CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD LAHONTAN REGION

MEETING OF AUGUST 30, 2023 APPLE VALLEY, CA

ITEM 8

Status Report on Cleanup Activities Concerning Chromium Contamination from Pacific Gas and Electric Company's Hinkley Compressor Station

CHRONOLOGY	
2002-2007	Pacific Gas & Electric (PG&E) developed and implemented a groundwater sampling program to determine background levels of chromium in the Hinkley Valley. Background levels are needed to determine the boundaries of contamination (i.e., draw plume maps), assess remediation progress, and to set cleanup levels.
2008	Water Board issues Cleanup and Abatement Order (CAO) R6V-2008-0002A1 that establishes average and maximum values for background total and hexavalent chromium, based on PG&E's 2007 Background Study Report. Adopted General Waste Discharge Requirements for PG&E, General Site-Wide Groundwater Remediation Project, Board Order No. R6V-2008-0014 to allow timely and efficient implementation of various remedial activities for hexavalent chromium in groundwater. Remedial projects are authorized by a Notice of Applicability (NOA) of General Waste Discharge Requirements issued by the Executive
	Officer.
2015	CAO R6V-2015-0068 establishes that background values from CAO R6V-2008-0002A1 will continue to be used and will be referred to as "interim" maximum background concentrations to distinguish these values from other values that may be adopted later based on the results from the United States Geological Survey (USGS) Chromium Background Study.
2023	Final USGS Chromium Background Study Report public release.

BACKGROUND

This agenda item has three components. First, Dr. Izbicki will be present to answer questions on methodology and findings of the USGS Chromium Background Study Report.

Second, the eighth annual update of PG&E's remediation effectiveness and cleanup status.

Last, Water Board staff will hold a workshop to solicit input from the public on the results of the background study and on our next steps to revise orders issued to PG&E now that the background study is complete.

ISSUES

Water Board members will be asked whether they have concerns with the Executive Officer "accepting" the USGS Chromium Background Study Report. Upon Water Board Executive Officer acceptance of the background study, the CAO establishes deadlines for PG&E to submit two feasibility studies within 180 days.

The annual update on remedial actions is an informational item, and no formal action is requested, though the Water Board members may give direction to staff.

The Staff Report provided as Enclosure 1 is intended to initiate discussion during the board meeting. Some of the key questions for discussion include:

- 1. What is the summative-scale plume?
- 2. Will trivalent chromium reconvert to hexavalent chromium?
- 3. What is the background concentration of hexavalent chromium in groundwater where I live?
- 4. How can I get involved in the CAO revision process? Does my input matter?

DISCUSSION

As a follow up to the April 2023 Water Board meeting, Dr. Izbicki will be present to take questions and provide clarity regarding methodology and findings of the USGS Chromium Background Study Report. Water Board members will be asked whether they have concerns with the Executive Officer "accepting" the USGS Chromium Background Study Report.

Upon Water Board Executive Officer acceptance of the USGS Chromium Background Study Report, the CAO establishes deadlines for PG&E to submit two feasibility studies, the Western Finger Cleanup Feasibility Study (CAO Requirement VI.C.1.a.iii) due within 60 days of Water Board acceptance, and the Northern Disputed Plume Area Cleanup Feasibility Study (CAO Requirement VI.C.2.d) due within 180 days of Water Board acceptance. These feasibility studies are in areas determined to have predominantly naturally occurring hexavalent chromium based on findings in the background study.

For the annual update, the Water Board will hear a report of our oversight, a report of PG&E's remedial actions conducted for chromium cleanup, and a report of the Independent Review Panel (IRP) Manager's community outreach and involvement

DISCUSSION

since the last update provided at the June 2022 board meeting. A written summary of PG&E's remedial actions is provided as Enclosure 2, the executive summary from

PG&E's Annual Cleanup Status and Effectiveness Report (January to December 2022).

Water Board staff will provide an update on:

- Requests received from PG&E;
- Agricultural Treatment Unit byproduct management (basin-wide approach to mitigate byproducts using Farm Swap and low energy precision application [LEPA]); and
- Status of a hexavalent chromium drinking water standard.

PG&E will provide an update on (Enclosure 3):

- Remedial actions conducted in 2022; and
- Progress to reach target chromium concentrations by the associated deadlines in the CAO.

The Hinkley Community IRP Manager, Project Navigator, will provide an update on (Enclosure 4):

- Outreach and technical advisory services provided to Hinkley Community; and
- IRP review of the USGS Chromium Background Study.

Following the annual update, Water Board staff will facilitate a discussion to solicit input from the public now that the USGS Chromium Background Study Report is complete. Input is being sought on the results of the background study, our next steps to potentially revise orders issued to PG&E, and ideas related to how the results of the background study may be integrated into revised orders. Staff will facilitate dialogue and discussion by addressing several fundamental questions that we anticipate the public may ask as outlined in the Staff Report provided in Enclosure 1.

CAO R6V-2015-0068 requires PG&E to clean up and abate the effects of its historical chromium discharges to background levels. Several different cleanup methods are being implemented by PG&E to meet the CAO requirement. Cleanup methods are currently conducted under Board Order R6V-2014-0023 for agricultural treatment and a Notice of Applicability of General Board Order R6V-2008-0014 for in-situ remediation zone and freshwater injection activities. A revised CAO would involve a public process with an opportunity for public comment. The content of a proposed CAO revision has not yet been developed. Various options could be considered such as revising the CAO to include new cleanup levels, the possibility of establishing multiple background values based on subareas, requirements associated with hotspots, revised monitoring, updated remediation timeframes based on a chosen cleanup level, and other changes. An updated timeline and major tasks to revise the CAO will be presented.

PUBLIC OUTREACH/INPUT

Water Board staff provide Status of Action sheets that are discussed during quarterly Hinkley Community meetings and are provided to the community via the "Pacific Gas & Electric Company, Hinkley Chromium Cleanup" interested persons e-mail subscription list; hard copies are mailed to those that had previously requested it.

This agenda item was announced in the July 2023 Independent Review Panel newsletter and the July 2023 Status of Actions, both distributed at and discussed during the Hinkley Community meeting held on July 27, 2023. This agenda item was also announced at the Mojave Water Agency Technical Advisory Committee meeting held on August 3, 2023.

The IRP Manager posted signs in the Hinkley community announcing the Board meeting location, date and time, and the title of this agenda item. Flyers were distributed to community members and stakeholders for general distribution on August 3, 2023, and August 4, 2023. Those flyers included the Board meeting location, date and time, the title of this agenda item, and included a link and QR code to the instructions on how to participate in the meeting remotely.

This agenda item was posted to the Water Board's website and distributed to the community via the "Pacific Gas & Electric Company, Hinkley Chromium Cleanup" interested persons e-mail subscription list, and hard copies of the agenda announcement were mailed to those that had previously requested it.

PRESENTERS

- 1. Amanda Lopez, Water Board
- 2. Dr. John Izbicki, USGS
- 3. Iain Baker, PG&E (Enclosure 3)
- 4. Dr. Raudel Sanchez, Project Navigator (Enclosure 4)

RECOMMENDATION

The Annual Status Report is an informational item, and no formal action is requested, though the Water Board members may give direction to staff.

ENCLOSURE	ITEM	BATES NUMBER
1	Staff Report	8 – 5
2	Executive Summary for PG&E's Annual Cleanup Status and Effectiveness Report (January to December 2022)	8 – 15
3	PG&E presentation: PG&E Annual Status Update of the Groundwater Remediation Program	8 – 23
4	IRP Manager presentation: IRP Manager's Final Thoughts on the USGS Cr (VI) BGS Report	8 – 45

ENCLOSURE 1



STAFF REPORT

Discussion Points and Next Steps: United States Geological Survey Background Study Report and PG&E Compressor Station Cleanup in Hinkley

Prepared for August 30, 2023 Lahontan Board Meeting



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Introduction

Lahontan Regional Water Quality Control Board (Water Board) staff are facilitating a discussion at the August 2023 meeting of the Lahontan Water Board to solicit input from the public now that the <u>United States Geological Survey (USGS) Hexavalent Chromium</u> <u>Background Study</u> (USGS Background Study) is complete. Input is being sought on the results of the USGS Background Study, next steps for the Water Board to revise orders issued to Pacific Gas & Electric (PG&E), and ideas related to how the Water Board may integrate the results of the USGS Background Study into revised orders. This staff report addresses several questions (**bold text**) we anticipate the public may ask and is intended to initiate dialogue during the discussion.

USGS Background Study

Why did the USGS perform a background study? In 2007, PG&E released a background study report that established background levels of hexavalent chromium in groundwater in the Hinkley Valley to assess remediation progress, determine plume boundaries, and establish cleanup goals (2007 PG&E Background Study). The 2007 PG&E Background Study was incorporated into the Water Boards 2008 Cleanup and Abatement Order (CAO). In 2010, community concerns about the validity of background chromium values resulted in a peer review of the 2007 PG&E Background Study. In 2012, Water Board staff were provided direction from the Board to consider a new background study and to bring in an independent third party to provide scientific defensibility and transparency in determining a background concentration. Dr. John Izbicki with the USGS, a recognized expert on the occurrence of chromium in the Mojave Desert, was selected to perform a revised background study, also referred to as the USGS Background Study.

In 2015, the State Water Board entered into a contract with the USGS to have Dr. Izbicki perform the USGS Background Study. Hinkley community members, Water Board staff, PG&E staff, and Dr. Izbicki developed a plan to evaluate the objectives of the USGS Background Study. The objectives were to determine the extent of anthropogenic hexavalent chromium released from the PG&E Hinkley Compressor Station, estimate background hexavalent chromium concentrations in the upper aquifer of the Hinkley and Water Valleys, and investigate the potential for trivalent chromium to re-convert back to hexavalent chromium after in-situ remediation is complete.

The final USGS Background Study Report was released to the public on April 25, 2023. Dr. Izbicki provided a presentation and report out on the results of the study at the <u>April</u> <u>26, 2023, Lahontan Water Board Meeting</u>.

Key Findings of the USGS Background Study

What is the summative-scale plume? The USGS analyzed the probable extent of anthropogenic hexavalent chromium released from the PG&E Hinkley Compressor Station through the summative-scale approach. The summative-scale plume defines the extent of human-made or anthropogenic hexavalent chromium in groundwater. The summative-scale plume boundary is the boundary between anthropogenic hexavalent chromium and naturally occurring hexavalent chromium. The predominantly anthropogenic hexavalent chromium is within the boundary and could be attributed to historic discharges from the PG&E Hinkley Compressor Station. The presence of hexavalent chromium outside of the summative-scale plume boundary generally could be considered as coming from the geology and lithology. The summative-scale plume is approximately 5.5 square miles and encompasses the regulatory plume as defined by the Water Board's CAO R6V-2015-0068 (2015 CAO).

What is the background concentration of hexavalent chromium in groundwater where I live? The findings of the study showed that although the Hinkley area geology is naturally low in chromium, background concentrations in groundwater vary based on lithology. The study area was divided into six distinct lithologic subareas (Water Valley, Northern subarea downgradient of Mount General fault, Northern subarea upgradient of Mount General fault, Northern subarea upgradient of Mount General fault, Western subarea, Eastern subarea, Mudflat/playa within eastern subarea), and each subarea was determined to have a different hexavalent chromium background concentration. For example, the Northern subarea in the northern part of Hinkley Valley upgradient of the Mount General fault has a hexavalent chromium background concentration of 4.8 micrograms per liter (μ g/L), whereas the Eastern subarea in the eastern part of the valley where the PG&E Hinkley Compressor Station is located, and most of the regulatory plume, has a lower hexavalent chromium background concentration of 2.8 μ g/L. The background concentration of hexavalent chromium background concentration of 2.8 μ g/L.

Will trivalent chromium re-convert (reoxidize) to hexavalent chromium? Through bench-scale laboratory testing, it was determined that there is a potential for trivalent chromium to re-convert back to hexavalent chromium after in-situ remediation is complete if the right conditions are present in the aquifer. Post-remediation monitoring could be performed to monitor whether reoxidation is or has the potential to occur.

Did the USGS Background Study identify any wells with increasing or decreasing hexavalent chromium trends? Chapter D in the USGS Background Study report identified wells with increasing and decreasing trends of hexavalent chromium in the shallow, medium, and deep zones of the upper aquifer outside of the regulatory plume but within the summative scale plume. There are also some wells with increasing trends of naturally occurring hexavalent chromium, located outside the summative-scale plume boundary (e.g., hot spots). Additional evaluation and comparative analysis using data collected for the USGS Background Study to current conditions or future investigative and monitoring data will occur. We are requesting copies of all data and map files from the USGS to aid our analysis.

Does the USGS Background Study show domestic wells with probable anthropogenic hexavalent chromium that were not considered to have anthropogenic hexavalent chromium before the study? A property that is not within the regulatory plume but is within the summative-scale plume means that property is in an area where hexavalent chromium in groundwater could be predominantly from an anthropogenic source. Statistically significant upward hexavalent chromium concentration trends were identified in eight of the 219 domestic wells in Hinkley and Water Valleys selected for analyses in the USGS Background Study. Two of the eight domestic wells are located within the summative-scale plume, indicating a probable anthropogenic source of hexavalent chromium. The remaining six wells are located outside the summative-scale plume boundary, indicating the hexavalent chromium is likely naturally occurring. Water Board staff value any public feedback on this topic.

Existing Water Board Orders and Possible Changes Based on the Findings of the USGS Background Study

The 2015 CAO requires PG&E to clean up and abate the effects of its historical chromium discharges to background levels. The CAO prescribes an interim maximum background level of 3.1 µg/L hexavalent chromium (based on the 2007 PG&E Background Study) as the cleanup goal, and as interim pending other background values that may be adopted later based on the results from the USGS Background Study. Several different cleanup methods are being implemented by PG&E to meet the CAO requirement. Cleanup methods are currently conducted under Board Order R6V-2014-0023 for agricultural treatment and a Notice of Applicability of General Board Order R6V-2008-0014 for in-situ remediation zone and freshwater injection activities. Each of these Board Orders require specific monitoring and reporting for remediation effectiveness, plume boundary control, plume containment, remediation byproducts, and private supply well protection, in addition to what is required in the CAO.

What levels are used in the 2015 CAO to measure remediation progress? The 2015 CAO uses the interim 3.1 µg/L hexavalent chromium cleanup number to contour the "regulatory plume boundary" and as the value to compare what progress has been made by PG&E's remediation and for evaluating plume containment. The 2015 regulatory plume extended north from the Hinkley Compressor Station just past Thomson Road, between Serra Road to the east and just past Summerset Road to the west. The regulatory plume was approximately 2.2 square miles and was located entirely within the summative-scale plume defined in the USGS Background Study.

How might the USGS Background Study influence revisions to the CAO? The Regional Board has authority to require dischargers to cleanup and abate the effects of discharges in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored. The USGS Background Studies provides information on where anthropogenic chromium and natural chromium exists.

This information, along with other resources, could be used by the Regional Board to set new cleanup goals, revise monitoring requirements, or consider other changes in a revised CAO.

How will a lower background hexavalent chromium concentration affect remedial timeframes? PG&E is required to remediate the known extent of the chromium plume in groundwater to background concentrations. Generally, the lower the background concentration (cleanup goal), the longer the remedial timeframe. If a new cleanup goal is considered by the Regional Board, the Regional Board could also consider requiring a feasibility study to determine a new remedial action timeframe.

Can the Water Board require PG&E to cleanup to more than one hexavalent chromium concentration? Yes. The Water Board could, after a public process and adoption meeting, incorporate six values for each of the six subareas identified in the USGS Background Study as the cleanup goals in a revised CAO. Another possible option could include one hexavalent chromium cleanup goal, versus multiple cleanup goals, to apply to the whole of the PG&E remediation project. In the Regional Board's selection of a cleanup goal(s), the Regional Board would consider protection of human health, the levels of water that can be restored, among other factors.

What additional information might be needed to complete a revision to the CAO? We cannot answer this question at this moment but intend to identify information needs and data gaps as we work through the CAO revision process and as our outreach program progresses.

Next Steps and Timeline for CAO Revision

How long will it take revise the CAO, and what steps will the Water Board take? While we are unable to give an exact date for a revised CAO, it is estimated the revision process could take anywhere between two and five years. The process to adopt the 2015 CAO took multiple years to complete, and we expect a similar timeline for this revision to the CAO. The following major tasks will be performed during the revision process.

- A community outreach program. We intend to hold workshops, listening sessions, and meetings to involve the public in the revision process over the next year. The community outreach period could be extended depending on progress of the development of the draft Revised CAO at the end of 2024. Details of this outreach program are still being developed.
- Determine CAO revisions needed. This will be concurrent with the community outreach program. Input from PG&E, the public, and Independent Review Panel manager (Project Navigator) will be instrumental in helping to define the regulatory plume, the cleanup goal(s) and timeframes, and additional monitoring and reporting to be included in the revised CAO. During this time, we will also identify other information needs or tasks to be completed and data gaps as we work through this process.

- Drafting revisions to the CAO. This will be concurrent with the community outreach program and occur after we have determined what revisions need to be made. During this time, we will also be working concurrently on gathering the additional information needed to support the proposed revisions to the CAO.
- Draft Revised CAO out for public comment. The draft Revised CAO will be distributed for a minimum 30-day public comment period in advance of a Board adoption meeting.

Hinkley Community Outreach and Communications Plan

Water Board staff are currently developing an outreach and communications plan to help us engage with the community and interested stakeholders to ensure that all voices are heard. Evaluation of 2020 Census data suggests the greater Hinkley and Water Valley area includes a significant Hispanic or Latinx population. To support engagement with all community members, the Lahontan Water Board and IRP Manager will continue to provide outreach and information in English and Spanish. We encourage the public to let us know if outreach and information needs to be provided in another language.

How can I get involved in the revision process? Does my input matter? The Water Board is looking to get public participation on decisions as to the future of the PG&E cleanup, all input matters! This will happen through the public providing comments, opinions, and ideas about what matters to them and what they would like addressed in a revised CAO. We strongly encourage the public to participate during the CAO revision. For questions or comments throughout the revision process, please contact Amanda Lopez at <u>amanda.lopez@waterboards.ca.gov</u> or (760)241-7373.

Past efforts to engage and inform the Hinkley community have included participation in the Technical Working Group (TWG), presentations and updates at quarterly Hinkley Community Meetings, Hinkley Community Breakfasts, the IRP's monthly <u>Hinkley</u> <u>Community Newsletter</u>, and annual updates at Lahontan Water Board Meetings. We intend to continue these efforts as well.

ENCLOSURE 2



Pacific Gas and Electric Company

Annual Cleanup Status and Effectiveness Report (January to December 2022)

Hinkley Compressor Station Hinkley, California Cleanup and Abatement Order No R6V-2015-0068

February 28, 2023

Executive Summary

This Annual Cleanup Status and Effectiveness Report (January to December 2022) evaluates the effectiveness of remedy components (including hydraulic containment, agricultural operations, and in situ treatment) that have been implemented to date at the Pacific Gas and Electric Company (PG&E) Hinkley Compressor Station, located in Hinkley California, towards reaching remedial targets specified in the Cleanup and Abatement Order No. R6V-2015-0068, issued on November 4, 2015 (2015 CAO; California Regional Water Quality Control Board, Lahontan Region [Water Board] 2015). The report also recommends improvements for remedy performance and includes the operational plan for 2023. Exhibit ES-1 below summarizes the key construction and optimization activities, effectiveness evaluations, and recommendations for improvements from observations made between January and December 2022.

The 2015 CAO (Water Board 2015) established cleanup requirements for the Hinkley Compressor Station including the following cleanup timeframes for the southern plume in Requirement VI:

- Reach and maintain 50 parts per billion (ppb; equivalent to micrograms per liter [µg/L]) hexavalent chromium (Cr(VI)) and total chromium (Cr(T)) in 90 percent of the 50 ppb Cr(VI) plume as of the date of the 2015 CAO by December 31, 2025, as determined by a specified set of monitoring wells; and
- Reach and maintain 10 ppb Cr(VI) and Cr(T) in 80 percent of the 10 ppb Cr(VI) plume as of the date of the 2015 CAO by December 31, 2032, as determined by a specified set of monitoring wells.

In 2014, Arcadis U.S., Inc. (Arcadis) conducted a remedial timeframe assessment (RTA; Arcadis 2014a) that estimated remedial timeframes based on a preliminary design of remedial infrastructure and a preliminary plan of construction sequencing and operations. The estimated timeframes from the RTA informed the cleanup timelines adopted in the 2015 CAO (Water Board 2015), although the deadlines established in the 2015 CAO are sooner than the range of estimates identified in the RTA.

Since the 2015 CAO (Water Board 2015) was issued, considerable progress has been made in remedy implementation. The majority of infrastructure planned in the RTA was constructed by 2019, with several components installed earlier than planned in the RTA. Improvements to the remedy, in excess of what was planned in the RTA, are made when areas that warrant additional infrastructure are identified each year as part of adaptive management. To date, more than triple the amount of remedial infrastructure that was planned in the RTA has been installed (i.e., 105 remedial wells have been installed since 2015 in comparison to the 35 that were planned in the RTA). The Four-Year Comprehensive Cleanup Status and Effectiveness Report (2016 to 2019) (Arcadis 2020a) and subsequent 2020 Remedial Timeframe Assessment Action Plan (Arcadis 2020b) recommended seven new construction projects to improve the remedy. Several additional areas were identified in 2020 and 2021 for remedy enhancements (Arcadis 2021a, 2022c). In 2022, several projects were completed and turned on, an investigation into challenging lithologic areas was conducted, and a few new projects outside of the 2020 and 2021 remedy enhancements were constructed, as summarized in Exhibit ES-1.

Considerable progress toward reaching the 2015 CAO (Water Board 2015) deadlines has been made since 2015. Significant plume contraction in the northern portion of the plume continued in 2022. In February 2022, further optimization of the pumping configuration to improve mass removal and plume contraction was initiated with an 18-month pilot test. The pilot test was successful and PG&E recommended a revision to Attachment 5 of the 2015 CAO (Water Board 2015) to make the optimized pumping configuration permanent (Arcadis 2022g). The

groundwater extraction and Agricultural Treatment Unit (ATU) operations for containment have also provided a secondary benefit of nitrate removal, with approximately 372 tons of nitrate in groundwater from pre-existing land use activities removed since 1992.

Progress has been made since 2015 in reduction in the area of the 50 µg/L and 10 µg/L Cr(VI) plumes and in mass removal, with 85 percent of the mass removed from groundwater to date. Progress temporarily slowed in 2020 and 2021 because new projects were in the process of being built and the enhancement took some time to show improvements. Progress resumed in 2022 with improvements from several new infrastructure projects realized. However, there continue to be several challenges identified in the Four-Year Comprehensive Cleanup Status and Effectiveness Report (2016 to 2019) (Arcadis 2020a) that will continue to impact remedy effectiveness and create uncertainty in reaching 2015 CAO remedial goals (Water Board 2015) as follows:

- There is uncertainty associated with areas of elevated chromium concentrations that were unknown in 2015 until proactive investigation identified them that have been slower to be treated to remedial targets than anticipated. In Situ Reactive Zone (IRZ) injections were increased in 2022 to address these areas and were successful in reducing Cr(VI) concentrations. However, the increased injections resulted in plume expansion, and the injections had to be greatly reduced to allow the plume to contract, thereby limiting plume treatment and progress toward 2015 CAO remedial targets (Water Board 2015). A revision to the Area of Allowed Expansion in Attachment 3 of the 2015 CAO is recommended to allow temporary and quantified plume expansion, as envisioned in the 2015 CAO to conduct the IRZ injections necessary to achieve 2015 CAO remediation targets.
- Areas that may be influenced by the complexity of the recently identified fault splays and hydrologic conditions within the plume core are limiting the effectiveness of existing remedial infrastructure and complicating plans for future designs. One example is the confined unit causing the plume expansion with IRZ injections noted in the bullet above.
- Areas that are becoming dewatered due to drought conditions are resulting in very thin saturated areas containing elevated chromium concentrations that are difficult to treat with IRZ injection and limit groundwater extraction. Because of the lack of Mojave River flows and limited Lenwood Recharge Basin imports in recent years, groundwater levels in the Hinkley Valley and greater area have shown a steady decline since 2011, when the last significant Mojave River flows occurred. Groundwater levels have decreased up to 40 feet in the Hinkley Valley agricultural area east of the chromium plume from 2011 through 2022. Groundwater levels within the plume core have also steadily declined by more than 20 feet in some areas over this period, creating complex conditions for remedial activities.

To improve the remedy and address these challenges in 2023, PG&E has proposed revisions to existing remedial plans and 2015 CAO attachments (Water Board 2015), as summarized in Exhibit ES-1. These regulatory requirement revisions will allow for the hydraulic control optimizations to continue and IRZ treatment to resume at full strength. In addition, a few areas that were identified for improvement are proposed for remedy enhancements.

The changes to sampling frequencies under 2015 CAO Requirements I.C and I.D (Water Board 2015) in 2021 included a decreased sampling frequency in 14 wells and increased sampling frequency in 15 wells. During 2022, remedial systems were generally operated according to the monthly goals set forth in the 2022 operational plan (Arcadis 2021a), with the following exceptions: Northern ATUs were below goals in January through March 2022 and June through September 2022 because of the fallowing of two fields, the Northwest Freshwater Injection

system was below goals in February and March 2022 because of pilot testing, and the Southern ATUs were below goals in June through October because of remedial construction and overturning and reseeding in one field. These exceptions did not impact system performance or hydraulic control.

Exhibit ES-1 2022 Remedy Summary

Remedial System/ Area	Were Plans for 2022 Construction Implemented? ^a	Additional Construction Activities ^b	System Effectiveness	Changes Recommended for 2023
Hydraulic Containment North	Yes Completed two pilot tests to improve hydraulic containment efficiency and plume contraction.	Not applicable	 Effective Successful containment and optimization ahead of plan; Significant plume contraction continued, while a remnant area of 50 μg/L Cr(VI) concentrations north of Santa Fe Road was rediscovered and captured. 	 Yes Water Board approval to revise Western Action Plan to keep Northwest Freshwater Injection system off; and Amend 2015 CAO Attachment 5 to adopt revised capture metrics and continue optimized pumping.
Hydraulic Containment South	Not applicable	Not applicable	Effective, with Exceptions IRZ injections were greatly reduced to reverse plume expansion.	Yes Amend 2015 CAO Attachment 3 to allow for eastern Central Area and Deep East SCRIA IRZ treatment to resume at higher rates.
Lower Aquifer	Yes Completed pilot test to assess improvements to treatment	Not applicable	 Effective, with recommendations Significant Cr(VI) concentration reductions in lower aquifer. Mass remains in transition zone. 	Yes Water Board approval to revise remedy to focus extraction in transition zone.

Remedial System/ Area	Were Plans for 2022 Construction Implemented? ^a	Additional Construction Activities ^b	System Effectiveness	Changes Recommended for 2023
Central Area IRZ	Partially Performed investigation in western Central Area.	Yes Four injection wells.	Effective, with Recommendations Eastern Central Area treatment is limited because of plume expansion during injection.	 Yes Additional western well in Central Area if treatment is not observed; and Amend Area of Allowed Expansion in 2015 CAO Attachment 3 to allow eastern Central Area treatment to resume at higher injection rates.
SCRIA IRZ	Yes • Four injection wells; and • Conducted investigation in western SCRIA.	Yes Four injection wells.	 Effective, with Exceptions Cr(VI) concentrations decreased in northwest; IRZ treatment greatly reduced to manage plume expansion; and Poor performance of southwestern injection wells limiting Cr(VI) treatment. 	Yes Amend Area of Allowed Expansion in 2015 CAO Attachment 3 to allow deep eastern SCRIA treatment to resume at higher injection rates.
Source Area IRZ	Yes Southeast freshwater pilot; and Conducted investigations. 	Not applicable	Effective, with Recommendations • Cr(VI) treatment improved with new infrastructure; and • Areas for improvement identified.	Yes Enhance remedy north of Community Boulevard on the east and west to improve treatment.

Notes:

^a 2022 construction plan as presented in Arcadis 2022b.

^b Construction activities in addition to those in the 2014 Remedial Timeframe Assessment (Arcadis 2014a).

SCRIA = South Central Reinjection Area

ENCLOSURE 3

Hinkley – Groundwater Remediation Program

August 2023





PG&E is committed to doing what's right for the Hinkley community, and we will be here until we finish the job.

- Remedy Implementation 2022
- Remediation Progress
- Looking Forward

Constant Refinement and Improvements

In response to dynamic conditions, PG&E has actively refined, improved and enhanced their remedial efforts across 20 projects since 2015 including:

- Installation of **104 remedial wells**
- Addition of 47 monitoring wells and piezometers
- Undergrounding of 32,906 feet of piping
- Placement of 23,035 feet of electrical lines



PG<mark>8</mark>E **2022 Remedy Enhancements**



Investigation into difficult hydrogeologic conditions



Northwestern Source Area IRZ Construction



Northeastern Source Area IRZ Construction

Continued Progress on the Plume

August 2004 Fourth Quarter 2017 Fourth Quarter 2022 Pueblo Rd Petra Rd Pueblo Rd Petra Rd Pueblo Rd Petra Rd Acacia St Acacia St Acacia St 0 0 Star Memorial Hwy Star Memorial Hwy e Star Memorial Hwy Front Front Carson Rd Carson Rd Carson Rd Granada Rd Granada Rd Granada Rd Com Com ____ 10 ppb Plume Outline — 10 ppb Plume Outline — 10 ppb Plume Outline ----- 50 ppb Plume Outline ----- 50 ppb Plume Outline ----- 50 ppb Plume Outline

2,000 ft

PG<mark>&</mark>E



Progress Toward 10 ppb Remedial Goal: 2032



PGSE Increasing Efficiency of Capture

Optimized pumping configuration for plume capture was tested in 2022

Northern ATUs	2014/2015	2021	2022
Flowrate (gpm)	1,087	789	580
Active ATU Acreage	240	184	132

Continued progress on plume retreat using less water and less ATU acreage



7

Mass Removal from Groundwater Over Time Dr

Estimated Mass Removal from Groundwater



Estimated Cr(VI) Mass Removal from Groundwater by IRZs

Estimated Cr(VI) Mass Removal from Groundwater by ATUs, Northwest Extraction, and Former Ranch and East LTUs

Estimated Cr(VI) Mass Remaining in Groundwater



PG<mark>&</mark>E

Shallow Aquifer



PG<mark>s</mark>e

Deep Aquifer



Progress Toward 50 ppb Remedial Goal: 2025

Data shows remedy is tracking towards 2025 goal, but several variables make a certain date difficult to predict.



Challenges for Treatment of 50 ppb Plume

PG<mark>&</mark>E

Eastern confined unit



Drought

Complexity of Fault System

Areas of slow treatment and local geologic conditions

Plume Bulging Experienced Due to Increased Injection

PG8E







Area of Increased Cr6 Concentration

Groundwater Flow Direction

Active Domestic Wells

2023 Remedy Recommendation: Revise Area of Allowed Plume Expansion

To resume robust IRZ injections and build additional IRZ infrastructure



PGSE

- Area of Increased Cr6 Concentration
- **Groundwater Flow Direction**
- **Active Domestic Wells**

PGSE Mojave River Flows March 22, 2023





LEGEND



Hydrograph Location

LENWOOD ROAD LOOKING NORTH



2023 Mojave River Flow Monitoring Well Response

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Historical River Flow Monitoring Well Response



Groundwater Levels

PG<mark>&</mark>E

Community Commitment

PG&E continues its strong commitment to the community through local hiring, sustainable practices, and community partnerships.

PG&E Supporting Our Local Community

- **4 COVID Vaccination Event**
- **1** COVID and Flu Vaccination Event
- 1 Community Clean-up Event



Hinkley residents line up at the free vaccine event at the Hinkley Community Center.

PG&E's Workforce Development helps young adults fill local job vacancies in our community

- Participants obtain valuable hands-on work experience and professional certifications
- Nearly 100% job placement rate upon completion and over 126 participants since 2011





Hinkley resident loads waste into an almost-full dumpster at the *Community Clean Up Day event.*

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- Continued implementation of mitigation measures in accordance with permits and the EIR to protect domestic wells.
- All domestic well chromium results remain below safe drinking water standards.
- The final USGS background study represents a thorough scientific approach and PG&E appreciates all the hard work that went into the study.

- Study findings support our approach treating the highest concentrations of chromium 6 in the near-term, while concentrations for the next several decades.
- this new information as we continue to

sustainably treating and managing lower

PG&E is committed to working with the community and Water Board to best utilize improve and adapt our remedial approach.

ENCLOSURE 4

Prepared by

IRP Manager Team

Dr. Raudel Sanchez Mr. Anthony Vu Mr. Anand Helekar Ms. Margaret DeAngelis Ms. Lorena Barahona Dr. Ian A. Webster

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projectnavigator.com

IRP Manager's Final Thoughts on the USGS Cr(VI) BGS Report



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How the IRP Manager Team Performs Community Outreach

The IRP Manager's team interfaces with community stakeholders in three ways

1. Relationships

- Reputation for delivering fact-based information
- One on Ones with timely follow-up
- Relationships built over our tenure
- Accurate media reporting and outreach
- Persistence and Attitude

2. Technical

- Third party data review, analysis and feedback
- Translating complex science and data into understandable visuals
- Photo reports, visual descriptions
- Newsletters, fact sheets
- Website (www.HinkleyGroundwater.com)
- Project knowledge
- Technical Working Group participation

3. Physical

- Meetings Be Visible
- Community Sponsored Events
- IRP Office Backroom/Models
- Use of Local Resources
- Field Trips





IRP Manager's Community Outreach Efforts to Date





IRP Manager Team Submitted Formal Comments to the Water Board on the USGS Cr(VI) BGS Report

AN PROJECT hine 30, 2023 Amanda Lopez Jan Zimmerman California Regional Water Quality Control Board, Labortan Region 15095 Amargosa Road, Building 2, Suite 210 Victorville, California 92394 IRP Manager's Review and Final Thoughts on the United States Geological Re: Survey's Hexavalent Chromium Background Study Report Dear Amanda and Jan. The Independent Review Panel (IRP) Manager Team has reviewed the United States Geological Survey's (USGS's) Natural and Anthropogenic (Human-Made) Hexavalent Chromium, Cr(VI), in Groundwater Near a Mapped Plume Report, or "Background Study Report (BGS Report)." Or. John Izbicki of the USGS submitted the BGS Report on April 25, 2023, one day before presenting his findings to the Lahontan Regional Water Quality Control Board (Water Board) during their Annual Meeting. The IRP Manager Team, Project Navigator Ltd. (PNL), continues to advise and provide technical outreach to the Hinkley Community on matters associated with PG&E's ongoing hexavalent chromium (Cr(VII) remediation activities. PNL also provides independent feedback and written comments on technical reports and cleanup and abatement orders pertaining to the Hinkley Groundwater Chromium Remediation Program. This formal letter herein is submitted consistent with the role of the IRP Manager Team. Purpose of the USGS Cr(VI) BGS The purpose of the USGS Cr(VI) BGS is to provide scientifically defensible estimates of naturally accuming Cr(VI) in groundwater in Hinkley and Water Valley by estimating background Cr(VI) in the upper aquifer upgradient, downgradient, along the perimeter, and within the footprint of the PG&E Cr(VI) plume. In 2012, Hinkley Community Members requested from the Water Board that an independent party perform an update to the 2007 PG&E Cr(VI) background study. The Water Board identified several deficiencies to the 2007 PG&E Cr(VI) background study that. included the following: · Use of existing wells not designed for groundwater monitoring and often having incomplete construction data:

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- IRP Manager Team submitted formal comments to the Water Board on June 30, 2023
- IRP Manager Team agrees with the findings of the USGS Cr(VI) BGS Report
- TWG provided a mechanism for transparency for Hinkley Community members throughout the Study
- IRP Manager Team will continue to conduct outreach with the Hinkley Community



Timeline of Background Study





TWG Meetings at IRP Manager Office Throughout the Years





TWG Meetings at IRP Manager Office Throughout the Years

ZUSGS





USGS Providing Updates During IRP Manager Quarterly Meetings





Geological Tour of Hinkley Valley









Hinkley Community Observing Groundwater Sampling





Hinkley Community Observation of Mobile Laboratory Analysis





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USGS Conducting Geophysical Survey





Boroscope Fieldwork

USGS Staff Discussing Preliminary Results from the Boroscope Logs with the IRP Manager Team.

Close up view of monitoring well.



Image shows the Boroscope conduit inside of a monitoring well. The Boroscope probe is placed inside the monitoring wells at different depths and provides groundwater direction at that specific depth. Ancillary data used to guide collection of the boroscope work.



Review of Core Samples at PG&E Core Library



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TWG Meeting in Sacramento to Discuss the Development of the ModFlow Model





TWG Tour of the Menlo Park Laboratory Where Task 8 Was Completed





USGS Demonstration of X-Ray Fluorescence Meter to TWG

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