

Interim Year 2 Environmental Conditions Colorado River Corridor



Public Meeting
October 27, 2014



Study Team

Travis County

City of Austin

Lower Colorado River Authority

Dr. Jack Sharp

URS Corporation

Introduction

- URS was selected as the lead contractor to provide professional services to Travis County TNR
- Services include groundwater, air, and noise environmental monitoring at planned TXI Hornsby Bend mining site
- Dr. Sharp (UT Jackson School of Geology) performed third party independent technical oversight
- Stake Holders Include
 - Local residents
 - TXI (mining)
 - Local farmers, ranchers, and nurseries
 - Travis County, LCRA, and City of Austin

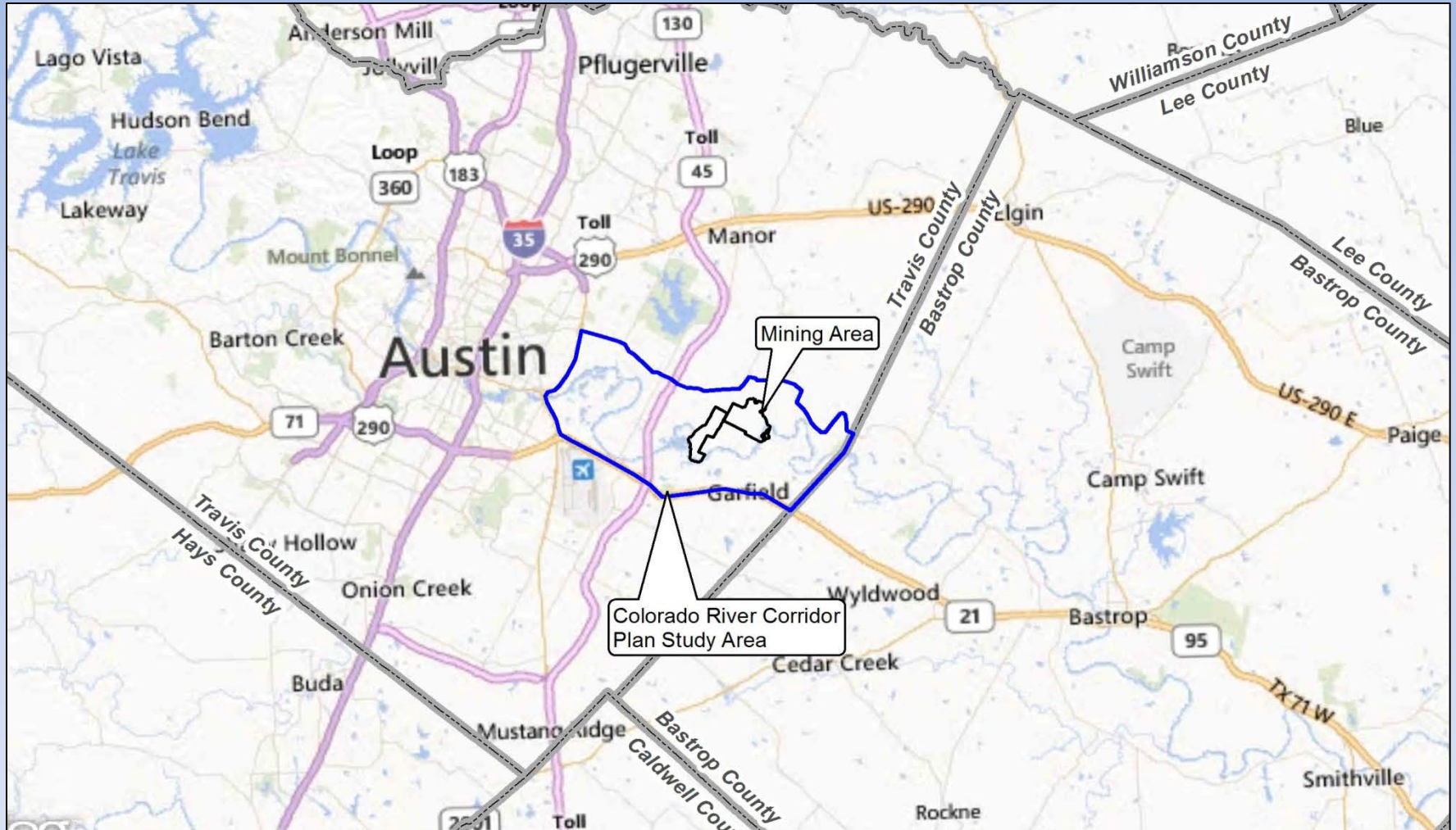
Ranch Land West of Planned Mining Area and Planned Mining Area in Background



Objectives

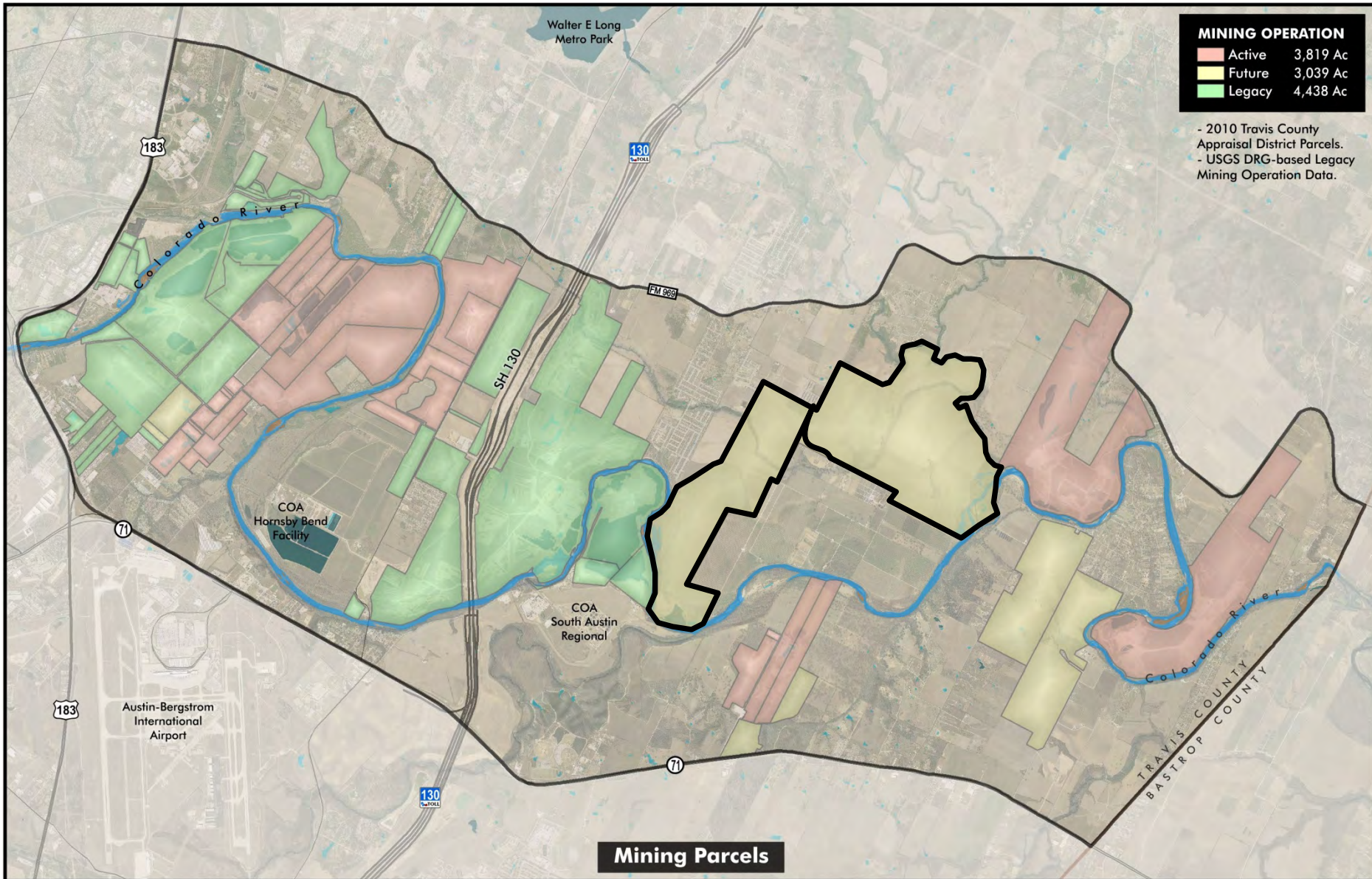
- Establish baseline environmental conditions prior to active mining operations beginning at Hornsby Bend mine site to determine if operations have an impact
 - Groundwater (Availability and Quality)
 - Air Quality
 - Noise
- Update groundwater baseline with interim data, i.e after the baseline year and prior to mining
- Continue monitoring after mining commences and compare results to the pre-mining conditions

Regional Site Map



Study area located in southeast Travis County

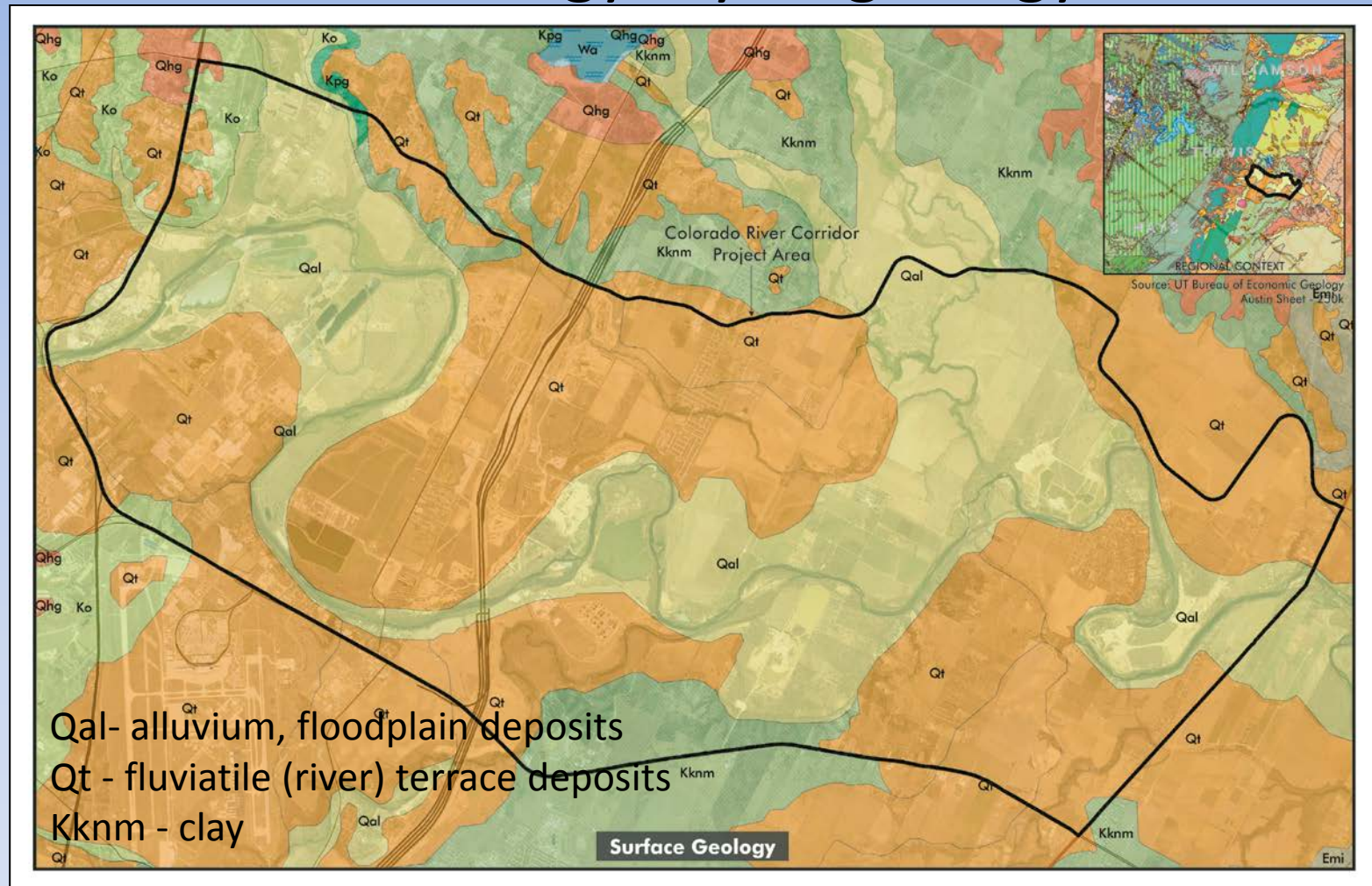
TXI's Hornsby Bend East and Hornsby Bend West Mining Sites



Planned Mining Area within the Hornsby Bend East Site



Site Geology, Hydrogeology



Geology - Shallow alluvial sand and gravel deposits ~10 to 60 feet thick overlying the Navarro and Taylor clay and shale

Hydrogeology - Colorado River Alluvial Aquifer; shallow unconfined aquifer with recharge from precipitation

Gravel



Task 1 - Groundwater

- Baseline Year (October 2011 to May 2012)
 - Well Inventory – reviewed TWDB well database and met with property owners to identify 10 wells for monitoring
 - Well top of casing elevation and location (X,Y) surveyed
 - Groundwater levels and basic water quality samples collected during six baseline year events
- Interim Year 1 (May 2012 to June 2013)
 - Quarterly groundwater levels
 - Annual basic water quality sample collected and included additional analysis for organics (TPH, PAHs, and VOCs)
- Interim Year 2 (June 2013 to May 2014)
 - Quarterly groundwater levels and TPH
 - Annual basic water quality sample collected

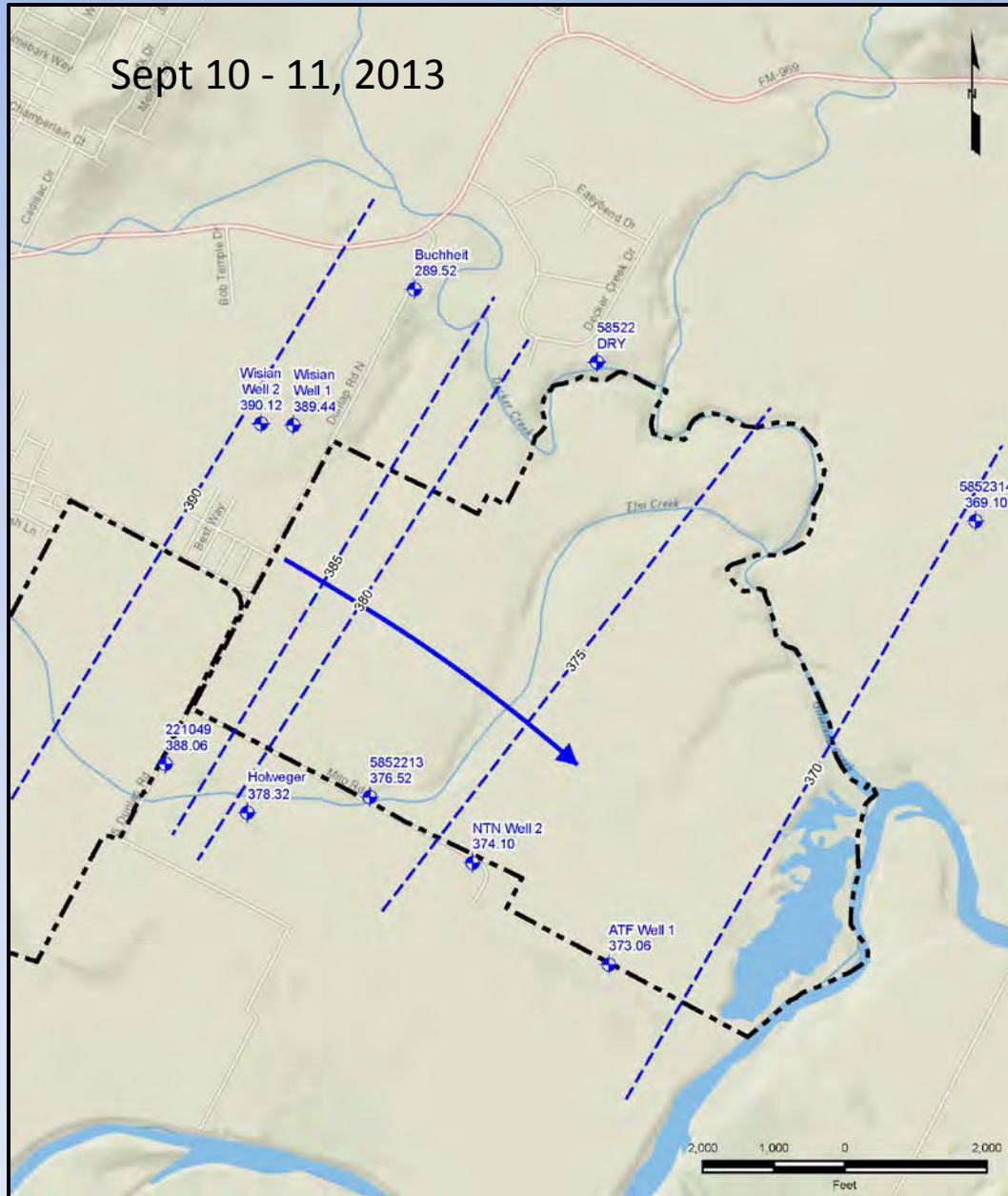
Survey Well Location and Top of Well Casing Elevation



Measuring Depth to Water with Water Level Indicator

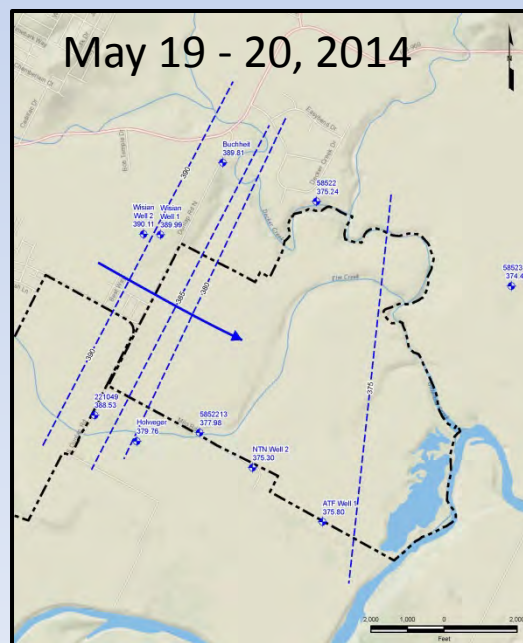
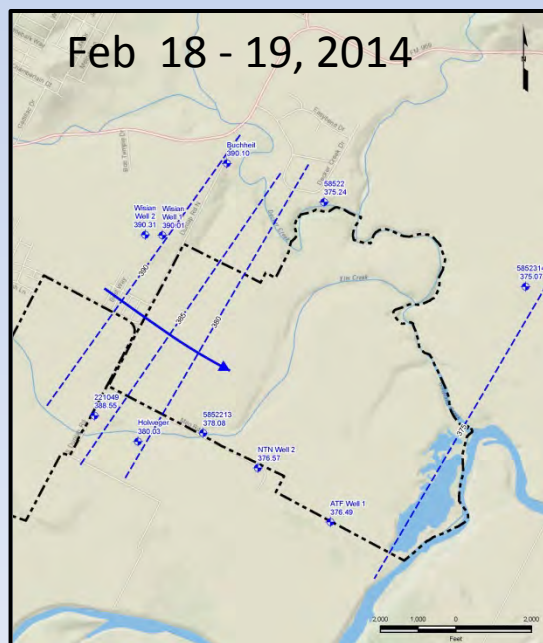


Groundwater Potentiometric Surface



Potentiometric Surface Contour (Dashed Where Inferred)

Groundwater Potentiometric Surfaces, September 2013 to May 2014



Potentiometric Surface Contour (Dashed Where Inferred)

Groundwater Elevation Change

Well ID	Baseline Year, October 2011 to May 2012	Interim Year 1, May 2012 to June 2013	Interim Year 2, June 2013 to May 2014	Baseline and Interim Years 1 & 2, October 2011 to May 2014
58522	+ 0.17	NM	NM	- 0.48
221049	+ 1.42	- 0.98	- 0.08	+ 0.36
5852213	+ 1.88	- 1.14	+ 0.77	+ 1.51
5852314	+ 4.85	- 6.10	+ 7.59	+ 6.34
ATF Well 1	+ 1.75	- 1.62	+ 1.57	+ 1.70
Buchheit	+ 0.82	- 0.87	- 0.30	- 0.35
Holweger	+ 1.44	- 0.81	+ 0.42	+ 1.05
NTN Well 2	+ 3.49	- 1.32	+ 0.38	+ 2.55
Wisian Well 1	+ 0.85	- 0.60	- 0.11	+ 0.14
Wisian Well 2	+ 0.67	- 0.37	- 0.21	+ 0.09

Task 1 – Groundwater (continued)

- Groundwater elevation measured every hour continually with pressure transducer in one well (5852213)





Well 5852213

Continuous Water Level Monitoring Equipment

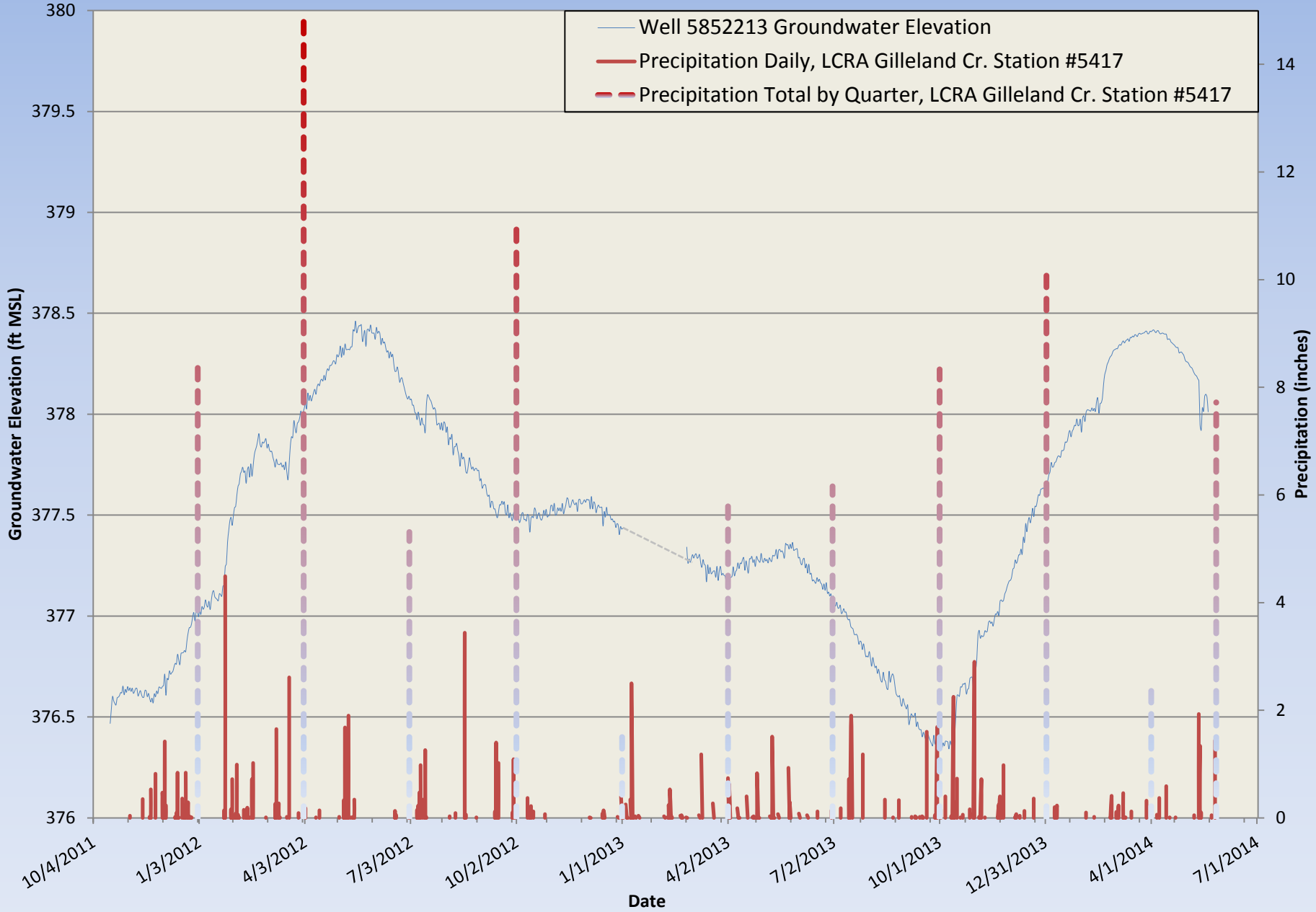


Water Level Pressure
Transducer

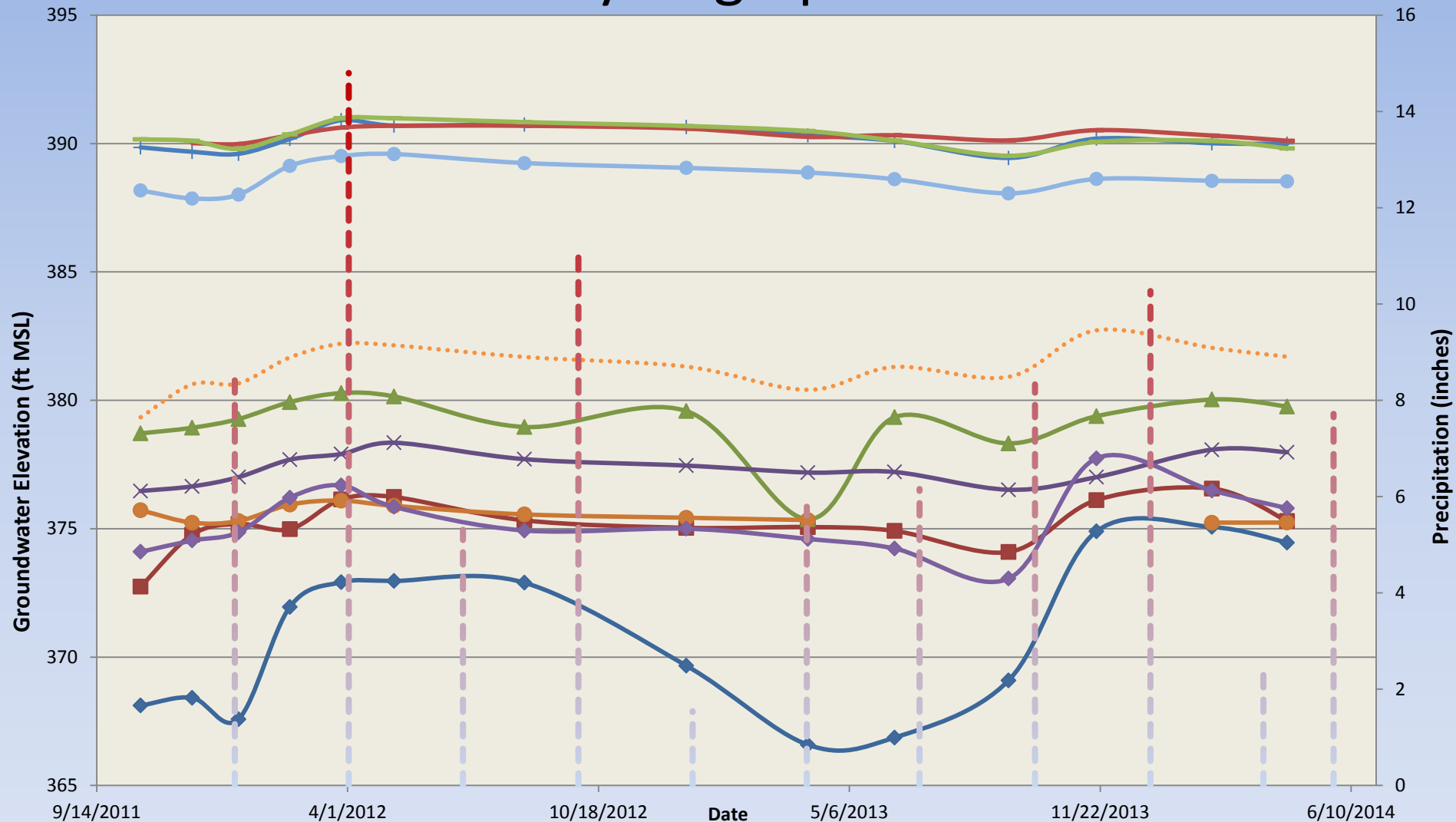
Downloading Water Level
Data from Transducer in
Well 585223



Well 5852213 Hydrograph



Well Hydrographs



Groundwater Availability

- Potentiometric surface ranged from approximately 390 ft to 369 ft above msl during Interim Year 2, and from 390 to 366 ft msl since Oct 2011
- An overall median groundwater rise of 0.7 ft observed from Oct 2011 to May 2014
- Winter and spring 2012 precipitation recharged the aquifer after a dry summer and fall 2011
- Declining water levels from summer 2012 to summer 2013 correspond with below average precipitation
- Rising water levels in fall 2013 and early 2014 correspond with the increased precipitation

Elm Creek by Well 5852213



Dry creek bed



Wet, after rains in
March 2012

Task 1 – Groundwater (continued)

- Analyzed water quality for PAHs, TPH, VOCs and basic water quality parameters including;

- Calcium
- Magnesium
- Potassium
- Sodium
- Ammonia
- Total Suspended Solids
- Chloride
- Fluoride
- Sulfate
- Nitrate
- Carbonate
- Bicarbonate

Groundwater Sampling, Field Parameters



Groundwater Sampling, for Lab Analysis



Portable Submersible Pump for Groundwater Sampling at Wells without Dedicated Pumps



Groundwater Sampling with Submersible Pump



Groundwater Sampling with Dedicated Pump



Groundwater Analytical Data Set, Well 5852213

Date	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Ammonia (mg/L)	TSS (mg/L)
10/18/2011	130	24.8	4.68	31.9	27.8	0.293	0.07	7.11	460	< 2	6.35	60
11/29/2011	133	21.2	4.70	28.9	19.8	0.360	<0.050	9.84	420	< 2	3.57	18.2
1/4/2012	128	20.2	4.35	30.0	16.5	0.39	<0.050	28.4	404	< 2	1.90	25.4
2/15/2012	129	20.1	6.01	25.5	15.6	0.239	<0.010	34.1	527	< 2	1.52	73.7
3/26/2012	150	23.2	4.41	25.5	15.2	0.230	<0.100	37.4	425	< 2	0.909	5.9
5/7/2012	150	23.6	4.62	22.6	18.5	0.332	0.025	14.6	455	< 2	1.22	7.0
6/11/2013	154	22.9	4.86	23.5	12.6	0.365	<0.100	21.1	409	<10	1.38	274
5/20/2014	145	36.0	5.29	33.0	17.6	0.334	<0.100	4.08	569	<10	1.04	10.1

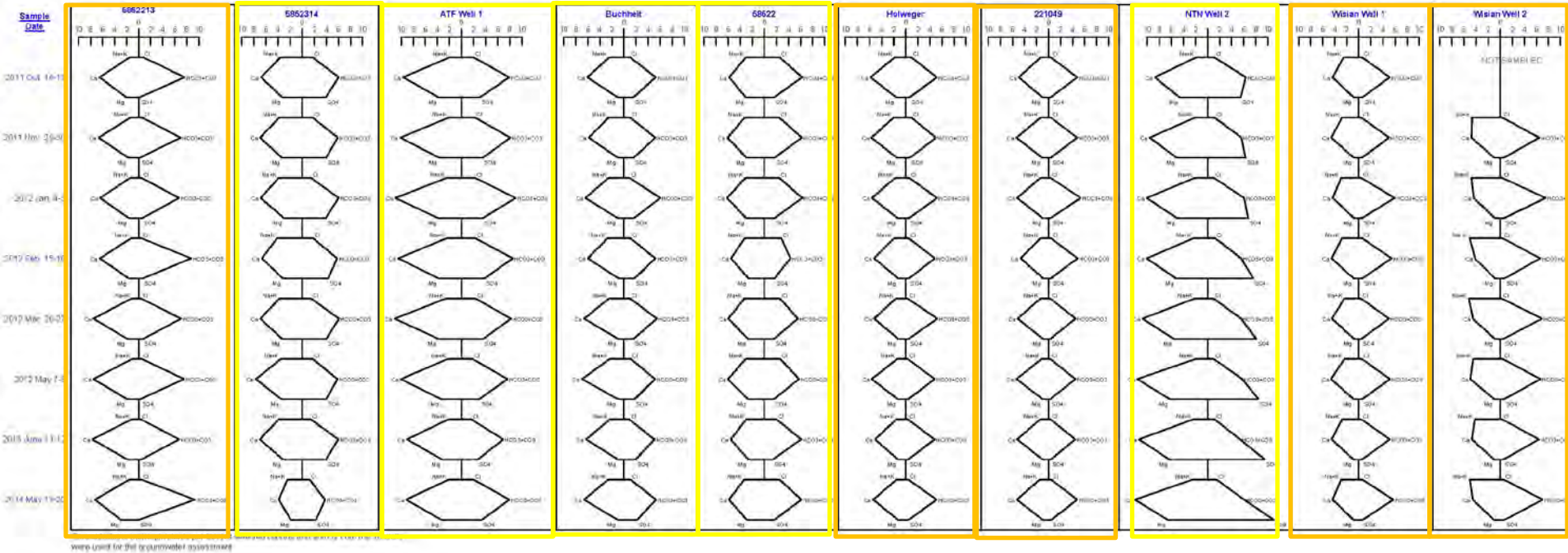
- Example water quality data set from well 5852213
- In total 79 data sets collected from 10 wells

Overall Water Quality Statistics

- PAHs, TPH, and VOC results were all less than detection limits
- Water chemistry from each sampling event is consistent for each well with small variation between most wells
- Calcium bicarbonate water type is dominate
- Wells 58522, Buchheit, 5852314, ATF 1 and NTN 2 have relatively more sulfate
- Wisian Well 2 has relatively more sodium

Stiff Diagrams

Stiff diagrams are a polygonal shape representation of the major ion composition of the water and are useful in making a rapid visual comparison between different water samples.



- Diamond shape Stiff pattern indicate calcium bicarbonate water type is dominate
- Wells 5852314, ATF 1, Buchheit, 58522 and NTN 2 have relatively more sulfate
- Identify East and West well populations based on geochemistry

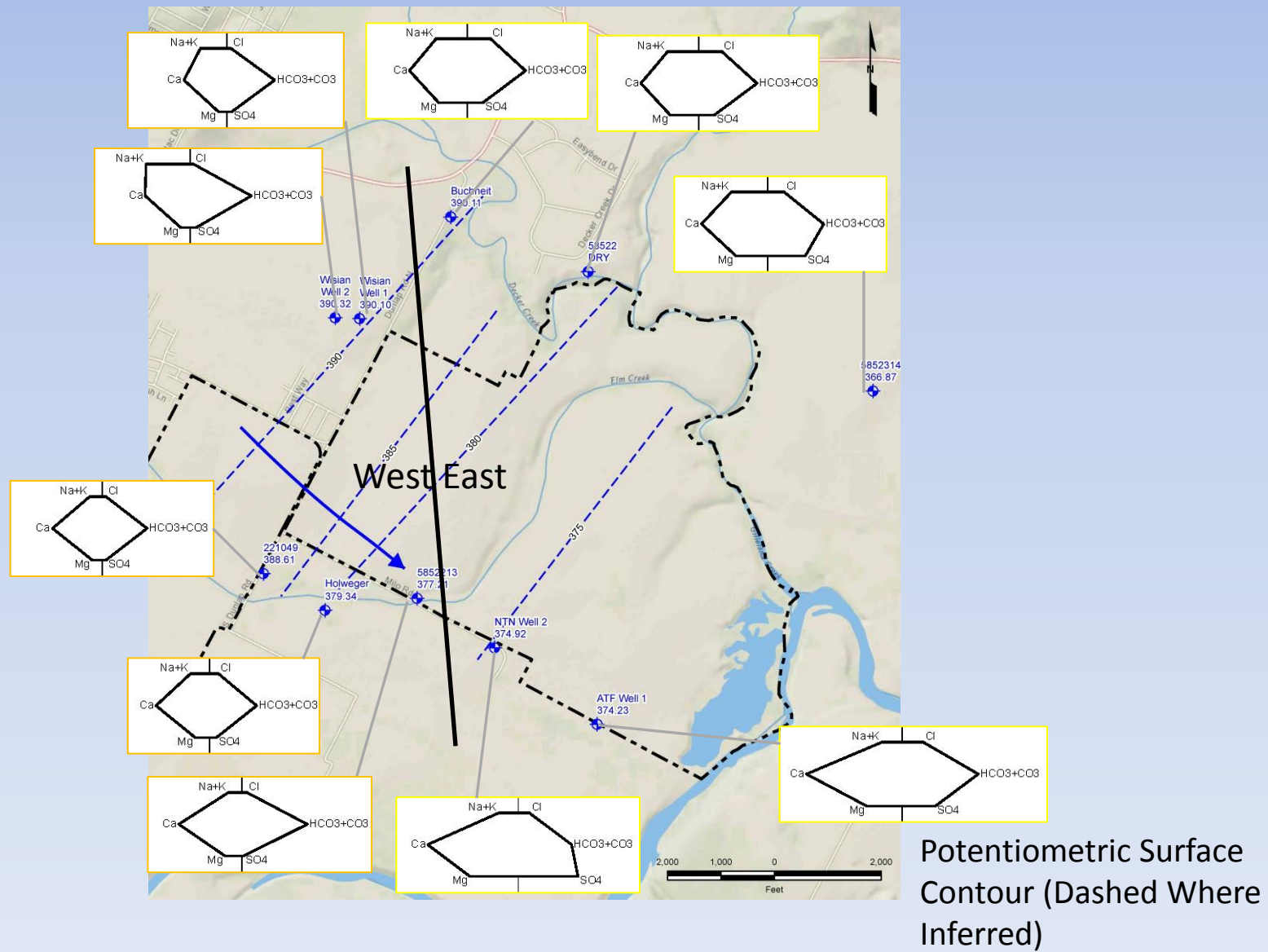
East Wells

Buchheit
58522
5852314
ATF 1
NTN W2

West Wells

Wisian W2
Wisian W1
Holweger
221049
5852213

April 3-5, 2013 – Potentiometric Surface & Stiff Diagrams



Baseline Groundwater Quality

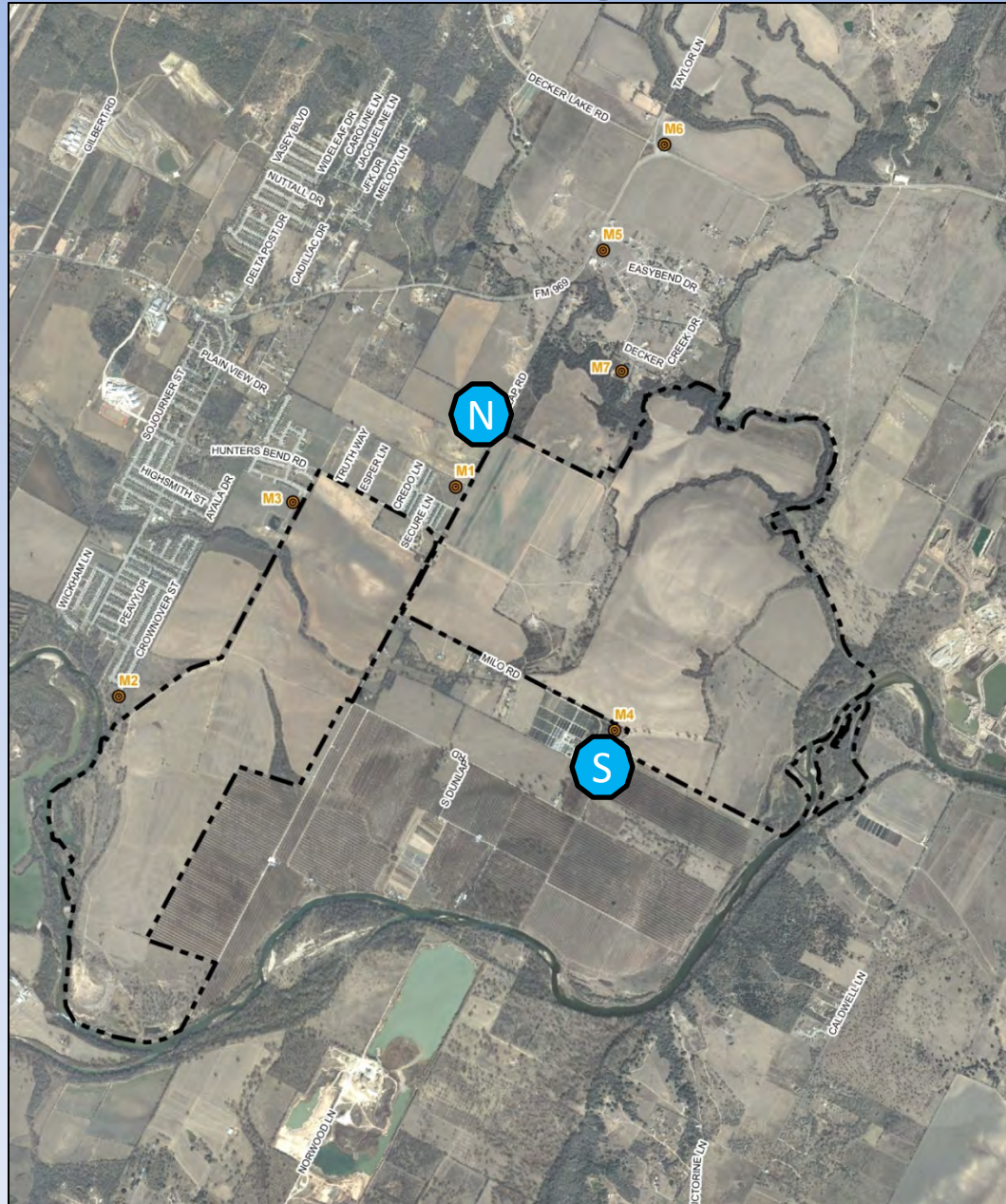
- The range of water quality values is representative of overall baseline water quality conditions
- Future water quality values incongruent with baseline conditions can be identified as concentrations greater than the maximum baseline value + two standard deviations

Wells Statistic (normal samples)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Ammonia (mg/L)	TSS (mg/L)	TDS (mg/L)
West Wells (Calcium-bicarbonate water type)													
# of Samples	39	39	39	39	39	39	39	39	39	39	39	39	39
Median (50th Percentile)	104	12.2	2.46	37.5	14.5	0.27	10.1	24.8	314	<2.00	0.02	2.40	548
Minimum	83.9	10.1	1.49	22.6	10.2	0.05	0.01	4.08	266	<2.00	0.02	1.00	440
Maximum	154	36.0	6.01	118	32.6	0.43	21.6	37.4	569	<10.0	6.35	274	810
Standard Deviation (SD)	19.2	5.51	1.14	29.5	5.34	0.09	6.00	7.9	74.5	<3.49	1.19	44.6	97.0
Median + 2 SD	142	23.2	4.74	96.5	25.2	0.45	22.1	40.6	463	<8.99	2.40	91.7	742
Maximum + 2 SD	192	47.0	8.29	177	43.3	0.62	33.6	53.2	718	<17.0	8.73	363	1004
East Wells (calcium-bicarbonate/calcium-sulfate mixed water type)													
# of Samples	40	40	40	40	40	40	40	40	40	40	40	40	40
Median (50th Percentile)	139	39.1	2.31	56.9	55.9	0.27	6.72	155	362	<2.00	0.02	1.10	876
Minimum	77.6	11.4	1.72	41.7	29.9	0.13	1.03	65.9	231	<2.00	0.02	1.00	544
Maximum	241	80.8	4.49	94.5	99.6	0.42	34.7	526	544	<10.0	0.77	26.0	1332
Standard Deviation (SD)	42.7	18.6	0.7	14.5	20.9	0.10	9.9	116	66.7	<3.50	0.10	3.90	187
Median + 2 SD	224	76.2	3.75	85.8	97.7	0.41	26.6	387	495	<8.93	0.26	8.92	1252
Maximum + 2 SD	326	118	5.92	123	141	0.57	54.6	757	677	<16.9	1.01	33.8	1708

Task 2 – Air, Baseline Year Review

- Air sampling for PM_{2.5} and PM₁₀ performed with Airmetrics, Inc MiniVol air samplers
- Samples collected at two locations - upwind and downwind of planned mining area
- Four air sampling events of six 24-hour samples collected in Baseline Year
 - Event 1: October 20 to November 4, 2011
 - Event 2: January 5 to 20, 2012
 - Event 3: March 15 to 30, 2012
 - Event 4: May 3 to 18, 2012
- No air samples collected during Interim Years 1 and 2

Air Monitoring Locations



Air Monitoring Location

Air Quality Sample Location, North Site



Air Quality Sample Location, South Site



Air Quality PM_{2.5} and PM₁₀ Size Fraction Results

Sampling Event	Date	North Site		South Site	
		PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
1	10/20/2011	28.1	7.6	15.8	7.5
1	10/23/2011	24.9	10.7	19.9	10.7
1	10/26/2011	11.9	8.1	15.0	8.2
1	10/29/2011	27.5	9.0	22.1	10.3
1	11/1/2011	22.6	11.7	28.6	13.6
1	11/4/2011	15.4	6.7	NV-L	7.4
2	1/5/2012	21.9	4.0	24.6	10.8
2	1/8/2012	31.7	10.3	31.9	19.3
2	1/11/2012	11.8	NS	12.5	6.5
2	1/14/2012	33.2	NS	17.5	8.9
2	1/17/2012	13.6	NS	13.9	NS ¹
2	1/20/2012	21.5	NS	60.1	16.0
3	3/15/2012	14.7	10.0	NS	9.0
3	3/18/2012	12.9	7.8	NS	10.3
3	3/21/2012	13.8	5.7	NS	5.8
3	3/24/2012	16.5	12.5	NS	11.7
3	3/27/2012	18.1	10.6	NS	NV-C
3	3/30/2012	19.6	13.3	NS	12.2
4	5/3/2012	16.5	NV-L	22.4	NS
4	5/6/2012	14.7	NV-L	22.8	NS
4	5/9/2012	19.7	12.5	32.9	NS
4	5/12/2012	11.3	9.2	16.7	NS
4	5/15/2012	17.2	8.5	27.9	NS
4	5/18/2012	18.1	NV-L	22.2	NS
	Average	19.1	9.3	23.9	10.5

Baseline Air Quality

- Average $PM_{2.5}$ and PM_{10} levels from north and south sites averaged $9.8 \mu\text{g}/\text{m}^3$ and $21.1 \mu\text{g}/\text{m}^3$ respectively, and are representative of baseline levels
- 24-hr average National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$ and PM_{10} are $35.0 \mu\text{g}/\text{m}^3$ and $150 \mu\text{g}/\text{m}^3$ (40 CFR Part 50)
- NAAQS are greater than the baseline levels

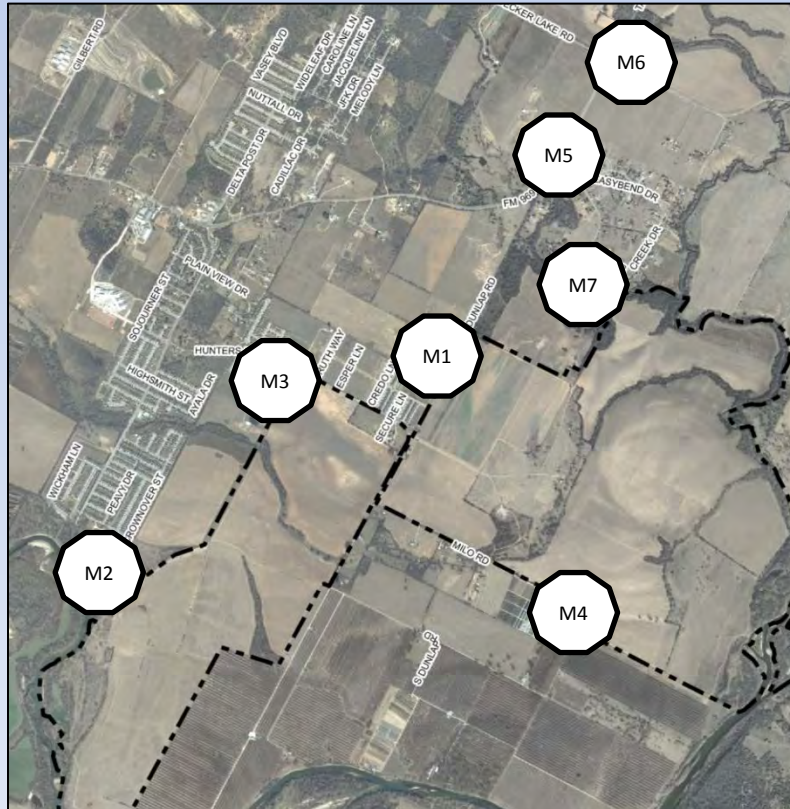
Task 3 – Noise, Baseline Year Review

- Noise Monitoring was performed with a Quest SoundPro DL-1 Type 1 precision sound level meter
- Noise monitoring at 7 representative noise receptor sites
- Two rounds of short-term (15 min) noise monitoring performed
 - Oct 26, 27, 28, 31 and Nov 2, 3, 2011
 - March 22, 23, 28, 29, and 30, 2012
- One long-term (4 hour) noise monitoring performed near Chaparral Crossing on March 20, 2012
- Noise Monitoring not performed during Interim Years 1 and 2



Noise Monitoring Locations

- M1 - NW corner of Dunlap Rd and Chaparral Crossing Blvd. Representative of residences located closest to the proposed mining area. Long-term noise measurement also performed.



- M2 - south end of Crownover Street in Austin's Colony near the west side of mining area boundary.
- M3 - south end of Yabers Ct and south of Hunters Bend Rd, near NW mining area boundary.
- M4 - at Native Texas Nursery, near SW mining area boundary.
- M5 - NW corner of FM 969 and Decker Creek Dr, representative of residences within Twin Creek Meadows.
- M6 - NW corner of FM 969 and Taylor Lane, representative of residences.
- M7 - south end of Decker Creek Dr representative of residences closest to north side of mining area.

Ambient Noise Measurements

Site Location	Monitored Noise Level (dBA Leq)										
	Round 1						Round 2				
	10/26	10/27	10/28	10/31	11/2	11/3	3/22	3/23	3/28	3/29	3/30
M1	47.0	53.6	51.0	50.4	53.1	55.5	45.5	42.7	52.6	44.4	44.0
M2	43.8	48.2	51.0	41.2	44.8	53.5	49.4	49.7	44.2	45.8	44.5
M3	42.1	46.9	46.6	43.7	47.5	47.6	51.3	44.4	44.3	47.1	41.6
M4	48.3	48.6	50.5	43.6	48.8	49.3	50.4	44.3	48.2	43.3	42.5
M5	59.6	59.9	59.1	58.2	61.6	60.8	57.6	58.9	58.5	56.7	56.8
M6	66.1	62.7	65.2	65.8	65.8	62.3	67.1	64.1	67.2	68.3	63.8
M7	39.7	47.2	52.4	46.0	48.7	43.3	44.7	41.6	53.5	45.7	45.2

dBA – A weighted sound level

Leq – Equivalent steady-state sound level

Federal Transit Administration Construction Noise Criteria Guidelines

Land Use	Eight-hour Leq (dBA)	
	Day	Night
Residential	80	70
Commercial	85	85
Industrial	90	90

Baseline Noise Levels

- M1 long-term (4-hour) noise level was 46.8 dBA
- M1 to M4 and M7 located away from FM 969, had noise levels of 40 dBA to 55 dBA
- M5 and M6 located next to FM 969, had noise levels of 57 dBA to 68 dBA
- Baseline noise levels are less than Federal Transit Administration (FTA) Construction Noise Criteria Guidelines for residential, commercial, and industrial day and night noise levels

Conclusions

- Groundwater
 - Groundwater elevation is at 390 to 366 ft MSL
 - Groundwater levels rise with rain fall and decline with lack of precipitation and during summer months
 - The range of observed water quality values is representative of baseline conditions within the east and west well populations
 - Maximum baseline value + two standard deviation can be used as water quality threshold levels to identify future water quality values greater than baseline conditions on the periphery of mined areas

Conclusions (continued)

- Air

- Average baseline $PM_{2.5}$ and PM_{10} levels are $9.8 \mu\text{g}/\text{m}^3$ and $21.1 \mu\text{g}/\text{m}^3$ and are representative of baseline levels
- $PM_{2.5}$ and PM_{10} NAAQS are $35.0 \mu\text{g}/\text{m}^3$ and $150 \mu\text{g}/\text{m}^3$ and are greater than baseline levels
- NAAQS can be used as air quality threshold levels

Conclusions (continued)

- Noise

- Baseline noise levels ranged from of 40 dBA to 68 dBA
- Baseline noise levels are less than residential, commercial, and industrial FTA Construction Noise Criteria Guidelines
- FTA Construction Noise Criteria Guidelines can be used as noise threshold levels

Recommendations

- Groundwater
 - Collect quarterly water level, TPH and PAH data, continuous water levels with transducer, annual basic water quality data until mining starts, and update baseline values as appropriate
 - Collect quarterly water level data and water quality data, and continuous water levels with transducer during first two years of active mining
- Air - Collect quarterly air quality samples during first two years of active mining
- Noise - Perform semi-annual noise monitoring during the first year of active mining
- Compare groundwater, air, and noise environmental conditions during active mining to pre-mining baseline levels and to NAAQS for air and FTA guidelines for noise

Thank You to all Land Owners for Allowing Access

- Austin Tree Farm
- Barbra Buchheit
- Dale Holweger
- Douglas Edgar
- James Glass
- Mary Wisian
- Native Texas Nursery
- Mansville Water Supply
- Sara King
- TXI



Tree Nursery Located South of Planned Mining Area,
Planned Mining Area in Left Background and Pecan
Trees in Right Background

Questions?



Extra Slides with Tabulated Detailed
Information, Stiff, Trilinear Diagrams,
and Photographs

Groundwater Wells for Monitoring Program

Well ID	Well Owner	Northing	Easting	TOC Elevation (ft msl)	Diameter (inches)	DTW (ft, TOC)	TD (ft, TOC)	Active Pumping	Notes
58522	Douglas Edgar	10063222.73	3174211.78	414.637	4	38.60	56.36	Yes, occasional use for lawn care	Gauged depth to water and sampled
221049	Sarah King	10057588.37	3168216.16	420.800	5	NM	43.98	Yes	Gauged depth to water and sampled
5852213	TXI	10057126.47	3171089.11	406.308	5	29.26	36.38	No	Gauged depth to water and sampled, next to Elm Creek; Transducer location
5852314	Manville WSC	10060996.99	3179527.77	409.216	12	NM	60.00	Yes, 668 GPM, cycles daily	Gauged depth to water and sampled; Water supply well
ATF Well 1	ATF	10054790.33	3174300.03	403.020	16	29.20	50.58	Yes, 450 GPM, occasional use	Gauged depth to water and sampled
Buchheit	Barb Buchheit	10064273.43	3171701.20	416.314	4	NM	30.75	Yes, occasional use for lawn care	Gauged depth to water and sampled
Glass	TXI	NM	NM	NM	30	46.00	46.99	No	Hand dug well, on west side of Hunters Mansion; Poor well production; Only gauged and sampled in October 2011
NTN Well 2	Native Texas Nursery	10056198.58	3172482.94	406.565	18	NM	40.77	Yes, 300 GPM, cycles daily	Gauged depth to water and sampled
Holweger	Dale Holweger	10056903.54	3169296.25	411.531	5	NM	39.75	Yes, occasional use for stock tanks	Gauged depth to water and sampled
Wisian Well 1	Mary Wisian	10062371.14	3169965.66	440.240	8	49.76	65.10	No	Gauged depth to water and sampled
Wisian Well 2	Mary Wisian	10062375.18	3169484.23	435.521	6	45.06	62.18	No	Gauged depth to water and sampled

Interim Year 2 Groundwater Elevation Data

Well Owner	Well ID	TOC Elevation (ft msl)	Date	Depth to Water (ft TOC)	Groundwater Elevation (ft msl)	Ft of Water in Well
Douglas Edgar	58522	414.64	10/19/2011 ^(A)	38.92	375.72	17.44
			6/12/2013 ^(B)	DRY	NA	NA
			9/11/2013	DRY	NA	NA
			11/18/2013	DRY	NA	NA
			2/19/2014	39.40	375.24	16.96
			5/19/2014	39.40	375.24	16.96
Sarah King	221049	420.80	10/19/2011 ^(A)	32.63	388.17	11.35
			6/12/2013 ^(B)	32.19	388.61	11.79
			9/11/2013	32.74	388.06	11.24
			11/18/2013	32.18	388.62	11.8
			2/19/2014	32.25	388.55	11.73
			5/19/2014	32.27	388.53	11.71
TXI	5852213	406.31	10/18/2011 ^(A)	29.84	376.47	6.54
			6/11/2013 ^(B)	29.10	377.21	7.28
			9/10/2013	29.79	376.52	6.59
			11/18/2013	29.30	377.01	7.08
			2/18/2014	28.23	378.08	8.15
			5/20/2014	28.33	377.98	8.05
Mansville Water Supply Company	5852314	409.22	10/18/2011 ^(A)	41.10	368.12	18.90
			6/12/2013 ^(B)	42.35	366.87	17.65
			9/10/2013	40.12	369.10	19.88
			11/19/2013	34.32	374.90	25.68
			2/19/2014	34.15	375.07	25.85
			5/19/2014	34.76	374.46	25.24
Austin Tree Farm	ATF Well 1	403.02	10/19/2011 ^(A)	28.92	374.10	21.66
			6/11/2013 ^(B)	28.79	374.23	21.79
			9/10/2013	29.96	373.06	20.62
			11/19/2013	25.28	377.74	25.3
			2/18/2014	26.53	376.49	24.05
			5/20/2014	27.22	375.80	23.36

Well Owner	Well ID	TOC Elevation (ft msl)	Date	Depth to Water (ft TOC)	Groundwater Elevation (ft msl)	Ft of Water in Well
Barb Buchheit	Buchheit	416.31	10/19/2011 ^(A)	26.15	390.16	4.60
			6/12/2013 ^(B)	26.20	390.11	4.55
			9/11/2013	26.79	389.52	3.96
			11/19/2013	26.25	390.06	4.50
			2/19/2014	26.21	390.10	4.54
			5/19/2014	26.50	389.81	4.25
Dale Holweger	Holweger	411.53	10/19/2011 ^(A)	32.82	378.71	13.68
			6/11/2013 ^(B)	32.19	379.34	14.31
			9/11/2013	33.21	378.32	13.29
			11/18/2013	32.15	379.38	14.35
			2/19/2014	31.50	380.03	15
			5/19/2014	31.77	379.76	14.73
Native Texas Nursery	NTN Well 2	406.57	10/19/2011 ^(A)	33.82	372.75	6.95
			6/11/2013 ^(B)	31.65	374.92	9.12
			9/10/2013	32.47	374.10	8.3
			11/19/2013	30.45	376.12	10.32
			2/18/2014	30.00	376.57	10.77
			5/20/2014	31.27	375.3	9.5
Mary Wisian	Wisian Well 1	440.24	10/18/2011 ^(A)	50.39	389.85	14.83
			6/11/2013 ^(B)	50.14	390.10	14.96
			9/10/2013	50.80	389.44	14.3
			11/18/2013	50.05	390.19	15.05
			2/18/2014	50.23	390.01	14.87
			5/20/2014	50.25	389.99	14.85
Mary Wisian	Wisian Well 2	435.52	11/29/2011 ^(A)	45.50	390.02	16.68
			6/11/2013 ^(B)	45.20	390.32	16.98
			9/10/2013	45.40	390.12	16.78
			11/18/2013	45.00	390.52	17.18
			2/18/2014	45.21	390.31	16.97
			5/20/2014	45.41	390.11	16.77

^(A) Groundwater Elevation Data from October 18, 19 or November 29, 2011, Baseline Year.

^(B) Groundwater Elevation Data from June 11 or 12, 2013, Interim Year 1.

Groundwater Analytical Data

Well ID	Date	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Ammonia (mg/L)	TSS (mg/L)
ATF 1	10/19/2011	194	46.2	3.48	43.2	71.3	0.245	6.87	148	478	< 2	< 0.020	< 1.0
ATF 1	11/29/2011	203	45.0	3.57	46.3	79.4	0.230	6.46	170	490	< 2	< 0.020	< 1.0
ATF 1	1/5/2012	220	47.3	4.01	53.2	81.3	0.200	6.76	171	544	< 2	< 0.020	< 1.1
ATF 1	2/15/2012	210	46.0	4.42	54.1	83.0	0.224	6.68	184	515	< 2	< 0.020	< 1.1
ATF 1	3/27/2012	222	46.8	4.49	57.4	83.6	0.140	4.86	175	496	< 2	< 0.020	1.7
ATF 1	5/8/2012	201	41.2	3.58	50.2	65.2	0.360	8.91	143	461	< 2	0.073	2.3
ATF 1	6/11/2013	181	39.3	3.28	47.3	57.5	0.249	11.3	130	418	<10	<0.020	< 1.06
ATF 1	5/20/2014	184	40.6	4.02	47.0	72.0	0.126 J	10.3	163	480	< 10.0	0.772	< 2.50
5852314	10/18/2011	137	39.9	2.22	81.2	61.0	0.235	10.8	188	364	< 2	< 0.020	< 1.1
5852314	11/30/2011	140	40.7	2.16	86.1	60.9	0.241	11.2	190	356	< 2	< 0.020	< 1.1
5852314	1/4/2012	138	36.8	2.21	88.4	52.2	0.300	11.1	187	364	< 2	< 0.020	1.7
5852314	2/16/2012	134	38.9	2.12	94.5	63.8	0.259	11.0	207	349	< 2	< 0.020	2.1
5852314	3/26/2012	139	40.7	1.98	85.8	53.3	0.170	10.7	192	368	< 2	< 0.020	2.3
5852314	5/7/2012	154	42.5	2.53	79.4	61.3	0.245	10.3E	192	353	< 2	< 0.020	1.2
5852314	6/12/2013	141	38.5	1.87	87.7	49.9	0.288	10.4	189	361	< 10	< 0.020	1.96
5852314	5/19/2014	77.6	23.0	1.72	56.2	43.4	0.288 J	1.03	111	231	< 10.0	< 0.100	< 2.50
NTNW2	10/19/2011	175	56.5	2.24	41.7	39.6	0.246	24.3	266	382	< 2	< 0.020	< 1.1
NTNW2	11/30/2011	192	62.2	2.31	46.2	41.3	0.264	17.9 E	302	340	< 2	< 0.020	< 1.0
NTNW2	11/30/2011	NA	NA	NA	NA	NA	NA	27.0 H	NA	NA	NA	NA	NA
NTNW2	1/5/2012	202	61.4	2.32	47.3	37.4	0.290	28.2	322	367	< 2	< 0.020	< 1.0
NTNW2	2/16/2012	202	63.8	2.42	52.6	44.9	0.348	34.7	364	337	< 2	0.027	< 1.0
NTNW2	3/27/2012	216	68.4	2.33	48.4	35.6	0.200	29.4	389	336	< 2	< 0.020	< 1.1
NTNW2	5/8/2012	233	76.7	2.51	44.2	37.5	0.420	31.1	406	347	< 2	0.020	< 1.0
NTNW2	6/11/2013	228	76.9	1.99	52.5	41.2	0.312	32.7	456	326	< 10	< 0.020	< 1.06
NTNW2	5/20/2014	241	80.8	2.44 J	56.3	54.3	0.147 J	30.7	526	371	< 10.0	< 0.100	< 2.50
Holweger	10/19/2011	117	19.7	2.03	41.3	32.2	0.301	21.6	31.4	310	< 2	< 0.020	< 1.1
Holweger	11/30/2011	114	18.3	1.88	45.2	32.6	0.286	20.7	34.1	300	< 2	< 0.020	< 1.1
Holweger	1/5/2012	112	16.8	2.00	40.2	20.6	0.296	17.8	27.0	311	< 2	< 0.020	< 1.1
Holweger	2/16/2012	105	15.5	1.99	44.0	17.7	0.296	16.5	26.1	289	< 2	< 0.020	< 1.0
Holweger	3/27/2012	105	15.3	1.98	37.5	11.8	0.430	15.2	23.8	314	< 2	< 0.020	< 1.0
Holweger	5/8/2012	113	16.5	1.94	31.9	11.9	0.390	16.1	21.1	287	< 2	< 0.020	< 1.0
Holweger	6/11/2013	102	15.8	1.49	35.1	11.8	0.334	15.3	19.5	290	< 10	0.0212	< 1.01
Holweger	5/19/2014	108	16.0	1.86	34.6	16.3	0.192 J	15.1	24.8	311	< 10.0	< 0.100	< 2.50
5852213	10/18/2011	130	24.8	4.68	31.9	27.8	0.293	0.07	7.11	460	< 2	6.35	60
5852213	11/29/2011	133	21.2	4.70	28.9	19.8	0.360	<0.050	9.84	420	< 2	3.57	18.2
5852213	1/4/2012	128	20.2	4.35	30.0	16.5	0.39	<0.050	28.4	404	< 2	1.90	25.4
5852213	2/15/2012	129	20.1	6.01	25.5	15.6	0.239	<0.010	34.1	527	< 2	1.52	73.7
5852213	3/26/2012	150	23.2	4.41	25.5	15.2	0.230	<0.100	37.4	425	< 2	0.909	5.9
5852213	5/7/2012	150	23.6	4.62	22.6	18.5	0.332	0.025	14.6	455	< 2	1.22	7.0
5852213	6/11/2013	154	22.9	4.86	23.5	12.6	0.365	< 0.100	21.1	409	< 10	1.38	274
5852213	5/20/2014	145	36.0	5.29	33.0	17.6	0.334 J	< 0.100	4.08	569	< 10.0	1.04	10.1

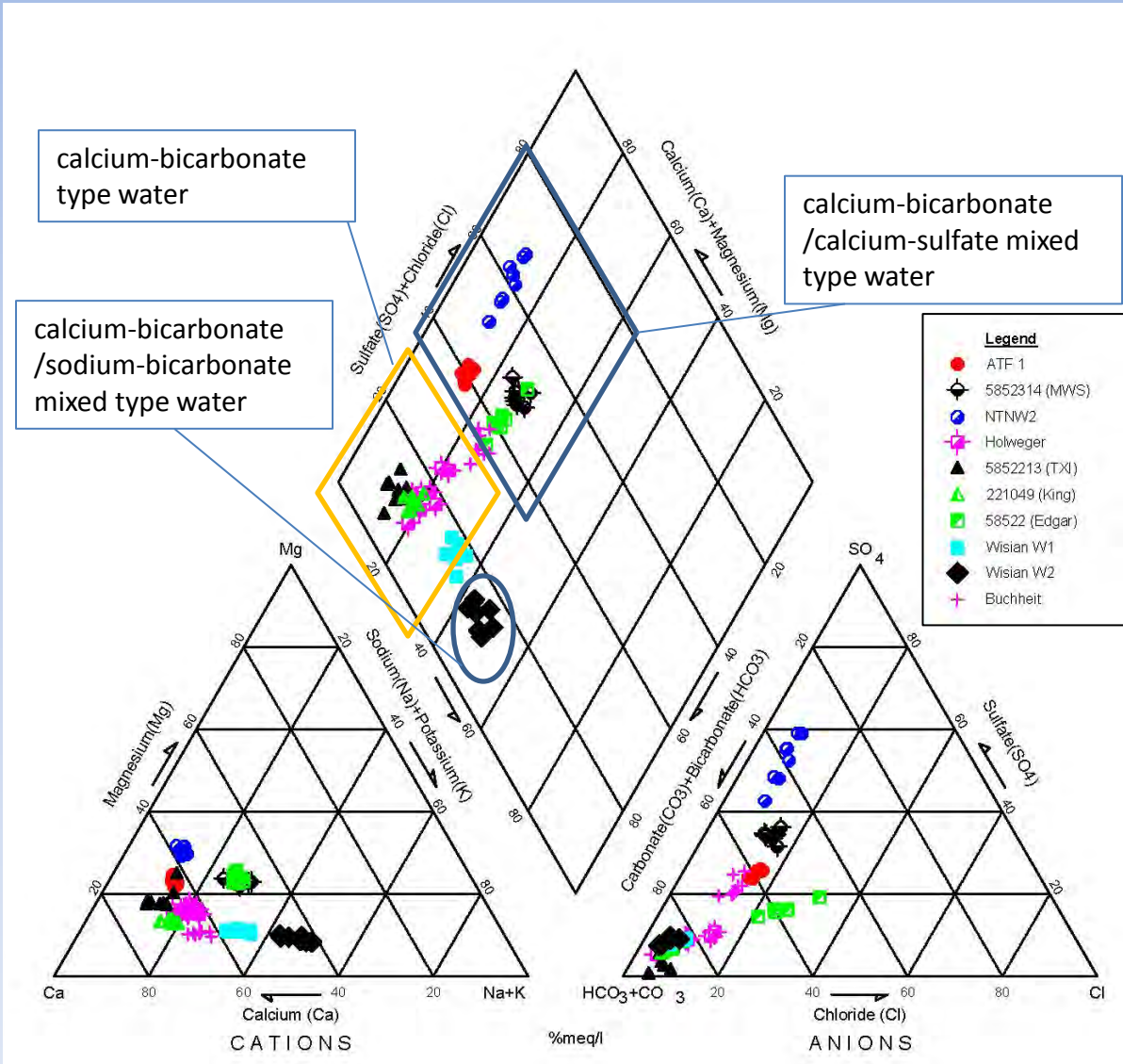
Groundwater Analytical Data (continued)

Well ID	Date	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Ammonia (mg/L)	TSS (mg/L)
221049	11/30/2011	106	13.1	2.01	29.4	13.7	0.266	11.3 E	17.8	285	< 2	< 0.020	11.2
221049	11/30/2011	NA	NA	NA	NA	NA	NA	14.2 H	NA	NA	NA	NA	NA
221049	1/5/2012	104	11.9	1.90	30.3	11.1	0.265	13.1	16.4	320	< 2	< 0.020	17.9
221049	2/15/2012	92.7	10.9	1.80	30.0	14.2	0.264	13.6	18.5	290	< 2	< 0.020	7.1
221049	3/27/2012	102	11.5	1.88	30.5	10.2	0.180	12.9	14.9	268	< 2	< 0.020	3.8
221049	5/8/2012	106	12.2	1.83	25.8	10.2	0.430	13.3	15.2	267	< 2	< 0.020	2.9
221049	6/12/2013	104	12.2	2.12	30.6	11.1	0.290	14.5	17.6	266	< 10	< 0.020	3.27
221049	5/19/2014	105	12.1	1.93	33.2	16.3	0.181 J	15.0	23.1	289	< 10.0	< 0.100	< 2.50
Glass	10/18/2011	3040	73.2	22.1	58.3	18.6	0.232	10.5	32.5	882	< 2	3.54	3120
58522	10/19/2011	117	37.5	2.02	69.5	89.5	0.262	4.27	77.3	382	< 2	< 0.020	3.4
58522	11/29/2011	122	36.2	2.00	73.9	87.8	0.320	3.88	81.0	374	< 2	< 0.020	< 1.0
58522	1/5/2012	124	36.9	2.23	71.1	88.2	0.277	3.73	81.3	378	< 2	< 0.020	< 1.0
58522	2/15/2012	111	32.1	1.98	73.8	99.6	0.253	3.36	81.2	259	< 2	< 0.020	1.9
58522	3/27/2012	120	33.1	2.14	75.2	92.1	0.200	2.42	76.1	335	< 2	< 0.020	3.8
58522	5/7/2012	121	32.9	1.84	70.7	93.5	0.268	2.71	76.7	345	< 2	< 0.020	1.1
58522	6/12/2013	112	32.7	1.75	68.0	71.3	0.331	2.98	65.9	367	< 10	< 0.020	26.0
58522	5/19/2014	118	35.5	2.10	75.6	90.0	0.203 J	2.42	80.8	374	< 10.0	0.160 J	< 2.50
Wisian W1	10/18/2011	87.0	11.0	2.64	56.8	18.5	0.238	8.62	27.2	308	< 2	< 0.020	2.3
Wisian W1	11/29/2011	91.4	10.8	2.65	62.8	14.5	0.300	8.80	24.2	305	< 2	< 0.020	< 1.0
Wisian W1	1/4/2012	86.6	10.1	2.61	66.1	13.8	0.330	8.78	24.8	356	< 2	< 0.020	1.5
Wisian W1	2/15/2012	90.2	10.8	2.89	63.1	19.2	0.240	8.87	27.5	327	< 2	< 0.020	2.4
Wisian W1	3/26/2012	89.5	10.1	3.04	54.0	12.7	0.410	8.03	21.2	300	< 2	< 0.020	< 1.0
Wisian W1	5/7/2012	92.2	10.8	2.79	53.9	17.3	0.236	8.38 E	27.5	310	< 2	< 0.020	< 1.0
Wisian W1	5/7/2012	NA	NA	NA	NA	NA	NA	8.88 H	NA	NA	NA	NA	NA
Wisian W1	6/11/2013	90.1	11.1	2.30	62.8	14.4	0.269	9.94	24.8	309	< 10	< 0.020	< 1.01
Wisian W1	5/20/2014	87.5	11.2	2.88	66.2	21.5	0.191 J	9.15	30.6	348	< 10.0	< 0.100	< 2.50
Wisian W2	11/29/2011	95.7	12.0	2.51	106	12.2	0.140	9.93	30.0	391	< 2	< 0.020	1.6
Wisian W2	1/4/2012	88.3	10.7	2.41	109	11.6	<0.050	9.07	31.2	455	< 2	< 0.020	< 1.1
Wisian W2	2/15/2012	83.9	10.2	2.46	115	14.2	0.142	12.5	36.2	400	< 2	< 0.020	1.8
Wisian W2	3/26/2012	90.7	10.8	2.47	118	10.6	0.110	11.3	27.9	418	< 2	< 0.020	< 1.0
Wisian W2	5/7/2012	99.4	12.2	2.72	102	15.3	0.120	10.3 E	33.3	403	< 2	< 0.020	< 1.0
Wisian W2	5/7/2012	NA	NA	NA	NA	NA	NA	12.3 H	NA	NA	NA	NA	NA
Wisian W2	6/11/2013	94.4	12.2	1.97	96.4	11.4	0.189	10.1	26.8	388	< 10	< 0.020	< 1.03
Wisian W2	5/20/2014	91.4	12.5	2.80	114	22.0	< 0.100	9.27	36.6	431	< 10.0	0.946	9.20

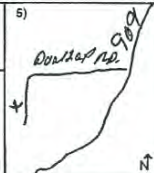
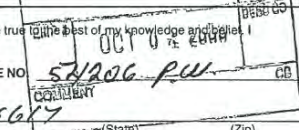
Groundwater Analytical Data (continued)

Well ID	Date	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Ammonia (mg/L)	TSS (mg/L)
Buchheit	10/19/2011	122	12.8	2.39	55.2	36.8	0.373	4.56	76.0	319	< 2	< 0.020	< 1.0
Buchheit	11/30/2011	117	12.4	2.30	58.1	37.0	0.382	4.70	78.2	311	< 2	< 0.020	< 1.0
Buchheit	1/5/2012	128	12.8	2.54	57.4	31.8	0.389	4.26	80.3	363	< 2	< 0.020	< 1.0
Buchheit	2/16/2012	120	11.4	2.39	61.5	37.6	0.381	4.02	84.3	312	< 2	< 0.020	< 1.1
Buchheit	3/26/2012	132	12.3	2.40	56.4	37.3	0.28	3.73	77.2	327	< 2	< 0.020	< 1.0
Buchheit	5/7/2012	139	13.0	2.59	53.6	39.9	0.37	3.84	85.2	310	< 2	0.045	1.2
Buchheit	6/12/2013	126	12.3	2.06	52.3	29.9	0.413	3.95	92.8	303	< 10	< 0.020	< 1.02
Buchheit	5/19/2014	133	13.1	2.48	59.2	39.4	0.294 J	5.16	105	323	< 10.0	< 0.100	< 5.00

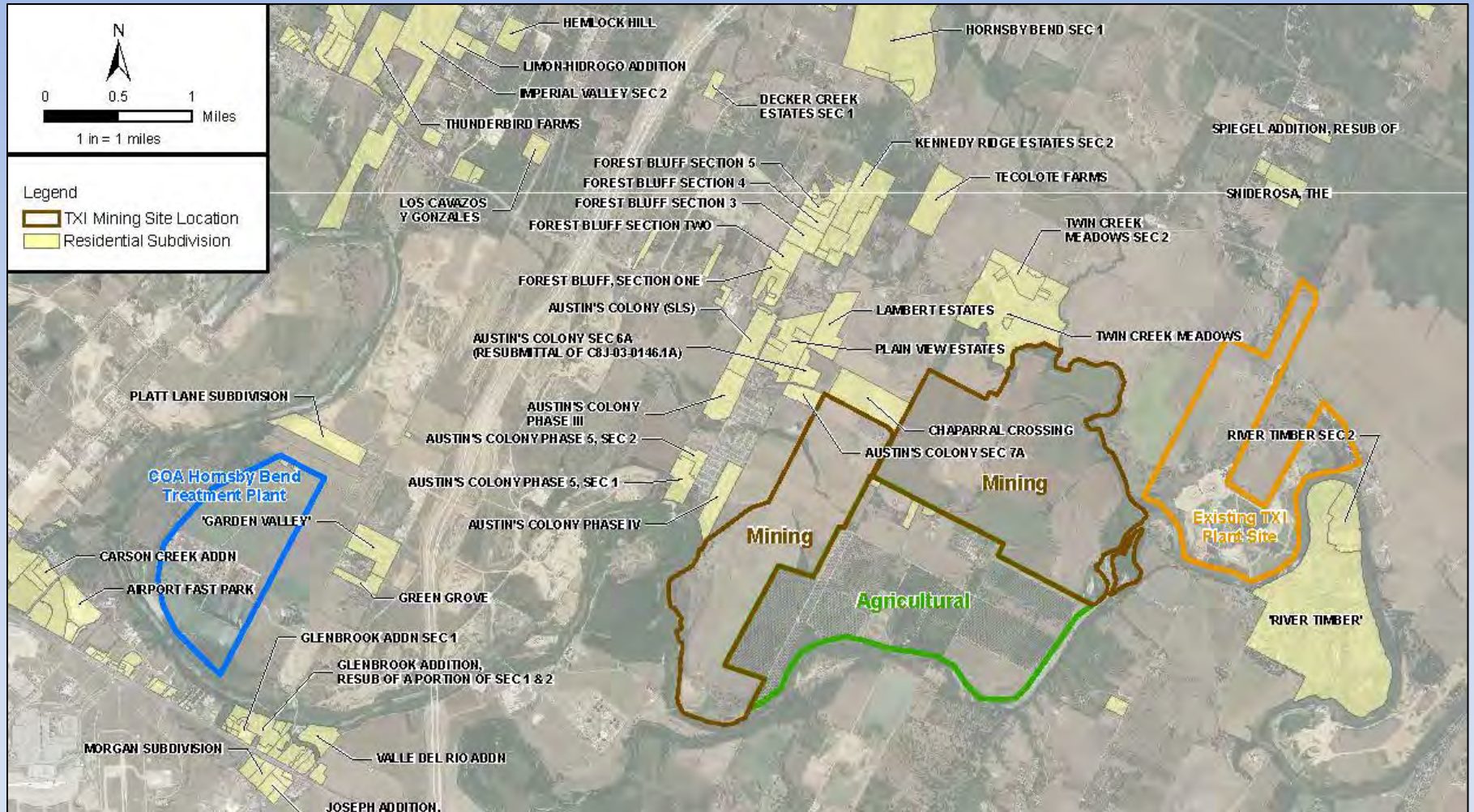
Trilinear Diagram



Typical Well Log from TWDB Well Database

ATTENTION OWNER: Confidentiality Privilege Notice on on reverse side of Well Owner's copy (pink)		State of Texas WELL REPORT		Texas Water Well Drillers Advisory Council MC 177 P.O. Box 13087 Austin, TX 78711-3087 512-239-0530	
1) OWNER: <u>CLAUDE BURGESS</u> (Name) ADDRESS: <u>DONTAP RD. 6.</u> (Street or RFD) <u>MANOR TEXAS</u> (City) (State) (Zip)		2) ADDRESS OF WELL: County: <u>THURMANT</u> (Street, RFD or other) (City) (State) (Zip) GRID # <u>58-52-2</u>			
3) TYPE OF WORK (Check): <input checked="" type="checkbox"/> New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Reconditioning <input type="checkbox"/> Plugging		4) PROPOSED USE (Check): <input type="checkbox"/> Monitor <input type="checkbox"/> Environmental Soil Boring <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Industrial <input type="checkbox"/> Irrigation <input type="checkbox"/> Injection <input type="checkbox"/> Public Supply <input type="checkbox"/> De-watering <input type="checkbox"/> Testwell If Public Supply well, were plans submitted to the TNRCC? <input type="checkbox"/> Yes <input type="checkbox"/> No		5) 	
6) WELL LOG: Date Drilling: Started <u>9/17</u> 19 <u>00</u> Completed <u>9/18</u> 19 <u>00</u>		DIAMETER OF HOLE Dia. (in.) From (ft.) To (ft.) <u>8"</u> Surface <u>55'</u>		7) DRILLING METHOD (Check): <input type="checkbox"/> Driven <input type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Mud Rotary <input type="checkbox"/> Bored <input type="checkbox"/> Air Hammer <input type="checkbox"/> Cable Tool <input type="checkbox"/> Jetted <input type="checkbox"/> Other _____	
From (ft.) To (ft.) Description and color of formation material		8) Borehole Completion (Check): <input type="checkbox"/> Open Hole <input type="checkbox"/> Straight Wall <input type="checkbox"/> Underreamed <input checked="" type="checkbox"/> Gravel Packed <input type="checkbox"/> Other _____ If Gravel Packed give interval ... from <u>30'</u> ft. to <u>55'</u> ft.			
<u>0-18' TOP SOIL</u> <u>18-29' BROWN RIVER CLAY</u> <u>29-37' RIVER SAND & GRAVEL</u> <u>37-55' GREY CLAY</u>		CASING, BLANK PIPE, AND WELL SCREEN DATA:			
		Dia. (in.) New or Used Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial		Setting (ft.) From To Gage Casting Screen	
		<u>4" N RUG-SLOTTED</u>		<u>30' 50'</u>	
		9) CEMENTING DATA [Rule 338.44(1)] Cemented from <u>0</u> ft. to <u>15'</u> ft. No. of sacks used _____ ft. to _____ ft. No. of sacks used _____ Method used <u>SHURLY</u> Cemented by <u>BILL LINDSEY</u> Distance to septic system field lines or other concentrated contamination <u>100'</u> ft. Method of verification of above distance <u>MEASURED BY TAPE</u>			
13) TYPE PUMP: <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input checked="" type="checkbox"/> Submersible <input type="checkbox"/> Cylinder <input type="checkbox"/> Other _____ Depth to pump bowls, cylinder, jet, etc., <u>40</u> ft.		10) SURFACE COMPLETION <input type="checkbox"/> Specified Surface Slab Installed [Rule 338.44(2)(A)] <input checked="" type="checkbox"/> Specified Steel Sleeve Installed [Rule 338.44(3)(A)] <input type="checkbox"/> Pitless Adapter Used [Rule 338.44(3)(b)] <input type="checkbox"/> Approved Alternative Procedure Used [Rule 338.71]			
14) WELL TESTS: Type test: <input type="checkbox"/> Pump <input type="checkbox"/> Bailor <input checked="" type="checkbox"/> Jetted <input type="checkbox"/> Estimated Yield: <u>14</u> gpm with _____ ft. drawdown after _____ hrs.		11) WATER LEVEL: Static level <u>24'</u> ft. below land surface Date <u>9/18/00</u> Artesian flow _____ gpm. Date _____			
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, submit "REPORT OF UNDESIRABLE WATER" Type of water? _____ Depth of strata _____ Was a chemical analysis made? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		12) PACKERS: Type Depth <u>CEMENT PACKER 15'</u> SEQ.# FILE ID			
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.					
COMPANY NAME <u>BILL'S WELL DRILLING</u> (Type or print) WELL DRILLER'S LICENSE NO. <u>54206-RW</u>					
ADDRESS <u>PO BOX 4178 DEL VALLE TEX 78647</u> (Street or RFD) (City) (State) (Zip)					
(Signed) <u>Bill Lindsey</u> (Licensed Well Driller)		(Signed) _____ (Registered Driller Trainee)			
Please attach electric log, chemical analysis, and other pertinent information, if available.					

Land Use



Agriculture - plant nursery, farming, and ranching

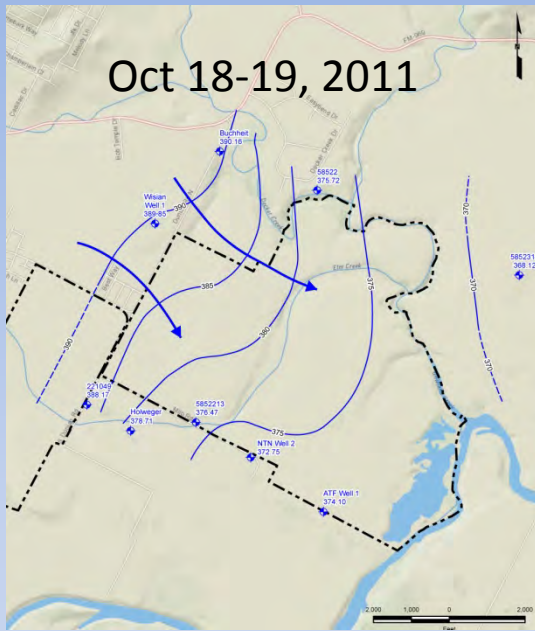
Residential - Chaparral Crossing, Austin Colony, Twin Creeks, and homes located south of Milo Road

Mining

Range of Common Sound Levels

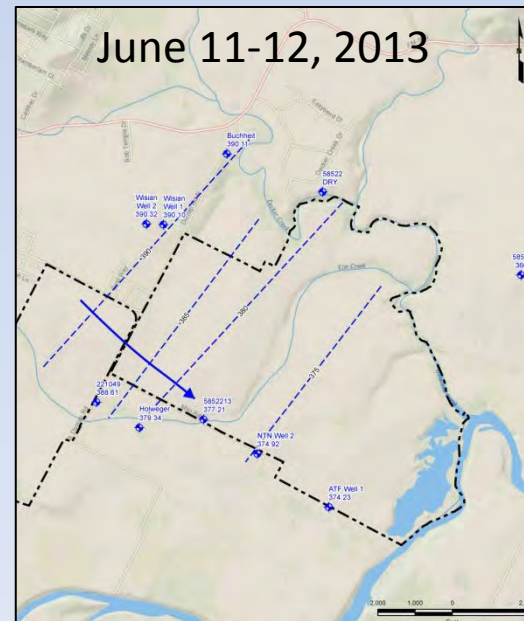
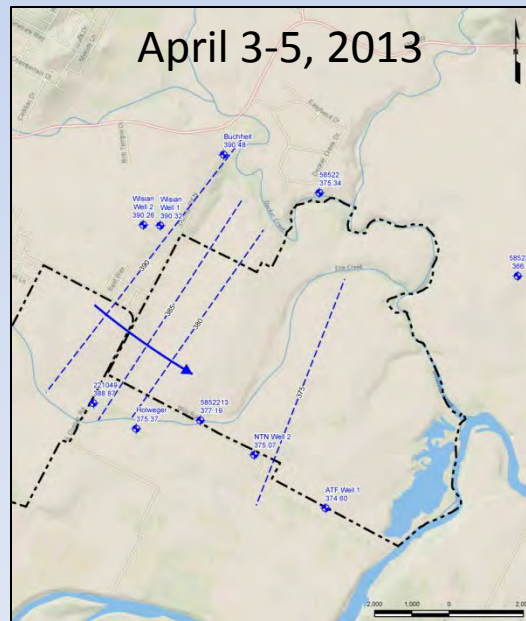
Outdoor	dBA	Indoor
Jet takeoff at 200 feet Car horn at 3 feet	120	Threshold of pain
Pneumatic hammer Gas lawn mower at 3 feet	100	Subway train
	90	Food blender at 3 feet
Downtown (large city)	80	Garbage disposal at 3 feet
Lawn mower at 100 feet	70	Vacuum cleaner at 10 feet Normal speech at 3 feet
Air conditioning unit Babbling brook	60	Clothes dryer at 3 feet Large business office
Quiet urban (daytime)	50	Dishwasher (next room)
Quiet urban (nighttime)	30	Recording studio
	0	Threshold of hearing

Sources: FHWA, 1997.



Potentiometric Surface Contour (Dashed Where Inferred)

Groundwater Potentiometric Surfaces, August 2012 to June 2013



Potentiometric Surface Contour (Dashed Where Inferred)

Elm Creek Low Water Crossing



Gilleland Creek Bridge



Gilleland Creek



View of Gilleland Creek facing south from the bridge.

Decker Creek by Well 58522



ATF Well 1 with Pecan Trees in Background

