CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MEETING OF OCTOBER 13-14, 2010
Barstow

ITEM: 4

SUBJECT: **WORKSHOP ON PACIFIC GAS AND ELECTRIC COMPANY'S HINKLEY CHROMIUM CLEANUP PROJECT, SAN BERNARDINO COUNTY**

CHRONOLOGY:

- December 29, 1987: Cleanup and Abatement Order (CAO) No. 6-87-160 adopted.
- June 3, 1994: Amended CAO No. 6-87-160A1 adopted.
- August 3, 1998: Amended CAO No. 6-87-160A2 adopted.
- June 29, 2001: CAO No. 6-01-50 adopted.
- August 6, 2008: CAO No. R6V-2008-0002 adopted.
- November 12, 2008: Amended CAO R6V-2008-0002A1 adopted.
- April 7, 2009: Amended CAO R6V-2008-0002A2 adopted.

ISSUES: An individual requested to address the Water Board to raise the following issues:

1. Should the Water Board staff have issued a formal public notification of, and a Notice of Violation for, Pacific Gas and Electric Company's (PG&E) violation of Cleanup and Abatement Order No. R6V-2008-0002A1, specifically the expansion of the chromium plume to the northeast beyond the established plume boundary?

2. Should the Water Board require additional delineation of the chromium in the lower aquifer because of the elevated chromium concentrations detected at monitoring well MW-23C, located east of Mountain View Road near Santa Fe Avenue?

3. Should the Water Board require the chromium plume map contour lines to delineate the 1.2 micrograms per liter (µg/L) and/or the 3.1 µg/L concentrations that the Water Board established as the average and maximum background concentrations of hexavalent chromium in the Hinkley area? Current orders require delineation of the 4, 10, and 50 µg/L contours.

4. Are plume maps consistent with the existing data and is the frequency of update of the maps appropriate?

DISCUSSION:

Background

The Water Board has been requiring investigation and cleanup actions for hexavalent chromium in groundwater at PG&E's Hinkley compressor station since 1987. Various interim cleanup methods have been employed at the site, including excavation of contaminated soil, groundwater extraction and land treatment, and in-situ (in the groundwater) treatment. Over 400 monitoring, domestic, and agricultural wells have been sampled to evaluate chromium extent, with more than 100 monitoring wells regularly sampled every quarter. In addition, approximately 160 remediation performance wells are sampled monthly to quarterly. On August 31, 2010, the Water Board received a feasibility study report from PG&E that evaluates alternatives for final cleanup of the chromium plume.

Violation of the CAO

Cleanup and Abatement Order No. R6V-2008-0002, as amended by CAO No. R6V-2008-0002A1, requires PG&E to, among other requirements, prevent expansion of the chromium plume from its August 2008 boundary, as determined by specified monitoring wells. Beginning in November 2008, one well on the northern edge of the plume (MW-62A) indicated potential plume expansion. Subsequent monitoring events confirmed that concentrations were increasing in this well.

At Water Board staff's direction, PG&E installed additional monitoring wells to the north and east of well MW-62A to evaluate the extent of plume expansion. Between April 2009 and June 2010, 14 additional well pairs were installed in this area to define the extent of the plume. At Water Board staff's direction, in March 2010, PG&E submitted an action plan to address the plume expansion. The Water Board adopted amended WDRs in July 2010 to allow PG&E to implement its action plan. The public was notified of the plume expansion in the area near MW-62A beginning with the April 2010 Fact Sheet on the chromium cleanup, at the April 2010 public meeting at the Hinkley school, on the Water Board's Internet site, and in the May 2010 public notice and proposed amended WDRs.

Water Board staff's verbal communication to PG&E regarding the violation is an informal enforcement action. A Notice of Violation is also an informal form of enforcement. Water Board staff did not issue a Notice of Violation for the plume expansion because the verbal enforcement action was effective in having PG&E respond appropriately to the violation.

Chromium in the Lower Aquifer

Groundwater in much of the Hinkley Valley is found in an unconfined aquifer, known as the upper aquifer, and in a confined or semi-confined aquifer, known as the deep aquifer, that is separated from the upper aquifer by a continuous clay layer. In the area near the chromium release at the compressor station, the clay layer separating the aquifers is quite thick. The chromium release was only detected in the upper aquifer. The clay layer thins to the northwest and appears to terminate into the bedrock that rises to the northwest and outcrops northwest of the chromium plume.

Monitoring well MW-23C is located near the western edge of the blue clay layer and is screened in the lower aquifer. Beginning in August 2007, concentrations in this well began exceeding background concentrations. Subsequent quarterly monitoring confirmed elevated concentrations in this well. Chromium concentrations in the well are at less than half the drinking water standard of 50 μg/L. Although limited in number, no other wells screened in the lower aquifer in the area of the chromium plume have exceeded background concentrations, including a well located approximately 2,400 feet downgradient (MW-21C) that has been in place since 2002.

PG&E installed three additional lower aquifer monitoring wells (MW-31C, MW-55C, and MW-68C) from approximately 1,600 to 4,400 feet downgradient of MW-23C in late 2009. Chromium concentrations in those wells have not exceeded background concentrations.

Due to the increasing concentrations detected in MW-23C and the significant distance to the nearest monitoring wells in the lower aquifer, Water Board staff directed PG&E to propose additional monitoring wells to more closely define the extent of elevated chromium in the area near MW-23C. On August 18, 2010, PG&E submitted a plan for three proposed wells surrounding MW-23C, and Water Board staff verbally approved the plan with modifications. Installation of those additional wells is scheduled to start October 4, 2010.

Plume Delineation

PG&E is currently required to delineate on chromium plume maps the 50 μg/L total chromium contour (the drinking water Maximum Contaminant Level), the 10 μg/L hexavalent chromium contour (identified as the detection limit in 1998), and the 4 μg/L hexavalent chromium contour (identified as the interim background

concentration). Based on the 2007 background chromium study conducted in the Hinkley area, the Water Board established background concentrations in CAO No. R6V-2008-0002A1 as follows:

Maximum background hexavalent chromium – 3.1 µg/L
Maximum background total chromium – 3.2 µg/L
Average background hexavalent chromium – 1.2 µg/L
Average background total chromium – 1.5 µg/L

That CAO also contained requirements for containing hexavalent chromium above 4 µg/L. Compliance with the plume containment requirement is made through evaluation of chromium concentrations at specific monitoring wells in the Boundary Control Monitoring Program, not through evaluation of plume contour plots.

Now that background levels have been established and sufficient monitoring wells are in place to delineate hexavalent chromium concentrations to the maximum background concentration, Water Board staff believe it is now appropriate to require PG&E to show the 3.1 µg/L hexavalent chromium background contour on plume maps rather than the 4 µg/L hexavalent chromium contour. Water Board staff don't believe plotting the average background chromium concentration contour of 1.2 µg/L is appropriate because it is not useful for defining the extent of contamination from PG&E's discharge.

Plume map consistency and frequency of update
Plume maps typically show data from monitoring wells and from certain supply wells, such as domestic wells and agricultural production wells. Some supply wells were incorrectly identified as monitoring wells on some plume maps. Beginning with the February 2010 plume map, lower aquifer well results were not shown on the map. The maps have always been identified as results for the upper aquifer, but previously results from lower aquifer and long-screened wells were shown as shaded on the maps and were not used for contouring. The plume maps appear to be consistent with the data, though all data may not be shown on the maps. All monitoring data is presented in the monitoring reports.

PG&E is required to monitor certain wells quarterly, others semiannually, and yet others annually. The chromium contour lines on plume maps have been updated semiannually due to the greater number of wells that are sampled then. Water Board staff believe that there are now enough wells sampled quarterly that it is

appropriate to require the plume be contoured quarterly, especially in light of the documented plume expansion. Quarterly updates of the plume contours will provide information on plume expansion and efforts at plume control that is not captured in the Boundary Control Monitoring Program evaluations.

RECOMMENDATION: The Water Board may provide direction to staff as appropriate.

ENCLOSURES:

1. CAO No. R6V-2008-0002
2. CAO No. R6V-2008-0002A1
3. Lower Aquifer Groundwater Monitoring Wells
4. Comment letter from Mukasa Kezala

ENCLOSURE 1

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

CLEANUP AND ABATEMENT ORDER NO. R6V-2008-0002

WDID NO. 6B369107001

REQUIRING PACIFIC GAS AND ELECTRIC COMPANY TO CLEANUP AND ABATE WASTE DISCHARGES OF TOTAL AND HEXAVALENT CHROMIUM TO THE GROUNDWATERS OF THE MOJAVE HYDROLOGIC UNIT

San Bernardino County

The California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board), finds:

1. The Pacific Gas and Electric Company owns and operates the Hinkley Compressor Station (hereafter the "Facility") located southeast of the community of Hinkley in San Bernardino County. For the purposes of this Order, the Pacific Gas and Electric Company is referred to as the "Discharger."

2. On December 29, 1987, the Lahontan Water Board issued Cleanup and Abatement Order (CAO) No. 6-87-160 to the Discharger because wastewater containing hexavalent chromium (also known as chrome six, chromium (VI), and Cr (VI)) was discharged at the Facility in a manner that polluted groundwater. The CAO required the Discharger to complete a site investigation, to characterize the hydrogeology of the site, and to initiate cleanup and abatement of hexavalent chromium in the soil and groundwater. The site investigation delineated a zone of groundwater polluted with elevated hexavalent chromium (the "plume") extending downgradient from the initial discharge area at the Facility to approximately 1 1/2 miles north of, and off, the PG&E compressor Facility. The requirements of CAO No. 6-87-160 have been completed.

3. Amendments to CAO No. 6-87-160 were issued on June 3, 1994 (CAO 6-87-160A1) and August 3, 1998 (CAO 6-87-160A2). The amendments required the Discharger to conduct further site characterization, determine the extent of soil and groundwater pollution, begin full-scale cleanup actions, estimate the time necessary to reach cleanup levels in groundwater, and submit annual reports evaluating the progress of cleanup. The Discharger chose to clean up the pollution by pumping polluted groundwater and using this water to irrigate forage crops at two land treatment units near the Facility. The land treatment units resulted in the conversion of hexavalent chromium in the pumped groundwater to trivalent chromium in the upper soils. This remedial method appeared to contain the chromium plume from further migration.

4. In response to the detection of hexavalent chromium in air samples taken surrounding the land treatment units, the Lahontan Water Board issued CAO No. 6-01-50 on June 29, 2001. This CAO required the Discharger to immediately abate the creation of a threatened nuisance formed by any airborne discharges of hexavalent chromium originating from the land treatment units. The CAO required submittal of a report evaluating hexavalent chromium treatment methods that would not have the potential for releasing airborne hexavalent chromium. The CAO also required groundwater sampling and the submittal of reports to evaluate stability of the chromium contaminant plume.

5. On June 29, 2001, the Discharger stopped groundwater extraction and irrigation at the two land treatment units because it had not identified a mechanism for preventing airborne discharges containing hexavalent chromium. The Discharger initiated well sampling to monitor stability of the chromium plume in groundwater. Sampling data obtained since July 2001 indicate that the chromium plume has expanded in a northerly direction.

6. On March 13, 2002, the Discharger submitted a report titled, Draft Proposed *Approach for Remediation of Hexavalent Chromium in Groundwater at the Hinkley Compressor Station, San Bernardino County*. The main elements of the proposal include: (a) in the short-term, implementing an action for controlling plume migration; (b) conducting a study of naturally-occurring chromium in groundwater; (c) conducting a feasibility study and pilot study of certain groundwater remedial technologies; and (d) implementing remediation of groundwater contamination.

7. In August 2004, the Discharger implemented a corrective action at the northern end of the plume by pumping groundwater from extraction wells to regain hydraulic control of chromium plume migration. Extracted water is distributed at the Desert View Dairy by a subsurface drip irrigation system, where soil and water interact to reduce hexavalent chromium to trivalent chromium. Crops are grown on the land that is irrigated. The discharge of pumped groundwater at the Desert View Dairy is regulated by Waste Discharge Requirements under Board Order No. R6V-2004-0034. This corrective action at the Desert View Dairy has halted the northern migration of the chromium plume but has not stopped migration to the west in the northern portion of the plume. Additional actions are necessary to completely contain the plume's migration.

8. On October 13, 2004, the Lahontan Water Board adopted Waste Discharge Requirements under Board Order No. R6V-2004-041 allowing the Discharger to conduct two in-situ pilot tests to evaluate remediation of hexavalent chromium in groundwater. The results of the field-scale tests, submitted in the July 2005 document titled, *Final Report, In-situ Remediation Pilot Study*, showed that lactate and emulsified vegetable oil successfully converted hexavalent chromium in groundwater to trivalent chromium and also showed an overall decrease in total chromium concentrations in groundwater in a limited area. This reduction in total chromium concentration occurred because the trivalent chromium tends to bind with the aquifer materials, resulting in less total chromium in the

groundwater. Besides chromium, reducing conditions also affect other metals in the aquifer, such as manganese and iron. While these by-products exist at levels exceeding drinking water standards, they do not migrate beyond cell boundaries. Because the water quality has not yet been restored in the pilot test cells, the Discharger is required to continue the monitoring program.

9. On June 14, 2006, the Lahontan Water Board adopted Waste Discharge Requirements under Board Order No. R6V-2006-023 allowing the Discharger to conduct a large-scale in-situ pilot study for remediation of hexavalent chromium in the central area of the groundwater plume. The field-scale study consists of injecting lactate, whey, and emulsified vegetable oil into the subsurface to evaluate in-situ remediation for long-term plume cleanup. The first phase of project implementation occurred October 2006 until February 2007. While monitoring reports are being submitted every three months, remediation effectiveness reports are not required but should be to evaluate progress towards aquifer restoration.

10. On November 9, 2006, the Lahontan Water Board adopted Waste Discharge Requirements under Board Order No. R6V-2006-0054 allowing the Discharger to conduct a full-scale in-situ project for remediation of hexavalent chromium in the source area of the groundwater plume at the compressor station. The project consists of injecting lactate, whey, emulsified vegetable oil, and/or ethanol, into the subsurface using a recirculation system for long-term plume cleanup. Hydrologic testing using clean water and baseline sampling of a recirculation well were conducted in fall 2006. Project startup began in May 2008. While monitoring reports are being submitted every three months, remediation effectiveness reports are not required but should be to evaluate progress towards aquifer restoration.

11. The Groundwater Monitoring Report for October 2007 contains data indicating plume migration continues along the northwest boundary. Groundwater data shows that total and hexavalent chromium concentrations increased above the drinking water standard of 50 µg/L (micrograms per liter) in monitoring wells MW-38A and MW-45A. The information suggests that the plume core boundary, consisting of total chromium concentrations of 50 µg/L or greater, migrated approximately 300 feet to the west along at least a one-half mile length in the northwestern area of this 50 µg/L plume boundary. Data in the report did not indicate that the plume boundary of the interim background chromium concentration of 4 µg/L had migrated during the same sampling event. However, historical data trends suggest that the latter boundary migration is a delayed effect that will likely be detected in future groundwater sampling events.

12. On November 28, 2007, the Lahontan Water Board adopted Amended Waste Discharge Requirements under Board Order No. R6V-2004-0034A1 that allows the Discharger to discharge to land at the Desert View Dairy groundwater containing chromium from off-site parcels. The project is intended to contain plume migration along the northwest boundary. The Waste Discharge Requirements allow disposal of groundwater extracted from six wells located

between Santa Fe Avenue and Highway 58, near the intersection of Mountain View Road. However, the revised Order did not increase the volume of groundwater that the Discharger may dispose; therefore, groundwater extraction will be reduced at the Desert View Dairy property to accommodate the additional extraction at off-site parcels. While modeling has indicated that plume containment can still be achieved at this reduced extraction level, continued monitoring of the plume in this area is needed. The project has been operating continuously since June 2008.

13. Also on November 28, 2007, the Lahontan Water Board adopted Revised Waste Discharge Requirements under Board Order No. R6V-2007-0032 for the Revised Central Area In-situ Remediation project. The Waste Discharge Requirements revises the project referenced in Finding No. 9 by allowing the use of ethanol for in-situ remediation. Full-scale implementation of the project began on November 29, 2007.

14. CAO No. 6-87-160A2 established the cleanup level for chromium in groundwater at background concentrations. Sampling at the Facility and in the vicinity indicates that hexavalent and total chromium occur naturally in groundwater at variable concentrations. On February 27, 2007, the Discharger submitted the document, *Background Chromium Study*. The Study presents the results of one year of water sampling from wells located outside the boundaries of the chromium plume. The Study concludes that statistical analysis shows maximum likely background chromium concentrations of near 4 µg/L for total and hexavalent chromium in groundwater in the Hinkley Valley. The mean concentrations detected in background are 1.19 µg/L for hexavalent chromium and 1.52 µg/L for total chromium. The Water Board has not accepted this report or its conclusions. However, it intends to use the information in the report to: (1) determine plume delineation levels; and, (2) establish background water quality as part of a process to establish final numerical cleanup levels.

15. On August 27, 2007, the Discharger submitted a report of waste discharge describing various remediation projects to provide plume containment and to clean up chromium contamination in groundwater at different locations within and outside the plume boundaries. The Lahontan Water Board adopted, at its April 9, 2008 meeting, general waste discharge requirements (Board Order No. R6V-2008-0014) allowing the Discharger to implement these types of projects as needed to contain and cleanup the chromium pollution in soils and groundwater.

16. On July 2, 2008, the Discharger submitted to the Lahontan Water Board a document titled, *Boundary Control Monitoring Program and Updated Site-wide Groundwater Monitoring Program*. The Discharger proposes in the Boundary Control Monitoring Program groundwater monitoring and data evaluation methods to evaluate if its remedial measures are complying with the requirement to achieve chromium plume stability. The method includes calculation of control limits, using the 95% upper confidence limits, for selected wells based on the chromium concentrations in those wells from February 2005 through the 3rd quarter 2008. Concentrations above the

control limits may indicate plume movement, which would be assessed through an evaluation monitoring program. If warranted, a corrective action program would be implemented to address the plume movement.

The document also proposes revisions to the site-wide monitoring program, which includes certain monitoring wells from remediation and plume control projects and from other wells that are used to evaluate plume stability. The proposed revisions include adding certain wells, eliminating monitoring at certain wells, and reducing the frequency at certain wells.

17. The 1995 *Water Quality Control Plan for the Lahontan Region* (Basin Plan) establishes Water Quality Objectives (WQOs) for the protection of beneficial uses. WQOs include the following Maximum Contaminant Level (MCL) established by the California Department of Health Services as a safe level to protect public drinking water supplies:

Total chromium	50 micrograms per liter (µg/L)

18. The Groundwater Monitoring Report for February 2008 contains the results of groundwater sampling of 137 monitoring, domestic, agricultural and inactive wells. The wells define the lateral and vertical extent of chromium in groundwater. Well PMW-05, located north of the Compressor Station property, contains the highest concentrations of chromium:

Total chromium	2,120 µg/L
Hexavalent chromium	2,270 µg/L

(Note that hexavalent chromium concentrations may exceed total chromium concentrations in a given well due to the different analytical methods used for hexavalent and total chromium and the analytical error of up to ±15 and ±25% for the respective methods.)

19. The concentrations of total chromium and hexavalent chromium detected in groundwater samples at the Facility exceed WQOs for groundwater specified in the Basin Plan. The concentrations adversely affect the groundwater in the Mojave Hydrologic Unit for its municipal and domestic supply beneficial uses. The levels of waste chromium in groundwater, therefore, constitute pollution as defined in Water Code section 13050, subdivision (l).

20. The discharge of waste, such as chromium, to the groundwaters of the Mojave Hydrologic Unit, as described in Finding Nos. 2, 19 and 20 above, violates a prohibition contained in the Basin Plan. Specifically, the discharge violates the following discharge prohibition:

> "The discharge of waste...as defined in Section 13050(d) of the California Water Code which would violate the water quality

objectives of this plan, or otherwise adversely affect the beneficial uses of water designated by this plan, is prohibited."

21. Chromium in groundwater continues to migrate in the northwest direction. Furthermore, chromium in the source area at the compressor station continues to adversely affect groundwater quality. Additional work is needed to clean up and abate the effects of the discharge. This Cleanup and Abatement Order requires implementing corrective actions for plume containment and long-term groundwater remediation. Technical reports are necessary to verify corrective action implementation, cleanup of water quality to background concentrations, and progress towards restoring the beneficial uses of the aquifer.

22. This enforcement action is being taken by this regulatory agency to enforce the provisions of the California Water Code, and as such is exempt from the provisions of the California Environmental Quality Act (Public Resources Code section 21000 et seq.) in accordance with California Code of Regulations, title 14, section 15321.

IT IS HEREBY ORDERED that, pursuant to the Water Code sections 13267 and 13304, the Discharger must clean up and abate the effects of the discharge and threatened discharge of chromium to waters of the State, and must comply with the provisions of this Order:

1. The Discharger must conduct the investigation and cleanup tasks by or under the direction of a California registered geologist or civil engineer experienced in the area of groundwater pollution cleanup. All technical documents submitted to the Lahontan Water Board must contain the signature and stamp of the registered individual overseeing corrective actions.

2. The Discharger shall not cause or permit any additional waste chromium to be discharged or deposited where it is, or probably will be, discharged into waters of the State.

3. <u>Plume Containment</u>

The Discharger must achieve containment of the chromium plume in groundwater. For the purposes of this Order, containment is defined as:

(a) no further migration or expansion of the chromium plume to locations where hexavalent chromium is below the background level, or

(b) no further migration or expansion of the 50 µg/L total chromium plume.

The current background level (interim level) in groundwater for hexavalent chromium is 4 µg/L. This level will be used to determine background until the Water Board either confirms this level or establishes another level based on the previously cited background chromium study.

The Discharger may propose that the Water Board allow a quantified (for specific area and for a defined period of time) migration of the 4 µg/L hexavalent chromium

plume or the 50 µg/L total chromium plume as part of a proposed remedial action project. The proposal must clearly justify that the quantified migration is necessary to achieve compliance with this Order and is the only feasible method readily available to the Discharger. Additionally, the Discharger must clearly describe the actions that will be implemented to return the 4 µg/L hexavalent chromium plume or the 50 µg/L total chromium plume to their prior boundaries. If allowed, the Water Board will amend this order to establish the boundaries of this migration and the date that the Discharger must eliminate all levels of hexavalent chromium above 4 µg/L or total chromium above 50 µg/L in groundwater in the area of the allowed migration.

3.1. **By December 31, 2008**, achieve containment of the chromium plume in groundwater as defined in (a) above. Compliance will be determined by comparing groundwater samples collected after this date to the control limits established using data through the third quarter 2008 using the methodology contained in the *Boundary Control Monitoring Program* (see Finding No. 16, above, and Order 6.2, below), except that only the last eight samples for each well through the 3rd quarter 2008 must be used to determine the control limits.

3.2. **By December 31, 2008**, achieve containment of the 50 µg/L total chromium plume, as defined in (b) above. Compliance will be determined by comparing groundwater samples collected after this date will be compared to the control limits established using data through the third quarter 2008 using the methodology contained in the *Boundary Control Monitoring Program* (see Finding No. 16, above, and Order 6.2, below), except that only the last eight samples for each well through the 3rd quarter 2008 must be used to determine the control limits.

4. Interim Groundwater Chromium Remediation

The Discharger must implement corrective actions to remediate the elevated chromium concentrations in groundwater in the source area at and near the Compressor Station.

4.1. The Discharger must continue implementation of full-scale in-situ corrective actions in the central area of the plume as described in Finding Nos. 9 and 13, or an alternate but equally effective method, to remediate the elevated chromium concentrations in groundwater in the central area of the plume.

4.2. The Discharger must continue implementation of the full-scale in-situ corrective actions in the source area described in Finding No. 10, or an alternate but equally effective method, to remediate the elevated chromium concentrations in groundwater in the source area.

5. Final Cleanup Actions

The Discharger must take all actions necessary to clean up and abate the effects of the discharge and threatened discharge of chromium to waters of the State.

5.1. **By September 1, 2010**, the discharger must submit a feasibility study report that assesses remediation strategies implemented at the site or proposed for the site for achieving compliance with State Water Resources Control Board Resolution 92-49, as amended. If the Discharger proposes a final cleanup strategy that will result in cleanup to concentrations higher than background water quality, the report must include a detailed analysis of different cleanup strategies, one of which must achieve background water quality, if feasible. For those strategies that have been implemented at the site, the report must describe the effectiveness of each remediation strategy compared to expected or modeled effectiveness. Any adverse environmental or public health impacts created from the implemented strategies must be reported along with remedies taken to correct such problems. The report must also include estimated cleanup times and costs for each remediation strategy to achieve the background level established by the Water Board or a level above background if it is not reasonable to achieve background levels considering the factors in section III.G. of Resolution 92-49. If background levels of water quality cannot be restored, the report must describe an alternate level of water quality above background that the remediation strategy can achieve and must describe why such a level is (1) consistent with the maximum benefit to the people of the state, (2) will not unreasonably affect present and anticipated beneficial use of the water, and (3) will not result in water quality less than that prescribed in the Water Quality Control Plans and Policies of the State and Lahontan Water Boards (See section III.G. of Resolution 92-49). Finally, the report must recommend a final remediation strategy for the entire site to achieve background levels of water quality or certain levels above background if achieving background is not reasonable and provide justifications for the recommendation.

5.2. **By April 1, 2011**, implement the final cleanup strategy as approved by Water Board.

6. Reporting

6.1. Groundwater monitoring associated with the site-wide groundwater monitoring program, the Desert View Dairy Land Treatment Unit, the Central Area In-Situ Remediation Zone project, and the Source Area In-Situ Remediation Zone project shall be reported on a coordinated schedule. Required quarterly sampling shall be reported by the 30th day following the end of the quarter, i.e., by April 30th, July 30th, October 30th, and January 30th of each year. Required semiannual sampling shall be

reported by April 30th and October 30th of each year. Sampling is to be conducted in the quarter prior to the appropriate reporting dates, i.e., from January 1 through March 31, April 1 through June 30, July 1 through September 30, and October 1 through December 31 of each year. The site-wide monitoring program shall conform to the wells and schedule presented in PG&E's July 2, 2008 *Updated Site-Wide Groundwater Monitoring Program* described in Finding No. 16, except that monitoring well MW-34 shall continue to be monitored semiannually and monitoring wells MW-64B and MW-67B shall be monitored semiannually.

This Order modifies the Monitoring and Reporting Program for Waste Discharge Requirements No. R6V-2006-0054 for the Source Area In-Situ Remediation Zone project and modifies the required monitoring and reporting periods of the August 17, 2007 order pursuant to Water Code section 13267 for the In-Situ Remediation Pilot Test Project.

6.2. The 3rd quarter 2008 groundwater monitoring report must contain a tabulation of the hexavalent and total chromium control limits for boundary control monitoring wells identified in the July 2, 2008 *Boundary Control Monitoring Program* described in Finding No. 16. The last eight samples for each well through 3rd quarter 2008 shall be used to calculate the 95 percent upper control limits, which become the control limits for those wells.

6.3. **Beginning September 30, 2008**, submit semiannual status reports describing actions taken to remediate chromium levels in groundwater and contain plume migration. The initial report must evaluate actions taken between January 1, 2008 and June 30, 2008 and subsequent reports must evaluate actions taken during each subsequent six-month period. Status reports must discuss remedial actions being implemented according to the cleanup plan approved by the Water Board. The report must tabulate the volume, concentration, and location of wastes discharged under orders from the Lahontan Water Board. Any and all violations of orders must be discussed and cite corrective measures taken. The report must provide groundwater monitoring data and discuss the actual effectiveness of the implemented remedy compared to its predicted effectiveness. Any adverse environmental or public health impacts created from the project must be reported along with remedies taken to correct such problems. The report must provide recommendations and an implementation schedule for increasing effectiveness if current actions are not achieving plume containment and expected reductions in chromium concentrations in groundwater. Subsequent semi-annual status reports must be submitted by March 31 and September 30 of each year.

6.4. **Beginning March 31, 2012**, submit semi-annual final cleanup effectiveness reports to the Water Board. The first report should evaluate actions taken between April 1, 2011 and December 31, 2011. Subsequent

reports must evaluate actions taken during six-month periods, the initial period being January 1, 2012 to June 30, 2012. Each report must discuss the actual effectiveness of the final cleanup remedy compared to expected effectiveness. If current actions are not achieving expected reductions in chromium concentrations throughout the entire site, the report must propose recommendations and an implementation schedule to increase effectiveness. Subsequent semi-annual status reports must be submitted by September 30 and March 31 of each calendar year.

7. Rescissions

This order rescinds Order No. 4 in CAO No. 6-01-50 requiring monthly groundwater monitoring and the May 1, 2003 Water Code section 13267 order that allowed bimonthly sampling to replace monthly sampling.

Failure to comply with the terms or conditions of this Order will result in additional enforcement action that may include the imposition of administrative civil liability pursuant to Water Code sections 13268 and 13350 or referral to the Attorney General of the State of California for such legal action as he may deem appropriate.

Ordered by: Harold J. Singer Dated: August 6, 2008

HAROLD J. SINGER
EXECUTIVE OFFICER

ENCLOSURE 2

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

AMENDED CLEANUP AND ABATEMENT ORDER NO. R6V-2008-0002A1

WDID NO. 6B369107001

REQUIRING PACIFIC GAS AND ELECTRIC COMPANY
TO CLEAN UP AND ABATE WASTE DISCHARGES OF
TOTAL AND HEXAVALENT CHROMIUM TO THE
GROUNDWATERS OF THE MOJAVE HYDROLOGIC UNIT

San Bernardino County

The California Regional Water Quality Control Board, Lahontan Region (Water Board), finds:

1. The Pacific Gas and Electric Company owns and operates the Hinkley Compressor Station (hereafter the "Facility") located southeast of the community of Hinkley in San Bernardino County. For the purposes of this Order, the Pacific Gas and Electric Company is referred to as the "Discharger."

2. On August 6, 2008, the Water Board issued Cleanup and Abatement Order (CAO) No. R6V-2008-0002 (attached) to the Discharger to cleanup and abate the effects of waste discharges and threatened discharges containing hexavalent chromium and total chromium to waters of the State. The CAO required the Discharger to take additional corrective actions to contain chromium migrating with groundwater, to continue to implement groundwater remediation in the source area and central plume area, and to develop and implement a final cleanup strategy. The Order also modified the monitoring and reporting program for permitted projects.

3. Amended CAO No. 6-87-160A2, issued in 1998, established the cleanup level for hexavalent chromium in groundwater at the laboratory method reporting limit that was in effect at the time of 10 micrograms per liter (µg/L). The method reporting limits for hexavalent chromium and total chromium are now 0.2 µg/L and 1 µg/L, respectively.

4. Sampling in the Hinkley Valley indicates that hexavalent and total chromium occur naturally in groundwater at variable concentrations, according to the February 27, 2007, document, *Groundwater Background Chromium Study Report, Hinkley Compressor Station* (Study). The Study, submitted by the Discharger, presents the results of one year of water sampling from wells located outside the boundaries of the chromium plume. The mean concentrations detected in background are 1.19 µg/L for hexavalent chromium and 1.52 µg/L for total chromium. The work plan for the Study recommended that maximum likely background concentrations should be expressed as the 95% upper tolerance limits. The 95% upper tolerance limit is the value that is estimated to include 95 percent of the

population with a 95 percent confidence level. The 95% upper tolerance limits are 3.09 µg/L for hexavalent chromium and 3.23 µg/L for total chromium.

The Study added the laboratory analysis methods' accuracy limits to the 95% upper tolerance limits to recommend background threshold values of 3.55 µg/L for hexavalent chromium and 4.04 µg/L for total chromium in groundwater. In an August 2008 staff report, Water Board staff recommended the 95% upper threshold limits, rather than the Study's recommended background threshold values, as the maximum background concentrations that should be considered when evaluating the chromium plume. Staff's recommendation is based on the independent, expert peer reviewers' comments on the draft Study work plan, which were incorporated into the final Study work plan. The peer reviewers recommended using the 95% upper tolerance limit of the background study sample results as the maximum likely background chromium concentrations. Staff's review of literature on setting background concentrations has not identified a single case where laboratory method accuracy limits were added to the maximum likely concentrations derived through statistical analysis, such as the 95% upper tolerance limit method.

5. On September 11, 2008, Water Board staff hosted a meeting in Hinkley to inform the public of the status of chromium cleanup in groundwater and of the contents of the 2007 *Background Chromium Study*. Public comments and concerns about the Study were considered by Water Board staff.

6. At the November 12-13, 2008 meeting, the Water Board considered the 2007 *Background Chromium Study* and comments and recommendations by interested persons and staff.

7. The 1995 *Water Quality Control Plan for the Lahontan Region* (Basin Plan) establishes Water Quality Objectives (WQOs) for the protection of beneficial uses. WQOs include the following Maximum Contaminant Level (MCL) established by the California Department of Health Services as a safe level to protect public drinking water supplies.

Total chromium	50 µg/L

8. On August 15, 2008, the Discharger submitted to the Water Board a document titled, *Second Quarter 2008 Monitoring Report, Source Area In-situ Remediation Project* (Report). Groundwater monitoring data in the Report shows that concentrations of total chromium were reported up to 7,400 µg/L and hexavalent chromium were reported up 7,050 µg/L in the source area at well SA-MW-05D.

9. The concentrations of total chromium and hexavalent chromium detected in groundwater at and downgradient of the Facility exceed WQOs for groundwater specified in the Basin Plan. The concentrations adversely affect the groundwater in the Mojave Hydrologic Unit for its municipal and domestic supply beneficial uses. The levels of waste chromium in groundwater, therefore, constitute a pollution of hazardous waste as defined in Water Code section 13050, subdivision (l).

10. The discharge of chromium to the groundwaters of the Mojave Hydrologic Unit, as described in Finding No. 8 above, violates a prohibition contained in the Basin Plan. Specifically, the discharge violates the following discharge prohibition:

> "The discharge of waste...as defined in Section 13050(d) of the California Water Code which would violate the water quality objectives of this plan, or otherwise adversely affect the beneficial uses of water designated by this plan, is prohibited."

11. Chromium in groundwater in and downgradient of the source area at the compressor station continues to adversely affect groundwater quality. This Amended Cleanup and Abatement Order establishes background chromium concentrations to be considered when evaluating final cleanup actions. Technical reports are necessary to verify corrective action implementation, cleanup of water quality, and progress towards restoring the beneficial uses of the aquifer.

12. This enforcement action is being taken by this regulatory agency to enforce the provisions of the California Water Code, and as such is exempt from the provisions of the California Environmental Quality Act (Public Resources Code section 21000 et seq.) in accordance with California Code of Regulations, title 14, section 15321. In addition, there is no possibility that the proposed activity will have a significant effect on the environment. In pertinent part, California Code of Regulations, title 14, section 15061, subdivision (b)(3), known as the "common sense exemption", states that where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA. In this case, the proposed activity maintains the interim background concentration for hexavalent chromium of 4 ug/L for the purpose of plume containment and establishes background concentrations for hexavalent chromium and total chromium against which remediation strategies are to be assessed. Consequently, because there is no possibility that the proposed activity will have a significant effect on the environment, the proposed activity is also exempt from CEQA pursuant to California Code of Regulations, title 14, section 15061, subdivision (b)(3).

IT IS HEREBY ORDERED that, pursuant to the Water Code sections 13267 and 13304, the Discharger must clean up and abate the effects of the discharge and threatened discharge of chromium to waters of the State, and must comply with the provisions of this Order:

1. For the purposes of evaluating plume containment and complying with Requirement No. 3 of Cleanup and Abatement Order No. R6V-2008-0002, the interim background concentration for hexavalent chromium of 4 µg/L remains in effect.

2. For the purposes of complying with Requirement No. 5, Final Cleanup Actions, of Cleanup and Abatement Order No. R6V-2008-0002, background concentrations against which remediation strategies are to be assessed are established as follow:

Maximum background hexavalent chromium = 3.1 µg/L
Maximum background total chromium = 3.2 µg/L
Average background hexavalent chromium = 1.2 µg/L
Average background total chromium = 1.5 µg/L

Remediation strategy assessment must include an evaluation of achieving average concentrations within the cleanup area that meet the average background concentrations established here, with discrete samples within the cleanup area not exceeding the maximum background concentrations established here.

Failure to comply with the terms or conditions of this Order will result in additional enforcement action that may include the imposition of administrative civil liability pursuant to Water Code sections 13268 and 13350 or referral to the Attorney General of the State of California for such legal action as he may deem appropriate.

Any person aggrieved by this action of the Lahontan Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must *receive* the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, of state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

I, Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Lahontan Region, on November 12, 2008.

Harold J. Singer

HAROLD J. SINGER
EXECUTIVE OFFICER

Attachment: Cleanup and Abatement Order No. R6V-2008-0002

040021

ENCLOSURE 3

040022

Z:\PG&E\MXD_Files\April 15 2010\Figure X (Lower Aquifer Groundwater Monitoring Locations) (2010-9-28).mxd

23-16
ND <1 / ND <0.2
08/2010 / 08/2010

MW-68C
ND <1 / ND <0.2
08/2010 / 08/2010

MW-55C
ND <1 / 0.29
08/2010 / 08/2010

MW-31C
ND <1 / ND <0.2
08/2010 / 08/2010

MW-34
ND <1 / 0.25
08/2010 / 08/2010

MW-21C
ND <1 / ND <0.2
08/2010 / 08/2010

26-65
ND <1 / ND <0.2
08/2010 / 08/2010

26-66
ND <1 / ND <0.2
08/2010 / 08/2010

MW-23C
19.8 / 22.2
08/2010 / 08/2010

MW-14C
ND <1 / ND <0.2
08/2010 / 08/2010

LA-1
LA-2
LA-3

Salinas Rd
Peublo Rd
Mountain View Rd
Manacor Rd
Serra Rd
Thompson Rd
Hervey Rd
Summerset Rd
Pera Rd
Pueblo Rd
Alcudia Rd
Santa Fe Ave
Acacia St
Fairview Rd
Frontier Rd
58
50
10
4

500 250 0 500 1,000 1,500 2,000 2,500 Feet
1 inch = 1,000 feet

NOTES:
Projection: CA State Plane NAD83 Feet Zone V
Outside Data Sources: Arcadis and CH2MHill, December 2009

Wells by Well Type
- Supply Well with Screen in the Lower Aquifer
- Lower Aquifer Monitoring Well
- New Lower Aquifer Wells in the Vicinity of MW-23C - to be Installed October 2010
- PGE Property Boundaries
- Estimated Northwest Limit of Blue Clay Layer

Iso-Concentration Contours of Hexavalent Chromium (µg/L) in the Upper Aquifer - February 2010
- 50 ug/l
- 10 ug/l
- 4 ug/l

General Form
Well ID
Dissolved Chromium / Hexavalent Chromium
Year / Year

Stantec
57 LAFAYETTE CIRCLE, 2ND FLOOR
LAFAYETTE, CALIFORNIA
PHONE: (925) 299-9300 FAX: (925) 299-9302

FOR: Pacific Gas & Electric Groundwater Remediation Project Hinkley, California

LOWER AQUIFER GROUNDWATER MONITORING WELLS

FIGURE:

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185702221	TF	CM	DRAFT	09/28/10

ENCLOSURE 4

040024

Mukasa Kezala
PO Box 547
Fresno, CA 93709
enviroauditors@gmail.com

September 20, 2010

Mr. Chuck Curtis, Manager
Cleanup and Enforcement Division
Lahontan Region Water Quality Control Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Regarding: **Comments for PG&E Hinkley Chromium Cleanup Project Workshop**

Dear Mr. Curtis:

Thank you for the opportunity to provide comments, for Water Board consideration, on issues related to Pacific Gas and Electric Company (PG&E) Hinkley chromium cleanup project, to be discussed at the October 13, 2010 workshop.

My interest in this matter stems from having worked for more than 10 years in Boron, not far from Hinkley. Some of my co-workers lived in Hinkley and Barstow - I can associate a human face to potential health issues associated with exposure to hexavalent chromium.

Attached, please some of my comments. Should you have any questions, please contact me at the above e-mail address.

Sincerely,

Mukasa Kezala

040025

Comments for Water Board Consideration
Pacific Gas and Electric Company Hinkley Chromium Cleanup Project

A. *Whether Water Board staff should have issued PG&E a Notice of Violation for being in violation of their Cleanup and Abatement Order (CAO) by failing to stop expansion of the chromium plume to the northeast, beyond the established plume boundary.*

PG&E should have been issued a Notice of Violation for failing to stop the plume expansion. Based on information in the most recent PG&E report (second quarter 2010), the chromium plume is still expanding to the northeast and then eastwards, past Summerset Road, a violation of Condition No. 3 (a) of the CAO. Issuing a Notice of Violation would have been consistent with the State Water Resources Control Board, Water Quality Enforcement Policy (Enforcement Policy) which, among other things, states:

> "*Violations of CAOs should trigger further enforcement in the form of an ACL, a Time Schedule Order (TSO) under California Water Code section 13308, or referral to the Attorney General for injunctive relief or monetary remedies*".

PG&E has so far not explained why the chromium plume continues to expand outside the established boundary. In contrast, a reasonable explanation was given for the increase in chromium concentration at Well No. MW-47, etc. A Notice of Violation would appear to be the appropriate next step. We understand that Water Board staff has some discretion in whether to issue Notices of Violation. In this situation we believe, one was warranted; and would serve as a trigger for "further enforcement" action(s). Following, are some of the reasons why a Notice of Violation should have been issued:

1. **Progressive enforcement:** The continuing expansion of the chromium plume is a repeat violation. According to the CAO, PG&E has been in violation since before 1987. The current CAO was issued on August 6, 2008 and by February 2009 PG&E was again in violation. Consistent with the Enforcement Policy, the current violation should be a **"Class 1 Priority Violation"**.

2. **Fairness in enforcement**. Review of compliance related information, posted on the Water Board website, indicates that there is a concerted effort by Water Board staff to follow guidance in the Enforcement Policy. Similar violations appear to be treated similarly and many more ACLs are being imposed. It would be unfair for Water Board staff to issue a small ma and pa operation a Notice of Violation and to assess a fine for failing to submit an annual report, even where there was no water pollution, while a very large corporation like PG&E is not issued a Notice of Violation for continuing to pollute a source of drinking water.

3. **Catalyst for Speedier Cleanup**: Cleanup and Abatement Orders have been issued for this site since 1987. PG&E may have been anesthetized to CAOs - superior officers may not be paying much attention to the matter – same old CAOs. But, were PG&E to be issued a Notice of Violation, we believe, the continued noncompliance would be noteworthy in their SEC filings. Some Board members and/or investors may ask some tough questions and somehow put some heat and pressure on lower level PG&E staff and contractors, to kick-up the cleanup effort a notch.

Whether Water Board staff should have issued a formal public notification of PG&E's violation of their Cleanup and Abatement Order (CAO) by failing to stop expansion of the chromium plume to the northeast, beyond the established plume boundary

In the sprit of the Enforcement Policy, a formal notice should have been issued to let the public know that PG&E had violated the CAO, and also let the public know whether the Water Board would take enforcement action. This is why:

Section D of the Enforcement Policy describes the opportunity and process for the public to appeal a Water Board decision not to take enforcement action. Without being informed of a violation and likely Water Board action, it is near impossible for a member of the public, without intimate knowledge of these matters, to put in practice the appeal process envisioned by the Water Board. To stay current with specific project compliance issues entails having to review reports in a timely manner and to be able to assess compliance. We count on governmental regulatory agency staff to do that for us, and to take enforcement action, as appropriate.

Even when a member of the public determines that a violation has occurred, he or she may think that a regulatory agency is handling it – will take enforcement action. Sometimes, that process takes a long time. By the time a member of the public realizes that no enforcement action will be taken after all, certain timelines may have expired and the opportunity for appeal lost.

For a cleanup site of this notoriety, and to encourage public participation, when there is a violation, the public should be notified of the violation and any planned Water Board action. Without that, a violation for which the Water Board has elected not to take enforcement action will just die quietly. The public may not be very happy if they find out about a violation, long after all timelines for action have expired. If the public is not satisfied with the Water Board's reason for not taking additional enforcement action(s), at least let them know in time to exercise the privilege to appeal, if they so choose.

C. *Whether the Water Board should require the plume map contour line to delineate the 1.2 and 3.1micrograms per liter concentrations.*

- The 1.2 micrograms per liter line would just clatter the map – would informational only. Numeric values written on map are adequate for that purpose.

- Perhaps, replace the 4 micrograms per liter boundary line with a 3.1 line to make it very easy to recognize noncompliance. As long as the actual values for each well continue to be printed on the map, the current scheme appears to work fine.

- Should the values for the boundary lines be changed, I request that the August 2008 reference map be redrawn with the new values.

- For clarity, how about putting a notation on the maps to indicate that values printed on the maps include or don't include the background value.

040027

PG&E Hexavalent Chromium Plume Expansion Beyond Boundary

Table 1

Well No. MW-62A

Sample Date	Micrograms/Liter	
	Measured	Net Increase*
August 2008	3.79	0.69
February 2009	7.17	4.07
5/14/2009	5.86	2.76
8/7/2009	4.81	1.71
11/17/2009	10.5	7.4
11/17/2009 Duplicate)	10.5	7.4
2/16/2010	14.7	11.6
May 2010	13.2	10.1

Table 2

Well No. MW-72S

Sample Date	Micrograms/Liter	
	Measured	Net Increase*
8/4/2009	2.97	0
11/12/2009	5.42	2.32
11/12/2009 (Duplicate)	5.39	2.29
2/15/2010	6.29	3.19
5/11/2010	6.1	3.0

Table 3

Wells east of Summerset Road, east and south of Desert View Dairy

Well No.	Sample Date	Net Increase*
MW-79S	6/21/2010	1.6
MW-86S	6/22/2010	2.4
MW-87S	6/22/2010	1.7
MW-88S	6/21/2010	1.6

* Net increase in hexavalent chromium concentration in groundwater above natural background level of 3.1 micrograms per liter.

040028

From: mukasa kezala <mukasa.kezala@gmail.com>
To: <ccurtis@waterboards.ca.gov>
Date: 9/20/2010 1:57 PM
Subject: Material for Board Consideration - PG&E Chromium Plume Cleanup Workshop
Attachments: Comment for October 13 Workshop Cover.doc; Comment for October 13 PG&E Work shop.doc

Mr. Curtis:

Attached are my comments on issues to be discussed at the October 13 Workshop. I will not be able to attend the workshop - too far from Fresno. Thanks for the opportunity to provide comments.

I would also like to let you know that Lisa of your staff has been great in giving me information related to this project - answering my questions promptly or pointing me to where to find information on the Internet. Great customer service!

Mukasa Kezala