Baseline Environmental Conditions Colorado River Corridor

Public Meeting

August 9, 2012

COUNTY OF TRAVIS · STATE OF TEXAS · 1839

LCRA
ENERGY • WATER • COMMUNITY SERVICES

CITY OF AUSTIN · FOUNDED 1839

Study Team

Travis County

City of Austin

Lower Colorado River Authority

Dr. Jack Sharp

URS Corporation

Cox McLain Environmental Consulting

Landesign Services, Inc.

Inter-Mountain Laboratories, Inc.

Introduction

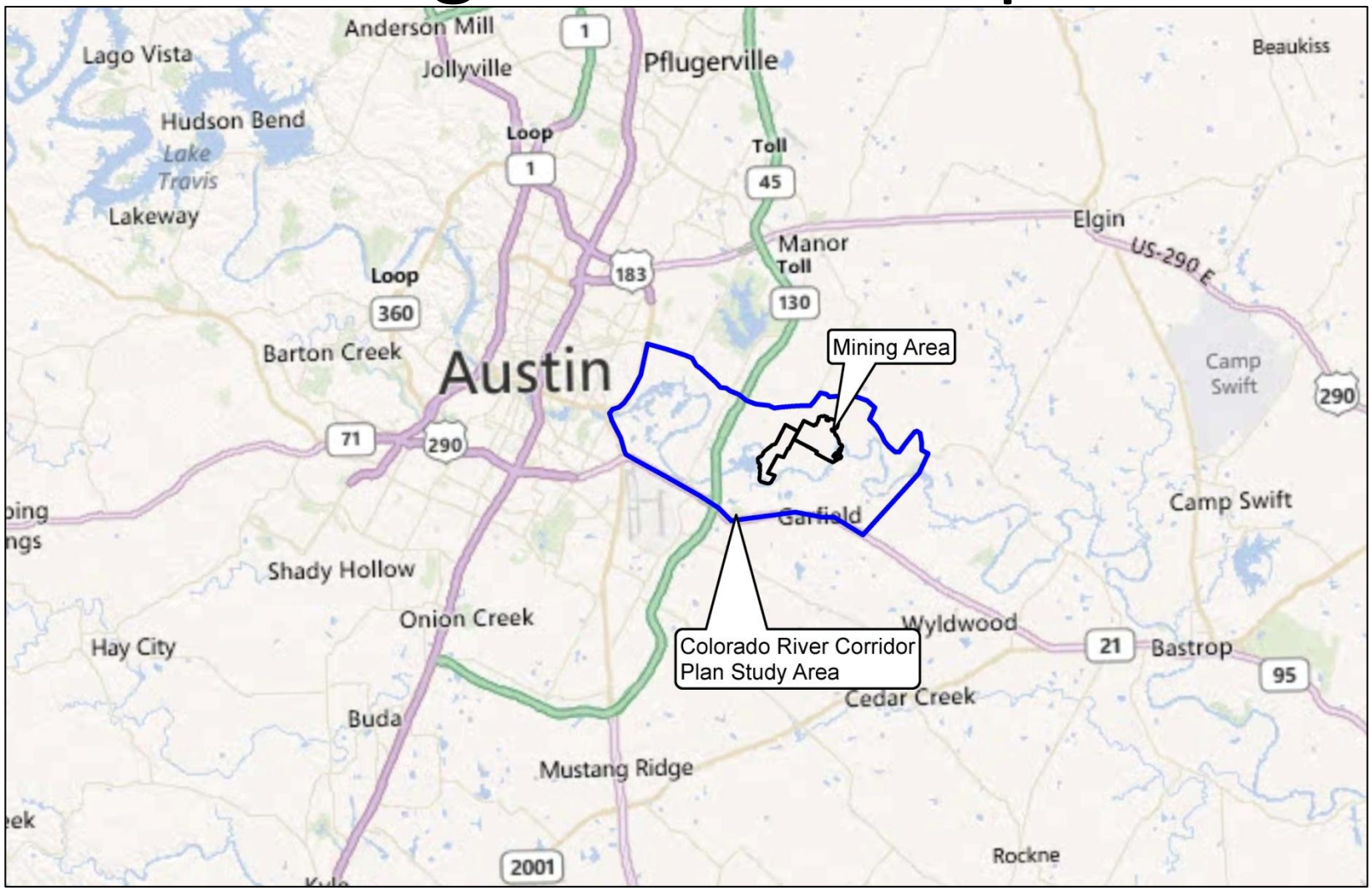
- URS was contracted by Travis County to perform groundwater, air, and noise environmental monitoring at planned TXI Hornsby Bend East and West mining site
- URS is an unbiased and impartial party
- Dr. Sharp (UT Jackson School of Geology) performed third party independent technical oversight
- Stake 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

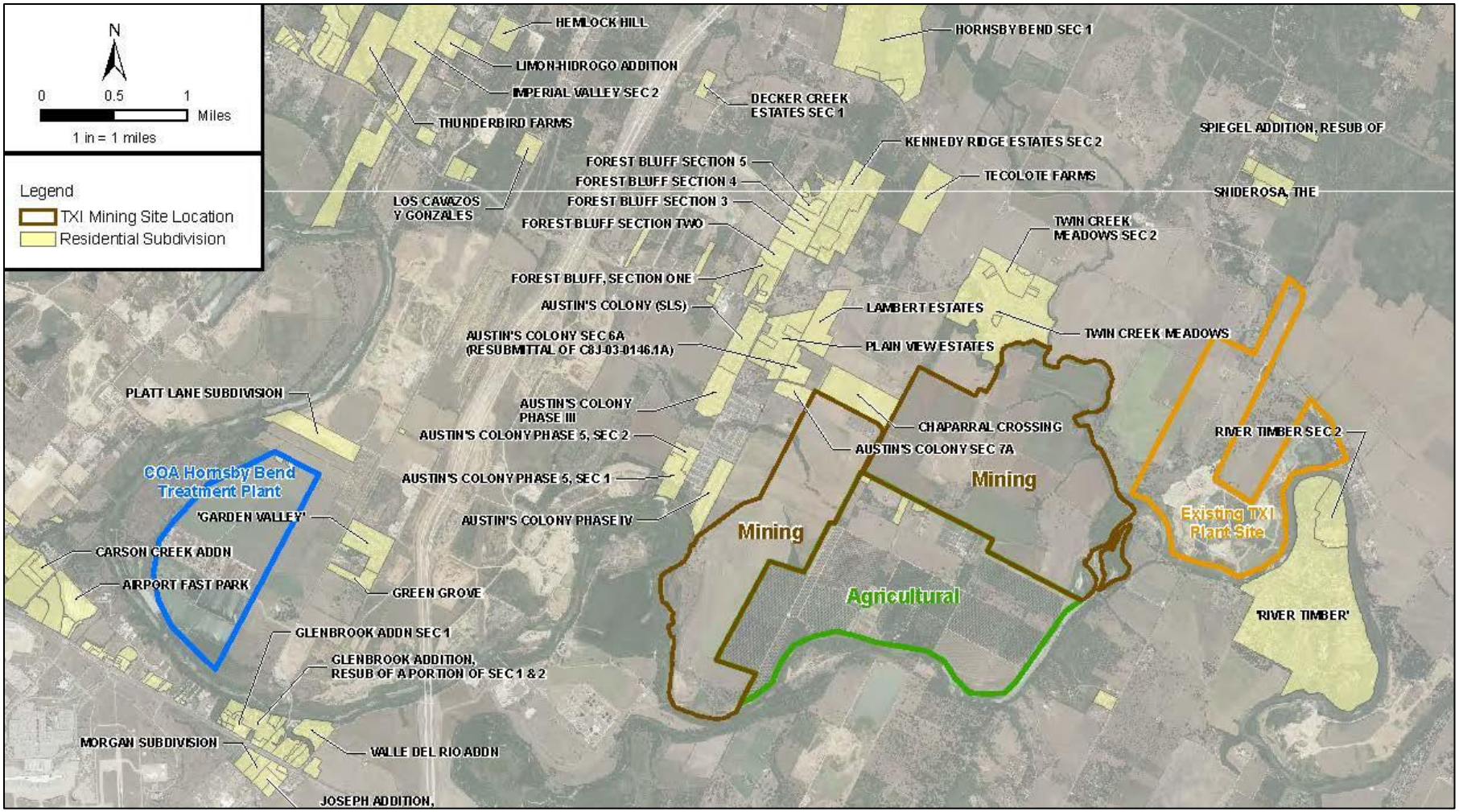
- Establish baseline environmental conditions prior to active mining operations beginning at Hornsby Bend mine site to determine if operations have an impact
  - Groundwater (Availability and Quality)
  - Air Quality
  - Noise
- Continue monitoring after mining commences and compare results to the pre-mining conditions

Regional Site Map



Study area located in southeast Travis County

Land Use

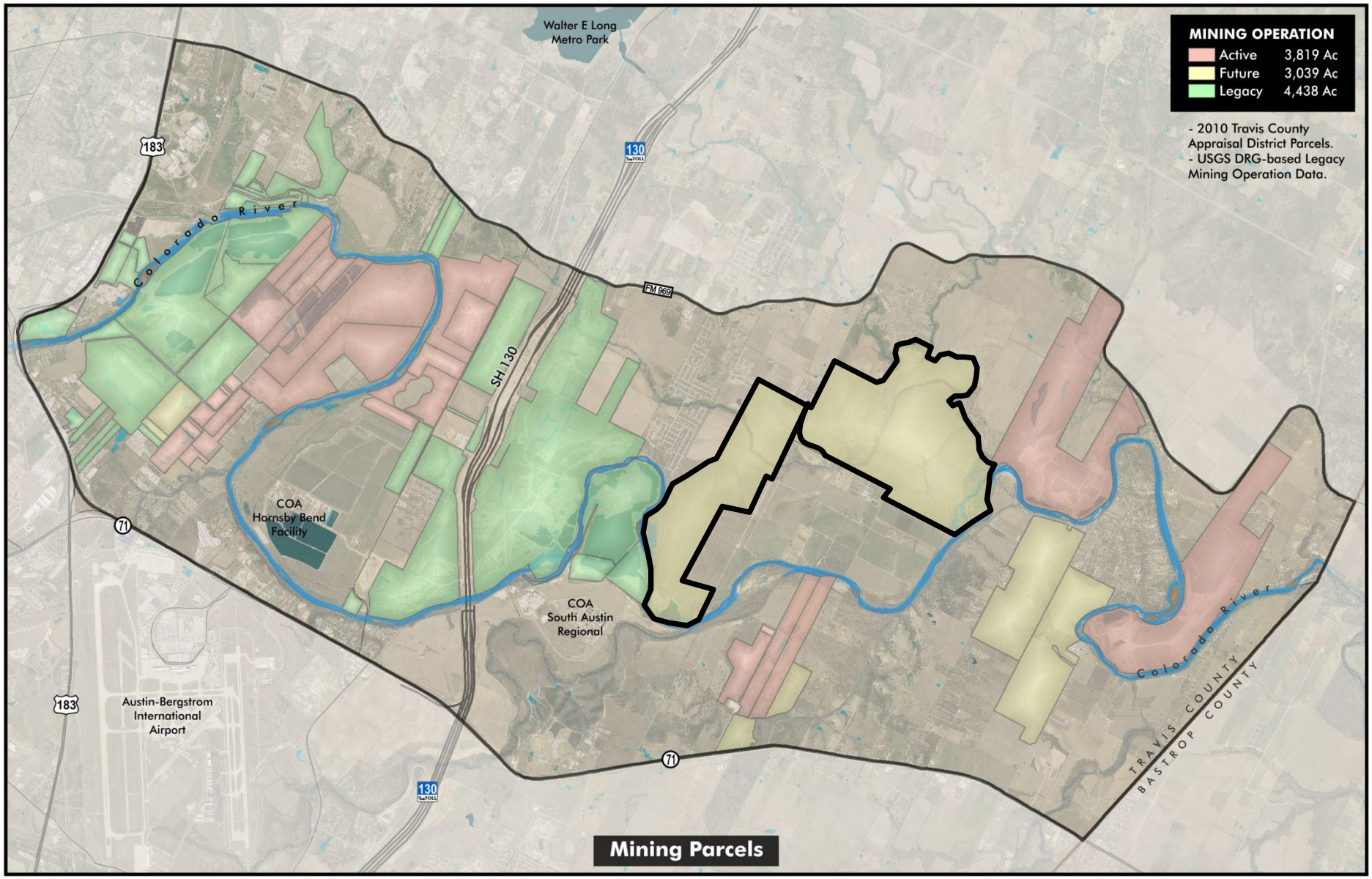


Agriculture - plant nursery, farming, and ranching

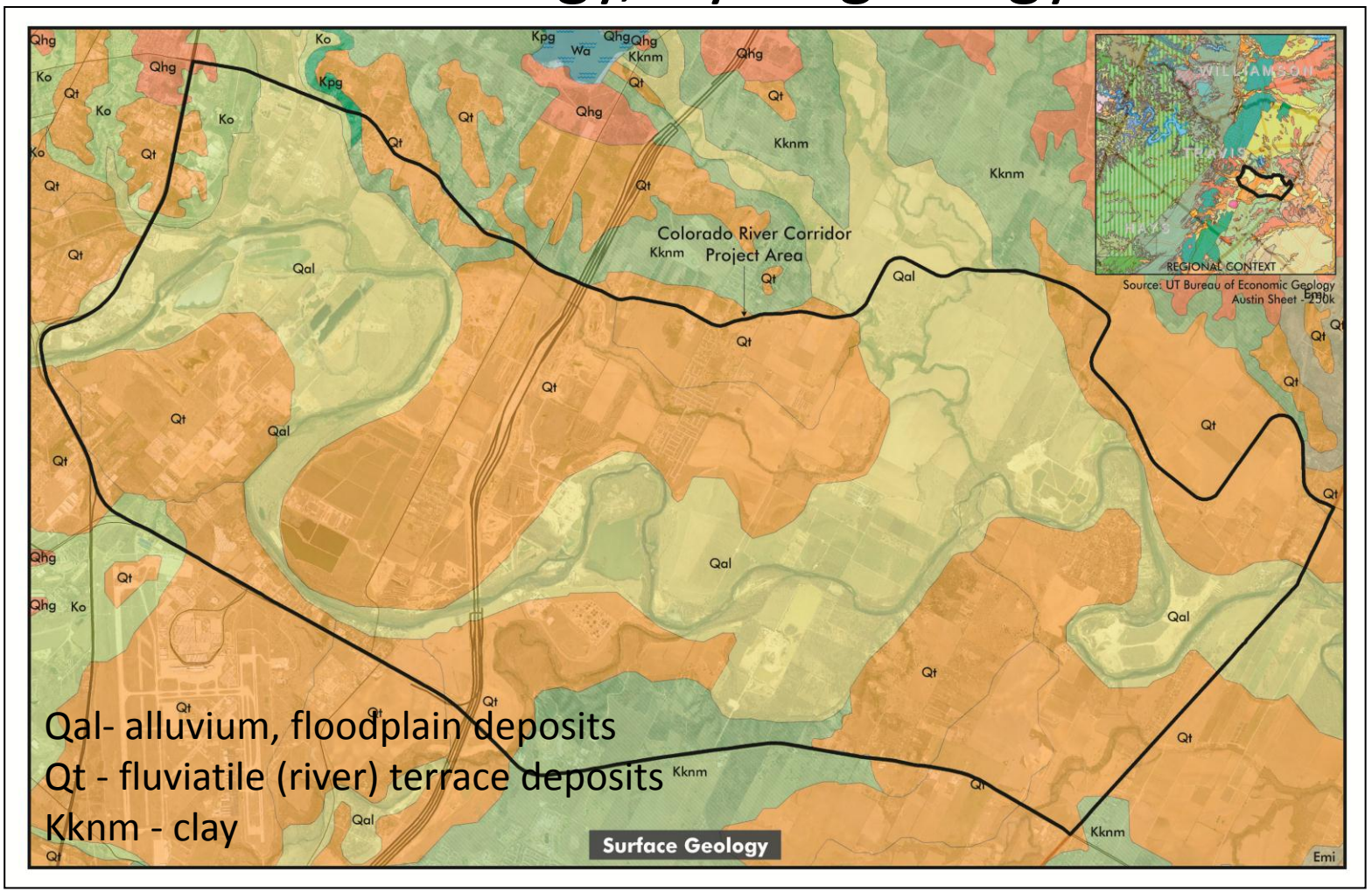
Residential - Chaparral Crossing, Austin Colony, Twin Creeks, and homes located south of Milo Road

Mining

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



Site Geology, Hydrogeology



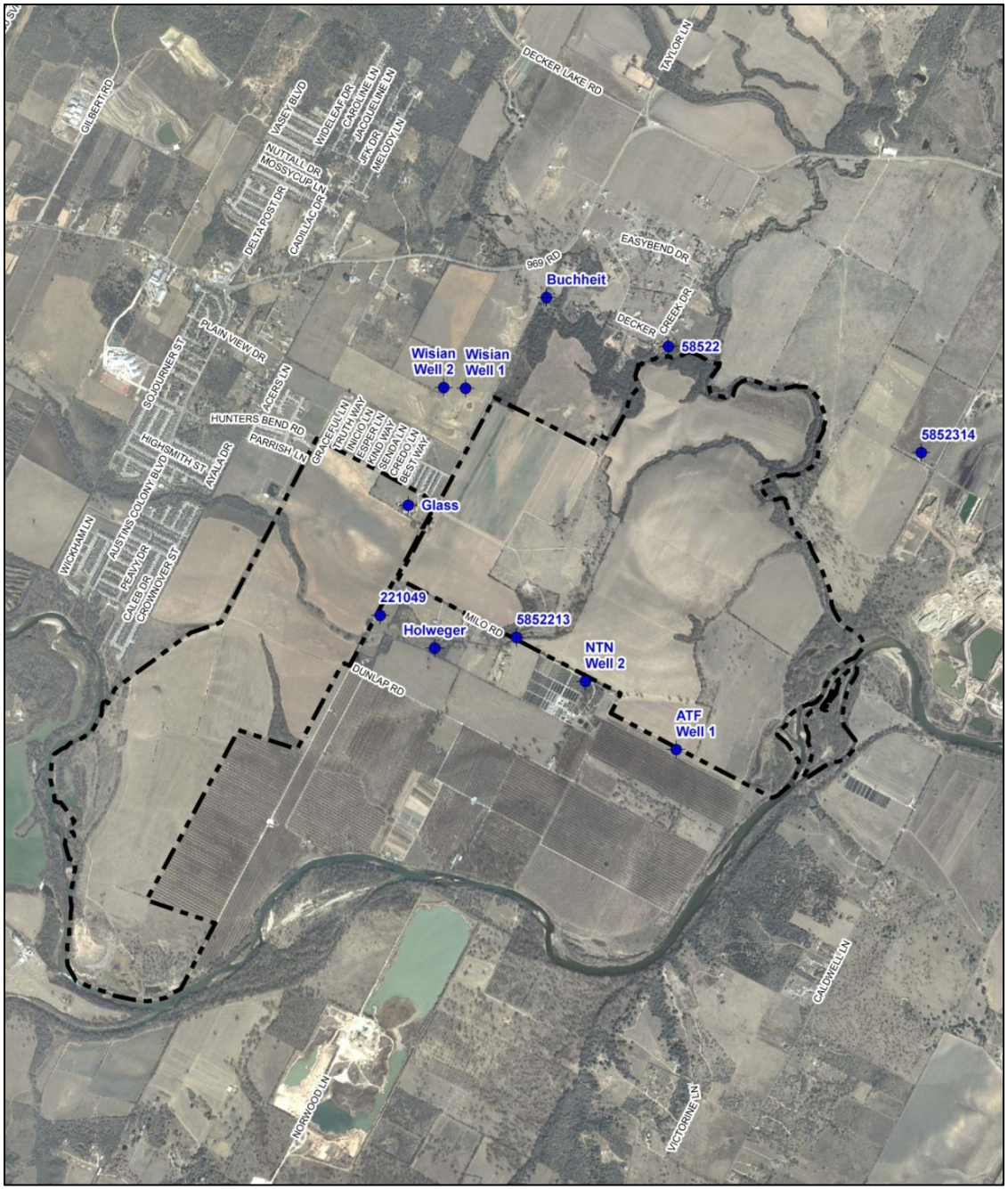
Geology - Shallow alluvial sand and gravel deposits ~10 to 60 feet thick overlying the Navarro and Taylor clay and shale

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

Task 1 - Groundwater

- 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
- Baseline groundwater levels and water quality samples collected during six events on
  - October 18-19, 2011
  - November 29-30, 2011
  - January 4-5, 2012
  - February 15-16, 2012
  - March 26-27, 2012
  - May 7-8, 2012

Selected Groundwater Monitoring Wells



- Selected 10 wells
- Each screened in the Colorado River Alluvial Aquifer
- Located around the periphery of planned mining area to measure baseline water level and water quality levels
- Obtained permission for access

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

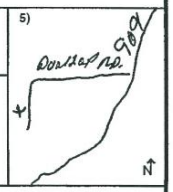
Texas Water Well Drillers Advisory Council
MC 177
P.O. Box 13087
Austin, TX 78711-3087
512-239-0530

1) OWNER Claud Burgess (Name) ADDRESS Dunlap RD. S. (Street or RFD) Manor (City) Texas (State) (Zip)

2) ADDRESS OF WELL: County Travis (Street, RFD or other) Same (City) (State) (Zip) GRID # 58-52-2

3) TYPE OF WORK (Check): ☑ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Monitor ☐ Environmental Soil Boring ☑ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell
If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 

6) WELL LOG:
Date Drilling: Started 9/14 19 00 Completed 9/15 19 00

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8"	Surface	55'

7) DRILLING METHOD (Check): ☐ Driven ☑ Air Rotary ☑ Mud Rotary ☐ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft.)	To (ft.)	Description and color of formation material
0	8'	Top Soil
8'	29'	Brown River Clay
29'	87'	River Sand & Gravel
87'	55'	Grey Clay

(Use reverse side of Well Owner's copy, if necessary)

8) Borehole Completion (Check): ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☑ Gravel Packed ☐ Other
If Gravel Packed give interval ... from 30' ft. to 55' ft.

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	Setting (ft.) To	Gage Casting Screen
4"	N	PVC. SLOTTED	30'	50'	

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 0 ft. to 15' ft. No. of sacks used
ft. to ft. No. of sacks used
Method used SLURRY
Cemented by Bill LINDSEY
Distance to septic system field lines or other concentrated contamination 100+ ft.
Method of verification of above distance MEASURED By Tape

13) TYPE PUMP:
☐ Turbine ☐ Jet ☑ Submersible ☐ Cylinder ☐ Other
Depth to pump bowls, cylinder, jet, etc., 40 ft.

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 338.44(2)(A)]
☑ Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
☐ Pitless Adapter Used [Rule 338.44(3)(b)]
☐ Approved Alternative Procedure Used [Rule 338.71]

14) WELL TESTS:
Type test: ☐ Pump ☐ Bailer ☑ Jetted ☐ Estimated
Yield: 10 gpm with ft. drawdown after hrs.

11) WATER LEVEL:
Static level 24' ft. below land surface Date 9/18/00
Artesian flow gpm. Date

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☑ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Depth of strata
Was a chemical analysis made? ☐ Yes ☑ No

12) PACKERS: Type Depth
CEMENT packer 15'

SEQ #
FILE ID
DEC 05
OCT 0 [illegible]
CB
CONTENT

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 Bill's Well Drilling (Type or print) WELL DRILLER'S LICENSE NO 52206

ADDRESS PO Box 478 (Street or RFD) Del Valle (City) Tex (State) 78617 (Zip)

(Signed) Bill [illegible] (Licensed Well Driller) (Signed) (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 05-21-96) White - TNRCC Yellow - DRILLER Pink - WELL OWNER

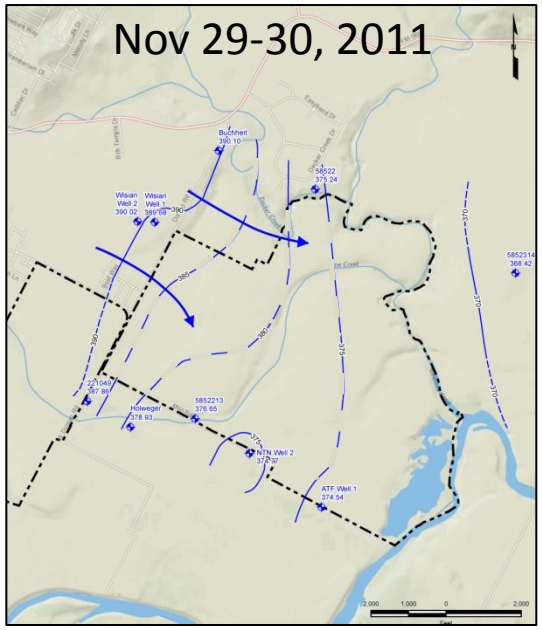
Survey Well Location and Top of Well Casing Elevation

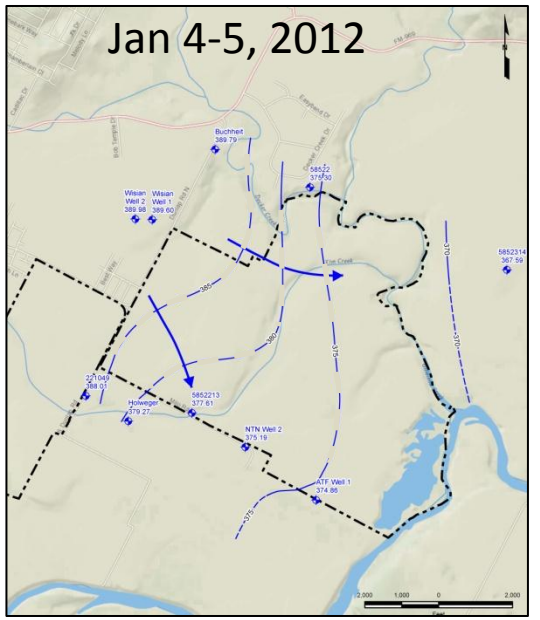
Measuring Depth to Water with Water Level Indicator

Groundwater Potentiometric Surface

Potentiometric Surface Contour (Dashed Where Inferred)

Groundwater Potentiometric Surfaces, October 2011 to May 2012





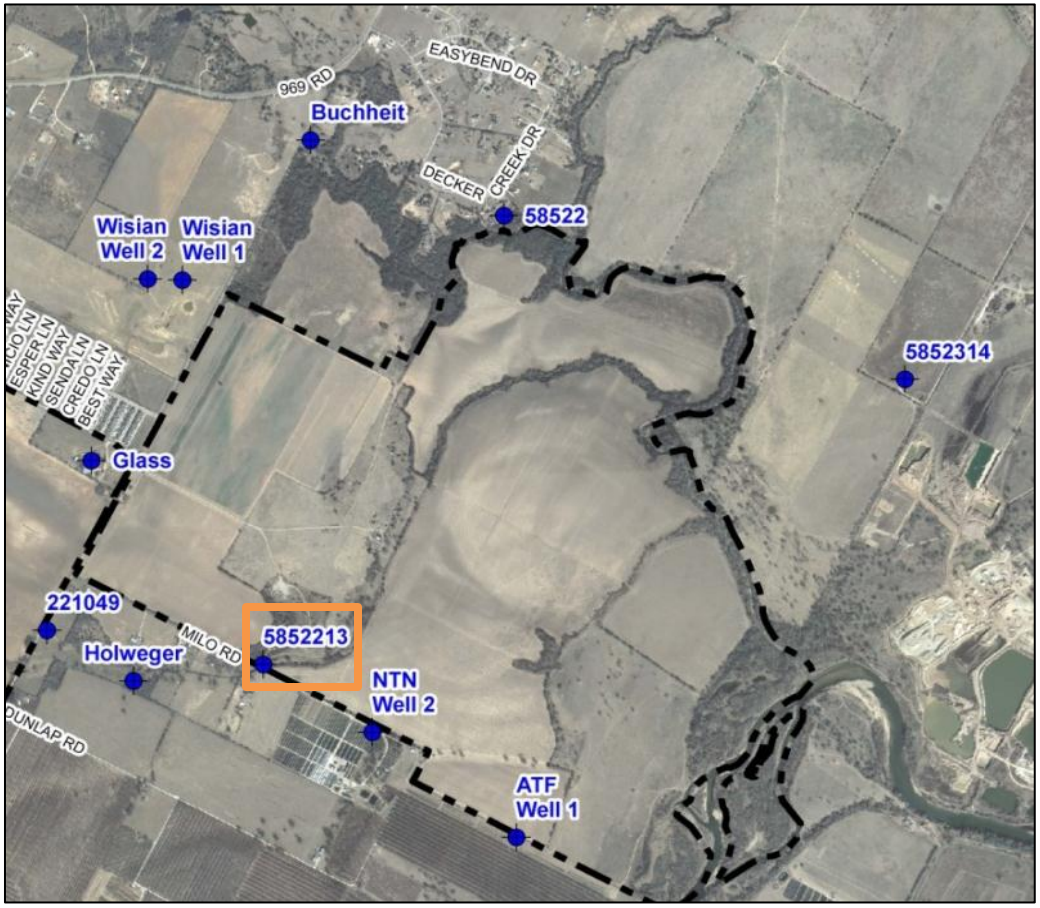
Potentiometric Surface Contour (Dashed Where Inferred)

Groundwater Elevation Increase From October 2011 to May 2012

Well ID	Change in Groundwater Elevation (ft)
58522	+ 0.17
221049	+ 1.42
5852213	+ 1.88
5852314	+ 4.85
ATF Well 1	+ 1.75
Buchheit	+ 1.83
Holweger	+ 1.44
NTN Well 2	+ 3.49
Wisian Well 1	+ 0.85
Wisian Well 2	+ 0.67

Task 1 – Groundwater (continued)

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



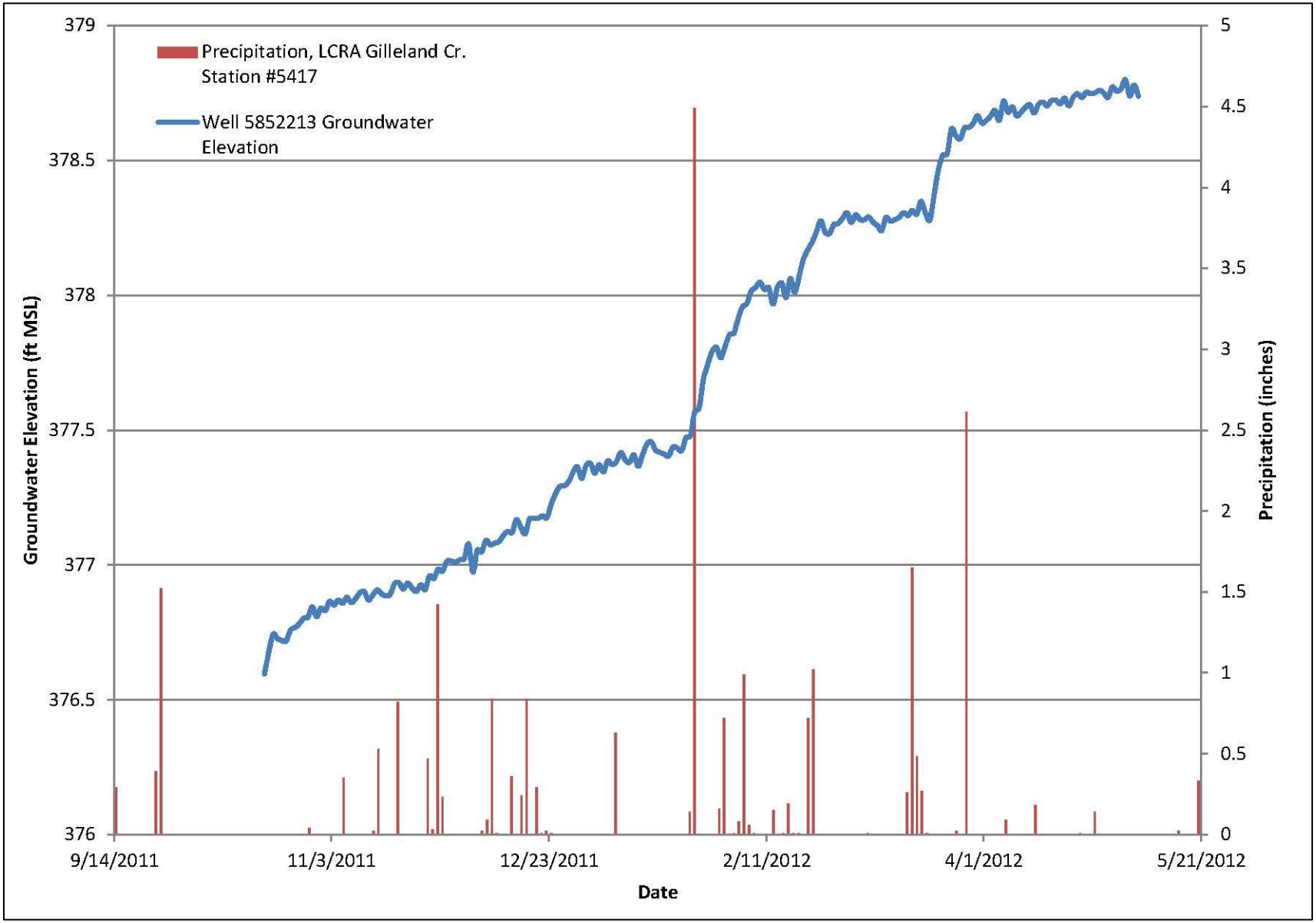
Continuous Water Level Monitoring Equipment

Well 5852213

Water Level Pressure Transducer

Downloading Water Level Data from Transducer in Well 585223

Well Hydrograph



Baseline Groundwater Availability

- Potentiometric surface ranged from approximately 390 ft to 368 ft above msl
- An average groundwater rise of 1.8 ft observed
- Above average precipitation during late 2011 and early 2012 preceded by extreme dry conditions that persisted from Feb to Oct 2011 is influencing groundwater levels and availability

Task 1 – Groundwater (continued)

- LCRA Environmental Laboratory Services analyzed water quality for 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 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

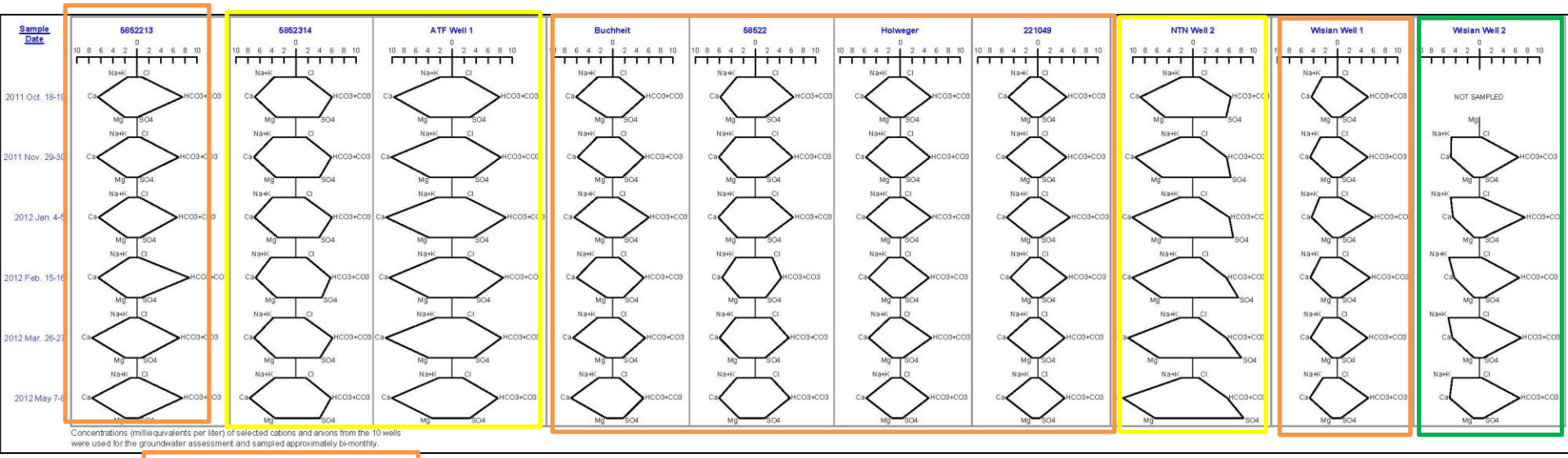
- Example water quality data set from well 5852213
- In total 60 data sets collected from 10 wells

Overall Water Quality Statistics

- Overall water quality is good
- Water chemistry from each sampling event is consistent for each well with small variation between most wells
- Calcium bicarbonate water type is dominate
- Wells 5852314, ATF 1 and NTN 2 have relatively more sulfate
- Wisian Well 2 has relatively more sodium

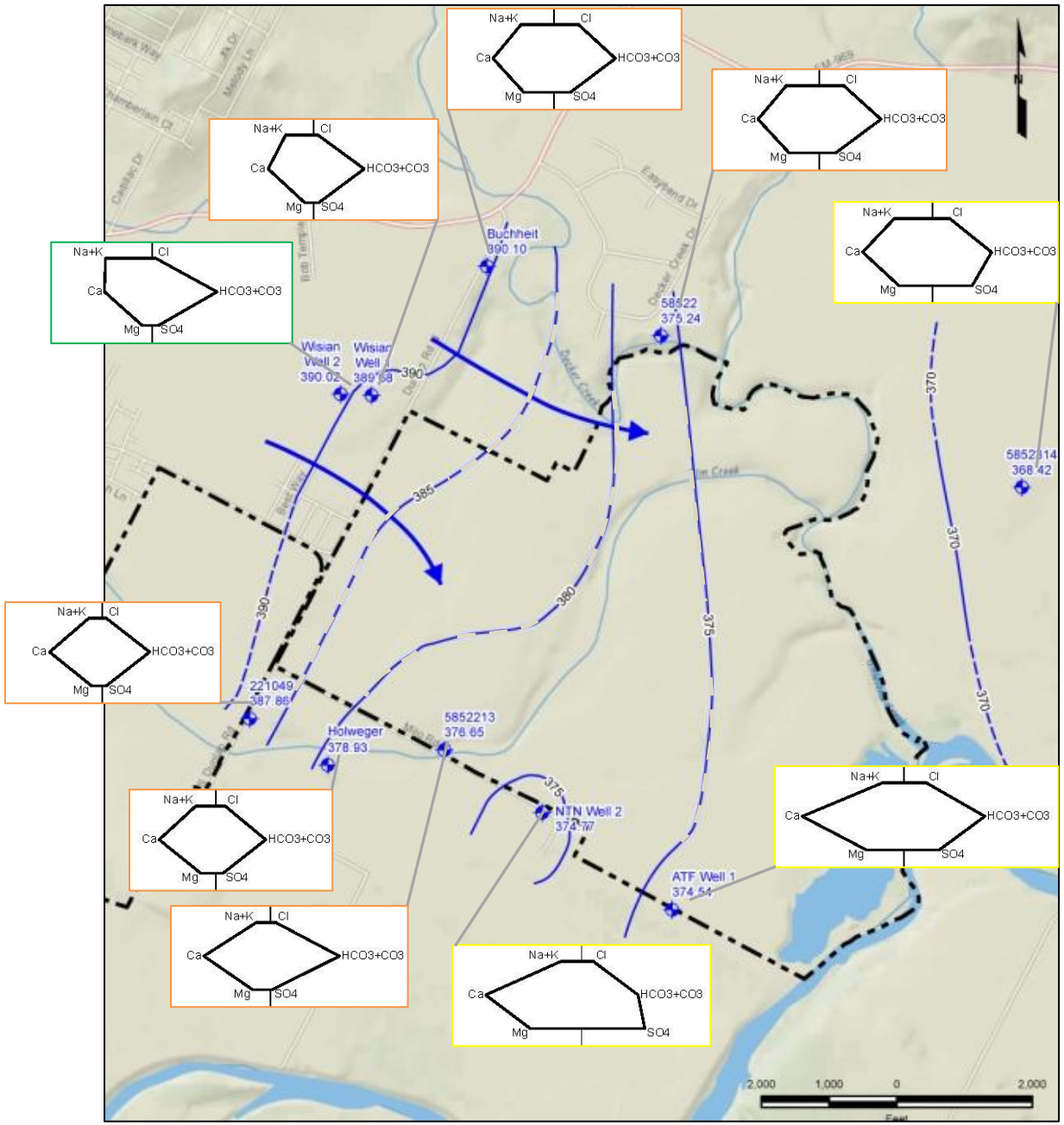
Stiff Diagrams

Stiff diagrams a graphical representation of the major ion composition of the water. A polygonal shape is created by plotting cations and anions in milliequivalents per liter on either side of a vertical zero axis. Stiff patterns 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 and NTN 2 have relatively more sulfate
- Wisian Well 2 has relatively more sodium

Nov 29-30, 2012 – Potentiometric Surface & Stiff Diagrams



Potentiometric Surface Contour (Dashed Where Inferred)

Baseline Groundwater Quality

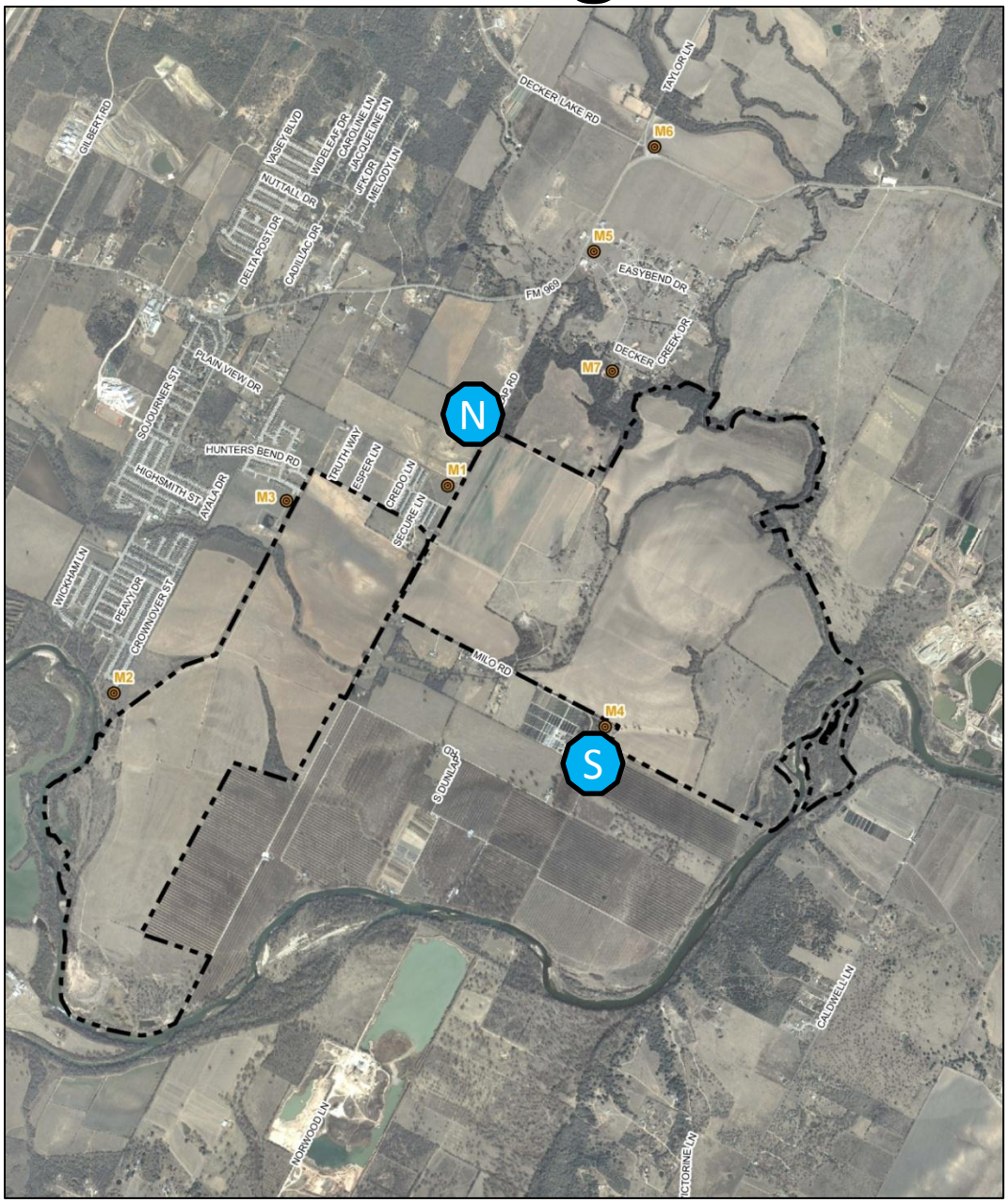
- The range of water quality values is representative of overall baseline conditions
- Future water quality values incongruent with baseline conditions can be identified as concentrations greater than the maximum baseline value + one standard deviation

Overall Statistic (all normal samples)	Calcium	Magnesium	Potassium	Sodium	Chloride	Fluoride	Nitrate	Sulfate	Bicarbonate	Carbonate	Ammonia	TSS	TDS
Minimum	84	10.1	1.80	22.6	10.2	0.11	0.01	7.11	259	< 2	0.02	1.00	440.2
Maximum	233	76.7	6.01	118	99.6	0.43	34.7	406	544	< 2	6.35	73.7	1148.9
Standard Deviation	41	17.9	0.94	24.2	27.7	0.09	8.19	103	69.9	< 2	0.99	12.6	204.8
Maximum + 1 Standard Deviation	**274**	**94.6**	**6.95**	**142**	**127**	**0.52**	**42.9**	**509**	**614**	**< 2**	**7.34**	**86.3**	**1353.7**

Task 2 - Air

- Air sampling for $PM_{2.5}$ and PM_{10} 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
  - 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

Air Monitoring Locations



S Air Monitoring Location

Air Quality Sample Location, North Site

Air Quality Sample Location, South Site

Air Quality $PM_{2.5}$ and PM_{10} Size Fraction Results

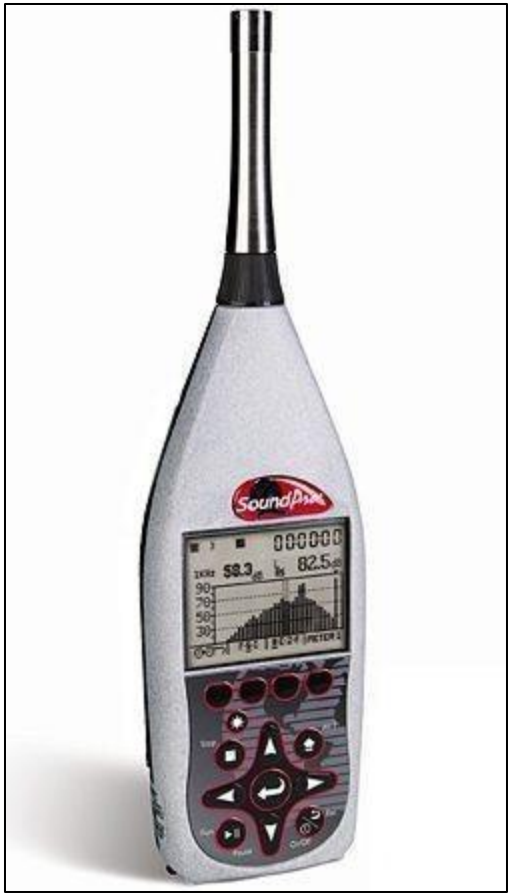
Sampling Event	Date	North Site		South Site	
		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
1	10/20/2011	28.1	7.6	15.8	7.5
1	10/23/2011	24.9	10.7	19.9	10.7
1	10/26/2011	11.9	8.1	15.0	8.2
1	10/29/2011	27.5	9.0	22.1	10.3
1	11/1/2011	22.6	11.7	28.6	13.6
1	11/4/2011	15.4	6.7	NV-L	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 *u*g/m^3 and 21.1 *u*g/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 *u*g/m^3 and 150 *u*g/m^3 and are greater than baseline levels
- TCEQ $PM_{2.5}$ and PM_{10} 2011 annual average levels from 2600B Weberville Rd were 10.9 *u*g/m^3 and 18.0 *u*g/m^3, similar to levels measured in the study area

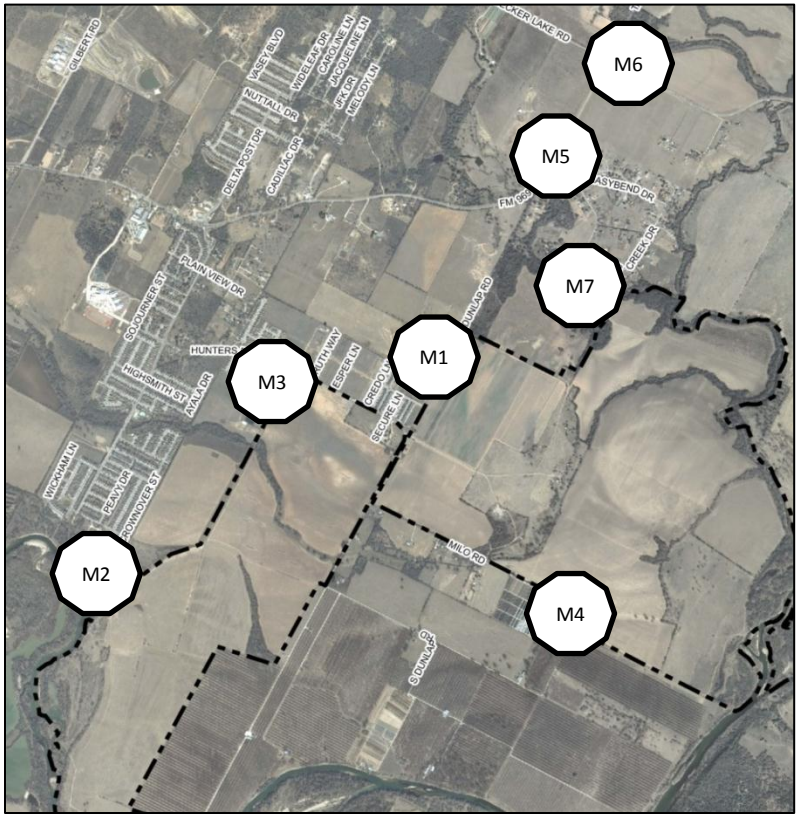
Task 3 - Noise

- Noise Monitoring was performed with a Quest SoundPro DL-1 Type 1 precision sound level meter
- Noise monitoring performed 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 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 on potential truck haul route along FM 969.
- M7 - south end of Decker Creek Dr representative of residences closest to north side of mining area.

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.

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

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
  - Baseline groundwater elevation is at 370 to 390 ft and rising with recent recharge from precipitation
  - Calcium-bicarbonate is the typical water type
  - The range of observed water quality values is representative of baseline conditions
  - Maximum baseline value + one 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 *u*g/m^3 and 21.1 *u*g/m^3 and are representative of baseline levels
  - $PM_{2.5}$ and PM_{10} NAAQS are 35.0 *u*g/m^3 and 150 *u*g/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 data, continuous water levels with transducer, annual 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

Questions?

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

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

Groundwater Elevation Data

Well ID	TOC Elevation (ft msl)	Date	Depth to Water (ft TOC)	Groundwater Elevation (ft msl)	Ft of Water in Well
58522	414.64	10/19/2011	38.92	375.72	17.44
		11/29/2011	39.40	375.24	16.96
		1/5/2012	39.34	375.30	17.02
		2/15/2012	38.70	375.94	17.66
		3/27/2012	38.54	376.10	17.82
		5/7/2012	38.75	375.29	17.61
221049	420.80	10/19/2011	32.63	388.17	11.35
		11/30/2011	32.94	387.86	11.04
		1/5/2012	32.79	388.01	11.19
		2/15/2012	31.67	389.13	12.31
		3/27/2012	31.29	389.51	12.69
		5/8/2012	31.21	389.59	12.77
5852213	406.31	10/18/2011	29.84	376.47	6.54
		11/29/2011	29.66	376.65	6.72
		1/4/2012	29.30	377.01	7.08
		2/15/2012	28.62	377.69	7.76
		3/26/2012	28.40	377.91	7.98
		5/7/2012	27.96	378.35	8.42
5852314	409.22	10/18/2011	41.10	368.12	18.90
		11/30/2011	40.80	368.42	19.20
		1/5/2012	41.63	367.59	18.37
		2/16/2012	37.26	371.96	22.74
		3/26/2012	36.30	372.92	23.70
		5/7/2012	36.25	372.97	23.75
ATF Well 1	403.02	10/19/2011	28.92	374.10	21.66
		11/29/2011	28.48	374.54	22.10
		1/5/2012	28.16	374.86	22.42
		2/15/2012	26.81	376.21	23.77
		3/27/2012	26.33	376.69	24.25
		5/8/2012	27.17	375.85	23.41
Glass	N/A	10/18/2011	47.01	N/A	0.39
		11/29/2011	47.28	N/A	0.12
		2/15/2012	47.00	N/A	0.40

Well ID	TOC Elevation (ft msl)	Date	Depth to Water (ft TOC)	Groundwater Elevation (ft msl)	Ft of Water in Well
Holweger	411.53	10/19/2011	32.82	378.71	6.93
		11/30/2011	32.60	378.93	7.15
		1/5/2012	32.26	379.27	7.49
		2/16/2012	31.60	379.93	8.15
		3/27/2012	31.25	380.28	8.50
		5/8/2012	31.38	380.15	8.37
NTN Well 2	406.57	10/19/2011	33.82	372.75	6.95
		11/30/2011	31.80	374.77	8.97
		1/5/2012	31.38	375.19	9.39
		2/16/2012	31.58	374.99	9.19
		3/27/2012	30.42	376.15	10.35
		5/8/2012	30.33	376.24	10.44
Wisian Well 1	440.24	10/18/2011	50.39	389.85	14.83
		11/29/2011	50.56	389.68	14.54
		1/4/2012	50.64	389.60	14.46
		2/15/2012	50.06	390.18	15.04
		3/26/2012	49.33	390.91	15.77
		5/7/2012	49.54	390.70	15.56
Wisian Well 2	435.52	11/29/2011	45.50	390.02	16.68
		1/4/2012	45.54	389.98	16.64
		2/15/2012	45.20	390.32	16.98
		3/26/2012	44.90	390.62	17.28
		5/7/2012	44.83	390.69	17.35
Buchheit	416.31	10/19/2011	26.15	390.16	4.60
		11/30/2011	26.21	390.10	4.54
		1/5/2012	26.52	389.79	4.23
		2/16/2012	25.96	390.35	4.79
		3/26/2012	25.33	390.984	5.42
		5/7/2012	25.33	390.984	5.42

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
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
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
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
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
221049	10/19/2011	99.0	12.3	1.83	29.0	13.3	0.267	13.6	17.9	286	< 2	< 0.020	4.8
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
Glass	10/18/2011	3040	73.2	22.1	58.3	18.6	0.232	10.5	32.5	882	< 2	3.54	3120

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)
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
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 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
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

Trilinear Diagram