

## **TABLES**

**TABLE 1**  
**Summary of Hydraulic Conductivity Data**

AQUIFER MATERIAL	NUMBER OF ESTIMATES	HYDRAULIC CONDUCTIVITY (ft/day)		
		MINIMUM	MAXIMUM	GEOMETRIC MEAN
<b>BASIN FILL</b>				
Basin Fill	51	0.01	118	15.05
Basin Fill and Demetrie Volcanics	7	9.4	15	11.90
Basin Fill and Granodiorite	4	0.011	0.020	0.013
<b>BEDROCK COMPLEX</b>				
Demetrie Volcanics	18	0.000067	151	0.0047
Cretaceous Sedimentary Rock	1	0.067	0.067	0.067
Brecciated Volcanics	3	0.0019	0.087	0.0122
Intrusive Rocks (Granite, Granodiorite, Quartz Monzonite)	26	0.000067	2.18	0.0312
Meta-Rhyolite and Rhyolite	9	0.03	1.07	0.12

**TABLE 2**  
**Sulfate Concentrations in Most Recent (as of April 2006) Groundwater Samples**

Well	Sulfate Concentration (mg/L)	Date Sampled	Source
1225	1320	4/12/00	PDSI
1759	340	11/25/03	PDSI
AN-1 (CW-11)	90	12/2/03	PDSI
CW-3	63.6	1/3/05	Community Water Company
CW-5	120	11/5/02	Community Water Company
CW-6	53.7	11/1/04	Community Water Company
CW-7	570	12/13/04	PDSI
CW-8	470	12/13/04	PDSI
CW-9	60	12/13/04	PDSI
ESP-1	220	4/14/06	Community Water Company
ESP-2	35	4/14/06	Community Water Company
ESP-3	36	4/14/06	Community Water Company
ESP-4	210	1/11/05	PDSI
ESP-5	170	4/3/01	PDSI
GV-01 (SDP)	170	4/11/06	Pima County Wastewater Treatment
GV-02 (SDP)	155	4/11/06	Pima County Wastewater Treatment
GV-1	40	12/13/05	PDSI
GV-2	70	12/13/05	PDSI
I-7	650	10/5/99	PDSI
I-9	750	4/3/01	PDSI
I-10	660	9/17/02	PDSI
I-12	780	10/5/99	PDSI
I-13	LAST DATA 1989	LAST DATA 1989	PDSI
IW-1	500	1/30/06	PDSI
IW-2	100	1/30/06	PDSI
IW-3A	1570	1/30/06	PDSI
IW-4	1570	1/30/06	PDSI
IW-5	1720	3/23/06	PDSI
IW-6A	1800	4/24/06	PDSI
IW-7	LAST DATA 1983	LAST DATA 1983	PDSI
IW-8	1810	2/21/06	PDSI
IW-9	1710	1/30/06	PDSI
IW-10	1670	9/14/05	PDSI
IW-11	1700	1/30/06	PDSI
IW-12	1560	4/24/06	PDSI
IW-13	1800	4/24/06	PDSI
IW-14	1800	2/1/06	PDSI
IW-15	1930	9/14/05	PDSI
IW-16	LAST DATA 1998	LAST DATA 1998	PDSI
IW-17	1480	6/7/05	PDSI
IW-18	1600	4/26/06	PDSI
IW-19	1580	4/26/06	PDSI
IW-20	1600	4/26/06	PDSI
IW-21	1560	4/26/06	PDSI
IW-22	1680	1/30/06	PDSI
IW-23	1650	1/24/06	PDSI
IW-24	1670	1/30/06	PDSI

**TABLE 2**  
**Sulfate Concentrations in Most Recent (as of April 2006) Groundwater Samples**

Well	Sulfate Concentration (mg/L)	Date Sampled	Source
M-1	10	11/25/03	PDSI
M-5	NO DATA	NO DATA	PDSI
M-6	NO DATA	NO DATA	PDSI
M-7	NO DATA	NO DATA	PDSI
M-8	30	11/1/00	PDSI
M-9	40	11/24/03	PDSI
M-10	40	11/24/03	PDSI
M-11	10	11/24/03	PDSI
M-12	50	9/18/02	PDSI
MH-1	1530	12/12/05	PDSI
MH-3	1660	12/6/04	PDSI
MH-4	2090	4/5/01	PDSI
MH-5	1900	12/12/05	PDSI
MH-6	1720	12/9/05	PDSI
MH-7	1810	12/8/05	PDSI
MH-9	420	12/6/05	PDSI
MH-10	1360	12/7/05	PDSI
MH-11	1570	1/24/06	PDSI
MH-12	1090	4/20/06	PDSI
MH-13A	1750	4/29/06	ELMA <sup>1</sup>
MH-13B	970	4/24/06	ELMA
MH-13C	320	4/13/06	ELMA
MH-14	1500	1/30/06	PDSI
MH-15W	1750	1/27/06	PDSI
MH-16W	1180	1/30/06	PDSI
MH-24	NO DATA	NO DATA	PDSI
MH-25A	<10	1/27/06	ELMA
MH-25B	1670	12/17/05	ELMA
MH-25C	1410	2/16/06	ELMA
MH-25D	600	2/20/06	ELMA
MH-26A	20	1/27/06	ELMA
MH-26B	1570	1/4/06	ELMA
MH-26C	730	1/11/06	ELMA
MH-30	1970	3/3/06	ELMA
RT-1	180	9/17/02	PDSI
S-1	70	12/13/05	PDSI
S-2	80	12/13/05	PDSI
ST-5	80	3/19/04	PDSI
ST-6	50	3/19/04	PDSI
ST-7	40	3/19/04	PDSI

<sup>1</sup> ELMA = Errol L. Montgomery & Associates, unpublished water quality data.

**TABLE 3**  
**Sulfate Concentrations at CW-7**

<b>Date Sampled</b>	<b>Sulfate, mg/L</b>
1/14/1992	68
10/5/1995	120
1/27/1999	247
2/10/1999	327
3/18/1999	319
4/12/1999	321
5/17/1999	251
7/15/1999	321
10/26/1999	461
11/15/1999	271
1/11/2000	380
4/19/2000	296
8/14/2000	362
10/18/2000	403
1/30/2001	387
4/4/2001	374
8/14/2001	402
10/15/2001	428
2/6/2002	463
4/8/2002	436
7/10/2002	470
11/5/2002	438
2/4/2003	451
4/21/2003	451
8/4/2003	505
1/20/2004	470
5/20/2004	491
8/3/2004	511
11/1/2004	533
12/13/2004	371

*Source: Community Water Company.*

**TABLE 4**  
**Summary of Major Element Ion Concentrations for Selected Wells**

	Proximal Wells	Medial Wells	Distal Wells	Upgradient Wells	Downgradient Wells
<b>Dissolved Calcium</b>					
Sample Number	23	3	4	4	2
Minimum	65.3	368	55.2	50.8	31.6
Maximum	623	505	196	69	32.8
Arithmetic Mean	470.9	454.3	113.9	59.2	32.2
<b>Dissolved Magnesium</b>					
Sample Number	23	3	4	4	2
Minimum	13.9	74.5	5.4	5.9	2.8
Maximum	121	108	21.5	9.5	3.1
Arithmetic Mean	93.7	93.5	11.4	8.1	3
<b>Dissolved Potassium</b>					
Sample Number	23	3	3	4	2
Minimum	5.6	10.5	3	2.9	2.5
Maximum	14.4	14.9	6.1	3.5	2.6
Arithmetic Mean	9.1	12.7	5	3.2	2.6
<b>Dissolved Sodium</b>					
Sample Number	23	3	4	4	2
Minimum	42	77.9	45.4	31.9	35.7
Maximum	221	110	121	50.8	36.2
Arithmetic Mean	147.7	98	70.4	41.5	36
<b>Bicarbonate<sup>1</sup></b>					
Sample Number	23	3	4	4	2
Minimum	105	71	94	147	130
Maximum	183	99	109	176	137
Arithmetic Mean	136	85.7	102	166	133.5
<b>Chloride</b>					
Sample Number	23	3	4	4	2
Minimum	19	115	20	13	8
Maximum	174	148	53	20	8
Arithmetic Mean	123.2	126.7	38.3	16.3	8
<b>Fluoride</b>					
Sample Number	23	3	4	4	2
Minimum	0.1	0.1	0.2	0.3	0.7
Maximum	0.3	0.2	1.4	0.5	1
Arithmetic Mean	0.2	0.2	0.8	0.4	0.9
<b>Total Sulfate</b>					
Sample Number	23	3	4	4	2
Minimum	100	1100	120	40	30
Maximum	1930	1620	570	80	30
Arithmetic Mean	1514	1430	323	65	30
<b>Total Dissolved Solids<sup>3</sup></b>					
Sample Number	23	3	3	4	2
Minimum	390	1960	340	300	230
Maximum	3190	2740	1030	400	230
Arithmetic Mean	2625.2	2460	743	350	230
<b>Hardness<sup>4</sup></b>					
Sample Number	23	3	4	4	2
Minimum	220	1224	160	151	90
Maximum	1965	1666	577	209	95
Arithmetic Mean	1559.8	1518	331	181	93
<b>Field pH (standard units)</b>					
Sample Number	23	3	4	4	2
Minimum	6.58	6.98	6.95	7.25	7.64
Maximum	7.87	7.20	7.51	7.62	7.85
Arithmetic Mean	7.30	7.10	7.17	7.50	7.70

*Note:*

*All Concentrations are in mg/L (except pH)*

<sup>1</sup> *as CaCO<sub>3</sub>*

<sup>2</sup> *as nitrogen*

<sup>3</sup> *filterable, dried at 180° C*

<sup>4</sup> *as CaCO<sub>3</sub>, computed from dissolved ions*

*See Table C.1 (Appendix C) for data.*

**TABLE 5**  
**Summary of Dissolved Metal Concentrations for Interceptor Wells (IW-series)**  
**1997 through April 2006**

AWQS <sup>1</sup>	Aluminum NS	Antimony 0.006	Arsenic 0.01	Barium 2	Beryllium 0.004	Boron NS	Cadmium 0.005	Chromium 0.1	Cobalt NS	Copper NS
Number of Samples	7	252	254	238	237	17	254	254	254	40
Number of Samples with Detections	1	32	207	238	4	17	37	25	4	6
Detection Frequency	14%	13%	81%	100%	2%	100%	15%	10%	2%	15%
Minimum Detected (mg/L)	0.15	0.0002	0.0006	0.024	0.0001	0.07	0.0001	0.01	0.01	0.01
Maximum Detected (mg/L)	0.15	0.0045	0.01	0.095	0.0004	0.30	0.002	1.55	0.03	0.02
Arithmetic Mean <sup>2</sup>	0.15	0.0014	0.0032	0.059	0.0010	0.15	0.0005	0.10	0.020	0.01
Number of AWQS Exceedances	NA	0	0	0	0	NA	0	3	NA	NA
Exceedance Frequency	NA	0.0%	0.0%	0.0%	0.0%	NA	0.0%	1.2%	NA	NA

**Notes:**

All concentrations are in milligrams per liter (mg/L)

<sup>1</sup> Aquifer Water Quality Standard

<sup>2</sup> Calculated for all samples with detected

NS = No standard

NA = Not applicable

See Table C.2 in Appendix C for data.

**TABLE 5**  
**Summary of Dissolved Metal Concentrations for Interceptor Wells (IW-series)**  
**1997 through April 2006**

AWQS <sup>1</sup>	Iron NS	Lead 0.05	Manganese NS	Mercury 0.002	Molybdenum NS	Nickel 0.1	Selenium 0.05	Thallium 0.002	Zinc NS
Number of Samples	232	253	231	231	255	237	255	237	40
Number of Samples with Detections	197	195	52	10	186	20	131	58	27
Detection Frequency	85%	77%	23%	4%	73%	8%	51%	24%	68%
Minimum Detected (mg/L)	0.01	0.0001	0.005	0.0002	0.01	0.01	0.0006	0.00007	0.01
Maximum Detected (mg/L)	19.5	0.08	0.99	0.0005	0.22	0.95	0.005	0.0028	0.15
Arithmetic Mean <sup>2</sup>	0.32	0.0029	0.062	0.0005	0.06	0.11	0.0022	0.00063	0.03
Number of AWQS Exceedances	NA	1	NA	0	NA	3	0	1	NA
Exceedance Frequency	NA	0.4%	NA	0.0%	NA	1.3%	0.0%	0.4%	NA

Notes:  
 All concentrations are in milligrams per liter (mg)  
<sup>1</sup> Aquifer Water Quality Standard  
<sup>2</sup> Calculated for all samples with detected  
 NS = No standard  
 NA = Not applicable  
 See Table C.2 in Appendix C for data.



**TABLE 6**  
**Summary of Data Needs and Proposed Work**

DATA NEED	PROPOSED AQUIFER CHARACTERIZATION PLAN (ACP)/FEASIBILITY STUDY (FS) WORK
<b>AQUIFER CHARACTERIZATION DATA NEEDS</b>	
Locations of drinking water wells downgradient and cross-gradient of the plume	ACP - Task 1 - Well Inventory: use Arizona Department of Water Resources data to identify the location and water use for individual wells
Groundwater sulfate data to determine the eastern and northern extents of the plume	ACP - Task 2 - Plume Characterization: install and sample proposed new monitoring wells east and north of the plume
Groundwater sulfate data to determine the vertical distribution of sulfate	ACP - Task 2 - Plume Characterization: install and sample proposed new monitoring wells allowing vertical sampling; conduct depth-specific sampling at existing wells
Local and regional water level measurements to characterize the regional flow system	ACP - Task 2 - Plume Characterization: ongoing monitoring by PDSI, measure regional and local water levels at existing wells, and measure water levels at proposed new monitoring wells
Local and regional water quality data to determine background water quality	ACP - Task 2 - Plume Characterization: ongoing monitoring by PDSI, sample groundwater at existing local and regional wells, and sample groundwater at proposed new monitoring wells
Aquifer structure and hydraulic properties	ACP - Task 2 - Plume Characterization: compile and evaluate data on the depths and hydraulic properties of aquifer units, conduct pumping tests at proposed new wells; and Task 4 - Sulfate Fate and Transport Evaluation: aquifer data will be incorporated into groundwater flow model
Pumping, sulfate concentrations, and water levels at the interceptor wellfield	ACP - Task 3 - Evaluation of PDSI's Groundwater Sulfate Control System: existing information on pumping, water quality, and water levels will be compiled and evaluated
Quantification of sources and sinks of groundwater for groundwater flow model	ACP - Task 4 - Sulfate Fate and Transport Evaluation: the flow rates and sulfate concentrations of historical and current sources and sinks of groundwater will be compiled or estimated for incorporation into the groundwater flow model
<b>FEASIBILITY STUDY DATA NEEDS</b>	
Water quality data for assessing treatability	ACP - Task 2 - Plume Characterization: identify and collect information on water quality parameters that may influence treatment effectiveness
Current and projected pumping rates for existing wells	FS - ISMAT and DSMA (see FS Task list below): determine current and projected demands for water users in the Green Valley area
Expected future pumping rates for planned wells	FS - ISMAT and DSMA: determine projected future demands for water users in the Green Valley area
Specifications for existing and planned water supply distribution and storage systems	FS - ISMAT and DSMA: obtain existing and projected future infrastructure specification from water users in the Green Valley area

**ACP Task List**

Task 1 - Well Inventory

Task 2 - Plume Characterization

Task 2.1 - Data Compilation and Evaluation

Task 2.2 - Groundwater Monitoring

Task 2.3 - Depth-Specific Groundwater Sampling at Existing Wells

Task 2.4 - Offsite Well Installation and Testing

Task 3 - Evaluation of PDSI Groundwater Sulfate Control System

Task 4 - Sulfate Fate and Transport Evaluation

Task 5 - Aquifer Characterization Report

**FS Task List**

Identification and Screening of Mitigation Actions and Technologies (ISMAT)

Development and Screening of Mitigation Alternatives (DSMA)

Detailed Analysis of Mitigation Alternatives (DAMA)

**TABLE 7  
Proposed Offsite Well Locations**

<b>PROPOSED WELL SITE</b>	<b>PURPOSE</b>	<b>ESTIMATED DEPTH TO BEDROCK (feet)</b>	<b>APPROACH TO WELL INSTALLATION</b>	<b>LAND STATUS</b>
1	Determine northern extent and vertical zoning of sulfate and hydraulic properties; long term water level and water quality monitoring	1,200 - 1,500	Three (3) wells installed to shallow, intermediate, and deep levels	Private
2	Determine northwestern extent and vertical zoning of sulfate and hydraulic properties; long term water level and water quality monitoring	800 - 1,000	Two (2) wells installed to shallow and deep levels	Private or Public
3	Determine eastern extent and vertical zoning of sulfate and hydraulic properties in area between CW-7 and CW-9; long term water level and water quality monitoring	1,500 - 2,000	Three (3) wells installed to shallow, intermediate, and deep levels	Private or Public
4	Determine eastern extent and vertical zoning of sulfate and hydraulic properties in area between CW-8 and CW-6; long term water level and water quality monitoring	1,500 - 2,000	Three (3) wells installed to shallow, intermediate, and deep levels	Private or Public
5	Determine eastern extent and vertical zoning of sulfate and hydraulic properties at CW-3 east of MH-13; long term water level and water quality monitoring	1,200 - 1,500	Single well with two screens installed to intermediate and deep levels to augment depth coverage at CW-3	Private
6	Determine southeastern extent and vertical zoning of sulfate and hydraulic properties east of GV-1 and GV-2; long term water level and water quality monitoring	1,200 - 1,500	Single well with two screens installed at shallow and intermediate levels	Private

*Note: See Figure 13 for approximate location of proposed wells. Actual locations may vary depending on negotiation of land access.*