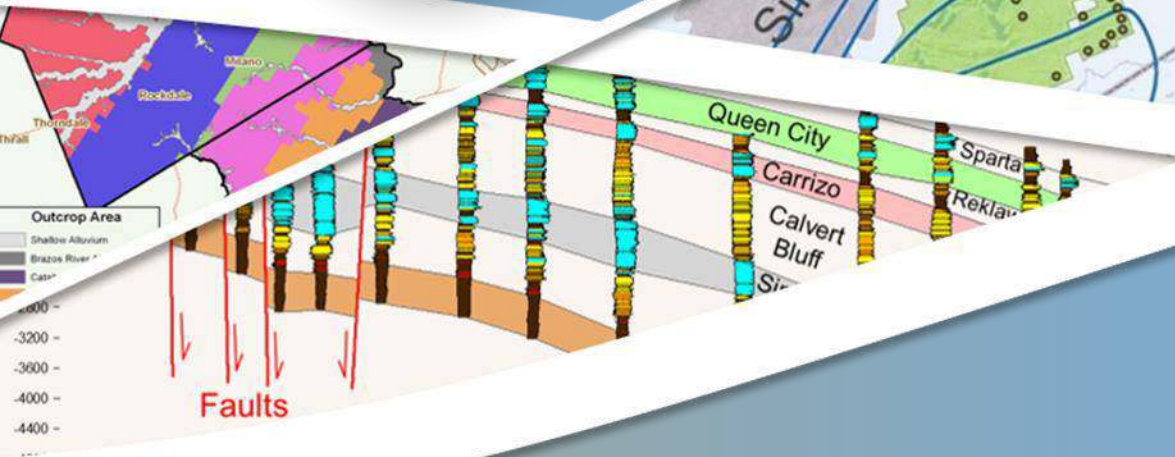


DFC Compliance Update and Considerations for Shallow Zone Protective Water Levels

Presented To:



Presented By:

Jevon Harding
Steve Young



Aug 1, 2017

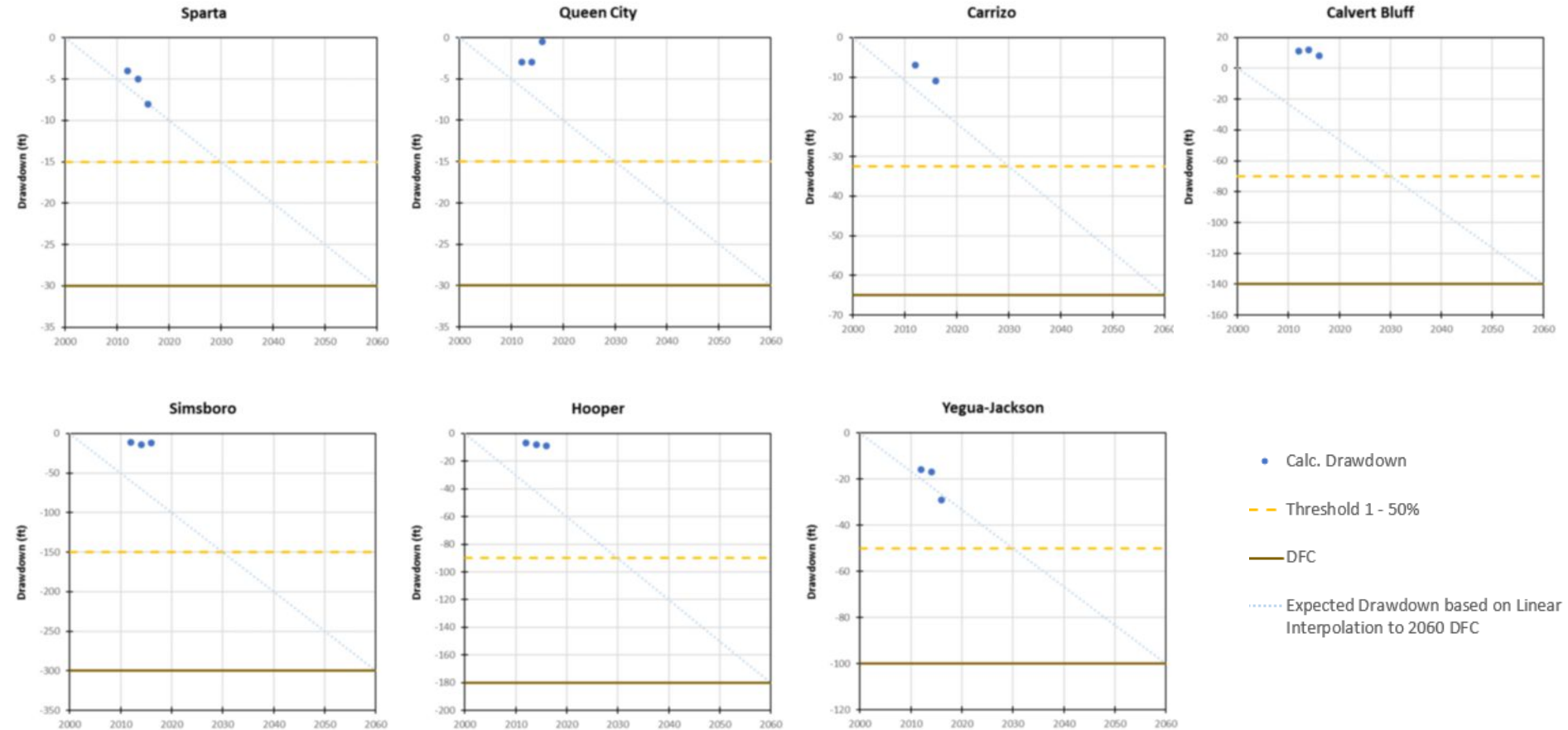
Next Steps

- Desired Future Conditions (DFC)
 - Compliance Calculations
 - Methodolgy
- Protective Drawdown Levels (PDL) Calculations
 - Compliance Calculations & Methodology based on Surfaces
 - Compliance Calculations & Methodology based on Volumes

DFC Compliance

Aquifer	Zone	DFC	Drawdown from 2000 to 2012			Drawdown from 2000 to 2014			Drawdown from 2000 to 2016		
			# of Wells	Calculated Drawdown	Percent of DFC	# of Wells	Calculated Drawdown	Percent of DFC	# of Wells	Calculated Drawdown	Percent of DFC
Sparta	Total	30	3	4	12%	8	5	15%	6	8	27%
Queen City	Total	30	5	3	10%	9	3	11%	7	0.5	2%
Carrizo	Total	65	1	7	10%	1	--	--	2	11	17%
Calvert Bluff (Upper Wilcox)	Total	140	11	-11	-8%	16	-12	-8%	15	-8	-6%
Simsboro (Middle Wilcox)	Total	300	14	11	4%	29	14	5%	29	12	4%
Hooper (Lower Wilcox)	Total	180	5	7	4%	5	8	5%	5	9	5%
Yegua Jackson	Total	100	1	16	16%	8	17	17%	5	29	29%
Brazos River Alluvium	Burleson	6	--	--	--	--	--	--	--	--	--
	Milam	5	--	--	--	--	--	--	--	--	--

Compliance with Shallow Zone Protective Water Levels



DFC Compliance: Future Considerations

Aquifer	Zone	DFC	Drawdown from 2000 to 2016	Drawdown from 2010 to 2016
			# of Wells	# of Wells
Sparta	Total	30	6	18
Queen City	Total	30	7	15
Carrizo	Total	65	2	5
Calvert Bluff (Upper Wilcox)	Total	140	15	25
Simsboro (Middle Wilcox)	Total	300	29	60
Hooper (Lower Wilcox)	Total	180	5	21
Yegua Jackson	Total	100	5	5

Shifting our Baseline from 2000 to 2010 would :

- allow us to use more of the POSGCD monitoring network
- Give us more confidence in our drawdown results

DFC Compliance Methodology

Step #1

Step #2

1999 | **2000** | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | **2012** | 2013 | 2014 | **2015** | 2016 | 2017

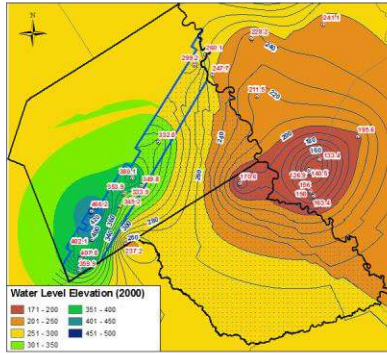


Average Water Level
For 2000

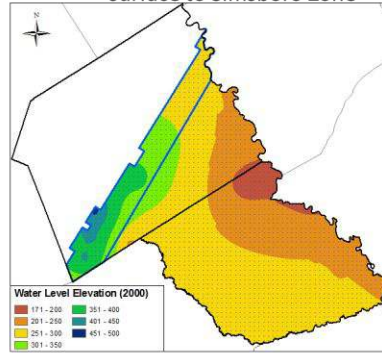
Average Water Level
for 2012

Average Water Level
for 2015

Step #3a Interpolate Baseline Simsboro
Water Level surface

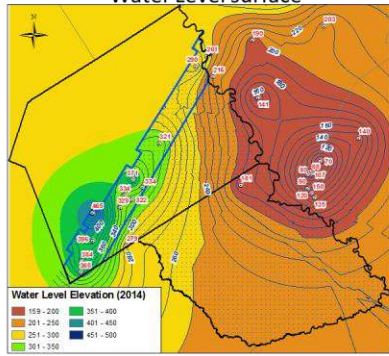


Step #4a Clip Baseline Water Level
surface to Simsboro Zone

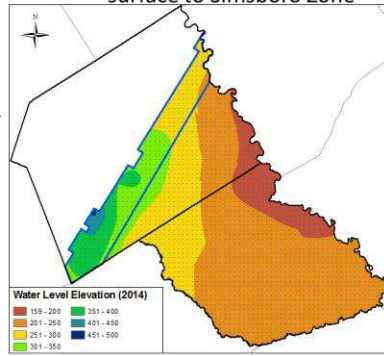


Step #5a : Calculate
Average *Baseline*
Simsboro Water Level
from clipped surface

Step #3b Interpolate Current Simsboro
Water Level surface



Step #4b Clip Current Water Level
surface to Simsboro Zone



Step #5b : Calculate
Average *Current*
Simsboro Water Level
from clipped surface

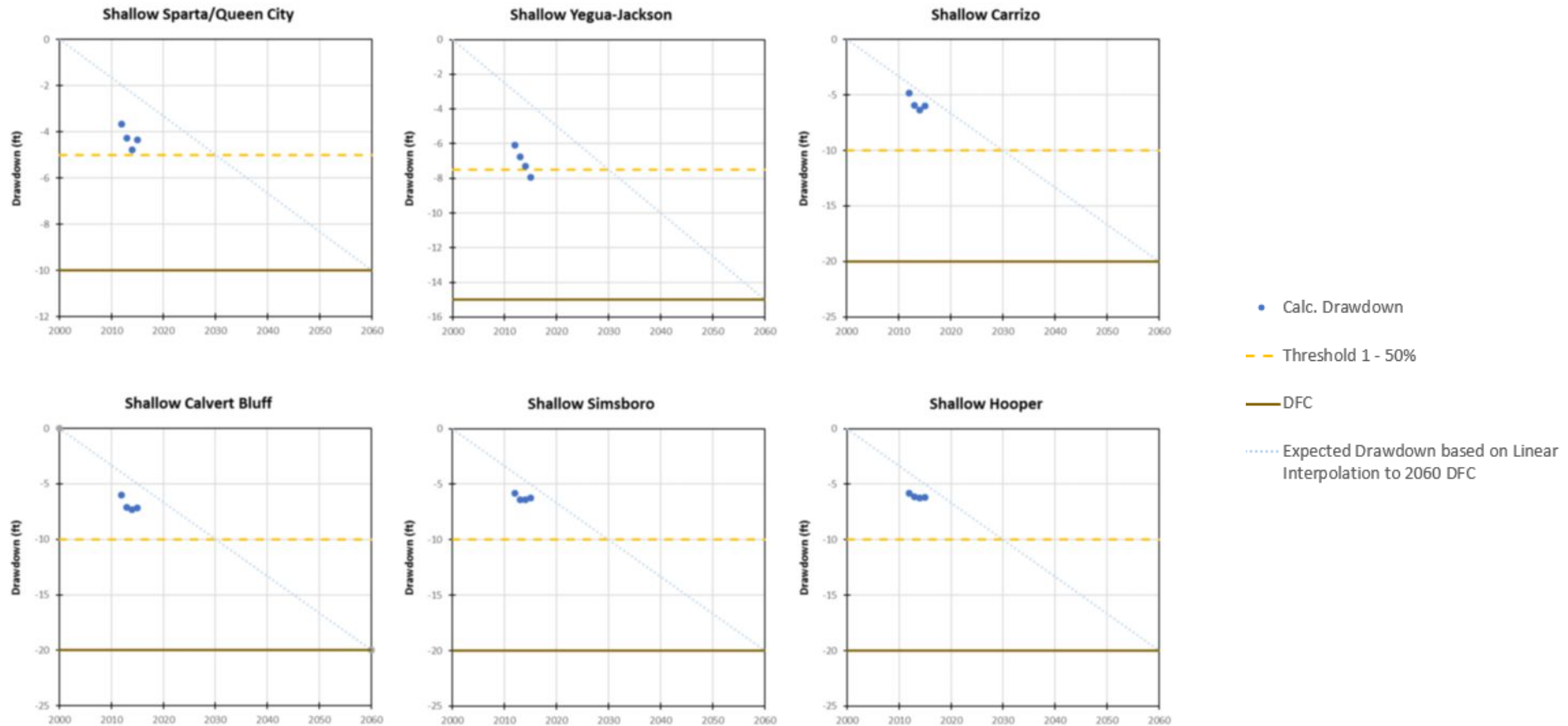
Step #6:
Drawdown = *Baseline* – *Current*
Water Level

PDLs Compliance for Shallow Zone– Methodology based on Surfaces

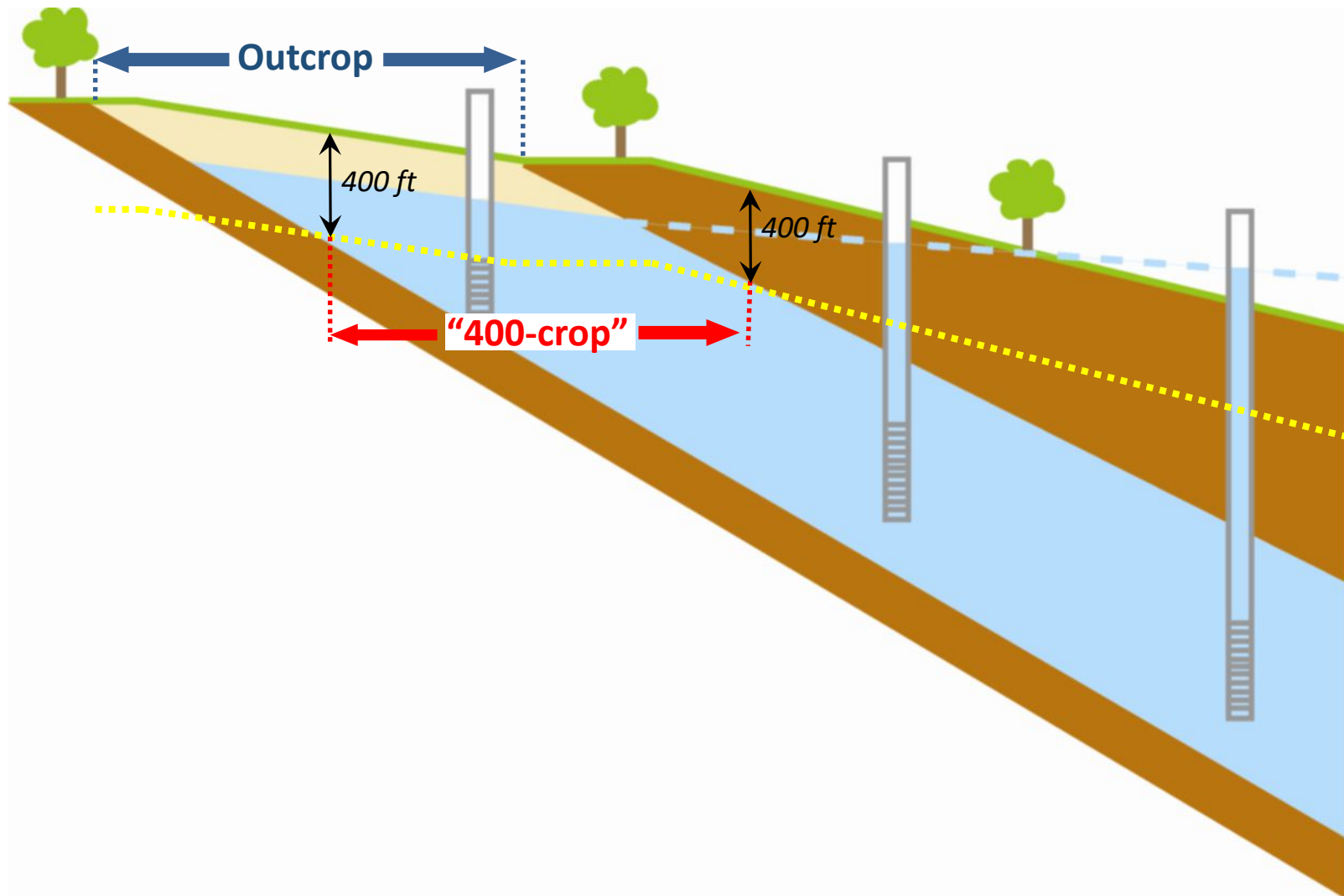
Shallow Management Zone	DFC	Drawdown from 2000 to 2012		Drawdown from 2000 to 2013		Drawdown from 2000 to 2014		Drawdown from 2000 to 2015		Drawdown from 2000 to 2016	
		Calculated Drawdown	Percent of DFC	Calculated Drawdown	Percent of DFC	Calculated Drawdown	Percent of DFC	Calculated Drawdown	Percent of DFC	Calculated Drawdown	Percent of DFC
Sparta/ Queen City	10 ¹	4	40%	4	40%	5	50%	4	40%	3	30%
Carrizo	20	5	25%	6	30%	6	30%	6	30%	4	20%
Calvert Bluff (Upper Wilcox)	20	6	30%	7	35%	7	35%	7	35%	6	30%
Simsboro (Middle Wilcox)	20	6	30%	6	30%	6	30%	6	30%	6	30%
Hooper (Lower Wilcox)	20	6	30%	6	30%	6	30%	6	30%	6	30%
Yegua Jackson	15	6	40%	7	47%	7	47%	8	53%	5	33%

¹ This value represents the individual DFCs defined for the Sparta and Queen City, and assumed to be valid for the combined extent.

Compliance with PDLs for Shallow Zone Water Levels as a Function of Time



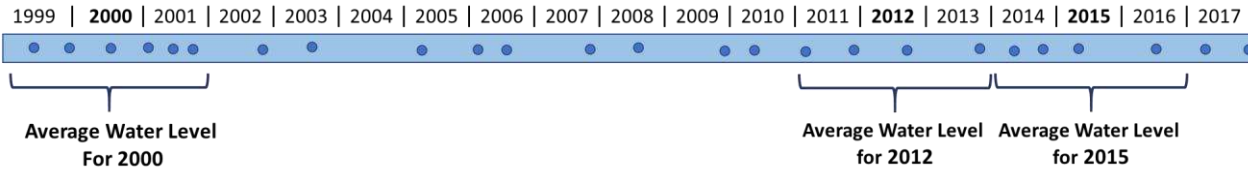
PDLs for Shallow Zone - Overview



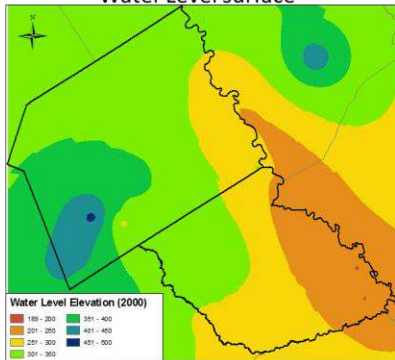
PDLs Compliance for Shallow Zone— Methodology based on Surfaces

Step #1

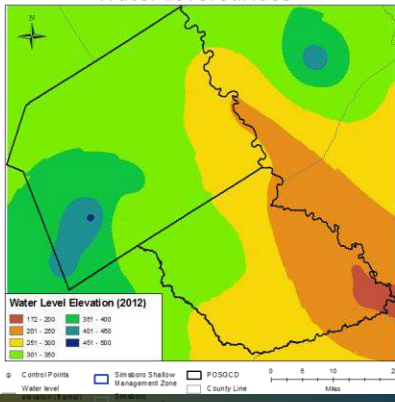
Step #2



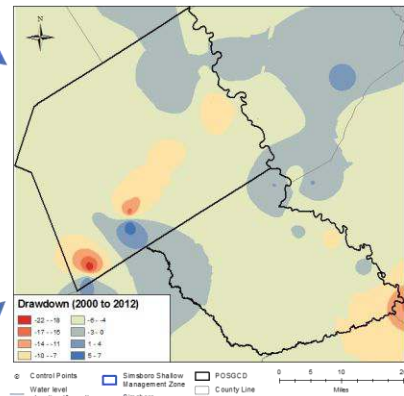
Step #3a Interpolate Baseline Shallow Water Level surface



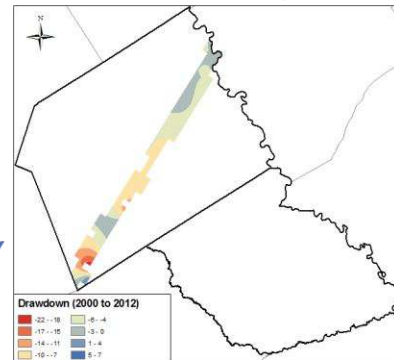
Step #3b Interpolate Current Shallow Water Level surface



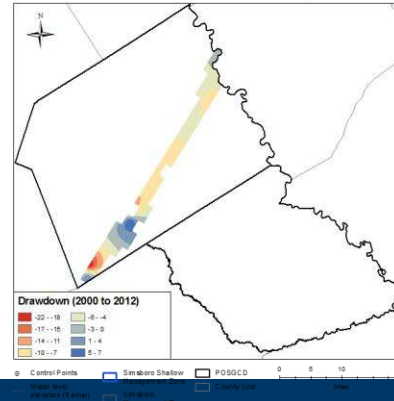
Step #4:
Shallow Drawdown = Baseline – Current Water Level



Step #5a : Clip Shallow Drawdown Surface to Simsboro outcrop



Step #5b : Clip Shallow Drawdown Surface to Simsboro "400-crop"



Step #6a : Calculate Average drawdown in Simsboro outcrop from clipped surface

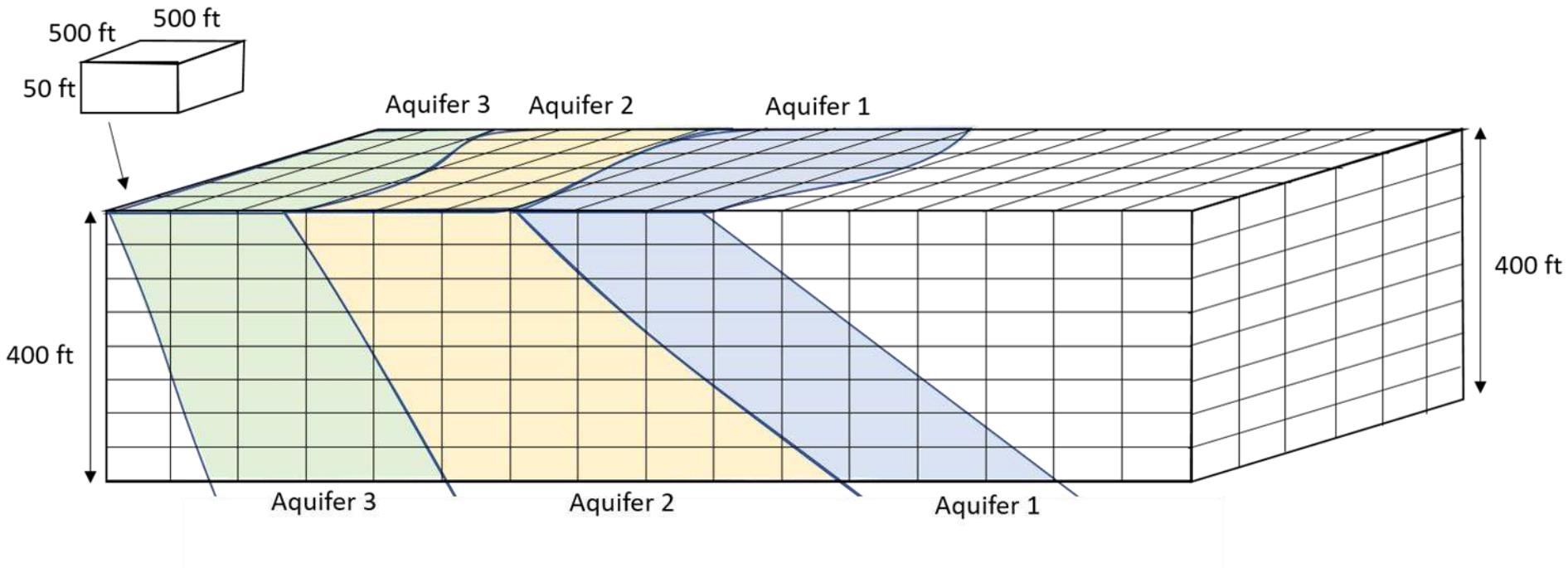
Step #7:
Drawdown = Average of outcrop & "400-crop" drawdown values

Step #6b : Calculate Average drawdown in Simsboro "400-crop" from clipped surface

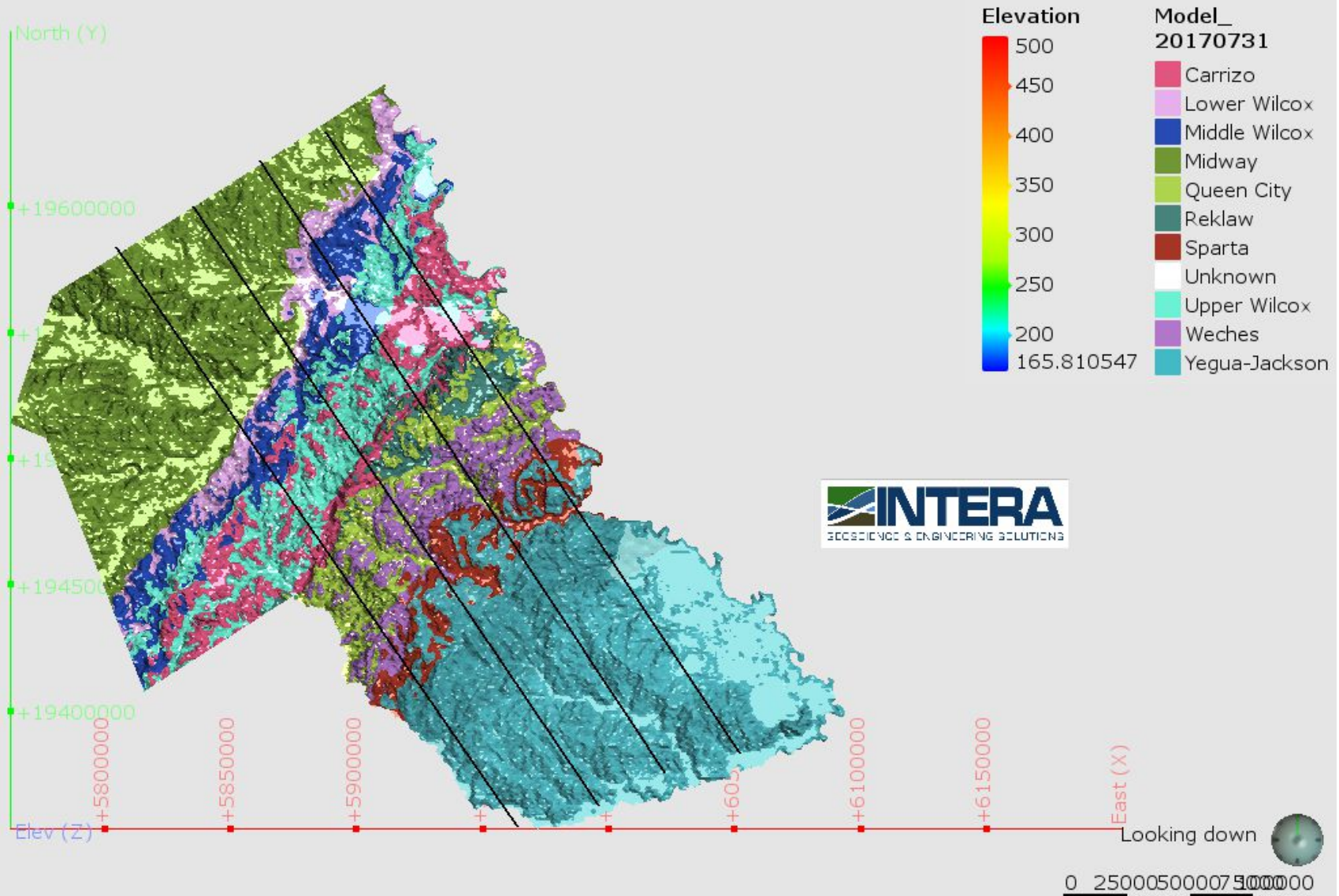
PDLs Compliance for Shallow Zone– Methodology based on Volumes

Shallow Management Zone	DFC	2015		2016	
		Calculated Drawdown	Percent of DFC	Calculated Drawdown	Percent of DFC
Sparta	10	5	50%	3	30%
Queen City	10	4	40%	2	20%
Carrizo	20	6	30%	3	15%
Calvert Bluff (Upper Wilcox)	20	7	35%	6	30%
Simsboro (Middle Wilcox)	20	7	35%	6	30%
Hooper (Lower Wilcox)	20	6	30%	6	30%
Yegua Jackson	15	7	47%	4	27%

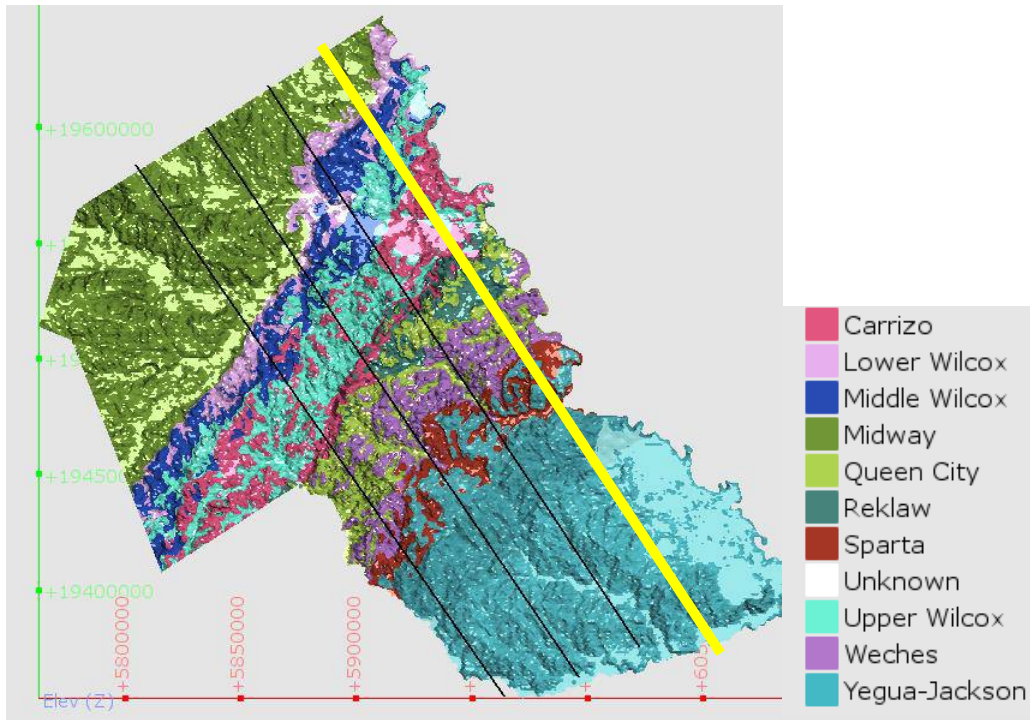
Methodology based on Volumes- Overview



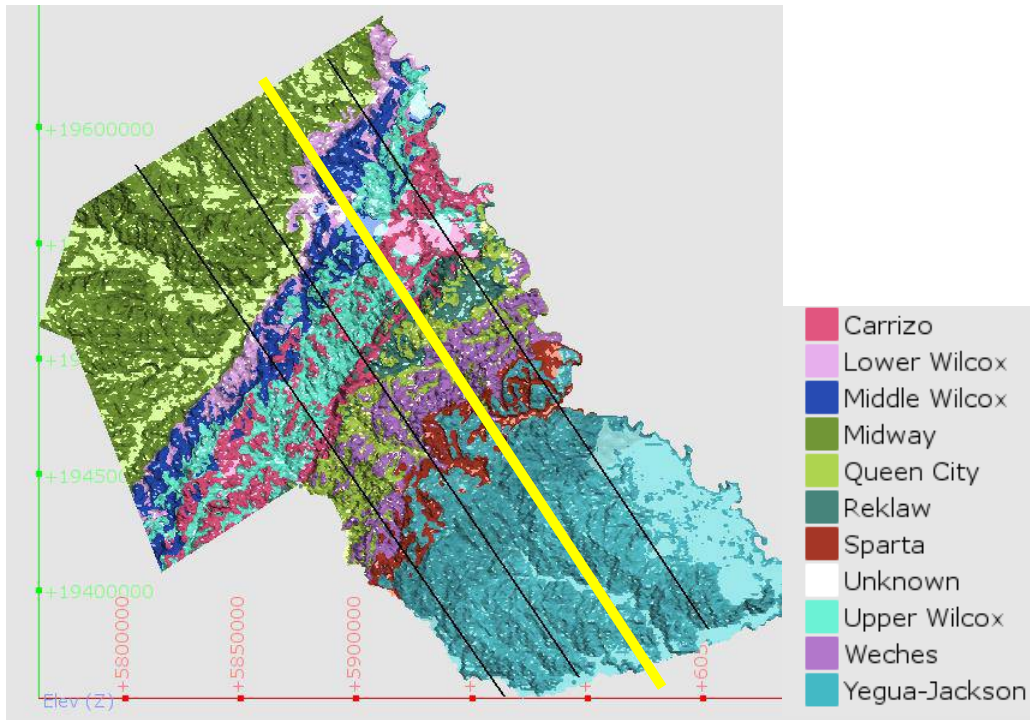
3-D Model of Shallow Zone (400 ft)



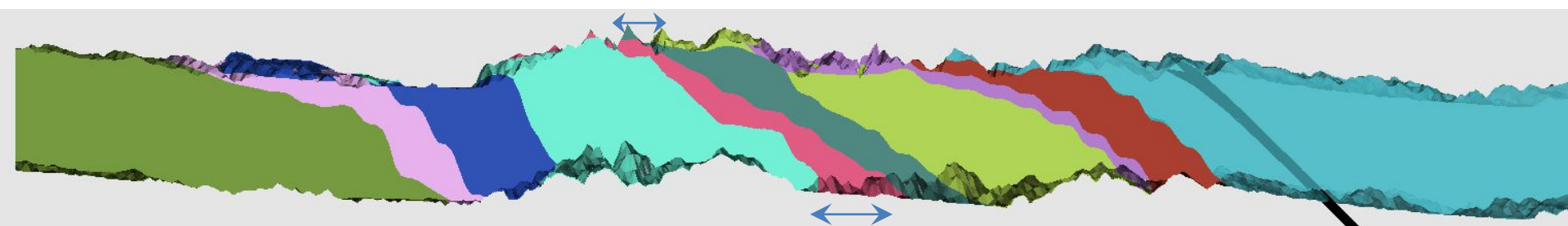
3-D Model of Shallow Zone (400 ft)



3-D Model of Shallow Zone (400 ft)

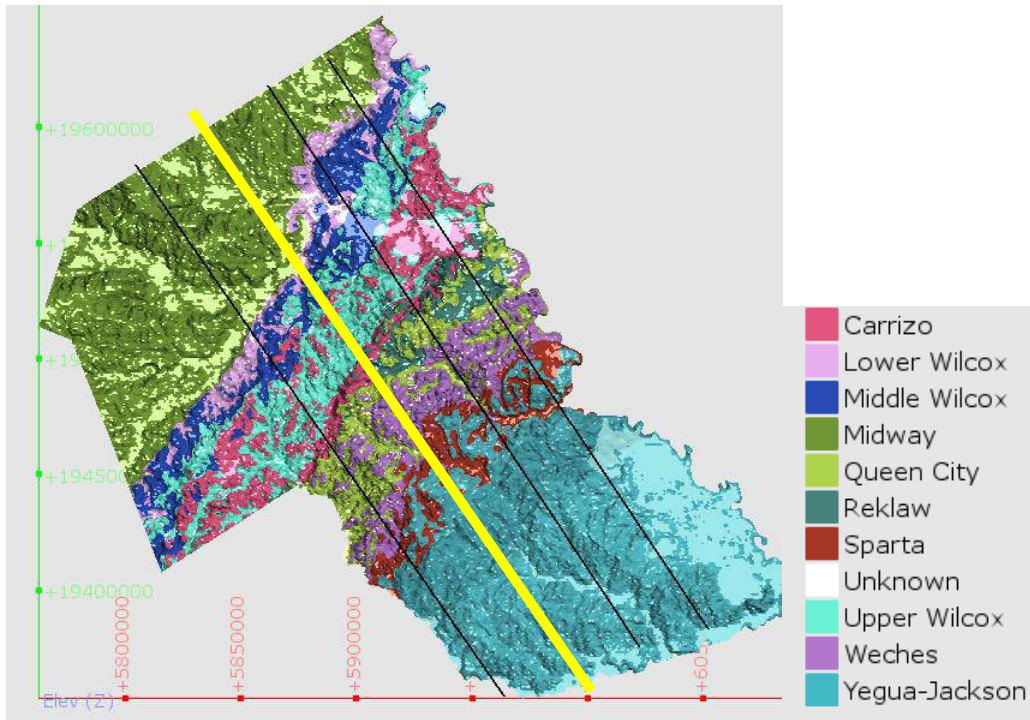


Carrizo outcrop

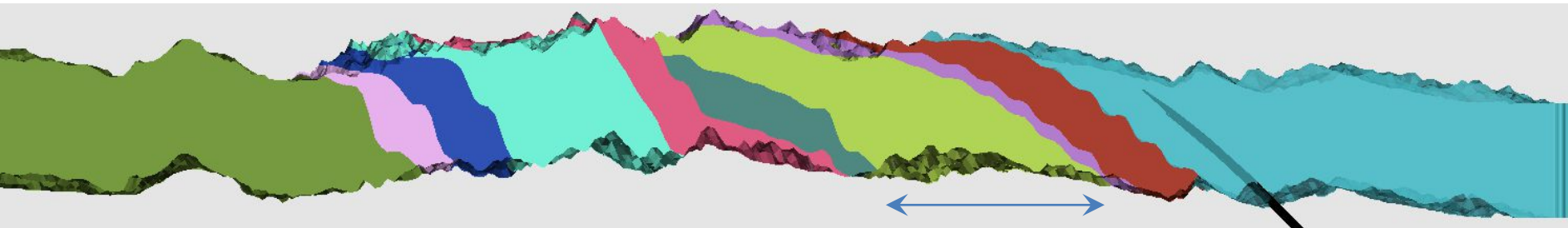


Carrizo @ 400 ft

3-D Model of Shallow Zone (400 ft)

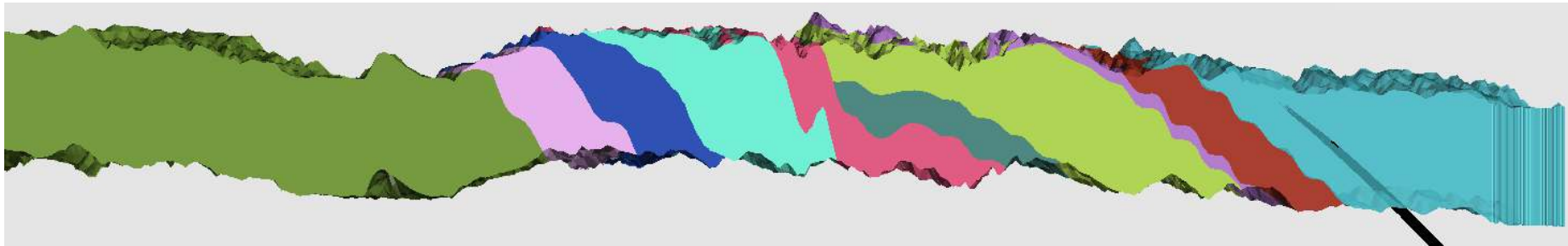
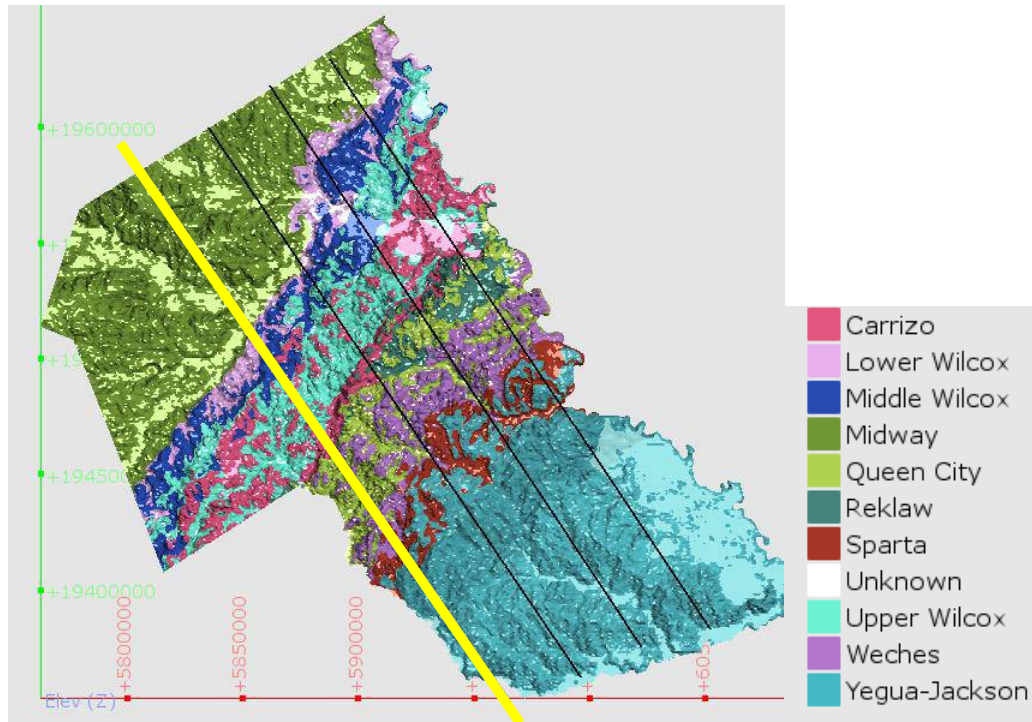


Queen City outcrop

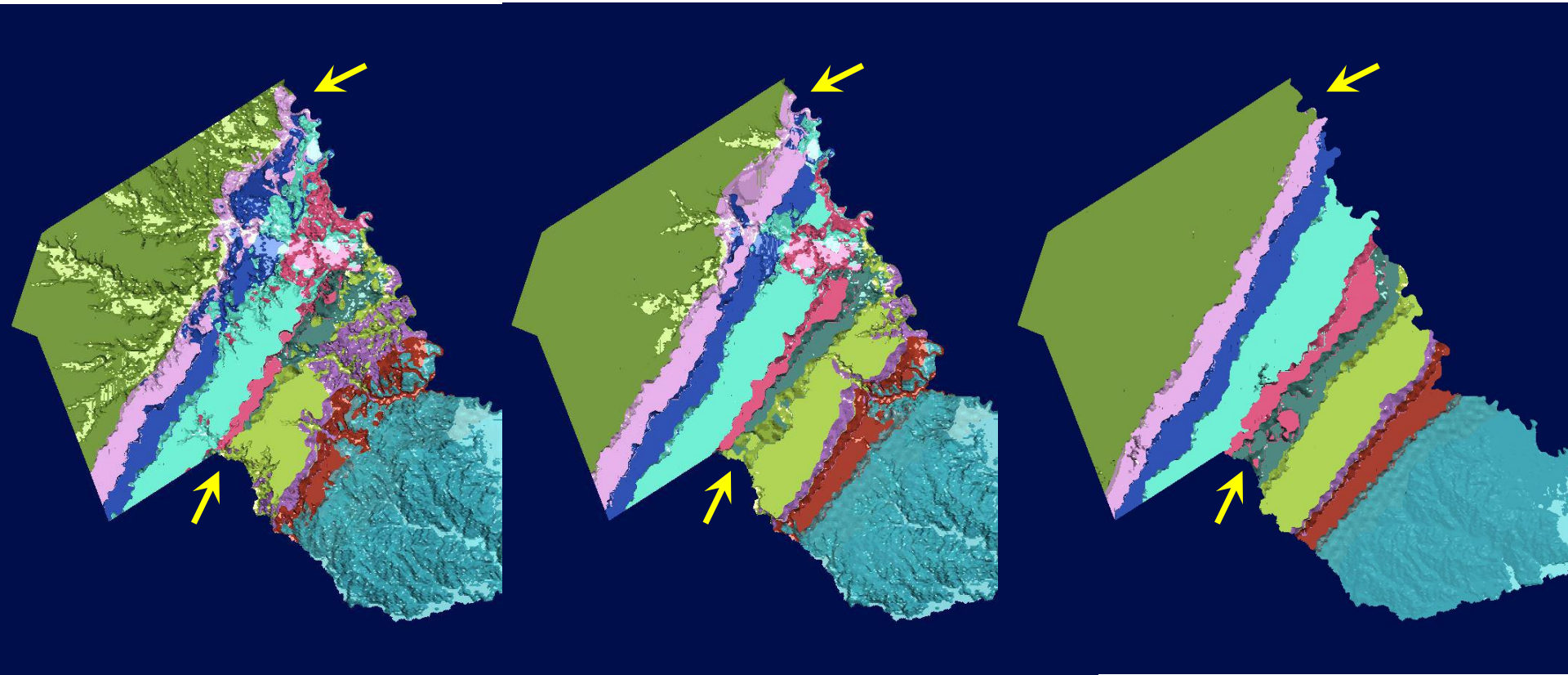


Queen City @ 400 ft

3-D Model of Shallow Zone (400 ft)



3-D Model of Shallow Zone (400 ft)



0 ft deep

~ 200 ft deep

~ 400 ft deep

Next Steps

- Discuss Refinements & Changes to Approach
- Update Methodology Document Presented on June 6, 2017 in August 2017
- Submit Methodology Document to POSGCD for Review in September 2017