

# Basin Management Objective Revisions

Technical Advisory Committee

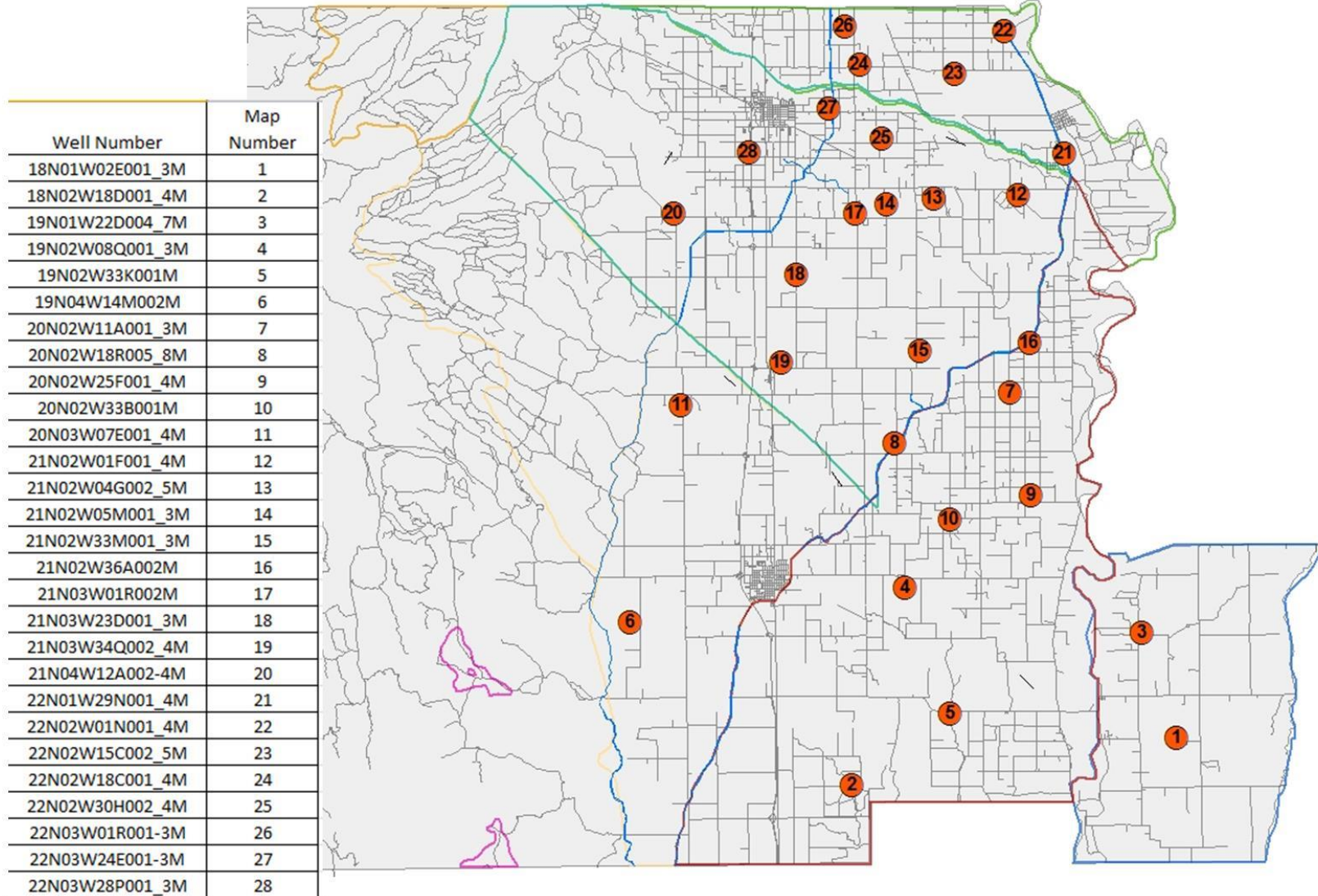
November 2, 2015

# Review of August TAC meeting

- Introduced potential BMO method
- Goal: Balance protection/responsible growth
- Accounts for:
  - Current well infrastructure
  - Groundwater levels
  - Seasonal fluctuations
- Sensitive to varying groundwater conditions
- Timeline for sustainability

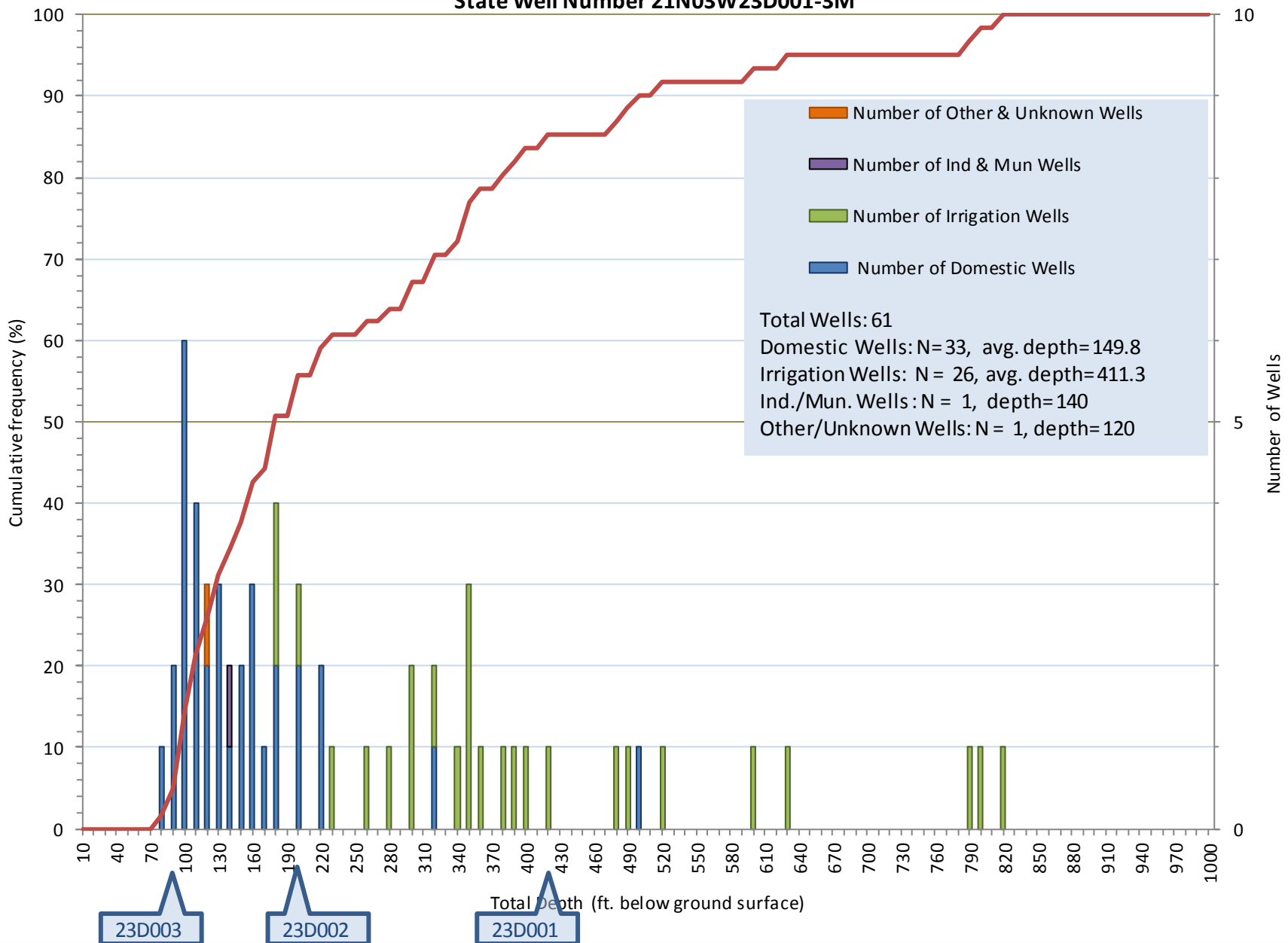


# Proposed Monitoring Network (Dedicated Monitoring Wells)

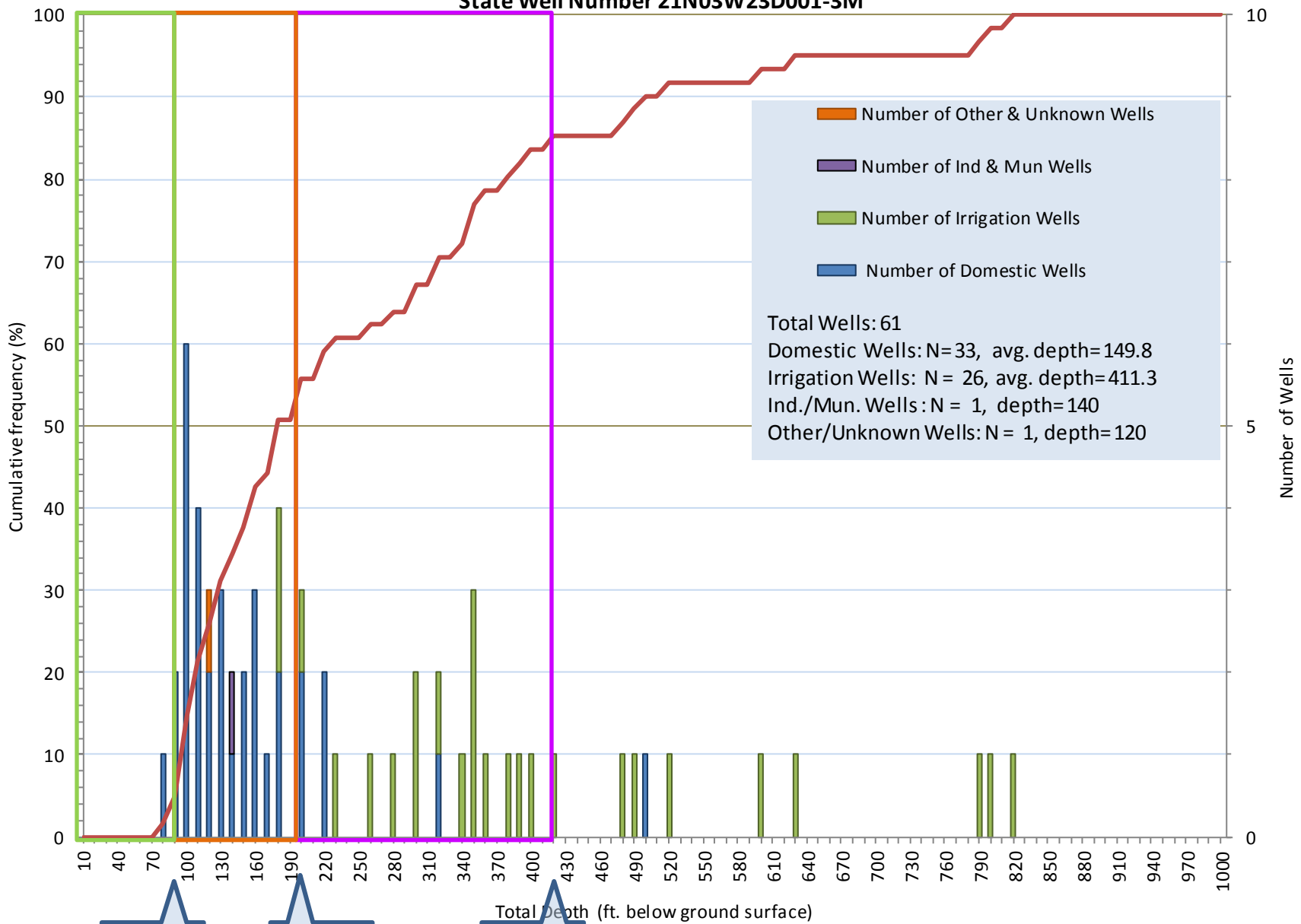


# Selecting a Representative Zone

## Wells Installed From 1970 to 2014 Within 9 Square Miles Surrounding State Well Number 21N03W23D001-3M



## Wells Installed From 1970 to 2014 Within 9 Square Miles Surrounding State Well Number 21N03W23D001-3M



23D003

3

23D002

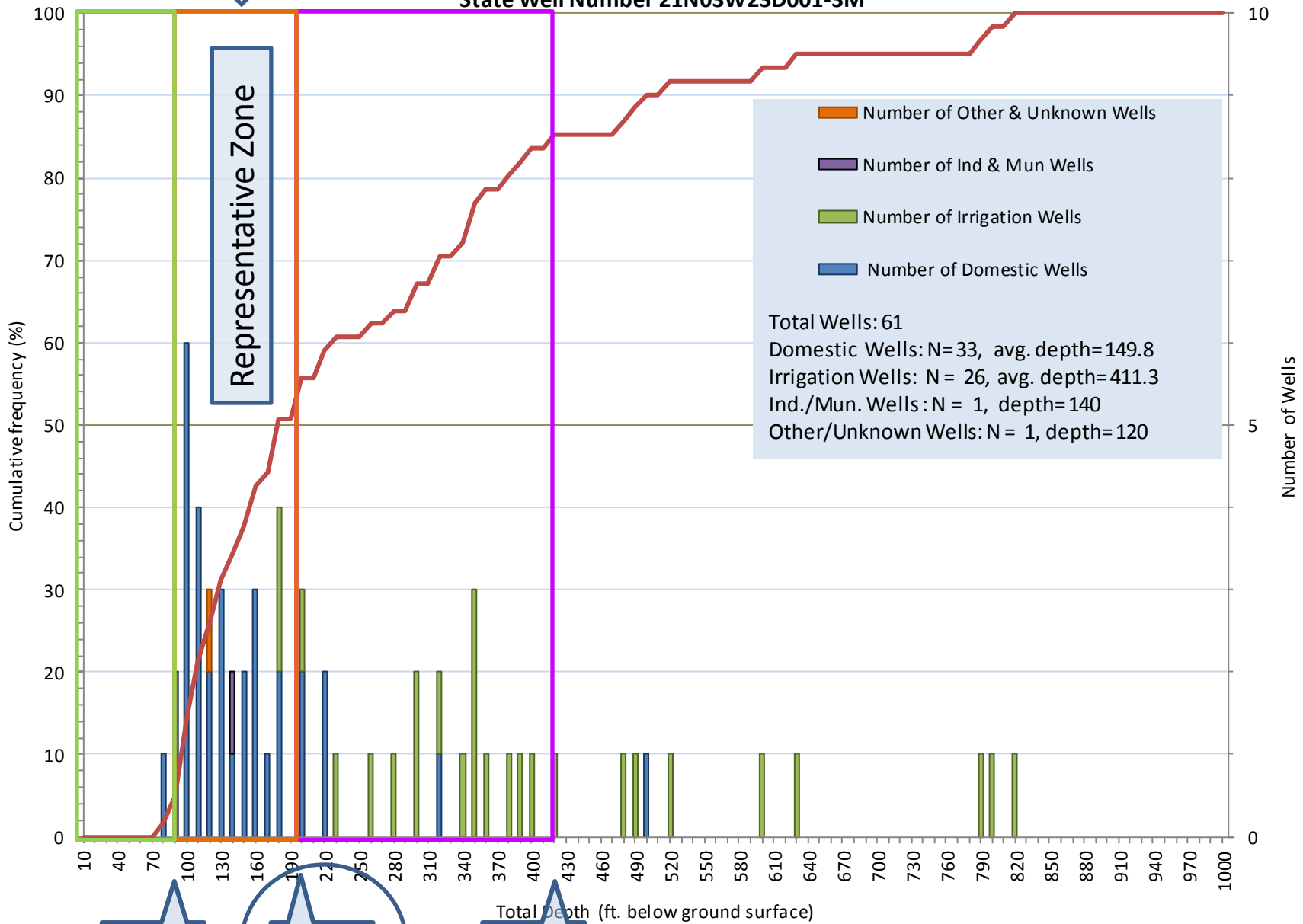
31

Total Depth (ft. below ground surface)  
23D001

18

9 unrepresented

Wells Installed From 1970 to 2014 Within 9 Square Miles Surrounding  
State Well Number 21N03W23D001-3M



23D003

3

23D002

31

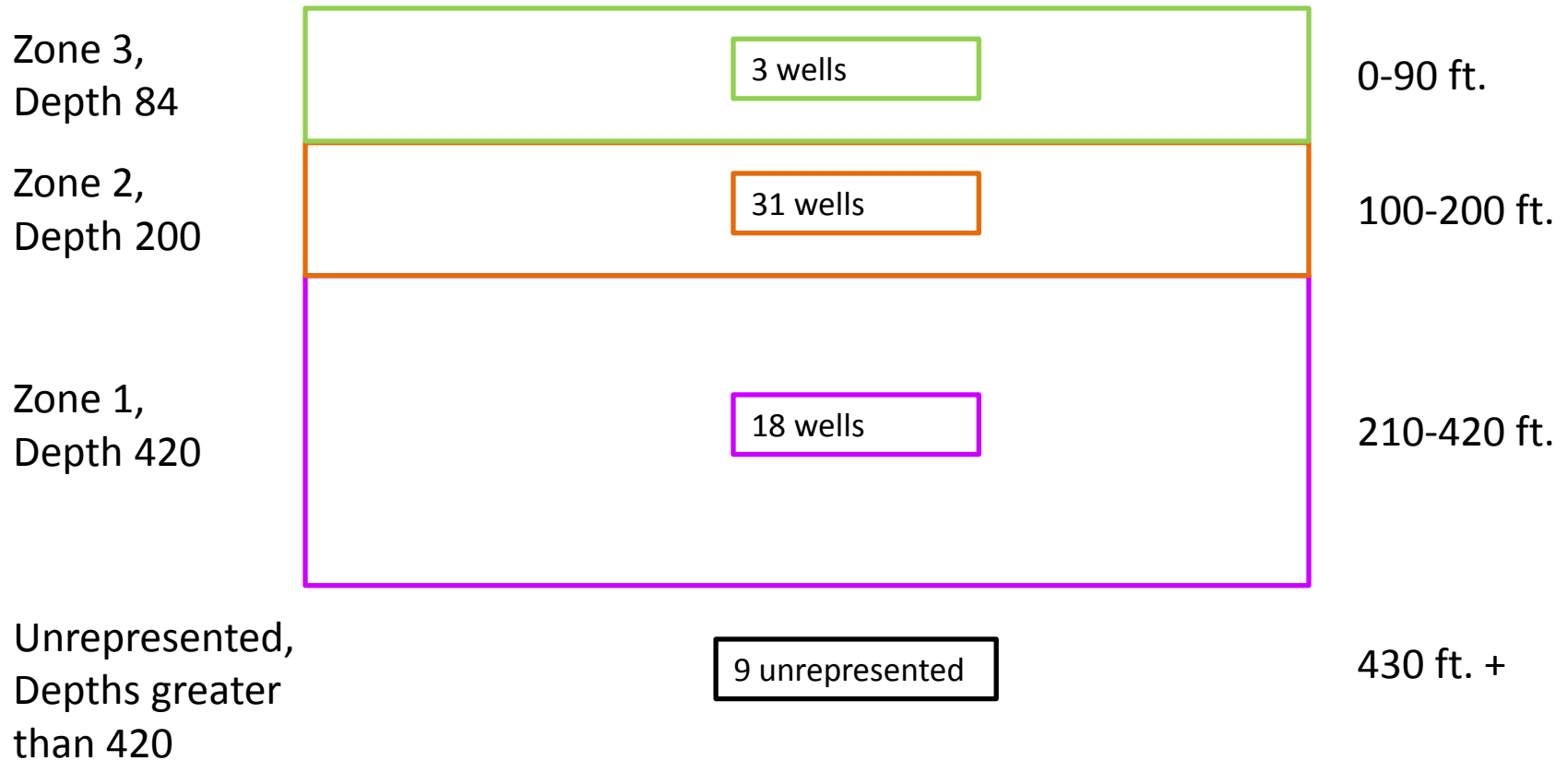
Total Depth (ft. below ground surface)  
23D001

18

9 unrepresented

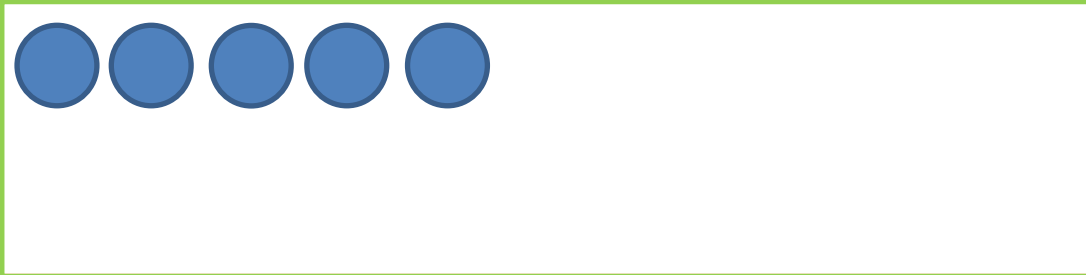


# Cross Section



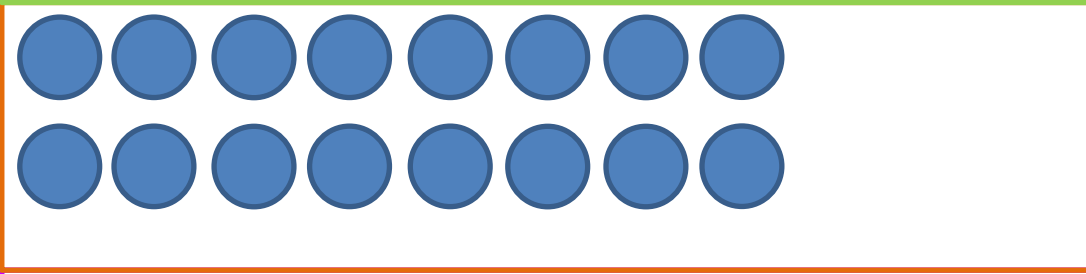
# Representative Zone by Depth

5



0-200 ft.

16



210-400 ft.

4



410-600 ft.

2

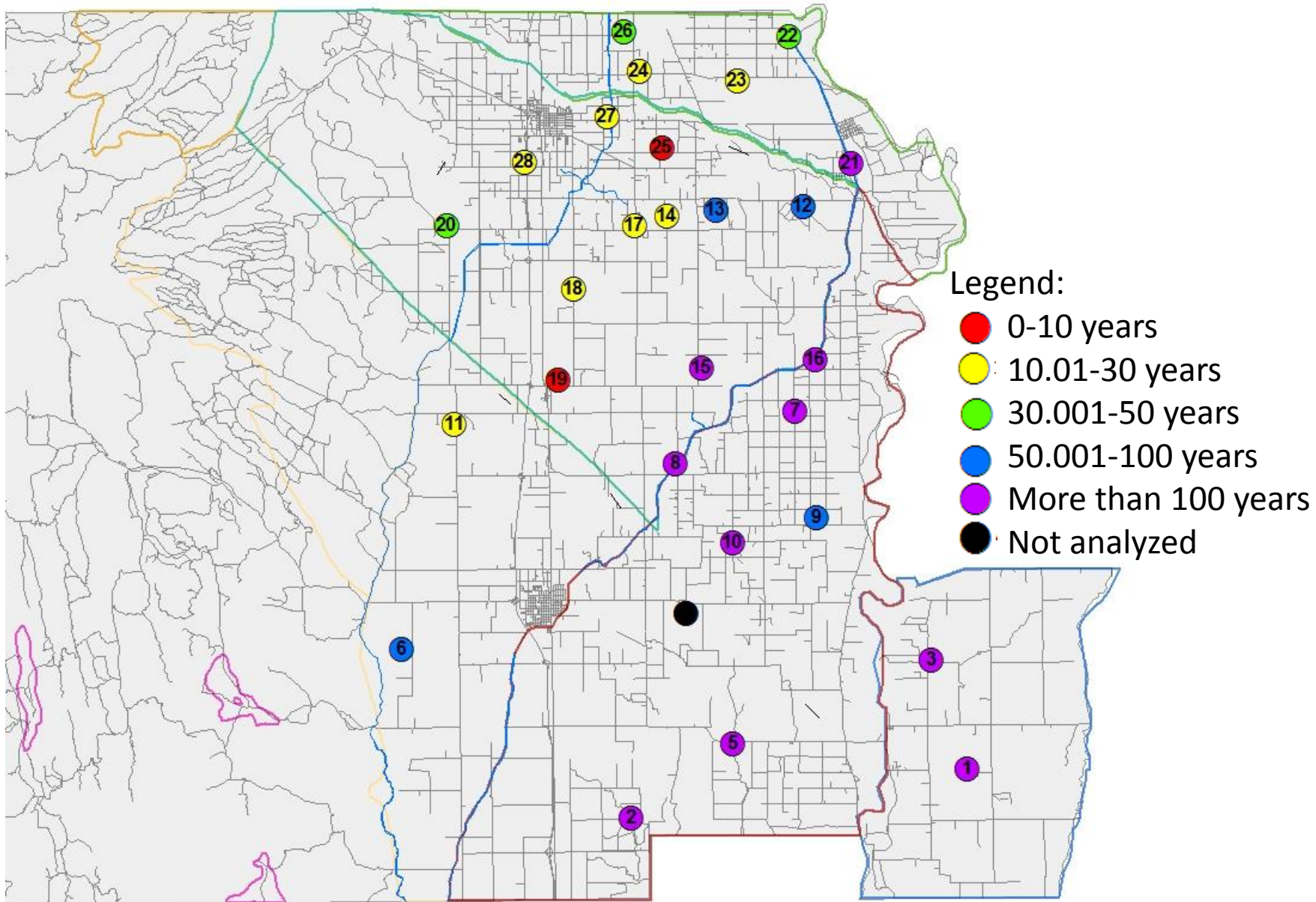


610-1000 ft.

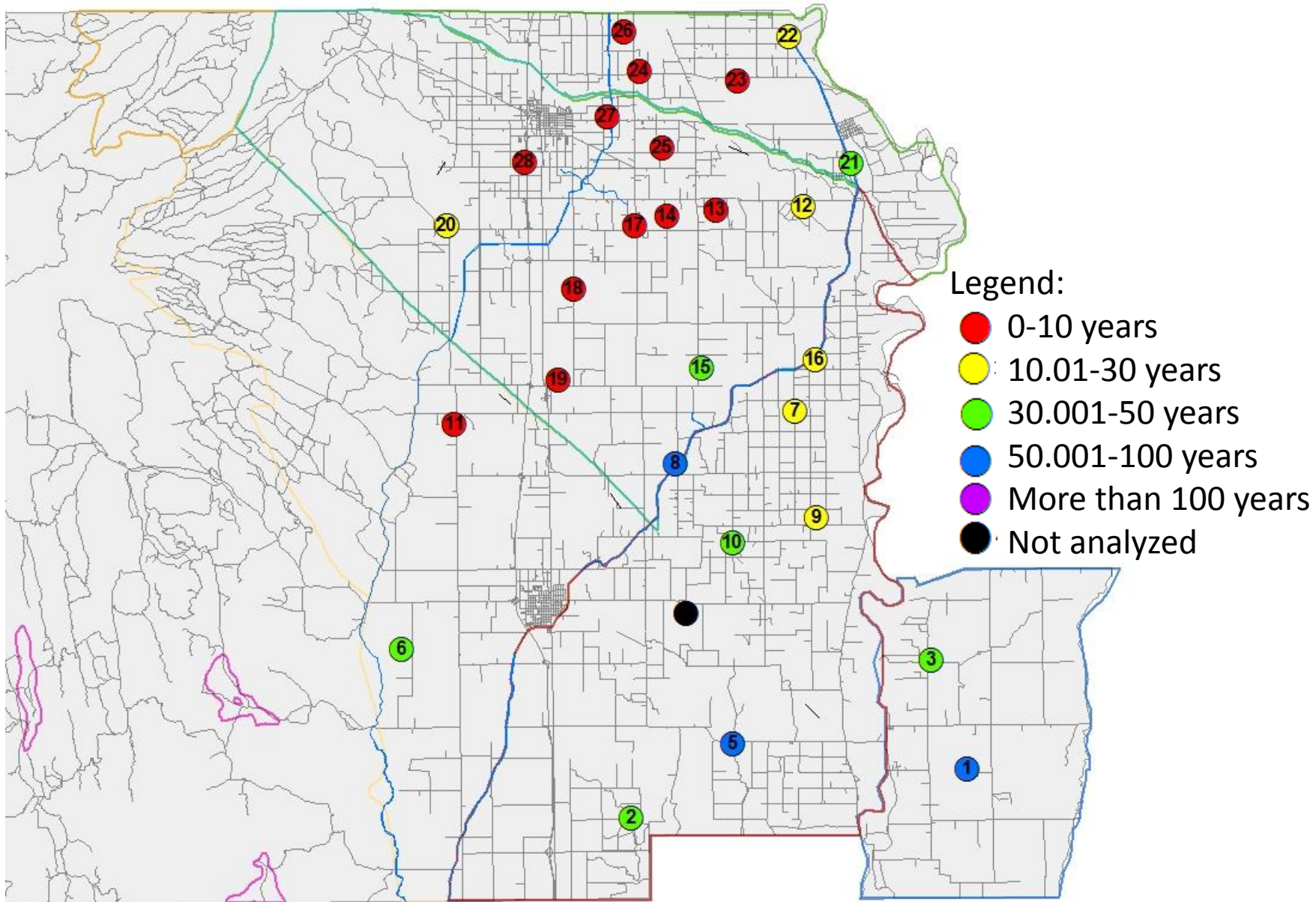
# Summary

MAP WELL NO	WELL DEPTH (FT)	WELLS WITHIN 9 SQ MILES	NUMBER OF WELLS REPRESENTED	DEPTH OF ZONE REPRESENTED (FT)	2014 LOW DEPTH TO GW (FT)	OBSERVED ANNUAL RATE OF CHANGE (FT/YR)	50% MAX WELL DEPTH CATEGORY	PROJECTED NUMBER OF YEARS TO REACH 50% MAX WELL DEPTH CATEGORY AT THE OBSERVED ANNUAL RATE OF CHANGE
1	200	34	19	0-200	30.44	-0.8	170	174.5
2	280	13	11	0-280	44.22	-0.7	240	279.7
3	380	41	26	130-380	41.94	-0.5	260	436.1
5	260	14	10	0-260	11.9	-0.1	250	2381
6	147	21	8	0-150	32.15	-1.5	160	85.2
7	510	27	13	170-510	37.7	-0.5	150	224.6
8	225	32	25	0-230	15.19	-0.6	190	291.4
9	283	34	14	120-290	31.67	-1.8	150	65.7
10	320	25	22	0-320	13.66	-0.2	160	731.7
11	515	31	16	170-520	183.81	-14.2	480	20.9
12	385	42	21	130-390	72.79	-1.5	180	71.5
13	327	55	33	110-330	91.82	-1.9	220	67.5
14	490	105	55	180-490	98.89	-4.3	180	18.9
15	210	37	20	0-210	39.53	-0.8	200	200.6
16	145	47	25	0-150	38.78	-0.5	150	222.4
17	255	65	40	0-255	109.55	-6	210	16.7
18	200	61	31	100-200	79.69	-3.4	180	29.5
19	720	86	72	120-720	134.17	-8.2	170	4.4
20	659	32	19	340-660	253.23	-8.1	560	37.9
21	400	60	40	130-400	48.1	-1	190	141.9
22	440	52	29	120-440	54.53	-1.9	140	45
23	258	70	39	110-260	113.26	-2.5	170	22.7
24	188	178	95	100-190	102.96	-2.5	140	14.8
25	291	200	139	100-300	99.57	-4.8	140	8.4
26	314	87	52	120-320	103.21	-1.4	150	33.4
27	225	263	188	100-230	87.96	-3.3	130	12.7
28	304	421	397	80-310	94.12	-2	120	12.9

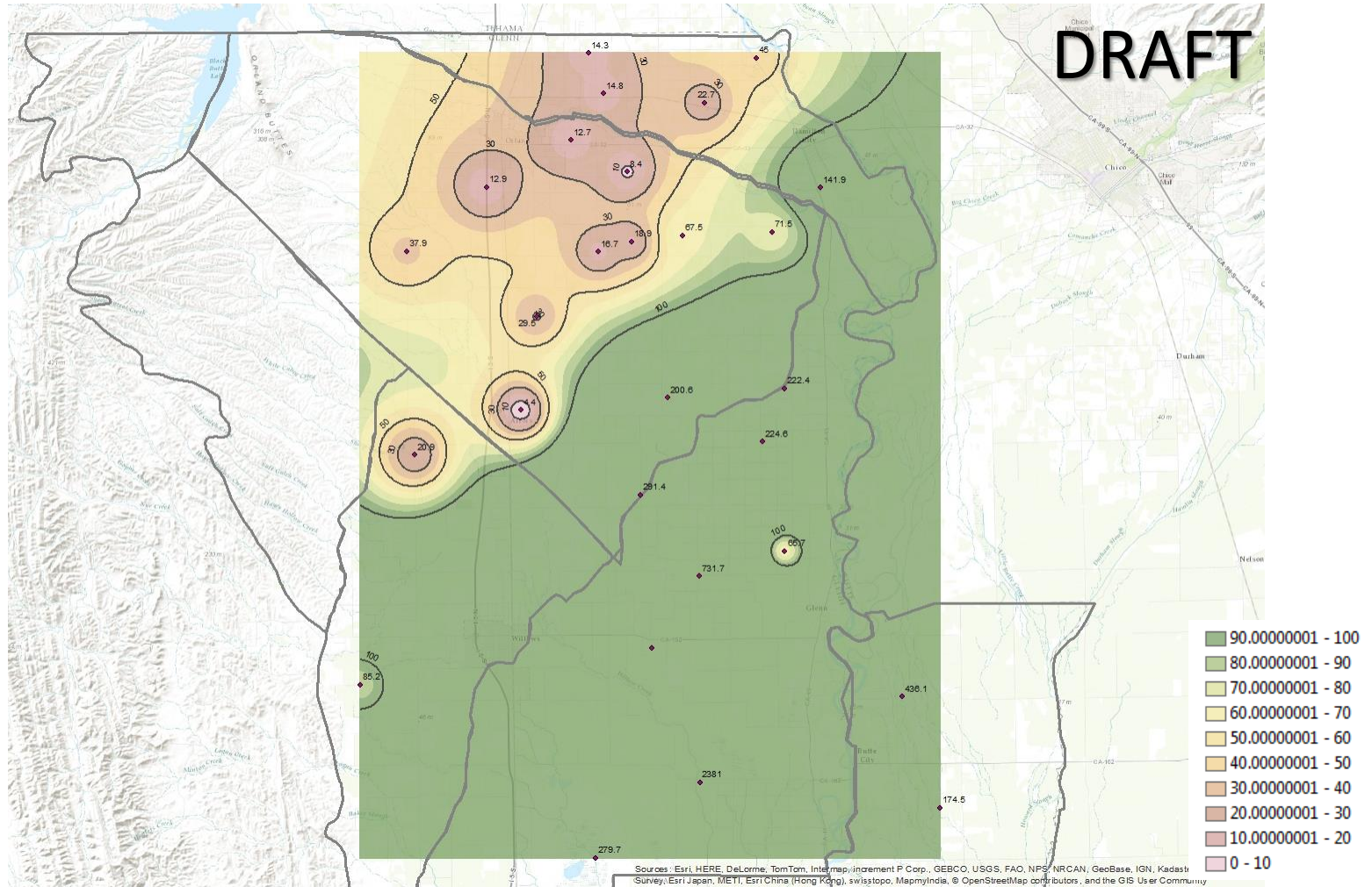
# Projected Number of Years to Reach 50% Max Well Depth at the Current Rate of Change in the Representative Well Zones



# Projected Number of Years to Reach 50% Max Well Depth at a Moderately High Rate of Change in the Representative Well Zones



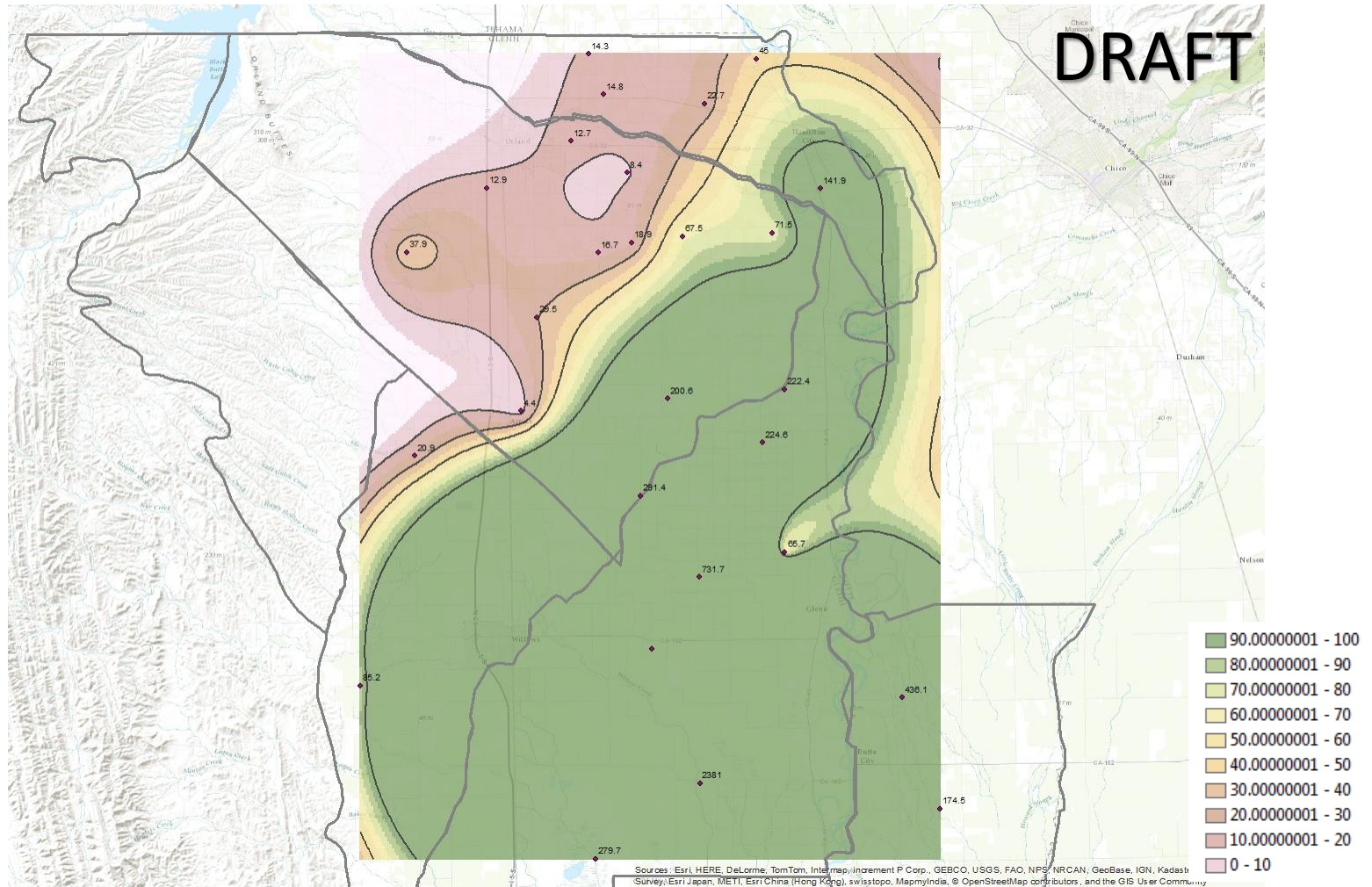
# Example Contour #1



Contours representing years at current rate of change to reach the 50% max well depth category of each representative well.



# Example Contour #3



Contours representing years at current rate of change to reach the 50% max well depth category of each representative well.



# Discussion

- Other Options??
- Recommendation/Update to the WAC

# Potential BMO Stage Alert Levels

- How many levels?
  - Example: 4 levels including monitoring, outreach/voluntary, minimal regulation, regulation

# Potential BMO Actions

- What types of actions could be associated with each level?
  - Examples could include:
    - Monitoring
    - Specific Outreach
    - Voluntary actions
    - Recharge requirements
    - Specific permit requirements
    - Limit pumping amount
    - Reporting requirements

# When to Rescind BMO Actions/Levels

- Examples could include:
  - When rate of decline stabilizes (equals 0)
  - When specific actions have been taken

Summary of Representative Zone  
Draft

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								(M-I)/J
1	200	34	19	0-200	30.44	-0.8	170	174.5
2	280	13	11	0-280	44.22	-0.7	240	279.7
3	380	41	26	130-380	41.94	-0.5	260	436.1
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27	225	263	188	100-230	87.96	-3.3	130	12.7
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## 2015 Groundwater Quality Summary

WELL	2015 TEMP (°C)	2015 pH	2015 EC (µs/cm)
<b>SUB- AREA 3</b>			
1	22.1	7.9	324
2	NM	NM	NM
3	NM	NM	NM
<b>SUB- AREA 4</b>			
4	19.9	7.8	343
<b>SUB-AREA 5</b>			
6	19.0	7.4	729
7	20.3	7.3	572
<b>SUB-AREA 7</b>			
8	18.9	7.6	615
9 (Average of 6 monitoring wells)	21.1	7.5	745
10	19.8	7.6	650
<b>SUB-AREA 8</b>			
11	NM	NM	NM
12	NM	NM	NM
13	NM	NM	NM
5	NM	NM	NM
<b>SUB-AREA 9</b>			
14	18.2	7.5	1080
15	18.4	7.5	568
<b>SUB-AREA 10</b>			
17	18.4	7.8	678
16	20.2	7.2	409
18	NM	NM	NM
CalWater-Willows (2013 report)	NM	7.9	566
<b>SUB-AREA 11</b>			
19	NM	NM	NM
<b>SUB-AREA 12</b>			
20	19.8	7.9	316
21	NM	NM	NM
<b>SUB-AREA 13</b>			
22	NM	NM	NM
<b>SUB-AREA 14</b>			
23	18.7	7.8	472
24	19.0	7.7	452
25	19.1	7.7	472
<b>SUB-AREA 15</b>			
26	NM	NM	NM
27	18.9	7.6	534

**\*\*\* NO MULTI COMPLETION WELLS INCLUDED**

\*\*\* pH Water Quality Threshold 6.5---8.5

\*\*\* EC Water Quality Threshold <900 µs/cm= Drinking Water <700 µs/cm = Ag water

17 wells sampled

pH-All within normal range

2 monitoring wells/well groups average exceeds the 700 µS/cm agricultural standards

1 well exceeds the 700 µS/cm agricultural standards and 900 µS/cm drinking water standards

## 2015 Groundwater Quality Summary

WELL	TEMP (°C)			pH			EC (µs/cm)		
	2015	Average	Range	2015	Average	Range	2015	Average	Range
<b>SUB- AREA 3</b>									
1	22.1	22.0	21.1-22.9	7.9	7.7	7.1-8.2	324	299	244-325
2	NM	23.0	22.4-24.6	NM	8	7.8-8.3	NM	550	523-593
3	NM	20.5	19.4-21.2	NM	7.9	7.5-8.3	NM	244	191-283
<b>SUB- AREA 4</b>									
4	19.9	19.3	18.0-21.0	7.8	7.7	7.0-8.1	343	310	264-354
<b>SUB-AREA 5</b>									
6	19.0	19.2	18.2-20.7	7.4	7.3	6.9-7.9	729*	630	332-846
7	20.3	20.9	19.3-22.9	7.3	7.2	6.4-8.1	572	443	226-572
<b>SUB-AREA 7</b>									
8	18.9	19.0	17.9-20.3	7.6	7.5	7.0-7.9	615	558	458-636
9 (Average of 6 monitoring wells)	21.1	19.9	18.3-22.9	7.5	7.6	7.3-8.0	745*	674	576-800
10	19.8	19.7	18.5-20.5	7.6	7.5	7.0-8.1	650	585	473-665
<b>SUB-AREA 8</b>									
11	NM	18.7	16.9-20.7	NM	7.5	7.1-7.8	NM	682	457-868
12	NM	18.9	17.6-20.4	NM	7.7	7.3-8.1	NM	526	253-668
13	NM	20.1	19.4-21.3	NM	7.5	7.0-7.9	NM	436	240-481
5	NM	19.7	18.7-21.0	NM	7.4	7.0-8.1	NM	462	247-529
<b>SUB-AREA 9</b>									
14	18.2	18.3	17.3-19.7	7.5	7.4	7.0-7.6	1080*	941	495-1083
15	18.4	19.0	17.7-21.3	7.5	7.3	6.4-7.8	568	600	419-744
<b>SUB-AREA 10</b>									
17	18.4	18.8	18.2-20.0	7.8	7.6	7.1-8.0	678	582	303-796
16	20.2	20.1	19.0-21.2	7.2	7.1	6.5-7.7	409	386	207-480
18	NM	19.1	18.2-20.0	NM	7.4	6.9-7.8	NM	679	421-818
CalWater-Willows (2014 report)	NM	NM	NM	7.9	7.9	7.9-8.1	566	530	409-566
<b>SUB-AREA 11</b>									
19	NM	19.5	18.5-20.9	NM	7.7	7.5-7.9	NM	451	359-653
<b>SUB-AREA 12</b>									
20	19.8	19.6	19.0-20.7	7.9	7.9	7.2-8.3	316	284	239-316
21	NM	19.9	19.0-20.9	NM	7.9	7.5-8.3	NM	301	260-344
<b>SUB-AREA 13</b>									
22	NM	19.6	18.6-20.5	NM	7.7	7.3-8.4	NM	442	395-486
<b>SUB-AREA 14</b>									
23	18.7	18.9	18.0-19.9	7.8	7.7	7.1-8.1	472	433	358-484

## 2015 Groundwater Quality Summary

WELL	TEMP (°C)			pH			EC (µs/cm)		
	2015	Average	Range	2015	Average	Range	2015	Average	Range
24	19.0	18.6	17.7-20.1	7.7	7.7	7.0-8.0	452	406	358-467
25	19.1	19.1	18.5-19.9	7.7	7.7	7.3-7.9	472	438	369-493
<b>SUB-AREA 15</b>									
26	NM	19.8	18.2-21.7	NM	7.9	7.6-8.0	NM	463	278-678
27	18.9	19.0	17.8-19.8	7.6	7.6	7.1-8.2	534	537	388-619

\* exceeds the EC Water Quality Threshold for agricultural water standards

Notes:

**NO MULTI COMPLETION WELLS INCLUDED**

pH Water Quality Threshold 6.5---8.5

EC Water Quality Threshold <900 µs/cm= Drinking Water <700 µs/cm = Ag water

Averages and ranges calculated on period of record

17 wells sampled for the 2015 season