Bluewater Valley Downstream Alliance Meeting
July 11, 2011

NMED Ground Water Quality Bureau

Discussion Topics

Remedial System Evaluation

EPA Slides from April 26, 2010 Public Meeting

*****Assessment of Leakage
from Evaporation Ponds (EPs)

*Relocation of the Tailings Piles

*Dilution of Ground Water Contamination

Alluvial Background Concentrations

What is RSE?

The review includes an independent team of experts

- Recommendations from RSE are not intended to identify any deficiency in the remedial work but suggestions for improvement
- Reading and analyzing site documents
- Evaluating the conceptual site model
- Evaluating historical and current remedies
- Identifying cost savings opportunities
- Identifying protectiveness improvements
- Identifying opportunities to accelerate site completion
- Planning conference calls with all stakeholders
- Developing a targeted scope of work
- A 1-day site visit (for most sites)
- A draft and final draft report (20 to 40 pages)

RSE Summary

- Final Report in 2010 by USACE
- Transparent process
- 18 Recommendations
- EPA agrees with 14 recommendations and partially agrees with 1
- EPA disagrees with 3 recommendations
- EPA has requested NRC to direct Homestake to take action

RSE Summary

- All three agencies NRC, EPA and NMED agree that there is no health and safety concern associated with any recommendation
- HMC is in compliance with NRC license and all other permit conditions
- HMC has indicated willingness to evaluate some of the recommendations voluntarily
- RSE did not identify alternate remediation strategies for the HMC site
- RSE did not recommend changing the current pump and treat remediation strategy

RSE Recommendation #2

Simplification of the extraction and injection system and reduce dilution as a component of the remedy

EPA agrees that HMC consider this recommendation

RSE Recommendation #8

Assess EP-1 for potential leaks

EPA agrees and requests HMC assess leakage from EP-1

RSE Recommendation #15

Develop a comprehensive, regular, and objectives-based monitoring program

The EPA agrees with this, however, Homestake has a comprehensive monitoring plan that needs update

RSE Recommendation #16

Quantitative long-term monitoring optimization techniques are highly recommended

The EPA agrees with this and requests HMC to update the monitoring plans in the Corrective Action Plan (CAP)

Assessment of Leakage from Evaporation Ponds (EPs)

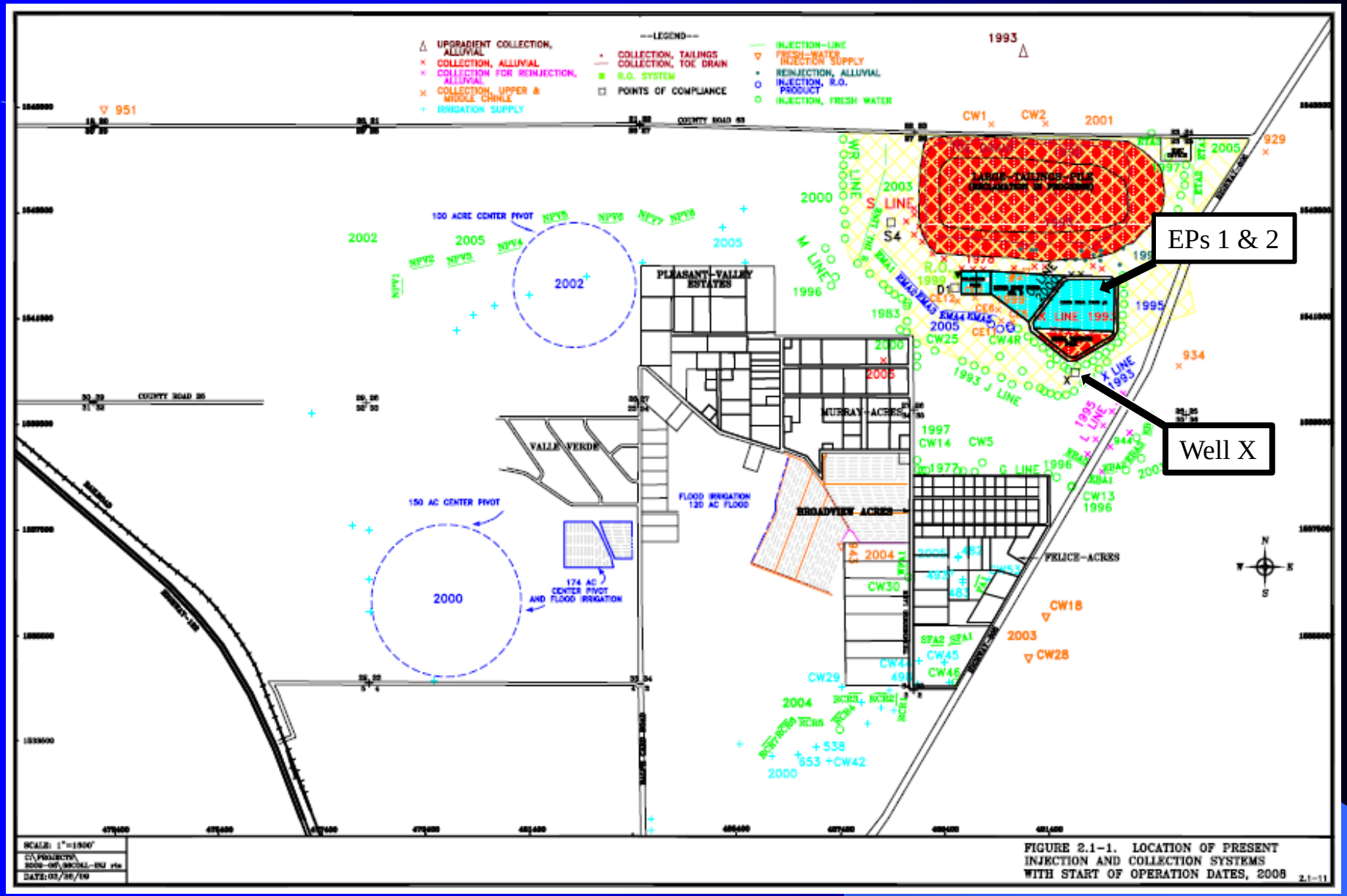
Background

Monitoring well time-series plots

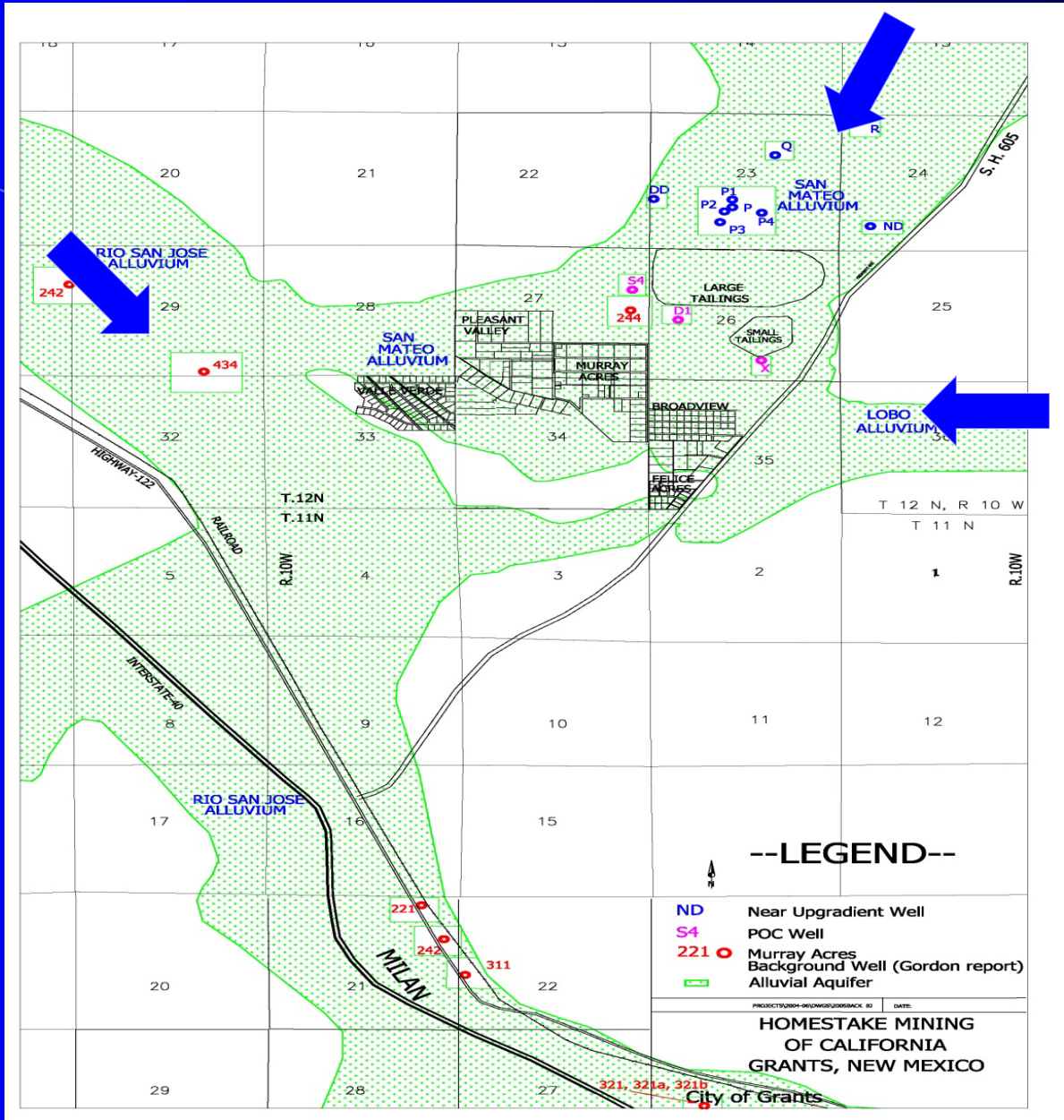
*Ground water contaminant concentrations

*Ground water levels

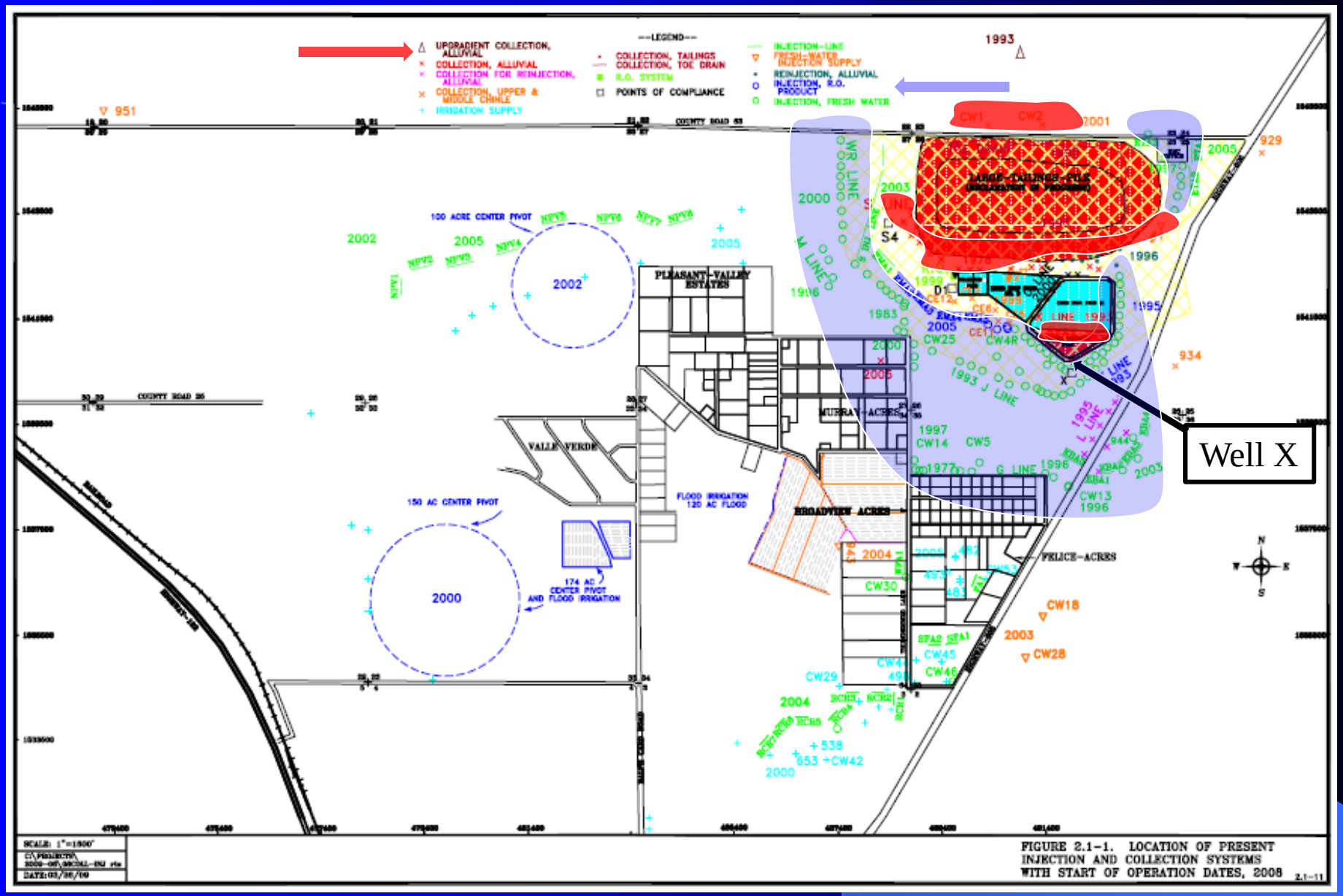
Location of EPs and Well X



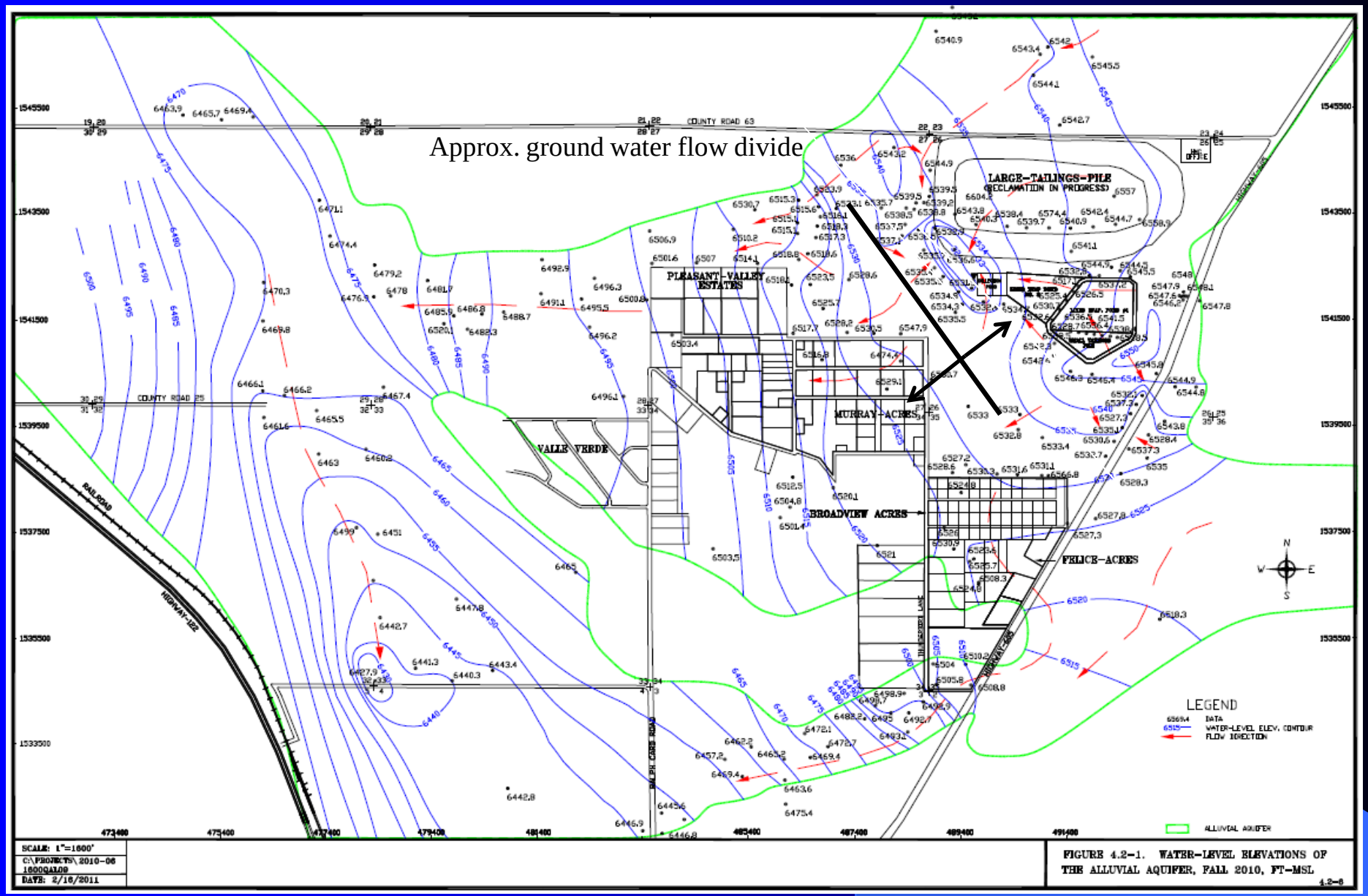
Ground Water Flow in the Alluvium



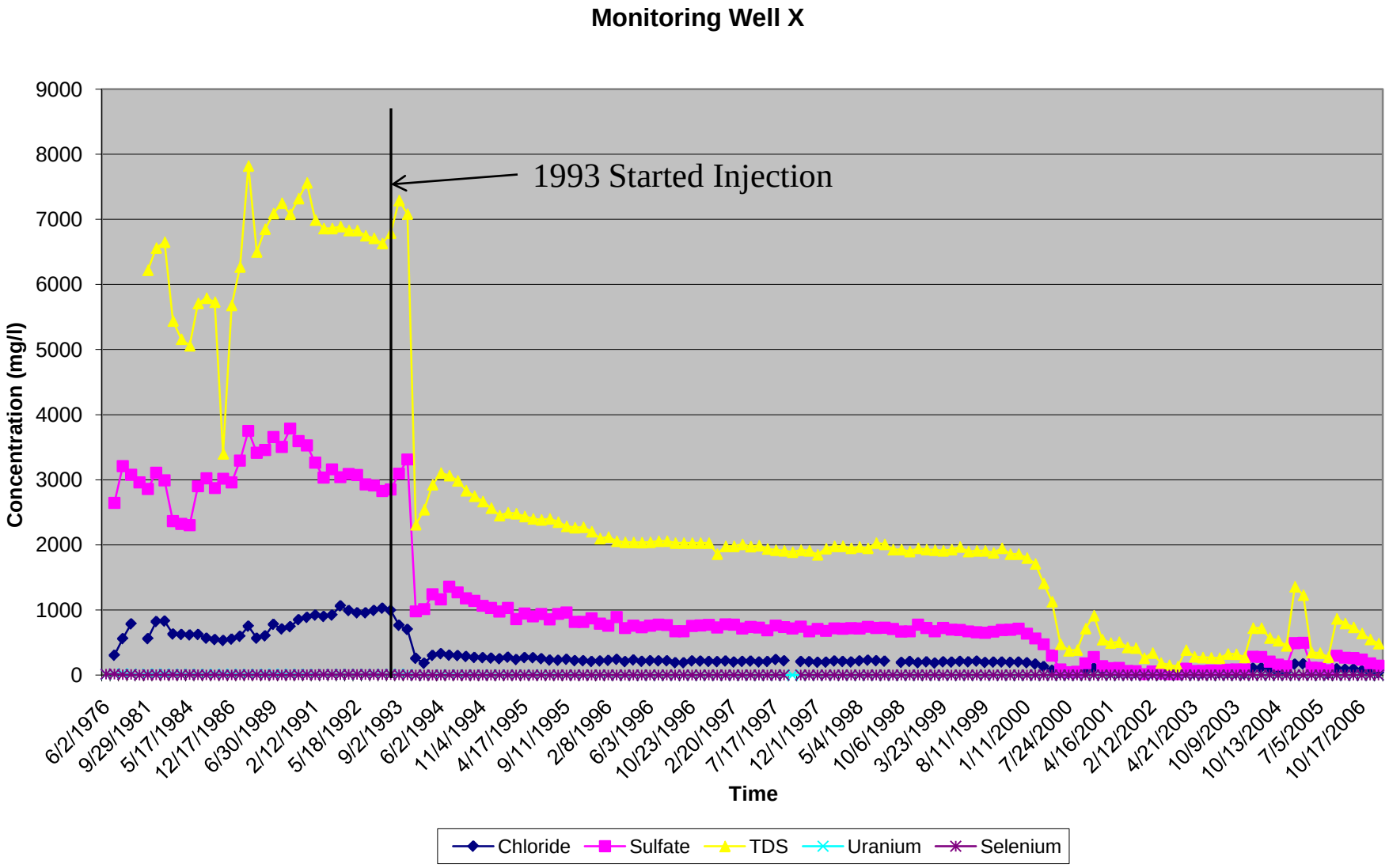
Ground Water Injection & Collection System Layout



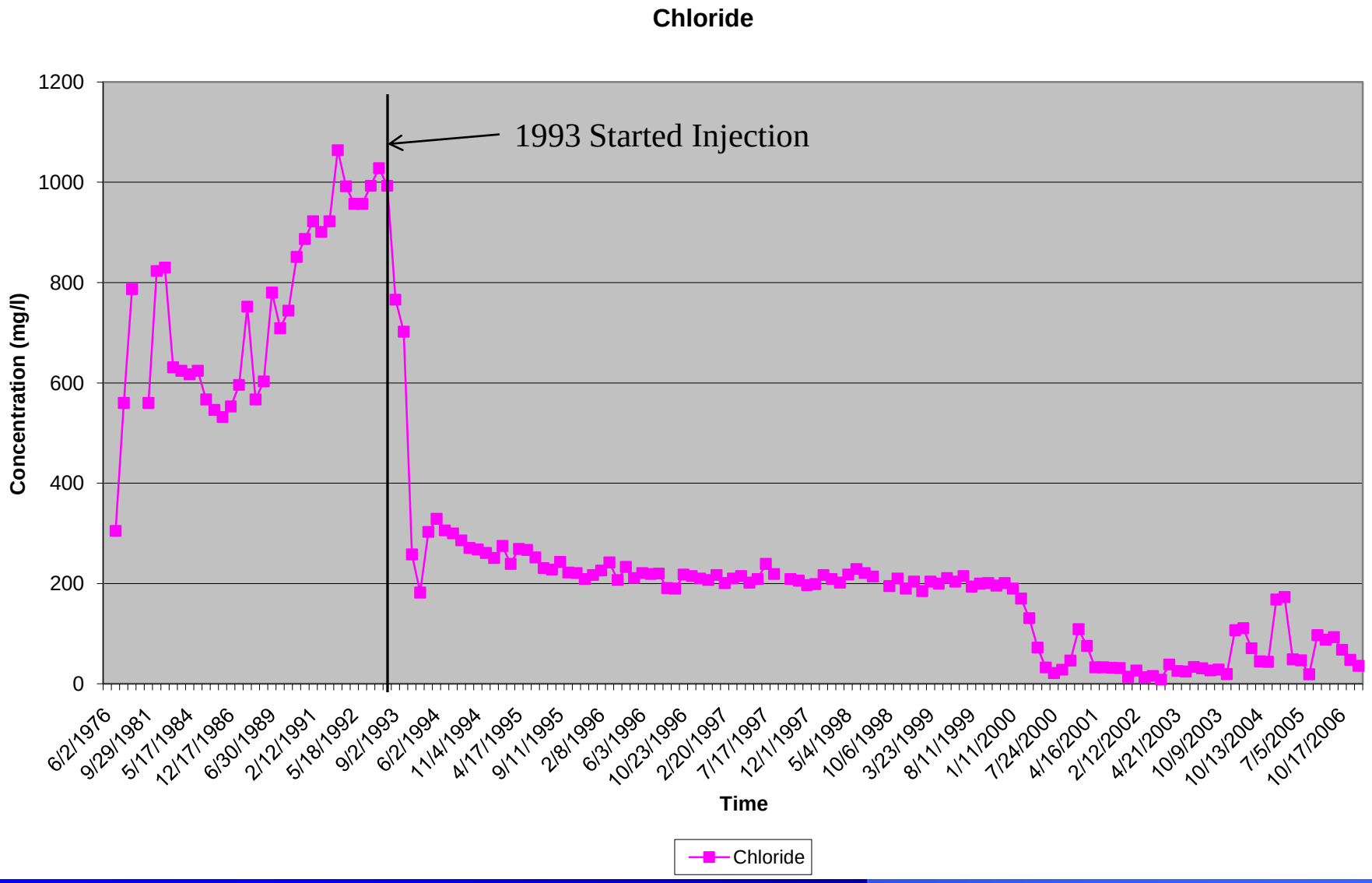
Ground Water Flow Divides in the Alluvium



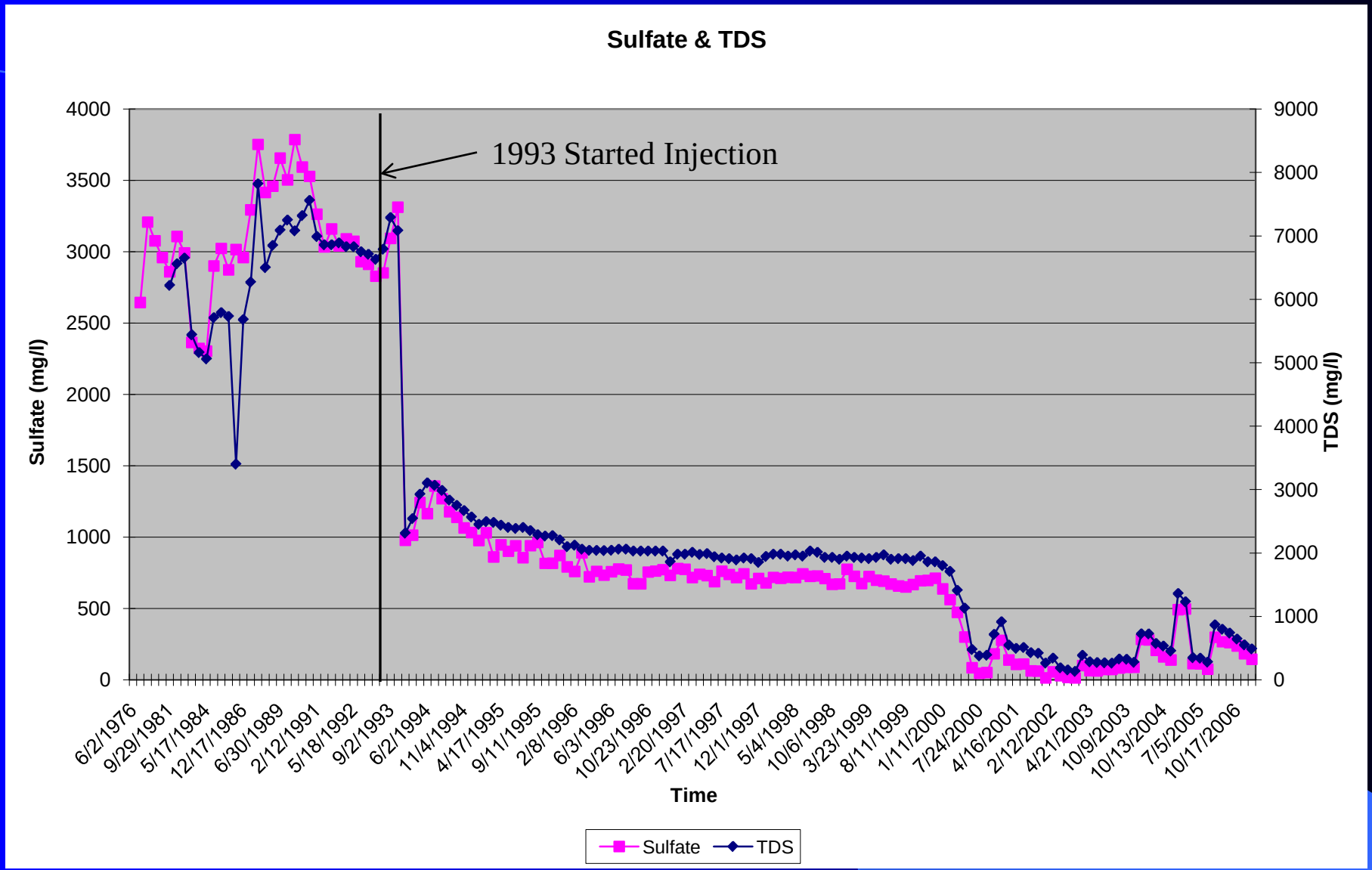
Time-series Plot of Ground Water COC Concentrations in Monitoring Well X



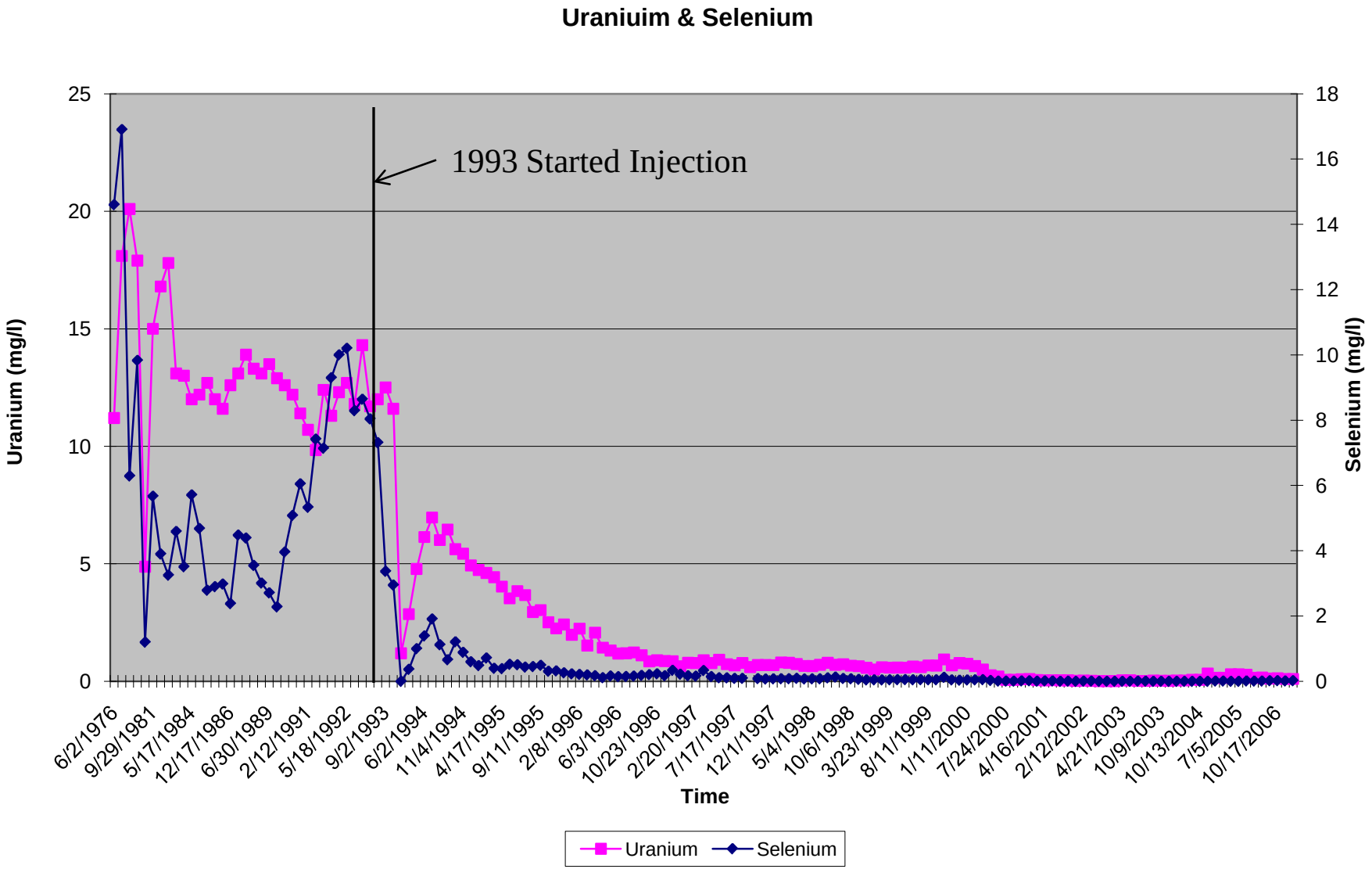
Time-series Plot of Chloride Concentrations in Well X



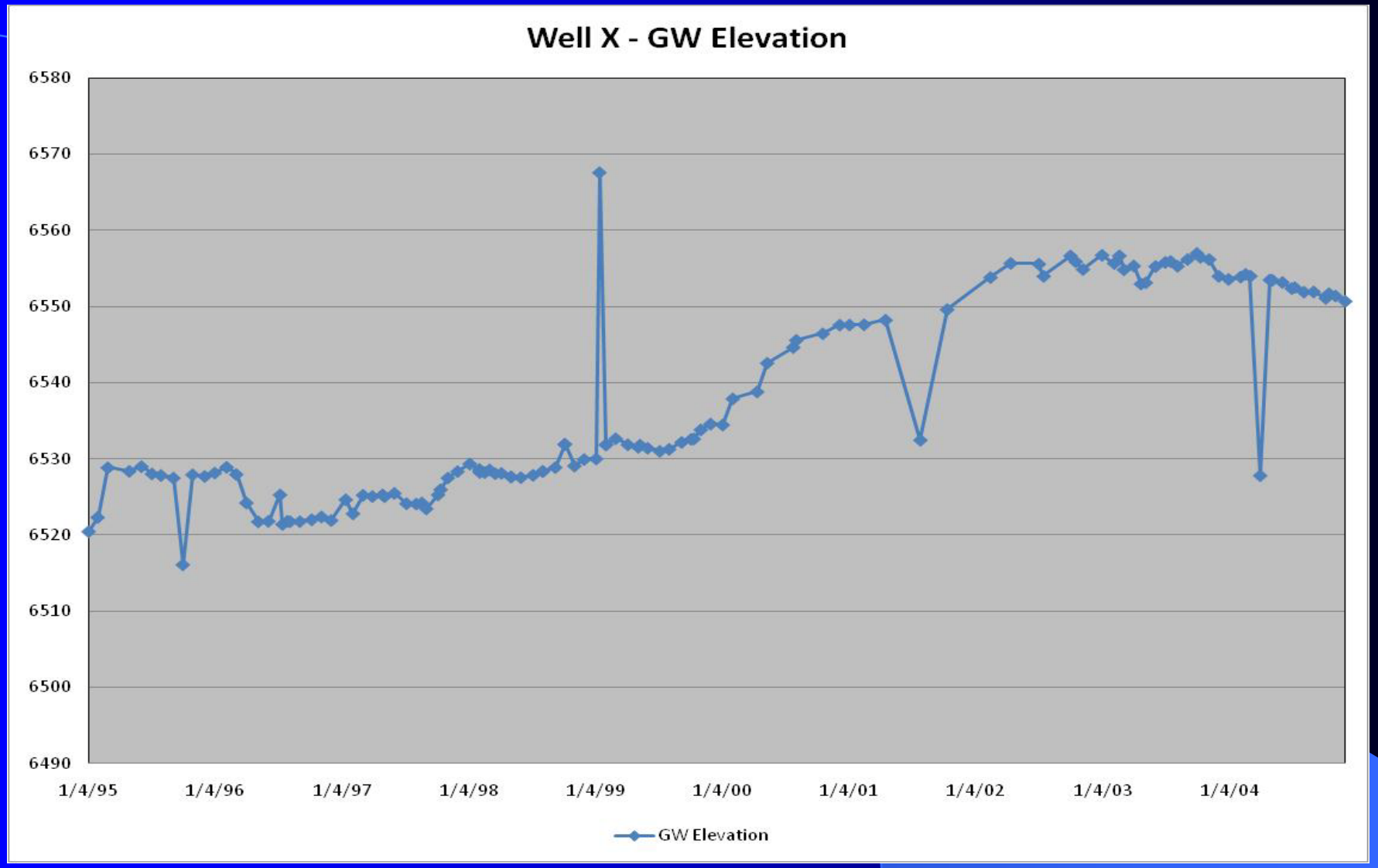
Time-series Plot of Sulfate & TDS Concentrations in Well X



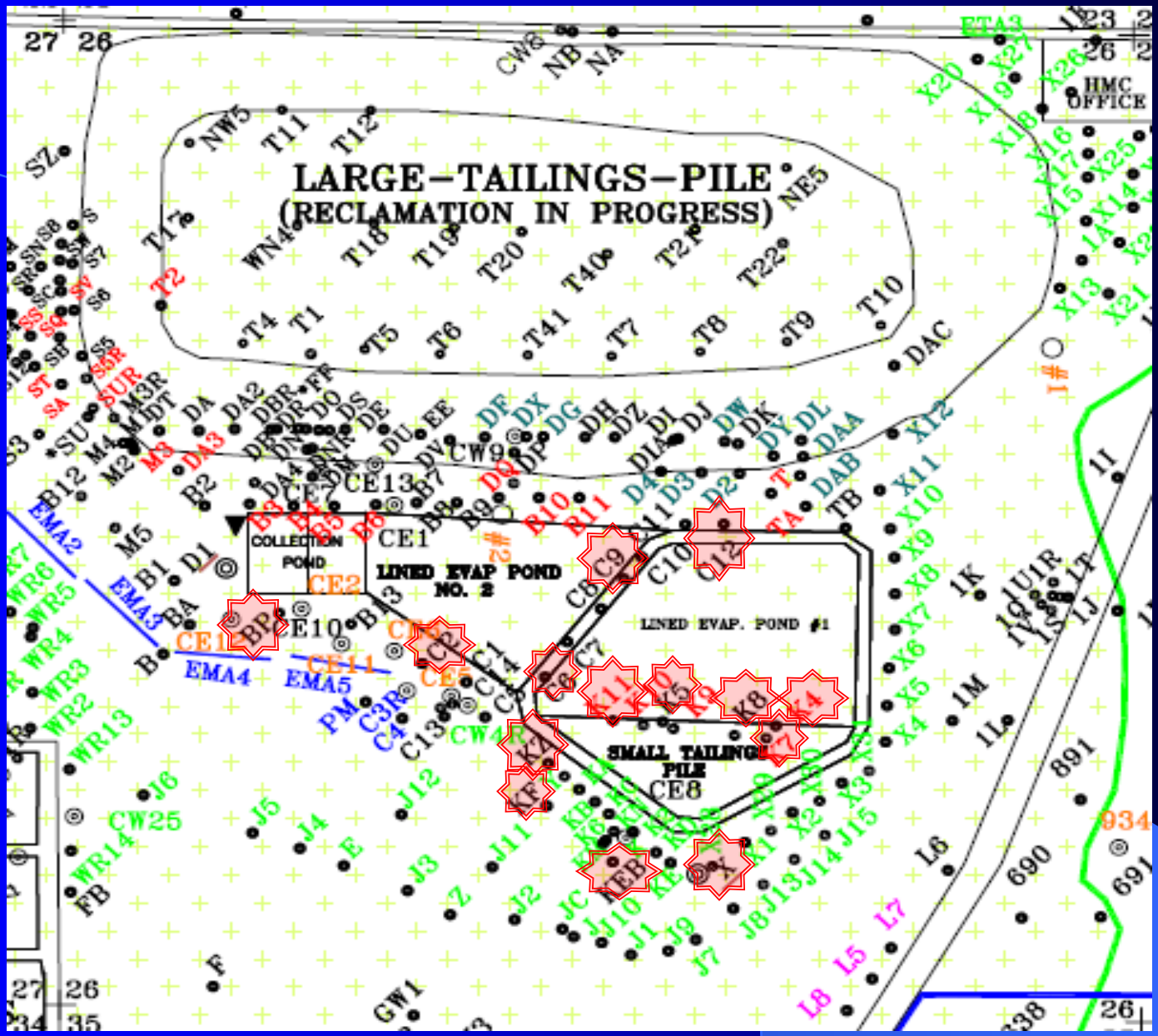
Time-series Plot of Uranium & Selenium Concentrations in Well X



Time-series Plot of Ground Water Elevations in Well X



Historical Data from Adjacent Alluvial Wells



Contaminants of Concern and Water Elevation Trends

Wells evaluated include:

*BP, C2, C6, C9, C12, KEB, KF, KZ, K4, K5, K7, K8, K11, & X

Downward trend in contaminant conc. vs. time

*Dramatic decrease after fresh water injection began

Upward trend in water levels vs. time

Contaminants of Concern and Water Elevation Trends

Well	H_2O Elev. Trend	Cont. Conc. Trend	Comments
X	upward	downward	MW
K4	flat to slight upward	downward	RO extraction well
K5	upward	downward	MW
K7	flat to slight upward	downward	RO extraction well
K8	upward	downward	MW
KEB	upward	downward	MW
KF	upward	downward	MW
KZ	upward	downward	MW
K11	flat to slight upward	downward	RO extraction well
C2	flat to slight upward	downward	MW
BP	slight upward	downward	MW

Conclusions

Data does not exist to determine if EPs are leaking or not

*Well X (& others) can't be used – all influenced by fresh water injection

Cannot install well(s) regionally downgradient of evaporation ponds that will not also be influenced by fresh water injection

Potential alternative(s) - horizontal boring(s) beneath Tailings Piles or geophysical tools

Ground water remediation controls are currently in place to prevent migration of contaminants from EP leakage should this occur

*Condition #18 of DP-725 requires secondary liner (EP-2 & 3) to remain "as dry as practicable"

*Shut down of EP-1 would hinder GW remediation

*Would only stall drain down of STP by a few years

*Existing extraction system captures any seepage

Relocation of the Tailings Piles via Slurry Pipeline

Assuming slurry removal is feasible, a viable disposal location needs to be identified

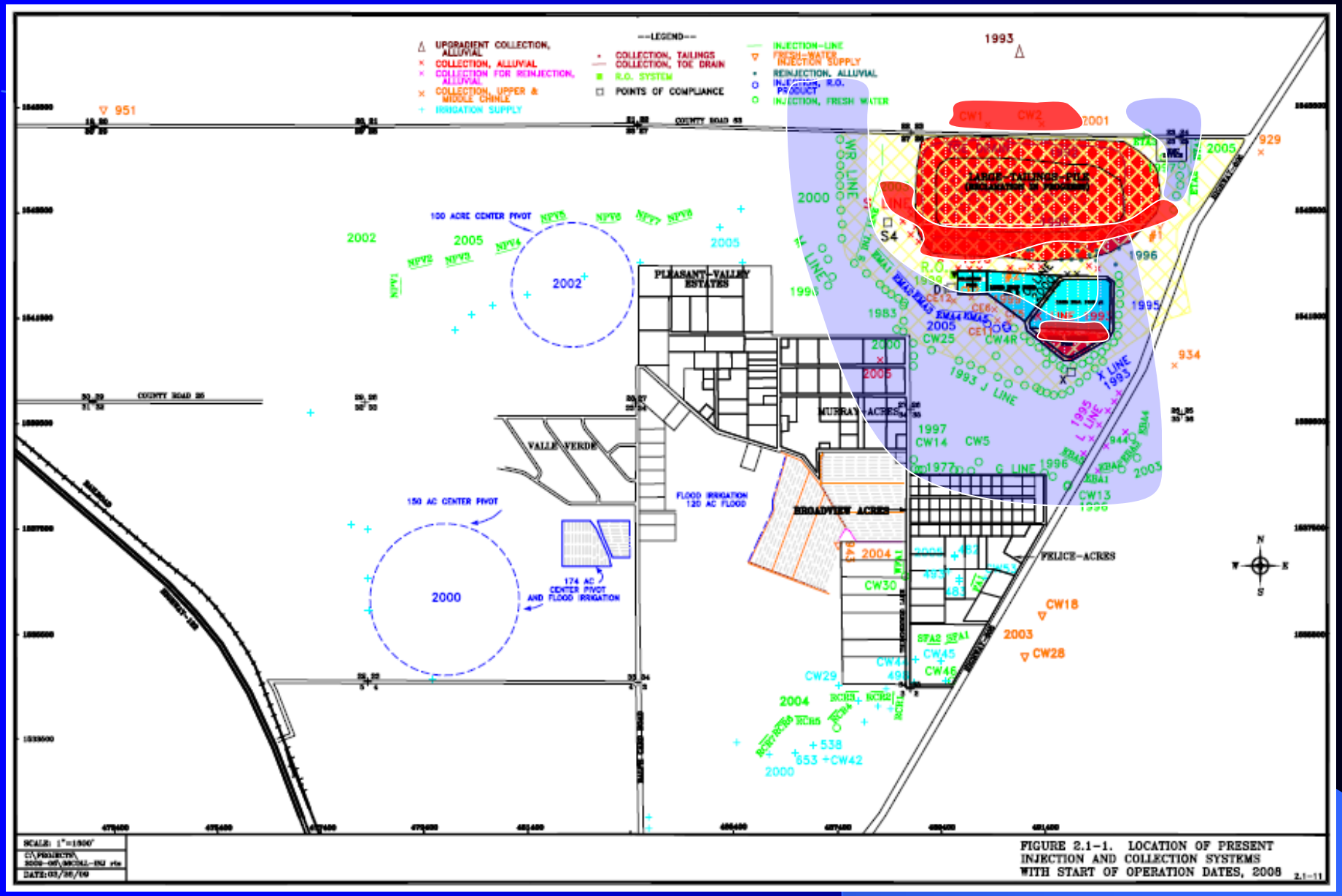
Final closure of the tailing piles will provide a comparable level of protection from radon exposure

Groundwater contamination issues do not go away with the removal of tailings piles

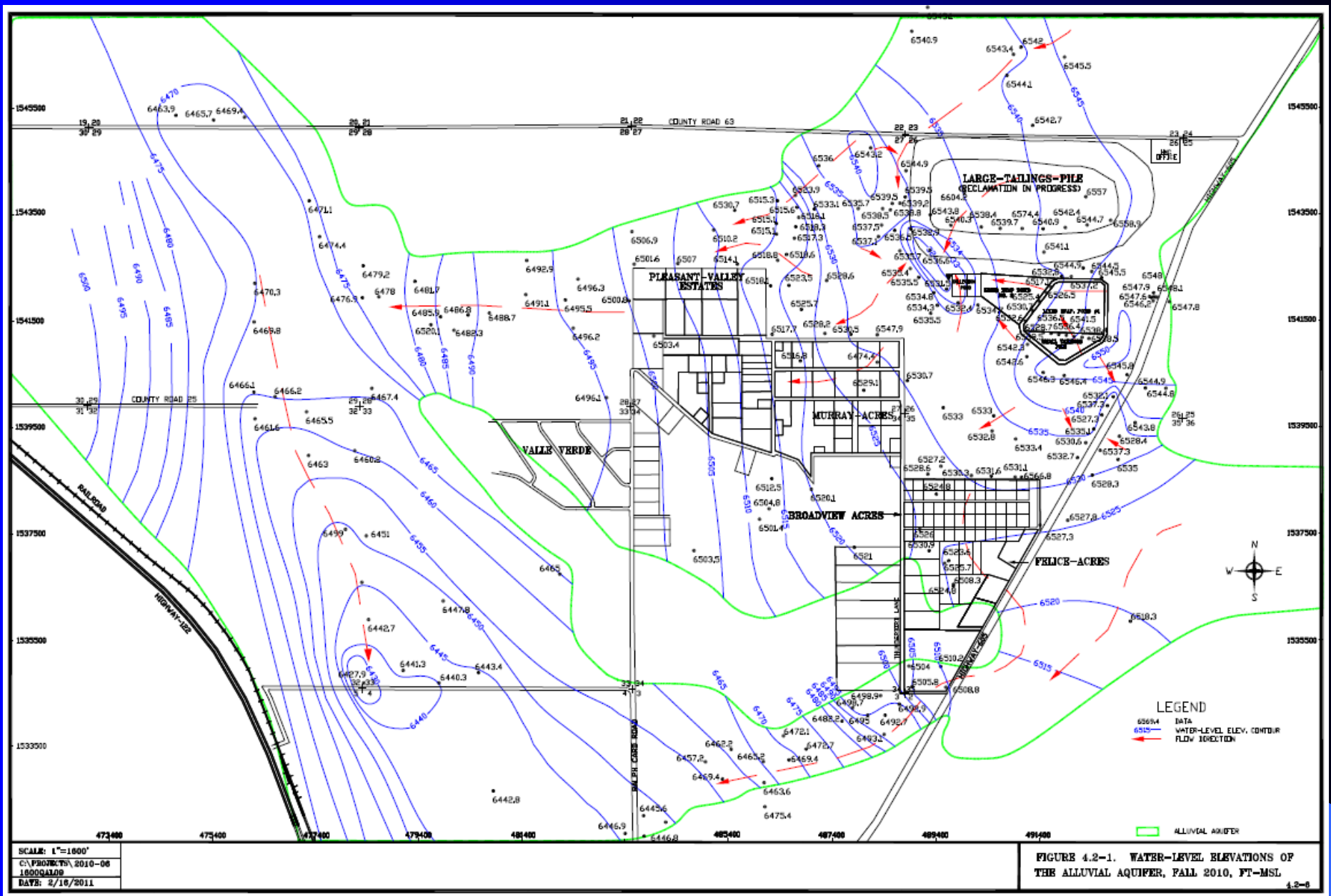
*P & T endpt. may change depending on success of tailings flushing

Relocation of tailings at Moab site was not based on technical considerations, but rather was a political decision

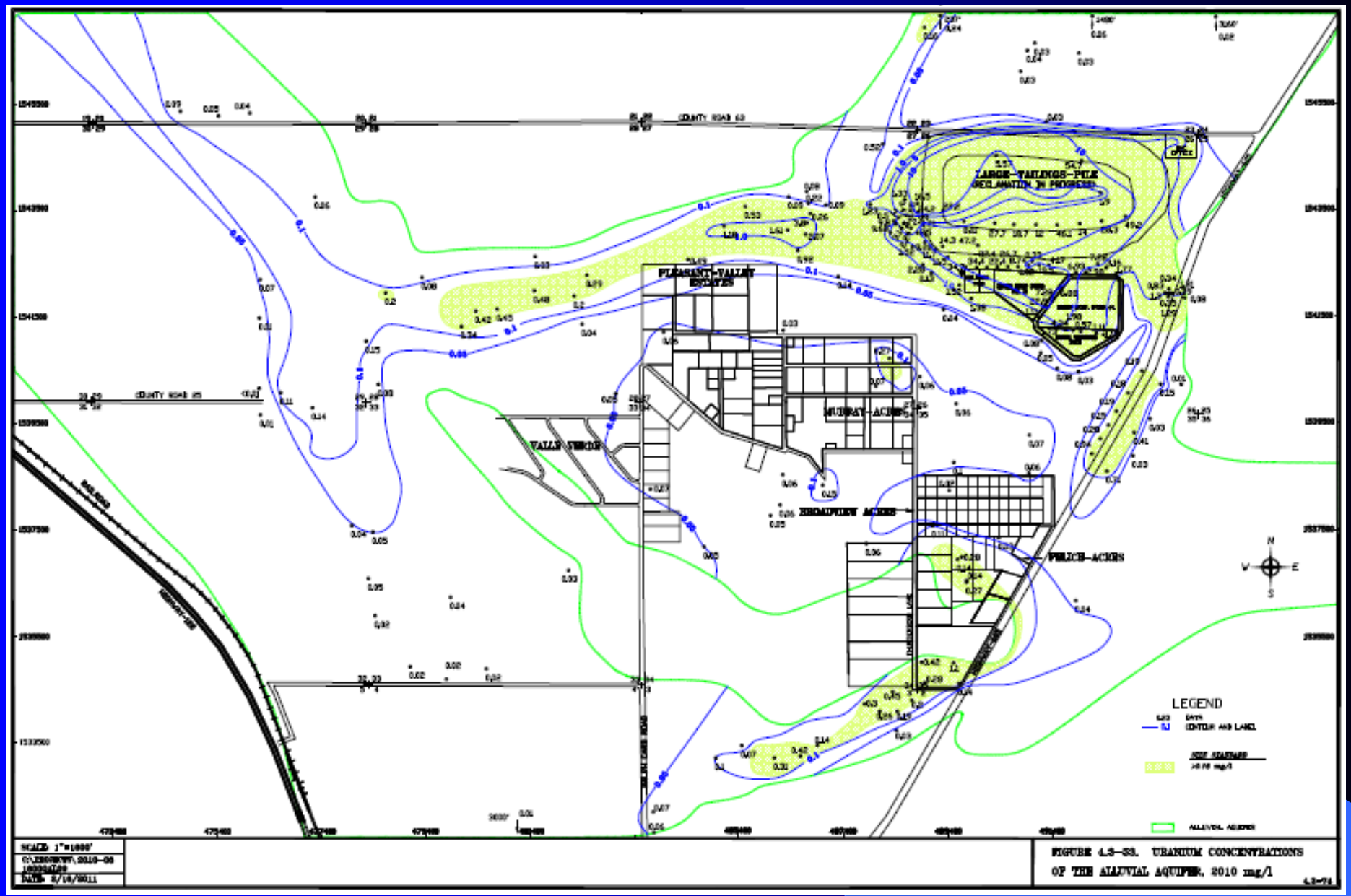
Dilution Component of Remediation - Injection and Extraction System



Groundwater Mound



Impact on COC Plume



Conclusions

RSE did not recommend an alternative technology to the existing Pump and Treat approach

Dilution is a recognized component of Pump and Treat technology

- *Provides containment, but takes a long period of time to achieve success
- *Requires management of contaminant plume as well as injectant
- *May not be capable of achieving MCLs

Agencies support recommendation for HMC to evaluate and optimize injection and extraction rates to minimize dilution, but only if containment can be ensured

Alluvial Background Concentrations
NMED's Analysis

Goal is not to determine pre-milling ground water contaminant concentrations, but rather to determine background concentrations. However, overall goal is to remediate the ground water to pre-milling conditions.

Background definition (NMWQCC) – "means…the amount of ground-water contaminants naturally occurring from undisturbed geologic sources or water contaminants which the responsible party establishes are occurring from a source other than the responsible party's facility…"

Alluvial Background Concentrations
NMED's Analysis

NMED's Evaluation Process

*Background
*Hydrographs
*Spatial Coverage
*Regional Data – upgradient sources, conc. gradient
*Dataset used to support proposal

Proposed Wells

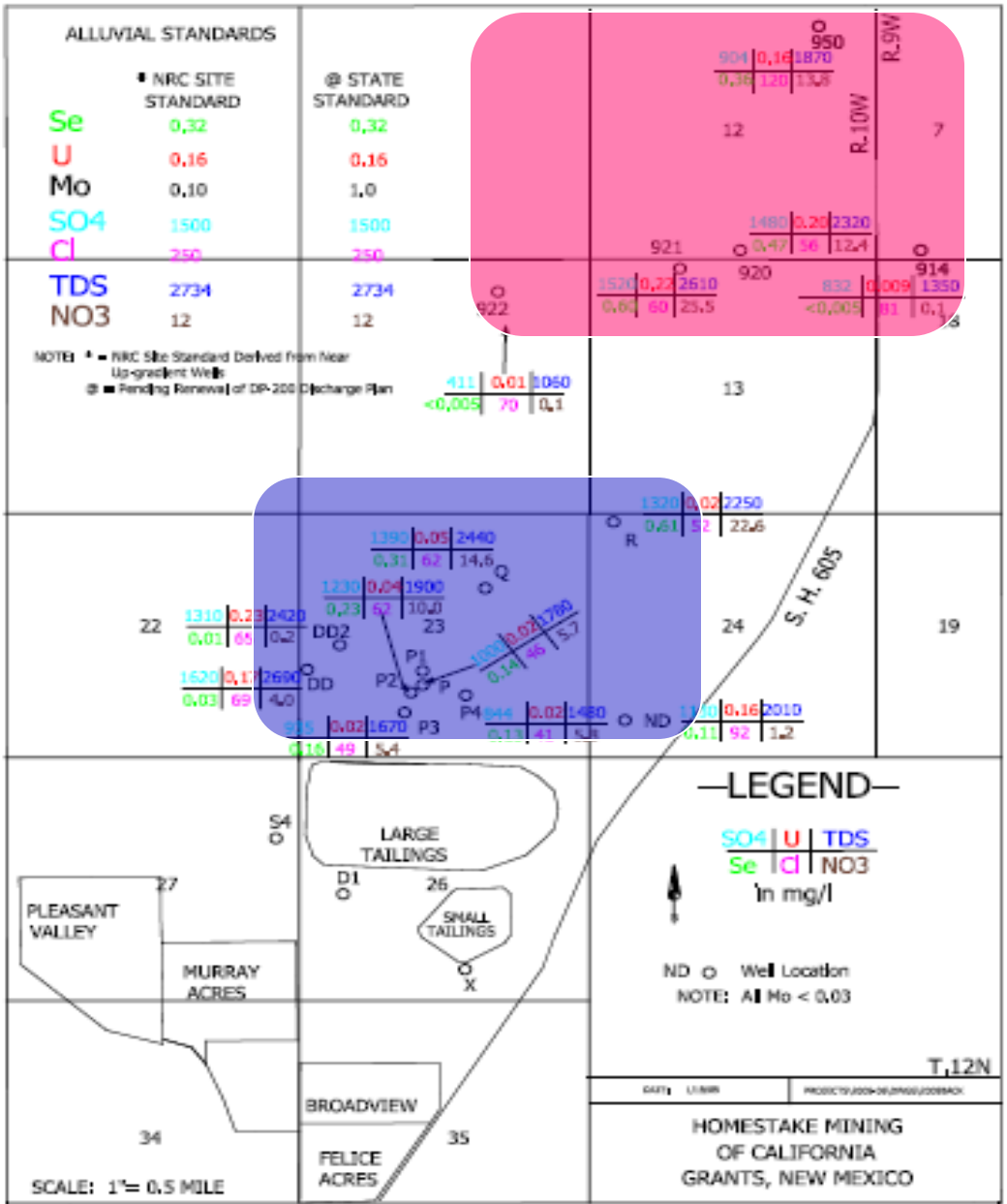


FIGURE 3.2-1, ALLUVIAL BACKGROUND GROUND WATER QUALITY, 2008

Hydrographs

1993 Started Pumping P Wells

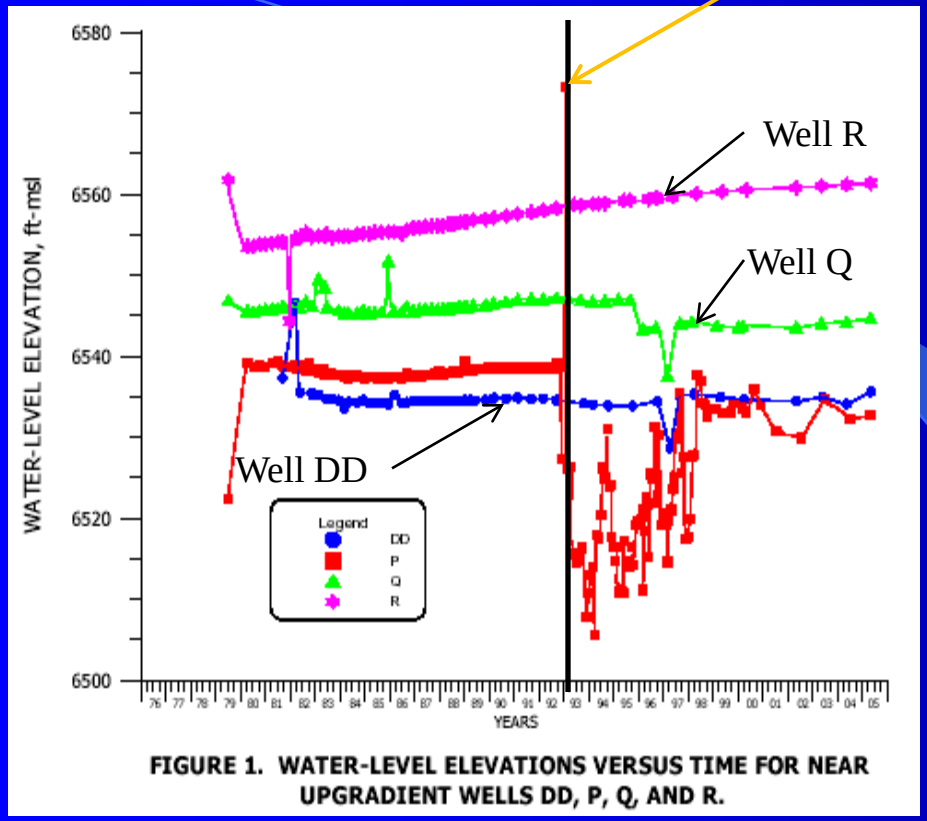


FIGURE 1. WATER-LEVEL ELEVATIONS VERSUS TIME FOR NEAR UPGRADIENT WELLS DD, P, Q, AND R.

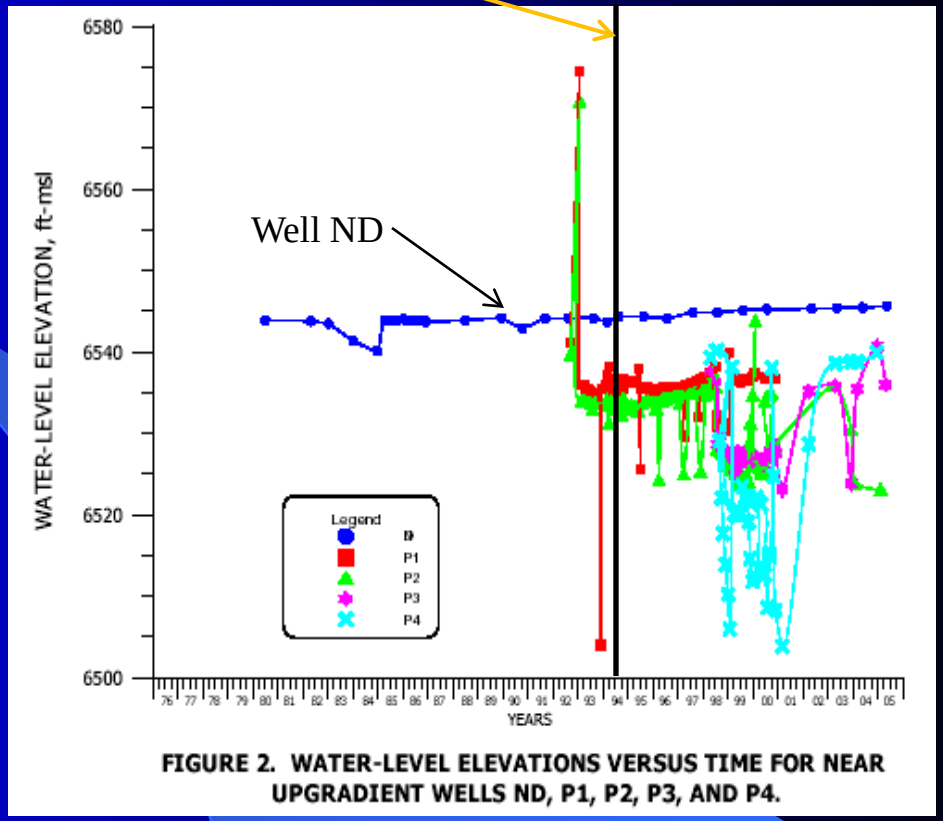
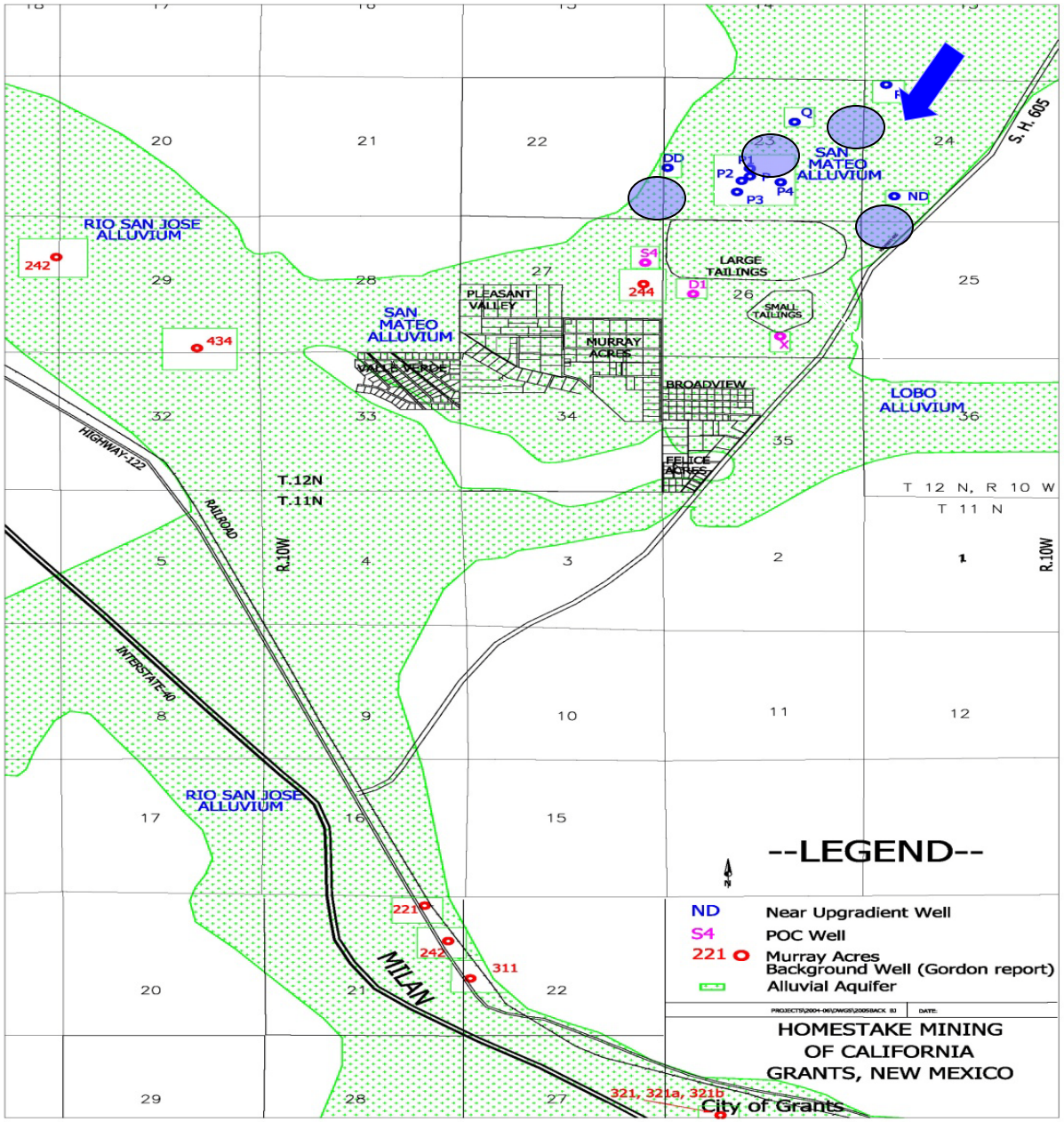
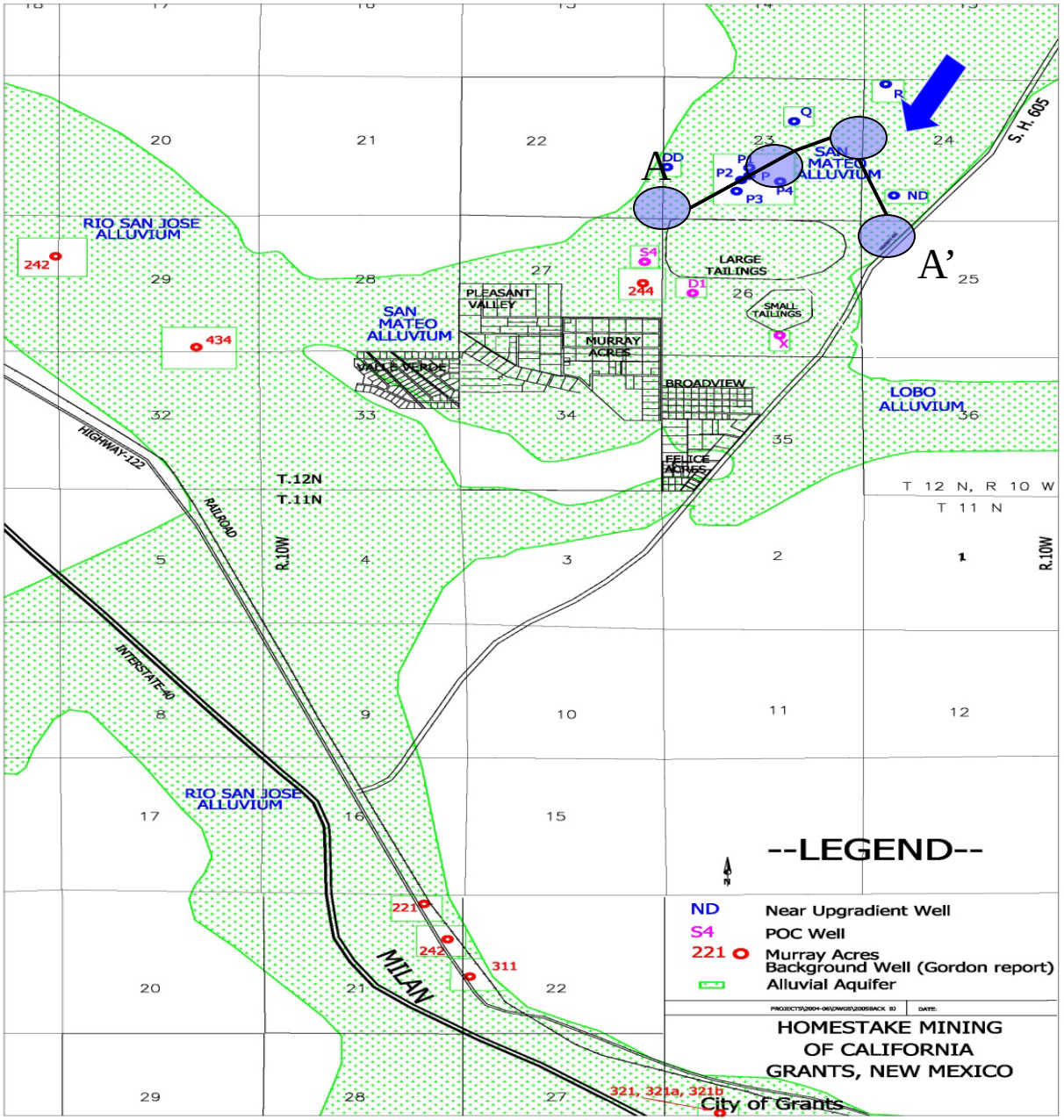


FIGURE 2. WATER-LEVEL ELEVATIONS VERSUS TIME FOR NEAR UPGRADIENT WELLS ND, P1, P2, P3, AND P4.

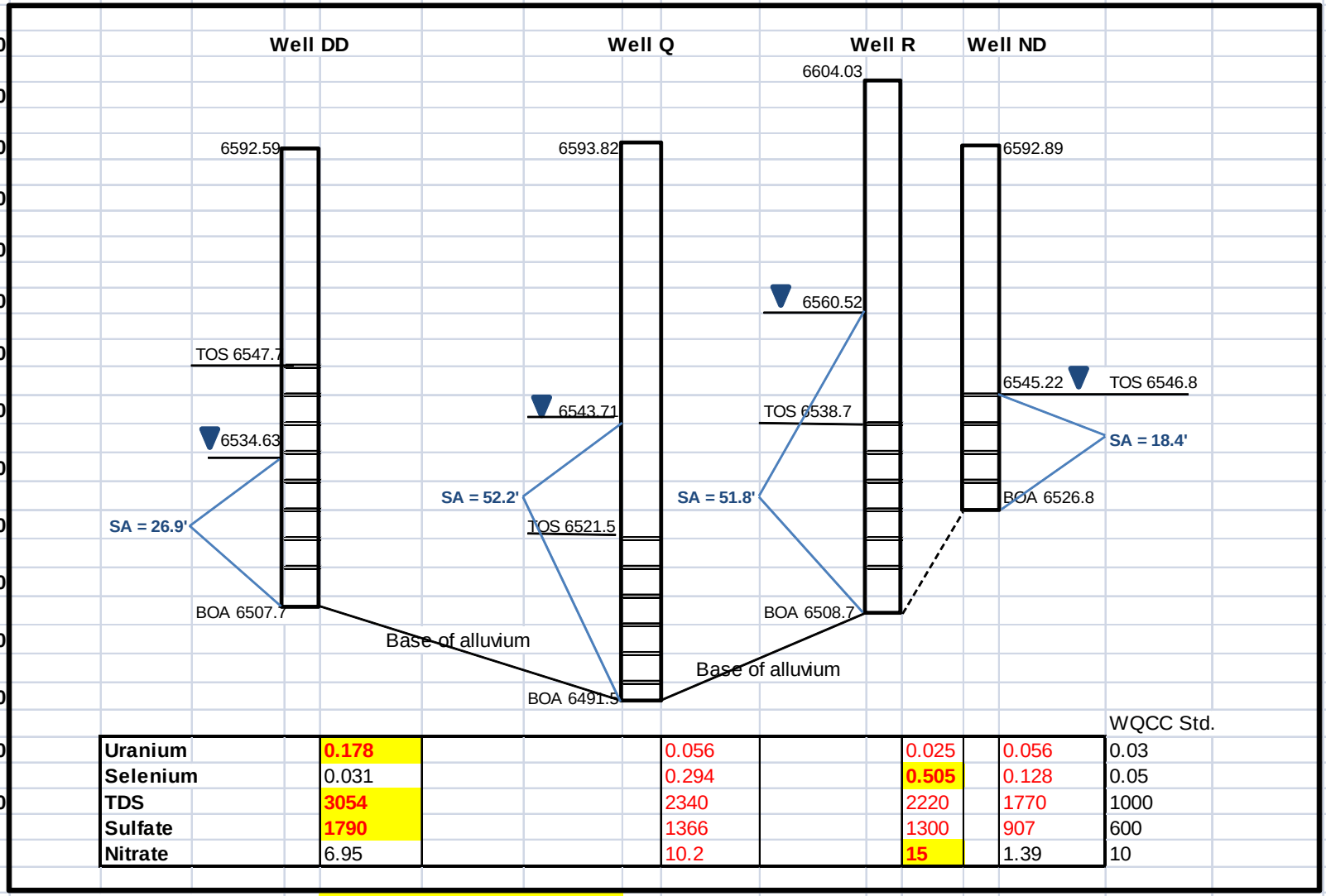
Spatial Coverage - Horizontal



Spatial Coverage - Vertical



Spatial Coverage - Vertical



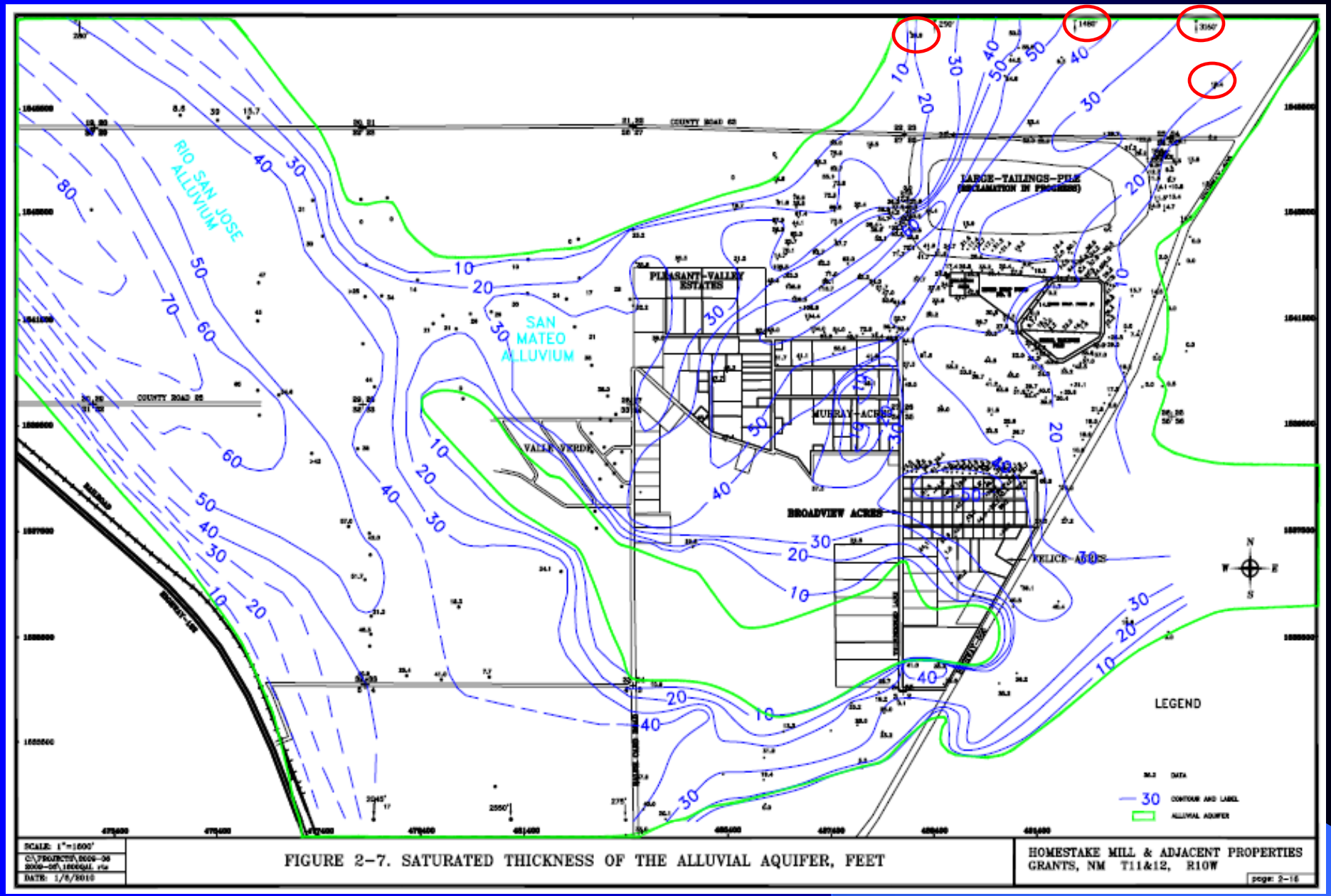
						WQCC Std.
Uranium	**0.178**		0.056	0.025	0.056	0.03
Selenium	0.031		0.294	**0.505**	0.128	0.05
TDS	**3054**		2340	2220	1770	1000
Sulfate	**1790**		1366	1300	907	600
Nitrate	6.95		10.2	**15**	1.39	10

Horizontal scale: 1" = 1600'
TOS = Top of screen
BOA = Bottom of alluvium
SA = Saturated thickness

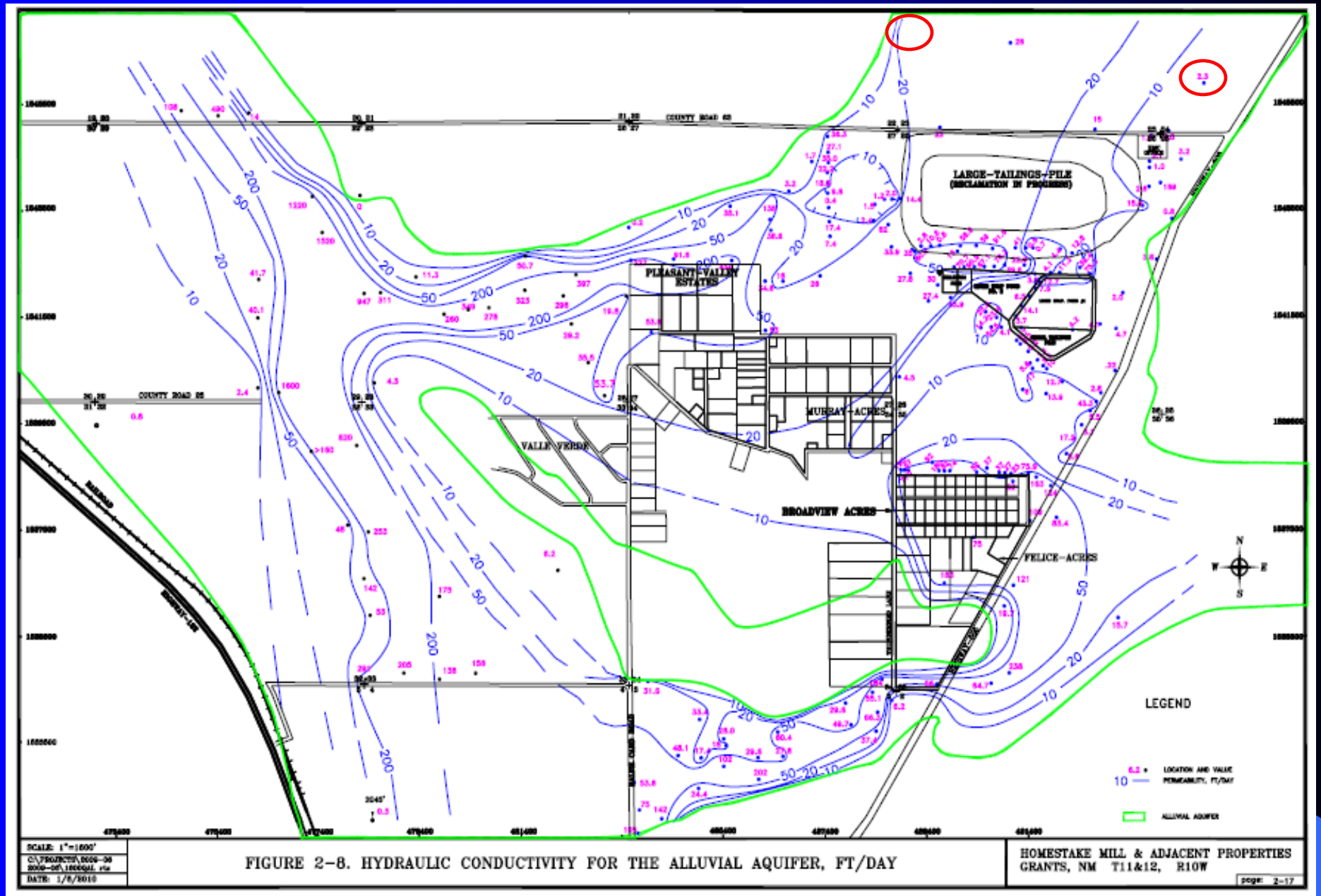
0.178 - Highest concentration
0.056 - exceeds WQCC Std.

A – A' Cross-section

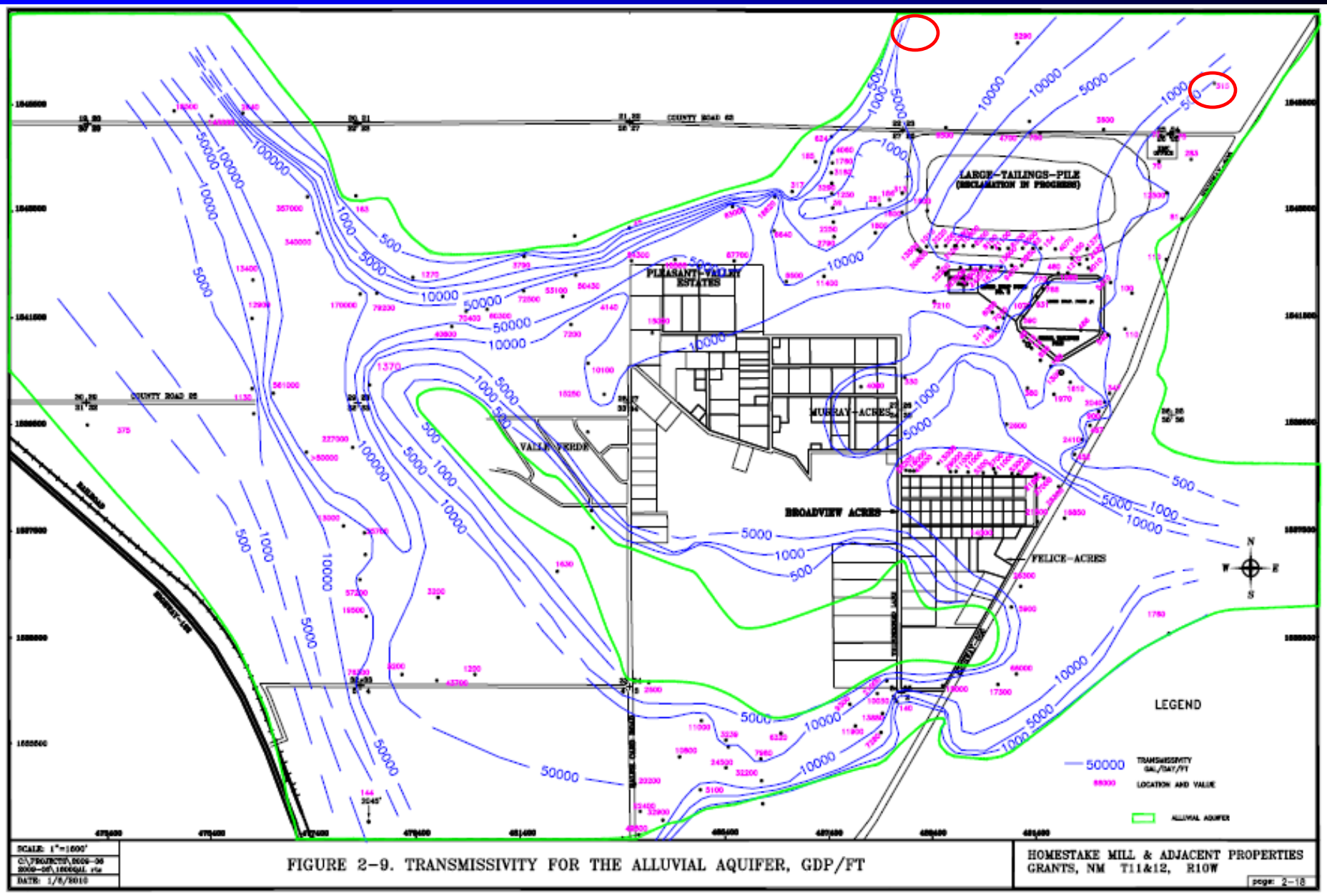
Spatial Coverage - Vertical



Spatial Coverage - Vertical



Spatial Coverage - Vertical



Spatial Coverage - Vertical

Completion Details for Wells DD, ND, Q, and R

Well ID	DTW (ft.)	DT Base of Alluvium (ft.)	TD (ft.)	Saturated Thickness (ft.)	Screen Interval (ft.)	Screen Length (ft.)
DD	56.06	83	78.5	26.9	40-80’	40
ND	46.57	65	70.0	18.4	50-70’	20
Q	47.81	100	98.3	52.2	72-102’	30
R	43.21	95	86.3	51.8	60-90’	30

Summary

*All wells completed to total depth of alluvium

*Wells DD & ND

-screened throughout the entire saturated zone

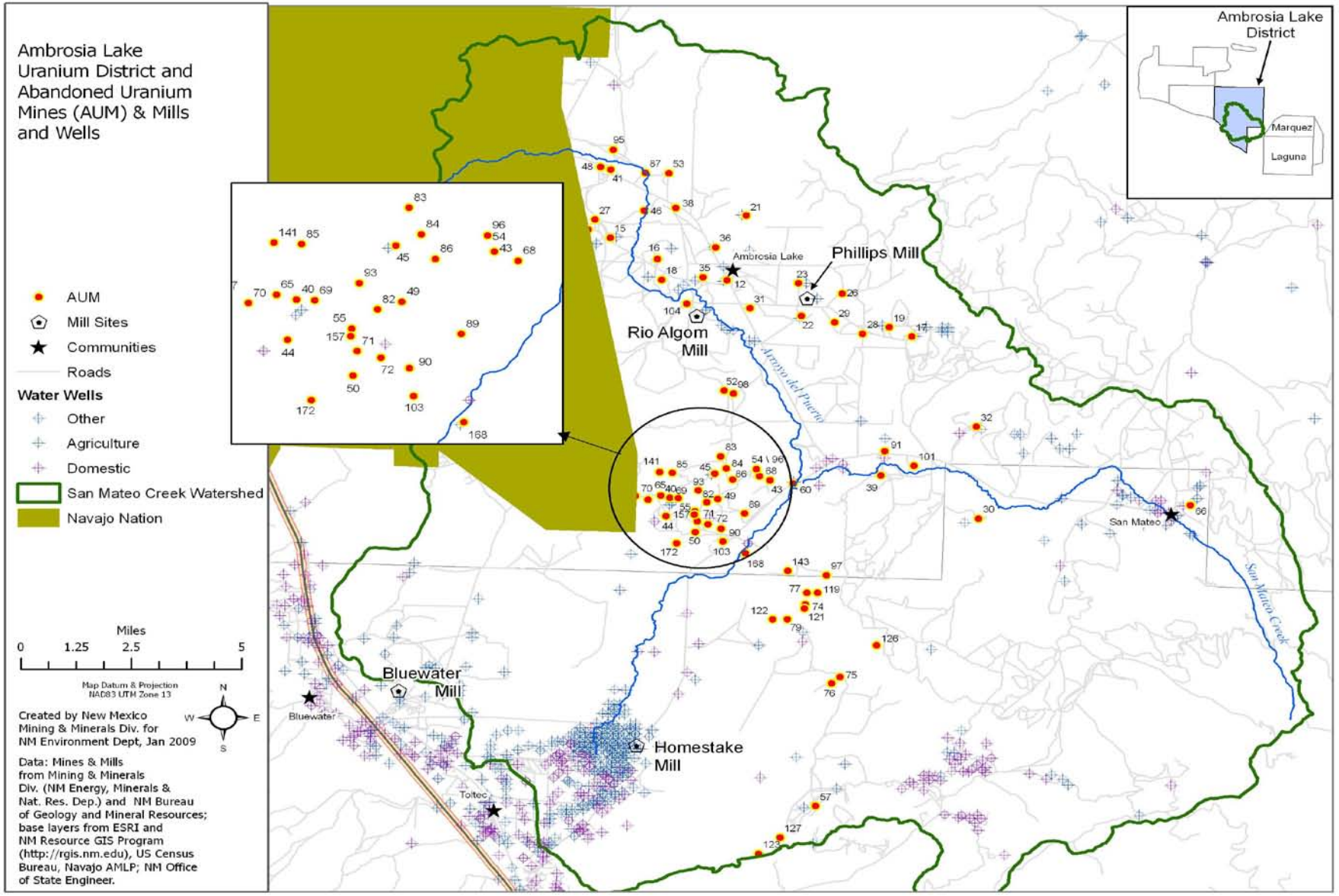
-< 30’ of saturation

*Wells Q & R

-screened 22’ below air/water interface (COC conc. conservative)

->50’ of saturation

Regional Data



Regional Data

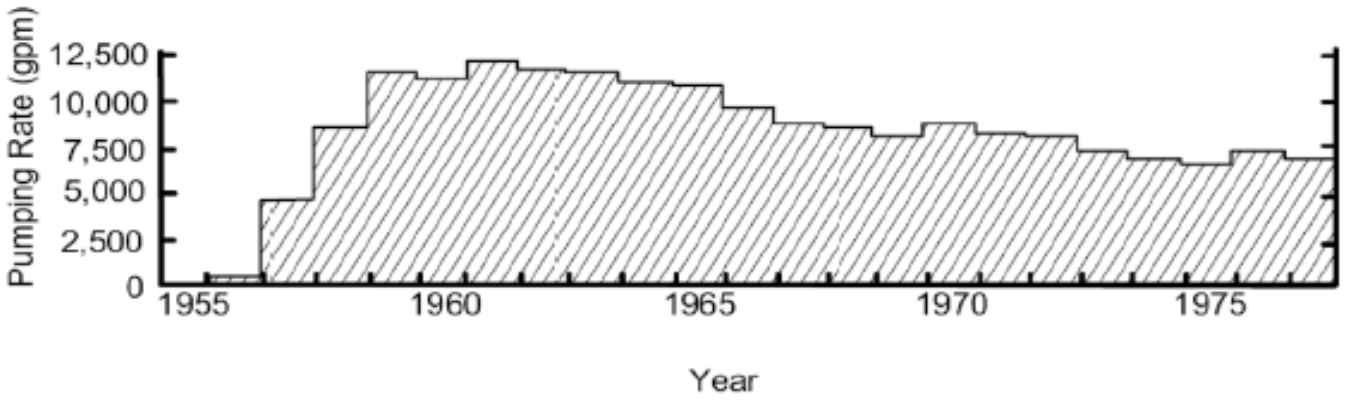
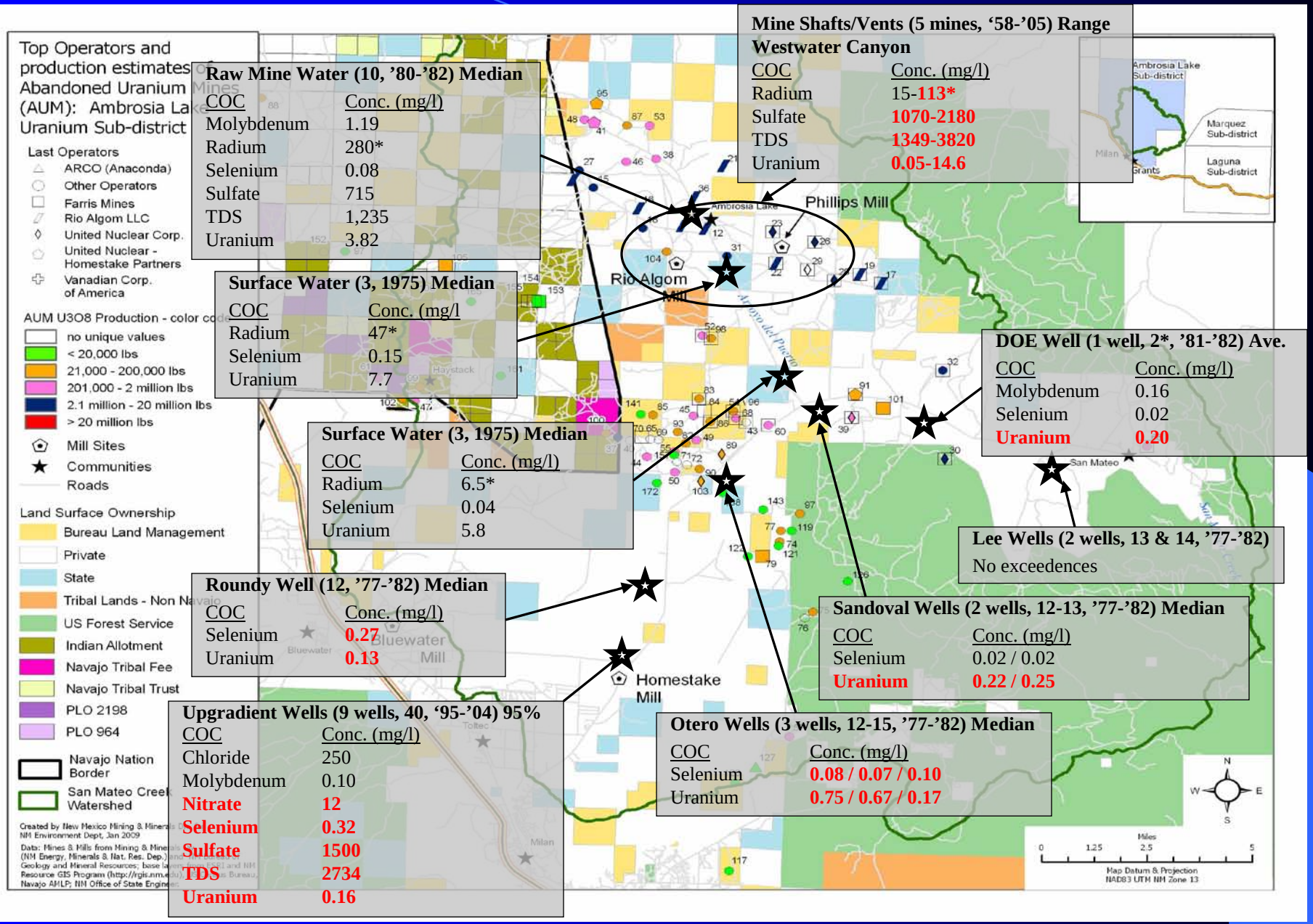


Figure 3
Water Production by Uranium Mines in Ambrosia Lake Valley (Modified from Stone et. al., 1983

INTERA

Rio Algom Mining, LLC
McKinley County, NM

Regional Data



Raw Mine Water (10, '80-'82) Median

COC	Conc. (mg/l)
Molybdenum	1.19
Radium	280*
Selenium	0.08
Sulfate	715
TDS	1,235
Uranium	3.82

Mine Shafts/Vents (5 mines, '58-'05) Range Westwater Canyon

COC	Conc. (mg/l)
Radium	15-**113***
Sulfate	**1070-2180**
TDS	**1349-3820**
Uranium	**0.05-14.6**

Surface Water (3, 1975) Median

COC	Conc. (mg/l
Radium	47*
Selenium	0.15
Uranium	7.7

Surface Water (3, 1975) Median

COC	Conc. (mg/l)
Radium	6.5*
Selenium	0.04
Uranium	5.8

DOE Well (1 well, 2*, '81-'82) Ave.

COC	Conc. (mg/l)
Molybdenum	0.16
Selenium	0.02
Uranium	**0.20**

Lee Wells (2 wells, 13 & 14, '77-'82)

No exceedences

Roundy Well (12, '77-'82) Median

COC	Conc. (mg/l)
Selenium	**0.27**
Uranium	**0.13**

Sandoval Wells (2 wells, 12-13, '77-'82) Median

COC	Conc. (mg/l)
Selenium	0.02 / 0.02
Uranium	**0.22 / 0.25**

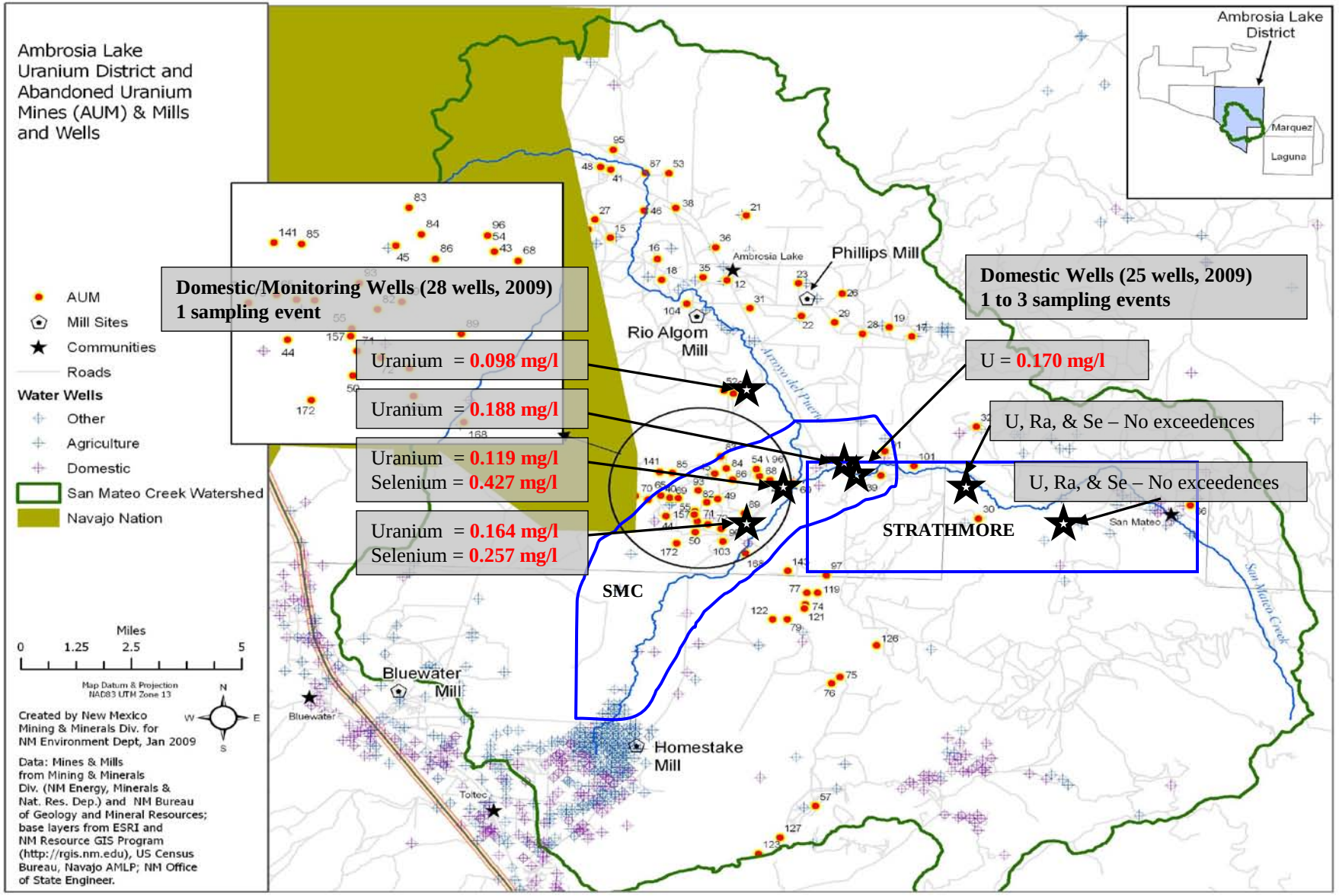
Upgradient Wells (9 wells, 40, '95-'04) 95%

COC	Conc. (mg/l)
Chloride	250
Molybdenum	0.10
Nitrate	**12**
Selenium	**0.32**
Sulfate	**1500**
TDS	**2734**
Uranium	**0.16**

Otero Wells (3 wells, 12-15, '77-'82) Median

COC	Conc. (mg/l)
Selenium	**0.08 / 0.07 / 0.10**
Uranium	**0.75 / 0.67 / 0.17**

Regional Data



Dataset

9 Wells proposed for dataset
*P, P1, P2, P3, P4, DD, ND, Q, and R

5 Eliminated from dataset based on hydrographs
*P, P1, P2, P3, and P4

Dataset used to evaluate background concentrations
*Wells DD, ND, Q, and R;
*10 years of data used (1995-2004) - Eliminated all but 2 duplicates, Well R, both w/in acceptable range
*Background based on the 95th percentile per EPA Guidance

Dataset

COC Concentrations 95th Percentile

Well	# Data Points (DD, ND, Q, R	Uranium	Selenium	TDS	Sulfate	Nitrate
DD	10,9,13,12	**0.178**	0.031	**3050**	**1710**	6.95
ND	10,9,13,12	0.056	0.128	1530	729	1.39
Q	10,9,13,12	0.057	0.294	2340	1366	10.2
R	10,9,13,12	0.025	**0.505**	2220	1300	**15**
Bkg Conc		**0.16**	**0.32**	**2734**	**1500**	**12**

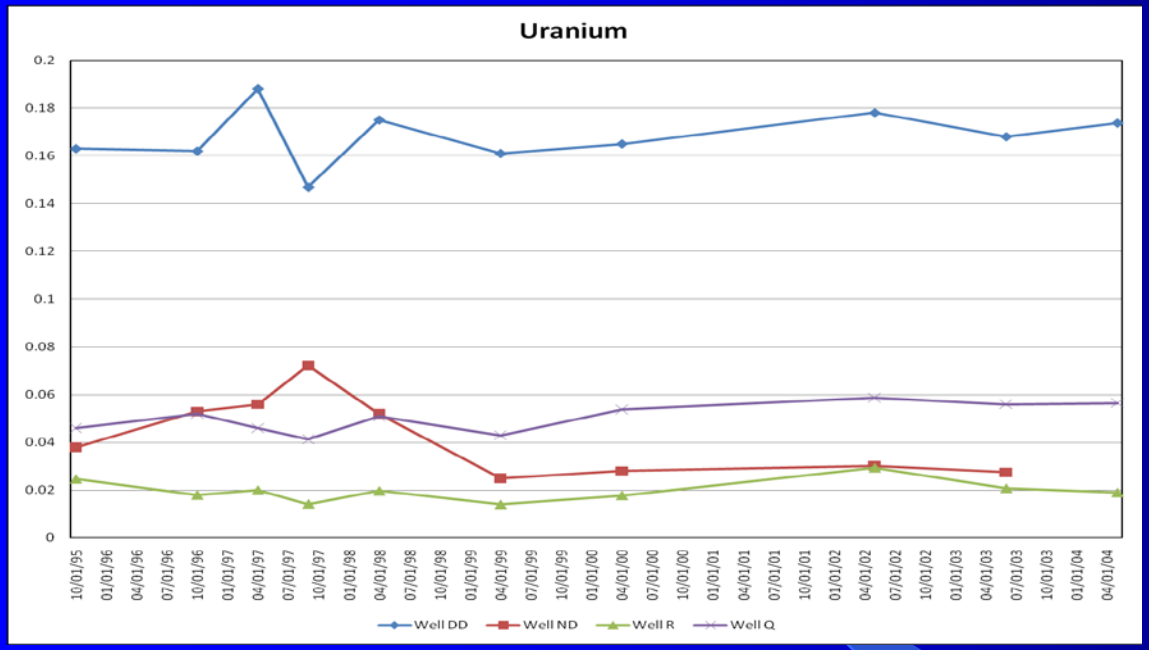
1995-2004 data
0.178 – highest concentration

Entire Dataset

DD, ND, Q, & R	**44**	**0.175**	**0.499**	**3010**	**1683**	**14.7**

Entire dataset – eliminated highest concentration

Time-Series Plots



Uranium

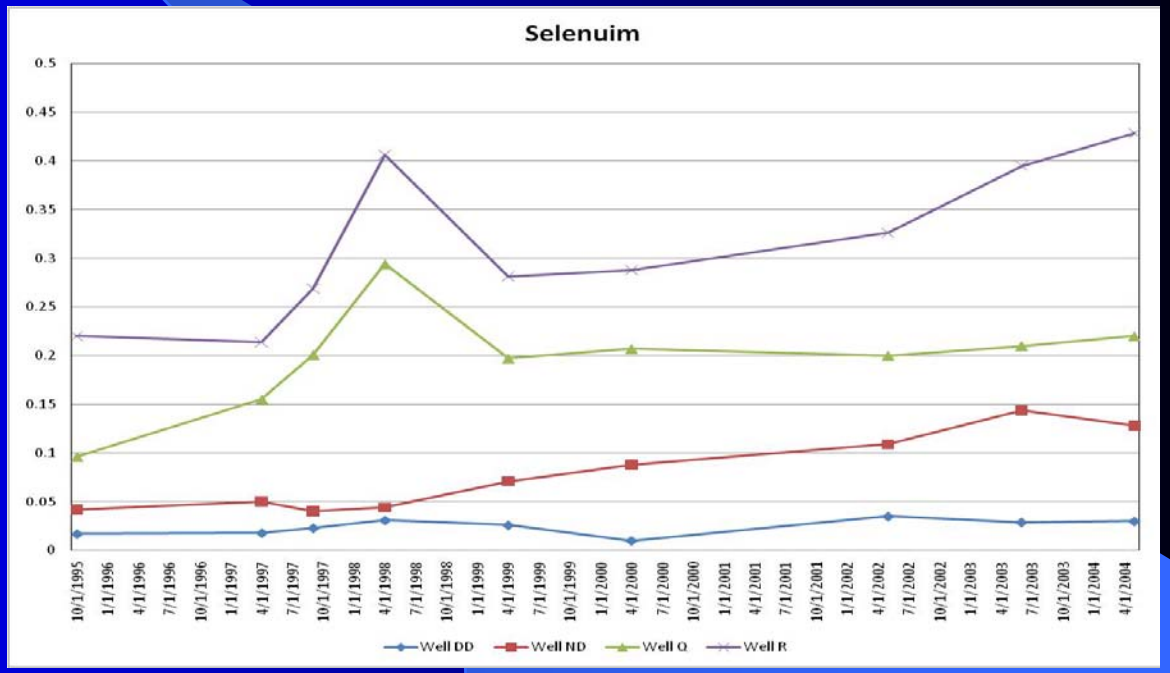
*All relatively flat trend, except ND ↓

*Well DD significantly higher than other wells

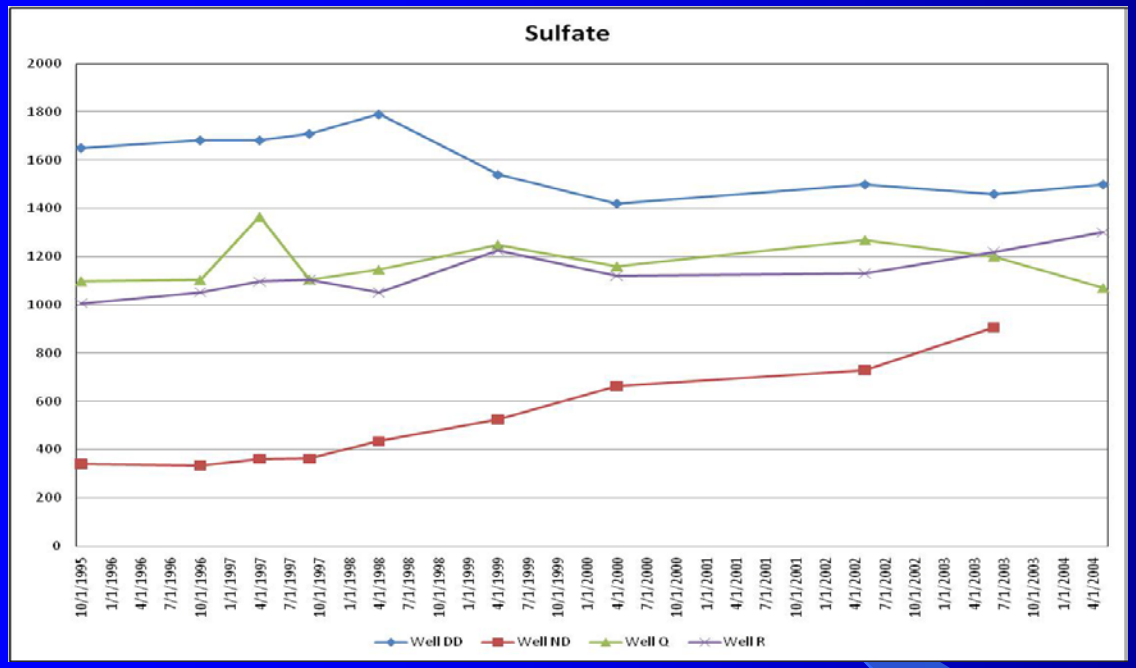
Selenium

*Wells ND, Q, & R trending upward, well DD flat

*No grouping of wells, concentrations



Time-Series Plots



Sulfate

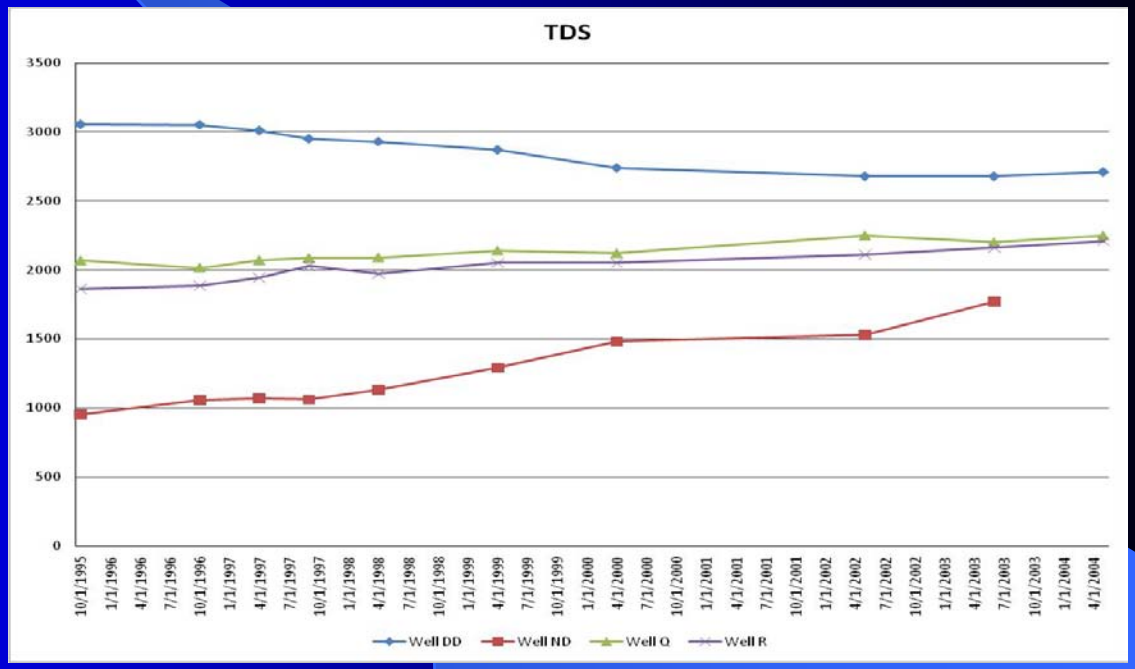
*All relatively flat trend, except ND ↑

*ND lower conc. than other wells, but approaching similar concentrations

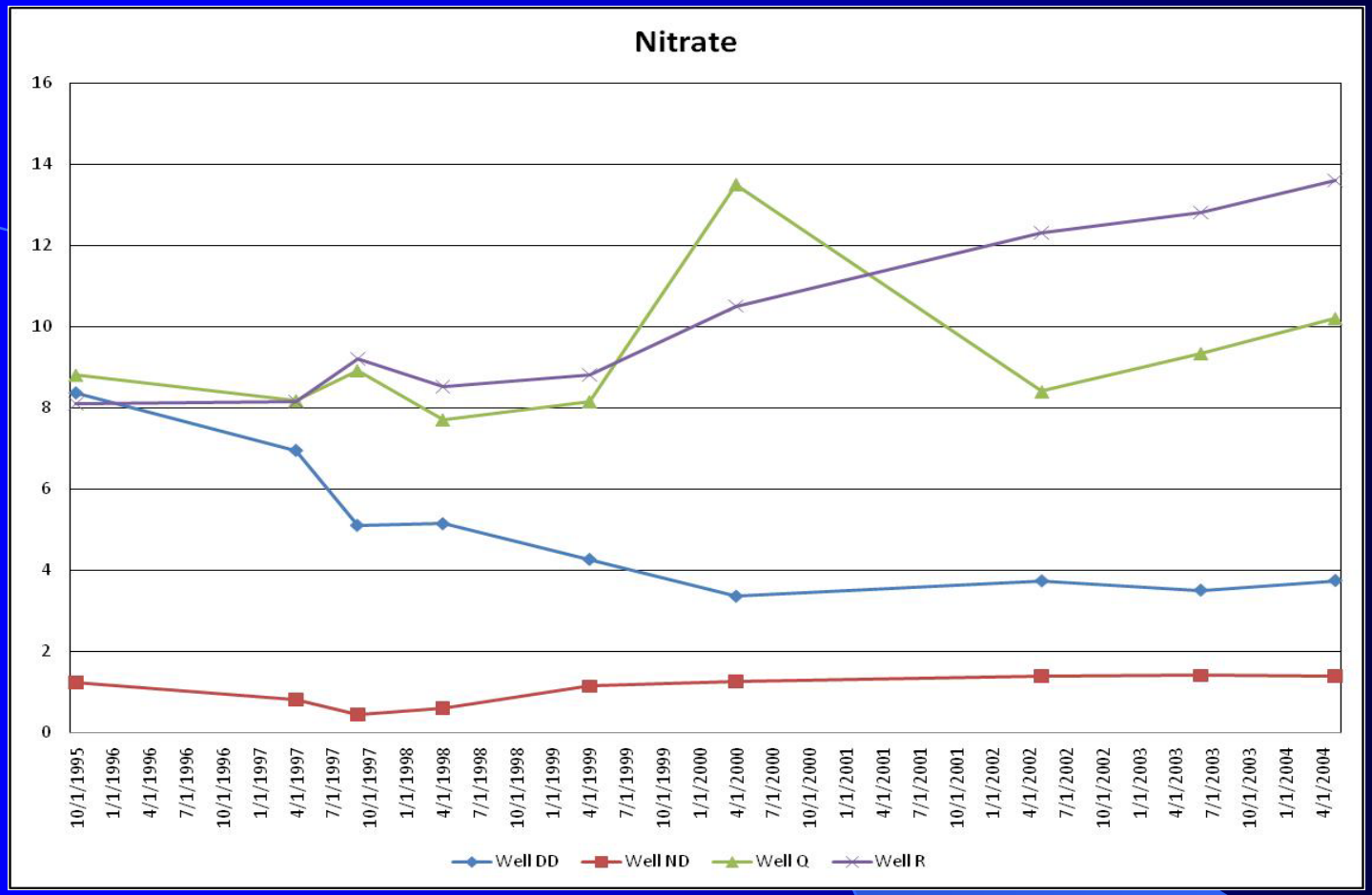
TDS

*Q & R relatively flat, DD ↓, & ND ↑

*Trending towards similar concentrations



Time-Series Plots



Nitrate

*R & Q trending up, DD trending down, ND flat

*No grouping of wells, concentrations

Conclusions

Hydrographs

*Wells P, P1, P2, P3, & P4 have been affected by site operations - eliminated

*Wells DD, ND, Q, & R have not been affected by site operations - placed in dataset

Spatial Coverage of Wells DD, ND, Q, & R

*Horizontal - adequate coverage of saturated San Mateo Creek alluvium

*Vertical - Well screens span entire saturated thickness

- Wells Q & R are screened below air/water interface (COC concentrations conservative

- Wells DD, ND, Q, and R adequately provide spatial coverage

Regional Data

*Upgradient sources present and contaminant concentration gradient exists

Dataset Check

*10 year dataset used eliminates duplicate concerns

- Duplicate sample results in final dataset are within acceptable ranges

*Time-series plots visually confirm data is acceptable

Alluvial background contaminant concentrations are supported