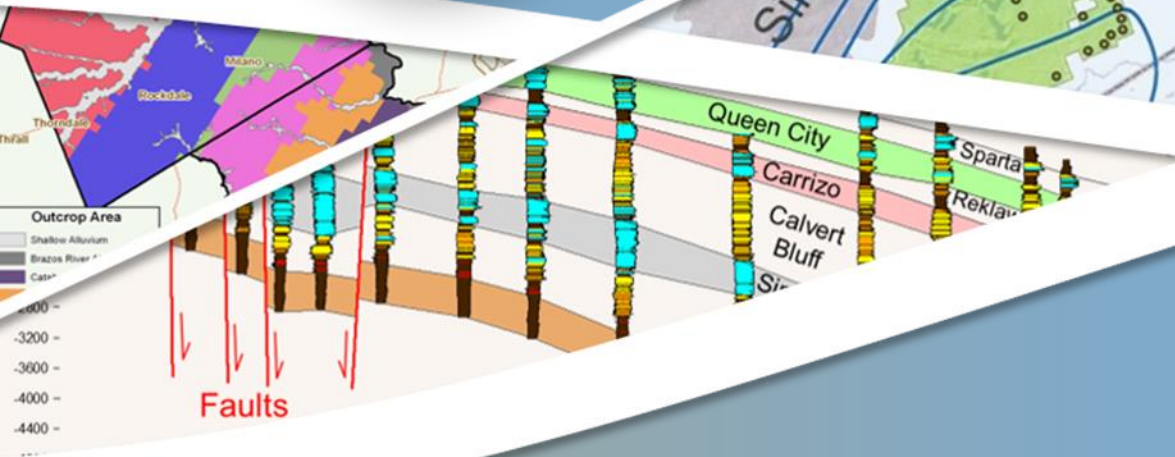


# Application to Amend Alcoa Drilling and Operating Permit No. POS D&O 0148

Presented To:



Presented by:  
Steven Young



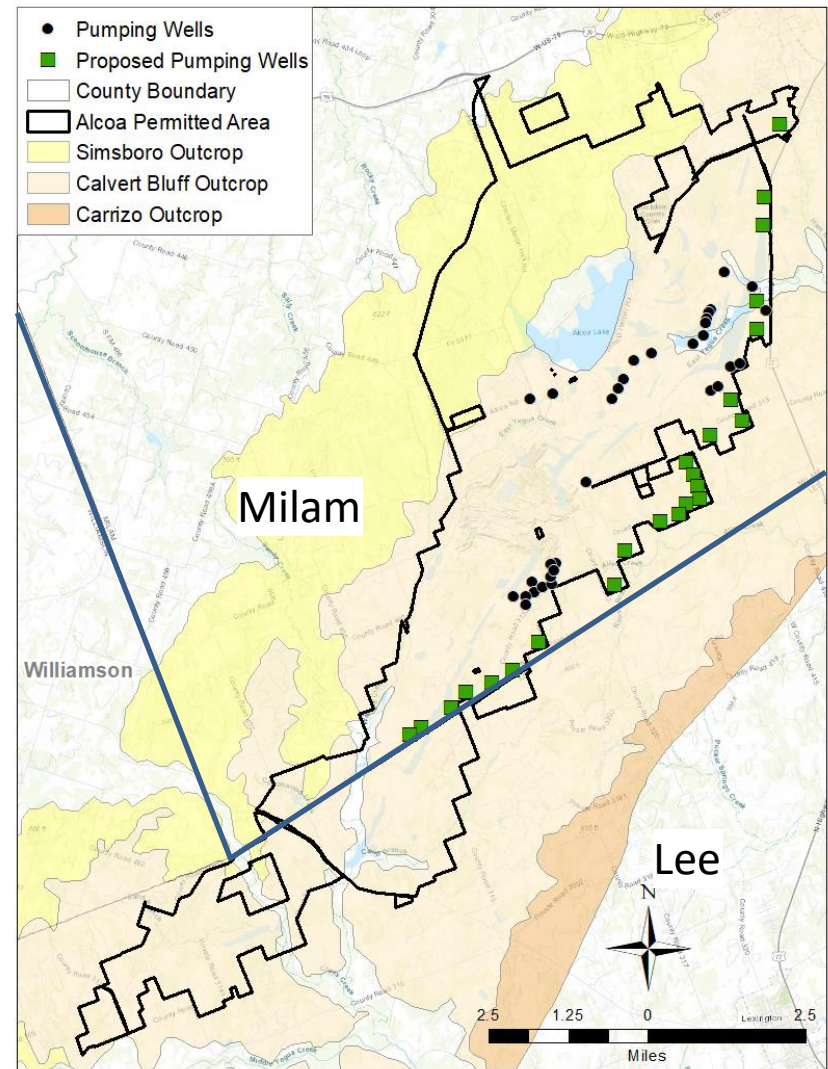
July 27, 2021

# Outline

- Review Application
- Permitted Wells
  - Well Location
  - Well Screen Interval
  - Aquifer Assignment
  - Spacing Requirements
- Predicted Drawdowns
  - Location and Rates of Pumping
  - Calculated Average Drawdowns every 10 years
  - Contours of Predicted Drawdown
- Monitoring Requirements
- Summary of Findings

# Application to Amend Operating Permit D&O-0148

- Current Permit
  - Issued Nov. 2012
  - 40-year Term (2012 – 2052)
  - Total Authorized Production of 25,000 AFY
  - Well Field: 32 wells with Historic Use \*  
24 new wells
  - Location: On-site
  - Use Type: Industrial
  - Aquifer: Simsboro Aquifer
- Requested Amendments
  - Extend Permit Term from date of amendment (2021 – 2061)
  - Location: include Williamson, Lee, Travis, Bell, & Milam counties
  - Use Type: add Municipal & Commercial



\*Historic Use Permit No. 0330 for 15,000 AFY from 62 wells - terminates in 2038

# Well Locations

- Identified that coordinates for wells 58-32-502 and 58-32-503 were switched -- Alcoa corrected values and sent revised pages for application
- Well E-1/A-9-4 is located about 500 from location in 2012 Permit Application
- Proposed wells OP-1 and OP-3 had different locations than 2012 Permit – used new locations for this presentation

**Table 1-2. Construction Summary for Operating Permit Wells**

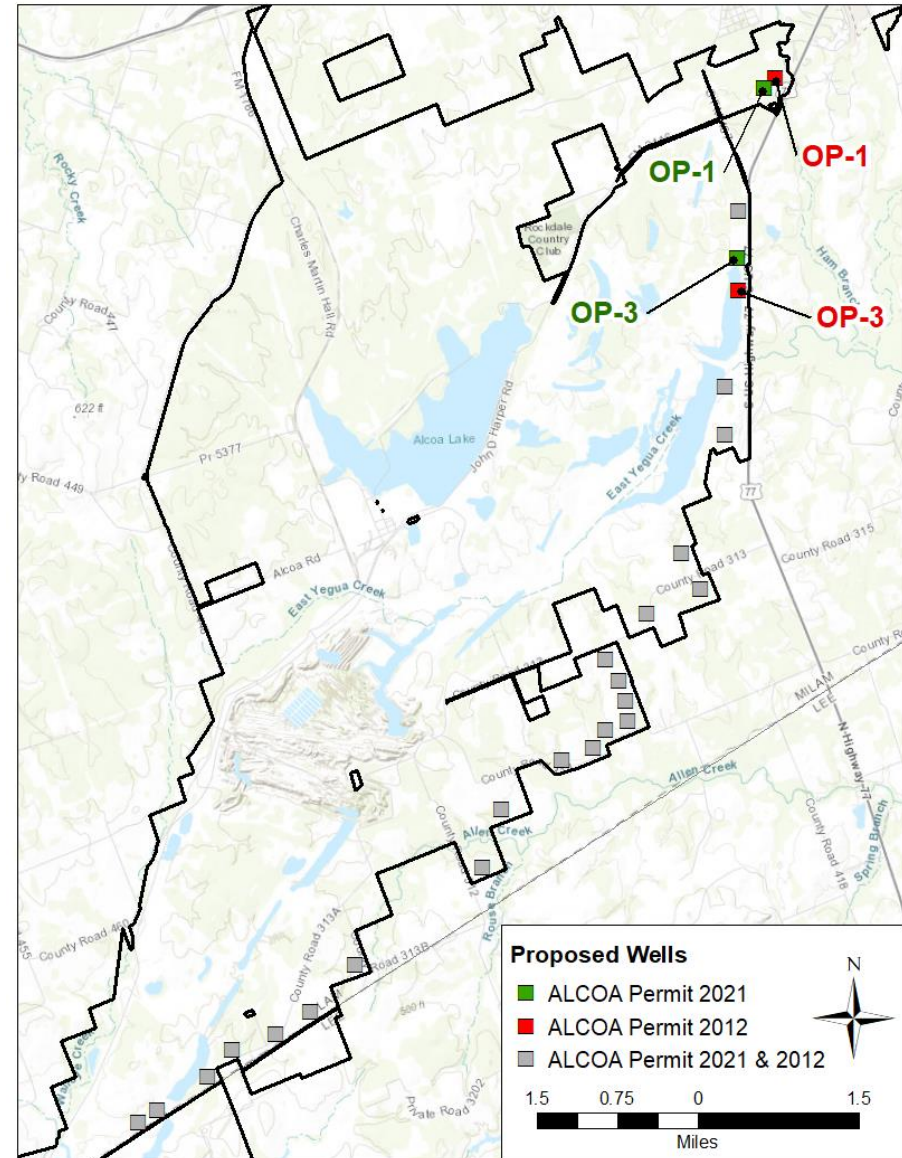
Well Name	Latitude	Longitude	Ground Level (ft, amsl)	Estimated Depth	
				Top of Screen (ft, bgl)	Bottom of Screen (ft, bgl)
OP-1	30.6217298	-97.003762	407	200	400
OP-2	30.6051961	-97.008376	442	250	600
OP-3	30.5988499	-97.008832	419	300	600
OP-4	30.5814542	-97.011233	397	350	700
OP-5	30.5750311	-97.011456	445	400	800

**Table 1-2. Construction Summary for Operating Permit Wells (con't)**

Well Name	Latitude	Longitude	Ground Level (ft, amsl)	Reported Depth	
				Top of Screen (ft, bgl)	Bottom of Screen (ft, bgl)
58-32-502	30.560556	-97.072222	480	117	190
58-32-503	30.561667	-97.066112	480	120	170
E-1/A-9-4	30.588348	-97.019437	427	197	317
AT-1 / AX(10)5	30.54111	-97.05764	507	236	383
C4052A	30.57223	-97.02831	407	238	438
C4245	30.57988	-97.02349	430	238	438

# Locations for Proposed Well in 2012 and 2021 Permit Applications

- Difference in OP-1 locations is 737 ft
- Difference in OP-3 locations is 1,567 ft
- Difference in remaining 22 locations is < 25 feet



# Screened Intervals for 32 Existing Wells

- 22 wells with Information
  - 2 TWDB driller reports
  - 18 Alcoa construction reports
  - 2 ALCOA database values
- 10 wells with no Information
  - 9 wells were video logged
  - 8 Alcoa construction reports

**Table 1-2. Construction Summary for Operating Permit Wells**

Well Name	Latitude	Longitude	Ground Level (ft, amsl)	Estimated Depth	
				Top of Screen (ft, bgl)	Bottom of Screen (ft, bgl)
OP-1	30.6217298	-97.003762	407	200	400
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OP-4	30.5814542	-97.011233	397	350	700
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C4052A	30.57223	-97.02831	407	238	438
C4245	30.57988	-97.02349	430	238	438

# Results from Video Log from 10 Wells

Well Number	Video Survey		ALCOA Construction Sheets		Difference	
	(a) Depth to Top of Screen (ft, bgl)	(b) Depth to Bottom of Screen (ft, bgl)	(c) Depth to Top of Screen (ft, bgl)	(d) Depth to Bottom of Screen (ft, bgl)	(a-c) Depth to Top of Screen (ft, bgl)	(b-d) Depth to Bottom of Screen (ft, bgl)
AT-1/AX(10)5	AX plugged; AT-1 not yet drilled					
DP-S-A-3	213	360	218	370	-5	-10
DP-S-A-4	216	354	238	385	-22	-31
DP-S-A-5	217	326	210	330	7	-4
DP-S-A-6	Pump Cable Obstruction		198	318	na	na
DP-S-A-7	164	278	178	306	-14	-28
F15 Sims	300	452	298	458	2	-6
F2 Sims	218	363	245	405	-27	-42
F4 Sims	252	341	265	360	-13	-19

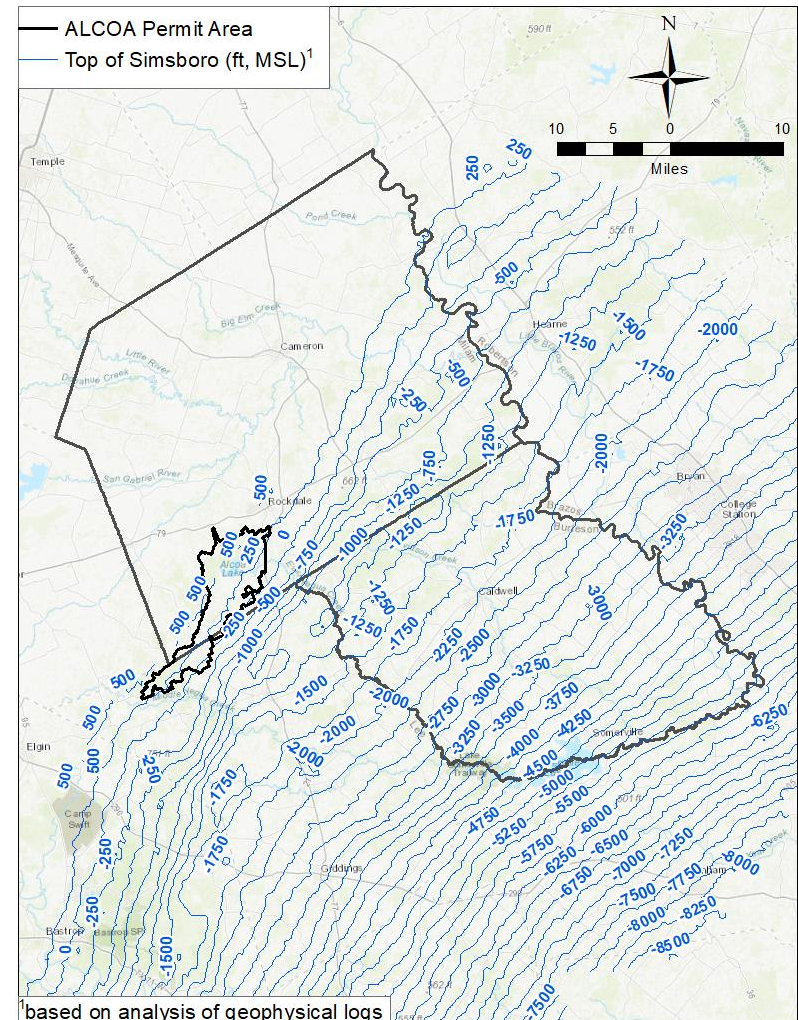
\*the screen interval averaged 134 ft for the 8 wells

- Wells with Video Survey

- 3 of 7 wells have 10 ft of less difference between construction sheet and video log
- 3 of 7 wells have between 25 and 40 ft of difference between construction sheet and video log

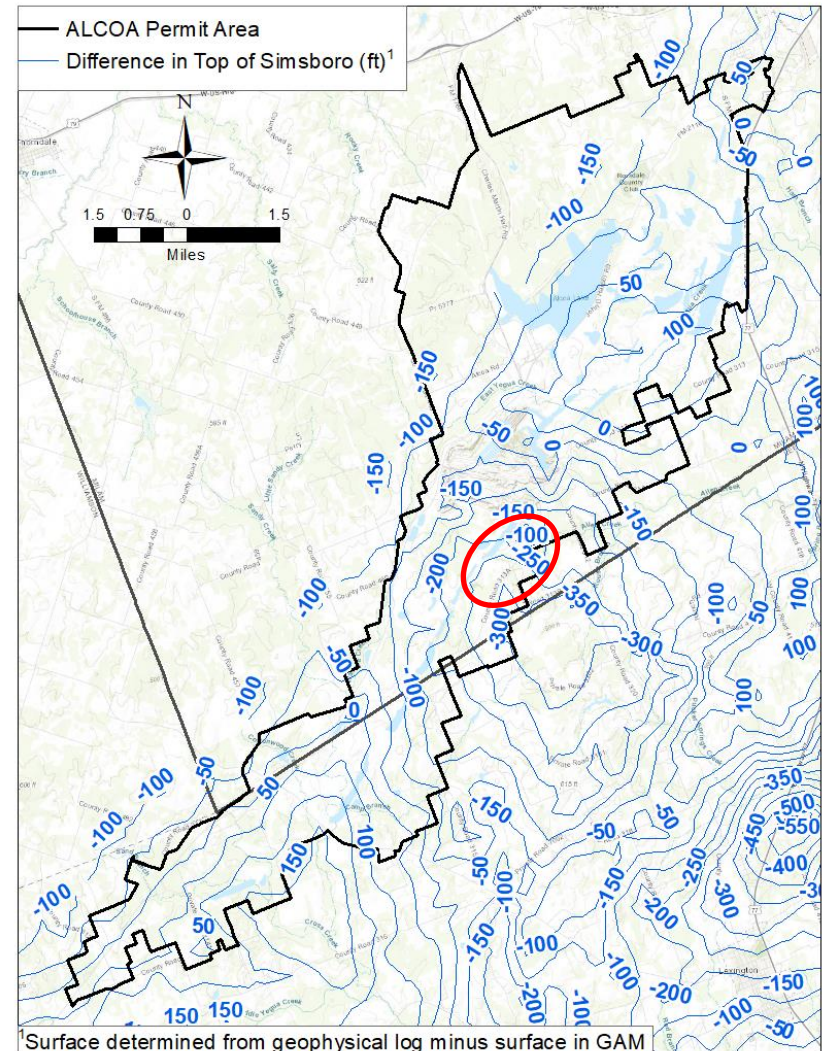
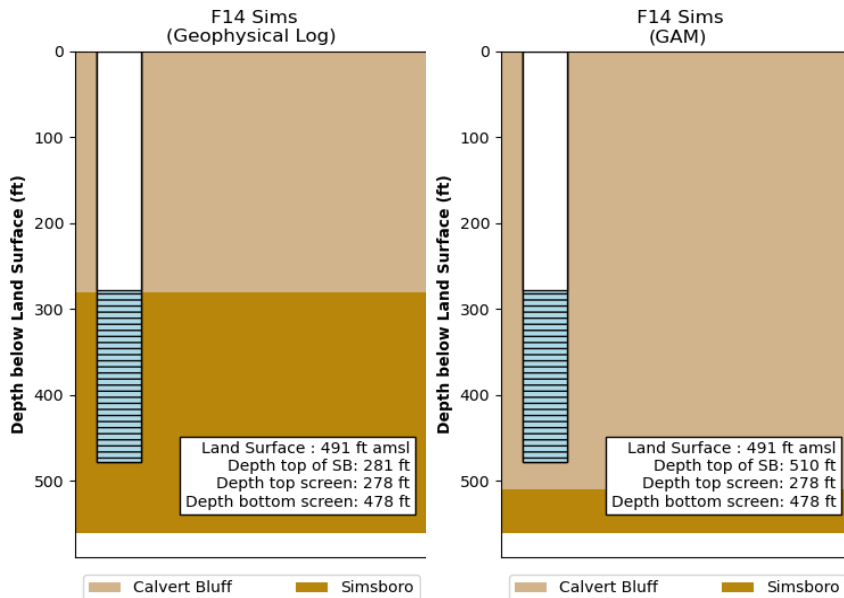
# Aquifer Assignment to Wells

- Well Assignments
  - Use aquifer surfaces in GAM, if deemed reliable
  - Validate GAM surfaces where possible with geophysical logs
  - Surfaces generated from the GAM and geophysical logs were used in INTERA's review
- Evaluation of Aquifer Surfaces in SP/QC/CW GAM
  - In 2016-2017 analysis of geophysical logs for updating faults in GAM, INTERA realized that GAM aquifer surfaces required adjustment in several areas but GAM funding was insufficient to perform task
  - Several areas where Simsboro thickness of 100 feet in "old" GAM was increase to about "500 feet" in the "updated" GAM –included small areas near the Gause Well and Vista Ridge well field
- Mapping of Surfaces in Carrizo/Wilcox Aquifer
  - During last several years, POSGCD has funded studies to analyze 920 geophysical logs to better characterize Carrizo-Wilcox Surfaces
  - Figure at left was created from by INTERA (Tom Ewing and Cody Draper)



# Aquifer Assignment to Wells (con't)

- INTERA Classified 55 out of the 56 wells as Simsboro wells
  - classification based on geophysical logs
  - difference between top of Simsboro based on geophysical log and GAM is at right
  - 11 of the 32 existing wells mapped into the Calvert Bluff based on GAM data (see below)
  - 11 wells are located mainly in red circle
  - Well F2-Sims classification as Simsboro is uncertain



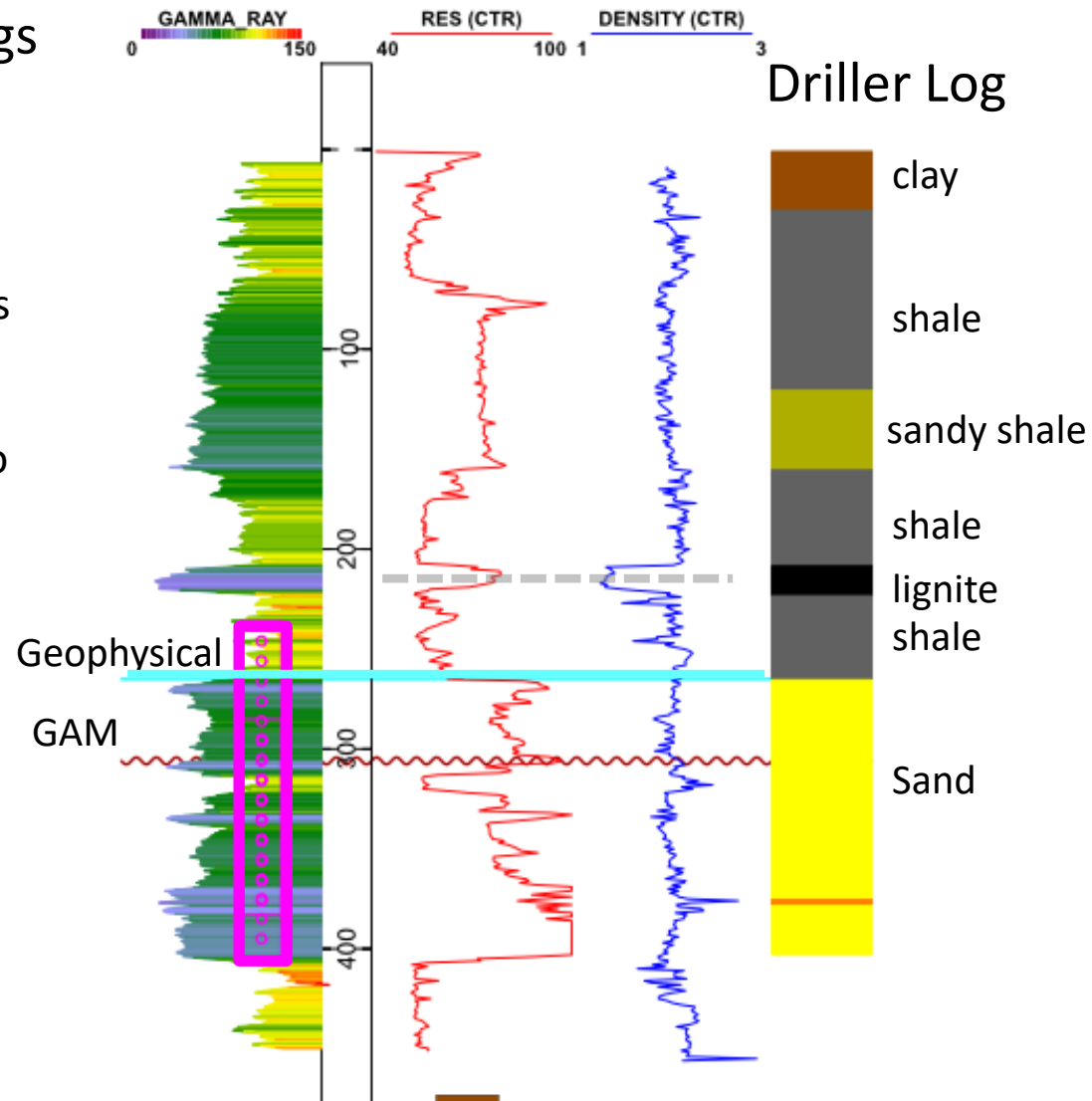
# Geophysical Log for Well AX 10-5

## Interpretation of Geophysical Logs

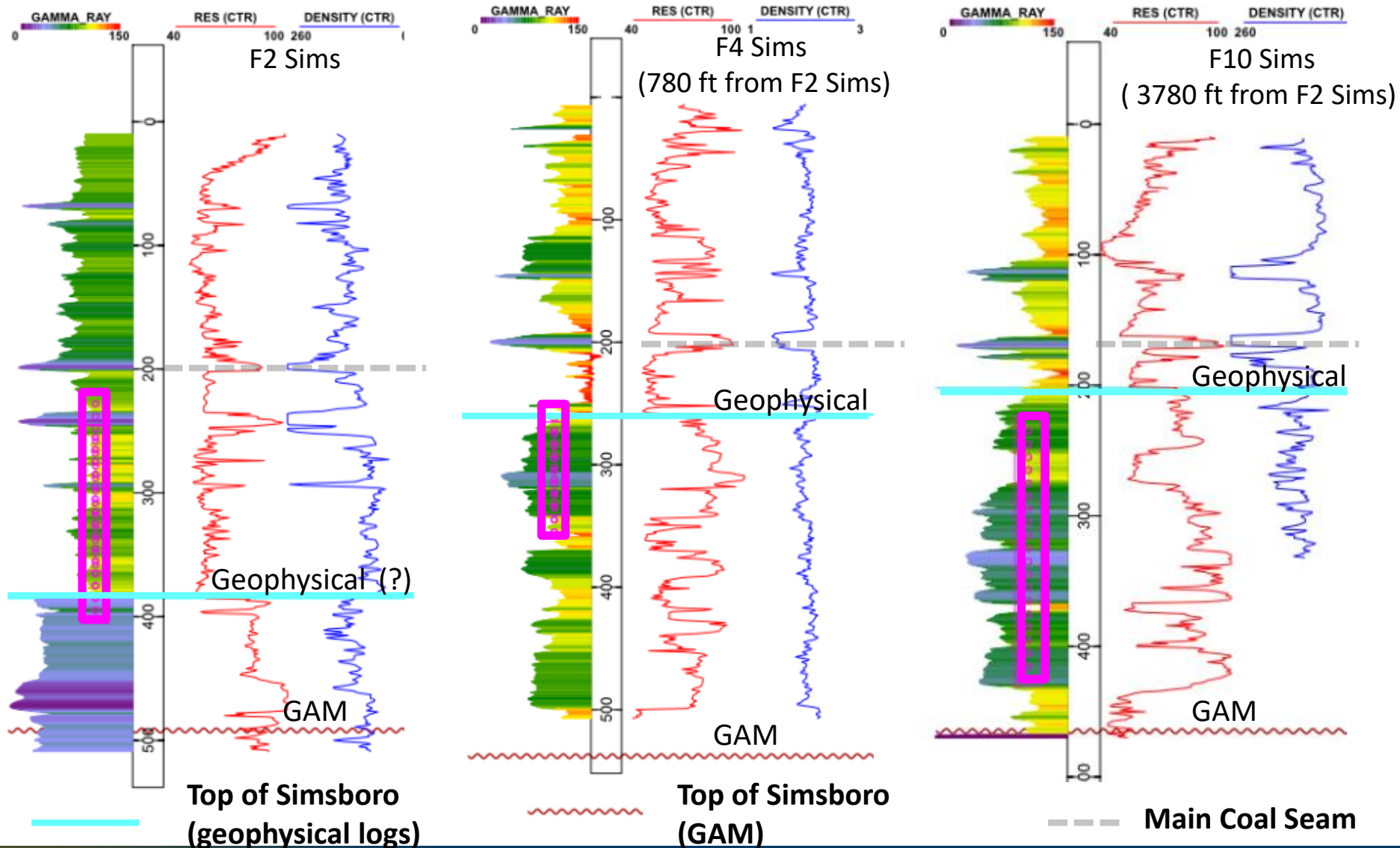
- Gamma Log – measures radioactive signatures - higher values and kicks to the right indicate clayey materials
- Resistivity – measures electrical conductance – lower values and kicks to the left indicate shaly material
- Density – measures density of formation – lower values and kicks to the left indicate lignite or carbonate

## Observation

- Top of thick sand agrees with kicks in the resistivity and gamma ray and top of Simsboro (geophysical)
- Lignite layer agrees with kicks in gamma ray, resistivity, and density
- Majority of the screen is in the Simsboro formation
- Main coal layer is in the Calvert Bluff



# Geophysical Logs for Well F2 Sims and Nearby Wells

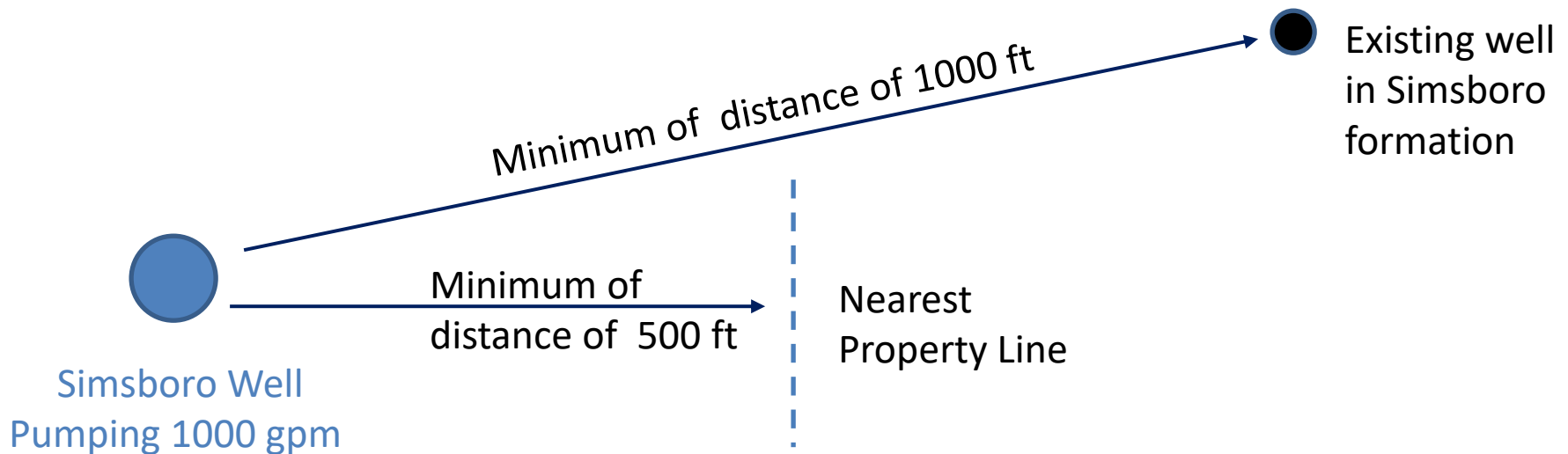


# Well Spacing

- Rule 4.1.2

In the Simsboro formation the spacing of a new well shall be as provided in (a) or (b), at the election of the owner exercised when the application for a new well permit is filed:

a. the spacing of a new well from any well in that formation shall be a distance of not less than one foot per one gallon per minute of production capacity and not less than one-half foot per gallon per minute from the property line of each adjoining landowner; [Amended November 5, 2019] or



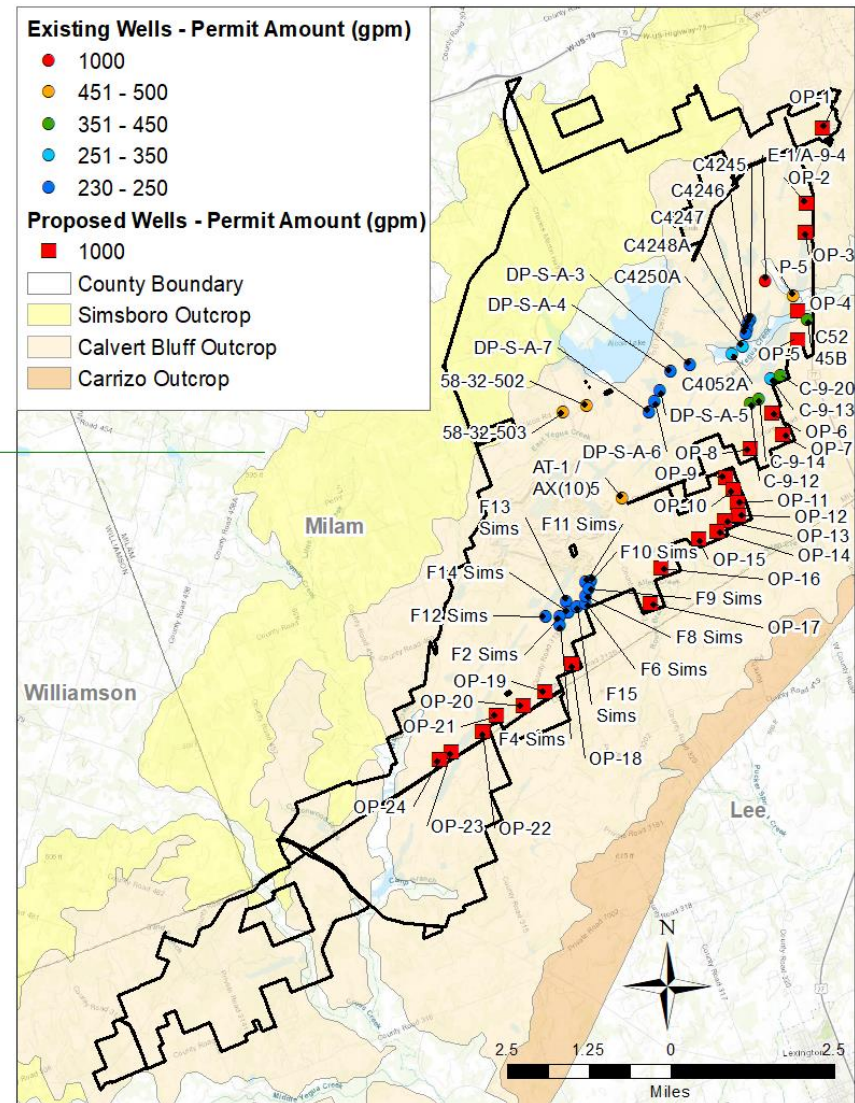
# Well Spacing – Nearest Well

- Confirmed that well spacing rules were met for closest nearest well
- Results from Analysis
  - All closest wells are ALCOA wells
  - Smallest difference:
    - Pumping rate = 250 gpm  
(nearest well = 335 ft)
    - Pumping rate = 1000 gpm  
( Nearest well = 1,132 ft)

Well Name	Distance to Closest Well (ft)	Permitted Pumping Rate (gpm)	Well Name	Distance to Closest Well (ft)	Permitted Pumping Rate (gpm)
58-32-502	606	500	F13-Sims	935	250
58-32-503	1155	500	F14-Sims	756	250
A-9-4	2,254	540	F15-Sims	810	250
AT-1	1,637	1000	P-5	512	500
C4052A	1,055	290	OP-1	6,198	1000
C4245	335	250	OP-2	2,317	1000
C4246	335	240	OP-3	2,317	1000
C4247	410	230	OP-4	940	450
C4248A	410	240	OP-5	981	260
C4250A	1,055	230	OP-6	1,537	420
C5245B	510	450	OP-7	1,971	1000
C-9-12	741	420	OP-8	2,908	1000
C-9-13	864	450	OP-9	1,190	1000
C-9-14	698	500	OP-10	1,049	1000
C-9-20	864	320	OP-11	1,020	1000
DP-S-A-3	1,656	250	OP-12	1,020	1000
DP-S-A-4	1,656	250	OP-13	1,057	1000
DP-S-A-5	967	250	OP-14	1,057	1000
DP-S-A-6	963	250	OP-15	1,645	1000
DP-S-A-7	963	250	OP-16	2,992	1000
F2-Sims	343	250	OP-17	2,992	1000
F4-Sims	413	250	OP-18	3,139	1000
F6-Sims	568	250	OP-19	2,044	1000
F8-Sims	568	250	OP-20	2,044	1000
F9-Sims	574	250	OP-21	1,813	1000
F10-Sims	421	250	OP-22	1,813	1000
F11-Sims	421	250	OP-23	1,132	1000
F12-Sims	1,119	250	OP-24	1,132	1000

# Spatial Distribution of Pumping

Well Name	Distance to Closest Well (ft)	Permitted Pumping Rate (gpm)	Well Name	Distance to Closest Well (ft)	Permitted Pumping Rate (gpm)
58-32-502	606	500	F13-Sims	935	250
58-32-503	1155	500	F14-Sims	756	250
A-9-4	2,254	540	F15-Sims	810	250
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C-9-13	864	450	OP-9	1,190	1000
C-9-14	698	500	OP-10	1,049	1000
C-9-20	864	320	OP-11	1,020	1000
DP-S-A-3	1,656	250	OP-12	1,020	1000
DP-S-A-4	1,656	250	OP-13	1,057	1000
DP-S-A-5	967	250	OP-14	1,057	1000
DP-S-A-6	963	250	OP-15	1,645	1000
DP-S-A-7	963	250	OP-16	2,992	1000
F2-Sims	343	250	OP-17	2,992	1000
F4-Sims	413	250	OP-18	3,139	1000
F6-Sims	568	250	OP-19	2,044	1000
F8-Sims	568	250	OP-20	2,044	1000
F9-Sims	574	250	OP-21	1,813	1000
F10-Sims	421	250	OP-22	1,813	1000
F11-Sims	421	250	OP-23	1,132	1000
F12-Sims	1,119	250	OP-24	1,132	1000



# Well Spacing – Property Boundary

Confirmed that well spacing rules were met for property boundary

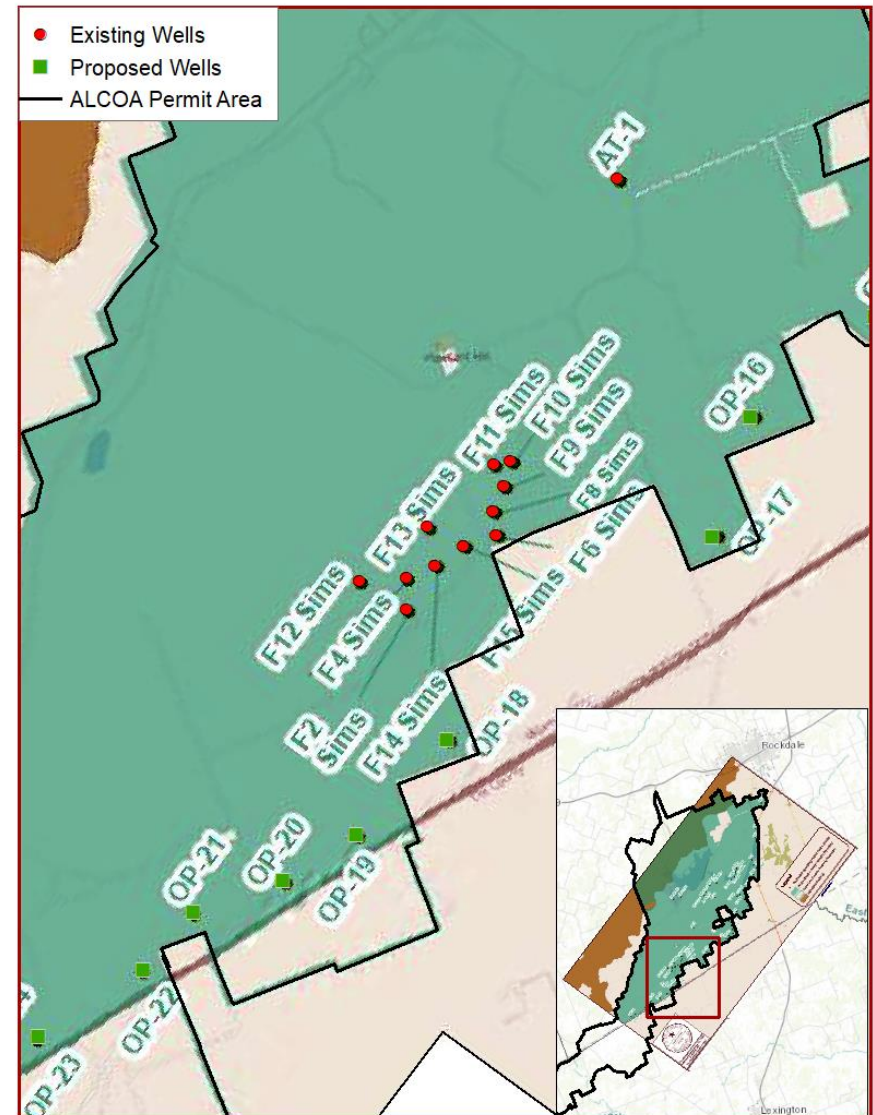
## Results from Analysis

- 8 wells where Table 1-3 calculated distances are more than 200 ft greater than INTERA distances
- 3 wells where Table 1-3 calculated distances are more than 500 ft greater than INTERA distances

Well Name	Pumping Rate (gpm)	Distance(ft) to Property Boundary			Well Name	Pumping Rate (gpm)	Distance(ft) to Property Boundary		
		Table 1-3	INTERA	Diff.			Table 1-3	INTERA	Diff.
DP-S-A-3	250	6029	6025	4	P-5	500	1526	1524	2
DP-S-A-4	250	6046	6051	-5	58-32-502	500	9081	9081	0
DP-S-A-6	250	4562	4562	0	58-32-503	500	7507	7507	0
DP-S-A-7	250	4357	4357	0	DP-S-A-5	250	4983	5088	-105
E-1	540	3037	3370	-333	OP-1	1000	675	701	-26
AX(10)5	1000	4133	4848	-715	OP-2	1000	521	522	-1
C4248A	240	3770	3770	0	OP-3	1000	522	535	-13
C4247	230	3861	3861	0	OP-4	450	1184	1183	1
C4246	240	3980	3980	0	OP-5	260	712	712	0
C4245	250	4004	4004	0	OP-6	420	585	585	0
C4250A	230	3739	3739	0	OP-7	1000	640	640	0
C4052A	290	4010	4010	0	OP-8	1000	715	715	0
C5245B	450	394	394	0	OP-9	1000	577	570	7
C-9-12	420	2145	2145	0	OP-10	1000	599	599	0
C-9-13	450	457	457	0	OP-11	1000	624	624	0
C-9-14	500	1409	1409	0	OP-12	1000	671	635	36
C-9-20	320	421	421	0	OP-13	1000	708	655	53
F2-SIMS	250	2442	2116	326	OP-14	1000	560	560	0
F4-SIMS	250	2034	1739	295	OP-15	1000	547	571	-24
F6-SIMS	250	875	360	515	OP-16	1000	656	656	0
F8-SIMS	250	1186	898	288	OP-17	1000	517	517	0
F9-SIMS	250	1350	1312	38	OP-18	1000	549	550	-1
F10-SIMS	250	1793	1793	0	OP-19	1000	1205	1205	0
F11-SIMS	250	1915	1886	29	OP-20	1000	2126	2193	-67
F12-SIMS	250	3347	2981	366	OP-21	1000	540	543	-3
F13-SIMS	250	2417	1651	766	OP-22	1000	543	551	-8
F14-SIMS	250	1858	1370	488	OP-23	1000	3446	3477	-31
F15-SIMS	250	1453	695	758	OP-24	1000	3501	3501	0

# Well Spacing – Property Boundary (con't)

Well Name	Pumping Rate (gpm)	Distance(ft) to Property Boundary		
		Table 1-3	INTERA	Georeferenced
F2-SIMS	250	2442	2116	2140
F4-SIMS	250	2034	1739	1730
F6-SIMS	250	<b>875</b>	<b>360</b>	<b>390</b>
F8-SIMS	250	1186	898	890
F9-SIMS	250	1350	1312	1300
F10-SIMS	250	1793	1793	1800
F12-SIMS	250	3347	2981	2990
F13-SIMS	250	<b>2417</b>	<b>1651</b>	<b>1670</b>
F14-SIMS	250	1858	1370	1380
F15-SIMS	250	<b>1453</b>	<b>695</b>	<b>700</b>



# GMA 12 Pumping Scenario Used for ALCOA Permit

- Baseline Pumping is PS-10
  - GMA 12 DFC run proposed by POSGCD in Jan. 2020

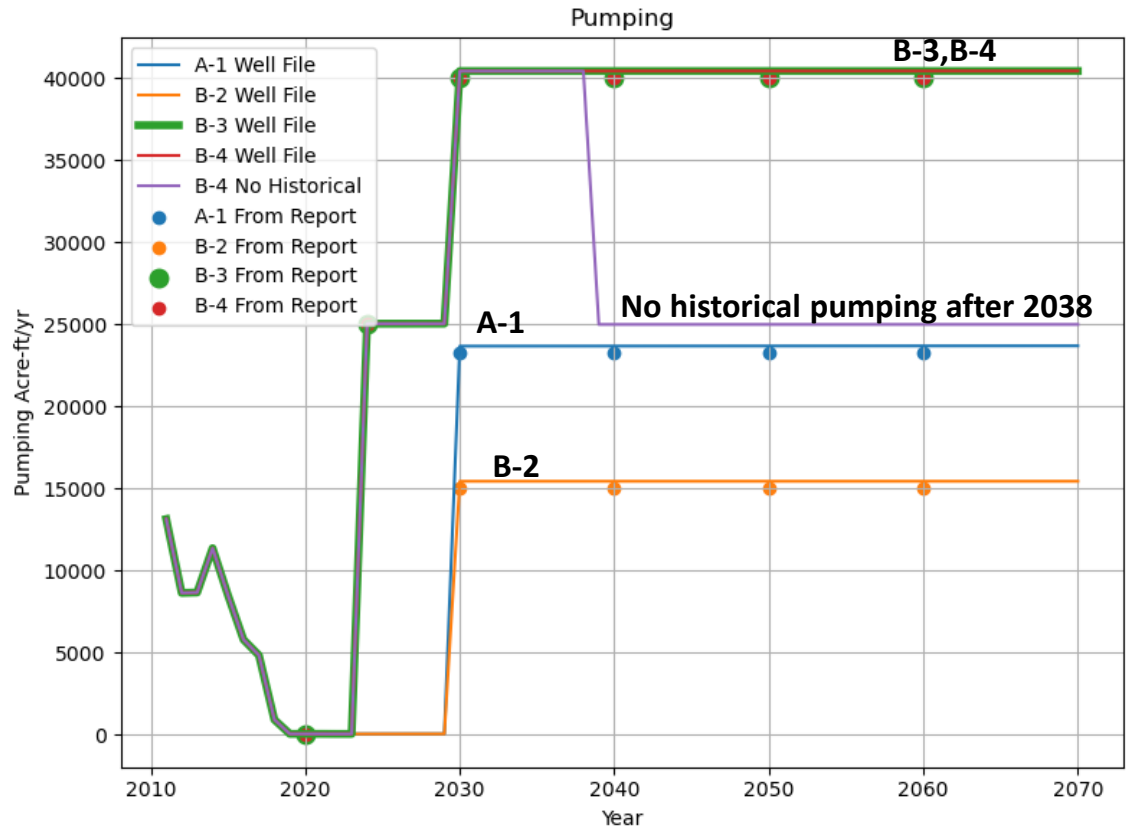
S-10 Input Pumpage in 2070						
Aquifer	Sparta	Queen City	Carrizo	Calvert Bluff	Simsboro	Hooper
LPGCD	2,766	1,774	12,982	5,563	125,967	3,274
POSGCD	4,105	7,838	12,000	4,761	79,433	3,126
BVGCD	13,162	1,269	5,499	1,726	147,246	2,139
METGCD	3,381	1,616	10,529	4,222	6,870	5,252
FCGCD	2,853	2,813	5,155	0	0	0

- GMA 12 DFC Run for Proposed DFC is PS-12
  - PS-12 has 6,206 AFY more 2070 Carrizo pumping in POSGCD
  - PS-12 had the same 2070 Simsboro pumping in BVGCD but 1% to 5% more Simsboro pumping from 2020 to 2054

# ALCOA Pumping Scenarios

- A-1 (PS-10)
  - ALCOA Pumping ~ 23,000 AFY at ALCOA 56 well locations (2030 to 2070)
  - Additional ~2,000 AFY for historical and exempt used on ALCOA property
- B-2
  - ALCOA pumping reduced to 15,000 AFY (historical and new permit)
- B-3 & B-4
  - ALCOA pumping increased to 25,000 FY in 2024 and then to 40,000 AFY in 2030
- No historical pumping after 2038
  - Same as B-3 and B-4 but pumping reduced to 25,000 AFY in 2039

## Pumping Amount at 56 Well Locations



# Calculated Average Drawdowns

- Rule 7.15 Operating Permit

- Rule 7.15.4

The District may impose more restrictive permit conditions on operating permit applications if the limitations:

- a apply uniformly within the same aquifer to all subsequent operating permit applications;
    - b bear a reasonable relationship to the management plan; and
    - c are found necessary by the Board to accomplish the purposes of the District; or [Added June 12, 2012]
    - d are reasonably necessary to protect permit holders, existing users, or existing and historic use. [Amended June 12, 2012]

- Drawdown Results

- Desired Future Conditions
  - Contours of Drawdown

# Calculated Average Drawdown From December 2010

Simsboro Aquifer  
(confined & unconfined layers)

GAM Simulation	Average Simsboro Drawdown since 2010				
	2030	2040	2050	2060	2070
PS-10	160	232	275	305	333
B-4	171	243	288	320	349
No Historic Pumping after 2039	171	241	281	310	337

Simsboro Aquifer  
(confined layer)\*

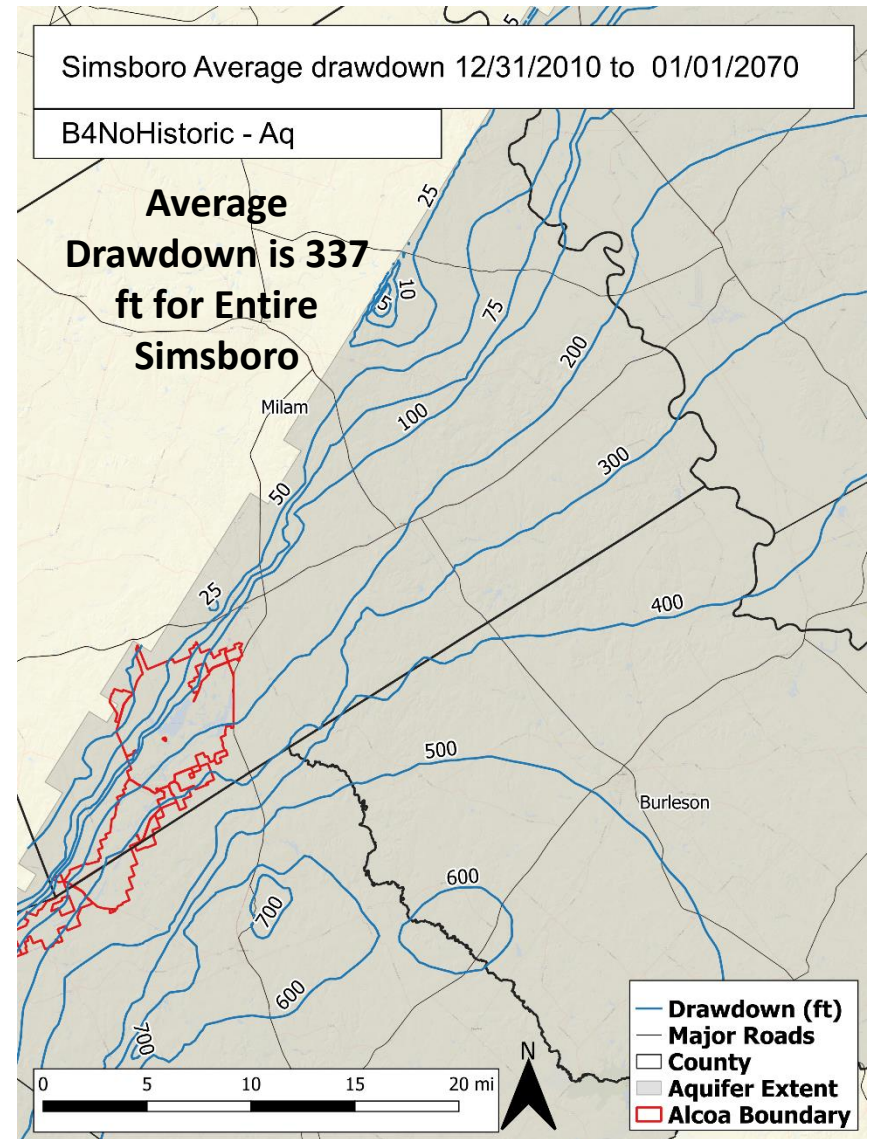
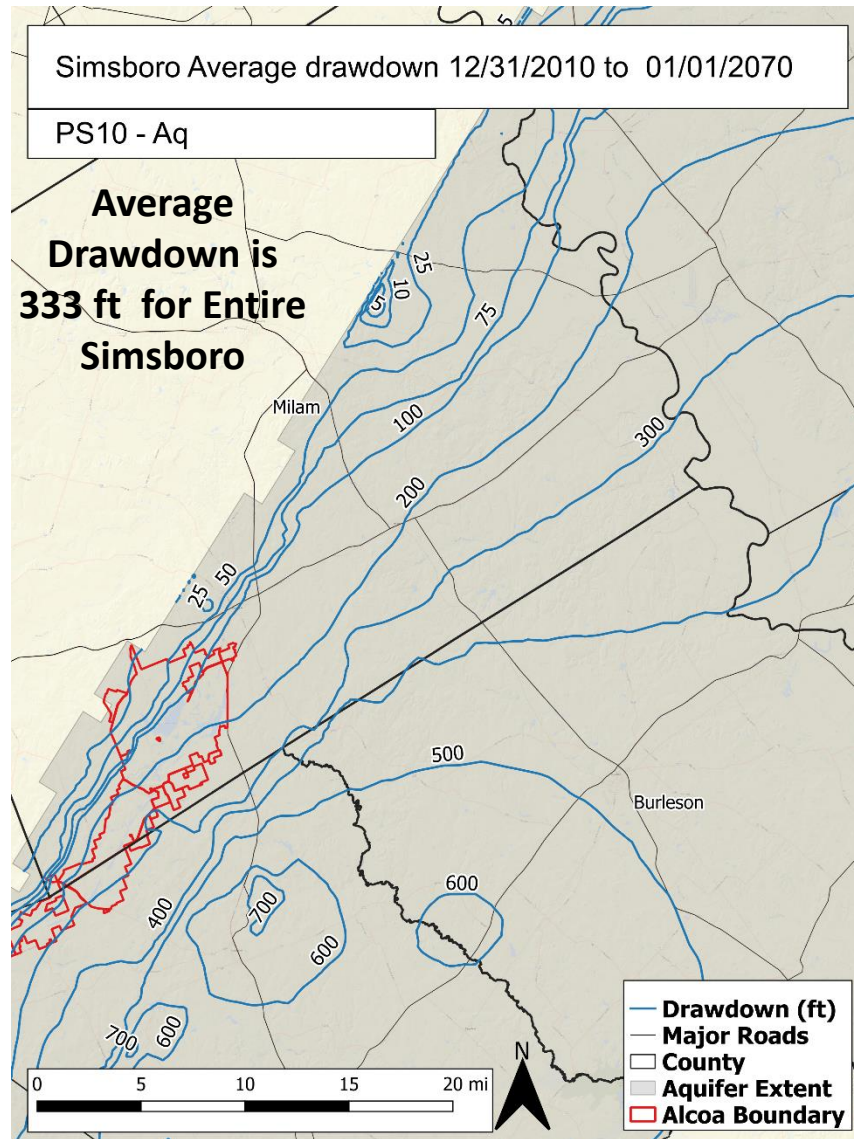
GAM Simulation	Average Simsboro Drawdown since 2010				
	2030	2040	2050	2060	2070
PS-10	185	252	296	327	356
B-4	194	263	309	342	373
No Historic Pumping after 2039	194	261	302	332	361

Simsboro Aquifer  
(unconfined layer)

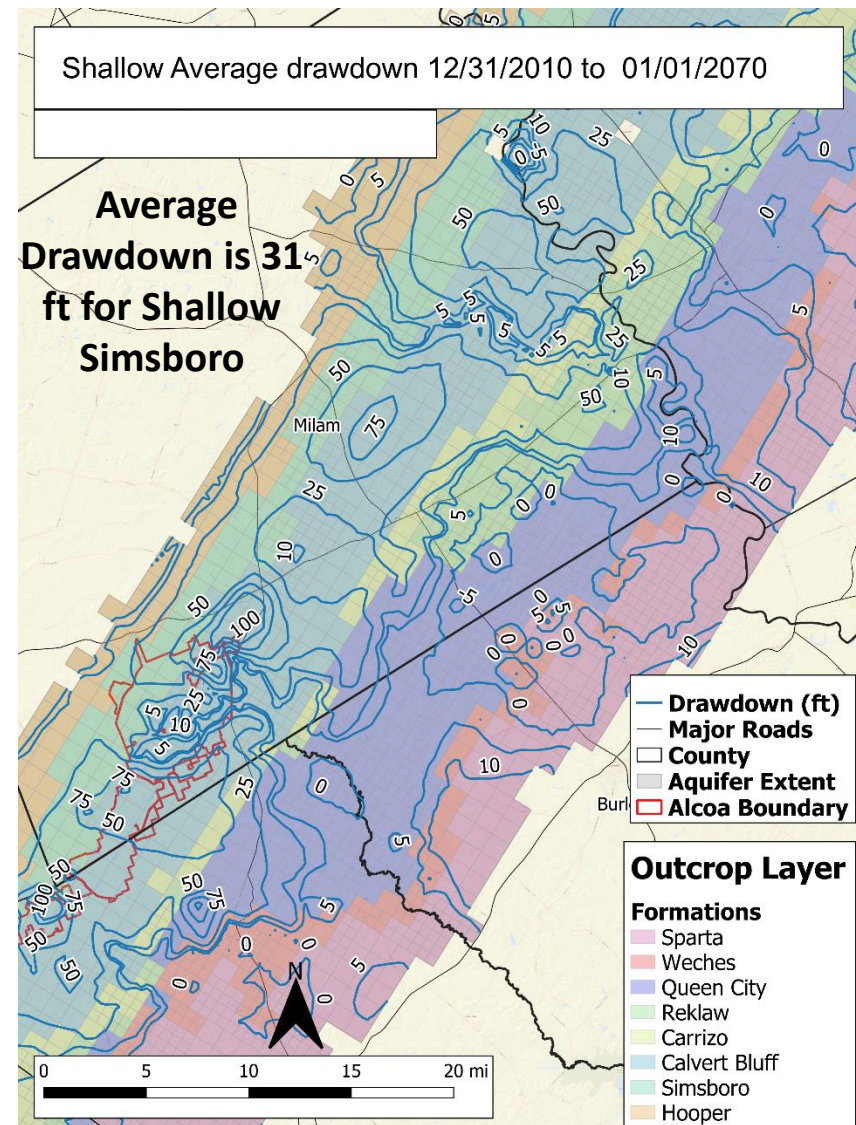
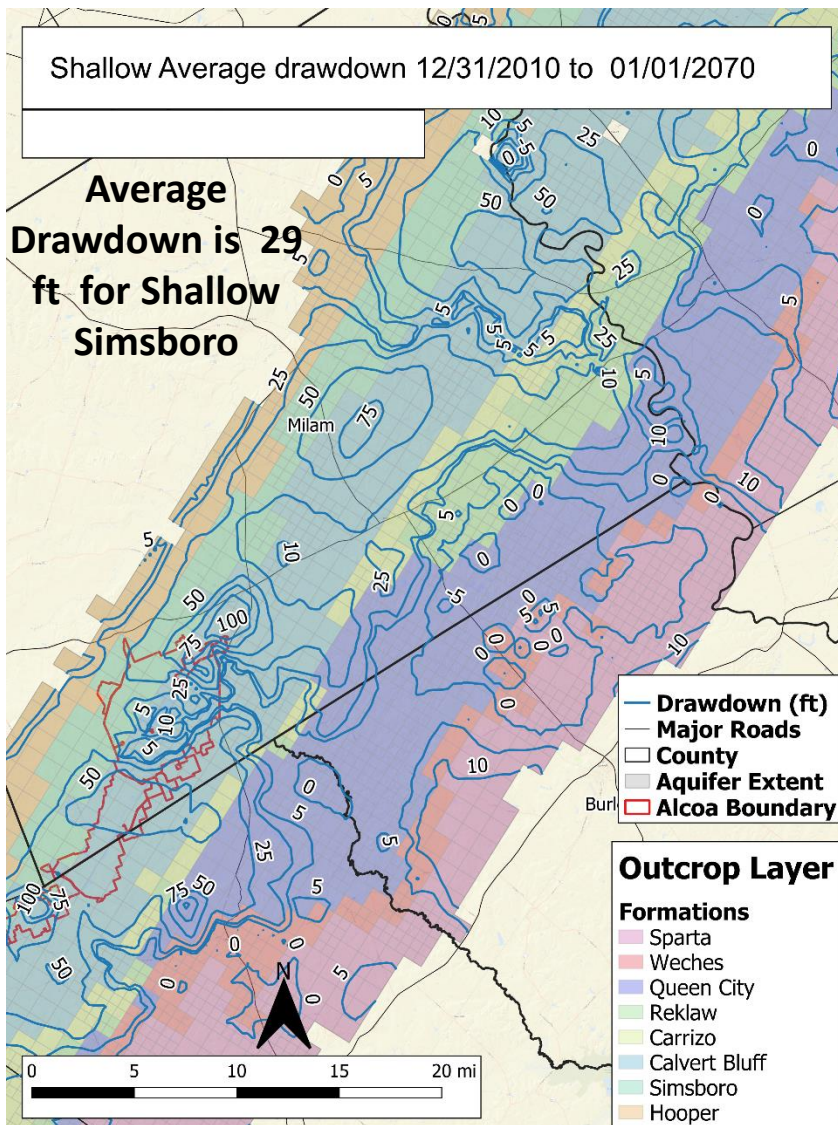
GAM Simulation	Average Simsboro Drawdown since 2010				
	2030	2040	2050	2060	2070
PS-10	6	11	17	23	29
B-4	6	12	19	25	31
No Historic Pumping after 2039	6	12	18	24	30

\*ALCOA calculates are ~15 ft above INTERA's values

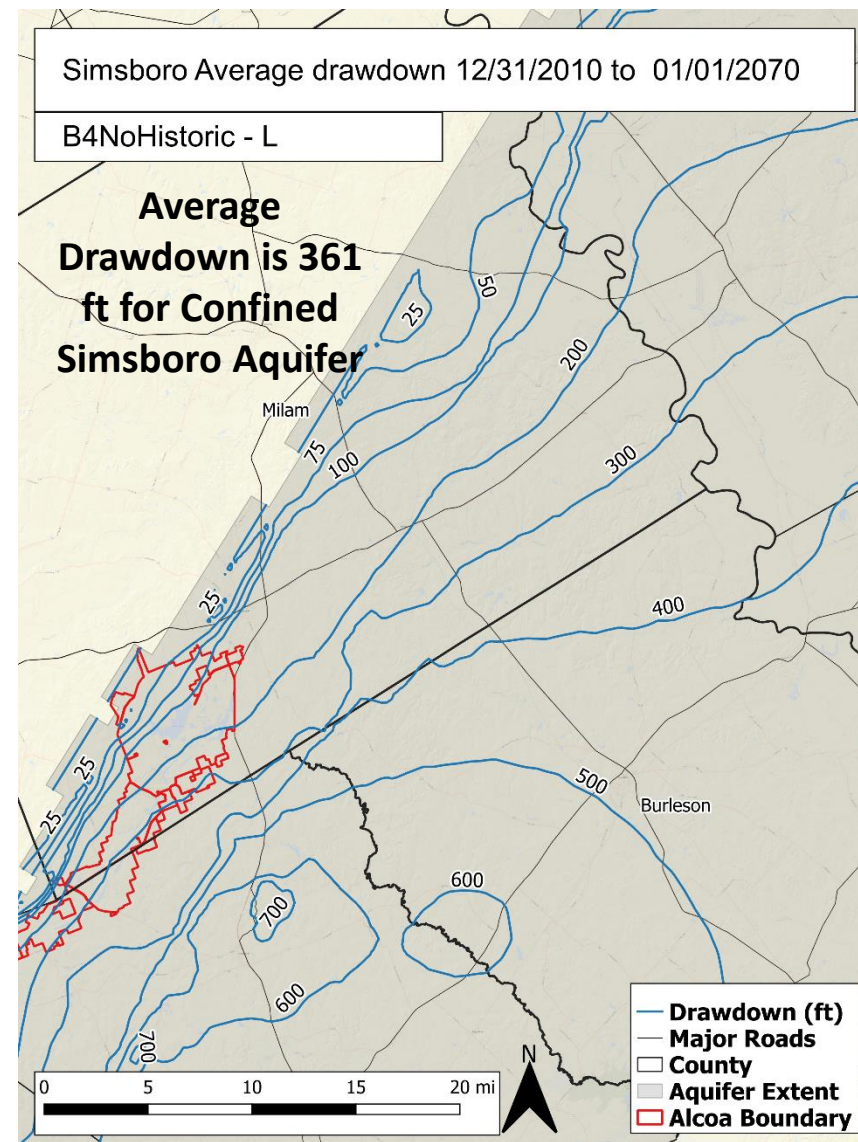
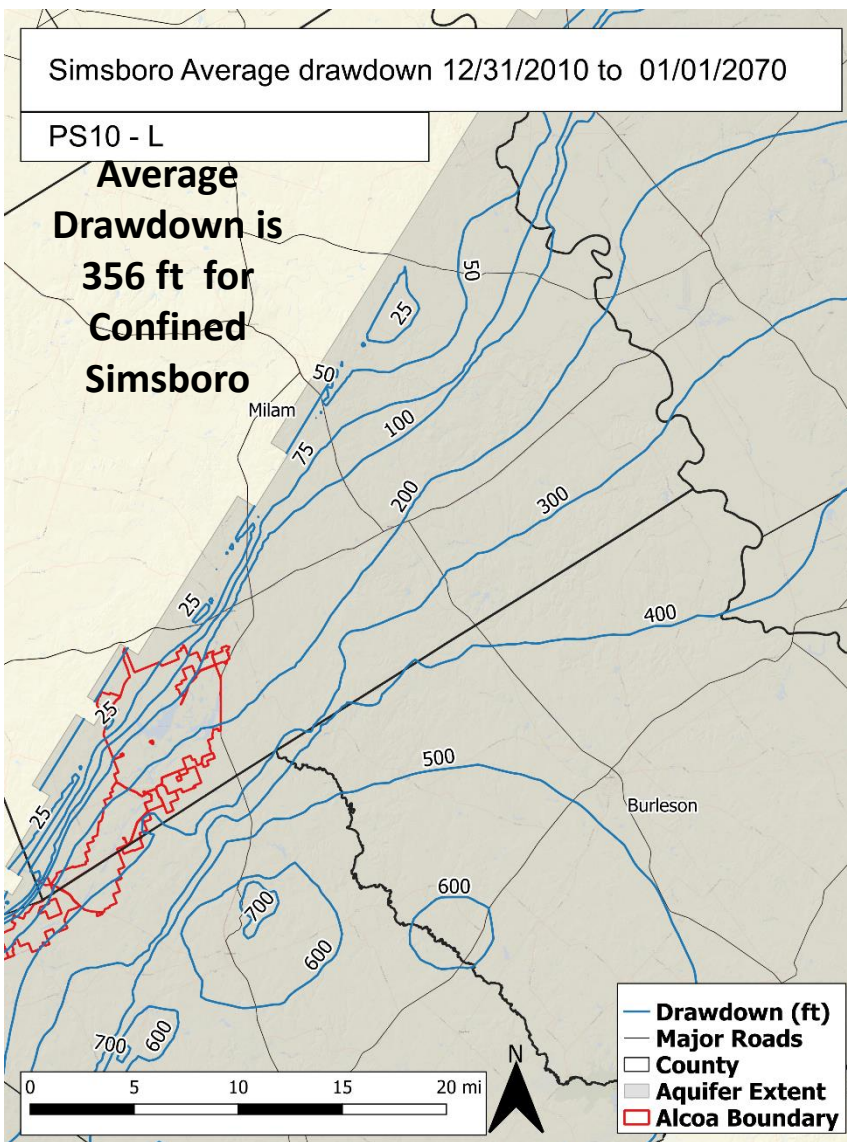
# Drawdown Contours from 2010 to 2070 for Simsboro Aquifer



# Drawdown Contours from 2010 to 2070 for Shallow Aquifer Layer



# Drawdown Contours from 2010 to 2070 for Shallow Aquifer Layer



# Rule 4.3 Monitoring Requirement -

2. Each well that is part of an operating permit with an aggregate withdrawal of 10,000 AFY or more, shall have monitoring equipment reasonably required by the District and be capable for use as a monitoring well. If a well from that aggregate has a production capacity of less than 500 gpm, then the District may consider removing the requirement of monitoring equipment for that well.
3. The monitoring equipment reasonably required by the District shall include the capability to automatically measure water levels in the well and to automatically measure cumulative discharge rates.
  - a. The equipment for measuring water levels will consist of a transducer, a sonic water level, or equivalent technology capable of measuring within an accuracy of 0.1 ft. The water level measuring equipment shall interface with software capable of recording measurements at hourly intervals.
  - b. The equipment for measuring discharge will consist of an inline totalizing water meter that satisfies Rules 11.2.2, 11.2.3, 11.2.4. The discharge measuring equipment will interface with software capable of recording measurements of cumulative flow at hourly intervals.
  - c. The District will have access to the monitoring equipment for the purpose of inspection. The District will give the permittee a notice for inspection not less than seven calendar days prior to the date of the inspection.

# Summary of Findings

- Well Locations

- Proposed locations for wells OP-1 and OP-3 differ by 700 and 1,000 feet from locations in 2012 permit
- Location of existing well E-1/A-9-4 differs by 120 feet from locations in 2012 permit

- Aquifer Assignments

- GAM surfaces are not reliable for assigning aquifers across southwest portion of Alcoa property
- 55 of 56 wells are screened primarily in Simboro
- F2 Sims appears to be screened in Calvert Bluff, but geophysical log appears to be an outlier

# Summary of Findings

- Well Spacing
  - Meet requirements for closest existing well based on both ALCOA's & INTERA's calculations (both calculations agree)
  - Meet requirements for closest property boundary based on ALCOA's and INTERA's calculations (calculations agree for 13 wells)
- Model Simulations
  - Assumptions regarding representation of ALCOA's historical use from 2022 to 2038 in GMA 12 DFC GAM runs needs to be revisited
  - Rule 7.14 should be considered when evaluating drawdowns
  - Average drawdowns is an appropriate metric for evaluating impacts of the permit because DFCs are based on average drawdowns
  - The “No Historical Pumping after 2038” is an appropriate GAM simulation for evaluating impacts of permit
  - The difference in the average drawdown between “No Historical Pumping after 2038” and PS-10 simulations is within the error limits of the model

# Summary of Findings

- Monitoring Will be Required
  - District rules require monitoring equipment for water level and pumping to be installed
  - Districts rules require reporting
  - May be beneficial to address ALCOA's approach to monitoring requirements



Questions ?