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April 11, 2005

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Geology and Corrective Action Branch
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Subject: Monitoring Plan for Groundwater and Surface Water Monitoring Program,
PG&E Topock Compressor Station, Needles, California

Dear Mr. Shopay:

This letter transmits the Monitoring Plan for Groundwater and Surface Water Monitoring Program, Revision 0. The monitoring plan has been prepared in conformance with your letter dated January 25, 2005.

If you have any questions, please do not hesitate to contact me at (805) 546-5243.

Sincerely,

Terri Hesson
For Yvonne Meeks

Monitoring Plan for Groundwater and Surface Water Monitoring Program PG&E Topock Compressor Station Needles, California

Prepared for
Pacific Gas and Electric Company

Revision 0
April 2005

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Acronyms and Abbreviations

μS/cm	microSiemens per centimeter
¹⁸ O	oxygen 18
AOC	Area of Concern
bgs	below ground surface
CACA	Corrective Action Consent Agreement
CCR	California Code of Regulations
CMS	corrective measures study
COC	constituents of concern
COI	constituents of interest
COPC	constituents of potential concern
Cr(III)	trivalent chromium
Cr(T)	total chromium
Cr(VI)	hexavalent chromium
CRBRWQCB	Colorado River Basin Regional Water Quality Control Board
DTSC	Department of Toxic Substances Control
GMP	groundwater monitoring program
HSP	Health and Safety Plan
IM	Interim Measure
MCL	maximum contaminant level
mg/L	milligrams per liter
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PG&E	Pacific Gas and Electric Company
PMP	Performance Monitoring Program
PMR	Performance Monitoring Report
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act

RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TDS	total dissolved solids
TPH	total petroleum hydrocarbon
TWG	Technical Work Group
VOC	volatile organic compound
WDR	Waste Discharge Requirement

1.0 Introduction

The Pacific Gas and Electric Company (PG&E) Topock Compressor Station is located in eastern San Bernardino County about 15 miles southeast of the city of Needles, California (Figure 1-1). In February 1996, PG&E and the California Department of Toxic Substances Control (DTSC) entered into a Corrective Action Consent Agreement (CACA) pursuant to Section 25187 of the California Health and Safety Code. Under the terms of the CACA, PG&E was directed to conduct a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and implement corrective measures at the site to address constituents of concern (COCs) associated with discharges of chromium-bearing wastewater in the Bat Cave Wash area adjacent to the compressor station. Since 1997, groundwater investigation and monitoring have been conducted at the site under the RFI and an ongoing groundwater and surface water monitoring program (GMP). The DTSC is the lead agency directing and overseeing the GMP and related programs at the site.

CH2M HILL prepared this Monitoring Plan for PG&E to present the current groundwater and surface water monitoring program for the Topock Compressor Station. This Monitoring Plan provides description of the site COCs for groundwater monitoring, analytical methods and reporting limits, groundwater and surface water monitoring locations, sampling frequency, and the field methods and procedures used for the current Topock GMP. This Monitoring Plan is submitted by PG&E in response to DTSC requirements for a revised and updated water quality sampling and analysis plan (SAP) (DTSC 2005a).

1.1 Site Corrective Action Program

In February 1996, PG&E began to implement the RCRA corrective action process at the Topock site, based on the requirements of the CACA. The CACA describes the required actions and submittals that PG&E must complete at the Topock Compressor Station under the RCRA corrective action process. Under the terms of the CACA, PG&E agreed to conduct an RFI to identify and evaluate the nature and extent of all hazardous waste and constituents releases at the compressor station. The results of the RFI are used to define the release and determine the cleanup objectives. The *Draft RCRA Facility Investigation and Remedial Investigation Report* (CH2M HILL 2005a) presents the results of the RFI from February 1996 through June 30, 2004.

In addition to the RFI activities implemented by PG&E, DTSC directed PG&E to take actions, called Interim Measures (IM), pursuant to Section IV.A of the CACA. Beginning in March 2004, PG&E initiated groundwater extraction from the MW-20 monitoring wells at the MW-20 bench as part of IM No. 2. The purpose of IM No. 2 is to maintain a landward (westward) gradient in the floodplain groundwater zone. In May 2004, the groundwater extraction was transitioned to the newly-completed wells TW-2S and TW-2D and, subsequently, to TW-2D alone to maximize pumping influence in the deeper aquifer zone. In December 2004 and January/February 2005, new injection wells were installed in the East Mesa Area under IM No. 3. The IM No. 3 injection system is scheduled to begin operation in mid-2005.

Long-term cleanup options for the site will be evaluated and summarized in a corrective measures study (CMS). The CMS will identify technologies, evaluate the technologies using selection criteria, and recommend a cleanup approach for the site. The CMS will define cleanup levels for groundwater and soil/sediment (as applicable) that are protective of human health and the environment. The CMS will focus on the evaluation of potential cleanup technologies and the selection of an alternative that is both protective and consistent with remedial objectives. The CMS will be evaluated by stakeholder agencies and the public before a final cleanup plan is implemented.

Since July 2004, as part of the DTSC-required groundwater pumping and hydraulic containment interim measure, PG&E has conducted further site characterization activities for the design and evaluation of the IMs. Several of these groundwater investigation activities have been initiated or are planned to support the IMs and CMS.

1.2 GMP Background

Routine groundwater and surface water monitoring activities were initiated in 1998 as a continuation of the RFI groundwater investigation. The program initially consisted of quarterly sampling of the monitoring wells and surface water stations established during the RFI, as well as periodic sampling of inactive supply wells. Beginning in November 2003, at DTSC's request, the GMP expanded to monthly sampling of 11 wells; in January 2004, the GMP expanded to include weekly well sampling of six wells. In February 2004, surface water sampling of the Colorado River (nine locations) was incorporated into the monthly sampling events. In mid-May 2004, an additional monitoring well, installed during IM hydrogeologic investigations, was added to the weekly sampling activity.

In July 2004, at the request of DTSC (DTSC 2004), PG&E submitted a *Sampling and Analysis Plan, Groundwater and Surface Water Monitoring* (CH2M HILL 2004a) that describes the scope, schedule, and sampling and analysis procedures for the ongoing GMP. In addition, the SAP presented recommended modifications to the monitoring locations, analyses, and sampling frequency for the GMP. On August 26, 2004, PG&E received DTSC approval to:

- Incorporate 22 new IM investigation wells into the GMP.
- Expand of monthly well sampling to include 11 of the new IM investigation wells in the floodplain.
- Replace the weekly well sampling activity with biweekly well sampling of four selected floodplain wells.
- Adjust the sampling frequency of specific wells, as supported by data trends.

According to the July 2004 SAP, samples have been collected from groundwater wells and surface water stations according to the following schedule:

- Fifty-five groundwater wells and nine surface water stations along the Colorado River are sampled quarterly.

- Twenty-four groundwater wells and the nine surface water stations are sampled monthly.
- Four groundwater wells on the floodplain are sampled biweekly.
- One test well and two background monitoring wells are sampled annually.
- Three inactive supply wells are sampled every 2 years (December events).

Prior to August 26, 2004, the wells and surface water monitoring locations were sampled for the site COCs defined in the 1996 CACA. The site COCs listed in the CACA include hexavalent chromium [Cr(VI)], total dissolved chromium [Cr(T)], copper, nickel, zinc, electrical conductivity (also referred to as specific conductance), and pH.

As described in the July 2004 SAP, the parameters sampled in the quarterly GMP have included the primary site COCs Cr(VI) and Cr(T), specific conductance, pH, and the California Code of Regulations (CCR) Title 22 full list of metals (including copper, nickel, and zinc) at selected groundwater monitoring wells. Groundwater and surface water elevation data and field water quality data are also measured during the monitoring events.

Beginning in March 2004, as directed by DTSC, PG&E initiated groundwater extraction at the MW-20 bench, located adjacent to the floodplain area of the site, as part of the IM program. One of the provisions requested by DTSC for the IM activity was the collection of chemical data from selected sampling locations in the vicinity of the pumping operation (CH2M HILL 2004b). The chemical parameter performance monitoring initiated under the IM is currently being conducted as part of the GMP quarterly monitoring activity.

During January and February 2005, new groundwater monitoring wells were installed in the floodplain area of the site under the IM program. In late February 2005, weekly sampling of selected floodplain monitoring wells and surface water stations was resumed at DTSC direction and in accordance with the approved IM *Contingency Plan for Sentry Well Groundwater Monitoring* (DTSC 2005b). Groundwater monitoring of sentry wells in the floodplain area will continue in 2005 under the GMP in support of the IM performance monitoring requirements.

Under the GMP, a comparison test is being conducted to evaluate and compare field filtration and laboratory filtration of groundwater samples to be analyzed for chromium. Sampling is occurring during the March and April 2005 quarterly and monthly monitoring events to support the comparison test. The *Final Work Plan for the Chromium Filtration Comparison Test* is a separate document (CH2M HILL 2005b). The findings of the comparison test will be presented in a report to be submitted to DTSC in May 2005. These findings will be evaluated by the Topock Technical Work Group (TWG), and any revisions to the GMP will be addressed in a subsequent revision to this Monitoring Plan.

This GMP Monitoring Plan is now being prepared to incorporate the new wells into the GMP. Further, it is appropriate, as part of preparing an updated monitoring plan, to review and re-assess the major components of the current GMP, specifically monitoring locations, analytical parameters, and sampling frequency. Based on the review of the GMP and new site investigation data, recommended modifications to the Topock GMP are presented in this Monitoring Plan (Sections 4.0 and 5.0).

The GMP project team organization is described and points of contact are identified in Appendix A.

1.3 Associated Monitoring Programs

PG&E is implementing several projects at the site that include a groundwater monitoring component:

- Under the IM program (IM No. 2), groundwater quality is evaluated to assess the performance of the IM and to monitor water quality in the floodplain area of the site. IM Performance Monitoring Reports are prepared and submitted monthly. Water quality data used in preparation of the Performance Monitoring Reports is collected through the GMP field effort. Evaluation of groundwater quality in the floodplain area of the site is conducted under the IM performance monitoring program (PMP). The Performance Monitoring Plan for Interim Measures in the Floodplain Area will be submitted in April 2005 and describes the design of the floodplain monitoring program and the rationale for use of specific data in the floodplain assessment.
- Planned IM No. 3 activities at the Topock site include the operation of a subsurface injection system as a proposed water management option for treated groundwater. Waste Discharge Requirements (WDRs) adopted by the Colorado River Basin Regional Water Quality Control Board (CRBRWQCB) regulates the injection system design and implementation. The proposed injection system includes a network of injection wells, observation wells, and compliance wells that will be used to monitor changes in water levels and water quality in the immediate vicinity of the injection wells. A Compliance Monitoring Plan is in preparation and will describe the data collection associated with monitoring compliance of the injection system; the Compliance Monitoring Plan will be submitted in April 2005.
- PG&E is currently implementing a background study to more completely evaluate the range of naturally-occurring metals concentrations, including Cr(VI), in groundwater in the vicinity of the Topock site. This study is being conducted in association with the CMS for the site. The background study is being conducted in accordance with the *Draft Work Plan for Assessing Background Metals Concentrations in Groundwater* (CH2M HILL 2004c).
- In association with WDRs issued by the CRBRWQCB for the Topock Compressor Station evaporation ponds, PG&E conducts groundwater monitoring at seven wells (MW-1 and MW-3 through MW-8). These wells are not included in the GMP.

For programs that have a WDR-compliance monitoring well network (i.e., the IM No. 3 injection area compliance monitoring and the new evaporation pond programs), these dedicated well networks are not incorporated in the GMP. However, if a specific need arises, these non-GMP wells may be used for collection of supplemental groundwater data.

The July 2004 SAP contained descriptions of the field methods and procedures to be used in association with the GMP. With the initiation of other Topock programs that incorporate groundwater and surface water sampling, described above, DTSC requested that field methods and procedures that are applicable to the GMP and other Topock sampling

programs be presented in a separate field procedures manual. To ensure consistency among these various groundwater monitoring programs, PG&E prepared the *Sampling, Analysis, and Field Procedures Manual, PG&E Topock Program* (Field Procedures Manual CH2M HILL 2005c). The Field Procedures Manual contains procedures for water quality sampling, analysis, and monitoring; and hydrogeologic investigation, hydraulic data collection, and aquifer testing.

This GMP Monitoring Plan, along with the associated Field Procedures Manual, defines the sampling and analysis procedures to be used in all groundwater monitoring at the site. However, this GMP Monitoring Plan presents the monitoring design/rationale for only the GMP. Design and rationale for groundwater sampling associated with the other PG&E Topock programs are identified in the separate program documents identified above.

Two companion documents, a Quality Assurance Project Plan (QAPP) for Water Quality Sampling and Analysis and a Health and Safety Plan (HSP), have also been prepared to support the Topock laboratory analyses and field sampling activities, respectively. The QAPP was submitted to DTSC as Appendix D of the Field Procedures Manual and reflects an update of the QAPP provided with the July 2004 *Sampling and Analysis Plan* (CH2M HILL 2004a). The QAPP for Water Quality Sampling and Analysis is used in conjunction with the *PG&E Program Quality Assurance Project Plan* (Program QAPP; CH2M HILL 2004d). The HSP was submitted as a stand-alone document in June 2004 (CH2M HILL 2004e). This Monitoring Plan, the Field Procedures Manual, the QAPP, and the HSP will be used in conjunction to guide and direct all groundwater and surface water sampling activities at the Topock site.

1.4 GMP Program Objectives

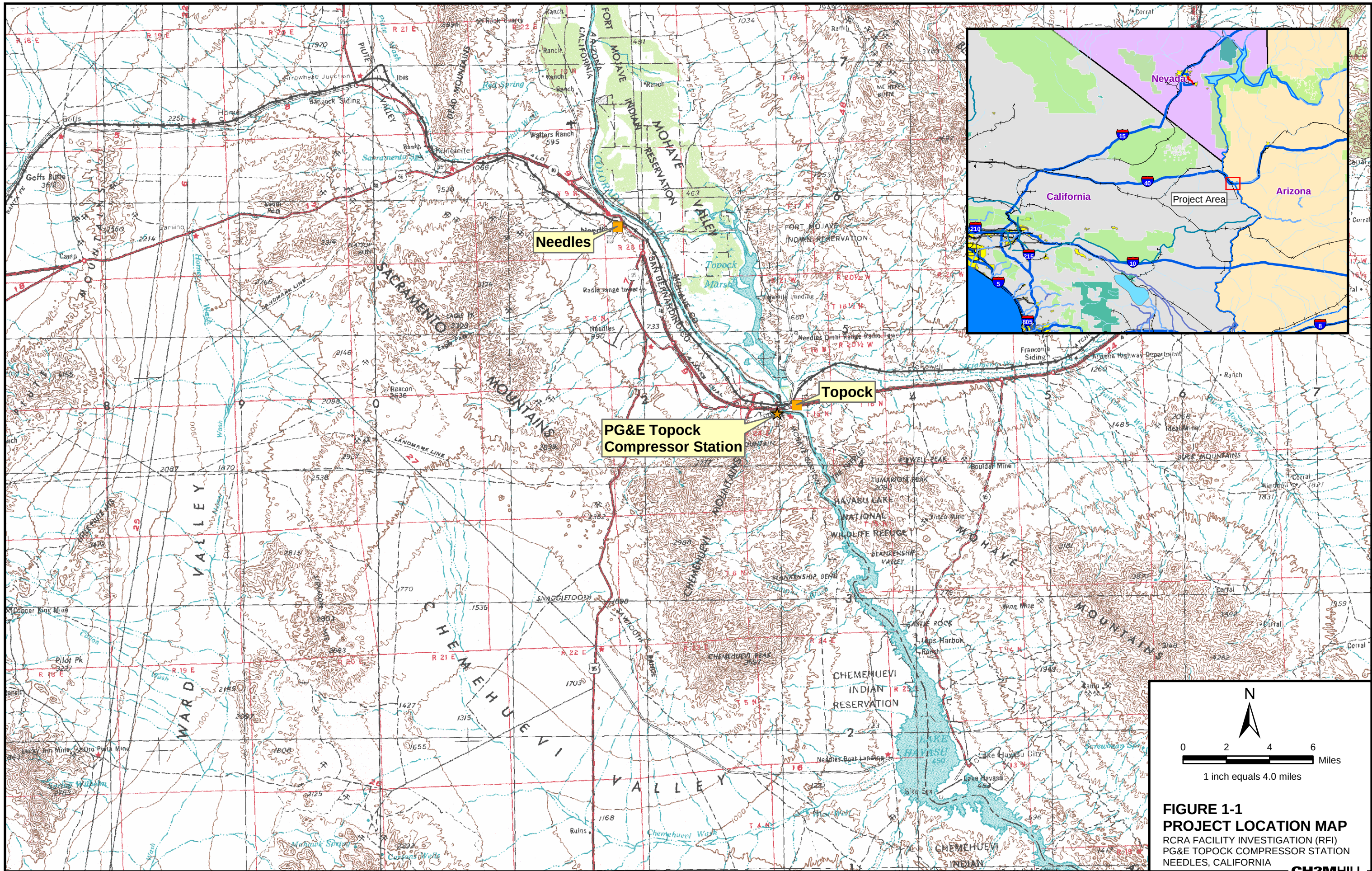
The primary purpose of the GMP is to monitor concentrations of Cr(VI), Cr(T), and other site parameters in groundwater and surface water so that changes in the distribution or concentration of the COCs can be identified and used in project decision-making and remedial planning and monitoring. Additionally, the GMP collects groundwater elevation and general chemistry data to support site characterization and other studies.

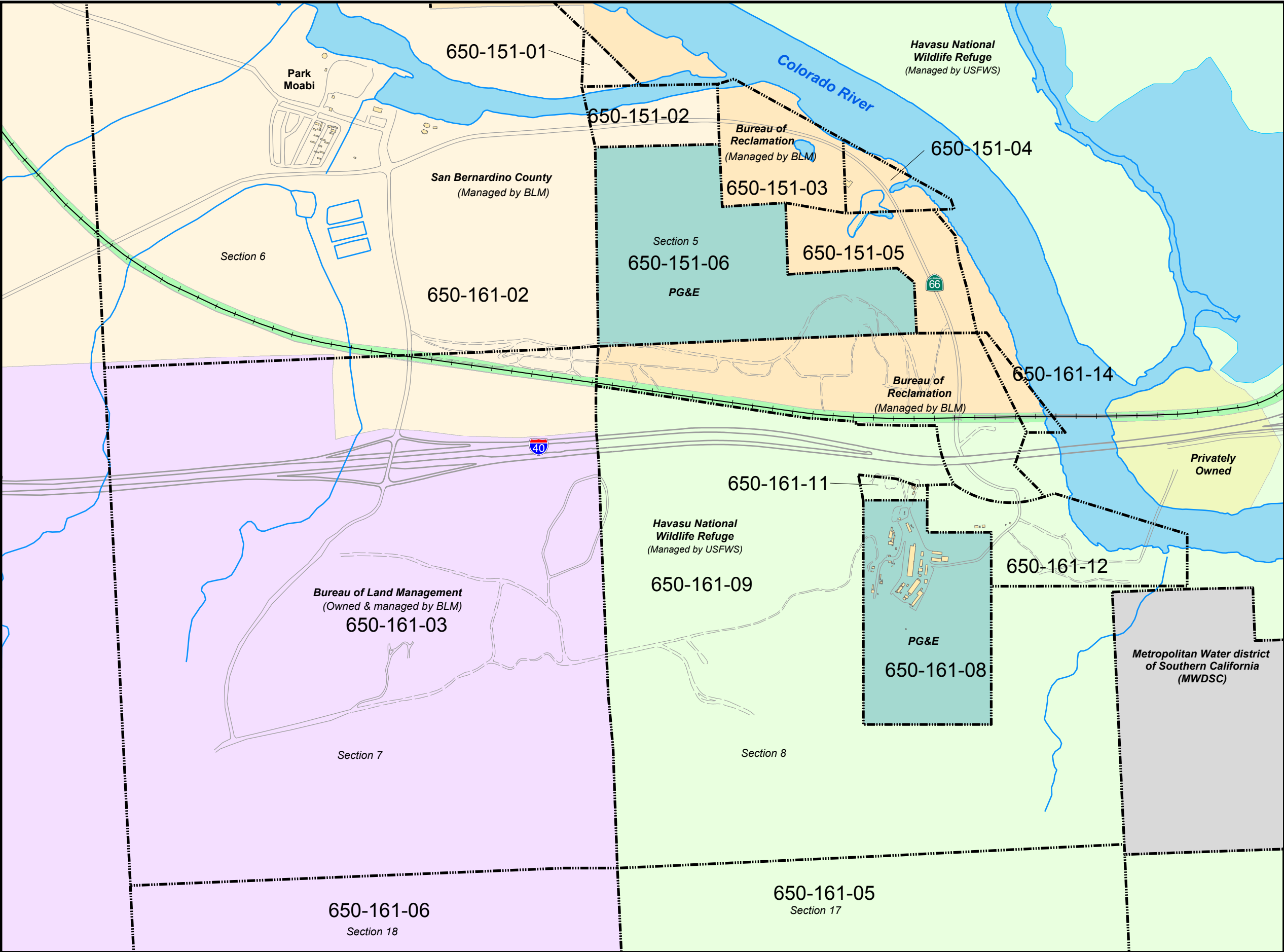
The general program data quality objectives developed for the GMP include:

- Collection of spatially-appropriate chemical data representative of the site.
- Collection of groundwater data on an appropriate frequency to assess changes in the distribution and concentration of site COCs.
- Collection of data for use in identifying whether other constituents associated with historic site disposal practices have impacted site groundwater.
- Maintenance of a sitewide database to ensure that there is a current, accurate, secure repository of site data for use among all Topock programs.
- Use of appropriate State-certified laboratory methods for chemical analyses and data quality control measures to support decision-making.

- Achieving laboratory reporting limits at levels below screening criteria (i.e., drinking water maximum contaminant levels [MCLs]).

These general data quality objectives are sufficient to support data needs for the current and future GMP and IM activities at the Topock site. Specific objectives for groundwater monitoring and surface water monitoring under the GMP are defined in Sections 4.0 and 5.0.





Legend

- Parcel Boundary
- Stream
- Railroad
- Highway
- Paved Road
- Dirt or Gravel Road
- Building

Owner

- BN & SF Railroad
- Bureau of Land Management (Owned and Managed by BLM)
- Bureau of Reclamation (Managed by BLM)
- Havasu National Wildlife Refuge (HNWR)
- Metropolitan Water District of Southern California (MWDSC)
- PG&E
- Privately Owned
- San Bernardino County (Managed by BLM)

Note: The boundary lines shown are approximate and for reference only.

Source: San Bernadino County Assessor, Parcel quest, State Board of Equalization, Pacific Gas and Electric Company, Ecology and Environment and Plat maps provided by BLM.

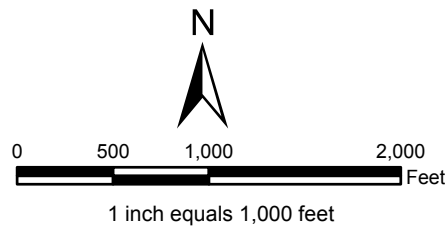


FIGURE 1-2
SURROUNDING PROPERTIES
RCRA FACILITY INVESTIGATION (RFI)
PG&E TOPECK COMPRESSOR STATION
NEEDLES, CALIFORNIA

2.0 Background

2.1 Site Description

The Topock Compressor Station is located in eastern San Bernardino County, California, about 15 miles southeast of Needles (Figure 1-1). The compressor station occupies approximately 65 acres of PG&E-owned land. However, the study area for RCRA corrective action activities covers additional surrounding land owned and managed by a number of federal and state government agencies (Figure 2-1). The closest communities are Moabi Regional Park, California; Topock, Arizona; and Golden Shores, Arizona. There are also three Indian reservations located within 35 miles of the facility: Chemehuevi Indian Reservation, the Fort Mojave Indian Reservation, and the Colorado River Indian Reservation.

2.2 Prior Investigations

From 1997 through June 2004, five phases of RFI investigations were completed at the Topock site. A summary of the site history and results of the RFI investigations are presented in the Draft RFI Report (CH2M HILL 2005a). Additional well drilling, groundwater sampling, and a testing program were conducted during September 2004 through March 2005 to characterize the hydrogeology and groundwater quality conditions in the IM No. 3 injection area. Results are summarized in the *Draft Groundwater and Hydrogeologic Report for Interim Measures No. 3 Injection Area* (CH2M HILL 2005d). The report documents the baseline hydrogeologic and water quality conditions of the injection area.

For background to this Monitoring Plan, Figure 2-2 shows average groundwater elevations and hydraulic gradient for the Upper zone of the Alluvial Aquifer in the GMP area. Based on the average groundwater elevations measured in shallow wells during 2001 to 2003, the natural groundwater gradient in the study area is relatively flat and towards the northeast. More detailed discussion of the site hydrogeologic setting and groundwater and surface water conditions is presented in the Draft RFI Report (CH2M HILL 2005a).

2.3 Previous Groundwater and Surface Water Monitoring Program

As of March 2005, the GMP involves the collection of samples from groundwater wells and surface water stations according to the following schedules:

- Fifty-five groundwater wells and nine surface water stations are sampled quarterly.
- Twenty-four groundwater wells and nine surface water stations are sampled monthly.
- Four groundwater wells in the floodplain are sampled biweekly.
- Three inactive supply wells are sampled every 2 years (December events).

Figure 2-3 shows the locations of the groundwater wells and surface water stations that have been monitored in the Topock GMP to date. Figure 2-3 also indicates the frequency of sampling for the groundwater wells and surface water locations in the GMP to date. Table 2-1 provides a summary of groundwater monitoring wells at the site and a brief summary of Cr(VI) sampling results. Appendix B presents more a more detailed summary of Cr(VI) sampling results.

In association with the IMs being implemented at the site, DTSC defined criteria for evaluating the performance of the IMs to hydraulically contain the chromium plume in the floodplain area of the Topock site (DTSC 2005b). As part of the performance criteria, DTSC specified response actions that PG&E must initiate if Cr(VI) is newly detected in a floodplain sentry well or if an increasing Cr(VI) trend is noted in a sentry well. Response actions include implementation of the *Contingency Plan for Sentry Well Groundwater Monitoring* (DTSC 2005b).

In response to elevated levels of Cr(VI) and Cr(T) in one of the sentry wells (new monitoring well MW-34-100, installed in February 2005), DTSC directed PG&E to initiate the contingency plan for sentry well groundwater monitoring and begin weekly sampling of four monitoring wells (MW-34-80, MW-34-100, MW-27-85, and MW-27-65), as well as four consecutive weekly surface water sampling events at three surface water sampling stations (R-22, R-27, and CON) (DTSC 2005c). The weekly contingency sampling was initiated during the week of February 21, 2005. The four consecutive weekly surface water sampling events were completed during the week of March 14, 2005. Weekly contingency sampling of the four monitoring wells continues to date, and the need for continued weekly contingency sampling of these wells is currently being evaluated. Reinitiation of the contingency sampling may be directed by the DTSC if warranted by site conditions.

TABLE 2-1
Summary of Groundwater Wells and Sampling Events
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID	GMP Monitoring Frequency (March 2005)	Site Area	Monitored Zone	Date Installed	Cr(VI) Sampling Summary ¹ through February 2005		Well Notes
					Number of Sampling Events	Average ² Cr(VI) Concentration (mg/L)	
GMP Monitoring Wells							
MW-9	Q	Bat Cave Wash	UA	01-Jul-97	26	0.347	Contingency plan well
MW-10	Q	Bat Cave Wash	UA	27-Jun-97	26	1.83	
MW-11	Q	Bat Cave Wash	UA	29-Jun-97	26	0.661	
MW-12	Q	East of Station	UA	08-Jul-97	25	0.966	
MW-13	Q	Bat Cave Wash	UA	09-Jul-97	26	0.0196	
MW-14	Q	Bat Cave Wash	UA	14-Jul-97	25	0.0353	
MW-15	Q	Bat Cave Wash	UA	10-Jul-97	24	0.0172	
MW-16	A	Near New Ponds	UA	09-Apr-98	22	0.0149	
MW-17	A	Bat Cave Wash	UA	17-May-98	19	0.00805	
MW-18	Q	West Mesa	UA	08-Apr-98	24	0.0308	
MW-19	Q	Bat Cave Wash	UA	26-Mar-98	23	0.717	
MW-20-70	Q	MW-20 bench	UA	24-Mar-98	26	10.6	
MW-20-100	Q	MW-20 bench	MA	28-Apr-99	25	3.29	
MW-20-130	Q	MW-20 bench	LA	25-Apr-99	25	6.26	
MW-21	Q	East of Station	UA	19-May-98	30	0.02	
MW-22	Q	Floodplain	UA	23-Apr-98	25	ND	
MW-23	Q	East of Station	MC	08-Apr-98	24	0.00532	
MW-24A	Q	MW-24 Bench	UA	12-May-98	24	3.19	
MW-24B	Q	MW-24 Bench	LA	13-May-98	24	4.24	
MW-24BR	Q	MW-24 Bench	BR	22-Apr-98	24	0.346	
MW-25	Q	Near Bat Cave Wash	UA	20-Apr-99	23	2.53	
MW-26	Q	Near Bat Cave Wash	UA	24-Apr-99	25	3.02	
MW-27-20	Q - M	Floodplain	UA	13-Apr-99	59	ND	
MW-27-60	---	Floodplain	MA	11-Feb-05	1	ND	
MW-27-85	---	Floodplain	LA	11-Feb-05	3	ND	
MW-28-25	Q - M	Floodplain	UA	13-Apr-99	59	ND	
MW-28-90	Q - M - BW	Floodplain	LA	17-Apr-04	16	ND	
MW-29	Q - M	Floodplain	UA	12-Apr-99	34	ND	
MW-30-30	Q - M	Floodplain	UA	12-Apr-99	57	ND	
MW-30-50	Q - M	Floodplain	MA	05-Mar-03	41	1.40	
MW-31-60	Q	MW-20 Bench	UA	22-Apr-99	26	3.68	
MW-31-135	Q	MW-20 Bench	LA	26-Mar-04	4	0.328	
MW-32-20	Q - M	Floodplain	UA	10-Mar-03	21	ND	
MW-32-35	Q - M	Floodplain	MA	10-Mar-03	21	ND	
MW-33-40	Q - M	Floodplain	UA	08-Mar-03	19	ND	
MW-33-90	Q - M - BW	Floodplain	MA	08-May-03	38	0.0151	
MW-33-150	---	Floodplain	LA	---	2	ND	
MW-33-210	---	Floodplain	LA	16-Feb-05	1	ND	
MW-34-55	Q - M	Floodplain	MA	06-Jun-03	41	ND	
MW-34-80	Q - M - BW	Floodplain	LA	06-Jun-03	50	0.0248	
MW-34-100	---	Floodplain	LA	30-Jan-05	3	0.376	
MW-35-60	Q	North Area	UA	30-Mar-04	4	0.0197	
MW-35-135	Q	North Area	LA	31-Mar-04	4	0.0117	
MW-36-20	Q - M	Floodplain	UA	03-May-04	8	0.0026	Contingency plan well

TABLE 2-1
Summary of Groundwater Wells and Sampling Events
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID	GMP Monitoring Frequency (March 2005)	Site Area	Monitored Zone	Date Installed	Cr(VI) Sampling Summary ¹ through February 2005		Well Notes	
					Number of Sampling Events	Average ² Cr(VI) Concentration (mg/L)		
GMP Monitoring Wells								
MW-36-40	Q - M	Floodplain	UA	03-May-04	8	ND		
MW-36-50	Q - M	Floodplain	MA	01-May-04	8	ND		
MW-36-70	Q - M	Floodplain	MA	03-May-04	8	ND		
MW-36-90	Q - M	Floodplain	LA	03-May-04	8	2.79		
MW-36-100	Q - M - BW	Floodplain	LA	01-May-04	16	2.16		
MW-37D	Q	Bat Cave Wash	LA	22-Apr-04	4	1.15		
MW-37S	Q	Bat Cave Wash	MA	23-Apr-04	4	0.0046		
MW-38D	Q	Bat Cave Wash	LA	10-Apr-04	4	0.165		
MW-38S	Q	Bat Cave Wash	UA	12-Apr-04	4	0.675		
MW-39-40	Q - M	Floodplain	UA	29-Apr-04	8	ND		
MW-39-50	Q - M	Floodplain	UA	28-Apr-04	8	2.29		
MW-39-60	Q - M	Floodplain	MA	22-Apr-04	8	2.83		
MW-39-70	Q - M	Floodplain	MA	29-Apr-04	8	6.33		
MW-39-80	Q - M	Floodplain	LA	28-Apr-04	8	9.12		
MW-39-100	Q - M	Floodplain	LA	22-Apr-04	9	11.1		
MW-40D	Q	I-40 Median	LA	02-May-04	4	0.0339		
MW-40S	Q	I-40 Median	UA	03-May-04	4	0.00567		
MW-41D	Q	Bat Cave Wash	LA	05-Nov-04	2	ND		
MW-41M	Q	Bat Cave Wash	MA	07-Nov-04	2	0.0047		
MW-41S	Q	Bat Cave Wash	UA	08-Nov-04	2	0.0096		
MW-42-30	---	Floodplain	UA	01-Feb-05	1	ND		
MW-42-55	---	Floodplain	MA	01-Feb-05	1	ND		
MW-42-65	---	Floodplain	LA	01-Feb-05	2	ND		
MW-43-25	---	Floodplain	UA	---	2	ND		
MW-43-75	---	Floodplain	LA	---	2	ND		
MW-43-90	---	Floodplain	LA	---	2	ND		
IM Compliance Wells								
CW-1D	---	East Mesa	LA	13-Jan-05	2	ND		
CW-1M	---	East Mesa	MA	18-Jan-05	2	0.0141		
CW-2D	---	East Mesa	LA	08-Feb-05	2	ND		
CW-2M	---	East Mesa	MA	05-Feb-05	2	0.0139		
CW-3D	---	East Mesa	LA	26-Jan-05	2	ND		
CW-3M	---	East Mesa	MA	07-Feb-05	2	0.006		
CW-4D	---	East Mesa	LA	15-Jan-05	2	ND		
CW-4M	---	East Mesa	MA	17-Jan-05	2	0.0133		
IM Observation Wells								
OW-1D	---	East Mesa	LA	24-Sep-04	3	ND		
OW-1M	---	East Mesa	MA	25-Sep-04	3	0.0085		
OW-1S	---	East Mesa	UA	18-Nov-04	1	0.0049		
OW-2D	---	East Mesa	LA	30-Dec-99	1	ND		
OW-2M	---	East Mesa	MA	05-Dec-04	1	0.0023		
OW-2S	---	East Mesa	UA	13-Dec-04	1	ND		
OW-3D	---	West Mesa	LA	11-Oct-04	3	ND		
OW-3M	---	West Mesa	MA	19-Oct-04	3	0.0129		

TABLE 2-1
Summary of Groundwater Wells and Sampling Events
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

					Cr(VI) Sampling Summary ¹ through February 2005		
					Number of Sampling Events	Average ² Cr(VI) Concentration (mg/L)	
Well ID	GMP Monitoring Frequency (March 2005)	Site Area	Monitored Zone	Date Installed			Well Notes
IM Observation Wells							
OW-3S	---	West Mesa	UA	21-Oct-04	3	0.0163	
OW-5D	---	East Mesa	LA	16-Nov-04	1	ND	
OW-5M	---	East Mesa	MA	20-Nov-04	1	0.008	
OW-5S	---	East Mesa	UA	21-Nov-04	1	0.0326	
Other Site Wells not in GMP							
MW-1	---	New Ponds	UA	24-Aug-86	3	0.0046	
MW-3	---	New Ponds	UA	01-Jan-86	3	0.0106	
MW-4	---	New Ponds	UA	01-Jan-86	3	0.0207	
MW-5	---	New Ponds	UA	01-Jan-89	3	0.0144	
MW-6	---	New Ponds	UA	01-Jan-89	3	0.00967	
MW-7	---	New Ponds	UA	01-Jan-89	3	0.012	
MW-8	---	New Ponds	UA	01-Jan-89	3	0.038	
MWP-8	---	Old Ponds		01-Oct-85	---	---	
MWP-10	---	Old Ponds		28-Jan-86	---	---	
MWP-12	---	Old Ponds	LA-BR	---	1	0.00024	
P-2	---	New Ponds		---	---	---	
PGE-9N	---			22-Apr-97	---	---	
PGE-9S	---			---	---	---	
Surface Water							
CON	Q-M	Surface Water		---	41	ND	
I-3	Q-M	Surface Water		---	37	ND	
NR-1	Q-M	Surface Water		---	15	ND	
NR-2	Q-M	Surface Water		---	15	ND	
NR-3	Q-M	Surface Water		---	13	ND	
R-22	Q-M	Surface Water		---	34	ND	
R-27	Q-M	Surface Water		---	36	ND	
R-28	Q-M	Surface Water		---	34	ND	
RRB	Q-M	Surface Water		---	32	ND	
Test and Extraction Wells							
IW-2	---	East Mesa	MA-LA	16-Dec-04	1	0.0064	IM system monitoring
IW-3	---	East Mesa	UA	18-Dec-04	---	---	IM system monitoring
PE-1	---	Floodplain		---	---	---	
TW-1	A	Plan B Test	UA-LA	11-Nov-03	4	4.63	
TW-2D	IM system monitoring	MW-20 bench	LA	30-Mar-04	5	7.09	IM system monitoring
TW-2S	IM system monitoring	MW-20 bench	UA	05-Apr-04	5	6.69	IM system monitoring
Water Supply Wells							
PGE-6	2A	MW-24 Bench	MA	01-Jan-64	16	0.907	
PGE-7	2A	MW-24 Bench	LA-BR	01-Jan-64	14	4.16	
PGE-8	2A	Station	BR	01-Jan-69	15	ND	
Park Moabi	Q	Park Moabi	MA	---	23	0.00474	

TABLE 2-1
Summary of Groundwater Wells and Sampling Events
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Notes:

¹ Groundwater sampling data through February 2005 except MW-43 cluster and MW-33-150, sampling data through March 2005.

² Average of detected values

IW-2 and IW-3 wells are grab samples during injection test.

ND not detected

Q quarterly

M monthly

BW biweekly

A annually

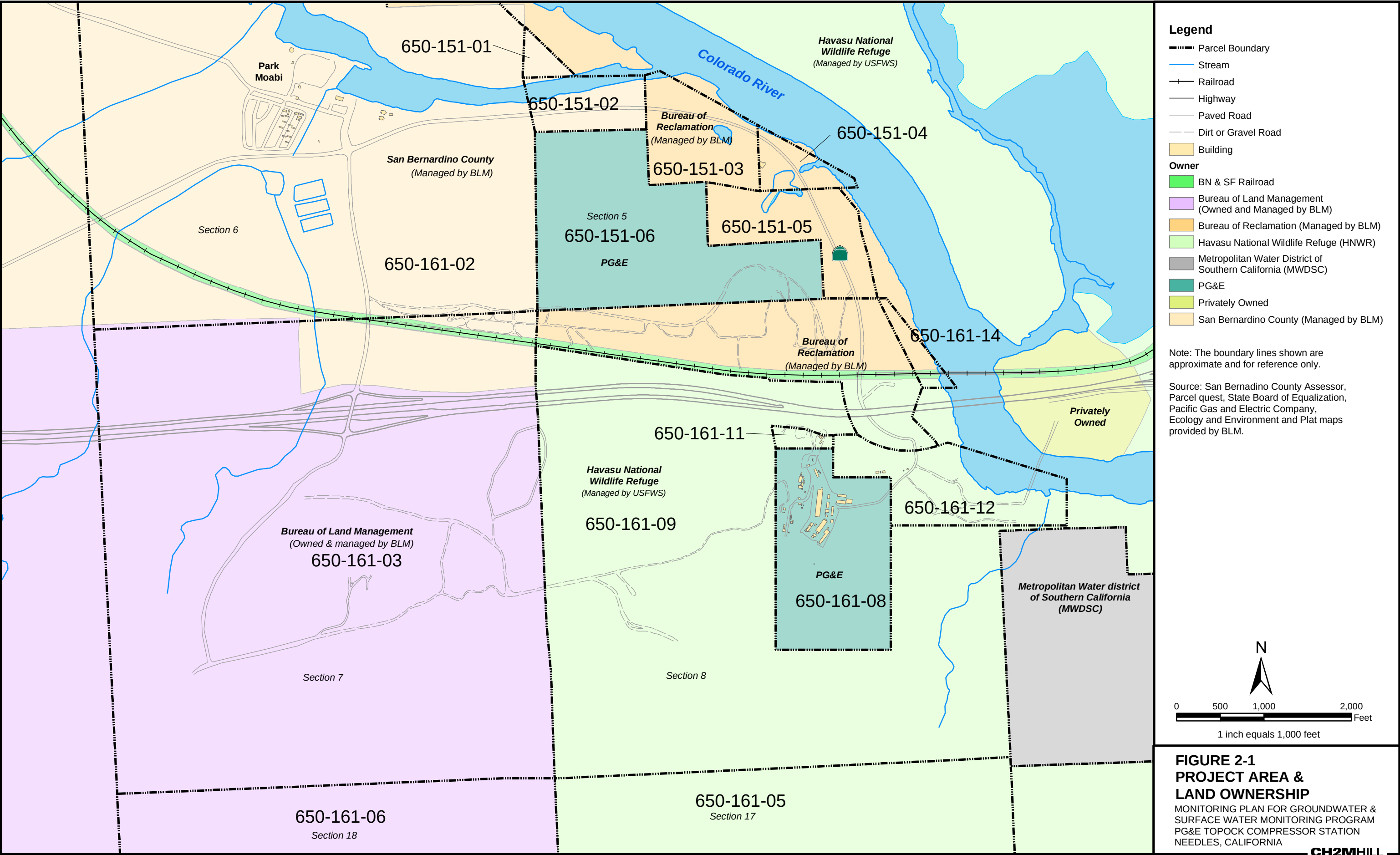
UA upper alluvial aquifer

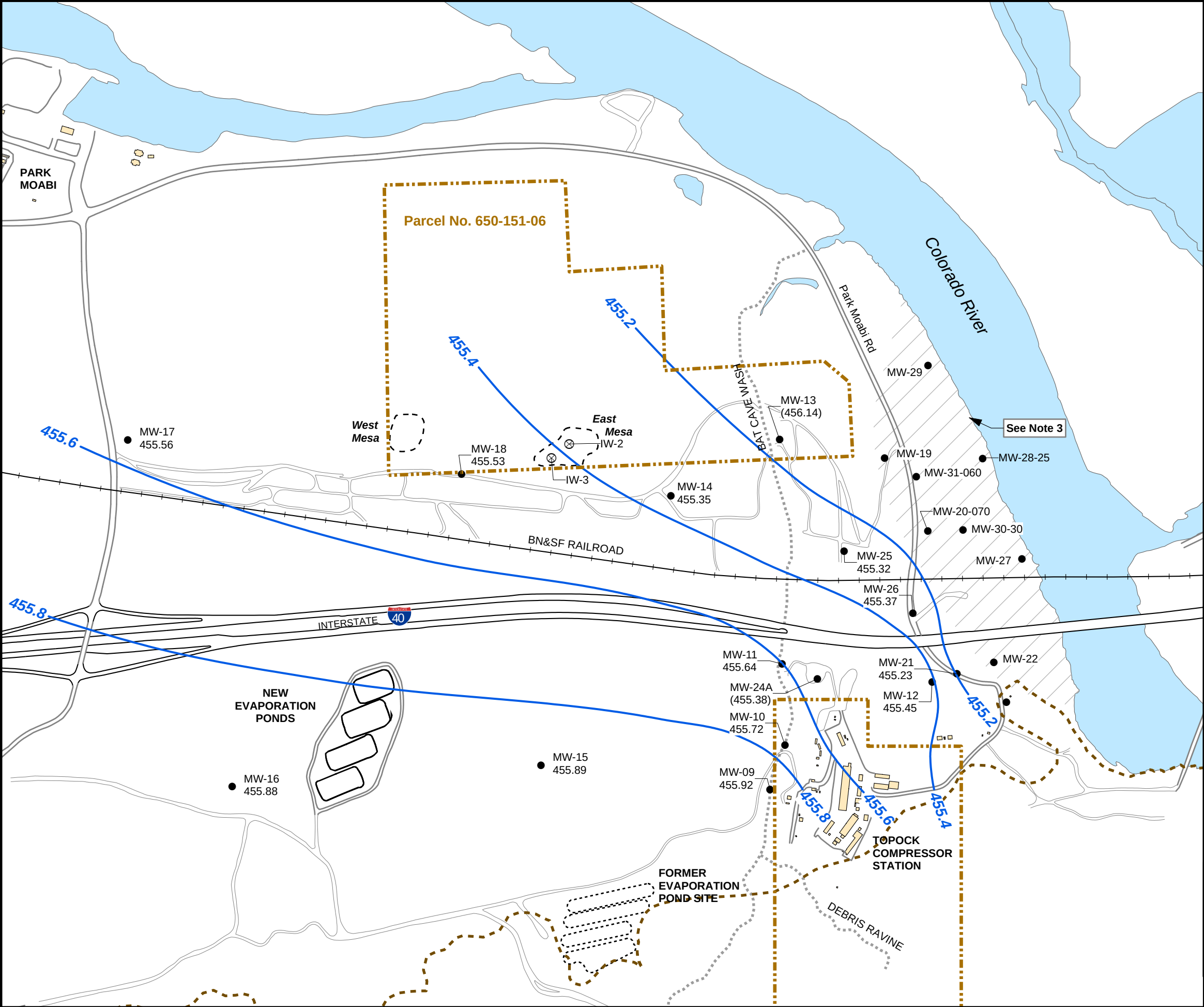
MA middle alluvial aquifer

LA lower alluvial aquifer

BR metamorphic bedrock

MC miocene conglomerate





LEGEND

●

Groundwater Monitoring Well

⊗

IM-3 Injection Well

Groundwater Elevation Contours (ft MSL)

Bedrock Contact

●

MW-29

Average groundwater elevation at wells (ft MSL)

455.04

(454.50)

Not used for contouring

Note:

- Figure shows groundwater elevations and hydraulic gradient for Upper Zone of Alluvial Aquifer using averages of manual water level measurements between 2001 and 2003.
- Data and contours are considered approximate. Measured elevations were subject to seasonal variation, river fluctuations, and measurement error.
- For groundwater elevations in floodplain, see Figures 2-22a, 2-22b, and 2-22c in Draft RFI Report, Volume I (CH2M Hill, 2005)
- Average groundwater elevations for new IM-3 wells in preparation (see text).

FIGURE 2-2
AVERAGE SHALLOW GROUNDWATER
ELEVATIONS 2001 - 2003
(QUARTERLY MONITORING DATA)
MONITORING PLAN FOR GROUNDWATER &
SURFACE WATER MONITORING PROGRAM
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

SFO \\ZINFANDEL\PROJ\PACIFICGASELECTRIC\CO\TOPOCKPROGRAM\GIS\MXD\2005\GMP_GWINVEST_AVE_GW_ELEV.MXD GMP_GWINVEST_AVE_GW_ELEV.PDF 4/1/2005 17:10:23

CH2MHILL

3.0 Results of Groundwater and Surface Water Monitoring

3.1 Site Constituents of Concern

Chemical constituents included in the Topock GMP can be categorized as COCs, constituents of potential concern (COPCs), or constituents of interest (COIs):

- COCs are defined as constituents that are associated with historic site disposal practices and, through the RFI process or subsequent groundwater monitoring, have been shown to have impacted the site groundwater.
- COPCs are chemical constituents that, based on site history and the types of products and/or wastes present at the site, could *potentially* be present in affected media (e.g., soil, sediment, groundwater, etc.).
- COIs are constituents that do not warrant inclusion as a COC or COPC but are of interest for use in assessing or monitoring groundwater conditions and for monitoring the performance and effects of IM pumping.

This section presents the rationale for identification of site COCs, COPCs, and COIs.

3.1.1 Constituents of Concern

The primary COCs for groundwater at the Topock site are Cr(VI) and Cr(T), derived from salts used historically as a corrosion inhibitor in the station's cooling towers. Based on historical disposal practices and on data from previous investigations, the CACA also identified copper, nickel, zinc, pH, and electrical conductance as site COCs (DTSC 1996). This list of seven COCs has been the focus of the Topock groundwater investigations to date.

A review of dissolved copper, nickel, and zinc groundwater concentrations for the GMP wells over the period of 1997 to 2004 was presented in the July 2004 SAP (CH2M HILL 2004a) to demonstrate that continued monitoring for copper, nickel, and zinc in the site groundwater wells as COCs is not warranted. Over this 7-year period, no groundwater samples contained detectable concentrations of copper or zinc that exceeded MCLs. In addition, over that same time period, only three groundwater samples contained nickel at concentrations slightly above the MCL. Figure B-1 in Appendix B presents the geographic distribution of detected concentrations of dissolved copper, nickel, and zinc from the March 2004 quarterly sampling event. Figure B-2 in Appendix B presents the detected concentrations of copper, nickel, and zinc from sampling events conducted from 1997 to early 2004. These data indicate that detected concentrations of copper, nickel, and zinc in groundwater are spatially variable, suggesting that the presence of these metals in groundwater is not related to activities at the compressor station.

Based on these data trends, the July 2004 SAP presented the recommendation for removing copper, nickel, and zinc from the list of site COCs sampled during the ongoing quarterly monitoring program. Further, the Draft RFI Report (CH2M HILL 2005a) also recommended that copper, nickel, and zinc not be considered groundwater COCs. Copper, nickel, and zinc will continue to be monitored under the GMP but will now be considered COIs. Analysis for copper, nickel, and zinc will occur as part of the full-list Title 22 metals suite of analyses that is conducted at selected wells on a quarterly basis.

Specific conductance and pH were identified in the 1996 CACA as site COCs. In the Draft RFI Report, specific conductance and pH are considered to be COPCs for groundwater. Specific conductance and pH warrant being considered COPCs rather than COCs because it has not been demonstrated that specific conductance and pH have impacted the site groundwater, one of the criteria for establishing a constituent as a COC. Further, pH and specific conductance are parameters that are useful in monitoring general water quality conditions and indicating anomalous or changing site conditions. Therefore, it is proposed that pH and specific conductance be considered COPCs in the GMP.

In summary, on the basis of GMP data collected to date, and the objectives and requirements of GMP and IM activities, Cr(VI) and Cr(T) are considered primary parameters that require continued monitoring at the Topock site and are therefore defined as the groundwater COCs for the Topock GMP.

3.1.2 Constituents of Potential Concern

Based on analytical data collected during the RFI process, the COPC list for the GMP can be developed and refined. Only those COPCs that are found to be present in site groundwater, are shown to have been associated with historic site disposal practices and, through the RFI process or subsequent groundwater monitoring, have been shown to have impacted site groundwater, will be considered COCs.

3.1.2.1 Previously-identified Groundwater COPCs

Groundwater COPCs identified in the Draft RFI Report are Cr(T), Cr(VI), copper, lead, nickel, zinc, electrical conductivity, pH, and total petroleum hydrocarbons (TPH). As described above, Cr(T) and Cr(VI) are already considered to be COCs for the GMP. In addition, historical groundwater sampling indicates that detected concentrations of copper, nickel, and zinc in groundwater are not related to activities at the compressor station; therefore, copper, nickel, and zinc no longer meet the definition of a groundwater COPC. Specific conductance, pH, lead, and TPH are retained as groundwater COPCs.

3.1.2.2 Soil/Sediment COPCs

Additional COPCs were identified in the Draft RFI Report for soil and sediment media for specific Solid Waste Management Unit (SWMUs)/ Area of Concern (AOCs) that are proposed to be further addressed in the RCRA corrective action process at the Topock site. These constituents were identified through the RFI process as COPCs for soil/sediment, but were not identified as groundwater COPCs due to either an incomplete groundwater pathway or it being unlikely that a release of the COPC would impact groundwater.

The discussion regarding these soil/sediment COPCs is based upon the comprehensive review of historic facility operations, development of conceptual site models, and soil, sediment, and air characterization results presented in the Draft RFI Report (CH2M HILL 2005a). For each SWMU or AOC identified in the Draft RFI Report for further investigation, the soil/sediment COPCs are:

- SWMU 1/AOC 1 – Former Percolation Bed: Cr(T), Cr(VI), copper, lead, nickel, zinc, pH, and TPH
- AOC 4 – Debris Ravine: metals (including Cr(T), Cr(VI)), polycyclic aromatic hydrocarbons (PAHs), semivolatile organic compounds (SVOCs), and asbestos
- AOC 5 and AOC 6 – Cooling Towers A and B: Cr(T), Cr(VI), copper, lead, nickel, zinc, and soil pH
- AOC 9 - Southeast Fenceline (Outside Visitor Parking Lot): Cr(T) and Cr(VI)
- AOC 10 – East Ravine: metals (including Cr(T) and Cr(VI)), SVOCs, and TPH
- AOC 13 – Unpaved Areas within the Compressor Station: metals (including Cr(T) and Cr(VI)), SVOCs, TPH motor oil, and soil pH
- Railroad Debris Site: metals (including Cr(T) and Cr(VI)), SVOCs, PAHs, TPH, and asbestos
- Auxillary Jacket Water Cooling Pumps: metals, including Cr(T) and Cr(VI)

A conceptual site model is presented in the Draft RFI Report for each of these areas. The conceptual site model for AOC 5/AOC 6, AOC 9, AOC 10 and AOC 13 indicates that the groundwater pathway is incomplete for these soil/sediment COPCs. The conceptual site model for AOC 4, the Railroad Debris Site, and the Auxillary Jacket Water Cooling Pumps indicates that releases to groundwater are unlikely due to the nature of the disposed waste, depth to groundwater, low annual precipitation, and high rates of evapotranspiration. Therefore, soil/sediment COPCs at the Topock site identified through the RFI process are eliminated as groundwater COPCs for the GMP.

3.1.2.3 Additional Constituents Analyzed at the Request of DTSC

During the RFI, at the request of DTSC, PG&E conducted groundwater sampling for perchlorate, volatile organic compounds (VOCs), SVOCs, and polychlorinated biphenyls (PCBs). Results of these additional analyses are presented in the Draft RFI Report (CH2M HILL 2005a). Perchlorate was never used or stored at the PG&E site; however, perchlorate from sources near Las Vegas has been detected in water samples from the Colorado River and Lake Havasu. DTSC was interested in determining whether perchlorate from the upstream sources had impacted the site groundwater. In June 2003, at the request of DTSC, PG&E sampled eight monitoring wells and two surface water locations for perchlorate. In June and July 2004, at DTSC request, seven selected wells, including the new IM groundwater extraction wells TW-2D and TW-2S, were sampled for perchlorate. In both the 2003 and 2004 sampling, perchlorate was not detected in any of the water samples collected at the selected groundwater wells and the two surface water locations. Due to matrix interference from the TDS levels in most of the groundwater samples, the laboratory

reporting limits for perchlorate were elevated above the reporting limits achieved for the relatively low TDS river water samples

In June 2004, at the request of DTSC, nine selected groundwater wells were sampled and analyzed for VOCs, SVOCs, and PCBs. In May 2004, DTSC collected samples for VOC, SVOC, and PCB analyses from the MW-20 cluster wells after these wells were used for interim groundwater extraction. The results of the organic compound sampling are summarized as follows:

- Except for trace concentrations of chloroform (a common laboratory contaminant) in four samples, VOCs were not detected in any of the groundwater samples collected at the 12 wells sampled.
- SVOCs were not detected in any of the groundwater samples collected at the 12 wells sampled.
- PCBs were not detected in any of the groundwater samples collected at the nine wells sampled.

VOCs, PCBs, and perchlorate were not identified during the RFI process as soil or groundwater COPCs, and the results of the groundwater sampling conducted at DTSC's request confirm that VOCs, PCBs, and perchlorate are not groundwater COPCs. SVOCs, though considered to be soil/sediment COPCs, have been shown to not be present in site groundwater; therefore, SVOCs are not considered groundwater COPCs.

3.1.2.4 Summary of Groundwater COPCs

Based on the COPC discussion above, specific conductance, pH, lead, and TPH are groundwater COPCs identified during the RFI process.

3.1.3 Constituents of Interest

As described in Section 3.1.1, copper, nickel and zinc were originally identified in the 1996 CACA as site COCs; however, these parameters have been shown to meet the definition of site COIs and are now considered to be COIs for the GMP.

Full-list CCR Title 22 trace metals analysis of select groundwater samples has been conducted quarterly since September 2004, as reported in the *Groundwater and Surface Water Monitoring Report, Third Quarter 2004* (CH2M HILL 2004f) and *Groundwater and Surface Water Monitoring Report, Fourth Quarter 2004* (CH2M HILL 2005e). Trace metals analysis of select groundwater samples will continue as part of the Topock GMP. Through this continued periodic analysis and the background study being conducted to evaluate naturally-occurring metals in site groundwater (CH2M HILL 2004c), PG&E will determine whether any trace metals are shown to have impacted site groundwater and therefore warrant inclusion as a groundwater COPC or COC. Until that determination is made, trace metals will be considered groundwater COIs (with the exception of chromium, which is a COC, and lead, which is a COPC).

The field water quality parameters of specific conductance, oxygen-reduction potential, dissolved oxygen, pH, temperature, TDS, and turbidity provide screening-level information regarding water quality, including the redox conditions of the aquifer, and are routinely

measured during groundwater and surface water monitoring events. These field water quality parameters are included as COIs for the GMP.

3.2 Distribution of COCs in Groundwater and Surface Water

This section summarizes the distribution of chromium in groundwater and surface water at the Topock site. As described in Section 3.1, Cr(T) and Cr(VI) are the only constituents that currently meet the definition of a COC for the Topock site. The distribution in groundwater of other constituents, defined as COPCs or COIs, are discussed in Section 3.3. The information provided here is summarized from the Draft RFI Report (CH2M HILL 2005a) and the *Groundwater and Surface Water Monitoring Report, Fourth Quarter 2004* (CH2M HILL 2005e).

Figure 3-1 presents recent Cr(VI) results for all wells installed at the site through the end of February 2005. Cr(VI) results presented in Figure 3-1 represent the highest value reported between December 2004 and February 2005, which captures analytical results from the fourth quarter 2004 sampling event as well as more recent results for the wells installed during the January–February 2005 period (wells that were not captured in the fourth quarter 2004 sampling event). Figure 3-1 also shows the approximate outline of Cr(VI) in groundwater greater than 0.050 mg/L (the California MCL for total chromium) based on the December 2004 sampling results.

Figures B-3, B-4, and B-5 in Appendix B present the vertical distribution of Cr(VI) results from the December 2004 quarterly sampling event, showing wells that monitor the upper, middle, and lower zones of the Alluvial Aquifer, respectively, and surface water locations. Figures B-3 through B-5 also show the approximate outline of Cr(VI) in groundwater greater than 0.050 mg/L based on the December 2004 quarterly event sampling results for the upper, middle, and lower zones of the Alluvial Aquifer. The distribution and concentrations of Cr(VI) shown in Figures B-3 through B-5 are consistent and comparable with the pre-December 2004 quarterly monitoring data (CH2M HILL 2005e).

In the Draft RFI Report, data assessing the vertical distribution of chromium in the Alluvial Aquifer were presented for 15 monitoring well clusters. The maximum detected and average concentrations of Cr(VI) observed in groundwater sampling at seven of the well clusters show a wide range in concentration and no uniform trend of Cr(VI) concentration with depth in the aquifer.

As describe in the Draft RFI Report, the chromium plume is defined as chromium-bearing groundwater exceeding the State of California MCL for Cr(T) of 0.05 mg/L. The chromium plume is confined to the more permeable alluvial/fluvial deposits that comprise the Alluvial Aquifer. The plume exceeding the MCL underlies an area of approximately 70 acres. The groundwater chromium plume extends over a distance of approximately 2,800 feet from the southern portion of the Alluvial Aquifer (upper Bat Cave Wash) to the Colorado River floodplain.

Since initiation of surface water sampling, Cr(VI) has not been detected in samples of Colorado River water collected at multiple locations both upstream and downstream from the Topock site. During the RFI, samples of interstitial water from shallow drive points installed at eight locations in the river bottom were also non-detect for Cr(VI).

3.3 Distribution of Other Constituents in Groundwater and Surface Water

Since initiation of the RFI and routine monitoring at the Topock site, several other constituents besides chromium have been monitored in groundwater and surface water. This section summarizes the distribution of these other constituents in groundwater and surface water at the site.

3.3.1 Inorganic Constituents

Several general water quality parameters have been measured at the Topock site from 1998 through June 2004. Parameters monitored include TDS, total organic carbon, anions, cations, general minerals, stable isotopes (deuterium and ^{18}O), pH, specific conductance, and field parameter measurements. In the Draft RFI Report (CH2M HILL 2005a), the groundwater analytical results for inorganic parameters were compared to the California primary and secondary MCL water quality standards, where applicable. A summary of exceedences to these MCL values is presented here.

As presented in the Draft RFI Report, the average TDS concentrations in the RFI wells range from maximum of 43,600 mg/L to less than 1,000 mg/L (recommended secondary MCL for TDS is 500 mg/L with an upper level of 1,000 mg/L). Only two monitoring wells in the well network have average TDS concentrations below the secondary MCL.

The following inorganic constituents have been detected at least once in concentrations in groundwater exceeding the state drinking water MCLs:

- Chloride, secondary MCL 250 mg/L (89 percent of the RFI wells)
- Fluoride, secondary MCL 2.0 mg/L (64 percent of the RFI wells)
- Nitrate as N, primary MCL 10.0 mg/L (three RFI wells sampled 2003-2004)
- Nitrite, primary MCL 1.0 mg/L (slight exceedences in wells MW-11, MW-24BR)
- Sulfate, secondary MCL 250 mg/L (78 percent of the RFI wells)
- Iron, secondary MCL 0.3 mg/L (31 percent of the RFI wells)
- Manganese, secondary MCL 0.05 mg/L (70 percent of the RFI wells)

3.3.2 Perchlorate

Groundwater sampling and analysis for perchlorate was conducted in June 2003 (eight monitoring wells and two surface water locations) and June and July 2004 (seven groundwater monitoring wells) at the request of the DTSC during the RFI process. As presented in the Draft RFI Report (CH2M HILL 2005a), in both the 2003 and 2004 sampling, perchlorate was not detected in any of the samples collected at the selected groundwater wells and surface water locations.

3.3.3 Other Trace Metals

Copper, nickel, and zinc were identified as site COPCs in the 1996 CACA and have been analyzed in groundwater during the RFI and subsequent site monitoring. Figures B-1 and B-2 in Appendix B summarize the maximum concentrations and frequency of detection for the dissolved copper, nickel, and zinc analyses from the RFI groundwater wells. As

presented in the July 2004 SAP (CH2M HILL 2004a), over 5 years of sampling data indicate these trace metals are either infrequently detected (copper, nickel) and/or are detected consistently at low concentrations below the drinking water MCL (zinc).

Full-list CCR Title 22 trace metals analysis was conducted in June 2004 for groundwater samples from nine wells as part of the RFI. CCR Title 22 trace metals analysis has also been included in quarterly GMP events since September 2004. In the June 2004 groundwater sampling event, in addition to Cr(T), the only dissolved trace metals detected above primary drinking water MCLs are antimony and arsenic (each exceeded its primary MCL in one location); the concentrations of the other detected metals, excluding Cr(T), were below drinking water standards. In the September 2004 sampling event, only antimony and arsenic were detected at concentrations above their respective drinking water standards, at only one well location; the concentrations of the other detected metals, excluding chromium, were below drinking water standards. In the December 2004 groundwater sampling event, excluding Cr(T), the dissolved concentrations of the trace metals detected were below drinking water standards.

3.3.4 Organic Compounds

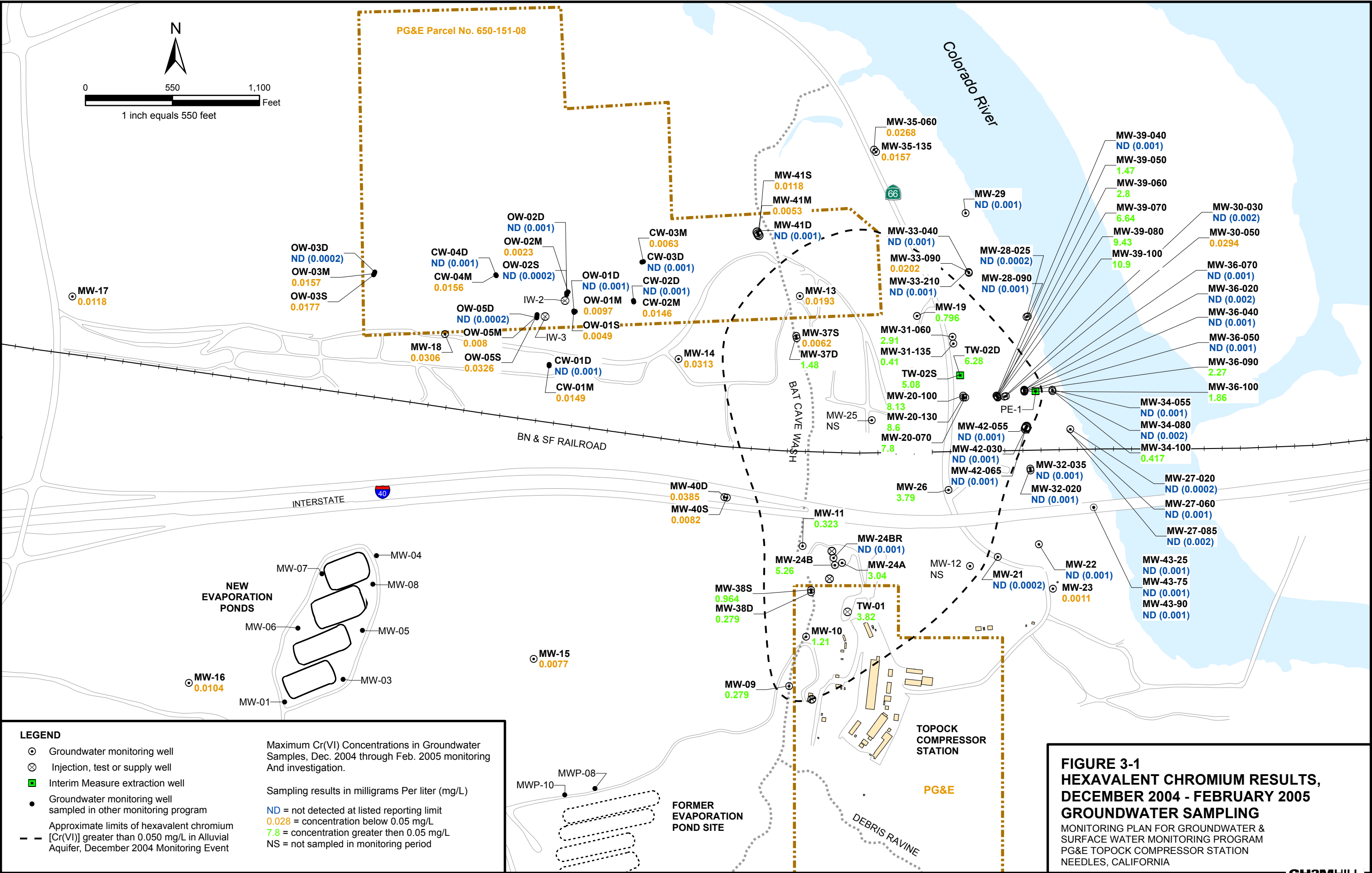
Groundwater sampling and analysis for other constituents have been conducted at the request of the DTSC during the RFI process. These other constituents include VOCs, SVOCs, and PCBs. As presented in the Draft RFI Report (CH2M HILL 2005a), VOCs were not detected in any of the groundwater samples collected from 12 wells, except for trace concentrations of chloroform (a common laboratory contaminant) in four samples. SVOCs were not detected in any of the groundwater samples collected from the 12 wells. PCBs were not detected in any of the groundwater samples collected from nine wells.

3.3.5 Specific Conductance and pH

Specific conductance and pH results for surface water were evaluated in the Draft RFI Report (CH2M HILL 2005a). The RFI surface water sampling indicates no discernable difference between specific conductance or pH results collected upstream and downstream of Bat Cave Wash.

3.4 Background Water Quality

PG&E is currently implementing a background study to more completely evaluate the range of naturally-occurring metals concentrations, including Cr(VI), in groundwater in the vicinity of the Topock CMS Measures Study. The *Draft Work Plan for Assessing Background Metals Concentrations in Groundwater* (CH2M HILL 2004c) identifies the process for selecting and evaluating potential background wells in the vicinity of the Topock site, describes the sampling frequency and analytical methods for the background study, and discusses methods to be used to calculate and evaluate background concentrations of metals in groundwater. Groundwater samples are proposed to be collected during six bimonthly sampling events from pre-selected wells in the area that exhibit similar groundwater geochemistry to at the Topock site. Wells to be sampled as part of the background study will include on-site monitoring wells and off-site supply wells located in both California and Arizona.



4.0 Current Groundwater Monitoring Plan

4.1 Groundwater Monitoring Objectives

In addition to the general GMP program objectives outlined in Section 1.4, the following specific objectives are established for groundwater monitoring at the Topock site:

- Monitor for new detections of Cr(T) and Cr(VI) beyond the leading edge of the plume. These data will be used to identify the need for additional monitoring locations and the need for modifications to the interim remedial measures in operation at the site.
- Monitor for spatial and temporal changes in Cr(T) and Cr(VI) concentrations at the leading edge of the plume. These data will be used to evaluate the effectiveness of the interim remedial measures at controlling the leading edge of the chromium plume.
- Monitor changes in Cr(T) and Cr(VI) concentrations within the plume over long periods of time. These data will be used to evaluate the effectiveness of the interim remedial measures at reducing chromium concentrations in the core of the chromium plume.
- Collect data regarding concentrations of any groundwater COPCs, identified in Section 3.1, in the vicinity of the SWMUs/AOCs for which the COPCs were identified in the Draft RFI Report. These data will be used to determine if any COPC has impacted site groundwater and warrants being included as a site COC.
- Collect general chemistry data to support identification of anomalous or changing groundwater conditions and to increase the understanding of site hydrogeological processes.

4.2 Assessment and Rationale for Groundwater Monitoring

As part of preparing this updated GMP monitoring plan, groundwater data from the existing GMP program and the IM groundwater investigations were reviewed to re-assess the monitoring needs and scope for the ongoing GMP. This review included an evaluation of new monitoring wells installed during January and February 2005 for inclusion in the GMP. (Table C-1 in Appendix C summarizes well depth, monitoring interval, and sampling information for the wells in the current GMP and the new IM investigation wells installed during January and February 2005.) The monitoring needs of the GMP were also re-assessed against the groundwater monitoring objectives outlined in Section 4.1.

For all wells included in the GMP, Table 4-1 summarizes the previous sampling frequency for the GMP wells, the proposed 2005 sampling frequency, the rationale for the proposed 2005 sampling frequency, and any proposed modifications to the analytical parameters for each well.

Based on the available sampling results and the addition of several new GMP and IM wells to the GMP network, several modifications to the sampling locations and frequency for the Topock GMP are proposed at this time and are summarized in Table 4-1. The intent of the modifications proposed in this Monitoring Plan is to optimize the location and collection of water quality data in areas of new and existing wells where IM activities and remediation efforts will be focused and to ensure that the objectives of groundwater monitoring are achieved.

4.2.1 Monitoring Locations

All GMP monitoring wells previously included in the GMP will carry into the revised Monitoring Plan. In addition, new monitoring wells installed during January and February 2005 will be incorporated into the GMP as follows:

- Eleven new floodplain wells will be added to the GMP: MW-27-60, MW-27-85, MW-33-150, MW-33-210, MW-34-100, the MW-42 cluster (MW-42-30, MW-42-55, and MW-42-65), and the MW-43 cluster (MW-43-25, MW-43-75, and MW-43-90).
- Three new wells in Bat Cave Wash will be added to the GMP: MW-41S, MW-41M, and MW-41D.
- Select new IM No. 3 observation wells will be added to the GMP to provide additional areal coverage of the north-central portion of the investigation area. The OW-3 cluster (OW-3S, OW-3M, and OW-3D) will be added to the GMP.

With these additions to the GMP, the number of groundwater wells and surface water sample locations to be monitored is as follows:

- Seventy groundwater wells and nine surface water stations will be sampled quarterly.
- Thirty-five groundwater wells and nine surface water stations will be sampled monthly.
- Four groundwater wells in the floodplain will be sampled biweekly.
- Four groundwater wells will be sampled semi-annually
- Three inactive supply wells and one test well will be sampled every 2 years.

Table 4-1 identifies the wells included in the GMP.

4.2.2 Monitoring Frequency and Parameters

This section presents the rationale for monitoring frequency of selected laboratory analyses. Table 4-2 presents a summary of the groundwater sampling analyses and frequency for each monitoring well in the GMP. Table 4-3 identifies the analytical methods and reporting limits for the COCs, COPCs, and field parameters monitored in the GMP.

All monitoring wells on the floodplain will be monitored monthly, at a minimum, for Cr(T) and Cr(VI), with the exception of MW-22, which will be monitored only quarterly. Four floodplain wells that are in critical sentry locations will be monitored biweekly for Cr(T) and Cr(VI). The wells proposed for monthly or biweekly sampling are identified in Table 4-1, Table 4-2, and Figure 4-1.

Most other GMP monitoring wells will be analyzed quarterly for Cr(T) and Cr(VI). Exceptions to the quarterly monitoring are MW-16 (a background monitoring well located

upgradient of Bat Cave Wash) and the three observation wells (OW-3 cluster), which will be monitored semiannually. Table 4-1, Table 4-2, and Figure 4-1 summarize the wells to be monitored quarterly. Quarterly monitoring of the active water supply well at Park Moabi will also continue.

At the request of DTSC (2005a), quarterly sampling for the full list of CCR Title 22 metals will continue to be conducted at nine specific GMP monitoring well locations: MW-20-70, MW-20-130, MW-34-55, MW-34-80, MW-10, MW-11, MW-12, MW-25, and MW-37D.

Monitoring of inactive test well TW-1 is proposed to continue once every two years under the GMP. This well is located within the chromium plume, and biennial monitoring for COCs will serve to verify water quality in this location. Other test wells (IW-2, IW-3, TW-2D, TW-2S, and PE-1) will be monitored as part of their respective IM system monitoring programs and are not included in the GMP.

Inactive PG&E water supply wells PGE-6, PGE-7, and PGE-8 will continue to be monitored once every 2 years to verify water quality in these locations. These wells are not constructed in the manner of a groundwater monitoring well and therefore do not provide data that are correlative to data from site monitoring wells. Therefore, more frequent monitoring of these wells is not warranted.

Additional COPCs, identified in the RFI, are proposed for periodic monitoring in locations where the COPCs could have the potential to impact site groundwater. COPC analysis is currently proposed only for the selected monitoring wells that are in proximity to the SWMUs or AOCs that were identified in the Draft RFI Report as potential source areas for the COPCs. The following specific COPCs and monitoring locations are proposed:

- Specific conductance and pH. Samples from all GMP monitoring wells will be continue to be analyzed for specific conductance and pH along with COCs during quarterly sampling events. In addition to being groundwater COPCs, these two parameters serve as indicators of potential anomalies or changing groundwater conditions and therefore warrant analysis.
- TPH was identified as a groundwater COPC. TPH analysis has not been previously included in the analytical suite for the GMP. To initially assess whether TPH warrants continued inclusion as a groundwater COPC, sampling of select monitoring wells for TPH is proposed to occur semi-annually for 4 events. MW-9, MW-10, MW-11, and MW-25 are selected for TPH analysis based upon the location of these wells close to the potential source SWMUs/AOCs.
- Lead was identified as a groundwater COPC. The location of wells that are currently monitored quarterly for CCR Title 22 metals (including lead) include several wells within the vicinity of RFI SWMUs and AOC. Therefore, additional monitoring for lead as a groundwater COPC is not currently proposed.

Finally, in late February 2005, weekly sampling of selected floodplain monitoring wells was initiated at DTSC direction and in accordance with the approved IM *Contingency Plan for Sentry Well Groundwater Monitoring* (DTSC 2005b). Weekly monitoring of selected wells will occur only when required in accordance with the Contingency Plan and by the direction of DTSC.

4.3 Sampling, Analysis, and Field Procedures

Standard procedures to be used in association with GMP monitoring events are presented in the Field Procedures Manual (CH2M HILL 2005c). The Field Procedures Manual presents standardized protocol for sample collection, laboratory analysis, and other field investigation and data collection activities for the several investigation, monitoring, and interim measure programs undertaken at the Topock compressor station.

Currently, GMP samples collected for Cr(VI) and Cr(T) analysis are sent to the laboratory unpreserved and unfiltered. Filtration followed by preservation is performed in the laboratory within 12 hours of sample collection, prior to analysis. However, to evaluate whether field filtration may be preferable to laboratory filtration for quality assurance, a chromium sample filtration comparison test is being undertaken at the Topock site. The final *Work Plan for Chromium Sample Filtration Comparison Test* describes the design of the test, sampling methodology, and data evaluation (CH2M HILL 2005b). Because the groundwater matrix is highly variable over the site area, and Cr(VI) concentrations vary spatially and temporally, a carefully planned and implemented comparative test is necessary to ensure the integrity of long-term data and the achievement of data quality objectives. The findings of the comparative test will be incorporated into a subsequent revision of this Monitoring Plan. The proposed field filtering and sample preservation procedures for use in the comparative test are presented as a standard operating procedure (SOP) in the Field Procedures Manual (CH2M HILL 2005c).

GMP samples collected for all metals except Cr(VI) and Cr(T) (pending comparative filtration test results evaluation) will be field filtered and preserved as appropriate.

It should be noted that samples collected from active water supply wells (e.g., the Park Moabi well) will not be filtered in the field or in the laboratory, in accordance with California Department of Health Services guidelines for sampling of water use systems.

4.4 Water Level Measurements

Manual water level measurements will routinely be collected as part of the GMP and are taken prior to purging and sampling of monitoring wells, observation wells, and inactive water supply wells included in the GMP. Groundwater level measurements will not be obtained from active supply wells due to their construction and near constant operation.

As part of the IMs being implemented at the Topock site, transducers have been installed in many of the GMP monitoring wells. Water level data collected using these transducers is downloaded and evaluated under the IM program and is not addressed in the GMP.

In addition to the routine water level measurements taken in association with well purging, a field water level measurement survey will be conducted quarterly to collect data needed to generate and update an average shallow groundwater elevations gradient map for the site. At the beginning of each quarterly event, water levels will be measured manually in approximately 15 selected wells that monitor the upper zone of the Alluvial Aquifer and are not located in the floodplain. (The quantity and/or distribution of monitoring wells in the middle and deeper zones do not provide sufficient coverage of the site to produce a site-wide gradient assessment for these depth zones.) The wells may include MW-9, MW-10,

MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18, MW-21, MW-24A, MW-25, MW-26, MW-38S, MW-40S, and MW-41S. Water level measurements obtained by transducers during the same time period from selected wells in the floodplain and the IM No. 3 well field will be incorporated with the manual water level measurements to produce a quarterly water level dataset.

After four quarters of water level datasets are compiled, average salinity-adjusted groundwater elevations for the shallow well network will be plotted and contoured to produce an average shallow groundwater gradient map. Following two additional quarters of water level measurements, the running-average quarterly groundwater elevations will be updated, and an updated gradient map will be prepared.

4.5 Well Inspection and Maintenance

Each time a monitoring well is sampled, the well will be inspected in accordance with the well inspection and maintenance procedures presented in the Field Procedures Manual (Section 4.10). The Field Procedures Manual describes the specific items to be inspected, documentation of the inspection, and corrective action measures to be taken to ensure that monitoring wells are maintained in good operating condition.

4.6 Groundwater Monitoring Schedule

Table 4-4 presents the schedule for the 2005 Topock GMP, including approximate sampling dates.

In the event the *IM Contingency Plan for Sentry Well Groundwater Monitoring* must be implemented, weekly contingency sampling of select groundwater monitoring wells will be implemented under the GMP. The weekly contingency sampling is not shown in the schedule in Table 4-4.

TABLE 4-1

Rational for Selection of Monitoring Wells for Inclusion in 2005 GMP
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID ¹	Site Area	Well Status	Previous Sampling Frequency	Proposed 2005 Sampling Frequency	Rationale for 2005 Sampling Frequency	Proposed Modifications to Analyses
GMP Monitoring Wells						
MW-9	Bat Cave Wash	existing GMP	Q	Q		Add semi-annual analysis for TPH, an RFI groundwater COPC.
MW-10	Bat Cave Wash	existing GMP	Q	Q		Add semi-annual analysis for TPH, an RFI groundwater COPC. Full-list Title 22 metals analysis per DTSC request.
MW-11	Bat Cave Wash	existing GMP	Q	Q		Add semi-annual analysis for TPH, an RFI groundwater COPC. Full-list Title 22 metals analysis per DTSC request.
MW-12	East of Station	existing GMP	Q	Q		Full-list Title 22 metals analysis per DTSC request.
MW-13	Bat Cave Wash	existing GMP	Q	Q		
MW-14	Bat Cave Wash	existing GMP	Q	Q		
MW-15	Bat Cave Wash	existing GMP	Q	Q		
MW-16	Near New Ponds	existing GMP	A	S	Background monitoring well located upgradient of Bat Cave Wash.	
MW-17	Bat Cave Wash	existing GMP	A	Q	Background monitoring well located upgradient of Bat Cave Wash. Increase monitoring frequency to quarterly to allow for assessment of temporal trends in the western portion of the site.	
MW-18	West Mesa	existing GMP	Q	Q		
MW-19	Bat Cave Wash	existing GMP	Q	Q		
MW-20-70	MW-20 bench	existing GMP	Q	Q		Full-list Title 22 metals analysis per DTSC request.
MW-20-100	MW-20 bench	existing GMP	Q	Q		
MW-20-130	MW-20 bench	existing GMP	Q	Q		Full-list Title 22 metals analysis per DTSC request.
MW-21	East of Station	existing GMP	Q	Q		
MW-22	Floodplain	existing GMP	Q	Q		
MW-23	East of Station	existing GMP	Q	Q		
MW-24A	MW-24 Bench	existing GMP	Q	Q		
MW-24B	MW-24 Bench	existing GMP	Q	Q		
MW-24BR	MW-24 Bench	existing GMP	Q	Q		

TABLE 4-1

Rational for Selection of Monitoring Wells for Inclusion in 2005 GMP
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID ¹	Site Area	Well Status	Previous Sampling Frequency	Proposed 2005 Sampling Frequency	Rationale for 2005 Sampling Frequency	Proposed Modifications to Analyses
GMP Monitoring Wells						
MW-25	Near Bat Cave Wash	existing GMP	Q	Q		Add semi-annual analysis for TPH, an RFI groundwater COPC. Full-list Title 22 metals analysis per DTSC request.
MW-26	Near Bat Cave Wash	existing GMP	Q	Q		
MW-27-20	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-27-60	Floodplain	new IM well	---	Q - M	New monitoring well on floodplain; monthly monitoring.	
MW-27-85	Floodplain	new IM well	---	Q - M - BW	New sentry monitoring well on floodplain. Conduct frequent (biweekly) monitoring in LA near river.	
MW-28-25	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-28-90	Floodplain	existing GMP	Q - M - BW	Q - M	Floodplain sentry well. Water quality trend established; monthly monitoring sufficient.	
MW-29	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-30-30	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-30-50	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-31-60	MW-20 Bench	existing GMP	Q	Q		
MW-31-135	MW-20 Bench	existing GMP	Q	Q		
MW-32-20	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-32-35	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-33-40	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-33-90	Floodplain	existing GMP	Q - M - BW	Q - M	Floodplain sentry well. Water quality trend established; monthly monitoring sufficient.	
MW-33-150	Floodplain	new IM well	---	Q - M	New monitoring well on floodplain; monthly monitoring.	
MW-33-210	Floodplain	new IM well	---	Q - M	New monitoring well on floodplain; monthly monitoring.	
MW-34-55	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	Full-list Title 22 metals analysis per DTSC request.
MW-34-80	Floodplain	existing GMP	Q - M - BW	Q - M - BW	Floodplain sentry well; maintain frequent (biweekly) monitoring in LA near river.	Full-list Title 22 metals analysis per DTSC request.
MW-34-100	Floodplain	new IM well	---	Q - M - BW	New sentry monitoring well on floodplain. Conduct frequent (biweekly) monitoring in LA near river.	

TABLE 4-1

Rational for Selection of Monitoring Wells for Inclusion in 2005 GMP
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID ¹	Site Area	Well Status	Previous Sampling Frequency	Proposed 2005 Sampling Frequency	Rationale for 2005 Sampling Frequency	Proposed Modifications to Analyses
GMP Monitoring Wells						
MW-35-60	North Area	existing GMP	Q	Q		
MW-35-135	North Area	existing GMP	Q	Q		
MW-36-20	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-36-40	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-36-50	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-36-70	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-36-90	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-36-100	Floodplain	existing GMP	Q - M - BW	Q - M - BW	Floodplain well; maintain frequent (biweekly) monitoring in LA near river for data trends.	
MW-37D	Bat Cave Wash	existing GMP	Q	Q		Full-list Title 22 metals analysis per DTSC request.
MW-37S	Bat Cave Wash	existing GMP	Q	Q		
MW-38D	Bat Cave Wash	existing GMP	Q	Q		
MW-38S	Bat Cave Wash	existing GMP	Q	Q		
MW-39-40	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-39-50	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-39-60	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-39-70	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-39-80	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-39-100	Floodplain	existing GMP	Q - M	Q - M	Monthly monitoring of this floodplain well.	
MW-40D	I-40 Median	existing GMP	Q	Q		
MW-40S	I-40 Median	existing GMP	Q	Q		
MW-41D	Bat Cave Wash	existing GMP	Q	Q		
MW-41M	Bat Cave Wash	existing GMP	Q	Q		
MW-41S	Bat Cave Wash	existing GMP	Q	Q		
MW-42-30	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	
MW-42-55	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	

TABLE 4-1

Rational for Selection of Monitoring Wells for Inclusion in 2005 GMP
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID ¹	Site Area	Well Status	Previous Sampling Frequency	Proposed 2005 Sampling Frequency	Rationale for 2005 Sampling Frequency	Proposed Modifications to Analyses
GMP Monitoring Wells						
MW-42-65	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	
MW-43-25	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	
MW-43-75	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	
MW-43-90	Floodplain	new IM well	---	Q-M	New monitoring well on floodplain; monthly monitoring	
IM Observation Wells						
OW-3D	West Mesa	new IM investigation well	---	S	Add this IM well to GMP to provide improved areal coverage of the north-central portion of the site.	
OW-3M	West Mesa	new IM investigation well	---	S	Add this IM well to GMP to provide improved areal coverage of the north-central portion of the site.	
OW-3S	West Mesa	new IM investigation well	---	S	Add this IM well to GMP to provide improved areal coverage of the north-central portion of the site.	
Test and Extraction Wells						
TW-1	Plan B Test	idle test well	A	2A	Long-screen; 2 year sampling frequency, sufficient for verifying water quality.	
Water Supply Wells						
PGE-6	MW-24 Bench	inactive supply	2A	2A		
PGE-7	MW-24 Bench	inactive supply	2A	2A		
PGE-8	Station	inactive injection	2A	2A		
Park Moabi	Park Moabi	active supply	Q	Q		

Notes:

Proposed changes to current sampling frequency are circled.

¹ Wells being monitored under other programs are addressed in their respective monitoring plans.

Q quarterly
M monthly
BW biweekly
A annually
2A every two years
S semi-annually

LA lower alluvial aquifer

TABLE 4-2
Groundwater Sampling Analyses and Frequencies
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID	Analytical Parameters and Frequencies						
	Constituents of Concern		Constituents of Potential Concern				COIs ¹
	Hexavalent Chromium	Total Chromium	Specific Conductance	pH	Lead	Total Extractable Petroleum Hydrocarbons	Title 22 Metals
GMP Monitoring Wells							
MW-9	Q	Q	Q	Q		S	
MW-10	Q	Q	Q	Q	Q	S	Q
MW-11	Q	Q	Q	Q	Q	S	Q
MW-12	Q	Q	Q	Q	Q		Q
MW-13	Q	Q	Q	Q			
MW-14	Q	Q	Q	Q			
MW-15	Q	Q	Q	Q			
MW-16	S	S	S	S			
MW-17	Q	Q	Q	Q			
MW-18	Q	Q	Q	Q			
MW-19	Q	Q	Q	Q			
MW-20-70	Q	Q	Q	Q	Q		Q
MW-20-100	Q	Q	Q	Q			
MW-20-130	Q	Q	Q	Q	Q		Q
MW-21	Q	Q	Q	Q			
MW-22	Q	Q	Q	Q			
MW-23	Q	Q	Q	Q			
MW-24A	Q	Q	Q	Q			
MW-24B	Q	Q	Q	Q			
MW-24BR	Q	Q	Q	Q			
MW-25	Q	Q	Q	Q	Q	S	Q
MW-26	Q	Q	Q	Q			
MW-27-20	Q - M	Q - M	Q	Q			
MW-27-60	Q - M	Q - M	Q	Q			
MW-27-85	Q - M - BW	Q - M - BW	Q	Q			
MW-28-25	Q - M	Q - M	Q	Q			
MW-28-90	Q - M	Q - M	Q	Q			
MW-29	Q - M	Q - M	Q	Q			
MW-30-30	Q - M	Q - M	Q	Q			
MW-30-50	Q - M	Q - M	Q	Q			
MW-31-60	Q	Q	Q	Q			
MW-31-135	Q	Q	Q	Q			
MW-32-20	Q - M	Q - M	Q	Q			
MW-32-35	Q - M	Q - M	Q	Q			
MW-33-40	Q - M	Q - M	Q	Q			
MW-33-90	Q - M	Q - M	Q	Q			
MW-33-150	Q - M	Q - M	Q	Q			
MW-33-210	Q - M	Q - M	Q	Q			
MW-34-55	Q - M	Q - M	Q	Q	Q		Q
MW-34-80	Q - M - BW	Q - M - BW	Q	Q	Q		Q
MW-34-100	Q - M - BW	Q - M - BW	Q	Q			
MW-35-60	Q	Q	Q	Q			
MW-35-135	Q	Q	Q	Q			
MW-36-20	Q - M	Q - M	Q	Q			
MW-36-40	Q - M	Q - M	Q	Q			

TABLE 4-2
Groundwater Sampling Analyses and Frequencies
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Well ID	Analytical Parameters and Frequencies						
	Constituents of Concern		Constituents of Potential Concern				COIs ¹
	Hexavalent Chromium	Total Chromium	Specific Conductance	pH	Lead	Total Extractable Petroleum Hydrocarbons	Title 22 Metals
GMP Monitoring Wells							
MW-36-50	Q - M	Q - M	Q	Q			
MW-36-70	Q - M	Q - M	Q	Q			
MW-36-90	Q - M	Q - M	Q	Q			
MW-36-100	Q - M - BW	Q - M - BW	Q	Q			
MW-37D	Q	Q	Q	Q	Q		Q
MW-37S	Q	Q	Q	Q			
MW-38D	Q	Q	Q	Q			
MW-38S	Q	Q	Q	Q			
MW-39-40	Q - M	Q - M	Q	Q			
MW-39-50	Q - M	Q - M	Q	Q			
MW-39-60	Q - M	Q - M	Q	Q			
MW-39-70	Q - M	Q - M	Q	Q			
MW-39-80	Q - M	Q - M	Q	Q			
MW-39-100	Q - M	Q - M	Q	Q			
MW-40D	Q	Q	Q	Q			
MW-40S	Q	Q	Q	Q			
MW-41D	Q	Q	Q	Q			
MW-41M	Q	Q	Q	Q			
MW-41S	Q	Q	Q	Q			
MW-42-30	Q - M	Q - M	Q	Q			
MW-42-55	Q - M	Q - M	Q	Q			
MW-42-65	Q - M	Q - M	Q	Q			
MW-43-25	Q - M	Q - M	Q	Q			
MW-43-75	Q - M	Q - M	Q	Q			
MW-43-90	Q - M	Q - M	Q	Q			
IM Observation Wells							
OW-3D	S	S	S	S			
OW-3M	S	S	S	S			
OW-3S	S	S	S	S			
Test and Extraction Wells							
TW-1	2A	2A	2A	2A			
Water Supply Wells							
PGE-6	2A	2A	2A	2A			
PGE-7	2A	2A	2A	2A			
PGE-8	2A	2A	2A	2A			
Park Moabi	Q	Q	Q	Q			

Notes:

See Table 4-3 for list of methods and reporting limits.

¹ Constituent of Interest. Chromium is a COC and Lead is a COPC.

BW = biweekly

A = annually

M = monthly

S = semi-annually

Q = quarterly

2A = bi-annually

TABLE 4-3

Site Analytical Parameters, Test Methods, and Reporting Limits
 Monitoring Plan for Groundwater and Surface Water Monitoring Program
 PG&E Topock Compressor Station, Needles, California

Analytical Parameter	Groundwater		Surface Water		Drinking Water production wells		Drinking Water Maximum Contaminant Levels ⁴ (mg/L)
	Analytical Method	Minimum Reporting ¹ Limit	Analytical Method	Minimum Reporting ¹ Limit	Analytical Method	Minimum Reporting ¹ Limit	
Constituents of Concern (COCs)							
Chromium							
Hexavalent Chromium	SW 7196 ²	0.01	NA	---	NA	---	not established
Hexavalent Chromium	SW 7199 ³	0.0002	SW 7199 ³	0.0002	EPA 218.6	0.0002	not established
Total Chromium	SW 6010B	0.001	SW 6010B	0.001	EPA 200.7	0.001	0.05
Constituents of Potential Concern (COPCs)							
Water Quality							
pH (pH units)	EPA 150.1	0.1	EPA 150.1	0.1	EPA 150.1	0.1	6.5 - 8.5 (pH units)*
Specific conductance (µmhos/cm)	EPA 120.1	2	EPA 120.1	2	EPA 120.1	2	1600 (µmhos/cm)*
Title 22 Metals							
Lead	SW 6010B	0.005	NA	---	NA	---	not established
Total Petroleum Hydrocarbons (TPH)							
TPH-Extractable (Diesel Range)	EPA 8015M	500	---	---	---	---	not established
TPH-Extractable (Motor Oil Range)	EPA 8015M	500	---	---	---	---	not established
Constituents of Interest (COIs)							
Title 22 Metals							
Antimony	SW 6010B	0.003	NA	---	NA	---	0.006
Arsenic	SW 6010B	0.005	NA	---	NA	---	0.05
Barium	SW 6010B	0.5	NA	---	NA	---	1
Beryllium	SW 6010B	0.001	NA	---	NA	---	0.004
Cadmium	SW 6010B	0.002	NA	---	NA	---	0.005
Cobalt	SW 6010B	0.005	NA	---	NA	---	not established
Copper	SW 6010B	0.01	NA	---	NA	---	1.0*
Mercury	SW 7470A	0.0002	NA	---	NA	---	0.002
Molybdenum	SW 6010B	0.005	NA	---	NA	---	not established
Nickel	SW 6010B	0.02	NA	---	NA	---	0.1
Selenium	SW 6010B	0.005	NA	---	NA	---	0.05
Silver	SW 6010B	0.005	NA	---	NA	---	0.100*
Thallium	SW 6010B	0.001	NA	---	NA	---	0.002
Vanadium	SW 6010B	0.005	NA	---	NA	---	not established

TABLE 4-3

Site Analytical Parameters, Test Methods, and Reporting Limits
 Monitoring Plan for Groundwater and Surface Water Monitoring Program
 PG&E Topock Compressor Station, Needles, California

Analytical Parameter	Groundwater		Surface Water		Drinking Water production wells		Drinking Water Maximum Contaminant Levels ⁴ (mg/L)
	Analytical Method	Minimum Reporting ¹ Limit	Analytical Method	Minimum Reporting ¹ Limit	Analytical Method	Minimum Reporting ¹ Limit	
Constituents of Interest (COIs)							
Title 22 Metals							
Zinc	SW 6010B	0.02	NA	---	NA	---	5.0*
Field Measurements							
Field Parameters							
Temperature	Field Instrumentation		NA	---	Field Instrumentation		---
Specific Conductivity	SW 9050		NA	---	SW 9050		---
Dissolved Oxygen	Field Instrumentation		NA	---	Field Instrumentation		---
Oxidation-Reduction Potential	Field Instrumentation		NA	---	Field Instrumentation		---
pH	SW 9040		NA	---	SW 9040		---
Turbidity	EPA 180.1		NA	---	EPA 180.1		---

Notes:

¹ Minimum reporting limit for undiluted samples. Reporting limits are increased when sample dilution is required.

² Method SW 7196A is used for samples collected from monitoring wells where prior monitoring has detected hexavalent chromium [Cr(VI)] concentrations above 0.010 milligrams per liter (mg/L). The minimum reporting limit for Method 7196A for undiluted samples is 0.010 mg/L. If hexavalent chromium concentrations at a given well drop below the MRL for two consecutive sampling events, samples from the well will be analyzed by Method 7199 during future events.

³ Method SW 7199 is used for all surface water samples and all groundwater samples collected from monitoring wells where prior monitoring has not detected Cr(VI) concentrations above 0.010 mg/L.

⁴ Drinking water maximum contaminant levels (MCLs) listed are California primary MCLs.

* secondary MCL

TABLE 4-4

Summary Schedule for 2005 Monitoring Activities

Monitoring Plan for Groundwater and Surface Water Monitoring Program

PG&E Topock Compressor Station, Needles, California

Month 2005	Week/Dates	Monitoring Event	Event Type	Notes
January	1/10/2005 1/25/2005	2005-051-M01 2005-052-W04	M BW	Resample for 4th quarter 2004 event.
February	2/7/2005 2/14/2005 2/23/2005	2005-053-M02 2005-MW-27-confirm 2005-054-W08	M W BW	Confirmation sampling. Instituted weekly sampling under Contingency Plan.
March	3/1/2005 3/7/2005 3/13/2005 3/22/2005 3/29/2005	2005-055-W09 2005-056-Q1 IM1-2005-057 2005-058-W12 2005-059-W13	W Q W BW W	Week 2 contingency sampling. Week 3 contingency sampling. Chromium filtration test round 1. Week 4 contingency sampling. Week 5 contingency sampling. Week 6 contingency sampling.
April	4/4/2005 4/12/2005 4/19/2005	2005-060-M04 2005-061-W15 2005-062-W16	M W BW	Chromium filtration test round 2.
May	5/2/2005 5/17/2005 5/31/2005	2005-063-M05 2005-064-W20 2005-065-W22	M BW BW	
June	6/13/2005 6/28/2005	2005-066-S1 2005-067-W26	A BW	Annual event includes quarterly and semi-annual sampling.
July	7/11/2005 7/25/2005	2005-068-M07 2005-069-W30	M BW	
August	8/8/2005 8/22/2005	2005-070-M08 2005-071-W34	M BW	
September	9/5/2005 9/19/2005	2005-072-W36 2005-073-Q3	BW Q	
October	10/3/2005 10/17/2005	2005-074-M10 2005-075-W	M BW	
November	10/31/2005 11/14/2005 11/28/2005	2005-076-M11 2005-077-W46 2005-078-W48	M BW BW	
December	12/12/2005 12/27/2005	2005-079-S2 2005-080-W52	S BW	Semi-annual event includes quarterly sampling.

Notes:

M = monthly

Q = quarterly

W = weekly

BW = biweekly

S = semi-annually

A = annually

Sampling events through April 4, 2005 have been completed

Sampling events from April 4 through December 26, 2005 are scheduled and subject to change

5.0 Current Surface Water Monitoring Plan

5.1 Monitoring Objectives

Surface water monitoring is an important component of the Topock GMP. In addition to the general GMP program objectives outlined in Section 1.4, the following are specific objectives established for surface water monitoring at the Topock site:

- Monitor surface water locations both upgradient and downgradient of the Topock site for concentrations of site COCs.
- Collect general water quality data for surface water locations adjacent to the Topock site. The general water quality parameters of pH and specific conductance, which are considered COPCs under the GMP, will be used to evaluate the hydraulic relationship between site groundwater and the surface water body (Colorado River).
- Collect manual river level elevation data periodically to verify the river gauge data collected under the IM PMP activity using transducers. Collection and evaluation of transducer measurements are not part of the GMP.

5.2 Assessment and Rationale for Surface Water Monitoring

5.2.1 Monitoring Locations

Nine surface water stations were previously established to facilitate collection of surface water samples both upstream and downstream of the Topock site. These stations are shown in Figure 4-1. All nine previously established surface water stations will carry into this revised GMP Monitoring Plan.

5.2.2 Monitoring Frequency

Surface water samples are collected on monthly and quarterly frequencies. The site COCs Cr(T) and Cr(VI) are analyzed monthly at all surface water stations. Specific conductance and pH, both COPCs, are monitored quarterly at all surface water stations. Table 5-1 summarizes the surface water monitoring frequency and analyses.

In late February 2005, weekly sampling at three of the surface water stations (CON, R-27, and R-28) was conducted for four consecutive weeks. This sampling was conducted at the direction of DTSC at the same time the weekly contingency sampling of groundwater monitoring wells was implemented in accordance with the IM *Contingency Plan for Sentry Well Groundwater Monitoring* (DTSC 2005b). Weekly sampling of surface water will occur only when specifically requested by the DTSC.

5.2.3 Monitoring Parameters

Table 5-1 presents a summary of the surface water sampling analyses and frequency for each surface water station in the GMP. Table 4-3 identifies the analytical methods and reporting limits for the GMP COCs, COPCs, COIs, and field parameters.

Monitoring at each surface water station includes the measurement of field parameters using field instrumentation. Surface water is monitored for temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, pH, and turbidity, using field instrumentation, as described in the Field Procedures Manual (CH2M HILL 2005c).

As part of the IMs being implemented at the Topock site, transducers have been installed at select river gauge stations. Water level data collected using these transducers is downloaded and evaluated under the IM program and is not addressed in the GMP.

Manual surface water level measurements are also routinely collected at three of the surface water stations (RRB, A-Dock, and I-3; other stations as required) as part of the GMP to confirm transducer measurements. Water level measurements are collected as described in the Field Procedures Manual (CH2M HILL 2005c).

5.3 Sampling, Analysis, and Field Procedures

Standard procedures to be used in association with GMP monitoring events are presented in the Field Procedures Manual (CH2M HILL 2005c). The Field Procedures Manual presents standardized protocol for sample collection, laboratory analysis, and other field investigation and data collection activities for the several investigation, monitoring, and interim measure programs performed at the Topock Compressor Station.

Currently, GMP samples collected for Cr(VI) and Cr(T) analysis are sent to the laboratory unpreserved and unfiltered. Filtration followed by preservation is performed in the laboratory within 12 hours of sample collection, prior to analysis. However, to evaluate whether field filtration may be preferable to laboratory filtration for quality assurance, a chromium sample filtration comparison test is being performed at the Topock site. The final *Work Plan for Chromium Sample Filtration Comparison Test* describes the design of the test, sampling methodology, and data evaluation (CH2M HILL 2005b). Although the filtration comparison test addresses only groundwater samples, the findings of the comparative test will be evaluated for applicability to both groundwater and surface water sampling, and recommendations will be incorporated into the subsequent revision of this Monitoring Plan. The proposed field filtering and sample preservation procedures for use in the comparative test are presented as a Standard Operating Procedure in the Field Procedures Manual.

GMP samples collected for all metals except Cr(VI) and Cr(T) (pending comparative filtration test results evaluation) will be field filtered and preserved in accordance with the Field Procedures Manual.

The sampling procedure currently in use at the Topock site calls for collection of surface water samples from approximately 6 inches below the water surface, as outlined in the Field Procedures Manual (CH2M HILL 2005c). The DTSC is presently evaluating the collection of depth-specific surface water samples. The TWG is being asked to discuss whether collection of depth-specific surface water samples would allow surface water sampling objectives to be

better achieved. Depending upon the outcome of the TWG discussions, the surface water sampling procedure currently in use may be subject to revision, which could include modification of the quantity and/or location of surface water sample locations and/or modification of the methodology for collection of surface water samples. The subsequent revision to this GMP Monitoring Plan (Revision 1, to be submitted in May 2005), will reflect any revisions to the surface water sampling procedure.

5.4 Surface Water Monitoring Schedule

Table 4-4 presents the schedule for the 2005 Topock GMP, including approximate sampling dates.

TABLE 5-1
 Surface Water Sampling Analyses and Frequencies
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

	Analytical Parameters and Frequencies			
Well ID	Hexavalent Chromium	Total Chromium	Specific Conductance	pH
Surface Water				
CON	Q - M	Q - M	Q	Q
I-3	Q - M	Q - M	Q	Q
NR-1	Q - M	Q - M	Q	Q
NR-2	Q - M	Q - M	Q	Q
NR-3	Q - M	Q - M	Q	Q
R-22	Q - M	Q - M	Q	Q
R-27	Q - M	Q - M	Q	Q
R-28	Q - M	Q - M	Q	Q
RRB	Q - M	Q - M	Q	Q

Notes:

See Table 4-3 for list of methods and reporting limits.

M = monthly

Q = quarterly

6.0 Quality Control and Data Management

Quality control procedures will be implemented for both field activities and laboratory work associated with the GMP. Detailed descriptions of quality control procedures specific to water quality sampling and analysis at the Topock site are provided in the *Quality Assurance Project Plan for Water Quality Sampling and Analysis* (Appendix D of the Topock Field Procedures Manual; CH2M HILL 2005c).

6.1 Field Quality Control

The QAPP presents requirements for field quality control sampling and sample handling and custody procedures to be implemented in the field.

6.2 Laboratory Quality Control

The QAPP outlines quality control requirements for laboratory analyses to be conducted under the GMP. The QAPP addresses data quality objectives; method detection limits, reporting limits, and instrument calibration requirements; laboratory quality control samples; laboratory data management procedures; performance evaluations; preventive maintenance; corrective action; and quality assurance reports.

6.3 Data Validation

The analytical results of groundwater and surface water samples will be evaluated to verify whether the data are sufficiently accurate, precise, and representative of site conditions for decision-making purposes in support of ongoing site investigation and remediation activities. Details regarding data validation for the Topock GMP are provided in the QAPP.

6.4 Data Management

Management of data generated from the Topock GMP will be conducted in accordance with the *PG&E Program Data Management Plan* (CH2M HILL 2004g). The Data Management Plan outlines standardized procedures for field data collection and review, analytical data loading into the information system (environmental database), verification of the uploaded data, quality assurance/quality control procedures associated with data management, and reporting formats.

7.0 Reporting

Reporting conducted as part of the Topock GMP includes the preparation of quarterly groundwater and surface water monitoring reports and monthly/weekly well sampling data transmittals.

7.1 Quarterly Monitoring Reports

Groundwater and surface water monitoring reports are generated quarterly for the GMP according to the following schedule:

- First Quarter monitoring period: report issued May
- Second Quarter monitoring period: report issued August
- Third Quarter monitoring period: report issued November
- Fourth Quarter monitoring period: report issued February

The quarterly report summarizes all sampling activities that occurred within the specified quarter. Analytical data from that quarter, as well as historic analytical data, are summarized in tabular format. The analytical results of the quarterly sampling event are also presented graphically. The graphical depiction of the quarterly data includes an isoconcentration line delineating the approximate extent of Cr(VI) concentrations above 0.05 mg/L, the California MCL for Cr(T). Field documentation will be included in the report.

7.2 Annual Monitoring Report

In order to support periodic reevaluation of the GMP, the Fourth Quarter monitoring report will include additional data presentation, such as presentation of COC distribution and concentration trends, monitoring well hydrographs, and the updated average shallow groundwater elevation map.

7.3 Floodplain Wells Monitoring Results Transmittals

Selected monitoring wells in the floodplain area are currently sampled monthly and weekly (Section 4.0). Validated analytical laboratory and field data from these monitoring events are compiled and presented in tabular sampling results reports. The monthly/weekly sampling results data reports are transmitted to the DTSC and the project stakeholders approximately monthly. These floodplain data are then evaluated as part of the IM floodplain monitoring program.

7.4 Program Data Reporting

Data reports for all wells in the GMP will occasionally be prepared to provide project stakeholders with a comprehensive update of groundwater quality data. A full report of

analytical results for all GMP wells will be produced as needed, anticipated to occur approximately once every 2 months.

8.0 References

- CH2M HILL. 2004a. *Sampling and Analysis Plan, Groundwater and Surface Water Monitoring, PG&E Topock Compressor Station, Needles, California*. July 14.
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- _____. 2004d. *PG&E Program Quality Assurance Project Plan*. November.
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- _____. 2005a. *Draft RCRA Facility Investigation and Remedial Investigation Report*. February.
- _____. 2005b. Technical Memorandum. "Final Work Plan for Chromium Sample Filtration Comparison Test, Pacific Gas and Electric Company, Topock Project." March 4.
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- _____. 2005e. *Groundwater and Surface Water Monitoring Report, Fourth Quarter 2004, PG&E Topock Compressor Station, Needles, California*. March 24.
- Department of Toxic Substances Control (DTSC). 1996. *Corrective Action Consent Agreement (Revised), Pacific Gas and Electric Company's Topock Compressor Station, Needles, California (EPA Identification No. CAT080011729)*. February 2.
- _____. 2004. Letter to PG&E. "Notification of Required Weekly Sampling and Analysis of Monitoring Well MW-33-90 and Submission of a Revised Water Quality Sampling and Analysis Plan, Pacific Gas & Electric Company, Topock Compressor Station, Needles, California." May 3.
- _____. 2005a. Letter to PG&E. "Sampling and Analysis Plan, Groundwater and Surface Water Monitoring, Dated July 14, 2004, Pacific Gas and Electric Company, Topock Compressor Station, Needles, California (EPA ID No. CAT080011729)." January 25.

- _____. 2005b. Letter to PG&E. "Criteria for Evaluating Interim Measures Performance Requirements to Hydraulically Contain Chromium Plume in Floodplain Area, Pacific Gas and Electric Company, Topock Compressor Station, Needles, California (EPA ID No. CAT080011729)." February 14.
- _____. 2005c. Letter to PG&E. "Response to Elevated Levels of Hexavalent and Total Chromium Concentrations Reported in Newly Installed Monitoring Well MW-34-100 at Pacific Gas and Electric Company, Topock Compressor Station, Needles, California (EPA ID No. CAT080011729)." February 16.

Appendix A

Project Organization and Contacts

Project Organization and Contacts

The Topock Groundwater and Surface Water Monitoring Program (GMP) is being performed for Pacific Gas and Electric Company (PG&E) by CH2M HILL. The GMP is part of a RCRA Facility Investigation (RFI) being performed at the PG&E Topock Compressor Station under a Corrective Action Consent Agreement issued in 1996 by the California Department of Toxic Substances Control (DTSC). The Topock Compressor Station is located in eastern San Bernardino County, 15 miles southeast of the city of Needles, California.

This section identifies and describes the responsibilities of key project positions related to project management, field task management, quality assurance/quality control (QA/QC) management, and data management. Contact information for the CH2M HILL staff is provided in Table A-1.

A.1 Project Manager

The CH2M HILL Project Manager (PM) for the GMP is responsible for:

- Development of the project.
- Technical oversight of groundwater and surface water monitoring and sampling.
- Overall project QA.
- Interfacing with the client, the program manager, and other project staff as needed to support development of the technical approach to GMP issues.
- After independent QA review by a senior review team, the PM and the senior review team will identify the appropriate corrective action to be initiated when QA problems or deficiencies requiring special action are uncovered.

The current CH2M HILL Project Manager for the Topock GMP is Paul Bertucci. He is assisted by the CH2M HILL Project Manager of Record, Ellen Hedfield, who is responsible for the following aspects of GMP project management:

- Implementation of the GMP in accordance with the technical direction provided by the PM and the senior review team.
- Schedule, financial, technical status, and contract management.
- Daily coordination of the GMP project team, including the Field Task Manager, the Reporting Task Manager, the Project Chemist, the Validation Task Manager, and the Data Manager.

A.2 Field Task Manager

The Field Task Manager for the GMP is responsible for:

- Coordinating field sampling schedules.

- Coordinating the organization of the field team and preparation for field activities.
- Developing event-specific field forms used to guide field sampling staff, and compiling sampling binders.
- Distributing sampling event information to the field team and ensuring the field team members understand the specific scope of work to be accomplished during the field effort.
- Notifying laboratory of pending sampling and coordinating courier service for pickup and delivery of collected samples.
- Coordinating CH2M Hill field personnel, subcontractors, and equipment at the site.
- Ensuring proper training of field personnel.
- Maintaining communication with the Project Chemist and laboratory staff regarding scheduled sampling events and coordinating delivery of samples to the laboratory.
- Management of project tasks associated with sampling, general QA oversight of field personnel in sampling activities, coordination of sample collection, and coordinating sample submittal to the analytical lab.
- Collecting and reviewing for completeness all field task related documents, and archiving the documents in the project file.
- Coordinating with field personnel, the Project Chemist, and the Data Manager to facilitate data transfer to the project database.

The current Field Task Manager for the GMP is Matt Ringier.

A.3 Reporting Task Manager

The Reporting Task Manager for the GMP is responsible for:

- Developing report preparation schedules, and planning and coordinating the report preparation effort.
- Coordinating with the Project Chemist and the Validation Task Manager to identify and prioritize data deliverable and validation requirements to ensure that validated data is available to support report preparation.
- Coordinating with the Data Manager to develop required data tables for report submittals.
- Coordinating with GIS staff to develop required figures for report submittals.
- Contributing to the preparation of GMP reports and coordinating the contributions of other GMP and senior technical staff.
- Performing QC review of report submittals.

The current Reporting Task Manager for the GMP is Serena Lee.

A.4 Validation Task Manager

The Validation Task Manager for the GMP is responsible for:

- Identifying and resolving any anomalies or out of control events that arise during the analysis of samples.
- Interpreting field and laboratory data quality issues and developing recommendations for appropriate data usability.
- Coordinating validation of the analytical data.
- Preparing data validation reports and memoranda.
- Performing quality audits and surveillance, preparation of QA reports, and implementation of QC activities and suggesting corrective actions, as necessary.

The current Validation Task Manager for the GMP is Dan Moore.

A.5 Project Chemist

The Project Chemist for the Topock GMP is responsible for:

- Approving and maintaining adherence to QA/QC requirements specified in this Monitoring Plan, the Field Procedures Manual, and the QAPP for Water Quality Sampling and Analysis.
- Providing guidance regarding environmental analytical chemistry methodologies and QC procedures applicable to environmental analytical chemistry.
- Managing project tasks associated with coordination of sample collection and analysis with the Field Task Manager acting as liaison between the Field Task Manager and contract laboratories.
- Managing sample tracking, sample analysis, and data reporting from the laboratory.
- Assisting the Project Manager of Record in preparation of laboratory purchase requests and verification of laboratory billings.
- Communicating QA/QC issues to the PM and Field Task Manager.
- Providing input into resolution of any anomalies or out of control events that arise during the analysis of samples.

The current Project Chemist for the GMP is Shawn Duffy.

A.6 Data Manager

The Data Manager for the GMP is responsible for:

- Overall management and control of all analytical and field data that will be used for decision-making and project reporting purposes.
- Coordinating with the Field Task Manager and the Project Chemist to facilitate data transfer into the project database.

- Coordinating with the Reporting Task Manager regarding the output of data from the database to the data users (e.g., PM and technical staff) and providing QC for all data outputs.

The current Data Manager for the GMP is Tuesdai Powers.

A.7 Site Safety and Health Manager

The site Safety and Health Manager for the Topock GMP is responsible for:

- Site safety and health for CH2M HILL and subcontractor personnel working on the project.
- Implementation of CH2M HILL's site-specific Health and Safety Plan, contractor safety, and training.

The current site Safety and Health Manager is Rick Caviel.

A.8 Field Sampling Team

The Field Team Leader is responsible for:

- Holding daily meetings with the field team to discuss sample handling and event-specific requirements.
- Conducting tailgate safety meetings.
- At the end of each sampling day, reviewing with the field team the samples collected against the planned sampling table to ensure samples were collected, filtered or preserved (as applicable), and labeled accurately.
- Reviewing sampling records at the end of each sampling day to ensure completeness of the records.

Members of the GMP Field Sampling Team are responsible for:

- Reading and understanding the Monitoring Plan and the applicable sections of the Sampling, Analysis, and Field Procedures Manual; signing the Employee Signoff Form acknowledging they have read the Field Procedures Manual.
- Reading and acknowledging the health and safety plan.
- Reviewing and understanding the sampling requirements, as outlined in the planned sampling table, for each specific sampling event.
- Conducting field sampling in accordance with the event-specific planned sampling table, the Monitoring Plan, and the Field Procedures Manual; documenting any field variances or unusual conditions in field notes and sampling logs.
- Fully completing all field notes and sampling logs daily.

TABLE A-1
Key Project Staff
PG&E Topock Groundwater & Surface Water Monitoring Program

Title	Name/Address	Phone	Fax	Email
Project Manager	Paul Bertucci 155 Grand Ave, Suite 1000 Oakland, CA 94612	510-587-7629	510-622-9629	pbertucc@ch2m.com
Project Manager of Record	Ellen Hedfield 2525 Airpark Drive Redding, CA 96001	530-229-3319	530-339-3319	ehedfiel@ch2m.com
Field Task Manager	Matt Ringier 155 Grand Ave, Suite 1000 Oakland, CA 94612	510-587-7510	510-622-9210	mringier@ch2m.com
Reporting Task Manager	Serena Lee 155 Grand Ave, Suite 1000 Oakland, CA 94612	510-587-7525	510-251-2426	slee4@ch2m.com
Validation Task Manager	Dan Moore 6001 Indian School Rd N.E. Suite 350 Albuquerque, NM 87110	505-855-5235	505-883-7507	dmoore4@ch2m.com
Project Chemist	Shawn Duffy 2525 Airpark Drive Redding, CA 96001	530-229-3303	530-339-3303	sduffy@ch2m.com
Data Manager	Tuesdai Powers 155 Grand Ave, Suite 1000 Oakland, CA 94612	510-587-7595	510-622-9595	tpowers@ch2m.com
Health and Safety Manager	Rick Cavil 1737 North First Street Suite 300 San Jose, CA 95112	408-436-4909 ext. 429	408-436-4829	rcavil@ch2m.com

Appendix B
Summary of Chromium and Site COC Sampling
Results, 1997-2004

TABLE B-1
Summary of Groundwater Results
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

			Cr(VI) Sampling Summary ¹⁻⁻ through February, 2005				
Well ID	Site Area	Monitored Zone	Number of Sampling Events	Number of Events Cr (VI) Detected	Minimum Cr(VI) Concentration (mg/L)	Maximum Cr(VI) Concentration (mg/L)	
GMP Monitoring Wells							
MW-9	Bat Cave Wash	UA	26	26	0.265	0.402	
MW-10	Bat Cave Wash	UA	26	26	0.867	3.47	
MW-11	Bat Cave Wash	UA	26	26	0.02	1.71	
MW-12	East of Station	UA	25	25	0.311	1.56	
MW-13	Bat Cave Wash	UA	26	24	0.01	0.028	
MW-14	Bat Cave Wash	UA	25	24	0.01	0.099	
MW-15	Bat Cave Wash	UA	24	16	0.0077	0.05	
MW-16	Near New Ponds	UA	22	15	0.009	0.03	
MW-17	Bat Cave Wash	UA	19	6	0.0023	0.0127	
MW-18	West Mesa	UA	24	23	0.02	0.0461	
MW-19	Bat Cave Wash	UA	23	23	0.557	0.966	
MW-20-70	MW-20 bench	UA	26	26	6.78	13.2	
MW-20-100	MW-20 bench	MA	25	25	1.35	8.13	
MW-20-130	MW-20 bench	LA	25	25	2.74	8.60	
MW-21	East of Station	UA	30	1	0.02	0.02	
MW-22	Floodplain	UA	25	0*	ND (0.0002)	ND (0.01)	
MW-23	East of Station	MC	24	4	0.0011	0.0101	
MW-24A	MW-24 Bench	UA	24	24	2.44	3.87	
MW-24B	MW-24 Bench	LA	24	24	0.741	5.26	
MW-24BR	MW-24 Bench	BR	24	1	0.302	0.346	
MW-25	Near Bat Cave Wash	UA	23	23	1.97	2.98	
MW-26	Near Bat Cave Wash	UA	25	24	0.759	4.06	
MW-27-20	Floodplain	UA	59	0*	ND (0.0002)	ND (0.01)	
MW-27-60	Floodplain	MA	1	0*	ND (0.001)	ND (0.001)	
MW-27-85	Floodplain	LA	3	0*	ND (0.001)	ND (0.002)	
MW-28-25	Floodplain	UA	59	0*	ND (0.0002)	ND (0.01)	
MW-28-90	Floodplain	LA	16	0*	ND (0.0002)	ND (0.001)	
MW-29	Floodplain	UA	34	0*	ND (0.0002)	ND (0.01)	
MW-30-30	Floodplain	UA	57	0*	ND (0.001)	ND (0.01)	
MW-30-50	Floodplain	MA	41	32	0.0262	3.76	
MW-31-60	MW-20 Bench	UA	26	26	2.91	4.52	
MW-31-135	MW-20 Bench	LA	4	4	0.266	0.41	
MW-32-20	Floodplain	UA	21	0*	ND (0.0002)	ND (0.01)	
MW-32-35	Floodplain	MA	21	0*	ND (0.0002)	ND (0.01)	
MW-33-40	Floodplain	UA	19	0*	ND (0.0002)	ND (0.01)	
MW-33-90	Floodplain	MA	38	33	0.012	0.0202	
MW-33-150	Floodplain	LA	2	0*	ND (0.0002)	ND (0.001)	
MW-33-210	Floodplain	LA	1	0*	ND (0.001)	ND (0.001)	
MW-34-55	Floodplain	MA	41	0*	ND (0.0002)	ND (0.01)	
MW-34-80	Floodplain	LA	50	13	0.00084	0.111	
MW-34-100	Floodplain	LA	3	3	0.354	0.417	
MW-35-60	North Area	UA	4	4	0.0048	0.0275	
MW-35-135	North Area	LA	4	3	0.0076	0.0157	
MW-36-20	Floodplain	UA	8	1	0.0026	0.0026	

TABLE B-1
Summary of Groundwater Results
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

			Cr(VI) Sampling Summary ¹⁻⁻ through February, 2005				
Well ID	Site Area	Monitored Zone	Number of Sampling Events	Number of Events Cr (VI) Detected	Minimum Cr(VI) Concentration (mg/L)	Maximum Cr(VI) Concentration (mg/L)	
GMP Monitoring Wells							
MW-36-40	Floodplain	UA	8	0*	ND (0.0002)	ND (0.001)	
MW-36-50	Floodplain	MA	8	0*	ND (0.0002)	ND (0.001)	
MW-36-70	Floodplain	MA	8	0*	ND (0.0002)	ND (0.001)	
MW-36-90	Floodplain	LA	8	8	1.72	3.66	
MW-36-100	Floodplain	LA	16	16	1.39	2.98	
MW-37D	Bat Cave Wash	LA	4	4	0.93	1.48	
MW-37S	Bat Cave Wash	MA	4	4	0.0018	0.0075	
MW-38D	Bat Cave Wash	LA	4	4	0.0331	0.279	
MW-38S	Bat Cave Wash	UA	4	4	0.332	0.964	
MW-39-40	Floodplain	UA	8	0*	ND (0.0002)	ND (0.001)	
MW-39-50	Floodplain	UA	8	8	0.819	4.14	
MW-39-60	Floodplain	MA	8	8	1.64	3.81	
MW-39-70	Floodplain	MA	8	8	5.04	8.21	
MW-39-80	Floodplain	LA	8	8	7.75	10.9	
MW-39-100	Floodplain	LA	9	9	9.18	12.9	
MW-40D	I-40 Median	LA	4	4	0.0256	0.0385	
MW-40S	I-40 Median	UA	4	4	0.0021	0.0082	
MW-41D	Bat Cave Wash	LA	2	0*	ND (0.001)	ND (0.002)	
MW-41M	Bat Cave Wash	MA	2	2	0.0041	0.0053	
MW-41S	Bat Cave Wash	UA	2	2	0.0074	0.0118	
MW-42-30	Floodplain	UA	1	0*	ND (0.001)	ND (0.001)	
MW-42-55	Floodplain	MA	1	0*	ND (0.001)	ND (0.001)	
MW-42-65	Floodplain	LA	2	0*	ND (0.001)	ND (0.001)	
MW-43-25	Floodplain	UA	2	0*	ND (0.0002)	ND (0.0002)	
MW-43-75	Floodplain	LA	2	0*	ND (0.001)	ND (0.001)	
MW-43-90	Floodplain	LA	2	0*	ND (0.001)	ND (0.001)	
IM Compliance Wells							
CW-1D	East Mesa	LA	2	0*	ND (0.001)	ND (0.001)	
CW-1M	East Mesa	MA	2	2	0.0134	0.0149	
CW-2D	East Mesa	LA	2	0*	ND (0.001)	ND (0.001)	
CW-2M	East Mesa	MA	2	2	0.013	0.0146	
CW-3D	East Mesa	LA	2	0*	ND (0.001)	ND (0.001)	
CW-3M	East Mesa	MA	2	2	0.0057	0.0063	
CW-4D	East Mesa	LA	2	0*	ND (0.001)	ND (0.001)	
CW-4M	East Mesa	MA	2	2	0.0111	0.0156	
IM Observation Wells							
OW-1D	East Mesa	LA	3	0*	ND (0.001)	ND (0.002)	
OW-1M	East Mesa	MA	3	3	0.0075	0.0097	
OW-1S	East Mesa	UA	1	1	0.0049	0.0049	
OW-2D	East Mesa	LA	1	0*	ND (0.001)	ND (0.001)	
OW-2M	East Mesa	MA	1	1	0.0023	0.0023	
OW-2S	East Mesa	UA	1	0*	ND (0.0002)	ND (0.0002)	
OW-3D	West Mesa	LA	3	0*	ND (0.0002)	ND (0.0002)	

TABLE B-1
Summary of Groundwater Results
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

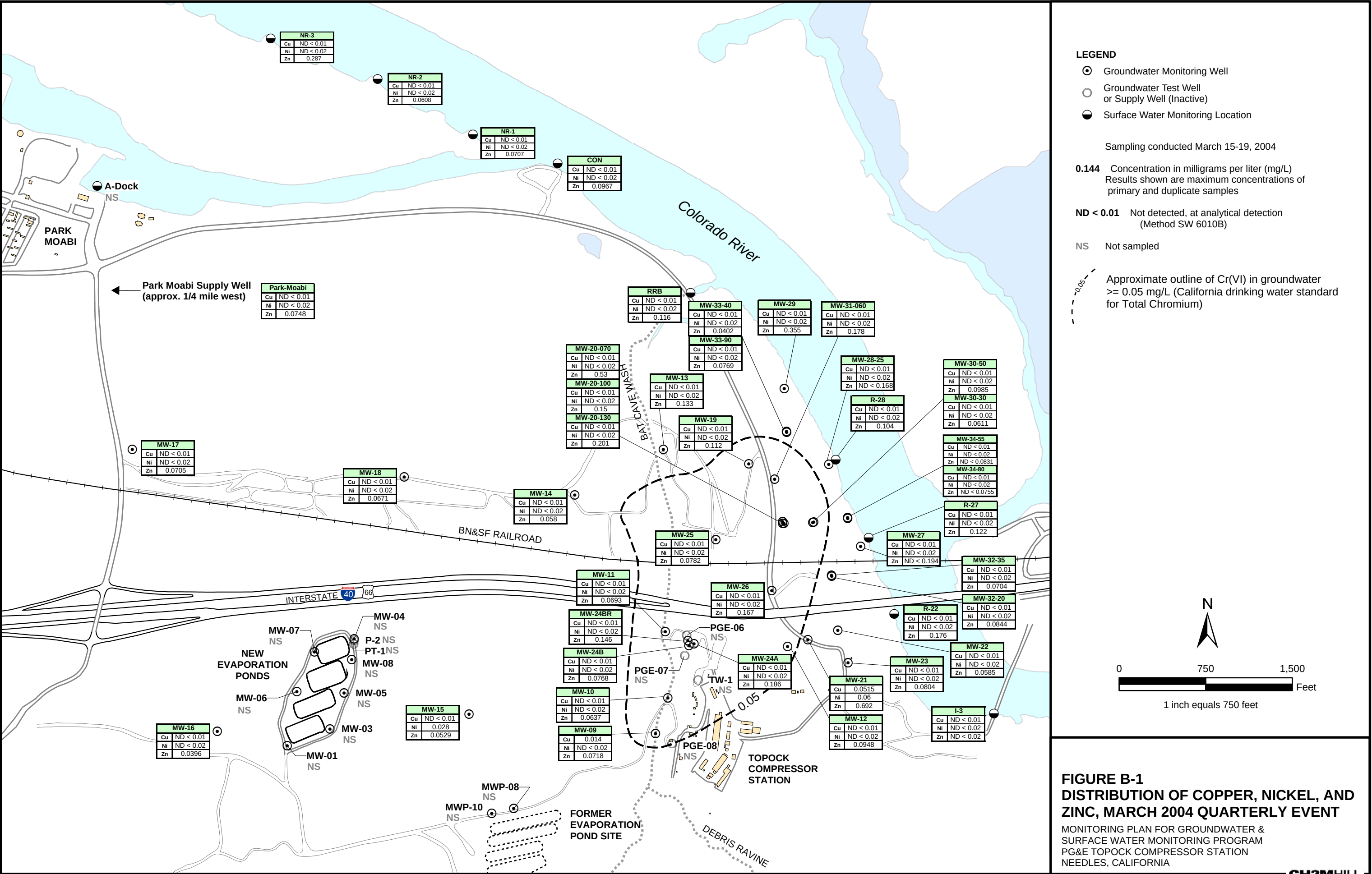
			Cr(VI) Sampling Summary ¹⁻⁻ through February, 2005				
Well ID	Site Area	Monitored Zone	Number of Sampling Events	Number of Events Cr (VI) Detected	Minimum Cr(VI) Concentration (mg/L)	Maximum Cr(VI) Concentration (mg/L)	
IM Observation Wells							
OW-3M	West Mesa	MA	3	3	0.0103	0.0157	
OW-3S	West Mesa	UA	3	3	0.0135	0.0177	
OW-5D	East Mesa	LA	1	0*	ND (0.0002)	ND (0.0002)	
OW-5M	East Mesa	MA	1	1	0.008	0.008	
OW-5S	East Mesa	UA	1	1	0.0326	0.0326	
Other Site Wells not in GMP							
MW-1	New Ponds	UA	3	1	0.0045	0.0046	
MW-3	New Ponds	UA	3	3	0.01	0.0117	
MW-4	New Ponds	UA	3	3	0.02	0.022	
MW-5	New Ponds	UA	3	3	0.01	0.02	
MW-6	New Ponds	UA	3	3	0.009	0.01	
MW-7	New Ponds	UA	3	3	0.01	0.0159	
MW-8	New Ponds	UA	3	3	0.02	0.0509	
MWP-8	Old Ponds			0*	ND ()	ND ()	
MWP-10	Old Ponds			0*	ND ()	ND ()	
MWP-12	Old Ponds	LA-BR	1	1	0.00024	0.00024	
P-2	New Ponds			0*	ND ()	ND ()	
PGE-9N				0*	ND ()	ND ()	
PGE-9S				0*	ND ()	ND ()	
Surface Water							
CON	Surface Water		41	0*	ND (0.0002)	ND (0.01)	
I-3	Surface Water		37	0*	ND (0.0002)	ND (0.01)	
NR-1	Surface Water		15	0*	ND ()	ND ()	
NR-2	Surface Water		15	0*	ND ()	ND ()	
NR-3	Surface Water		13	0*	ND ()	ND ()	
R-22	Surface Water		34	0*	ND ()	ND ()	
R-27	Surface Water		36	0*	ND ()	ND ()	
R-28	Surface Water		34	0*	ND ()	ND ()	
RRB	Surface Water		32	0*	ND (0.0002)	ND (0.01)	
Test and Extraction Wells							
IW-2	East Mesa	MA-LA	1	1	0.002	0.0064	
IW-3	East Mesa	UA		0*	ND ()	ND ()	
PE-1	Floodplain			0*	ND ()	ND ()	
TW-1	Plan B Test	UA-LA	4	4	0.00055	7.52	
TW-2D	MW-20 bench	LA	5	5	0.0545	8.07	
TW-2S	MW-20 bench	UA	5	5	5.08	8.31	
Water Supply Wells							
PGE-6	MW-24 Bench	MA	16	11	0.16	3.10	
PGE-7	MW-24 Bench	LA-BR	14	14	0.827	5.40	
PGE-8	Station	BR	15	0*	ND (0.0002)	ND (0.01)	
Park Moabi	Park Moabi	MA	23	4	0.00028	0.0094	

TABLE B-1
Summary of Groundwater Results
Monitoring Plan for Groundwater and Surface Water Monitoring Program
PG&E Topock Compressor Station, Needles, California

Notes:

¹ Groundwater sampling data through February 2005 except MW-43 cluster and MW-33-150, sampling data through March 2005.

UA upper alluvial aquifer
MA middle alluvial aquifer
LA lower alluvial aquifer
BR metamorphic bedrock
MC miocene conglomerate



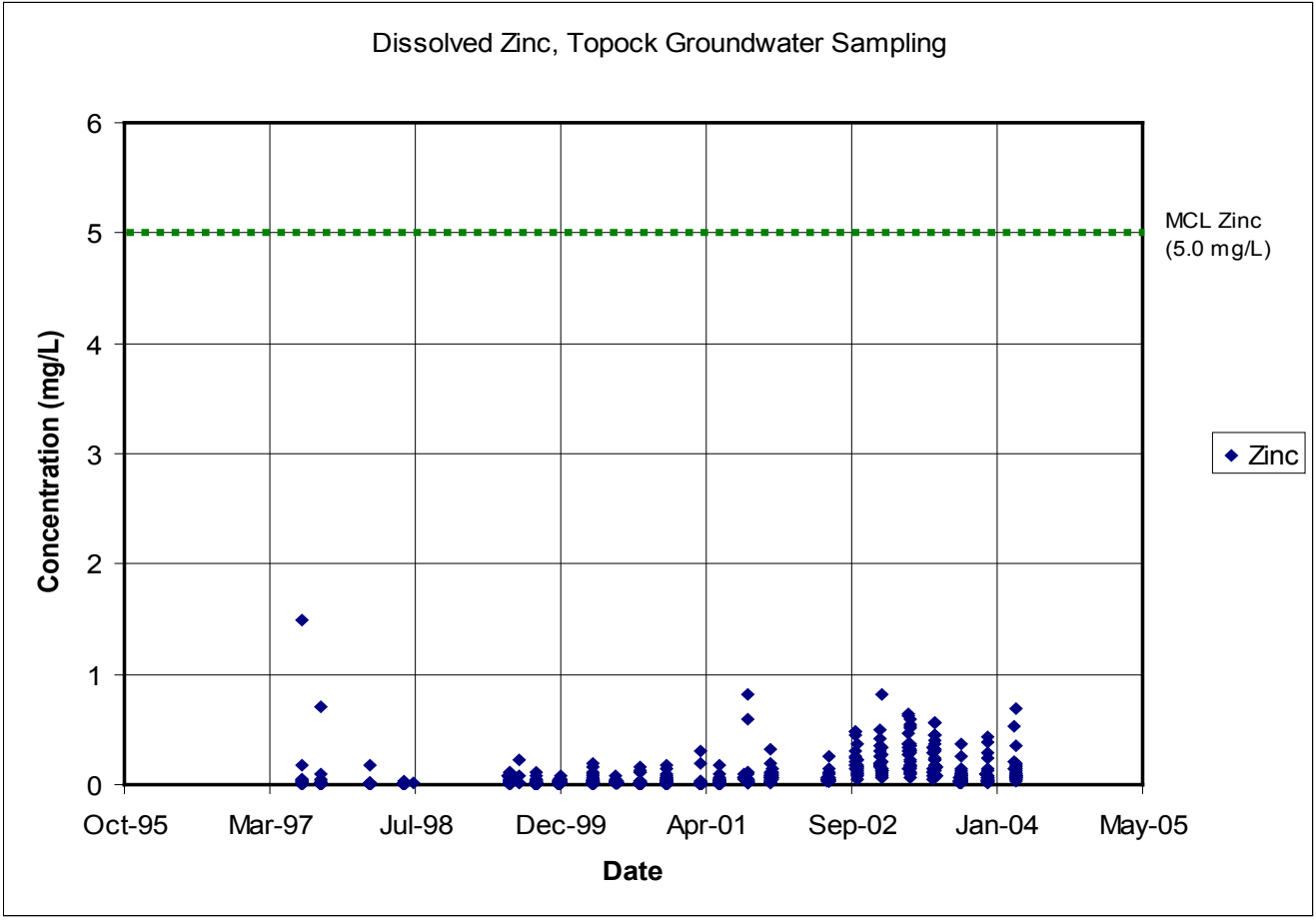
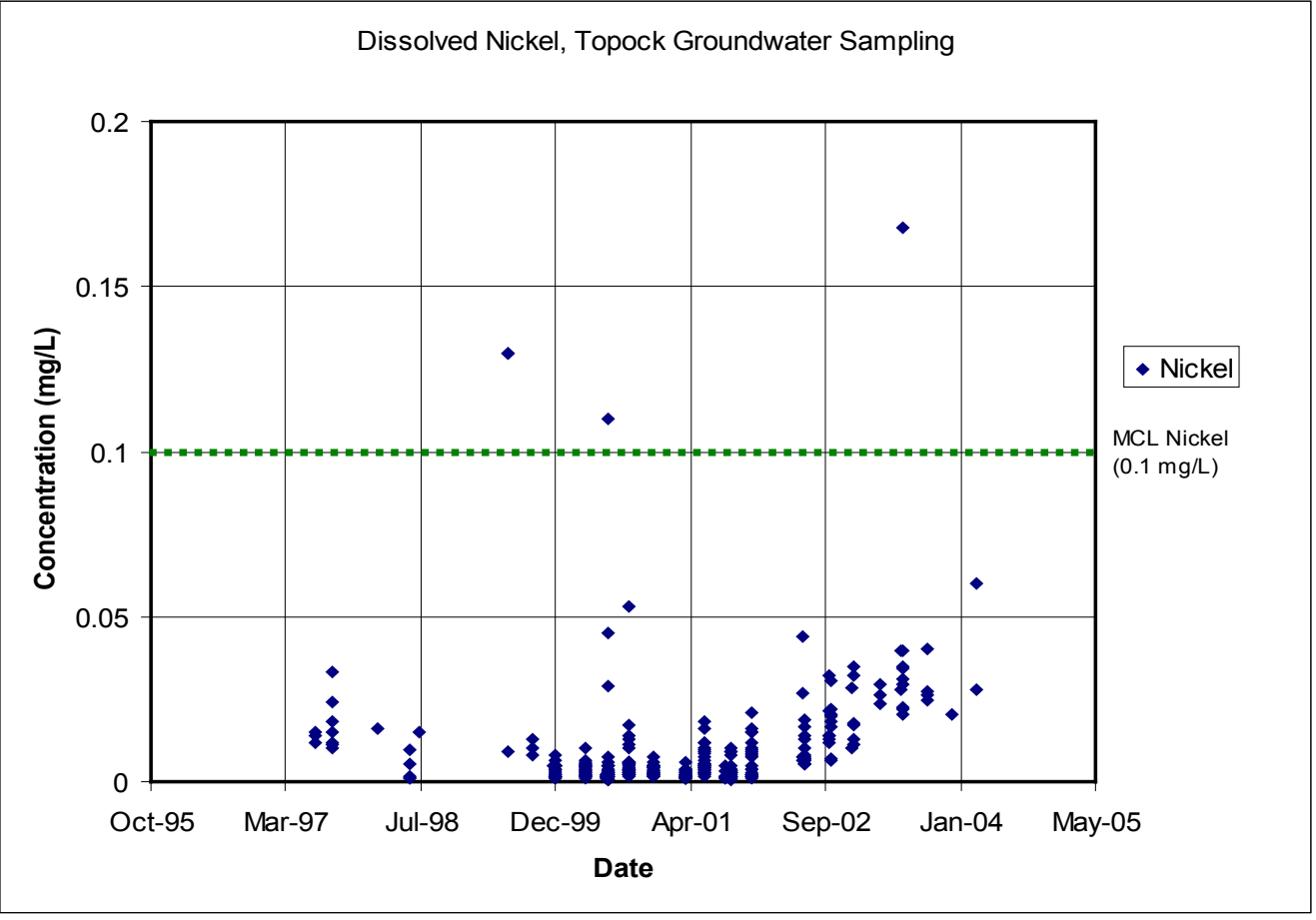
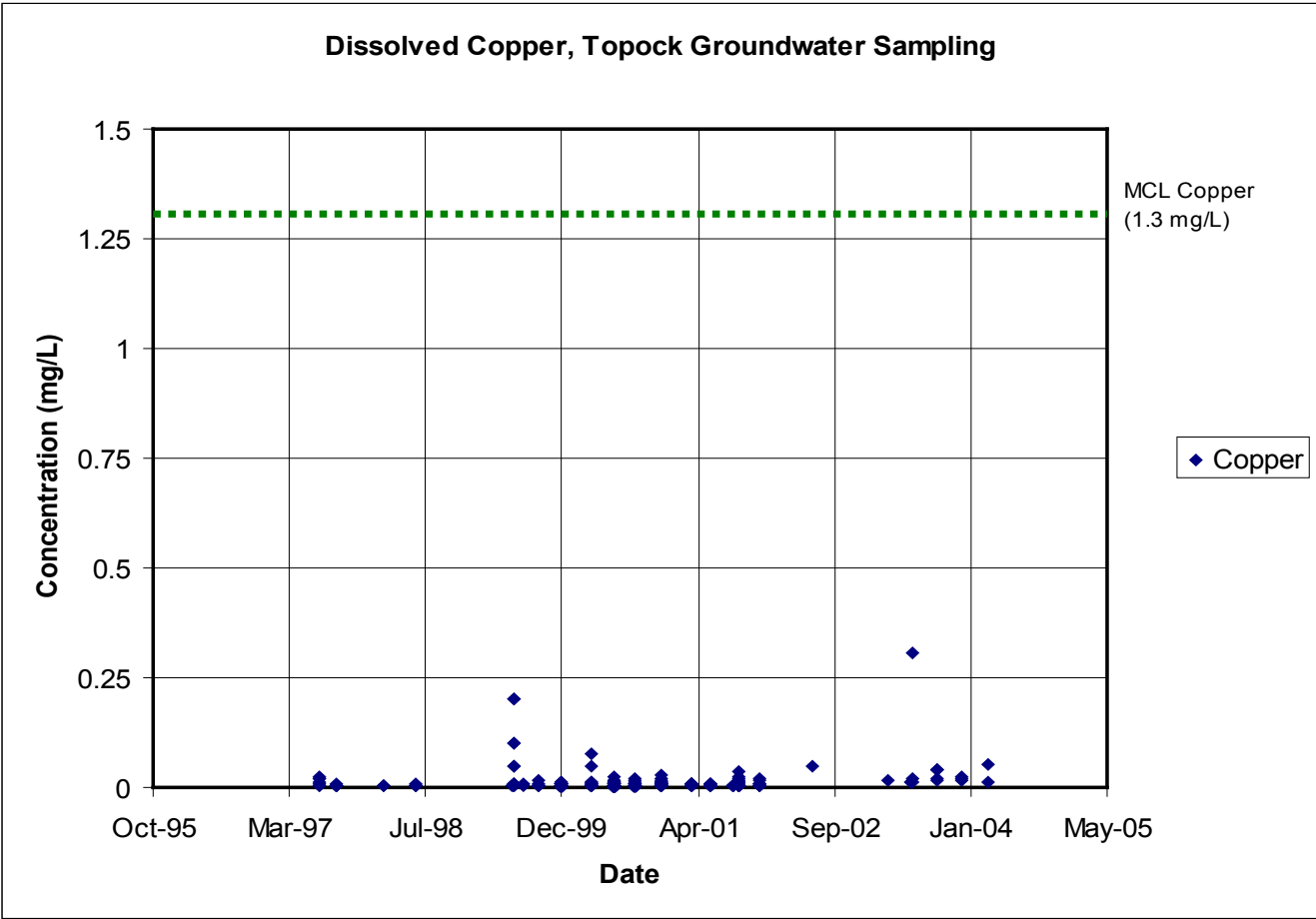
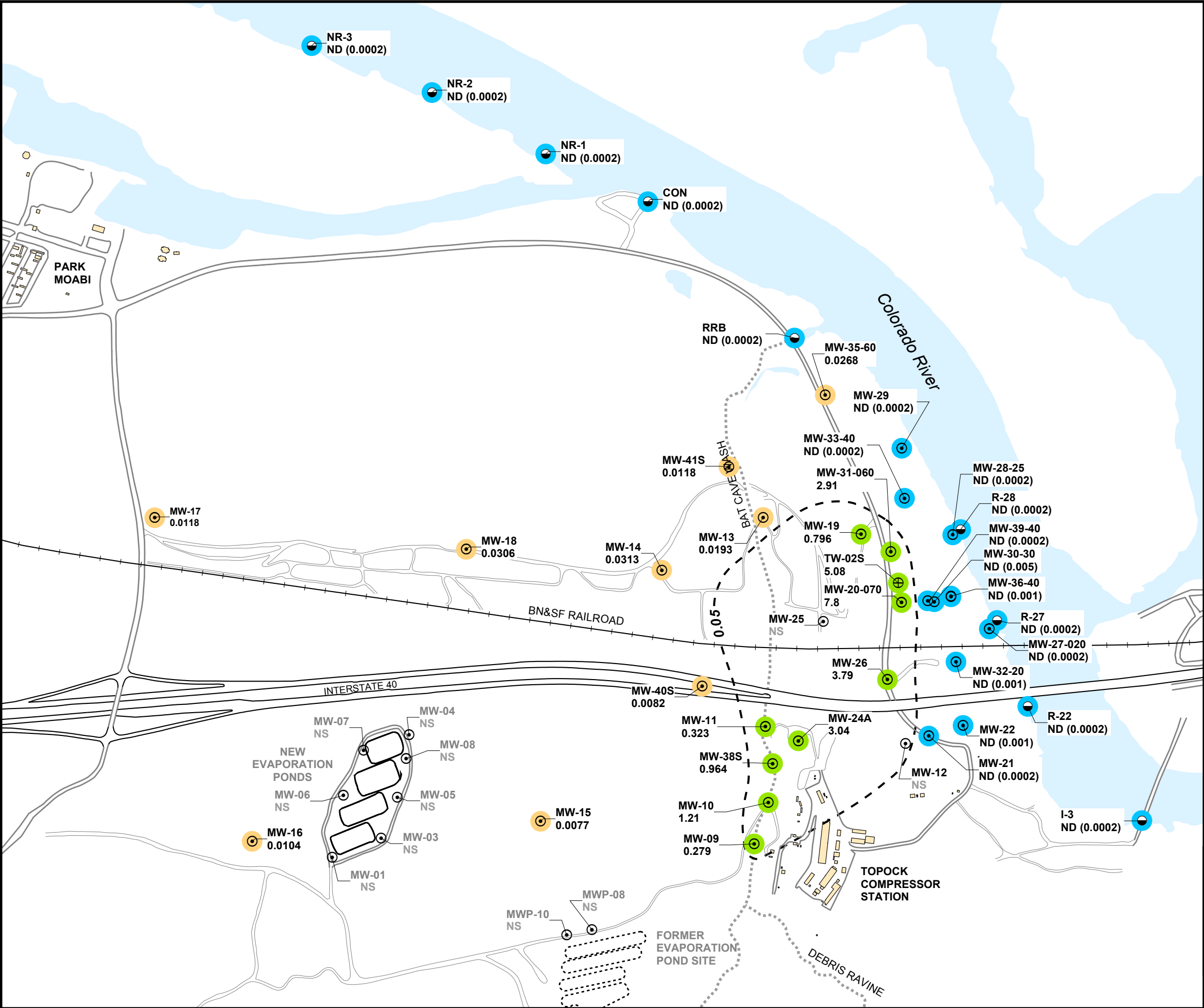


FIGURE B-2
SUMMARY OF COPPER, NICKEL, AND ZINC CONCENTRATIONS
1997 TO 2004
MONITORING PLAN FOR GROUNDWATER & SURFACE WATER MONITORING PROGRAM
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA



- LEGEND**
- Groundwater Monitoring Well
 - Groundwater Test or Supply Well
 - Surface Water Monitoring Location
 - Extraction Well

1.47 Concentration of hexavalent chromium [Cr(VI)] in milligrams per liter (mg/L)

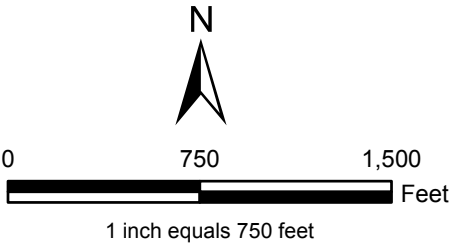
Results shown are maximum concentrations detected in primary and duplicate samples from wells completed in **Upper** zone of Alluvial Aquifer, December 2004 monitoring event. See Table 2 for complete results

ND (0.0002) Cr(VI) not detected, at listed reporting limit

NS Not sampled

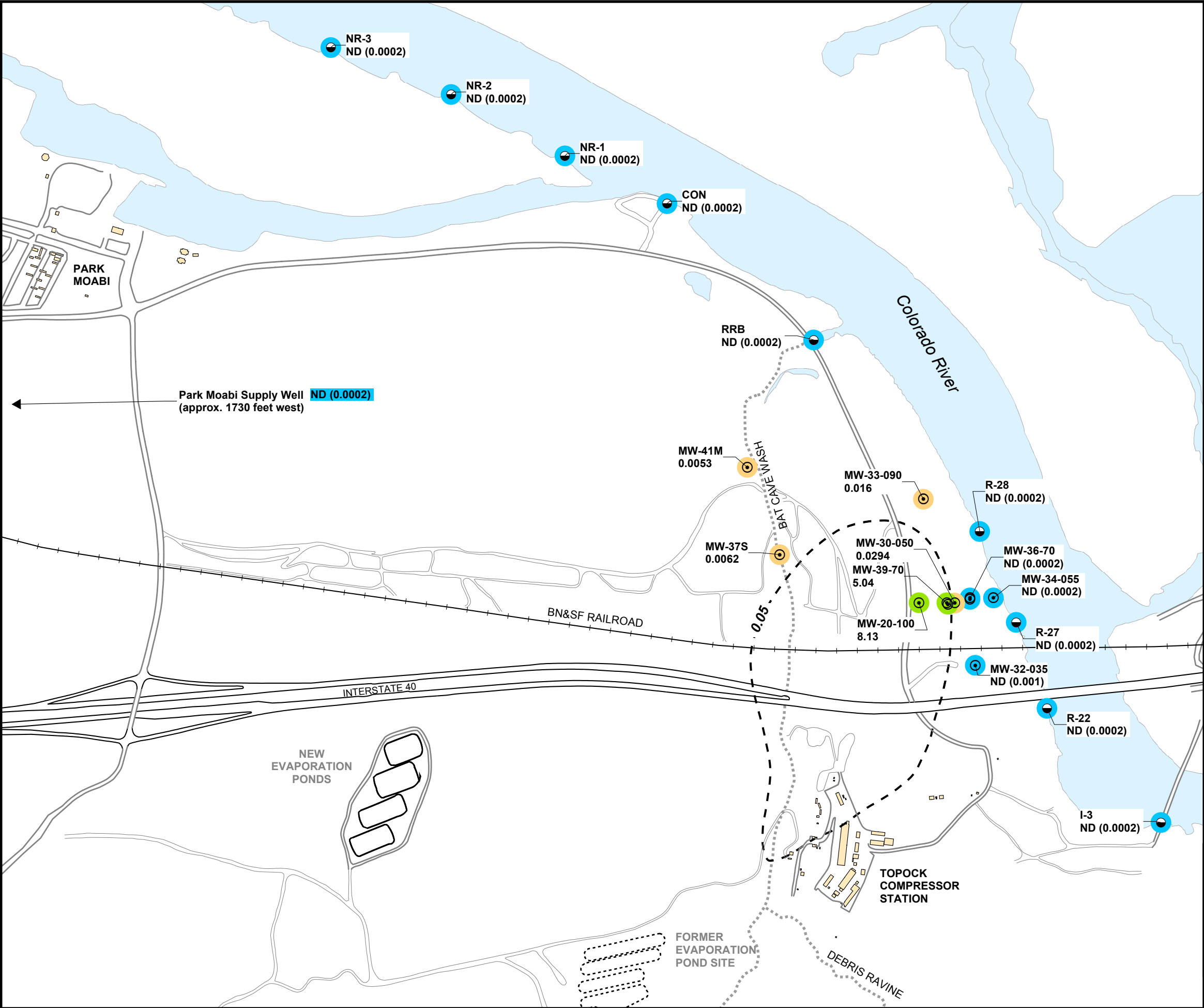
Cr(VI) Concentrations in Water Samples

- Not detected at analytical reporting limit
 - Concentration between reporting limit and 0.05 mg/L
 - Concentration greater than 0.05 mg/L
- Approximate outline of Cr(VI) in groundwater >= 0.05 mg/L (California drinking water standard for Total Chromium)



**FIGURE B-3
HEXAVALENT CHROMIUM SAMPLING
RESULTS UPPER ZONE OF ALLUVIAL
AQUIFER, FOURTH QUARTER 2004
MONITORING EVENT**

MONITORING PLAN FOR GROUNDWATER &
SURFACE WATER MONITORING PROGRAM
PG&E TOPECO COMPRESSOR STATION
NEEDLES, CALIFORNIA



- LEGEND**
- Groundwater Monitoring Well
 - Groundwater Test or Supply Well
 - Surface Water Monitoring Location
 - Extraction Well

8.13 Concentration of hexavalent chromium [Cr(VI)] in milligrams per liter (mg/L)

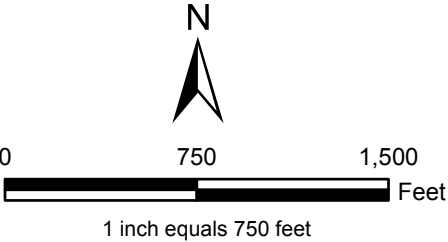
Results shown are maximum concentrations detected in primary and duplicate samples from wells completed in **Middle** zone of Alluvial Aquifer, December 2004 monitoring event. See Table 2 for complete results.

ND (0.0002) Cr(VI) not detected, at listed reporting limit

NS Not sampled

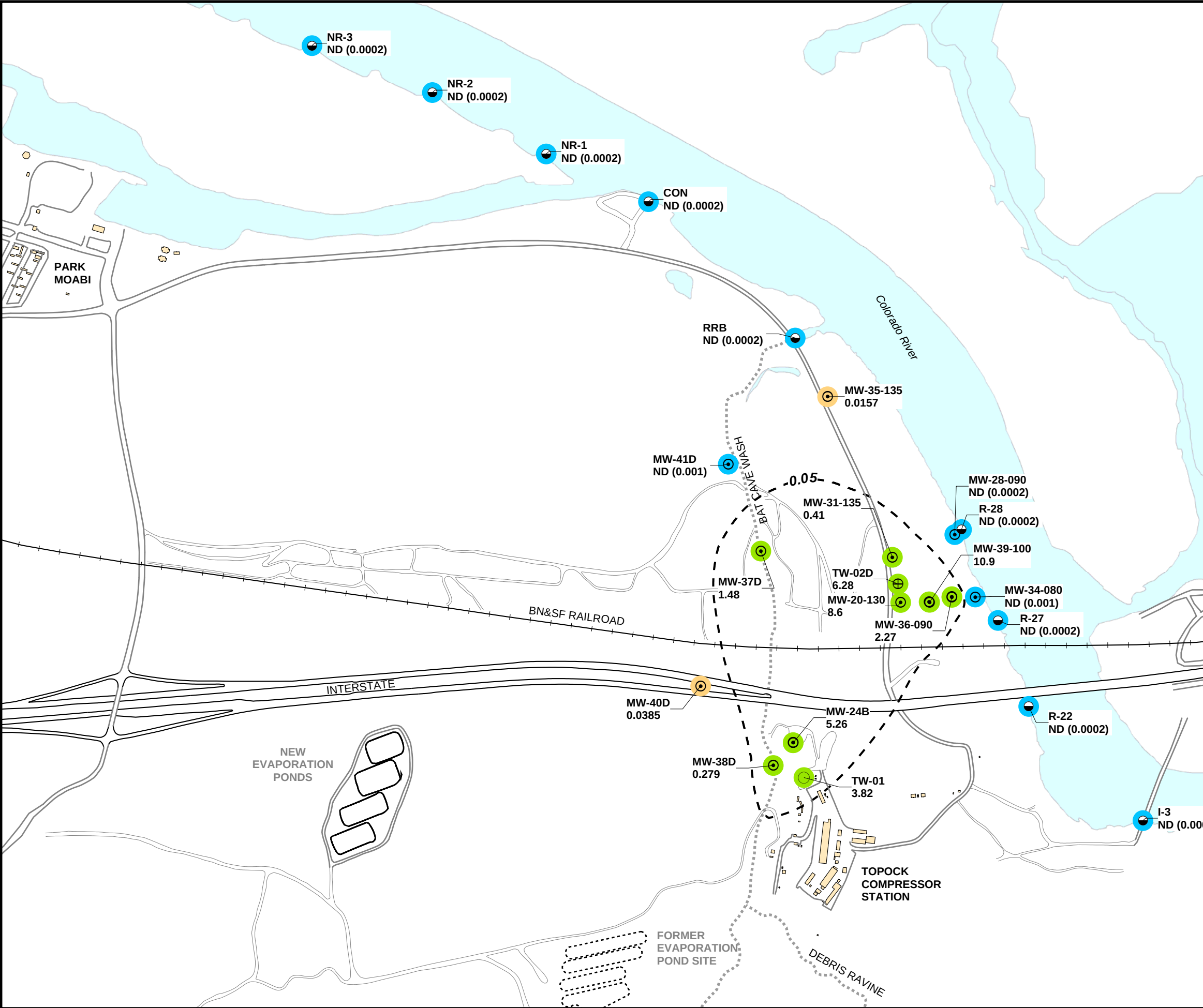
Cr(VI) Concentrations in Water Samples

- Not detected at analytical reporting limit
 - Concentration between reporting limit and 0.05 mg/L
 - Concentration greater than 0.05 mg/L
- Approximate outline of Cr(VI) in groundwater >= 0.05 mg/L (California drinking water standard for Total Chromium)



**FIGURE B-4
HEXAVALENT CHROMIUM SAMPLING
RESULTS MIDDLE ZONE OF ALLUVIAL
AQUIFER, FOURTH QUARTER 2004
MONITORING EVENT**

MONITORING PLAN FOR GROUNDWATER &
SURFACE WATER MONITORING PROGRAM
PG&E TOPEACK COMPRESSOR STATION
NEEDLES, CALIFORNIA



- LEGEND**
- Groundwater Monitoring Well
 - Groundwater Test or Supply Well
 - Surface Water Monitoring Location
 - Extraction Well

6.28 Concentration of hexavalent chromium [Cr(VI)] in milligrams per liter (mg/L)

Results shown are maximum concentrations detected in primary and duplicate samples from wells completed in **Lower** zone of Alluvial Aquifer, December 2004 monitoring event. See Table 2 for complete results.

ND (0.0002) Cr(VI) not detected, at listed reporting limit

NS Not sampled

Cr(VI) Concentrations in Water Samples

- Not detected at analytical reporting limit
- Concentration between reporting limit and 0.05 mg/L
- Concentration greater than 0.05 mg/L

Approximate outline of Cr(VI) in groundwater ≥ 0.05 mg/L (California drinking water standard for Total Chromium)

**FIGURE B-5
HEXAVALENT CHROMIUM SAMPLING
RESULTS LOWER ZONE OF ALLUVIAL
AQUIFER, FOURTH QUARTER 2004
MONITORING EVENT**

MONITORING PLAN FOR GROUNDWATER &
SURFACE WATER MONITORING PROGRAM
PG&E TOPECK COMPRESSOR STATION
NEEDLES, CALIFORNIA

Appendix C
Well Construction and Sampling Information for
GMP Wells

TABLE C-1

Well Construction and Sampling Summary

Monitoring Plan for Groundwater and Surface Water Monitoring Program

PG&E Topock Compressor Station, Needles, California

Well ID	Site Area	Measuring Point Elevation (ft MSL)	Screen Interval (ft bgs)	Well Casing (inches)	Well Depth (ft btoc)	Depth to Water (ft toc)	Sampling System	Typical Purge Rate (gpm)	Typical Purge Volume (gallons)	Pump Depth (ft bgs)	Transducer Installed	Remarks
GMP Monitoring Wells												
MW-9	Bat Cave Wash	536.56	77 - 87	4 (PVC)	90.7	82.3	CD pump	3	11	82		
MW-10	Bat Cave Wash	530.65	73.7 - 93.7	4 (PVC)	97.6	76.3	CD pump	5	40	84	Active	
MW-11	Bat Cave Wash	522.61	62.5 - 82.5	4 (PVC)	90.7	68.5	CD pump	5	30	73		
MW-12	East of Station	484.01	27.5 - 47.5	4 (PVC)	51.6	30.1	Ded. Redi-Flo AR	3	40	38	Inactive	
MW-13	Bat Cave Wash	488.64	28.5 - 48.5	4 (PVC)	52.5	35.2	CD pump	4	30	39		
MW-14	Bat Cave Wash	570.99	111 - 131	4 (PVC)	134.9	117.3	CD pump	4	30	121		
MW-15	Bat Cave Wash	641.52	180.5 - 200.5	4 (PVC)	205.1	187.2	CD pump	5	30	191		
MW-16	Near New Ponds	657.31	198 - 218	4 (PVC)	219.6	201.6	CD pump	7	35	208	Inactive	
MW-17	Bat Cave Wash	589.96	130 - 150	4 (PVC)	152.5	134.1	CD pump	5	32	140		
MW-18	West Mesa	545.32	85 - 105	4 (PVC)	111.8	91.1	CD pump	5	30	95	Inactive	
MW-19	Bat Cave Wash	499.92	46 - 66	4 (PVC)	66.5	47.1	CD pump	7	41	56	Active	
MW-20-70	MW-20 bench	500.15	50 - 70	4 (PVC)	70.9	47.1	CD pump	10	53	60	Active	
MW-20-100	MW-20 bench	500.58	89.5 - 99.5	4 (PVC)	101.1	47.8	CD pump	10	110	95	Active	
MW-20-130	MW-20 bench	500.66	121 - 131	4 (PVC)	132.7	72.9	CD pump	10	180	126	Active	
MW-21	East of Station	505.55	36 - 59	4 (PVC)	59.5	51.0	CD pump	10	10	54		low recharge well; purges dry at 1 casing volum
MW-22	Floodplain	460.72	5.5 - 11	2 (PVC)	13.0	7.5	Peristaltic	0.2	4	9	Active	
MW-23	East of Station	507.33	60 - 80	4 (PVC)	82.0	53.0	CD Pump	5	20	70		low recharge well; purges dry at 1 casing volum
MW-24A	MW-24 Bench	567.16	104 - 124.5	4 (PVC)	126.6	113.1	CD pump	3	30	114	Inactive	
MW-24B	MW-24 Bench	564.76	194 - 213	4 (PVC)	218.9	110.8	CD pump	7	210	204	Inactive	
MW-24BR	MW-24 Bench	563.95	378 - 437	4 (PVC)	441.2	109.5	CD pump	8	185	408	Inactive	low recharge well; purges dry at 1 casing volum
MW-25	Near Bat Cave	542.90	84.5 - 104.5	4 (PVC)	107.0	89.5	CD pump	5	32	95	Active	
MW-26	Near Bat Cave	502.22	51.5 - 71.5	2 (PVC)	74.0	49.0	CD pump	7	50	62	Active	
MW-27-20	Floodplain	460.56	7 - 17	2 (PVC)	19.0	8.7	Ded. Redi-Flo AR	1	7	12	Active	
MW-27-60	Floodplain	461.38	47.3 - 57.3	2 (PVC)	59.4	7.3	Redi-Flo AR	2	25	25	Active	
MW-27-85	Floodplain	460.99	77.5 - 87.5	2 (PVC)	80.0	7.0	Redi-Flo AR	2	36	25	Active	
MW-28-25	Floodplain	466.85	13 - 23	2 (PVC)	25.0	14.9	Ded. Redi-Flo AR	1	5	25	Active	
MW-28-90	Floodplain	467.51	70 - 90	2 (PVC)	98.5	13.8	Ded. Redi-Flo AR	2	50	27	Active	
MW-29	Floodplain	485.21	29.5 - 39.5	2 (PVC)	42.0	32.4	Ded. Mini-Monsoon	0.5	6	35	Active	
MW-30-30	Floodplain	468.12	12 - 32	2 (PVC)	34.0	15.8	Ded. Redi-Flo AR	1	10	22	Active	
MW-30-50	Floodplain	468.81	40.5 - 50.5	4 (PVC)	52.4	17.1	Ded. Redi-Flo AR	2	75	46	Active	
MW-31-60	MW-20 Bench	496.81	41.5 - 61.5	4 (PVC)	64.0	44.7	CD pump	10	40	52	Active	
MW-31-135	MW-20 Bench	498.11	113 - 133	2 (PVC)	133.6	46.4	Redi-Flo AR	3	60	123	Active	
MW-32-20	Floodplain	461.51	10 - 19	2 (PVC)	22.0	9.3	Ded. Redi-Flo AR	1.5	6	15	Active	

TABLE C-1

Well Construction and Sampling Summary

Monitoring Plan for Groundwater and Surface Water Monitoring Program

PG&E Topock Compressor Station, Needles, California

Well ID	Site Area	Measuring Point Elevation (ft MSL)	Screen Interval (ft bgs)	Well Casing (inches)	Well Depth (ft btoc)	Depth to Water (ft toc)	Sampling System	Typical Purge Rate (gpm)	Typical Purge Volume (gallons)	Pump Depth (ft bgs)	Transducer Installed	Remarks
GMP Monitoring Wells												
MW-32-35	Floodplain	461.63	26 - 36	4 (PVC)	39.0	10.1	Ded. Redi-Flo AR	2	60	32	Active	
MW-33-40	Floodplain	487.38	29 - 38	4 (PVC)	42.0	35.5	Ded. Mini-Monsoon	0.5	4	35	Active	
MW-33-90	Floodplain	487.55	69 - 88	4 (PVC)	91.0	33.9	Ded. Redi-Flo AR	2	110	82	Active	
MW-33-150	Floodplain	487.77	132 - 152	2 (PVC)	155.4	35.4	Redi-Flo AR	3	60	50	Active	
MW-33-210	Floodplain	487.25	190 - 210	2 (PVC)	222.8	35.4	Redi-Flo AR	3	90	50	Active	
MW-34-55	Floodplain	460.95	45 - 55	4 (PVC)	56.5	9.2	Ded. Redi-Flo AR	2	100	50	Active	
MW-34-80	Floodplain	461.20	73 - 82	4 (PVC)	83.8	7.1	Ded. Redi-Flo AR	3	150	78	Active	
MW-34-100	Floodplain	460.96	89.5 - 99.5	2 (PVC)	116.5	7.1	Redi-Flo AR	2	55	25	Active	
MW-35-60	North Area	484.19	37 - 57	2 (PVC)	60.2	32.0	Redi-Flo AR	2	18	37	Active	
MW-35-135	North Area	483.57	116 - 136	2 (PVC)	159.2	31.4	Redi-Flo AR	3	66	127	Active	
MW-36-20	Floodplain	469.26	12 - 22	1 (PVC)	22.8	18.0	Peristaltic	0.5	4	15	Active	
MW-36-40	Floodplain	469.61	- 33	1 (PVC)	42.8	18.0	Peristaltic	0.5	4	20	Active	
MW-36-50	Floodplain	469.60	48 - 53	1 (PVC)	53.4	18.0	Peristaltic	0.75	5	20	Active	
MW-36-70	Floodplain	469.25	62 - 72	1 (PVC)	72.6	17.7	Peristaltic	0.5	7	20	Active	
MW-36-90	Floodplain	469.61	82 - 92	1 (PVC)	92.6	18.6	Peristaltic	0.4	10	20	Active	
MW-36-100	Floodplain	469.64	90 - 100	2 (PVC)	110.4	16.7	Ded. Redi-Flo AR	2	45	93	Active	
MW-37D	Bat Cave Wash	486.19	180 - 200	2 (PVC)	226.6	33.2	Redi-Flo AR	3	100	190		
MW-37S	Bat Cave Wash	485.97	64 - 84	2 (PVC)	87.1	33.2	Redi-Flo AR	2	30	74		
MW-38D	Bat Cave Wash	525.31	153 - 173	2 (PVC)	191.0	72.3	Redi-Flo AR	3	60	163		
MW-38S	Bat Cave Wash	525.51	75 - 95	2 (PVC)	98.2	72.1	Redi-Flo AR	1	13	85		
MW-39-40	Floodplain	468.02	32 - 42	1 (PVC)	42.3	16.8	Peristaltic	0.5	3.5	20	Active	
MW-39-50	Floodplain	467.93	50 - 55	1 (PVC)	50.0	16.8	Peristaltic	0.5	5	20	Active	
MW-39-60	Floodplain	468.00	51 - 61	1 (PVC)	66.4	16.9	Peristaltic	0.5	6	20	Active	
MW-39-70	Floodplain	468.02	62 - 72	1 (PVC)	71.8	17.0	Peristaltic	0.5	7	20	Active	
MW-39-80	Floodplain	467.92	72 - 82	1 (PVC)	82.6	17.0	Peristaltic	0.5	9	20	Active	
MW-39-100	Floodplain	468.01	83 - 103	2 (PVC)	117.8	16.8	Ded. Redi-Flo AR	2	45	90	Active	
MW-40D	I-40 Median	566.08	240 - 260	2 (PVC)	266.0	112.7	Redi-Flo AR	3	75	250		
MW-40S	I-40 Median	566.04	115 - 135	2 (PVC)	133.9	112.3	Redi-Flo AR	2	13	125		
MW-41D	Bat Cave Wash	479.42	271 - 291	2 (PVC)	313.0	26.3	Redi-Flo AR	3	145	281		
MW-41M	Bat Cave Wash	479.83	170 - 190	2 (PVC)	192.0	26.3	Redi-Flo AR	3	85	180		
MW-41S	Bat Cave Wash	480.07	40 - 60	2 (PVC)	62.0	26.6	Redi-Flo AR	2	42	50		
MW-42-30	Floodplain	463.81	9.8 - 29.8	2 (PVC)	32.3	12.1	Redi-Flo AR	2	28	20	Active	
MW-42-55	Floodplain	463.87	42.5 - 52.5	2 (PVC)	56.0	12.1	Redi-Flo AR	3	21	37	Active	

TABLE C-1

Well Construction and Sampling Summary

Monitoring Plan for Groundwater and Surface Water Monitoring Program

PG&E Topock Compressor Station, Needles, California

Well ID	Site Area	Measuring Point Elevation (ft MSL)	Screen Interval (ft bgs)	Well Casing (inches)	Well Depth (ft btoc)	Depth to Water (ft toc)	Sampling System	Typical Purge Rate (gpm)	Typical Purge Volume (gallons)	Pump Depth (ft bgs)	Transducer Installed	Remarks
GMP Monitoring Wells												
MW-42-65	Floodplain	463.37	56.2 - 66.2	2 (PVC)	80.0	11.8	Redi-Flo AR	3	36	37	Active	
MW-43-25	Floodplain	462.54	15 - 25	(PVC)		10.7	Redi-Flo AR	1	9	26	Uncalibrated	
MW-43-75	Floodplain	462.71	65 - 75	(PVC)		10.3	Redi-Flo AR	2	28	26	Uncalibrated	
MW-43-90	Floodplain	462.76	80 - 90	(PVC)		11.1	Redi-Flo AR	2	47	26	Uncalibrated	
IM Compliance Wells												
CW-1D	East Mesa	566.46	250 - 300	(PVC)	321.5	112.4					Planned	
CW-1M	East Mesa	566.07	140 - 190	(PVC)	191.1	112.0					Planned	
CW-2D	East Mesa	549.43	-	(PVC)	355.0	95.7					Planned	
CW-2M	East Mesa	549.45	-	(PVC)	202.0	95.6					Planned	
CW-3D	East Mesa	534.14	270 - 320	(PVC)	342.0	80.6					Planned	
CW-3M	East Mesa	534.10	140 - 190	(PVC)	223.6	80.3					Planned	
CW-4D	East Mesa	518.55	232 - 282	2 (PVC)	305.2	104.2					Planned	
CW-4M	East Mesa	518.55	119.5 - 169.5	2 (PVC)	171.2	64.4					Planned	
IM Observation Wells												
OW-1D	East Mesa	550.36	258 - 278	2 (PVC)	280.8	96.4					Uncalibrated	
OW-1M	East Mesa	550.36	165 - 185	2 (PVC)	189.2	94.6					Uncalibrated	
OW-1S	East Mesa	550.15	84 - 114	2 (PVC)	113.5	96.3					Uncalibrated	
OW-2D	East Mesa	549.01	300 - 330	2 (PVC)	342.0	95.3					Uncalibrated	
OW-2M	East Mesa	548.52	190 - 210	2 (PVC)	211.1	96.4					Uncalibrated	
OW-2S	East Mesa	548.75	70 - 110	(PVC)	120.6	94.9					Uncalibrated	
OW-3D	West Mesa	558.63	243 - 263	2 (PVC)	274.5	62.7					Uncalibrated	
OW-3M	West Mesa	558.90	180 - 200	2 (PVC)	202.0	104.6					Uncalibrated	
OW-3S	West Mesa	558.58	86 - 116	2 (PVC)	118.0	104.3					Uncalibrated	
OW-5D	East Mesa	552.35	300 - 320	2 (PVC)	352.0	98.2					Uncalibrated	
OW-5M	East Mesa	551.75	210 - 250	2 (PVC)	253.6	97.5					Uncalibrated	
OW-5S	East Mesa	551.75	70 - 110	2 (PVC)	113.2	97.7					Uncalibrated	
Other Site Wells not in GMP												
MW-1	New Ponds	661.76	200.5 - 210.5	4 (PVC)	217.0	206.1	air bladder pump					active PG&E pond monitoring well
MW-3	New Ponds	650.51	193 - 203	4 (PVC)	205.0	193.8	air bladder pump					active PG&E pond monitoring well
MW-4	New Ponds	625.73	164.5 - 174.5	4 (PVC)	178.7	168.6	air bladder pump					active PG&E pond monitoring well
MW-5	New Ponds	635.69	175.9 - 185.4	4 (PVC)	189.6	178.9	air bladder pump					active PG&E pond monitoring well
MW-6	New Ponds	642.84	184.5 - 193.5	4 (PVC)	197.9	186.0	air bladder pump					active PG&E pond monitoring well

TABLE C-1

Well Construction and Sampling Summary

Monitoring Plan for Groundwater and Surface Water Monitoring Program

PG&E Topock Compressor Station, Needles, California

Well ID	Site Area	Measuring Point Elevation (ft MSL)	Screen Interval (ft bgs)	Well Casing (inches)	Well Depth (ft btoc)	Depth to Water (ft toc)	Sampling System	Typical Purge Rate (gpm)	Typical Purge Volume (gallons)	Pump Depth (ft bgs)	Transducer Installed	Remarks
Other Site Wells not in GMP												
MW-7	New Ponds	631.91	172.7 - 182.7	4 (PVC)	184.7	174.8	air bladder pump					active PG&E pond monitoring well
MW-8	New Ponds	627.54	169 - 178	4 (PVC)	183.4	170.5	air bladder pump					active PG&E pond monitoring well
MWP-8	Old Ponds	677.48	181 - 210	3 (PVC)	213.0	187.8	---					inactive monitoring well
MWP-10	Old Ponds	675.81	195 - 235	3 (PVC)	237.0	208.1	---					inactive monitoring well
MWP-12	Old Ponds	663.49	-	4 (PVC)		109.7	---					inactive monitoring well
P-2	New Ponds	537.60	238.5 - 248.5	4 (steel)	251.0	169.8	---					inactive monitoring well
PGE-9N		462.21	25 - 95	12 (steel)								
PGE-9S		461.99	30 - 100	12 (steel)								
Test and Extraction Wells												
IW-2	East Mesa	550.10	170 - 330	(PVC)	343.0	95.8						
IW-3	East Mesa	554.44	160 - 320	(PVC)	333.0	100.1						
PE-1	Floodplain		-	(steel)		16.6						
TW-1	Plan B Test	620.55	168 - 268	5 (PVC)	269.0	65.8	CD pump	20	200			inactive pilot test well
TW-2D	MW-20 bench	499.57	115 - 150	6 (PVC)	150.0	72.9	CD pump				Active	active IM extraction well
TW-2S	MW-20 bench	499.05	45 - 95	6 (PVC)	90.0	46.2	CD pump				Active	IM extraction well
Water Supply Wells												
PGE-6	MW-24 Bench	563.32	110 - 180	14 (steel)	181.5	108.1	CD pump	24	650			inactive supply
PGE-7	MW-24 Bench	563.89	195 - 330	14 (steel)	331.6	108.8	CD pump	12	600			inactive supply
PGE-8	Station	596.01	405 - 554	8 (steel)	564.3	141.1	CD pump	20	1900			inactive injection
Park Moabi	Park Moabi	518.55	-	8 (steel)	252.0	61.3	active supply well					call Park Ranger to schedule sampling

Notes:

Depth to water shown is the most recently measured depth to water.

Well depth, and screen interval and water level depths rounded-off to whole-foot values.

BGS = below ground surface

MSL = mean sea level

BTOC = below top of polyvinyl chloride (PVC) casing

NA = not known or available

CD pump = dedicated constant-discharge electric submersible pump

Redi-Flo AR = adjustable-rate electric submersible pump

All GMP wells except low recharge wells and Park Moabi well are purged and sampled using well-volume method.