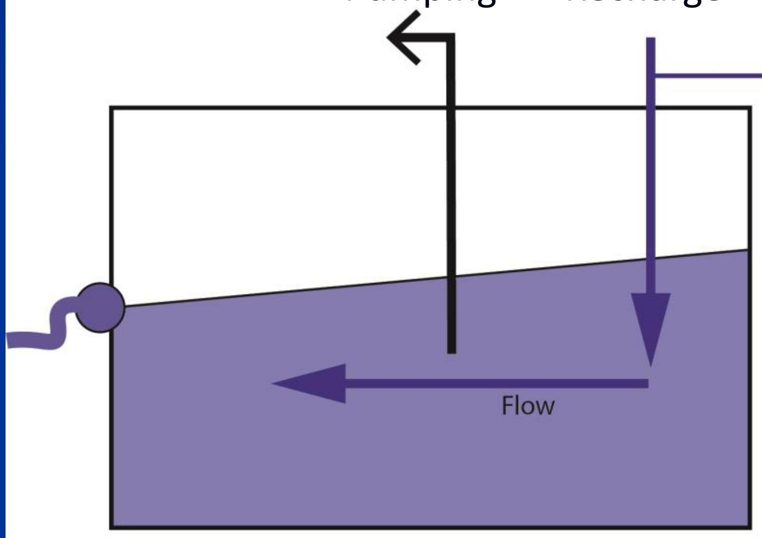
Characterizing the Sustainable Yield of Two Contrasting Aquifer Systems

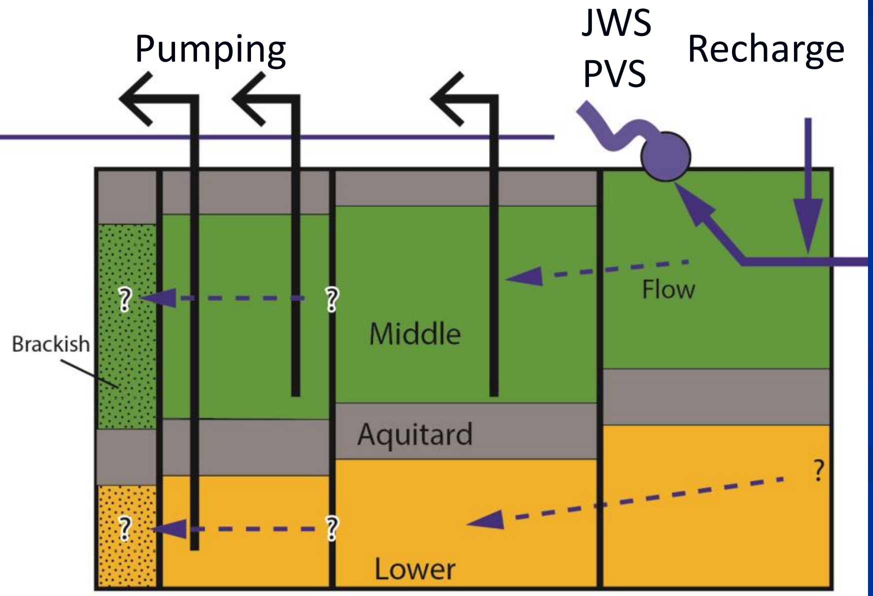


- Homogeneous
- Rapid flow (mature karst)
- Well-defined water budget
- Barton Springs flow and water levels are primary measures of sustainability
- Drought-of-record (1950s) data available
- Numerous models available

- Heterogeneous
- Mostly slower flow (semi-mature karst)
- Poorly-defined water budget
- Distal spring flow and water levels are likely measures of sustainability
- Little historical data available
- One model (two versions) available

Characterizing the Sustainable Yield of Two Contrasting Aquifer Systems





- Homogeneous
- Rapid flow (mature karst)
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Undesired results

- Heterogeneous
- Mostly slower flow (semi-mature karst)
- Poorly-defined water budget
- Distal spring flow and water levels are likely measures of sustainability
- Little historical data available
- One model (two versions) available

Unreasonable impacts

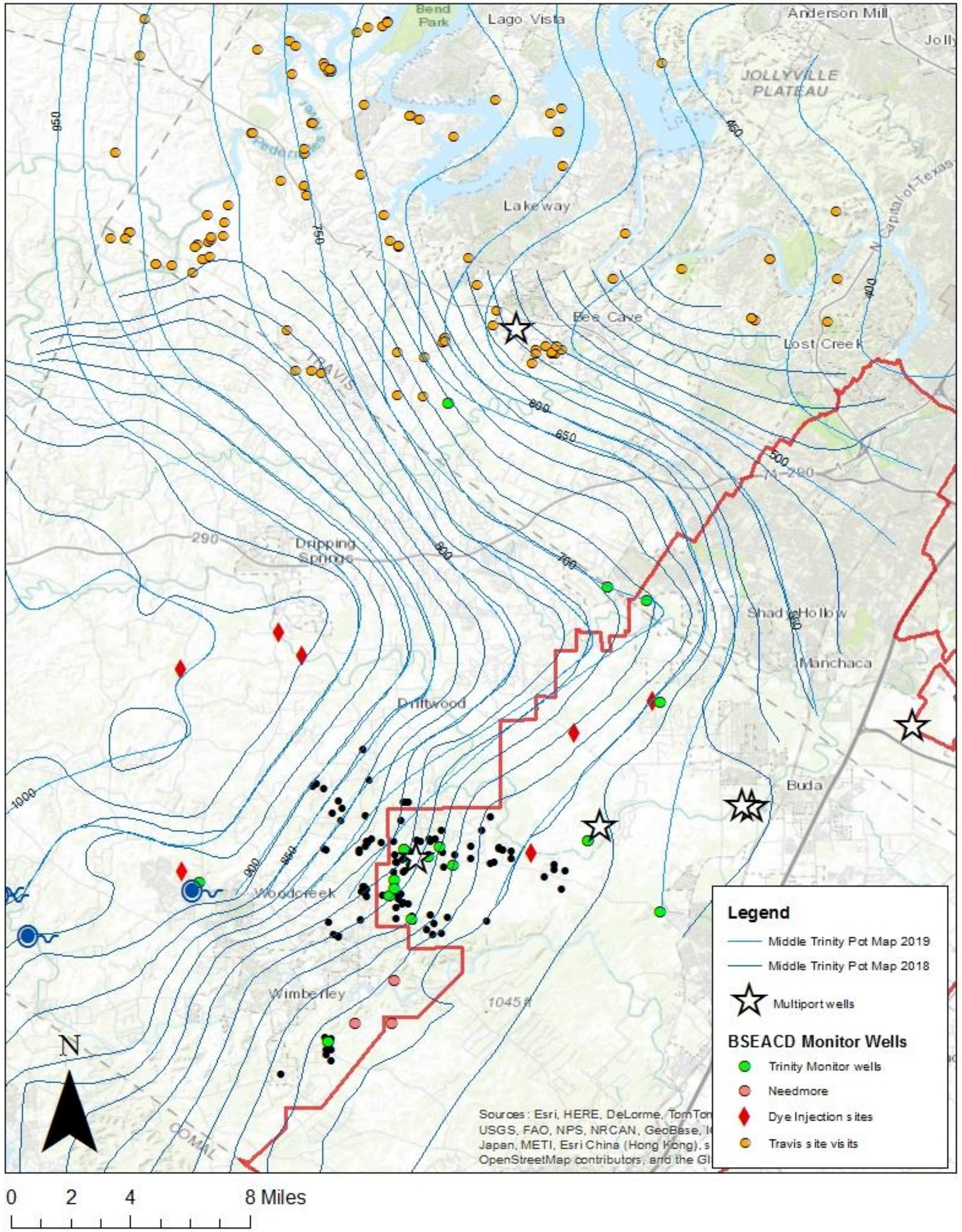
Key Objectives of Study

- Determine potential for unreasonable impacts from localized and regional pumping on water levels, wells, and springflow.
- Evaluate the combined effects of pumping and extreme drought on water levels, wells and springflow.
- Provide a scientific basis for any rules that would need to be promulgated following the study.

Key Tasks

- Water-level monitoring
- Adding more monitor wells to existing network
- Preparation of hydrographs and maps
- Analytical modeling for localized impacts from pumping
- Assessment of exempt and permitted pumping
- Water-quality sampling and analysis
- Rainfall, stream-flow measurements
- Dye-trace studies
- Numerical modeling- TWDB GAM, Blanco River model, District's Trinity model

Recent Trinity Studies and Data Sites



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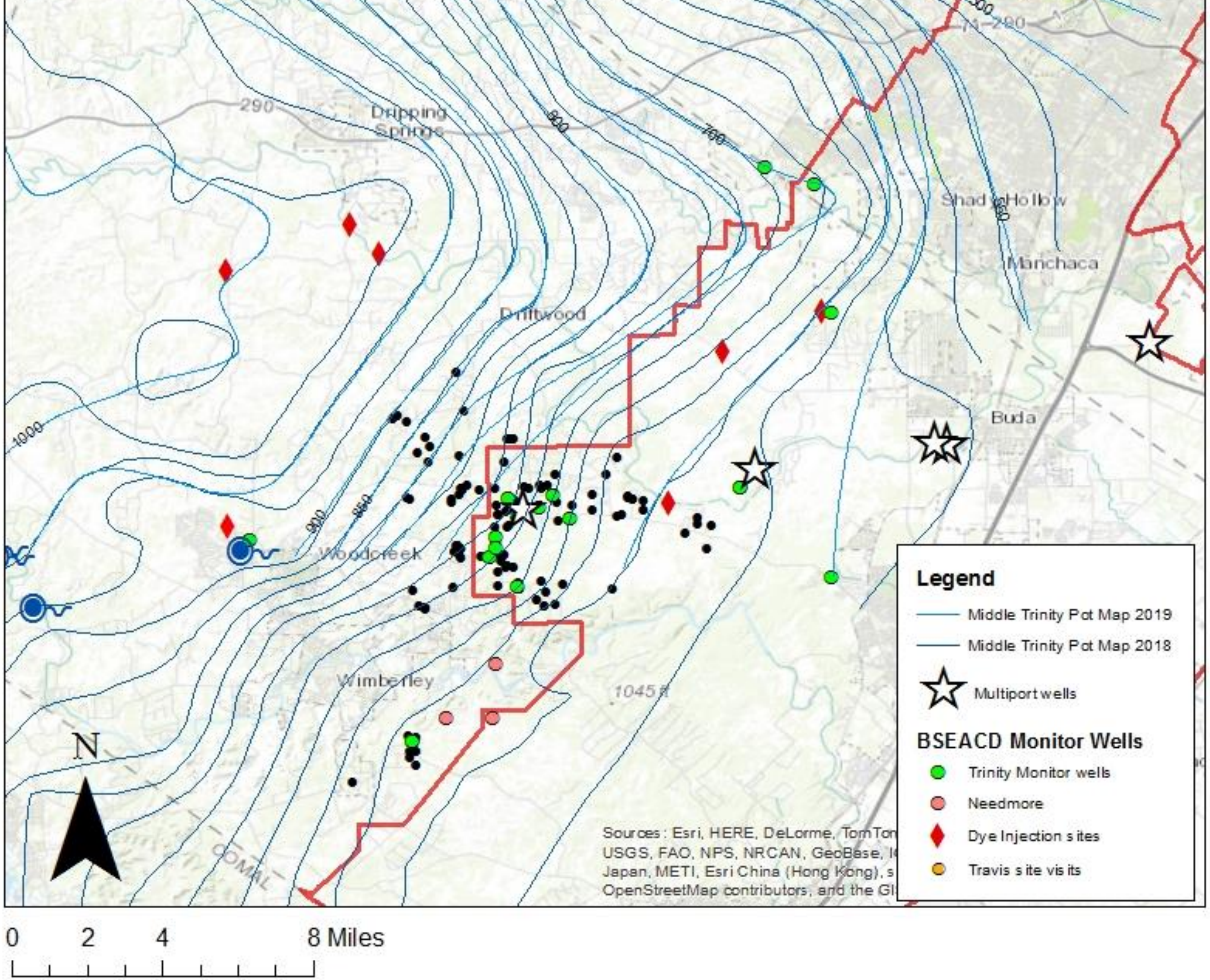
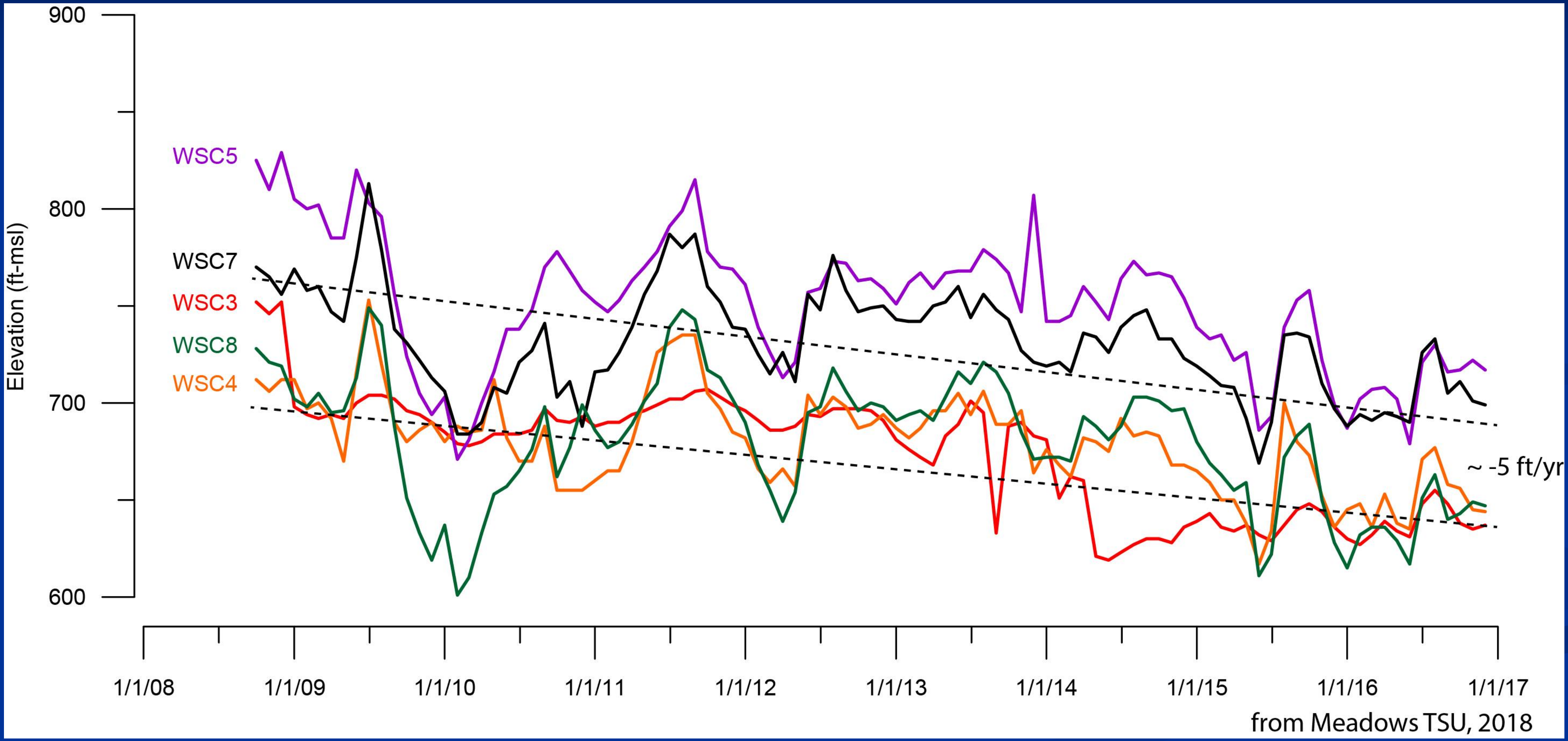


Legend
Middle Trinity Pot Map 2019
Middle Trinity Pot Map 2018
Multiport wells
BSEACD Monitor Wells
Trinity Monitor wells
Needmore
Dye Injection sites
Travis site visits
Dripping Springs
Driftwood
Shady Hollow
Manchaca
Buda
Woodcreek
Wimberley
290
1000
900
950
800
700
1045 ft
COMAL
N
0
2
4
8 Miles
Sources: Esri, HERE, DeLorme, TomTom
USGS, FAO, NPS, NRCAN, GeoBase
Japan, METI, Esri China (Hong Kong)
OpenStreetMap contributors, and the GIS

Middle Trinity Hydrographs 2008 - 2018

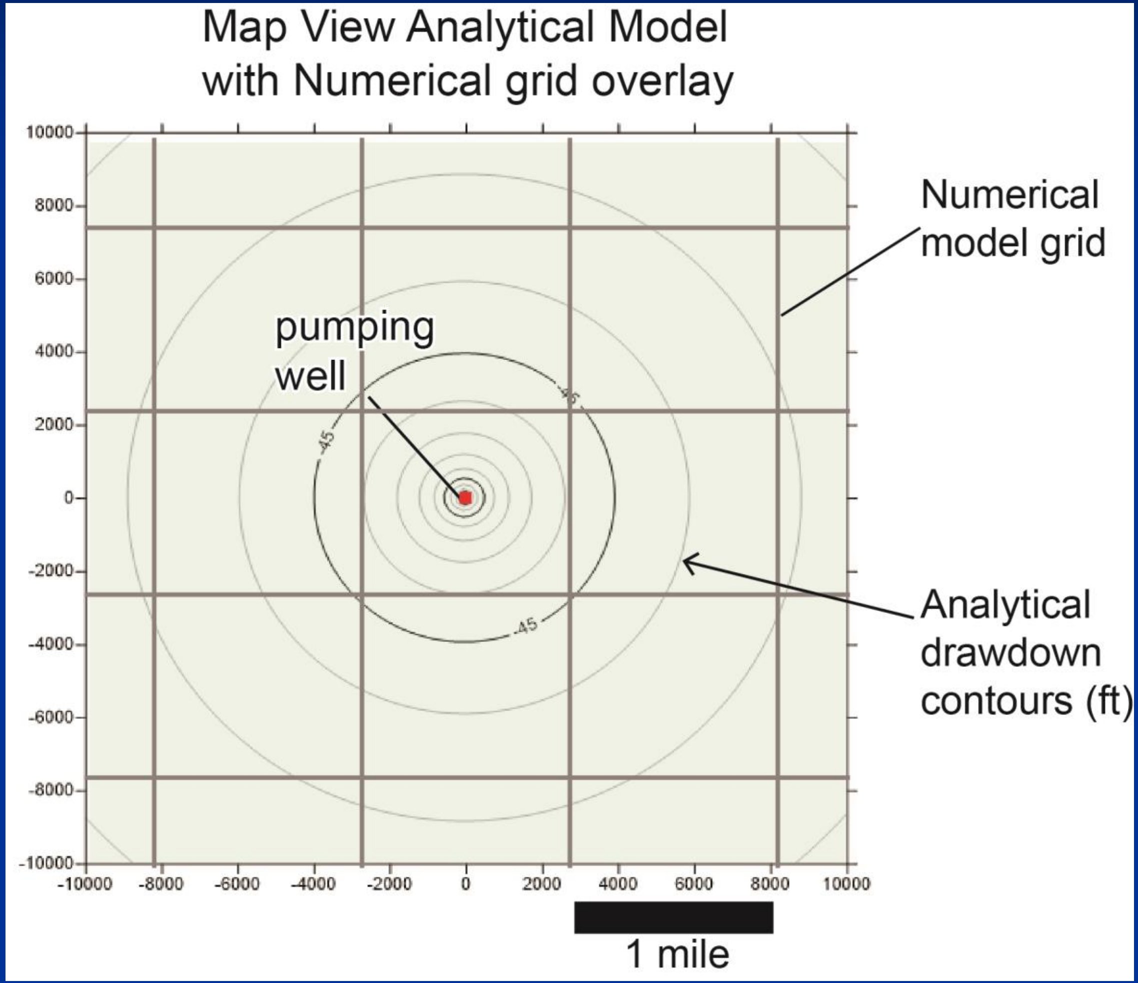


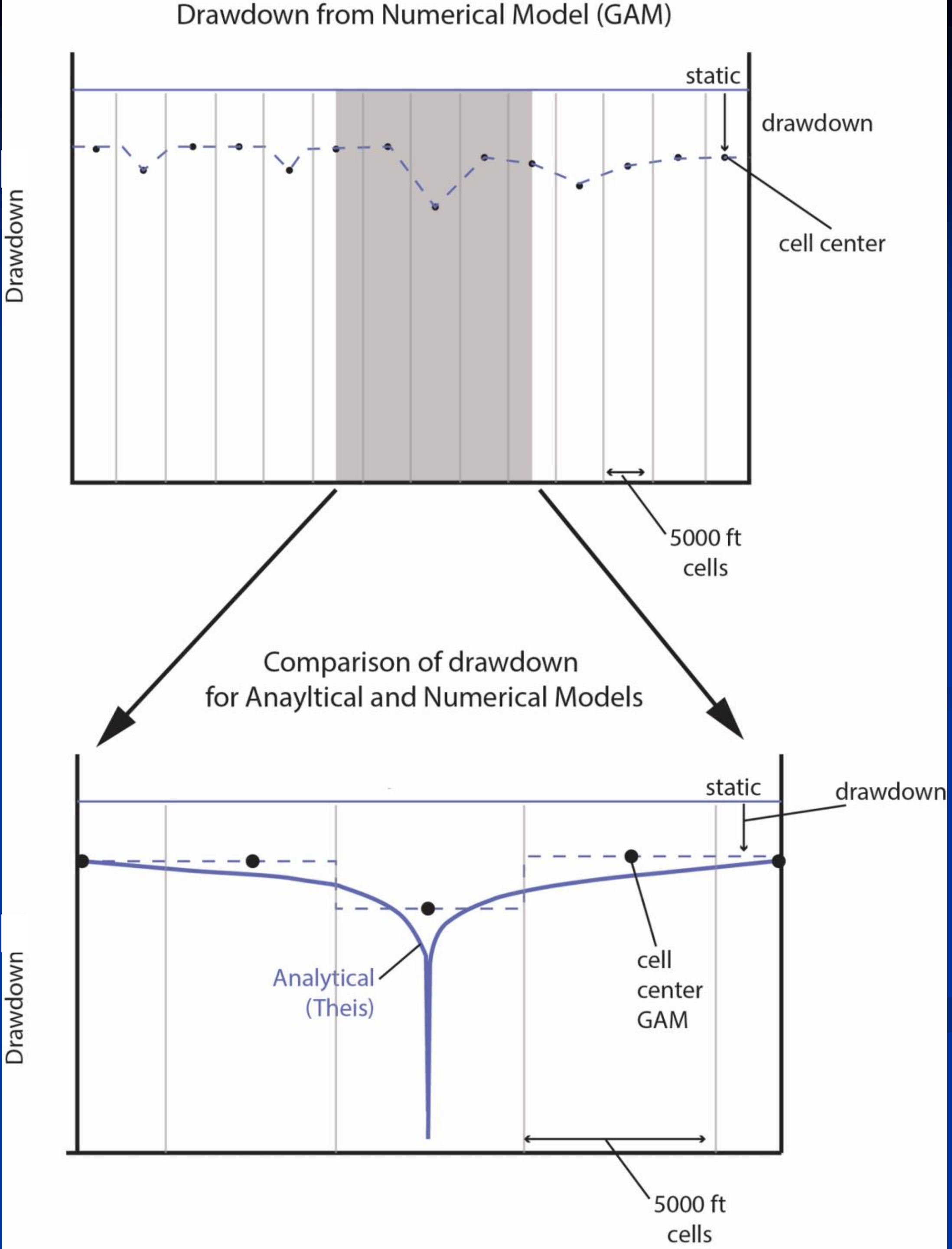
Analytical vs Numerical Modeling

- Analytical models are good for evaluating local impacts from pumping with reasonable results up to about 2 miles from pumping well and periods of time.

- Numerical models can cover hundreds of square miles and can give reasonable results for impacts from pumping at considerable distances from pumping wells. Local impacts cannot be reasonably evaluated with these models.

Analytical vs Numerical Models





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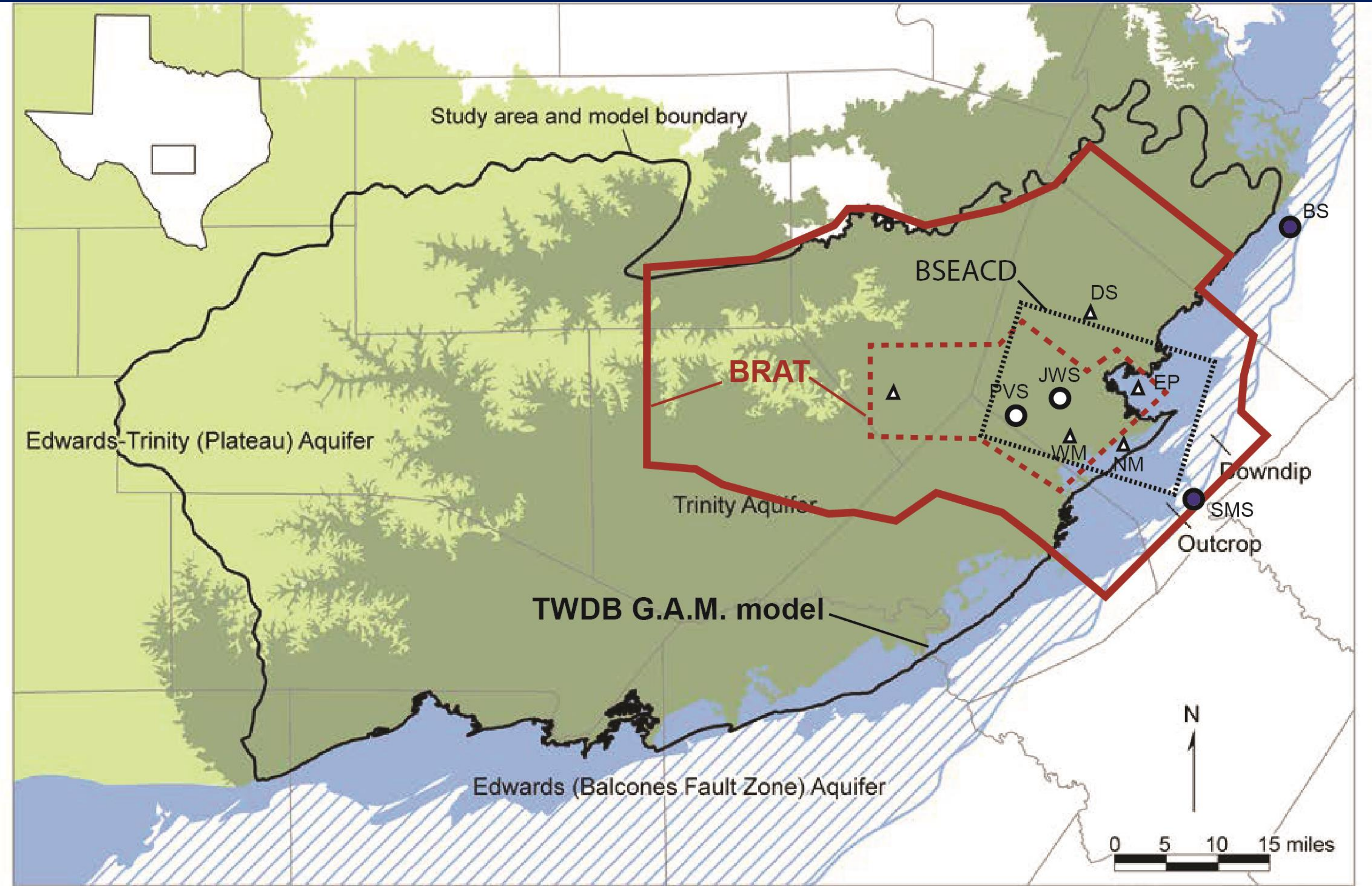
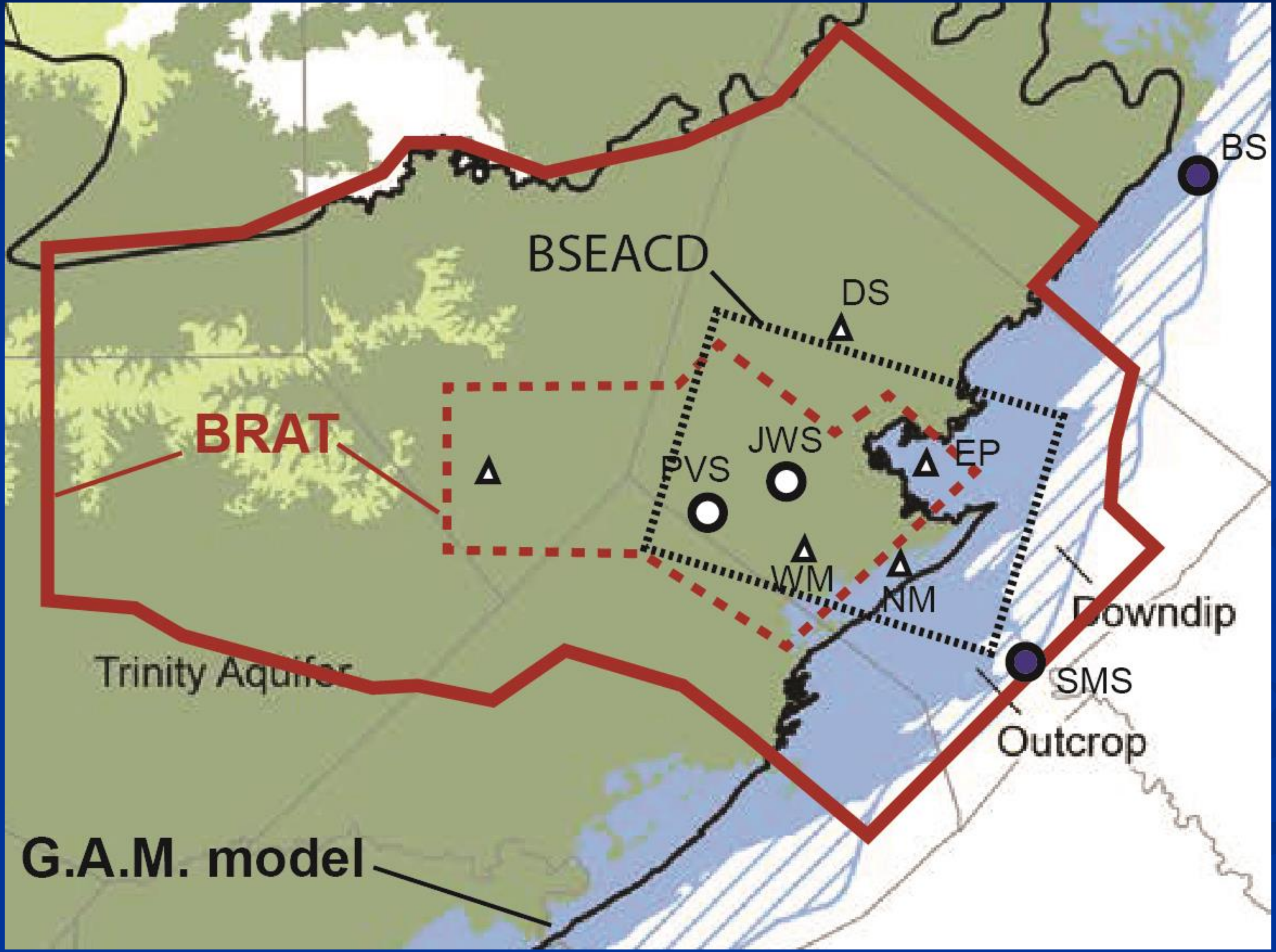
Numerical Model Domains



Modified from Jones et al., 2011.

Numerical Model Domains



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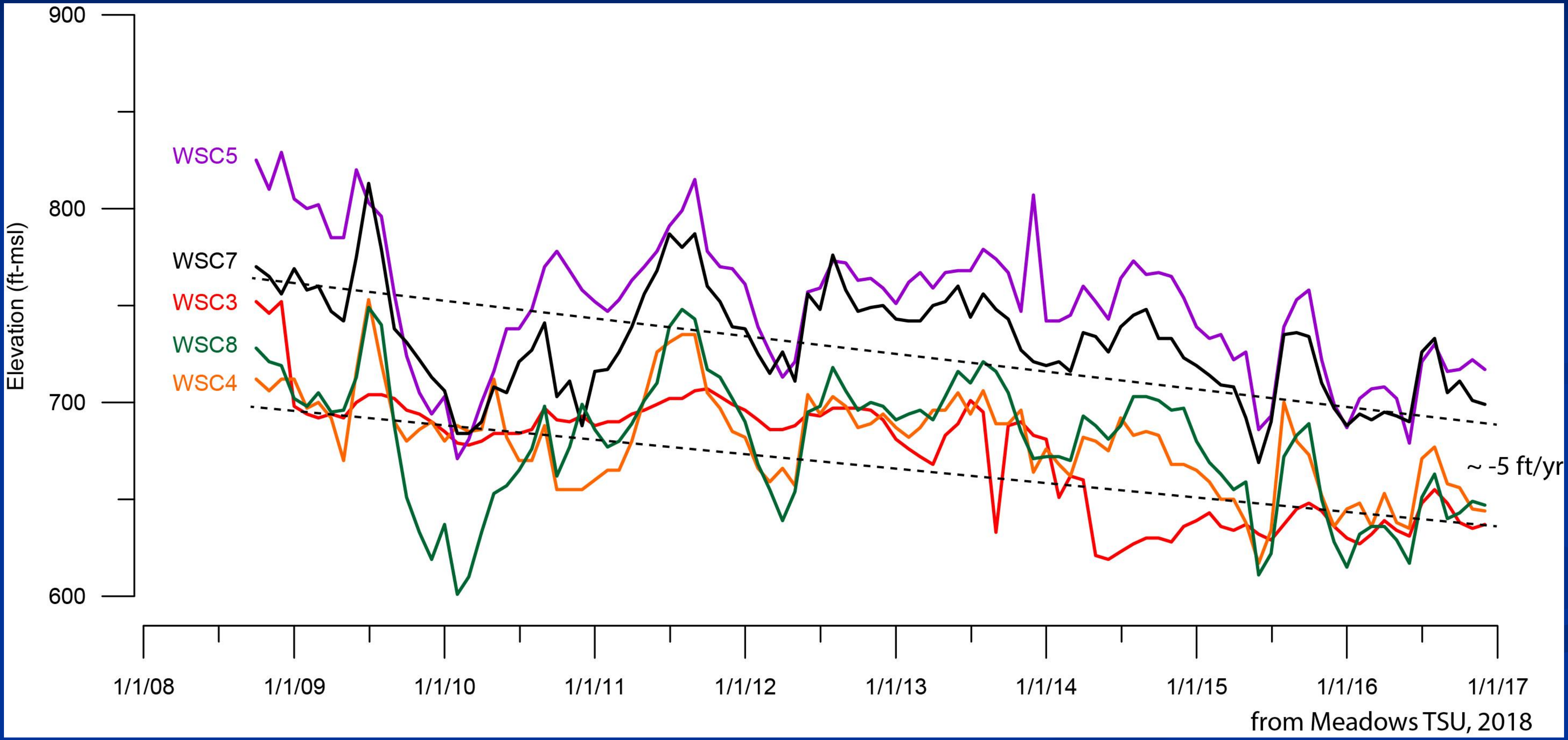
Policy-related questions to be considered by the study

- Do we need to end historical permitting of the Trinity?
- Do we need a non-Edwards drought trigger for the Trinity?
- Should we set a 50% pumpage reduction for extreme drought?
- Can Jacob's Well and Pleasant Valley Springs be impacted by Trinity pumping in the District?
- Are the current Desired Future Conditions (DFCs) adequately protective of the aquifers?
- Should we consider a separate management zone for those areas that could impact springs?

Approximate Timeline

- District's Trinity model is functional by September 2020
- Testing of pumping and drought scenarios
- Draft report by March 2021 (dependent on completion of District's Trinity model)
- Review of draft report by technical advisory committee (2 months)
- Drafting of rules by District staff (2 months)
- Review of proposed rule changes by policy advisory committee (2 months)

Middle Trinity Hydrographs 2008 - 2018



Optional Path of Rule Making

Phase 1 will proceed with existing data and interpretations and will consider:

- Management zones
- Drought restrictions
- Conditional permitting
- Spacing requirements
- Other

Phase 2 will be rule making based on results on numerical modeling

Alternate Timeline

- Compilation of existing data to support Phase 1 of rule making (and continuation of modeling to support Phase 2 of rule making)
- Draft report on findings and recommendations for tentative rules (February 2020)
- Review of draft report by technical advisory committee (2 months)
- Drafting of rules by District staff (2 months)
- Review of proposed rule changes by policy advisory committee (2 months)

QUESTIONS?

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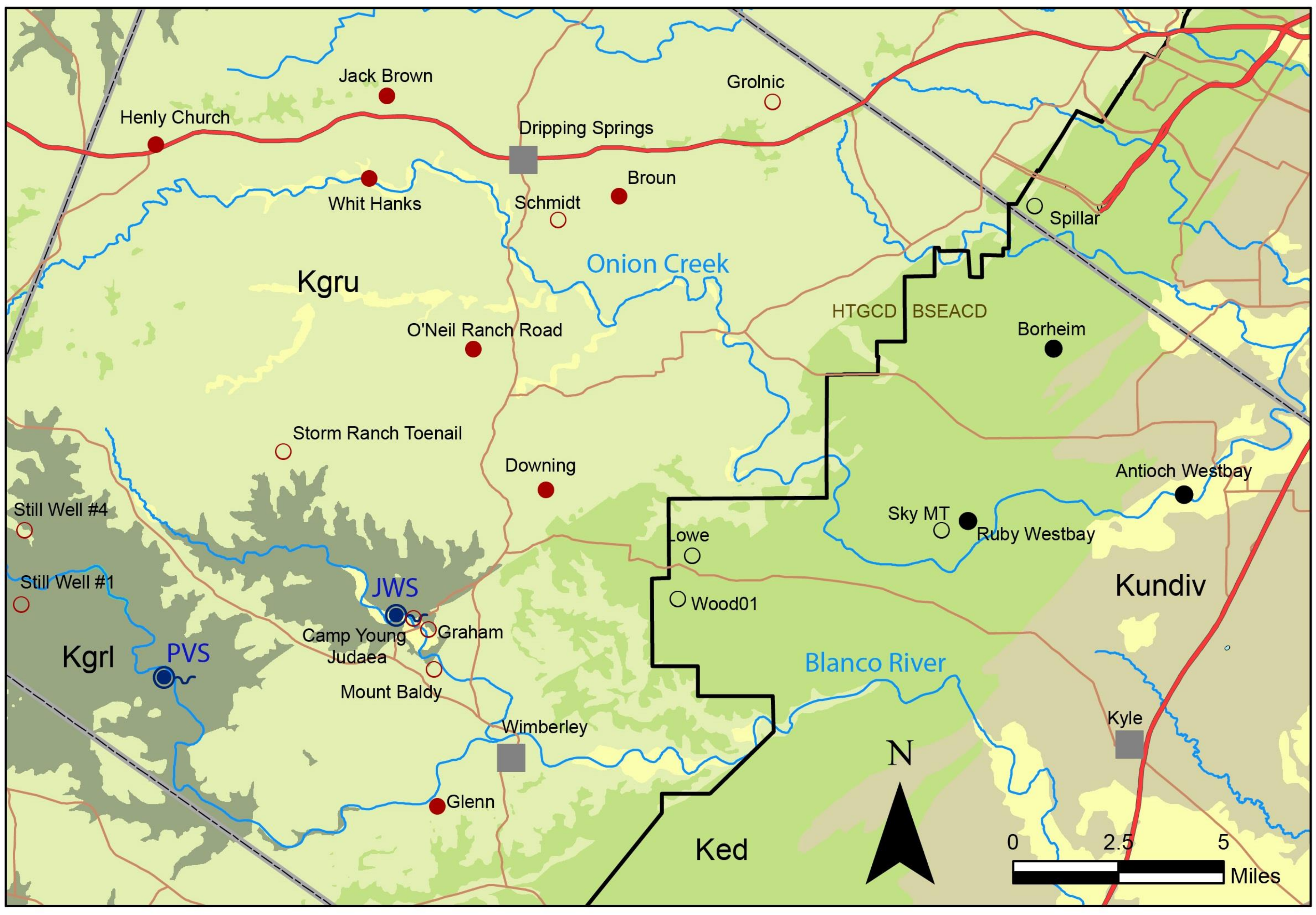
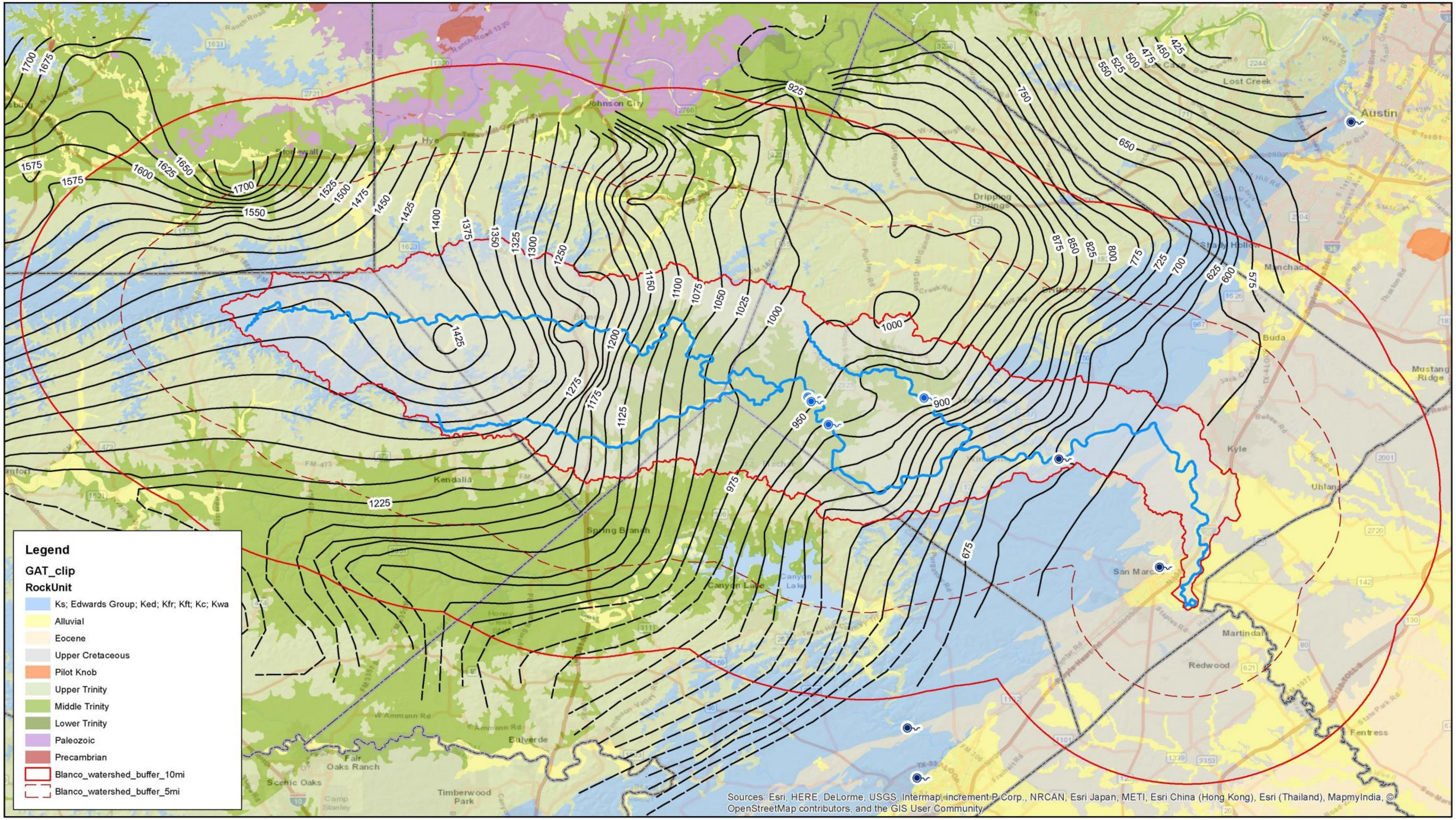

Jack Brown
Grolnic
Henly Church
Dripping Springs
Broun
Whit Hanks
Schmidt
Spillar
Onion Creek
Kgru
HTGCD
BSEACD
Borheim
O'Neil Ranch Road
Storm Ranch Toenail
Downing
Antioch Westbay
Still Well #4
Sky MT
Ruby Westbay
Lowe
Still Well #1
JWS
Wood01
Kundiv
Camp Young
Graham
Judaea
Kgrl
PVS
Blanco River
Mount Baldy
Wimberley
Kyle
N
Glenn
Ked
0
2.5
5
Miles

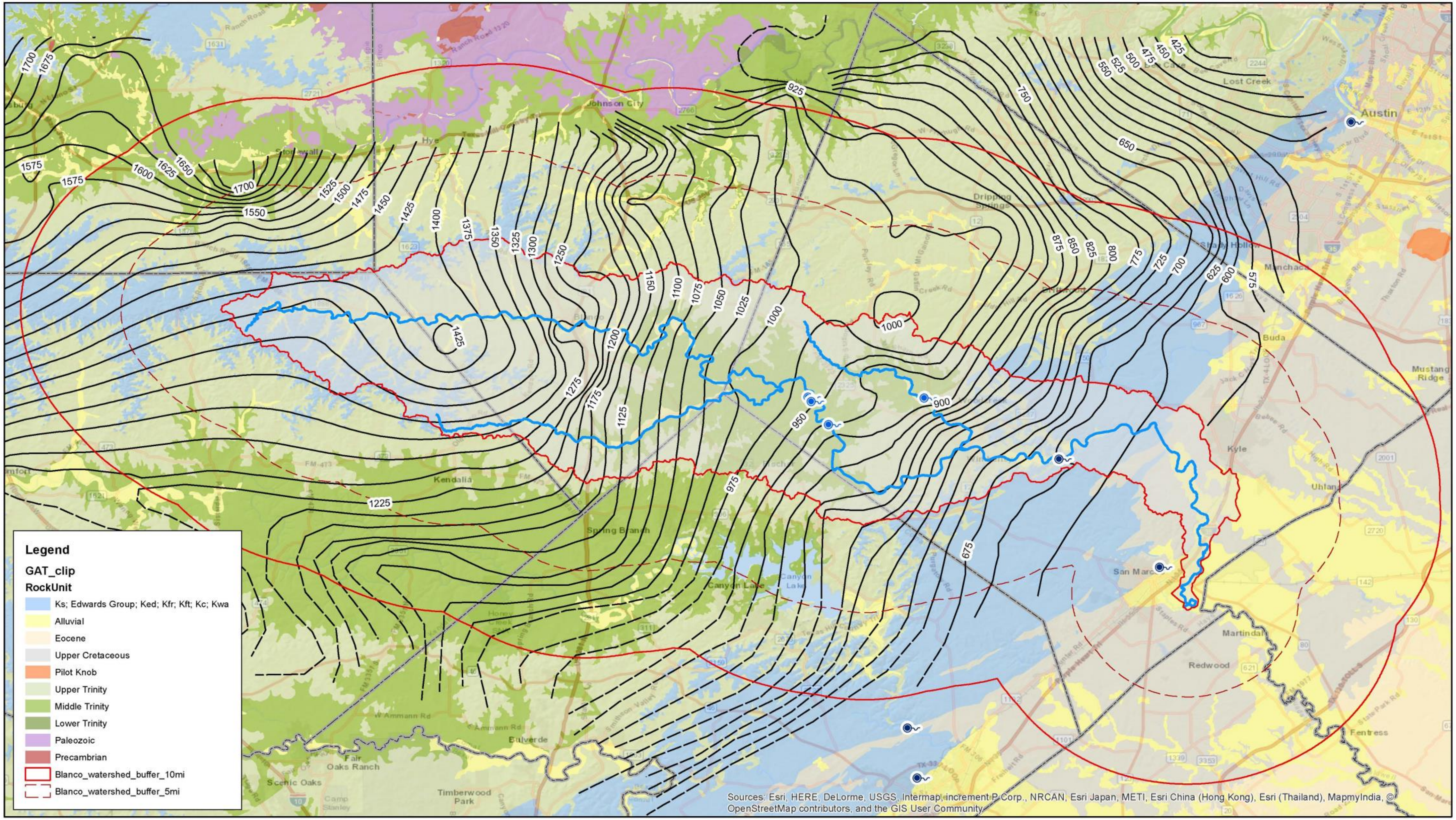
BRATWURST



BRATWURST Potential Study Area Domain
December 7, 2018

0 2.5 5 10 Miles

Blanco **R**iver **A**quifer **T**ool for **W**ater and **U**nderstanding **R**esiliency and **S**ustainability **T**rends



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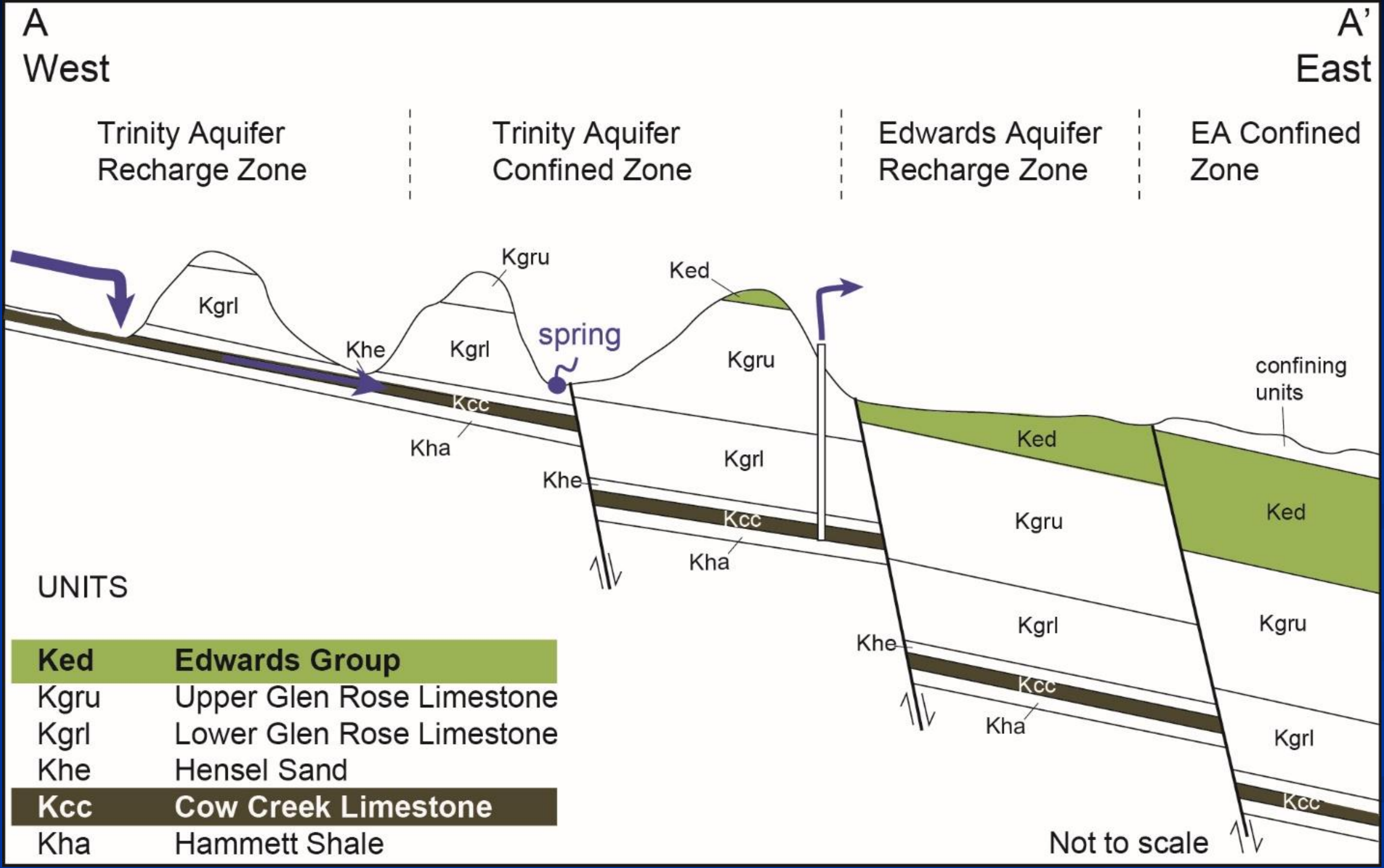

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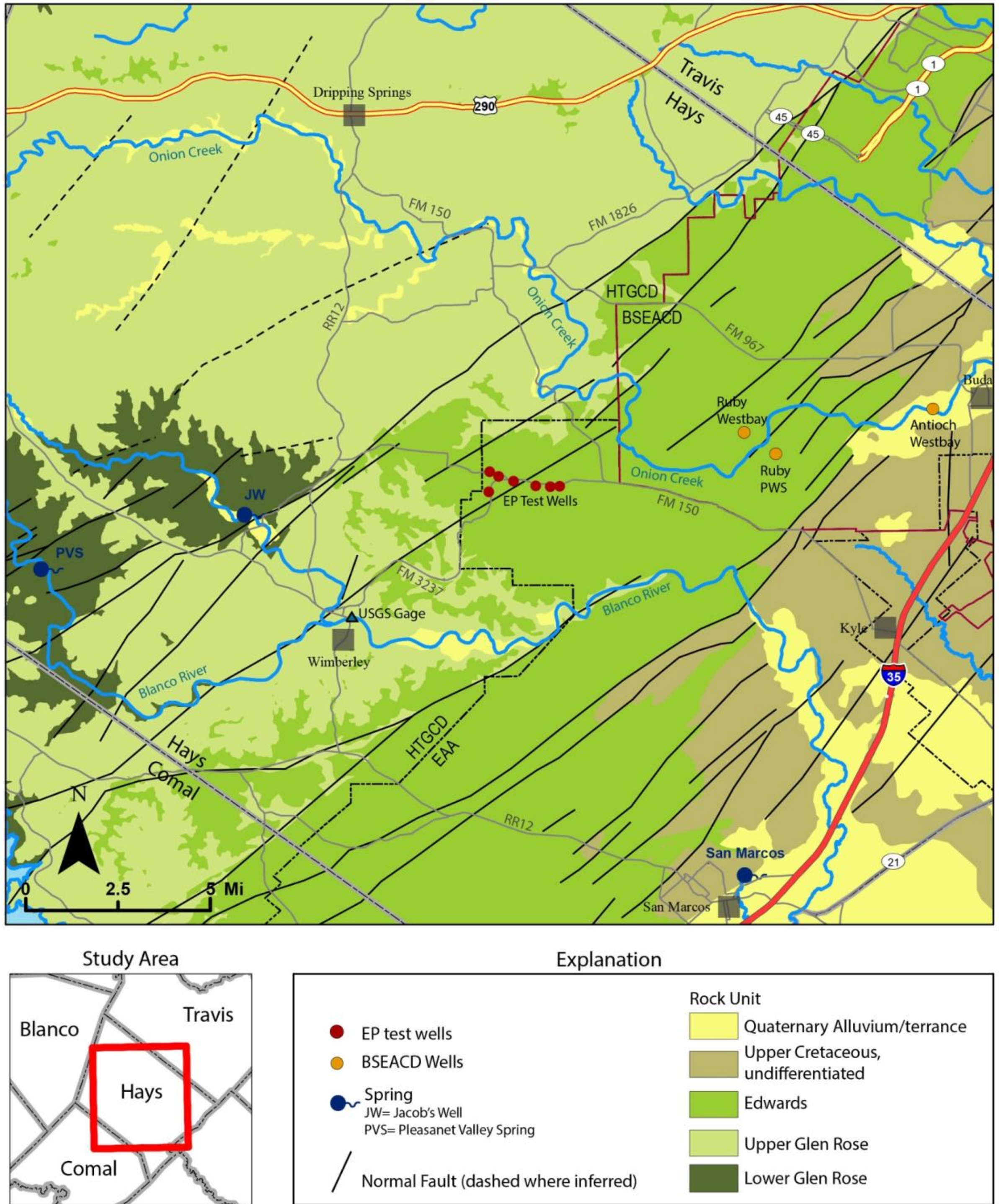

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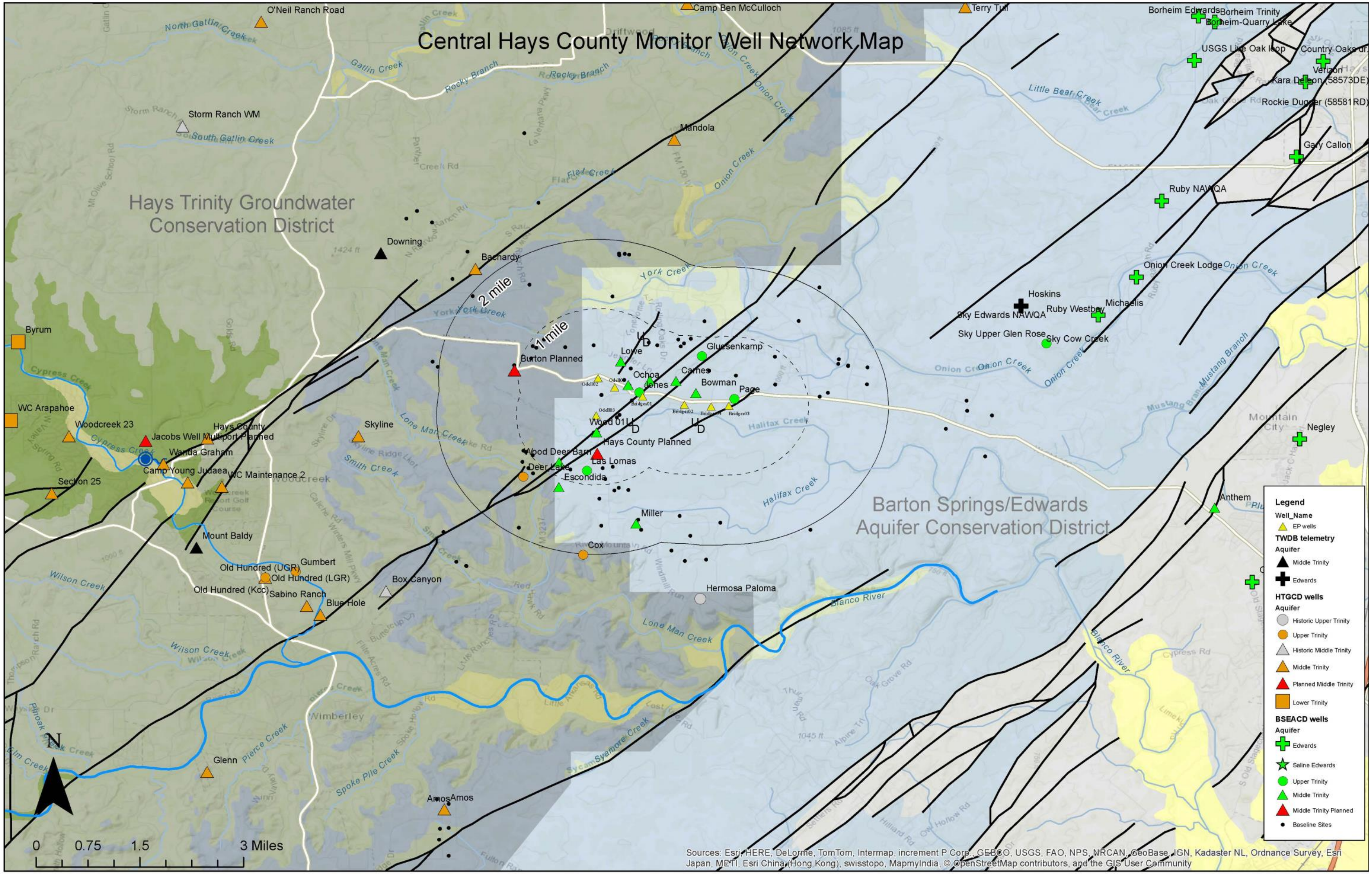
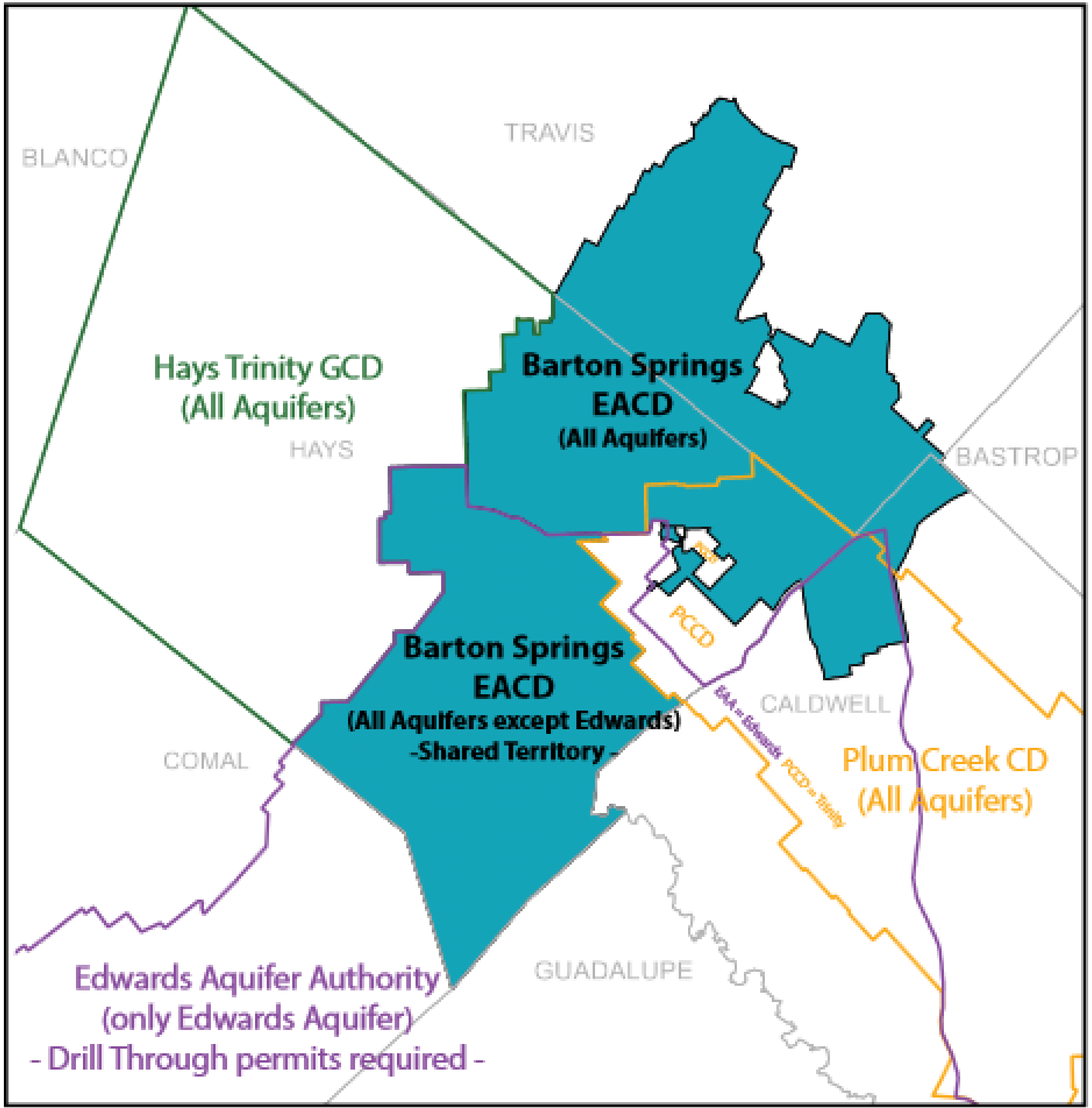

Central Hays County Monitor Well Network Map
Hays Trinity Groundwater Conservation District
Barton Springs/Edwards Aquifer Conservation District
2 mile
1 mile
Legend
Well_Name
EP wells
TWDB telemetry
Aquifer
Middle Trinity
Edwards
HTGCD wells
Aquifer
Historic Upper Trinity
Upper Trinity
Historic Middle Trinity
Middle Trinity
Planned Middle Trinity
Lower Trinity
BSEACD wells
Aquifer
Edwards
Saline Edwards
Upper Trinity
Middle Trinity
Middle Trinity Planned
Baseline Sites
0 0.75 1.5 3 Miles
N
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



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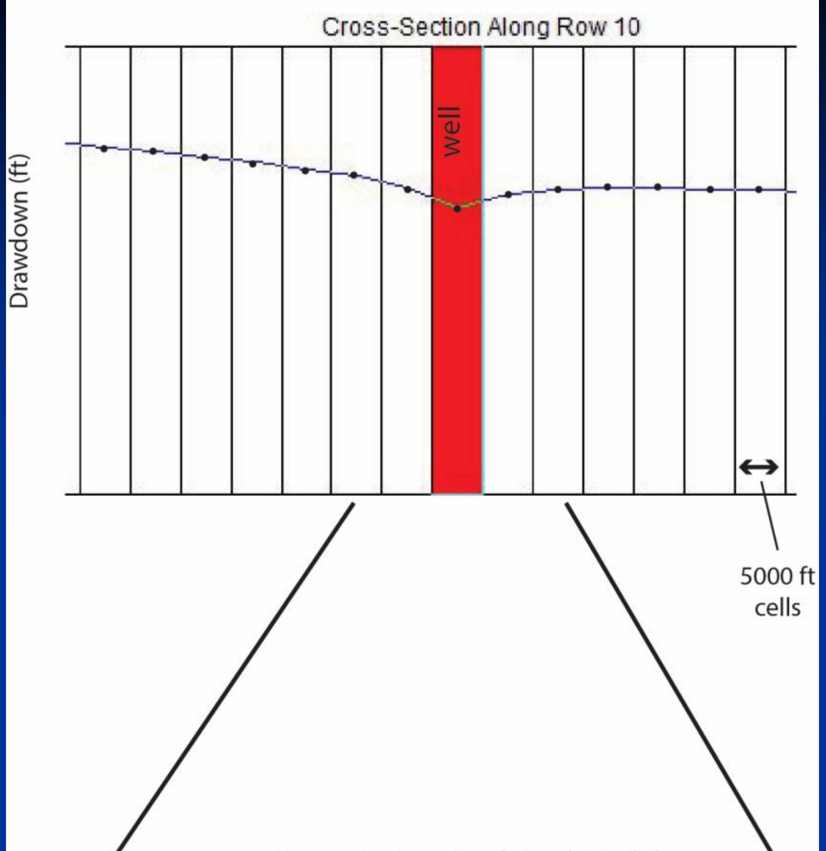
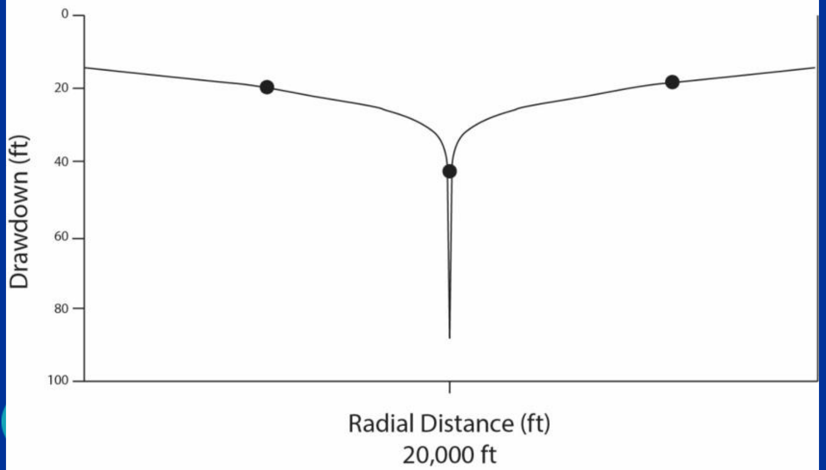
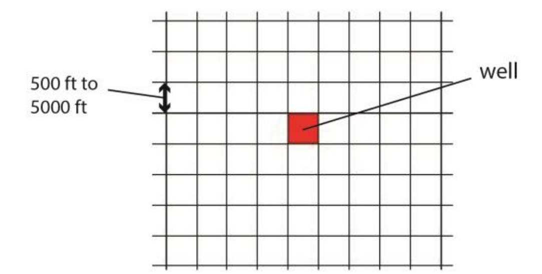
Cross Section Numerical Model



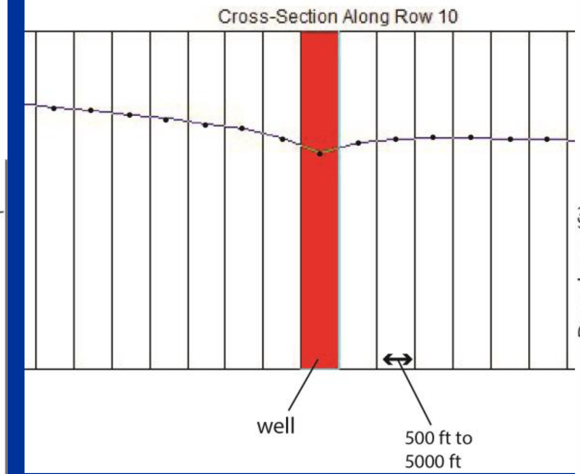
Cross Section Analytical Model



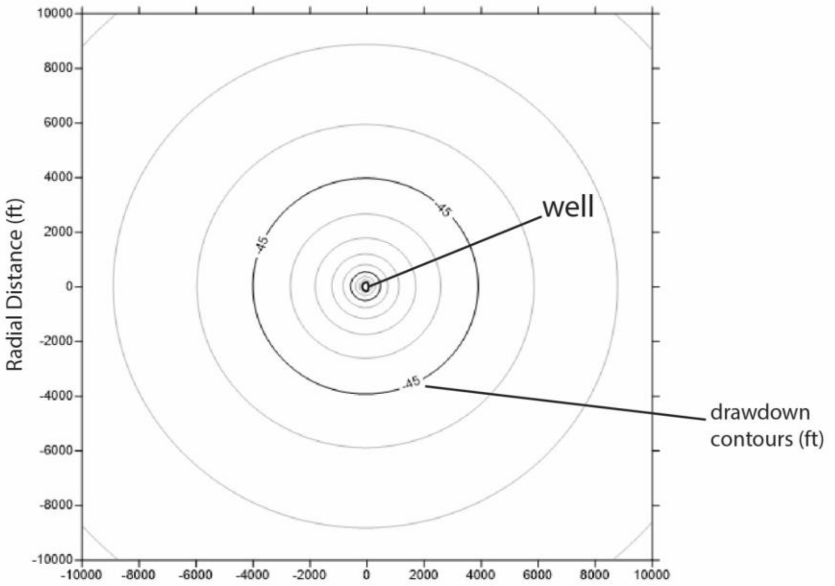
Map View Numerical Grid



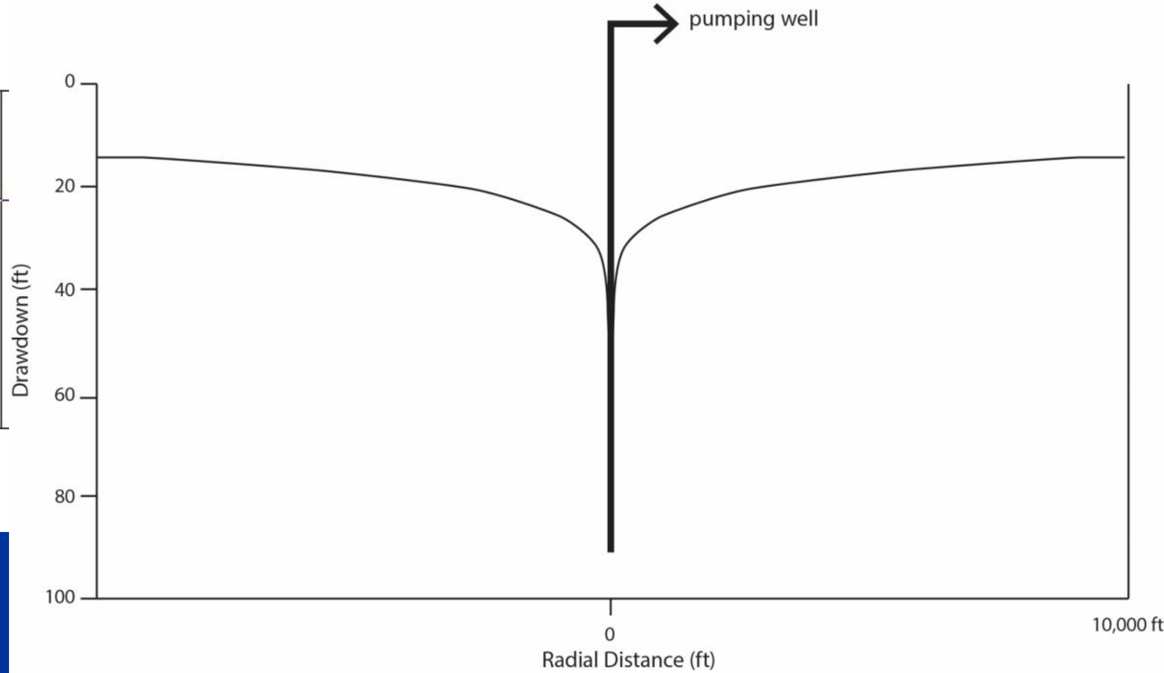
Cross Section Numerical Model



Map View Distrance-Drawdown



Cross Section Distrance-Drawdown



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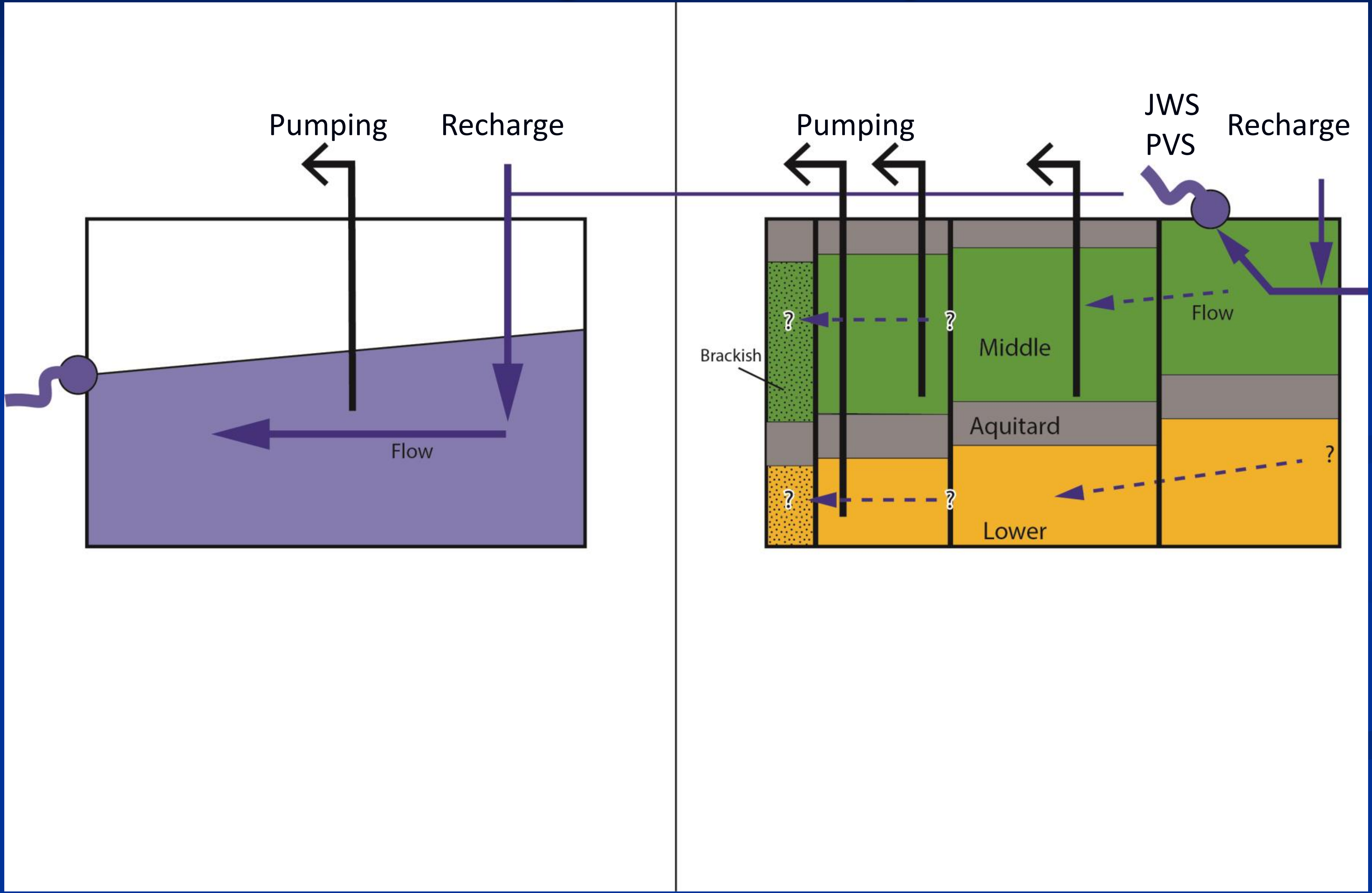

Partners in Trinity Studies

- Hays Trinity Groundwater Conservation District
- Edwards Aquifer Authority
- Texas State University- Meadows Center
- University of Texas at Austin
- Blanco Pedernales Groundwater Conservation District
- City of Austin

Outline

- Definitions of sustainable yield
- Comparison of Edwards and Trinity sustainable yield studies
- Key objectives of sustainable yield study
- Analytical vs numerical modeling
- Questions to be considered by the study
- Timeframe