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May 2, 2005

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Subject: Interim Measures Phase 2 Monitoring Well Installation Report  
Pacific Gas and Electric Company, Topock Project

Dear Mr. Shopay:

This letter transmits the *Interim Measures Phase 2 Monitoring Well Installation Report* for the well drilling, installation, and sampling activities conducted from January to March 2005 at the Pacific Gas and Electric Company (PG&E) Topock site. The primary objective of the IM Phase 2 field program was to provide additional monitoring wells to further characterize the hydrogeology and to assess the distribution of chromium in the Colorado River floodplain area. During the Phase 2 investigation, monitoring wells or monitoring well clusters were installed at five locations on the western floodplain of the Colorado River.

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

Sincerely,

cc: Kate Burger/DTSC

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# **Interim Measures Phase 2 Monitoring Well Installation Report**

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

Prepared for  
**Pacific Gas and Electric Company**

May 2, 2005

Prepared by  
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**Interim Measures Phase 2  
Monitoring Well Installation Report**


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

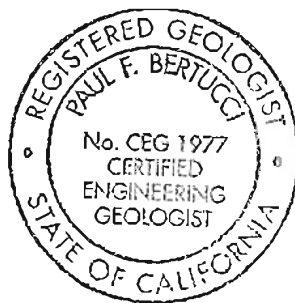
Prepared for  
California Department of Toxic Substances Control

On behalf of  
Pacific Gas and Electric Company

May 2, 2005

This report was prepared under supervision of a  
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# Acronyms and Abbreviations

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bgs	below ground surface
BLM	United States Bureau of Land Management
Cr(T)	total chromium
Cr(VI)	hexavalent chromium
DTSC	Department of Toxic Substances Control
IM	Interim Measures
µg/L	micrograms per liter
mg/L	milligrams per liter
µS/cm	microSiemens per centimeter
MW	monitoring well
ORP	oxidation-reduction potential
PG&E	Pacific Gas and Electric Company
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
TDS	total dissolved solids
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

# 1.0 Introduction

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Pacific Gas and Electric Company (PG&E) is addressing chromium in groundwater at the Topock Compressor Station in Needles, California, under the oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). PG&E's *Draft Interim Measures Work Plan*, dated February 2004 (CH2M HILL 2004a), identified the general locations where new field investigations and groundwater monitoring and test wells were proposed for the Interim Measures (IM) program. The activities described in PG&E's *Draft Interim Measures Work Plan* are collectively referred to as Interim Measures No. 1. In a letter dated February 9, 2004, DTSC directed PG&E to implement IM No. 2 to begin pumping, transport, and disposal of groundwater. As part of IM No. 2, PG&E is required to conduct additional hydrogeologic investigations to further delineate the plume and to support remediation activities.

The first phase of investigations was implemented from March to May 2004 and involved the installation of wells or well clusters at eight locations. During the planning for Phase 1, additional well locations were identified as step-out locations that might be drilled later, depending on the outcome of Phase 1. After the sampling results from the Phase 1 wells became available, potential data gaps were identified, and the number and locations of Phase 2 wells were modified to address these data gaps. The proposed scope of the Phase 2 drilling program was described in the DTSC-approved *Phase 2 Monitoring Well Installation Work Plan* (CH2M HILL 2005a), and the results are presented herein. The Phase 2 investigation consisted of the installation of monitoring wells or monitoring well clusters at five locations on the western floodplain of the Colorado River.

## 1.1 Project Background

The Topock Compressor Station is located in San Bernardino County, approximately 15 miles to the southeast of Needles, California (Figure 1-1). In February 1996, PG&E and DTSC entered into a Corrective Action Consent Agreement pursuant to Section 25187 of the California Health and Safety Code. Under the terms of that agreement, PG&E was directed to conduct a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and to implement corrective measures to address constituents of concern released in the Bat Cave Wash Area near the PG&E Topock Compressor Station. DTSC determined that immediate action was required and, recognizing the time-critical nature of its directive, prepared a California Environmental Quality Act Notice of Exemption on February 10, 2004. The primary constituents of concern at Topock are hexavalent chromium [Cr(VI)] and total chromium [Cr(T)]. The source was Cr(VI) salts historically used as a corrosion inhibitor in the station's cooling towers. DTSC is the lead administering agency for the project.

Assisting DTSC and PG&E with the planning and review of interim remedial measures are the members of the Topock Consultative Work Group, which was constituted under California's Site Designation Process. The Consultative Work Group consists of representatives from DTSC; the California Regional Water Quality Control Board, Colorado River Basin Region; the Metropolitan Water District of Southern California; the Arizona

Department of Environmental Quality; and the various federal agencies who own or manage adjacent property; and other project stakeholders.

## 1.2 Project Documents and Approvals

The United States Bureau of Land Management (BLM) authorized the site activity under an Action Memorandum, dated March 3, 2004 (BLM 2004a). Section V of this Action Memorandum authorizes PG&E to site, install, and test new wells as part of the time-critical removal actions (BLM 2004a). PG&E submitted a request to BLM on December 22, 2004 summarizing the proposed Phase 2 Interim Measure groundwater investigation activities on BLM land (CH2M HILL 2004b). In a letter dated December 29, 2004, BLM approved the drilling at seven well locations, including MW-27, MW-33, MW-34, MW-42, MW-43, and PE-1 (BLM 2004b).

United States Fish and Wildlife Service (USFWS) authorized drilling at location MW-43 (formerly named SO-2) in an Action Memorandum issued on February 17, 2005 (USFWS 2005). The authorization was based on PG&E's request submitted on February 3, 2005 (CH2M HILL 2005b).

DTSC conditionally approved the Phase 2 work in a letter dated January 25, 2005 (DTSC 2005a), and PG&E submitted a final *Phase 2 Monitoring Well Installation Work Plan* to address the conditions (CH2M HILL 2005a). Initially, five locations were identified on Parcel 650-151-14 for installation of 10 new monitoring wells: MW-27, MW-33, MW-34, MW-42, and MW-43. On February 15, 2005, DTSC requested the installation of an additional, intermediate depth monitoring well screen at location MW-33, bringing the total number of wells installed to 11 (DTSC 2005b).

Site preparation for this drilling effort involved access coordination with land agencies, the BLM, California Department of Fish and Game, and the USFWS. Permission was obtained from the California Department of Transportation for the MW-43 drilling in the footprint of the Interstate Highway I-40 bridge on the Colorado River floodplain. San Bernardino County well permits were also obtained before work started at each new monitoring well location.

Prior to moving equipment onto BLM and Havasu National Wildlife Refuge properties, the drilling sites and the access routes were surveyed for biological and cultural resources, and mitigation measures were established to protect these resources during the drilling activities.

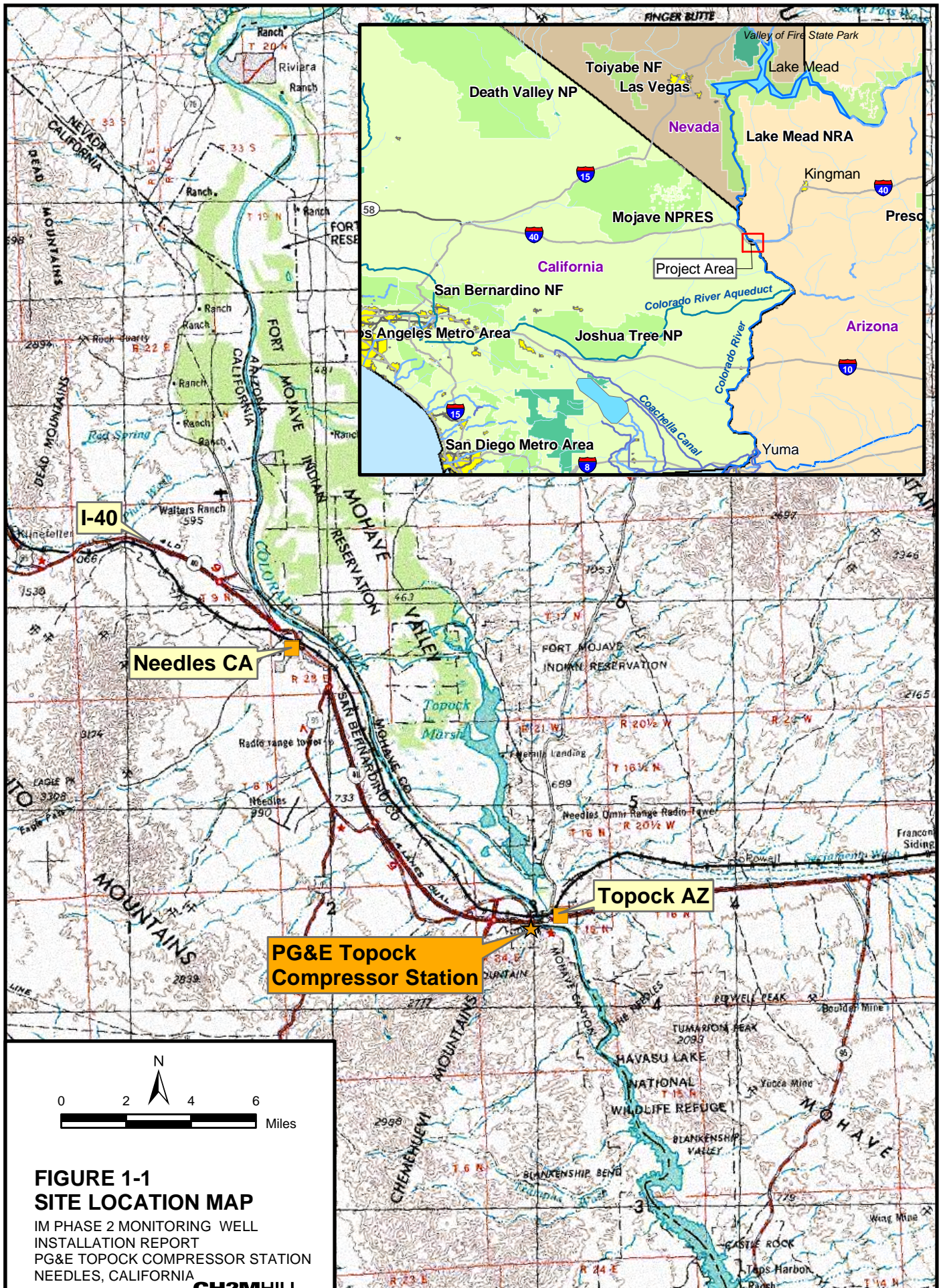
## 1.3 Purpose and Objectives

The primary objective of the IM Phase 2 drilling program was to provide additional monitoring wells to further characterize the hydrogeology and to assess the distribution of chromium in the floodplain area. The purpose of this report is to document the sampling, logging, installation, and development of 11 new monitoring wells at locations MW-27, MW-33, MW-34, MW-42, and MW-43.

This report documents the logging and groundwater quality screening sampling and monitoring well installation, development, and initial sampling that were conducted at locations MW-27, MW-33, MW-34, MW-42, and MW-43 from January to March 2005. The report presents documentation and results of:

- Soil boring logs and monitoring well completion logs.
- Results of borehole grab groundwater sampling.
- Documentation of cased-hole geophysical logging.
- Results of initial groundwater sampling conducted after well development.







## 2.0 Background

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This section provides brief descriptions of the floodplain study area and the general site hydrogeology as background for this report.

### 2.1 Site Description

The IM Phase 2 groundwater investigation was conducted in the floodplain area adjacent to the Colorado River. The floodplain is located northeast of the PG&E Topock Compressor Station and east of station access road. Figure 2-1 shows the site features and locations of existing wells in the floodplain and adjoining areas.

As directed by the DTSC under IM No. 2, PG&E is currently pumping groundwater from one deep extraction well (TW-2D) located on a bench along the station access road and above the Colorado River floodplain. The bench, referred to as the monitoring well MW-20 bench, is owned by the United States Bureau of Reclamation and is managed by the BLM. PG&E began pumping from this location in March 2004 and is currently pumping at a rate of approximately 70 gallons per minute. The parcels on which the Phase 2 monitoring wells were installed are maintained by either BLM, located to the north, or the Havasu National Wildlife Refuge, located to the south (Figure 2-1). Monitoring well installations described in this report were completed under IM No. 2.

### 2.2 Site Hydrogeologic Setting

For background to this report, the following hydrogeologic summary has been excerpted from the *Draft RCRA Facility Investigation/Remedial Investigation Report* (Draft RFI Report), dated February 28, 2005 (CH2M HILL 2005c).

The geology at the study area is characterized by bedrock basement formations (pre-Tertiary metamorphic/igneous rocks and consolidated Miocene conglomerate) overlain by younger sedimentary deposits. Near-surface sedimentary units include Tertiary and Quaternary to Recent-age alluvial fan deposits, Pliocene lacustrine deposits, and Tertiary and Quaternary to Recent-age fluvial deposits of the Colorado River. The alluvial fan and lacustrine deposits are generally found in the western portion of the study area, while the fluvial deposits predominate in the eastern area adjacent to the Colorado River.

Groundwater occurs under unconfined to semi-confined conditions within the alluvial fan and fluvial sediments beneath most of the Topock site. The saturated portion of the alluvial fan and fluvial sediments are collectively referred as the Alluvial Aquifer. In the floodplain area adjacent to the Colorado River, the fluvial deposits interfinger with, and are hydraulically connected to, the alluvial fan deposits. The unconsolidated alluvial and fluvial deposits are underlain by the Miocene conglomerate and pre-Tertiary metamorphic and igneous bedrock with very low permeability; therefore, groundwater movement occurs primarily in the overlying unconsolidated deposits.

The water table in the Alluvial Aquifer is very flat throughout the site and typically equilibrates to an elevation within 2 to 3 feet of the river level. Due to the variable topography at the site, the depth to groundwater ranges from as shallow as 5 feet below ground surface (bgs) in floodplain wells next to the river to approximately 170 feet bgs at the upland alluvial terrace areas.

The Colorado River has a strong influence on groundwater levels at the Topock site. The effects are most notable in the floodplain area, the IM extraction area, and adjacent inland area. The stage of the Colorado River varies both daily and seasonally in response to upstream dam discharges regulated for resource management and electricity production. The fluctuations in river stage cause the surface water-groundwater interaction in the floodplain to be very dynamic.

The most recent previous well installation and groundwater investigations in the floodplain area were conducted in March through June 2004 as part site characterization in support of the Interim Measures and completion of the RFI. The IM Phase 1 investigation included the installation of 13 wells at three locations in the floodplain area (MW-28-90, MW-36 cluster, and MW-39 cluster). Additional wells were installed along Park Moabi Road and at interior locations within and west of Bat Cave Wash (Figure 2-1). A summary and results of the RFI hydrogeologic studies through June 2004, including the RFI drilling investigations in the floodplain area, are presented in the Draft RFI Report (CH2M HILL 2005c).







## 3.0 Summary of Field Activities

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This section summarizes the drilling, well installation, and field sampling activities performed for the IM Phase 2 hydrogeologic investigation in the floodplain area. The groundwater investigation was conducted during January through March 2005 and included drilling, hydrogeologic logging/sampling of exploratory borings, and the installation and sampling of 11 groundwater monitoring wells at five drilling sites on the floodplain. The drilling and new groundwater investigations were conducted at well sites MW-27, MW-33, MW-34, MW-42, and MW-43. Figure 2-1 shows the locations of the groundwater investigations and new monitoring wells installed for this drilling program.

The IM Phase 2 field investigation included:

- Drilling, corehole logging, and depth-specific groundwater sampling in deep pilot borings at the five locations in the floodplain investigated.
- Collecting and archiving core samples for supplemental studies, including samples for anaerobic and aerobic testing and samples provided to the United States Geological Survey (USGS) for radiocarbon and microfossil analyses.
- Installing, developing, and completing 11 new groundwater monitoring wells at the five well cluster locations.
- Conducting initial groundwater sampling and analysis for water quality characterization for all new monitoring wells.
- Collecting cased-well geophysical logs at each of the investigation sites.

In addition, thermistor temperature sensors and data-loggers were installed in the deep monitoring wells/borings at each of the five locations for detailed temperature monitoring of the saturated zone. The well drilling, installation, and sampling activities were conducted following the final work plan for the IM Phase 2 groundwater investigations (CH2M HILL 2005a).

Table 3-1 summarizes the drilling, logging, well installation, and sampling activities completed for this investigation. The drilling, core sample collection, and hydrogeologic logging results are summarized and presented in Appendices A, B, and C. The results of the depth-specific groundwater sampling and groundwater sampling and analysis are presented in Section 4.0.

### 3.1 Drilling and Borehole Logging

The primary objective of the drilling program was to establish a more comprehensive monitoring well network to fill potential data gaps and further characterize the hydrogeology and water quality in the floodplain area. Continuous coring and geologic logging was performed at each of the deepest borings at each of the drilling sites to document geologic conditions and provide a detailed information on the hydrogeology at this site.

Drilling was accomplished using roto-sonic drilling methods that involve advancing a rotating and vibrating drill head or core barrel through the subsurface. This method was selected because it produces a continuous core from the land surface to the target drilling depth (approximately 80 to 240 feet bgs); generates minimal drilling wastes; and typically can drill through gravel, cobble, and competent bedrock formations. The continuous core obtained from sonic drilling was used to prepare core logs, collect subsurface soil samples, and was subsequently added to the IM drilling program core archive.

Lithologic descriptions for each of the deep borings were prepared under the supervision of a California-registered geologist based on visual inspection of the retrieved core. Soil boring logs are presented in Appendix A1. The primary information recorded on the drilling and boring logs include:

- Soil boring or well identification.
- Location in relation to an easily identifiable landmark.
- Names of the drilling subcontractor and logger.
- Start and finish dates and times.
- Drilling method.
- Depth at which saturated conditions were first encountered.
- Lithologic descriptions (based on the Unified Soil Classification System).
- Other geologic information including clast rounding and lithology.
- Sampling-interval depths.
- Driller observations on drilling advance and coring.

Selected core samples were collected during drilling at approximately 10-foot intervals within the saturated zone, sealed in aluminized Mylar sleeves inside a nitrogen-filled glove box, and archived for potential future testing or analysis. Core samples for preservation were selected based on lithology, with zones that are different from the norm being targeted. Any obvious gray- or black-colored potential reducing zones were sampled along with any obvious aerobic zones. One core sample from the unsaturated zone was also preserved. These are being stored in a freezer for potential future studies of floodplain geochemistry or microbiology. Shelf life of the frozen samples preserved in this way is indefinite.

During exploratory boring, samples of wood were collected and provided to the USGS for their carbon-14 age-dating studies. The collection of wood samples followed the provisions and procedures described in the approved work plan for the IM Phase 2 monitoring well installation (CH2M HILL 2005a). Appendix B1 presents an inventory of cores samples collected during the Phase 2 investigation. PG&E collected these at the request of the USGS. The USGS is studying the development of drainage patterns in the lower Colorado basin and wanted to take advantage of the opportunity to obtain wood samples while the Phase 2 drilling was underway. The data obtained from the samples provided to USGS are not considered to be part of the Topock project data set and will not be reported by PG&E.

## 3.2 Borehole Depth-specific Groundwater Sampling

During drilling at each of the five deep borings, groundwater samples were collected from the open borehole using the Isoflow® vertical aquifer profiling system. Samples were

collected at 20-foot intervals throughout the saturated zone along with one sample in the zone just above bedrock. The Isoflow® system isolates the lower portion of the open borehole using a hard-rubber packer and discharges the groundwater to the surface with a submersible pump. The purging involved pumping one to three borehole volumes from the open interval being sampled and monitoring the field parameters (temperature, pH, electrical conductivity, and oxidation-reduction potential [ORP]). After the field parameters stabilized and at least one casing volume had been removed, groundwater samples were collected directly into laboratory-supplied sample containers.

Samples were submitted to the field laboratory, currently set up at the batch treatment plant, for analysis of dissolved Cr(VI). A sufficient quantity of sample was collected and subsequently filtered at the onsite laboratory, so that confirmation samples could be submitted to an offsite certified laboratory if Cr(VI) was detected in any of the grab samples. The purpose of these samples was to assess the vertical distribution of chromium concentrations at the drilling sites and to assist in selecting well screens.

### 3.3 Monitoring Well Installation and Development

The well installation procedures were the same at each of the 11 monitoring well locations. After reaching total depth at each of the five deep drilling locations, PG&E conferred with DTSC regarding gravel pack and screen size for the deep monitoring well. The selection of shallower screened intervals (if applicable) for that location and modifications of the gravel pack were also selected at the same time.

All monitoring wells were constructed of 2-inch-diameter PVC well casing and screen. The well casing and screen were installed in the borehole through the sonic drill casing (approximate 10-inch outside diameter). The well completion logs and screen intervals and other well information for these wells are summarized in Table 3-1 and in Appendix A2. Refer to the *Sampling, Analysis, and Field Procedures Manual* (CH2M HILL 2005d) for installation methods and field procedures.

Following well construction and annular seal placement, the monitoring wells were developed using a surge block, bailer, and submersible pump. During development, temperature, pH, specific conductance, and turbidity were measured using field instruments. Well development was continued until field parameters stabilized and turbidity was reduced to less than 50 nephelometric turbidity units.

### 3.4 Thermistor Installation

Thermistor temperature sensors were installed on the outside of the well screen and blank casing of the deep well at each of the five Phase 2 drilling locations. The thermistors are connected to data loggers, which record temperature vs. time at discrete depths in the saturated unconsolidated sediments. Because of the large difference between groundwater temperature and river water temperature, it is possible that monitoring groundwater temperatures may provide useful information on the nature of groundwater/surface water interaction in the floodplain wells. The thermistors were installed as an experiment to evaluate the utility of collecting this type of data. The thermistor installation depths are summarized in Appendix B2. Thermistor data collection began in March, following data-

logger setup, which was performed after well development and sampling. The thermistor data are currently undergoing initial review and will be reported when analysis is completed. It is anticipated that thermistor downloads and reporting will be incorporated into IM No. 2 performance monitoring field and reporting tasks.

### 3.5 Monitoring Well Groundwater Sampling

All Phase 2 monitoring wells were sampled within approximately 10 days after well development using an adjustable-rate submersible pump. The pump intake was placed in the middle of the screened interval. All wells were purged and sampled following the methods in the *Sampling, Analysis, and Field Procedures Manual* (CH2M HILL 2005d).

Groundwater samples collected from the new monitoring wells were analyzed for Cr(VI), Cr(T), total dissolved solids (TDS), specific conductance, and cations/anions (chloride, sulfate, alkalinity, carbonate/bicarbonate, nitrate, and general minerals). Field water quality parameters (temperature, pH, specific conductance, ORP, dissolved oxygen, and turbidity) were also measured and recorded.

In addition to the planned groundwater sampling of two initial rounds from the new monitoring wells, confirmation sampling was conducted at wells MW-42-65, MW-27-85, and MW-34-100 in response to the detection of Cr(VI) during field screening of grab samples from the borehole for MW-27-85 prior to the planned sampling rounds. These samples were analyzed for Cr(T) with expedited laboratory turnaround.

Groundwater sampling activities followed the procedures, analytical methods, reporting limits, and quality control plan used for the Topock groundwater monitoring program, as described in the *Sampling, Analysis, and Field Procedures Manual* (CH2M HILL 2005d). The Cr(VI) and Cr(T) samples were filtered in the laboratory before analysis, consistent with prior IM field investigations and the groundwater monitoring program. General chemistry and other parameters were included in subsequent sampling from all newly installed IM monitoring wells.

### 3.6 Geophysical and Hydrogeologic Logging

Cased-hole geophysical logging (natural gamma ray and induction) was performed at each of the five deep monitoring wells following completion of the well installation. The purpose of the geophysical logging was to confirm the contact depth of the bedrock formation, assess the hydrogeologic characteristics of the aquifer, and provide additional data to support the site conceptual hydrogeologic model.

The geophysical logs for the floodplain drilling sites MW-27, MW-33, MW-34, MW-42, and MW-43 are presented in Appendix C. These summary presentations show the well screen depths of the monitoring well clusters and a grain-size core plot from the deep borings.

**TABLE 3-1**  
 Summary of Well Drilling, Installation, and Testing Details  
*IM Phase 2 Monitoring Well Installation Report*  
*PG&E Topock Compressor Station*

Exploratory Boring ID	Boring Depth (ft bgs)	Borehole Logging & Core Sampling	Wells Installed	Approx. Water Level (ft bgs)	Screen Interval (ft bgs)	Well Logging and Testing
<b>MW-27</b>	107	Continuous core log	<b>MW-27-085</b>	9	77.5 – 87.5	Cased-well geophysical
	60		<b>MW-27-060</b>	9	47.3 – 57.3	--
<b>MW-33</b>	237	Continuous core log	<b>MW-33-210</b>	35	190 – 210	Cased-well geophysical
	158		<b>MW-33-150</b>	35	132 – 152	--
<b>MW-34</b>	116	Continuous core log	<b>MW-34-100</b>	9	89.5 – 99.5	Cased-well geophysical
<b>MW-42</b>	81.2	Continuous core log	<b>MW-42-065</b>	12	56.2 – 66.2	Cased-well geophysical
	52.8	--	<b>MW-42-055</b>	12	42.5 – 52.2	--
	30.1	--	<b>MW-42-030</b>	12	9.8 – 29.8	--
<b>MW-43</b>	97	Continuous core log	<b>MW-43-090</b>	11	80 – 90	Cased-well geophysical
	75	--	<b>MW-43-075</b>	11	65 – 75	--
	25	--	<b>MW-43-025</b>	11	15 – 25	--

Note:

Ft bgs = feet below ground surface

## 4.0 Groundwater Sampling Results

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This section summarizes the results of groundwater sampling and water quality characterization completed during the IM Phase 2 groundwater investigation. The groundwater analytical results presented include:

- Water quality data from depth-specific groundwater sampling conducted during drilling.
- Groundwater analytical results for chromium, field water quality, and general chemistry parameters from the initial sampling of the new monitoring wells.

### 4.1 Borehole Depth-specific Groundwater Sampling Results

During drilling, depth-specific groundwater grab samples were collected from the deep pilot borings for field water quality measurements and testing. The methods used and parameters measured in this sampling activity are described in Section 3.2. Since the water samples were obtained from open boreholes during drilling, the samples are considered screening-level data for qualitative assessment of water quality conditions in the aquifer.

Twenty-three groundwater grab samples were collected from the following five boring locations:

- Four samples from MW-27D (22 to 87 feet bgs)
- Eight samples from MW-33D (52 to 217 feet bgs)
- Four samples from MW-34D (13 to 87 feet bgs)
- Two samples from MW-42D (27 to 57 feet bgs)
- Five samples from MW-43D (22 to 97 feet bgs)

The locations of the borings sampled are shown on Figure 3-1.

Table 4-1 summarizes the results of Cr(VI) field testing and the temperature, pH, specific conductance, and ORP measurements for the sampling depths in the deep pilot borings. Of these 23 samples, Cr(VI) was detected in the field laboratory testing (screening level data) in four locations: MW-27D at 82-87 feet (400 micrograms per liter [ $\mu\text{g/L}$ ]), MW-33D at 72-77 feet (13  $\mu\text{g/L}$ ), MW-42D at 47-57 feet (101  $\mu\text{g/L}$ ), and MW-43D at 42-47 feet (12  $\mu\text{g/L}$ ).

Specific conductance (measure of TDS) ranged from 1,850 to 19,100 microSiemens per centimeter ( $\mu\text{S/cm}$ ). An observed trend of increasing specific conductance with depth was observed at all locations, although there is limited data for MW-33D due to equipment malfunctions. In general, the specific conductance measurements ranged from approximately 9,000  $\mu\text{S/cm}$  in the shallow sampling intervals to 15,000 to 19,100  $\mu\text{S/cm}$  in the deeper sample intervals (Table 4-1).

Water temperatures in the grab samples ranged from 19.1 °C to 27.6 °C. There was a minor trend observed of increasing temperature with depth at all locations. Shallow interval

temperature was about 19 to 22 °C, and on average temperature increased 0.05 °C per 20-foot depth increase.

## 4.2 Monitoring Well Groundwater Sampling Results

The results of chromium analyses from the initial groundwater sampling of the IM Phase 2 monitoring wells are presented in Table 4-2 and general chemistry results from the monitoring well sampling are presented in Table 4-3. The field water quality parameter and water level measurements collected during sampling of the new wells are summarized in Appendix B3.

The first groundwater sampling was conducted on February 14 and 16, 2005 at wells MW-27-85, MW-34-100, and MW-42-65. This initial sampling for Cr(VI) and Cr(T) was performed in response to the field laboratory test detection of Cr(VI) in two groundwater grab samples collected during drilling in boreholes MW-27D and MW-42D (Table 4-1). In the confirmation samples analyzed by the certified laboratory, Cr(VI) and Cr(T) were detected in the MW-34-100 samples but were not detected in samples from wells MW-27-85 and MW-42-65 (Table 4-2).

Two subsequent rounds of groundwater sampling were performed later in February and early March according to the approved work plan. The results of the initial groundwater chromium sampling of the new monitoring wells installed in the floodplain area are displayed on two hydrogeologic cross sections. The locations of the cross sections and IM Phase 2 monitoring wells are shown on Figure 4-1. Cross-section A (Figure 4-2) extends east-west across the floodplain, and Cross-section B (Figure 4-3) is north-south in the floodplain area parallel to the Colorado River. The cross sections show the locations and depths of the new monitoring wells (well clusters), the Cr(VI) sampling results, and ORP measurements from March 2005 groundwater sampling. For completeness, the March 2005 sampling results for the other previously-installed monitoring wells in the floodplain are also shown on Figures 4-2 and 4-3.

In the February and March 2005 sampling, Cr(VI) was detected in only two wells installed in the Phase 2 drilling program: well MW-34-100 (maximum 426 µg/L) and well MW-33-210 (one sample 1.4 µg/L). In the initial IM sampling, Cr(VI) and Cr(T) were not detected in any groundwater samples collected from wells MW-27-60, MW-27-85, MW-33-150, MW-42-30, MW-42-55, MW-42-65, MW-43-25, MW-43-75, and MW-43-90 (Table 4-2).

The general chemistry results are shown in Table 4-3. TDS concentrations measured in the March samples ranged from 1,220 milligrams per liter (mg/L) at the shallow well MW-43-25 located near the Colorado River to a maximum of 37,100 mg/L at well MW-42-30. TDS concentrations in the majority of the wells ranged from approximately 8,500 mg/L in the middle depth wells to an average 10,000 mg/L in the deeper wells (Table 4-3). The cation and anion data summarized in Table 4-3 indicate that the dissolved solids are predominately sodium and chloride with lesser magnesium and sulfate concentrations. Nitrate was detected in the groundwater samples at wells MW-33-150, MW-33-210, and MW-34-100.



## 4.3 Data Quality Assessment

The laboratory analytical data generated during the IM Phase 2 groundwater investigation were independently reviewed to assess data quality and identify deviations from analytical requirements. Detailed review of data quality for all sampling data are summarized in data validation reports, which are kept in the project file and are available upon request. The results of the data quality review are summarized below.

All IM Phase 2 water sample analyses performed by a State of California-certified laboratory were validated. As noted in Tables 4-1, 4-2, and 4-3, several Cr(T) and general chemistry results were qualified as estimated detections or non-detects (J-flag results) based on exceedances of quality control acceptance criteria. However, no significant analytical deficiencies were identified in the data, and the Phase 2 investigation data are considered acceptable for the intended purpose of characterizing groundwater conditions at the sampling locations.

As noted in Section 4.1, the groundwater samples analyzed at the MW-20 bench field laboratory for Cr(VI) using field test instrumentation are used only as screening-level quality data and do not undergo independent review or validation. The documentation and analytical records for the field laboratory analyses are maintained for project records.

TABLE 4-1

## Borehole Grab Groundwater Analytical Results - Chromium and Field Water Quality Parameters

IM Phase 2 Monitoring Well Installation Report

PG&amp;E Topock Compressor Station

Location ID	Sample Date	Sample Depth (ft bgs)	Concentrations in µg/L		Field Water Quality Parameters			
			Field Test Analysis	Certified Lab Data	Temperature (° Celsius)	pH (pH units)	Specific Conductance (µS/cm)	ORP (mV)
			Hexavalent Chromium	Dissolved Total Chromium				
MW-27D	09-Feb-05	22 - 27	ND (10) S	---	22.0	7.65	9990	-2.0
MW-27D	09-Feb-05	42 - 47	ND (10) S	---	20.6	7.62	11800	-80
MW-27D	10-Feb-05	62 - 67	ND (10) S	---	20.6	7.27	12400	3.00
MW-27D	10-Feb-05	82 - 87	400 S	317	21.3	7.80	19100	56.0
MW-33D	12-Feb-05	52 - 57	ND (10) S	---	25.3	6.97	1850	94.0
MW-33D	12-Feb-05	72 - 77	13.0 S	---	26.6	9.94	7810	24.0
MW-33D	13-Feb-05	110 - 117	ND (10) S	---	26.4	7.14	---	-47
MW-33D	13-Feb-05	132 - 137	ND (10) S	---	27.0	7.22	---	-15
MW-33D	13-Feb-05	152 - 157	ND (10) S	---	24.9	7.38	---	-37
MW-33D	14-Feb-05	172 - 177	ND (10) S	---	25.0	6.85	---	-3.0
MW-33D	14-Feb-05	192 - 197	ND (10) S	---	27.1	7.31	---	-33
MW-33D	14-Feb-05	212 - 217	ND (10) S	---	27.7	7.77	---	-55
MW-34D	27-Jan-05	13 - 13	ND (10) S	---	---	---	---	---
MW-34D	28-Jan-05	42 - 47	ND (10) S	---	22.2	7.13	9290	-140
MW-34D	28-Jan-05	62 - 67	ND (10) S	---	23.2	7.18	14200	-88
MW-34D	28-Jan-05	82 - 87	ND (10) S	---	23.8	7.49	16500	-44
MW-42D	31-Jan-05	27 - 37	ND (10) S	---	21.1	7.59	9860	-26
MW-42D	31-Jan-05	47 - 57	101 S	89.9	24.4	7.62	10000	42.0
MW-43D	23-Feb-05	22 - 27	ND (10) S	---	19.1	7.12	9000	-65
MW-43D	23-Feb-05	42 - 47	12.0 S	ND (1.0) J	20.4	7.48	12300	-145
MW-43D	23-Feb-05	62 - 67	ND (10) S	---	20.2	7.52	13900	-172
MW-43D	23-Feb-05	82 - 87	ND (10) S	---	21.5	7.01	15000	-84
MW-43D	23-Feb-05	92 - 97	ND (10) S	---	22.6	8.00	5520	-69

## Notes:

µg/L results in micrograms per liter  
 µS/cm microSiemens per centimeter  
 mV milli volts  
 ND parameter not detected at the listed reporting limit.  
 --- not applicable  
 S screening level data  
 J concentration or reporting limit estimated

At boring MW-33D, an additional groundwater sample was attempted for interval 92-97 feet below ground surface (bgs). This interval was dry and no water sample collected.

Per the "Phase 2 Monitoring Well Installation Work Plan" (CH2MHill, 2005), certified lab analysis for Total Chromium were used to verify Field Test results greater than the detection limit of 10 µg/L.

TABLE 4-2  
Groundwater Analytical Results for New Monitoring Wells - Chromium  
IM Phase 2 Monitoring Well Installation Report  
PG&E Topock Compressor Station

Location ID	Sample Date	Hexavalent Chromium	Dissolved Total Chromium
MW-27-060	23-Feb-05	ND (1.0)	ND (1.0)
MW-27-060 FD	23-Feb-05	ND (1.0)	ND (1.0)
MW-27-060	14-Mar-05	ND (1.0)	ND (1.0)
MW-27-085	14-Feb-05	ND (1.0)	ND (1.0)
MW-27-085	16-Feb-05	ND (2.0)	ND (1.0)
MW-27-085	23-Feb-05	ND (2.0)	ND (1.0)
MW-27-085	14-Mar-05	ND (1.0)	ND (1.0)
MW-33-150	02-Mar-05	ND (1.0)	ND (1.0)
MW-33-150 FD	02-Mar-05	ND (1.0)	ND (1.0)
MW-33-150	16-Mar-05	ND (1.0)	ND (1.0)
MW-33-210	24-Feb-05	ND (1.0)	ND (2.1) J
MW-33-210	16-Mar-05	1.40	ND (1.0)
MW-34-080	16-Feb-05	ND (2.0)	ND (1.0)
MW-34-080	15-Mar-05	ND (1.0)	ND (1.0)
MW-34-100	14-Feb-05	357	328
MW-34-100	16-Feb-05	354	294
MW-34-100	23-Feb-05	417	391
MW-34-100	14-Mar-05	426	474
MW-42-030	23-Feb-05	ND (1.0)	ND (1.0)
MW-42-030	16-Mar-05	ND (1.0)	ND (1.0)
MW-42-055	23-Feb-05	ND (1.0)	ND (1.0)
MW-42-055	16-Mar-05	ND (1.0)	ND (1.0)
MW-42-065	14-Feb-05	ND (1.0)	ND (1.0)
MW-42-065	24-Feb-05	ND (1.0)	ND (2.8) J
MW-42-065	16-Mar-05	ND (1.0)	ND (1.0)
MW-43-025	07-Mar-05	ND (0.2)	ND (1.0)
MW-43-025	15-Mar-05	ND (0.2)	ND (1.0)
MW-43-075	07-Mar-05	ND (1.0)	ND (1.0)
MW-43-075	15-Mar-05	ND (1.0)	ND (1.0)
MW-43-090	07-Mar-05	ND (1.0)	ND (1.0)
MW-43-090	15-Mar-05	ND (1.0)	ND (1.0)
MW-43-090 FD	15-Mar-05	ND (1.0)	ND (1.0)

Notes:

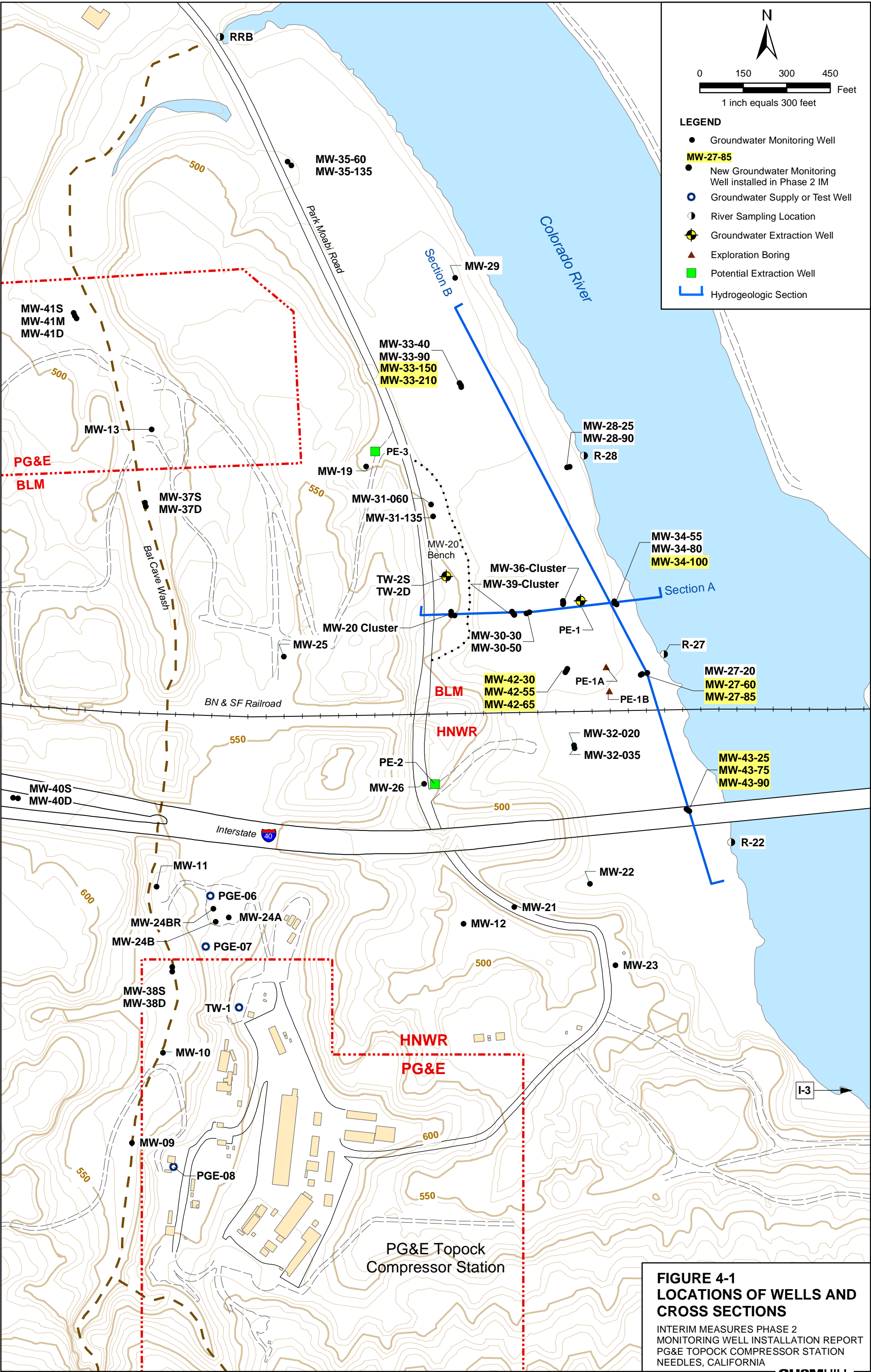
µg/L results in micrograms per liter  
ND parameter not detected at the listed reporting limit.  
J concentration or reporting limit estimated  
FD field duplicate sample

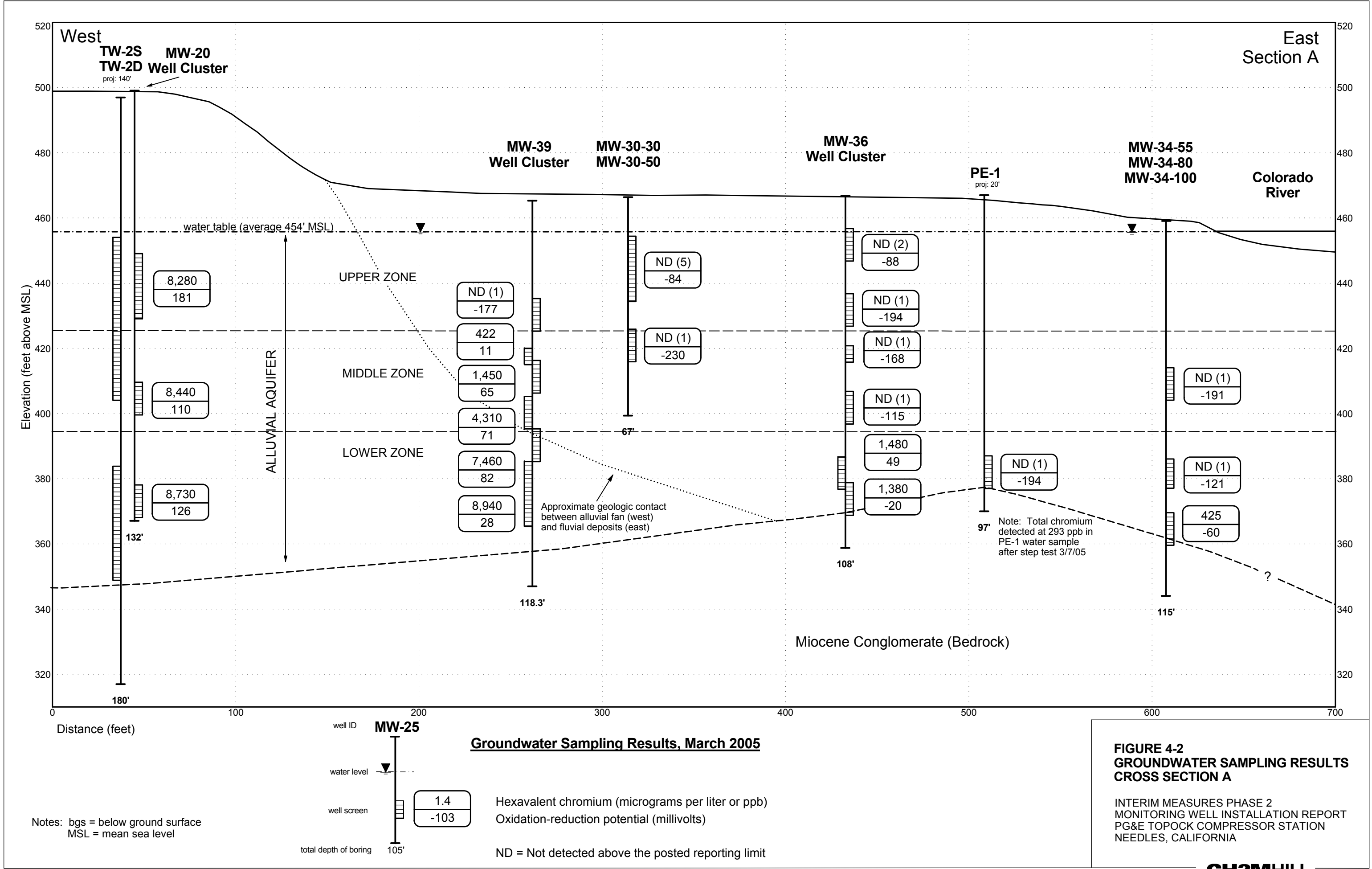
TABLE 4-3

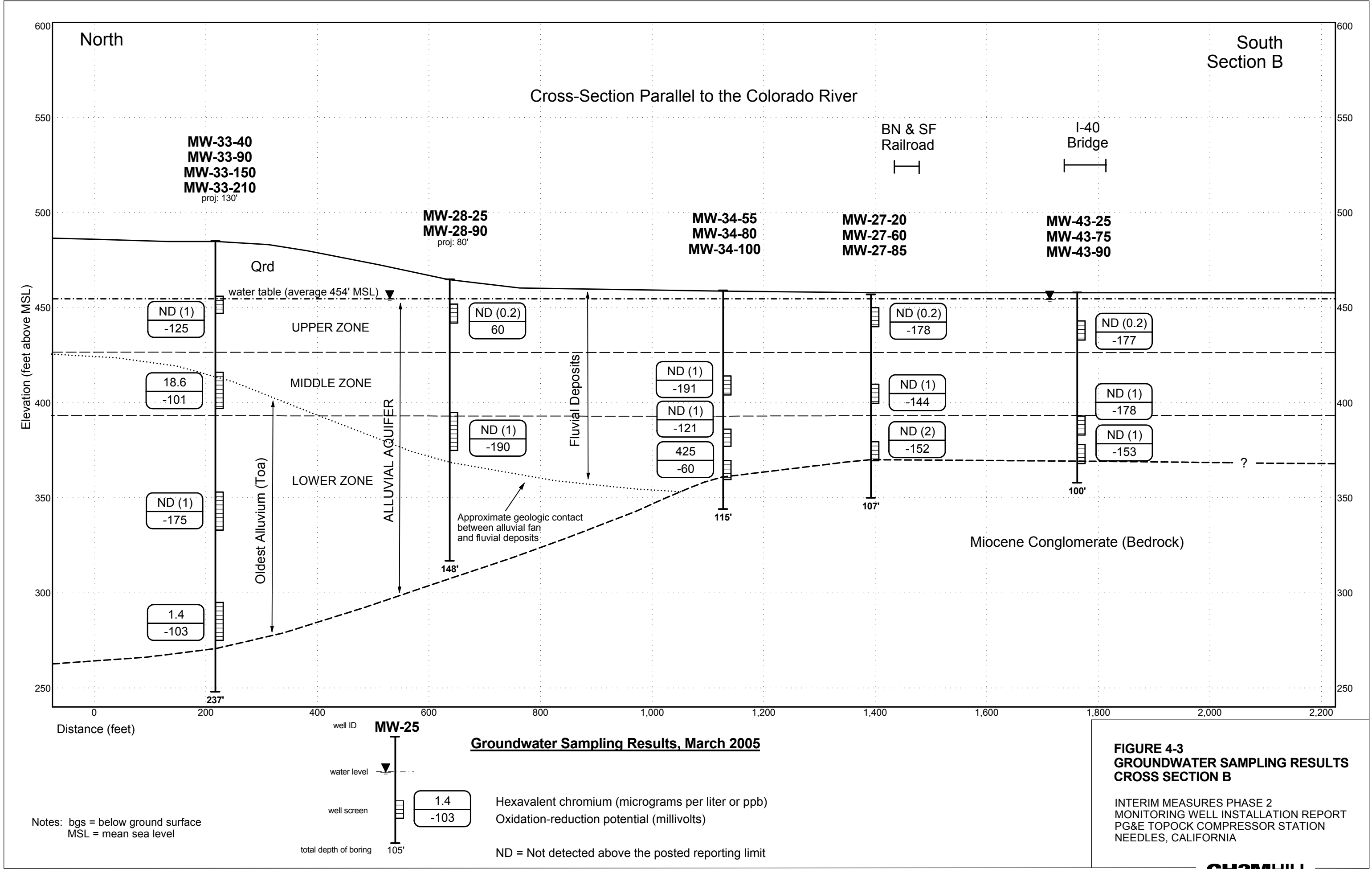
Groundwater Analytical Results for New Monitoring Wells - General Chemistry Parameters  
*IM Phase 2 Monitoring Well Installation Report*  
*PG&E Topock Compressor Station*

Location ID	Sample Date	Specific Conductance (µS/cm)	Total Dissolved Solids (mg/L)	Alkalinity Bicarbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Barium (mg/L)	Iron (mg/L)	Manganese (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)
MW-27-060	23-Feb-05	13500	8500	507 J	3980	ND (5.0)	ND (0.5)	919	452	ND (0.5)	3.22	0.856	143	25.8	2600
MW-27-060	FD 23-Feb-05	13500	8620	517 J	3890	ND (5.0)	ND (0.5)	879	479	ND (0.5)	3.40	0.904	151	27.9	2830
MW-27-060	14-Mar-05	13800	8860	348	4130	ND (13)	ND (1.0)	1030	417	ND (0.5)	3.71	0.895	133	22.2	2660
MW-27-085	23-Feb-05	17800	12300	311 J	5450	ND (5.0)	ND (0.5)	1190	431	ND (0.5)	0.854	1.38	39.1	39.8	4020
MW-27-085	14-Mar-05	18600	13000	211	5920	ND (13)	ND (0.5)	1330	417	ND (0.5)	0.72	1.06	36.8	38.6	4020
MW-33-150	02-Mar-05	15600	10300	50.9	5430	ND (5.0)	1.03	666	421	---	ND (0.5)	ND (0.5)	51.3	25.8	2820
MW-33-150	FD 02-Mar-05	15800	10200	48.4	5330	ND (5.0)	0.975	683	430	---	ND (0.5)	ND (0.5)	50.5	24.7	2580
MW-33-150	16-Mar-05	16900	10700	52.8	5780	ND (1.0) J	ND (1.0)	732	468	ND (0.5)	ND (0.5)	0.754	59.1	26.3	3510
MW-33-210	24-Feb-05	18900	12200	60.6	6480	ND (5.0)	1.07	998	532	ND (0.5)	ND (0.5)	ND (0.5)	79.9	40.5	3820
MW-33-210	16-Mar-05	18800	12500	55.3	6210	ND (1.0) J	1.19	1030	538	ND (0.5)	ND (0.5)	ND (0.5)	66.6	43.8	4000
MW-34-100	23-Feb-05	16000	9780	273 J	4780	ND (5.0)	0.786	1140	230	ND (0.5)	ND (0.5)	ND (0.5)	18.0	37.6	3580
MW-34-100	14-Mar-05	16200	10800	175	5010	ND (13)	ND (1.0)	1210	221	ND (0.5)	ND (0.5)	ND (0.5)	17.4	34.1	3600
MW-42-030	23-Feb-05	11300	9140	442 J	3330	ND (5.0)	ND (0.5)	845	557	ND (0.5)	4.35	1.09	170	18.9	2050
MW-42-030	16-Mar-05	13100	37100	319	4220 J	ND (1.0) J	ND (1.0)	997	561	ND (0.5)	2.43	0.994	184	18.5	2330
MW-42-055	23-Feb-05	12600	8990	219 J	3600	ND (5.0)	ND (0.5)	967	559	ND (0.5)	2.11	0.776	108	30.8	2340
MW-42-055	16-Mar-05	15600	10800	209	4970	ND (1.0) J	ND (1.0)	1220	686	ND (0.5)	1.95	1.30	135	32.6	3050
MW-42-065	24-Feb-05	15400	10200	209	4960	ND (5.0)	ND (0.5)	1190	723	ND (0.5)	2.20	2.33	145	36.7	3080
MW-42-065	16-Mar-05	12500	8600	163	3970	ND (1.0) J	ND (1.0)	1070	511	ND (0.5)	2.01	0.769	95.5	27.0	2340
MW-43-025	07-Mar-05	1440	935	298	109	0.63	ND (0.2)	368	---	---	3.48	0.558	46.1	---	---
MW-43-025	15-Mar-05	1440	1220	206	107	ND (1.0)	ND (1.0)	361	112	ND (0.5)	2.20	0.519	48.6	8.64	117
MW-43-075	07-Mar-05	13300	6170	611	3670	1.56	ND (0.2)	1520	---	---	3.72	0.463	92.2	---	---
MW-43-075	15-Mar-05	13800	9320	505	3900	ND (1.0)	ND (1.0)	1540	446	ND (0.5)	3.83	ND (0.5)	88.1	27.9	2840
MW-43-090	07-Mar-05	19900	13200	527	7080	1.37	ND (1.0)	1870	---	---	13.6	1.47	381	---	---
MW-43-090	15-Mar-05	20100	14600	412	6470	ND (1.0)	ND (1.0)	1670	781	ND (0.5)	14.3	1.38	356	45.5	3640
MW-43-090	FD 15-Mar-05	20000	14500	412	6470	ND (1.0)	ND (1.0)	1550	790	ND (0.5)	14.5	1.40	359	46.1	3730

Notes: mg/L milligrams per liter  
 µS/cm microSiemens per centimeter  
 ND parameter not detected at the listed reporting limit.  
 FD field duplicate sample  
 J concentration or reporting limit estimated









## 5.0 Summary

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This section summarizes the monitoring well drilling, groundwater sampling, and testing program conducted from January to March 2005 to characterize the hydrogeology and groundwater quality conditions in the IM investigation area. The study area encompasses the southern portion of the Colorado River floodplain. The drilling and sampling effort collected core into the Miocene conglomerate bedrock at each of the five locations.

Hydrogeologic and groundwater investigations completed during this investigation included:

- Drilling, depth-specific groundwater grab sampling, and borehole logging at five monitoring well locations.
- Installing 11 groundwater monitoring wells at the five locations.
- Performing confirmation groundwater sampling and analyses at three new wells in response to the grab sample Cr(VI) detection at MW-27-85.
- Performing two rounds of groundwater sampling and analyses for chromium and general chemistry parameters to establish water quality conditions at the Phase 2 monitoring wells.
- Performing cased-hole geophysical logging of the deepest well at each of the five new well locations.
- Collecting preserved core soil samples for possible future analyses.
- Installing thermistors at each well location for detailed temperature logging in the saturated zone.

Per BLM requirements, the drilling and well installation activities were completed before start of the Willow flycatcher nesting season.

The IM Phase 2 drilling program accomplished the objectives of filling the potential hydrogeologic data gaps on the floodplain. No major changes in the conceptual model of the site resulted from this effort, although, based on drilling observations at the MW-33 location, the depth to bedrock in the northern portion of the floodplain is greater than previously estimated. The sampling results from the Phase 2 wells generally confirmed our understanding of the distribution of chromium in groundwater in the floodplain. Chromium was not found in any of the new shallow or middle-depth monitoring wells. Chromium was detected in two of the Phase 2 wells (MW-34-100 and MW-33-210) that monitor the lower zone of the Alluvial Aquifer.



## 6.0 References

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## Appendix A

### Drilling and Well Construction Records

## Appendix A1

### Monitoring Well Drilling Logs


SHEET 1 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-27	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 107.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.4 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,290.53		EASTING (CCS NAD 27 Z 5): 7,616,540.35		DATE STARTED: 02/09/2005	
DATE COMPLETED: 02/10/2005		DRILLING METHOD: Rotasonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5		Box 1	5.6	SP	POORLY GRADED SAND (SP) - lt yellowish brn 10YR6/4, 98% f sand, 2% fines, subrnd fine qtz-rich sand, loose, dry.	collect bag samples for archive description and potential grain-size testing.	
10		Box 2 Box 3	10	SP	POORLY GRADED SAND WITH SILT (SP) - very dk gray 7.5YR3/1, 95% sand, 5% fines (silt), wet, organic zone 10-15ft, some roots noted.	soil becomes compacted and pushed aside. 7ft run becomes 4ft	
15				SP	POORLY GRADED SAND (SP) - becomes brn 7.5YR5/3 at 15ft and below, 98% sand, 2% fines.	collect bag sample MW27D-GS-10@12:45 saturated at ~11ft	
20				SP	POORLY GRADED SAND WITH SILT (SP) - very dk gray 7.5YR3/1, 95% sand, 5% fines, no rocks observed, dk organic zone 17-19.5 ft.	20ft samples at 13:00	
25		Box 4 Box 5	9.5	SP	POORLY GRADED SAND (SP) - brn 7.5YR4/3, 98% sand, 2% fines, no gravel, few lithics, subrnd qtz-rich sand, loose, wet	water sample at 14:10	
30				SP	- brn 7.5YR5/3, few mafic minerals, qtz-rich fine sand	sands fine upwards from 30 to 38ft, 30ft samples collected at 14:25	
35		Box 6 Box 7	9		- grades to m sand by 33 ft, 98% sand, 2% fines	water sample collected at 32-37ft MW27D-24.5	

SHEET 1 of 8				PROJECT NUMBER: <b>326228.IM</b>		BORING NUMBER: <b>MW-33</b>	
<b>SOIL BORING LOG</b>							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
						DATE COMPLETED: 02/15/2005	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5		Box 1	5.6	SP	POORLY GRADED SAND (SP) - brn 7.5YR5/4, 99% subrnd to subang f sand, 97% qtz, ~3% mafics, <1% fines, loose, moist	collect bag samples for archive description and potential grain-size testing. moisture from rain on 02/11/05	
10					- as above, 98% sand, <2% fines, becomes dry	no bag sample collected above water	
15		Box 2 Box 3	8			soft drilling	
20					- 90% qtz, 10% mafics, dry, some feldspar	poor recovery as loose dry sands are pushed aside by core barrel, 10ft soil sample @ 13:30	
25		Box 4 Box 5	8.5	SP	- vf-f sand, no gravel, massive, loose, dry	soil samples at 20ft @ 13:45	
30					POORLY GRADED FINE SAND (SP) - brn 7.5YR5/3, 99% qtz rich fine sand, 1% fines, no gravel, loose, moist	becomes moist at 27 ft	
35		Box 6 Box 7	9			30ft soil sample @14:00	

SHEET 2 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33		
SOIL BORING LOG								
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ		
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005		
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic		
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble		
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION  SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS		
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
40		Box 8 Box 9	9	SP	POORLY GRADED FINE SAND (SP) - brn 7.5YR5/3, 96% qtz rich fine sand, 2% fines, 2% m subrnd gravel, loose, dry	bag sample at 35ft: MW33D-GS-35 @ 14:10		
				ML	SILT (ML) - brn 7.5YR4/3, 65% silty fines, 35% vf sand, non-sticky, very plastic, soft, wet  - yellow mottled with roots	bag sample at 39ft: MW33D-GS-39 @ 14:10 40ft soil sample @14:10		
				ML	CLAYEY SILT (ML) - lt brn, 85% clayey fines, 15% vf sand, non sticky, very plastic, soft, wet			
45				GW	WELL GRADED GRAVEL WITH SAND AND CLAY (GW) - brn, 60% gravel up to 2" long, 27% subrnd well graded sand, 13% clayey fines, subrnd igneous & metamorphic, medium density			
50				SM	SILTY SAND (SM) - lt brn 7.5YR5/4 with iron oxide staining, 80% vf sand, 20% silty fines, loose to medium, wet			
55		Box 10 Box 11	9	SW	WELL GRADED SAND WITH SILT AND GRAVEL (SW) - dk brn 7.5YR3/2, 80% subrnd lithic sand, predominantly medium coarse, 15% silty fines, 5% gravel, hard to medium density, wet, very little pore space  - becomes moist below 54ft, clay rich zone 54-55ft - 17% clayey fines - 62% sand, 30% gravel, 8% fines, overall subang with 2% rounded, metamorphic	bag MW33D-GS-53 in cleaner SW  collect isoflow groundwater sample between 52 & 57 ft, MW-33D-GS-54.5 @15:45		
60		Box 12 Box 13	9	SW	WELL GRADED SAND WITH GRAVEL (SW) - brn 7.5YR4/2, 70% subrnd lithic sand with red sand stone, 25% rnd gravel up to 2.6" long, 5% fines, gray metamorphic and brn chert, medium to hard, wet  - as above, less gravel, 87% sand, 10% gravel, 3% fines  - 65% sand, 20% gravel up to 1 1/2", 15% fines	60ft soil samples @16:00		
65								bag sample at 63ft: MW33D-GS-63 @16:00
70							SM	SILTY SAND (SM) - brn 7.5YR5/3, 77% rnd well graded lithic sand, 20% silty fines, 3% f gravel, soft, wet
				SW	WELL GRADED SAND WITH SILT AND GRAVEL (SW) - brn 7.5YR5/3 fine, and gray 7.5YR5/1 sand, 80% subrnd lithic sand, 10% silty fines, 7% gravels, 3% cobbles	hard drilling		

SHEET 3 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
75		Box 14 Box 15	9	SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 7.5YR5/3 fine, and gray 7.5YR5/1 sand, 77% subrnd lithic sand, 30% gravel, 3% silty fines  - sand becomes greenish gray and subang, very poorly sorted vf-vc - one 3.5 inch MM cobble - brn 7.5YR4/3, 58% sand, 40% gravel, 2% silty fines, subang, hard, wet  - subang to subrnd - one metamorphic subang cobble at 78ft, and one at 83ft	70ft soil sample @16:30  collect isoflow groundwater sample between 72 & 77 ft, MW-33D-GS-74.5 @16:45	
80							partial cementation? 80ft soil sample @ 7:55 on 2/13/05
85		Box 16 Box 17	8.5	SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - brn 7.5YR4/4, 80% well packed sand, 15% fines, 5% gravel, subang to well sorted, hard, moist, color due to fines  - some clay in fines from 86-87ft	igneous and metamorphic: source for greenish gray sand	
90				SC	<b>CLAYEY SAND (SC)</b> - greenish gray sand/ brn fines/ brn overall, 80% subrnd sand, 20% clayey fines, hard, well sorted and well packed, moist	collect bag sample MW33D-88.5 @8:45	
95		Box 18 Box 19	0	SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - brn overall (greenish gray sand) as above, 73% subang sand, 20% fines, 7% f MM gravels, hard, well sorted and well packed, moist	no water for isoflow sample 92-97ft	
100				SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - brn, 80% sand, 10% gravel, 10% fines, subrnd, hard, moist to wet  - clayey fines - brn overall 7.5YR5/3, greenish gray MM sand and gravel, 78% subang sand, 15% f gravel, 7% silty fines, wet	bag sample collected at 98ft:MW33DGS-98@ 9:10  100ft soil sample @9:10	
105		Box 20 Box 21	9			- more fines, 79% sand, 12% gravel, 9% silt and clay	


SHEET 4 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33	
<b>SOIL BORING LOG</b>							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION  SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
110		Box 22 Box 23	9	SM	SILTY SAND WITH GRAVEL (SM) - brn overall, 75% sand, 15% silty fines, 10% gravel, subang MM sands and gravels, hard, moist	partially cemented, hard drilling  reworked older alluvium?	
				SW	WELL GRADED SAND WITH SILT AND GRAVEL (SW) - brn 7.5YR5/3, 85% sand, 10% gravels, 5% fines, subrnd, medium density, wet		
115		Box 22 Box 23	9	SM	SILTY SAND WITH GRAVEL (SM) - brn 7.5YR5/3, subang greenish gray sand and gravel, 75% sand, 20% silty fines, 5% gravel, hard, moist	110ft soil sample @9:55	
				SC	CLAYEY SAND WITH GRAVEL (SC) - brn 7.5YR4/2, 60% sand, 22% clay and silt, 18% gravel up to 2.7" long, subang to ang, metamorphic sands and gravels, hard, well sorted, well packed, moist (near dry)		
120		Box 24 Box 25	8.5	SW	WELL GRADED SAND WITH SILT (SW) - brn overall 5YR5/3, 85% sand, 10% fines, 5% f gravel, subrnd MM sands and gravels, medium to hard, wet		
				SM	SILTY SAND (SM) - brn 5YR5/3, 75% well packed sand, 20% silty fines, 5% f gravel, subang, hard, well graded, well packed, moist	partially cemented, hard drilling	
125		Box 24 Box 25	8.5	SC	CLAYEY SAND WITH GRAVEL (SC) - brn, 60% subang well graded sand, 30% clayey fines, 10% gravel, hard, moist		
				SM	SILTY SAND WITH GRAVEL (SM) - brn, 70% sand, 18% silty fines, 12% gravel and cobbles, subang, hard, moist		
130		Box 26 Box 27	9	SW	WELL GRADED SAND WITH SILT AND GRAVEL (SW) - brn 5YR4/3, 80% sand, 13% f gravel, 7% silty fines, subrnd metamorphic sand and gravel, medium density, wet		
				SW	WELL GRADED SAND WITH GRAVEL (SW) - brn 5YR5/3, 80% sand, ~60% qtz, ~30% mafics, 15% f gravel, ~10% feldspar, 5% fines, subrnd metamorphic sand and fine gravel, medium to hard, wet	bag sample @130ft: MW33D-GS-130 @14:45	
135		Box 26 Box 27	9	SW	- larger gravel up to 1 inch below 135ft, 75% sand, 20% gravel, 5% silty fines	collect groundwater isoflow sample between 132-137ft: MW33D-134.5 @ 15:35	
					- well graded sand as above, 75% sand, 18% f subang gravel up to 1 inch long, 7% silty fines		
140							


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SHEET 5 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
DATE COMPLETED: 02/15/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
145		Box 28 Box 29	9	SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 5YR5/3, 80% sand, ~60% qtz, ~30% mafics, 15% f gravel, ~10% feldspar, 5% fines, subang to ang sharp metamorphic sand and fine gravel, medium to hard, wet  - 73% sand, 25% gravel up to 2.5 inch, 2%fines	collect 140ft soil sample @15:55	
150					- as above with smaller gravels up to 1.5 inch long, becomes reddish brn 2.5YR5/3	collect 150ft soil sample @16:30	
155		Box 30 Box 31	9	SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - reddish brn 2.5YR5/3, 72% sand, 18% silty fines, 10% f gravel, subang metamorphic gravel and sand, hard, wet	hard, cemented, possibly reworked fanglomerate collect groundwater 152-157: MW33D-154.5 @17:15 collect bag sample at 155ft: MW33D-GS-155 @16:30	
160				SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - reddish brn 2.5YR5/3, 70% sand, 18% gravel, 12% fines, subang metamorphic sand and gravel, medium density, wet  - less gravel below 161.5ft, 78% sand, 12% fines, 10% gravel,	collect bag sample at 160 ft: MW33D-GS-160 @07:30	
165		Box 32 Box 33	9		- 72% sand, 15% gravel, 13% red fines, subang metamorphic sand and gravel, medium to hard		
170					- fractured metamorphic cobbles at 171.5ft	collect 170ft soil sample @8:10, reworked fanglomerate ?	
175		Box 34 Box 35	9.5	SM	- 70% sand, 20% gravel, 10% silty fines  <b>SILTY SAND (SM)</b> - reddish brn, 72% sand, 18% silty fines, 10%	collect groundwater isoflow sample	


SHEET 6 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
DATE COMPLETED: 02/15/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
180		Box 36 Box 37	9.5	SW	gravel, subang, hard <b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - 75% sand, 15% gravel, 10% fines	between 172-177ft: MW33D-174.5 @ 09:00  collect 180ft soil sample at 9:50  reworked fanglomerate ?	
				GM	<b>SILTY GRAVEL WITH SAND (GM)</b> - reddish brn, subang to ang, moist		
				SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - 77% sand, 15% gravel, 8% fines		
				SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - 60% sand, 20% fines, 20% gravel and cobbles		
				SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - reddish brn 2.5YR5/3, 72% sand, 20% gravel, 8% silty fines, subang metamorphic sand and gravel up to 2" long, medium density, wet		
185				SC	<b>CLAYEY SAND WITH GRAVEL (SC)</b> - reddish brn, 60% sand, 20% gravel, 20% clay and silt, subang, hard		
190		Box 38 Box 39	9.5	SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - reddish brn 2.5YR5/3, subang metamorphic sand and gravel, loose to medium, wet - 70% sand, 20% gravel, 10% fines - cobbles	collect 190ft soil samples @10:50, easier drilling	
195					- more gravel below 194.5 ft, 65% sand, 25% gravel, 10% fines		
200					- as above with more silt and less gravel, 72% sand, 15% gravel, 13% fines		
205		Box 40 Box 41	9.5	SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - 65% sand, 20% silty fines, 15% gravel	collect 200ft soil sample @12:00  reworked fanglomerate	
	SW			<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - reddish brn 2.5YR5/3, 68% sand, 20% gravel, 12% silty fines, subang metamorphic sand and gravel up to 1.5" long, loose to medium, wet			
	SM			<b>SILTY SAND WITH GRAVEL (SM)</b> - reddish brn, 65% sand, 20% fines, 15% gravel, subang, hard, moist			
210					<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - reddish brn 2.5YR5/3, 73% sand, 15% gravel, 12% silty fines, subang metamorphic sand and gravel up to 1.2" long, medium density, wet		


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SHEET 7 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005	
DATE COMPLETED: 02/15/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
215		Box 42 Box 43	9.5	SW	WELL GRADED SAND WITH SILT AND GRAVEL (SW) - reddish brn 2.5YR5/3, 73% sand, 15% gravel, 12% silty fines, subang metamorphic sand and gravel up to 1.2" long, medium density, wet	collect 210ft sample @12:20	
				BR	CONGLOMERATE (BR) - reddish brn 2.5YR5/3, 60% sand, 22% silty fines, 18% gravel, subang metamorphic, hard, moist, partially cemented	collect isoflow water sample Top Miocene Conglomerate 213 ft bgs	
- as above, cobbles at 218.5 ft, 58% sand, 22% gravel and cobbles, 20% fines	harder drilling, weathered fanglomerate, not wet below 213.5ft (moist)						
- more clay and stronger cementation observed below 222 ft, 55% sand, 25% silt and clay, 20% gravel	less weathering in fanglomerate						
- as above	relatively intact red fanglomerate						
- as above							
220		Box 44 Box 45	9.5				
225							
230		Box 46 Box 47	9.5				
235							
					Boring Terminated at 237 ft		
					<b>ABBREVIATIONS</b> cc = continuous core run brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained		



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SHEET 8 of 8				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-33			
SOIL BORING LOG									
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ			
SURFACE ELEVATION: 484.6 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,103,295.06		EASTING (CCS NAD 27 Z 5): 7,615,909.82		DATE STARTED: 02/12/2005		DATE COMPLETED: 02/15/2005	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic			
LOCATION: 600 ft NE of TW-2D, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble			
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.			
					vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz				


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SHEET 2 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-27	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 107.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.4 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,290.53		EASTING (CCS NAD 27 Z 5): 7,616,540.35		DATE STARTED: 02/09/2005	
DATE COMPLETED: 02/10/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
40		Box 8 Box 9	9	SP	<b>POORLY GRADED SAND (SP)</b> - brn 7.5YR4/3, 98% sand, 2% fines, no gravel, few lithics, subrnd qtz-rich sand, loose, wet  - grades to c sand by 35ft, 98% sand, 2% fines, ~85% qtz, 5% feldspars, ~10% mafics, no gravel  - 1st isolated rounded fluvial pebble - 95% sand, 3% subrnd to rnd gravel up to 1", 2% fines, gravel composed of chert metamorphics and one weathered limestone  - 89% sand, 10% gravel, 1% fines  - 94% sand, 5% gravel, 2% fines, subrnd medium qtz-rich sand as above, no gravel	bag sample MW27D-GS-35 collected at 14:20   40ft samples collected at 14:40  collect groundwater sample from 42-47ft MW27D-44.5	
45							
50		Box 10 Box 11	8.5				bag sample MW27D-GS-50 collected at 15:50
55				SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn, 58% rnd f to c qtz-rich sand, 40% gravel, 2% fines, gravel is igneous and metamorphic, rnd up to 2.5", medium density, wet	bag sample collected MW27D-GS-56 at 16:00	
60							
65		Box 12 Box 13	8.5	SP	<b>POORLY GRADED SAND (SP)</b> - brn 7.5YR5/3, 93% qtz-rich sand, 5% gravel, 2% fines, subrnd, fine, loose, wet  - poorly graded fine sand as above, 91% f sand, 7% rnd quartzite gravel, 2% gravel  - becomes gravelly at 67ft with gravels up to 1.7 inch long - 88% sand, 10% gravel, 2% fines	60ft samples collected at 16:10  collect groundwater sample at 62-67ft MW27D-64.5  soft drilling	
70							

SHEET 3 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-27		
<b>SOIL BORING LOG</b>								
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 107.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ		
SURFACE ELEVATION: 458.4 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,290.53		EASTING (CCS NAD 27 Z 5): 7,616,540.35		DATE STARTED: 02/09/2005		
DATE COMPLETED: 02/10/2005		DRILLING METHOD: Rotasonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic		
LOCATION: Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble		
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS		
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.		
75		Box 14 Box 15	10	SP	<b>POORLY GRADED SAND (SP)</b> - brn 7.5YR5/3, 88% qtz-rich sand, 10% gravel, 2% fines, subrnd, fine, loose, wet  - 93% subrnd qtz-rich sand, 5% rnd to subrnd gravel up to 2 inch long, 1% fines	harder, slower drilling below 75ft  bag sample taken in gravel zone at 77ft MW27D-GS-77		
80				SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 7.5YR5/2, 57% subrnd sand, 40% rnd to subrnd gravel, 3% fines, 3.5" long cobbles (weathered metamorphic and igneous), medium density, wet  - vesicular basalt cobble			
85		Box 16 Box 17	9.5	SC	<b>CLAYEY SAND (SC)</b> - gray 7.5YR5/1, 80% sand, 20% silt and clay, silty plastic, soft, wet			
				GW	<b>WELL GRADED GRAVEL WITH SAND AND COBBLES (GW)</b> - brn 7.5YR5/2, 80% gravel, 18% sand, 2% fines, subrnd metamorphic gravel and cobbles, medium dense, wet - 75% gravel, 23% sand, 2% fines, igneous rnd gravel			
				SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - reddish brn 2.5YR4/4, 60% sand, 30% silty fines, 10% f gravel, subrnd, medium to hard, moist to wet			
90				BR	<b>CONGLOMERATE (BR)</b> - reddish brn 2.5YR4/4, 60% sand, 30% silty fines, 10% f gravel, subrnd, medium to hard density, moist  - core is shattered and dry, reddish brn indurated conglomerated with subang cobbles and gravels, fines are primarily composed of red silt. When crushed : 42% sand, 40% cobbles and gravels, 18% silty fines, color: pale reddish brn 10YR5/4 (on rock color)	Top Miocene Conglomerate at 87 ft		
95		Box 18 Box 19	8.5				moisture introduced below 92ft during drilling	
100								
105		Box 20 Box 21	8.5		- some intact core at 99, 100 and 103 ft			


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SHEET 4 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-27	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 107.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.4 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,290.53		EASTING (CCS NAD 27 Z 5): 7,616,540.35		DATE STARTED: 02/09/2005	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
					<b>CONGLOMERATE (BR)</b> - reddish brn 2.5YR4/4, 60% sand, 30% silty fines, 10% f gravel, subrnd, medium to hard density, moist  - same conglomerate to 107 ft, Boring Terminated at 107 ft  <b>ABBREVIATIONS</b> cc = continuous core run brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz		


**CH2MHILL**


SHEET 1 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-34	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 116.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,530.55		EASTING (CCS NAD 27 Z 5): 7,616,452.40		DATE STARTED: 01/27/2005	
DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DATE COMPLETED: 01/29/2005			
DRILLING EQUIPMENT: Track Mounted Sonic				LOGGED BY: B. Moayyad, T. McDonald			
LOCATION: Adjacent to MW-34-55 on Colorado River floodplain.							
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5		Box 1	7	SP	POORLY GRADED SAND (SP) - dk grayish brn 10YR4/2, 98% sand, 2% fines with some organic matter and roots, loose, moist	collect bag samples for archive description and potential grain-size testing.	
					- pale brn 10YR6/3, 95% m sand, massive	collect bag sample: MW34-GS-4	
10					- yellowish brn 10YR5/4, moist to wet, bottom 8" transition with mottling with dark gray 10YR4/1	collect bag sample: MW34-GS-8	
15		Box 2 Box 3 Box 4	10		- dk grayish brn 10YR4/2, wet, massive		
					- transition zone and mottling coincides with water tube at approx 8.5 to 9 ft bgs		
					- 99% f sand, 1% fines		
20					- color shift to yellowish brn 10YR5/4		
25		Box 4 Box 5 Box 6	10	SP	POORLY GRADED SAND (SP) - dk grayish brn 10YR4/2, 99% f-m sand, 1% fines with some organic matter and roots, loose, moist	collect bag sample: MW34-GS-16	
					- brn 10YR5/3		
					- 99% vf sand, 1% fines		
30							
35		Box 6 Box 7 Box 8	10			collect bag sample: MW34-GS-30	




SHEET 2 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-34	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 116.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,530.55		EASTING (CCS NAD 27 Z 5): 7,616,452.40		DATE STARTED: 01/27/2005	
DATE COMPLETED: 01/29/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Adjacent to MW-34-55 on Colorado River floodplain.						LOGGED BY: B. Moayyad, T. McDonald	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
40		Box 8 Box 9 Box 10	10	SP	POORLY GRADED SAND (SP) - dk grayish brn 10YR4/2, 99% f-m sand, 1% fines with some organic matter and roots, loose, moist	collect bag sample: MW34-GS-42.2 collect bag sample: MW34-GS-43	
					- 70-80% qtz, 20-30% mafic grains		
					- 96% sand, 3% gravel, 1% fines		
					POORLY GRADED SAND WITH GRAVEL (SP) - brn 10YR5/3, 87% sand, 15% rnd to well rnd gravel <1cm to 6cm, 4% silt, igneous, metamorphic, vesicular basalt, quartzite, soft, wet, massive, carbonate		
45				SP	- dk gray 2.5YR2/1, 60% silt, 40% vf sand, soft, wet, massive		
					POORLY GRADED SAND (SP) - brn 10YR5/3, 95% rnd to well rnd sand, 5% fines, 3% rnd to well rnd gravel, igneous and metamorphic, soft, wet, gravel with vesicular basalt, carbonate, massive		
50			0	ML	SILTY CLAY (ML) - brn 10YR5/3 - 7.5YR5/3, 98% fines, 2% sand, very abrupt boundary, sticky, plastic, fine grain layer	took sample at 13:05: MW34-GS-50	
					POORLY GRADED SAND (SP) - brn 10YR4/3, 92% rnd sand, 5% subrnd gravel up to 1", 3% fines, qtz, some mafic, wet		
55		Box 11	5	SP	- 10YR5/3, 90% rnd sand, 10% subrnd f gravel up to 1 cm, qtzite, mafic, darker/coarser than above		
					- 896% sand, 4% f gravel up to 1/2" subrnd to subang, less mafic		
60					- 10YR5/3, subang to subrnd gravel		
					- 90% subrnd to rnd sand, coarsening, 10% rnd gravel up to 2 1/2", carbonate/granitic		
65		Box 12 Box 13	10.45		- 96% subrnd to rnd sand, 4% gravel up to 1", 5"mm cobble		
					- no gravel		
70				SW	- occasional silty clay lenses 2-4" thick	took sample at 13:40: MW34-GS-65	
					WELL GRADED SAND WITH GRAVEL (SW) - 80% rnd f sand, 15% fines, 5% subang to subrnd gravel up to 1"		
					POORLY GRADED SAND (SP) - brn 7.5YR5/4, 90% f sand, 8% c sand, 2% fines, rnd, loose, wet		
					- becomes more gray in color near wood		

SHEET 3 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-34	
<b>SOIL BORING LOG</b>							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 116.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,530.55		EASTING (CCS NAD 27 Z 5): 7,616,452.40		DATE STARTED: 01/27/2005	
DATE COMPLETED: 01/29/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Adjacent to MW-34-55 on Colorado River floodplain.						LOGGED BY: B. Moayyad, T. McDonald	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION  SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
75		Box 14 Box 15	9	SP	<b>POORLY GRADED SAND (SP)</b> - brn 7.5YR5/4, 90% f sand, 8% c sand, 2% fines, rnd, loose, wet  - large wood fragments >6", no sediment, charcoal appearance - 98% sand, <2% fines, coarse, subrnd, f qtz sand	sample collected at 14:35: MW34-GS-73	
				GW	<b>WELL GRADED GRAVEL WITH SAND AND SILT (GW)</b> - brn 7.5YR5/3, 70% gravel up to 5", 20% sand, 10% fines, rnd to subrnd, medium, wet		
80				SP	<b>POORLY GRADED SAND (SP)</b> - brn 7.5YR5/2, 95% f rnd qtz sand, 5% silt, some mafics, loose, wet	sample collected at 15:00: MW-34P-GS-80	
85		Box 16 Box 17	9.5	GW	<b>WELL GRADED GRAVEL WITH SAND AND COBBLES (GW)</b> - brn 7.5YR5/3, 60% rnd gravel up to 5", 35% subrnd qtz sand, 5% fines, igneous and metamorphic, wet  - 60% gravel with 15% cobbles		
90				GW	<b>SILTY SANDY GRAVEL (GW)</b> - 55% sand, 43% gravel up to 6", 2% fines	drilling becomes much harder below 87 ft  cobbles fall from core at 89, difficulty removing core barrel due to hard material	
95		Box 18 Box 19	9	SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - very dk gray 7.5YR3/4, 70% sand, 15% rnd f-m gravel, 15% clay and silt, wet  - dark gray/brn silty sand, becomes hard with 10-15% clay and silt fines - becomes reddish brn 5YR4/4 by 95 ft - 87% sand, 10% gravel, 3% fines		
100				SW	<b>WELL GRADED SAND WITH SILT AND GRAVEL (SW)</b> - weak red 10YR4/4, 70% sand, 15% silt, 15% gravel, medium density <b>CONGLOMERATE (BR)</b> - weak red 10YR4/4, conglomerate consists or 60% subang gravel up to 2.7", 25% subang sand, 15% silty fines, hard, dry.	possible reworked Miocene Conglomerate Top Miocene Conglomerate 98 ft	
105		Box 20 Box 21	8.1			sample collected at 16:40: MW-34D-GS-102	

SHEET 4 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-34	
<b>SOIL BORING LOG</b>							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 116.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 458.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,530.55		EASTING (CCS NAD 27 Z 5): 7,616,452.40		DATE STARTED: 01/27/2005	
DATE COMPLETED: 01/29/2005		DRILLING METHOD: Rotosonic		WATER LEVEL (ft):		DRILLING EQUIPMENT: Track Mounted Sonic	
LOCATION: Adjacent to MW-34-55 on Colorado River floodplain.						LOGGED BY: B. Moayyad, T. McDonald	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
110		Box 22	9	BR	<b>CONGLOMERATE (BR)</b> - weak red 10YR4/4, conglomerate consists or 60% subang gravel up to 2.7", 25% subang sand, 15% silty fines, hard, dry.  - carbonate cement evident, weak to moderate induration	- core is shattered by vibration and is moist due to injected water, otherwise dry   no bag sample taken	
115					Boring Terminated at 116 ft  <b>ABBREVIATIONS</b> cc = continuous core run brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz		



**CH2MHILL**

SHEET 1 of 3				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-42	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 81.2		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,296.95		EASTING (CCS NAD 27 Z 5): 7,616,274.95		DATE STARTED: 02/01/2005	
						DATE COMPLETED: 7:00:00 AM	
DRILLING METHOD: Rotasonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track-Mounted All Terrain Sonic	
LOCATION: Between to MW-27 & MW-20 on Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5		Bag 10	5.6	SP	POORLY GRADED SAND (SP) - lt yellowish brn 10YR6/4, 98% f sand, 2% silt, subang qtz, loose, moist	collect bag samples for archive description and potential grain-size testing. moist from previous rain some compaction of surficial sands	
10					- becomes subrnd by 6 ft, < 10% m sand	take bag sample at 10 ft, @7:50 MW-42D-GS-10	
15		Bag 10 Bag 25	9.5	SP	POORLY GRADED SAND (SP) - dk gray brn, 95% f qtz rich sand, 5% subrnd fines, loose, wet, sulfur smell	saturated zone	
20				SP	POORLY GRADED SAND (SP) - brn 7.5YR5/3, 97% qtz rich sand, 3% subrnd fines, loose, wet		
25		Bag 25 Bag 53	9.5		- occasionally micas, <10% mafics, no gravels		
30					- 98% vf-m sand, 2% fines, rnd to subrnd	take bag sample at 25 ft, @8:15 MW-42D-GS-25  collect groundwater at 27-37 ft	
35		Bag 53	10		POORLY GRADED SAND (SP) - brn 7.5YR5/4, 98% sand, 2% fines, qtz rich sand, subrnd to rnd, loose, wet	soft drilling	


**CH2MHILL**

SHEET 2 of 3				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-42	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 81.2		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,296.95		EASTING (CCS NAD 27 Z 5): 7,616,274.95		DATE STARTED: 02/01/2005	
						DATE COMPLETED: 7:00:00 AM	
DRILLING METHOD: Rotasonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track-Mounted All Terrain Sonic	
LOCATION: Between to MW-27 & MW-20 on Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
					<b>POORLY GRADED SAND (SP)</b> - 95% brn 7.5YR5/3, 13% rgs sand, 2% fines, qtz rich sand, subrnd to rnd, loose, wet  - as above, no gravel		
40							
		Bag 53	9	SP	- 95% sand, 2% gravel, <3% fines, subrnd gravel up to 1" long - silty clay lens 2" thick at 43 ft		
45							
					- brn 7.5YR5/2, subrnd to subang with gravel up to 3" long, 62% f sand, 30% m sand, 5% gravel, 3% fines, medium to loose		
50							
		Bag 53 Bag 64	8		- grades to m sand with gravel by 52 ft - brn 7.5YR5/3, 60% m sand, 33% f sand, 5% gravel, 2% fines, subrnd to rnd, qtz rich sand, loose		
55				SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - 88% sand, 10% gravel, 2% fines	collect bag sample at 53 ft @ 9:45	
				SP	<b>POORLY GRADED SAND (SP)</b> - m sand, <2% fines, no gravel	MW-42-GS-53	
60							
		Bag 64	9	SP	<b>POORLY GRADED SAND WITH GRAVEL (SP)</b> - brn, 85% sand, 15% chert and metamorphic gravel, m sand with gravel up to 3" long, medium density, wet  - 15" thick clay lens at 62.5 ft - gravelly zone at 63-64 ft, 60% sand, 38% gravel, 2% fines		
65				SW	<b>WELL GRADED SAND WITH GRAVEL(SW)</b> - brn, 75% sand, 25% v round pebbles 1/2 to 1"	collect bag sample at 64 ft @ 10:45	
				ML	<b>SILT (ML)</b> - strong brn 7.5YR4/6, 70% silt, 30% sand, firm to soft, wet - gravel and cobble zone at 66 to 67 ft, 35% rnd gravel, 65% silt	MW-42D-GS-64	
70				ML	<b>SANDY SILT (ML)</b> - reddish brn 7.5YR4/4, 65% silt, 32% sand, 3% f rnd gravel, massive, firm, wet  - gravelly ML	collect bag sample at 65 ft @ 10:45	
						MW-42D-GS-65	
						Top Miocene Conglomerate at 69.5 ft,	

SHEET 3 of 3				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-42	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 81.2		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 461.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,102,296.95		EASTING (CCS NAD 27 Z 5): 7,616,274.95		DATE STARTED: 02/01/2005	
						DATE COMPLETED: 7:00:00 AM	
DRILLING METHOD: Rotosonic				WATER LEVEL (ft):		DRILLING EQUIPMENT: Track-Mounted All Terrain Sonic	
LOCATION: Between to MW-27 & MW-20 on Colorado River floodplain.						LOGGED BY: B. Moayyad, B. Trebble	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
75			9	BR	CONGLOMERATE (BR) - reddish brn 7.5YR4/4, 65% silt, 32% sand, 3% f rnd gravel, massive, firm, wet	hard drilling	
80			4.2			reddish brn, indurated, cemented, fanglomerate shattered by sonic coring, dry, hard	
					Boring Terminated at 81.2 ft	same shattered fanglomerate	
					<b>ABBREVIATIONS</b> cc = continuous core run brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz		


**CH2MHILL**


SHEET 1 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-43	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 97.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 459.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,824.65		EASTING (CCS NAD 27 Z 5): 7,616,693.23		DATE STARTED:	
DRILLING METHOD:		WATER LEVEL (ft):		DATE COMPLETED:			
LOCATION: Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.				DRILLING EQUIPMENT:			
				LOGGED BY: B. Trebble, T. Lae			
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5			6	SP	POORLY GRADED SAND (SP) - olive yellow 2.5YR6/6, 95% f sand, 5% ang gravel to 4 ft, subrnd, loose, damp, trace organics	collect bag samples for archive description and potential grain-size testing.	
10		CC1	10		- topsoil organic rich		
15					- 100% subrnd f sand	saturated below 10 ft	
20		CC2	10		- trace organics to ~16 ft	at 10:00 collect MW43(USGS, PW, RESP)-12	
25					- olive yellow 2.5YR6/6, 100% f sand, saturated	at 10:05 collect MW43(USGS, PW, RESP)-20	
30		CC3	11			at 10:45 collect MW43-24.5 (hex chrome)	
35					at 11:00 collect MW43(USGS, PW, RESP)-30		

SHEET 2 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-43	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 97.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 459.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,824.65		EASTING (CCS NAD 27 Z 5): 7,616,693.23		DATE STARTED:	
DRILLING METHOD:		WATER LEVEL (ft):		DATE COMPLETED:			
LOCATION: Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.				DRILLING EQUIPMENT:			
				LOGGED BY: B. Trebble, T. Lae			
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
40					POORLY GRADED SAND (SP) - olive yellow 2.5YR6/6, 95% f sand, 5% ang gravel to 4 ft, subrnd, loose, damp, trace organics		
45		CC4	10		- lt brn gray 10YR6/2, 70% f sand, 29% m sand, 1% gravel, subrnd to subang	at 11:15 collect MW43(USGS, PW, RESP)-40	
50					- olive yellow, 100% sand, subrnd		
55		CC5	10		- 99% sand, 1% fines	at 11:40 collect MW43(USGS, PW, RESP)-44.5	
60					- increase in fines to 95%		
65		CC6	10		- 95% sand, subrnd to subang, 1st occurrence of 5% subrnd gravel	at 13:10 collect MW43(USGS, PW, RESP)-50	
70					- start of interspersed coarse gravel, 93% sand, 5% gravel, 2% fines		
				GW	WELL GRADED GRAVEL (GW) - 65% rnd-vrnd gravel up to 2", 33% sand, 2% fines		
				SW	GRAVELLY SAND (SW) - lt yellow brn 2.5YR6/3, 65% subrnd to subang sand, 35% f subrnd to rnd gravel, loose	at 14:00 collect MW43-64.5	
					- 85% f sand, 10% gravel, 5% m sand		



SHEET 3 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-43	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 97.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ	
SURFACE ELEVATION: 459.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,824.65		EASTING (CCS NAD 27 Z 5): 7,616,693.23		DATE STARTED:	
DRILLING METHOD:		WATER LEVEL (ft):		DATE COMPLETED:			
LOCATION: Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.				DRILLING EQUIPMENT:			
				LOGGED BY: B. Trebble, T. Lae			
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
75		CC7	10	SW	<b>GRAVELLY SAND (SW)</b> - lt yellow brn 2.5YR6/3, 65% subrnd to subang sand, 35% f subrnd to rnd gravel, loose  - 65% sand, 35% gravel  - lt brn gray 2.5YR6/2, 83% sand, 15% gravel, 2% fines	at 14:05 collect MW43(USGS, PW, RESP)-70	
80		CC8	10		- 69% sand, 30% gravel, 1% fines	at 14:15 collect MW43(USGS, PW, RESP)-80, GS sample 83'	
85						- 64% sand, 35% gravel, 1% fines	at 15:00 collect MW43-84.5 (hex chrome)
90		CC9	10	BR	<b>CONGLOMERATE (BR)</b> - dk reddish brn 2.5YR3/4, conglomerate consists of 65% sand, 25% fines (silt), 10% gravel, dry, weakly-moderately cemented fanglomerate	Top Miocene Conglomerate at 89 ft at 15:50 collect MW43(USGS, PW, RESP)-90  very hard drilling	
95					Boring Terminated at 97 ft  <b>ABBREVIATIONS</b> cc = continuous core run brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained	at 16:30 collect MW43-94.5 (hex chrome)	

SHEET 4 of 4				PROJECT NUMBER: 326228.IM		BORING NUMBER: MW-43			
SOIL BORING LOG									
PROJECT NAME: PG&E Topock, Interim Measures, Phase 2 (2005)				HOLE DEPTH (ft): 97.0		DRILLING CONTRACTOR: Prosonic Corp. Phoenix, AZ			
SURFACE ELEVATION: 459.9 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,824.65		EASTING (CCS NAD 27 Z 5): 7,616,693.23		DATE STARTED:		DATE COMPLETED:	
DRILLING METHOD:				WATER LEVEL (ft):		DRILLING EQUIPMENT:			
LOCATION: Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.						LOGGED BY: B. Trebble, T. Lae			
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS			
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.			
					vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz				

 CH2MHILL

## Appendix A2

### Monitoring Well Construction Logs

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-27-060

**LOCATION:** Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 02/10/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/11/2005

**LOGGER:** B. Moayyad, B. Trebble

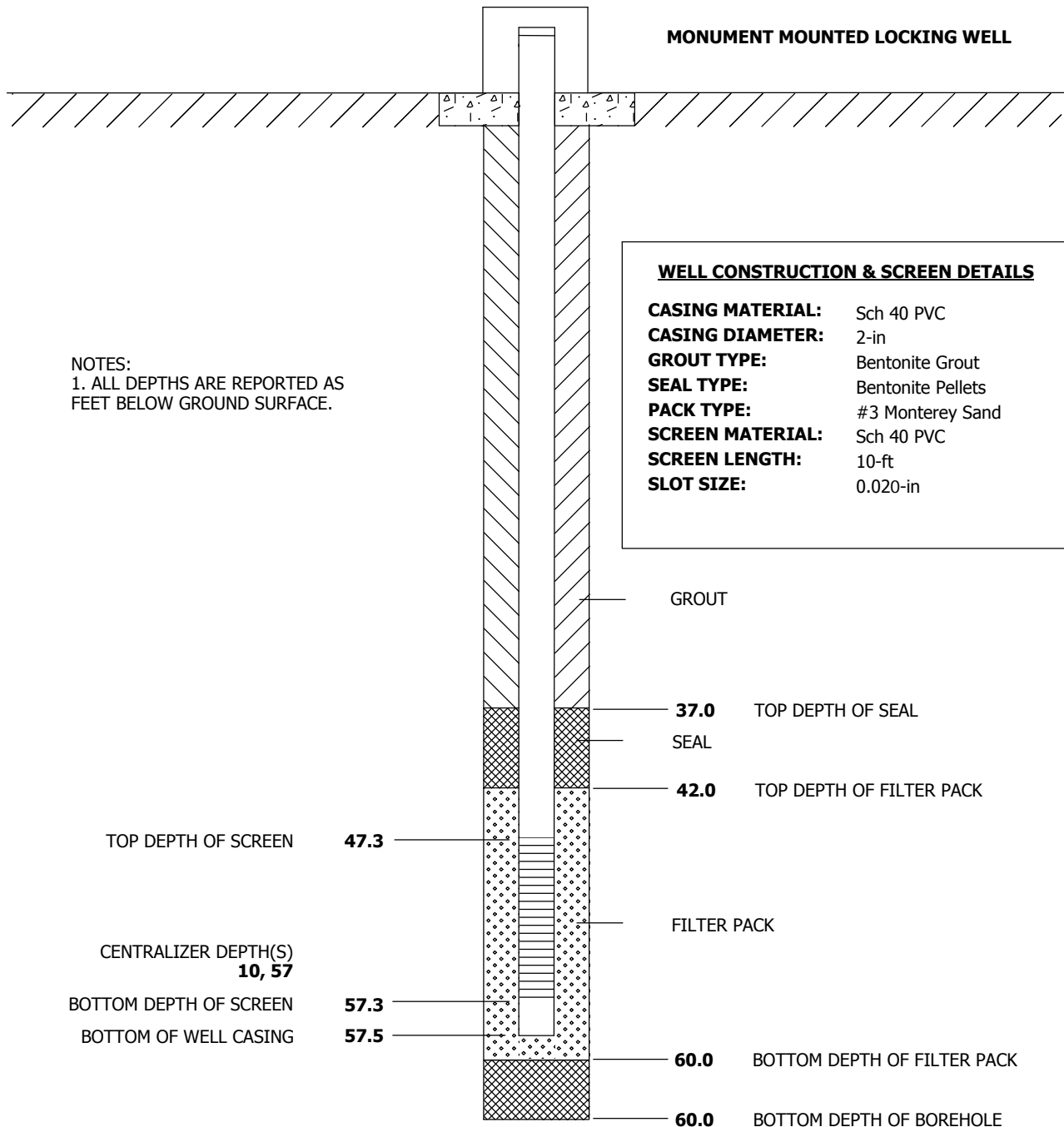
**WELL COMPLETION DATE:** 02/11/2005

**TOP OF WELL CASING (NGVD 29):** 461.38

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2102288.26

**GROUND SURFACE ELEVATION (NGVD 29):** 458.37

**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616534.75



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-27-085

**LOCATION:** Approx 600' southeast of TW-2D, near MW-27, Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 02/09/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/10/2005

**LOGGER:** B. Moayyad, B. Trebble

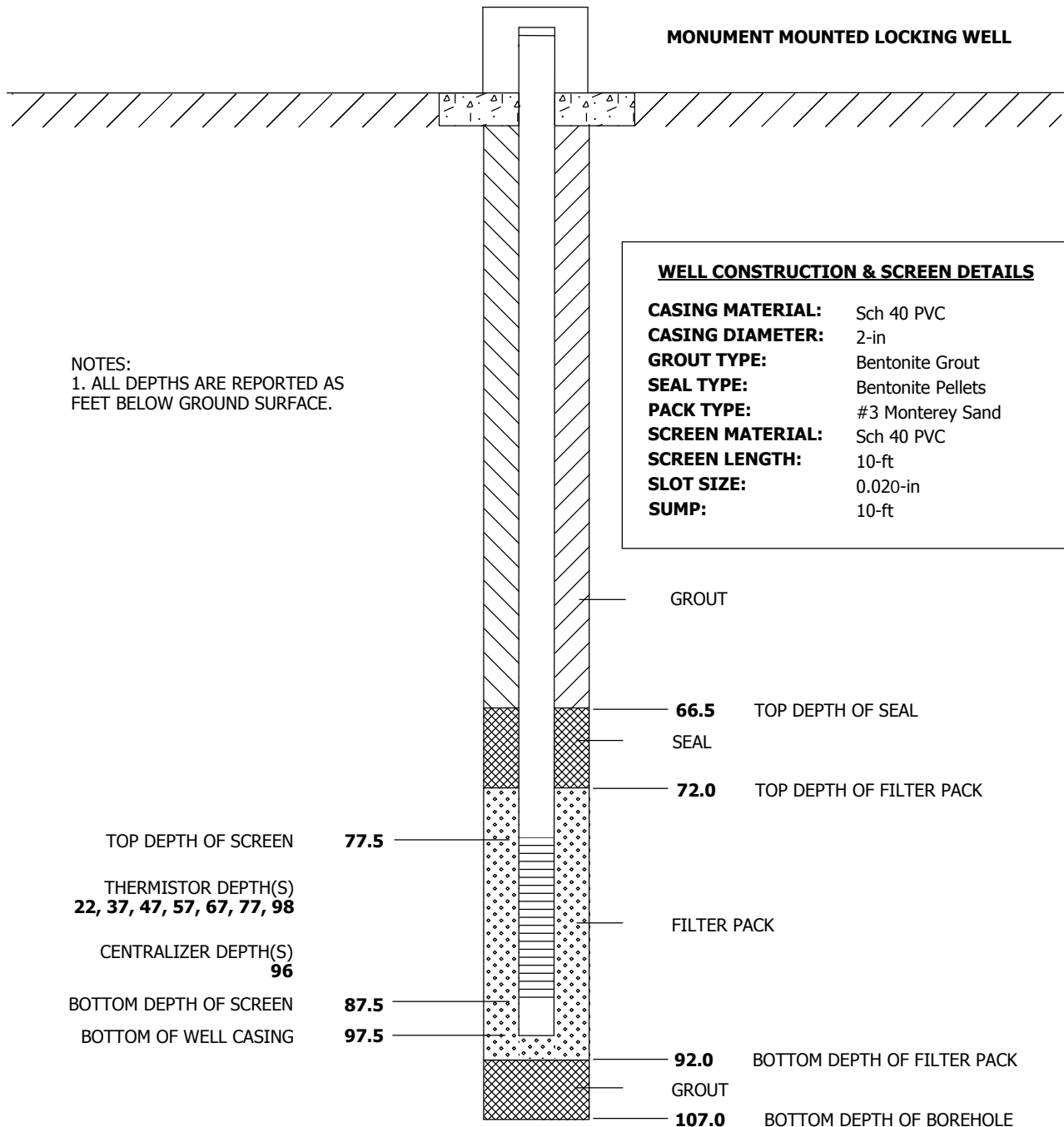
**WELL COMPLETION DATE:** 02/11/2005

**TOP OF WELL CASING (NGVD 29):** 460.99

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2102290.53

**GROUND SURFACE ELEVATION (NGVD 29):** 458.44

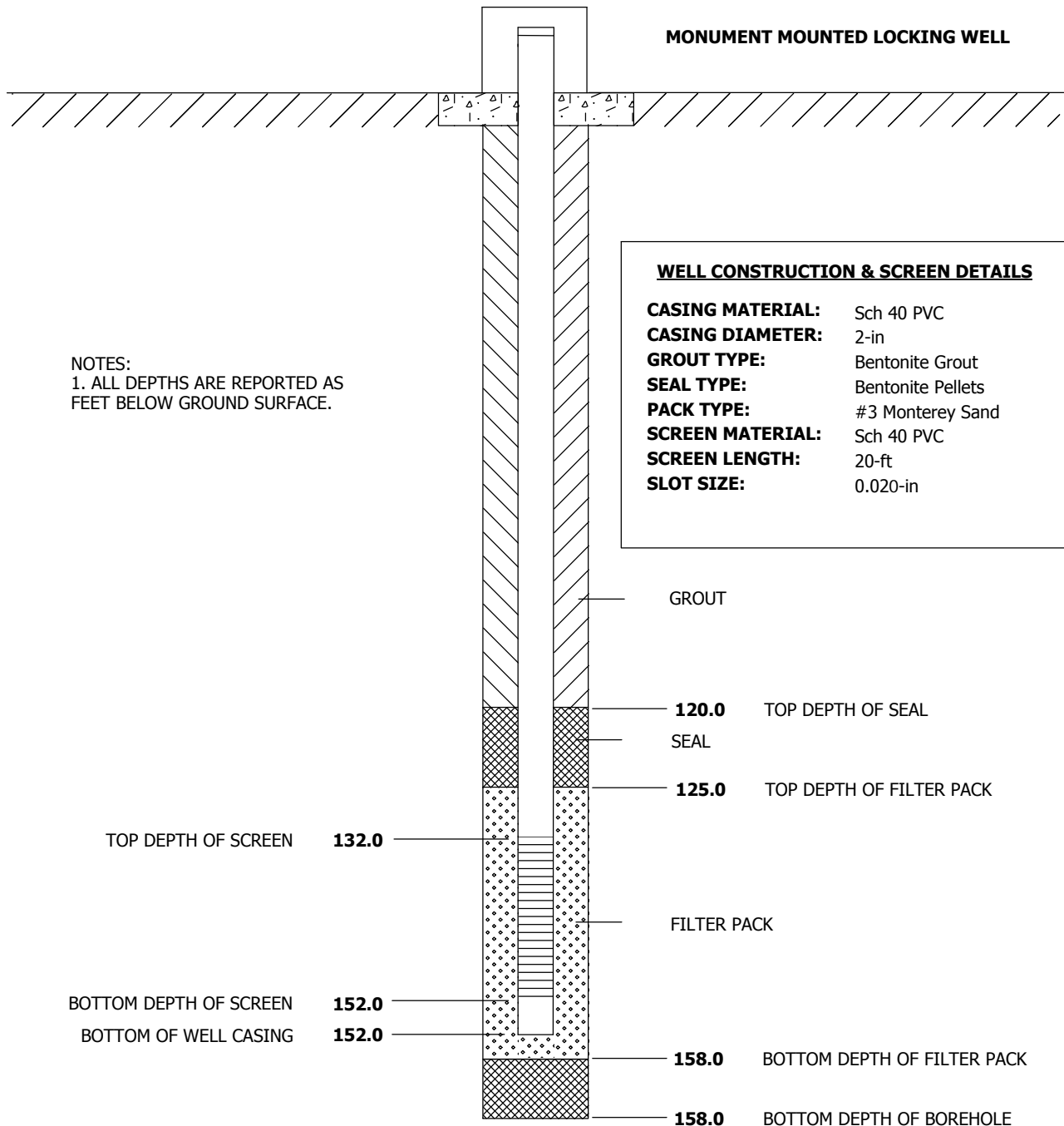
**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616540.35



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

<b>PROJECT NO:</b> 326228.IM	<b>PROJECT:</b> PG&E Topock, Interim Measures, Phase 2 (2005)	<b>WELL NO:</b> MW-33-150
<b>LOCATION:</b> 600 ft NE of TW-2D, Colorado River floodplain.		
<b>DRILLING CONTRACTOR:</b> Prosonic Corp. Phoenix, AZ		<b>DRILLING START DATE:</b> 02/21/2005
<b>DRILLING METHOD:</b> Rotosonic		<b>DRILLING END DATE:</b> 02/22/2005
<b>LOGGER:</b> A. Erickson, T. Lae		<b>WELL COMPLETION DATE:</b> 02/24/2005
<b>TOP OF WELL CASING (NGVD 29):</b> 487.77		<b>NORTHING COORDINATE (CCS DAND 27, ZONE 5):</b> 2103302.58
<b>GROUND SURFACE ELEVATION (NGVD 29):</b> 485.00		<b>EASTING COORDINATE (CCS NAD 27 ZONE 5):</b> 7615906.05



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-33-210

**LOCATION:** 600 ft NE of TW-2D, Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 02/12/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/15/2005

**LOGGER:** B. Moayyad, B. Trebble

**WELL COMPLETION DATE:** 02/16/2005

**TOP OF WELL CASING (NGVD 29):** 487.25

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2103295.06

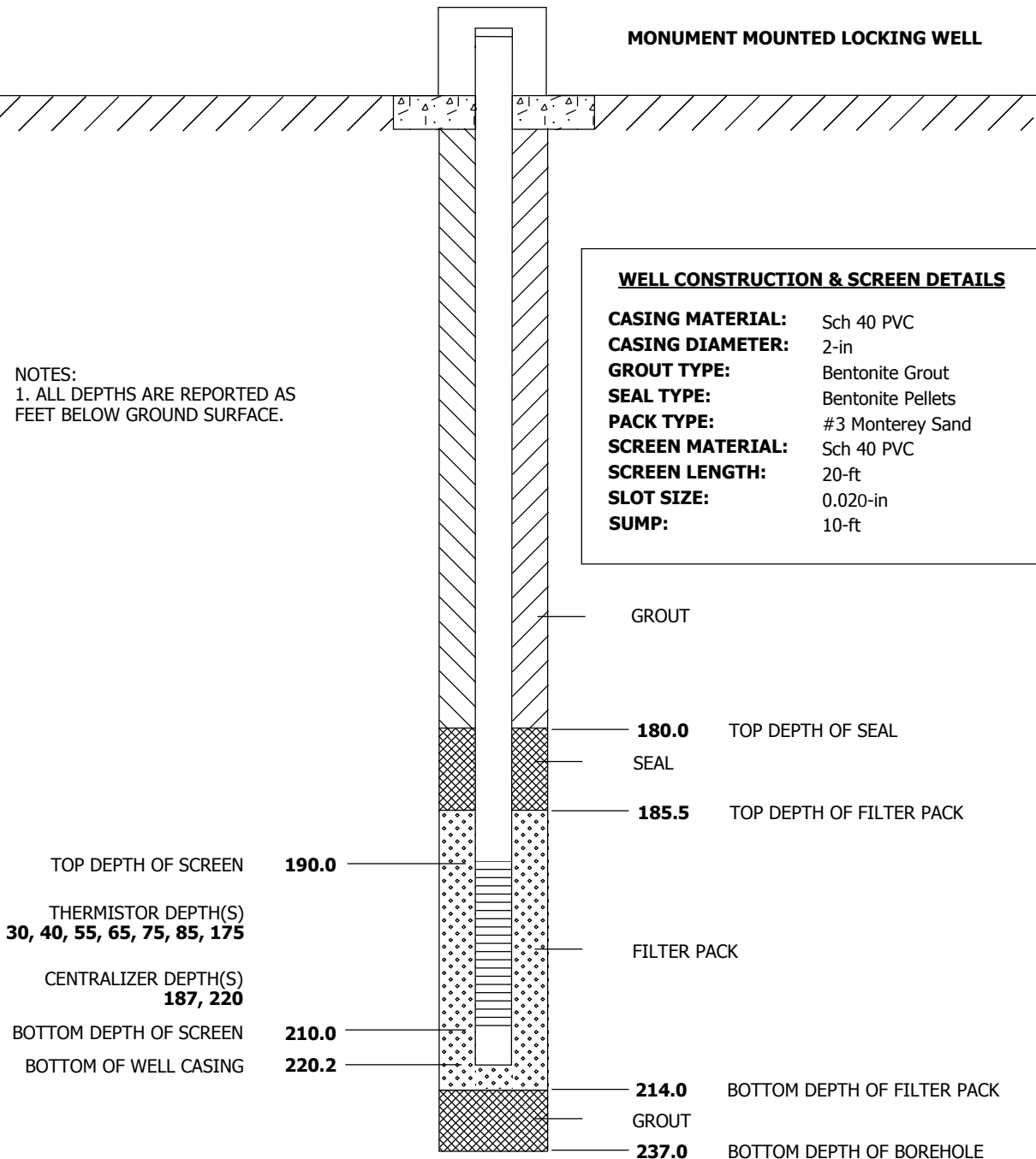
**GROUND SURFACE ELEVATION (NGVD 29):** 484.61

**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7615909.82

NOTES:  
1. ALL DEPTHS ARE REPORTED AS  
FEET BELOW GROUND SURFACE.

## WELL CONSTRUCTION & SCREEN DETAILS

**CASING MATERIAL:** Sch 40 PVC  
**CASING DIAMETER:** 2-in  
**GROUT TYPE:** Bentonite Grout  
**SEAL TYPE:** Bentonite Pellets  
**PACK TYPE:** #3 Monterey Sand  
**SCREEN MATERIAL:** Sch 40 PVC  
**SCREEN LENGTH:** 20-ft  
**SLOT SIZE:** 0.020-in  
**SUMP:** 10-ft



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-34-100

**LOCATION:** Adjacent to MW-34-55 on Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 01/27/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 01/29/2005

**LOGGER:** B. Moayyad, T. McDonald

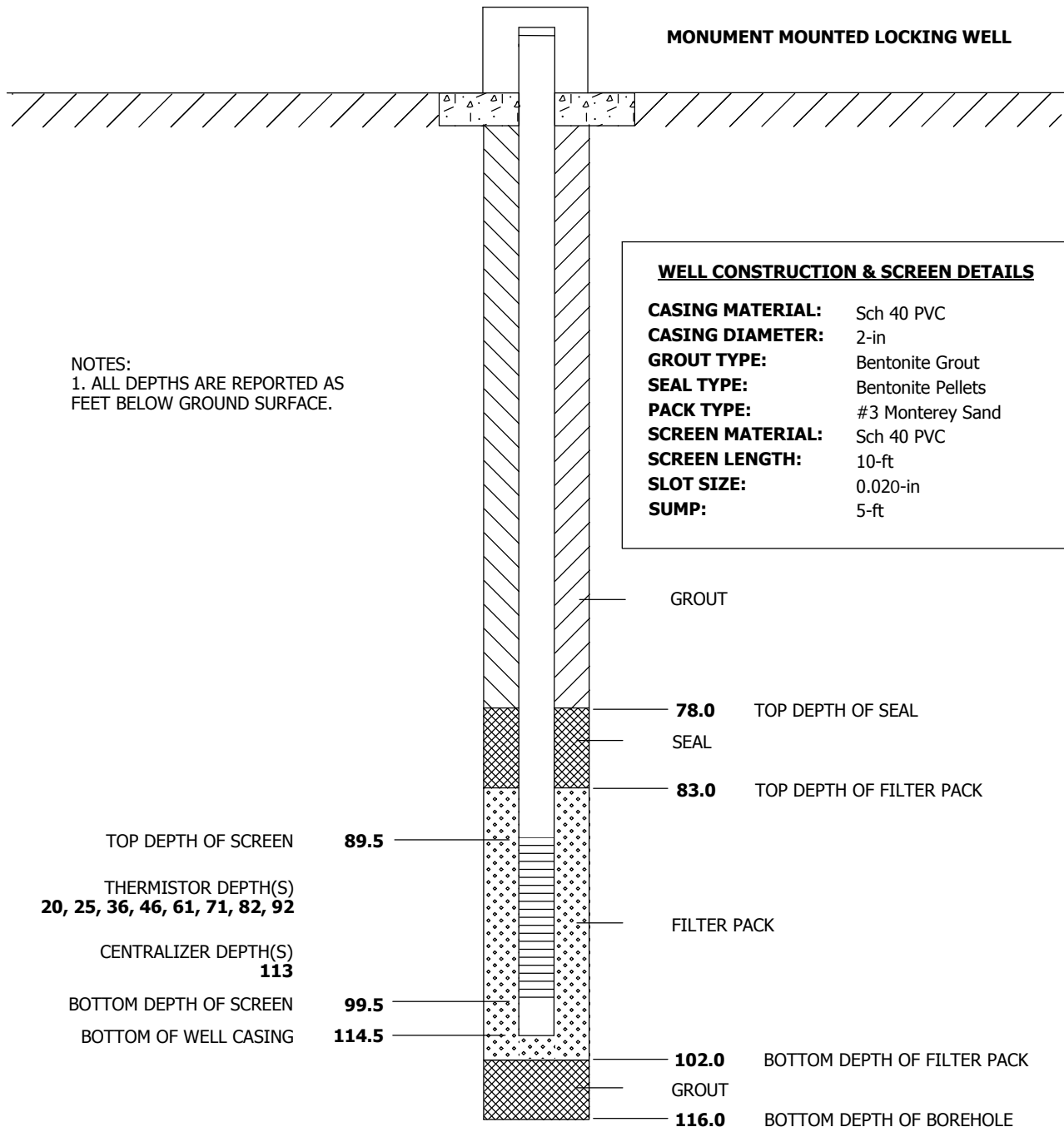
**WELL COMPLETION DATE:** 01/30/2005

**TOP OF WELL CASING (NGVD 29):** 460.97

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2102530.55

**GROUND SURFACE ELEVATION (NGVD 29):** 458.93

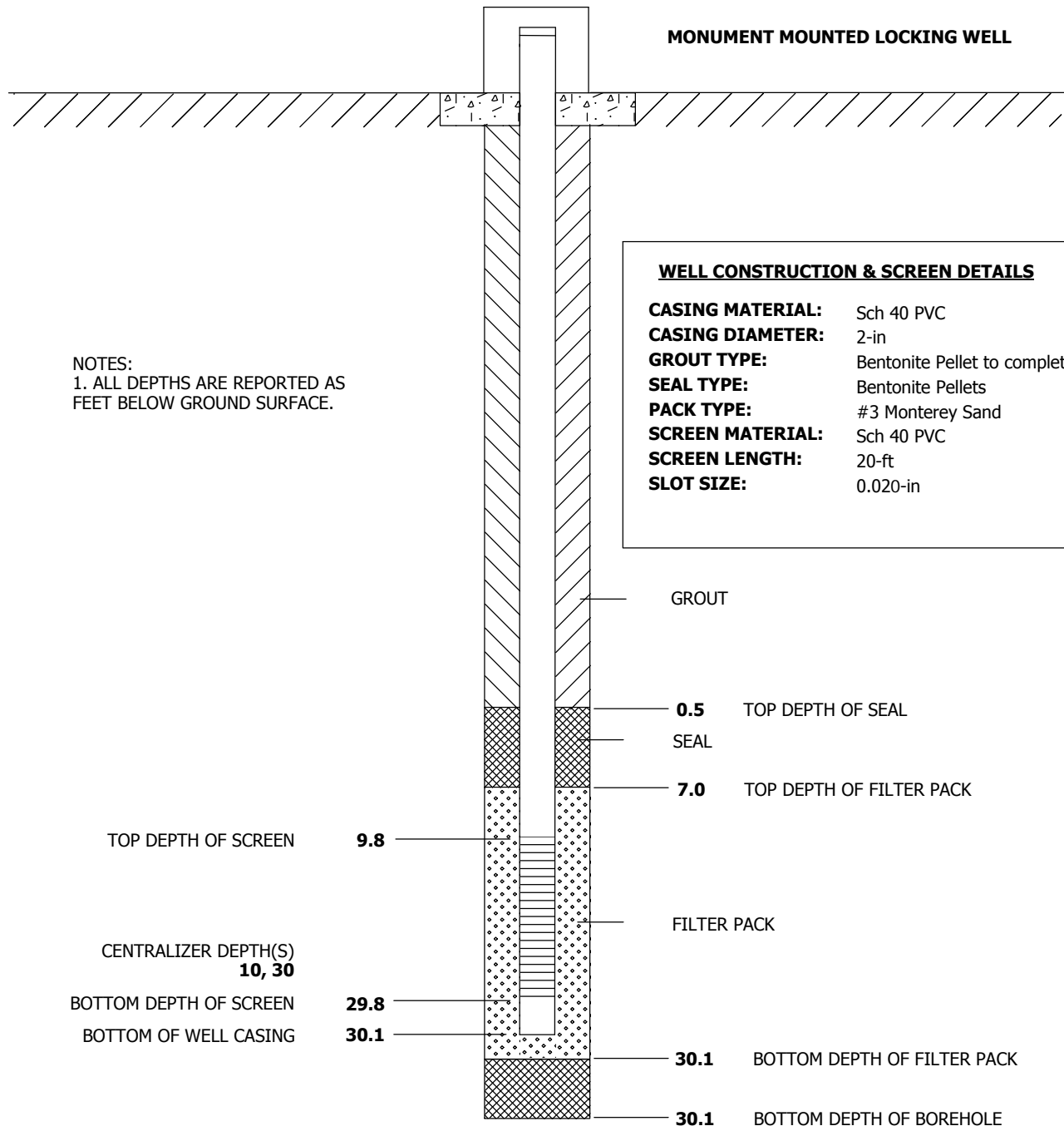
**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616452.40





# WELL COMPLETION DIAGRAM

<b>PROJECT NO:</b> 326228.IM	<b>PROJECT:</b> PG&E Topock, Interim Measures, Phase 2 (2005)	<b>WELL NO:</b> MW-42-030
<b>LOCATION:</b> Between to MW-27 & MW-20 on Colorado River floodplain.		
<b>DRILLING CONTRACTOR:</b> Prosonic Corp. Phoenix, AZ	<b>DRILLING START DATE:</b> 02/01/2005	
<b>DRILLING METHOD:</b> Rotosonic	<b>DRILLING END DATE:</b> 02/01/2005	
<b>LOGGER:</b> B. Moayyad, B. Trebble	<b>WELL COMPLETION DATE:</b> 02/02/2005	
<b>TOP OF WELL CASING (NGVD 29):</b> 463.81	<b>NORTHING COORDINATE (CCS DAND 27, ZONE 5):</b> 2102309.36	
<b>GROUND SURFACE ELEVATION (NGVD 29):</b> 461.40	<b>EASTING COORDINATE (CCS NAD 27 ZONE 5):</b> 7616282.04	



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-42-055

**LOCATION:** Between to MW-27 & MW-20 on Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 02/01/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/01/2005

**LOGGER:** B. Moayyad, B. Trebble

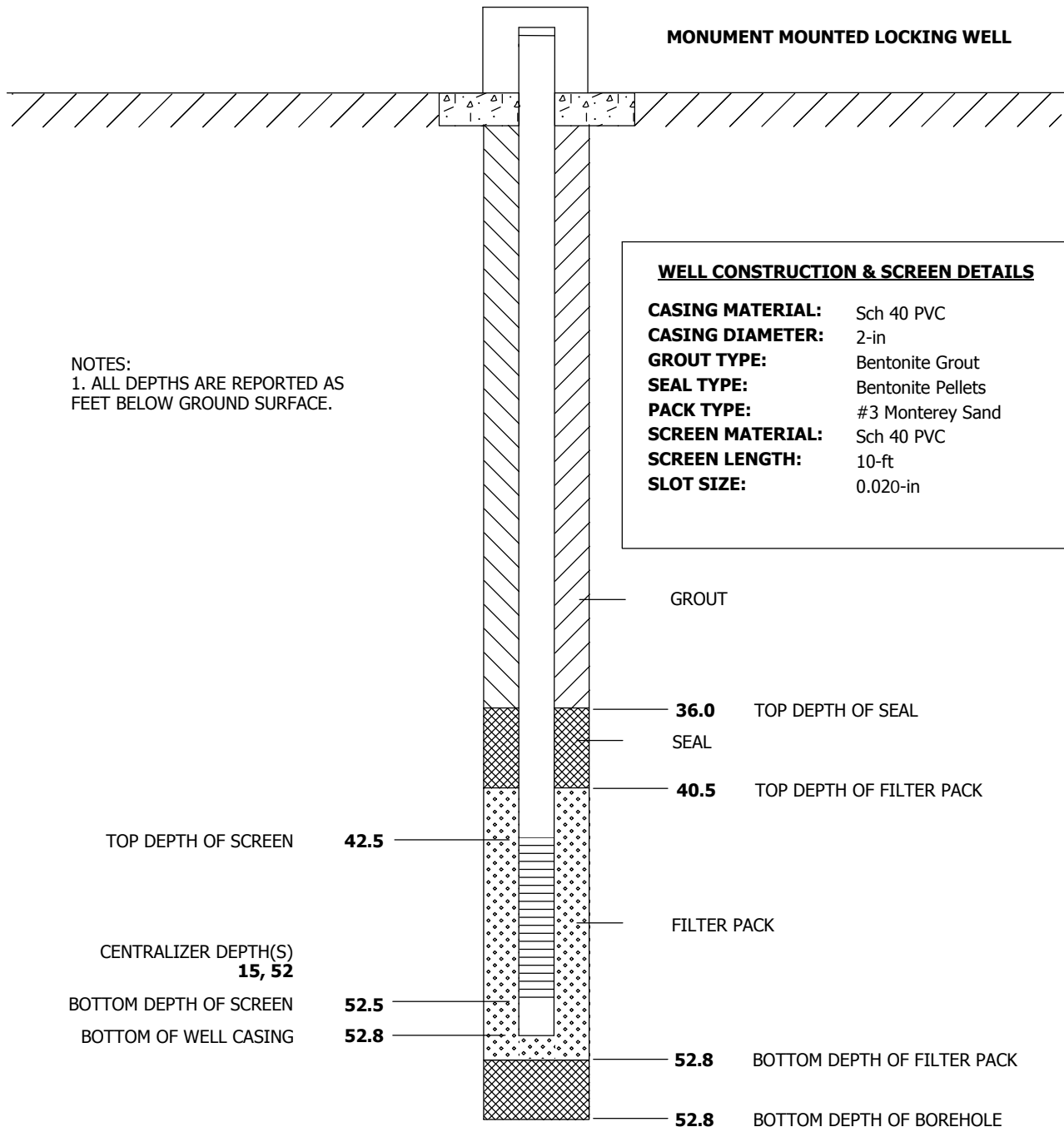
**WELL COMPLETION DATE:** 02/02/2005

**TOP OF WELL CASING (NGVD 29):** 463.87

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2102303.44

**GROUND SURFACE ELEVATION (NGVD 29):** 461.23

**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616278.56



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-42-065

**LOCATION:** Between to MW-27 & MW-20 on Colorado River floodplain.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 01/31/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/01/2005

**LOGGER:** B. Moayyad, B. Trebble

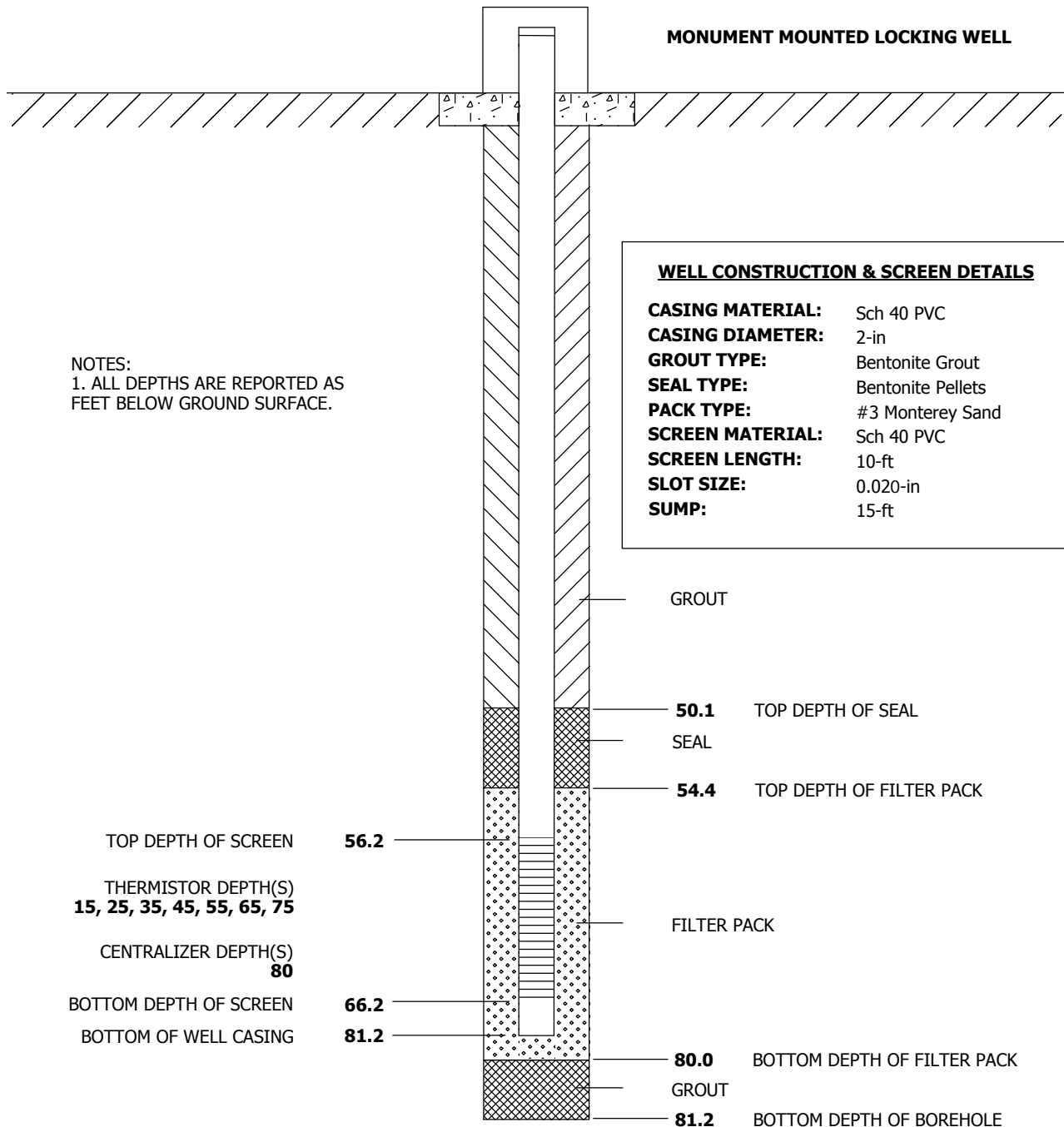
**WELL COMPLETION DATE:** 02/01/2005

**TOP OF WELL CASING (NGVD 29):** 463.37

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2102296.95

**GROUND SURFACE ELEVATION (NGVD 29):** 460.97

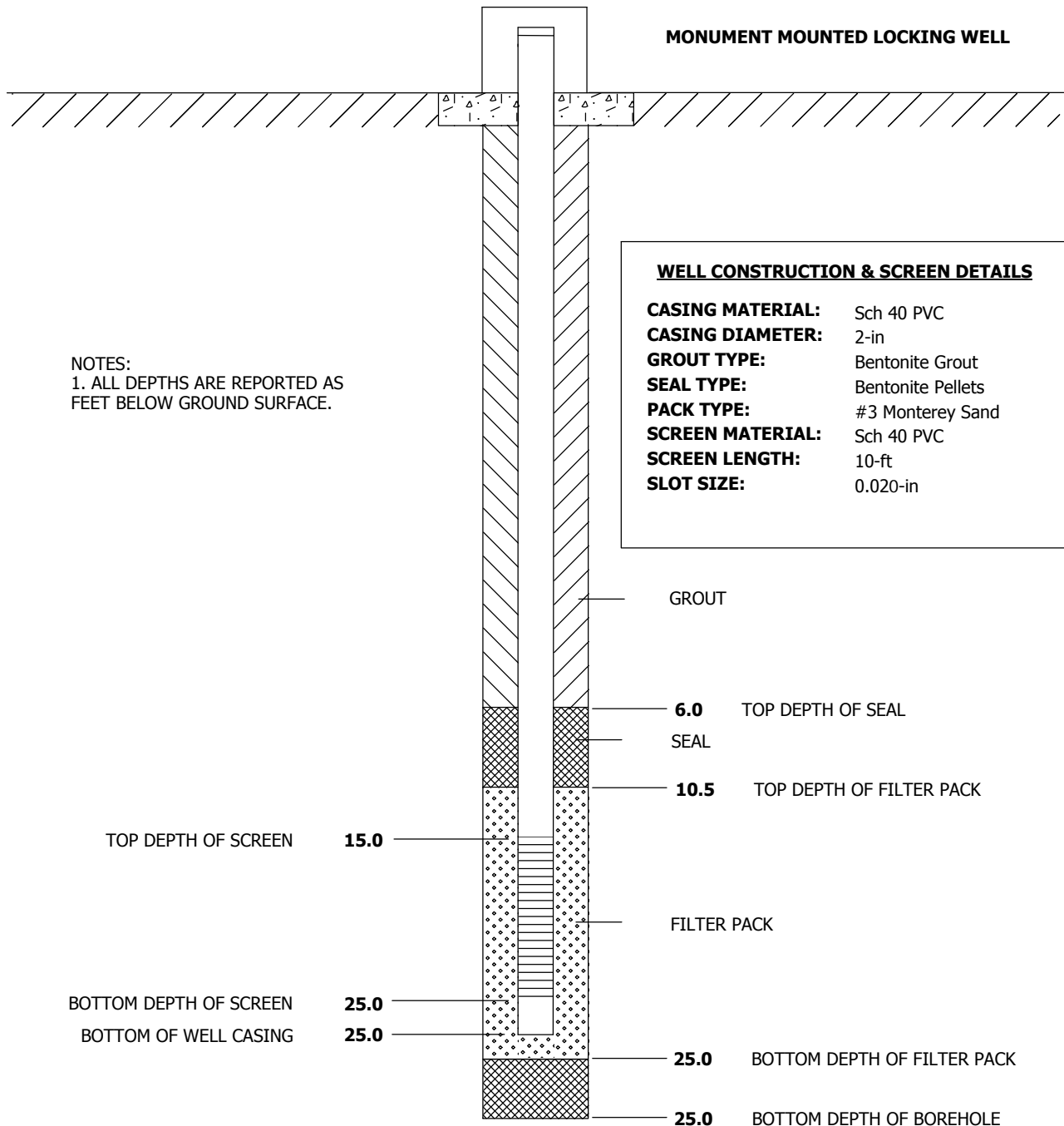
**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616274.95



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

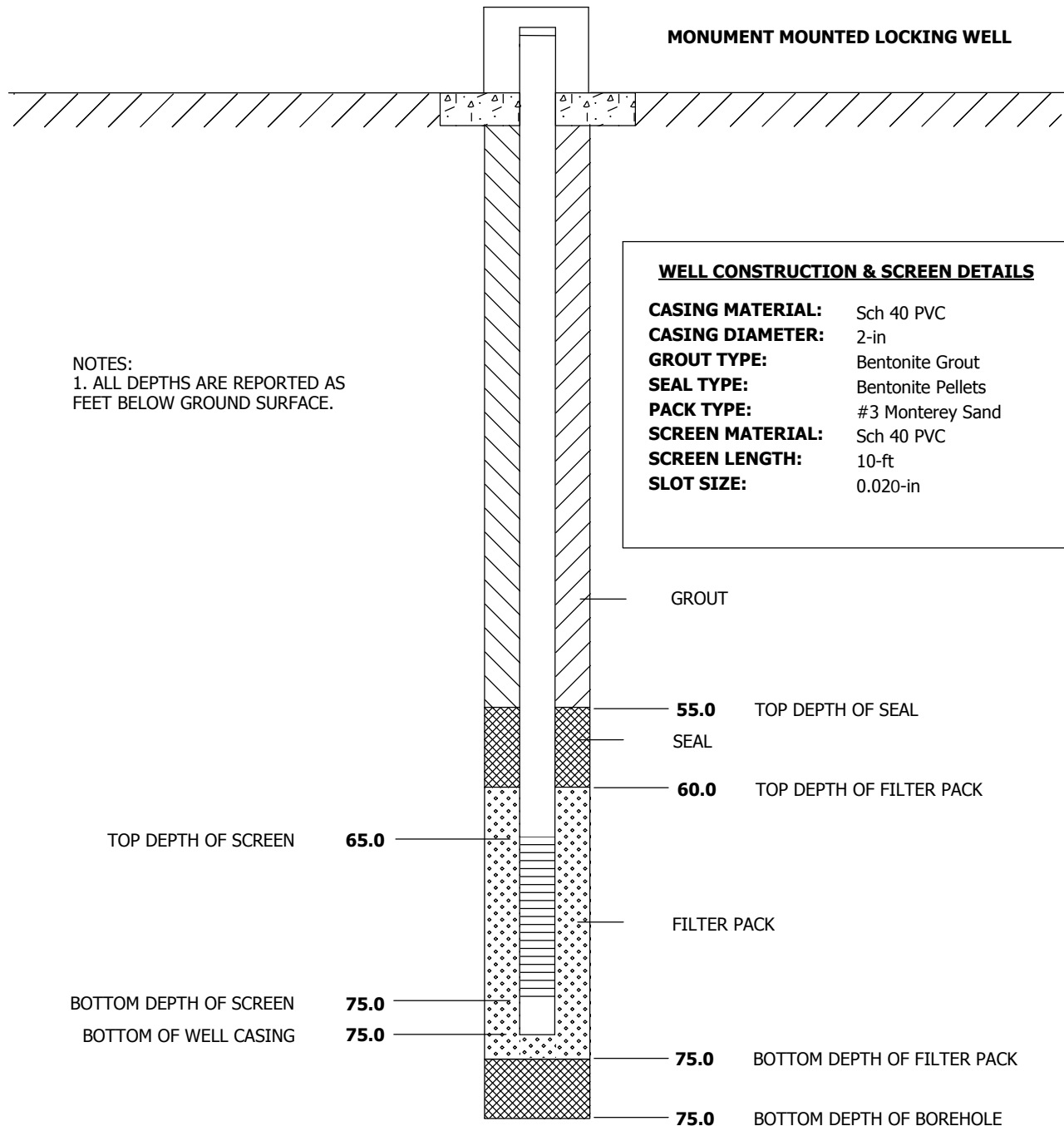
<b>PROJECT NO:</b> 326228.IM	<b>PROJECT:</b> PG&E Topock, Interim Measures, Phase 2 (2005)	<b>WELL NO:</b> MW-43-025
<b>LOCATION:</b> Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.		
<b>DRILLING CONTRACTOR:</b> Prosonic Corp. Phoenix, AZ		<b>DRILLING START DATE:</b> 02/25/2005
<b>DRILLING METHOD:</b> Rotosonic		<b>DRILLING END DATE:</b> 02/25/2005
<b>LOGGER:</b> B. Trebble, T. Lae		<b>WELL COMPLETION DATE:</b> 02/25/2005
<b>TOP OF WELL CASING (NGVD 29):</b> 462.54		<b>NORTHING COORDINATE (CCS DAND 27, ZONE 5):</b> 2101817.50
<b>GROUND SURFACE ELEVATION (NGVD 29):</b> 460.02		<b>EASTING COORDINATE (CCS NAD 27 ZONE 5):</b> 7616702.79



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

<b>PROJECT NO:</b> 326228.IM	<b>PROJECT:</b> PG&E Topock, Interim Measures, Phase 2 (2005)	<b>WELL NO:</b> MW-43-075
<b>LOCATION:</b> Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.		
<b>DRILLING CONTRACTOR:</b> Prosonic Corp. Phoenix, AZ		<b>DRILLING START DATE:</b> 02/25/2005
<b>DRILLING METHOD:</b> Rotosonic		<b>DRILLING END DATE:</b> 02/25/2005
<b>LOGGER:</b> B. Trebble, T. Lae		<b>WELL COMPLETION DATE:</b> 02/25/2005
<b>TOP OF WELL CASING (NGVD 29):</b> 462.71		<b>NORTHING COORDINATE (CCS DAND 27, ZONE 5):</b> 2101821.29
<b>GROUND SURFACE ELEVATION (NGVD 29):</b> 459.92		<b>EASTING COORDINATE (CCS NAD 27 ZONE 5):</b> 7616698.13



WELL DIAGRAM IS NOT TO SCALE

# WELL COMPLETION DIAGRAM

**PROJECT NO:** 326228.IM

**PROJECT:** PG&E Topock, Interim Measures, Phase 2 (2005)

**WELL NO:** MW-43-090

**LOCATION:** Floodplain, N. side of 1-40 bridge ROW, 1/4 mi SE of MW-20 Bench.

**DRILLING CONTRACTOR:** Prosonic Corp. Phoenix, AZ

**DRILLING START DATE:** 02/23/2005

**DRILLING METHOD:** Rotosonic

**DRILLING END DATE:** 02/23/2005

**LOGGER:** B. Trebble, T. Lae

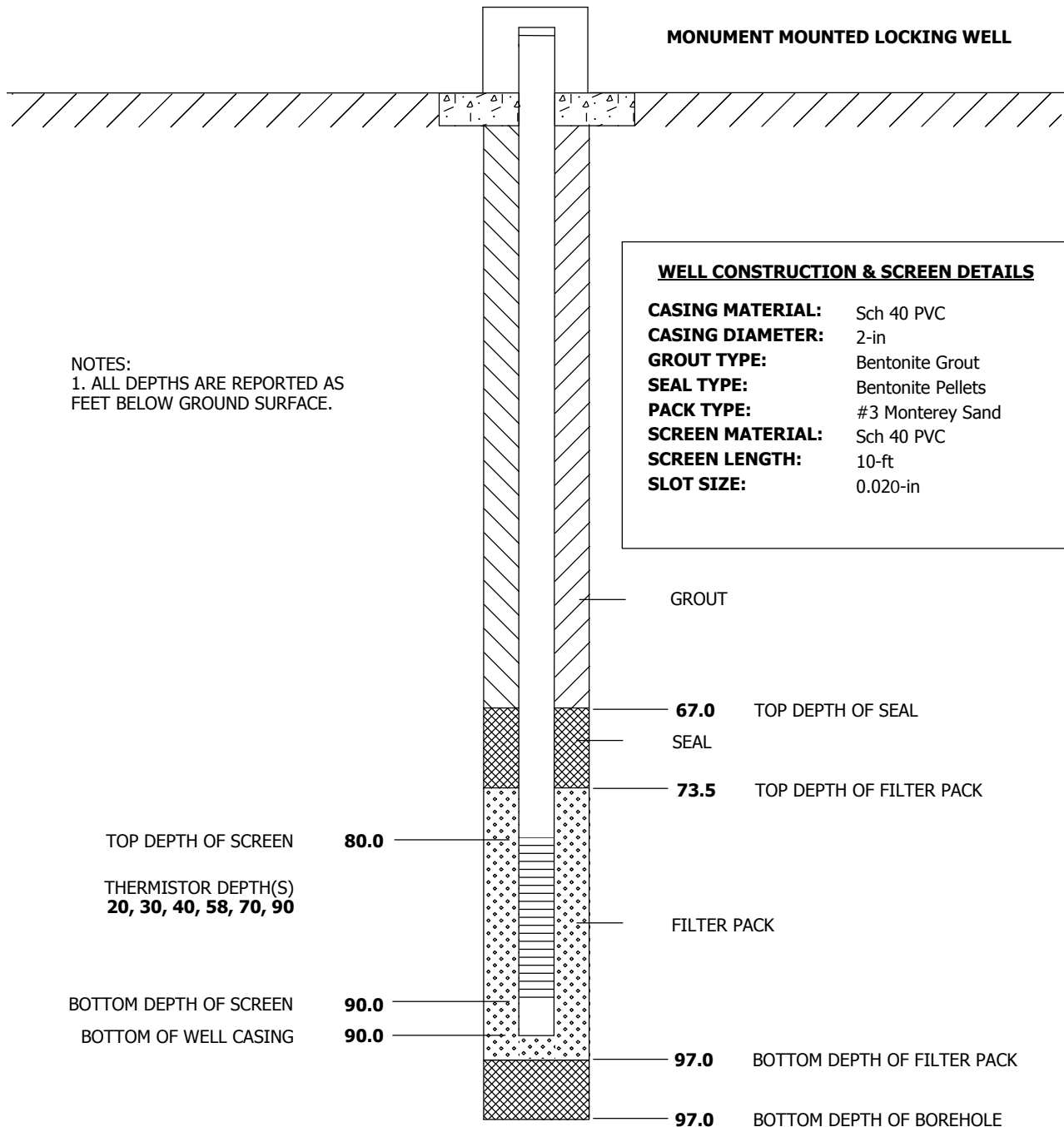
**WELL COMPLETION DATE:** 02/24/2005

**TOP OF WELL CASING (NGVD 29):** 462.76

**NORTHING COORDINATE (CCS DAND 27, ZONE 5):** 2101824.65

**GROUND SURFACE ELEVATION (NGVD 29):** 459.94

**EASTING COORDINATE (CCS NAD 27 ZONE 5):** 7616693.23



WELL DIAGRAM IS NOT TO SCALE

**TABLE A-1**

Well Survey Report

IM Phase 2 Monitoring Well Installation Report

PG&amp;E Topock Compressor Station

Station ID	Northing feet	Easting feet	Top of PVC Elevation feet MSL	Top of Steel Casing Elevation feet MSL	Concrete Pad Elevation feet MSL	Ground Elevation feet MSL
<b>New IM Phase 2 Monitoring and Extraction Wells</b>						
MW-27-060	2,102,288.26*	7,616,534.75*	461.37*	---	---	458.37
MW-27-085	2,102,290.53*	7,616,540.34*	460.99*	---	---	458.44
MW-33-150	2,103,302.58	7,615,906.05	487.77	488.11*	485.36*	485.00
MW-33-210	2,103,295.06	7,615,909.82	487.25	487.66	485.09	484.61
MW-34-100	2,102,530.55	7,616,452.40	460.97	461.22	459.2*	458.93*
MW-42-030	2,102,309.36	7,616,282.04	463.81	464.33	461.7*	461.4*
MW-42-055	2,102,303.44	7,616,278.56	463.87	464.39	461.5*	461.23*
MW-42-065	2,102,296.95	7,616,274.95	463.37	463.88	461.3*	460.97*
MW-43-025	2,101,817.50	7,616,702.79	462.54	462.95	460.28	460.02
MW-43-075	2,101,821.29	7,616,698.13	462.71	463.11	460.21	459.92
MW-43-090	2,101,824.65	7,616,693.23	462.76	463.11	460.16	459.94
PE-01	2,102,550.25	7,616,345.31	469.65	---	---	467.02
PE1A_GRD	2,102,326.16	7,616,405.15	---	---	---	461.23
PE1B_GRD	2,102,210.36	7,616,424.89	---	---	---	458.64
<b>Previously Installed Floodplain Monitoring Wells re-surveyed 2005</b>						
MW-28-090	2,103,005.99	7,616,289.60	467.51	467.81	465.49	464.80
MW-33-040	2,103,280.86	7,615,916.43	487.38	487.86	485.01	484.58
MW-33-090	2,103,287.52	7,615,914.60	487.55	487.97	485.17	484.72
MW-34-055	2,102,542.57	7,616,444.52	460.95	461.21	458.84	458.74
MW-34-080	2,102,535.32	7,616,445.08	461.20	461.33	459.02	458.94
MW-36-020	2,102,542.68	7,616,267.10	469.26	469.55*	467.53	466.5*
MW-36-040	2,102,537.29	7,616,267.58	469.61	469.77	467.48	466.74
MW-36-050	2,102,532.27	7,616,267.47	469.60	469.77	467.52	466.83
MW-36-070	2,102,542.78	7,616,267.17	469.25	469.54	467.53	466.63
MW-36-090	2,102,537.42	7,616,267.66	469.61	469.77	467.48	466.74
MW-36-100	2,102,532.49	7,616,267.52	469.64	469.77	467.52	466.83

**Notes:**

Well survey conducted 3/8/05 by PG&amp;E. Survey data annotated \* are from initial PG&amp;E survey conducted 2/15/05.

All measurements are on northerly side and are a black mark with red paint dot. (---) denotes not applicable

Surveys used the following datums:

Coordinates are CCS NAD 83, Zone 5, 1991.35 Epoch, based on values found on NGS data sheets EU1248 and EU0763.

Elevations in feet above mean sea level (MSL) are NAVD 88, based on values found on NGS data sheet EU0763.

PE-1A and PE-2A borings were surveyed on stake at boring location (no well installed)

Appendix B  
Sampling Information for IM Phase 2  
Investigation



Appendix B1  
IM Core Sample Collection Inventory

**TABLE B-1****Core Sample Collection Inventory**

Interim Measures Phase 2 Drilling Investigation, January - February 2005

PG&amp;E Topock Compressor Station, Needles, California

Location ID	Sample Type	Sample ID	Sample Date	Sample Depth (ft bgs)	Preservation Method	Sample Custodian
MW-27-85	Pore Water/Preserved Core	MW27D-PW-10	9-Feb-05	10	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-20	9-Feb-05	20	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-30	9-Feb-05	30	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-40	9-Feb-05	40	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-50	9-Feb-05	50	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-60	9-Feb-05	60	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-70	10-Feb-05	70	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Pore Water/Preserved Core	MW27D-PW-80	10-Feb-05	80	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-27-85	Log Archive (grain size)	MW27D-GS-10	9-Feb-05	10	Aerobic (plastic)	CH2M HILL
MW-27-85	Log Archive (grain size)	MW27D-GS-35	9-Feb-05	35	Aerobic (plastic)	CH2M HILL
MW-27-85	Log Archive (grain size)	MW27D-GS-50	9-Feb-05	50	Aerobic (plastic)	CH2M HILL
MW-27-85	Log Archive (grain size)	MW27D-GS-56	9-Feb-05	56	Aerobic (plastic)	CH2M HILL
MW-27-85	Log Archive (grain size)	MW27D-GS-77	10-Feb-05	77	Aerobic (plastic)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-10N	9-Feb-05	10	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-20N	9-Feb-05	20	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-30N	9-Feb-05	30	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-40N	9-Feb-05	40	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-50N	9-Feb-05	50	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-60N	9-Feb-05	60	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-70N	10-Feb-05	70	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Anaerobic Preserved Core	MW27D-Anaerobic Preserved Core-80N	10-Feb-05	80	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-27-85	Pollen	MW27D-USGS-10	9-Feb-05	10	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-20	9-Feb-05	20	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-30	9-Feb-05	30	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-40	9-Feb-05	40	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-50	9-Feb-05	50	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-60	9-Feb-05	60	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-70	10-Feb-05	70	Aerobic (plastic)	USGS
MW-27-85	Pollen	MW27D-USGS-80	10-Feb-05	80	Aerobic (plastic)	USGS
MW-33-210	Pore Water/Preserved Core	MW33D-PW-10	12-Feb-05	10	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-20	12-Feb-05	20	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-30	12-Feb-05	30	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-40	12-Feb-05	40	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-50	12-Feb-05	50	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-60	12-Feb-05	60	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-70	12-Feb-05	70	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-80	13-Feb-05	80	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-90	13-Feb-05	90	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-100	13-Feb-05	100	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-110	13-Feb-05	110	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-120	13-Feb-05	120	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-130	13-Feb-05	130	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-140	13-Feb-05	140	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-150	13-Feb-05	150	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-160	14-Feb-05	160	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-170	14-Feb-05	170	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-180	14-Feb-05	180	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-190	14-Feb-05	190	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-200	14-Feb-05	200	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-210	14-Feb-05	210	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-33-210	Pore Water/Preserved Core	MW33D-PW-220	14-Feb-05	220	Aerobic (plastic, Protectacore, refig.)	CH2M HILL

**TABLE B-1****Core Sample Collection Inventory**

Interim Measures Phase 2 Drilling Investigation, January - February 2005

PG&amp;E Topock Compressor Station, Needles, California

Location ID	Sample Type	Sample ID	Sample Date	Sample Depth (ft bgs)	Preservation Method	Sample Custodian
MW-33-210	Log Archive (grain size)	MW33D-GS-35	12-Feb-05	35	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-39	12-Feb-05	39	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-53	12-Feb-05	53	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-63	12-Feb-05	63	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-88.5	13-Feb-05	88.5	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-98	13-Feb-05	98	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-130	13-Feb-05	130	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-155	13-Feb-05	155	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-160	14-Feb-05	160	Aerobic (plastic)	CH2M HILL
MW-33-210	Log Archive (grain size)	MW33D-GS-196	14-Feb-05	196	Aerobic (plastic)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-10N	12-Feb-05	10	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-20N	12-Feb-05	20	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-30N	12-Feb-05	30	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-40N	12-Feb-05	40	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-50N	12-Feb-05	50	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-60N	12-Feb-05	60	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-70N	12-Feb-05	70	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-80N	13-Feb-05	80	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-90N	13-Feb-05	90	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-100N	13-Feb-05	100	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-110N	13-Feb-05	110	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-120N	13-Feb-05	120	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-130N	13-Feb-05	130	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-140N	13-Feb-05	140	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-150N	13-Feb-05	150	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-160N	14-Feb-05	160	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-170N	14-Feb-05	170	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-180N	14-Feb-05	180	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-190N	14-Feb-05	190	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-200N	14-Feb-05	200	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-210N	14-Feb-05	210	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Anaerobic Preserved Core	MW33D-Anaerobic Preserved Core-220N	14-Feb-05	220	Anaerobic (N2, plastic, foil, refriger.)	CH2M HILL
MW-33-210	Pollen	MW33D-USGS-10	12-Feb-05	10	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-20	12-Feb-05	20	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-30	12-Feb-05	30	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-40	12-Feb-05	40	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-50	12-Feb-05	50	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-60	12-Feb-05	60	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-70	12-Feb-05	70	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-80	13-Feb-05	80	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-90	13-Feb-05	90	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-100	13-Feb-05	100	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-110	13-Feb-05	110	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-120	13-Feb-05	120	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-130	13-Feb-05	130	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-140	13-Feb-05	140	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-150	13-Feb-05	150	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-160	14-Feb-05	160	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-170	14-Feb-05	170	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-180	14-Feb-05	180	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-190	14-Feb-05	190	Aerobic (plastic)	USGS

**TABLE B-1****Core Sample Collection Inventory**

Interim Measures Phase 2 Drilling Investigation, January - February 2005

PG&amp;E Topock Compressor Station, Needles, California

Location ID	Sample Type	Sample ID	Sample Date	Sample Depth (ft bgs)	Preservation Method	Sample Custodian
MW-33-210	Pollen	MW33D-USGS-200	14-Feb-05	200	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-210	14-Feb-05	210	Aerobic (plastic)	USGS
MW-33-210	Pollen	MW33D-USGS-220	14-Feb-05	220	Aerobic (plastic)	USGS
MW-34-100	Pore Water/Preserved Core	MW34D-PW-40	28-Jan-05	40	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-50	28-Jan-05	50	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-63	28-Jan-05	63	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-70	28-Jan-05	70	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-80	28-Jan-05	80	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-90	28-Jan-05	90	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-100	28-Jan-05	100	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-34-100	Pore Water/Preserved Core	MW34D-PW-110	29-Jan-05	110	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-43	28-Jan-05	43	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-50	28-Jan-05	50	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-65	28-Jan-05	65	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-73	28-Jan-05	73	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-80	28-Jan-05	80	Aerobic (plastic)	CH2M HILL
MW-34-100	Log Archive (grain size)	MW34D-GS-102	28-Jan-05	102	Aerobic (plastic)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-40N	28-Jan-05	40	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-50N	28-Jan-05	50	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-63N	28-Jan-05	63	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-70N	28-Jan-05	70	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-80N	28-Jan-05	80	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-90N	28-Jan-05	90	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-100N	28-Jan-05	100	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-110N	29-Jan-05	110	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-34-100	Pollen	MW34D-USGS-40N	28-Jan-05	40	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-50N	28-Jan-05	50	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-63N	28-Jan-05	63	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-70N	28-Jan-05	70	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-80N	28-Jan-05	80	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-90N	28-Jan-05	90	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-100N	28-Jan-05	100	Aerobic (plastic)	USGS
MW-34-100	Pollen	MW34D-USGS-110N	29-Jan-05	110	Aerobic (plastic)	USGS
MW-34-100	Wood - C <sup>14</sup>	MW34D-RC-67	28-Jan-05	67	Aerobic (plastic)	USGS
MW-34-100	Wood - C <sup>14</sup>	MW34D-RC-70	28-Jan-05	70	Aerobic (plastic)	USGS
MW-42-65	Pore Water/Preserved Core	MW42D-PW-20	31-Jan-05	20	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-30	31-Jan-05	30	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-40	31-Jan-05	40	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-50	31-Jan-05	50	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-60	31-Jan-05	60	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-70	31-Jan-05	70	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Pore Water/Preserved Core	MW42D-PW-80	31-Jan-05	80	Aerobic (plastic, Protectacore, refig.)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW42D-GS-10	31-Jan-05	10	Aerobic (plastic)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW34D-GS-25	31-Jan-05	25	Aerobic (plastic)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW34D-GS-53	31-Jan-05	53	Aerobic (plastic)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW34D-GS-60	31-Jan-05	60	Aerobic (plastic)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW34D-GS-64	31-Jan-05	64	Aerobic (plastic)	CH2M HILL
MW-42-65	Log Archive (grain size)	MW34D-GS-65	31-Jan-05	65	Aerobic (plastic)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-10	31-Jan-05	10	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-20	31-Jan-05	20	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-30	31-Jan-05	30	Anaerobic (N2, plastic, foil, refig.)	CH2M HILL

**TABLE B-1****Core Sample Collection Inventory**

Interim Measures Phase 2 Drilling Investigation, January - February 2005

PG&amp;E Topock Compressor Station, Needles, California

Location ID	Sample Type	Sample ID	Sample Date	Sample Depth (ft bgs)	Preservation Method	Sample Custodian
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-40	31-Jan-05	40	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-50	31-Jan-05	50	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-60	31-Jan-05	60	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-70	31-Jan-05	70	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-42-65	Anaerobic Preserved Core	MW34D-Anaerobic Preserved Core-80	31-Jan-05	80	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-42-65	Pollen	MW34D-USGS-20	31-Jan-05	20	Aerobic (plastic)	USGS
MW-42-65	Pollen	MW34D-USGS-30	31-Jan-05	30	Aerobic (plastic)	USGS
MW-42-65	Pollen	MW34D-USGS-40	31-Jan-05	40	Aerobic (plastic)	USGS
MW-42-65	Pollen	MW34D-USGS-50	31-Jan-05	50	Aerobic (plastic)	USGS
MW-42-65	Pollen	MW34D-USGS-60	31-Jan-05	60	Aerobic (plastic)	USGS
MW-42-65	Pollen	MW34D-USGS-70	31-Jan-05	70	Aerobic (plastic)	USGS
MW-43-90	Pore Water/Preserved Core	MW43-PW-12	23-Feb-05	12	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-20	23-Feb-05	20	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-30	23-Feb-05	30	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-40	23-Feb-05	40	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-50	23-Feb-05	50	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-60	23-Feb-05	60	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-70	23-Feb-05	70	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-80	23-Feb-05	80	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Pore Water/Preserved Core	MW43-PW-90	23-Feb-05	90	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
MW-43-90	Log Archive (grain size)	MW43-GS-20	23-Feb-05	20	Aerobic (plastic)	CH2M HILL
MW-43-90	Log Archive (grain size)	MW43-GS-60	23-Feb-05	60	Aerobic (plastic)	CH2M HILL
MW-43-90	Log Archive (grain size)	MW43-GS-83	23-Feb-05	83	Aerobic (plastic)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-12	23-Feb-05	12	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-20	23-Feb-05	20	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-30	23-Feb-05	30	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-40	23-Feb-05	40	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-50	23-Feb-05	50	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-60	23-Feb-05	60	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-70	23-Feb-05	70	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-80	23-Feb-05	80	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Anaerobic Preserved Core	MW43-Anaerobic Preserved Core-90	23-Feb-05	90	Anaerobic (N2, plastic, foil, refrig.)	CH2M HILL
MW-43-90	Pollen	MW43-USGS-12	23-Feb-05	12	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-20	23-Feb-05	20	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-30	23-Feb-05	30	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-40	23-Feb-05	40	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-50	23-Feb-05	50	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-60	23-Feb-05	60	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-70	23-Feb-05	70	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-80	23-Feb-05	80	Aerobic (plastic)	USGS
MW-43-90	Pollen	MW43-USGS-90	23-Feb-05	90	Aerobic (plastic)	USGS
PE-1	Pore Water/Preserved Core	PE1-PW-10	1-Mar-05	10	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-20	1-Mar-05	20	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-30	1-Mar-05	30	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-40	1-Mar-05	40	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-50	1-Mar-05	50	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-60	1-Mar-05	60	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-70	1-Mar-05	70	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Pore Water/Preserved Core	PE1-PW-80	1-Mar-05	80	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1	Log Archive (grain size)	PE1-GS-20	1-Mar-05	20	Aerobic (plastic)	CH2M HILL
PE-1	Log Archive (grain size)	PE1-GS-60	1-Mar-05	60	Aerobic (plastic)	CH2M HILL

**TABLE B-1****Core Sample Collection Inventory**

Interim Measures Phase 2 Drilling Investigation, January - February 2005

PG&amp;E Topock Compressor Station, Needles, California

Location ID	Sample Type	Sample ID	Sample Date	Sample Depth (ft bgs)	Preservation Method	Sample Custodian
PE-1	Pollen	PE1-USGS-10	1-Mar-05	10	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-20	1-Mar-05	20	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-30	1-Mar-05	30	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-40	1-Mar-05	40	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-50	1-Mar-05	50	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-60	1-Mar-05	60	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-70	1-Mar-05	70	Aerobic (plastic)	USGS
PE-1	Pollen	PE1-USGS-80	1-Mar-05	80	Aerobic (plastic)	USGS
PE-1A	Pore Water/Preserved Core	PE1A-PW-8	28-Feb-05	8	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-20	28-Feb-05	20	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-30	28-Feb-05	30	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-40	28-Feb-05	40	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-50	28-Feb-05	50	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-60	28-Feb-05	60	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-70	28-Feb-05	70	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Pore Water/Preserved Core	PE1A-PW-80	28-Feb-05	80	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1A	Log Archive (grain size)	PE1B-GS-33	28-Feb-05	33	Aerobic (plastic)	CH2M HILL
PE-1A	Log Archive (grain size)	PE1B-GS-63	28-Feb-05	63	Aerobic (plastic)	CH2M HILL
PE-1A	Pollen	PE1A-USGS-8	28-Feb-05	10	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-20	28-Feb-05	20	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-30	28-Feb-05	30	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-40	28-Feb-05	40	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-50	28-Feb-05	50	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-60	28-Feb-05	60	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-70	28-Feb-05	70	Aerobic (plastic)	USGS
PE-1A	Pollen	PE1A-USGS-80	28-Feb-05	80	Aerobic (plastic)	USGS
PE-1B	Pore Water/Preserved Core	PE1B-PW-8	26-Feb-05	8	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-20	26-Feb-05	20	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-30	26-Feb-05	30	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-40	26-Feb-05	40	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-50	27-Feb-05	50	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-60	27-Feb-05	60	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-70	27-Feb-05	70	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Pore Water/Preserved Core	PE1B-PW-80	27-Feb-05	80	Aerobic (plastic, Protectacore, refrig.)	CH2M HILL
PE-1B	Log Archive (grain size)	PE1B-GS-34	26-Feb-05	34	Aerobic (plastic)	CH2M HILL
PE-1B	Log Archive (grain size)	PE1B-GS-58	27-Feb-05	58	Aerobic (plastic)	CH2M HILL
PE-1B	Log Archive (grain size)	PE1B-GS-61	27-Feb-05	61	Aerobic (plastic)	CH2M HILL
PE-1B	Pollen	PE1B-USGS-8	26-Feb-05	8	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-20	26-Feb-05	20	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-30	26-Feb-05	30	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-40	26-Feb-05	40	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-50	27-Feb-05	50	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-60	27-Feb-05	60	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-70	27-Feb-05	70	Aerobic (plastic)	USGS
PE-1B	Pollen	PE1B-USGS-80	27-Feb-05	80	Aerobic (plastic)	USGS

**Notes:**

1. Refer to Final IM Phase 2 Monitoring Well Work Plan (CH2M HILL 2005a) for collection procedures for wood and pollen/microfossil samples for USGS studies.
2. Refer to supplemental memorandum for Final IM Phase 2 Monitoring Well Work Plan (CH2M HILL, 2005e) for aerobic or anaerobic core collection procedures.
3. PE-1, PE-1A and PE-1B borehole drilling and sampling are described in the Groundwater Extraction Well PE-1 Installation Report (CH2M HILL, April 29, 2005).

## Appendix B2

### Thermistor Temperature Probe Installation

**TABLE B-2**

Thermistor Temperature Probe Installation  
*IM Phase 2 Monitoring Well Installation Report*  
*PG&E Topock Compressor Station*

<b>Monitoring Well</b>	<b>Depth of Temperature Probes (feet below ground surface)</b>
MW-43-085	90, 83, 70, 60, 45, 30, 20
MW-27-085	87, 77, 67, 57, 47, 37, 22
MW-34-100	92, 82, 71, 61, 46, 36, 25, 20
MW-42-065	75, 65, 55, 45, 35, 25, 15
MW-33-210	175, 85, 75, 65, 55 40, 30

Note: The temperature probes were attached to the outside of the monitoring well blank casing or screen during well installation. Refer to supplemental memorandum to Final IM Phase 2 Monitoring Well Work Plan (CH2M HILL 2005e) for installation procedures.



Appendix B3  
Water Level and Field Water Quality  
Measurements for New Monitoring Wells

TABLE B-3

Water Level and Field Water Quality Measurements for New Monitoring Wells

IM Phase 2 Monitoring Well Installation Report

PG&amp;E Topock Compressor Station

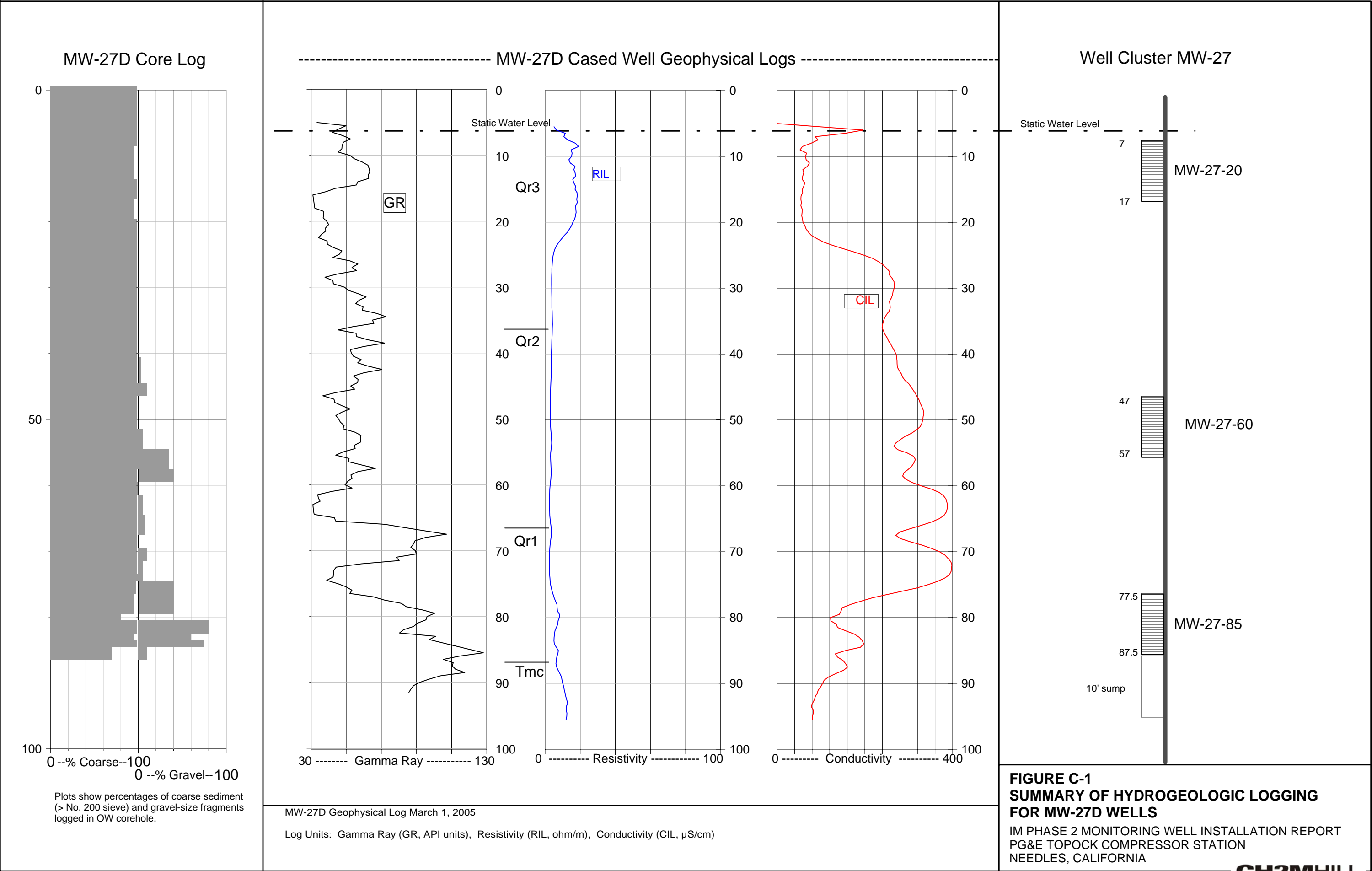
Location ID	Screen Interval (ft bgs)	Sample Date	Depth to Water (ft btoc)	Temperature (° Celsius)	pH (pH units)	Specific Conductance (µS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)
MW-27-060	47.3 - 57.3	23-Feb-05	8.92	20.5	7.20	15200	-151	1.33
		14-Mar-05	9.7	21.7	7.13	20300	-158	0.76
MW-27-085	77.5 - 87.5	14-Feb-05	7.72	21.6	7.63	26700	-519	0.13
		16-Feb-05	9.02	22.2	8.05	23400	-491	5.24
		23-Feb-05	8.58	20.8	7.47	17700	-235	1.15
		14-Mar-05	9.3	21.9	7.30	27000	-153	0.85
MW-33-150	132 - 152	02-Mar-05	34.89	26.5	7.70	15900	-120	4.57
		16-Mar-05	35.4	26.0	7.30	21600	-175	1.60
MW-33-210	190 - 210	24-Feb-05	34.75	27.2	7.98	22200	-116	4.91
		16-Mar-05	35.43	27.0	7.59	25300	-103	0.58
MW-34-100	89.5 - 99.5	14-Feb-05	8.19	23.0	7.63	25000	-246	0.18
		16-Feb-05	9.15	23.6	7.95	20400	-159	5.32
		23-Feb-05	8.79	22.1	7.34	18000	-35	1.37
		14-Mar-05	9.57	23.5	7.36	23700	-55	0.74
MW-42-030	9.8 - 29.8	23-Feb-05	11.6	23.3	7.20	12600	-175	1.47
		16-Mar-05	12.1	24.7	7.29	17800	-136	1.21
MW-42-055	42.5 - 52.5	23-Feb-05	11.63	23.7	7.36	13600	-188	0.95
		16-Mar-05	12.12	25.5	7.51	17100	-191	0.51
MW-42-065	56.2 - 66.2	14-Feb-05	10.72	24.7	7.21	22200	-201	0.26
		24-Feb-05	11.13	24.6	7.41	20500	-119	5.03
		16-Mar-05	11.75	25.5	7.10	21400	-126	0.55
MW-43-025	15 - 25	07-Mar-05	10.62	20.3	7.17	1690	-161	6.05
		15-Mar-05	10.72	19.7	7.67	1660	-177	4.59
MW-43-075	65 - 75	07-Mar-05	10.74	21.7	7.29	15200	-150	5.60
		15-Mar-05	10.27	20.9	7.60	14900	-178	0.49
MW-43-090	80 - 90	07-Mar-05	10.94	22.2	6.94	21500	-185	0.23
		15-Mar-05	11.11	20.9	7.28	22000	-153	0.47

## Notes:

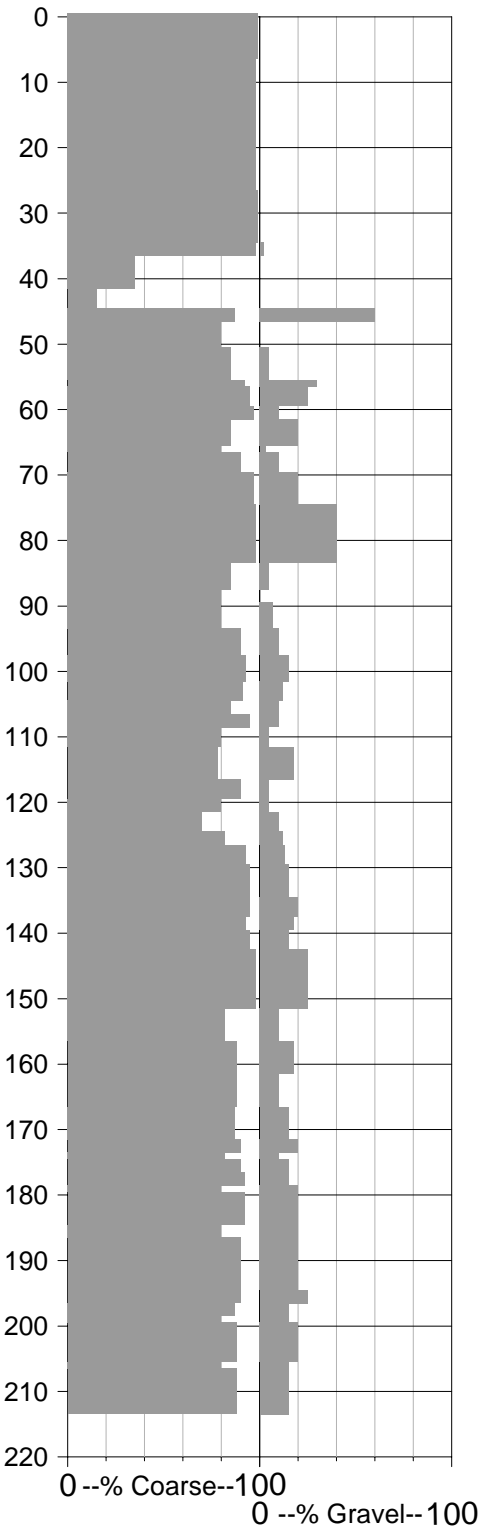
ft bgs feet below ground surface  
ft btoc feet below top of casing  
µS/cm microSiemens per centimeter  
mg/L results in milligrams per liter  
mV milli Volts

## Appendix C

### Hydrogeologic and Geophysical Logging Data

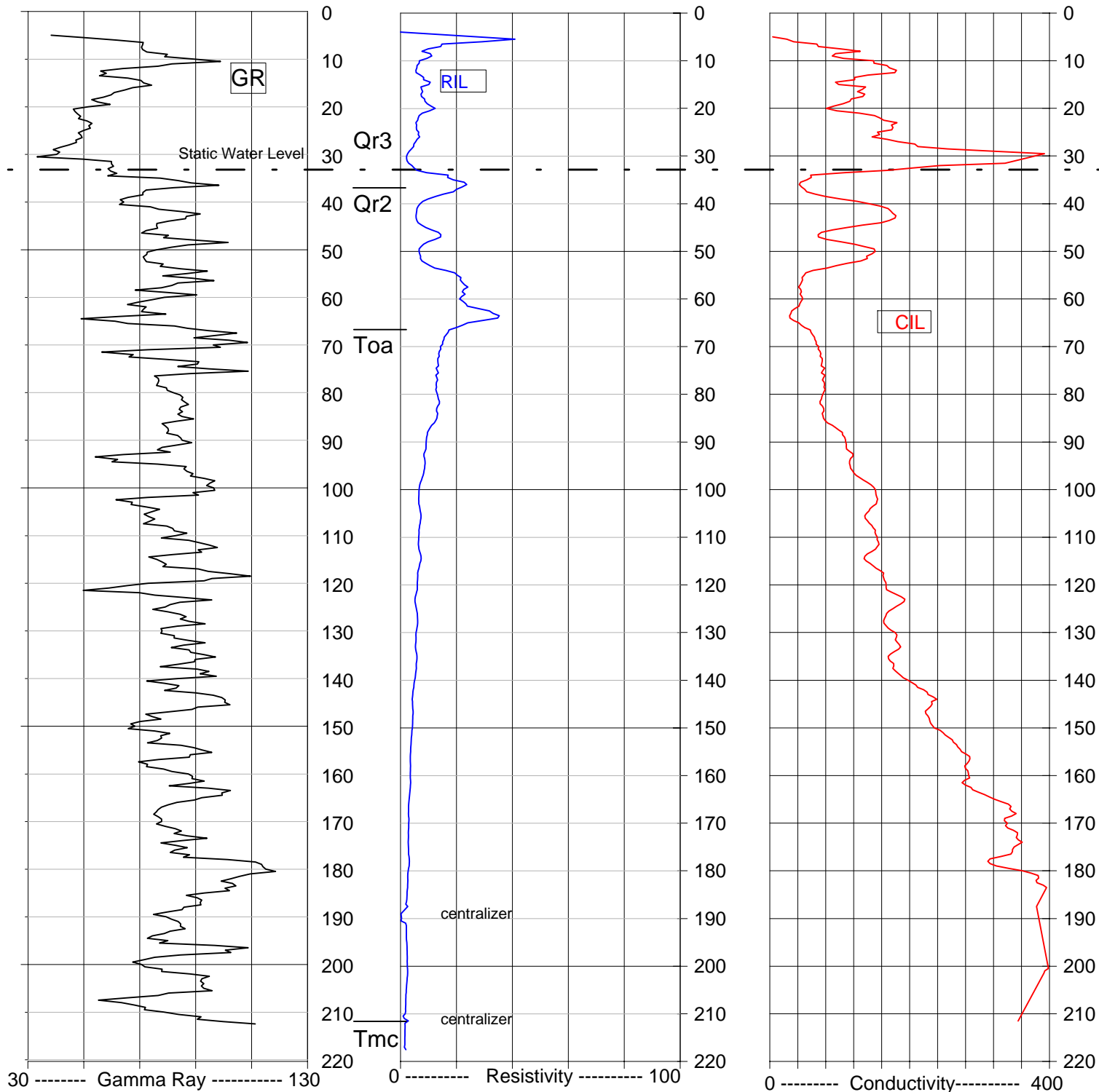


MW-33D Core Log



Plots show percentages of coarse sediment (> No. 200 sieve) and gravel-size fragments logged in OW corehole.

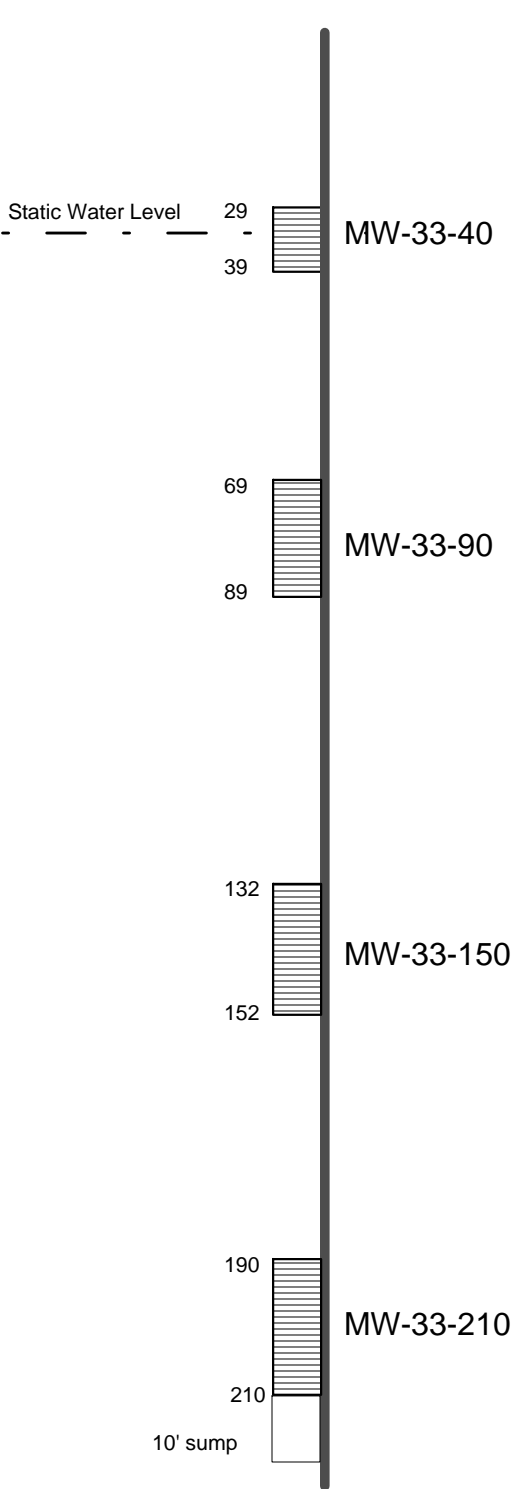
MW-33D Cased Well Geophysical Logs



MW-33D Geophysical Log March 1, 2005

Log Units: Gamma Ray (GR, API units), Resistivity (RIL, ohm/m), Conductivity (CIL,  $\mu\text{S}/\text{cm}$ )

Well Cluster MW-33



**FIGURE C-2**  
**SUMMARY OF HYDROGEOLOGIC LOGGING**  
**FOR MW-33D WELLS**

IM PHASE 2 MONITORING WELL INSTALLATION REPORT  
PG&E TOPOCK COMPRESSOR STATION  
NEEDLES, CALIFORNIA

