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TECHNICAL MEMORANDUM

TO: Mary Beth Marks – On-Scene Coordinator

FROM: Cam Stringer – Senior Hydrogeologist
Mark F. Pearson – Project Geologist

DATE: January 7, 2004

RE: 2003 Como Basin Area Groundwater Monitoring
New World Mining District Response and Restoration Project

INTRODUCTION

This technical memorandum presents the results of biweekly groundwater monitoring completed by Maxim Technologies, Inc.® (Maxim) in the Como Basin area during the 2003 field season. Biweekly monitoring was conducted according to the scope and methods described in the 2003/2004 Work Plan for the New World Mining District Response and Restoration Project (Maxim, 2003a). Biweekly measurements of depth to water, pH, specific conductance (SC), dissolved oxygen (DO), and oxidation/reduction potential (ORP) were collected during the period beginning in July 2003 and ending in early October 2003.

References are listed at the end of the memorandum. Figures and tables are presented in **Attachments A and B**, respectively. **Figure 1 (Attachment A)** shows well locations and other features important to discussions presented in this memorandum.

PREVIOUS INVESTIGATIONS

The objectives of investigations in the Como Basin are to determine how the basin "becomes dewatered" as measured by the seasonal decline in groundwater levels, and how groundwater quality is influenced during this decline. Groundwater in the Como Basin likely contributes to surface water flows draining the Como Basin and inflows to the Glengarry mine. In 2001, Maxim, in cooperation with the New World Response and Restoration Project hydrogeology technical group, developed additional hydrogeologic investigations to help identify the occurrence of groundwater in the Como Basin.

Groundwater investigation at the Como Basin area in 2002 included installation of 20 monitoring wells (previously referred to as piezometers) in disturbed and in-place, unconsolidated material (referred to as colluvial material) overlying a bedrock-hosted massive sulfide deposit (**Figure 1**). Colluvial material encountered during drilling in August 2002 ranges in thickness between 1.1 to 4.3 meters (3.7 to 14 feet) and consists of silt, clay, and sand with scattered rock fragments. Moist colluvium was noted in most borings and the colluvium/bedrock contact was wet in several of the boreholes. Field parameters were measured in the wells but samples were not submitted for laboratory analysis.

During August 2002, wells FCGW-114, -116, -119, -122, -126, and -129 contained groundwater but the other colluvial wells were dry. Water levels declined in bedrock wells and colluvial wells containing groundwater between August and October 2002. By the last monitoring event of the year in October 2002 all shallow colluvial wells had gone dry except FCGW-119, -122, and -126. The 2002 field monitoring averages of pH and SC measurements ranged between 2.5 to 6.75 standard units (s.u.) and 168 to 1,378 microsiemens (µS), respectively. Wells 114 and 126 exhibited the lowest pH values (less than 3.0 s.u.) and highest SC values (greater than 650 µS).

METHODS

Groundwater monitoring in 2003 was conducted biweekly between mid-July and late September 2003 according to methods and procedures outlined in the New World Mining District Response and Restoration Project 2003/2004 Work Plan (Maxim, 2003) and the Site-Wide Sampling and Analysis Plan (Maxim, 1999). Wells FCGW-119, -129, and -123 were inaccessible during the initial monitoring event on July 17, 2003, because these wells were buried in snow. During the second biweekly event, a bailer was found to be stuck in well FCGW-119 so no data were obtained from this well in 2003.

Depth to groundwater was measured in monitoring wells using a decontaminated electric water level indicator. Field parameters including pH, SC, ORP, and DO were measured in groundwater from monitoring wells using a YSI 556 downhole multiprobe. Samples were collected for field parameter measurements in the initial 2003 monitoring events of the Como Basin wells. During later monitoring events, downhole measurements were made with or without purging the well beforehand because many of the Como Basin colluvial wells had only a small amount of water and recharged slowly after purging. Monitoring wells screened in bedrock where a relatively large purge volume was required were also monitored downhole without purging. When depth to groundwater in a deep well exceeded the length of the multiprobe cable (20 meters), then a sample would be collected using a disposable bailer for measurement of parameters. Other exceptions to standard sampling and purging procedures are noted in **Table 1 (Attachment B)**.

RESULTS

Results of groundwater monitoring completed in the Como Basin area during 2003 are presented below. Figures are presented in **Attachment A**. Tabulated data and the project water quality database are presented in **Attachment B**.

For brevity in the following discussion, the prefix FCGW, which is used in the well designation for the series of wells beginning with the number 100, is not used. Wells installed by the EPA and CBMI in the mid-'90's (EPA-11, EPA-12, MW-1, MW-8, Tracer 4, and Tracer 6) are referred to with their complete well designation.

BEDROCK GEOLOGY, SURFACE, AND STRUCTURE

Noranda identified bedrock type, faults, and elevation of bedrock surface during exploration drilling in 1990 using reverse-circulation drilling techniques (Kirk, 1992). Bedrock geology, structure, and bedrock surface elevation contours of the Como Basin area in relation to colluvial monitoring wells installed during 2002 are illustrated in **Figure 2** Maxim (2002) identified relatively low areas and inferred paleochannels in the bedrock surface where groundwater could potentially flow in overlying colluvium to help in the placement of monitoring wells. These channels and their location relative to monitoring wells installed in the Como Basin during 2002 are shown in **Figure 3**.

GROUNDWATER OCCURRENCE AND FLOW

During the initial 2003 groundwater monitoring event (July 17, 2003), 11 of the 17 accessible colluvial monitoring wells in the Como Basin contained groundwater (three wells were inaccessible because they were buried in snow). By the next monitoring event on July 30, all but one of the 20 shallow colluvial wells were accessible, and four wells were dry (117, 123, 124, and 127). **Figure 4** is a potentiometric surface map for the shallow groundwater system in the Como Basin based on July 30, 2003, depth to groundwater data. This data set was used because it contained the most data points that were available on any one date in 2003. Based on these data, groundwater flow in the shallow groundwater system was generally perpendicular to slope. The hydraulic gradient was 0.15 between wells 116 and 111.

Saturation of colluvium in the Como Basin is a seasonal occurrence that results from melting snow and spring runoff. In September of 2002, most colluvial wells were dry. In 2003, colluvium in the basin began to fill with recharge from melting snow. The seasonal maximum for most colluvial wells was reached in July 2003 (**Figure 5**), with water table elevations in shallow colluvial monitoring wells declining from late July through late September 2003 (**Figure 5**). On August 12, 2003, nine wells had water (113 through 116, 120, 122, 126, 128, and 129). By September 30th, only three wells (114, 120 and 126) had measurable water, indicating that groundwater had drained from colluvium in the area. Monitoring wells 113, 115, 116, 120, and 126 are completed in or adjacent to inferred paleochannels in the bedrock surface (**Figure 3**) and were some of the last wells to contain measurable groundwater, indicating that shallow groundwater flows out of the colluvium along these inferred paleo bedrock channels. Groundwater elevations in Como Basin bedrock wells also declined though the monitoring period (**Table 1**).

GROUNDWATER QUALITY

Field parameter data collected in 2003 for Como Basin area monitoring wells are presented in Table 1. **Figures 6, 7, and 8** are isopleth maps for pH, SC, and ORP in monitoring wells, respectively, based on data from the July 30, 2003 monitoring event. **Figure 9** is an isopleth map for DO concentrations from the August 12, 2003 monitoring event.

Isopleth maps for ph, SC, and ORP (**Figures 6, 7, and 8**) indicate that there are two distinct zones of water quality in shallow groundwater in the Como Basin. Groundwater quality is relatively good in wells that are completed in unmineralized colluvium upslope from wells 115 and 129; groundwater

quality is poorer in wells completed in mineralized colluvium downslope from these two wells. The upslope area is characterized by pH greater than 6.0 standard units (s.u.), SC less than 800 micromhos/centimeter (µmhos/cm), and ORP less than 400 millivolts (mv). Groundwater in wells downslope of 115 and 129 is characterized by pH less than 3.0 s.u., SC greater than 1,500 µmhos/cm and ORP greater than 400 mv. Comparison of **Figures 6, 7 and 8** with **Figure 2** shows that monitoring wells with groundwater exhibiting low pH and high SC values are generally completed in colluvium derived from massive sulfide bearing rock in the Meagher Limestone or mineralized portions of the Woolsey Shale.

Shallow groundwater flowing in colluvium derived from massive sulfide bearing rock has relatively high ORP (wells 112 through 114, 125 through 128, **Figure 8**). As pH drops with the generation of acidity by the oxidation of sulfides in the colluvium, Fe^{+3} becomes soluble, increasing the ORP of groundwater.

Figure 10 shows trends in pH and SC for shallow monitoring wells in upslope and downslope areas. In the upslope area, pH in most wells increased appreciably between the mid- and late July monitoring events, and then declined between late-July and mid August. Specific conductance in wells 115 and 129 decreased between mid-July and mid-August, but SC was variable throughout the season in most other wells upslope of the mineralized area. Well 120 exhibits different trends in pH and SC than other upslope wells. Between mid-July and mid-August, pH decreased and SC increased in groundwater from well 120, indicating an increase in acidity and dissolved solids in that location. In most wells in the downslope mineralized area, pH declined from mid-July through September. Specific conductance in downslope wells 114, 125, and 126 increased between mid-July and late July, decreased between late July and mid-August, then increased between mid-August and the last monitoring event. Specific conductance in groundwater from well 114 decreased between mid-July and mid-August, then increased between mid-August and the last monitoring event.

Field parameter values measured in groundwater from bedrock wells EPA-11, EPA-12, MW-1, MW-8, Tracer 4, and Tracer 6 (**Table 1**), were similar to previous data for those wells. Specific conductance values for all bedrock wells, and pH values for all bedrock wells except EPA 11, were the highest during the first monitoring event (July 15) of the season (**Table 1**).

SUMMARY AND CONCLUSIONS

Shallow groundwater in the Como Basin occurs in bedrock and colluvium water-bearing units near the surface. Groundwater occurrence in the Como Basin appears to be directly related to infiltration from seasonal snowmelt and spring runoff. Groundwater rises as the snowpack melts and is highest in July. With the last snowfield melting in the basin in August, water levels begin to drop, and continue to drop through the fall. Groundwater flow is generally parallel to the topographic slope. Colluvial deposits are thickest where colluvium fills paleochannels in the surface of underlying bedrock. These filled channels are generally the last portion of colluvial groundwater to drain in the fall.

Groundwater quality in the colluvium of the Como Basin appears to be related to shallow bedrock geology. In upslope areas of the basin, groundwater quality is more neutral in pH and lower in dissolved solids (based on specific conductance measurements). These upslope areas are underlain by the

unmineralized Park Shale Formation. In downslope areas where rocks of the Meagher Limestone and Wolsey Shale contain pyrite mineralization, groundwater quality is poorer, with acidic pH and high dissolved solids (based on specific conductance values). Deeper bedrock water-bearing units in the Como Basin area, particularly those completed in Tertiary intrusive rocks that are mineralized, contain the poorest quality water.

REFERENCES

Kirk, Allan R., 1992. Year End Report, 1991, New World Project, Park County, Montana. Prepared for Noranda.

Maxim Technologies, Inc., 2003a, 2003/2004 Work Plan, New World Mining District, Response and Restoration Project, Prepared for the USDA Forest Service Northern Region, March 2003.

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Maxim Technologies, 1999. Site-Wide Sampling and Analysis Plan. New World Mining District Response and Restoration Project. Appendix B of the Overall Project Work Plan. Final. Prepared for the USDA Forest Service, Northern Region, November 10.

ATTACHMENT A

FIGURES
Como Basin Area 2003 Biweekly Groundwater Monitoring
New World Mining District Response and Restoration Project

Figure

1 Groundwater Monitoring Locations, Como Basin Area
2 Geology and Structure, Como Basin Area
3 Inferred Paleochannels in the Bedrock Surface, Como Basin Area
4 Potentiometric Surface Map
5 Groundwater Hydrographs, 2003 Como Basin Area Monitoring
6 Isopleth Map of pH, July 30, 2003
7 Isopleth Map of Specific Conductance, July 30, 2003
8 Isopleth Map of Oxidation Reduction Potential, July 30, 2003
9 Isopleth Map of Dissolved Oxygen, July 30 and August 12, 2003
10 Trends in pH and Specific Conductance, 2003 Como Basin Area Groundwater Monitoring

newworld\cadpro\missoula_rpt\comobasin\como 12-03.dwg

Lulu Pass

Small Como Dump (Removed 2001)

Tracer 6

EPA-11

Poles

Old Tailings

Como Basin

EPA-12

MW-1

T No. 353
Elev. 2935.26
E 564259.32
N 91228.45

124

126 127 125 111

123 129 128 113 112

130 120 121 122 115 114 116 117 119 118

Como Raise

South Channel

North Channel

Old Well

Diversion Ditch

Tailings Pile

Glengarry Mine

N

0 10 Meters 50

Scale 1:2000

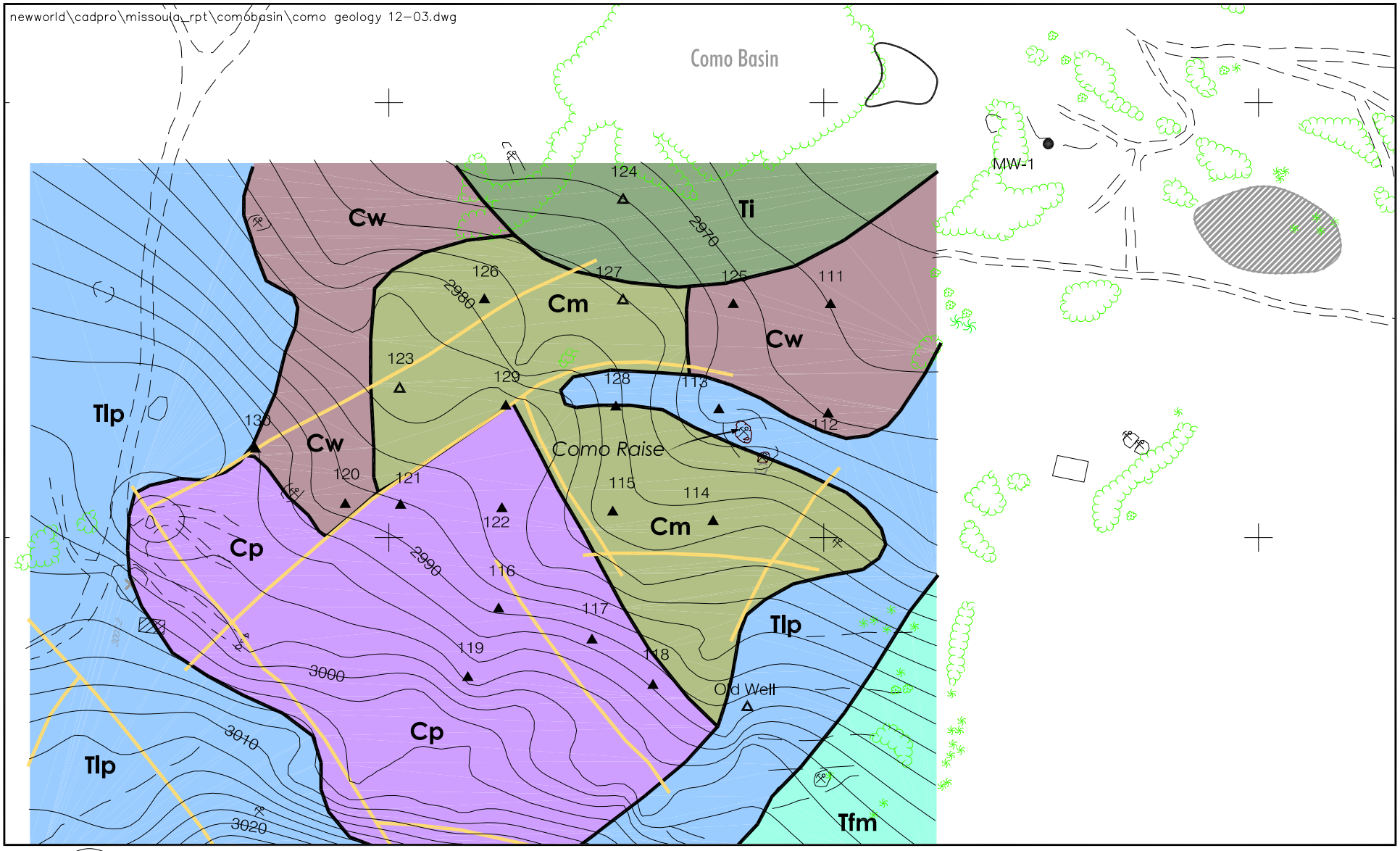
Contour Interval = 1 meter

MAXIM TECHNOLOGIES INC® 9902245.523

- Index Contour
- Intermediate Contour
- Old Roads & Trails
- Top / Toe Slope
- Terraces
- 9549.9 Spot Elevation
- Diversion Ditch
- Ditchs / Drains
- Test Hole
- Old Building Site
- Tree & Vegetation Outline
- Shrub
- Tree
- Como Monitoring Well
- Other Bedrock Monitoring Well

July 2003

Groundwater Monitoring Locations
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 1



N

0 10 Meters 40

Scale 1:1500

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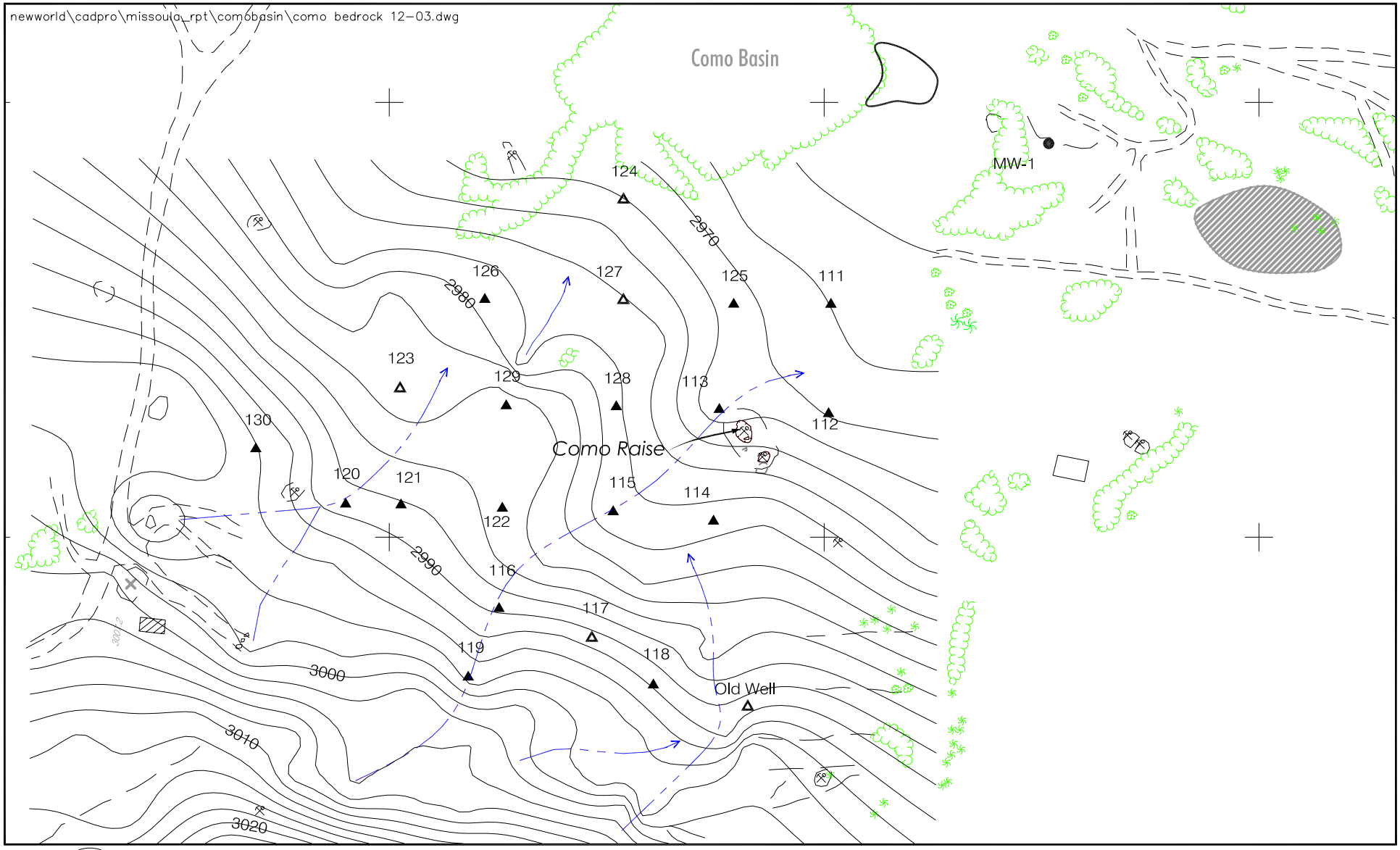
Tlp	Latite Porphyry
Ti	Tertiary Intrusive
Tfm	Fisher Mtn. Complex
Cp	Park Formation
Cm	Meagher Formation
Cw	Wolsey Formation

- Lithologic Contact
- Mapped Fault or Fracture Zone
- ▲ Monitoring Well Containing Water
- △ Dry Monitoring Well
- ● Other Bedrock Monitoring Well
- Bedrock Surface Elevation Contour (Meters)

July 2003

Geology and Structure
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 2



N

0 10 Meters 40

Scale 1:1500

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Inferred Paleochannel in Bedrock (Interpreted from Structure Contours)

▲ Monitoring Well Containing Water

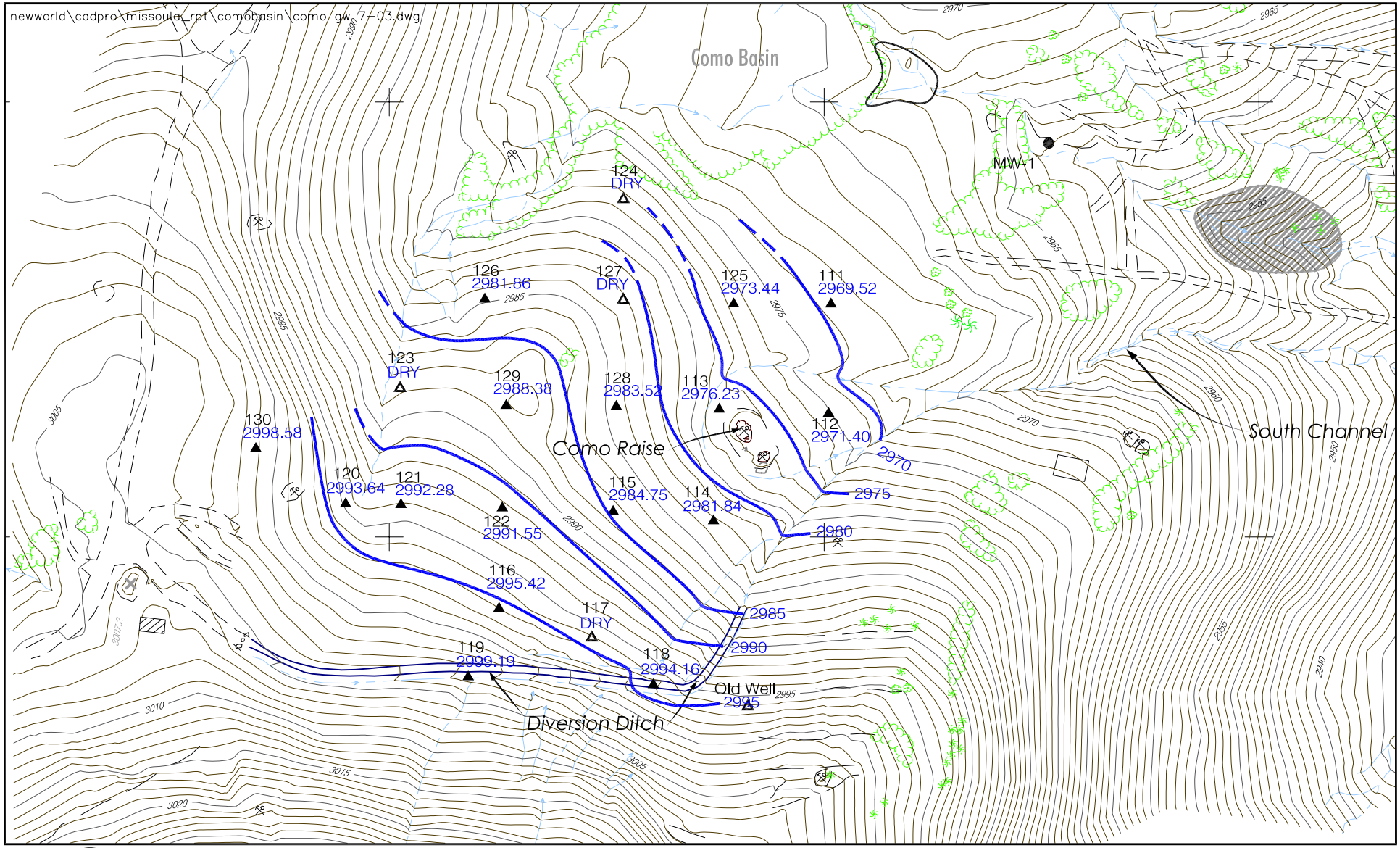
△ Dry Monitoring Well

● Other Bedrock Monitoring Well

Bedrock Surface Elevation Contour (Meters)

July 2003

Inferred Paleochannels in the Bedrock Surface
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 3



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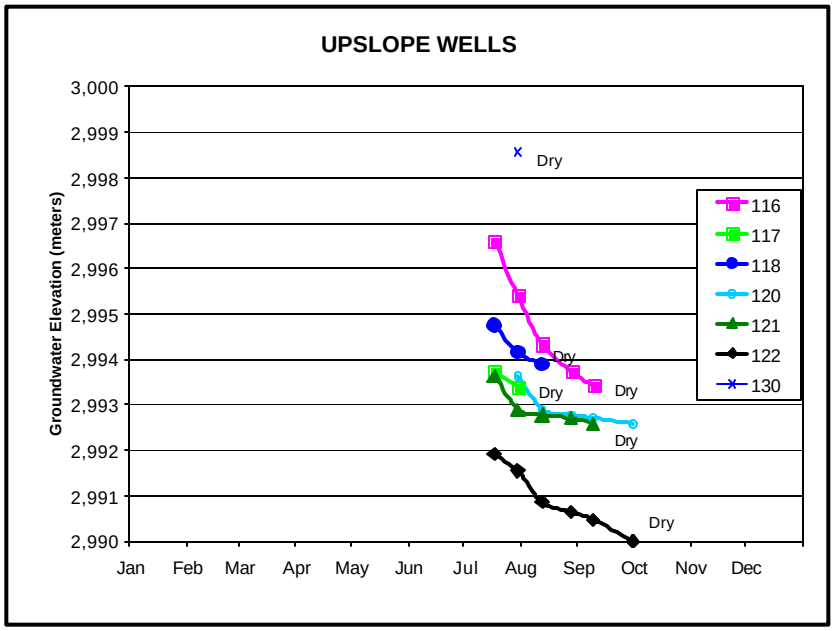
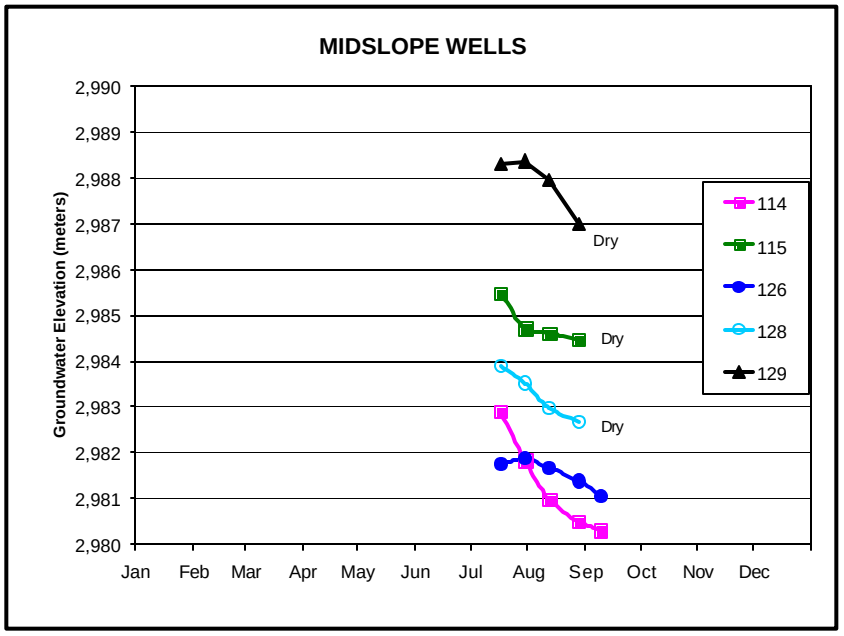
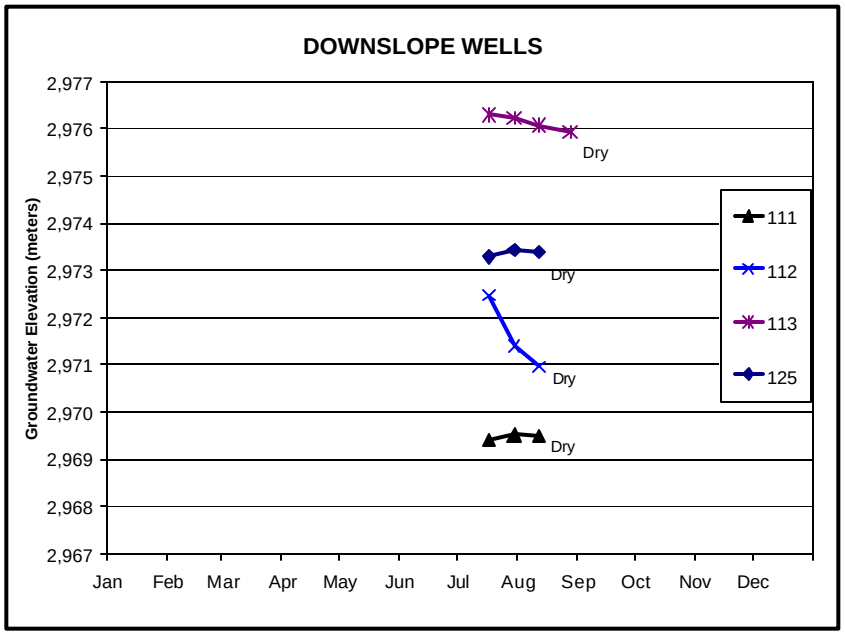
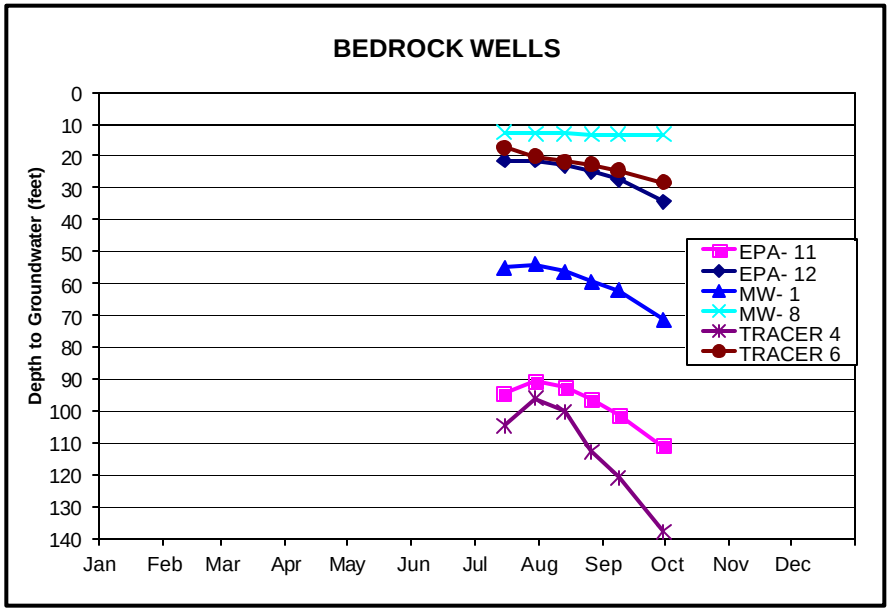
July 2003

Potentiometric Surface Map
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 4

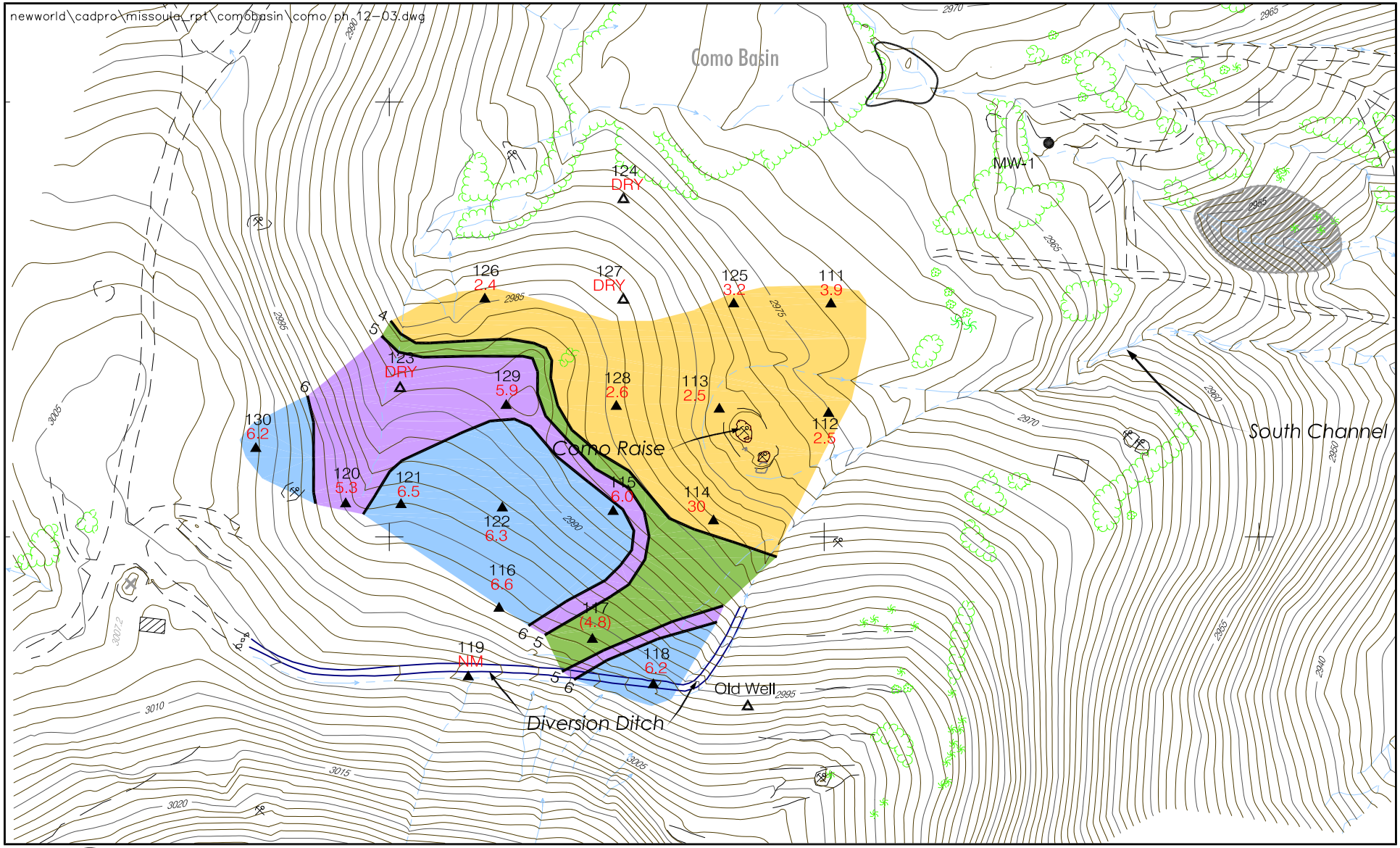








Groundwater Hydrographs
2003 Como Basin Area Monitoring
FIGURE 5



N

0 10 Meters 40

Scale 1:1500

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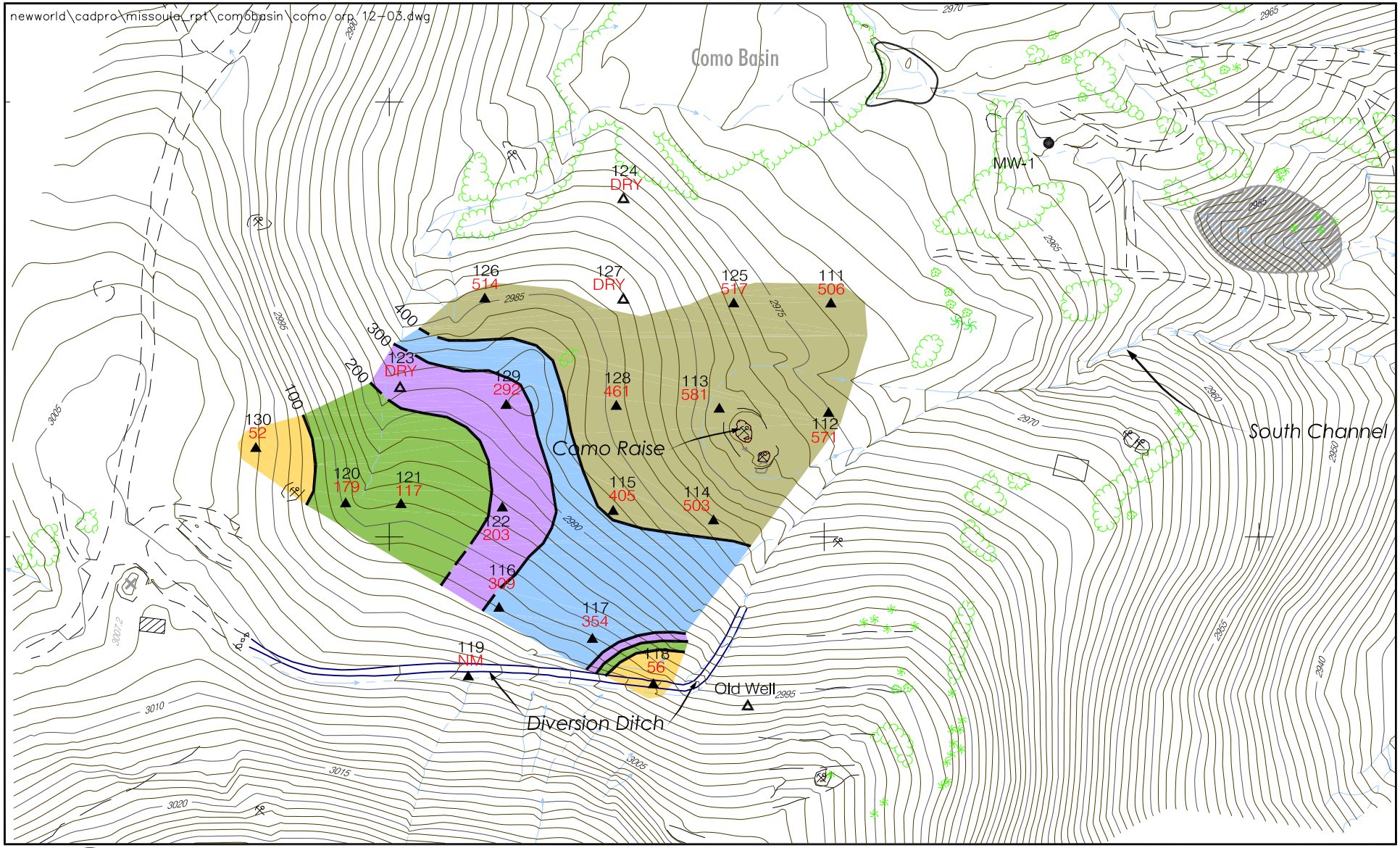
pH (standard units)

- <4
- 4-5
- 5-6
- >6

- 6.6 pH (Standard Units)
- ▲ Monitoring Well Containing Water in Shallow Groundwater
- △ Dry Monitoring Well
- ● Other Bedrock Monitoring Well
- Diversion Ditch
- Ditchs / Drains

July 2003

Isopleth Map of pH
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 6



Oxidation Reduction Potential (mv)

- <100
- 100-200
- 200-300
- 300-400
- >400

354 Oxidation Reduction Potential (millivolts)

▲ Monitoring Well Containing Water in Shallow Groundwater

△ Dry Monitoring Well

● Other Bedrock Monitoring Well

Diversion Ditch

Ditchs / Drains

N

0 10 Meters 40

Scale 1:1500

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July 2003

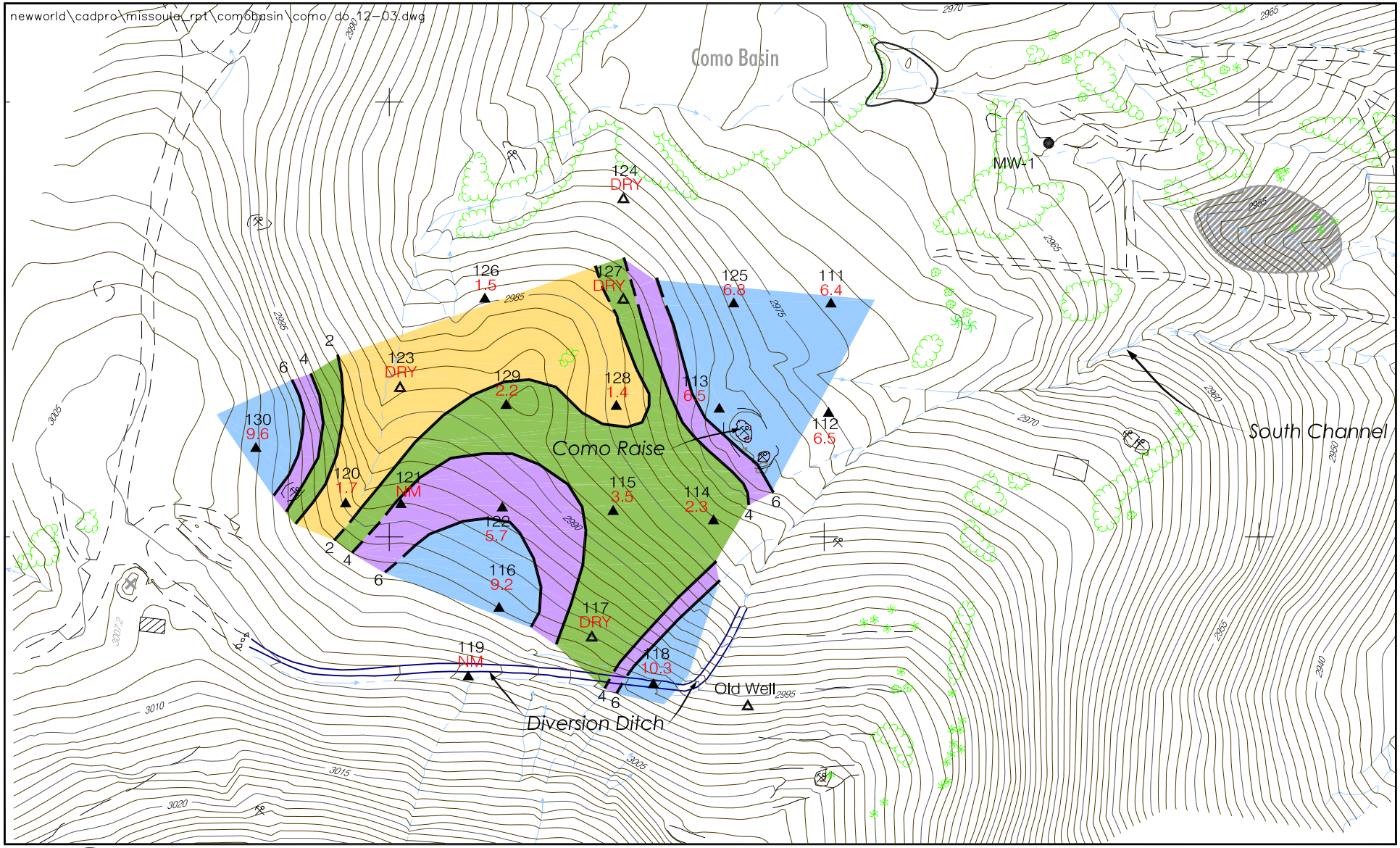
Isopleth Map of Oxidation Reduction Potential

Como Basin Area

New World Mining District

Response and Restoration Project

FIGURE 8



N

0 10 Meters 40

Scale 1:1500

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Dissolved Oxygen (mg/L)

- <2
- 2-4
- 4-6
- >6

9.2 Dissolved Oxygen Concentration (milligrams/liter)

▲ Monitoring Well Containing Water in Shallow Groundwater

△ Dry Monitoring Well

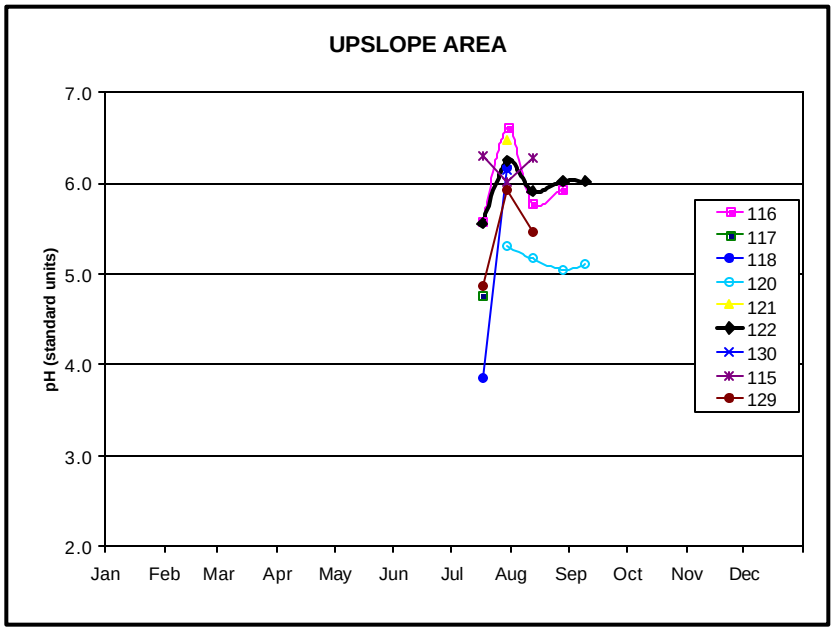
● Other Bedrock Monitoring Well

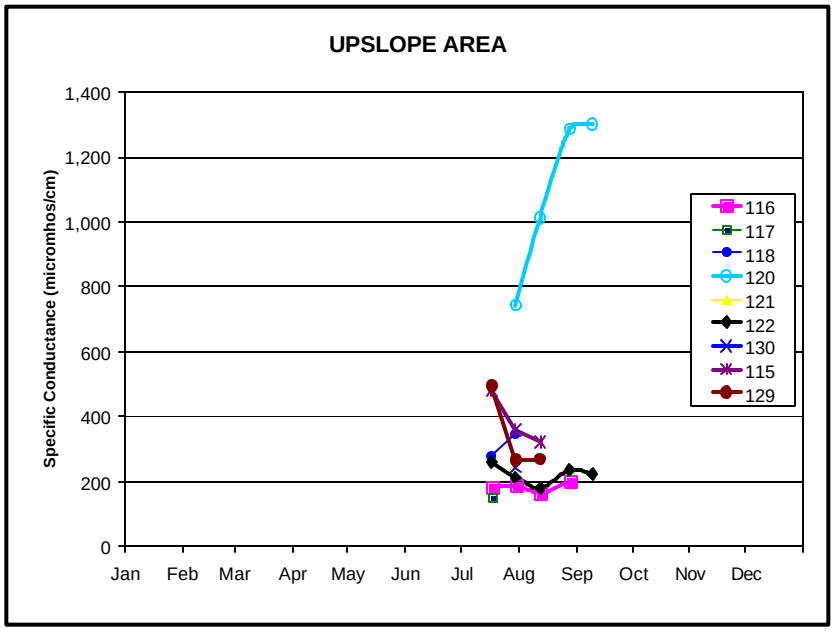
Diversion Ditch

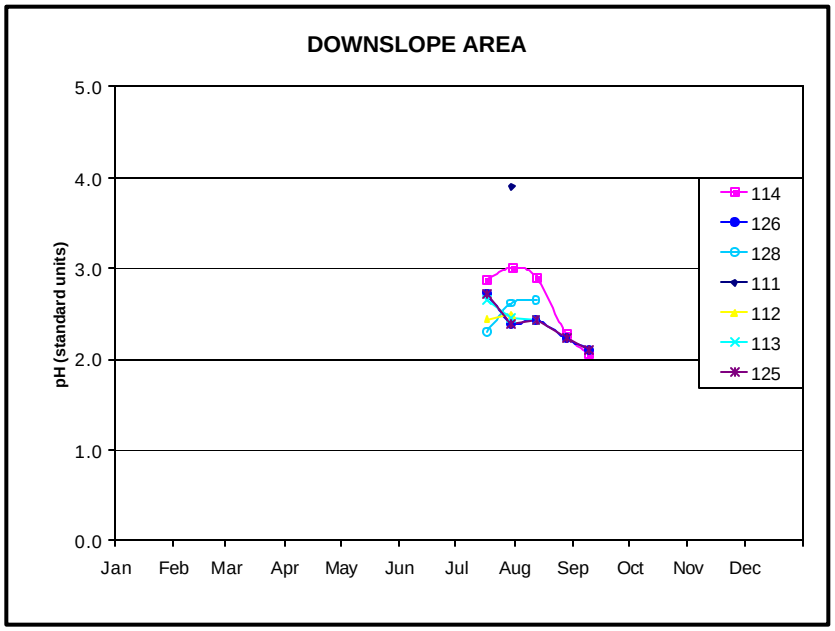
Ditches / Drains

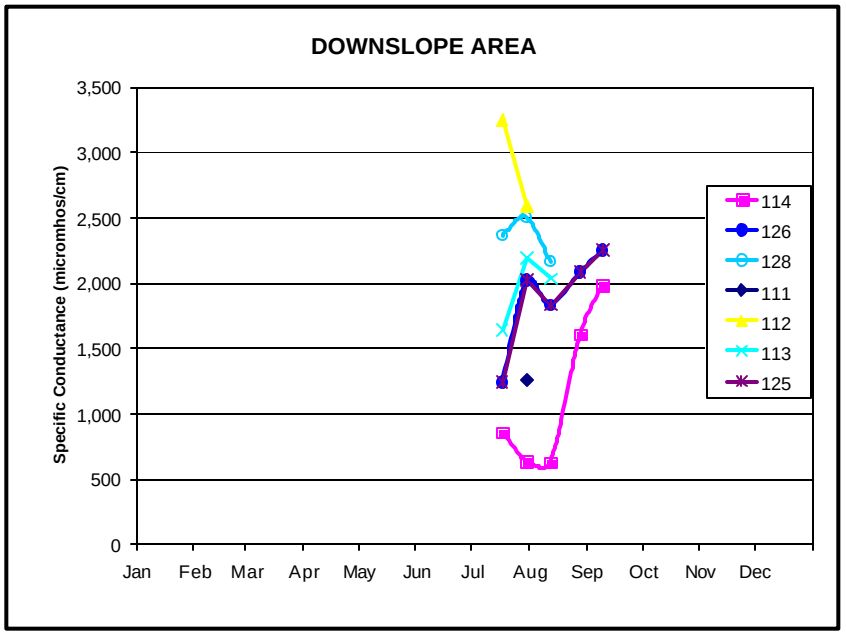
July 2003

Isopleth Map of Dissolved Oxygen
Como Basin Area
New World Mining District
Response and Restoration Project
FIGURE 9









Trends in pH and SC
2003 Como Basin Area Groundwater Monitoring
FIGURE 10

ATTACHMENT B

TABLES
Como Basin Area 2003 Biweekly Groundwater Monitoring
New World Mining District Response and Restoration Project

TABLE 1
COMO BASIN MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTE
EPA- 11	7/10/2002	152.9	NM	NM		96.75	5.4	5.18	1,864	144	NM	4
	7/15/2003					94.15	5.0	5.21	1,910	97	1.26	4
	7/30/2003					90.23	NM	NM	NM	NM	NM	7
	8/13/2003					92.22	4.0	5.57	1,616	77.1	1.52	3
	8/26/2003					96.31	4.0	5.41	1,825	92.2	1.89	3
	9/8/2003					101.04	2.9	5.37	1,807	126.5	2.40	3
	9/30/2003					110.83	3.7	5.64	1,624	119.6	1.51	3
					2003 Minimum	90.23	2.9	5.21	1,616	77.1	1.26	
					2003 Maximum	110.83	5.0	5.64	1,910	126.5	2.40	
					2003 Mean	97.46	3.9	5.44	1,756	102.5	1.72	
EPA- 12	7/11/2002	153	NM	NM		21.02	6.0	5.95	357	0.0	NM	4
	7/15/2003					21.47	6.5	6.60	392	-61	1.44	1
	7/30/2003					21.33	3.0	5.60	327	139.0	1.50	5
	8/13/2003					22.90	3.6	5.88	301	45.5	0.86	5
	8/26/2003					25.03	2.9	5.68	671	97.7	0.95	5 *
	9/8/2003					27.42	2.8	5.69	326	83.9	0.41	5 *
	9/30/2003					34.14	2.7	5.91	344	137.0	0.70	5 *
					2003 Minimum	21.33	2.7	5.60	301	45.5	0.41	
					2003 Maximum	34.14	6.5	6.60	671	139.0	1.50	
					2003 Mean	25.38	3.6	5.89	394	100.6	0.98	
MW- 1	7/11/2002	105	NM	NM		55.80	4.7	3.22	856	383.0	NM	4
	7/15/2003					54.81	5.0	3.53	861	363.0	0.38	4
	7/30/2003					53.81	2.8	3.28	762	382.0	1.13	5
	8/13/2003					56.05	3.2	3.46	638	359.6	1.13	5
	8/26/2003					59.26	3.6	3.27	583	371.6	2.42	3
	9/8/2003					62.06	2.5	3.33	547	390.5	0.58	5
	9/30/2003					71.23	3.6	3.30	664	416.4	2.47	3
					2003 Minimum	53.81	2.5	3.27	547	359.6	0.38	
					2003 Maximum	71.23	5.0	3.53	861	416.4	2.47	
					2003 Mean	59.54	3.4	3.36	676	380.5	1.35	
MW- 8	7/11/2002	38.5	NM	NM		12.76	4.6	6.95	542	17.0	NM	4
	7/15/2003					12.79	3.9	7.66	579	114.0	5.32	1
	8/1/2003					12.86	1.9	7.27	575	108.2	5.65	5
	8/12/2003					12.99	2.0	6.83	494	259.0	5.76	5 *
	8/28/2003					13.14	2.5	6.78	739	258.9	5.04	5 *
	9/8/2003					13.22	2.7	6.89	492	460.2	5.50	5
	9/30/2003					13.43	3.1	6.69	543	205.5	6.07	5
					2003 Minimum	12.79	1.9	6.69	492	108.2	5.04	
					2003 Maximum	13.43	3.9	7.66	739	460.2	6.07	
					2003 Mean	13.07	2.7	7.02	570	234.3	5.56	
TRACER 4	7/10/2002	200	NM	NM		90.17	2.6	3.24	1,059	414.0	NM	4
	7/15/2003					104.27	2.8	4.42	768	157.0	3.82	4
	8/1/2003					95.78	2.3	3.82	703	340.2	1.64	3 **
	8/12/2003					100.12	2.2	3.39	636	364.6	1.64	3
	8/28/2003					112.41	1.8	3.18	787	370.7	2.75	3
	9/9/2003					120.72	1.3	3.24	736	340.6	1.27	3
	9/30/2003					137.49	2.7	3.51	761	363.6	2.78	3
					2003 Minimum	95.78	1.3	3.18	636	157.0	1.27	
					2003 Maximum	137.49	2.8	4.42	787	370.7	3.82	
					2003 Mean	111.80	2.2	3.59	732	322.8	2.32	

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COMO BASIN MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTE
TRACER 6	7/10/2002	175	NM	NM		15.55	4.6	6.11	127	46.0	NM	4
	7/15/2003					17.33	5.0	6.34	1,456	90.0	0.92	4
	7/30/2003					20.10	2.5	4.3	213	411.0	9.01	5
	8/12/2003					21.63	2.6	3.95	184	531.5	7.41	5
	8/26/2003					22.80	2.2	4.23	273	315.9	7.76	5
	9/8/2003					24.47	2.1	4.09	205	559.0	6.69	5 *
	9/30/2003					28.22	2.3	4.38	220	416.8	7.58	5
					2003 Minimum	17.33	2.1	3.95	184	90.0	0.92	
					2003 Maximum	28.22	5.0	6.34	1,456	559.0	9.01	
					2003 Mean	22.43	2.8	4.54	425	387.4	6.56	
FCGW- 111	8/22/2002	15.41	1.4	11.5		Dry						
	7/17/2003					Dry						
	7/30/2003					15.04	2.55	3.9	1,262	506.0	6.35	5,8
	8/12/2003	No further monitoring until 2004				15.11	Dry					8
FCGW- 112	8/22/2002	15.43	2.3	11.0		Dry						
	7/17/2003					10.05	2.00	2.44	3,250	503	0.37	1
	7/30/2003					13.60	4.58	2.49	2,597	570.6	6.50	4
	8/12/2003	No further monitoring until 2004				15.03	Dry					8
FCGW- 113	8/22/2002	10.40	1.1	8.3		Dry						
	7/17/2003					9.18	3.4	2.65	1,640	508	3.06	1
	7/30/2003					9.41	6.1	2.45	2,196	580.6	6.52	5
	8/12/2003					9.90	5.0	2.43	2,034	589.2	5.17	5
	8/28/2003	No further monitoring until 2004				Dry						
					2003 Minimum	9.18	3.4	2.43	1,640	508.0	3.06	
					2003 Maximum	9.9	6.1	2.65	2,196	589.2	6.52	
					2003 Mean	9.50	4.8	2.51	1,957	559.3	4.92	
FCGW- 114	8/23/2002	11.92	1.7	5.3		9.58	4.0	2.49	659			4
	9/16/2002					Dry						
	10/8/2002					Dry						
	7/17/2003					2.59	1.1	2.88	861	457	2.91	1
	7/30/2003					6.12	2.4	3.01	637	503.1	4.05	4
	8/12/2003					8.92	2.1	2.91	630	468.5	2.31	6
	8/28/2003					10.51	2.4	2.28	1,610	478.4	3.08	5
	9/9/2003					11.13	2.5	2.06	1,987	462.2	1.70	5
	9/30/2003	No further monitoring until 2004				11.52						8
					2003 Minimum	2.59	1.1	2.06	630	457.0	1.70	
					2003 Maximum	11.52	4.0	3.01	1,987	503.1	4.05	
					2003 Mean	8.62	2.4	2.61	1,064	473.8	2.81	
FCGW- 115	8/22/2002	10.43	1.3	5.0		Dry						
	7/17/2003					7.10	3.5	6.29	481	279.0	0.95	1
	7/30/2003					9.57	6.7	6.01	360	405.0	2.25	5,8
	8/12/2003					9.95	7.8	6.28	323	317.5	3.54	5
	8/28/2003	No further monitoring until 2004				Dry						
					2003 Minimum	7.10	3.5	6.01	323	279.0	0.95	
					2003 Maximum	9.95	7.8	6.29	481	405.0	3.54	
					2003 Mean	8.87	6.0	6.19	388	333.8	2.25	

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NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTE
FCGW- 116	8/23/2002	13.13	2.0	9.9		10.91	3.5	6.15	151			4
	9/16/2002					9.40	3.2	6.85	184			4
	10/8/2002					Dry						
	7/17/2003					2.66	0.4	5.58	181	340.0	9.38	1
	7/30/2003					6.56	1.5	6.61	187	309.2	11.20	4
	8/12/2003					10.13	1.0	5.78	165	100.0	9.17	6 *
	8/28/2003					12.14	1.6	5.94	199	187.2	9.71	5
	9/9/2003	No further monitoring until 2004				Dry						
					2003 Minimum	2.66	0.4	5.58	151	100.0	9.17	
					2003 Maximum	12.14	3.5	6.85	199	340.0	11.20	
					2003 Mean	8.63	1.9	6.15	178	234.1	9.87	
FCGW- 117	8/22/2002	10.37	1.8	4.5		Dry						
	7/17/2003					9.30	1.2	4.76	152	354.0	2.41	3
	7/30/2003					Dry						
	8/12/2003	No further monitoring until 2004				Dry						
FCGW- 118	8/22/2002	13.00	1.8	8.3		Dry						
	7/17/2003					10.14	1.0	3.85	277	403.0	6.09	1
	7/29/2003					12.10	1.7	6.16	348	56.2	10.26	5,8
	8/12/2003	No further monitoring until 2004				Dry						
FCGW- 119	8/23/2002	16.90	2.1	7.5		14.54	5.0	5.7	174			4
	9/16/2002					13.80	2.0	7.05	228			4
	10/8/2002					15.27	1.0	7.52	268			4
	7/17/2003					Buried in snow						
	7/29/2003					No water - bailer stuck in well						
	8/12/2003					Same condition as above						
	8/28/2003	No further monitoring until 2004				Same condition as above						
FCGW- 120	8/22/2002	9.70	2.6	5.1		Dry						
	7/17/2003					Buried in snow						
	7/30/2003					5.82	3.2	5.30	744	179.1	4.50	4
	8/12/2003					8.25	4.2	5.17	1,013	201.7	1.69	6
	8/28/2003					8.65	3.8	5.05	1,288	221.5	0.88	5
	9/9/2003					8.87	4.2	5.10	1,302	211.7	0.74	5
	9/30/2003	No further monitoring until 2004				9.25						8
					2003 Minimum	5.82	3.2	5.05	744	179.1	0.74	
					2003 Maximum	9.25	4.2	5.30	1,302	221.5	4.50	
					2003 Mean	8.17	3.8	5.16	1,087	203.5	1.95	
FCGW- 121	8/22/2002	8.95	2.1	4.7		Dry						
	7/17/2003					Dry						
	7/30/2003					8.64	2.5	6.47	250	117.4	NM	5,8
	8/12/2003	No further monitoring until 2004				Dry						
FCGW- 122	8/23/2002	9.70	1.9	4.5		6.21	4.0	6.1	180			4
	9/16/2002					6.70	3.5	6.84	208			4
	10/8/2002					9.07	2.0	7.32	234			4
	7/17/2003					3.21	1.5	5.56	259	437.0	5.49	4
	7/30/2003					4.41	3.7	6.25	213	202.6	6.30	4
	8/12/2003					6.67	3.4	5.91	179	198.0	5.66	6 **
	8/28/2003					7.40	3.6	6.02	235	290.8	7.18	6
	9/9/2003					7.95	3.9	6.02	221	215.1	5.04	5 **
	9/30/2003	No further monitoring until 2004				9.49						8
					2003 Minimum	3.21	1.5	5.56	179	198.0	5.04	
					2003 Maximum	9.49	4.0	7.32	259	437.0	7.18	
					2003 Mean	6.79	3.2	6.25	216	268.7	5.93	

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WELL	DATE	TOTAL DEPTH (feet)	CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTE
FCGW- 123	8/22/2002	7.57	3.2	3.7		Dry						
	7/17/2003					Buried in snow						
	7/30/2003					Dry						
	8/12/2003	No further monitoring until 2004				Dry						
FCGW- 124	8/22/2002	12.20	2.3	9.2		Dry						
	7/17/2003					Dry						
	7/30/2003					Dry						
	8/12/2003	No further monitoring until 2004				11.76	Dry					8
FCGW- 125	8/22/2002	12.77	2.6	10.4		Dry						
	7/17/2003					Dry						
	7/30/2003					12.30	3.2	3.18	1542	516.6	6.75	5,8
	8/12/2003	No further monitoring until 2004				12.48	Dry					8
FCGW- 126	8/23/2002	17.42	3.1	14.0		14.58	3.5	2.36	1,242			4
	9/16/2002					14.20	3.2	2.85	1,486			4
	10/8/2002					16.67	4.0	2.93	1,405			4
	7/17/2003					14.03	1.2	2.73	1,240	474.0	1.88	1
	7/30/2003					13.62	2.0	2.39	2,020	514.0	3.36	4
	8/12/2003					14.28	1.5	2.44	1,833	509.8	1.46	6
	8/28/2003					15.22	2.4	2.23	2,090	513.8	1.00	6
	9/9/2003					16.33	2.7	2.11	2,249	474.1	1.07	5
	9/30/2003	No further monitoring until 2004				16.97						8
					2003 Minimum	13.62	1.2	2.11	1,240	474.0	1.00	
					2003 Maximum	16.97	4.0	2.93	2,249	514.0	3.36	
					2003 Mean	15.10	2.6	2.51	1,696	497.1	1.75	
FCGW- 127	8/22/2002	10.40	2.5	7.5		Dry						
	7/17/2003					Dry						
	7/30/2003					Dry						
	8/12/2003	No further monitoring until 2004				10.01	Dry					
FCGW- 128	8/22/2002	6.55	1.8	4.5		Dry						
	7/17/2003					2.58	4.8	2.31	2,370	468.0	0.27	1
	7/30/2003					3.86	8.3	2.62	2,505	461.0	1.97	4
	8/12/2003					5.65	7.9	2.65	2,169	467.6	1.36	5
	8/28/2003	No further monitoring until 2004				Dry						
					2003 Minimum	2.58	4.8	2.31	2,169	461.0	0.27	
					2003 Maximum	5.65	8.3	2.65	2,505	468.0	1.97	
					2003 Mean	4.03	7.0	2.53	2,348	465.5	1.20	
FCGW- 129	8/23/2002	8.00	2.3	5.2		5.61	4.0	5.55	441			4
	9/16/2002					5.36	5.5	5.65	482			4
	10/8/2002					Dry						
	7/17/2003					3.72	2.5	4.87	495	435.0	2.22	1
	7/30/2003					3.53	7.0	5.92	266	291.8	4.93	4
	8/12/2003					4.90	6.1	5.47	269	221.4	2.19	6 **
	8/28/2003	No further monitoring until 2004				Dry						
					2003 Minimum	3.53	2.5	4.87	266	221.4	2.19	
					2003 Maximum	5.61	7.0	5.92	495	435.0	4.93	
					2003 Mean	4.62	5.0	5.49	391	316.1	3.11	

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WELL	DATE	TOTAL DEPTH (feet)	CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTE
FCGW- 130	8/22/2002	11.50	NM	4.3		Dry						
	7/17/2003					Dry						
	7/30/2003					10.94	4.0	6.15	244	51.8	9.64	5,8
	8/12/2003	No further monitoring until 2004				Dry						

Notes:

NI Not intersected in the drilling
NM Not measured
ND Not determined
SC Specific Conductivity measured in micro siemens/cm
ORP Oxidation Reduction Potential or Eh measured in millivolts
DO Dissolved Oxygen measured in milligrams/Liter

Total Depth (TD) and depth to groundwater measured from top of PVC casing
Casing stick-up and depth to bedrock measured from ground surface
Water Bearing Interval identified during drilling and measured from ground surface

_____ Dashed line separates 2002 and 2003 data
* ORP measurement continuing to slowly decrease
** ORP measurement continuing to slowly increase

1 Temperature and DO measurement conducted as pre-purge, downhole measurement, other parameters measured after purging well
2 DO measurement conducted as an in-situ, downhole measurement, remainder of parameters measured after purging well
3 Sample collected for measurement of field parameters. No purging of well conducted
4 Sample collected for measurement of field parameters after purging of well conducted
5 All field parameters measured with multiprobe in in-situ, downhole measurement. No purging of well conducted
6 All field parameters measured with multiprobe in in-situ, downhole measurement after purging of well conducted
7 Depth to groundwater exceeded multiprobe chord length and no sample was collected
8 Insufficient water for multiprobe in well

August 11-13 Monitoring Multiprobe lowered within 5 feet of well bottom or to total cable length (50 feet) when downhole measurement made
August 26-28 Same method as above

TABLE 2
GROUNDWATER ANALYTICAL DATA SUMMARY
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT
Como Basin Area

Station Name	Sample Date	Depth to Water (feet)	Anions (mg/L)						Cations (mg/L)								Total Dissolved Metals (mg/L)						
			Acid-idity as CaCO3	Alkalinity as			Chlor-ide	Sulfate	Calcium	Hard-ness as CaCO3	Magne-sium	Potass-ium	Sod-ium	SC (umhos/cm)	pH (s.u.)	Total Dis-solved Solids (mg/L)	Alum-inum	Cad-mium	Copper	Iron	Lead	Manga-nese	Zinc
				HCO3	CO3	Total CaCO3											Groundwater Standard**						
																	NA	0.005	1.3	0.3	0.015	0.05	2.0
Como Basin Area																							
EPA-11	7/15/2003	94.15	493	<1	0	<1	3	1040	204	825	77	4	3	2090	3.6	JF%1910	4.34	0.0057	0.3	261	0.14	14.6	1.08
EPA-11R	7/15/2003	--	23	<1	0	<1	<2	5	<1	<7	<1	<1	<1	<10	5.6	JF%32	0.07	<0.0001	0.002	0.03	<0.001	<0.003	<0.01
EPA-12	7/15/2003	21.97	44	17	0	14	<2	134	29	114	10	2	3	368	6.1	JF%258	<0.05	<0.0001	<0.001	30.5	<0.001	1.62	0.03
MW-1	7/15/2003	54.81	9	<1	0	<1	<2	302	63	239	20	2	3	871	3.2	JF%514	1.36	0.0005	0.15	38.7	0.011	3.08	0.09
MW-8	7/15/2003	12.79	<2	224	0	183	<2	135	54	321	45	1	4	522	7.5	JF%338	<0.05	<0.0001	0.001	0.02	<0.001	<0.003	<0.01
Tracer 4	7/15/2003	104.27	204	<1	0	<1	<2	291	44	163	13	3	1	964	3.4	JF%580	1.79	0.0006	0.31	99.3	0.019	9.06	1.7
Tracer 6	7/15/2003	17.33	9	36	0	29	<2	784	274	864	44	2	5	1260	5.9	JF%1130	0.16	0.0006	0.12	26.7	<0.001	4.36	0.14

Notes:

** - MDEQ Circular WQB-7 Human Health Standard
s.u. - Standard units
mg/L - Milligrams per liter
R - Rinsate blank
X - Field duplicate
S - Shallow well
D - Deep well
umhos/cm - micromhos per centimeter

-- - Indicates parameter not analyzed
< - Indicates analyte not detected above practical quantitation limit (PQL)
JF% - The associated values are estimated quantities because field duplicate results exceed acceptable limits by relative percent difference determination
NA - Not available
Shading indicates exceedance of standard