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March 6, 2008

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

Kris Doebbler
BLM WO-360D, Building 50
Denver Federal Center
Denver, CO 80225

Subject: Final Corrective Measures/Feasibility Study Work Plan
PG&E Topock Compressor Station, Needles, California

Dear Mr. Yue and Ms. Doebbler:

This letter transmits the Final *Corrective Measures/Feasibility Study Work Plan* for the PG&E Topock Compressor Station. This final work plan has been revised to incorporate agency comments and direction on the draft work plan dated June 2007.

Please call me at (805) 234-2257 if you have questions regarding the enclosed work plan.

Sincerely,

Yvonne Meeks

Enclosure

Cc: Karen Baker/DTSC
Chris Guerre/DTSC

Corrective Measures/Feasibility Study Work Plan

Topock Compressor Station Needles, California

Prepared for

Department of Toxic Substances Control and United States Department of the Interior

On behalf of

Pacific Gas and Electric Company

March 2008

CH2MHILL

Corrective Measures/Feasibility Study Work Plan

PG&E Topock Compressor Station
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March 2008

This work plan was prepared under supervision of a California Professional Engineer:

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Acronyms & Abbreviations

μg/L	micrograms per liter
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
CACA	Corrective Action Consent Agreement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS/FS	corrective measures study/feasibility study
COC	chemical of concern
COPC	chemical of potential concern
Cr(III)	trivalent chromium
Cr(T)	total chromium
Cr(VI)	hexavalent chromium
DOE	United States Department of Energy
DOI	United States Department of the Interior
DTSC	California Department of Toxic Substances Control
ft/d	feet per day
ft/ft	feet per foot
IM	Interim Measure
ISV	*in-situ* vitrification
mg/L	milligrams per liter
MNA	monitored natural attenuation
PG&E	Pacific Gas and Electric Company
PRB	permeable reactive barrier
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
RFI/RI	RCRA facility investigation/remedial investigation
SVE	soil vapor extraction
SVOC	semivolatile organic compound

SWMU	Solid Waste Management Unit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 Introduction

This work plan conceptually describes the planned activities and the schedule to complete the corrective measures study/feasibility study (CMS/FS) at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station located in eastern San Bernardino County, California. The purpose of the CMS/FS is to identify and evaluate potential remedies for past waste releases. A general vicinity map is shown in Figure 1-1 (all Figures are located at the end of this document).

The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) is the state lead regulatory agency overseeing remedial activities at the Topock Site under the Resource Conservation and Recovery Act (RCRA) and the California Health and Safety Code. In February 1996, PG&E and DTSC entered into a Corrective Action Consent Agreement (CACA) pursuant to Section 25187 of the California Health and Safety Code (DTSC, 1996). The CACA requires the preparation of a CMS if contaminant concentrations exceed current health-based action levels and/or if the DTSC determines that the contaminant releases pose a potential threat to human health and/or the environment.

The United States Department of the Interior (DOI) is the lead federal agency on land under its jurisdiction, custody, or control and is responsible for oversight of response actions being conducted by PG&E pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Portions of the site where hazardous substances from the Topock Compressor Station have come to be located are on or under land managed by the Bureau of Land Management, United States Fish and Wildlife Service, and Bureau of Reclamation (collectively the "federal agencies"). In July 2005, PG&E and the federal agencies entered into an Administrative Consent Agreement under which PG&E agreed to perform a remedial investigation and feasibility study (RI/FS) at the site as set forth in the National Oil and Hazardous Substances Pollution Contingency Plan.

A RCRA Corrective Measures Study Work Plan was originally submitted to DTSC in 2002 (CH2M HILL, 2002). In its letter dated May 15, 2007, the DTSC provided consolidated comments from DTSC and DOI and directed that the work plan be revised and resubmitted to incorporate updated information about the site, schedule, and regulatory framework for the cleanup (DTSC, 2007a). A Corrective Measures/Feasibility Study Work Plan was submitted on June 29, 2007 that addressed the comments contained in DTSC's May 15, 2007 letter, and incorporated the requirements of the CACA and the National Contingency Plan (CH2M HILL, 2007a). In a letter dated September 3, 2007, DTSC provided consolidated comments from DTSC and DOI on the June 2007 work plan and directed that PG&E prepare responses to the comments (DTSC, 2007b). This work plan incorporates those additional changes to the work plan as directed by DTSC and DOI (DTSC, 2008). Appendix A contains information on the incorporation of the comments into this work plan.

1.1 CMS/FS Process

Both the RCRA CMS and the CERCLA FS identify and evaluate remedial alternatives to address the release of hazardous wastes/hazardous substances into the environment. Both build on the findings of the RCRA facility investigation/remedial investigation (RFI/RI) and follow very similar processes. Exhibit 1-1 shows the steps in the site investigation, the remedial action evaluation and implementation process, and how the RCRA terminology and steps align with the CERCLA terminology and steps.

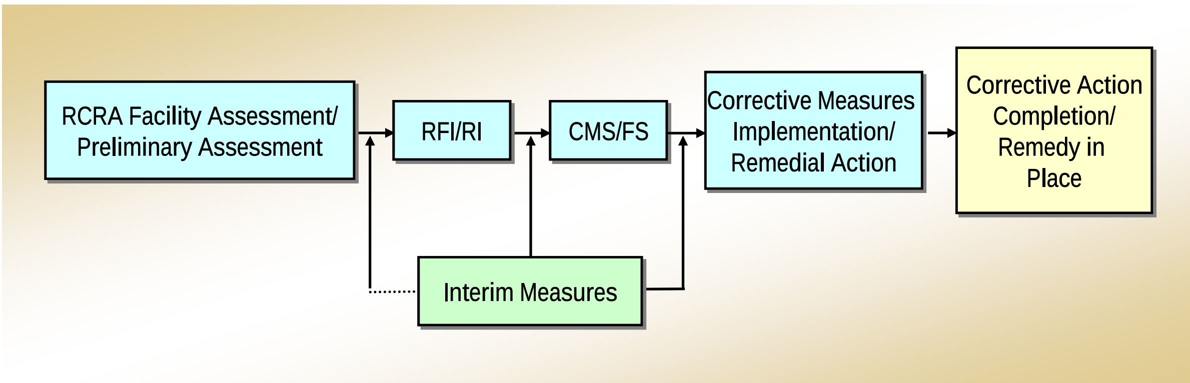

EXHIBIT 1-1
RCRA/CERCLA Process

To date, major portions of the site investigations have been completed for the Topock site, Interim Measures (IMs) have been implemented, and treatability studies have been initiated. The status and findings of these activities may be reviewed at the DTSC Topock web site: http://www.dtsc-topock.com. Following the completion of the RFI/RI, the CMS/FS will be prepared.

1.2 Site History and RFI/RI Status

Volume 1 of the RFI/RI provides the background and history of the PG&E Topock Compressor Station (CH2M HILL, 2007b). The RFI/RI Volume 1 identifies the solid waste management units (SWMUs), areas of concern (AOCs), and other undesignated areas to be carried forward in the RFI/RI. Based on the conclusions of the RFI/RI Volume 1, there are two SWMUs, 17 AOCs, and one other undesignated area at the Topock Compressor Station to be addressed further in the RFI/RI.[1] Table 1-1 summarizes the conclusions of the RFI/RI Volume 1. The locations of the SWMUs, AOCs, and other undesignated area to be addressed in the RFI/RI are shown in Figure 1-2.

[1] In addition, RFI/RI Volume 1 identifies four SWMUs, 1 AOC, and four undesignated areas that were previously closed but for which additional investigation has been requested. If the additional investigation data indicate that the closure status for any of these SWMUs, AOC and undesignated areas is to be rescinded, these will also be addressed further in the RFI/RI.

TABLE 1-1
Status of SWMUs, AOCs, and Other Undesignated Areas Within the Site Investigation and Closure Process
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Status	Sites	Addressed in RFI/RI Volume 2? [b]	Addressed in RFI/RI Volume 3? [c]
SWMUs and AOCs for which Site Investigation and Closure Process is Complete	SWMU 2 – Inactive Injection Well PGE-8 (soil only)	No	No
	SWMU 3 – PG&E Abandoned Well #6	No	No
	SWMU 4 – PG&E Abandoned Well #7	No	No
	SWMU 7 – Precipitation Tank	No	No
	SWMU 10 – Old Evaporation Ponds	No	No
	AOC-2 – Area Around Inactive Injection Well PGE-8	No	No
	AOC 3 – Area Around PG&E Inactive Wells #6 & #7 (PGE-06 and PGE-07)	No	No
	Unit 4.6 – Waste Oil Storage Tank	No	No
Previously Closed SWMUs and AOCs for Which Additional Investigation Has Been Requested	SWMU 5 – Sludge Drying Beds	No	--[a]
	SWMU 6 – Chromate Reduction Tank	No	--[a]
	SWMU 8 – Process Pump Tank	No	--[a]
	SWMU 9 – Transfer Sump	No	--[a]
	Unit 4.3 – Oil/Water Holding Tank	No	--[a]
	Unit 4.4 – Oil/Water Separator	No	--[a]
	Unit 4.5 – Portable Waste Oil Storage Tank	No	--[a]
	AOC 18 – Former Two-step Wastewater Treatment System Piping	No	--[a]
	Former 300B Pipeline Liquids Tank	No	--[a]
SWMUs, AOCs, and Other Undesignated Areas To Be Carried Forward in RFI/RI	SWMU 1 – Former Percolation Bed	Yes	Yes
	SWMU 2 – Inactive Injection Well PGE-8 (for groundwater only)	Yes	No
	AOC 1 – Area Around Former Percolation Bed	Yes	Yes
	AOC 4 – Debris Ravine	No	Yes
	AOC 5 – Cooling Tower A	No	Yes
	AOC 6 – Cooling Tower B	No	Yes
	AOC 7 – Hazardous Materials Storage Area	No	Yes
	AOC 8 – Paint Locker	No	Yes
	AOC 9 – Southeast Fence Line (Outside Visitor Parking Area)	No	Yes
	AOC 10 – East Ravine	No	Yes
	AOC 11 – Topographic Low Areas	No	Yes
	AOC 12 – Fill Area	No	Yes
	AOC 13 – Unpaved Areas Within the Compressor Station	No	Yes
	AOC 14 – Railroad Debris Site	No	Yes
	AOC 15 – Auxiliary Jacket Water Cooling Pumps	No	Yes
	AOC 16 – Sandblast Shelter	No	Yes

TABLE 1-1
Status of SWMUs, AOCs, and Other Undesignated Areas Within the Site Investigation and Closure Process
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Status	Sites	Addressed in RFI/RI Volume 2? [b]	Addressed in RFI/RI Volume 3? [c]
	AOC 17 – Onsite Septic System	No	Yes
	AOC 19 – Former Cooling Chemical Mixing Shed	No	Yes
	AOC 20 – Industrial Floor Drains	No	Yes
	Potential Pipe Disposal Area	No	Yes

Notes:

[a] SWMU/AOC will be addressed in RFI/FI Volume 3 if additional data requested suggest that closure status is to be rescinded.

[b] Media to be addressed in RFI/RI Volume 2 include groundwater, surface water, pore water and river sediment for the evaluation of contaminant migration in groundwater.

[c] Media to be addressed in RFI/RI Volume 3 include soil, sediment in washes, groundwater for the evaluation of contaminant migration in soil to groundwater through infiltration, and transport as suspended material in flowing surface water.

Source: *Revised Final RCRA Facility Investigation/Remedial Investigation Report, PG&E Topock Compressor Station, Needles, California. Volume 1 – Site Background and History*. (CH2M HILL, 2007b)

Since 1996, there have been multiple phases of investigation at the Topock site to:

- Investigate past facility operations and sources of releases.
- Document significant features (biological, cultural, archaeological, historical, hydrogeological).
- Sample and analyze environmental media potentially affected by releases (soil, sediment, surface water, groundwater, air, interstitial water, historical wastes) to determine the nature and extent of contamination from the release.

Much of the focus of investigation in recent years has been on defining the extent of hexavalent chromium (Cr[VI]) in groundwater at the site. Additional investigation is planned to further delineate the distribution of Cr(VI) in groundwater and to complete the characterization of soil contamination both within the fenceline of the compressor station and at locations outside the compressor station fenceline.

Following completion of additional investigations, the final RFI/RI will be prepared. Volume 2 of the RFI/RI will address the historical operational practice of wastewater discharge to Bat Cave Wash and PGE-8 comprising groundwater, surface water, pore water, and river sediment and will contain data from those media. Volume 3 will address the remaining Topock Compressor Station operations, and will contain soil data from the SWMUs, AOCs, and other undesignated areas addressed in Volume 3, as well as sediment data near the mouth of Bat Cave Wash, and groundwater data from wells within and immediately surrounding the compressor station. The separation of the Final RFI/RI into three volumes is intended to efficiently manage the large amount of information associated with the RFI/RI and to accelerate site remediation of the main groundwater plume by allowing remedial planning of those portions of the RFI/RI completed earlier.

Concurrent with completion of the RFI/RI, risk assessments will be prepared, and applicable or relevant and appropriate requirements (ARARs) will be identified. Prior to the start of the CMS/FS, a determination will be made as to which of the SWMUs, AOCs, and other undesignated areas at the Topock Compressor Station will be carried forward from the RFI/RI to the CMS/FS. Sites will be moved forward from the RFI/RI to the CMS/FS based on the conclusions of the RFI/RI and risk assessments. The determination of which sites are to be moved to the CMS/FS will be made through approval of the RFI/RI and risk assessment conclusions by DTSC and DOI. Additionally, if future areas are identified as requiring investigation, these new areas will be evaluated for inclusion in the CMS/FS. The CMS/FS will re-iterate the conclusions of the RFI/RI and risk assessments about which SWMUs, AOCs, and undesignated units are addressed in the CMS/FS and the rationale for inclusion.

1.3 Work Plan Organization

The organization of this work plan follows the steps in the CMS/FS process, as illustrated in Exhibit 1-2. This exhibit is repeated in each section with the relevant portion of the flowchart highlighted.

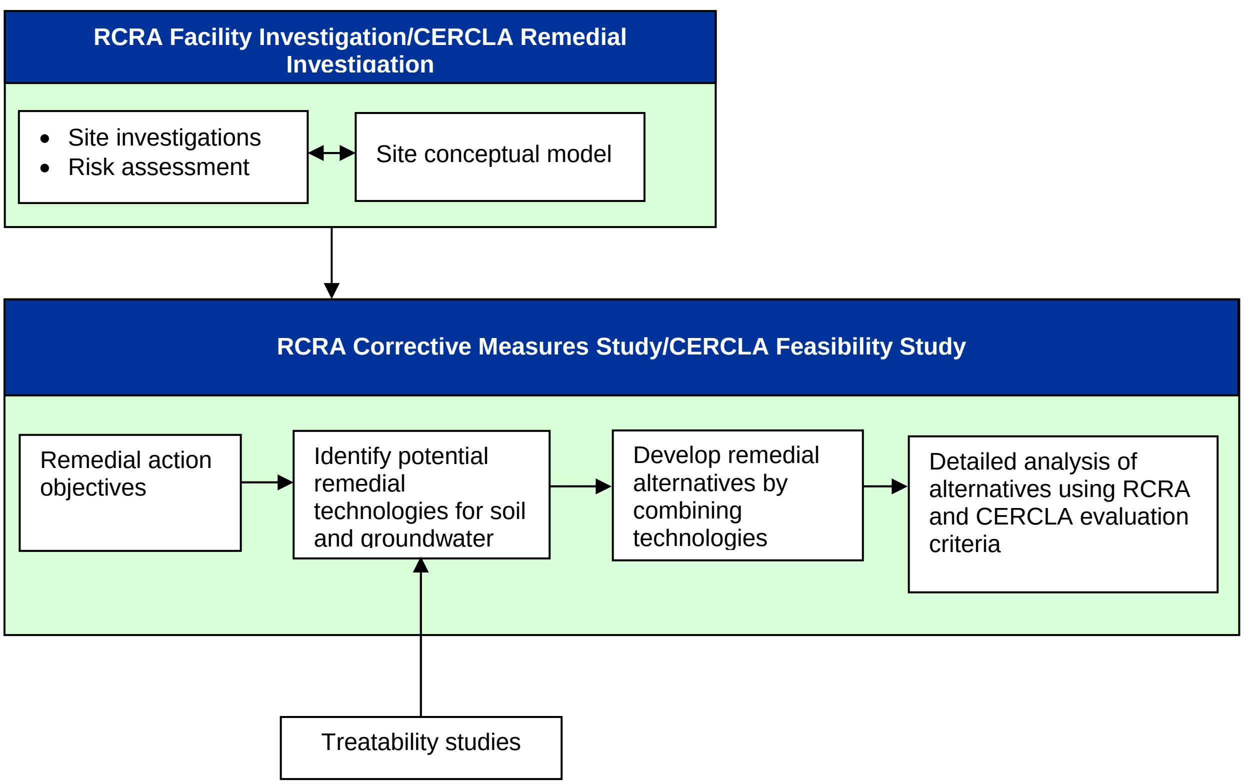

EXHIBIT 1-2
CMS/FS Process Overview

The contents of this work plan are as follows:

- Section 2.0 discusses the existing conceptual model and the proposed refinement of this model that will be incorporated into the CMS/FS.
- Section 3.0 presents the expected remedial action objectives and the inputs to be used to determine the media cleanup goals and standards in the CMS/FS.
- Section 4.0 identifies likely technologies to be screened and evaluated in the CMS/FS for the identified chemicals of concern (COCs).
- Section 5.0 discusses how the remedial technologies will be formulated into remedial alternatives while considering key site features. This section also discusses how those remedial alternatives will be evaluated in the CMS/FS.
- Sections 6.0 and 7.0 provide the proposed outline and schedule for the CMS/FS report, respectively.
- Section 8.0 provides a list of references used in the preparation of this document.

2.0 Site Conceptual Model

A conceptual model is a graphical and narrative summary of site conditions, based on currently available data, that describes the probable sources of contamination and potential pathways by which human or environmental exposures might occur. The site conceptual model is initiated during the planning phases but is refined based on the results of the site investigations and risk assessment. The development of the site conceptual model is iterative, with refinements made as additional information is collected.

The current Topock site conceptual models for groundwater and soil are discussed below. The current site conceptual model will be modified as additional investigations of soil and groundwater are completed. The conceptual site model will be documented in the RFI/RI and risk assessment prior to the CMS/FS. Exhibit 2-1 shows how the conceptual model fits in with the CMS/FS process. The conceptual site model will be completed through DTSC and DOI approval of the RFI/RI and risk assessment.

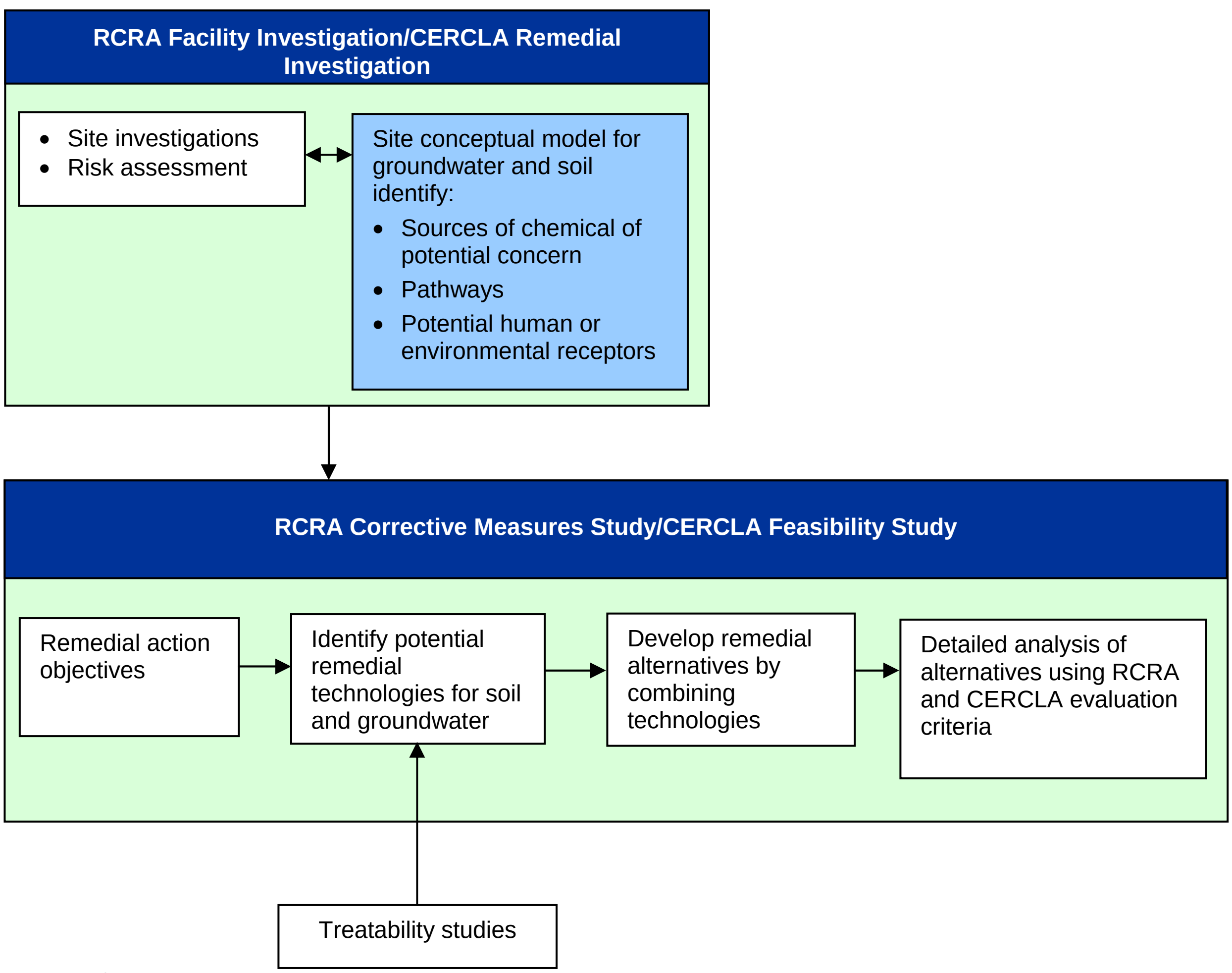

EXHIBIT 2-1
CMS/FS Process—Site Conceptual Model

2.1 Conceptual Model for Groundwater

2.1.1 Source of Groundwater Contaminants

The principal contaminant in groundwater at the site is hexavalent chromium. Cr(VI) was contained in water treatment products added to the cooling water from 1951 to 1985 to inhibit corrosion, minimize scale, and control biological growth. From 1951 to 1964, untreated cooling tower blowdown water containing Cr(VI) was discharged to Bat Cave Wash near the compressor station. From 1964 to 1969, PG&E began treating the wastewater by converting the Cr(VI) to trivalent chromium (Cr[III]). In 1969, the process was expanded to two steps that converted Cr(VI) to Cr(III) (Step 1) and then removed Cr(III) via precipitation (Step 2). Beginning in May 1970, discharges to Bat Cave Wash ceased, and treated wastewater was discharged alternately to an injection well (PGE-08) located on PG&E property and lined ponds. In 1973, PG&E discontinued use of injection well PGE-08, and wastewater has since been discharged to lined ponds. PG&E replaced the Cr(VI)-based cooling water treatment products with non-hazardous phosphate-based products in 1985.

Nearly all of the Cr(VI) present in groundwater at the site is believed to have been released during the 13-year period when untreated wastewater was discharged to Bat Cave Wash. From the discharge locations in Bat Cave Wash, the cooling tower blowdown water infiltrated into the coarse sand and gravel of the wash bed and percolated approximately 75 downward feet through the unsaturated zone to reach groundwater. Based on history of the wastewater discharge, the chemicals of potential concern (COPCs) in groundwater are total chromium (Cr[T]), Cr(VI), copper, nickel, lead, zinc, pH, electrical conductivity and total petroleum hydrocarbons (CH2M HILL, 2007b). This list of COPCs in groundwater will be refined in the forthcoming RFI/RI based on site characterization data.

While the principal contaminant in groundwater at the site is hexavalent chromium, and the primary source of contamination is the historical practice of discharging untreated wastewater to Bat Cave Wash, it is acknowledged that other COPCs and sources to groundwater may be identified as ongoing investigations are completed and will be documented in the RFI/RI.

The COCs to be addressed in the CMS/FS will be limited to those that are found to be elevated (above a risk threshold and/or above ARAR level) in groundwater during the site investigation and risk characterization.

2.1.2 Contaminant Distribution in Groundwater

For the RFI/RI, the chromium plume has been defined as chromium-bearing groundwater exceeding the State of California maximum contaminant level for Cr(T) of 50 micrograms per liter (µg/L). The conceptual model of groundwater plume and key site features are depicted in Figure 2-1. The chromium plume is essentially confined to the more permeable alluvial/fluvial deposits that comprise the Alluvial Aquifer. The plume exceeding the maximum contaminant level underlies an area of approximately 90 acres. The chromium plume in groundwater extends approximately 2,800 feet downgradient from the former cooling water disposal area in Bat Cave Wash to the Colorado River floodplain. Figure 2-2 shows the distribution of Cr(VI) in groundwater in the floodplain in October 2007. As investigation of additional sources proceeds, new data are collected from existing wells, and new wells are installed, the plume will be more precisely defined. Additional tools may be employed to assist in the delineation, such as stable isotopes of oxygen, hydrogen, and chromium, which may provide a chemical fingerprint of plume water.

2.1.3 Routes of Contaminant Migration in Groundwater

The primary route of chromium migration at the site is through groundwater transport. Groundwater gradients at the site are slight, on the order of 0.0005 foot per feet (ft/ft), and hydraulic conductivity of the aquifer along the axis of the plume is moderate, averaging about 30 feet per day (ft/d). The general direction of groundwater flow from the source area in Bat Cave Wash is toward the north or northeast. Figure 2-3 is a regional hydrogeologic cross section. Characterization of groundwater gradients at the site will be documented in the forthcoming RFI/RI.

Strongly-reducing geochemical conditions are observed in groundwater in the fluvial deposits along the Colorado River floodplain. Reducing conditions were also observed in the sediments beneath the river during the pore water study (CH2M HILL, 2006) and the recent slant drilling under the river (CH2M HILL, 2007c). The pore water study included 64 sampling locations, each to a depth of 6 feet, located along a 3-mile reach of river both upstream and downstream from the Topock site. Slant drilling characterized the full thickness of the fluvial material from the river bottom to bedrock from the California shoreline towards the center of the river at two locations near the I-40 bridge. Cr(VI) is not stable in reducing conditions and reverts to Cr(III), which is strongly sorbed to aquifer materials or forms insoluble precipitates. The reducing conditions in the fluvial sediments provide a natural geochemical barrier that greatly limits or prevents the movement of Cr(VI) through the fluvial sediments adjacent to and beneath the Colorado River. Characterization data of the reducing conditions in the fluvial sediments will be documented in the forthcoming RFI/RI.

2.1.4 Potential Groundwater Receptors

Receptors potentially could be affected if contaminated groundwater were to reach drinking water wells or the Colorado River. Drinking water wells would be primarily associated with human receptors. The Colorado River would be associated with both human and ecological receptors. The final remedy will be designed to protect potential receptors in the future.

2.2 Conceptual Model for Soil

The RFI/RI Volume 1 identified one SWMU, 17 AOCs, and one other undesignated area to be addressed in the RFI/RI for soil (CH2M HILL, 2007b).[2] Locations of the SWMUs, AOCs, and other undesignated area to be addressed in the RFI/RI are shown on Figure 1-2. Additional soil investigations are planned as part of the RFI/RI. Prior to the completion of the RFI/RI, PG&E will collect additional soil samples at these SWMUs, AOCs, and the other undesignated area to supplement the existing dataset. The complete site conceptual model

[2] One SWMU (SWMU 2) will be addressed in RFI/RI Volume 2 but not in RFI/RI Volume 3. In addition, RFI/RI Volume 1 identifies four SWMUs, 1 AOC, and four undesignated areas that were previously closed but for which additional soil investigation has been requested.. If the additional investigation data indicate that the closure status for any of these SWMUs, AOC and undesignated areas is to be rescinded, these will also be addressed further in the RFI/RI.

for soils will be provided in the RFI/RI and risk assessment. It will address the same general topics as described in the preceding sections for the groundwater conceptual model.

2.2.1 Source of Contaminants in Soils

Contaminants may have been released to soils through past management practices associated with hazardous material handling, spills, and leaks of cooling water and other fluids at the compressor station. Most of the AOCs and SWMUs are in or near the compressor station where hazardous materials were handled and spills or leaks may have occurred. AOCs outside the compressor station fence are generally associated with runoff or past disposal of debris and solid wastes.

Based on review of historical operations at the compressor station, COPCs identified for soil at the site include metals, pH, asbestos, polynuclear aromatic hydrocarbons, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total petroleum hydrocarbons (CH2M HILL, 2007b). This list of COPCs will be refined in forthcoming RFI/RI based on site characterization data. The COCs to be addressed in the CMS/FS will be limited to those that are found to be elevated (above a risk threshold and/or ARAR level) in soil during the site investigation and risk characterization. Other sources of soil contamination may be identified as ongoing investigations are completed, and will be documented in the RFI/RI.

2.2.2 Distribution of Contaminants in Soils

As indicated above, the characterization of soils is not yet complete for all SWMUs and AOCs. Existing data show that most of the chromium detected in soil is in the trivalent state. Sampling results to date indicate that, of a total of 281 analyses from locations outside of the compressor station fence, Cr(VI) was detected in 23 percent of the samples (64 detections), with a maximum concentration of 114 milligrams per kilogram. Sampling results to date on the 98 analyses inside the compressor station indicate Cr(VI) in 40 percent of the samples (39 detects), with a maximum concentration of 53 milligrams per kilogram. Copper and zinc have also been found above preliminary background levels in several areas. Final background levels will be documented in the RFI/RI.

2.2.3 Routes of Contaminant Migration in Soils

The primary routes of soil contaminant migration that will be considered are: (1) transport to groundwater through infiltration and (2) transport as suspended material in flowing surface water. All routes of soil contaminant migration identified as significant in the risk assessment will be addressed in the CMS/FS. Cleanup levels will be established and final remedies will be evaluated with these potential transport pathways in mind.

2.2.4 Potential Soil Receptors

Receptors for contaminants in soil include humans, animals, and plants. The risk assessment will evaluate exposure routes considering both direct exposure to contaminants in soils and indirect exposure to those contaminants that may leach from the soil to groundwater or be transported in flowing surface water. Exposure routes identified in the risk assessment as complete and contributing to elevated risk levels will be addressed in the CMS/FS.

Different cleanup standards may be evaluated for different AOCs and SWMUs depending on location and intended future use.

2.3 Conceptual Model Development

The conceptual model for the Topock site, as discussed in this section, is based upon existing information collected through multiple rounds of RFI/RI data collection activities at the Topock site since 1996. Additional data will be collected to complete the RFI/RI. The conceptual site model will be refined and documented in the final RFI/RI and risk assessments. Additional data planned prior to completion of the RFI/RI include:

- Further delineation of the distribution of chromium in groundwater in the area east and southeast of the existing floodplain wells. This will be accomplished using ongoing monitoring data of both existing and new wells, along with specialized tools such as analysis of stable isotopes of oxygen, hydrogen, and chromium.
- Delineation of chromium and other constituents in soil. Collection of additional soil data is planned at 19 SWMUs, AOCs, and other undesignated areas within and surrounding the compressor station through soil borings, trenching, and geophysical techniques. Samples will be analyzed for a wide range of potential contaminants.
- The evaluation of soil contamination within and surrounding the compressor station will include an evaluation of transport to groundwater through infiltration. This evaluation will include the installation of additional groundwater wells and collection of additional groundwater data to evaluate other sources (aside from the historical discharge of wastewater to Bat Cave Wash and PGE-8).

As discussed in Section 1, following completion of additional investigations, the final RFI/RI will be prepared. Volume 2 of the RFI/RI will address the historical operational practice of wastewater discharge to Bat Cave Wash and PGE-8, and will contain data from the following media: groundwater, surface water, pore water, and river sediment. Volume 3 will address the remaining Topock Compressor Station operations, and will contain soil data from the SWMUs, AOCs, and other undesignated areas addressed in Volume 3, as well as sediment data near the mouth of Bat Cave Wash, and groundwater data from wells within and immediately surrounding the compressor station. RFI/RI Volume 2 will address the main source and contaminant in groundwater at the site, the hexavalent chromium plume resulting from the historical discharge to Bat Cave Wash. Additional groundwater data (and soil data that may indicate potential impacts to groundwater) to be collected after completion of RFI/RI Volume 2 will be reported in an addendum to RFI/RI Volume 2, RFI/RI Volume 3, data summary reports, or monitoring reports as appropriate given the nature of the data and the effect on the site conceptual model.

The site conceptual model for the Topock site will be refined from that presented in this section following completion of the additional investigations. The final site conceptual model will be documented in the forthcoming RFI/RI and risk assessments. The risk assessments will estimate potential exposure levels, evaluate potential adverse effects of exposures, estimate potential adverse health or environmental effects based on carcinogenic, non-carcinogenic, and environmental risks, and identify COCs. This analysis not only determines which constituents are of interest but also whether there are locations where

COCs are present in concentrations that pose unacceptable risk. This forms a basis for determining "points of compliance,"[3] or the geographic locations where risks need to be controlled or eliminated. The conceptual site model will be completed through DTSC and DOI approval of the RFI/RI and risk assessments, prior to initiating the CMS/FS. The schedule for completion of the additional data collection, site investigations, RFI/RI documents, and risk assessments is presented in Section 7.0.

The CMS/FS will reiterate the conceptual site model developed in the RFI/RI and risk assessments, as refined based on the additional site investigation and risk assessments, as well as any new information developed after the final RFI/RI report is prepared that could significantly affect the evaluation and selection of remedial alternatives.

[3] The term "point of compliance" is typically a RCRA term applied to the location at which water quality standards must be met. Under CERCLA, ARARs pertaining both to contaminant levels and to performance or design standards should generally be attained at all points of exposure or at the point specified in the ARAR itself

3.0 Remedial Action Objectives

The results of the completed RFI/RI investigations, risk assessment, and conceptual site model development at the Topock site will provide the basis for identifying remedial action objectives for the site. Remedial action objectives specify medium-specific goals for removing or controlling risks to human health and the environment. The remedial action objectives identify acceptable COC levels for each receptor and exposure route. These factors may be based on state and federal standards and regulations, risk assessment, and land use considerations. Exhibit 3-1 illustrates the process.

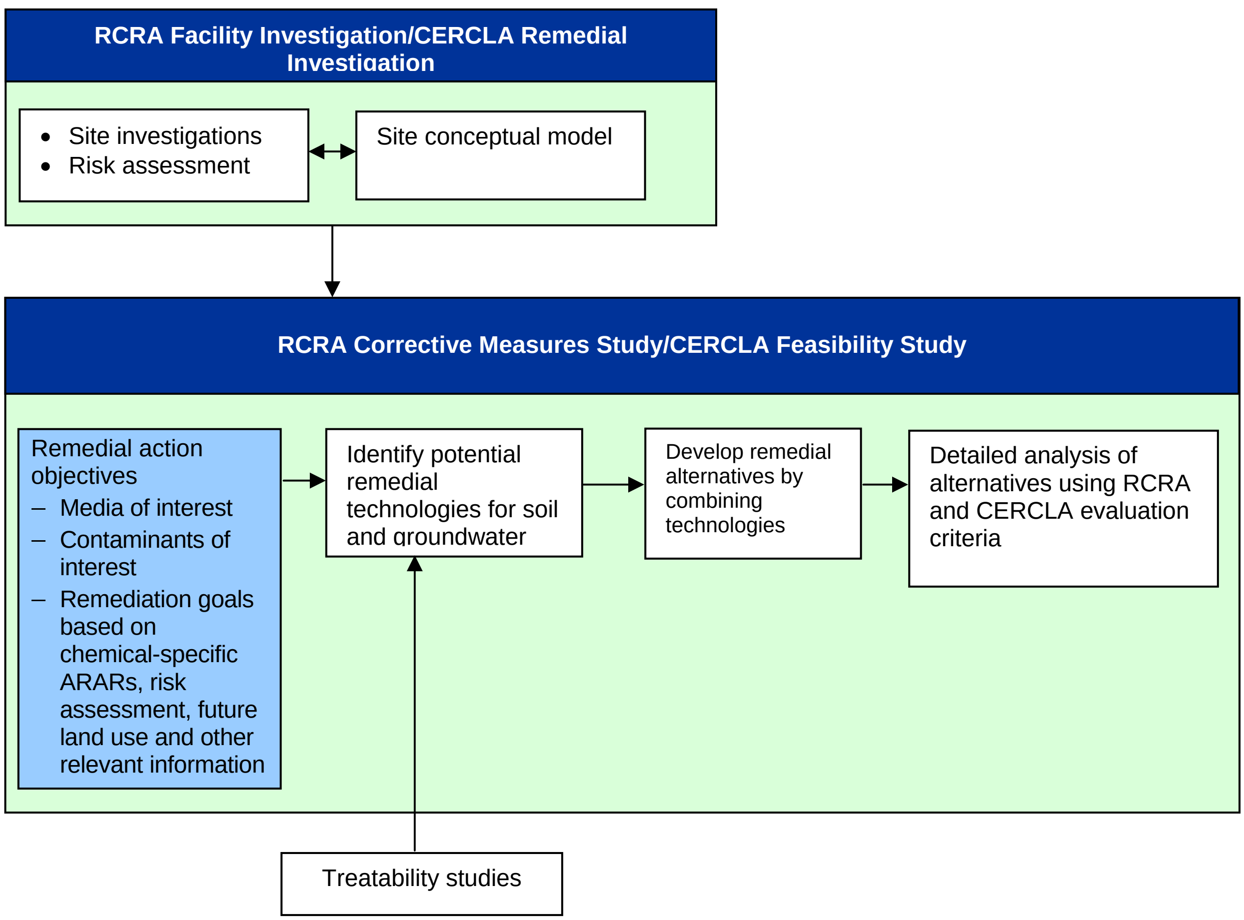

EXHIBIT 3-1
CMS/FS Process—Developing Remedial Action Objectives

3.1 Topock Site Objectives

Based on investigation findings to date, the expected remedial action objectives for the Topock site are identified below.

3.1.1 Groundwater

Remedial action objectives for groundwater include:

- Ensuring elevated concentrations of CR(VI) in groundwater at the Topock site above a risk threshold and/or above an ARAR level remain isolated from the Colorado River and the region.
- Remediating groundwater to reduce Cr(VI) concentrations.
- Remediating groundwater to eliminate unacceptable risks to human and ecological receptors and attain ARARs.
- Implementing remedial actions in a manner that is respectful of and causes minimal disturbance to cultural resources including, in particular, resources that are of special significance to tribes in the area.
- Implementing remedial actions in a manner that limits the disturbance to wildlife and their habitats.

3.1.2 Soil

Remedial action objectives for soil include:

- Preventing unacceptable risks to human and ecological receptors from direct exposure, inhalation, or ingestion of chemicals of concern in soil by humans or wildlife.
- Preventing unacceptable risks to human and ecological receptors resulting from chemicals of concern in soils migrating to groundwater or surface water.
- Attaining ARARs.
- Implementing remedial actions in a manner that is respectful of and causes minimal disturbance to cultural resources including, in particular, resources that are of special significance to tribes in the area.
- Implementing remedial actions in a manner that limits the disturbance to wildlife and their habitats.

3.2 Media Cleanup Goals and Standards

The CMS/FS will define cleanup levels for groundwater and soil that will be protective of human health and the environment and will attain ARARs. Points of compliance and cleanup levels for soil and groundwater will be developed based on the results of site-specific risk assessments and/or ARARs, with consideration of natural background concentrations, as appropriate. Individual SWMUs, AOCs, and other undesignated areas may have different cleanup goals and standards based on specific contaminant distribution and exposure assumptions.

3.2.1 Site-specific Risk-based Media Cleanup Goals

Currently, there are no site-specific risk-based criteria for the Topock site. The human health risk assessment and screening ecological risk assessment have not yet been completed. Risk assessments will be prepared following the completion of the RFI/RI report.

3.2.2 Applicable or Relevant and Appropriate Requirements (ARARs)

The DOI is leading a solicitation and evaluation of ARARs for the Topock site. The ARARs were developed during the RFI/RI to allow early opportunity for review and comment, and were issued by the DOI in December 2007 (DOI, 2007). Chemical-specific and location-specific ARARs for soil and groundwater will guide the development of the proposed media cleanup goals and standards and will be included in the final RFI/RI report The identified chemical-specific ARARs for Cr(VI), Cr(III), and Cr(T) in groundwater and surface water are shown in Table 3-1. No chemical-specific ARARs were identified for soil or sediment. In addition to Cr(VI), Cr(III), and Cr(T) the CMS/FS will consider the ARARs for other COCs identified in the RFI/RI and risk assessments.

TABLE 3-1
Chemical-Specific ARARs for Cr(VI), Cr(III), and Cr(T) in Groundwater and Surface Water
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

ARAR	Unit	Cr (VI)	Cr(III)	Cr(T)
Groundwater				
Federal Safe Drinking Water Act (42 USC §300f, et seq., 40 CFR 141)	µg/L	N/A	N/A	100
California Safe Drinking Water Act (22 CCR δ64431, §64444, §64449)	µg/L	N/A	N/A	50
Surface Water				
Federal Water Pollution Control Act (33 USC §§ 1251-1387, 40 CFR 131.38)	µg/L	11	237[a]	N/A

Notes:

[a] Freshwater aquatic life, chronic, assuming water hardness = 142,000 parts per billion (calcium carbonate [$CaCO_3$] equivalents)

µg/L = micrograms per liter
CCR = California Code of Regulations.
CFR = Code of Federal Regulations.
N/A = not applicable.
USC = U.S. Code

Source: DOI, 2007

3.2.3 Ambient (Background) Conditions and Concentrations

Natural background concentrations of metals in soil and groundwater near the Topock site are being assessed through site-specific studies. A groundwater background study implemented between 2005 and 2006 calculated the background concentrations of Cr(VI), Cr(T), and other metals in groundwater near the Topock site (CH2M HILL, 2008). A similar study is being implemented for soil. The results of the background studies will be considered as appropriate during development of media cleanup standards in the CMS/FS. Agency approval of the background studies for soil and groundwater is pending; agency approval of the background studies is expected prior to the initiation of the CMS/FS.

4.0 Corrective Measure/Remedial Action Technologies

Corrective measure/remedial action technologies are the building blocks from which complete sitewide cleanup alternatives are developed. For each medium of interest, technologies are identified that are judged to be capable of being implemented and of being potentially effective in meeting the remedial action objectives for the site based on the volume or area requiring remediation and the COCs present.

Technologies may be identified based on data from application at other sites, bench-scale testing, or site-specific pilot testing. During the CMS/FS, remedial sitewide alternatives are developed using various combinations of technologies applied to different areas of the site or volumes of media (e.g., soil, groundwater) described in Section 5.0. Exhibit 4-1 illustrates this portion of the CMS/FS process.

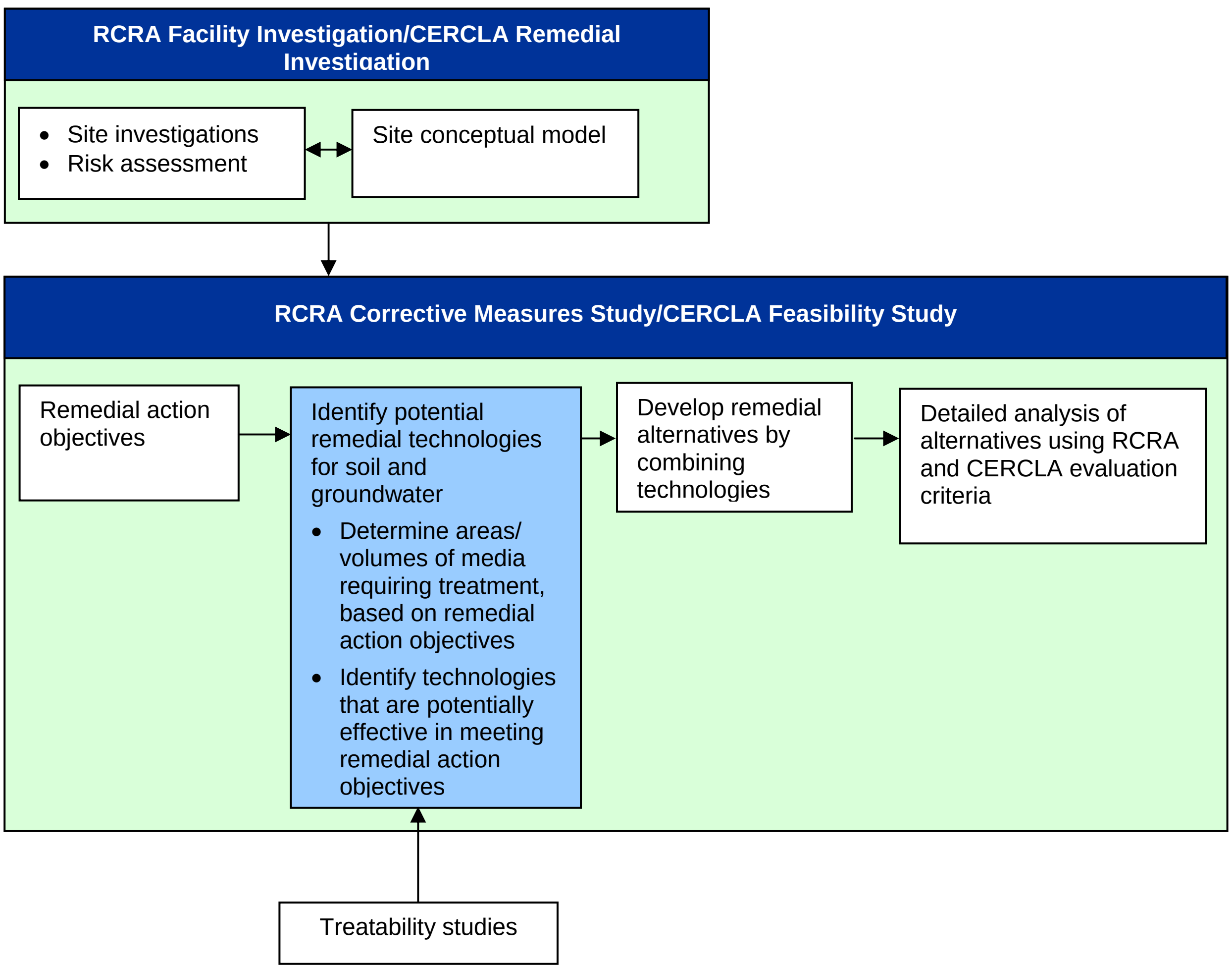

EXHIBIT 4-1
CMS/FS Process—Identifying Remedial Technologies

Potential treatment technologies for various COPCs in soil and groundwater are presented in Table 4-1. As the site investigations and risk characterization are completed, the list of COPCs will be refined prior to the CMS/FS.

TABLE 4-1
Potential Remedial Technologies
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Constituents of Potential Concern	Potential Remedial Technologies	
	Groundwater	**Soil**
Total petroleum hydrocarbons	MNA, *in-situ* remediation, impermeable barriers	Excavation, stabilization, capping in place, soil washing, soil flushing, thermal desorption.
Volatile organic compounds	MNA, *in-situ* remediation, pump and *ex-situ* treatment, permeable and impermeable barriers, phytoremediation	Soil-vapor extraction, excavation, soil washing, soil flushing
Semivolatile organic compounds	MNA, *in-situ* remediation, pump and *ex-situ* treatment, impermeable barriers	Excavation, soil washing, capping in place, soil flushing, stabilization, thermal desorption, *in-situ* vitrification, incineration
Polynuclear aromatic hydrocarbons	MNA, pump and *ex-situ* treatment, impermeable barriers	Excavation, stabilization, capping in place, soil washing, soil flushing, *in-situ* vitrification, incineration
Cr(VI)	MNA, pump and *ex-situ* treatment, permeable and impermeable barriers, reactive treatment zones, phytoremediation	Excavation, soil washing, soil flushing, stabilization, chemical reduction, phytoremediation, capping in place, *in-situ* vitrification
Metals (other than Cr[VI])	Pump and *ex-situ* treatment, *in-situ* remediation, impermeable barriers, phytoremediation	Excavation, soil washing, stabilization, capping in place, soil flushing, *in-situ* vitrification
Asbestos	N/A	Stabilization, excavation, capping in place, *in-situ* vitrification

Notes:
MNA = monitored natural attenuation.
N/A = not applicable.

Based on available site information, a preliminary list of potentially effective remedial technologies for groundwater and soil are presented in Sections 4.1 and 4.2. As the nature and extent of COPCs becomes better defined, these technologies can be refined, modified, or supplemented to accommodate any further site understanding.

Technologies to be used in developing remedial alternatives are typically screened based on expected effectiveness in meeting remedial action objectives, ability to be implemented, and cost-effectiveness. Evaluations use standard engineering and scientific methods to the extent possible and typically rely on the following:

- existing studies and data in literature to indicate whether a technology or alternative will be effective;
- bench-scale or pilot-scale studies to evaluate technologies under site-specific conditions;

- professional judgment; and
- site-specific data on soil, geology, hydrogeology, sensitive habitat, historical and cultural resources, and other physical conditions that could influence the degree to which technologies may be implementable and effective.

Bench-scale and pilot testing to evaluate remedial alternatives at the Topock site are discussed in Section 4.3. Some of the proposed remedial alternatives may have significant impacts on cultural resources, and it is expected that alternatives will be subjected to screening based on the nature and type of potential impacts on cultural resources.

Technologies will be screened out if they would clearly not meet the remedial action objectives, or if there are significant limitations to implementation. The following criteria are expected to be taken into consideration when evaluating implementability:

- Ability to construct and operate the technology
- Reliability of the technology
- Ease of undertaking additional remedial actions, if necessary
- Ability to monitor the effectiveness of remedy
- Ability to obtain approvals from other agencies
- Availability of offsite treatment/storage/disposal services
- Availability of necessary equipment and specialists
- Availability of prospective technologies

4.1 Groundwater Remediation Technologies

As indicated in Table 4-1, there is a wide range of technologies that may be applicable for different COCs. Because the groundwater COCs to be addressed in the CMS/FS have not yet been determined, this work plan focuses on technologies to address Cr(VI), which is the primary COPC at the site. The CMS/FS may include additional technologies if additional COCs are identified during completion of the site investigations and risk characterization.

The five technologies that appear to have the potential to address Cr(VI) contamination in groundwater at the Topock site either alone or in combination are:

- **Monitored Natural Attenuation**: involves monitoring the effectiveness of naturally-occurring conditions to reduce concentrations of Cr(VI) and prevent it from discharging to the Colorado River.

- **Pump-and-Treat:** an *ex-situ* technology similar to that employed for the Topock IM that involves pumping contaminated groundwater to the surface for treatment in an aboveground treatment plant to remove Cr(VI). Treated water could be reinjected to the subsurface, used for irrigation or industrial purposes, discharged to surface water, or managed by some other means. Pump-and-treat remediation is often implemented to provide hydraulic containment and prevent further expansion of a contaminant plume.

- **Impermeable Barrier:** involves constructing a barrier to groundwater flow (cutoff wall) from the ground surface to bedrock and pumping groundwater from the landward side of the barrier to prevent Cr(VI)-containing groundwater from reaching the Colorado River.

- **Permeable Reactive Barrier (PRB)**: involves a constructing a subsurface flow-through barrier between the contaminant plume and the Colorado River that would convert Cr(VI) into insoluble Cr(III), while allowing natural groundwater flow to continue.
- **Reactive Treatment Zones:** areas where reductants are injected into the groundwater to create *in-situ* geochemical conditions that will reduce Cr(VI) to Cr(III) as the groundwater passes through the zone. *In-situ* reactive zones differ from reactive barriers in that they do not involve constructing a barrier below ground but, rather, use combinations of extraction and injection wells and/or natural groundwater movement to create a zone within the aquifer where Cr(VI) is converted into Cr(III).

The following sections provide additional general descriptions of these technologies without discussion of specific application to the Topock site. Specific application of selected technologies will be described in the CMS/FS after full consideration of site conditions and constraints.

4.1.1 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is any combination of "physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater" (USEPA, 1999). Groundwater monitoring data are collected to evaluate the effectiveness of natural conditions to reduce Cr(VI) concentrations. Specifically, monitoring evaluates the movement and reduction of Cr(VI) with respect to the point(s) of compliance and/or sensitive receptors.

MNA is often combined with other active remedial technologies to provide a complete remedial alternative.

4.1.2 Groundwater Pump-and-Treat

Pump-and-treat remediation methods involve the installation of one or more groundwater extraction wells within the contaminant source zone and/or downgradient plume. Pumps are used to pull groundwater into the wells and bring it to the surface, where it is treated using one or more aboveground treatment processes. The number and spacing of wells, extraction rates, and treatment methods are dependent on the physical site characteristics and the contaminant type.

Pump-and-treat can provide an effective means for implementing hydraulic containment and is often used to prevent a plume of contaminated groundwater from spreading while simultaneously providing for contaminant removal. When used as the sole remedial technology, pump-and-treat groundwater systems typically require long timeframes to achieve cleanup objectives. Therefore, pump-and-treat is often combined with other remedial technologies to achieve cleanup goals more quickly.

As shown in Exhibit 4-2, pump-and-treat systems typically require:

- A groundwater extraction system to pump the contaminated groundwater from the aquifer.
- A groundwater treatment system to remove constituents from the extracted water.

- Conveyance piping to transport water to and from the treatment plant.
- Some means of disposal or reuse of the treated water.

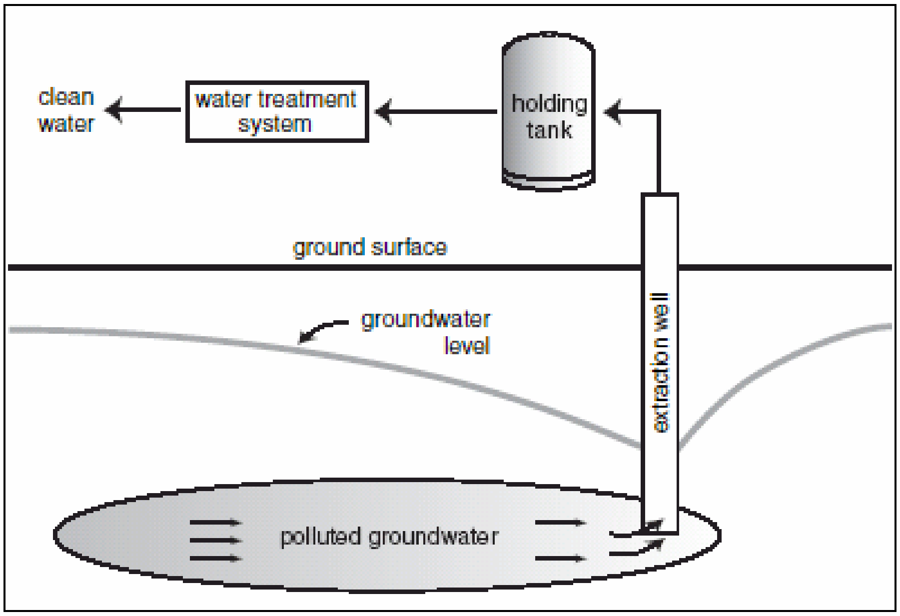

EXHIBIT 4-2
Groundwater Pump-and-Treat
Source: USEPA, 2001a.

Other considerations may include well placement constraints due to pipeline access considerations and maximum flow rate constraints due to the capacity of the water disposal/reuse facilities. Treatment facilities may be located onsite or offsite. A number of potential disposal/reuse options may exist for the Topock site including discharge to the Colorado River, reuse at the compressor station, irrigation, and injection into the aquifer. Alternatively, disposal facilities may be located offsite.

An interim pump-and-treat system is now in place at the Topock site. PG&E and the Fort Mojave Indian Tribe have agreed that, to the extent that a pump-and-treat system is required as part of the final remedy, the treatment plant would be relocated to the current location of the compressor station. It is expected that the CMS/FS will identify and evaluate potential locations for a treatment plant, should one be required as part of the final remedy.

4.1.3 Clean Water Injection

Clean water injection is typically coupled with pump-and-treat remediation, but may be used with other remedies. It involves the use of injection wells or injection galleries to introduce clean water to the aquifer. Injection wells are currently being used for disposal of treated groundwater from the IM No. 3 pump-and-treat system. The IM No. 3 injection wells are located beyond the margin of the plume and contributes to flushing of the plume toward the IM No. 3 extraction wells.

The passive treatment technologies such as permeable reactive barriers, *in-situ* reactive treatment zones, and MNA may require many years to achieve remedial objectives because groundwater flow is relatively slow at the Topock site. Strategic use of injection wells in conjunction with a passive technology could significantly accelerate the cleanup. It should be noted that clean water injection would not be used as a stand-alone technology. It would be coupled with one of the passive remedies or with pump-and-treat.

4.1.4 Impermeable Barrier Wall

An impermeable barrier wall is a subsurface barrier installed across the flow path of groundwater to prevent movement of groundwater past the wall. Impermeable barriers are used to contain contaminated groundwater, divert uncontaminated groundwater flow, and/or provide barriers for groundwater treatment systems. These vertical barriers must extend down to an impermeable natural horizontal barrier, such as a clay or bedrock zone, to effectively impede groundwater flow. As heavy equipment is needed for construction, vehicle access is a requirement. Exhibit 4-3 shows a typical impermeable barrier wall.

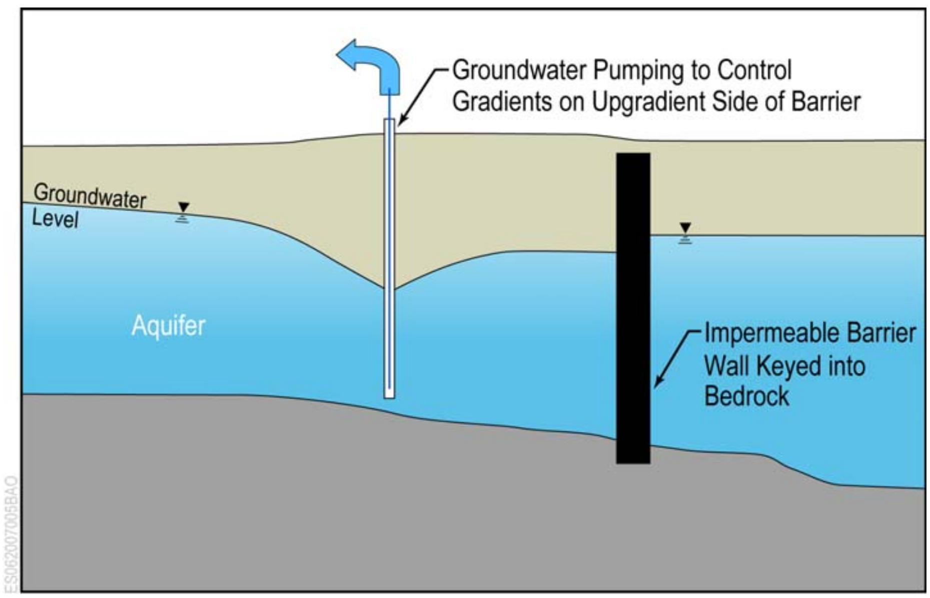

EXHIBIT 4-3
Impermeable Barrier Wall

Vertical barriers typically used to control groundwater flow include soil-bentonite, soil-cement-bentonite, cement-bentonite, sheet pile (steel or high-density polyethylene), and clay barriers. The most widely-used technique for containment is the soil-bentonite slurry wall. Other possible applications include ground modification methods (curtain wall [jet grouting]) and cement deep soil mixing).

A groundwater extraction system is typically installed upgradient of the impermeable barrier to prevent buildup of groundwater pressure that could cause groundwater to flow around the ends of the barrier or emerge at the land surface.

Impermeable barriers are typically placed at depths up to 100 feet and are 8 inches to 4 feet thick. Depending on the type of impermeable barrier and subsurface conditions, installation to greater depths is possible, but the difficulty of installation increases as depths increase below 100 feet. The most effective application of the impermeable barrier for site remediation is to base (or key) the slurry wall 2 to 3 feet into a low-permeability layer such as clay or bedrock. This “keying-in” provides for an effective foundation with minimum leakage potential.

4.1.5 Permeable Reactive Barrier

As shown in Exhibit 4-4, a PRB is a subsurface wall constructed of reactive materials that allow groundwater to pass through while prohibiting the movement of constituents. For Cr(VI), the reactive materials typically consist of zero-valent iron or sodium dithionite, which chemically reduce Cr(VI) to relatively insoluble Cr(III). The converted Cr(III) is then removed from groundwater within the PRB material, with groundwater containing acceptable chromium concentrations flowing out the downgradient side of the PRB.

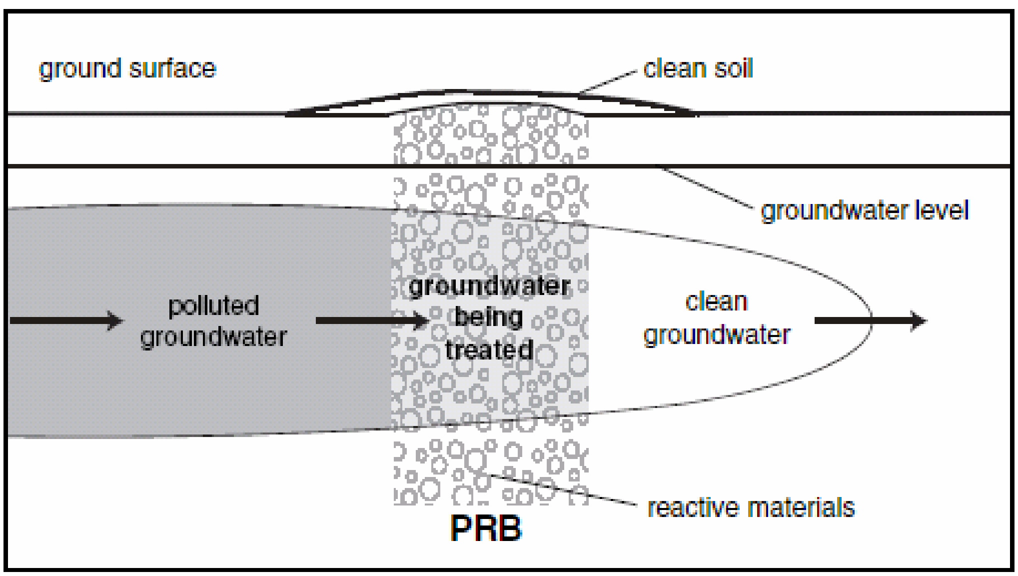

EXHIBIT 4-4
Permeable Reactive Barrier (PRB)
Source: USEPA, 2001b.

Permeable reactive barriers work best at sites with loose sandy soil where contamination is no deeper than 50 to 100 feet and the barrier can be constructed down to an impermeable layer such as bedrock to prevent contaminated groundwater from passing beneath the barrier. As heavy equipment is needed for construction, vehicle access is a requirement. The installation of PRB walls is limited to depths of less than 150 feet below ground surface using continuous wall construction methods.

4.1.6 Reactive *In-situ* Treatment Zones

Chemical injection methods can be used to reduce Cr(VI) in groundwater to the relatively immobile Cr(III) without the use of the PRB structures, described in Section 4.1.4. The reduced chromium precipitates or becomes adsorbed onto aquifer solids. *In-situ* chemical reduction can be implemented by:

- Extracting contaminated groundwater and treating it aboveground followed by reinjection of the treated groundwater into the aquifer. The reinjected groundwater is dosed with a reductant to reduce any residual Cr(VI) remaining in the interstitial water.
- Injecting the reductant into the aquifer using a strategically designed well network to form an *in-situ* treatment zone.

A variety of reactive materials may be applicable at the Topock site, including both chemical reductants and organic carbon substrates. Chemical reductants—including sodium hydrosulfite (dithionite), ferrous sulfate, calcium polysulfide, and hydrogen releasing compounds—work directly to reduce Cr(VI). Organic carbon substrates such as lactate, ethanol, acetic acid (vinegar), molasses, or emulsified vegetable oil can be injected into the groundwater to stimulate microorganisms to create the necessary reducing conditions to convert Cr(VI) to Cr(III). At Topock, this technology is currently being pilot tested to evaluate performance at the field level and to determine design parameters such as substrate quantities and the number of injection wells required.

4.2 Soil Remediation Technologies

Additional studies are planned to determine the nature and extent of soil contamination at the Topock site. The need and type of soil remediation will be determined based on the findings of these studies. Because the soil COCs to be addressed in the CMS/FS have not yet been determined, this work plan focuses on technologies to address Cr(VI), which is the primary COPC in groundwater and likely in soil. The CMS/FS may include additional technologies if additional COCs are identified during completion of the site investigations and risk characterization.

- **Excavation and Offsite Disposal:** involves excavation, transportation, and disposal of contaminated material from the Topock site to a permitted offsite disposal facility. Pretreatment may be required to meet disposal requirements of the offsite facility.
- **Excavation and Onsite Treatment:** is an *ex-situ* method that involves excavation of contaminated soil and treatment onsite by either soil washing or chemical reduction.
- **Soil Flushing:** is an *in-situ* method that involves application of water or additive-containing water to soil to enhance contaminant solubility. Soil flushing is used in combination with groundwater remedial method. Contaminants are leached from soil into the groundwater, which is then remediated.
- **Solidification/Stabilization:** can be either *ex-situ* or *in-situ* and involves use of various chemical additives to physically bind or enclose contaminants within a stabilized mass (solidification) or to chemically reduce the contaminants' mobility by inducing chemical reaction between the stabilizing agent and the contaminants (stabilization).

- ***In-Situ* Chemical Reduction:** involves addition of reagents to react with targeted constituents in soil to chemically convert hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. Reductants could be applied to soil by infiltrating a liquid reductant from the surface, injecting a liquid reductant through wells, or injecting a gaseous reductant through wells.
- **Phytoremediation**: involves planting vegetation on contaminated soils. Contaminants are removed from soil through geochemical reactions in the root zone or through uptake by the roots and incorporation into the plant tissue. If contaminants become incorporated into the plants, the plant material may be periodically harvested and removed to a hazardous waste disposal facility. Phytoremediation is generally effective only for contaminants that are soluble in water and located at shallow depths that can be reached by the plant roots, or in combination with other measures, where it is used to reduce the amount of surface water infiltration to a deeper contaminated zone or to lower local groundwater levels to prevent contact with contaminated soils.
- **Capping in Place:** involves construction of a capping system on top of the contaminated area to contain and minimize exposure of the contaminants to the environment.
- **Soil Vapor Extraction (SVE):** involves application of a vacuum through a network of wells to remove contaminated vapor from the soil. Volatile contaminants are removed with the vapor stream. A treatment system is typically incorporated to remove the contaminants before the soil vapor is vented to the atmosphere.
- **Thermal Desorption:** involves heating the subsurface to accelerate the movement of contaminants from the soil into the soil vapor. It is typically combined with SVE to remove the contaminants from the subsurface. By heating the subsurface, SVE can be used for a wider range of contaminants with lower volatility. Heating can also speed up the removal of volatile contaminants, particularly if contaminants are present in the form of is non-aqueous phase liquids (NAPLs). Heating can be accomplished by injection of hot air or steam, or through use of electric current.
- ***In-Situ* Vitrification**: involves intensive heating of the subsurface to melt the soil into a molten mass, which then cools into a glassy, vitrified block. Most organic contaminants are driven off or broken down during the heating. Inorganic contaminants are incorporated into the vitrified block and sequestered from the surrounding soil or groundwater.
- **Incineration:** involves burning excavated soil at high temperatures in a kiln or furnace. Incinerators are carefully designed to capture and treat the gasses generated during combustion. Due to difficulties in permitting incinerators, most incineration is accomplished in offsite hazardous waste treatment facilities rather than with onsite incinerators. Depending on the contaminants present, the ash remaining may require disposal as a hazardous waste.

The following sections provide additional general descriptions of these technologies without discussion of specific application to the Topock site. Specific application of selected technologies will be described in the CMS/FS after full consideration of site conditions and constraints.

4.2.1 Excavation and Offsite Disposal

Excavation and offsite disposal is a well-proven technology. Prior to 1984, excavation and offsite disposal was the most common method for cleaning up contaminated sites. Excavation is the initial component in all *ex-situ* treatments.

As shown in Exhibit 4-5, the process of excavation and offsite disposal involves excavation of the contaminated area using backhoes, front loaders, continuous excavators, scrapers, and other equipment. The excavated material is typically staged for loading (treated if required) and loaded into transport vehicles for shipment to a permitted offsite disposal facility. Loading may be conducted directly from the excavators into the transport vehicles but is typically performed with front-end loaders after stockpiling, soil characterization, and/or pretreatment.

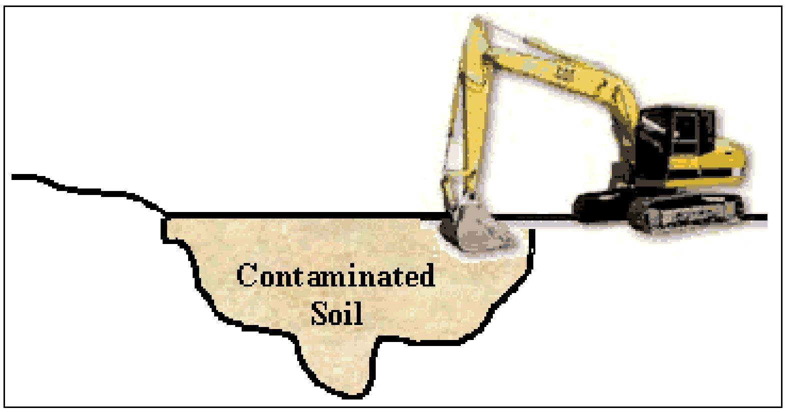

EXHIBIT 4-5
Typical Excavation

Landfill disposal typically requires that no free liquid be present in the material or that the material meet toxic characteristic leaching procedure leaching criteria or both. Where applicable, pretreatment (e.g., stabilization, fixation, etc.) of material may be required to bind free water and prevent leachate development from the excavated wastes once disposed of offsite.

Other considerations may include generation of fugitive emission during operations, distance from the site to the nearest disposal facility, and community acceptability towards excavation and transportation of the contaminated material.

4.2.2 Excavation and Onsite Treatment

This technology involves excavation of contaminated soil and treatment of the excavated soil onsite. Different treatment methods may be considered depending on the type of contaminants present. This work plan highlights two of the most common treatment methods: soil washing and chemical reduction/oxidation.

4.2.2.1 Soil Washing

Soil washing is an *ex-situ* soil separation technique that is often considered to be environmentally preferred and that is being widely used in Northern Europe and North

America. It is a water-based soil scrubbing process to sort contaminated solids by sizes after the material is excavated. The process removes contaminants from soils either by:

- Dissolving or suspending the contaminants in the wash solution.
- Concentrating the contaminants into a smaller volume of soil through particle size separation and gravity separation.

The concept of reducing soil contamination through the use of particle size separation is based on the finding that most organic and inorganic contaminants tend to bind, either chemically or physically, to clay, silt, and organic soil particles. Washing processes that separate the fine clay and silt particles from the coarser sand and gravel soil particles can be used to effectively separate and concentrate the contaminants into smaller volumes of soil. Further treatment or disposal can be performed subsequent to the washing processes.

As shown in Exhibit 4-6, the soil washing process typically comprises the following components:

- Contaminated soil is excavated, screened, and homogenized prior to being fed into the washing apparatus. Oversized material is removed.
- Extraction agents and makeup water are added to the soil.
- After sufficient mixing, treated soils are separated from the wash water.
- Contaminants are concentrated into a smaller volume of soil through the separation of fine clay and silt particles from the coarser sand and gravel particles using various screening and controlled rate-settling processes. The cleaned soil can often be replaced onsite.

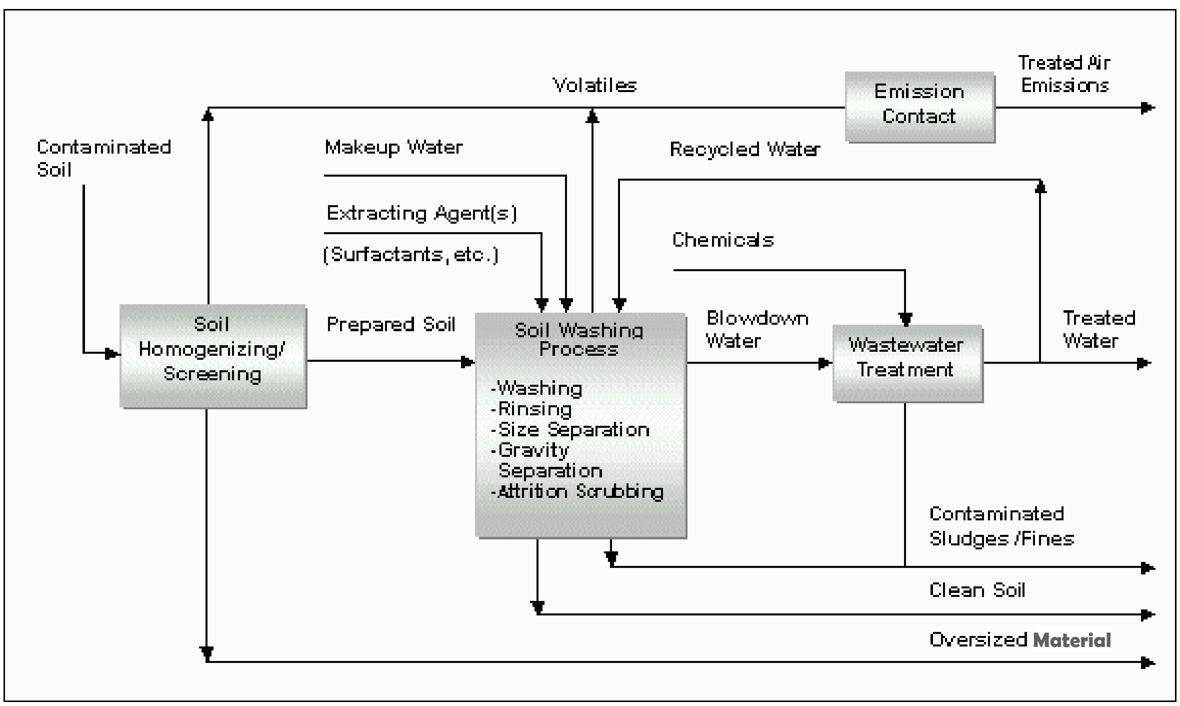

EXHIBIT 4-6
Typical Soil Washing Process
Source: Federal Remediation Technology Roundtable, 2002.

Soil washing is generally considered to be a media transfer technology. The wash water is treated in a wastewater treatment plant and, whenever possible, treated water is recycled back into the washing apparatus. Other considerations may include additional treatment that may be required on oversized materials, as well as management of wastewater, contaminated fines, and solids.

4.2.2.2 Chemical Reduction

Chemical reduction/oxidation is a full-scale, well-established technology for treatment of chromium-containing materials that involves chemical reactions of electron transfer (and usually other chemical groups) from one reactant (oxidized compound) to another compound (reduced compound).

As shown in Exhibit 4-7, the chemical reduction process typically comprises the following components:

- Contaminated soil is excavated, and screened. Oversized material is removed.
- Water is added to the screened soil, and the slurry is transferred to a reactor, where reagents are added to react with targeted constituents.
- The reagent/soil mixture is transferred to a separator, where excess reagent is removed and recycled back into the reactor. The treated soil is washed and dewatered.
- Water from the dewatering process is recycled back to the soils washer. The dewatered sludge is combined with the oversized material for disposal.

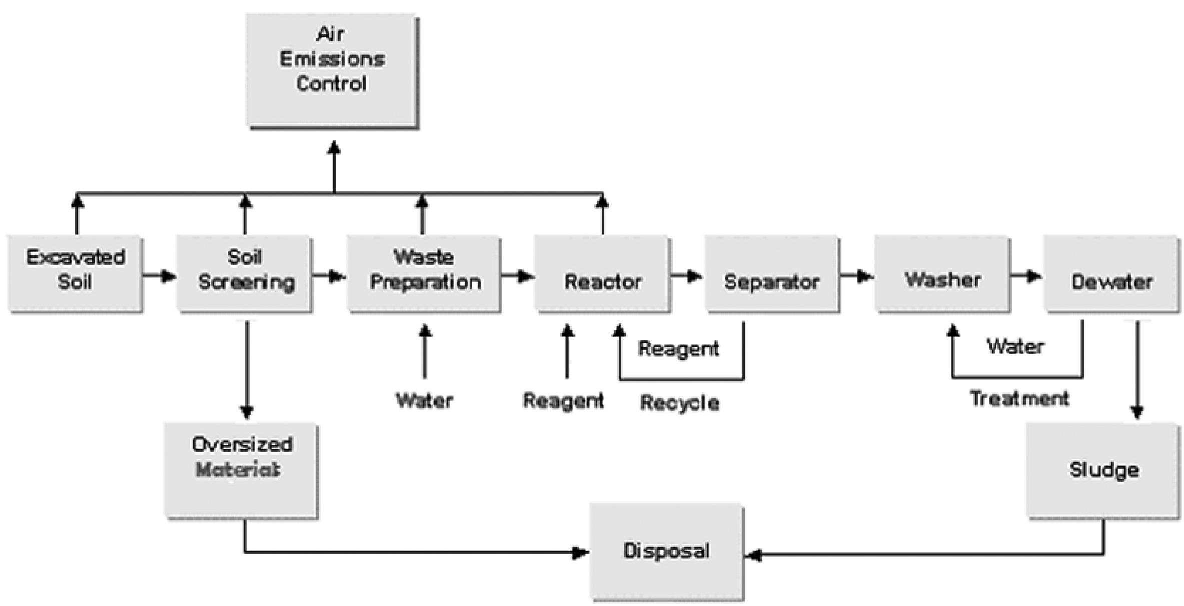

EXHIBIT 4-7
Typical Chemical Reduction Process
Source: United States Army Corps of Engineers (USACE), 2003.

If the process is not optimized, formation of intermediate byproducts may occur. Other considerations may include additional treatment that may be required of effluent water from dewatering, sludge and oversized material.

4.2.3 Soil Flushing

Soil flushing is an *in-situ* treatment technology that is used in combination with a groundwater remedial technology. It is a developing technology that has had limited use in the United States. Laboratory and field treatability studies must be performed under site-specific conditions prior to its full-scale implementation.

As shown in Exhibit 4-8, the soil flushing process involves infiltrating water, with or without additives (such as surfactants), through contaminated soils to flush (*in-situ* wash) contaminants from the soil into the underlying groundwater for collection by downgradient groundwater extraction wells and treatment. Additives are typically surfactant compounds that enhance the solubility of the contaminants and improve the efficiency of the flushing process.

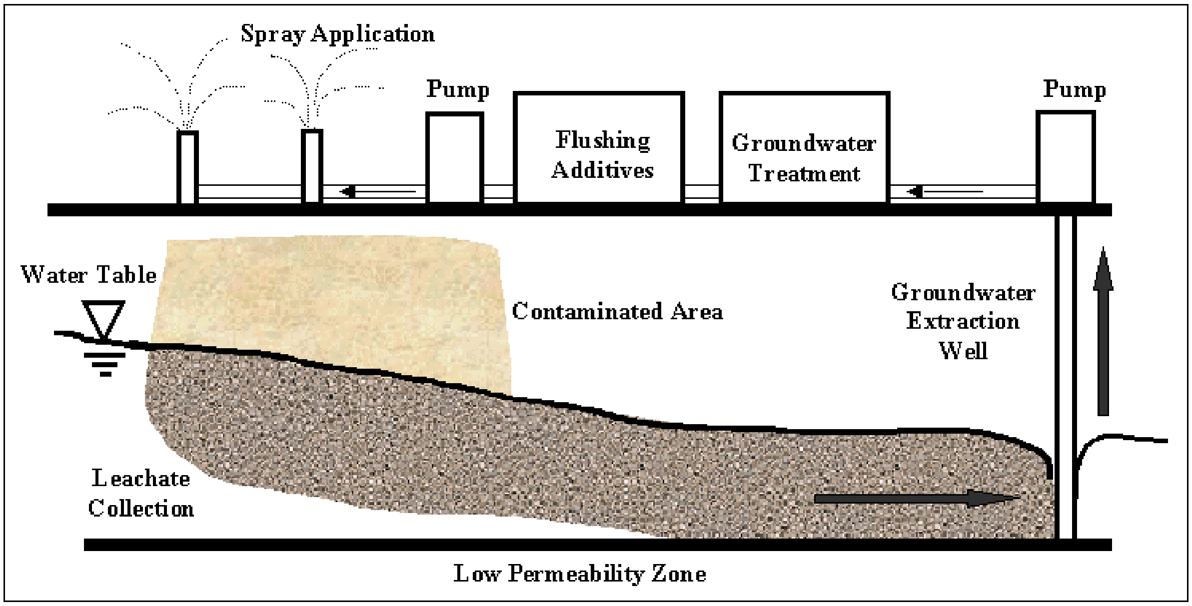

EXHIBIT 4-8
Soil Flushing
Source: Federal Remediation Technology Roundtable, 2002.

Soil flushing is typically coupled with groundwater treatment to allow contaminants flushed from soil to be removed from the groundwater. Recovered groundwater and flushing additives with the desorbed contaminants typically need treatment to meet appropriate discharge standards. Ideally, some or all of the treated groundwater can be reused in the flushing process.

The primary requirement for soil flushing is that groundwater can be captured, extracted, and treated or that the groundwater can be treated *in-situ* to prevent further spread of contamination. Other considerations may include the potential of washing of the contaminants beyond the capture zone and the introduction of surfactants to the subsurface.

4.2.4 Solidification/Stabilization

Solidification/stabilization reduces mobility of contaminants in the environment through both physical and chemical means. Solidification generally refers to a physical process where a semi-solid material is treated to render it more solid. Stabilization typically refers to a chemical process that actually binds the matrix of the contaminant such that its constituents are immobilized. Both processes tend to trap or immobilize contaminants within their “host” medium. Leachability testing is typically performed to measure the immobilization of contaminants.

As shown in Exhibit 4-9, solidification and stabilization can be performed *in-situ* or *ex-situ*. Typical binding/stabilizing agents include Portland cement, pozzolanic binders, and various kiln dusts. Most of these materials are highly alkaline and form a solidified matrix when mixed with the contaminated material.

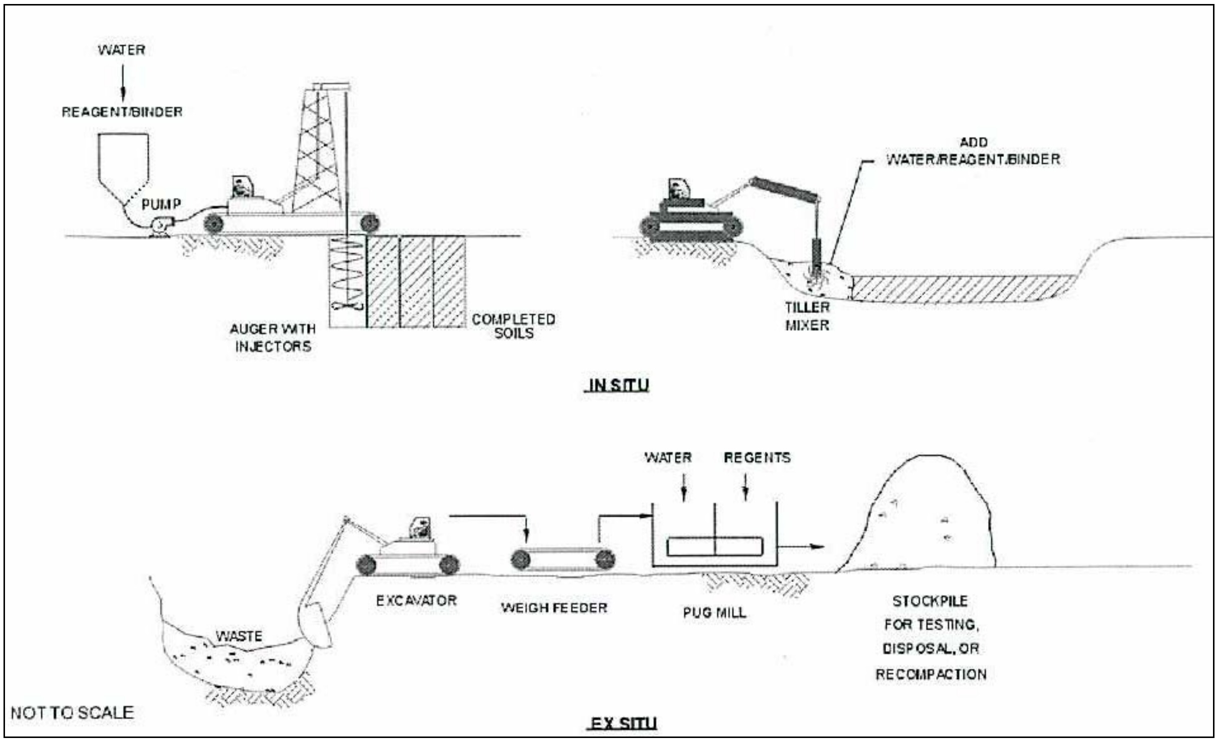

EXHIBIT 4-9
Solidification/Stabilization
Source: USACE, 2003.

The *ex-situ* method involves excavation and staging of the soil, screening to remove larger-diameter material, blending the binding agents and water with solids, and stockpiling treated solids for testing prior to offsite disposal or placement back in the excavation. The *in-situ* method involves injection or mixing of stabilizing agents into subsurface soils, addition of water if necessary, and then repeated in-place mixing with the bucket of a backhoe or track hoe to thoroughly mix and stabilize the soils in place.

The *ex-situ* method generally requires greater material handling than for *in-situ* methods, but the degree of mixing and blending control is significantly higher than for *in-situ* processing. This generally yields higher confidence that the contaminants have been effectively immobilized and may require less reagent-per-unit-volume of solids treated. However, a significant consideration in applying the *ex-situ* technology is the swell factor in the solid volume created by the binding agent. This factor can approach up to 50 percent in some cases; in which case, not all of the treated material can be backfilled into the original excavation.

The solidification/stabilization process has been successfully demonstrated and used for inorganic contaminants such as metals. Laboratory and field treatability studies must be performed under site-specific conditions prior to its full-scale implementation.

4.2.5 *In-situ* Reduction

In-situ reduction in soil is a technology involves introducing reductants to the contaminated soil zone to chemically reduce contaminants. This method could be used to reduce Cr(VI) to Cr(III) in place without the need for excavation. Reductants can be introduced in either liquid or gaseous form. When using liquid reductants, this process would be similar to soil flushing described above except that only a fraction of the Cr(VI) would be flushed to the groundwater. Much of the Cr(VI) would be reduced by contact with the reductant within the unsaturated zone. Chemical reductants such as polysulfide or thiosulfate would be favored over biological amendments such as lactate or ethanol because of the difficulty of maintaining anaerobic conditions in the unsaturated zone necessary for biological reduction.

I*n-situ* reduction using gaseous injection would also be considered. This technology involves injecting a gaseous reductant such as sulfur dioxide or methane into a network of wells. Exhibit 4-10 shows the application of a gaseous injection system at the White Sands Missile Range in New Mexico. Although gaseous reduction technology has been demonstrated at a few sites, it has not seen widespread use.

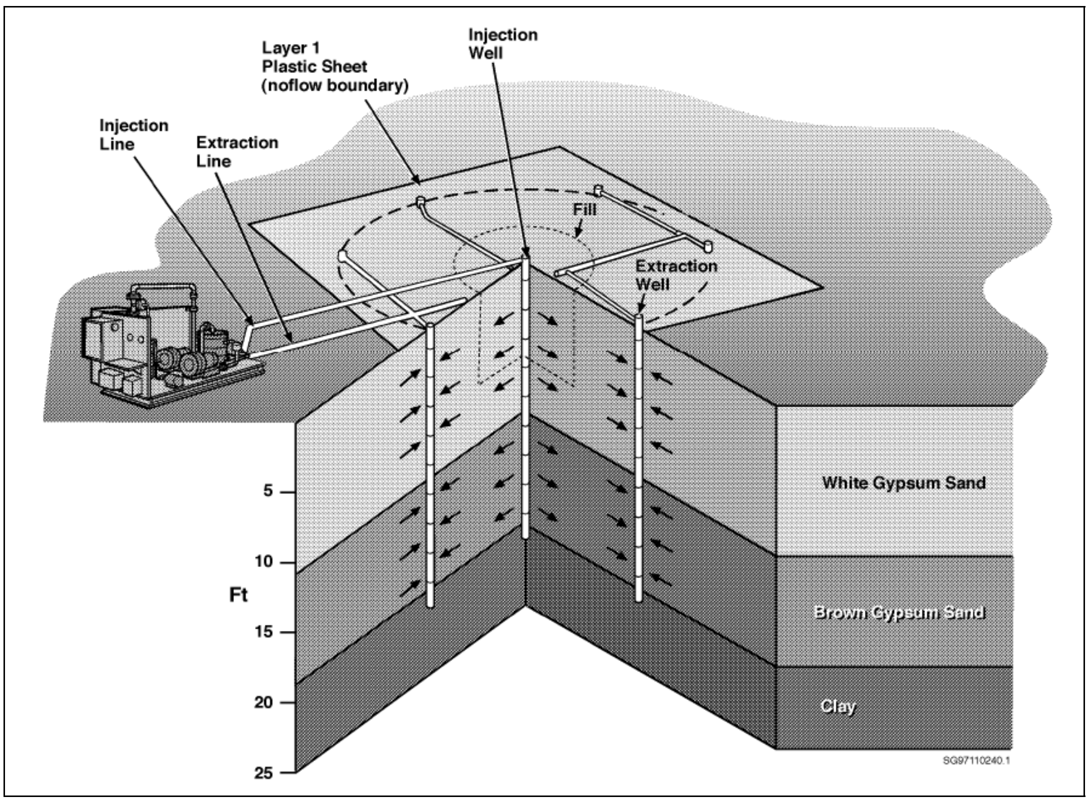

EXHIBIT 4-10
In-situ Reduction
Source: United States Department of Energy (DOE), 2000.

4.2.6 Capping in Place

Capping in place is a common form of soil remediation. A capping system may consist of liners and covers. Liners are installed on the bottom and sides with natural and synthetic barriers to prevent liquids and waste from escaping into underlying soils. The engineered covers are installed on top to keep water from infiltrating into the materials, while maintaining a protective cover to secure the materials in place.

As shown in Exhibit 4-11, typical cover installation includes the following procedures:

- Prior to installing an engineered cover, the surface of the area to be capped is contoured to enhance positive runoff drainage.
- The low-permeability liner is installed on top of the contaminated area.
- A layer of coarse sand or a engineered drainage layer is then placed over the liner to collect and transport the water off the surface of the cover.
- A protective soil layer is added to protect the underlying cover components and support vegetative growth.

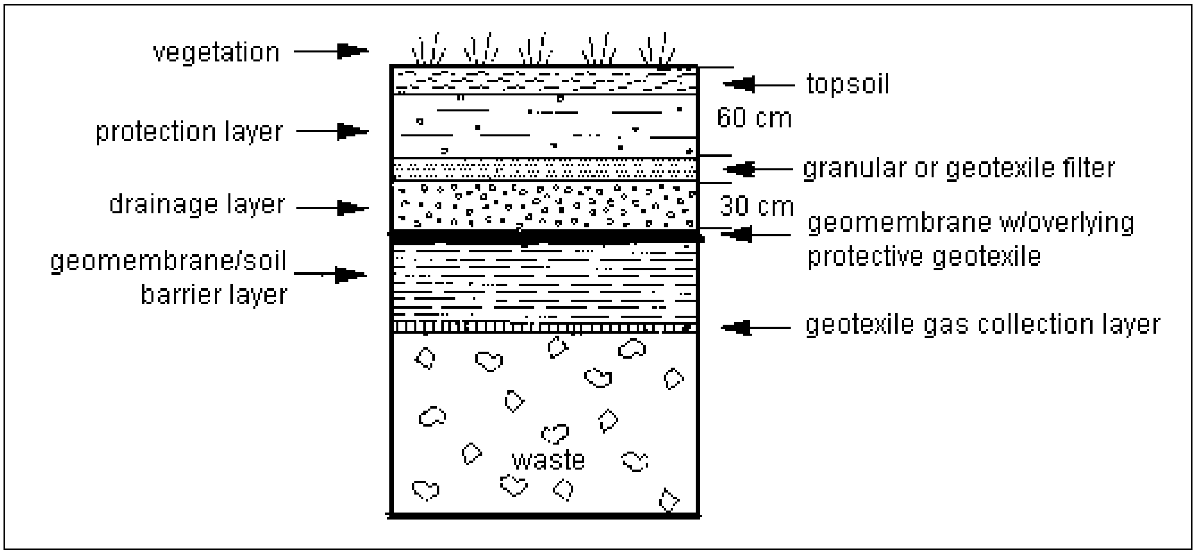

EXHIBIT 4-11
Capping in Place
Source: Federal Remediation Technology Roundtable, 2002.

Construction of a cap does not reduce toxicity, mobility, or volume of contaminated soil, but the cap does mitigate migration and direct exposure to surface receptors. The effective life of the capping system can be extended by long-term inspection and maintenance. In addition, precautions must be taken to ensure integrity of the cap is not compromised by further land use activities.

4.2.7 Soil Vapor Extraction (SVE)

SVE is a commonly used remediation technique for removal of VOCs and some SVOCs from soil in the unsaturated zone. Because it relies on movement of air through the soil to transport contaminants to the surface, SVE is not effective for metals and organic compounds with low volatility.

SVE involves extracting vapor from the soil, usually through a network of vapor extraction wells. Although Exhibit 4-12 below shows only one well, SVE systems typically involve a network of wells, spaced to provide good airflow across the contaminated zone. Typical well spacing is in the range of a few tens of feet, dependent on the properties of the unsaturated zone. SVE wells are constructed using conventional drilling equipment in much the same way as groundwater monitoring wells are constructed.

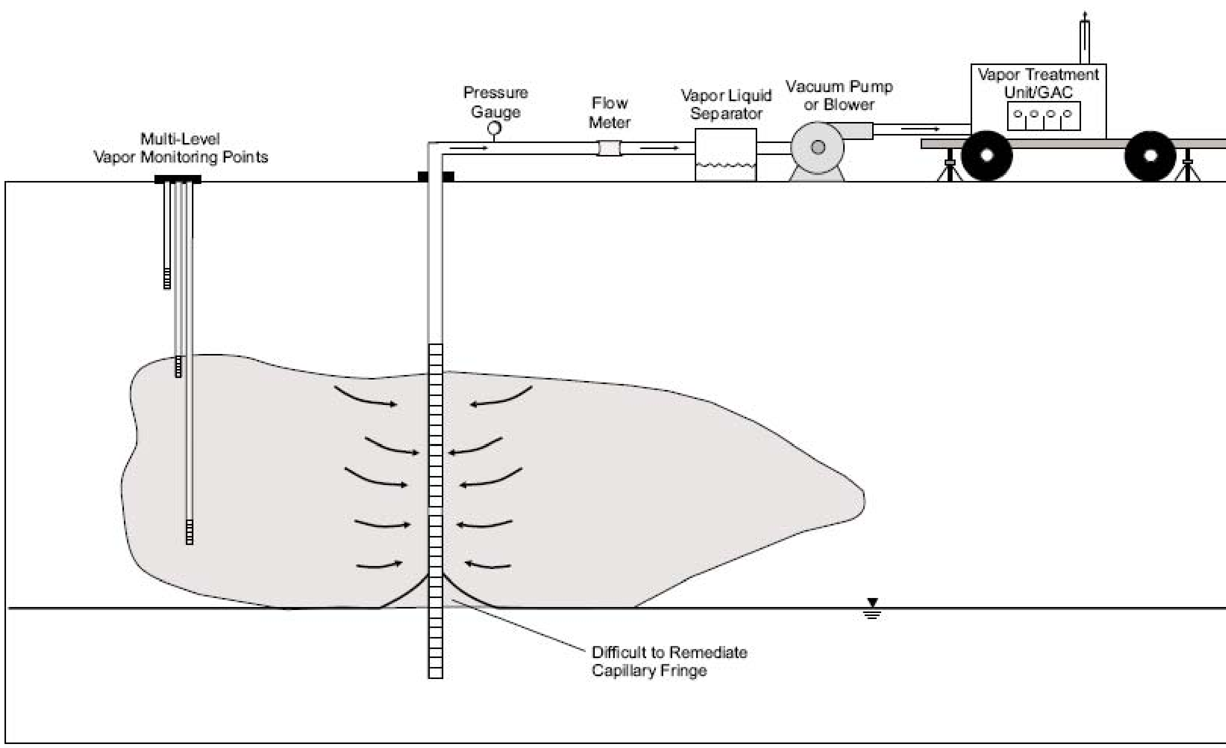

EXHIBIT 4-12
Typical Soil Vapor Extraction Process
Source: Federal Remediation Technology Roundtable, 2002.

Typically, extracted soil vapor is treated to remove the contaminants and then released to the atmosphere. Treatment processes depend on the type and concentrations of contaminants present. There are three broad classes of treatment technologies that are commonly used: thermal, adsorptive, and biological. Thermal technologies involve use of heat to break down contaminants. This can involve something as simple as burning the off-gas stream in an internal combustion engine, or more complex technologies like thermal or thermo-catalytic oxidation. The most commonly applied absorptive treatment is granular activated carbon, which can effectively remove a wide range of VOCs from SVE off-gas. Biofiltration involves passing the off gas stream through a biologically active filter medium.

This technology is less commonly used but can be very effective in treating fuel hydrocarbons.

4.2.8 Thermal Desorption

Thermal desorption involves applying heat to the subsurface to render organic contaminants more amenable to vapor extraction. This technology is typically applied in conjunction with SVE. It allows SVE to be used to remediate heavier hydrocarbon and semi-volatile contaminants that do not volatilize rapidly enough at normal temperatures. Thermal desorption has also been used to speed remediation in source areas where NAPLs are present. Exhibit 4-13 shows an example of a thermal desorption application where hot air or steam is injected to heat the soil, driving contaminants into a vapor phase and toward the surface. The contaminants are then removed through a network of vent gas collection channels and the off-gas is collected for treatment.

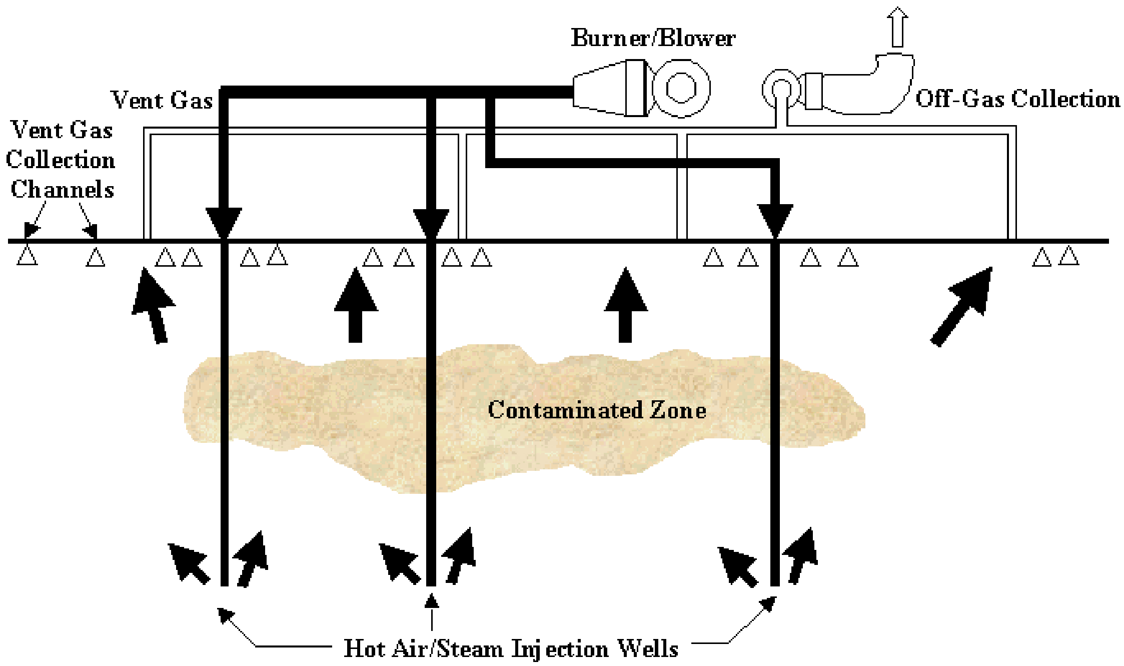

EXHIBIT 4-13
Typical Thermal Desorption Process
Source: Federal Remediation Technology Roundtable, 2002.

Another means of applying heat is through use of electric current to heat the soil. The two most common types of electrical heating are electrical resistance heating and radio frequency heating. Both of these methods involve insertion of electrodes at relatively close spacing throughout the contaminated area. Electrodes are inserted in a network of boreholes drilled using conventional drilling equipment. Strong electric current is applied which heats the soil as it flows between the electrodes. Exhibit 4-14 shows an example of electrical resistance heating.

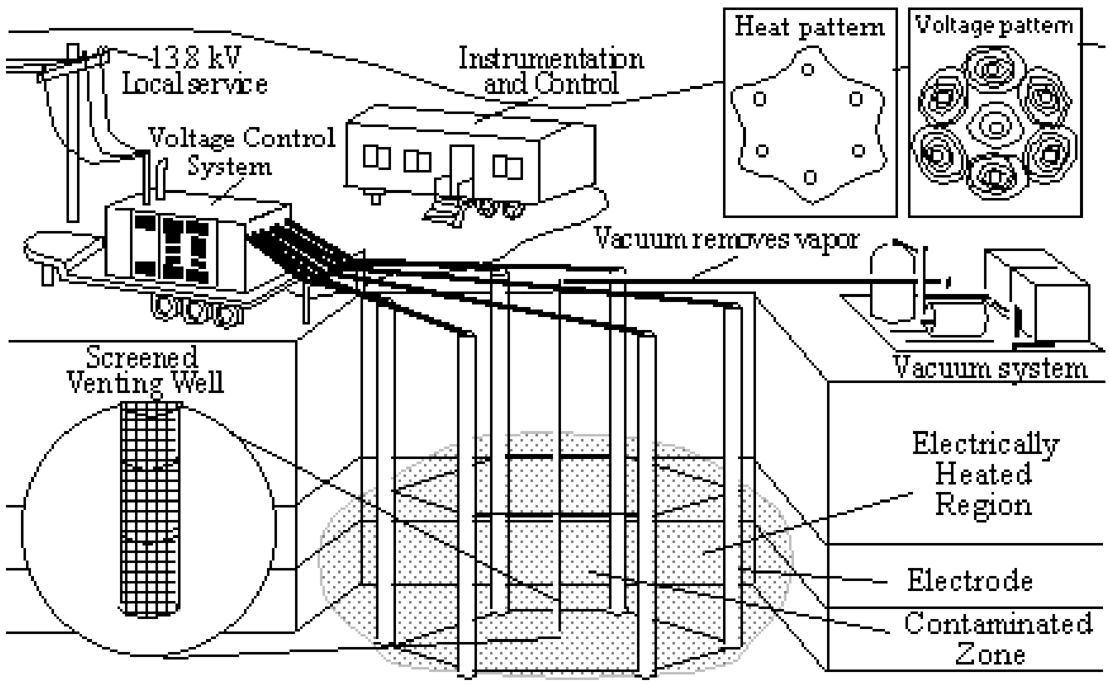

EXHIBIT 4-14
Example of Electrical Resistance Heating
Source: Federal Remediation Technology Roundtable, 2002.

Typical size of the treatment array shown is about 40 feet across. If the contaminated area is larger than 40 feet in diameter, multiple treatment arrays may be installed.

4.2.9 *In-situ* Vitrification (ISV)

ISV involves melting of the subsurface to break down or trap contaminants in the solid mass that forms after the molten material cools. The heat required to melt the soil is generated by passing large electric currents between electrodes placed in a network of boreholes. ISV can treat both organic and inorganic contaminants. Organic contaminants can be broken down by the intense heat (2,900 to 3,650°F) generated during the melt. Inorganic contaminants, like chromium, are incorporated into the melt and become sequestered in the glasslike mass that forms after the melted soil cools.

Exhibit 4-15 below shows a typical ISV installation. The land surface over the ISV area is covered with a metal off-gas collection hood. Off-gasses generated during the melting process are collected and treated. The land surface above the treatment zone subsides as the underlying soil melts and becomes more compact.

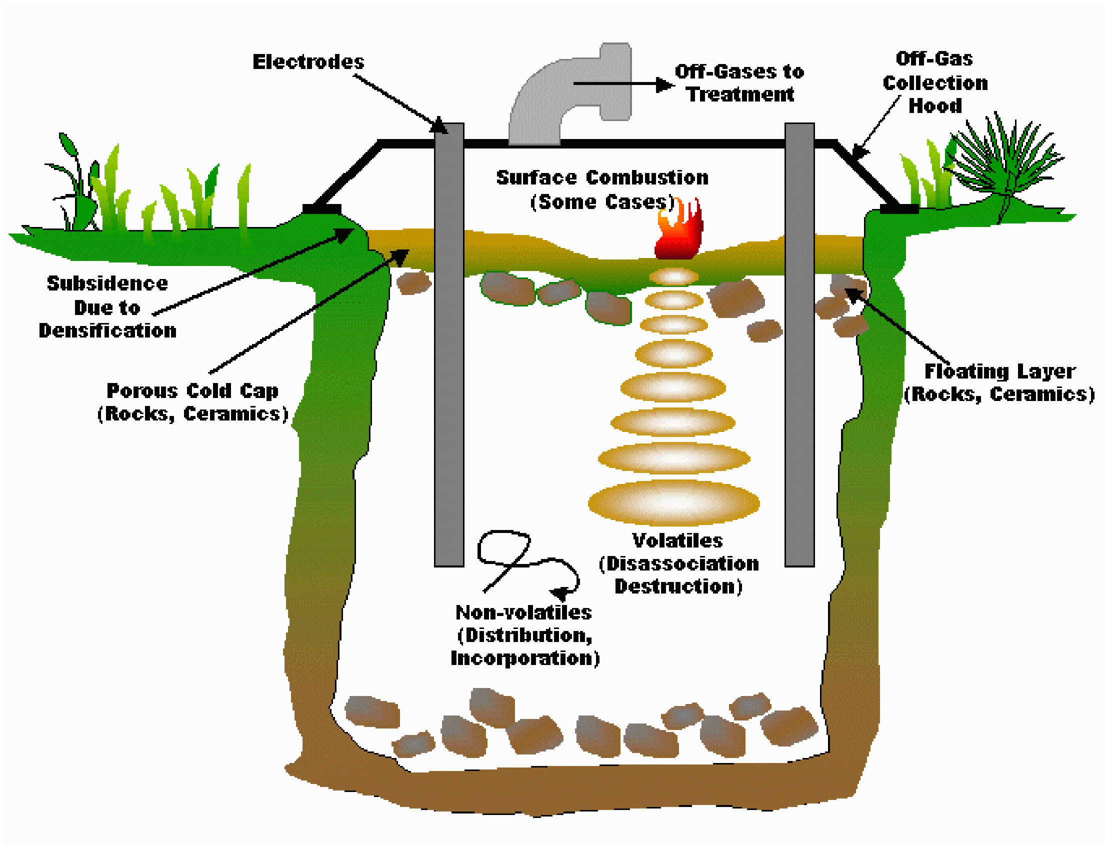

EXHIBIT 4-15
Typical *In-Situ* Vitrification Process
Source: Federal Remediation Technology Roundtable, 2002.

Typical ISV treatment zones are 20 to 40 feet in diameter. ISV becomes more difficult to implement at greater depths due to the high current demands. Depths up to 20 feet have been achieved using conventional ISV techniques. Greater depths may be possible.

4.2.10 Incineration

Incineration is an *ex-situ* technology that involves the use of high temperatures (1,400 to 2,200°F) to volatilize and combust organic compounds. Contaminated soil is excavated and transported to the incinerator, which may be installed at the site or at a remote location. After passing through the incinerator, the soil is turned to ash, which may be safe to return to the site or may require disposal at a licensed hazardous waste disposal facility.

Incineration is most commonly used for soils contaminated with explosives residue and non-volatile organic contaminants such as pesticides. Off-gases and combustion residuals generally require treatment. Incineration is generally not effective in destroying inorganic contaminants, although some inorganic contaminants can become less toxic and less mobile after incineration. Volatile heavy metals, including lead, cadmium, mercury, and arsenic, may be discharged with the flue gases, requiring the installation of flue-gas cleaning systems for removal.

There are various different types equipment used for incineration of contaminated soils, including circulating bed combustors, fluidized bed combustors, infrared combustors, and rotary kilns. Some of these are available as mobile units that can be brought to a site on trailers and set up relatively easily. Incinerators are typically subject to stringent air and environmental permitting regulations, which has limited their use in recent years, particularly in populated areas. Most Superfund sites where incineration has been chosen as the remedy have utilized an offsite hazardous waste incinerator rather than attempt to get an incinerator permitted for onsite use.

4.3 Treatability Studies and Other Relevant Studies

Treatability studies to collect data on technologies identified during the alternative development process are conducted, as appropriate, to provide additional information for evaluating technologies. CERCLA guidance (USEPA, 1988) focuses on investigations of treatment technologies; however, this subsection describes other relevant studies for the design and evaluation of remedial technologies.

At the PG&E Topock site, several studies have been performed or are planned to assist in the identification, screening, and evaluation of remedial technologies for soil and groundwater. These activities include:

- Extensive data collection regarding groundwater extraction, *ex-situ* groundwater treatment, and groundwater injection through implementation of interim measures.
- Groundwater, pore water, and surface water monitoring to define the extent of the elevated concentrations of chemical constituents in groundwater, geochemical characteristics of the groundwater, and variations of these parameters over time.
- Groundwater level measurements, hydraulic testing, and groundwater modeling to determine the direction and rate of groundwater movement to determine optimal locations for facilities and to estimate time required to achieve cleanup.
- Anaerobic core testing of shallow floodplain (fluvial) sediments to evaluate the capacity of anaerobic zone materials to chemically and biochemically reduce Cr(VI) to Cr(III).
- Aerobic core testing to evaluate the degree of sorption or other interactions between Cr(VI) in groundwater and the aquifer material in the aerobic zone.
- Soil borings and seismic survey to determine presence and depth to an impermeable base layer.
- Soil borings and soil sample analysis to characterize the aquifer permeability and flow rates.
- Soil borings and soil sample analysis to measure geotechnical properties needed to evaluate excavation techniques and to evaluate suitability of in-place materials for use in low-permeability backfill material.
- Groundwater model calibration updates to estimate cleanup times for various scenarios and to model simulations to predict effects of *in-situ,* pump/treat/inject, and barrier wall technologies.

- *In-situ* pilot testing to evaluate site-specific effectiveness of *in-situ* treatment, longevity of reactants, ability to distribute reactants in the subsurface, and to assess potential effects of injected reagents on aboveground treatment systems. The effectiveness of *in-situ* reduction is being evaluated through pilot testing in both the fluvial aquifer in the floodplain and the Alluvial Aquifer in the upland portion of the site.

The data and studies listed above will be used to evaluate specific technologies. The data and studies provide information used to screen the technologies based on expected effectiveness in meeting remedial action objectives, ability to be implemented, and cost-effectiveness. The schedule for completion of the studies is presented in Section 7.0.

5.0 Corrective/Remedial Measures Alternatives Development and Evaluation

More than one technology typically is needed to fully remediate a site due to site-specific goals and the presence of different media and COCs. CERCLA and RCRA require that a range of treatment and containment alternatives be developed. Alternatives are screened against RCRA- and CERCLA-specified criteria to aid in remedy selection.

Sitewide corrective/remedial measures alternatives are developed by combining and configuring remedial technologies, with the goal of identifying a range of alternatives that will achieve the remedial action objectives through reduction of toxicity, mobility, or volume of contaminants. In addition to being effective in addressing contaminants in soil and groundwater, alternatives also must consider other site-specific constraints and regulatory requirements.

As shown in Exhibit 5-1, after a list of potentially effective remedial alternatives has been developed, the various alternatives are screened to identify those that cannot be technically implemented at the site. Alternatives that pass the initial screening are carried forward for more detailed analysis against the evaluation criteria, as described in Section 5.2.

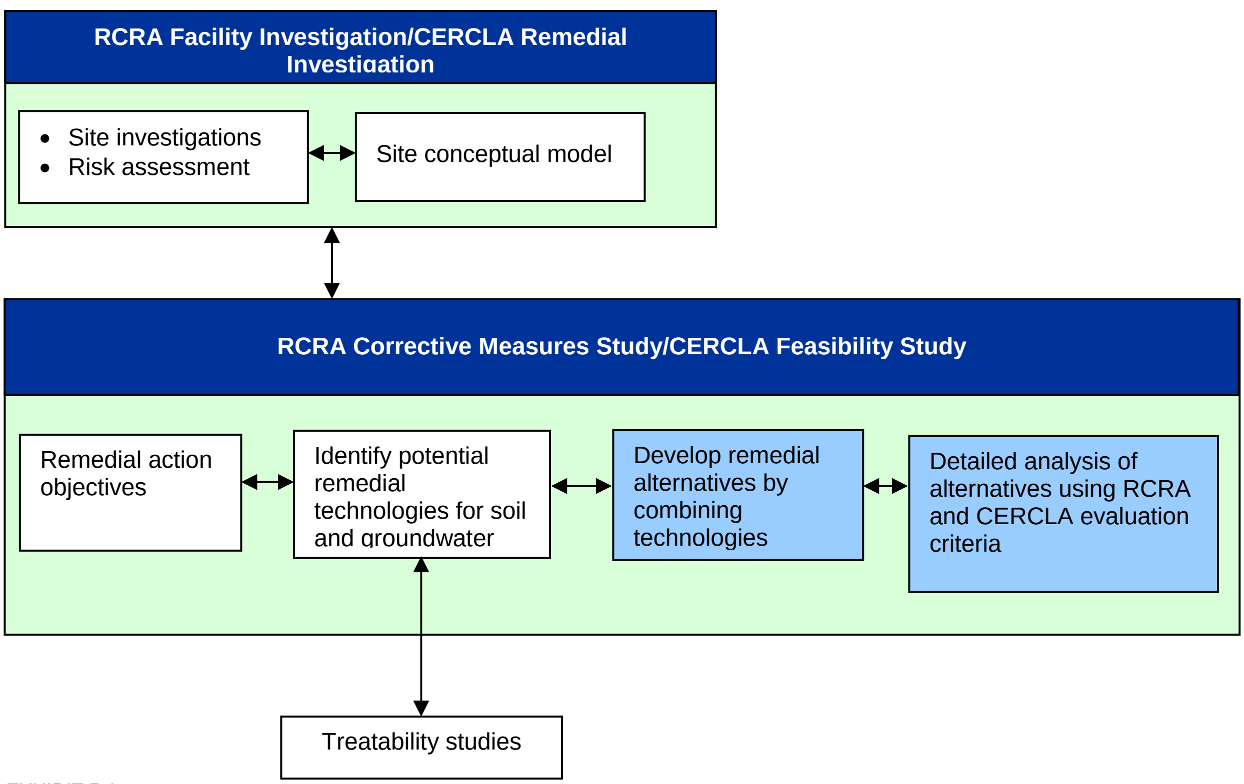

EXHIBIT 5-1
CMS/FS Process—Developing and Analyzing Remedial Alternatives

5.1 Development of Remedial Alternatives

The process by which remedial technologies are combined into site-specific remedial alternatives is described in detail in United States Environmental Protection Agency (USEPA) guidance (USEPA, 1988). Each site has unique hydrogeologic conditions and constraints that must be considered during the development of site-specific remedial alternatives.

At sites where multiple media are contaminated, combinations of remedial technologies are typically used to provide a complete remedy. Consideration must be given to the compatibility of these technologies so that the alternatives developed will be able to meet remedial action objectives for all media and contaminants of concern. For example, if soil flushing were selected as a remedy for deep soil contamination, it would be necessary to ensure that the groundwater remedy in the vicinity of the soil flushing operations was robust enough to handle the additional contaminants that would be flushed from the soil into the groundwater. Similarly, if a soil excavation remedy were selected in an area with a high density of groundwater remediation and monitoring wells, it would be necessary to ensure that the wells would be protected and continue to operate in the midst of the excavation work.

Even within a single medium, it is often necessary to combine one or more technologies to meet remedial action objectives. For example, an impermeable barrier wall functions like a subsurface dam, causing groundwater levels to build up on the upgradient side of the wall. It is typically necessary to combine a barrier wall with a groundwater pumping system to control the groundwater levels behind the wall. Groundwater pumping may also be combined with *in-situ* treatment zones or PRBs. The slow velocity of natural groundwater flow at the Topock site may not provide for flushing of contaminated groundwater through an *in-situ* treatment zone at a rate that would achieve cleanup in an acceptable amount of time. Combining an *in-situ* technology with groundwater pumping and injection could increase groundwater flow velocities through the *in-situ* treatment zone, resulting in shorter cleanup times.

5.1.1 Key Site Characteristics

There are several key characteristics of the Topock site that are expected to influence the effectiveness and implementability of corrective/remedial action alternatives:

- **Chemical Constituents:** Cr(VI) is the primary chemical of concern in groundwater. It is present above the regulatory standard for total chromium of 50 micrograms per liter in an area extending about 3,200 feet north of the Topock Compressor Station and 2,500 feet west of the Colorado River. There are, however, several other COPCs that have been identified in soil and groundwater at the site. The remedial alternatives developed in the CMS/FS will address all of the COCs identified in the RFI/RI and risk assessment.

- **Groundwater Characteristics:** Natural groundwater moves very slowly at the Topock site; therefore, remediation technologies that rely solely on natural groundwater flow could require long time frames to achieve remedial action objectives. Groundwater flow rate can be increased or redirected by extraction or injection of water. The depth to groundwater across much of the site is relatively large, limiting the applicability of some types of groundwater remedies and drilling/construction methods.

- **Geochemical Conditions in the Colorado River Floodplain:** The aquifer materials in the vicinity of the Colorado River and floodplain exhibit natural "reducing" conditions characterized by the lack of dissolved oxygen and oxidized compounds. These reducing conditions naturally convert Cr(VI) into Cr(III), which is removed from groundwater by chemical precipitation.
- **Groundwater and Surface Water Uses:** The groundwater in the deeper portions of the aquifer in the vicinity of the Topock site has high levels of dissolved salts, which render it generally unusable for drinking water. Groundwater at the Topock site naturally flows north and east, toward the Colorado River, which is used for drinking water, recreation, fishing, and ecological habitat. Therefore, even though groundwater is not used for drinking at the Topock site, the remedial alternatives will need to be developed to ensure protection of the beneficial uses of the Colorado River.
- **Cultural Resources**: The study area encompasses archaeological and historical resources, including areas of important cultural and spiritual significance to a number of sovereign tribal nations. It is anticipated that cultural resource identification will proceed in parallel with the development of the CMS/FS to ensure that cultural resources considerations are considered as part of the analysis of remedial alternatives.
- **Sensitive Habitats:** The study area encompasses a portion of the Havasu National Wildlife Refuge, the Beale Slough Area of Critical Concern, and the Colorado Floodplain. These lands are administered by the U.S. Fish and Wildlife Service, the U.S. Bureau of Land Management and the U.S. Bureau of Reclamation. Actions taken on those lands will be in accordance with applicable laws, regulations and agency policies and procedures for managing public lands.
- **Threatened and Endangered Species:** Federally listed threatened and endangered species that may be found in or near the study area include the southwest willow flycatcher, the Yuma clapper rail, the Mohave desert tortoise, the razorback sucker and the bonytail chub. The states of California and Arizona also maintain lists of additional threatened and endangered species that can be found in or near the study site. All actions will be required to be in compliance with the Federal Endangered Species Act of 1973, as well as those requirements set by the States, and must avoid and/or mitigate any adverse impacts to any listed species and their critical habitat. The overall application of the original document Mitigation Measures, Lake Havasu Field Office are to be adhered to so as to generally minimize and/or avoid impacts to the natural environment.
- **Existing Structures:** Design and construction of remedial alternatives will need to account for the existing transportation corridor including Interstate 40, the Burlington Northern Santa Fe Railroad, and natural gas transmission pipelines, as well as ongoing operations at the Topock Compressor Station.

5.1.2 Remedial Alternative Definition

Considering the key site characteristics described above, as well as the site-specific remedial objectives and remedial technologies, remedial alternatives will be developed for the Topock CMS/FS. Alternatives that are not compatible with site constraints or would clearly not meet remedial action objectives may be screened out early in the process.

Depending on the number of feasible alternatives and variations between alternatives, an appropriate number of alternatives will be defined for evaluation in the CMS/FS. The intent is to define a range of alternatives, including the "No Action" alternative. It is expected that between three and eight remedial alternatives for each media will be defined and carried forward in the alternatives evaluation. Each alternative will be defined to a sufficient level of detail to develop a remedial cost estimate, in accordance with USEPA guidance (USEPA, 2000), including construction and operational and maintenance elements (such as effectiveness monitoring) of each alternative.

It is expected that remedial alternatives for soil will be developed separately from remedial alternatives for groundwater, as the technologies will be different, and the location of the groundwater plume is geographically separate from the SWMUs and AOCs within and surrounding the compressor station. It is also expected that SWMUs and AOCs with similar remedial action objectives, similar COCs, and similar site characteristics may be combined together for purposes of remedial alternative development and evaluation.

It is further expected that land use controls or other forms of institutional controls will be incorporated into the remedial alternative development. Likely, controls may include restrictions on residential or other sensitive uses, restrictions on the use of groundwater and development of water supplies, and access restrictions such as road closures or vehicular barriers.

5.2 Evaluation Criteria for Remedial Alternative

Criteria for evaluating alternatives are described in RCRA and CERCLA regulations and guidance and are summarized in Table 5-1. In the CMS/FS, the defined remedial alternatives will first be evaluated individually against the evaluation criteria then in comparison with each other.

A number of approaches to integrate and balance stakeholders values and preferences have been developed for the remediation industry in recent years. Such approaches use various techniques for comparing the benefits and costs associated with alternative remedial actions that affect the environment. The goal of the analysis is to rank these alternatives in terms of the total environmental benefits realized from their implementation (Efroymson et al., 2004).

Available techniques will be evaluated and, if an appropriate tool is identified, it may be used to help address varied stakeholder interests at Topock by specifying metrics that capture stakeholder values to compare the effects of different remedial alternatives. For example, a metric that assesses land disturbance and visual aesthetics could be constructed. Similarly, metrics of habitat quality for sensitive habitats and endangered species could be constructed as well. Such an approach could be used to assess the trade-offs realized by each remedial alternative in terms of say, the change in levels of risk to drinking water versus the disturbance of sensitive habitats. Measuring how those metrics change over time from the implementation of each remedial alternative allows for the direct comparison of impacts across the different remedial alternatives.

TABLE 5-1
Selection Criteria under RCRA and CERCLA
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

RCRA[a]	CERCLA[b]
Protect human health and the environment	Overall protection of human health and the environment
Attain media cleanup standards set by implementing agency	Compliance with ARARs (including chemical-, location-, and action-specific)
Control sources of releases	
Comply with applicable standards for management of wastes	
Long-term effectiveness and permanence	Long-term effectiveness and permanence
Reduction of toxicity, mobility, or volume through treatment	Reduction of toxicity, mobility, or volume through treatment
Short-term effectiveness	Short-term effectiveness
Implementability	Implementability
Cost	Cost
	Regulatory agency acceptance
	Community acceptance

Notes:

[a] Resource Conservation and Recovery Act selection criteria from USEPA, 1994.

[b] Comprehensive Environmental Response, Compensation, and Liability Act selection criteria from USEPA, 1988.

6.0 CMS/FS Report Outline

The Corrective Measures/Feasibility Study Report will present and evaluate potential remedial alternatives to address sitewide chromium management. The CMS/FS report will be prepared in accordance with the guidelines provided in the CACA for a corrective measures study (DTSC, 1996) and USEPA guidance for a feasibility study (USEPA, 1988).

The CMS/FS report will include the following elements:

- Introduction
  - Objectives of the CMS/FS
- Description of Current Conditions
  - Background information (summary of RFI/RI report, risk assessment, ARARs)
  - New information developed since the final RFI/RI report was prepared that could significantly affect the evaluation and selection of remedial alternatives
- Corrective Action/Remedial Action Objectives
  - Corrective action/remedial action objectives
  - Proposed media cleanup standards and points of compliance
- Identification and Screening of Technologies
  - Identification
  - Screening
- Development and Analysis of Corrective Measure/Remedial Action Alternatives
  - Alternatives development
  - Detailed analysis of corrective measure/remedial action alternatives
  - Comparative analysis of corrective measure/remedial action
- Recommended Corrective Measure/Remedial Action Alternative

7.0 Project Schedule

This section presents a preliminary schedule for the various tasks proposed as part of the CMS/FS. A schedule for the various tasks outlined below is provided in Figure 7-1.

Implementation of the CMS/FS tasks will follow completion of the various studies and evaluations for completion of the RFI/RI, ARARs identification, risk assessments, and treatability/pilot studies.

Currently it is envisioned that two separate CMS/FS documents will be prepared:

1. Groundwater CMS/FS, to address the conclusions and recommendations of RFI/RI Volume 2, expected to focus primarily on remedial action objectives for groundwater.
2. Soil CMS/FS, to address the conclusions and recommendations of RFI/RI Volume 3, expected to focus primarily on remedial action objectives for soil.

As discussed in Section 1.2, RFI/RI Volume 2 will address the historical operational practice of wastewater discharge to Bat Cave Wash and PGE-8 comprising groundwater, surface water, pore water, and river sediment and will contain data from those media. RFI/RI Volume 3 will address the remaining Topock Compressor Station operations, and will contain soil data from the SWMUs, AOCs, and other undesignated areas addressed in Volume 3, as well as sediment data near the mouth of Bat Cave Wash, and groundwater data from wells within and immediately surrounding the compressor station.

As the conclusions of the RFI/RI and risk assessments are not complete at the time of preparation of this work plan, the remedial action objectives for each of the two CMS/FS documents are not yet final. As discussed in Section 2, existing information suggests that the principal contaminant in groundwater at the site is hexavalent chromium associated with the historical operational practice of wastewater discharge to Bat Cave Wash. If additional sources of groundwater contamination and groundwater COPCs are identified through additional characterization, the Groundwater CMS/FS will be revised to incorporate that information.

As shown in the schedule, preparation of the Groundwater CMS/FS is expected to precede preparation of the Soil CMS/FS, as the current expected schedule for completion of RFI/RI Volume 3 lags behind the current expected schedule for RFI/RI Volume 2 by approximately one year. As discussed previously, the remedial alternatives to be evaluated for groundwater are anticipated to be different from the alternatives to be evaluated for soil. This schedule is subject to change based on regulatory review and approvals, input from the various governmental agencies, and completion of the final RFI/RI reports.

8.0 References

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Figures

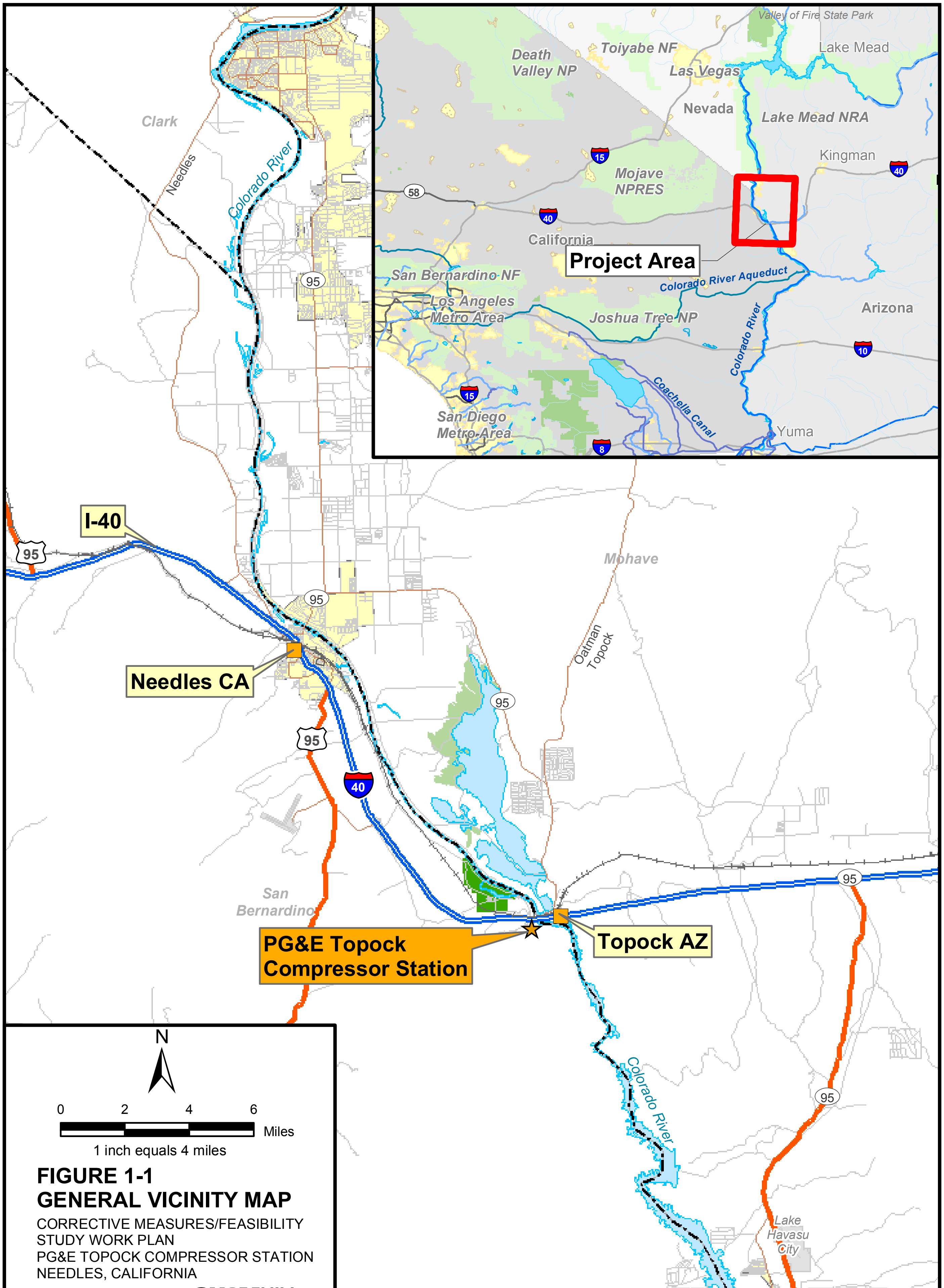

FIGURE 1-1
GENERAL VICINITY MAP
CORRECTIVE MEASURES/FEASIBILITY STUDY WORK PLAN
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

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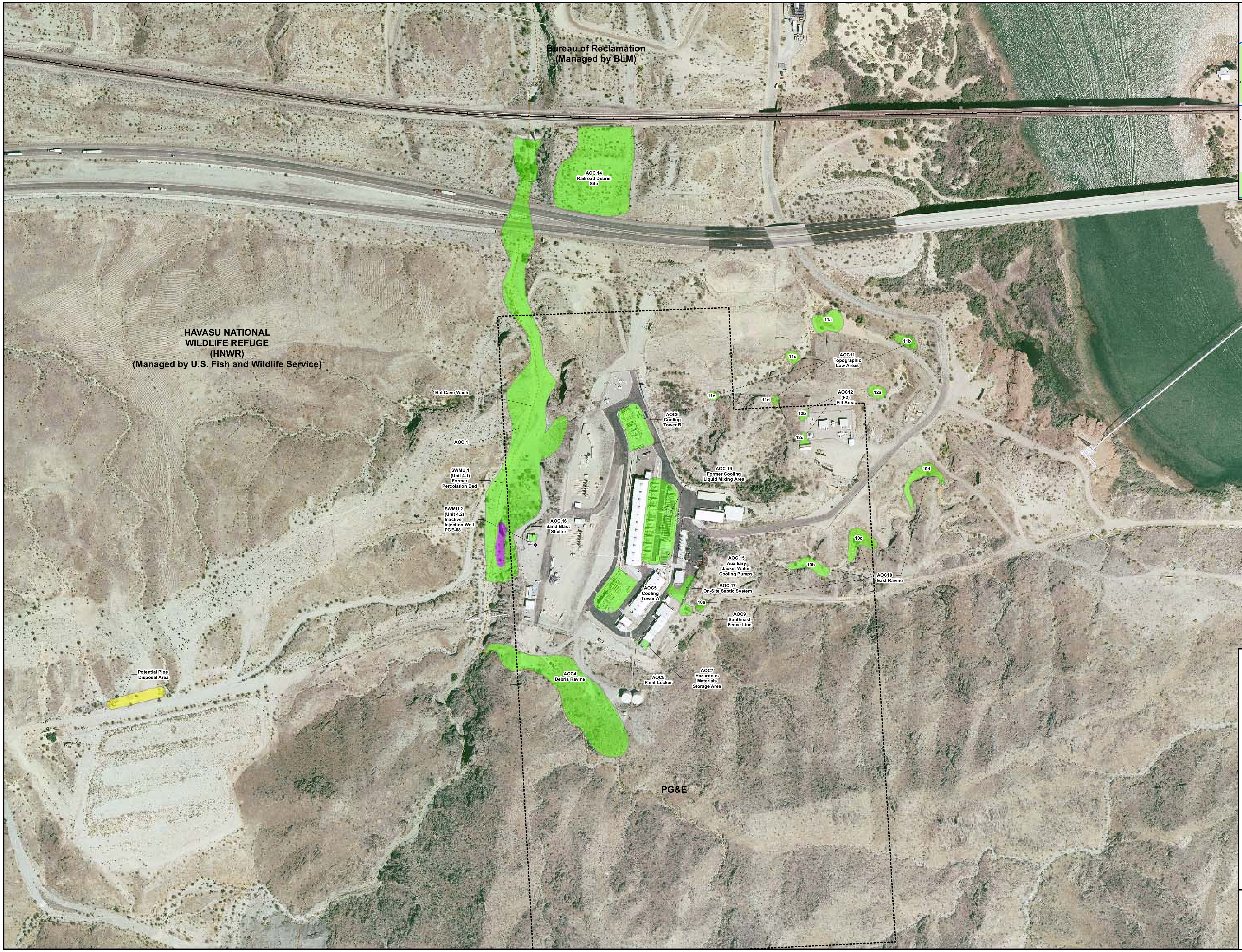

LEGEND

- Solid Waste Management Unit (SWMU)
- Area of Concern (AOC)
- Other Undesignated Areas

Notes:

AOC 13 is not depicted on this figure. It consists of the unpaved areas within the compressor station.

AOC 20 is not depicted on this figure. It consists of industrial floor drains within the compressor station.

Boundaries of all SWMUs, AOCs, and Other Undesignated Areas are approximate.

N

0 150 300 600 Feet

1 inch equals 150 feet

FIGURE 1-2
SOLID WASTE MANAGEMENT UNITS (SWMUS), AREAS OF CONCERN (AOCS), AND OTHER UNDESIGNATED AREAS TO BE ADDRESSED IN RFI/RI

CORRECTIVE MEASURES STUDY/
FEASIBILITY STUDY WORK PLAN
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

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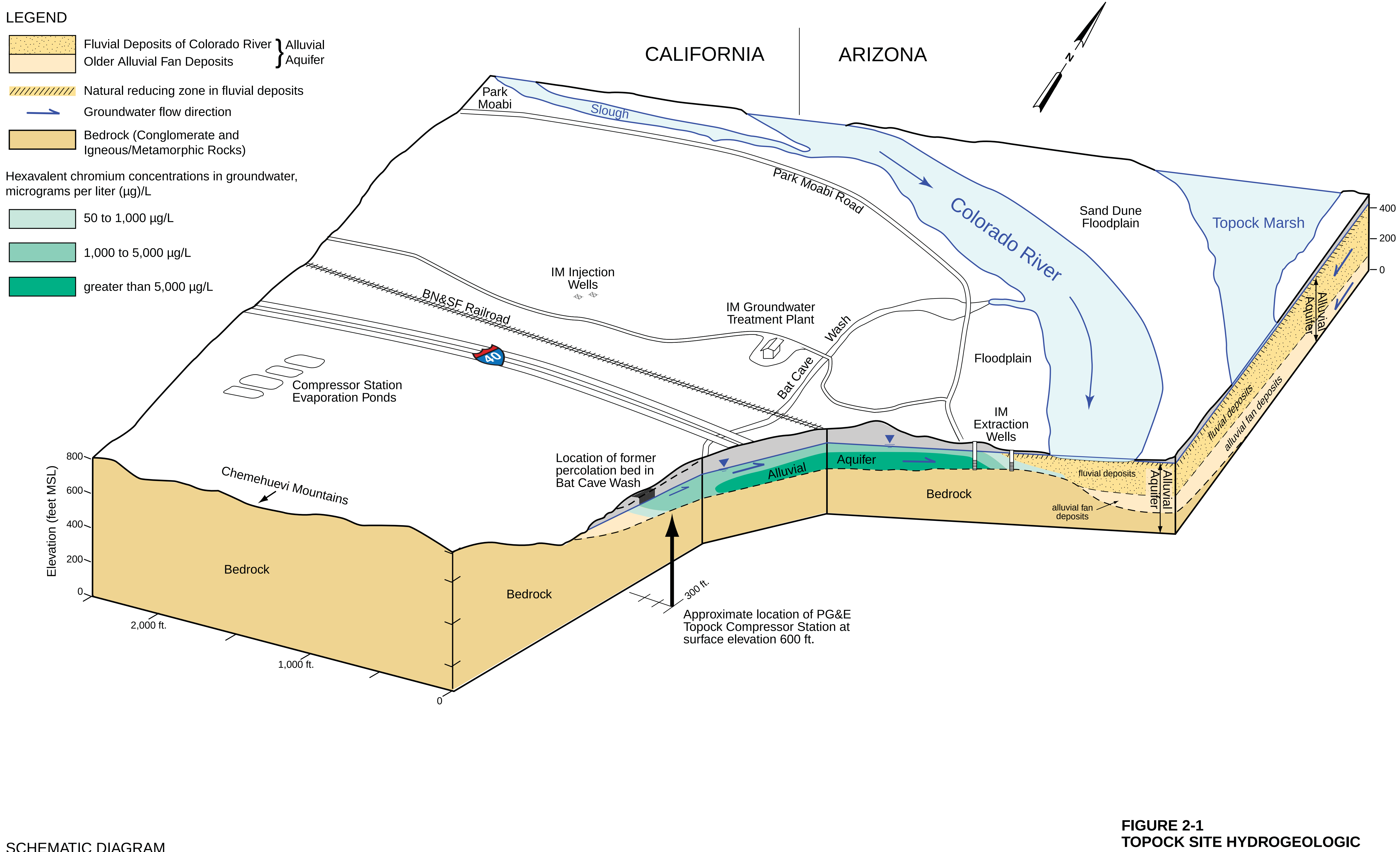
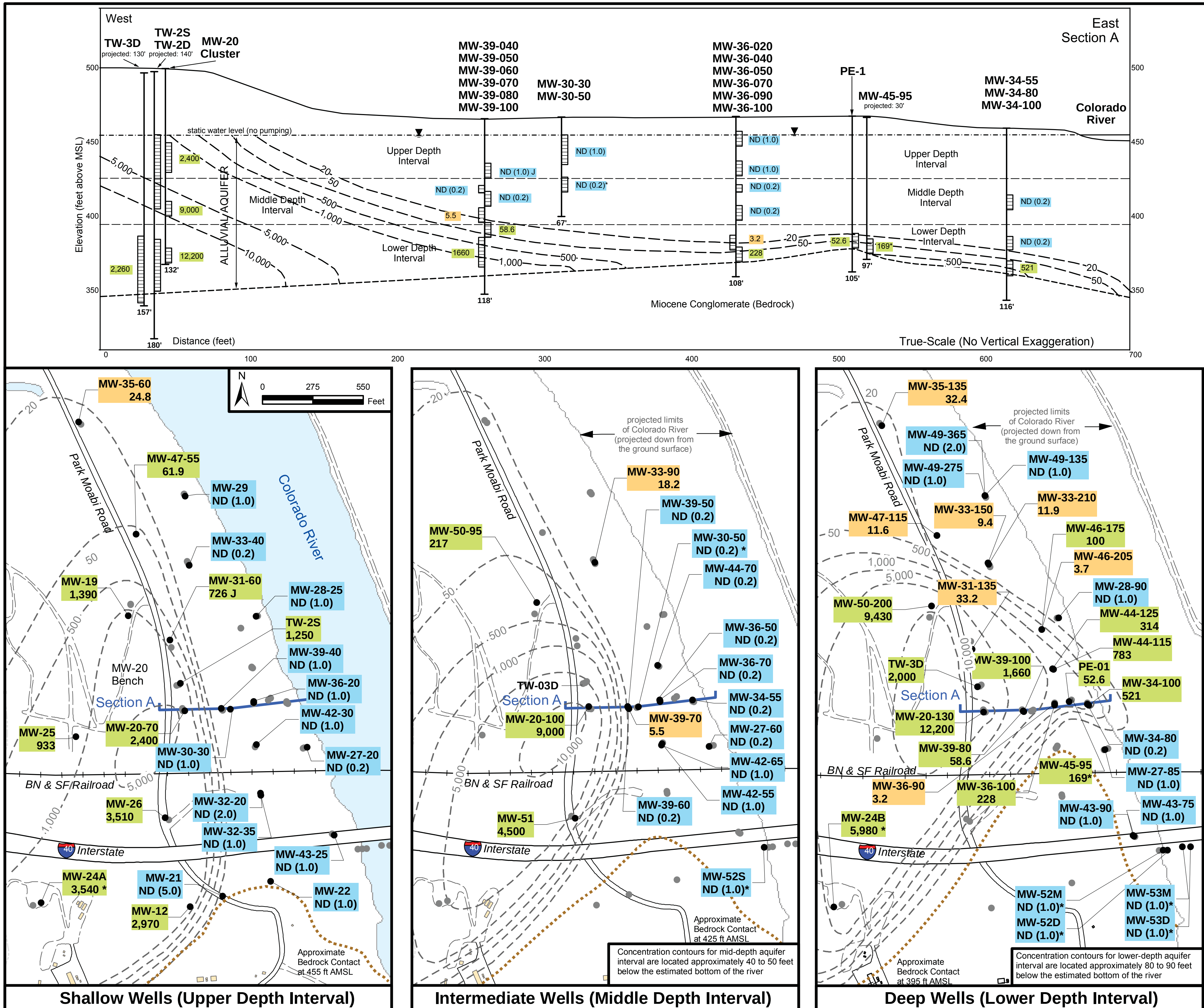


FIGURE 2-1
TOPOCK SITE HYDROGEOLOGIC FEATURES
CORRECTIVE MEASURES/FEASIBILITY STUDY WORK PLAN
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

ES092006010BAO topock_hydrogeologic_features.ai 06-27-07 dash



LEGEND

Maximum Hexavalent Chromium [Cr(VI)] Concentrations in Groundwater, October 2007

Concentrations in micrograms per liter (µg/L) equivalent to parts per billion (ppb)

ND = Not detected at listed reporting limit
J = Concentration estimated by laboratory or data validation

Results from October 2007 groundwater sampling are posted.
* Indicates results from prior 2007 sampling events.

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

- ND (1) — Not detected at listed reporting limit (ppb)
- 41 — Less than 50 ppb
- 3,810 — Greater than 50 ppb
- — 50 — Inferred Cr(VI) concentration contour within aquifer depth interval. Contours incorporate the maximum concentration from wells within each depth interval
- Hydrogeologic Section A (true-scale) showing aquifer depth intervals, well screens, and Cr(VI) sampling results.

NOTES ON CONTOUR MAPS

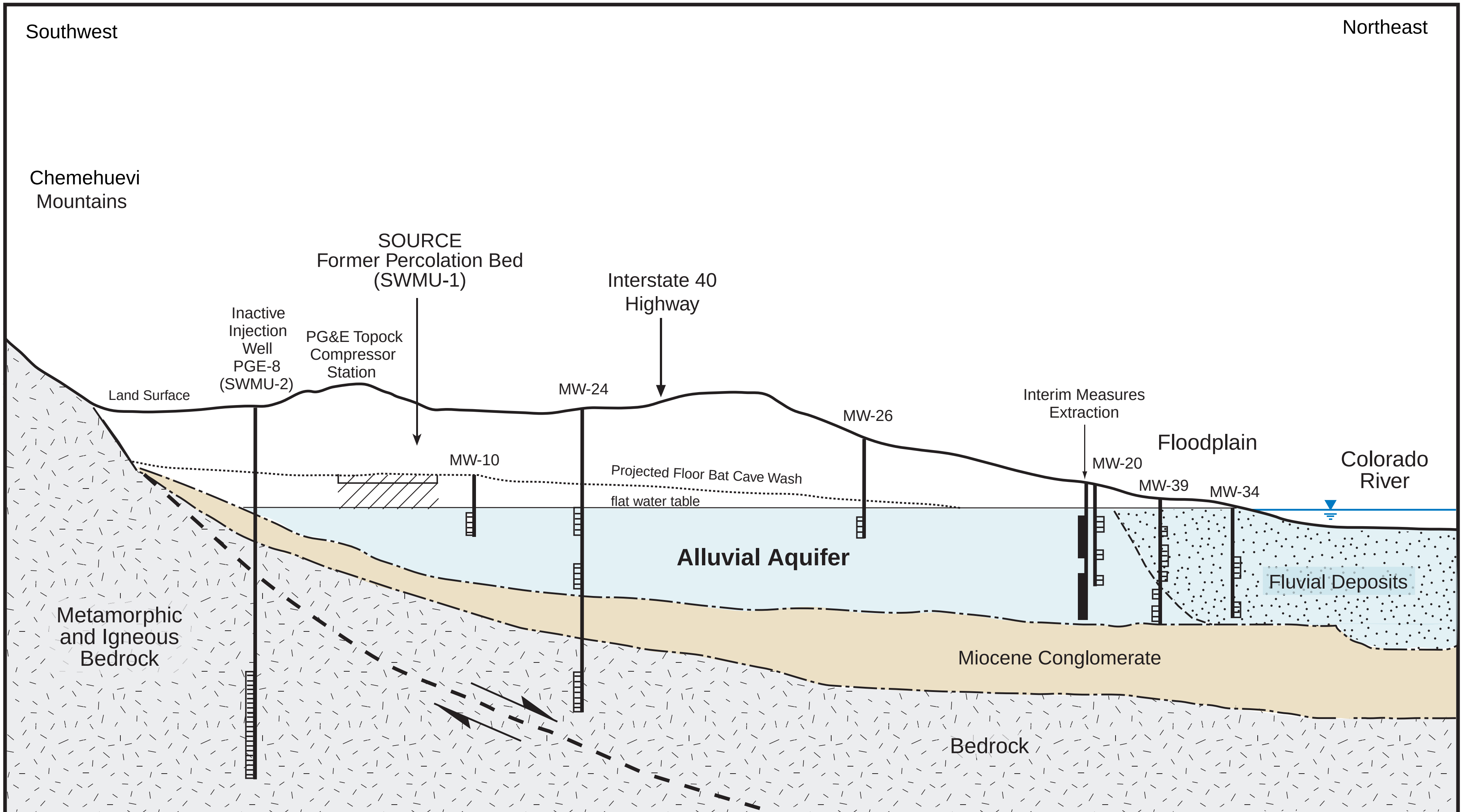
1. The Cr(VI) contour maps for 2006-2007 performance monitoring incorporate data from new wells and water quality data trends for the floodplain area. The contour maps provide additional interpretation of plume limits and do not reflect plume migration during performance monitoring

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

FIGURE 2-2
MAXIMUM CR(VI) CONCENTRATIONS IN ALLUVIAL AQUIFER, OCTOBER 2007

CORRECTIVE MEASURES/FEASIBILITY STUDY WORK PLAN
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL



Schematic Section, No Scale

FIGURE 2-3
REGIONAL HYDROGEOLOGIC CROSS SECTION
CORRECTIVE MEASURES/FEASIBILITY STUDY WORKPLAN
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

ES092006010BAO_Fig2-3_RegionalHydro.ai 06-27-07 dash

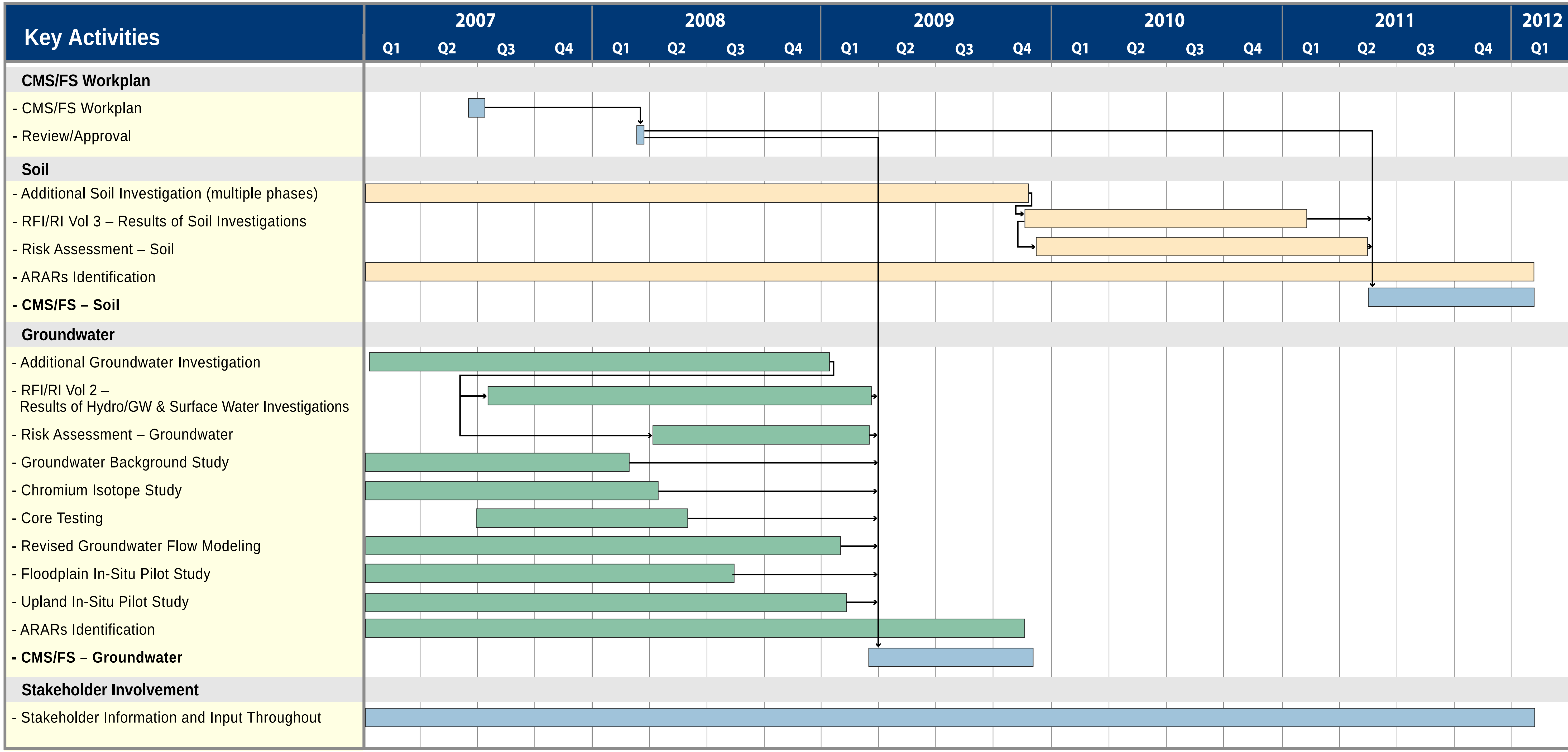


FIGURE 7-1
TOPOCK CORRECTIVE MEASURES/ FEASIBILITY STUDY SCHEDULE
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

ES022008008BAO_Fig7-1_Topock_StudySchedule_v3.ai_022808_lho

Appendix A
Response to Agency Comments on the Draft Topock Corrective Measures/Feasibility Study Work Plan

TABLE A-1
Response to Agency Comments on the Draft Topock Corrective Measures Study/Feasibility Study Work Plan
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Agency	Comment Number	Section	Comment	Response	DOI Direction	DTSC Direction	Work Plan Revisions
U.S. Department of the Interior	DOI-1	Cover page and interior cover	Following "Prepared for Department of Toxic Substances Control", please add "…and United States Department of the Interior"	Yes, while this work plan was specifically directed by DTSC's May 15, 2007 letter, the DOI is the lead federal agency, and the CMS/FS will be prepared in conformance with the Administrative Consent Agreement between PG&E and the federal agencies as discussed in Section 1.0.	Add text as requested within revised work plan.		Text was revised as suggested on cover page and interior cover.
U.S. Department of the Interior	DOI-2	Section 1.0	Sentence should read *"This work plan* conceptually (insert) *describes the planned activities and the schedule to complete the corrective measures study/feasibility study (CMS/FS) at the Pacific Gas and Electric Company……….* Rational: The level of detail (i.e. area of disturbance; machinery to be used; amount of vegetation removed; dates when activities will occur; mitigation etc.) within this Draft Report is not adequate to assess the level of impacts that may occur to the biological environment or to species listed under the Endangered Species Act. Please note that all activities performed must comply with conservation measures established by the *Programmatic Biological Assessment for Pacific Gas and Electric, Topock Compressor Station Remedial and Investigative Actions (2007)*.	Yes, this work plan is intended to be conceptual and lay out the overall framework for the CMS/FS and is not intended to substitute for, nor provide the detail that will be included in the CMS/FS. It is noted that the Programmatic Biological Assessment is intended to cover field activities up to the final remedy (essentially the RFI and RI data collection, IM operation, and pilot studies) and does not cover implementation of the final remedy. PG&E fully anticipates, however, that the Federal Endangered Species Act (FESA) will be identified as an ARAR that will be considered in the evaluation of alternatives in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The first sentence in Section 1, Introduction, has been modified to add the word 'conceptually.'
U.S. Department of the Interior	DOI-3	Sec 1.0	In the last sentence of the third paragraph, please replace "to implement response actions" with "under which PG&E agreed to perform a remedial investigation and feasibility study (RI/FS)"	PG&E does not object to alternative language describing PG&E's obligations under the Administrative Consent Agreement.	Add text as requested within revised work plan.		Text was revised as suggested on page 1-1 of CMS/FS work plan.
U.S. Department of the Interior	DOI-4	Sec 1.1	Please revise the first sentence of the first paragraph to read as follows: "Both the RCRA CMS and the CERCLA FS identify and evaluate remedial alternatives to address the release of hazardous wastes/hazardous substances into the environment.	PG&E does not object to the alternative language describing the consistent purpose between the CMS and FS.	Add text as requested within revised work plan.		Text was revised as suggested in Section 1.1 of the CMS/FS work plan.
Department of Toxic Substances Control	DTSC-1	Page 1-2, Section 1.2, Site History and RFI/RI Status	The CMS Work Plan suggests six phases of investigation at the Topock Site, but did not specifically identify these phases. For clarity, please identify the six phases as stated.	The first five phases of investigation at the Topock Site are described in the *Draft RCRA Facility Investigation and Remedial Investigation Report*, dated February 2005 (2005 RFI/RI) and illustrated in Figure 9-1 of that report. The sixth phase of investigation consists of data collected between June 2004 and July 2007. An update of Figure 9-1 in the 2005 RFI/RI will be included in the forthcoming *RCRA Facility Investigation/Remedial Investigation Report, Volume 2* (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008.	Response is not adequate. Add the exact references for the other phases and describe each phase for the reader <u>or</u> take out reference to "6 phases" on entire discussion.	The six phases as suggested seem arbitrary and unnecessary, but DTSC does not object to the definition as long as they are properly defined.	The work plan has been revised to refer to multiple phases of investigation. Information describing the six phases of investigation between 1997 and 2007 will be provided in the forthcoming RFI/RI Volume 2.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-1	Section 1.2	Section 1.2 mentions that "… there have been six phases of investigation at the Topock Site. " Please identify the six phases of investigation that are being referred to.	The first five phases of investigation at the Topock Site are described in the 2005 RFI/RI and illustrated in Figure 9-1 of that report. The sixth phase of investigation consists of data collected between June 2004 and July 2007. An update of Figure 9-1 in the 2005 RFI/RI will be included in the forthcoming *RCRA Facility Investigation/Remedial Investigation Report, Volume 2* (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008.	Response is not adequate. Add the exact references for the other phases and describe each phase for the reader <u>or</u> take out reference to "6 phases" on entire discussion.	See DTSC-1 above.	The work plan has been revised to refer to multiple phases of investigation. Information describing the six phases of investigation between 1997 and 2007 will be provided in the forthcoming RFI/RI Volume 2.

TABLE A-1
Response to Agency Comments on the Draft Topock Corrective Measures Study/Feasibility Study Work Plan
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Agency	Comment Number	Section	Comment	Response	DOI Direction	DTSC Direction	Work Plan Revisions
San Diego Water Authority	SDWA-1	Page 1-2, Section 1.2, second paragraph	Page 1-2, Section 1.2, second paragraph: This paragraph states that there "have been six phases of investigation at the Topock site." It would be beneficial to reference a document or other source where the reader could locate what the six phases included and when they occurred.	The first five phases of investigation at the Topock Site are described in the 2005 RFI/RI and illustrated in Figure 9-1 of that report. The sixth phase of investigation consists of data collected between June 2004 and July 2007. An update of Figure 9-1 in the 2005 RFI/RI will be included in the forthcoming *RCRA Facility Investigation/Remedial Investigation Report, Volume 2 (*Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008.	Response is not adequate. Add the exact references for the other phases and describe each phase for the reader or take out reference to "6 phases" on entire discussion.	See DTSC-1 above.	The work plan has been revised to refer to multiple phases of investigation. Information describing the six phases of investigation between 1997 and 2007 will be provided in the forthcoming RFI/RI Volume 2.
Metropolitan Water District of Southern California	MWD-1	Section 1.2	Section 1.2 discusses the site history and Remedial Facility Investigation (RFI)/Remedial Investigation (RI). Six phases off investigation are mentioned. What were those six phases? What was conducted under each phase? What are the existing data gaps? Volume 1 of the RFI/RI is cited but has yet to be released to the CWG. When will Volume 1 be released to the CWG? It also states that determination of the areas for remediation will be decided prior to the start of the CMS/FS. The PG&E compressor station fenceline is referred to several times. What is the significance of the fenceline compared to areas that have been impacted by past PG&E operations? What will the start date be for the CMS/FS??	The first five phases of investigation at the Topock Site are described in the 2005 RFI/RI and illustrated in Figure 9-1 of that report. The sixth phase of investigation consists of data collected between June 2004 and July 2007. An update of Figure 9-1 in the 2005 RFI/RI will be included in the forthcoming RCRA Facility Investigation/Remedial Investigation Report, Volume 2 (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008. Data needs for the RFI/RI are addressed outside of this CMS/FS work plan. PG&E is currently planning or implementing several investigations for completion of the RFI/RI, including bedrock hydraulic testing; groundwater wells in Arizona and within the Topock Compressor Station; and soil sampling at SWMUs, AOCs, and other undesignated areas within and surrounding the Topock Compressor Station. The Revised Final RCRA Facility Investigation/Remedial Investigation Report Volume 1 (Site Background and History) was published in August 2007 and released to the CWG. The soils investigation work plans have been split up into two parts: Part A addresses SWMUs, AOCs, and other undesignated areas outside the compressor station fence line. Part B addresses SWMUs and AOCs within the compressor station fence line. There are some differences in planning and permitting between inside and outside the compressor station fence line, but there is no current plan to continue this separation in RFI/RI Volume 3 or in the CMS/FS. The proposed schedule for the CMS/FS is presented in Section 7.0 of the CMS/FS work plan.	Response is not adequate. Add the exact references for the other phases and describe each phase for the reader or take out reference to "6 phases" on entire discussion.	See DTSC-1 above.	The work plan has been revised to refer to multiple phases of investigation. Information describing the six phases of investigation between 1997 and 2007 will be provided in the forthcoming RFI/RI Volume 2.
Department of Toxic Substances Control	DTSC-2	Page 1-2, Section 1.2	The third bullet in paragraph 2 should include a reference to the fact that interstitial water and historic wastes were also sampled and analyzed as part of the site investigation conducted at the Topock site.	PG&E does not object to the additional detail about the media sampled as part of previous investigations.	Provide the detail within text	Please add the detail within the text.	Text was revised as suggested in the third bullet in paragraph 2 of Section 1.2 of CMS/FS work plan.
U.S. Department of the Interior	DOI-5	Sec. 1.2, Page 1-2	It should be clarified and stated in this section which sites will be handled under this work plan…all sites whether or not they are on the compressor station property? Or only sites outside the compressor station fence?	The CMS/FS work plan is intended to be comprehensive to all historic operations at the Topock Compressor Station. The specific number of sites to be carried forward in the RFI/RI and addressed in the Final RFI/RI Volume 2 and Final RFI/RI Volume 3 are identified in the *Revised Final RCRA Facility Investigation and Remedial Investigation Report, Volume 1 (Site Background and History),* dated August 2007. As discussed in the CMS/FS work plan, prior to the start of the CMS/FS, a determination will be made as to which of the SWMUs, AOCs, and other undesignated areas will be carried forward from the RFI/RI to the CMS/FS.	The text should discuss the process of how AOCs or SWMUs will be eliminated from further consideration in the CMS/FS. In addition describe how this information will be conveyed to the decision-makers; whether it will be in the RFI/RI or the risk assessment, or by technical memo.	The election of SWMU/AOCs and undesignated areas to be carried forward into the CMS/FS is traditionally part of the RFI report. Since the CMS/FS work plan is currently ahead of the RFI, especially for soils, PG&E must discuss the decision logic in the CMS/FS work plan so that the path forward is clear to readers and decision makers.	The following sentences have been added to Section 1.2 in response to this comment: "Sites will be moved forward from the RFI/RI to the CMS/FS based on the conclusions of the RFI/RI and risk assessments. The determination of which sites are to be moved to the CMS/FS will be made through approval of the RFI/RI and risk assessment conclusions by DTSC and DOI. The CMS/FS will re-iterate the conclusions of the RFI/RI and risk assessments about which SWMUs, AOCs, and undesignated units are addressed in the CMS/FS and the rationale for inclusion."

TABLE A-1
Response to Agency Comments on the Draft Topock Corrective Measures Study/Feasibility Study Work Plan
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Agency	Comment Number	Section	Comment	Response	DOI Direction	DTSC Direction	Work Plan Revisions
U.S. Department of the Interior	DOI-6	Sec 1.2, Page 1-2	Please revise the second, third, and fourth sentences of the fourth paragraph to read as follows: "Volume 2 of the RFI/RI will address the "Groundwater Operable Unit" (OU) comprising groundwater, surface water, pore water, and river sediment and will contain data from those media. Volume 3 will address the "Soils Operable Unit" and will contain soil data. The separation of the Final RFI/RI into three volumes (and two OUs) is intended to manage efficiently (continue with the remainder of the sentence)."	PG&E does not object to the identification of operable units. It should be noted and clarified, however, that RFI/RI Volume 2 is intended to focus on characterization of groundwater, surface water, and pore water from PG&E's historic operational practice of wastewater discharge to Bat Cave Wash and PGE-8, while RFI/RI Volume 3 is intended to focus on the remaining historical Topock Compressor Station operations that will largely focus on soil, but will also include groundwater data from wells within and immediately surrounding the compressor station.	Please clarify whether PG&E intends to use "operable unit" for GW and Soil and then define in the CMS/FS work plan exactly how these 2 units will be addresses thru process. In addition, please explain how all media and migration pathways will be addressed.	DTSC understands that there are proposed options on the extent of information covered in each volume of the RFI document. DTSC, however, is still looking for a concise and definitive clarification from PG&E on this subject. If the OU concept is used, PG&E must properly define its intentions from the investigation stand point and its timing accordingly.	Section 1.2 has been revised in response to this comment. Operable units are not defined, but the distinction between RFI/RI Volume 2 and RFI/RI Volume 3 is as follows: "Volume 2 of the RFI/RI will address the historic operational practice of wastewater discharge to Bat Cave Wash and PGE-8 comprising groundwater, surface water, pore water, and river sediment and will contain data from those media. Volume 3 will address the remaining Topock Compressor Station operations, and will contain soil data from the SWMUs, AOCs, and other undesignated areas addressed in Volume 3, as well as sediment data near the mouth of Bat Cave Wash, and groundwater data from wells within and immediately surrounding the compressor station."
U.S. Department of the Interior	DOI-7	Sec. 1.2, Page 1-3, Last Para.	Has the final number of sites to be investigated been agreed to?	The SWMUs, AOCs, and other undesignated areas to be addressed in RFI/RI Volume 2 and RFI/RI Volume 3 are identified in the *Revised Final RCRA Facility Investigation and Remedial Investigation Report, Volume 1 (Site Background and History)* dated August 2007. Both DTSC and DOI have approved this document. Prior to the start of the CMS/FS, a determination will be made as to which of the SWMUs, AOCs, and other undesignated areas will be carried forward from the RFI/RI to the CMS/FS.	The response is not adequate. Please explain how PG&E plans to document and formalize which sites are moved to CMS/FS after completion of RFI/RI. Provide process that will be implemented/followed for moving document decisions between RFI/CMS. Will this involve only DTSC and DOI or CWG members? DOI understands not all SWMUs/AOCs may be moved forward.	Please note that the CMS Work Plan currently omits one undesignated area (i.e., 300B Pipeline Liquids Tank) from those listed in RFI/RI Volume within text and Figures. This omission needs to be corrected. Additionally, new areas identified in the future as requiring investigation (e.g., debris area on the MW-24 bench) will also have to be evaluated for inclusion in the CMS/FS.	The following sentences have been added to Section 1.2 in response to this comment: "Sites will be moved forward from the RFI/RI to the CMS/FS based on the conclusions of the RFI/RI and risk assessments. The determination of which sites are to be moved to the CMS/FS will be made through approval of the RFI/RI and risk assessment conclusions by DTSC and DOI. The CMS/FS will re-iterate the conclusions of the RFI/RI and risk assessments about which SWMUs, AOCs, and undesignated units are addressed in the CMS/FS and the rationale for inclusion." In addition, the following sentence has been added in a footnote to Sections 1.2 and 2.2 in response to this comment: "In addition, RFI/RI Volume 1 identifies four SWMUs, 1 AOC, and four undesignated areas that were previously closed but for which additional investigation has been requested. If the additional investigation data indicate that the closure status for any of these SWMUs, AOC and undesignated areas is to be rescinded, these will also be addressed further in the RFI/RI." Also, the requested sentence about future areas identified as requiring investigation and evaluation for inclusion in the CMS/FS has been added to Section 1.2.
U.S. Department of the Interior	DOI-8	Sec. 1.3, Exhibit 1-2, Page 1-4	The Conceptual Site Model (CSM) is generally initiated during the DQO process and refined during the risk assessment. The intent of the RFI/RI is to fully characterize the site which includes the finalization of the conceptual site model. The first block of the diagram doesn't present this approach.	The comment is correct that the risk assessment and RFI/RI refine and finalize the site conceptual model. The first block in the diagram is intended to illustrate this; the site conceptual model is refined based on results from the site investigations and the pathways and receptors included in the risk assessment.	The final CSM should be agreed to by the decision -makers prior to initiating the CMS/FS. PG&E should describe the process for obtaining agreement from decision-makers on the final CSM.		Section 2.3 has been revised in response to this comment to add the following sentence: "The final conceptual site model will be documented in the forthcoming RFI/RI and risk assessment. PG&E will submit the RFI/RI and risk assessment to DTSC and DOI for approval of the final conceptual site model prior to initiating the CMS/FS."
U.S. Department of the Interior	DOI-9	Sec. 1.3, Exhibit 1-2, Page 1-4	Where do ARARs fit into this process? This section should be revised to incorporate the regulatory requirement for ARARs within the CERLCA process. (ref. CERCLA Section 121(d) and	As discussed in Section 3.0 of the CMS/FS work plan, ARARs are used to guide the development of the media cleanup goals and standards. Also, as discussed in Section 5.0 of the CMS/FS work plan, compliance with ARARs is an evaluation criteria that will be used in the CMS/FS evaluation process	Be sure this response is reflected in the text		No changes to the work plan have been made in response to this comment. ARARs are discussed in the CMS/FS work plan in Sections 3.0 and 5.0.

TABLE A-1
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Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Agency	Comment Number	Section	Comment	Response	DOI Direction	DTSC Direction	Work Plan Revisions
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-2		The flowcharts depicting the process to be followed within each chapter is both useful and effective. However, it seems that the step involving identification of applicable or relevant and appropriate requirements (ARARs) should appear somewhere in the diagrams as well as the stage at which screening out of alternatives will occur.	As discussed in Section 3.0 of the CMS/FS work plan, ARARs are used to guide the development of the media cleanup goals and standards. Also, as discussed in Section 5.0 of the CMS/FS work plan, compliance with ARARs is an evaluation criterion that will be used in the CMS/FS evaluation process. As shown in the Exhibit 1-2, following the development of remedial action objectives, potential remedial technologies for soil and groundwater are identified, and remedial alternatives are developed. During both the remedial technologies identification step and the remedial alternative development step, technologies and alternatives will be “screened out” as others are retained for evaluation. The flowcharts are intended to provide the primary steps and not to identify all the details within each step.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Metropolitan Water District of Southern California	MWD-21		Several wells have been proposed for installation on the Arizona side of the Colorado River. These wells will provide new information on the extent of the plume. The CMS/FS work plan should include a discussion on evaluation of results from the Arizona wells	The comment is correct that the wells planned for installation in Arizona are intended to be included in the forthcoming RFI/RI and will be considered in the development of the conceptual site model. The forthcoming RFI/RI documents will describe the various phases of investigation at the Topock site and provide detail on wells installed for site characterization.		DTSC agrees with PG&E that the evaluation of the Arizona wells should not be part of the CMS/FS, but instead belongs in the RFI/RI. However, depending on the results of those wells, it may affect the remedy design and clean-up criteria.	No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Section 2							
U.S. Department of the Interior	DOI-10	Sec. 2.0, Exhibit 2-1, Page 2-1	The initiation of the CSM should be during the planning stages and refined as additional information is collected. This iterative approach will serve to direct the investigation to meet the requirement of an adequate and detailed site characterization. Please provide additional clarification on the development of the CSM.	The purpose of Exhibit 2-1 is to illustrate how the conceptual model fits with the CMS/FS process. Details about the development of the various specific aspects of the site conceptual model are not necessary for this purpose. The comment is correct that the site conceptual model is initiated during the planning stages and refined as additional data are collected. The site conceptual model information provided in the CMS/FS work plan for the Topock site is intended to be a summary of the physical processes associated with the release and potential migration of site related compounds based on currently available information. It is acknowledged that the site conceptual model will be refined and finalized in an iterative manner as additional data are collected during the RFI/RI. Additional refinements will be presented in the risk assessments documents as the relevant human and ecological receptors and their potential exposure pathways are identified.		DTSC agrees with PG&E's response. However, the CMS/FS Work Plan should be clear on the decision logic as to how this iterative process works, and how new information will be incorporated into the CSM.	Section 2.3 has been revised in response to this comment. The following sentences have been added: “The site conceptual model for the Topock site will be refined from that presented in this section following completion of the additional investigations. The final site conceptual model will be documented in the forthcoming RFI/RI and risk assessments. The CMS/FS will reiterate the conceptual site model developed in the RFI/RI and risk assessments, as refined based on the additional site investigation and risk assessments, as well as any new information developed after the final RFI/RI report is prepared that could significantly affect the evaluation and selection of remedial alternatives.”
Metropolitan Water District of Southern California	MWD-2	Section 2.0	In the flow chart shown in section 2.0, the risk assessment feeds into the site conceptual model, which is incorrect. The site conceptual model provides input to the risk assessment, which is used to estimate the risk to human health and the environment. These results are used in turn to identify impacted media that require treatment for the CMS.	As discussed in response to comment DOI-8, the site conceptual model is initiated during the planning phases but refined based on the results of the site investigations and the needs and objectives for evaluating the relevant receptors and exposure pathways identified in the risk assessment. The figure is not intended to show a linear sequence of process steps, but rather that information from the site investigation and the risk assessment processes both are incorporated into the final site conceptual model. The comment is correct that the risk assessment estimates risk to human health and the environmental and identifies the media to be addressed in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.

TABLE A-1
Response to Agency Comments on the Draft Topock Corrective Measures Study/Feasibility Study Work Plan
Corrective Measures/Feasibility Study Work Plan, Topock Compressor Station

Agency	Comment Number	Section	Comment	Response	DOI Direction	DTSC Direction	Work Plan Revisions
Department of Toxic Substances Control	DTSC-3	Page 2-1, Exhibit 2-1	The exhibit suggests that the site investigation and the risk assessment provide the initial steps to the Site Conceptual Model. The reality is probably more of an iterative process to refine the Site Conceptual Model leading to a good predicative risk assessment to derive at the Remedial Action Objectives.	As discussed in response to comment DOI-8 and MWD-2, the site conceptual model is initiated during the planning phases but is refined based on the results of the site investigations and objectives of the risk assessment. The comment is correct that the development and refinement of the site conceptual model is iterative. However, the final site conceptual model is derived from the results of the site investigations and modifications presented in the risk assessment that incorporate the receptors and exposure pathways identified during that evaluation step.		DTSC agrees with PG&E's response. However, the CMS/FS Work Plan should be clear on the decision logic as to how this iterative process works, and how new information will be incorporated into the CSM.	Section 2.3 has been revised in response to this comment. The following sentences have been added: "The site conceptual model for the Topock site will be refined from that presented in this section following completion of the additional investigations. The final site conceptual model will be documented in the forthcoming RFI/RI and risk assessments. The CMS/FS will reiterate the conceptual site model developed in the RFI/RI and risk assessments, as refined based on the additional site investigation and risk assessments, as well as any new information developed after the final RFI/RI report is prepared that could significantly affect the evaluation and selection of remedial alternatives."
U.S. Department of the Interior	DOI-11	Figure 2-1 and Secs. 2.1.1 and 2.1.2, Page 2-2	The CSM presented in the figure does not illustrate the other potential sources of contamination. It focuses on the percolation beds in Bat Cave Wash without considering other potential and uncharacterized sources. Please revise the CSM to illustrate other potential sources and make it consistent with other CSMs developed during the DQO process.	It should be clarified that Section 2.1 and Figure 2-1 of the CMS/FS focus on the conceptual model associated with the historic practice of wastewater discharge to Bat Cave Wash. This is a known source of groundwater contamination for which extensive characterization has been performed. If any of the other historic operations at the Topock Compressor Station have affected groundwater, these activities would likely be secondary sources due to the relatively low quantities released, types of materials managed, depth to groundwater, and precipitation rates at the site. While the effect on groundwater of other historic operations at the Topock Compressor Station is considered secondary to the historic practice of wastewater discharge to Bat Cave Wash, characterization of these other potential sources is planned and will be included in the forthcoming RFI/RI Volume 3. The conceptual site model to be presented in the CMS/FS will incorporate the data developed from the characterization of these other sources.	Add statement within section that acknowledges other sources of contamination may be possible and will be documented in CSM following completion of RFI/RI	DTSC agrees with this response as long as the text of the CMS/FS Work Plan is modified to incorporate this idea.	The last sentence in Section 2.1.1 has been modified in response to this comment and states: "Other COPCs and sources to groundwater may be identified as ongoing investigations are completed and will be documented in the RFI/RI." The seventh sentence in the first paragraph in Section 2.1.2 has been modified in response to this comment and states: "As investigation of additional sources proceeds, new data are collected from existing wells, and new wells are installed, the plume will be more precisely defined."
San Diego Water Authority	SDWA-2	Page 2-2, Section 2.1.1, second paragraph	Page 2-2, Section 2.1.1, second paragraph: The information presents a 13-year period for release of the Cr(VI), which represents the time period before 1951 to 1964. However, depending on the time in 1951 it started and the time in 1964 it ceased, it may be more appropriately represented as a 14year period.	PG&E does not object to defining the period between 1951 and 1964 when untreated wastewater was discharged to Bat Cave Wash as a 14-year period.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-12	Sec. 2.1.1, Page 2-2	Source of Groundwater Contaminants, Second Paragraph, Second Sentence – Electrical conductivity is listed as a COPC (Chemical of Potential Concern). Electrical conductivity is a measurement of a material's (in this case ground water) ability to conduct an electric current. The COPC to be listed here is probably instead total dissolved solids.	The COPCs in groundwater as listed in Section 2.1.1 are consistent with the COPCs identified for SWMU 1, AOC 1, and SWMU 2 in Table 4-1 of the *Revised Final RCRA Facility Investigation/Remedial investigation, Volume 1 (Site Background and History),* dated August 2007. Electrical conductivity was defined as a potential COPC in the DTSC Corrective Action Consent Agreement. Electrical conductivity is an analog for total dissolved solids but much easier to measure.	The response is not adequate. In agreement with DTSC, remove electrical conductivity as a COPC	Technically, DOI is correct that EC is a measurement. DTSC, however, recognizes that EC is listed in the 1996 consent agreement as a COPC when it is preferable to consider the TDS as a COPC. DTSC requests that PG&E clarify this issue in the Work Plan.	The following sentence has been added to the second paragraph in Section 2.1.1: "This list of COPCs will be refined in the forthcoming RFI/RI based on site characterization data." The relationship between total dissolved solids and electrical conductivity will be discussed in the forthcoming RFI/RI Volume 2.

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Metropolitan Water District of Southern California	MWD-3	Section 2.1.1 Section 2.1.2	Section 2.1.1 describes the source of contamination and lists the chemicals of potential concern (COPCs)) as chromium VI, chromium (T), copper, nickel, lead, zinc, pH, electrical conductivity, and total petroleum hydrocarbons. Although other COPCs may be identified later in the project, these represent the main COPCs for groundwater and should be the basis for the CMS. Some of the metals have been deleted from the routine groundwater monitoring because they have been infrequently detected or detected at low levels. Releases of COPCs from the old evaporation ponds and the disposal well should also be identified in addition to the releases to Bat Cave Wash. In section 2.1.2 it states that COPCs that will be addressed in the CMS/FS will be restricted to those that are found to be elevated. The plan should stipulate the identity of these COPCs and what is meant by elevated (i.e., compared to a regulatory standard or background level).	The COPCs in groundwater as listed in Section 2.1.1 are consistent with the COPCs identified for SWMU 1, AOC 1, and SWMU 2 in Table 4-1 of the *Revised Final RCRA Facility Investigation/Remedial investigation, Volume 1 (Site Background and History),* dated August 2007. These are based on the history of wastewater discharge. Section 2.1.2 considers groundwater monitoring data in the discussion of the COPCs. The term “elevated,” as used in this work plan, is intended to mean above a risk threshold and/or above an ARAR level. Only those COPCs identified as “elevated” will be carried forward as COCs. Because the RFI/RI, risk assessment, and ARARs identification are not yet complete, the list of chemicals of concern to be addressed in the CMS/FS cannot be completely defined at this time. The CMS/FS will clearly establish the chemicals of concern and media cleanup goals.	Remove the term "elevated" or accompany it with text describing what the COPC is compared to. DOI does not agree with last statement. The CMS/FS does not establish COC and media cleanup goals. The COCs are determined in RFI/RI and media cleanup goals are typically defined by risk assessment/ARAR evaluation.	DTSC is in agreement with DOI.	Sections 2.1.1 and 2.2.1 were revised to more specifically define the use of the term elevated.
U.S. Department of the Interior	DOI-20	General comment	The term COPCs is used throughout this document to refer to the chemicals that will be evaluated during the CMS/FS. However, following convention, the COPCs are defined in the RFI/RI and the COCs are identified during the risk assessment. Once the COCs have been identified, the CMS/FS evaluates technologies to deal with the COCs not the COPCs.	It should be clarified that COPCs are defined and evaluated in the RFI/RI and risk assessments, while COCs are defined in the remedial action objectives, considering the results of the risk assessments and ARARs evaluations. The CMS/FS evaluates technologies to address the COCs requiring remedial action, not the COPCs.	Replace the COPC with COC throughout work plan when referring to those contaminants to be evaluated in CMS/FS. DOI cautions that a global text change may not be appropriate	DTSC is in agreement with DOI	Text was revised as suggested throughout the CMS/FS work plan where applicable.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-4	Section 2.1.2	The Tribe is also concerned with the apparently open-ended statement in Section 2.1.2 that indicates “As … new wells are installed, the plume will be more precisely defined. ” As you are aware, in commenting on past work plans involving proposed drilling of new wells, the Tribe has emphasized the need for minimization of the number of intrusions (such as the drilling of new wells) into sacred areas.	PG&E respects the Fort Mojave Indian Tribe’s desire to minimize the number of intrusions (such as drilling new wells) into sacred areas, and supports with this position. The CMS/FS work plan does not propose any new wells. If additional wells are required by regulatory agencies, a specific separate work plan with clear data objectives and defined mitigation measures associated with additional well installation will be developed and provided.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-5	Page 2-2, Section 2.1.2	The first paragraph identifies the California MCL for Cr(T) in units of milligrams per liter (mg/L). Since the figures in the CMS/FS Work Plan present concentrations of COPCs, including Cr(T), in units of micrograms per liter (µg/L), this paragraph also should provide the MCL for Cr(T) in units of µg/L. The text and figures should be consistent in the units of measure utilized.	PG&E does not object to reporting the California MCL in the units of µg/L rather than mg/L.	Modify the text as requested		Text was revised as suggested in Sections 2.1.2 and 3.2.2 in the CMS/FS work plan.

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U.S. Department of the Interior	DOI-13	Sec. 2.1.3, Page 2-3	This section focuses on groundwater as the primary route of contaminant migration, however, overland flow by surface runoff should also be considered. There has been documented erosion within Bat Cave Wash at the location of the former percolation beds. The white material identified as potentially containing Cr has been eroded down stream. There is also the potential for vertical migration from potential sources in the AOCs and SWMUs that will be investigated under the soils work plan. The CMS/FS work plan should be able to deal with all the sources once they are identified. The CSM should also reflect all potential migration pathways. Please revise this section to include a discussion of other potential migration pathways.	It should be clarified that Section 2.1 focuses on the conceptual model of groundwater contamination associated with the historic practice of wastewater discharge to Bat Cave Wash, while Section 2.2 focuses on the remaining Topock Compressor Station operations, as well as other media associated with Bat Cave Wash. This is a consistent separation planned for RFI/RI Volume 2 vs. RFI/RI Volume 3. The comment is correct that the potential migration routes from the SWMUs, AOCs, and other undesignated areas (other than the groundwater contamination associated with SWMU 1, AOC 1, and SWMU 2) are being evaluated and will be included in the forthcoming RFI/RI Volume 3. As discussed in Section 2.3, the conceptual model information presented in the work plan is based on existing data, and the conceptual site model will be updated as additional data are planned and evaluated. The information in the CMS/FS work plan is not intended to substitute for the final conceptual site model that will be developed through completion of the RFI/RI and risk assessment and presented in the CMS/FS.	Describe how the CSM will be modified following rounds of soil investigations and potentially unexpected conditions while the GW CMS/FS is concurrent with soil investigation. DOI suggests establishing a process of issuing tech memos on new data/CSM developments to minimize revisions to work plans and obtain approval of the CSM prior to the implementing in the CMS/FS.	DTSC is in agreement with DOI. Please refer to DTSC-3	Section 2.1.1 has been modified in response to this comment. The following sentences have been added: "While the principal contaminant in groundwater at the site is hexavalent chromium, and the primary source of contamination is the historic practice of discharging untreated wastewater to Bat Cave Wash, it is acknowledged that other COPCs and sources to groundwater may be identified as ongoing investigations are completed and will be documented in the RFI/RI." Section 2.3 has been modified in response to this comment. The following sentences have been added: "Additional groundwater data (and soil data showing potential impacts to groundwater) to be collected after completion of RFI/RI Volume 2 will be reported in an addendum to RFI/RI Volume 2, RFI/RI Volume 3, data summary reports, or monitoring reports as appropriate given the nature of the data and the effect on the site conceptual model."
Department of Toxic Substances Control	DTSC-6	Page 2-3, Section 2.1.3	No quantification is provided with regard to reducing conditions observed in groundwater in the fluvial deposits and sediments beneath the Colorado River. The last sentence in this section misleads the effectiveness of the natural reducing conditions to limit or prevent Cr(VI) impacted groundwater through the sediments. Please notes that the deepest well screen interval for MW-34 has Cr(VI) concentrations above 50 µg/L.	The conceptual site model descriptions provided in the CMS/FS work plan are intended to be a summary based on currently available information and are not intended to present all the details or quantification on the hydrogeologic conditions and groundwater characterization, which is presented in the RFI/RI. Information on the reducing conditions in the fluvial deposits and sediments beneath the Colorado River will be included in the forthcoming *RCRA Facility Investigation/Remedial Investigation Report, Volume 2* (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008.		DTSC agrees with PG&E's response. However, the current language in the CMS Work Plan is too final and specific. PG&E should qualify the statements that are currently in the CMS/FS Work Plan.	The following sentence has been added as the last sentence in Section 2.1.3: "Characterization data of the reducing conditions in the fluvial sediments will be documented in the forthcoming RFI/RI."
Metropolitan Water District of Southern California	MWD-4	Section 2.1.3	In section 2.1.3 the description of groundwater movement as "relatively slow" is misleading. While compared to other sites, movement of the PG&E chromium plume may be slow, it should be pointed out that the plume has moved approximately 2,800 feet in less than 50 years equating to a rate of movement greater than 50 feet per year. Section 2.1.3 also discusses the reducing conditions that exist in the floodplain. The pore water study did find reducing conditions, but the depth of testing was limited to only 6 feet. Groundwater in the floodplain and below the river exists at much deeper depths. Initial sampling from the slant wells has also indicated reducing conditions, but these wells have not yet equilibrated. Metropolitan believes that the equilibration process for these wells will take some time (6 months or more) because of the low flow conditions of the wells. Proper evaluation of the chromium VI levels and reducing conditions cannot be accurately determined until the wells have equilibrated. In addition, the anaerobic core testing will be conducted on core samples taken from the slant wells. The anaerobic core testing will determine the reducing capacity of the fluvial sediments below the river and in the floodplain. Until these studies are complete the reducing capacity of the sediments in the floodplain cannot be definitely stated.	The conceptual site model descriptions provided in the CMS/FS work plan are intended to be a summary based on currently available information and are not intended to present all the details on the hydrogeologic conditions and groundwater characterization, which is presented in the RFI/RI. Information on groundwater movement, results from the pore water study, results from the slant well installation and monitoring, and results from the core testing of sediments in the floodplain will be including in the forthcoming RCRA Facility Investigation/Remedial Investigation Report, Volume 2 (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008. The description of groundwater movement as "relatively slow" is accurate for the Topock site, particularly in the context of the CMS/FS. The slow groundwater flow at the site must be considered in the design of the final remedy.	Second paragraph of response is not appropriate and vague. Eliminate the phrase "relatively slow" or define "relatively" within the W.P. The response doesn't answer the comment	DTSC does not believe the response to be adequate. Although the comment from MWD misrepresents the current hydraulic movement of the plume, it is based on probable historic hydraulic conditions that would have resulted in hydraulic mounding at the point of discharge. PG&E should be able to clarify current conditions and define the current natural gradient at the site. The statement that the groundwater movement is "relatively slow" is too vague.	Section 2.1.3 has been revised to remove the sentence in question. In addition, the following sentence has been added as the last sentence in the first paragraph in Section 2.1.3: "Characterization of groundwater gradients at the site will be documented in the forthcoming RFI/RI."

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Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-5	Section 2.1.4	Section 2.1.4 refers to the protection of "… potential receptors in the future." It is unclear as to which future receptors this might refer to as well as why, if it is unlikely there are any complete exposure pathways in the present, there would be any in the future.	Exposure assumptions considering potential future receptors will be based on reasonably foreseeable land uses and will be defined in the forthcoming risk assessments. The intent of the statement in Section 2.1.4 is to clarify that the final remedy will be designed to protect potential future receptors, if any are identified.		For clarification, it should be understood that State law requires the groundwater basin to be protected and provide beneficial uses. PG&E's remedy will need to comply with this law and protect potential future uses including the ability of the basin to provide drinking water wells	No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Metropolitan Water District of Southern California	MWD-5	Section 2.1.4	Section 2.1.4 states that there is currently no evidence of a complete pathway for chromium VI in groundwater to reach a receptor. Although this statement may be true, it is premature to state this definitively at this time. It has been stated that the plume has traveled under the river. It is likely that a pathway could exist for chromium VI to enter the Colorado River. Interim Measures 3 (IM No. 3) has been put in place to reverse the hydraulic gradient to protect the river. In addition, the reducing conditions below the river may present a natural barrier of protection for the river. Additional studies are being conducted to determine if the objectives of IM3 and the reducing capacity of the sediments actually protect the river.	The conceptual site model descriptions provided in the CMS/FS work plan are intended to be a summary based on currently available information. The final conceptual site model, including definition of complete pathways between a source and receptor, will be refined to include additional data collected during the completion of the RFI/RI, summarized in the risk assessment and presented in the CMS/FS	Remove the statement.	DTSC agrees with DOI. Please refer to DTSC-7 below.	Section 2.1.4 has been revised to remove the sentence in question.
Department of Toxic Substances Control	DTSC-7	Page 2-3, Section 2.1.4, Potential Groundwater Receptors	The conclusion or suggestion that there is currently no evidence of a complete pathway for Cr(VI) in groundwater to reach a receptor is premature and unsubstantiated. Unless PG&E provides full justification and discussion of potential pathways with the site conceptual model in this work plan, DTSC cannot concur with this statement and suggests its removal.	The conceptual site model descriptions provided in the CMS/FS work plan are intended to be a summary based on currently available information. The final conceptual site model, including definition of complete pathways between a source and receptor, will be defined following completion of the RFI/RI and will be presented in the risk assessment.	Remove the statement	DTSC believes that the statement in the CMS Work Plan is premature. The conclusion that there is no complete pathway does not belong in the CMS/FS work plan.	Section 2.1.4 has been revised to remove the sentence in question.
Department of Toxic Substances Control	DTSC-4	Page 2-2, Contaminant Distribution in Groundwater	Section 2.1.1 identifies the following COPCs for groundwater: total chromium (Cr(T)), hexavalent chromium (Cr(VI)), copper, nickel, lead, zinc, pH, electrical conductivity and total petroleum hydrocarbons (TPH) as well as other COPCs as ongoing investigation are completed. Section 2.1.2 states that, in August 2004, DTSC approved the deletion of copper, nickel and zinc from the routine groundwater monitoring suite. However, the Work Plan does not seem to emphasize and carry forward other COPCs except chromium in groundwater. DTSC notes that arsenic and molybdenum were also identified as potentially elevated in recent groundwater investigations for some wells.	The COPCs in groundwater as listed in Section 2.1.1 are consistent with the COPCs identified for SWMU 1, AOC 1, and SWMU 2 in Table 4-1 of the *Revised Final RCRA Facility Investigation/Remedial investigation, Volume 1 (Site Background and History),* dated August 2007. These are based on the history of wastewater discharge. Section 2.1.2 considers groundwater monitoring data in the discussion of the COPCs. The CMS/FS states that the chemicals of concern to be addressed in the CMS/FS will be limited to those that are found to be elevated in groundwater during the site investigation and risk characterization. It is acknowledged that the CMS/FS work plan has been prepared prior to the completion of the site investigation and risk characterization. Based on the investigation findings to date, the principal contaminant in groundwater at the site is hexavalent chromium. However stating this in this work plan is not intended to circumvent the conclusions of the final RFI/RI and risk assessment.	Response not adequate. Provide process for moving COPCs forward as COCs.	DTSC disagrees with PG&E's response. Although the CMS/FS will be limited to chemicals of concern which are elevated above a defined clean-up goal, PG&E has yet to define the chemicals of concern or the clean-up goal. PG&E should not limit the specific chemicals of potential concern in the CMS/FS work plan, particularly if DTSC has identified other potential chemicals of concern such as arsenic and molybdenum in groundwater. PG&E has arbitrarily limited "groundwater" to SWMU 1, AOC 1 and SWMU 2. The site investigation is incomplete at this point. As DOI suggests, PG&E should acknowledge that there could be additional COCs by providing a discussion on the process for identifying COCs from the COPCs under the CMS/FS.	Section 2.1.2 has been modified to remove the discussion in the second paragraph about the removal of parameters from the site monitoring program. In addition, the following sentence has been added to Section 2.1.1: "This list of COPCs in groundwater will be refined in the forthcoming RFI/RI based on site characterization data." Section 2.1.1 also discusses that the COCs to be addressed in the CMS/FS will be limited to those that are found to be elevated (above a risk threshold and/or above ARAR level) in groundwater during the site investigation and risk characterization.
U.S. Department of the Interior	DOI-14	Sec. 2.2, Page 2-3	The CSM should be finalized before the completion of the CMS/FS. As discussed in the DQOs the CSM is the foundation of the investigation and is revised as needed until the characterization is complete. Waiting until the CMS/FS is complete to evaluate the CSM is not acceptable.	PG&E agrees that the site conceptual model should be finalized before the completion of the CMS/FS. This is clearly described in the work plan, and Exhibit 1-2 shows the conceptual site model as the first step in the CMS/FS process.	Response not acceptable. The CSM should be finalized before the <u>start</u> of the CMS/FS. This is not clearly described in the work plan.		Section 2.3 has been modified to add the following sentence: "The conceptual site model will be completed through DTSC and DOI approval of the RFI/RI and risk assessments, prior to initiating the CMS/FS."

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Department of Toxic Substances Control	DTSC-8	Page 2-3, Section 2.2, Conceptual Model for Soil	DTSC notes that PG&E cited one SWMU, 17 AOCs and one undesignated area for the soil investigation, but listed SWMU 2 in Figure 1-2 to be inclusive. DTSC recommends inclusion of a table of all SWMUs, AOCs, and other undesignated areas as an additional exhibit for clarity. This table can also differentiate which units are studied within the soil or groundwater RFI.	The specific SWMUs, AOCs, and other undesignated areas to be included in the forthcoming RFI/RI Volume 2 and RFI/RI Volume 3 are identified in the Revised Final RCRA Facility Investigation and Remedial Investigation Report, Volume 1 (Site Background and History), dated August 2007. The CMS/FS work plan is intended to be conceptual and not to provide all the detail that is included in other documents.	DOI agrees with DTSC that a table should be added	Although DTSC agrees that not all information from other documents should be repeated, PG&E elected to cite the number of SWMUs and AOCs in the work plan and assumed conclusions on the site investigations based on information known to date. As such, PG&E should clarify what those units are and how they will be studied in the CMS/FS. DTSC believes the requested table to be necessary. Please also refer to DOI-7 above	In response to this comment, Table 1-1 has been added.
U.S. Department of the Interior	DOI-15	Sec. 2.2.1, Page 2-4	Define the term elevated.	The term "elevated" as used in this work plan is intended to mean above a risk threshold and/or above an ARAR level. Only those COPCs identified as "elevated" will be carried forward as COCs in the CMS/FS. The CMS/FS will clearly establish the chemicals of concern and media cleanup goals. See also response to MDW-3 in Section 2.	Define the term "elevated" within text of work plan.	Please include definition in the text of the revised work plan.	Sections 2.1.1 and 2.2.1 were revised to more specifically define the use of the term "elevated."
Department of Toxic Substances Control	DTSC-9	Page 2-4, Section 2.2.1	PG&E only noted the origin of contaminants to be released through spills and leaks. PG&E should also recognize that some release of contaminants could have been associated with past management practices associated with hazardous material handling.	The comment is correct that the source of contaminants could be through mechanisms other than through spills and leaks. Management practices associated with hazardous material handling were evaluated to determine the SWMUs, AOCs, and other undesignated areas to be evaluated in the RFI/RI as documented in the *Revised Final RCRA Facility Investigation and Remedial Investigation Report, Volume 1 (Site Background and History),* dated August 2007.		Please appropriately modify the text of the revised work plan to address this comment	Text was revised as suggested in Section 2.2.1 of the CMS/FS work plan.
Department of Toxic Substances Control	DTSC-10	Page 2-4, Section 2.2.2	This section suggests that copper and zinc are found above background concentrations. However, background concentrations for COPCs have yet to be determined.	The comment is correct that final background levels in soil have not been completely defined. However, there have been several studies of background concentrations at the Topock Compressor Station and there are published values of background concentrations in soil in the region that provide a relative indication of the background concentrations.		PG&E should qualify the statement in the text of the work plan to indicate that the background study has not been completed and that zinc and copper appear to be elevated based on preliminary assessment	Text was revised as suggested in Section 2.2.2 of the CMS/FS work plan.
U.S. Department of the Interior	DOI-16	Sec. 2.2.3, Page 2-4	Routes of Contaminant Migration in Soils – An additional route of soil contamination migration is wind transport of contaminated soil particles.	The comment is correct that the routes of migration identified in Section 2.2.3 are not the only potential migration routes. Details about the exposure routes for receptors will be included in the forthcoming risk assessments.	The response is not appropriate. Add all migration routes or place statement that acknowledges other routes may be identified.	Since PG&E acknowledged in the response that those in the work plan are not the only potential migration routes, PG&E should revise the work plan to reflect this statement.	The following sentence has been added to Section 2.2.3: "Other routes of soil contaminant migration may be identified as ongoing investigations are completed, and will be documented in the RFI/RI and/or risk assessment."
Metropolitan Water District of Southern California	MWD-6	Section 2.2.3	In Section 2.2.3 possible migration of soil contaminants should also consider transport in air as dust and vapors.	The comment is correct that the routes of migration identified in Section 2.2.3 are not the only potential migration routes. Details about the exposure routes for receptors will be included in the forthcoming risk assessments.	The response is not appropriate. Add all migration routes or place statement that acknowledges other routes may be identified.	See comment above.	The following sentence has been added to Section 2.2.3: "Other routes of soil contaminant migration may be identified as ongoing investigations are completed, and will be documented in the RFI/RI and/or risk assessment."
Department of Toxic Substances Control	DTSC-11	Page 2-4, Section 2.2.3	This section discusses two primary routes of soil contaminant migration that will be considered in the CMS/FS. Additional route; however, consisting of transport of contaminants through soil via infiltration (but not to groundwater), and possible air dispersion due to blowing wind should also be included in this section.	The comment is correct that the routes of migration identified in Section 2.2.3 are not the only potential migration routes. Details about the exposure routes for receptors will be included in the forthcoming risk assessments.	The response is not appropriate. Add all migration routes or place statement that acknowledges other routes may be identified.	See comment above.	The following sentence has been added to Section 2.2.3: "Other routes of soil contaminant migration may be identified as ongoing investigations are completed, and will be documented in the RFI/RI and/or risk assessment."
U.S. Department of the Interior	DOI-17	Sec. 2.2.4, Page 2-4	What are the exposure routes for the receptors? Dermal contact, ingestion, uptakes, inhalation, etc? Please add the exposure routes for the receptors.	Details about the exposure routes for receptors will be included in the forthcoming risk assessments.	The response is not appropriate. Add text stating that all exposure routes identified in the risk assessment will be addressed in the CMS/FS.	DTSC agrees with DOI.	The following sentence was added to Section 2.2.4: "Exposure routes identified in the risk assessment as complete and contributing to elevated risk levels will be addressed in the CMS/FS."

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San Diego Water Authority	SDWA-3	Page 2-4, Section 2.2.4	Page 2-4, Section 2.2.4: The paragraph indicates "different cleanup standards may be evaluated…depending on location and intended future use." Future use is likely only as far as related land use documents have planned, which could change. The cleanup standard should be a consistent level so that no further remediation would be necessary in the future at an additional cost and planning effort.	Because there are AOCs and SWMUs in different areas with multiple landowners and multiple current and possible future uses, there is the possibility that there may be different cleanup standards for different AOCs and SWMUs.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-18	Page 2-5	The risk assessment should also determine protective levels of the chemicals of concern (COCs).	The comment is correct that the risk assessment will be one method of identifying acceptable levels of COCs.	DOI acknowledges the comment is not clear so PG&E's response is adequate.		No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-19	Sec. 2.3, Page 2-5, 1st Para.	In general the COPCs are identified during the site characterization phase of the effort. The risk assessment is used to evaluate the potential risk to human health and the environment, and the result is the identification of the COCs. The COCs are evaluated in the selection of the remedial alternative. We suggest changing the term COPC to COC throughout the document.	It should be clarified that COPCs are defined and evaluated in the RFI/RI and risk assessments, while COCs are defined in the remedial action objectives, considering the conclusions of the risk assessments and ARARs evaluations. The CMS/FS evaluates technologies to address the COCs not the COPCs.	Replace COPC w/COC where appropriate. The comment response still misses the point. The COPCs are evaluated in the Risk Assessment to identify the COCs. The RAOs are determined in the CMS/FS. Please state the process correctly in the revised work plan.	DTSC agrees with DOI.	Text was revised as suggested throughout the CMS/FS work plan where applicable.
Department of Toxic Substances Control	DTSC-12	Page 2-5, Section 2.3	PG&E used the term "points of compliance" in a couple of sections in this work plan, but failed to properly define its meaning or its use. DTSC notes that this is a similar comment in our May 15, 2007 letter.	As discussed in Section 3.2, points of compliance and cleanup levels for soil and groundwater will be developed based on the results of the site-specific risk assessments and/or ARARs, with consideration of natural background concentrations, as appropriate. The points of compliance for the Topock site have not yet been determined but will be identified in the CMS/FS. The term "point of compliance" is typically a RCRA term applied to the location at which water quality standards must be met. Under CERCLA, ARARs, pertaining both to contaminant levels and to performance or design standards should generally be attained at all points of exposure or at the point specified in the ARAR itself. USEPA guidance indicates that while points of compliance for attaining media cleanup goals are established on a site-specific basis, there are some general USEPA policies as follows: • In groundwater, cleanup goals should generally be attached throughout the contaminant plume or at the edge of the waste management area when waste is left in place. • In surface water, cleanup goals should generally be attached at the point or points where the release enters the surface water. • In air, cleanup goals should generally be achieved at the maximum exposed individual, considering the reasonably expected uses of the site and surrounding area. • For soils, cleanup goals should generally be attained wherever direct contact might reasonably occur (CERCLA Compliance with Other Laws Manual; Interim Final. EPA/540/G¬89-006; Final National Contingency Plan, March 8, 1990).		PG&E should provide proper explanation and define the term as used in the CMS/FS document.	A footnote has been added to Section 2.3 that defines the term "point of compliance."
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-3	**Site Conceptual Model**	Proper development and understanding of the site conceptual model (SCM) is arguably the most important step in the process as erroneous concepts can lead to serious problems in the final decision. This section defines the SCM as "… a graphical and narrative summary of site conditions based on currently available data that describes the probable sources of contamination and the potential pathways	As described in the CMS/FS work plan and previous comment responses, the development, refinement, and completion of the site conceptual model is a foundation step for the CMS/FS process. PG&E agrees that data interpretation, including testing of the site conceptual model with respect to new data is an important aspect of development and refinement of the site conceptual model.	Response is not adequate. PG&E needs to re-state their understanding of CSM development. The CSM is more appropriately a foundation step for the risk assessment		The following sentences have been added to page 2-1: "The site conceptual model is initiated during the planning phases but is refined based on the results of the site investigations and risk assessment. The development of the site conceptual model is iterative, with refinements made as additional information is collected. The conceptual site model will be completed through DTSC and DOI approval of the

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			by which human or environmental exposures could occur." This definition is incomplete because the importance of data interpretation is not acknowledged. Indeed, the data assemblage is important and the basis for site assessment, but it is more than a mapping of data points. As data are generated, it must continually be examined and re-examined within the context of accepted scientific concepts. Each new set of data has the potential for consistency or conflict with elements of the currently-accepted SCM and should be viewed as such. As this process evolves, the uncertainty associated with the SCM should decrease. Likewise, with confidence in the SCM, the need for collection of new data is reduced. The reason for emphasizing the interrelationship between data acquisition and the SCM relates to a theme that the Tribe has previously emphasized … specifically a minimalist approach that involves only the most necessary disturbances to the earth and its resources. A recent example is the proposed drilling on the Arizona shore at the Site 1 location. Among other reasons, it was argued data at this location would be needed to define the lateral extent of the hexavalent chromium plume in groundwater. At the same time, it was asserted that monitoring data from a well at this location was fully expected to produce negative results. This is a clear indication that the application of conceptual reasoning is a useful tool in developing the SCM. The likely reason for expecting negative results at that location was based on generally accepted concepts of regional groundwater flow, which would be inconsistent with groundwater underflow beneath a major river system such as the Colorado River, without some anthropogenic stress factor overriding natural gradients. Another useful exercise with regard to development of the SCM is to consider alternative interpretations of the data set with the intent of determining whether further data acquisition would be useful in discriminating between the alternatives, and moreover, whether such discrimination would actually be important to a pending remedial decision. It is quite an important observation that " Nearly all of the Cr(VI) present in groundwater at the site is believed to have been released during the 13-year period [1951-1964] when untreated wastewater was discharged into Bat Cave Wash. " Likewise it is worth noting that there have not been detections of Cr(VI) in the Colorado River along the Topock reach to date. Together, these observations seem to support (1) limited plume " strength; " (2) slow groundwater velocities; and/or (3) the effect of the geochemical barrier associated with the Colorado River fluvium.				RFI/RI and risk assessment."
Section 3							
U.S. Department of the Interior	DOI-21	Sec 3.0	Please revise the fourth sentence of the first paragraph by deleting "including existing restrictions on land uses and/or agreements made by authorities regarding limitations on land use."	The purpose of the clause in the fourth sentence is to provide additional information about how land uses are considered while developing remedial action objectives.	Response not acceptable, please remove the text as requested		Text was revised as suggested on page 3-1 of the CMS/FS work plan.

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U.S. Department of the Interior	DOI-22	Sec 3.1, Page 3-2	Typically the RAOs are derived during the risk assessment and are the levels or concentration of specific chemical or compounds that will not present an unacceptable risk to human health or the environment. Please make this section more specific in regards to the RAOs by specifying, in particular, that remediation of groundwater will be to eliminate unacceptable risks to humans and ecological receptors and attain ARARs.	The comment is correct that the National Contingency Plan requires that remedial goals are established to reduce risk to an acceptable level and attain ARARs. The remedial objectives in Section 3.1 are intended to meet the National Contingency Plan requirement in a manner specific to the site based on the investigation findings to date and knowledge of site-specific characteristics.	Response not acceptable. Revise section to be more specific.	DTSC does not believe the response to have adequately addressed the concerns.	In response to this comment, a bullet has been added to Section 3.1.1 to state “Remediating groundwater to eliminate unacceptable risks to humans and ecological receptors and attain ARARs.”
Department of Toxic Substances Control	DTSC-13	Page 3-2, Section 3.1.1, Groundwater site objectives	Remedial action objectives for the groundwater should also include consideration for elimination or control of contaminated groundwater migration in the region, not just to river	The remedial objectives in Section 3.1 are based on the investigation findings to date and knowledge of site-specific characteristics. The remedial objectives in the CMS/FS will be based on the final conceptual site model and ARARs that may indicate additional pathways and receptors to be addressed by the remedial action.	Response not acceptable. Revise section to be more specific	The remedial action objectives should include the elimination or control of contaminated groundwater migration in the region and not just discharge to river.	The first bullet in Section 3.1.1 was revised in response to this comment.
Metropolitan Water District of Southern California	MWD-7	Section 3.1.1	Section 3.1.1 states an objective for groundwater to be “Preventing elevated concentration of Cr(VI) in groundwater …from discharging to the Colorado River”. The term “elevated” is not defined. The objective should be to prevent the contaminated groundwater from discharging to the river. The objective should be similar to that of IM3— to maintain a hydraulic gradient away from the river and prevent the groundwater chromium VI plume from entering the river. The second objective states “Remediating groundwater to reduce Cr(VI) concentrations”. This objective should be to reduce concentrations to a background level. Studies are being conducted to determine the background levels and these studies should be utilized to establish the cleanup objective.	The term “elevated,” as used in this work plan, is intended to mean above a risk threshold and/or above an ARAR level. Only those COPCs identified as “elevated” will be carried forward as COCs in the CMS/FS. The CMS/FS will clearly establish the chemicals of concern and media cleanup goals (see Section 3.2). Reversal of gradient is one of several methods for preventing elevated concentrations of Cr(VI) in groundwater from the Topock site from discharging to the Colorado River. The site objective is as stated in Section 3.1.1. Various methods will be considered and evaluated through the CMS/FS to attain the objective, including reversal of gradient. As discussed in Section 3.2, media cleanup standards have not yet been developed and will consider risk-based cleanup goals, ARARs, and ambient (background) conditions and concentrations.		See comment above for definition of "elevated." DTSC is in agreement with the response on cleanup standards.	The first bullet in Section 3.1.1 was revised in response to this comment.
U.S. Department of the Interior	DOI-23	Sec.3.1.2, Page 3-2	There is no discussion of the RAOs for the biota. Please discuss the RAOs for biota.	The first and second bullets in Section 3.1.2 that discuss unacceptable risks are intended to address both human and ecological receptors.	Response not acceptable; needs expansion on response for biota	DTSC agrees with DOI.	The first two bullets in Section 3.1.2 have been revised in response to this comment. The term ecological receptor is specified.
Metropolitan Water District of Southern California	MWD-8	Section 3.1.2	Section 3.1.2 states an objective for soil as “Preventing unacceptable risks resulting from chemicals of concern in soils migrating to groundwater or surface water”. The term unacceptable risk is not defined. The objective should be defined by studies that determine the migration potential of the COPCs from the soil remediation to the groundwater or surface water.	The term “unacceptable risk” is defined by RCRA and CERCLA guidance for conducting baseline risk assessments. RFI/RI Volume 3 and the risk assessment for soil will address the potential migration pathway of COPCs in soil to groundwater, the results of which will be considered in the definition of remedial action objectives in the CMS/FS.		PG&E must properly define the extent of investigation, and studies under Volume 2 and Volume 3. This has significant affect on the scope of the remedy since the potential for migration of residual sources in soil may continually impact groundwater.	The following sentences have been added to Section 2.3 in response to this comment: “Volume 2 of the RFI/RI will address the historic operational practice of wastewater discharge to Bat Cave Wash and PGE-8, and will contain data from the following media: groundwater, surface water, pore water, and river sediment. Volume 3 will address the remaining Topock Compressor Station operations, and will contain soil data from the SWMUs, AOCs, and other undesignated areas addressed in Volume 3, as well as sediment data near the mouth of Bat Cave Wash, and groundwater data from wells within and immediately surrounding the compressor station. RFI/RI Volume 2 will address the main source and contaminant in groundwater at the site, the hexavalent chromium plume resulting from the historic discharge to Bat Cave Wash. Additional groundwater data (and soil data that may indicate potential impacts to groundwater) to be collected after completion of RFI/RI Volume 2 will be reported in an addendum to RFI/RI Volume 2, RFI/RI Volume 3, data summary reports or monitoring reports as appropriate given the nature of the data and the effect on the site conceptual model.”

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Metropolitan Water District of Southern California	MWD-9	Section 3.2.1	Section 3.2.1 mentions that the human health risk assessment and screening ecological risk assessment have not been completed. The risk assessments are cited throughout the CMS/FS work plan. How will the risk assessments be conducted? What criteria will be used for the risk assessments? When will the risk assessments be completed? How will the results of the risk assessment be incorporated into the CMS/FS?	PG&E is preparing risk assessment work plans that will outline the methodologies and schedules for completion of the risk assessments at the Topock site. It is anticipated that the risk assessment work plans will be completed in 2008 for submittal to DTSC and DOI. As discussed in Section 2.0 of the CMS/FS work plan, the site conceptual model refinements including receptors and relevant exposure pathways will be presented in the risk assessment. The risk assessments will determine whether the SWMUs, AOCs, and other undesignated areas at the Topock site present an unacceptable risk for certain COCs, which is the basis for determining what is included in the CMS/FS. It is anticipated that risk assessments may also be used for establishing media cleanup goals and objectives for reducing the risk to acceptable levels.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-14	Page 3-3, Section 3.2.2	The write up should also consider "action specific" ARARs which are completely absent from this section.	Action-specific ARARs are not typically used to develop remedial action objectives. Action-specific ARARs, however, are identified as part of the CMS/FS, and compliance with ARARs (including action-specific) is an evaluation criterion for the remedial alternatives (see Section 5.0 of the work plan).		Section 5 did not specifically call out action specific ARARs. However, DTSC will accept the response if PG&E properly clarifies this position in the revised CMS/FS work plan.	Table 5-1 has been revised in response to this comment to specifically mention action specific ARARs.
San Diego Water Authority	SDWA-4	Page 3-3, Section 3.2.2, Notes to Table 3-1	Page 3-3, Section 3.2.2, Notes to Table 3-1: CaCO3 should be included in the Acronyms on page vii or noted in this section. It is not apparent that this was introduced in any prior section.	PG&E does not object to including CaCO3 in the acronyms list.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The requested clarification was added to Table 3-1.
Metropolitan Water District of Southern California	MWD-10	Section 3.2.2	Section 3.2.2 discusses the solicitation and evaluation of Applicable or Relevant and Appropriate Requirements (ARARs) for the Topock site. There appears to be a typo in section 3.2.2 line 4. The word "medial" should be either "media" or "remedial". Also, Table 3-1 lists several chemical specific ARARs. There should be consideration of background levels in relation to any other criteria. Table 3-1 shows Cr (III) criteria for surface water, which is higher than background. Any cleanup criteria chosen cannot be appreciably higher than background.	The word in the second sentence in Section 3.2.2 is intended to be "media." Table 3-1 lists published numerical criteria, but other goals will be considered when the complete list of ARARs is developed. As discussed in Section 3.2.3, background concentrations will be considered in the development of media cleanup goals and standards. Cleanup criteria can be higher than background, depending on the designated chemical-specific ARARs and results of the site-specific risk characterization.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-15	Page 3-3, Section 3.2.3	Please clarify that the groundwater background study report is still under evaluation despite the completion of the field study. This section misleads readers to think that there is a conclusion on the background study results.	The comment is correct that the background study report cited in Section 3.2.3 is under review by DTSC.		The revised work plan should include text to address the concern raised in this comment.	Section 3.2.3 has been revised in response to this comment. The following sentence has been added: "Agency approval of the background studies for soil and groundwater is pending; agency approval of the background studies is expected prior to the initiation of the CMS/FS."
Metropolitan Water District of Southern California	MWD-11	Section 3.2.3	Section 3.2.3 cites a study conducted between 2005 and 2006 in which calculated background concentrations for chromium (T), chromium VI, and other metals were determined. The background concentrations should be listed in this work plan. These levels should be tied into the objectives for the final remedy.	The results of the background study cited in Section 3.2.3 are contained in the *Groundwater Background Study, Steps 3 and 4 Results, PG&E Topock Compressor Station,* dated January 2007, which is currently under review by DTSC. The CMS/FS work plan is intended to lay out a conceptual framework for completion of the CMS/FS and is not intended to contain all the detail that is and will be included in other studies and reports. The background study results will also be reported in the forthcoming *RCRA Facility Investigation/Remedial Investigation Report, Volume 2* (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations) to be published in 2008.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.

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U.S. Department of the Interior	DOI-24	Page 3-3, Table 3-1	Anticipated Chemical-specific ARARs for Cr (VI), CR (III), and Cr (T) in Groundwater and Surface Water Corrective Measures Study Work Plan, Topock Compressor Station, footnote a – Metal toxicity to aquatic life is influenced by water hardness. The footnote should say "assuming water hardness = 142 parts per million [CaCO3 equivalents]".	PG&E does not object to the clarifying language in the table footnote.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The requested clarification has been added to the footnote.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-6	**Remedial Action Objectives**	With regard to the groundwater remedial action objectives (RAOs), the goal of " Preventing elevated concentrations of Cr(VI) in groundwater at the Topock Site from discharging to the Colorado River" is vague, potentially unquantifiable, and potentially unachievable to some degree. The RAO of implementing remedial actions "… in a manner that is respectful of and causes minimal disturbance to cultural resources …" overlooks the possibility of avoiding such disturbances altogether. The RAO should be to avoid such impacts. This comment also applies to the soil RAOs. Table 3-1 identifies only chemical-specific applicable or relevant and appropriate requirements (ARARs). As discussed in the June 20, 2007, Consultative Work Group (CWG) meeting, it is likely that there are also action- and location-specific ARARs that need to be addressed. Appropriate ARARs for Cr(t) and Cr(VI) in groundwater are the MCLs and the California Public Health Goals (PHGs). It should be noted in the text that these values are in the process of being re-evaluated for Cr(VI), due to the availability of newly published long-term animal studies. For example, focusing the groundwater cleanup on the California Cr(VI) MCL of 50 micrograms per liter may not be appropriate if the MCL is significantly lowered. Accordingly, the flexibility of the remedial alternatives in achieving even lower cleanup goals should be assessed in the CMS/FS.	The goal of preventing elevated concentrations of Cr(VI) in groundwater at the Topock Site from discharging to the Colorado River will be further quantified in the CMS/FS by defining media cleanup goals and standards as discuss in Section 3.2. PG&E agrees that remedial actions should avoid disturbance to cultural resources if appropriate, and should be conducted in a respectful manner that minimizes disturbances to cultural resources. Location-specific ARARs are often used in the development of remedial action objectives, but these ARARs do not provide concentration levels such as the chemical-specific ARARs listed in Table 3-1. Action-specific ARARs are not typically used to develop remedial action objectives; however, action-specific ARARs are identified as part of the CMS/FS, and compliance with ARARs (including action-specific) is an evaluation criterion for the remedial alternatives (see Section 5.0 of the work plan). As discussed in Section 3.2.2, the DOI is leading a solicitation and evaluation of ARARs for the Topock site, which is not yet complete. The purpose of Table 3-1 is only to provide a sampling of anticipated ARARs for select constituents in select media. The listing of chemical-specific ARARs that will be used to develop media cleanup goals will be provided in the CMS/FS. Maximum Contaminant Levels are legally binding and therefore considered ARARs under CERCLA, while Public Health Goals are not.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Section 4							
U.S. Department of the Interior	DOI-25	Sec 4.0, Page 4-1	There is no mention of effectiveness or compliance monitoring as being part of the remedial technologies. Please add effectiveness or compliance monitoring to the remedial technologies, or explain the rationale used to not include them.	The comment is correct that remedial alternatives typically include a verification component to evaluate whether the remedial action goals are being attained. This often includes confirmation sampling, inspections, and other operational monitoring. The intent of Section 4.0 is to identify the likely groundwater and soil remediation technologies that may be applicable for the COPCs identified at the Topock site that will be evaluated in the CMS/FS. Details on the components of the remedial alternatives, such as effectives monitoring, will be included in the CMS/FS.	Add the requested information to the revised Work Plan		Section 5.1.2 was revised in response to this comment. The last sentence in the second paragraph states: "Each alternative will be defined to a sufficient level of detail to develop a remedial cost estimate, in accordance with USEPA guidance (USEPA, 2000), including construction and operational and maintenance elements (such as effectiveness monitoring) of each alternative."

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U.S. Department of the Interior	DOI-26	Sec. 4.0	This section presents a list of alternative technologies that are being considered for this project. These technologies are discussed very conceptually and do not provide adequate information to assess the impacts they may impose on the environment or to listed species. Further detail is required if that is the intent of the Report. This section also states that "If appropriate, bench- or pilot-scale treatability tests may be performed to better evaluate specific technologies (page 4-2)." Many of the technologies presented are not discussed within the current *Programmatic Biological Assessment (2007)* and may require individual biological assessments for each project. Please insert language requiring that DOI wildlife biologists be contacted early in the project, so as to determine and coordinate the development of any biological assessments that may be needed.	The intent of the CMS/FS work plan is to provide a brief discussion of the various technologies that would be evaluated in the CMS/FS and to describe the process that would be used for developing and evaluating remedial alternatives. It is intended that the CMS/FS document will provide sufficient detail to allow assessment of the impacts to the environment or listed species. The paragraph referred to in the comment describes this step in the CMS/FS in a general manner. Bench-scale and pilot testing to evaluate remedial alternatives at the Topock site are discussed in Section 4.3, some of which are covered by the Programmatic Biological Assessment (e.g., *in-situ* pilot testing), and some of which pre-date the Programmatic Biological Assessment (e.g., geotechnical studies). It is noted that the Programmatic Biological Assessment is intended to cover field activities up to the final remedy (essentially the RFI and RI data collection, IM operation, and pilot studies), and does not cover implementation of the final remedy. PG&E fully anticipates, however, that the FESA will be identified as an ARAR that will be considered in the evaluation of alternatives in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-27	Sec. 4.0	Are the technologies presented the preferred ones or just examples of potential alternatives that are available? Please clarify.	CMS/FS work plan is intended to present the full range of remedial technologies that are considered applicable to the Topock site, based on the currently understood conceptual site model. As discussed in Section 4.1 and Section 4.2, the CMS/FS may include additional technologies if additional COPCs are identified during completion of the site investigations and risk characterization. Also, as discussed in Section 4.0, these technologies can be refined, modified, or supplemented to accommodate further site understanding. Based on a telephone call between DTSC, DOI, and PG&E, PG&E is aware that DTSC would like the technology descriptions in Sections 4.1 and 4.2 to be expanded to cover all possible COPCs identified in Table 4-1	Within the PG&E response, COPCs should be changed to COCs. In addition, the use of the terms COPC and COC should be reviewed for all documents and the proper usage be incorporated to all future discussions.	According to earlier discussion, the final conceptual site model is not anticipated until the CMS/FS report. If PG&E is considering a full range of alternatives, PG&E should be more inclusive on the discussion of remedial alternatives during preparation of the CMS/FS work plan and include a logical process in the evaluation of those alternatives.	The following sentences are included in Section 4.0 "Based on available site information, a preliminary list of potentially effective remedial technologies for groundwater and soil are presented in Sections 4.1 and 4.2. As the nature and extent of COPCs becomes better defined, these technologies can be refined, modified, or supplemented to accommodate any further site understanding."
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-7	**Corrective Measure/ Remedial Action**	In selecting, developing, and evaluating the corrective measure/remedial action (CM/RA) alternatives for this site, it will be necessary to examine the alternatives in a perhaps atypical manner due to the potential for impacts on unique cultural resources. Preference needs to be given in developing alternatives in such a way as to minimize, if not eliminate, land disturbances and avoid disturbances to cultural resources.	PG&E agrees that remedial actions should avoid disturbance to cultural resources if appropriate, and should always be conducted in a respectful manner that minimizes disturbances to cultural resources. Specifically, an expected remedial action objective is "implementing remedial actions in a manner that is respectful of and causes minimal disturbance to cultural resources including, in particular, resources that are of special significance to tribes in the area." In the CMS/FS, each of the remedial alternatives will be evaluated to assess attainment of the remedial action goals.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Metropolitan Water District of Southern California	MWD-12	Section 4.0	Section 4.0 discusses the screening of technologies for developing the remedial alternatives. It states that the screening will be based on expected effectiveness in meeting objectives, ability to be implemented, and cost-effectiveness. How will each of these evaluations be conducted? Will it be a paper study, bench/pilot study, or other? What are the criteria for selection? A description on the methodologies used to determine effectiveness, ability to implement and cost-effectiveness should be included.	Development and screening of remedial alternatives involves several steps, including identifying and screening technologies and combining technologies to form alternatives. Each step involves evaluation and screening against the CERCLA- and RCRA- prescribed criteria. Evaluations use standard engineering and scientific methods to the extent possible and typically rely on: • Existing studies and data in literature to indicate whether a technology or alternative will be effective. • Bench-scale or pilot-scale studies to evaluate technologies under site-specific conditions. • Professional judgment. • Site-specific data on soil, geology, hydrogeology, sensitive habitat, historic and culture resources, and other physical conditions that could influence the degree to which technologies may be implementable and effective.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.

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Department of Toxic Substances Control	DTSC-16	Page 4-2, Section 4.0	*In-situ* remediation is not used consistently in Table 4-1. For example, with TPH, no specific *in-situ* remediation technologies are listed for soil or groundwater. For volatile organic compounds (VOCs), along with *in-situ* remediation, soil vapor extraction, which is a specific *in-situ* remediation technology, is also listed. The same holds true for Cr(VI) where specific *in-situ* remediation technologies are listed. Instead of just stating *in-situ* remediation as a technology, the specific potential *in-situ* remediation technologies applicable to the site should be mentioned. This table also has MNA (monitored natural attenuation) which should be defined when initially introduced in the table, and this abbreviation also is not included in the Acronyms and Glossary. Similarly, Table 4.1 should include technologies for *ex-situ* treatment of excavated soil. DTSC also notes that additional potential remedial technologies for groundwater should also be listed including phytoremediation for VOC, Cr(VI) and other metals. Extraction and trucking should also be considered and evaluated for groundwater and soil. Also, potential of using soil washing for TPH and PAH in soil should also be considered.	It is acknowledged that additional details could be added to Table 4-1 to describe specific remedial technologies for specific COPCs. Because the specific COPCs are not yet known, the listing of technologies in the table was meant to be general and inclusive. PG&E considers soil vapor extraction to be an extractive rather than an *in-situ* remediation technology. The applicability of phytoremediation for groundwater remediation at the site is considered to be limited due to the large depth to groundwater and relatively high salinity of the groundwater that would make it not suitable for many of the plants typically used for phytoremediation. Trucking and offsite disposal could be considered in the CMS/FS, although it is likely not practical at the flow rate that would be needed for full-scale groundwater remediation. MNA is defined in a footnote to Table 4-1. PG&E does not object to including MNA in the acronyms list.		Although trucking and offsite disposal may appear as impractical, PG&E should evaluate it against the selection criteria or discuss the rationale in the CMS/FS of the impracticality. PG&E should be inclusive of the remedial alternatives and technologies to be considered... such as hydraulic barriers.	Section 4.1.2 was revised to clarify that treatment and disposal facilities may be located either onsite or offsite. Impermeable barrier walls are discussed in Section 4.1.3.
Metropolitan Water District of Southern California	MWD-13	Section 4.1	Section 4.1 states that the groundwater COPCs have not yet been determined. The groundwater monitoring over the past 10-years has been extensive. The COPCs and the zones where they occur should already be known. The CMS/FS work plan should be based on those COPCs known to date. Any additional COPCs discovered from more recent monitoring can be added later. Also, the bulleted paragraph on reactive treatment zones states that chromium VI will be removed. Chromium VI will be reduced to chromium III, which will then precipitate as a solid. This sentence should be changed to better reflect the result of the *in-situ* process.	It is acknowledged that the CMS/FS work plan has been prepared prior to the completion of the site investigation and risk characterization. Based on the investigation findings to date, the principal contaminant in groundwater at the site is hexavalent chromium. As such, Section 4.1 of the work plan focuses on technologies to address Cr(VI). We agree that if additional COPCs are found, they can be added later. The comment is correct that the reactive treatment zones create *in-situ* geochemical conditions that reduce Cr(VI) to Cr(III).			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-8	p. 4-4	With regard to waste disposal options available for groundwater pump-and-treat alternatives (p. 4-4), offsite transportation to a treatment and disposal facility should be listed. This technology was implemented successfully at the site in the past and should be at least listed and considered in the CMS/FS.	The comment is correct that trucking and offsite disposal of contaminated groundwater was previously used as an interim remedy at the site. Although it is likely not practical at the flow rates that would be needed for a final remedy, PG&E agrees that it is a potential groundwater remedial technology that should be evaluated in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. Section 4.1.2 was revised to clarify that treatment and disposal facilities may be located either onsite or offsite.
Metropolitan Water District of Southern California	MWD-14	Section 4.1.2	Section 4.1.2 lists discharge to the Colorado River as a potential disposal option for the pump-andtreat remediation. This would require an evaluation to determine whether discharge would cause any degradation in water quality of the river. The discharge to the river would also have to be approved by the Regional Water Quality Control Board.	The comment is correct. Clean Water Action regulations are anticipated to be action-specific ARARs. As discussed in Section 5.2, compliance with ARARs is a criterion for remedial alternative evaluation.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-9	p. 4-5	The Tribe also reiterates its opposition to all types of barrier technologies emplace within biologically or culturally sensitive areas as the Tribe believes that such systems would interfere with spiritual and biological pathways (p. 4-5).	PG&E understands that the Tribe is opposed to using barrier technologies within biologically or culturally sensitive areas. The intent of the CMS/FS work plan is to present the technologies that could potentially be effective in attaining remedial action goals and that will be evaluated in the CMS/FS. All of these technologies have advantages and disadvantages, which will be detailed in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.

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San Diego Water Authority	SDWA-5	Page 4-5, Section 4.1.3, second paragraph	Page 4-5, Section 4.1.3, second paragraph: This section and paragraph include a listing of several vertical barriers typically used to control groundwater flow. Page 5-3, Section 5.1.2, states that the "intent is to define a wide range of alternatives." Therefore, is there a reason that deep soil mixing has not been included?	Deep soil mixing involves emplacing a grout slurry through construction of a series of closely spaced auger holes. This method is not as reliable at cutting off the flow of contaminants as other methods of barrier wall emplacement because there is a potential that un-grouted spaces may be left between the boreholes. It also generates larger quantities of waste material than the other methods of barrier wall construction. For these reasons, this method was not included in the CMS/FS work plan.	PG&E needs to describe the process of rejecting a method within CMS/FS technology inclusion. Don't make conclusions in work plan	DTSC agrees with DOI.	In response to this comment, additional language has been added to Section 4.0 to describe the technology screening, and the process for rejecting a technology. In addition, the following sentence has been added to Section 4.1.3. "Other possible applications include ground modification methods (curtain wall [jet grouting]) and cement deep soil mixing)."
Metropolitan Water District of Southern California	MWD-15	Section 4.1.3	Section 4.1.3 discusses the impermeable barrier wall. This section should include the statement from section 4.1.4: "As heavy equipment is needed for construction, vehicle access is a requirement". It also states that impermeable barriers are typically placed at depths of up to 100 feet. Barrier walls are typically 2 to 3 feet wide and have been constructed to depths over 400 feet.	The comment is correct that vehicle access for construction of an impermeable barrier is similar to vehicle access for a permeable reactive barrier. The CMS will provide details about the type of equipment and footprint required for the construction of all the remedial alternatives. The statement in the CMS work plan indicating that typical depths for placement of barrier walls is up to 100 feet is considered to be accurate although we agree that greater depths are certainly achievable.	PG&E needs to describe the process of rejecting a method within CMS/FS technology inclusion. Don't make conclusions in work plan.	DTSC agrees with DOI.	In response to this comment, additional language has been added to Section 4.0 to describe the technology screening, and the process for rejecting a technology. In addition, the following sentence has been added to Section 4.1.3 "As heavy equipment is needed for construction, vehicle access is a requirement."
Department of Toxic Substances Control	DTSC-17	Page 4-6, Section 4.1.4	PG&E states that "heavy equipment is needed for construction" of a permeable reactive barrier. Please define "heavy." DTSC notes that in some cases, such as for some zero-valent iron filing walls, installation can be completed with equipment similar to a drill rig. Since the intention of the CMS/FS is to present an unbiased evaluation of the available technologies based on specific alternative evaluation criteria, PG&E should be cautious of any discussion which may bias the technology in this work plan	The purpose of the CMS/FS work plan is to provide a brief description of the technologies that will be presented and evaluated in the CMS/FS. The specific type of equipment required to construct a trenched PRB and a PRB emplaced through vertical borings will be provided in the CMS/FS, if a remedial alternative involving this technology is developed.	PG&E needs to describe the process of rejecting a method within CMS/FS technology inclusion. Don't make conclusions in work plan.	DTSC cautions PG&E not to draw conclusions in the work plan as to the viability of specific technologies. Those findings should be fully vented in the CMS Report.	In response to this comment, additional language has been added to Section 4.0 to describe the technology screening, and the process for rejecting a technology.
Metropolitan Water District of Southern California	MWD-16	Section 4.1.4	Section 4.1.4 discusses the permeable reactive barrier. This section should include a more complete statement on the composition of the barrier material (both reactive and inert materials). Does this barrier need to be keyed into the bedrock? What is the lifetime capacity estimate for the reactive barrier? It should be noted in this section that construction requirements are similar to those for impermeable barrier walls.	The purpose of the CMS/FS work plan is to provide a brief description of the technologies that will be presented and evaluated in the CMS/FS. Information on the composition of the barrier material and construction methods for a permeable reactive barrier will be included in the CMS/FS, if a remedial alternative involving this technology is developed. The comment is correct that vehicle access for construction of an impermeable barrier is similar to vehicle access for a permeable reactive barrier.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-18	Page 4-7, Section 4.2	This section states that the soil COPCs to be addressed in the CMS/FS have not been determined yet; therefore, the CMS/FS Work Plan focuses on technologies to address Cr(VI), which is the primary COPC in groundwater and likely in soil. However, the 2005 Draft RFI/RI indicated that the COPCs Cr(T), polynuclear aromatic hydrocarbons (PAHs), and lead have been found at concentrations above the residential and, in some cases, industrial PRGs during investigations conducted at the site to date. Based on this information, it would be pertinent to include a discussion of soil remediation technologies for those additional COPCs in the Draft CMS/FS Work Plan.	The comment is correct that Section 4.2 states that the work plan focuses on technologies to address Cr(VI). However, the list of soil remediation technologies in Section 4.2 covers the potential remedial technologies for soil in Table 4-1 for the other COPCs with the exception of soil vapor extraction. Additional potential technologies for soil could include incineration, thermal desorption, and *in-situ* vitrification.		Since PG&E acknowledged that there are additional potential technologies for soil, please add them to the discussion within the work plan.	In response to this comment, Sections 4.2.7, 4.2.8, 4.2.9, and 4.2.10 have been added to the work plan to describe the technologies soil vapor extraction, thermal desorption, *in-situ* vitrification, and incineration.

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Metropolitan Water District of Southern California	MWD-17	Section 4.2	Section 4.2 discusses the technologies for soil remediation. The work plan should describe how each of these technologies will be evaluated. Paper studies may be utilized to evaluate and screen out some of the technologies. Pilot or bench studies may be necessary for some of the other technologies. In particular, migration of COPCs [e.g., chromium (T) and chromium VI] should be evaluated to determine the effect on the groundwater aquifer and the Colorado River. A description of the evaluation process should be included in the work plan. The soil flushing technology described in Section 4.2 may affect the groundwater. It is important to evaluate this effect because it can create a greater burden on the groundwater remediation.	See the response to comment MWD-12 regarding the process for remedial alternative development and evaluation. It is recognized that the various technologies applied must all be compatible for the final remedy to be successful. If soil flushing is considered as a technology to be included in a final remedy, the potential effects of soil flushing on the groundwater remedial technology will be evaluated.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-28	Sec. 4.2.1	"*According to CERCLA's statutory preference for treatment of contaminants, excavation, and offsite disposal is now less acceptable than in the past.*" This is a conclusive statement and tends to bias the alternatives prior to any selection. If the statement is accurate, it should be referenced appropriately. In addition, the statement should be revised to acknowledge that offsite disposal and treatment are not mutually exclusive. Or. In the alternative, the statement should be deleted.	The intent of the statement is to provide some perspective on the use of this technology (Excavation and Offsite Disposal) prior to 1984 and following the enactment of CERCLA. There is no intent to bias a future evaluation since the CERCLA criteria will be applied in the CMS/FS. It is acknowledged that offsite disposal without treatment is considered a separate technology from offsite treatment (followed by disposal of treatment byproducts).	Remove the conclusive statement	DTSC agrees with DOI	Section 4.2.1 was revised to remove the statement in question.
Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-10	p. 4-7, 4-8, 4-14	Under soil remediation technologies, the Tribe has expressed serious concerns with actions that would necessitate soil disruption, particularly with excavation and offsite disposal (p. 4-7). Accordingly, Page 4-8 should list impacts to cultural resources under " Other Considerations. " Also, because some tribes believe that capping in place may lead to the "suffocation" of tangible and intangible cultural resources, this should be listed under the other considerations for this technology (p. 4-14).	PG&E agrees that potential impacts to cultural resources and tribal beliefs associated with potential remediation technologies are important considerations in technology evaluation. As noted in Section 3.1, an expected remedial action objective is "implementing remedial actions in a manner that is respectful of and causes minimal disturbance to cultural resources including, in particular, resources that are of special significance to tribes in the area." In the CMS/FS, each of the remedial alternatives will be evaluated to assess attainment of the remedial action goals.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-19	Page 4-10, Section 4.2.2.2	The soil screening box in Exhibit 4-7 should have the arrow directed to the oversized material box. The arrow from the dewatering step should be directed to the sludge box.	The comment is correct that the two arrows in the exhibit should be reversed (from soil screening to oversized materials, and from dewater to sludge).			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The arrows in Exhibit 4-7 have been modified.
Department of Toxic Substances Control	DTSC-20	Page 4-11, Section 4.2.3	Two primary requirements for soil flushing should be listed: (1) the flushing solution must be effectively transported so as to contact the impacted soil and remove the contaminant; this is not identified as a key requirement for this technology's success, and (2) groundwater can be captured, extracted, and treated (this is stated in the Work Plan).	The comment correctly identifies the primary requirements for successful soil flushing.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Department of Toxic Substances Control	DTSC-21	Page 4-13, Section 4.2.6	Change wording that "capping in place is a common form of soil remediation," rather than "the most common form."	PG&E does not object to the alternative language describing the common use of capping in place for soil remediation.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The language has been modified as requested.
Metropolitan Water District of Southern California	MWD-18	Section 4.3	Section 4.3 lists treatability studies and other relevant studies. It would be helpful to define how these studies will be used to evaluate the treatment alternatives. In addition, there appears to be a typo on the second to the last bullet on page 4-15. The term "pump/inject" should be "pump/treat"	The data and studies listed in Section 4.3 will be used to evaluate specific technologies. The data and studies provide information used to screen the technologies based on expected effectiveness in meeting remedial action objectives, ability to be implemented, and cost-effectiveness. The term in the second to last bullet on page 4-15 is intended to be "pump/treat/inject."			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The following language was added to Section 4.3: "The data and studies listed above will be used to evaluate specific technologies. The data and studies provide information used to screen the technologies based on expected effectiveness in meeting remedial action objectives, ability to be implemented, and cost-effectiveness."

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Section 5							
Metropolitan Water District of Southern California	MWD-19	Section 5.0	Section 5.0 describes that the potential effective remedial alternatives will be screened to identify those that cannot be technically implemented at the site. How will the screening process be conducted? What are the criteria for this screening? This section is vague as to the process for developing and applying screening criteria.	The following criteria are expected to be taken into consideration when evaluating implementability: • Ability to construct and operate the technology • Reliability of the technology • Ease of undertaking additional remedial actions, if necessary • Ability to monitor the effectiveness of remedy • Ability to obtain approvals from other agencies • Availability of offsite treatment/storage/disposal services • Availability of necessary equipment and specialists • Availability of prospective technologies	Add the criteria for evaluating technologies	Please include discussion in the text of the revised CMS/FS work plan.	The requested language has been added to Section 4.0 in response to this comment.
Department of Toxic Substances Control	DTSC-22	Page 5-1, Section 5.0, 1st paragraph	CERCLA and RCRA does not "require" that technologies be combined… instead, it allows it to be combined. Please change the wording.	"Require" in this sentence refers to the regulatory requirement that a range of alternatives be developed, rather than the use of multiple technologies in alternatives	Revise text in work plan to clarify "require" per PG&E response	DTSC agrees with DOI.	The second sentence in Section 5.0 has been modified to only state that RCRA and CERCLA require development of a range of alternatives.
U.S. Department of the Interior	DOI-29	Sec. 5.1.1	Suggested Language Sensitive Habitats: The study area encompasses a portion of the Havasu National Wildlife Refuge, the Beale Slough Area of Critical Concern, and the Colorado Floodplain. These lands are administered by the U.S. Fish and Wildlife Service, the U.S. Bureau of Land Management and the U.S. Bureau of Reclamation. Any actions taken will be in accordance with applicable laws, regulations and agency policies and procedures for managing public lands. Threatened and Endangered Species: Federally listed threatened and endangered species that may be found in or near the study area include the Southwest Willow Flycatcher, the Yuma Clapper Rail, the Mohave Desert Tortoise, the Razorback Sucker and the Bonytail Chub. The States of California and Arizona also maintain lists of additional threatened and endangered species that can be found in or near the study site. All actions will be required to be in compliance with the Federal Endangered Species Act of 1973, as well as those requirements set by the States, and must avoid and/or mitigate any adverse impacts to any listed species and their critical habitat. Please also add the overall application of the original document Mitigation Measures, Lake Havasu Field Office are to be adhered to so as to generally minimize and/or avoid impacts to the natural environment.	This section is intended to describe Topock features that need to be considered while developing and evaluating remedial alternatives. Each of these features will have regulatory requirements and site-specific considerations that will be reflected in the ARARs identification. As noted n the CMS/FS work plan, DOI is leading a solicitation and evaluation of ARARs for the Topock site, and compliance with ARARs is an evaluation criterion to be applied to each of the remedial alternatives. This CMS/FS work plan is not intended to provide all the detail that will be included in the ARARs identification.	The DOI is requesting that the suggested language replace the work plan text as suggested in the original comment.		Text was revised as suggested in Section 5.1.1 of the CMS/FS work plan.
U.S. Department of the Interior	DOI-30	Sec. 5.1, Page 5-3	For clarification, please add "tribal" to sovereign nations to read "sovereign tribal nations".	PG&E does not object to the clarifying language.	Revise text in work plan.		Text was revised as suggested in Section 5.1.1 of the CMS/FS work plan.
Metropolitan Water District of Southern California	MWD-20	Section 5.1.1	Section 5.1.1 describes key site characteristics. The bulleted paragraph on geochemical conditions in the floodplain states "…reducing conditions naturally convert Cr(VI) into the relatively innocuous Cr(III)…". Chromium III, although less toxic and less soluble, is still of concern. The maximum contaminant level is based on total chromium. This statement should be rephrased to read "These reducing conditions naturally convert Cr(VI) into Cr(III), which is removed from groundwater by chemical precipitation".	PG&E does not object to the alternative language describing the reducing conditions in the floodplain.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.

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Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-11	Section 5.1.1, page 5-2	Section 5.1.1. (Page 5-2), while the Tribe appreciates the listing of Cultural Resources as a " Key Site Characteristic, " the Tribe ' s strong view that this area is a cultural landscape should be noted here. Also, it should be listed that the Bureau of Land Management (BLM), through its recently adopted Resource Management Plan, has designated this area as the "Topock-Needles Special Cultural Resource Management Area." Finally, under Sensitive Habitats, the word "proposed" should be struck because the Resource Management Plan (RMP) that designated the Beale Slough Area of Critical Environmental Concern (ACEC) has been adopted by BLM. It should further be noted that a Management Plan for the ACEC will be adopted.	This section is intended to describe Topock features that need to be considered while developing and evaluating remedial alternatives. Each of these features will have regulatory requirements and site-specific considerations that will be reflected in the ARARs identification. As noted n the CMS/FS work plan, DOI is leading a solicitation and evaluation of ARARs for the Topock site, and compliance with ARARs is an evaluation criterion to be applied to each of the remedial alternatives. This CMS/FS work plan is not intended to provide all the detail that will be included in the ARARs identification.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-31	Sec 5.2	All of the alternatives will affect the biological resources in or near the project area in some form or another, but it appears that the constraints will be evaluated with the use of a matrix to compare/contrast alternatives. While a sample matrix may be appropriate for providing an example of some of the criteria that may used to weight the alternatives, please also reference the *Programmatic Biological Assessment (2007).*	It is noted that the Programmatic Biological Assessment is intended to cover field activities up to the final remedy (essentially the RFI and RI data collection, IM operation, and pilot studies) and does not cover implementation of the final remedy. PG&E fully anticipates, however, that the FESA will be identified as an ARAR that will be considered in the evaluation of alternatives in the CMS/FS.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
U.S. Department of the Interior	DOI-32	Sec. 5.2, Page	Please explain whether, and how, the proposal discussed in the second and third paragraphs to use "a number of approaches" to develop cost/benefit comparisons of remedial alternatives will be consistent with the application of the CERCLA remedy selection criteria. CERCLA and the NCP do not use a cost/benefit analysis in selecting a remedy. Does the proposal in this section contradict that? There is a typo in last sentence – remedial alterative should be remedial "alternative".	As noted in Section 5.2 of the work plan, the RCRA and CERCLA evaluation criteria will be used to evaluate the defined remedial alternatives. The alternative approaches do not modify the evaluation criteria. CERCLA requires that remedial actions should be cost-effective. The determination of cost-effectiveness is made by balancing cost against the evaluating criteria of long-term effectiveness; short-term effectiveness; reduction of toxicity, mobility, and volume through treatment; and implementability. This balancing exercise typically involves qualitative and quantitative evaluations, which are discussed in this section of the work plan. Yes, the word "alterative" should be "alternative" in the last sentence in Section 5.2.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment.
Section 7							
Department of Toxic Substances Control	DTSC-23	Figure 7-1	Since the submission of the CMS/FS Work Plan, a revised base line for the project schedule has been proposed. DTSC requests PG&E to revise the included schedule to follow the new base line schedule. Also, some of the key activities are unclear in the CMS Work Plan schedule. For example, what is meant by "Additional Soil Investigation?" Why did it start before Q1 2007?	It is acknowledged that the baseline schedule has changed since submission of the CMS/FS work plan. The additional soil investigations are to supplement the existing soil data sets for completion of the RFI/RI. Preparation of work plans for the additional soil investigation began in the spring of 2006.			No DTSC or DOI direction to modify the CMS/FS work plan in response to this comment. The schedule in Figure 7-1 has been updated to correspond to the most recent project schedule.

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Hargis + Associates, Inc. (on behalf of the Fort Mojave Indian Tribe)	H+A-12	**Project Schedule**	Based on the June 20, 2007, meeting of the project's CWG, the Tribe understands that separate CMS/FS documents are being prepared for the soils and the groundwater operating units (OUs). This is also reflected on Figure 7-1. According to this schedule, this work plan will be completed during the third quarter (Q3) of this year (2007). Work on the soils CMS/FS will be performed beginning in Q4 2009 and ending during Q1 2011, whereas the groundwater CMS/FS work will begin during Q1 2009 and end during Q4 2009. The Tribe understands that at this time, this division appears to be an appropriate strategy in the interest of schedule efficiency. At the same time, there needs to be some level of awareness with regard to potential relationships between the two OUs. For example, in the soils work plan the issue of continuing sources of groundwater contamination was raised. If indeed this condition were present, would it be dealt with in the context of the groundwater remedy or the soil remedy or both? The screening of various remedial technologies would then need to account for such potential media interactions. Perhaps another example would be that various groundwater remedies may have surface facilities (e.g., wells, pipelines, etc.). The siting of such facilities might need to account for the location soil contamination areas. Basically, the Tribe would generally support the decoupling of the CMS/FS documents for the two OUs, but cautions that PG&E should remain aware of the potential need to address interactions between the two media.	It is acknowledged that the baseline schedule has changed since submission of the CMS/FS work plan. PG&E is aware of the potential relationships between the two operable units and is committed to thoroughly addressing such aspects of the project. It should be clarified that the separation is not strictly between groundwater and soil. • RFI/RI Volume 2 is intended to focus on the characterization of groundwater, surface water, and pore water from PG&E's historic operational practice of wastewater discharge to Bat Cave Wash and PGE-8. The resulting "Groundwater" CMS/FS will address those COCs, media, and pathways identified through the conclusions of RFI/RI Volume 2 and associated risk assessment as requiring remedial alternative evaluation in a CMS/FS. It is expected that the dominant media for alternative evaluation in this CMS/FS will be groundwater. • RFI/RI Volume 3 is intended to focus on the remaining historical Topock Compressor Station operations—as well as other media associated with Bat Cave Wash—and will largely focus on soil but will also include groundwater data from wells within and immediately surrounding the Topock Compressor Station. The resulting "Soil" CMS/FS will address those COCs, media, and pathways identified through the conclusions of the RF/RI Volume 3 and associated risk assessment as requiring remedial alternative evaluation in a CMS/FS. It is expected that the dominant media for alternative evaluation in this CMS/FS will be soil.		PG&E has yet to properly identify the "operable units." To properly respond to the comment, PG&E should define the extent and boundaries of each remedy.	Additional language has been added to Section 7.0 to describe the anticipated extent and boundaries of each remedy. In addition, the schedule in Figure 7-1 has been updated to correspond to the most recent project schedule.