Pacific Gas and Electric Company

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February 5, 2007

Aaron Yue
California Department of Toxic Substances Control
Senior Hazardous Substance Engineer
5796 Corporate Avenue
Cypress, California 90630

Subject: Interim Measures Compliance Monitoring Program
Alternative Demonstration Report for the IM No. 3 Injection Well Field
PG&E Topock Compressor Station, Needles, California

Dear Mr. Yue:

Enclosed is the *Alternative Demonstration Report for the IM No. 3 Injection Well Field* for the Interim Measure Compliance Monitoring Program at the PG&E Topock Compressor Station. This report has been prepared in conformance with requirements in DTSC's January 5, 2007 acceptance letter for the Injection Well Field Performance Assessment Report, in which DTSC requested PG&E to submit an Alternative Demonstration Report to better document and investigate the observed action level exceedences for chromium in wells OW-2S and OW-5S.

Please contact me at (805) 546-5243 if you have any questions on this submittal.

Sincerely,

for Yvonne Meeks

cc. Christopher Guerre, DTSC

Enclosure

Alternative Demonstration Report for IM No. 3 Injection Well Field

DATE: February 5, 2007

1.0 Introduction

Pacific Gas and Electric Company (PG&E) is implementing an Interim Measure (IM) to address chromium concentrations in groundwater at the Topock Compressor Station near Needles, California. The IM is under the oversight of the State of California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and consists of groundwater extraction for hydraulic control of the plume boundaries near the Colorado River floodplain and management of extracted groundwater. The groundwater extraction, treatment, and injection systems collectively are referred to as Interim Measure No. 3 (IM No. 3). Currently, the IM No. 3 facilities include a groundwater extraction system, conveyance piping, a groundwater treatment plant, and an injection well (IW) field for the discharge of the treated groundwater. The IW field is composed of two IWs and a network of monitoring wells. Figure 1-1 shows the location of the IM injection wells and a number of surrounding monitoring wells.

In November 2006, PG&E submitted to DTSC a Performance Assessment Report (PAR) evaluating the effectiveness of the IM injection wellfield (CH2M HILL 2006). The report concluded that the injection wellfield has operated successfully since injection began, and has been shown to be an effective strategy for management of treated groundwater generated through implementation of the IM at the PG&E Topock Site.

As reported in the PAR, injection has shown very little effect on groundwater quality in shallow zone observation wells located near the injection wells (OW-1S, OW-2S, and OW-5S). It was noted, however, that some samples from two of these wells (OW-2S and OW-5S) had concentrations of either hexavalent chromium, Cr(VI), or total chromium, Cr(T), above interim action levels. In addition, Cr(VI) concentrations had increased in OW-2S from non-detect at the time of installation in December 2004 to between 30 and 40 μg/L in 2006. It was reasoned in the PAR that this increase was not the result of injection, since the injection water contained less than 1 μg/L Cr(VI) (CH2M HILL 2006), and other chemical parameters (e.g., TDS) did not reflect injectate chemistry. Both of these observations were considered to be the result of natural variation in local shallow zone hexavalent and total chromium concentrations.

In its January 5, 2007 acceptance letter for the PAR, DTSC requested PG&E to submit an Alternative Demonstration Report to better document and investigate the observed action level exceedences for chromium in wells OW-2S and OW-5S (DTSC 2007). At a minimum, DTSC requested that the ADR should include: evaluation of existing core/logs for organic content; evaluation of potential impact drilling and development could have had on water quality monitoring data; evaluation of other monitoring well data to determine if similar concentration trends have been observed elsewhere at the site; and sampling of wells OW-2S and OW-5S for chromium isotopes.

This report is submitted in fulfillment of these requirements. Section 2 first provides a brief history of applicable action levels and the changes in hexavalent and total chromium concentrations in wells OW-2S and OW-5S over time. This information is then discussed in relation to other IM No. 3 monitoring wells and the region as a whole. The results of groundwater oxidation-reduction potential analyses are then reviewed, and discussed together with the occurrence of fine grained materials observed in the OW geologic logs as a possible explanation for this observed trend. Section 3 presents conclusions and recommendations.

DTSC requested that OW-2S and OW-5S be sampled for chromium isotopes. No information with respect to chromium isotopes was available for discussion in this report, as these wells were not originally included as part of the Phase I Chromium Isotope Study. The time needed for sampling and processing chromium isotope samples exceeded the time allotted for preparing this report, so it was also not possible to provide information in this report with respect to samples collected specifically in response to DTSC's request. OW-2S and OW-5S will be added to the upcoming Phase II of the chromium isotope study, and the results from those samples will be discussed in the report for that study. In addition, DTSC requested evaluation of core/logs for organic content. Organic carbon was not analyzed in core samples from IM No. 3 well borings, and no specific noting of organic content was recorded on any of the boring logs. Therefore, the relative organic content of subsurface zones can only be estimated on the basis of grain size, which is described in Section 2.

2.0 IM3 Injection Wellfield and Observation Well Data

As described in the PAR (CH2M HILL 2006), injection of treated groundwater has been active since July 31, 2005. The injection rate has gradually increased as extraction from IM3 wells increased. Since February 2006 injection has been relatively steady, averaging 121 gpm for the period from February through December 2006. Three observation well clusters (OW-1, OW-2, and OW-5) are located between 40 and 210 feet from the injection wells IW-2 and IW-3, as shown in Figure 1-1. The well clusters are each composed of three wells screened at shallow (S), medium (M), and deep (D) intervals. The OW wells were designed to monitor chemical changes in groundwater within the first 1 to 2 years of injection in the area near the injection wells. Four additional well clusters (CW-1, CW-2, CW-3, and CW-4) are located farther away from the injection wells (approximately 300 to 700 feet) and were designed to observe changes occurring after approximately 5 to 10 years of injection and provide compliance monitoring points.

2.1 Overview of Chromium Concentrations

Action Levels for various constituents were initially established in the Compliance Monitoring Plan (CH2M HILL 2005a) and submitted to DTSC for approval on June 17, 2005. DTSC reviewed this document and issued interim Action Levels in a letter to PG&E (DTSC 2005), and required PG&E to re-evaluate Action Levels after three additional monthly sampling events were completed at the IM monitoring well network. On December 13, 2005, PG&E submitted an update to the Action Levels based on a statistical evaluation of water quality data collected through September, 2005 (CH2M HILL 2005b). Hexavalent and total chromium Action Levels were calculated using relatively small data sets that were influenced strongly by the initial data collected in well OW-5S. For each of the three separate Action Level evaluations, the proposed Cr(VI) interim Action Level concentration was 32.6 µg/L. For Cr(T), the variation in input data and statistical method resulted in a slightly different Action Level concentration between evaluations. However, because the differences between the evaluations was slight (29.5, 28, and 28.1 µg/L, respectively), the interim Action Level issued by DTSC (2005) of 28 µg/L was used as the triggering level within the contingency plan.

Figures 2-1 through 2-3 present concentrations of Cr(VI), Cr(T), TDS, and ORP over time in IM No. 3 observation well clusters. Six samples, all from OW-2S, have exceeded the Cr(VI). The Cr(T) Action Limit of 28 µg/L was exceeded seven times at OW-2S and twice at OW-5S.

Table 2-1 provides summary statistics for Cr(T) and Cr(VI) for all wells that have not regularly exceeded the CA MCL of 50 µg/L screened in alluvial material in the Topock region. Wells OW-2S and OW-5S have concentrations among the highest in the table, yet are not inconsistent with wells considered to be background wells. An analysis of these concentrations and their time trends is presented below.

2.2 Assessment of OW-2S and OW-5S Data

2.2.1 Chromium Concentrations in OW-2S and OW-5S

Chromium concentrations in wells OW-2S and OW-5S are consistent with the upper range of natural levels in the region, according to the preliminary Background Study findings (CH2M HILL 2007). As shown in Table 2-1, concentrations of chromium in these wells are similar to those from two wells included in the Background Study: MW-18 and GSRV-2. GSRV-2 is located two miles away, and Well MW-18 is located in the general area of the OW wells (600 to 800 feet away, see Figure 1-1), suggesting that there is relatively elevated naturally occurring chromium in shallow groundwater in this area. Samples from well MW-18 have consistently had concentrations in the 20-40 µg/L range since the well was installed in 1998, with no temporal trend over that time. The MW-18 data show that chromium concentrations similar to those of OW-2S and OW-5S were present in shallow groundwater in this area years before IM No. 3 injection began, and provides one line of evidence that injection has not played a role in the OW-2S and OW-5S concentrations.

Groundwater level data collected since injection began indicate a groundwater mound surrounding the IW-2/IW-3 area. Figures 2-4 and 2-5 show groundwater elevation contours of middle and deep zone groundwater, respectively, in the IM No. 3 area. Vertical gradients have been consistently upward since injection began, as most of the injected water initially flows into the deeper zones of the Alluvial Aquifer increasing the head in this zone relative to the shallower zones. Figure 2-6 shows the consistent upward gradient toward the shallow zone in the OW-2 cluster through time.

2.2.2 Upward Trend in Chromium Concentration in OW-2S

Chromium concentrations in samples from OW-2S showed an upward trend from non-detect in the initial sample in December 2004 to as much as 40 µg/L in 2006 (Figure 2-2). By comparison, OW-5S and MW-18 have shown similar concentrations to those of the more recent OW-2S samples, but have remained fairly consistent through time (Figure 2-7).

Although increases in concentration at a well sometimes suggest a contaminant source moving into the screened area of the well, this is not the case for OW-2S. As explained previously, groundwater gradient in the vicinity of this well is upward and away from OW-2S, as the injection wells are creating a groundwater mound.

There is no indication that the injected water is reacting geochemically with the aquifer materials to release Cr(VI). Contact of treated water with chromium-containing minerals in the subsurface does not geochemically result in a release of chromium to groundwater. Chromium in these minerals is in the form of trivalent chromium, Cr(III), which is highly insoluble in waters of the near-neutral pH range (6.5 to 8.5) observed in this area. The treated injection water is essentially saturated with atmospheric oxygen, has a TDS of approximately 4,200 mg/L, and contains less than 1 µg/L chromium. Under these conditions, oxidation of the Cr(III) will not occur at site pH and temperature due to the insolubility of Cr(III) minerals and the extremely slow kinetics of oxygen-driven oxidation of Cr(III) (Hering and Harmon 2004; Kimbrough et al. 1999). This is substantiated by the fact that no elevated Cr(VI) has been observed in the deeper observation wells where the injected water signature is clearly seen.

In addition, it is evident from the TDS data in Figure 2-2 that injection water has not reached OW-2S, since this well has significantly lower TDS (1,000 to 1,200 mg/L) than the injection water, and there has been little or no change in TDS in OW-2S over time. By contrast, the deeper wells have shown clear indications of injection water breakthrough in their TDS plots, evidenced by TDS evolving to that of injected water (see OW-1D, OW-2D, and OW-5D in Figures 2-1, 2-2, and 2-3). In summary, geochemical data indicate that the injectate has not reached the shallow groundwater system in the vicinity of the injection wells and that changes in dissolved metal concentrations are not being caused directly or indirectly by injection.

2.2.3 Oxidation-Reduction Potential and Fine Grained Materials

Oxidation-reduction potential (ORP) values at OW-2S were initially highly negative, indicating a reducing environment in which chromium is not chemically stable in solution. Correspondingly, concentrations of Cr(T) and Cr(VI) were below detection limit or very low for the first 2 to 3 sample events. Over time, the rise in chromium concentration in this well ran parallel to the rise in ORP (Figure 2-7), indicating that chemical changes were occurring in the well environment.

Although the vast majority of the Alluvial Aquifer is composed of sands and gravels, there are discontinuous beds of silt and clay that represent ancient overbank deposits or standing water areas. These deposits tend to contain more organic carbon and other reduced material (e.g., iron and manganese minerals), which could produce low ORP values such as those in the early samples from this well. During drilling, these fine-grained materials could become smeared over the inside surface of the borehole, producing a thin veneer of reducing clay/silt extending down part or all of the screened interval of the constructed well. Such a thin veneer of fine-grained, organic carbon bearing material would be expected to initially produce reducing conditions within groundwater moving into the well, resulting in Cr(VI) being readily reduced to Cr(III) and the Cr(III) in turn removed from groundwater by precipitation or adsorption reactions. With time, the higher ORP shallow groundwater of this area would gradually overcome the limited reducing capacity of this veneer, resulting in a rise in ORP and correspondingly a rise in chromium concentration. Eventually the reducing capacity of this thin veneer would be consumed, resulting in ORP and Cr(VI) concentrations more reflective of the natural groundwater surrounding the well area.

To evaluate whether the scenario above is plausible, logs were examined to check for the presence and abundance of clay and silt in OW-2S and compare it with other wells in the area. Each boring log contains the logger's estimate of clay, silt, sand, and gravel content throughout the core. Table 2-2 provides the percentage of clay and silt in both the screened interval and between the screened interval and ground surface in shallow wells of the IM No. 3 area. Table 2-2 indicates that OW-2S has a comparatively high percentage of clay between the ground surface and the base of the screened interval, as well as in the screened interval itself. This supports the scenario described above, although it does not provide complete proof. What is certain is that the rise in Cr(VI) in OW-2S was not caused by IM No. 3 injection or by plume migration into the well area, as described in the previous section.

Other monitoring wells at the site have shown similar rises in ORP (and in some cases coupled with Cr(VI) increases) over time following installation. Figure 2-8 shows selected wells with ORP levels over time since each well's installation date. Cr(VI) concentrations in these wells are also shown in the same time scale. In these cases, the Cr(VI) value of the groundwater, whether it is within the plume or not, has increased after installation until the well has reached redox equilibrium.

3.0 Conclusions and Recommendations

The Action Levels for hexavalent and total chromium (32.6 and 28 μg/L, respectively) were exceeded in some samples from IM No. 3 observation wells OW-2S and OW-5S during the past years. Upon further analysis, chromium concentrations in these wells are consistent with the range of natural levels in the region, according to preliminary Background Study findings. The Action Limits were developed from relatively few data collected in the first year following installation of the IM No. 3 wells, and the more recent data show that natural fluctuations in OW-5S have slightly exceeded the total chromium Action Level (which was based on earlier data from this well) on two occasions. This is not unexpected, given that that the Action Level represents an upper limit at an approximately 95% confidence interval. The use of this type of statistical method contains the built-in assumption that natural exceedences outside of this limit and confidence interval estimate will occur occasionally.

The observed rise in chromium concentrations in OW-2S is not due to IM No. 3 injection directly or indirectly or plume migration into the well area. This conclusion is based on hydraulic gradient and general chemical data. An explanation for the rise is not certain, but drilling log data suggest that the geologic material surrounding OW-2S has a greater concentration of clay. The fine clay commonly contains more reducing material that can initially remove hexavalent chromium from the groundwater that enters the well. With time, the reducing capacity of the relatively small amount of clay is exhausted, allowing chromium to gradually rise to its natural level in this area.

Monitoring of chromium levels in all IM No. 3 wells will continue. Although concentrations appear to have reached stable levels, they will be checked for indications of further elevation with each sampling round. It is recommended that revised action levels be assigned based on IM No. 3 data through 2007 in combination with final Background Study conclusions.

4.0 References

CH2M HIL. 2005a. Groundwater Compliance Monitoring Plan for Interim Measures No. 3 Injection Area. Report submitted to DTSC on behalf of PG&E. June 17, 2005..

CH2M HILL. 2005b. Addendum to the Compliance Monitoring Plan for the IM No. 3 Injection Area. Report submitted to DTSC on behalf of PG&E. December 13, 2005.

CH2M HILL. 2006. Performance Assessment Report, Interim Measure No. 3 Injection Well Field. Report submitted to DTSC on behalf of PG&E. November 30, 2006.

CH2M HILL. 2007. Groundwater Background Study Step 3 and 4 Results, PG&E Topock Compressor Station. Report submitted to DTSC on behalf of PG&E. January 26, 2007.

California Department of Toxic Substances Control (DTSC). 2005. Letter to PG&E. "Conditional Approval for the Start Up and Operation of the Interim Measures No. 3 Treatment System and Injection Wells, Pacific Gas & Electric Company, Topock Compressor Station." July 15.

California Department of Toxic Substances Control (DTSC). 2007. Letter to PG&E. "Acceptance of the Performance Assessment Report for Interim Measures No. 3 Injection Well Field, Pacific Gas & Electric Company, Topock Compressor Station." January 5, 2007.

Hering, J.G. and Harmon, T.C. 2004. Geochemical Controls on Chromium Occurrence, Speciation, and Treatability. Awwa Research Foundation (pub.). 133 pp.

Kimbrough, D.E., Y. Cohen, A.M. Winer, L. Creelman, and C. Mabuni. 1999. A Critical Assessment of Chromium in the Environment. *Critical Reviews in Environmental Science and Technology*. 29(1):1-46.

Professional Geologist Certification

This Alternative Demonstration Report has been prepared under the supervision of a California-registered professional geologist.

Brian Schroth, PG	
Professional Geologist No.	7423
State of Registration:	California
Expiration Date:	8/31/08

Tables

TABLE 2-1
Summary Statistics for Wells with Hexavalent Chromium Below the CA MCL
Interim Measures Compliance Monitoring, PGE Topock Compressor Station

LocID	Screen Depth (ft bgs)	Average	Median	Minimum	Maximum	Standard Deviation	Number of samples
MW-14	111-131	0.033	0.032	0.005	0.099	0.016	35
MW-15	181-201	0.012	0.009	0.005	0.050	0.010	30
MW-16	198-218	0.011	0.009	0.004	0.030	0.006	31
MW-17	130-150	0.008	0.005	0.002	0.017	0.004	28
MW-18	85-105	0.030	0.031	0.005	0.046	0.007	36
MW-35-060	37-57	0.027	0.029	0.005	0.034	0.008	11
MW-40S	115-135	0.005	0.005	0.002	0.008	0.002	12
MW-41S	40-60	0.015	0.017	0.007	0.020	0.004	9
MW-47-055	45-55	0.038	0.040	0.011	0.061	0.025	4
OW-01S	84-114	0.018	0.019	0.005	0.021	0.004	11
OW-02S	71-101	0.028	0.033	0.000	0.040	0.012	12
OW-03S	86-116	0.019	0.019	0.014	0.022	0.003	6
OW-05S	70-110	0.025	0.025	0.022	0.033	0.003	12
MW-41M	170-190	0.007	0.008	0.004	0.010	0.002	9
CW-01M	140-190	0.015	0.015	0.013	0.018	0.002	6
CW-02M	152-202	0.015	0.015	0.013	0.016	0.001	6
CW-03M	172-222	0.009	0.010	0.006	0.011	0.003	6
CW-04M	120-170	0.015	0.017	0.000	0.021	0.008	6
OW-01M	165-185	0.007	0.006	0.001	0.016	0.005	14
OW-02M	190-210	0.003	0.003	0.001	0.008	0.002	12
OW-03M	180-200	0.015	0.017	0.010	0.018	0.003	7
OW-05M	210-250	0.009	0.009	0.002	0.013	0.003	12
P-2	239-249	0.003	0.003	0.003	0.003	0.000	6
CW-01D	250-300	0.001	0.001	0.001	0.001	0.000	6
CW-02D	285-335	0.002	0.001	0.001	0.003	0.001	6
CW-03D	270-320	0.002	0.001	0.001	0.003	0.001	6
CW-04D	233-283	0.001	0.001	0.001	0.003	0.001	6
MW-35-135	117-137	0.019	0.021	0.000	0.035	0.010	11
MW-41D	271-291	0.005	0.005	0.001	0.005	0.001	9
MW-47-115	105-115	0.003	0.001	0.000	0.008	0.004	4
OW-01D	258-278	0.001	0.001	0.001	0.001	0.000	13
OW-02D	310-330	0.000	0.001	0.000	0.001	0.000	12
OW-03D	243-263	0.001	0.000	0.000	0.003	0.001	6
OW-05D	300-320	0.001	0.001	0.000	0.002	0.000	12
Topock-2	100-140	0.007	0.007	0.004	0.012	0.002	8
Topock-3	85-150	0.009	0.009	0.005	0.014	0.004	3
ADOT New Well	330-530	0.007	0.008	0.004	0.009	0.002	6
EPNG-2	322-482	0.009	0.009	0.007	0.010	0.001	6
GSRV-2	205-245	0.027	0.025	0.024	0.037	0.005	6
CA Agriculture Station	unknown	0.002	0.002	0.000	0.003	0.001	5
GSWC-1	unknown	0.013	0.013	0.013	0.013	0.000	6
GSWC-2	unknown	0.005	0.005	0.004	0.006	0.001	6

Notes: All concentrations in mg/L. ft bgs = feet below ground surface
Concentrations calculated using 1/2 the reported detection limit for samples that were non detect.

TABLE 2-1

Summary Statistics for Wells with Hexavalent Chromium Below the CA MCL

Interim Measures Compliance Monitoring, PGE Topock Compressor Station

LocID	Screen Depth (ft bgs)	Average	Median	Minimum	Maximum	Standard Deviation	Number of samples
GSWC-3	unknown	0.010	0.010	0.007	0.013	0.004	2
GSWC-4	352-522	0.010	0.010	0.009	0.011	0.001	6
Langmaack	unknown	0.021	0.021	0.019	0.022	0.001	6
Lily Hill	220-225	0.007	0.009	0.003	0.011	0.004	6
PMM-Supply	65-180	0.005	0.005	0.000	0.010	0.003	37
Tayloe	360-400	0.001	0.000	0.000	0.001	0.000	6
TMLP-2	750-880	0.017	0.019	0.011	0.020	0.004	6

Notes: All concentrations in mg/L. ft bgs = feet below ground surface

Concentrations calculated using 1/2 the reported detection limit for samples that were non detect.

TABLE 2-2
Comparison of Fine-Grained Materials Content in Shallow IM No. 3 Wells
Interim Measures Compliance Monitoring, PG&E Topock Compressor Station

Well	Percentage of Fines Between Surface and Bottom of Screen	Percentage of Fines in Screened Interval	Percentage of Clay Between Surface and Bottom of Screen	Percentage of Clay in Screened Interval
OW-1S	24%	33%	2%	0%
OW-2S	15%	27%	8%	18%
OW-3S	10%	6%	2%	3%
OW-5S	15%	19%	0%	0%

Notes: The term “fines” refers collectively to silt and clay-size material, as logged from core inspection during drilling. Percentages were calculated by thickness-weighted sum of logged fines and clay percentages provided on the logs for each soil type.

Figures

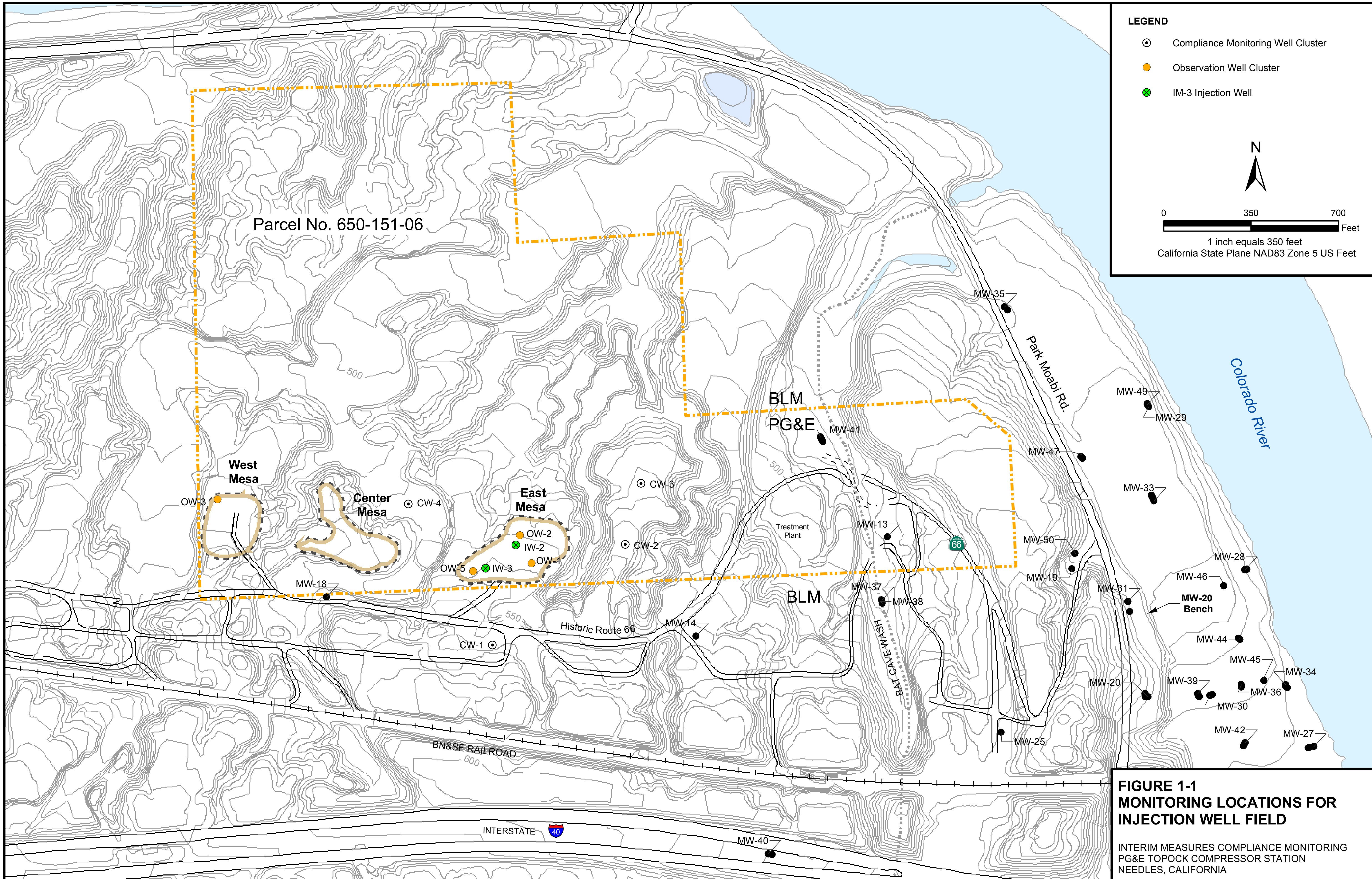

FIGURE 1-1
MONITORING LOCATIONS FOR INJECTION WELL FIELD

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

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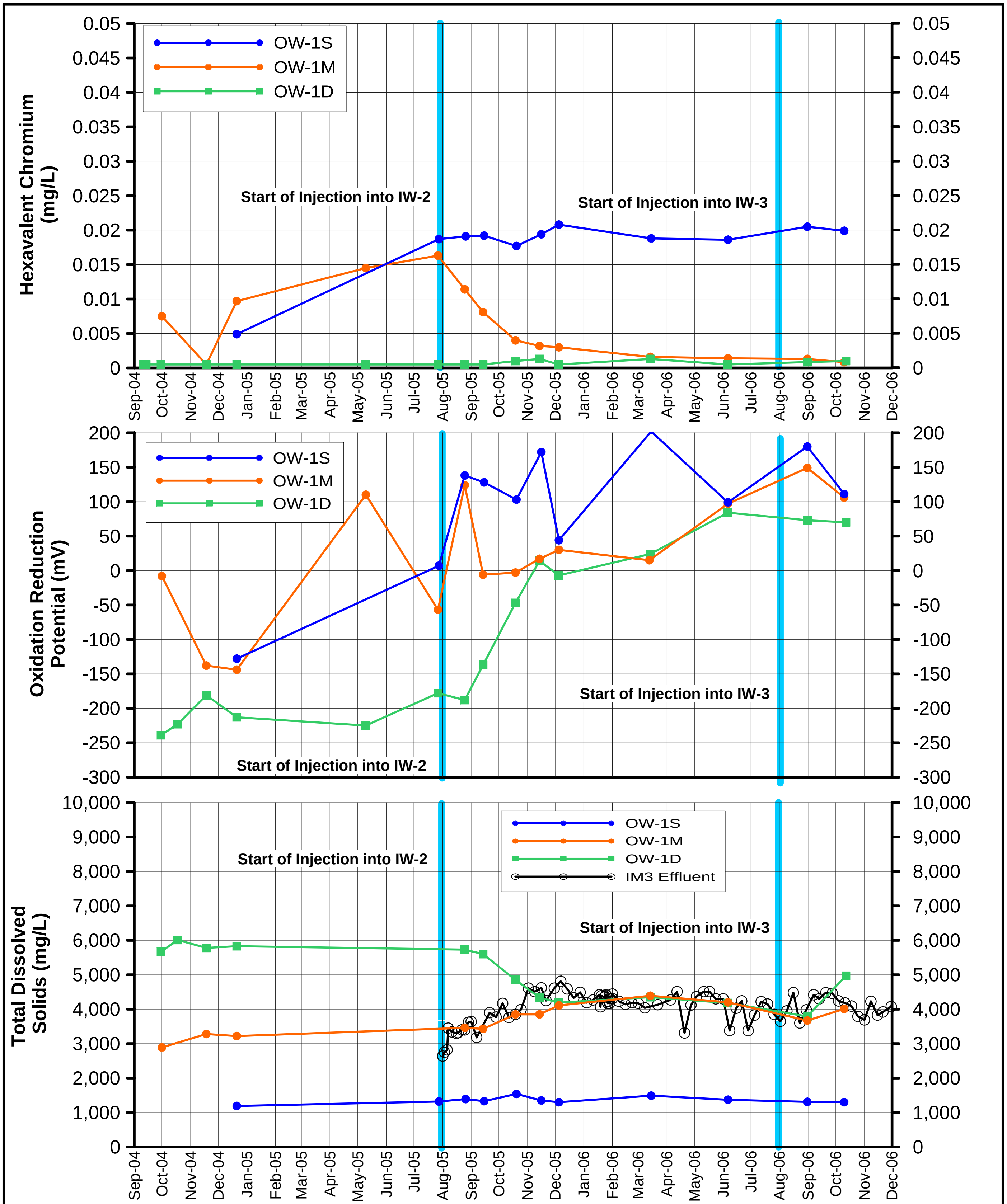

FIGURE 2-1
HEXAVALENT CHROMIUM, OXIDATION REDUCTION POTENTIAL AND TOTAL DISSOLVED SOLIDS IN OW-1 WELL CLUSTER

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

CH2MHILL

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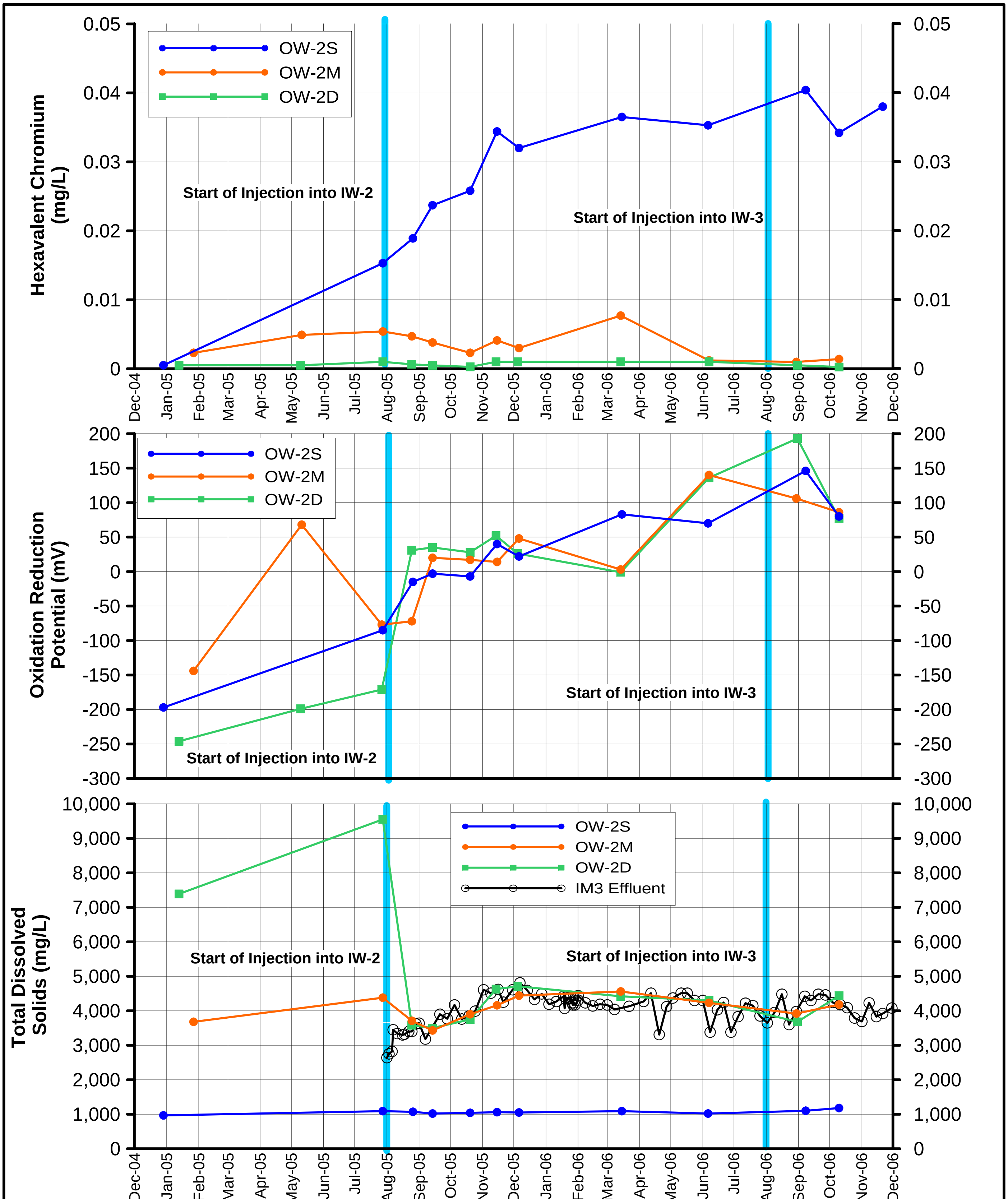

FIGURE 2-2
HEXAVALENT CHROMIUM, OXIDATION REDUCTION POTENTIAL AND TOTAL DISSOLVED SOLIDS IN OW-2 WELL CLUSTER
INTERIM MEASURES COMPLIANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

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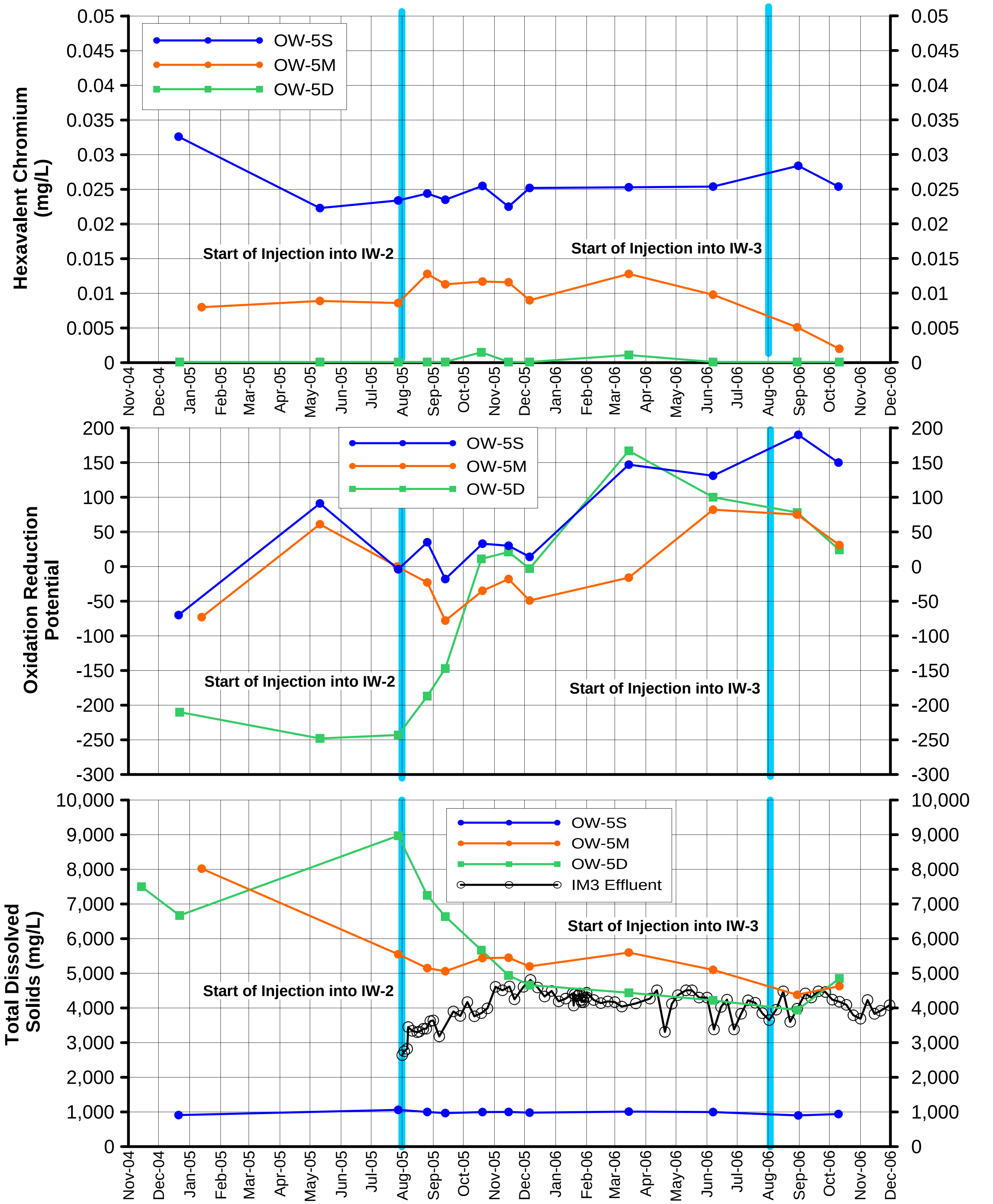

FIGURE 2-3
HEXAVALENT CHROMIUM, OXIDATION REDUCTION POTENTIAL AND TOTAL DISSOLVED SOLIDS IN OW-5 WELL CLUSTER
INTERIM MEASURES COMPLIANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

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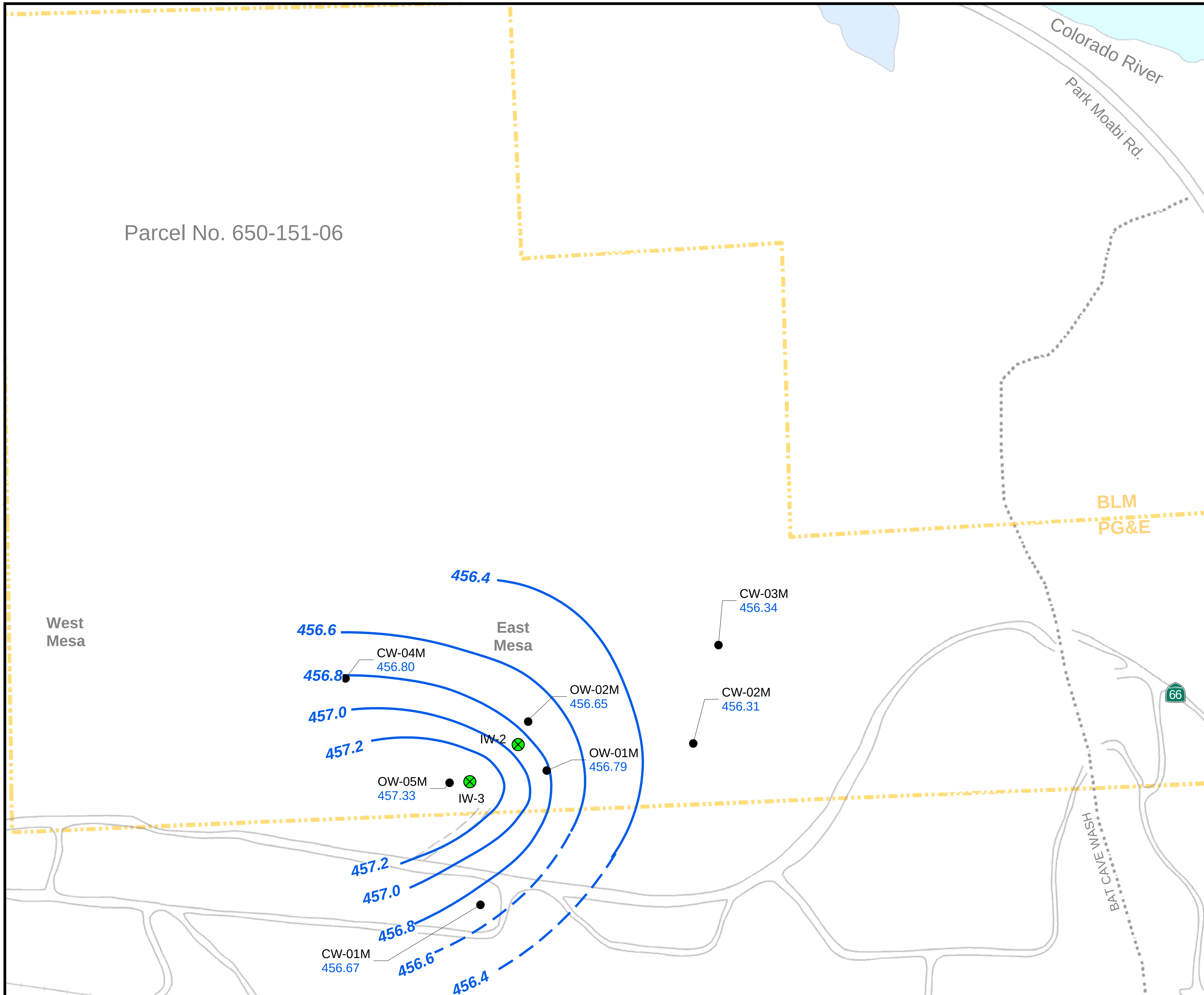

N

0 250 500 Feet

1 inch equals 250 feet

California State Plane NAD83 Zone 5 US Feet

LEGEND

Groundwater Monitoring, Compliance, and Observation Well

IM-3 Injection Well

Groundwater Elevations for Mid-depth Wells in IM-3 Injection Area

OW-02M **454.75** Salinity and temperature adjusted groundwater head elevation in feet above mean sea level (MSL)

Groundwater elevation contour in feet above MSL (0.2 foot interval), dashed where inferred

Note: Average monthly groundwater elevations are calculated with pressure transducer data measured at 30 minute intervals. OW-5M is the average of data from 9/15/2006 through 9/23/2006.

FIGURE 2-4
AVERAGE GROUNDWATER ELEVATION CONTOURS FOR MID-DEPTH WELLS SEPTEMBER 15 TO OCTOBER 15, 2006

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

CH2MHILL

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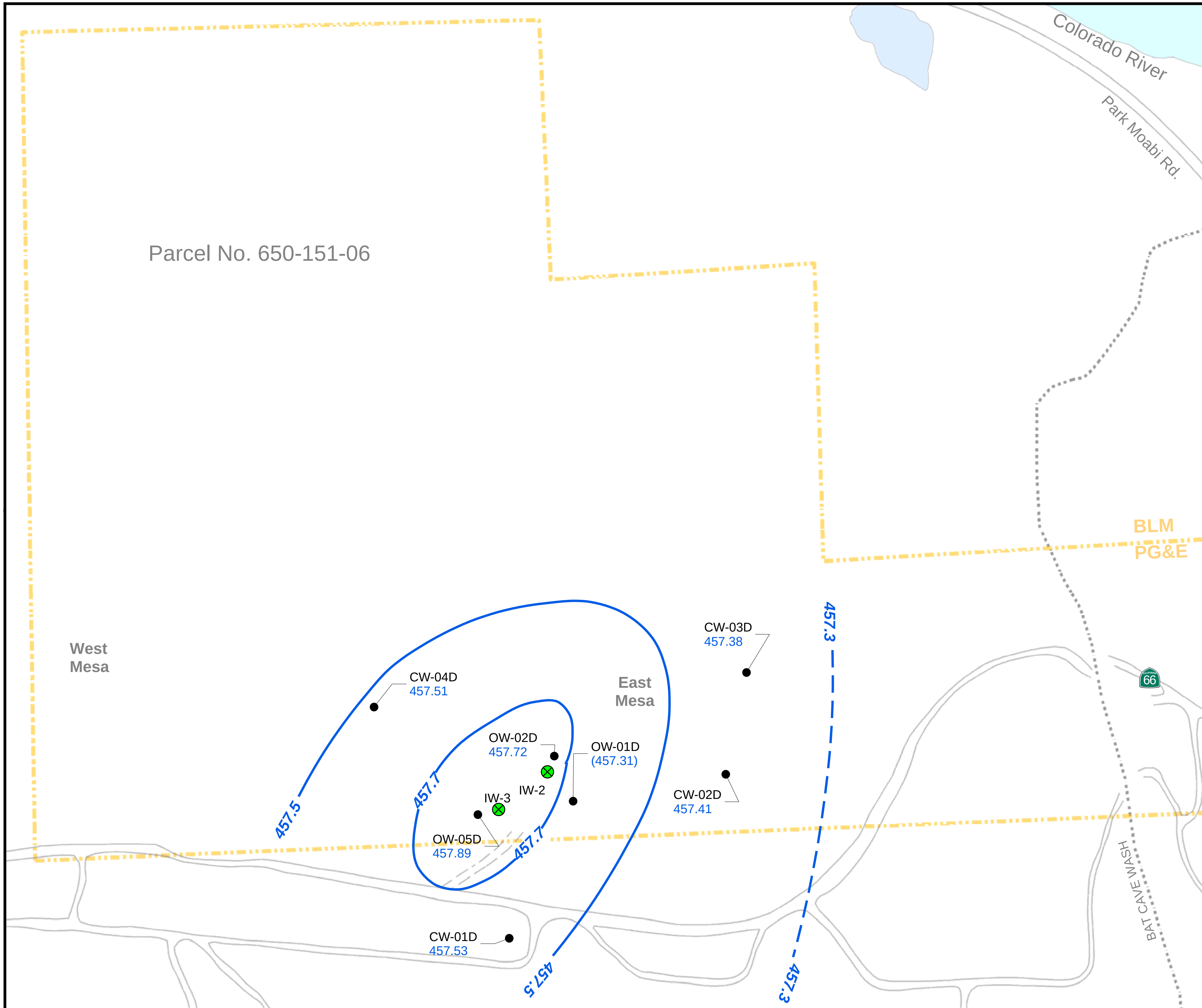

N

0 250 500 Feet

1 inch equals 250 feet

California State Plane NAD83 Zone 5 US Feet

LEGEND

- Groundwater Monitoring, Compliance, and Observation Well
- IM-3 Injection Well

Groundwater Elevations for Deep Wells in IM-3 Injection Area

- **OW-05D** **454.75** — Salinity and temperature adjusted groundwater head elevation in feet above mean sea level (MSL)
- Groundwater elevation contour in feet above MSL (0.2 foot interval), dashed where inferred

Notes:
Data posted and contoured from monthly average heads measured with tranducers at 30 minute intervals.
(OW-1D) excluded from contouring.

FIGURE 2-5
AVERAGE GROUNDWATER ELEVATION CONTOURS FOR DEEP WELLS SEPTEMBER 15 TO OCTOBER 15, 2006
INTERIM MEASURES COMPLIANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

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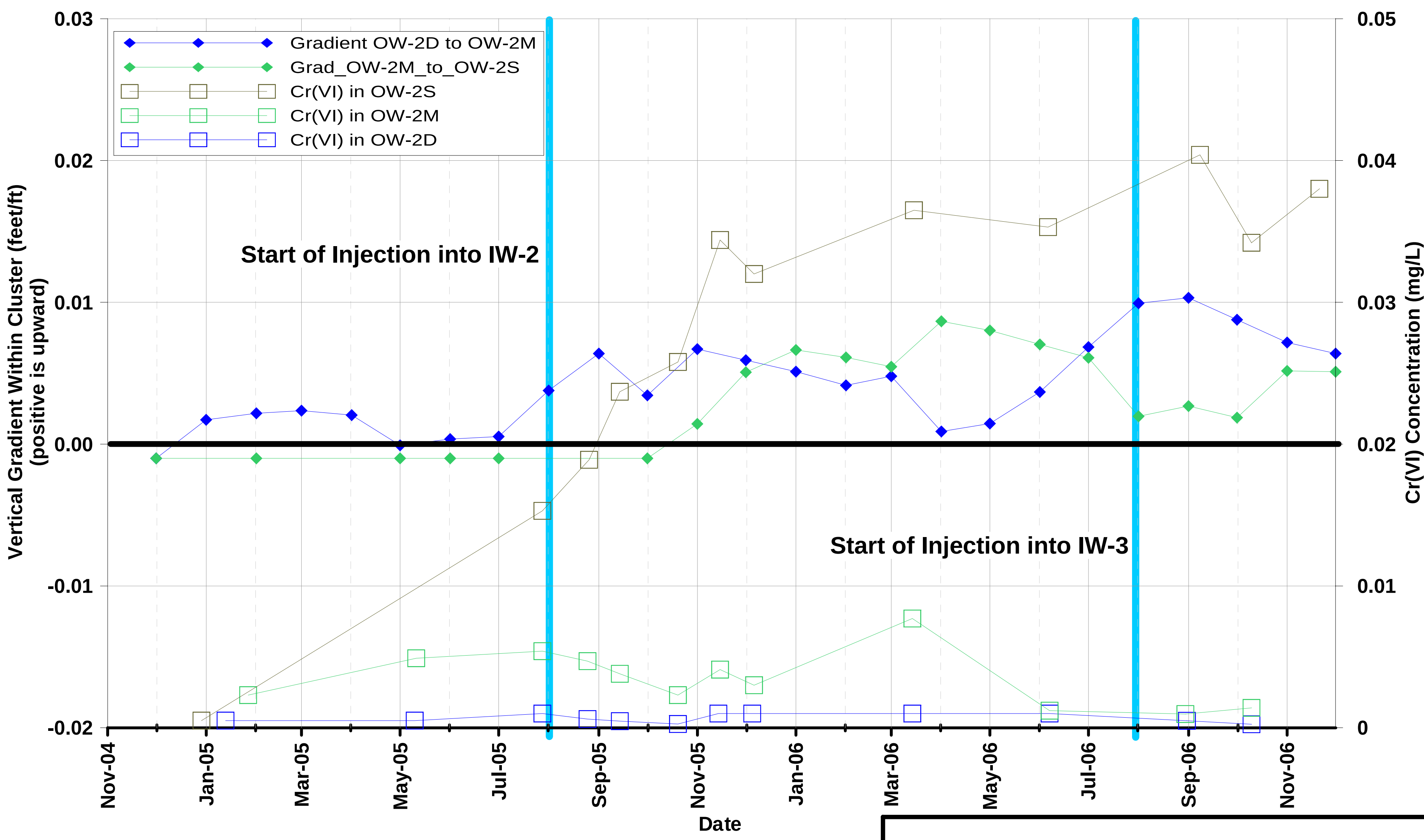

FIGURE 2-6
MONTHLY AVERAGE VERTICAL GRADIENTS IN OW-2 CLUSTER AND HEXAVLENT CHROMIUM CONCENTRATIONS
INTERIM MEASURES COMPLIANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

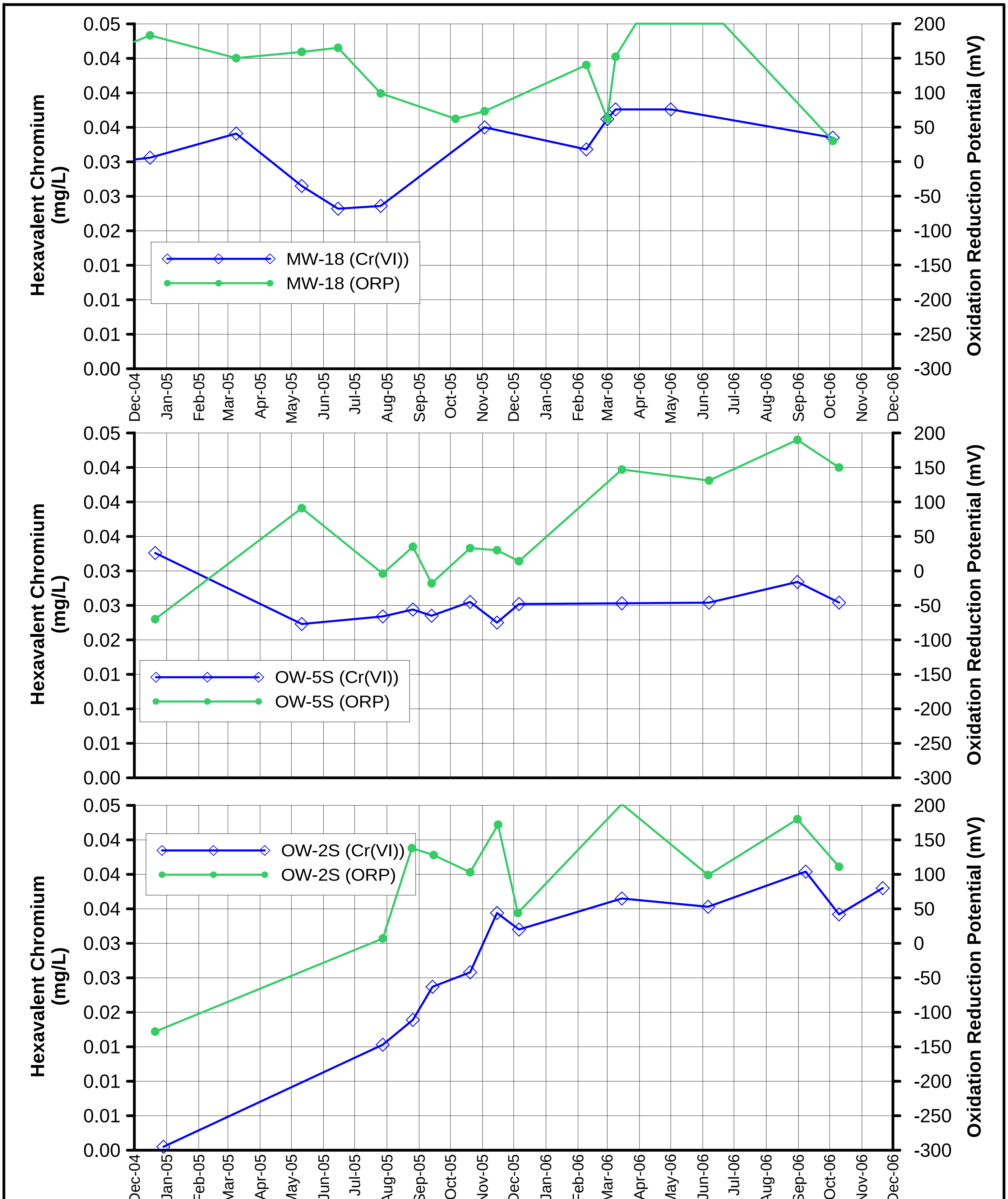

FIGURE 2-7
HEXAVALENT CHROMIUM AND OXIDATION REDUCTION POTENTIAL IN WELLS MW-18, OW-5S, and OW-2S

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

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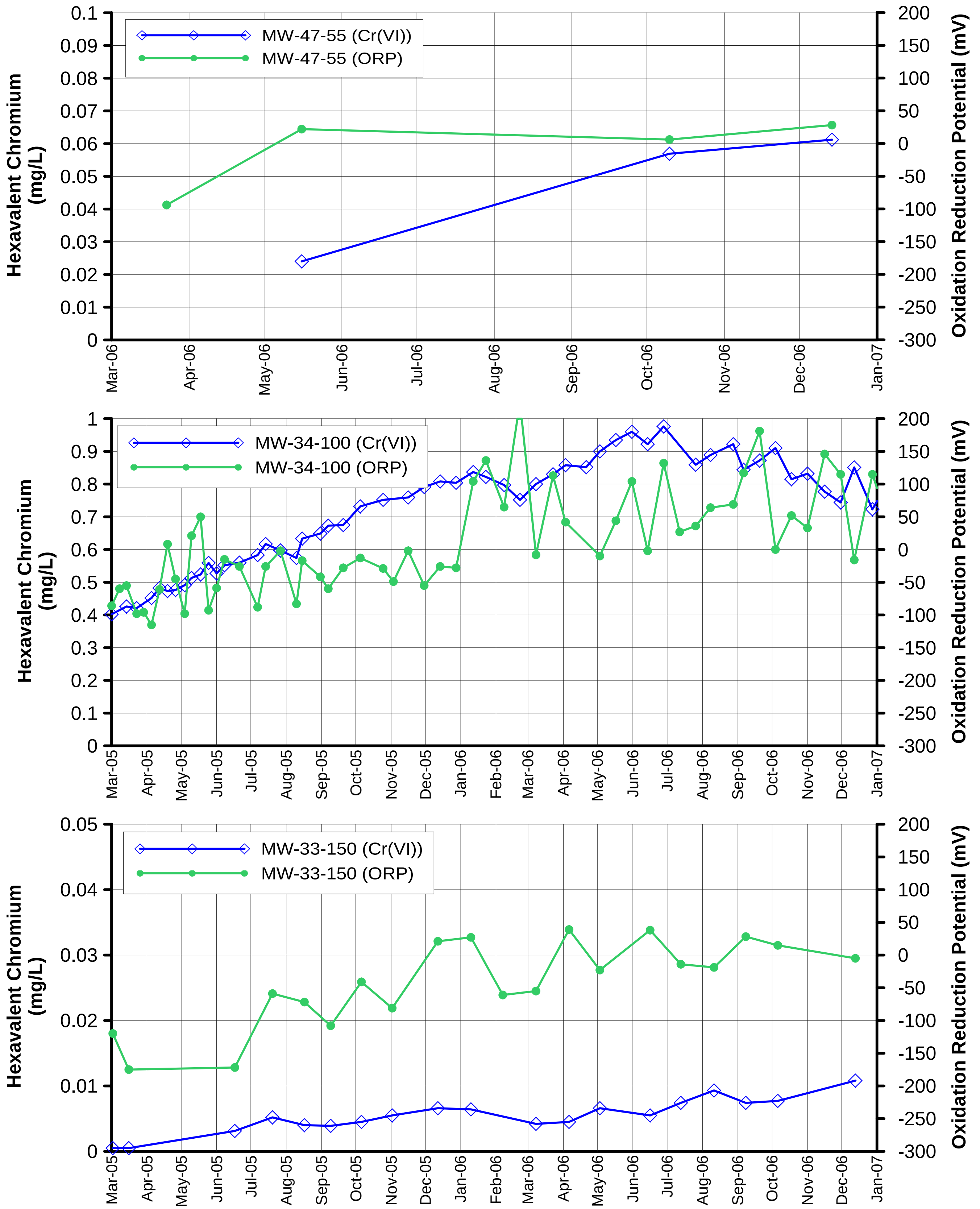

FIGURE 2-8
HEXAVALENT CHROMIUM AND OXIDATION REDUCTION POTENTIAL IN SELECT MONITORING WELLS
INTERIM MEASURES COMPLIANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

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