FREEPORT-McMoRan
COPPER & GOLD

Copper Queen Branch/Freeport-McMoRan Corporation
36 West Highway 92
Bisbee, Arizona 85603

January 25, 2010

Ms. Cynthia S. Campbell
Manager, Water Quality Compliance Section
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007-2935

Re: Request to Modify Groundwater Monitoring Program
Mitigation Order on Consent No. P-121-07

Dear Ms. Campbell:

Freeport-McMoRan Corporation, Copper Queen Branch (CQB) has conducted groundwater monitoring and drinking water supply sampling from the first quarter of 2008 through the fourth quarter of 2009 according to specifications in the Work Plan[1] approved by Arizona Department of Environmental Quality (ADEQ). The Work Plan was designed to fill data gaps with respect to water quality and water level conditions in the vicinity of the sulfate plume and the sulfate concentration of drinking water supplies. Eight quarters of groundwater monitoring have been completed and the Aquifer Characterization Report[2] for which the Work Plan groundwater monitoring program was developed was submitted to ADEQ in April 2009. This letter recommends modifications to the groundwater monitoring program to reflect the completion of aquifer characterization activities, the information gained after eight quarters of groundwater monitoring, and the current status of work for the Mitigation Order.

CQB recommends the following objectives for future groundwater monitoring:

- Determination of the sulfate concentration in drinking water supply wells (DWS) outside of and within one mile of the sulfate plume for the purpose of identifying the need for mitigation actions and tracking the plume margin

- Identification of the plume margin for ongoing delineation of the plume extent and migration

[1] Hydro Geo Chem, Inc. 2008. Revision 1. Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Concentrator Tailing Storage Area, Cochise County, Arizona. July 3, 2008.
[2] Hydro Geo Chem, Inc. 2009. Aquifer Characterization Report, Task 4 of the Aquifer Characterization Plan, Mitigation Order on Consent Docket No. P-121-07, Cochise County, Arizona. April 29, 2009.

- Documentation of the sulfate concentration in the plume and at areas distal to the plume to monitor long-term concentration trends

- Measurement of water levels in the vicinity of the plume to document potentiometric conditions

A revised groundwater monitoring plan is proposed herein to accomplish the objectives of future groundwater monitoring. The revised monitoring plan uses most of the wells currently monitored under the Work Plan, but reduces the frequency of sampling in some wells, and eliminates sampling at DWS wells that are within the plume and receive an interim action. Table 1 lists the 62 wells recommended for water quality sampling, including the well type (i.e., DWS or monitor well) and the sampling frequency. Figure 1 shows the locations of wells recommended for water quality sampling. Table 2 lists wells recommended for water level measurement. Figure 2 shows the wells recommended for water level measurement. Figure 3 and Table 3 show wells recommended for elimination from the monitoring plan. The sample collection and analysis specifications of the Work Plan would be retained for the revised monitoring plan.

Objective 1 - Determination of Sulfate at DWS Wells Outside of and Within One Mile of the Sulfate Plume

There are 28 DWS wells outside of the plume and within one mile of the plume. These wells, shown on Figure 1 by green labels and highlighted in green in Table 1, would be sampled at least quarterly. Included in this group of wells are wells in the footprint of the plume but screened in the aquifer below the plume and, thus, outside of the plume (e.g., GARNER 635). The sulfate concentration of samples collected at the DWS wells would be used to determine the need for a mitigation action. Sulfate concentration data for DWS wells outside the plume would also be used to document the location of the plume because some of the wells are in the vicinity of the current plume margin.

The quarterly sampling frequency recommended for DWS wells outside the plume is the same monitoring frequency as current sampling under the Work Plan. Sulfate concentration data obtained from DWS wells would be subject to the interim action specifications of the Work Plan. In the event that the sulfate concentration of a sample from a DWS well were to exceed 135 milligrams per liter (mg/L) and be less than 250 mg/L, monthly sampling would be conducted for four months to determine whether the concentrations display a time trend as described in Section 4 of the Work Plan. A DWS with sulfate equal to or greater than 250 mg/L would be provided a mitigation action as described in Section 4 of the Work Plan if sulfate is due to the Concentrator Tailing Storage Area.

Objective 2 - Identification of the Sulfate Plume Margin

Monitoring to identify the plume margin would be accomplished by sampling the DWS wells identified for Objective 1 plus seventeen monitor wells and three DWS wells that are outside of the sulfate plume. Figure 1 shows these additional twenty wells with blue labels. Included in this group of wells are BMO-2008-4B, -7M, -8M, and -9M; TM-02A; and TM-19A that are in the footprint of the plume but screened below the plume.

The monitoring frequency for wells used to identify the plume margin varies from quarterly for wells proximal to the advancing western edge of the plume (e.g. BMO-2008-5B/5M and BMO-2008-6B/6M) to semiannually for monitor wells north, east, and south of the plume and below the plume, which show little to no plume movement (Table 1). Three DWS wells (OSBORN, SWAN, and HESS) that are outside and upgradient of the eastern margin of the plume are also included for semiannual sampling to identify the plume margin. Wells to be monitored to identify the plume margin are highlighted in blue on Table 1.

Objective 3 - Documentation of Sulfate Concentration in the Plume and Distal Environs

Water quality sampling within the plume and at locations distal to the plume margin would be conducted to document long-term concentration trends. Fifteen (15) wells would be sampled for ongoing measurement of sulfate concentrations in the plume and at locations distant from the plume edge. Shown with red labels on Figure 1 and highlighted in red on Table 1, these wells would be sampled annually because sulfate concentrations in the plume and distant from plume edge are not expected to change quickly. The annual sampling would be timed to coincide with quarterly and semiannual sampling for Objectives 1 and 2 to collect a set of sulfate concentration data over a geographically large area for enhancement of the sulfate plume map.

Objective 4 - Measurement of Water Levels in the Vicinity of the Sulfate Plume

Water level measurements under the revised monitoring plan would be collected at the same 75 wells that were monitored for water levels in the third quarter of 2009 (Table 2 and Figure 2). Water level measurements would be made to document potentiometric conditions in the vicinity of the sulfate plume. Water levels would be measured semiannually, preferably in the first and third quarters of the year, to represent winter and summer conditions. Some wells identified for water level measurement are not identified for sampling and vise versa because well construction and use preclude one or the other type of monitoring activity. Water level data collected from these wells will be used to prepare water level maps, and to identify the direction and magnitude of hydraulic gradients in the vicinity of the sulfate plume.

Summary of Proposed Modifications

The list of wells sampled by the current groundwater monitoring program has evolved over time based on the original specification of wells in the Work Plan, the elected participation

of well owners, site-specific access and well use constraints, and the identification of DWS wells for the well inventory and interim action programs. The revised monitoring plan would maintain most water quality sampling sites and all the water level measurement sites from the current monitoring program under the Work Plan. The largest differences between the revised monitoring plan and monitoring under the Work Plan are the elimination of water quality sampling at DWS wells that are in the plume and receiving an interim action, and the reduction of the sampling frequency in monitor and non-DWS wells both in and outside the plume.

The wells sampled in the third quarter of 2009 were compared to the wells in Table 1 to identify differences. Under the revised monitoring plan 62 of the 80 wells, or 78% of the wells, sampled in the third quarter of 2009 would continue to be sampled. Wells that would not be sampled are listed in Table 3 and highlighted in red on Figure 3. Fourteen (14) of the 18 wells recommended for elimination are DWS wells that receive bottled water as an interim action. Water quality data from DWS wells receiving a mitigation action are no longer needed because the wells are known to be in the plume, are no longer used for DWS, and the data are not useful for mitigation planning. The remaining four wells are monitoring wells GL-03 and TM-03 and the non-DWS private well BURKE which are north of the plume and the non-DWS private well COLLINS which is in the plume. Sulfate concentration data from these wells are no longer needed for aquifer characterization, plume definition, or mitigation planning.

DWS wells outside the plume would be sampled at the same frequency as under the Work Plan. However, sampling at most monitoring and non-DWS private wells would be reduced to quarterly or semiannually at wells that delineate the plume margin and annually at wells in the plume and distal to it. The reduced sample frequency at monitoring and non-DWS private wells is warranted because sulfate concentrations are not observed to change rapidly and DWS well concentrations outside the plume would be monitored based on quarterly sampling results.

CQB looks forward to discussing any questions ADEQ may have regarding the revised groundwater monitoring plan. Upon ADEQ's approval of the revised monitoring plan, CQB would submit a schedule for water quality sampling and water level measurement so that the maximum amount of data is collected in the first and third quarters of the year. If you have questions regarding the revised monitoring plan please call me at (520) 432-6206.

Sincerely,

Rebecca A. Sawyer
Senior Environmental Engineer
Copper Queen Branch

Attachments: Tables (3)
Figures (3)

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cc: Michael Jaworski, Freeport-McMoRan Corporation, Copper Queen Branch
Sheila Deely, Freeport-McMoRan Copper & Gold Inc.
Stuart Brown, Freeport-McMoRan Copper & Gold Inc.
Dalva Moellenberg, Gallagher & Kennedy
James Norris, Clear Creek Associates, PLC

TABLE 1
Wells for Groundwater Sampling

Well	ADWR 55 Registry No.	Owner	Well Type	Sampling Frequency		
				Quarterly	Semiannual	Annual
OBJECTIVE 1 - DWS WELLS OUTSIDE OF AND WITHIN ONE MILE OF THE SULFATE PLUME						
AWC-02	616586	Arizona Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
AWC-03	616585	Arizona Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
AWC-04	616584	Arizona Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
AWC-05	590620	Arizona Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
BANKS 986	647986	Banks	DWS Well (Down or Cross Gradient of Plume)	X		
BIMA	577927	Bisbee Municipal Airport	DWS Well (Down or Cross Gradient of Plume)	X		
CHAMBERS	629807	Chambers	DWS Well (Down or Cross Gradient of Plume)	X		
COOPER	623564	Cooper, Teresa	DWS Well (Down or Cross Gradient of Plume)	X		
DODSON	644927	Dodson	DWS Well (Down or Cross Gradient of Plume)	X		
EAST	599796	East	DWS Well (Down or Cross Gradient of Plume)	X		
EPPELE 641	805641	Eppele	DWS Well (Down or Cross Gradient of Plume)	X		
FULTZ	212447	Fultz	DWS Well (Down or Cross Gradient of Plume)	X		
GARNER 635	587635	Garner	DWS Well (Down or Cross Gradient of Plume)	X		
KEEFER	209744	Keefer	DWS Well (Down or Cross Gradient of Plume)	X		
MOORE	538847	Moore	DWS Well (Down or Cross Gradient of Plume)	X		
NWC-02	562944	Naco Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
NWC-04	551849	Naco Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
NWC-06	575700	Naco Water Company	DWS Well (Down or Cross Gradient of Plume)	X		
PALMER	578819	Palmer	DWS Well (Down or Cross Gradient of Plume)	X		
POOL	509518	Pool	DWS Well (Down or Cross Gradient of Plume)	X		
RAMIREZ	216425	Ramirez	DWS Well (Down or Cross Gradient of Plume)	X		
RAY	803772	Ray	DWS Well (Down or Cross Gradient of Plume)	X		
ROGERS E	216018	Rogers, Ernest M	DWS Well (Down or Cross Gradient of Plume)	X		
RUIZ	531770	Ruiz	DWS Well (Down or Cross Gradient of Plume)	X		
SCHWARTZ	210865	Schwartz	DWS Well (Down or Cross Gradient of Plume)	X		
WEED	544535	Weed	DWS Well (Down or Cross Gradient of Plume)	X		
ZANDER	205126	Zander	DWS Well (Down or Cross Gradient of Plume)	X		
OBJECTIVE 2 - WELLS FOR MONITORING THE MARGIN OF THE SULFATE (IN ADDITION TO OBJECTIVE 1 WELLS)						
BMO-2008-1G	909474	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-3B	909147	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-4B	910096	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-5B	909653	Copper Queen Branch	Monitor Well (Plume Edge)	X		
BMO-2008-5M	909552	Copper Queen Branch	Monitor Well (Plume Edge)	X		
BMO-2008-6B	909146	Copper Queen Branch	Monitor Well (Plume Edge)	X		
BMO-2008-6M	909019	Copper Queen Branch	Monitor Well (Plume Edge)	X		
BMO-2008-7M	908794	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-8M	909711	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-9M	909255	Copper Queen Branch	Monitor Well (Plume Edge)		X	
BMO-2008-11G	909434	Copper Queen Branch	Monitor Well (Plume Edge)		X	
COB MW-2	903984	City of Bisbee	Monitor Well (Plume Edge)		X	
GGOOSE 547	628547	Galloping Goose Properties	Monitor Well (Plume Edge)		X	
NESS	509127	Ness	DWS Well (Upgradient of Plume)		X	
OSBORN	643436	Osborn	DWS Well (Upgradient of Plume)		X	
SWAN	NR	Swan, Alan	DWS Well (Upgradient of Plume)		X	
TM-02A	522574	Copper Queen Branch	Monitor Well (Plume Edge)		X	
TM-07	522576	Copper Queen Branch	Monitor Well (Plume Edge)		X	
TM-19A	522580	Copper Queen Branch	Monitor Well (Plume Edge)		X	
TVI 875	568875	Turquoise Valley, Inc.	Monitor Well (Plume Edge)		X	
OBJECTIVE 3 - WELLS IN THE SULFATE PLUME AND DISTAL ENVIRONS FOR MONITORING LONG-TERM CONCENTRATION TRENDS						
BF-01	539783	Copper Queen Branch	Monitor Well (Within Plume)			X
BMO-2008-10GU	909272	Copper Queen Branch	Monitor Well (Within Plume)			X
BMO-2008-10GL	909435	Copper Queen Branch	Monitor Well (Within Plume)			X
BMO-2008-8B	910097	Copper Queen Branch	Monitor Well (Within Plume)			X
BMO-2008-13B	909551	Copper Queen Branch	Monitor Well (Within Plume)			X
BMO-2008-13M	909760	Copper Queen Branch	Monitor Well (Within Plume)			X
COB MW-1	903992	City of Bisbee	Monitor Well (Within Plume)			X
COB MW-3	906823	City of Bisbee	Monitor Well (Distal to Plume)			X
COB WL	593116	City of Bisbee	Monitor Well (Distal to Plume)			X
PANAGAKOS	35-76413[1]	Panagakos	DWS Well (Within Plume, Receives Interim Action)			X
TM-06 MILLER	522695	Miller	Monitor Well (Distal to Plume)			X
TM-15 MILLER	522699	Miller	Monitor Well (Distal to Plume)			X
TM-16	522578	Copper Queen Branch	Monitor Well (Within Plume)			X
TM-42	562554	Copper Queen Branch	Monitor Well (Within Plume)			X
TVI 236	802236	Turquoise Valley, Inc.	Monitor Well (Distal to Plume)			X

Notes:

DWS = Drinking Water Supply

ADWR = Arizona Department of Water Resources

NR = No Record

[1] ADWR 35 Database

TABLE 2
Wells for Semi-annual Water Level Measurements

Well Name	ADWR 55 Registry No.	Owner	Casing Depth (feet)
ANDERSON	613396	Anderson	236
BANKS 987	647987	Banks	339
BARTON 919	644919	Barton	130
BF-01	539783	Copper Queen Branch	400
BIMA	577927	Bisbee Municipal Airport	465
BMO-2008-10GL	909435	Copper Queen Branch	810
BMO-2008-10GU	909272	Copper Queen Branch	449
BMO-2008-11G	909434	Copper Queen Branch	760
BMO-2008-13B	909551	Copper Queen Branch	474
BMO-2008-13M	909760	Copper Queen Branch	1030
BMO-2008-1G	909474	Copper Queen Branch	310
BMO-2008-3B	909147	Copper Queen Branch	260
BMO-2008-4B	910096	Copper Queen Branch	610
BMO-2008-5B	909653	Copper Queen Branch	285
BMO-2008-5M	909552	Copper Queen Branch	450
BMO-2008-6B	909146	Copper Queen Branch	265
BMO-2008-6M	909019	Copper Queen Branch	450
BMO-2008-7M	908794	Copper Queen Branch	670
BMO-2008-8B	910097	Copper Queen Branch	480
BMO-2008-8M	909711	Copper Queen Branch	1210
BMO-2008-9M	909255	Copper Queen Branch	775
BURKE	212268	Burke	781
COB MW-1	903992	City of Bisbee	420
COB MW-2	903984	City of Bisbee	170
COB MW-3	906823	City of Bisbee	269
COB WL	593116	City of Bisbee	150
COLLINS[1]	565260	Collins	320
COOPER C	637069	Cooper, Charles	220
DODSON	644927	Dodson	200
DOUGLASS 791	592791	Douglass	200
DOUGLASS 792	592792	Douglass	200
EAST	599796	East	125
EPPELE 641	805641	Eppele	265
FLEMING	218386	Fleming	400
FULTZ	212447	Fultz	300
GARNER 557	558557	Garner	300
GARNER 635	587635	Garner	680
GGOOSE 547	628547	Galloping Goose Properties	800
GL-03	539782	Copper Queen Branch	820
GOAR RANCH	610695	Goar	250
HOBAN	805290	Hoban	316
HOWARD	NR	Howard	200
KEEFER	209744	Keefer	245
MCCONNELL 265	539265	McConnell, Virginia	216
METZLER	35-71891[2]	Metzler	351
NESS	509127	Ness	812

TABLE 2
Wells for Semi-annual Water Level Measurements

Well Name	ADWR 55 Registry No.	Owner	Casing Depth (feet)
NWC-02	562944	Naco Water Company	312
NWC-03	203321	Naco Water Company	312
NWC-03 CAP	627684	Naco Water Company	179
NWC-04	551849	Naco Water Company	795
NWC-06	575700	Naco Water Company	410
OSBORN	643436	Osborn	258
PANAGAKOS	35-76413[2]	Panagakos	200
PARRA	576415	Parra	355
PIONKE	613395	Pionke	300
POOL	509518	Pool	313
RAMIREZ	216425	Ramirez	300
RAY	803772	Ray	100
ROGERS 803	641803	Rogers, Ernest D	140
ROGERS E	216018	Rogers, Ernest M	290
RUIZ	531770	Ruiz	312
SCHWARTZ	210865	Schwartz	305
STEPHENS	808560	Stephens	NR
SUNBELT	201531	Sunbelt Marketing, Inc.	380
SWAN	NR	Swan, Alan	NR
TM-02A	522574	Copper Queen Branch	925
TM-03	522575	Copper Queen Branch	200
TM-06 MILLER	522695	Miller	200
TM-16	522578	Copper Queen Branch	115
TM-19A	522580	Copper Queen Branch	700
TM-42	562554	Copper Queen Branch	250
TVI 236	802236	Turquoise Valley, Inc.	222
TVI 713	567713	Turquoise Valley, Inc.	200
WEISKOPF	641802	Weiskopf	200
ZANDER	205126	Zander	280

Notes:

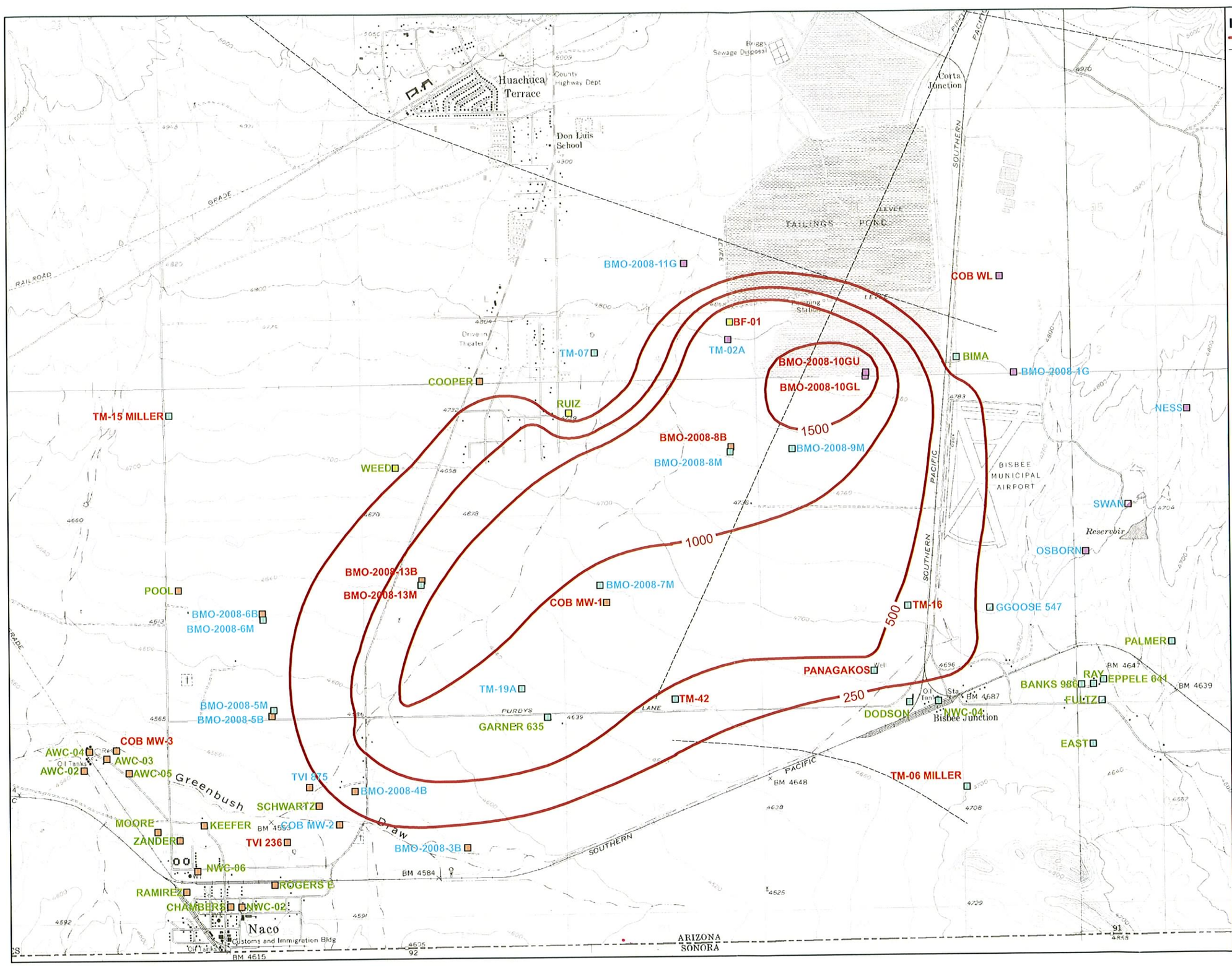
ADWR = Arizona Department of Water Resources
BIMA = Bisbee Municipal Airport
NR = No Record
[1] former owner ENGLUND
[2] ADWR 35 Database

TABLE 3
Wells Eliminated from Groundwater Sampling

Well Name	ADWR 55 Registry No.	Owner	Casing Depth (feet)	Description
ANDERSON	613396	Anderson	236	DWS Well (Receives Interim Action)
BURKE	212268	Burke	781	Non-DWS Private Well Northwest of Plume
COLLINS[1]	565260	Collins	320	Non-DWS Private Well Within Plume
COOPER C	637069	Cooper, Charles	220	DWS Well (Receives Interim Action)
DURAZO	NR	Durazo	ND	DWS Well (Receives Interim Action)
FRANCO	500101	Franco	200	DWS Well (Receives Interim Action)
GL-03	539782	Copper Queen Branch	820	Monitor Well North of Plume
HOBAN	805290	Hoban	316	DWS Well (Receives Interim Action)
HOWARD	NR	Howard	200	DWS Well (Receives Interim Action)
MCCONNELL 265	539265	McConnell, Virginia	216	DWS Well (Receives Interim Action)
METZLER	35-71891[2]	Metzler	351	DWS Well (Receives Interim Action)
NOTEMAN	212483	Noteman[3]	400	DWS Well (Receives Interim Action)
NWC-03	203321	Naco Water Company	312	DWS Well (Receives Interim Action)
PARRA	576415	Parra	355	DWS Well (Receives Interim Action)
PIONKE	613395	Pionke	300	DWS Well (Receives Interim Action)
ROGERS 803	641803	Rogers, Ernest D	140	DWS Well (Receives Interim Action)
TM-03	522575	Copper Queen Branch	200	Monitor Well Northeast of Plume
WEISKOPF	641802	Weiskopf	200	DWS Well (Receives Interim Action)

Notes:

ADWR = Arizona Department of Water Resources
NR = No Record
[1] former owner ENGLUND
[2] ADWR 35 Database



Legend

Sulfate Concentration (mg/L) 3rd Quarter 2009

Faults (inferred)

Screened Formation

- Basin Fill
- Basin Fill and Undiferentiated Bisbee Group
- Undifferentiated Bisbee Group
- Undifferentiated Bisbee Group - Estimated
- Undifferentiated Bisbee Group and Glance Conglomerate
- Glance Conglomerate
- Glance Conglomerate - Estimated

Sample Frequency

- Quarterly Sampling at DWS Wells Outside of Plume (green)
- Quarterly to Semi-Annual Sampling to Delineate Plume Edge (blue)
- Annual Sampling at Wells Within and Distal to Plume (red)

Scale

0 1,250 2,500 5,000 Feet

Notes:
Projection: UTM Zone 12N NAD83

Date	File ID
1/20/10	055038-003

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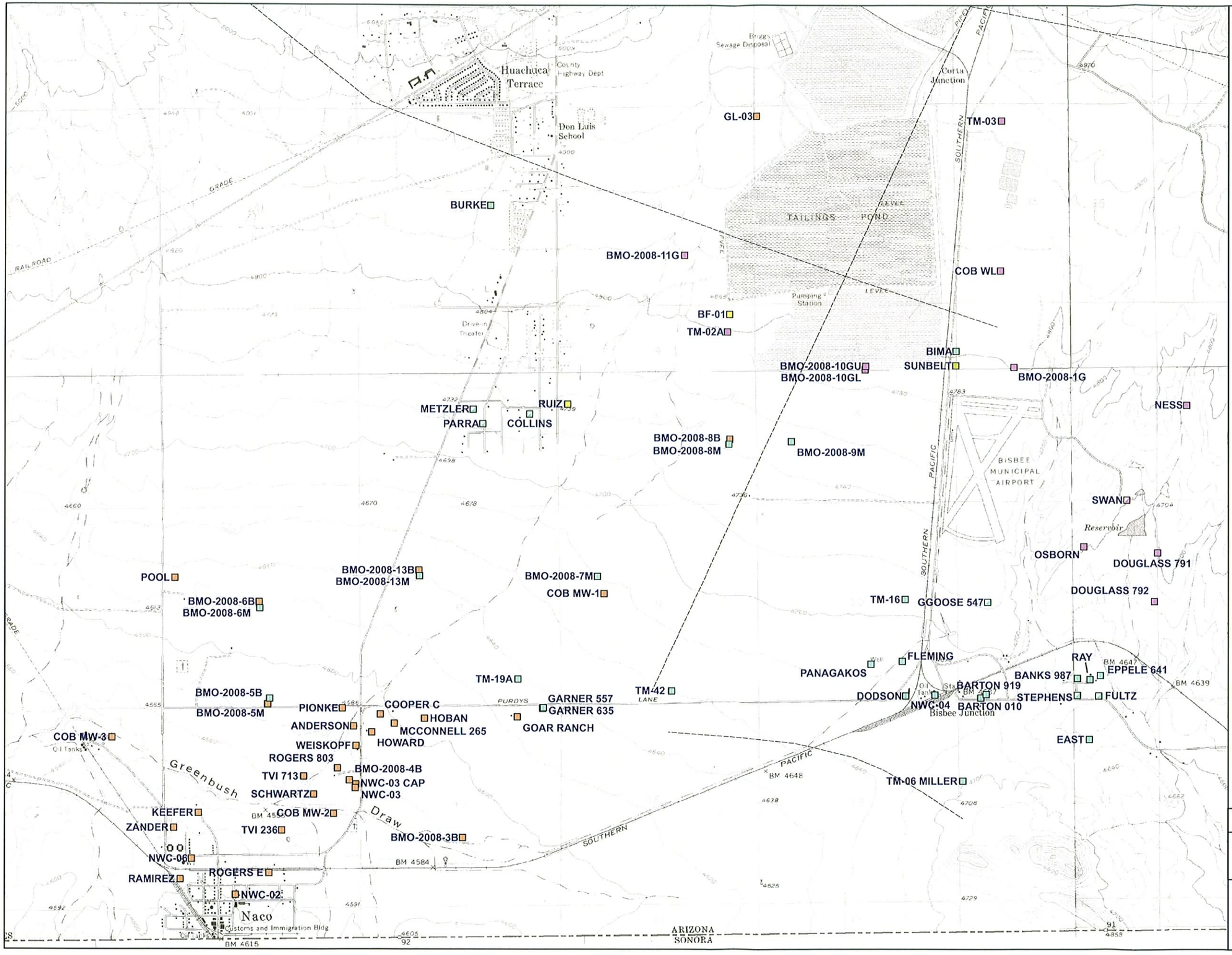
Figure 1
Groundwater Sampling Locations



Legend

Faults (inferred)

Screened Formation

- Basin Fill
- Basin Fill and Undiferentiated Bisbee Group
- Undifferentiated Bisbee Group
- Undifferentiated Bisbee Group - Estimated
- Undifferentiated Bisbee Group and Glance Conglomerate
- Glance Conglomerate
- Glance Conglomerate - Estimated

Scale

0 1,250 2,500 5,000 Feet

Notes:
Projection: UTM Zone 12N NAD83

Date	File ID
1/20/10	055038-004

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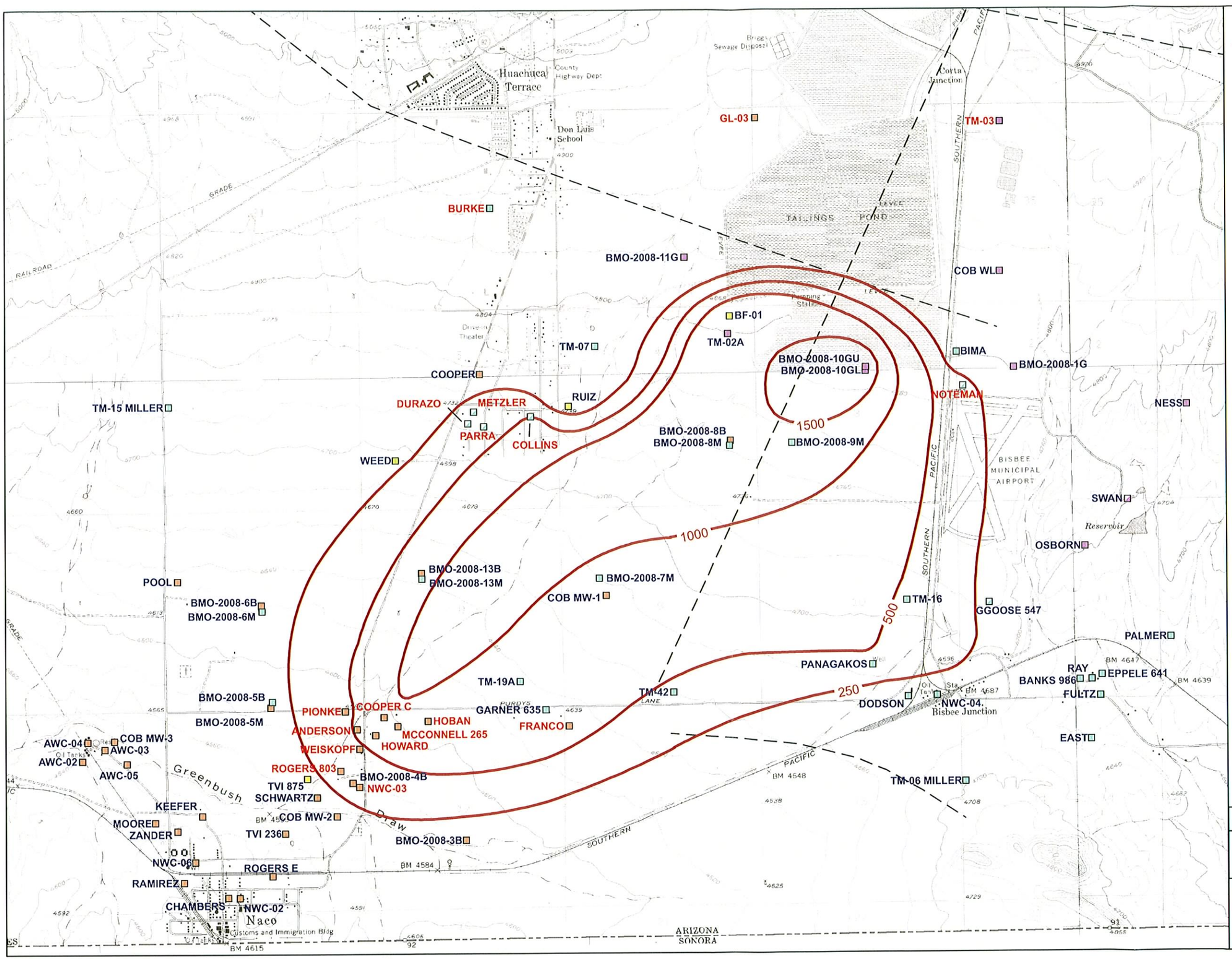
Figure 2
Water Level Measurement Locations



Legend

Sulfate Concentration (mg/L) 3rd Quarter 2009

Faults (inferred)

Screened Formation

- Basin Fill
- Basin Fill and Undiferentiated Bisbee Group
- Undifferentiated Bisbee Group
- Undifferentiated Bisbee Group - Estimated
- Undifferentiated Bisbee Group and Glance Conglomerate
- Glance Conglomerate
- Glance Conglomerate - Estimated

Well Label

- Wells Retained for Monitoring Plan (blue)
- Wells Eliminated from Monitoring Plan (red)

Scale

0 1,250 2,500 5,000 Feet

Notes:
Projection: UTM Zone 12N NAD83

Date	File ID
1/20/10	055038-005

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Figure 3
Wells Eliminated from Groundwater Sampling