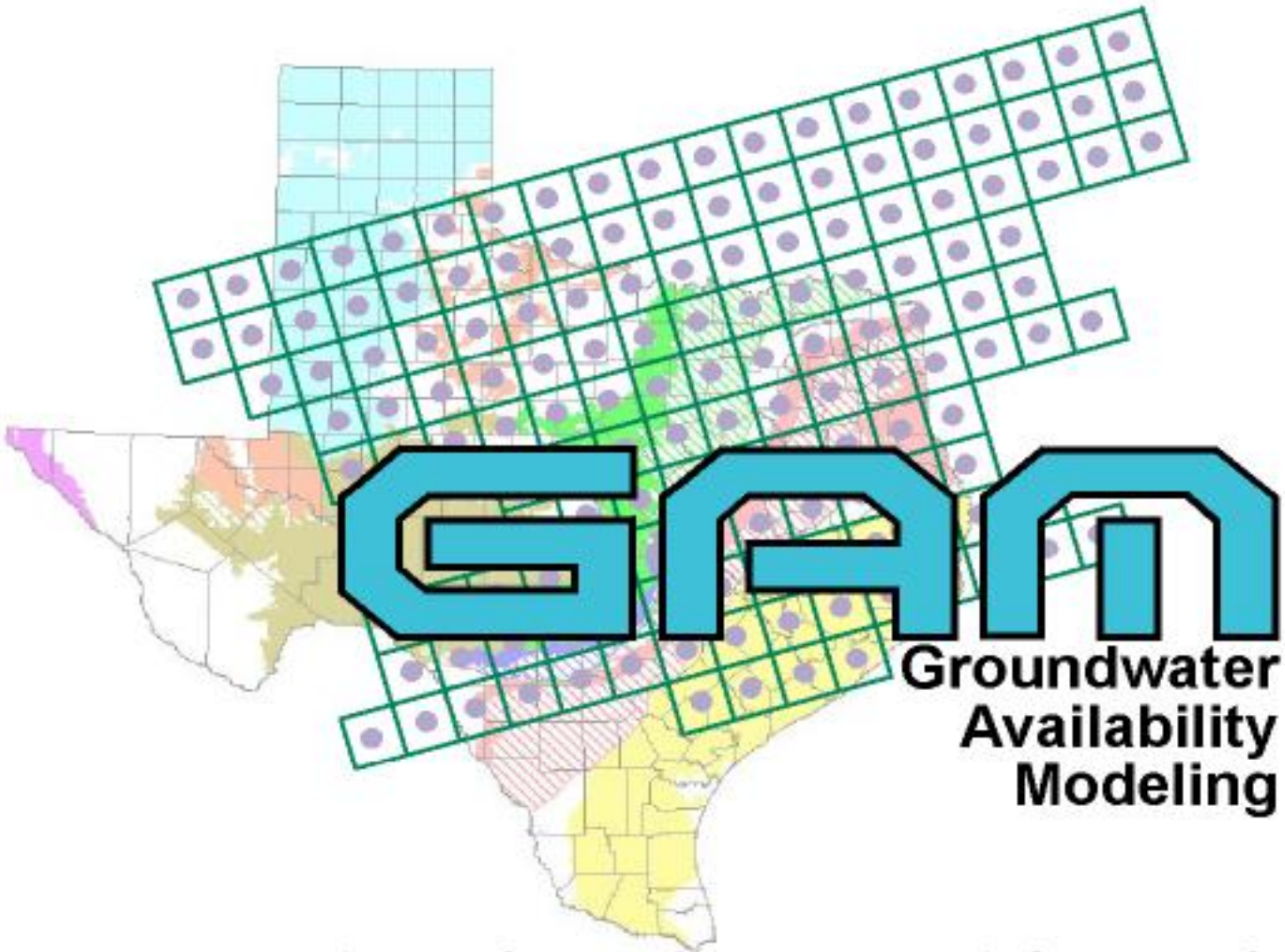
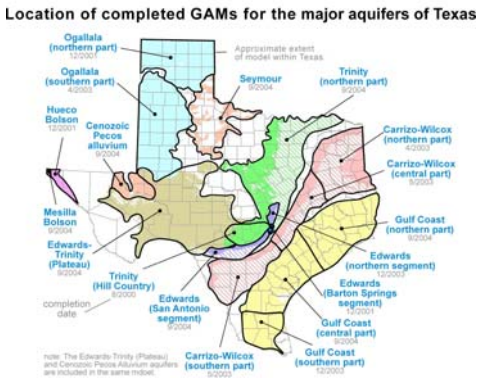
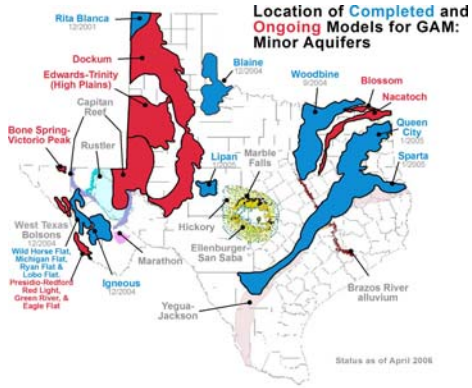


texas water development board

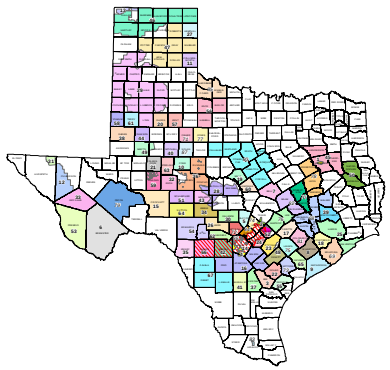
Groundwater Availability Modeling

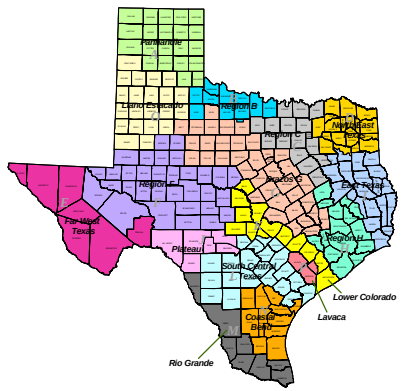




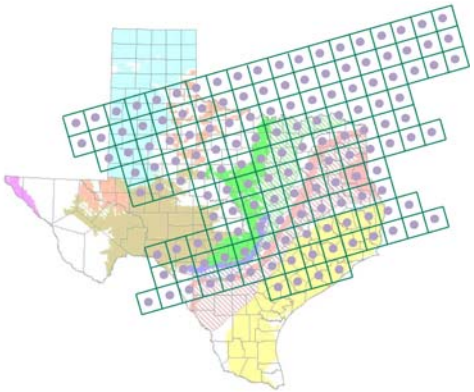
Contract Manager

Ted Angle





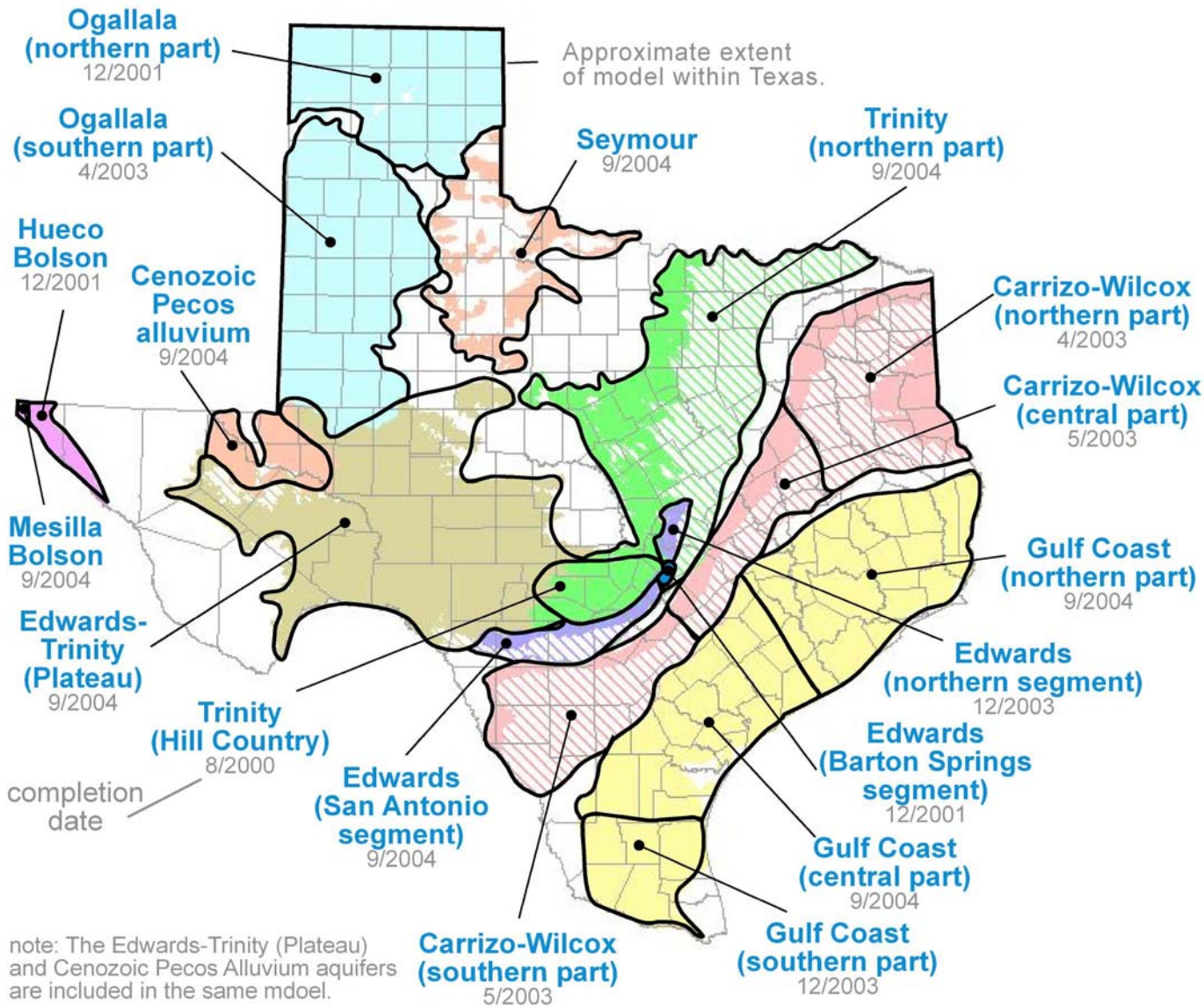
Texas Water Development Board

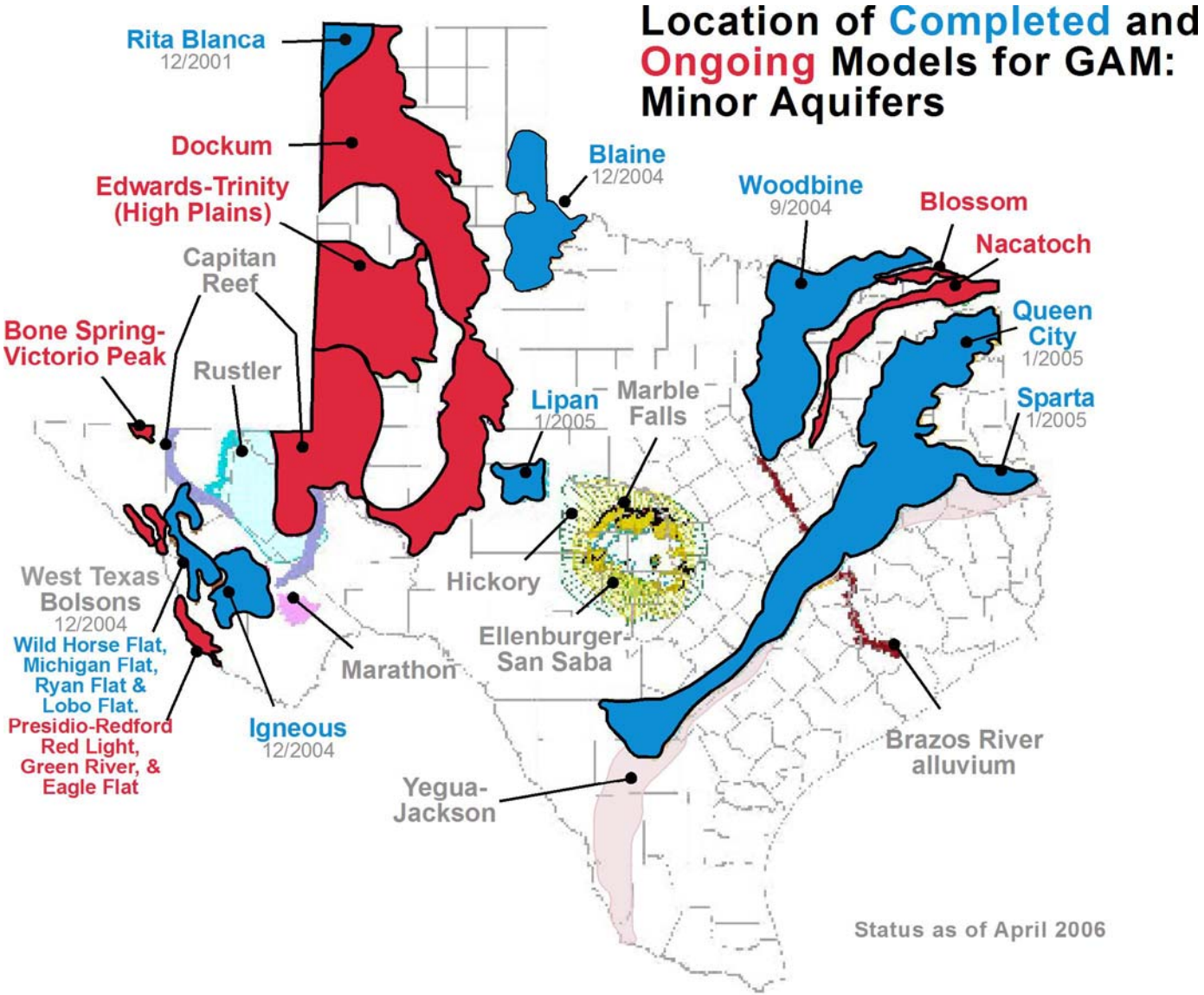


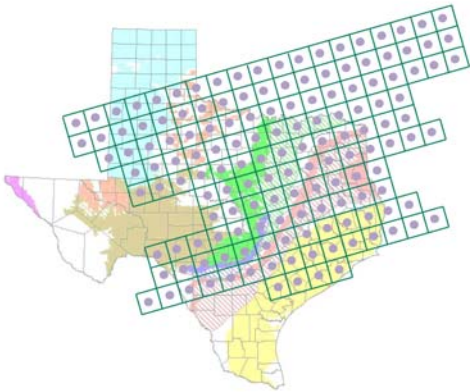
GAM

- Purpose: to develop tools that can be used to help GCDs, RWPGs, and others assess groundwater availability.
- Public process: you get to see how the model is put together.
- Freely available: standardized, thoroughly documented, and available over the internet.
- Living tools: periodically updated.

Location of completed GAMs for the major aquifers of Texas

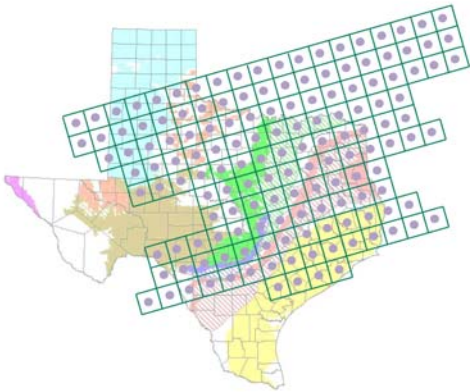



Location of Completed and Ongoing Models for GAM: Minor Aquifers
Rita Blanca
12/2001
Dockum
Edwards-Trinity (High Plains)
Capitan Reef
Bone Spring-Victorio Peak
Rustler
Blaine
12/2004
Woodbine
9/2004
Blossom
Nacatoch
Queen City
1/2005
Sparta
1/2005
Lipan
1/2005
Marble Falls
Hickory
Ellenburger-San Saba
West Texas Bolsons
12/2004
Wild Horse Flat, Michigan Flat, Ryan Flat & Lobo Flat.
Presidio-Redford
Red Light, Green River, & Eagle Flat
Marathon
Igneous
12/2004
Yegua-Jackson
Brazos River alluvium
Status as of April 2006



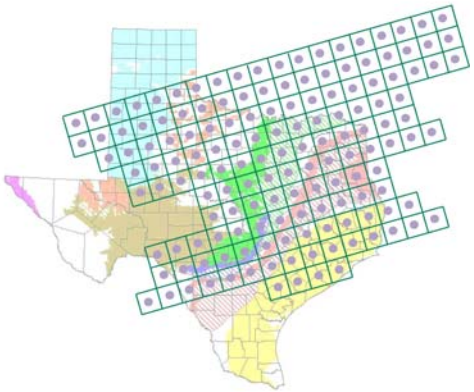
What is groundwater availability or MAG?

- Managed available groundwater (MAG)…the amount of groundwater available for use.
- The State does not directly decide how much groundwater is available for use: GCDs will through GMA process
- A GAM is a tool that can be used to assess groundwater availability once GCDs and GMAs decide on the desired future condition of the aquifer.



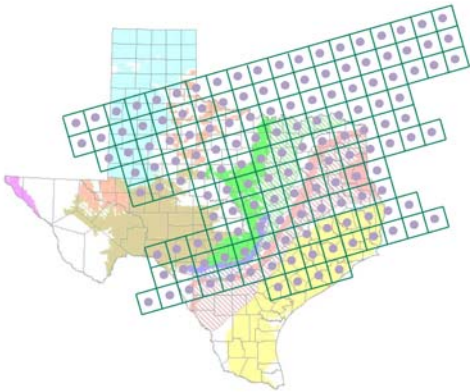
Do we have to use GAM?

- Water Code & TWDB rules require that GCDs use GAM information, if available, for their management plans.
- TWDB rules require that RWPGs use managed available groundwater estimates, if developed in time for the planning cycle



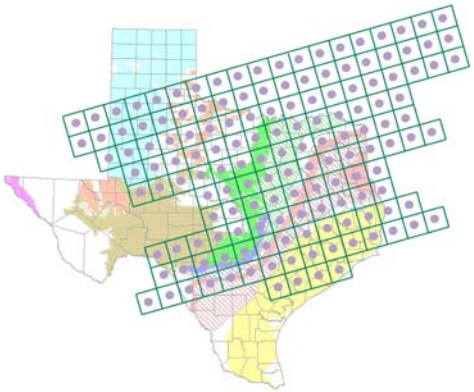
How do we use GAM?

- The model
  - predict water levels and flows in response to pumping and drought
  - effects of well fields
- Data in the model
  - water in storage
  - recharge estimates
  - hydraulic properties
- GCDs and RWPGs can request runs



Living tools

- GCDs, RWPGs, TWDB, and others collect new information on aquifer.
- This information can enhance the current GAMs.
- TWDB plans to update GAMs every five years with new information.
- Please share information and ideas with TWDB on aquifers and GAMs.



Participating in the GAM process

- SAF meetings
  - hear about progress on the model
  - comment on model assumptions
  - offer information (timing is important!)
- Report review
  - at end of project
- Contact TWDB
  - Ted Angle

Comments:

Ted Angle
ted.angle@twdb.state.tx.us
(512) 463-3879
www.twdb.state.tx.us/gam

Groundwater Availability Modeling (GAM) for the West Texas Bolson Aquifers

Presented to

Stakeholder Advisory Forum

Van Horn, Texas

July 13, 2006

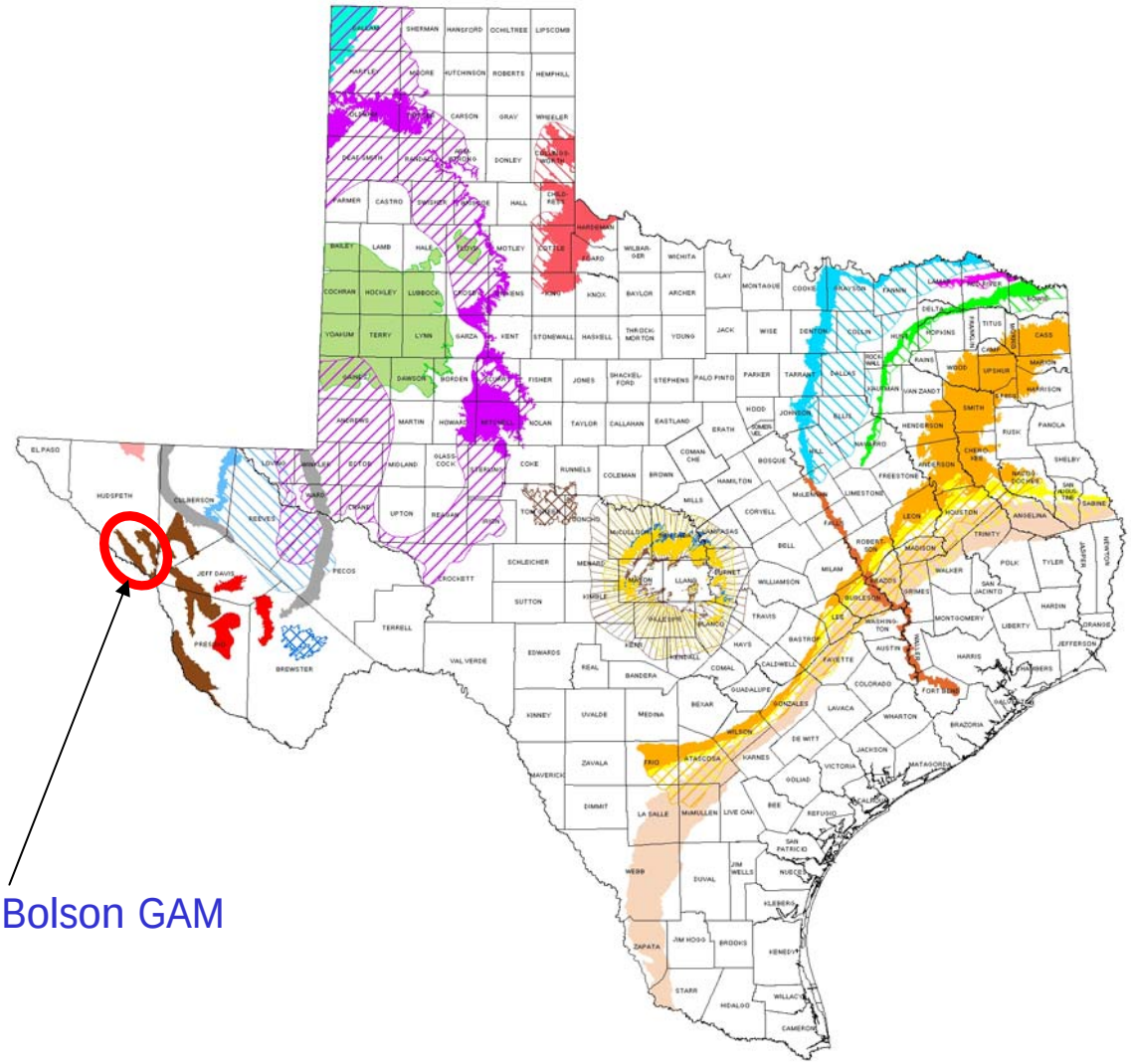
Presentation Outline

1) the basics of groundwater flow in the aquifer;
2) the concept of numerical groundwater flow modeling;
3) experience from previous models of the aquifer, if applicable;
4) the planned approach for modeling the aquifer;
5) request for local scientific data and model input information; and
6) the proposed schedule for the project

West Texas Bolson GAM Team

- LBG-Guyton Associates
- John Shomaker & Associates, Inc.
- Daniel B. Stephens & Associates, Inc.
- Senior Technical Advisors
  - Eddie Collins, UT BEG
  - Barry Hibbs, Ph.D.
  - Kevin Urbanczyk, Ph.D.

Minor Aquifers



West Texas Bolson GAM

Why GAMs?

- A groundwater model provides a good way to integrate geologic information and measured data to predict groundwater flow.
- Best available technology.

What a GAM IS.

- Tool to meet the TWDB GAM objectives as specified by Texas Legislature.
- Tool to perform regional evaluation for long-term water supply.
- Tool developed from an assimilation and interpretation of significant research and different types of data.

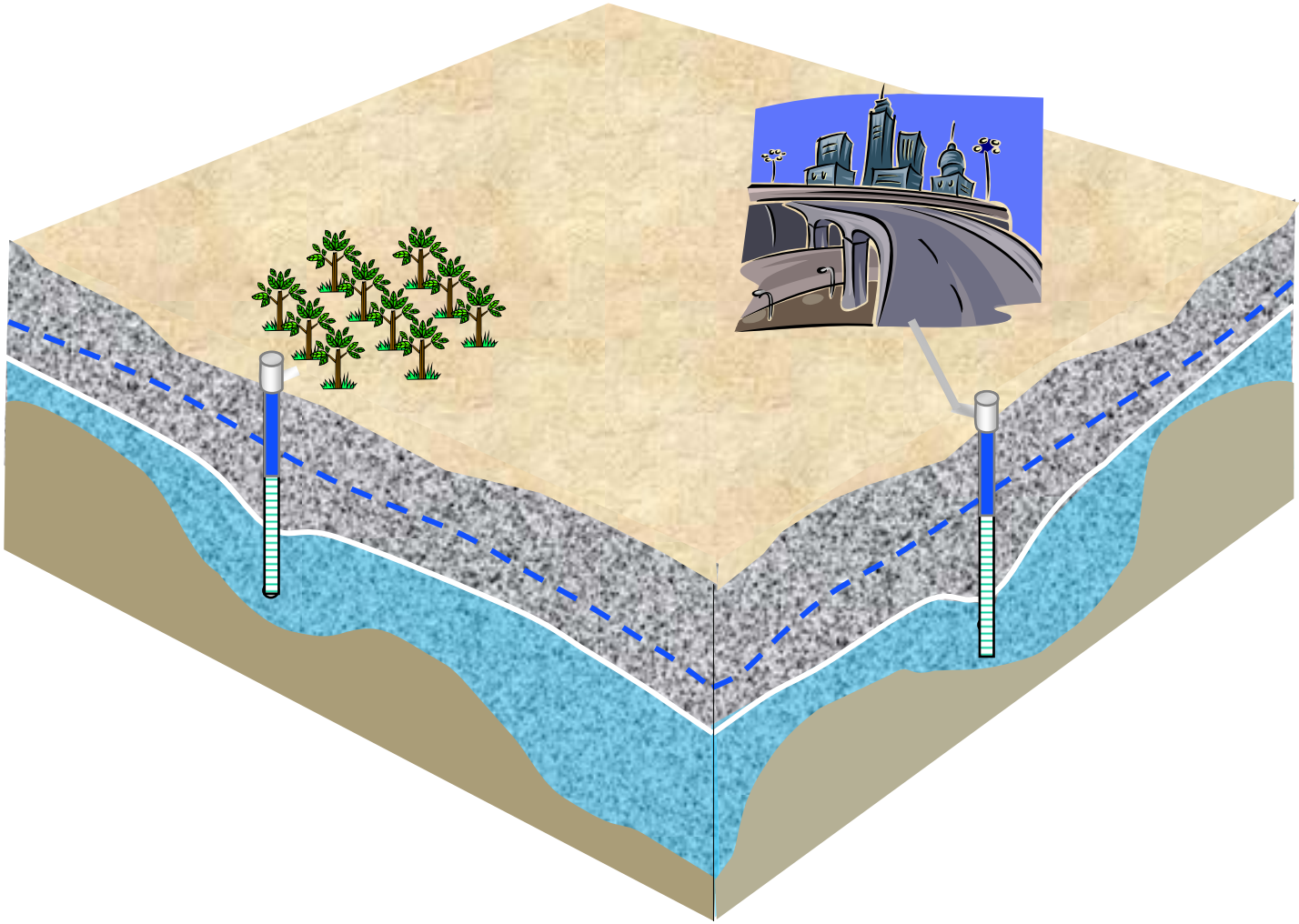
What a GAM is NOT.

- Something that can tell you the water level in your backyard well to the nearest hundredth of a foot every minute of the day.
- Icon on a desktop computer that can be easily used and correctly interpreted by anyone.
- The definition of groundwater availability.

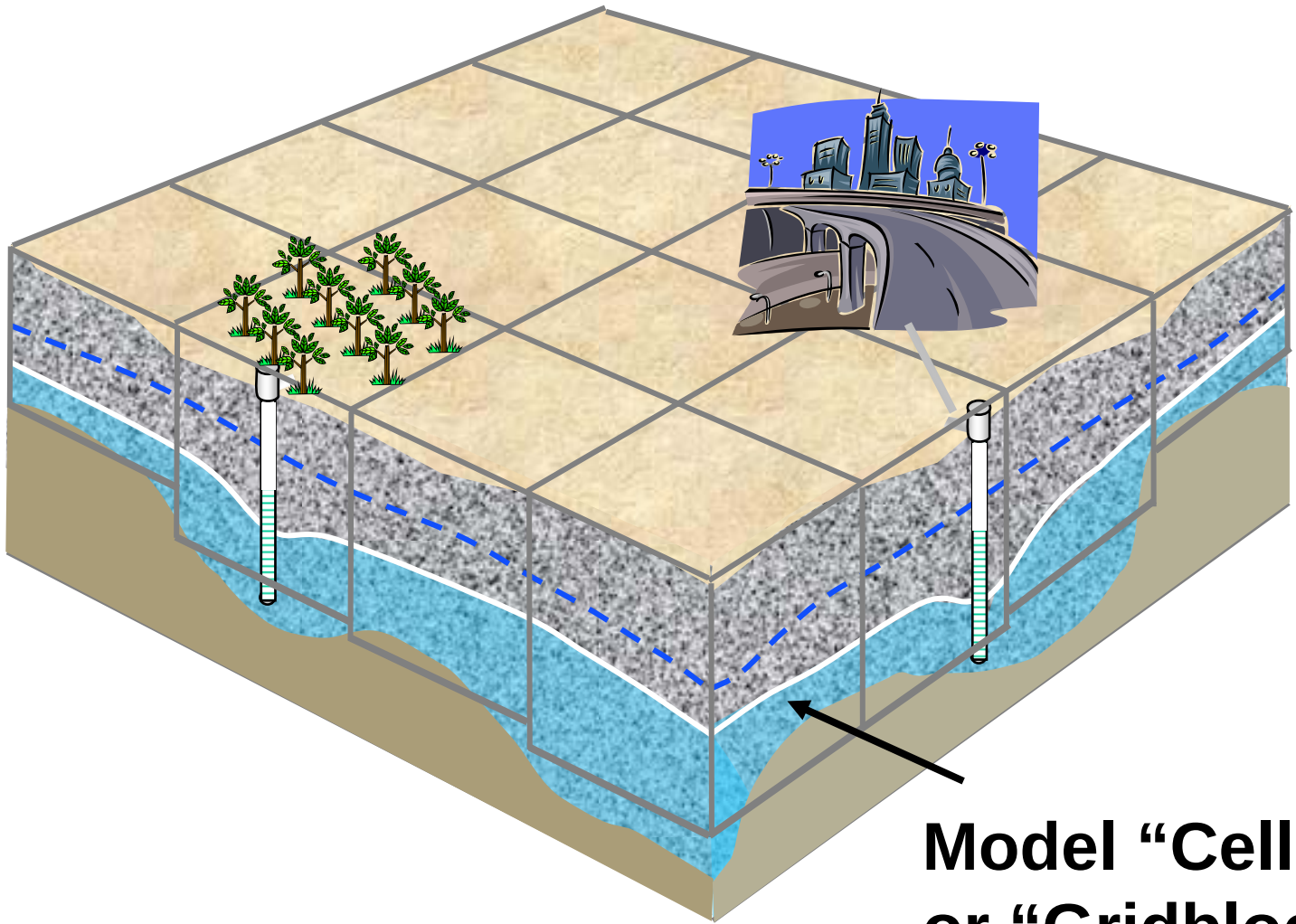
Numerical GW Flow Modeling

- A numerical groundwater flow model is the mathematical representation of the physical aquifer
- A numerical model calculates the water level at specific locations based on aquifer characteristics, pumping, recharge, etc.
- Calculated water levels can be compared to measured water levels in wells

Modeling Basics

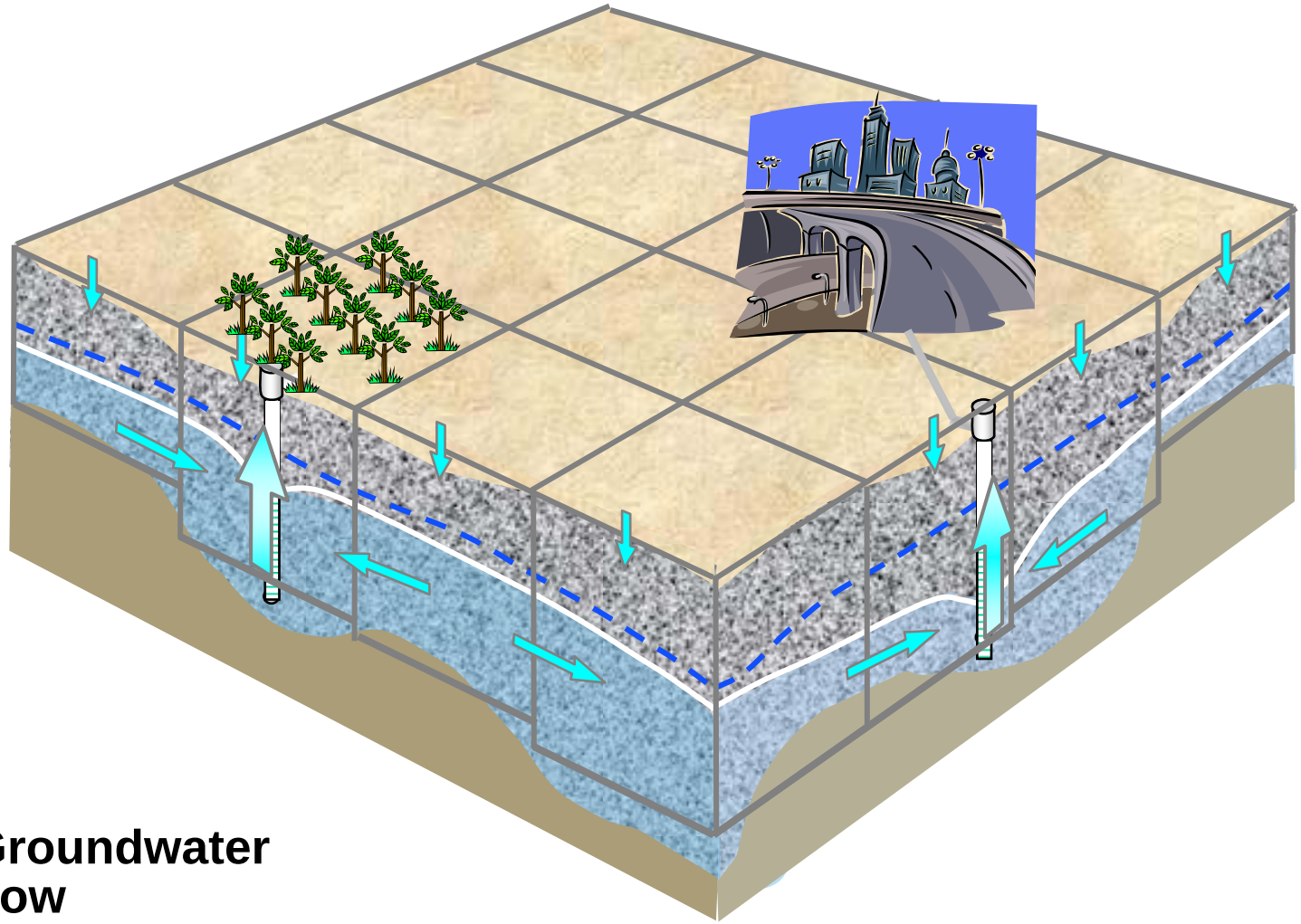


Groundwater Flow Modeling



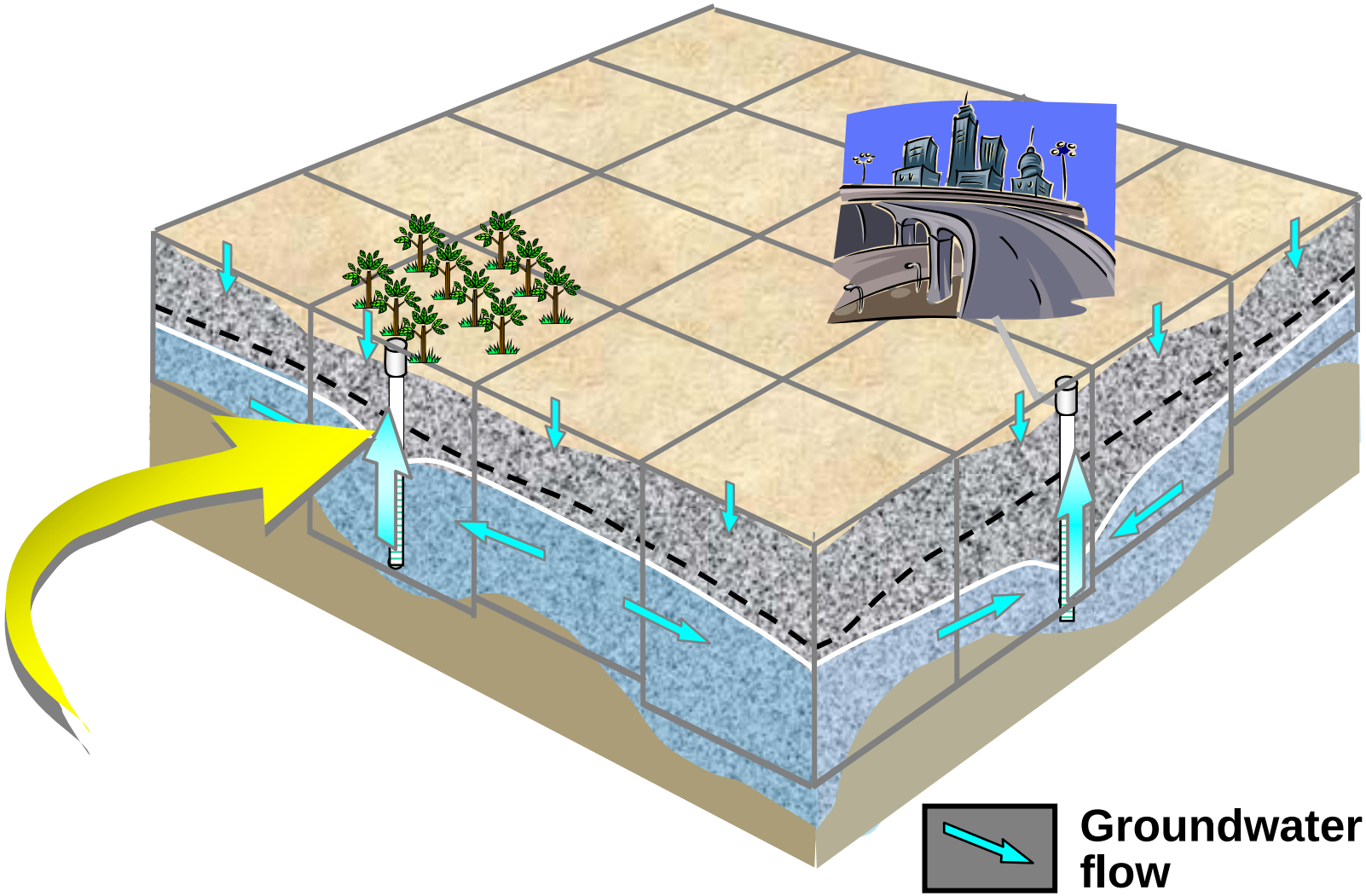
Model “Cell”
or “Gridblock”

Cells “Communicate”

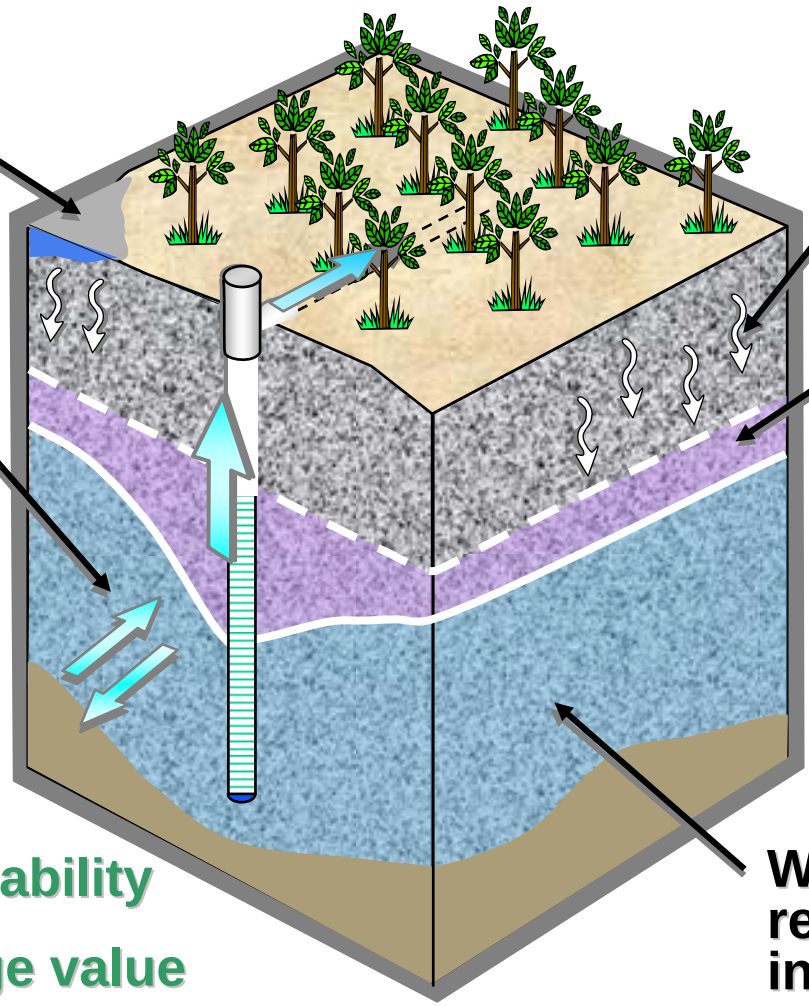


Groundwater flow

What Goes on In A Gridblock?



Gridblock Accounting



Natural recharge

Irrigation return flow

Water removed from storage by pumping

Exchange of water with neighboring cells

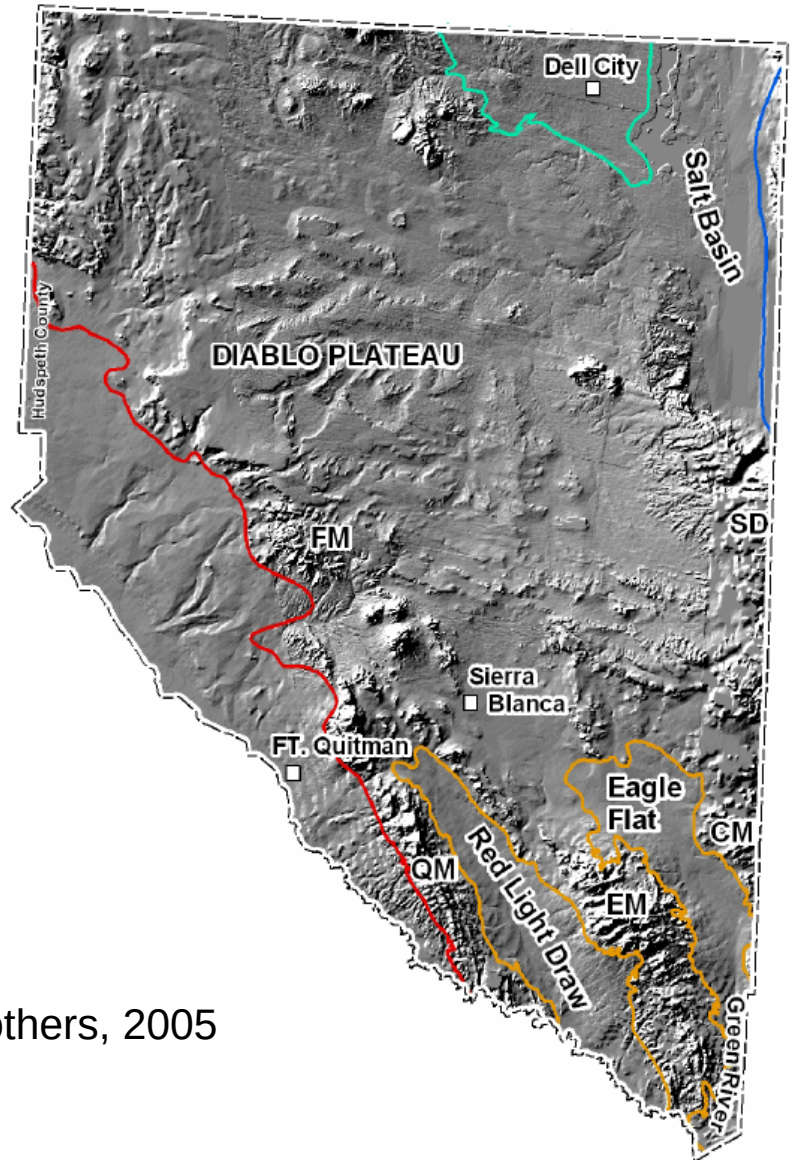
Water remaining in storage

- Permeability
- Storage value
- Thickness

Previous Investigations of West Texas Bolson Aquifers

- Bolson Studies
  - Gates and Smith (1975)
  - Gates, et. al. (1980)
  - Darling (1994)
  - Darling, Hibbs, and Dutton (1994)
  - Hibbs, Darling and Ashworth (1995)
  - LBG-Guyton Associates (1998)
  - UT BEG (unpublished)

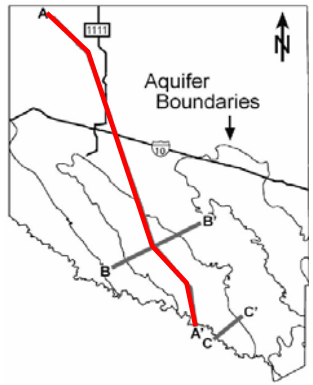
Bolson Aquifers

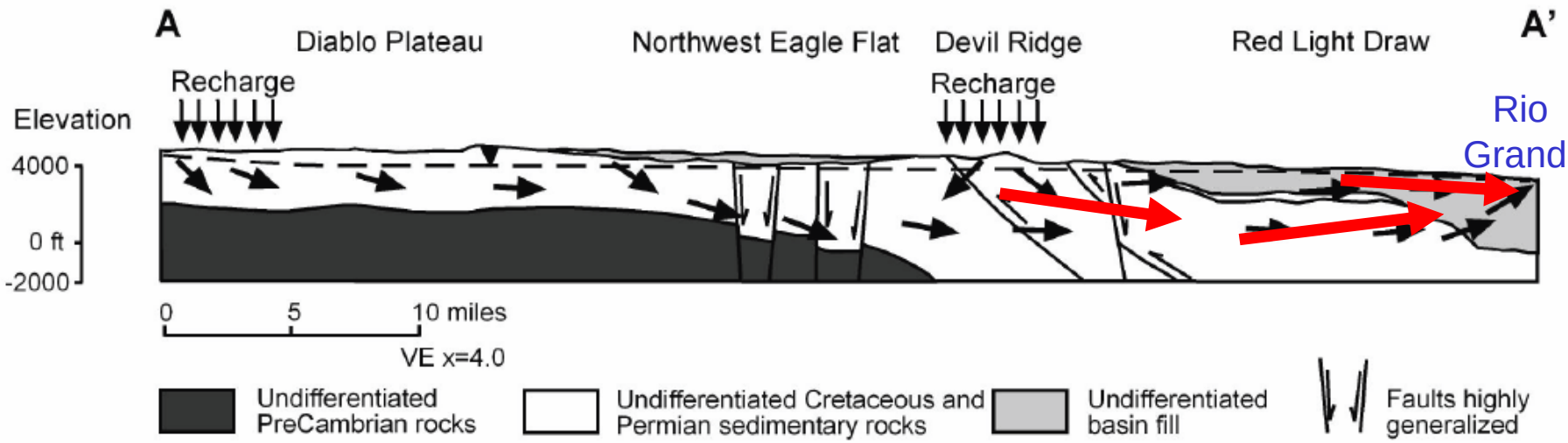


After George and others, 2005

Mountains and Bolsons

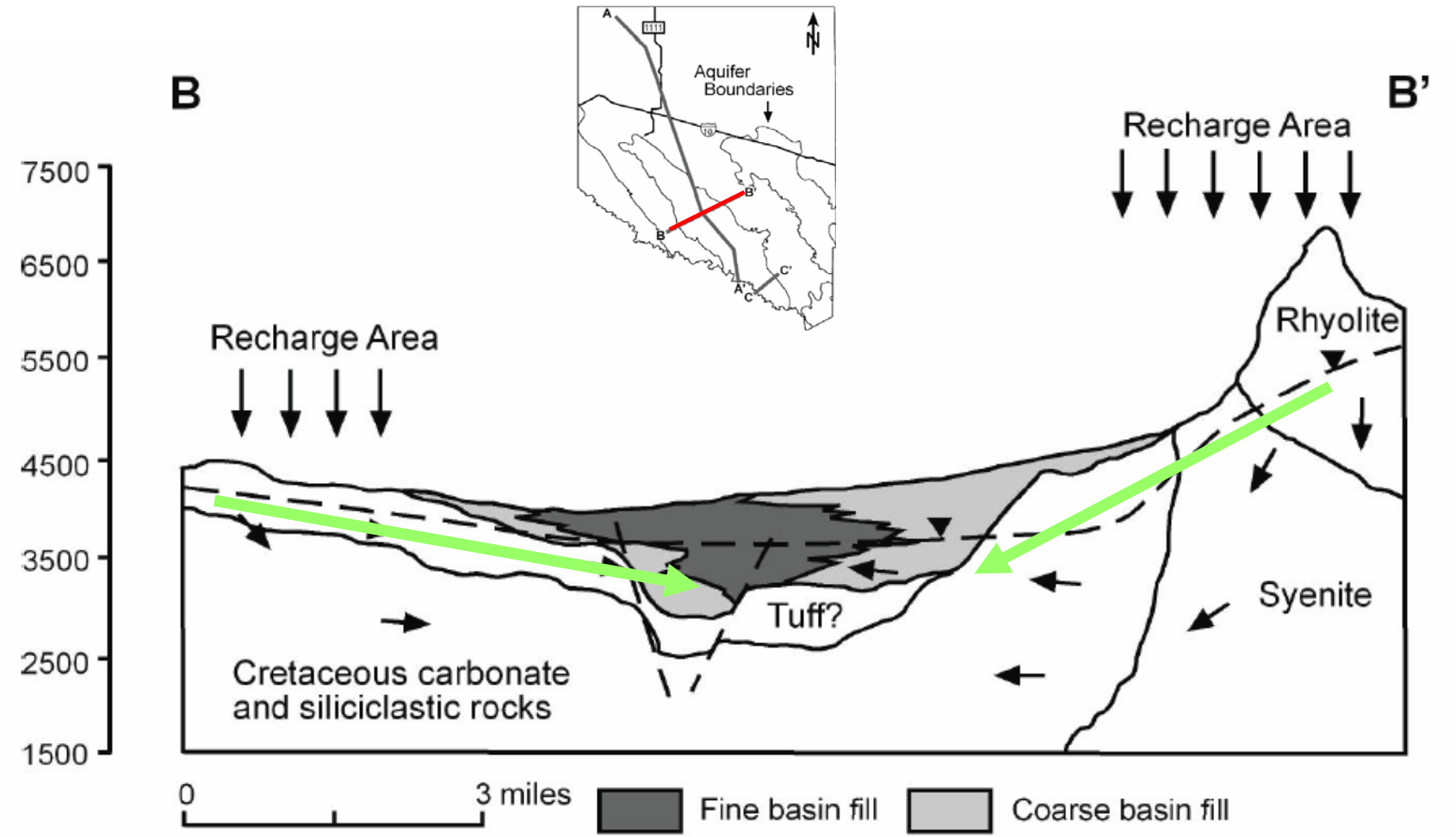
Hydrogeologic Cross-section





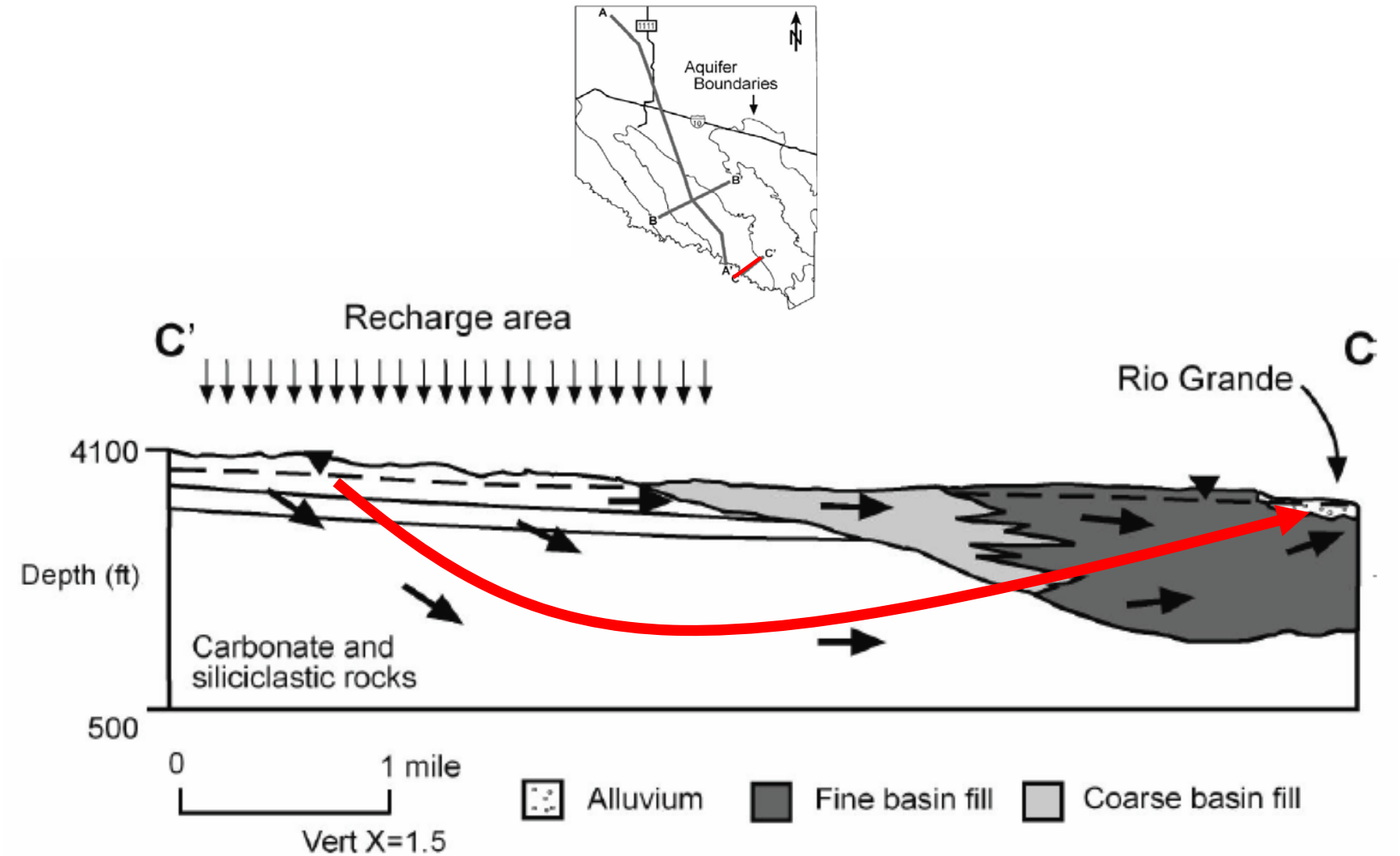
After George and others, 2005

Hydrogeologic Cross-sections



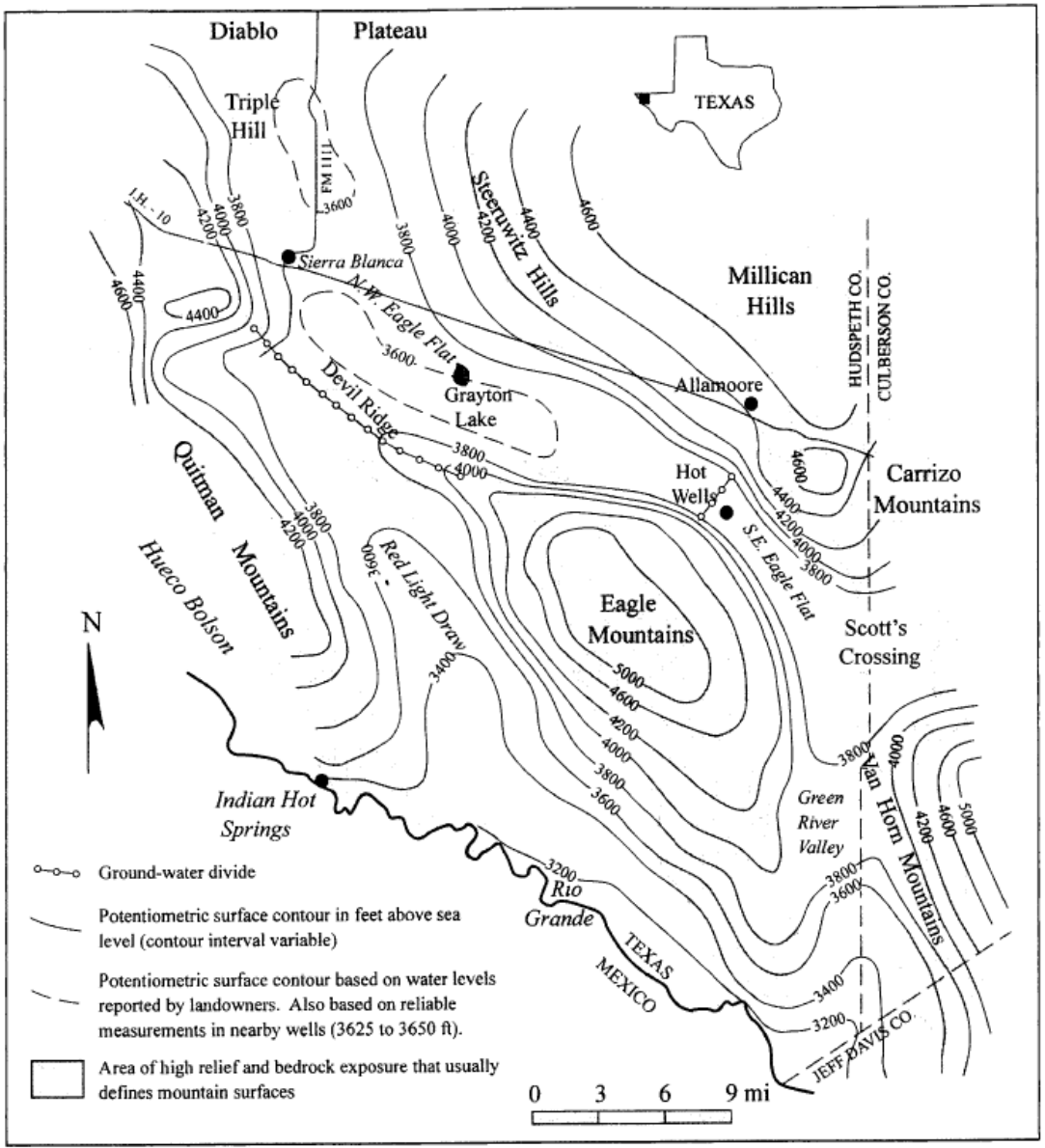
After George and others, 2005

Hydrogeologic Cross-section



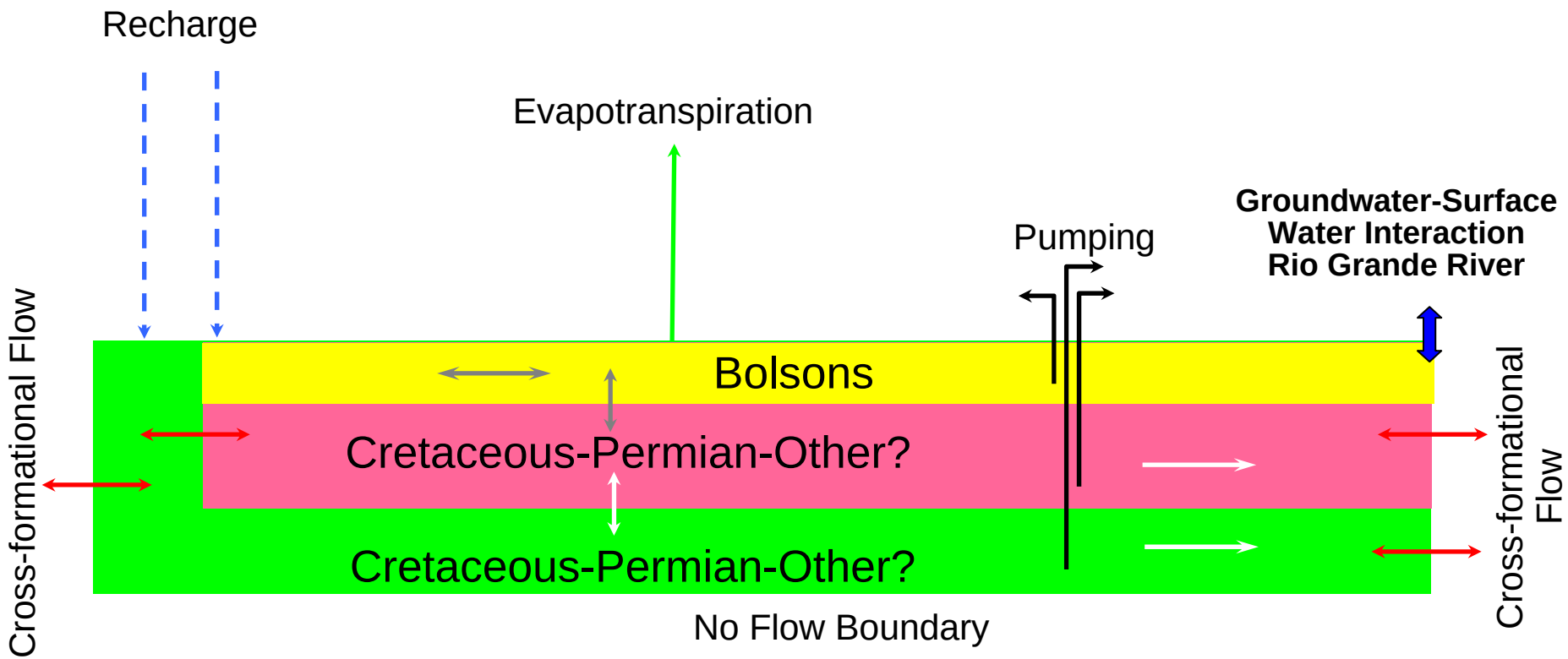
After George and others, 2005

Regional Groundwater Flow



After Hibbs and Darling, 2005

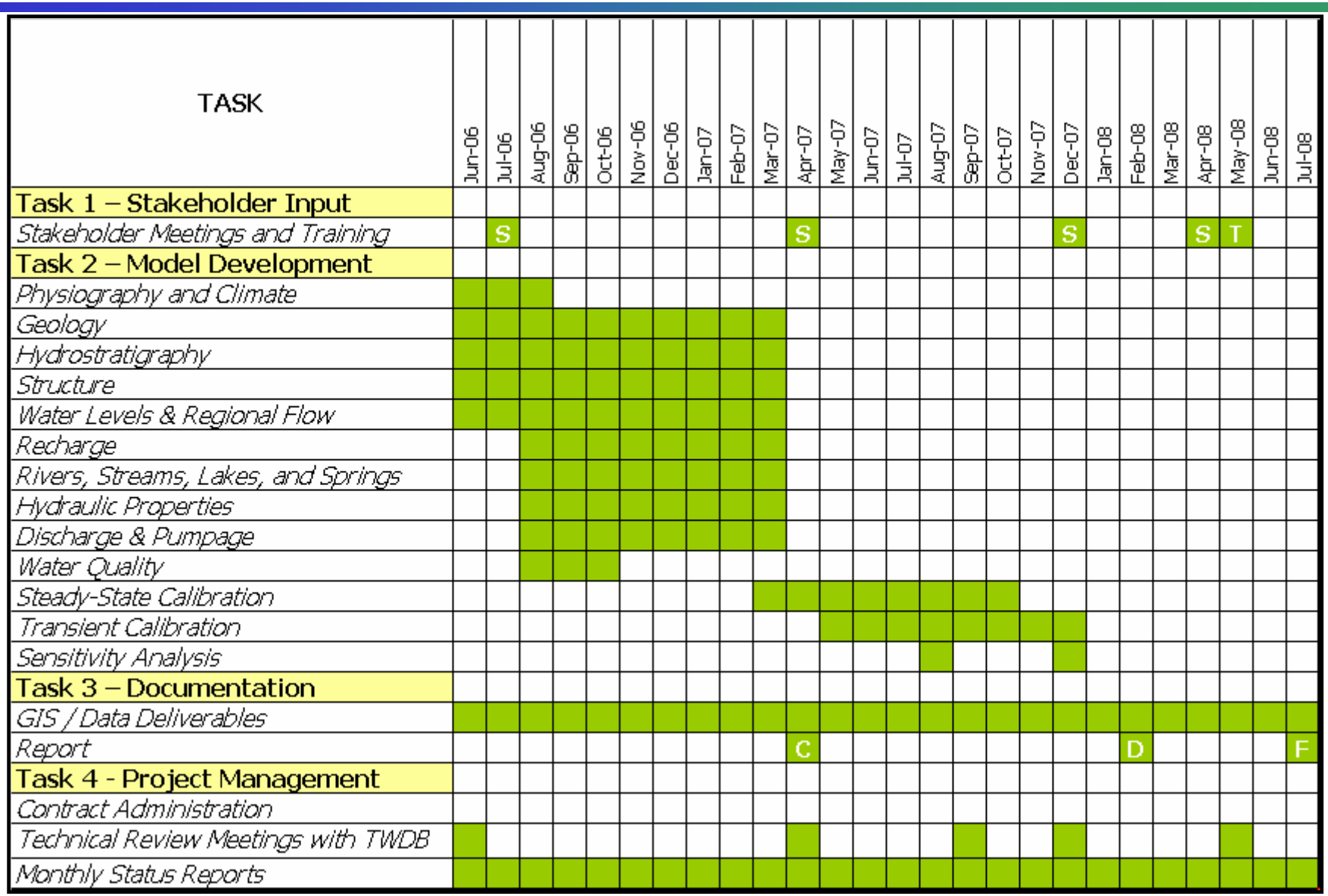
Conceptual Approach



Do you have new information?

- Well locations
- Pump test information
- Water quality data
- Water usage records

Project Schedule



SAF Schedule

Item	Date	Topics
1	Jul-2006	Introduction & Modeling Approach
2	Apr-2007	Conceptual Model
3	Dec-2007	Model Architecture & Calibration
4	Apr-2008	Final Report
Training	TBD	Stakeholder Training Seminar
Final Report	Jul-2008	Final Report Due to TWDB

Contractor Contact:

James Beach
jbeach@lbg-guyton.com
(512) 327-9640

First Stakeholder Advisory Forum
West Texas Bolsons GAM

July 13, 2006

Name	Affiliation
Hector Garza	USGS
Barbara Kauffman	Rio Grande Council of Governments
James Beach	LBG-Guyton Associates
Ted Angle	TWDB

QUESTIONS AND ANSWERS
West Texas Bolson GAM
SAF Meeting 1 – July 13, 2006
Van Horn, Texas

Q: Will the project collect any new field data?
A: The scope and resulting budget for the project did not anticipate collecting new field data. However, the TWDB is open to collecting water levels and other information in the model area willing landowners and appropriate wells can be located.

Comment: Hector Garza (with the UGGS) said that he would check to see if the USGS or any other agencies had any new data in the study area.