

Pacific Gas and Electric Company

Yvonne J. Meeks Topock Project Manager Chromium Remediation Project Office Gas Transmission & Distribution 6588 Ontario Road San Luis Obispo, CA 93405

Mailing Address 4325 South Higuera Street San Luis Obispo, CA 93401

805.546.5243 Internal: 664.5243 Fax:: 805.546.5232 E-Mail: YJM1@pge.com

December 15, 2006

Mr. Aaron Yue Project Manager California Department of Toxic Substances Control 5796 Corporate Avenue Cypress, CA 90630

Subject: November 2006 Performance Monitoring Report Interim Measures Performance Monitoring Program PG&E Topock Compressor Station, Needles, California

Dear Mr. Yue:

Enclosed is the *Performance Monitoring Report for November 2006* for the Interim Measure Performance Monitoring Program at the PG&E Topock Compressor Station. This monitoring report documents the performance monitoring results for November 1 through 30, 2006, and has been prepared in conformance with DTSC's letter dated February 14, 2005.

Please contact me at (805) 546-5243 if you have any questions on the performance monitoring program.

Sincerely,

Paul Batter for Yvonno Meeks

Enclosure Cc: Chris Guerre/DTSC

# Performance Monitoring Report for November 2006

# Interim Measures Performance Monitoring Program PG&E Topock Compressor Station Needles, California

Prepared for

**California Department of Toxic Substances Control** 

on behalf of

Pacific Gas and Electric Company

December 15, 2006

CH2MHILL 155 Grand Avenue, Suite 1000 Oakland, California 94612

### Performance Monitoring Report for November 2006

### **Interim Measures Performance Monitoring Program**

### PG&E Topock Compressor Station Needles, California

#### Prepared for

**California Department of Toxic Substances Control** 

on behalf of

Pacific Gas and Electric Company

December 15, 2006

This report was prepared under the supervision of a California Certified Engineering Geologist

am

Paul Bertucci, C.E.G. No. 1977 Project Hydrogeologist



ii

### Contents

Acro	nyms and Abbreviations	iv
1.0	Introduction	
2.0	Extraction System Operations	2-1
3.0	Chromium Sampling Results	3-1
4.0	Hydraulic Gradient Results	4-1
5.0	Status of Operation and Monitoring	5-1
6.0	References	6-1

#### Tables

2-1	Pumping [	Rate and	Extracted	Volume for	r IM System	through N	Jovember 2006
	1 ()					()	

- 2-2 Analytical Results for Extraction Wells, March through November 2006
- 4-1 Predicted and Actual Monthly Average Davis Dam Discharge and Colorado River Elevation at I-3
- 4-2 Average Hydraulic Gradients Measured at Well Pairs, November 2006

#### Figures

- 1-1 Locations of IM No. 3 Groundwater Extraction, Conveyance, and Treatment Facilities
- 1-2 Locations of Wells and Cross Sections Used for IM Performance Monitoring
- 3-1 Maximum Cr(VI) Concentrations in Alluvial Aquifer, November 2006
- 3-2 Cr(VI) Concentrations, Floodplain Cross-section B, November 2006
- 4-1 Average Groundwater Elevations, Shallow Wells and River, November 2006
- 4-2 Average Groundwater Elevations, Mid-depth Wells, November 2006
- 4-3 Average Groundwater Elevations, Deep Wells, November 2006
- 4-4 Average Groundwater Elevations for Wells on Floodplain Cross-section A, November 2006

#### Appendices

- A Extraction System Operations Log for November 2006
- B Chromium Sampling Results for Monitoring Wells in Floodplain Area
- C Hydraulic Monitoring Data for Reporting Period

# **Acronyms and Abbreviations**

µg/L	micrograms per liter (essentially the same as parts per billion [ppb])
cfs	cubic feet per second
Cr(T)	total chromium
Cr(VI)	hexavalent chromium
DTSC	California Department of Toxic Substances Control
gpm	gallons per minute
IM	Interim Measure
PG&E	Pacific Gas and Electric Company
PMP	Performance Monitoring Program
TDS	total dissolved solids
USBR	United States Bureau of Reclamation

### 1.0 Introduction

Pacific Gas and Electric Company (PG&E) is implementing an Interim Measure (IM) to address chromium concentrations in groundwater at the Topock Compressor Station near Needles, California. The IM consists of groundwater extraction for hydraulic control of the plume boundaries in the Colorado River floodplain and management of extracted groundwater. Collectively, the groundwater extraction, treatment, and injection systems are referred to as Interim Measure Number 3 (IM No. 3). Currently, the IM No. 3 facilities include a groundwater extraction system (four extraction wells: TW-2D, TW-3D, TW-2S, and PE-1), conveyance piping, a groundwater treatment plant, and an injection well field for the discharge of the treated groundwater. Figure 1-1 shows the location of the IM No. 3 extraction, conveyance, treatment, and injection facilities.

In a letter dated February 14, 2005, the California Department of Toxic Substances Control (DTSC) established the criteria for evaluating the performance of the IM. As defined by DTSC, the performance standard for this IM is to "establish and maintain a net landward hydraulic gradient, both horizontally and vertically, that ensures that hexavalent chromium [Cr(VI)] concentrations at or greater than 20 micrograms per liter [ $\mu$ g/L] in the floodplain are contained for removal and treatment" (DTSC 2005). The DTSC directive also defined the monitoring and reporting requirements for the IM. A draft *Performance Monitoring Plan for Interim Measures in the Floodplain Area* (CH2M HILL 2005) was submitted to DTSC on April 15, 2005 (herein referred to as the Performance Monitoring Plan). The site monitoring, data evaluation, reporting, and response actions required under the February 2005 DTSC directive are collectively referred to as the IM Performance Monitoring Program for the floodplain area.

This monthly report has been prepared in compliance with DTSC's requirements and documents the monitoring activities and performance evaluation of the IM hydraulic containment system for the period from November 1 through November 30, 2006. The results and status of IM performance monitoring during December 2006 will be reported in the January 2007 performance monitoring report.

Figure 2-1 shows the locations of wells used for IM extraction, performance monitoring, and hydraulic gradient measurements. The performance monitoring wells that were in service/active as of November 2006 are defined as:

- Floodplain Wells (monitoring wells on the Colorado River floodplain): MW-22, MW-27 cluster (three), MW-28 cluster (two), MW-29, MW-30 cluster (two), MW-32 cluster (two), MW-33 cluster (four), MW-34 cluster (three), MW-36 cluster (six), MW-49 cluster (six), MW-44 cluster (three), MW-45, MW-46 cluster (two), MW-49 cluster (three).
- Intermediate Wells (monitoring wells located immediately north, west, and southwest of the floodplain): MW-12, MW-19, MW-20 cluster (three), MW-21, MW-26, MW-31 cluster (two), MW-35 cluster (two), MW-47 cluster (two), MW-50 cluster (two), and MW-51.

• Interior Wells (monitoring wells located upgradient of IM pumping): MW-10 and MW-25.

Three extraction wells (TW-2D, TW-3D and TW-2S) are located on the MW-20 bench (Figure 1-1). In March 2005, extraction well PE-1 was installed on the floodplain approximately 450 feet east of extraction well TW-2D (Figure 1-1). Construction of the conveyance piping and power supply to well PE-1 was completed in January. Testing and commissioning of well PE-1 began on January 25, 2006, with full-time operation of the well beginning on January 26, 2006. Currently, both TW-3D and PE-1 are in full-time operation.

The wells screened in the unconsolidated alluvial fan and fluvial deposits that comprise the Alluvial Aquifer have been separated into three depth intervals to present groundwater quality and groundwater level data. The depth intervals of the Alluvial Aquifer – designated upper, middle, and lower – are based on grouping the monitoring wells screened at common elevations and do not represent distinct hydrostratigraphic units or separate aquifer zones. The subdivision of the aquifer into three depth intervals is an appropriate construct for presenting and evaluating groundwater quality data in the floodplain. The three-interval concept is also useful for presenting and evaluating lateral gradients, while minimizing effects of vertical gradients and observing the influence of pumping from partially-penetrating wells. It should be noted, however, that these divisions do not correspond to any distinct lithostratigraphic layers within the aquifer. The floodplain aquifer is considered to be hydraulically undivided.

### 2.0 Extraction System Operations

Pumping data for the IM groundwater extraction system for the period November 1 through November 30, 2006 are shown in Table 2-1. During the reporting period, extraction wells TW-3D and PE-1 operated at a combined target pump rate of 135 gallons per minute (gpm), excluding periods of planned and unplanned downtime.

The November 2006 monthly average pumping rate was 133.0 gpm. A total of 5,747,281 gallons of groundwater was extracted and treated by the IM No. 3 treatment plant during November 2006. Approximately 1,040 gallons of purge water from the groundwater monitoring program and 6,000 gallons of re-development water from injection well IW-02 were also treated at the IM No. 3 facility during November 2006. The operational run time for the IM extraction system was over 99 percent during this reporting period. An operations log for the extraction system during November 2006, including downtime, is included in Appendix A.

The concentrate (i.e., brine) from the reverse osmosis system was shipped offsite with shipping papers as a Resource Conservation and Recovery Act non-hazardous waste and transported to US Filter Corporation in Los Angeles, California for treatment and disposal. Two containers of solids (approximately 22 cubic yards total) from the IM No. 3 facility were transported to the Chemical Waste Management at the Kettleman Hills facility during November 2006.

Daily inspections included general facility inspections, flow measurements, and site security monitoring. Daily logs with documentation of inspections are maintained onsite.

Table 2-2 summarizes the analytical results of groundwater samples collected from the extraction well system during the November reporting period and prior months. Future monitoring of the extraction well water quality will be completed at the frequency required by the Waste Discharge Requirements issued for the IM No. 3 treatment facility.

## 3.0 Chromium Sampling Results

During November 2006, the groundwater monitoring wells in the floodplain area were sampled for Cr(VI), total chromium [Cr(T)], and field water quality parameters under newly updated monthly and biweekly schedules, in accordance with the approved groundwater monitoring plan and DTSC directives. Refer to PG&E's Topock *Groundwater and Surface Water Monitoring Report, Second Quarter 2006* (CH2M HILL 2006) and DTSC (2006) for the prior and current sampling plan and frequencies for groundwater wells in the performance monitoring area.

Table B-1 in Appendix B presents the groundwater sampling results for Cr(VI) and Cr(T), as well as groundwater elevation and selected field water quality parameters for monitoring wells in the floodplain area during November 2006 and the previous months. Table B-2 (Appendix B) presents the groundwater sampling data for the other wells monitored in the Performance Monitoring Program area during the 2006 period.

Figure 3-1 presents the Cr(VI) results distribution for November 2006, in plan view, for the groundwater wells monitoring the upper, middle, and lower depth intervals of the Alluvial Aquifer in the floodplain area. Interpretations of Cr(VI) contours at each depth interval are also provided on this figure. The actual locations of contours beyond well data points are not certain but are inferred using available site investigation and monitoring data (bedrock structure, hydraulic gradients, observed distribution of geochemically-reducing conditions, and Cr(VI) concentration gradients). The aquifer depth intervals, well screens, and November 2006 Cr(VI) sampling results and interpreted contours are also shown on Figure 3-1 in a vertical cross-section extending east-west across the floodplain. The California drinking water standard for Cr(T) is  $50 \mu g/L$ .

Figure 3-2 presents the November 2006 Cr(VI) results for additional floodplain monitoring wells on a cross-section oriented parallel to the Colorado River (see Figure 1-2 for locations of the cross-sections). For ongoing IM performance evaluation, Cr(VI) concentration trend graphs and hydrographs for key floodplain monitoring wells are presented on Figures B-1 (well MW-33-90), B-2 (well MW-34-100), and B-3 (well MW-36-100) in Appendix B.

### 4.0 Hydraulic Gradient Results

During the reporting period, water levels were recorded at intervals of 30 minutes with pressure transducers in 65 wells and two river monitoring stations (I-3 and RRB). The data are typically continuous, with only short interruptions for sampling or maintenance. The location of the wells monitored are shown on Figure 1-2 and listed in Section 1.0.

The monthly average and the minimum and maximum daily average groundwater and river elevations have been calculated from the pressure transducer data for the November reporting period (November 1 through November 29, 2006) and are summarized in Appendix C, Table C-1. Due to the timing of transducer downloading, the data for this reporting period is one day less than the full month.

Due to the variation in groundwater salinity at the site, the water level measurements need to be adjusted (density-corrected) to equivalent freshwater hydraulic heads prior to calculating groundwater elevations and gradients (Fetter 1994). The methods and procedures used for adjusting the performance monitoring water level data for salinity and temperature differences are described in the Performance Monitoring Plan. Groundwater elevation hydrographs (for November 2006) for all wells with transducers are included in Appendix C. The elevation of the Colorado River measured at the river gauge (I-3, Figure 1-2) during November 2006 is also shown on the hydrographs.

The November 2006 hydraulic data and groundwater gradient maps for the upper, middle, and lower depth intervals are shown on Figures 4-1, 4-2, and 4-3, respectively. The groundwater elevations for all depth intervals of the Alluvial Aquifer indicate strong landward hydraulic gradients within the IM No. 3 capture zone throughout the floodplain. To the west of the TW-3D and PE-1 pumping area, the hydraulic gradient in the upper depth interval is easterly and consistent with the regional gradient outside of the floodplain area. The average groundwater elevations measured in the new IM monitoring wells during November 2006 are presented on the middle and lower depth interval gradient maps (Figures 4-2 and 4-3, respectively). Many of the new monitoring wells are significantly deeper than other wells in the lower aquifer zone. Due to vertical gradients present at the Topock site, water levels in deeper wells tend to be higher than water levels in shallower wells. Consequently, some of the new wells with screen intervals significantly deeper than existing wells exhibit water levels that are not contoured with nearby shallower lower zone wells in the plan view on Figure 4-3.

The landward gradients measured during November 2006 were slightly less than October 2006, due to dropping river levels over the reporting period. The November 2006 average monthly groundwater elevations are also presented and contoured in cross-section on Figure 4-4 (cross-section location shown on Figure 1-2). The groundwater elevation contours on this cross-section show the strong downward and landward hydraulic gradients produced by the combined pumping from IM extraction wells TW-3D and PE-1.

Table 4-1 summarizes the estimated and actual dam discharges and river elevations since April 2004. The actual Davis Dam average discharge for November 2006 of 8,222 cubic feet

per second (cfs) slightly less than the United States Bureau of Reclamation (USBR) projected discharge of 8,300 cfs for the current reporting period. The actual Colorado River elevation at I-3 (monthly average) was the same level predicted by using the multiple regression method with USBR projections for the November reporting period.

Table 4-2 summarizes gradients measured between the three designated well pairs (MW-31-135/MW-33-150, MW-20-130/MW-34-80, and MW-20-130/MW-42-65) during November 2006. Pumping from extraction well PE-1 began on January 26, 2006. Since that time, the central well pair has been affected by PE-1 pumping. Pumping at well PE-1 would tend to lower the water level in well MW-34-80 and decrease the apparent gradient in the central well pair. Nevertheless, average gradients in the three well pairs were landward at magnitudes that were up to three times the target value of 0.001 feet per foot (0.0019, 0.0024, and 0.0030, respectively). These gradients were slightly less than the average gradients for these well pairs measured in October 2006, since river levels dropped over a foot during the reporting period. Data for the northern well pair were limited to the first eight days of the month in November because of two battery failures in the transducer; it is believed that the manufacturer produced a bad batch of batteries, which were installed twice. Batteries from a new package were installed on November 30, 2006.

### 5.0 Status of Operation and Monitoring

Reporting of the IM extraction and monitoring activities will continue as described in the Performance Monitoring Plan. The next monthly monitoring report for the December reporting period will be submitted by January 15, 2007.

Per DTSC direction, PG&E will continue to operate both TW-3D and PE-1 at a target combined pumping rate of 135 gpm during December 2006, except for periods when planned and unplanned downtime occurs. Treated groundwater will be discharged into the IM No. 3 injection wells in accordance with Waste Discharge Requirements Order No. R7-2006-0060. Brine generated as a byproduct of the treatment process will continue to be transported offsite.

PG&E will balance the pumping rates between wells TW-3D and PE-1 to maintain the target pumping rate and maintain appropriate hydraulic gradients across the Alluvial Aquifer. If, at any time, hydraulic data indicate that well PE-1 pumping has the potential to draw higher concentrations of chromium away from the capture zone of well TW-3D, PG&E will request authorization from DTSC to increase the pumping rate at TW-3D and decrease the rate at well PE-1. Extraction well TW-2D will continue serve as a backup extraction well to TW-3D and PE-1.

Current USBR projections show that the average Davis Dam release for December 2006 (8,100 cfs) will be similar to November 2006 (8,222 cfs). Based on December 7, 2006 USBR projections, it is anticipated that the Colorado River level at the I-3 gage location during December 2006 will decrease approximately 0.3 foot compared to the average river level in November 2006.

With the initiation of pumping from PE-1 (late January 2006) and expansion of the IM monitoring well network, new gradient control well pairs will be defined by DTSC to account for the more complex gradient caused by pumping at both TW-3D and PE-1. Modifications and updates to the IM performance monitoring program will be incorporated pending DTSC approval and direction.

California Department of Toxic Substances Control (DTSC). 2005. Letter. "Criteria for Evaluating Interim Measures Performance Requirements to Hydraulically Contain Chromium Plume in Floodplain Area, Pacific Gas & Electric Company, Topock Compressor Station." February 14.

\_\_\_\_\_. 2006. Letter to PG&E. "Modification of Groundwater and Shoreline Surface Water Sampling Frequencies at Pacific Gas & Electric Company, Topock Compressor Station, Needles, California" October 26.

CH2M HILL. 2005. Draft Performance Monitoring Plan for Interim Measures in the Floodplain Are, PG&E Topock Compressor Station. April 15.

\_\_\_\_\_. 2006. Groundwater and Surface Water Monitoring Report, Second Quarter 2006, PG&E Topock Compressor Station. September 11.

Fetter, C.W. 1994. Applied Hydrogeology. Third Edition. Prentice-Hall.

### Tables

# **TABLE 2-1**Pumping Rate and Extracted Volume for IM System through November 2006Interim Measures Performance MonitoringPG&E Topock Compressor Station

	November 20	Project To Date <sup>b</sup>	
Extraction Well	Average Pumping Rate <sup>c</sup> (gpm)	Volume Pumped (gal)	Cumulative Volume Pumped (gal)
TW-2S	0	0	994,438
TW-2D	0	0	53,015,001
TW-3D	98.4	4,253,217	47,680,812
PE-1	34.6	1,494,064	15,385,302
Total	133.0	5,747,281	117,075,553
	Volume Pumped from the	ne MW-20 Well Cluster	1,527,724
	Total	118,603,277	
	Total	/olume Pumped (ac-ft)	364.0

gpm: gallons per minute.

gal: gallons.

ac-ft: acre-feet.

<sup>a</sup> Pumping results during the monthly period are based on readings collected between November 1, 2006 at 12:00 a.m. and November 30, 2006 at 11:59 p.m. (30 days). <sup>b</sup> Interim Measure groundwater extraction at the Topock site was initiated in March 2004.

<sup>c</sup> The "Average Pumping Rate" is the overall average during the reporting period, including system downtime based on flow meter readings.

#### TABLE 2-2

Analytical Results for Extraction Wells, June through November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

Well ID	Sample Date	Dissolved Total Chromium mg/L	Hexavalent Chromium mg/L	Total Dissolved Solids mg/L
TW-3D	15-Jun-06	2.45	2.61	5510
TW-3D	12-Jul-06	2.44	2.59	5510
TW-3D	09-Aug-06	3.06	2.66	5860
TW-3D	07-Sep-06	2.44	2.38	5700
TW-3D	04-Oct-06	2.46	2.47	5350 J
TW-3D	01-Nov-06	3.18	2.49	4920
PE-1	15-Jun-06	0.0873	0.101	6050
PE-1	12-Jul-06	0.0724	0.0959	6160
PE-1	09-Aug-06	0.0834	0.0959	5270
PE-1	07-Sep-06	0.0905	0.0854	5920
PE-1	04-Oct-06	0.0839	0.0901	5950 J
PE-1	01-Nov-06	0.0833	0.0925	5010

#### NOTES:

mg/L = concentration in milligrams per liter (mg/L)

Analytical results from inactive extraction wells are presented in Table B-2.

Groundwater samples from active extraction wells are taken at sample taps in Valve Vault 1 on the MW-20 Bench.

J = concentration or RL estimated by laboratory or data validation

#### TABLE 4-1

Predicted and Actual Monthly Average Davis Dam Discharge and Colorado River Elevation at I-3 Interim Measures Performance Monitoring PG&E Topock Compressor Station

	Davis Dam Release		Colorado River Elevation at I-3			
Month	Projected (cfs)	Actual (cfs)	Difference (cfs)	Predicted (ft AMSL)	Actual (ft AMSL)	Difference (feet)
April 2004	17,400	17,354	-46	456.4	456.2	-0.2
May 2004	17,100	16,788	-312	456.3	456.3	-0.1
June 2004	15,800	16,869	1,069	455.8	456.6	0.7
July 2004	14,000	14,951	951	455.2	455.9	0.7
August 2004	12,100	12,000	-100	454.5	454.9	0.4
September 2004	11,200	10,979	-221	454.2	454.6	0.4
October 2004	8,600	7,538	-1,062	453.2	453.5	0.3
November 2004	9,500	8,075	-1,425	453.6	453.4	-0.2
December 2004	6,200	8,090	1,890	452.4	453.3	0.9
January 2005	8,800	4,900	-3,900	453.4	452.4	-1.0
February 2005	8,000	4,820	-3,180	453.1	452.6	-0.5
March 2005	15,600	7,110	-8,490	455.8	452.9	-2.9
April 2005	16,700	16,306	-394	455.9	456.0	0.1
May 2005	16,700	15,579	-1,121	456.2	456.1	-0.1
June 2005	14,600	15,223	623	455.8	456.1	0.3
July 2005	15,400	15,612	212	456.0	456.0	0.0
August 2005	11,700	11,544	-156	454.6	454.8	0.2
September 2005	12,400	12,335	-65	454.6	NA	NA
October 2005	12,300	11,201	-1,099	454.5	454.3	-0.2
November 2005	10,900	10,216	-684	454.3	454.3	0
December 2005	6,900	6,745	-155	452.8	452.7	-0.1
January 2006	8,400	9,166	766	453.2	453.6	0.4
February 2006	11,100	10,790	-310	454.1	454.1	0.1
March 2006	13,000	12,429	-571	454.7	454.8	0.2
April 2006	16,600	18,300	1700	456.0	456.1	0.0
May 2006	15,500	16,818	1318	456.0	456.3	0.3
June 2006	16,100	17,547	1447	456.2	456.4	0.2
July 2006	14,700	15,171	-471	455.7	455.8	0.1
August 2006	12,900	12,871	29	454.9	455.1	0.1
September 2006	12,100	12,409	-309	454.7	454.7	0.0
October 2006	11,400	11,150	250	454.1	454.4	0.3
November 2006	8,300	8,222	78	453.3	453.3	0.0
December 2006	8,100			453.0		

#### NOTES:

NA = I-3 transducer data unavailable for month of September 2005 due to damage by debris.

I-3 elevation for the month of October 2006 limited to average of data from 10/4/2006 through 10/31/2006.

Projected Davis Dam releases, updated monthly, are reported by the US Department of Interior, Bureau of Reclamation at http://www.usbr.gov/lc/region/g4000/24mo.pdf; listed projections for April 2004 through July 2004 are from April 2004, and the remainder were from the beginning of each respective month.

Colorado River levels at I-3 are predicted from a linear regression between historical dam releases and measured river levels at I-3 (updated monthly).

cfs = cubic feet per second; ft AMSL = feet above mean sea level

#### TABLE 4-2

Average Hydraulic Gradients Measured at Well Pairs, November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

Well Pair	Mean Landward Hydraulic Gradient (feet/foot)	Measurement Dates 2006
Northern Gradient Pair		
MW-31-135 / MW-33-150	0.0019	November 1 through 8
Central Gradient Pair		
MW-20-130 / MW-34-80	0.0024	November 1 through 30
Southern Gradient Pair		
MW-20-130 / MW-42-65	0.0030	November 2 through 30

#### Notes:

1) Refer to Figure 1-2 for location of well pairs

2) For IM pumping, the target landward gradient for the selected well pairs is 0.001 feet/foot

3) Extraction well PE-1 began pumping on 1/26/06. As a result, the gradient reported for the central well pair is affected by

having an additional pumping well between wells used for gradient calculation.

4) The transducer in MW-33-150 stopped recording data (new batteries failed twice) during the month of November, so the remainder of the month is unavailable.

Figures



BAO \\ZINFANDEL\PROJ\PACIFICGASELECTRICCO\TOPOCKPROGRAM\GIS\MXD\2006\IMPM MARCH06 LOCS IM3 FACILITIES SHIFTED.MXD IMPM MARCH06 LOCS IM3 FACILITIES SHIFTED.PDF 11/30/2006 14:03:17

**CH2MHILL** 



BAO \\ZINFANDEL\PROJ\PACIFICGASELECTRICCO\TOPOCKPROGRAM\GIS\MXD\2006\PMP\_WELLS\_SECTIONS\_8X11M\_APRIL06.MXD PMP\_WELLS\_SECTIONS\_8X11M\_APRIL06.PDF 8/24/2006 09:48:10



BAO \/ZINFANDEL\PROJ\PACIFICGASELECTRICCO\TOPOCKPROGRAM\GIS\MXD\2006\PMR\_CR6\_CONCENTRATIONS\_PPB\_NOV06.MXD PMR\_CR6\_CONCENTRATIONS\_NOV06.PDF 12/6/2006 10:52:41

#### LEGEND Maximum Hexavalent Chromium [Cr(VI)] Concentrations in Groundwater, November 2006 Monitoring

Concentrations in micrograms per liter ( $\mu$ g/L) equivalent to parts per billon (ppb)

$$\label{eq:ND} \begin{split} \text{ND} &= \text{not detected at listed reporting limit} \\ \text{J} &= \text{Concentration estimated by laboratory or data validation} \end{split}$$

Samples with  $^{\star}$  are from November 2006 sampling, all other samples are from October 2006.

Results posted are maximum concentrations from primary and duplicate samples. See Tables B-1 and B-2 for sampling data and other results.

ND (1)	Not detected at listed reporting limit (ppb)
41	Less than 50 ppb

Greater than 50 ppb

3,810



Inferred Cr(VI) concentration contour within aquifer depth interval

Contours incorporate the maximum concentration from wells within each depth interval

Hydrogeologic Section A (true-scale) showing aquifer depth intervals, well screens, and Cr(VI) sampling results.

#### NOTES ON CONTOUR MAPS

1. The Cr(VI) contour maps for 2006 performance monitoring have been revised to incorporate data from new wells and water quality data trends for floodplain area. The revised maps provide additional interpretation of plume limits and do not reflect plume migration during performance monitoring.

2. The locations of the Cr(VI) contours shown for depths 80-90 feet below the Colorardo River (east and southeast of well clusters MW-34) are estimated based on hydrogeologic and geochemical conditions documented in site investigations 2004-2006. The actual locations of contours beyond well control points in these areas are not certain, but are inferred using available site investigation and monitoring data (bedrock structure, hydraulic gradients, observed distribution of geochemically reducing conditions and Cr(VI) concentration gradients). There are no data confirming the existence of Cr(VI) under the Colorado River.

#### FIGURE 3-1 MAXIMUM CR(VI) CONCENTRATIONS IN ALLUVIAL AQUIFER, NOVEMBER 2006

INTERIM MEASURES PERFORMANCE MONITORING PG&E TOPOCK COMPRESSOR STATION NEEDLES, CALIFORNIA





\ZINFANDEL\PROJ\PACIFICGASELECTRICCO\TOPOCKPROGRAM\GIS\MXD\2006\GW\IM\_AVERAGE\_GROUNDWATER\_UA\_OCT06.MXD

- CH2MHILL

![](_page_24_Figure_0.jpeg)

SFO \/ZINFANDEL\PROJ/PACIFICGASELECTRICCO\TOPOCKPROGRAM\/GIS\MXD\2006\GW\IM AVERAGE GROUNDWATER MA Nov06.MXD

- CH2MHILL

![](_page_25_Figure_0.jpeg)

BAO \\ZINFANDEL\PROJ\PACIFICGASELECTRICCO\TOPOCKPROGRAM\GIS\MXD\2006\GW\IM Average groundwater LA Nov 06.mxd

CH2MHILL

![](_page_26_Figure_0.jpeg)

Appendix A Extraction System Operations Log for November 2006

### Appendix A Extraction System Operations Log for November 2006 PG&E Topock Interim Measures Performance Monitoring Program

During November 2006, extraction wells TW-3D and PE-1 operated at a target pump rate of at 135 gallons per minute (gpm) excluding periods of planned and unplanned downtime. The operational run time for the IM groundwater extraction system (combined or individual pumping) was approximately 99 percent during the November 2006 reporting period.

The IM No. 3 facility also treated approximately 1,040 gallons of water generated from the groundwater monitoring program and 6,000 gallons from injection well IW-02 redevelopment during November 2006. Two containers of solids (approximately 22 cubic yards total) from the IM No. 3 facility were transported to the Chemical Waste Management at the Kettleman Hills facility during November 2006.

Periods of planned and unplanned extraction system down time (that resulted in 99 percent runtime during November 2006) are summarized below. The times shown are in Pacific Standard Time (PST) to be consistent with other data collected (e.g. water level data) at the site.

- November 2, 2006 (planned): The extraction well system was shut down from 9:43 a.m. to 12:02 p.m. to switch to a cleaned set of microfilter modules and clean chemical mixing loop and chromium reduction reactor piping. Extraction system downtime was 2 hours 19 minutes.
- November 21, 2006 (planned): The extraction well system was shut down from 10:58 a.m. to 12:28 p.m. to drain the chromium reduction loop reactor and chemical mixing loop so that the isolation valves around flow sensor FSL-201 could be removed, cleaned and re-installed. Extraction system downtime was 1 hour 28 minutes.
- November 28, 2006 (unplanned): The extraction well system was shut down from 11:44 a.m. until 1:33 p.m. while repairing a connection in the seal ('cooling') water line going into the clarifier feed pump (P-400). Extraction system downtime was 1 hour 49 minutes.

Appendix B Chromium Sampling Results for Monitoring Wells in Floodplain Area

Groundwater Sampling Results for Floodplain Monitoring Wells, June through November 2006 Interim Measures Performance Monitoring

PG&E Topock Compressor Station

		Dissolved		Selected Field Parameters			Groundwater and River Elevations at Sampling Time	
	Sample Chro Date I	Hexavalent Chromium µg/L	Hexavalent Total Chromium Chromium µg/L µg/L	ORP mV	Dissolved Oxygen ( mg/L	Specific Conductance µS/cm	Groundwater Elevation salinity-adjusted feet MSL	River Elevation Downstream I-3 Station
Shallow Wel	ls						•	
MW-27-020	03-Oct-06	ND (0.2)	ND (1.0)	-176	0.5	1,240	455.0	М
MW-28-025	11-Oct-06	ND (0.2)	ND (1.0)	-111	1.5	1,860	454.4	453.7
MW-29	13-Oct-06	ND (0.2)	ND (1.0)	-56	5.3	4,770	454.9	455.0
MW-30-030	10-Oct-06	ND (2.0)	ND (1.0)	-129	1.4	56,500	454.3	453.6
MW-32-020	02-Oct-06	ND (5.0)	ND (1.0)	-122	0.9	59,800	454.3	М
MW-32-035	02-Oct-06	ND (1.0)	ND (1.0)	-162	0.7	20,000	454.4	М
MW-33-040	06-Oct-06	ND (0.2)	ND (1.0)	167		6,710	455.2	455.0
MW-36-020	02-Oct-06	ND (1.0)	ND (1.0)	-177	1.8	24,000	454.6	М
MW-36-040	05-Oct-06	ND (1.0)	ND (1.0)	-194	1.4	16,000	454.2	455.0
MW-39-040	05-Oct-06	ND (0.2)	ND (1.0)	-198	1.4		454.0	454.0
MW-42-030	03-Oct-06	ND (1.0)	ND (1.0)	-160	0.9	19,700	454.4	М
MW-43-025	02-Oct-06	ND (0.2)	ND (1.0)	-172	0.6	1,310	454.8	М
Middle-Dept	h Wells	. ,	. ,					
MW-27-060	03-Oct-06	ND (1.0)	ND (1.0)	-122	0.8	14,300	455.0	М
MW-30-050	11-Oct-06	ND (0.2)	ND (1.0)	-113	0.8	8,280	454.5	454.6
	11-Oct-06 FD	ND (0.2)	ND (1.0)	FD	FD	FD	FD	FD
MW-33-090	06-Oct-06	17.3	20.9		0.9	12,500	455.2	454.5
MW-34-055	04-Oct-06	ND (0.2)	ND (1.0)	-178	2.2	3,080	455.0	453.9
MW-36-050	05-Oct-06	ND (0.2)	ND (1.0)	-165	1.4	4,200	454.9	455.1
MW-36-070	13-Jun-06	ND (0.2) J	ND (1.0)			7,840	456.1	455.9
	11-Jul-06	ND (1.0)	ND (1.0)	-108	0.6	7,320	455.4	454.8
	09-Aug-06	ND (0.2)	ND (1.0)	-149	0.7	6,920	455.3	455.4
	07-Sep-06	ND (0.2)	ND (1.0)	-105	1.7	5,930	455.1	455.5
	02-Oct-06	ND (0.2)	ND (1.0)	-122	1.4	5,220	454.5	М
MW-39-050	05-Oct-06	ND (0.2)	ND (1.0)	-77	1.4	11,200	454.2	454.2
MW-39-060	05-Oct-06	ND (1.0)	ND (1.0)	-54	1.2	11,300	454.2	454.5
	05-Oct-06 FD	ND (2.0)	ND (1.0)	FD	FD	FD	FD	FD
MW-39-070	14-Jun-06	107 J	94.6	197	0.0	10,300	455.9	457.0
	12-Jul-06	77.0 J	66.7	74	0.9	9,570	455.1	456.4
	10-Aug-06	89.6	86.2	67	0.6		454.7	456.0
	07-Sep-06	155	153	21	1.7	9,760	455.0	454.7
	05-Oct-06	112	103	-1	1.2	12,200	453.6	453.9
MW-42-055	03-Oct-06	ND (1.0)	ND (1.0)	-126	0.8	19,100	454.4	М
MW-42-065	03-Oct-06	ND (1.0)	ND (1.0)	-50	0.7	20,400	454.5	М
MW-44-070	13-Jun-06	ND (1.0)	ND (1.0)	-131	4.3	12,200	456.3	456.1
	13-Jun-06 FD	ND (1.0)	ND (1.0)	FD	FD	FD	FD	FD
	15-Jun-06	ND (1.0)	ND (1.0)	-118	5.4	14,900	456.4	456.8

Refer to table footnotes for data qualifier explanation.

Groundwater Sampling Results for Floodplain Monitoring Wells, June through November 2006 Interim Measures Performance Monitoring

PG&E Topock Compressor Station

			Dissolved alent Total nium Chromium /L µg/L	Selected Field Parameters			Groundwater and River Elevations at Sampling Time	
	Sample Date	Hexavalent Chromium µg/L		ORP mV	Dissolved Oxygen mg/L	Specific Conductance µS/cm	Groundwater Elevation salinity-adjusted feet MSL	River Elevation Downstream I-3 Station
Middle-Deptl	h Wells							
MW-44-070	04-Oct-06	ND (1.0)	ND (1.0)	-181	2.3	8,910	454.0	453.8
Deep Wells				<u> </u>				
MW-27-085	14-Jun-06	ND (1.0)	ND (1.0)	-98	3.3	22,400	456.4	456.3
	12-Jul-06	ND (2.0)	ND (1.0)	-71	2.2	21,400	456.2	456.8
	08-Aug-06	ND (1.0)	ND (1.0)	-33	2.7	22,900	454.8	456.2
	06-Sep-06	ND (1.0)	ND (1.0)	-87	2.4	23,200	454.7	454.4
	13-Oct-06	ND (1.0)	ND (1.0)	-78	1.1	24,100	454.0	454.2
	16-Nov-06	ND (1.0)	ND (1.0)	-87	1.2	23,400	453.1	452.8
MW-28-090	15-Jun-06	ND (1.0)	ND (1.0)	-153	3.9	7,980	456.4	456.5
	13-Jul-06	ND (1.0) J	ND (1.0)	-150	1.6		456.6	457.1
	11-Aug-06	ND (0.2)	ND (1.0)	-159	0.6	12,300	456.1	456.5
	08-Sep-06	ND (0.2)	ND (1.0)	-133	3.2	7,830	454.1	454.1
	13-Oct-06	ND (0.2)	ND (1.0)	-156	1.0	9,700	454.9	454.9
MW-33-150	16-Jun-06	5.50	5.40	38	2.8	21,300	456.6	457.1
	13-Jul-06	7.40 J	6.70	-14	1.1	22,400	456.2	456.5
	11-Aug-06	9.30	8.10	-19	1.8	20,200	456.0	456.4
	08-Sep-06	7.40	4.10	28	1.8	17,900	454.8	454.3
	06-Oct-06	7.70	5.70	15	0.9	20,500	454.9	454.0
MW-33-210	16-Jun-06	9.20	8.30	-27	2.9	23,600	456.7	456.9
	13-Jul-06	10.0 J	7.50	36	2.2	27,100	456.5	456.8
	08-Aug-06	9.80	8.70	70	3.1	23,900	455.8	454.8
	08-Sep-06	9.20	4.90	59	1.7	21,000	455.2	454.4
	06-Oct-06	10.2	10.0	28	0.9	24,000	455.3	454.2
MW-34-080	14-Jun-06	ND (1.0)	ND (1.0)	-99	2.7	15,600	456.9	456.8
	12-Jul-06	ND (1.0)	ND (1.0)	-75	1.6	14,800	456.1	456.3
	08-Aug-06	ND (1.0)	ND (1.0)	-33	0.6	16,200	455.5	455.4
	06-Sep-06	ND (1.0)	ND (1.0)	-84	0.9	16,000	454.8	454.7
	04-Oct-06	ND (1.0)	ND (1.0)	-111	2.1	14,400	453.7	453.9
	16-Nov-06	ND (1.0)	ND (1.0)	-86	1.1	13,200	453.0	452.6
MW-34-100	14-Jun-06	922	839	-2	3.2	20,800	456.5	456.6
	14-Jun-06 FD	921	864	FD	FD	FD	FD 450.0	FD
	28-Jun-06	976	1130	132	5.0	21,800	456.2	456.6
	12-JUI-06	823 J	851	27	1.5	19,300	455.9	456.6
	12-JUI-06 FD	020 J	055	FD 26		FD	FD 456.2	
	20-JUI-00	800	955		2.2	20,600	400.2	450.7
	00-Aug-00	009	962	60 60	0.5	20,000	453.5	453.9
	20-Aug-00	922	945	117	1.5	28,900	453.0	453.0
	06-Sep-06 ED	707	903	ED	FD	22,300 ED	434.0 FD	434.9 FD
	20-Sep-00 PD	872	907	191	15	19 600	454.3	M
	04-Oct-06	910	880		20	20 700	454.6	453 0
	18-Oct-06	815	920	52	0.8	21,700	454 0	453.9
	01-Nov-06	832	752	33	1.6	20,200	454.0	453.9
				•			•	

Refer to table footnotes for data qualifier explanation.

Groundwater Sampling Results for Floodplain Monitoring Wells, June through November 2006 Interim Measures Performance Monitoring

PG&E Topock Compressor Station

		Dissolved		Sel	ected Field	Parameters	Groundwater and River Elevations at Sampling Time		
	Sample Date	Hexavalent Chromium µg/L	Total Chromium µg/L	ORP mV	Dissolved Oxygen mg/L	Specific Conductance µS/cm	Groundwater Elevation salinity-adjusted feet MSL	River Elevation Downstream I-3 Station	
Deep Wells									
MW-34-100	16-Nov-06	777	801	146	1.4	20,500	453.0	453.0	
	30-Nov-06	744	712	115	0.9	21,900	452.5	452.2	
MW-36-090	13-Jun-06	10.9	9.00			10,300	455.7	456.4	
	11-Jul-06	12.2	11.1	-34	0.8	14,000	454.4	455.3	
	09-Aug-06	9.00	8.20	-96	0.8	9,190	454.9	455.9	
	07-Sep-06	8.80	7.70	-55	1.7	8,400	454.9	455.4	
	02-Oct-06	9.00	8.50	-20	1.0	8,270	453.6	Μ	
	02-Oct-06 FD	8.90	10.8	FD	FD	FD	FD	FD	
	15-Nov-06	ND (1.0)	2.40	-64	1.0	11,700	452.4	453.6	
MW-36-100	15-Jun-06	496 J	465	7	3.6	18,200	455.4	456.2	
	13-Jul-06	528	497	37	1.0	19,600	455.7	457.5	
	09-Aug-06	551	474	67	1.6	14,600	455.1	456.3	
	08-Sep-06	556	561	-10	2.6	16,200	453.4	454.0	
	11-Oct-06	556	629	17	0.9	16,500	453.7	453.8	
	14-Nov-06	657	764	13	1.0	17,900	452.5	453.1	
MW-39-080	14-Jun-06	1000 J	934	184	0.0	15,100	455.9	456.8	
	12-Jul-06	830 J	750	69	1.1	14,600	455.2	456.8	
	10-Aug-06	481	447	78	0.6	15,800	454.5	455.4	
	07-Sep-06	1160	1160	47	1.6	17,500	455.2	454.5	
	05-Oct-06	580	594	76	1.2	19,500	454.2	454.3	
	15-Nov-06	339	422	52	0.9	17,600	452.6	453.5	
MW-39-100	14-Jun-06	3270	3250	79	3.4	23,100	455.8	455.7	
	13-Jul-06	3790	3470	80	1.5	26,200	455.5	457.4	
	10-Aug-06	3230	3440	141	1.6	23,000	454.9	456.0	
	10-Aug-06 FD	3170	3410	FD	FD	FD	FD	FD	
	08-Sep-06	3290	3780	46	2.8	20,700	453.6	453.9	
	11-Oct-06	3370	3500	87	1.2	23,100	454.4	454.4	
	15-Nov-06	2850	3190	96	2.5	23,000	452.9	453.2	
	15-Nov-06 FD	2960	3060	FD	FD	FD	FD	FD	
MW-43-075	02-Oct-06	ND (1.0)	ND (1.0)	-128	1.2	17,900	454.2	М	
MW-43-090	02-Oct-06	ND (1.0)	ND (1.0)	-108	0.4	23,600	455.2	М	
MW-44-115	13-Jun-06	1420	1350	-26	3.3	17,700	455.6	455.9	
	28-Jun-06	1600	1830	-37	4.0	16,800	455.6	456.5	
	12-Jul-06	1700 J	1430	14	1.2	17,300	455.2	455.9	
	26-Jul-06	1290	1530	-31	0.6		455.4	455.9	
	09-Aug-06	1230	1460 LF	63	2.9	17,700	455.0	455.3	
	23-Aug-06	1370	1440	93	0.6	16,800	454.6	455.0	
	07-Sep-06	1380	1340	139	1.7	15,600	454.7	455.5	
	21-Sep-06	911	1180	57	2.7	14,600	454.4	Μ	
	05-Oct-06	1300	1310	3	2.9	18,400	454.7	454.4	
	18-Oct-06	1250	1380	23	0.8	18,300	454.1	454.5	
	15-Nov-06	1210	1480	19	1.5	14,000	453.1	453.5	

Refer to table footnotes for data qualifier explanation.

Groundwater Sampling Results for Floodplain Monitoring Wells, June through November 2006 Interim Measures Performance Monitoring

PG&E Topock Compressor Station

	Hexava Sample Chromi Date µg/L		Dissolved	Selected Field Parameters			Groundwater and River Elevations at Sampling Time	
		Hexavalent Chromium µg/L	t Total 1 Chromium µg/L	ORP mV	Dissolved Oxygen ( mg/L	Specific Conductance µS/cm	Groundwater Elevation salinity-adjusted feet MSL	River Elevation Downstream I-3 Station
Deep Wells								
MW-44-125	28-Jun-06			-186	4.3	13,000	455.9	456.5
	11-Jul-06	373	395	-16	0.7	12,100	455.0	455.1
	11-Jul-06 FD	365	335	FD	FD	FD	FD	FD
	26-Jul-06	155	177	-140	1.9		455.7	455.9
	26-Jul-06 FD	157	180	FD	FD	FD	FD	FD
	09-Aug-06	218	227 LF	-93	0.6	16,800	455.4	455.7
	28-Aug-06	468	486	-188	1.1	17,700	454.4	454.2
	28-Aug-06 FD	462	540	FD	FD	FD	FD	FD
	07-Sep-06	314	297	-39	4.1	14,600	454.6	455.2
	07-Sep-06 FD	311	275	FD	FD	FD	FD	FD
	20-Sep-06	224	262	-130	0.4	16,700	453.8	Μ
	20-Sep-06 FD	226	261	FD	FD	FD	FD	FD
	05-Oct-06	284	280	-97	2.6	18,000	455.1	454.5
	18-Oct-06	304	327	-112	0.8	18,900	454.7	454.6
	18-Oct-06 FD	308	272	FD	FD	FD	FD	FD
	15-Nov-06	320	363	-119	1.3	14,200	453.5	453.7
MW-45-095a	13-Jul-06	197	202	45	1.4	22,200	454.4	456.1
MW-46-175	15-Jun-06	233	211	-16	3.2	19,900	456.5	456.9
	30-Jun-06	112	160	56	6.2	21,800	456.0	456.0
	30-Jun-06 FD	111	164	FD	FD	FD	FD	FD
	12-Jul-06	135 J	85.8	38	1.5	19,500	456.0	455.6
	27-Jul-06	174	206	16	0.7		456.2	456.6
	09-Aug-06	210	186	65	0.7	21,900	455.3	454.8
	09-Aug-06 FD	223	214	FD	FD	FD	FD	FD
	25-Aug-06	137	136	-24	1.1	19,800	455.2	454.9
	07-Sep-06	183	170	90	2.2	26,400	454.8	454.7
	21-Sep-06	190	244	43	2.3	18,300	455.4	Μ
	05-Oct-06	194	192	0	2.8	22,200	454.9	453.9
	05-Oct-06 FD	195	187	FD	FD	FD	FD	FD
	18-Oct-06	204	253	15	0.9	21,900	454.8	454.0
	15-Nov-06	163	147	-118	1.1	17,100	453.9	453.1
MW-46-205	15-Jun-06	ND (1.0)	1.80	-147	2.9	24,100	456.8	457.2
	13-Jul-06	ND (1.0)	3.50	-152	1.0	24,900	456.4	457.4
	10-Aug-06	ND (1.0)	ND (1.0)	-88	1.3	22,900	455.9	455.4
	07-Sep-06	2.00	2.30	-37	1.6	26,000	455.2	454.5
	05-Oct-06	2.10	2.30	-96	2.4	27,500	455.2	453.9
MW-49-135	12-Oct-06	ND (1.0)	ND (1.0)	-200	1.9	21,200	455.3	453.9
MW-49-275	12-Oct-06	ND (1.0)	ND (1.0)	-252	1.8	31,100	455.9	453.5
MW-49-365	12-Oct-06	ND (2.0)	ND (1.0)	-275	1.4	47,700	457.3	453.0

Groundwater Sampling Results for Floodplain Monitoring Wells, June through November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

#### NOTES:

ND = not detected at listed reporting limit (RL)

FD = field duplicate

LF = lab filtered

J = concentration or RL estimated by laboratory or data validation

- T = data from the downhole transducers to fill groundwater elevation data gaps at some locations
- MSL = mean sea level

(---) = data not collected, available, rejected, or field instrumentation malfunctioned

µg/L= micrograms per liter

mV = oxidation-reduction potential (ORP)

 $\mu S/cm = microSiemens \ per \ centimeter$ 

M = I-3 Transducer damaged

Beginning in July 2005, samples analyzed for total chromium by EPA Method 6010B or 6020 were filtered and preserved in the field after sample collection, as per DTSC's June 30, 2005 letter.

The RLs for certain hexavalent chromium results from Method 7199 analyses have been elevated above the standard RL of  $0.2 \mu g/L$  due to required sample dilution to accommodate matrix interferences.

Groundwater and river elevations in feet above mean sea level (MSL) rounded to 0.1 foot. River elevations from presssure transducer record at I-3.

Groundwater Sampling Results for Other Monitoring Wells in PMP Area, March through November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

Well ID	Sample Date	Hexavalent Chromium μg/L	Dissolved Total Chromium µg/L	Selected Field Parameters		
				ORP mV	Dissolved Oxygen mg/L	Specific Conductance µS/cm
Shallow Wells						
MW-12	18-Apr-06	1210	1300	91.0	7.28	3460
	01-May-06	1250	1280			3840
	04-Oct-06	1740	1790	128	5.22	
MW-19	09-Mar-06	1090	1080	227	7.43	3850
	02-May-06	1130	1120	38.0	3.30	2450
MW-20-070	02-0ct-06 10-Mar-06 05-May-06 03-Oct-06	5170 4100 3290	4510 4440 3390	228 97.0 117	7.32 7.21 7.47	5830 3050 3460
MW-21	03-Oct-06 FD	3410	3330	FD	FD	FD
	09-Mar-06				4.20	15100
	02-May-06	ND (1.0)	ND (1.0)	-77		11500
MW-22	03-Oct-06	ND (1.0)	ND (1.0)	-67	6.90	15900
	15-Mar-06	ND (2.0)	ND (1.0)		8.54	34800
	03-May-06	ND (1.0) J	ND (1.0)	-88	4.14	34200
	13-Oct-06	ND (1.0)	ND (1.0)	-105	0.97	42200
MW-24A	06-Mar-06	3490	3980	239	5.17	3140
	03-Oct-06	4300	4260	101	2.87	3910
MW-25	09-Mar-06	1360	1430	210	7.40	2750
	03-May-06	1390	1310	98.0	7.72	2110
	03-May-06 FD	1280	1310	FD	FD	FD
	03-Oct-06	1140	1150	81.0	6.88	1720
MW-26	08-Mar-06	3280	3020	170	9.16	3840
	01-May-06	3210	3110			3290
	03-Oct-06	3590	3850	104		4140
MW-31-060	15-Mar-06	1020	1010	217	7.01	2750
	15-Mar-06 FD	1000	1010	FD	FD	FD
	01-May-06	952	959			2740
	05-Oct-06	773	849	82.0	7.77	3440
MW-35-060	14-Mar-06	31.6	24.3	42.0	2.92	
	01-May-06	25.7	26.4	-37		6770
	12-Oct-06	28.6	29.1	112	1.26	12200
MW-47-055	23-Mar-06	10.9 J	7.90	-94	2.98	5800
	16-May-06	24.0	27.3	22.0	2.89	4430
	10-Oct-06	56.9	56.8	6.00	2.83	5300
TW-02S	15-Mar-06	2720	2870	-38	7.53	3200
	03-May-06	2400	2600	80.0	6.75	3150
	04-Oct-06	1920	2130	224	6.70	3470
Middle-Depth W	/ells		I			
MW-20-100	10-Mar-06	10100	10200	198	3.77	4360
	05-May-06	10400	12100	98.0	5.20	3760
	03-Oct-06	9520	10300	106	3.46	4340

Groundwater Sampling Results for Other Monitoring Wells in PMP Area, March through November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

			Dissolved	Selected Field Parameters		
Well ID	Sample Date	Hexavalent Chromium μg/L	Total Chromium µg/L	ORP mV	Dissolved Oxygen mg/L	Specific Conductance µS/cm
MW-50-095	09-May-06	199	194	30.0	3.00	5480
	24-May-06	218	221	50.0	3.42	
	10-Oct-06	278	277	24.0	2.85	7120
MW-51	12-May-06	4370	4630	92.0	2.51	12100
	30-May-06	4130	4530	17.0	1.53	10600
	06-Oct-06	4560	4590	119	3.79	13800
Deep Wells						
MW-20-130	10-Mar-06	10700	10600	213	3.49	14500
	05-May-06	12000	13700	97.0	2.21	12400
	18-Oct-06	11600	16400	78.0	2.68	19500
MW-24B	07-Mar-06	5650	5970	199	2.59	17200
	03-Oct-06	6120	5830	85.0	2.72	18700
MW-31-135	15-Mar-06	173	186	33.0	3.05	13400
	09-May-06	154	146 LF	82.0	2.75	15900
	05-Oct-06	85.7	81.7	65.0	2.91	13600
MW-35-135	10-Mar-06	28.0	24.0	103	2.44	12400
	10-Mar-06 FD	26.5	25.7	FD	FD	FD
	02-May-06	21.0	20.7	0.00	2.70	13000
	12-Oct-06	35.4	34.6	113	1.20	14400
	12-Oct-06 FD	34.0	30.8	FD	FD	FD
MW-47-115	23-Mar-06	ND (2.0) J	ND (1.0)	-161	2.32	15600
	16-May-06	1.40	5.10	-67	1.93	18400
	10-Oct-06	ND (3.5)	6.90	-80	1.13	16800
MW-50-200	09-May-06	7750	7360	-11	1.91	20200
	24-May-06	5810	5910	60.0	4.11	37000
	10-Oct-06	9660	11800	93.0	2.99	28100
TW-02D	15-Mar-06	1360	1360	5.00	5.20	8470
	03-May-06	1120	1120	82.0	6.10	8490
	04-Oct-06	872	910	162	4.91	11900
TW-04	18-May-06	1.00	6.40	-97	0.56	15600
	05-Jun-06	ND (1.0)	4.10	-131	0.00	18300
	09-Oct-06	28.5	26.6	12.0	1.11	24700
TW-05	10-May-06	1.10 J	1.30	-161	0.60	15100
	01-Jun-06	ND (1.0) J	ND (1.0)	17.0	1.51	10600
	09-Oct-06	3.60	3.20	60.0	1.12	15800

Groundwater Sampling Results for Other Monitoring Wells in PMP Area, March through November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

#### NOTES:

Analytical results are validated. ND = not detected at listed reporting limit (RL) FD = field duplicate LF = lab filtered (---) = data not collected, available, or field instrumentation malfunctioned  $\mu g/L$ = micrograms per liter mg/L = milligrams per liter mV = oxidation-reduction potential (ORP)  $\mu$ S/cm = microSiemens per centimeter

PMP = Interim Measure Performance Monitoring Program

Samples analyzed for total chromium by EPA Method 6010B or 6020 were filtered and preserved in the field after sample collection, as per DTSC's June 30, 2005 letter.

MW-21 was not sampled in March 2006 because the well was purged dry and did not produce enough water within 24 hours.

![](_page_38_Figure_0.jpeg)

<sup>\/</sup>zinfandel\proj\PacificGasElectricCo\TopockProgram\Project\_GMP\GMP\_Reports\Chemplots\

CH2MHILL

![](_page_39_Figure_0.jpeg)

\\zinfandel\proj\PacificGasElectricCo\TopockProgram\Project\_GMP\GMP\_Reports\Chemplots\

- CH2MHILL

![](_page_40_Figure_0.jpeg)

<sup>\/</sup>zinfandel\proj\PacificGasElectricCo\TopockProgram\Project\_GMP\GMP\_Reports\Chemplots\

CH2MHILL

Appendix C Hydraulic Monitoring Data for Reporting Period

#### TABLE C-1

Monthly Average, Minimum, and Maximum Groundwater Elevations, November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

Well	Average (ft AMSL)	Minimum (ft AMSL)	Maximum (ft AMSL)	Aquifer Depth
1-3	453.31	452.63	454.00	River Station
MW-10	455.83	455.77	455.89	Shallow
MW-19	454.10	454.00	454.19	Shallow
MW-20-070	452.87	452.77	453.00	Shallow
MW-20-100	452.41	452.27	452.64	Mid-Depth
MW-20-130	452.04	451.06	452.37	Deep
MW-22	INC	INC	INC	Shallow
MW-26	454.74	454.70	454.78	Shallow
MW-25	454.49	454.44	454.56	Shallow
MW-27-020	453.32	453.10	453.50	Shallow
MW-27-060	453.47	453.10	453.84	Mid-Depth
MW-27-085	453.30	452.93	453.66	Deep
MW-28-025	453.41	453.08	453.73	Shallow
MW-28-090	453.31	452.85	453.77	Deep
MW-29	INC	INC	INC	Shallow
MW-30-030	INC	INC	INC	Shallow
MW-30-050	453.10	452.77	453.44	Mid-Depth
MW-31-060	453.64	453.51	453.74	Shallow
MW-31-135	453.08	452.85	453.35	Deep
MW-32-020	453.34	453.24	453.42	Shallow
MW-32-035	453.36	453.14	453.54	Shallow
MW-33-040	INC	INC	INC	Shallow
MW-33-090	INC	INC	INC	Mid-Depth
MW-33-150	INC	INC	INC	Deep
MW-33-210	INC	INC	INC	Deep
MW-34-055	453.46	452.99	453.93	Mid-Depth
MW-34-080	453.41	452.96	453.87	Deep
MW-34-100	453.26	452.85	453.70	Deep
MW-35-060	453.98	453.78	454.15	Shallow
MW-35-135	INC	INC	INC	Deep
MW-36-020	453.05	452.74	453.36	Shallow
MW-36-040	453.13	452.81	453.45	Shallow
MW-36-050	453.13	452.76	453.49	Mid-Depth
MW-36-070	453.10	452.72	453.48	Mid-Depth
MW-36-090	452.43	451.27	452.94	Deep
MW-36-100	452.91	452.58	453.32	Deep
MW-39-040	453.55	453.15	454.00	Shallow
MW-39-050	453.04	452.74	453.39	Mid-Depth
MW-39-060	453.03	452.74	453.35	Mid-Depth
MW-39-070	453.05	452.91	453.38	Mid-Depth
MW-39-080	452.67	452.38	453.04	Deep
MW-39-100	452.85	452.60	453.19	Deep
MW-42-030	453.06	452.80	453.29	Shallow

#### TABLE C-1

Monthly Average, Minimum, and Maximum Groundwater Elevations, November 2006 Interim Measures Performance Monitoring PG&E Topock Compressor Station

Well	Average (ft AMSL)	Minimum (ft AMSL)	Maximum (ft AMSL)	Aquifer Depth	
MW-42-055	453.22	452.96	453.45	Mid-Depth	
MW-42-065	453.71	453.09	463.06	Mid-Depth	
MW-43-025	453.28	452.93	453.63	Shallow	
MW-43-075	INC	INC	INC	Deep	
MW-43-090	453.64	453.26	454.02	Deep	
MW-44-070	453.21	452.78	453.63	Mid-Depth	
MW-44-115	453.14	452.79	453.57	Deep	
MW-44-125	453.95	453.22	454.35	Deep	
MW-45-095	451.87	451.46	452.57	Deep	
MW-46-175	453.96	453.64	454.27	Deep	
MW-46-205	454.46	454.22	454.72	Deep	
MW-47-055	453.96	453.82	454.07	Shallow	
MW-47-115	454.16	454.01	454.29	Deep	
MW-49-135	454.20	453.92	454.47	Deep	
MW-49-275	455.20	455.03	455.36	Deep	
MW-49-365	456.73	456.58	456.88	Deep	
MW-50-095	454.09	453.97	454.18	Mid-Depth	
MW-50-200	454.65	454.52	454.78	Deep	
MW-51	454.34	454.29	454.41	Mid-Depth	
RRB	452.39	452.13	452.74	River Station	
PT2D	452.64	452.36	453.04	Deep	
PT5D	453.59	453.21	454.16	Deep	
PT6D	INC	INC	INC	Deep	
INC= Data incomplete over reporting period					

![](_page_44_Figure_0.jpeg)

![](_page_45_Figure_0.jpeg)

![](_page_46_Figure_0.jpeg)

![](_page_47_Figure_0.jpeg)

![](_page_48_Figure_0.jpeg)

![](_page_49_Figure_0.jpeg)

![](_page_50_Figure_0.jpeg)

![](_page_51_Figure_0.jpeg)

![](_page_52_Figure_0.jpeg)

![](_page_53_Figure_0.jpeg)

![](_page_54_Figure_0.jpeg)

![](_page_55_Figure_0.jpeg)

![](_page_56_Figure_0.jpeg)

![](_page_57_Figure_0.jpeg)

![](_page_58_Figure_0.jpeg)

![](_page_59_Figure_0.jpeg)

![](_page_60_Figure_0.jpeg)

![](_page_61_Figure_0.jpeg)

![](_page_62_Figure_0.jpeg)

![](_page_63_Figure_0.jpeg)

![](_page_64_Figure_0.jpeg)

— CH2MHILL

![](_page_65_Figure_0.jpeg)