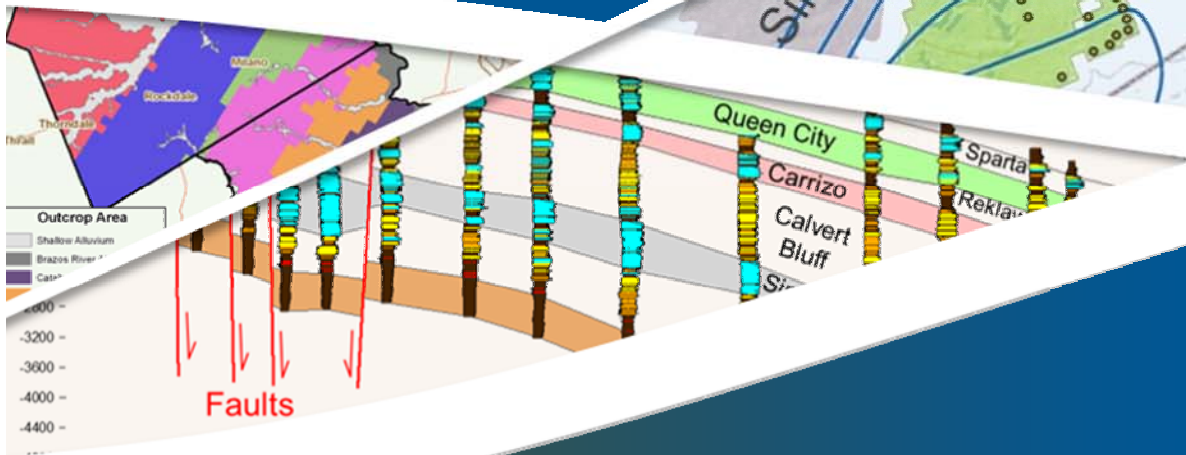


DFC Committee Meeting: Status Update of GMA 12 GAM Project

Presented To:



Presented By:

Steve Young

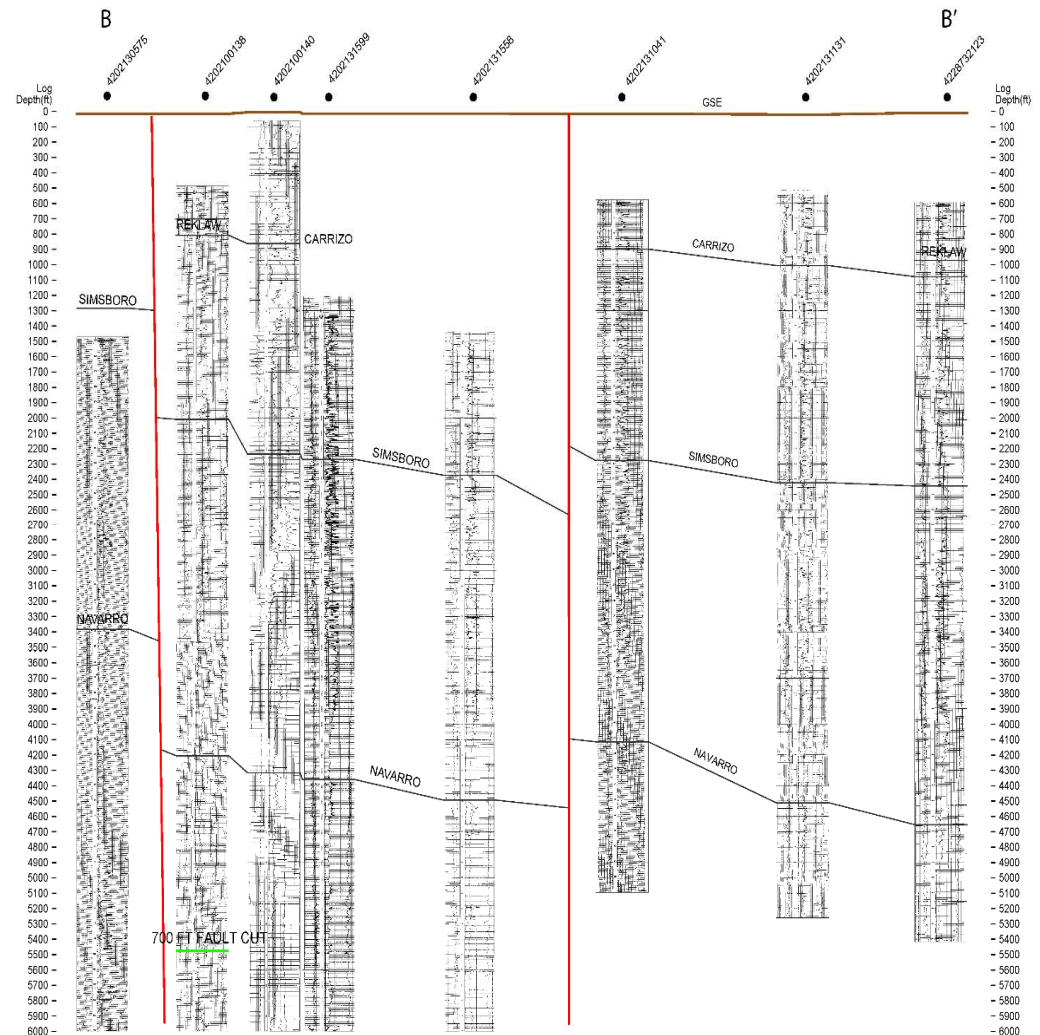
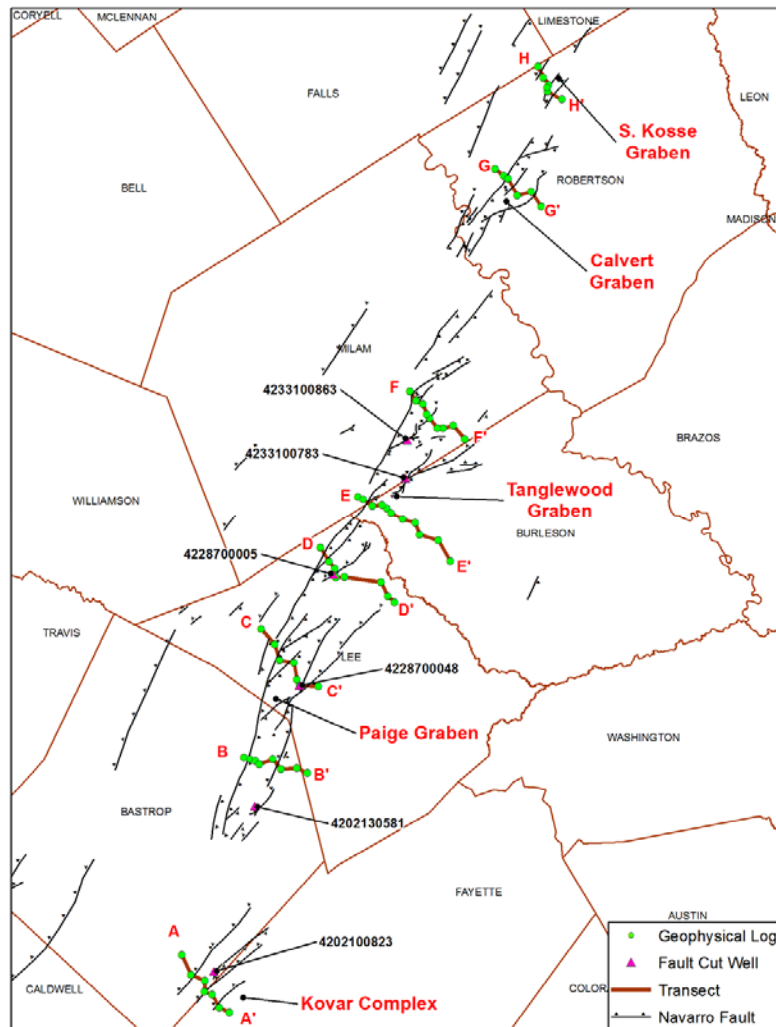


March 28, 2017

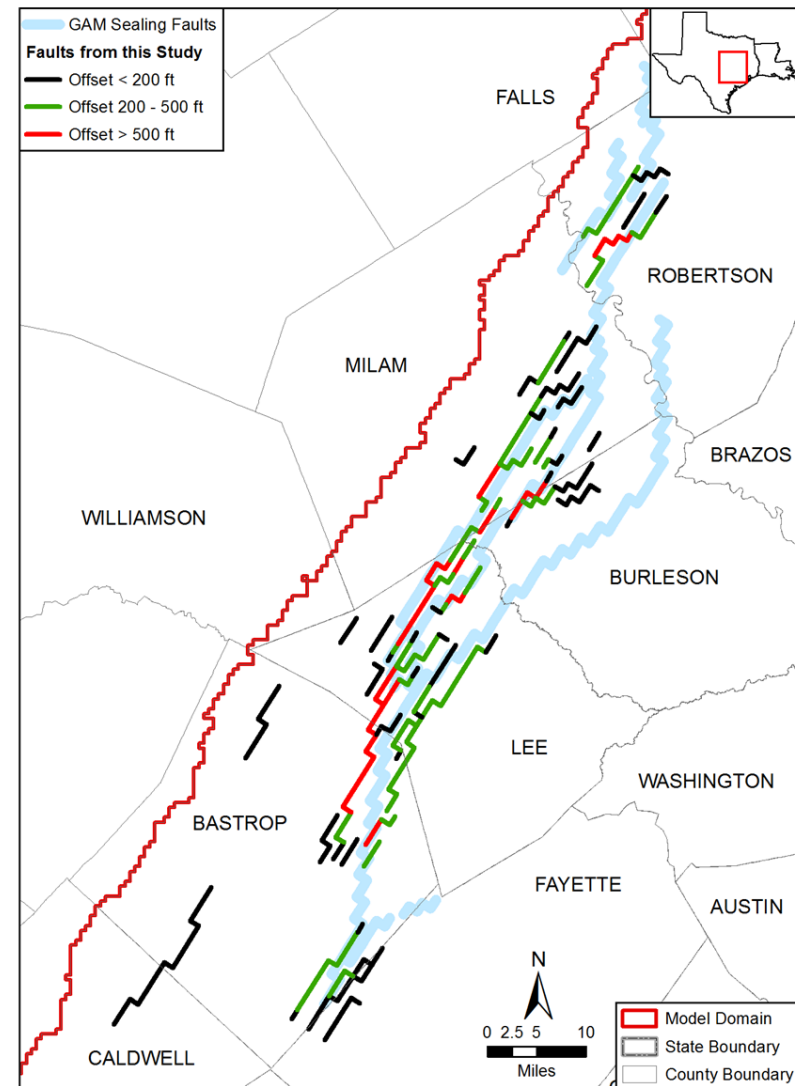
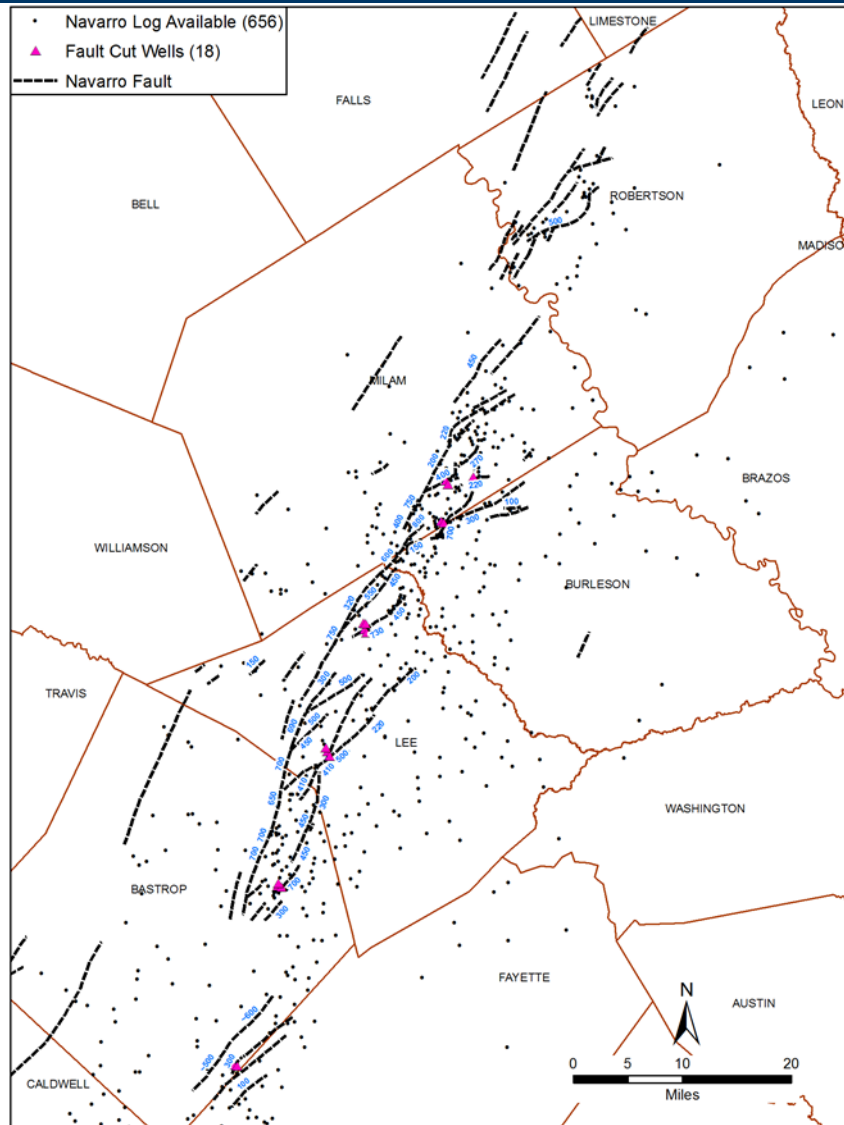
Draft Report Objectives

- Analyze geophysical logs to map faults
- Perform sensitivity analysis with GAM regarding fault locations and fault properties
- Interpret aquifer pumping tests to determine evidence that faults impact groundwater flow

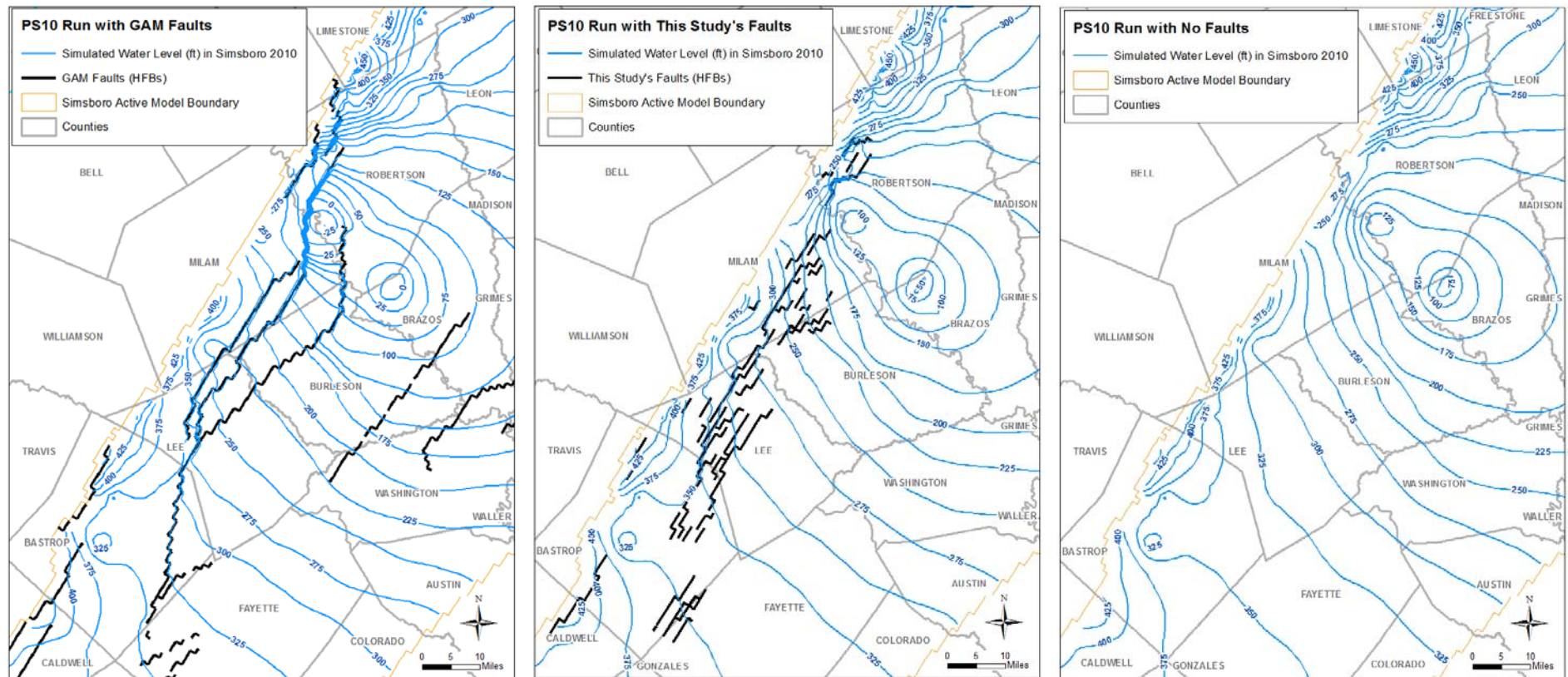
Analysis of Geophysical Logs to Identify Faults Associated with Milano Fault Zone



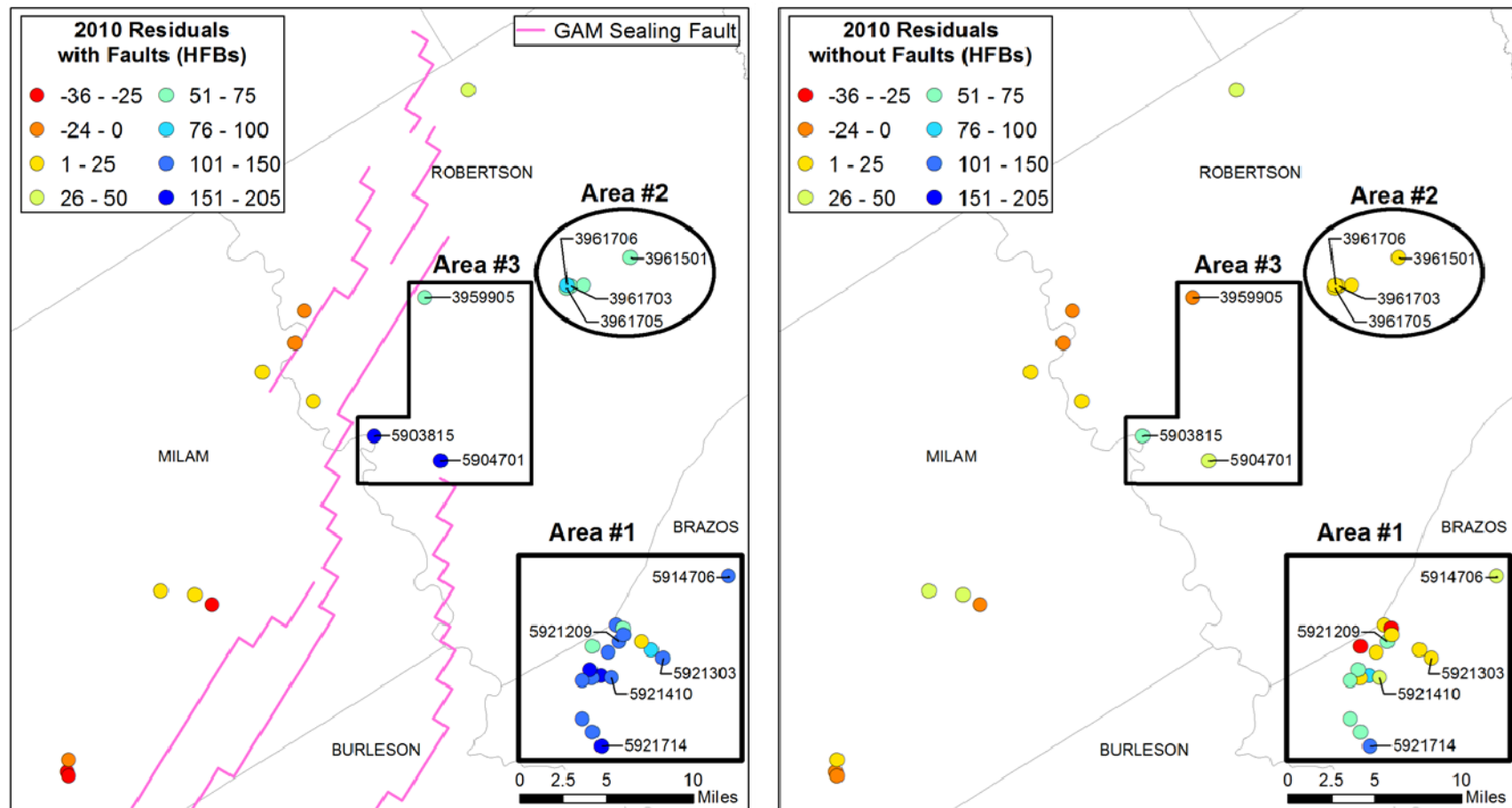
Mapping Faults to Location of Grid Cells that Comprise Groundwater Availability Model



Simulated Drawdowns in 2010 for Three Different Assumptions Regarding Faults

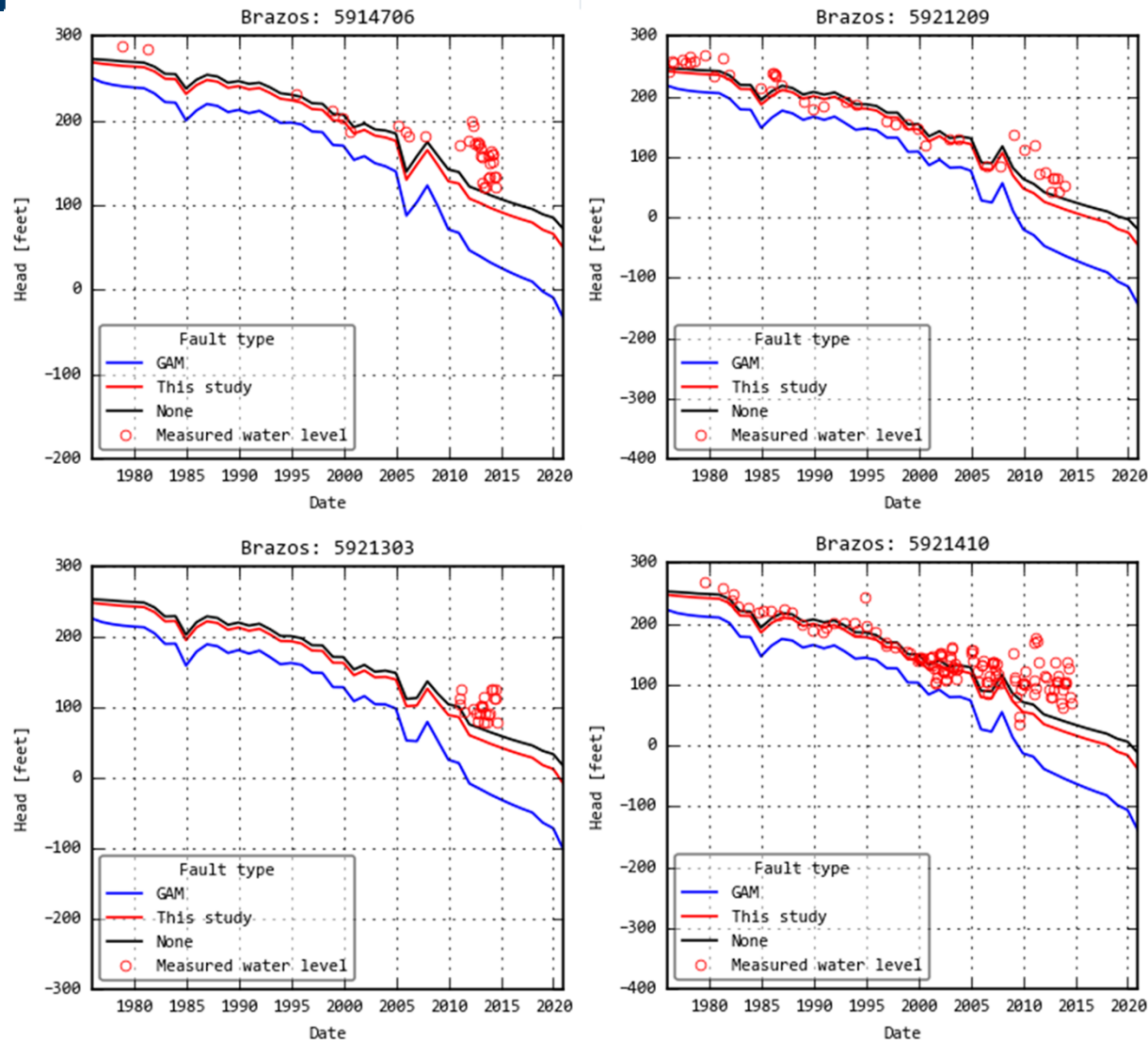


Comparison of Residual for GAM Simulations with and without GAM Faults

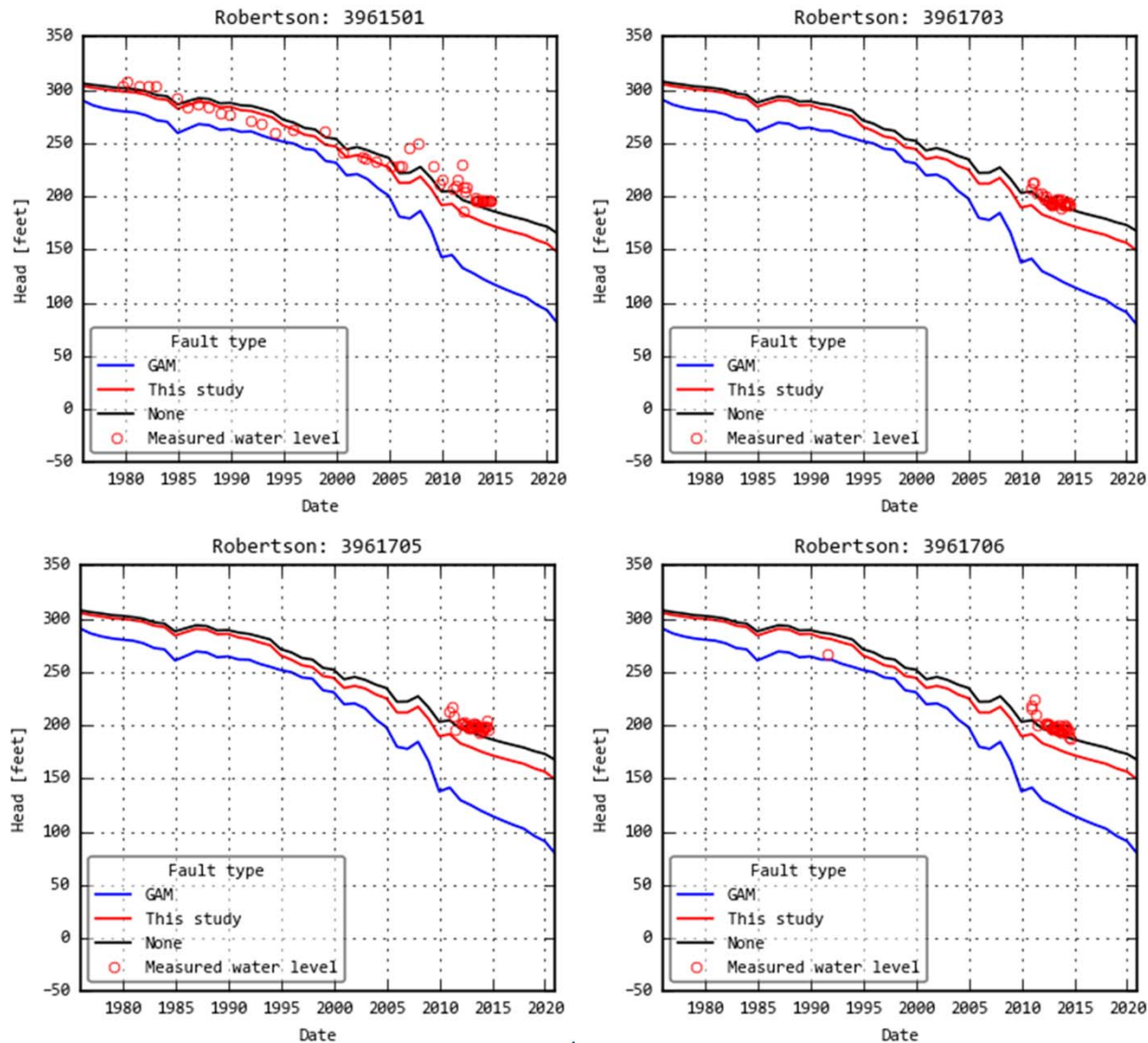


Residual (ft) = Measured Water Level Elevation (ft,msl) – Model Water Level (ft,msl)
(positive residuals means GAM overpredicts drawdowns)

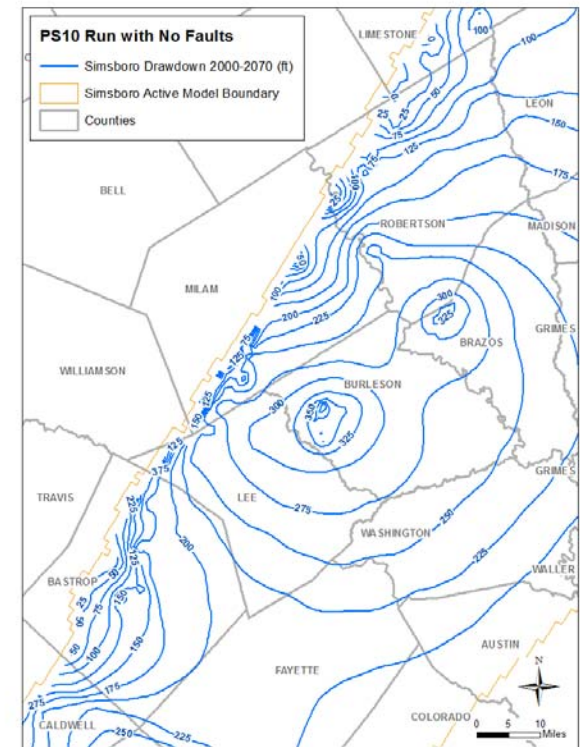
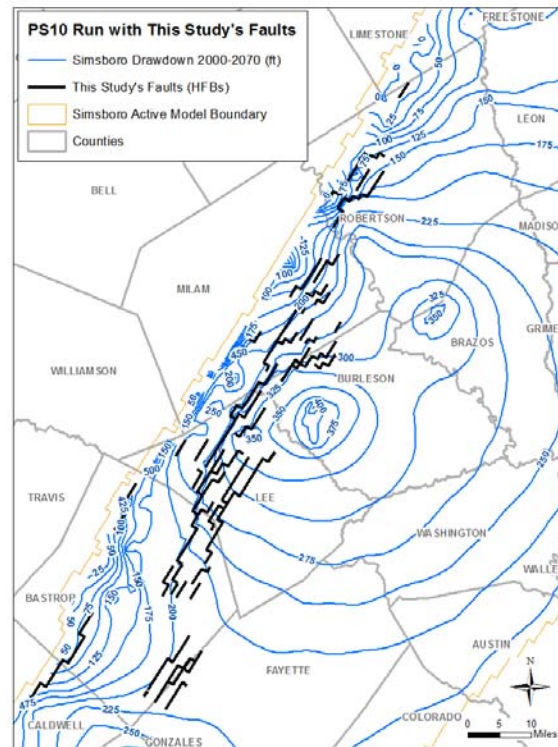
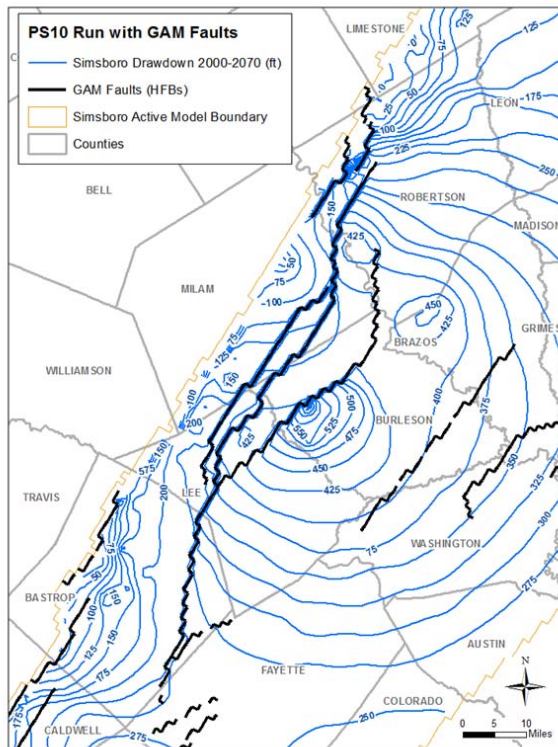
Hydrographs for Area 1



Hydrographs for Area 2



Simulated Drawdowns in 2070 for Three Different Assumptions Regarding Faults



Simulated Average Drawdown from 2000 to 2070 for Different Assumptions Regarding Faults

Table 1

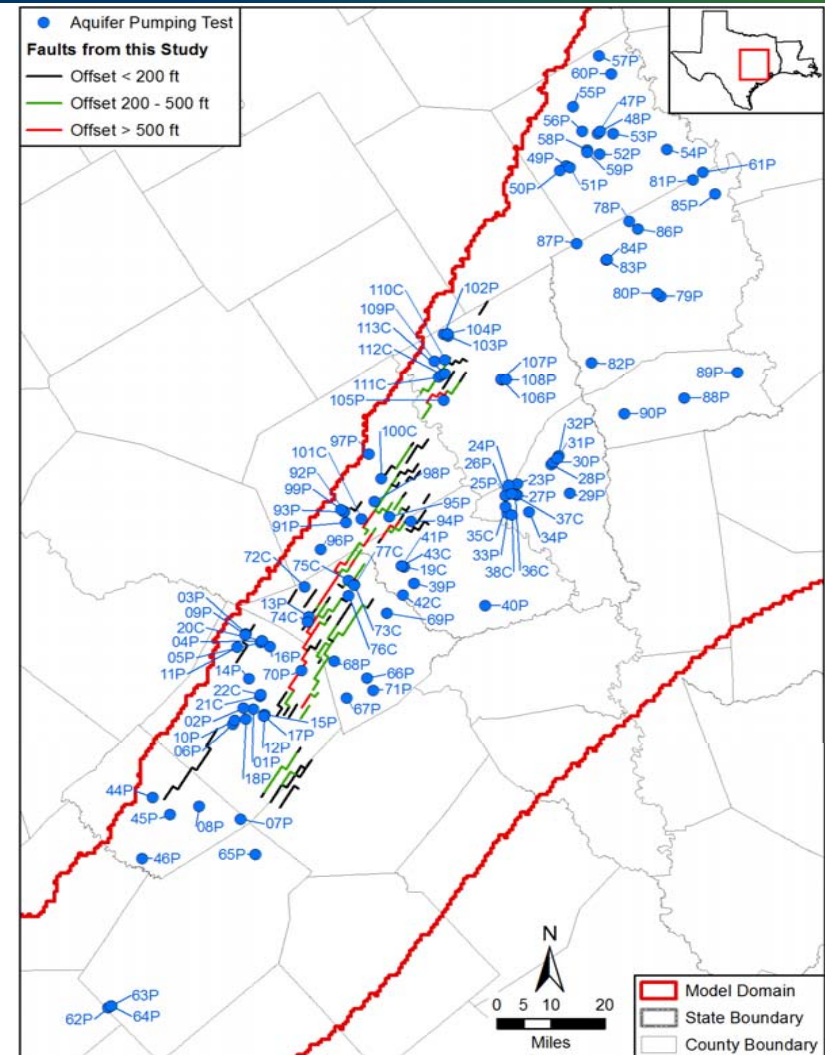
County	Fault Type	Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper
Bastrop	GAM Faults	-9	16	74	81	175	154
	This Study Faults	-9	15	72	72	160	140
	No Faults	-10	15	72	68	155	136
Brazos	GAM Faults	19	22	81	178	360	248
	This Study Faults	17	20	66	135	271	187
	No Faults	17	19	63	124	250	171
Burleson	GAM Faults	29	34	76	192	423	273
	This Study Faults	25	28	64	146	315	208
	No Faults	25	27	62	132	287	189
Lee	GAM Faults	10	16	64	142	350	225
	This Study Faults	7	13	56	112	283	183
	No Faults	7	12	55	101	262	169
Milam	GAM Faults	n/a	-5	27	66	179	129
	This Study Faults	n/a	-5	36	58	188	119
	No Faults	n/a	-5	38	55	182	114
Robertson	GAM Faults	-9	-4	36	85	250	181
	This Study Faults	-10	-6	30	65	177	134
	No Faults	-10	-6	28	60	160	123

Note: GAM = groundwater availability model

□

Aquifer Pumping Tests

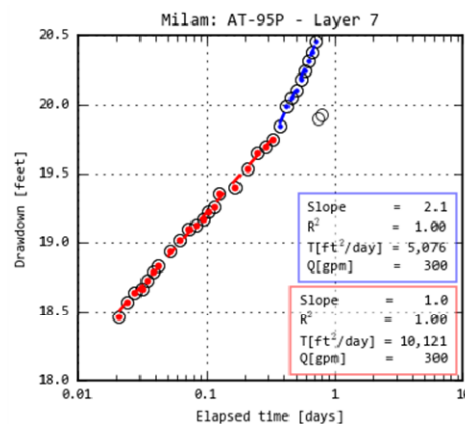
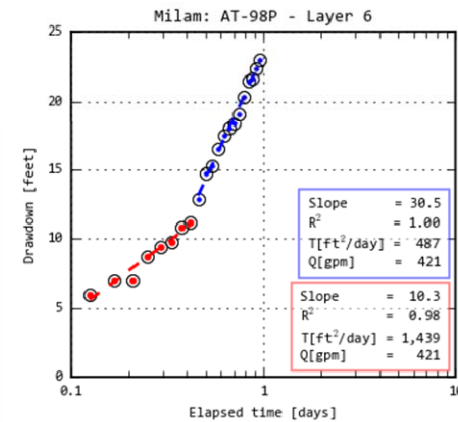
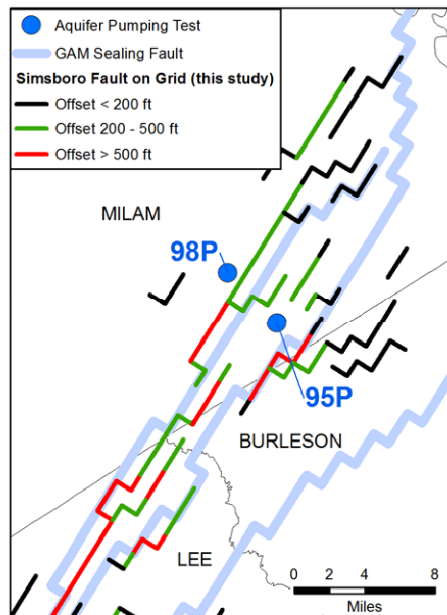
- Assembled field data from 113 aquifer pumping tests
- In a homogeneous aquifer, time-drawdown data will plot as a straight line with constant slope
- If a low-permeability fault is near a pumping well, then slope will be steeper at late time than at early time



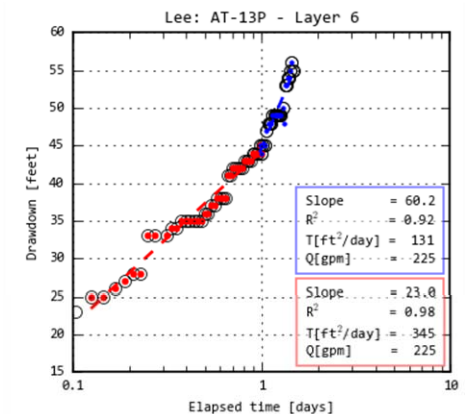
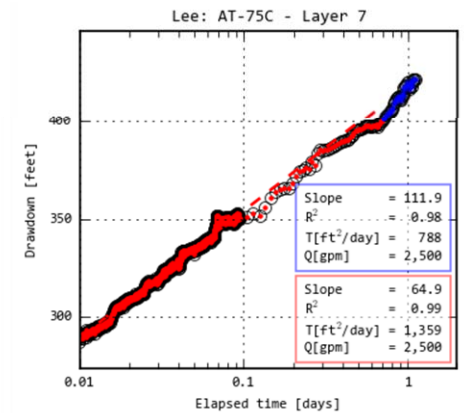
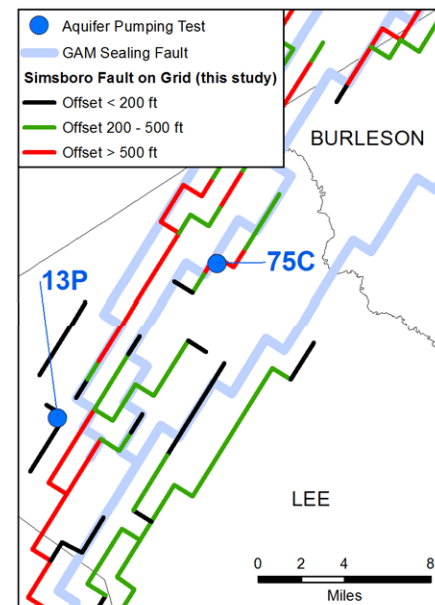
Document Path: S:\AUS\tdwb_gma12\GIS\mxd\Fault_Report_mxd\Aquifer_Test_Locations_w_Faults_v5.mxd

Aquifer Pumping Tests Near Faults that Exhibit Slope Change in Time-drawdown Data

MILAM County



Lee County



Comparison of Slope Change in Time-drawdown for Wells Near and Away from Faults

Fault Type	Fault Offset (feet)	Distance from Closest Fault (miles)	Total Number of Wells	Percentage of Wells with T_{late}/T_{early} Ratio < 0.65	Percentage of Wells with T_{late}/T_{early} Ratio < 0.85
This Study Faults	> 500	2	10	50%	70%
	> 200		17	35%	53%
	GAM Faults		23	26%	39%
This Study Faults	> 500	4	16	38%	63%
	> 200		20	30%	55%
	GAM Faults		30	20%	33%
This Study Faults	> 500	6	24	29%	50%
	> 200		34	21%	38%
	GAM Faults		38	24%	39%
This Study Faults	> 500	> 8	58	3%	5%
	> 200		48	2%	4%
	GAM Faults		47	6%	9%

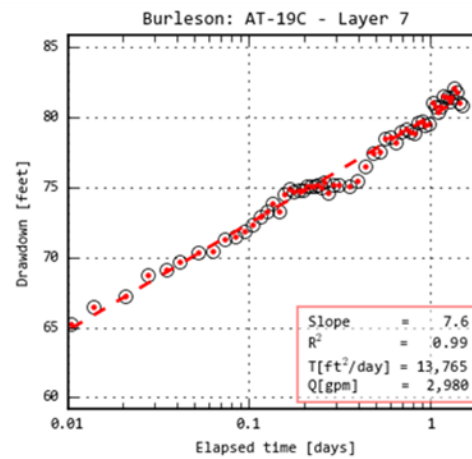
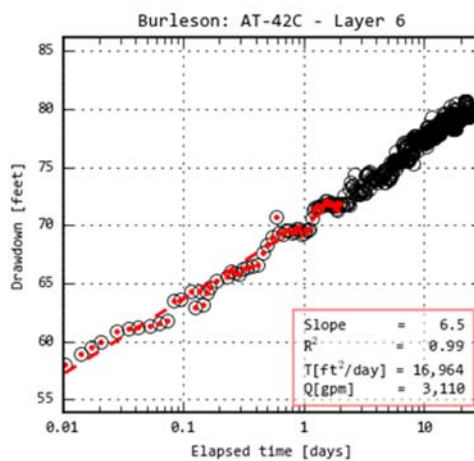
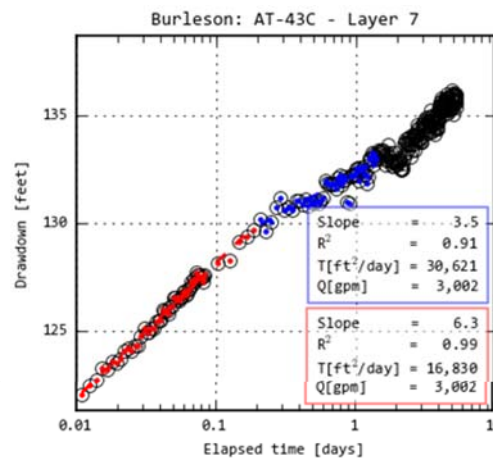
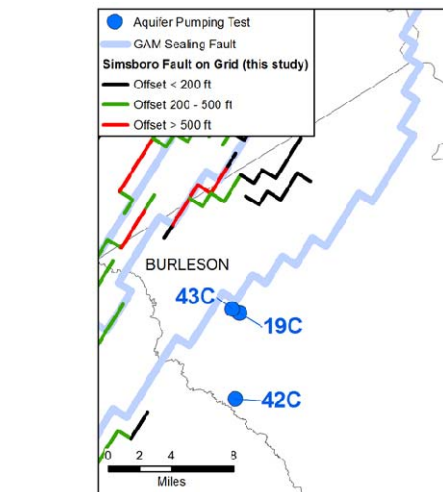
Comparison of Slope Changes Among Measured and Modeled Time-Drawdown Data

Aquifer Test ID	From Interpretation of Observed Data	From Interpretation of TTim Simulated Data	
	T_{late}/T_{early}	This Study Faults	GAM Faults
		T_{late}/T_{early}	T_{late}/T_{early}
AT-73P	0.72	0.73	0.71
AT-76C	0.59	0.86	0.64
AT-112C	0.82	0.76	0.97
AT-105P	0.50	0.68	0.99
AT-43C	1.00	1.00	0.52
AT-42C	1.00	0.91	0.65
Note: ID = identification; GAM = groundwater availability model			

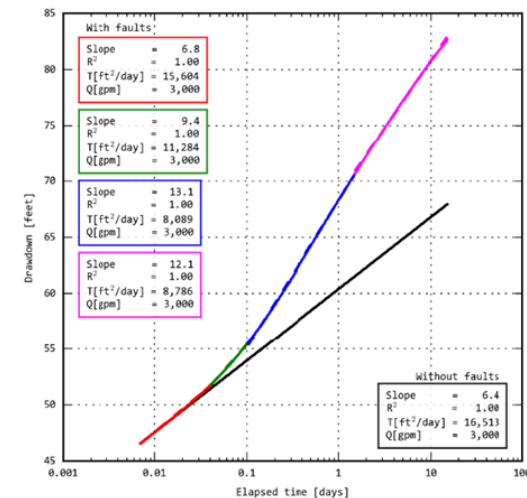
Comparison of Measured and Modeled Time-Drawdown Data for Aquifer Test 43C

Measured Time-Drawdown Data

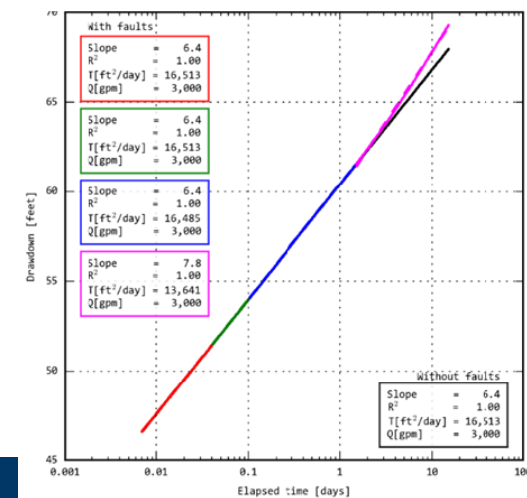
Modeled Time-Drawdown Data for 43C



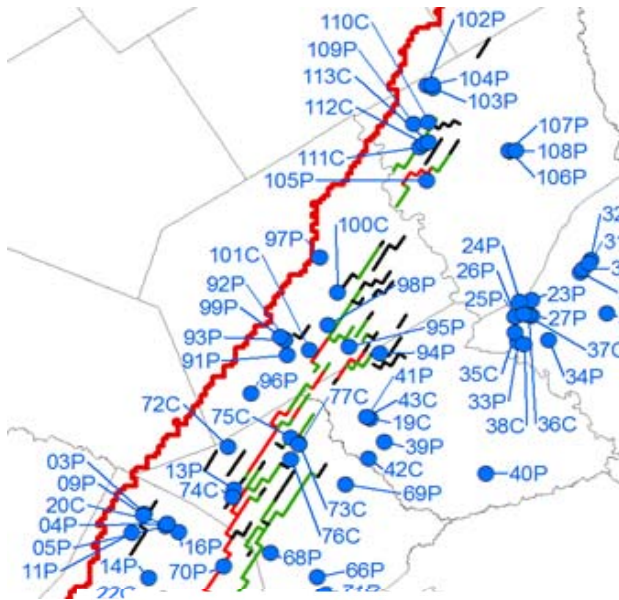
(a) GAM faults



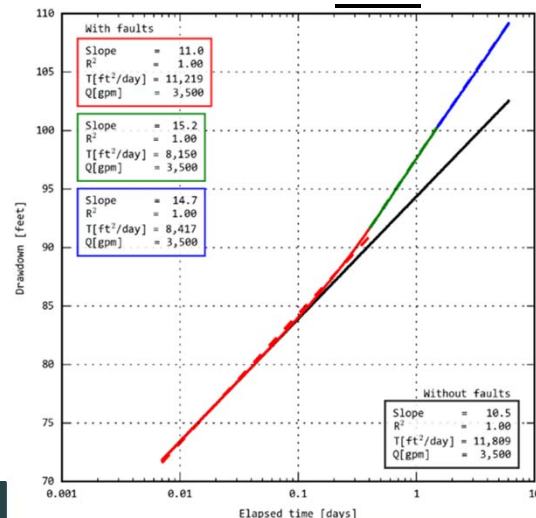
(b) This study faults



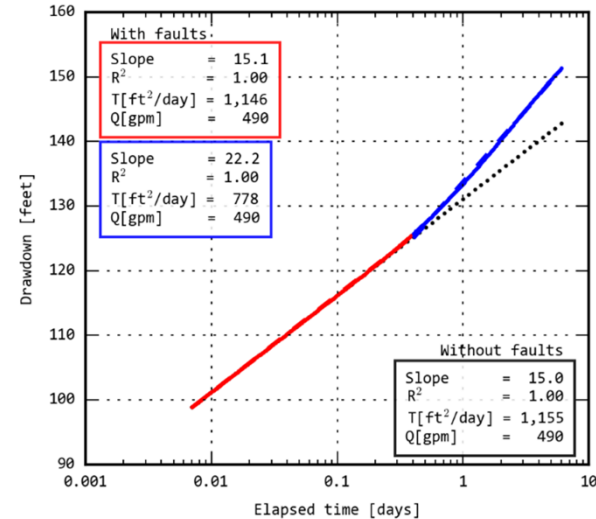
Modeled Time-Drawdown Data for Aquifer Tests 73C, 105P, and 112C



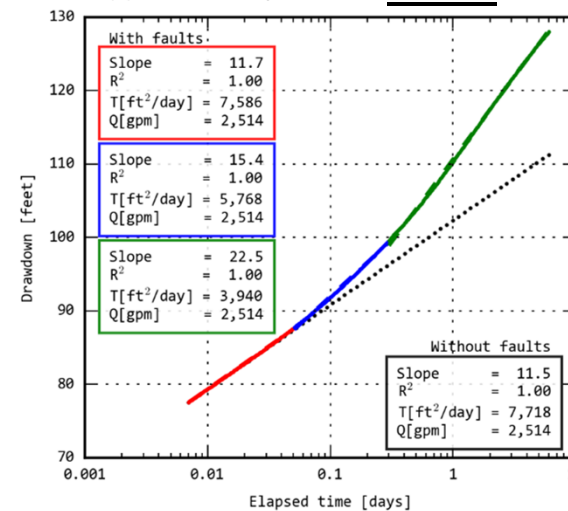
(a) This study faults 73C



(a) This study faults 105P



(a) This study faults 112C



Draft Report Conclusions

- Analysis of geophysical logs supports a different conceptualization of fault zone than in current GAM
 - Not long continuous faults, more piecemeal so groundwater can more easily flow through it
- Model Sensitivity analysis supports the fault locations from this study than fault locations in GAM
 - Current faults cause over prediction of drawdowns
- Analysis and modeling of aquifer tests supports that faults impact groundwater flow in vicinity of Milano Fault Zone

Questions ?

