

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2019-0076

WASTE DISCHARGE REQUIREMENTS
FOR
PACIFIC GAS AND ELECTRIC COMPANY
FORMER GEOTHERMAL INC. FACILITY
CLASS II LANDFILL
POST-CLOSURE MAINTENANCE AND CORRECTIVE ACTION
LAKE COUNTY

FINDINGS

The California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) finds as follows.

Introduction

1. Pacific Gas and Electric Company (PG&E, Discharger) owns and operates the Former Geothermal Inc. Landfill (Facility), which is located approximately 2.5 miles southeast of Middletown in Lake County, Section 7, T10N, R6W, Mount Diablo Base and Meridian (MDB&M). The Facility's location is depicted on the Site Location Map in Attachment A.
2. PG&E as the Facility's owner and operator, is responsible for compliance with this Order.
3. This Order encompasses the post-closure maintenance and corrective action of the following waste management units (WMUs) at the Facility:

Table 1. Facility Waste Management Units

WMU	Unit Type	Class	Size	Status
Closed Landfill	Landfill	Class II	15 acres	Closed

4. The following materials are attached to this Order, and incorporated herein:
 - Attachment A Site Location Map
 - Attachment B Site Plan
 - Attachment C Groundwater Monitoring Network
 - Attachment D Surface Water Monitoring NetworkInformation Sheet

Standard Provisions and Reporting Requirements, December 2015
Edition (SPRRs)

5. Also attached and incorporated as part of this Order is the separately-issued Monitoring and Reporting Program R5-2019-0076 (MRP), which sets forth the approved Water Quality Protection Standard (WQPS). (See Title 27, § 20390 et seq.) Compliance with the operative MRP (including subsequent amendments) is required under this Order.
6. The Facility, prior to closure as a landfill, was owned and operated as seven unlined surface impoundments by Geothermal Inc. to accept waste produced from geothermal exploration, steam power generation and other geothermal related activities. Following Geothermal Inc.'s filing for bankruptcy in November 1987, the Central Valley Water Board pursued an enforcement action against all potentially responsible parties (PRPs), including generators of the waste received at the Facility and Geothermal Inc. (Resolution No. 91-200, adopted on 6 September 1991). Waste generators were identified as PRPs from Geothermal Inc. waste disposal records. On 8 May 1992, the Attorney General sent a letter to a list of eight PRPs, including companies or entities that later acquired the environmental liability for waste at the Facility from a waste generator, to inform them about the enforcement action and preference to secure voluntary corporation in cleanup and closure of the Facility. Following a meeting between the Central Valley Water Board, the Attorney General, and the PRPs on 4 June 1992, the PRPs formed a Technical Committee (TC) consisting of representatives from PG&E, Northern California Power Agency, Unocal, and Santa Fe Geothermal/Occidental Petroleum Geothermal, Shell, Sacramento Municipal Utility District (SMUD), Freeport McMoran, and Thermal, to develop a technical basis for PRP allocation of costs. Subsequent to that meeting, on April 14, 1993 a five-member Management Committee (MC) was formed by the PRPs to provide technical oversight for the site cleanup and closure. PG&E has served as the main contact for the MC. A Cleanup and Abatement Order (CAO) was issued to the PRPs in 2002 (R5-2002-0204). After establishment of a Qualified Settlement Fund for the site into which PRPs paid their allocated share of cleanup, PG&E purchased and took title of the entirety of the former Geothermal Inc. property as of 16 August 2004.
7. On 13 August 2018, the Discharger submitted an updated Report of Waste Discharge (ROWD) for the Facility. Information in the ROWD, and other sources including the case files, monitoring reports, closure evaluation report, corrective action feasibility study reports and site conceptual model, was used in the development of this Order. These waste discharge requirements (WDRs) include:
 - a. A summary of work completed at the Facility since the time of adoption of CAO R5-2002-0204;

- b. A summary of CAO R5-2002-0204 requirements and compliance;
- c. An update to current understanding of site geology and hydrogeology, and the site conceptual model;
- d. Requirements for additional corrective action for waste/groundwater separation and impacted groundwater;
- e. Requirements for an updated water quality protection standard; and
- f. Requirements for the Facility's monitoring network
- g. Requirements for the post-closure maintenance and additional corrective action financial assurances.

Waste / Unit Classifications

- 8. In WDRs Order 86-087, the Facility was classified as a "Class II-1" waste disposal site subject to regulations formerly in California Code of Regulations, title 23 (Title 23), division 3, chapter 15 (§ 2510 et seq.). Regulations governing non-Class I facilities were subsequently consolidated in California Code of Regulations, title 27 (Title 27), division 2, subdivision 1 (§ 20005 et seq.) Subsequent site investigations have demonstrated that waste at the Facility meets the criteria for non-hazardous "designated waste" (Class II). This Facility continues to be subject to Title 27 regulations.
- 9. The Facility formerly accepted liquid and solid wastes produced by geothermal exploration, steam power generation and other geothermal related activities. These wastes consisted of:
 - a. Drilling mud and fluids;
 - b. Geothermal brines and sump liquids, including rainwater;
 - c. Condensates from cooling towers;
 - d. Petroleum fractions;
 - e. Hydrogen sulfide scrubber wastes from the Stretford process and the iron peroxide-caustic abatement process, both of which were used in treating the gas stream generated in the geothermal energy process; and
 - f. Solid waste from geothermal plant construction and maintenance.
- 10. On 6 December 2002, the Central Valley Water Board adopted CAO R5-2002-0204, which classified the Facility's waste management unit (WMU) as

Class II unit for the discharge of non-hazardous solid waste and designated waste (as defined per Wat. Code, § 13173). This Order continues such classifications, which are set forth herein.

11. The Facility formerly consisted of seven surface impoundments (Ponds 1 through 7), three disposal trenches, and two unlined unused ponds. CAO R5-2002-0204 required the Discharger to close all units and submit the final closure report by 1 February 2006. Waste from the former surface impoundments and three disposal trenches were consolidated into four surface impoundments (Ponds 2, 3, 4 and 6) which were closed as one landfill, and the remainder of the former surface impoundments and the three former disposal trenches were backfilled with clean soil to a minimum thickness of 4 feet (ft) and graded. This work was completed in 2006. The Discharger has not proposed construction of any new waste management units at the Facility. This Order does not authorize the discharge of any additional waste at the Facility as specified in Section A.1.

Site Description

12. The Facility is situated on a 460-acre property comprised of Lake County Assessor's Parcel Numbers (APNs) 014-004-01 and 014-004-31. The address associated with the Facility is 19020 Butts Canyon Road, Middletown, California 95461 (site).
13. The site is situated at the base of the foothills of Long Valley in the Collayomi Valley Basin of the Sacramento River Hydrologic Region, and is surrounded by oak trees and grasslands. Eucalyptus plantations have been planted along the perimeter of the closed landfill to assist in lowering the groundwater table.
14. Three geologic units have been identified by the Discharger at the site: unconsolidated sediments consisting of eluvium, alluvium, colluvium and fill materials; a massive sandstone unit; and a bedrock mélange unit comprised of serpentine, pelitic, and sandstone rocks. The Facility primarily overlies the unconsolidated sediments underlain by the bedrock mélange and locally overlies the bedrock mélange in the former Pond 2 area. The Discharger has designated hydrostratigraphic unit (HSU) -1, HSU-2 and HSU-3 for unconsolidated sediments, massive sandstone and bedrock mélange units, respectively.
15. Land uses within one mile of the Facility include rural lands, resource conservation, rural residential and agricultural.
16. In 2007, a Covenant and Environmental Restriction on Property was put in place for the site as an institutional control measure, part of corrective action, which prohibits groundwater use and indicates that the site shall not be used for growing crops and no wells will be drilled or used without written permission of the Central Valley Water Board.

17. There are 24 domestic wells, 14 irrigation wells (9 wells are in use and 5 are unused), and 11 wells of unknown use are within one mile of the Facility boundary. Additionally, the Discharger provided a well location map that shows eight locations that could possibly be wells within one mile of the Facility boundary. The nearest known irrigation well is 0.5 miles and domestic well is 0.33 miles from the site.
18. Class III WMUs must be designed and constructed to withstand a maximum probable earthquake, whereas Class II WMUs must withstand a maximum credible earthquake (MCE). (Title 27, § 20370.) According to a site-specific seismic analysis for the Facility, such seismic events occurring along the Collayami 2011 CFM Fault, first identified by the Uniform California Earthquake Rapture forecast system in 2013, at a closest rupture distance of 0.8 miles would result in a MCE magnitude of 6.6, and a peak ground acceleration of 0.364g.
19. Based on data from the nearest weather station (Western Regional Climate Center Station 04-5598), the Facility has an annual average precipitation of 44.1 inches, and a mean pan evaporation of 47 inches per year based on Lakeport station.
20. WMUs must be constructed to accommodate stormwater runoff from 24-hour precipitation events with a return period of 100 years for Class III WMUs, and a return period of 1,000 years for Class II WMUs. (See Title 27, § 20320.) According to National Oceanic and Atmospheric Administration's (NOAA) Precipitation Frequency Atlas 14, Volume 6 (rev. 2014), the Facility's 100-year and 1,000-year, 24-hour rainfall events based on Middletown 4 SE (04-5598) station, are estimated to result in 10.5 and 13.1 inches of precipitation, respectively. [Source: [NOAA Precipitation Frequency Data Server](https://hdsc.nws.noaa.gov/hdsc/pfds/), (https://hdsc.nws.noaa.gov/hdsc/pfds.)]
21. The Facility does not have a stormwater sedimentation basin. The stormwater drainage features at the Facility collect stormwater runoff and discharge to unnamed streams at the site which eventually discharge to Putah Creek.
22. According to the [Federal Emergency Management Agency's \(FEMA\) Flood Insurance Rate Map](https://msc.fema.gov/portal), available online at (https://msc.fema.gov/portal), the Facility is not located within a 100-year floodplain.
23. The measured horizontal hydraulic conductivity of native soils (unconsolidated sediments) underlying landfill units approximately ranges from 3.5×10^{-7} to 1.8×10^{-3} centimeters per second (cm/s) based on information provided by the discharger in *Site Conceptual Model Update* submitted on 22 August 2014.

Groundwater and Surface Water Conditions

24. The Discharger developed a site conceptual model in 2002 and subsequently updated it based on results of additional investigations and field data collected at the site. The last update to the site conceptual model was submitted on 16 June 2017 and an addendum was submitted on 4 January 2018.
25. Groundwater beneath the Facility occurs in unconsolidated sediments (HSU-1) and fractured bedrock (HSU-2 and HSU-3). The thickness of the unconfined aquifer varies temporally and spatially, from 0 to 50 ft at the site. The landfill and former ponds are located on top of a hydrological divide, with groundwater entering from the north and south, and discharging to the east and west. The depth to groundwater is as shallow as approximately 2 ft below grade in the vicinity of the closed landfill. Groundwater velocity in the unconsolidated sediments (HSU-1) aquifer ranges from 0.045 ft per day to the west to 0.37 ft per day to the east towards Freeman Lake based on information provided by the discharger in *Site Conceptual Model Update* submitted on 22 August 2014.
26. The Discharger submitted *Site Conceptual Model Update and Plume Delineation Report*, dated 16 June 2017, which presented the following conclusions based on the cumulative investigation findings, supplemental field data, geophysical surveys, aquifer testing, and hydrogeologic evaluations.
 - a. The unconsolidated sediments (HSU-1) and massive sandstone (HSU-2) units are porous media, and the groundwater direction can be indicated in these units.
 - b. The head distribution in the bedrock mélange unit (HSU-3) indicates that the wells are not hydraulically connected, and the bedrock mélange unit (HSU-3) is not hydraulically connected to the overlying unconsolidated sediments (HSU-1) except at shallow, highly weathered portions of the bedrock mélange unit (HSU-3).
 - c. The closed landfill piezometer data indicates that there are shallow perched lenses of water located within the waste; however, they are hydraulically isolated from underlying groundwater.
 - d. The landfill waste is deep enough in some locations to encounter groundwater during the winter rainy season when groundwater levels rise up to and around the waste.
27. Based on the comparison of groundwater levels and quality in HSU-1 and HSU-3 pair wells presented in *Site Conceptual Model Update and Plume Delineation Report*, dated 16 June 2017, it appears that groundwater in HSU-3 has hydraulically limited to no connection with groundwater in HSU-1. Though some

of the pair wells show no groundwater head differences, the piper diagrams presented in the report indicates that the groundwater ionic compositions of those pair wells are different. Additionally, analytical results indicate that concentrations of constituents of concern (COCs) are higher in some of the HSU-3 monitoring wells located proximal to the former ponds, than in the HSU-1 wells; but ionic compositions of groundwater from those wells were different from the waste existed in the ponds based on the piper diagrams. Therefore, it appears that there are naturally occurring COCs in HSU-3 that are present at higher concentrations than the HSU-1 groundwater concentrations. However, the Discharger has acknowledged in the *Site Conceptual Model Update and Plume Delineation Report* that HSU-3 monitoring well A-7, LP-4C, P-13d and SP-27 may have some degree of water quality impacts from the waste, but not at concentrations that are greater than background concentrations found in HSU-3. Therefore, it is determined that the COCs are naturally present at high concentration in HSU-3 which is not impacted by waste in the former ponds except in shallow areas.

28. The site is located at a surface drainage divide. The western part of the site drains to an unnamed drainage that flows to Putah Creek and then to Lake Berryessa. The eastern part of the site drains to another unnamed drainage that flows to Detert Reservoir, then to McCreary Lake, then Putah Creek and Lake Berryessa.

Monitoring Networks

29. The Facility’s monitoring system consists of groundwater and surface water monitoring. The Discharger has been monitoring for groundwater in all HSUs, including HSU-3 which underlies HSU-1 in most of the Facility area. Based on the evidence noted in Finding 27, HSU-3 is not a reasonable hydrogeological unit for detection or corrective action monitoring. The Facility’s groundwater monitoring network for HSU-1 and HSU-2 consists of the following monitoring wells in Tables 2-3, as shown in Attachment C:

Table 2. Monitoring Well Network for HSU-1

Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
A-2	Detection	Downgradient	1099.19	41.50	9.93 - 41.43
A-3	Detection	Downgradient	1102.52	61.50	11.50 – 61.50

Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
FMW-5	Corrective Action	Downgradient	1116.76	24.00	14.00 – 24.00
FMW-6	Corrective Action	Downgradient	1118.23	23.00	15.00 – 23.00
FMW-7	Corrective Action	Sidegradient	1119.24	33.50	32.00 – 33.50
FMW-8	Corrective Action	Sidegradient	1120.02		
MW-102	Background	Upgradient	1112.20	34.50	19.50 - 34.50
MW-103	Detection	Downgradient	1106.92	25.00	15.00 – 25.00
MW-104	Detection	Downgradient	1106.88	25.00	15.00 – 25.00
MW-106	Corrective Action	Downgradient	1112.89	22.00	12.00 – 22.00
MW-107	Corrective Action	Downgradient	1113.66	22.00	12.00 – 22.00
MW-108	Corrective Action	Downgradient	1114.55	22.00	12.00 – 22.00
MW-110	Background	Upgradient	1119.68	32.50	17.50 - 32.50
MW-113	Background	Upgradient	1145.14	26.00	16.00 – 26.00
MW-118	Detection	Downgradient	1123.92	40.00	20.00 – 40.00
MW-119	Corrective Action	Downgradient	1108.43	25.00	5.00 – 25.00
MW-125	Detection	Downgradient	1116.59	12.00	7.00 – 12.00
MW-126	Detection	Downgradient	1108.5	23.00	13.00 – 23.00
MW-128	Detection	Downgradient	1109.34	7.50	5.00 – 7.50
SP-35	Detection	Downgradient	1116.75	20.00	10.90 – 15.50
SP-41	Corrective Action	Downgradient	1133.12	35.00	11.30 – 16.00
SP-43	Background	Upgradient	1115.76	19.40	9.89 - 19.40

Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
SP-44	Corrective Action	Downgradient	1110.41	15.33	10.65-15.33
A-4	Background	Upgradient	1149.54	9.50	4.50 – 9.50
MFP-3	Background	Upgradient	1167.11	50.30	35.30 – 50.30
MFP-6d	Corrective Action	Downgradient	1126.02	27.34	18.06 – 27.34
SP-01	Corrective Action	Downgradient	1136.41	34.40	27.45 – 38.85
SP-04	Detection	Downgradient	1126.02	27.30	20.79 – 30.09

30. The Discharger has installed wells at the site to collect additional data as part of the site investigation and feasibility evaluation study since 2002. Not all the wells are used for groundwater monitoring per Title 27 requirements (see Attachment C). The Discharger shall propose abandonment of wells which are no longer needed to collect groundwater samples or testing, and submit a well abandonment work plan as described in Time Schedule I.C.
31. The Discharger has demonstrated that there are no unsaturated zone monitoring devices or methods designed to operate under subsurface conditions at the Facility's WMUs. Due to the nature of the waste (drilling mud) and the site conditions, unsaturated zone monitoring is not practicable.
32. The Facility's surface water monitoring network consists of the following monitoring points (existing and proposed), as shown in Attachment D:

Table 3. Surface Water Monitoring Points

Monitoring Point	Program
SW01R	Background
SW02	Detection
SW03R	Detection
LAKE-R	Detection

33. As discussed in the MRP R5-2019-0076, the above-described monitoring networks comply with the requirements of Title 27. (See Title 27, §§ 20415–20435.)

Corrective Actions and Compliance with Title 27 Prescriptive Standards

34. As reported in the *Groundwater Corrective Action Plan* (CAP, November 2005), first impacts to groundwater were noted during the operation of the ponds in the early 1980s. The groundwater in the vicinity of the former ponds has been impacted with inorganic COCs including boron, sulfate, chloride and Total Dissolved Solids (TDS). Waste management activities that contributed to groundwater impacts during its operating period, as reported by the Discharger in the ROWD, were:
- a. Wastewater stored in the unlined ponds infiltrated through the former pond bottoms and sides and into underlying soil and groundwater.
 - b. Wastewater seepage discharged to the surface drainage might have moved some distance down gradient from the former ponds, allowing it to infiltrate into the soil and then to groundwater. (The seepage through the dikes was collected through the French drains installed along western side of the former Pond 1, between the former Ponds 1 and 2, and southern edges of the former Ponds 1, 2, 3, and 4, and discharged to a sump at the southwest corner of the former Pond 1. The collected seepage in the sump was pumped into the surface drainage, immediately south of the former Pond 1, which discharges to the Western Ponding Area.)
 - c. Direct releases from the former Pond 6 into the northern drainage and seepage through the eastern berm of the former Pond 6 onto the Freeman property to the east.
 - d. No separation between the waste and groundwater at all locations of the closed landfill at all times.
35. Based on the remedial action alternative evaluation and demonstration from 1995 through 2002, the Geothermal Site Management Committee (MC) submitted the closure plan for the Facility on 20 December 2002. As a source control measure, the proposed closure plan was to consolidate waste from Ponds 1 and 7, and disposal trenches in Ponds 4 and 6; and close Ponds 2, 3, 4 and 6 as a landfill with an engineered alternative final cover in compliance with Title 27 requirements. The Facility units were closed in 2006. See Findings 55-61 for unit closure.
36. The Discharger's closure documents did not provide evidence for closure of the French drains installed along western side of the former Pond 1, between the

former Ponds 1 and 2, and southern edges of the former Ponds 1, 2, 3, and 4 to collect seepage through the dikes (Finding 34). The Discharger shall investigate the presence of the French drains remaining in place that represent a potential pathway for groundwater or infiltrated surface water migration in the immediate vicinity of the closed landfill, as described in Time Schedule I.D.

37. The Discharger submitted the *Groundwater Engineering Feasibility Study* report (October 2003) to assess the feasibility of various options for groundwater remediation at the Facility with the objective of returning groundwater to conditions that existed prior to waste being discharged at the Facility per the CAO Provision C.4. The *Amendment to Groundwater Engineering Feasibility Study* report, submitted in July 2004, presented the results of an evaluation of three additional potential remedial alternatives and an evaluation of the sensitivity of the numerical model to variations in effective recharge. The evaluated alternatives were: approved closure plan implementation with no action, institutional controls, additional phyto-extraction, additional groundwater extraction from four wells, additional groundwater extraction from trenches, enlarged phytoextraction (7.6 acres), soil washing new Pond 1 and additional excavation near Pond 1. *Groundwater Engineering Feasibility Study* and the amendment reports recommended “approved closure plan implementation with institutional controls” alternative to be implemented since it is a low-cost alternative compared to other alternatives except “no action” alternative, and as effective as other alternatives. The proposed institutional controls consisted of prohibitions on supply well construction and the use of groundwater in the site.

The Central Valley Water Board requested the MC to conduct a more thorough assessment of the alternative “approved closure plan implementation with additional excavation near Pond 1” since the excavation of the potentially impacted soil beneath Pond 1 might more effectively remediate groundwater than indicated by the numerical model. The MC responded to the Central Valley Water Board request in a letter¹ which stated that the excavation of the native soil beneath Pond 1 would not remove a significant amount of boron since this element is very soluble and there is no mechanism for it to accumulate in the soil. Further, the letter discussed the technical and logistical difficulties related to excavating soil below the water table and providing additional clean borrow soil to mix with the wet excavated soil for stability prior to placement in the landfill, and the delay that the additional excavation of soil below Pond 1 may cause in completing the Facility closure per schedule. The letter also provided an outline for contingency remedial actions that to be addressed in Corrective Action Plan. On 5 May 2005, the Central Valley Water Board approved the *Groundwater*

¹ Summary from February 16, 2005 Meeting and Request for Approval of Recommended Alternative, dated 15 April 2005.

Engineering Feasibility Study as modified by the amendment report and the letter.

38. The *Groundwater Engineering Feasibility Study* report (October 2003) identified the groundwater remedial action goals in compliance with Provision C.4 of the CAO, which required the engineering feasibility study to assess the feasibility of remedies that will return groundwater to conditions that existed prior to wastes being discharged at the Facility. The Discharger has acknowledged that the precise groundwater chemistry that would have existed prior to wastes being discharged cannot be established because of the size of the former disposal Facility, its location at a groundwater divide, the complicating local effects of geothermal waters, and the geologic variation. Based on the natural variability and the observation of COCs concentrations similar to or greater than the water quality objectives (WQOs), the Discharger concluded that the use of the WQOs as the remedial action goals for onsite groundwater is practical, is consistent with overall background levels at the site, and is protective of human health and the environment.

Based on the further site investigation, collected field data and analysis performed since 2002, and the information presented in *Site Conceptual Model Update and Plume Delineation Report*, dated 16 June 2017, the corrective action goals will be background concentration limits as in Section C.4 of the MRP R5-2019-0076.

39. Per the CAO Provision C.5 requirements, the MC submitted November 2005 CAP report which provided a summary of the closure status, groundwater conditions, proposed groundwater cleanup goals, approved remedial action which is closure plan implementation with institutional controls (see Finding 16), and potential contingency remedial actions which would depend on the then-current groundwater conditions, COC concentrations, and the specific elements of the closure or areas at the Site that require attention. The CAP report stated that if groundwater conditions did not appreciably improve within the first 5 to 7 years following implementation of the closure plan, contingency remedial actions would be evaluated. Further, the CAP report included discussion about potential contingency remedial options which were additional phyto-extraction, groundwater extraction and treatment, or establishment of a Containment Zone. On 8 December 2005, the Central Valley Water Board approved the CAP report.
40. On 28 February 2012, in compliance with CAO Provision C.9, the Discharger submitted *Closure Evaluation Report* which presented an evaluation of the landfill closure relative to the requirements of CAO R5-2002-0204, an updated site conceptual model and numerical model for the Facility, and a forecast of future groundwater conditions at the Facility. The Facility complied with all requirements of the CAO Facility Specifications, with one exception: a minimum five-foot

separation between waste and underlying groundwater.² Further, the report presented that the separation between groundwater and waste would increase in the future and five-foot separation would likely be achievable over most of the closed landfill, but may not be at all locations at all the time based on the results of numerical modeling forecast simulations.

41. The Discharger submitted *Feasibility Study, Additional Corrective Measures for Groundwater* report, dated 3 August 2012, to identify and evaluate the feasibility of additional remedies that could increase the likelihood of providing and maintaining the minimum five-foot separation between groundwater and waste, and return groundwater conditions to those prior to wastes being discharged at the site. The evaluation included alternatives developed from general response actions: no action, institutional controls, groundwater extraction, groundwater containment, waste relocation, ex-situ groundwater primary treatment, secondary treatment (for treatment of residuals generated from primary treatment), in-situ groundwater treatment, and water disposal, and then screened and selected based on effectiveness, implementability and cost. The remedial action alternatives those were evaluated in the feasibility study were: no action, implementation of an approved closure plan, extraction of groundwater near closed cells, construction of a hydraulic barrier wall around closed cells with and without groundwater extraction, clean water option – construction of hydraulic barrier north of closed cells with groundwater extraction, and modification of on-site closure cells. The results of the feasibility study indicated that none of the evaluated alternatives provide significant improvements to the predicted groundwater conditions expected under the approved closure plan with institutional controls. Though some of the alternatives were predicted to achieve and maintain the five-ft separation between waste and groundwater at all locations, implementation cost of the alternatives was higher than the institutional controls alternative. The Discharger proposed to conduct additional data collection, refinement of the hydrogeological model, and evaluation of whether the refined hydrogeological model affects predictions for future performance of the implemented closure plan and the effectiveness of the remedial alternatives.
42. On 25 April 2014, the Discharger submitted *Site Conceptual Model Update* report which included the additional fieldwork performed to refine the groundwater model, and the Discharger's interpretation of the extent of groundwater contamination and separation of waste from groundwater. Additionally, the report indicated that separation between waste and groundwater was not maintained at all locations at all times. The Central Valley Water Board staff suggested the

² Title 27 requires that "[e]xisting landfills ... be operated to ensure that wastes will be a minimum of five feet (5 ft.) above the highest anticipated elevation of underlying ground water." (Title 27, § 20240, subd. (c).) Compliance with this prescriptive standard does not, in and of itself, constitute "corrective action" under title 27. (See, e.g., *id.*, § 20430.)

Discharger install piezometers through the closed cells wherever the separation was not maintained to monitor the separation and depth of water within the waste. Further, staff requested the Discharger to explain how to achieve, maintain, and monitor hydraulic control beneath the unit, and to establish concentration limits for each geological unit and background monitoring wells as needed, in the review comments letter³.

43. On 15 April 2015, the Discharger submitted *Waste Separation Feasibility Study and Corrective Action Plan* report to evaluate and identify alternatives to increase the effectiveness of the previously implemented closure to achieve the Title 27 separation requirements. The results of the feasibility study recommended to install a hydraulic barrier wall (HBW) adjacent to the closed landfill cells to control groundwater flow adjacent to the landfill. The study concluded that it is an effective alternative to meet the remedial action objectives, does not have long-term permitting delays prior to implementation and can be implemented for a reasonable cost in comparison to the other alternatives. The Discharger proposed the corrective action to include installation of storm drain piping to connect existing storm water management features along the western and southern sides of the closed landfill and convey storm water to a new outfall located near Freeman Lake and construction of a hydraulic barrier wall adjacent to the closed landfill cells.
44. On 16 June 2017, the Discharger submitted *Site Conceptual Model Update and Plume Delineation Report* which described the changes to the site conceptual model geology and hydrogeology, delineated the groundwater impacts from waste, and evaluated the stability of the groundwater plume. In addition to the conclusions described in Finding 26, the report presented the following conclusions based on the cumulative investigation findings and feasibility evaluation results:
 - a. Impacts from waste are almost exclusively found in the unconsolidated sediments (HSU-1). The impact is concentrated in the immediate vicinity of the closed landfill and extends to the property boundary to the west.
 - b. Potential impacts to the massive sandstone unit (HSU-2) are limited to shallow wells located closer to former Pond 7. The monitoring and field data indicated that there is not a significant plume as the extent is limited and there is no vertical migration.
 - c. A plume in the bedrock mélangé unit (HSU-3) has not been identified. The shallow groundwater wells in the immediate vicinity of the closed landfill

³ Water Board Comments on the 25 April 2014 Site Conceptual Model Update, Geothermal Inc., Geothermal Inc. Landfill, Lake County letter dated 20 November 2014.

could have some contribution from the waste, but at concentrations below the background concentrations associated with unit HSU-3.

- d. The plume has not grown in over two decades. The outer-most plume boundaries have not changed significantly in shape over the past two decades.

Based on the above and Finding 26 conclusions, the Discharger determined that corrective action for groundwater cleanup needs to be addressed only in the unconsolidated sediments unit, and this served as the basis for hydraulic containment of impacted groundwater beneath the closed landfill via HBW. Further, in the *Corrective Action Plan for Waste Separation Engineered Alternative and Groundwater Cleanup* report submitted on 16 June 2017, the Discharger determined that the sensitivity of the groundwater model was not sufficient to provide an acceptable level of certainty for the evaluation of waste separation alternatives relative to the five-ft separation goal, and HBW to control groundwater flow adjacent to the closed landfill is not technically viable for ensuring five-ft separation at all locations in the closed landfill at all times.

45. The Discharger proposed a full-perimeter HBW to achieve hydraulic containment of impacted groundwater beneath the closed landfill and to obtain hydraulic isolation around the landfill, and monitored natural attenuation (MNA) for the groundwater plume outside the HBW, in *Corrective Action Plan for Waste Separation Engineered Alternative and Groundwater Cleanup* report. The proposed HBW would consist of low-permeability soil bentonite, placed into an approximately 5,600-foot long (around the landfill footprint and former Ponds 5 and 7) trench, 35 to 60 ft deep and key into unweathered bedrock, and 2.5 ft to 4 ft wide. The Discharger's estimated cost for the proposed alternative is 12.6 million in 2015 dollars. The Central Valley Water Board staff conditionally approved the corrective action plan for the waste separation on 3 July 2018⁴ with the following conditions:
 - a. The design has to meet all requirements of Title 27 section 20360 (b).
 - b. The Discharger must implement strategies and/or install and operate infrastructure necessary to dewater the area contained within the cutoff wall to maintain hydraulic containment of the waste. Extracted groundwater must be monitored and properly disposed of.

⁴ Conditional Approval of Corrective Action Plan, Pacific Gas & Electric Company, Geothermal Inc. Facility, Lake County, California, letter dated 3 July 2018.

- c. An Operations and Maintenance Manual (O&M Manual) must be developed for whatever dewatering infrastructure the Discharger chooses to implement at the site.
- d. The Discharger must install monitoring devices that will clearly show if hydraulic containment is being achieved at all times.
- e. The Discharger shall propose an updated schedule to be approved by the Central Valley Water Board to install the cutoff wall and all necessary infrastructure.
- f. The Discharger must provide an alternative plan to be implemented immediately in the event the cutoff wall does not create hydraulic containment.

The Discharger's response to the conditional approval letter was that an update to the required conditions will need to be evaluated or updated to better align with the findings in the 2017 site conceptual model update report and the site-specific conditions driving the proposed corrective action approach, in a letter⁵.

- 46. The Discharger acknowledged in their 2017 CAP report that the HBW is not a technically viable solution to maintaining the required five feet of separation as required in Title 27. Given the estimated cost of \$12.6 million (2015 dollars), the Discharger's information regarding the limited effectiveness of the HBW, and the complex geology underlying the WMUs, the Central Valley Water Board now believes that a hydraulic barrier wall is not a technically and economically viable corrective action measure. Further, all feasibility studies conducted to evaluate the alternatives to create and maintain five-foot separation between the bottom of waste to underlying groundwater since 2002, concluded that it is not technically or economically feasible to achieve five-foot separation due to site geologic and hydrogeologic conditions at the Facility.
- 47. Groundwater elevation trends presented in *Water Quality Monitoring Report Semi-annual Period July through December 2018* indicate that groundwater levels at monitoring wells in HSU-1 or HSU-2 are stable or declining and are showing seasonal variations. Based on the groundwater analytical results presented in the semi-annual monitoring reports, COC concentrations in groundwater in HSU-1 are showing stable or declining trends.
- 48. Ponding water was observed adjacent to the closed landfill, along the southwest edge of the former Ponds 1 and 2 during site inspection by Central Valley Water

⁵ Conditional Approval of Corrective Action Plan – Schedule Modification Request Pacific Gas & Electric Company, Geothermal Inc. Facility, Lake County, California, letter dated 16 October 2018

Board staff on 4 December 2018. The Discharger shall submit a revised drainage improvements design to provide positive surface water drainage at the site to limit ponding and potential infiltration of surface water runoff immediately adjacent to the closed landfill, as described in Time Schedule I.E.

49. Title 27, section 20400, subdivision (a) requires the Discharger to propose concentration limits for each COC for each medium (including surface water under § 20415). The Discharger did not have concentration limits established or proposed for surface water monitoring in the ROWD. The Discharger shall propose the concentration limits for each COC for surface water in the upcoming semiannual report, as described in Time Schedule I.F.
50. In controlling the COC plume and groundwater coming in contact with the waste in the closed landfill, the Discharger shall monitor the effectiveness of the corrective actions already implemented, additional corrective actions, if any, to be implemented as a result of French drain investigation (Finding 36), and the surface drainage improvements to be implemented (Findings 43 and 48). A summary of the evaluation of effectiveness of corrective actions shall be included in semiannual monitoring reports as required by MRP R5-2019-0076.
51. Based on all information available to the Central Valley Water Board (including as described in the findings above), compliance with the prescriptive standard for five-foot groundwater separation (per Title 27, § 20240, subd. (c)), either through groundwater extraction or an engineered alternative, is neither technically nor economically feasible at this time. Nor are there any technically or economically feasible engineered alternatives capable of providing truly equivalent water quality protection. Consequently, the Discharger will not be required to maintain five feet of groundwater separation under this Order.

New Unit Construction

52. In the ROWD, the Discharger did not propose construction of new waste management units at the Facility, at the time this Order was adopted. However, the following information presented in Findings 53, 54 and 55 are provided to the Discharger for reference if a new waste management unit is contemplated in the future.
53. Liners for new Class II WMUs (landfills and surface impoundments) must be designed and constructed to contain fluids (e.g., leachate, waste and landfill gas condensate), so as to prevent the migration of waste to adjacent geologic materials, groundwater and surface water. (See Title 27, §§ 20310(a), 20330(a).)
54. Liners for new Class III WMUs (landfills) must be designed and constructed to contain fluids (e.g., leachate, waste and landfill gas condensate), so as to be

capable of preventing degradation of groundwater and surface water, even with inadequate site characteristics. (See Title 27, §§ 20310(c), 20330(a).)

55. The Central Valley Water Board is authorized to approve an engineered alternative to Title 27 prescriptive standards (see, e.g., Title 27, § 20330 (c)), provided that the discharger demonstrates that compliance with the prescriptive standard would be unreasonably and unnecessarily burdensome in comparison to the proposed alternative. (Title 27, § 20080 (b) and (c); State Water Board Resolution 93-62).

Unit Closures

56. Ponds 5 and 6 were clean closed in 1985 prior to being retrofitted with double clay liners. Ponds 5 which was subsequently taken out of service when the LCRS was filled with rainwater, did not receive any waste after being clean closed and lined. Ponds 2 and 3 received interim closure in 1996 by transferring free liquid to Ponds 1 and 7, stabilizing solid wastes with clean soil and covering the wastes with a 20-mil high density polyethylene (HDPE) geomembrane.
57. On 20 December 2002, the Discharger submitted *Final Closure Plan* proposing closure of the Facility per the Facility Specification B.6 of the CAO R5-2002-0204 which required the Discharger to close all units at the Facility. Updates to Final Closure Plan was submitted on 30 May 2003 and 14 August 2003. The Discharger proposed to consolidate wastes from Ponds 1 and 7, and three disposal trenches into Ponds 4 and 6; close Ponds 2, 3, 4 and 6 as landfills; and backfill the rest of the ponds and three disposal trenches with a minimum four feet of clean soil. Central Valley Water Board approved the *Final Closure Plan* on 3 February 2003 and update to the *Final Closure Plan* on 5 June 2003.
58. Title 27 section 21400, subdivision (b) (1) requires a mandatory clean closure attempt for surface impoundments unless the Discharger demonstrates, and the Regional Board finds, that it is infeasible to attempt clean closure. The Discharger demonstrated, to the satisfaction of the Central Valley Water Board, that clean closure of the surface impoundments was infeasible because it would cost substantially more than the alternative closure, and therefore was unreasonably and unnecessarily burdensome. Additionally, the Discharger provided the following reasons why the prescriptive standard was unreasonably or unnecessarily burdensome:
 - a. Clean closure involves significantly more handling of the waste and therefore more exposure to human health and the environment;
 - b. Ponds 2 and 3 were previously closed through an interim remedial measure in 1996 that included stabilizing the waste with clean soil and would need to be re-excavated under the clean closure option;

- c. The engineered alternative closure provides at least equivalent protection to the prescriptive standard by preventing the creation of leachate by using infiltration before it can reach the waste;
 - d. Under the clean closure option, the bottom of the liner would likely be in contact with underlying groundwater;
 - e. Under clean closure, the landfill would be less aesthetically appealing than under the engineered alternative closure; and
 - f. With an equivalently protective and lower cost closure alternative available, it is unreasonably and unnecessarily burdensome.
59. The Discharger's proposed engineered alternative final cover consisted of, from top to bottom:
 - a. A two-feet thick vegetative cover soil layer,
 - b. A 200-mil geocomposite drainage layer,
 - c. A 60-mil double-side textured high-density polyethylene geomembrane,
 - d. A 12-ounce non-woven geotextile cushion layer, and
 - e. Prepared subgrade.
60. The Central Valley Water Board is authorized to approve an engineered alternative to Title 27 prescriptive standards (see, Title 27, § 20950 (a)(2)(A)), provided that the discharger demonstrates that compliance with the prescriptive standard would be unreasonably and unnecessarily burdensome in comparison to the proposed alternative. (Title 27, § 20080, (b) and (c); State Water Board Resolution 93-62). The Discharger demonstrated, to the satisfaction of the Central Valley Water Board, that the proposed engineered alternative is consistent with the performance goals and would provide equivalent protection to the prescriptive standard (see Finding 59).
61. The slope stability analysis for the landfill final slopes was presented in *December 2002 Final Closure Plan*. Stability analysis results indicated that the proposed final slope would be stable under both static and dynamic conditions, and no significant earthquake-induced displacements would be expected at the site. The MCE considered for the analysis is 6.9 magnitude earthquake on the Hunting Creek-Berryessa fault, approximately 8.6 miles from the site, with corresponding PGA of 0.33g at the site. However, the Collayami 2011 CFM Fault was identified at a closest rupture distance of 0.8 miles from the Facility in 2013 (see Finding 18). The Discharger shall prepare and submit a facility

inspection plan for the inspection procedures to be performed following an earthquake event at the closest fault from the site, as described in Time Schedule I.G.

62. The Discharger closed all the surface impoundments and the disposal trenches in 2006. On 24 February 2006, Central Valley Water Board approved *February 2006 Closure Report and QA/QC Results for Landfill Construction* report. Closure activities at the Facility included:
- a. The two unused Ponds A and B, south of Ponds 2 and 3, were graded to match to surrounding ground to prevent ponding of water and provide drainage.
 - b. Free liquid from Ponds 1, 4, 6 and 7 was removed, and solid wastes from these ponds were stabilized by mixing with dry soils from borrow areas and consolidated in Ponds 4 and 6.
 - c. Soil below the bottom of the waste was removed from minimum 2 to 4-foot depth from final grade and perimeter berms soil was removed to 1-foot depth in Pond 1 which was eventually backfilled with clean soil to minimum 4-foot thickness and to the extent necessary to grade to provide drainage.
 - d. Soil below the bottom of waste was removed to minimum depth of 1 to 4 feet from final grade, in Pond 7 which was backfilled with minimum 4-foot thickness of clean soil.
 - e. Waste from the three disposal trenches were removed and consolidated in Ponds 4 and 6. Disposal trench of Pond 4 was backfilled with engineered soil, and disposal trenches south of Pond 4 were backfilled with clean soil and graded to surrounding ground.
 - f. The perimeter berms of Ponds 1, 5 and 7 were breached and regraded to prevent ponding of water, and the ponds were backfilled to the extent necessary to provide drainage.
 - g. Evaporated salt crests from the Western Ponding Area were removed and placed in Ponds 4 and 6.
 - h. Additional solidified waste was placed over the interim cover in Ponds 2 and 3.
 - i. Ponds 2, 3, 4 and 6 received final cover (see Finding 59) and the top deck and the side slopes were graded to 3 percent and 2H:1V, respectively.

- j. Surface runoff and drainage structures were constructed including installation of earthen and concrete-lined drainage channels and V-ditches, drop inlets and corrugated HDPE discharge pipes, and corrugated metal pipe (CMP) culverts.
- k. Freeman lake spillway was lowered from elevation 1106 ft to 1096 ft MSL, to achieve separation between waste material and groundwater in the vicinity of the ponds.

Post-Closure Maintenance

- 63. On 30 May 2003, the Discharger submitted the *Post-Closure Maintenance Plan* (PMP) which provides for post-closure maintenance of the closed landfill at the Facility for the entire post-closure maintenance period of at least 30 years, and until it is demonstrated that the Facility no longer poses a threat to the public health and safety and the environment. (See Title 27, §§ 20950(a)(1), 21180(a).) Central Valley Water Board approved the PMP on 5 June 2003. The PMP includes the following components:
 - a. Groundwater elevation monitoring to document the separation between groundwater and waste;
 - b. Inspection, monitoring and maintenance of final cover(s), drainage feature(s), vegetation and tree plantation, all groundwater and surface water monitoring points, emergency and fire safety system, and Facility security systems;
 - c. Timely identification and repair of any areas of the final cover and drainage system.

Financial Assurances

- 64. The PMP includes costs estimate of \$5,071,500 for post-closure maintenance (Title 27, §§ 22210–22212) in 2003 dollars. The estimate included the cost estimate to maintain the plantation that lowers the groundwater to provide separation between groundwater and the base of waste. As of the date of this Order, the cost estimate, calculated in accordance with Title 27, is \$6,367,515 in 2018 dollars based on *PG&E Financial Assurances for GI Landfill* submitted on 26 March 2018.
- 65. The Discharger did not submit a correction action cost estimate (see Title 27, §§ 20430, 22101) for impacted groundwater remediation and additional corrective action required at the Facility. This order requires the Discharger to submit a corrective action cost estimate for Central Valley Water Board staff review and approval, as described in Time Schedule I.H. Upon approval of the

cost estimate for corrective actions, the Discharger shall establish an irrevocable fund (or to provide other means) pursuant to the CalRecycle-promulgated sections, but with the Central Valley Water Board named as beneficiary, to ensure funds are available to address a known or reasonably foreseeable release from the Unit (Title 27, § 22222), as described in Time Schedule I.H.

66. The Discharger initially proposed to use either Financial Means Test (see Title 27, § 22246, subd. (g)) for Closure and/or Post-closure Maintenance and /or Reasonably Foreseeable Corrective Action Insurance (see Title 27, § 22248)⁶. Central Valley Water Board approved both the operative post-closure maintenance cost estimate and the proposed financial assurances mechanisms⁷. On 7 August 2006, the Discharger submitted documents in support of use of the Financial Means Test, for the approved cost estimate amount, to demonstrate financial responsibility for the facility post-closure maintenance.

Given the recent bankruptcy filing of the Discharger, it is highly unlikely that they will qualify to use the Financial Means Test for post-closure maintenance financial assurances. Additionally, Chapter 6 of Title 27 does not expressly permit the use of the Financial Means Test for corrective action. Therefore, the Discharger shall establish an irrevocable fund (or to provide other means) for the post-closure maintenance and corrective actions pursuant to the CalRecycle-promulgated sections, but with the Central Valley Water Board named as beneficiary, as described in Time Schedule I.H.

Other Regulatory Considerations

67. This Order implements the Central Valley Water Board's *Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan)*, which designates beneficial uses for surface water and groundwater and establishes water quality objectives (WQOs) necessary to preserve such beneficial uses. (See Wat. Code, § 13241 et seq.)
68. According to the operative *Basin Plan*, designated beneficial uses of the nearest surface water include: municipal and beneficial use (MUN); agricultural supply (AGR); industrial process supply (PRO); industrial service supply (IND); water contact recreation (REC-1); non-water contact recreation (REC-2); warm freshwater habitat (WARM); cold freshwater habitat (COLD); wildlife habitat (WILD);; and spawning, reproduction and/or early development (SPWN).

⁶ Geothermal Inc. Site: Financial Assurance letter dated 28 April 2006.

⁷ Approval of Cost Estimate and Financial Assurances Mechanism, Geothermal Inc. Facility, Lake County letter dated 10 May 2006.

69. Per the operative *Basin Plan*, designated beneficial uses of groundwater at the Facility include: municipal and beneficial use (MUN); agricultural supply (AGR); industrial service supply (IND); and industrial process supply (PRO).
70. The issuance of this Order, which prescribes waste discharge requirements and monitoring for an existing facility, is exempt from the procedural requirements of the California Environmental Quality Act (CEQA), Public Resources Code section 21000 et seq., pursuant to section 15301 of the CEQA Guidelines (Cal. Code Regs., tit. 14, § 15000 et seq.)
71. The State Water Resources Control Board's *Statement of Policy with Respect to Maintaining High Quality Waters in California*, Resolution 68-16 (*Antidegradation Policy*) prohibits the Central Valley Water Board from authorizing degradation of "high quality waters" unless it is shown that such degradation: (1) will be consistent with the maximum benefit to the people of California; (2) will not unreasonably affect beneficial uses, or otherwise result in water quality less than as prescribed in applicable policies; and (3) is minimized through the discharger's best practicable treatment or control.
72. This Order requires the Discharger to maintain its Facility so as to: (1) prevent surface water runoff from entering the WMU; (2) contain waste within the existing unit (accounting for unique site features and waste characteristics); and (3) otherwise address releases through corrective action. No degradation is authorized under this Order. Accordingly, this Order complies with the *Antidegradation Policy*.
73. For the purposes of California Code of Regulations, title 23 (Title 23), section 2200, the Facility has a threat-complexity rating of 2-B, where:
 - a. Threat Category "2" reflects waste discharges that can impair receiving water beneficial uses, cause short-term water quality objective violations, cause secondary drinking water standard violations, and cause nuisances; and
 - b. Complexity Category "B" reflects any discharger not included in Category A, with either (1) physical, chemical or biological treatment systems (except for septic systems with subsurface disposal), or (2) any Class II or Class III WMUs.
74. Water Code section 13263, subdivision (b)(1) provides that:

[T]he regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region ... shall furnish, under penalty of perjury, technical or monitoring

program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

75. The Central Valley Waterboard commits to meaningful involvement and consultation with the Middletown Rancheria Band of Pomo Indians. The Central Valley Water Board will continue to engage in Government-to-Government communications with Tribal representatives with regard to activities at the Former Geothermal Landfill. These communications will include notifications of new documents available for Tribal review, as well as other written and verbal communications. As an agency of the State of California, the Central Valley Water Board has an obligation, as evinced in Executive Order B-10-11, to allow Tribal representatives to provide meaningful input in matters that may affect tribal communities.
76. The technical reports required under this Order, as well as those required under the separately-issued MRP, are necessary to ensure compliance with prescribed WDRs and the provisions of Title 27.

Procedural Requirements

77. All local agencies with regulatory jurisdiction over land-use, solid waste disposal, air pollution and public health protection have approved the use of the Facility's site for the discharge of waste to land as provided for herein.
78. The Discharger interested agencies and interested persons were notified of the Central Valley Water Board's intent to prescribe the WDRs in this Order, and provided an opportunity to submit their written views and recommendations at a public hearing. (Wat. Code, § 13167.5; Title 27, § 21730.)
79. At a public meeting, the Central Valley Water Board heard and considered all comments pertaining to the discharges regulated under this Order.

REQUIREMENTS

IT IS HEREBY ORDERED THAT, pursuant to Water Code sections 13263 and 13267,; CAO R5-2002-0204 and WDRs Order 86-087⁸ are hereby rescinded; and that the

⁸ To the extent that WDRs Order 86-087 has not already been rescinded.

Discharger their agents, successors and assigns, in accordance with Water Code division 7 (§ 13000 et seq.), shall comply with the following requirements.

A. Prohibitions—Except as otherwise expressly directed below, the Discharger shall comply with all *Standard Prohibitions* (SPRRs, § C), which are incorporated herein, as well as the following.

1. Discharge of any solid waste is prohibited.
2. The cessation of any correction action measure is prohibited without written Executive Officer approval. If routine maintenance or a breakdown results in cessation of correction action for greater than 24 hours, the Discharger shall notify Central Valley Water Board staff.

B. Discharge Specifications—Except as otherwise expressly directed below, the Discharger shall comply with all *Standard Discharge Specifications* (SPRRs, § D), which are incorporated herein, as well as the following.

1. The Discharger shall promptly remove and relocate all waste discharged at the Facility in violation of this Order. If unable to do so, they shall submit a report to the Central Valley Water Board: explaining how the violative discharge(s) occurred, and why the waste(s) cannot be removed; and proposing waste acceptance program updates to prevent reoccurrences.

C. Facility Specifications—Except as otherwise provided below, the Discharger shall comply with all *Standard Facility Specifications* (SPRRs, § E) which are incorporated herein.

1. Corrective action treatment, if any, shall not cause pollution or a nuisance as defined in the Water Code, Section 13050.
2. Water used on the final cover shall be limited to the minimum amount necessary for dust control, moisture conditioning of cover soil, and to establish and maintain vegetation.
3. The Discharger shall not be required to maintain five feet of groundwater separation per Title 27, section 20240, either through groundwater extraction or an engineered alternative. (See Finding 51).
4. The discharger shall consult with the Middletown Rancheria prior to conducting any ground disturbance at the site that may occur as a result of any requirements set forth by these WDRs. The pre-disturbance consultation shall include maps of any areas where disturbance may occur. If during ground disturbance activities potential tribal cultural resources, archaeological resources, other cultural resources, articulated,

or disarticulated human remains are discovered work will cease within one-hundred feet of the find (based on the apparent distribution of cultural resources) and a tribal representative shall be immediately notified.

To avoid or minimize adverse impacts when tribal cultural resources, archaeological resources, or other cultural resources are discovered, Native American Representatives and Monitors from culturally affiliated Native American Tribes may make recommendations for further evaluation and treatment as provided in Public Resources Code section 21084.3 and CEQA Guidelines section 15370. These recommendations will be documented in the project record. For any recommendations made by interested Native American Tribes which are not implemented, a justification for why the recommendation was not followed will be provided in the project record.

D. Unit Construction—The Discharger shall comply with all *Standard Construction Specifications* and *Standard Storm Water Provisions* (SPRRs, §§ F, L), which are incorporated herein.

E. Landfill Post-Closure Maintenance and Corrective Action—Except as otherwise directed below, the Discharger shall comply with all *Standard Closure and Post-Closure Specifications* (SPRRs, § G) and closure-related *Standard Construction Specifications* (SPRRs, § F), as well as the following with respect to post-closure maintenance of landfills at the Facility.

1. The Discharger may perform minor modifications to problematic areas of the final cover, provided that: (a) the barrier layer of the final cover (e.g., geomembrane, GCL and vegetative soil cover) remains intact; and (b) the Central Valley Water Board approves of such modifications.
2. The Discharger shall apply sufficient seed, binder and nutrients to the vegetative/erosion-resistant layer to establish the vegetation proposed in the *Post-Closure Maintenance Plan* (Title 27, § 21090, subd. (a)(3)). The Discharger shall also install any necessary erosion and sedimentation controls to protect vegetation while it is being established.
3. The Discharger shall maintain healthy tree plantation (including current tree acreage, (see Finding 37) that may hydraulically control the groundwater level at the Facility, per the observation and maintenance procedures proposed in the *Post-Closure Maintenance Plan*.
4. The Discharger shall maintain positive drainage at the Facility to direct surface runoff away from the closed landfill and prevent ponding of water along the southwest edge of the closed landfill.

F. Financial Assurances—Except as otherwise directed below, the Discharger shall comply with all *Standard Financial Assurance Provisions* (SPRRs, § H), as well as the following.

1. The Discharger shall submit and cost estimate for the additional corrective actions to be implemented at the Facility, as described in Time Schedule I.H.
2. The Discharger shall establish and maintain with the Central Valley Water Board assurances of financial responsibility for the Estimate Cost amounts specified for post-closure maintenance in Finding 64 and the additional corrective action upon approval of the cost estimate (Financial Assurances Specification F.1, above), adjusted annually for inflation.
3. A report regarding financial assurances shall be submitted to the Central Valley Water Board annually, no later than 1 June.
4. If the Central Valley Water Board determines that the Discharger's financial assurances for the Facility are inadequate, the Discharger shall, within 90 days of such determination:
 - a. Obtain a new eligible financial assurance mechanism for the amount specified by the Central Valley Water Board; and
 - b. Submit a report documenting such financial assurances to the Central Valley Water Board.
5. Whenever changed conditions increase the estimated costs of post-closure maintenance and corrective actions, Discharger shall promptly submit an updated PMP to the Central Valley Water Board.

G. Monitoring—Except as otherwise directed below, the Discharger shall comply with all applicable *Standard Monitoring Specifications* (SPRRs, § I) and *Standard Response to Release Specifications* (SPRRs, § J), as well as the following:

1. The Discharger shall comply with all provisions of the separately-issued MRP R5-2019-0076 and any subsequent revisions thereto.
2. The Discharger shall comply with the Water Quality Protection Standard (WQPS) set forth in the operative MRP (see also Title 27, § 20390); and shall verify the compliance of each WMU with each subsequent monitoring event.

3. For all WMUs, the Discharger shall implement a groundwater and surface water detection monitoring program (DMP) in accordance with Title 27, sections 20385, 20415 and 20420.
4. For each WMU subject to corrective action, the Discharger shall implement a corrective action program (CAP) in accordance with Title 27, sections 20385, 20415 and 20430, and Section I of the SPRRs.
5. Constituents of concern (COC) in water passing through each WMU's Point of Compliance shall not exceed concentration limits specified in the operative MRP. The Point of Compliance is a vertical plane situated at the hydraulically downgradient limit of each WMU, extending through the uppermost underlying aquifer. (See Title 27, §§ 20164, 20405.)

H. General Provisions—Except as otherwise expressly directed below, the Discharger shall comply with the Standard General Provisions (SPRRs, § K), as well as the following.

1. Notwithstanding Section G.1, the provisions of this Order shall supersede any contrary provision in MRP R5-2019-0076 and revisions thereto.
2. The Discharger shall comply with all applicable provisions of Title 27 and Code of Federal Regulations, title 40, part 258, including those not specifically referenced in this Order.
3. Measures implemented as part of a Corrective Action Program, if any, shall not be terminated without express written approval by the Executive Officer. Central Valley Water Board staff shall be notified of all corrective actions system shutdowns lasting longer than 24 hours. For the purposes of this provision, "terminated" does not include:
 - a. Planned periods of corrective action nonoperation, if previously-approved in writing by Central Valley Water Board staff.
4. The Discharger shall ensure that operating personnel are familiar with this Order (including all attachments and SPRRs) and the operative MRP, both of which shall be kept onsite and made available at all times to operating personnel and regulatory agency personnel.
5. All reports and monitoring data shall be submitted online in an appropriately-formatted file via the State Water Board's [GeoTracker](http://geotracker.waterboards.ca.gov) Database, at (<http://geotracker.waterboards.ca.gov>) (Title 23, §§ 3892(d), 3893.) Additional information regarding electronic submittals is accessible through the "Information" tab on the GeoTracker homepage. After uploading a document via GeoTracker, the submitting party shall notify

Central Valley Water Board via email at centralvalleysacramento@waterboards.ca.gov, including the following information body of the email:

Attention: Title 27 Compliance & Enforcement Unit
Report Title: [title of submitted report]
Geotracker Upload ID:
Discharger: Pacific Gas and Electric Company
Facility: Former Geothermal Inc. Facility, Class II Landfill
County: Lake County
CIWQS ID: 210951

6. All reports and workplans that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geological sciences, shall:
 - a. Be prepared by, or under the direction of, professionals registered to practice in California pursuant to Business and Professions Code sections 6735, 7835 and 7835.1; and
 - b. Bear the signature(s) and seal(s) of the responsible registered professional(s) described above.

I. Time Schedule—The Discharger shall complete all tasks according to the time schedule set forth below.

Task	Compliance Date
A. Construction Plans Submit construction and design plans for review and approval. (See Unit Construction, § D; SPRRs, § I.)	90 days prior to proposed construction date
B. Construction Report Submit a construction report for review and approval upon completion demonstrating construction in accordance with approved construction plans. (See SPRRs, § F.27.)	60 days prior to proposed discharges of waste

Task	Compliance Date
<p>C. Well Abandonment Work Plan The Discharger shall propose abandonment of existing groundwater wells which are no longer needed for collecting groundwater samples or testing.</p>	31 August 2020
<p>D. French Drains Investigation The Discharger shall submit a work plan to investigate for the presence of historical French drains which were installed to collect seepage through the former ponds' dikes as described in Finding 34. Upon approval of the workplan, the Discharger shall perform the investigation and submit a French Drain Investigation Report documenting the findings and recommendations to reduce infiltration adjacent to the closed landfill.</p>	<p>31 March 2020</p> <p>180 days after approval</p>
<p>E. Revised Surface Drainage Improvements Design The Discharger shall submit a revised surface improvements design to prevent ponding and potential infiltration of surface water runoff immediately adjacent to the closed landfill by providing positive surface water drainage away from the closed landfill. The design report shall include a workplan including implementation schedule.</p>	15 April 2020
<p>F Surface Water Concentration Limits Title 27 §20400(a) requires the Discharger to propose concentration limits for each COCs for each medium. The Discharger shall calculate the surface water concentration limits and propose in the upcoming monitoring</p>	<p>Second semiannual/annual 2019 monitoring report</p>

Task	Compliance Date
reports for Central Valley Water Board staff approval.	
G. Facility Inspection Plan	
The Discharger shall submit a facility inspection plan for the inspection procedures and response actions to be performed following an earthquake event at the closest fault from the site. The inspection plan shall be a stand-alone document or part of the PMP which to be updated to include this inspection plan.	1 June 2020
H. Corrective Action Cost Estimate(s) and Financial Assurances	
1. The Discharger shall submit cost estimate(s) and a plan, as appropriate, for initiating and completing known or reasonably foreseeable or additional corrective action pursuant to Title 27 §22101, for the Central Valley Water Board staff review and approval.	30 April 2020
2. Upon approval of the cost estimate, the Discharger shall establish an irrevocable fund (or to provide other means) pursuant to the CalRecycle-promulgated sections, but with the Central Valley Water Board named as beneficiary, to ensure funds are available to address a known or reasonably foreseeable release from the Unit (Title 27 §22222) and for the post-closure maintenance (Finding 65).	Within 3 months following the approval

Persons aggrieved by this Central Valley Water Board action may petition the State Water Board for administrative review in accordance with Water Code section 13320, and California Code of Regulations, title 23, section 2050 et seq. To be timely, a petition must be received by the State Water Board no later than 5 pm on 30th day after the date that this Order becomes final. However, if the 30th day falls on a Saturday, Sunday or state holiday, the petition must be received by the State Water Board by 5 pm on the

next business day. Copies of the [law and regulations](#) applicable to filing petitions are available online (at the address below) and will be provided upon request.

(http://www.waterboards.ca.gov/public_notices/petitions/water_quality)

I, PATRICK PULUPA, 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, Central Valley Region, on 5 December 2019.

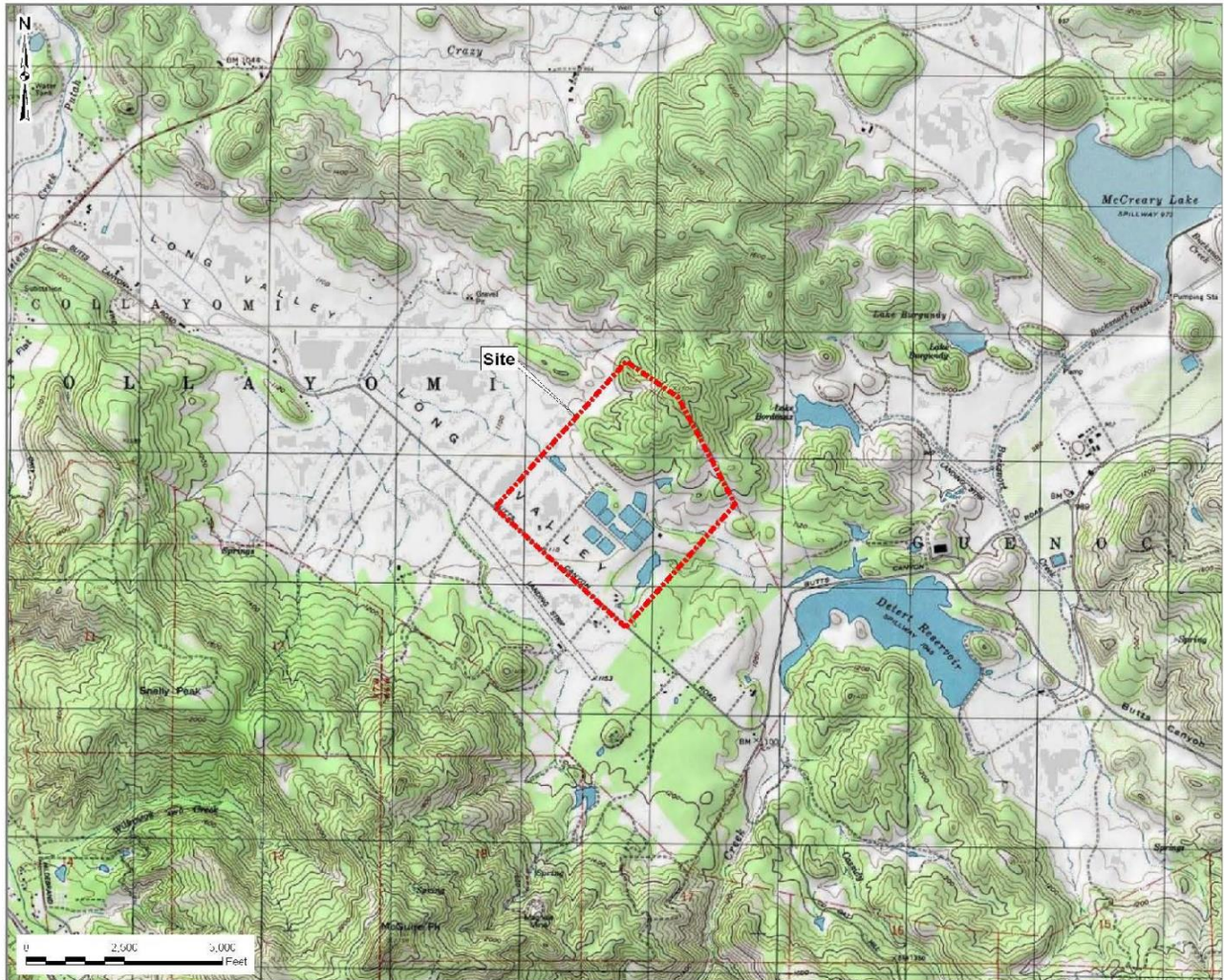


PATRICK PULUPA,
Executive Officer

mp/bss

WASTE DISCHARGE REQUIREMENTS ORDER R5-2019-0076
PACIFIC GAS AND ELECTRIC COMPANY
FORMER GEOTHERMAL INC. FACILITY, CLASS II LANDFILL
LAKE COUNTY

ATTACHMENT A-SITE LOCATION MAP



Drawing Reference:
ROWD (13 August 2018), Figure 2-1

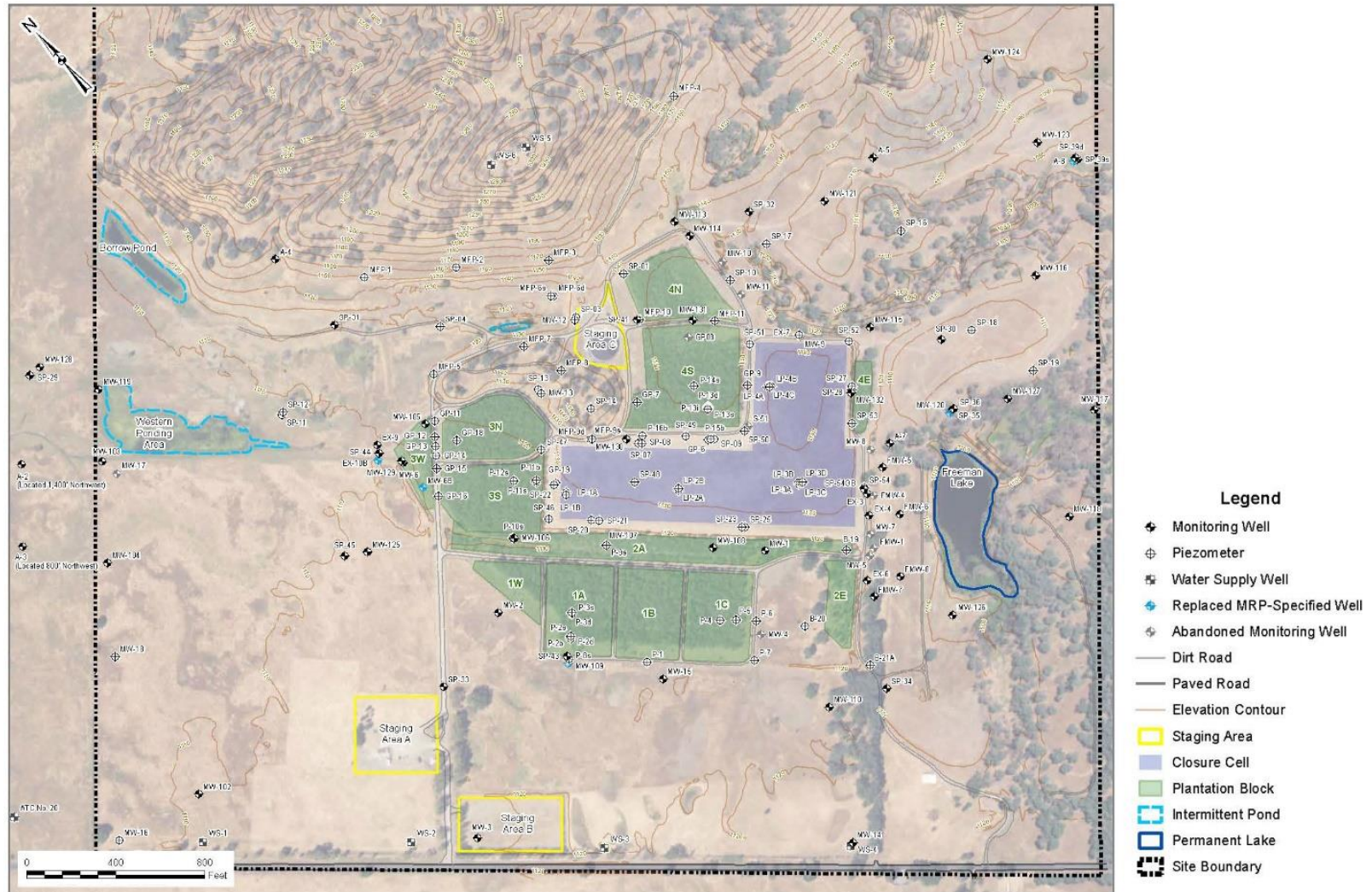
ATTACHMENT B-SITE PLAN



Drawing Reference:
ROWD (13 August 2018), Figure 2-2

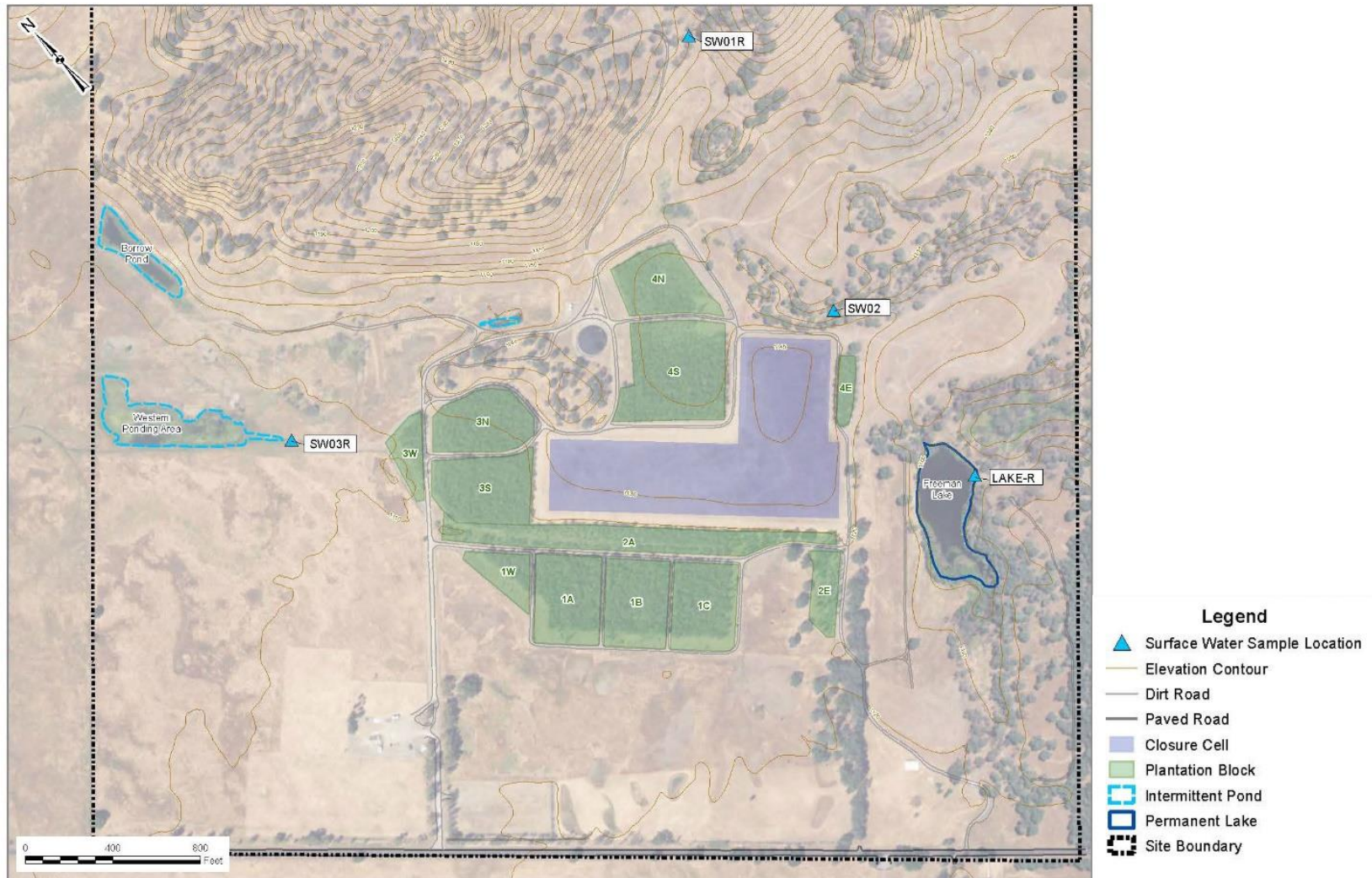
WASTE DISCHARGE REQUIREMENTS ORDER R5-2019-0076
PACIFIC GAS AND ELECTRIC COMPANY
FORMER GEOTHERMAL INC. FACILITY, CLASS II LANDFILL
LAKE COUNTY

ATTACHMENT C-GROUNDWATER MONITORING NETWORK



Drawing Reference:
ROWD (13 August 2018), Figure 5-1

ATTACHMENT D-SURFACE WATER MONITORING NETWORK



Drawing Reference:
ROWD (13 August 2018), Figure 5-2

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM R5-2019-0076
FOR
PACIFIC GAS AND ELECTRIC COMPANY
FORMER GEOTHERMAL INC. FACILITY
CLASS II LANDFILL
POST-CLOSURE MAINTENANCE, AND CORRECTIVE ACTION
LAKE COUNTY

This monitoring and reporting program (MRP) is issued pursuant to California Water Code section 13267 and incorporates requirements for groundwater, and surface water monitoring and reporting; facility monitoring, maintenance, and reporting; and financial assurances reporting contained in California Code of Regulations, title 27, section 20005, et seq. (hereafter Title 27), Waste Discharge Requirements (WDRs) Order R5-2019-0076, and the Standard Provisions and Reporting Requirements (SPRRs) dated December 2015. Compliance with this MRP is ordered by the WDRs and the Discharger shall not implement any changes to this MRP unless a revised MRP is issued by the Central Valley Water Board or the Executive Officer.

A. MONITORING

The Discharger shall comply with the detection monitoring program provisions of Title 27 for groundwater, and surface water in accordance with Standard Monitoring Specifications in Section I of the SPRRs and the Monitoring Specifications in Section G of the WDRs. All monitoring shall be conducted in accordance with the most current approved *Sample Collection and Laboratory Analysis Plan* (August 2013), which includes quality assurance/quality control standards.

All compliance monitoring wells established for the detection monitoring program and corrective action program shall constitute the monitoring points for the groundwater Water Quality Protection Standard. All detection monitoring program and corrective action monitoring groundwater monitoring wells, and surface water monitoring points shall be sampled and analyzed for monitoring parameters and constituents of concern (COCs) as indicated and listed in Tables I and II.

The Discharger may use alternative analytical test methods, including new USEPA approved methods, provided the methods have detection limits equal to or lower than the analytical methods specified in this Monitoring and Reporting Program, and are identified in the approved Sample Collection and Laboratory Analysis Plan.

The monitoring program of this MRP includes:

Section	Monitoring Program
A.1	Groundwater Monitoring
A.2	Unsaturated Zone Monitoring
A.3	Surface Water Monitoring
A.4	Facility Monitoring
A.5	Corrective Action Monitoring

1. Groundwater Monitoring

The Discharger shall operate and maintain a groundwater detection and corrective action monitoring system that complies with the applicable provisions of Title 27, Subchapter 3 “Water Monitoring”. The detection and corrective action monitoring system shall be certified by a California-licensed professional civil engineer or geologist as meeting the requirements of Title 27. The current groundwater detection and corrective action monitoring system meets the applicable requirements of Title 27. The Discharger shall revise the groundwater detection monitoring system (after review and approval by Central Valley Water Board staff) as needed each time a new landfill cell or module is constructed.

The current groundwater monitoring network shall consist of the following:

HSU Monitored	Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
HSU-1	A-2	Detection	Downgradient	1099.19	41.50	9.93 - 41.43
	A-3	Detection	Downgradient	1102.52	61.50	11.50 – 61.50
	FMW-5	Corrective Action	Downgradient	1116.76	24.00	14.00 – 24.00
	FMW-6	Corrective Action	Downgradient	1118.23	23.00	15.00 – 23.00
	FMW-7	Corrective Action	Sidegradient	1119.24	33.50	32.00 – 33.50
	FMW-8	Corrective Action	Sidegradient	1120.02		

HSU Monitored	Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
	MW-102	Background	Upgradient	1112.20	34.50	19.50 - 34.50
	MW-103	Detection	Downgradient	1106.92	25.00	15.00 – 25.00
	MW-104	Detection	Downgradient	1106.88	25.00	15.00 – 25.00
	MW-106	Corrective Action	Downgradient	1112.89	22.00	12.00 – 22.00
	MW-107	Corrective Action	Downgradient	1113.66	22.00	12.00 – 22.00
	MW-108	Corrective Action	Downgradient	1114.55	22.00	12.00 – 22.00
	MW-110	Background	Upgradient	1119.68	32.50	17.50 - 32.50
	MW-113	Background	Upgradient	1145.14	26.00	16.00 – 26.00
	MW-118	Detection	Downgradient	1123.92	40.00	20.00 – 40.00
	MW-119	Corrective Action	Downgradient	1108.43	25.00	5.00 – 25.00
	MW-125	Detection	Downgradient	1116.59	12.00	7.00 – 12.00
	MW-126	Detection	Downgradient	1108.5	23.00	13.00 – 23.00
	MW-128	Detection	Downgradient	1109.34	7.50	5.00 – 7.50
	SP-35	Detection	Downgradient	1116.75	20.00	10.90 – 15.50
	SP-41	Corrective Action	Downgradient	1133.12	35.00	11.30 – 16.00
	SP-43	Background	Upgradient	1115.76	19.40	9.89 - 19.40
	SP-44	Corrective Action	Downgradient	1110.41	15.33	10.65-15.33

HSU Monitored	Monitoring Well	Program	Gradient	Top of Casing, Mean Sea Level (MSL)	Total Depth, ft	Screen Interval from Top of Casing, ft
HSU-2	A-4	Background	Upgradient	1149.54	9.50	4.50 – 9.50
	MFP-3	Background	Upgradient	1167.11	50.30	35.30 – 50.30
	MFP-6d	Corrective Action	Downgradient	1126.02	27.34	18.06 – 27.34
	SP-01	Corrective Action	Downgradient	1136.41	34.40	27.45 – 38.85
	SP-04	Detection	Downgradient	1126.02	27.30	20.79 – 30.09

Groundwater samples shall be collected from the background wells, detection monitoring wells, corrective action monitoring wells, and any additional wells added as part of the approved groundwater monitoring system. The collected samples shall be analyzed for the parameters and constituents listed in Table I in accordance with the specified methods and frequencies. The Discharger shall collect, preserve, and transport groundwater samples in accordance with the approved Sample Collection and Laboratory Analysis Plan.

Once per quarter, the Discharger shall measure the groundwater elevation in each well, determine groundwater flow direction in the uppermost aquifer and in any zones of perched water and in any additional portions of the zone of saturation monitored. The results shall be reported semiannually, including the times of expected highest and lowest elevations of the water levels in the wells, pursuant to Title 27, section 20415(e)(15).

Samples collected for the COC monitoring specified in Table I shall be collected and analyzed in accordance with the methods listed in Table II every two or five years. Five-year COCs were last monitored in 2018. Two-years and 5-year COCs shall be monitored again in **2020**. The results shall be reported in the first Semi-Annual Monitoring Report for the year in which the samples were collected.

2. Unsaturated Zone Monitoring

The Discharger has demonstrated that there are no unsaturated zone monitoring devices or methods designed to operate under subsurface conditions at the Facility. Due to the nature of the waste (drilling mud) and the site conditions, unsaturated zone monitoring is not practicable.

3. Surface Water Monitoring

The Discharger shall operate a surface water detection monitoring system for any landfill facility where runoff from landfill areas flows or could flow to waters of the United States. The monitoring system shall comply with the applicable provisions of Title 27, sections 20415 and 20420. At the former Geothermal Inc. landfill site, the western part of the site drains to an unnamed drainage that flows to Putah Creek and then to Lake Berryessa. The eastern part of the site drains to another unnamed drainage that flows to Detert Reservoir, then to McCreary Lake, then Putah Creek and Lake Berryessa. The current surface water detection monitoring system meets the applicable requirements of Title 27.

The current surface water monitoring points for the landfill are:

Mon Pt.	Status
SW01R	Background
SW02	Detection
SW03R	Detection
LAKE-R	Detection

For surface water detection monitoring, a sample shall be collected at each monitoring point location and analyzed for the monitoring parameters and constituents in accordance with the methods and frequency specified in Table I. All surface water monitoring samples shall be collected and analyzed for the 2-year COCs specified in Table II every two years, beginning again in **2020**.

4. Facility Monitoring

a. Annual Facility Inspection

Annually, prior to the anticipated rainy season, but no later than **30 September**, the Discharger shall conduct an inspection of the facility. The inspection shall assess repair and maintenance needed for drainage control systems, cover systems, and groundwater monitoring wells; and shall assess preparedness for winter conditions (including but not limited to erosion and sedimentation control). The Discharger shall take photos of any problem areas before and after repairs. Any necessary construction, maintenance, or repairs shall be completed by **31 October**. Annual

facility inspection reporting shall be submitted as required in Section B.3 of this MRP.

b. Major Storm Events

The Discharger shall inspect all precipitation, diversion, and drainage facilities and all landfill side slopes for damage **within 7 days** following major storm events capable of causing damage or significant erosion. The Discharger shall take photos of any problems areas before and after repairs. Necessary repairs shall be completed **within 30 days** of the inspection. Notification and reporting requirements for major storm events shall be conducted as required in Section B.4 of this MRP.

c. Five-Year Iso-Settlement Survey for Closed Units

For closed landfill units, the Discharger shall conduct a five-year iso-settlement survey and produce an iso-settlement map accurately depicting the estimated total change in elevation of each portion of the final cover's low-hydraulic-conductivity layer. For each portion of the landfill, this map shall show the total lowering of the surface elevation of the final cover, relative to the baseline topographic map [Title 27, section 21090(e)(1 & 2)]. Reporting shall be in accordance with Section B.5 of this MRP. The next iso-settlement survey shall be conducted in 2021.

d. Standard Observations

The Discharger shall conduct Standard Observations at the landfill in accordance with this section of the MRP. Standard observations shall be conducted in accordance with the following schedule:

Landfill Unit Type	Frequency	Season
Closed	Monthly	Wet: 1 October to 30 April
Closed	Quarterly	Dry: 1 May to 30 September

The Standard Observations shall include:

- 1) For the landfill units:
 - a) Evidence of ponded water at any portion of the landfill cover (show affected area on map); and
 - b) Evidence of erosion and/or of day-lighted cover or waste.
- 2) Along the perimeter of the landfill units:

- a) Evidence of ponded water along the perimeter of the landfill (show affected area on map); and
 - b) Evidence of erosion and/or of day-lighted cover or waste.
- 3) For receiving waters:
- a) Floating and suspended materials of waste origin - presence or absence, source, and size of affected area; and
 - b) Discoloration and turbidity - description of color, source, and size of affected area.

Results of Standard Observations shall be submitted in the semiannual monitoring reports required in Section B.1 of this MRP.

5. Corrective Action Monitoring

The Discharger shall conduct corrective action monitoring to demonstrate the effectiveness of corrective action in accordance with Title 27, section 20430 and this MRP. Groundwater monitoring wells that are in a corrective action monitoring program shall be monitored in accordance with the groundwater monitoring requirements in parts A.1 of this MRP, except as modified in this part of the MRP for any additional constituents or modified monitored frequencies.

a. Groundwater Corrective Action

The Discharger shall monitor the corrective action monitoring wells as required in part A.1 of this MRP.

B. REPORTING

The Discharger shall submit the following reports in accordance with the required schedule:

Reporting Schedule

Section	Report	End of Reporting Period	Due Date
B.1	Semiannual Monitoring Report	30 June, 31 December	1 August, 1 February
B.2	Annual Monitoring Report	31 December	1 February
B.3	Annual Facility Inspection Report	31 October	15 November
B.4	Major Storm Event Reporting	Continuous	7 days from damage discovery

Section	Report	End of Reporting Period	Due Date
B.5	Survey and Iso-Settlement Map for Closed Landfills	Every Five Years	At Closure Completion and Every Five Years
B.6	Financial Assurances Report	31 December	1 June

The Discharger shall enter all monitoring data and reports into the online Geotracker database as required by Division 3 of Title 27 and Chapter 30, Division 3 of Title 23. Notification of the Geotracker upload shall be emailed to the Central Valley Water Board at: centralvalleysacramento@waterboards.ca.gov. To ensure that the submittal is routed to the appropriate staff as quickly as possible, the following information shall be included in the body of the email:

Attention:	Title 27 Compliance & Enforcement Unit
Report Title:	
Geotracker Upload ID:	
Discharger name:	Pacific Gas and Electric Company
Facility name:	Former Geothermal Inc. Facility, Class II Landfill
County:	Lake County
CIWQS place ID:	210951

Reporting Requirements

The Discharger shall submit monitoring reports **semiannually** with the data and information as required in this Monitoring and Reporting Program and as required in WDRs Order R5-2019-0076 and the Standard Provisions and Reporting Requirements (particularly Section I: “Standard Monitoring Specifications” and Section J: “Response to a Release”). In reporting the monitoring data required by this program, the Discharger shall arrange the data in tabular form so that the date, the constituents, the concentrations, and the units are readily discernible. The data shall be summarized in such a manner so as to illustrate clearly the compliance with waste discharge requirements or the lack thereof. Data shall also be submitted in a digital format, such as a computer disk.

Field and laboratory tests shall be reported in each monitoring report. Semiannual and annual monitoring reports shall be submitted to the Central Valley Water Board in accordance with the above schedule for the calendar period in which samples were taken or observations made.

The results of **all monitoring** conducted at the site shall be reported to the Central Valley Water Board in accordance with the reporting schedule above for the calendar period in which samples were taken or observations made.

The Discharger shall retain records of all monitoring information, including all calibration and maintenance records, all original strip chart recordings of continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained throughout the life of the facility including the post-closure period. Such records shall be legible and shall show the following for each sample:

- a) Sample identification and the monitoring point or background monitoring point from which it was taken, along with the identity of the individual who obtained the sample;
- b) Date, time, and manner of sampling;
- c) Date and time that analyses were started and completed, and the name of the personnel and laboratory performing each analysis;
- d) Complete procedure used, including method of preserving the sample, and the identity and volumes of reagents used;
- e) Calculation of results; and
- f) Results of analyses, and the MDL and PQL for each analysis. All peaks shall be reported.

Required Reports

1. **Semiannual Monitoring Report:** Monitoring reports shall be submitted semiannually and are due on **1 August** and **1 February**. Each semiannual monitoring report shall contain at least the following:
 - a) For each groundwater monitoring point addressed by the report, a description of:
 - 1) The time of water level measurement;
 - 2) The type of pump - or other device - used for purging and the elevation of the pump intake relative to the elevation of the screened interval;
 - 3) The method of purging used to stabilize water in the well bore before the sample is taken including the pumping rate; the equipment and methods used to monitor field pH, temperature, and conductivity during purging; results of pH, temperature, conductivity, and turbidity testing; and the method of disposing of the purge water;
 - 4) The type of pump - or other device - used for sampling, if different than the pump or device used for purging; and

- 5) A statement that the sampling procedure was conducted in accordance with the approved Sample Collection and Laboratory Analysis Plan.
- b) A map or aerial photograph showing the locations of observation stations, monitoring points, and background monitoring points.
- c) The estimated quarterly groundwater flow direction in the uppermost aquifer, in any zones of perched water, and in any additional zone of saturation monitored based upon water level elevations taken prior to the collection of the water quality data submitted in the report [Title 27, section 20415(e)(15)].
- d) Potentiometric surface maps for groundwater, combining all hydrogeological units being monitored.
- e) Cumulative tabulated monitoring data for all monitoring points and constituents for groundwater, and surface water. Concentrations below the laboratory reporting limit shall not be reported as "ND" unless the reporting limit is also given in the table. Otherwise they shall be reported "<" the reporting limit (e.g., <0.10). Units shall be as required in Tables I and II unless specific justification is given to report in other units. Refer to the SPRRs Section I "Standard Monitoring Specifications" for requirements regarding MDLs and PQLs.
- f) Laboratory statements of results of all analyses evaluating compliance with requirements.
- g) An evaluation of the concentration of each monitoring parameter (or 2-year or 5-year COC when 2-year or 5-year COC sampling is conducted) as compared to the current concentration limits, and the results of any required verification testing for constituents exceeding a concentration limit. Report any actions taken under Section J: Response to a Release for verified exceedances of a concentration limit for wells/constituents not already in corrective action monitoring.
- h) An evaluation of the effectiveness of the run-off/run-on control facilities.
- i) A summary of all Standard Observations for the reporting period required in Section A.4.d of this MRP.
- j) A summary of inspection, leak search, and repair of final covers on any closed landfill units in accordance with an approved final post-closure maintenance plan as required by Standard Closure and Post-Closure Maintenance Specifications G.26 through G.29 of the SPRRs.
- k) A comprehensive discussion of any Corrective Action Program required by this MRP under Section A.5, and its effectiveness.

2. Annual Monitoring Report: The Discharger shall submit an Annual Monitoring Report to the Central Valley Water Board by **1 February** covering the reporting period of the previous monitoring year. If desired, the Annual Monitoring Report may be combined

with the second semiannual report, but if so, shall clearly state that it is both a semi-annual and annual monitoring report in its title. Each Annual Monitoring Report shall contain the following information:

- a) All monitoring parameters shall be graphed to show historical trends at each monitoring point and background monitoring point, for all samples taken within at least the previous ten calendar years. If a 2-year COC event was performed, then these parameters shall also be graphically presented. Each such graph shall plot the concentration of one or more constituents for the period of record for a given monitoring point or background monitoring point, at a scale appropriate to show trends or variations in water quality. The graphs shall plot each datum, rather than plotting mean values. Graphical analysis of monitoring data may be used to provide significant evidence of a release. If a 5-year COC event was performed, then these parameters shall be presented in tabular format.
- b) All historical monitoring data for which there are detectable results, including data for the previous year, shall be submitted in tabular form in a digital file format such as a computer disk. The Central Valley Water Board regards the submittal of data in hard copy and in digital format as "...the form necessary for..." statistical analysis [Title 27, section 20420(h)], that facilitates periodic review by the Central Valley Water Board.
- c) Hydrographs of each well showing the elevation of groundwater with respect to the elevations of the top and bottom of the screened interval and the elevation of the pump intake. Hydrographs of each well shall be prepared quarterly and submitted annually.
- d) A comprehensive discussion of the compliance record, and the result of any corrective actions taken or planned which may be needed to bring the Discharger into full compliance with the waste discharge requirements.
- e) A written summary of the monitoring results, indicating any changes made or observed since the previous Annual Monitoring Report.
- f) Updated concentration limits for each monitoring parameter at each monitoring well based on the new data set.

3. Annual Facility Inspection Reporting: By **15 November** of each year, the Discharger shall submit a report describing the results of the inspection and the repair measures implemented, preparations for winter, and include photographs of any problem areas and the repairs. Refer to Section A.4.a of this MRP, above.

4. Major Storm Event Reporting: Following major storm events capable of causing damage or significant erosion, the Discharger **immediately** shall notify Central Valley Water Board staff of any damage or significant erosion upon discovery and report

subsequent repairs within **14 days** of completion of the repairs, including photographs of the problem and the repairs. Refer to Section A.4.b of this MRP, above.

5. Survey and Iso-Settlement Map for Closed Landfills: The Discharger shall conduct a survey and submit an iso-settlement map for each closed area of the landfill every five years pursuant to Title 27, section 21090(e). Refer to Section A.4.c of this MRP, above. The next report is due by **2021**.

6. Financial Assurances Report: By **1 June** of each year, the Discharger shall submit the annual financial assurances report that updates the financial assurances for post-closure maintenance, and corrective action. Refer to Financial Assurances Specifications F of the WDRs.

C. WATER QUALITY PROTECTION STANDARD AND COMPLIANCE PERIOD

1. Water Quality Protection Standard Report

For each waste management unit, the Water Quality Protection Standard shall consist of all COCs, the concentration limit for each constituent of concern, the verification retesting procedure to confirm measurably significant evidence of a release, the point of compliance, and all water quality monitoring points for each monitored medium.

The Water Quality Protection Standard for naturally occurring waste constituents consists of the COCs, the concentration limits, and the point of compliance and all monitoring points. Any proposed changes to the Water Quality Protection Standard other than biannual update of the concentration limits shall be submitted in a report for review and approval.

The report shall:

- a. Identify **all distinct bodies of surface and ground water** that could be affected in the event of a release from a waste management unit or portion of a unit. This list shall include at least the uppermost aquifer and any permanent or ephemeral zones of perched groundwater underlying the facility.
- b. Include a map showing the monitoring points and background monitoring points for the surface water monitoring program, and groundwater monitoring program. The map shall include the point of compliance in accordance with Title 27, section 20405.
- c. Evaluate the perennial direction(s) of groundwater movement within the uppermost groundwater zone(s).
- d. Include a proposed statistical method for calculating concentration limits for monitoring parameters and constituents of concern that are detected in 10% or greater of the background data (naturally-occurring constituents) using a statistical procedure from Title 27, section 20415(e)(8)(A-D)] or section 20415(e)(8)(E).

- e. Include a retesting procedure to confirm or deny measurably significant evidence of a release pursuant to Title 27, section 20415(e)(8)(E) and section 20420(j)(1-3).

The Water Quality Protection Standard shall be certified by a California-registered civil engineer or geologist as meeting the requirements of Title 27. If subsequent sampling of the background monitoring point(s) indicates significant water quality changes due to either seasonal fluctuations or other reasons unrelated to waste management activities at the site, the Discharger may request modification of the Water Quality Protection Standard.

The Discharger proposed the methods for calculating concentration limits in the 2018 *Water Quality Monitoring Report Semi-annual Period January through June 2018*. The limits are calculated using Interwell tolerance limits at 95% confidence and 95% coverage based on background data from background monitoring well MW-102, 110 and 113, and SP-43 in HSU-1; and A-4, and MFP-3 in HSU-2.

The Water Quality Protection Standard shall be updated biannually for each monitoring well using new and historical monitoring data.

2. Monitoring Parameters

Monitoring parameters are a select group of constituents that are monitored during each monitoring event that are the waste constituents, reaction products, hazardous constituents, and physical parameters that provide a reliable indication of a release from a waste management unit. The monitoring parameters for all waste management units are those listed in Tables I for the specified monitored medium.

3. Constituents of Concern (COCs)

The COCs include a larger group of waste constituents, their reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste contained in the waste management unit, and are required to be monitored every five years [Title 27, sections 20395 and 20420(g)]. The COCs for all waste management units at the facility are those listed in Tables I for the specified monitored medium, and Table II. The Discharger shall monitor all COCs every five years, or more frequently as required in accordance with a Corrective Action Program. The last 5-year COC report was submitted to the Central Valley Water Board in the 2018 *Water Quality Monitoring Report Semi-annual Period January through June 2018*, and 2-year and 5-year COCs are due to be monitored again in 2020.

4. Concentration Limits

For a naturally occurring constituent of concern, the concentration limit for each constituent of concern shall be determined as follows:

- a. By calculation in accordance with a statistical method pursuant to Title 27, section 20415(e)(8); or

- b. By an alternate statistical method meeting the requirements of Title 27, section 20415(e)(8)(E).

The methods for calculating concentration limits were included in Appendix E of *Water Quality Monitoring Report Semiannual Period July-December 2018 and 2018 Annual Summary*. The approved method uses Interwell tolerance limits at 95% confidence and 95% coverage based on background data from background monitoring well MW-102, MW-110, MW-113 and SP-43 in HSU-1 and MFP-2 through 4 in HSU-2. Historical water quality data set from background wells MFP-1, MFP-2 and MFP-4 may be used to determine concentration limits for HSU-2.

The most recent concentration limits for select parameters as reported in the *Water Quality Monitoring Report Semiannual Period July-December 2018 and 2018 Annual Summary* were as follows:

HSU	Analysis Type	pH (Std units)	Chloride (mg/L) ¹	Boron (mg/L) ¹	Sulfate (mg/L)	TDS ² (mg/L)
HSU-1	Interwell	9.1	27.30	0.22	109	515
HSU-2	Interwell	8.5	15.90	0.19	590	1,300

¹ Milligrams per liter

² Total Dissolved Solids

The Discharger shall use the background wells provided in section C.1 to calculate the concentration limits in the future.

5. Retesting Procedures for Confirming Evidence of a Release

If monitoring results indicate measurably significant evidence of a release, as described in Standard Monitoring Specification I.45 of the SPRRs, then:

- a. For analytes that are detected in less than 10% of the background samples (such as non-naturally occurring constituents), the Discharger shall use the non-statistical retesting procedure required in Standard Monitoring Specification I.46 of the SPRRs.
- b. For analytes that are detected in 10% or greater of the background samples (naturally occurring constituents), the Discharger shall use one of the statistical retesting procedure as required in Standard Monitoring Specification I.47 of the SPRRs.

6. Point of Compliance

The point of compliance for the water standard at each waste management unit is a vertical surface located at the hydraulically downgradient limit of the Unit that extends through the uppermost aquifer underlying the unit. Point of compliance monitoring

points consist of the monitoring wells screened in HSU-1 and HSU-2 that are hydraulically downgradient to and closest to the closed landfill.

7. Compliance Period

The compliance period for each waste management unit shall be the number of years equal to the active life of the unit plus the closure period. The compliance period is the minimum period during which the Discharger shall conduct a water quality monitoring program subsequent to a release from the waste management unit. The compliance period shall begin anew each time the Discharger initiates an evaluation monitoring program [Title 27, section 20410].

8. Monitoring Points

A monitoring point is a well, device, or location specified in the waste discharge requirements, which monitoring is conducted and at which the water quality protection standard applies. The monitoring points for each monitored medium are listed in Section A of this MRP.

D. TRANSMITTAL LETTER FOR ALL REPORTS

A transmittal letter explaining the essential points shall accompany each report. At a minimum, the transmittal letter shall identify any violations found since the last report was submitted, and if the violations were corrected. If no violations have occurred since the last submittal, this shall be stated in the transmittal letter. The transmittal letter shall also state that a discussion of any violations found since the last report was submitted, and a description of the actions taken or planned for correcting those violations, including any references to previously submitted time schedules, is contained in the accompanying report. The transmittal letter shall contain a statement by the discharger, or the discharger's authorized agent, under penalty of perjury, that to the best of the signer's knowledge the report is true, accurate, and complete.

I, PATRICK PULUPA, Executive Officer, do hereby certify the forgoing is a full, true and correct copy of the Monitoring and Reporting Program issued by the California Regional Water Quality Control Board, Central Valley Region, on 5 December 2019.



PATRICK PULUPA,
Executive Officer

**TABLE I
 GROUNDWATER AND SURFACE WATER MONITORING PROGRAMS**

Parameter	GeoTracker Code	Units	Sampling Frequency	Reporting Frequency
Field Parameters				
Groundwater Elevation	GWELEV	Ft. & 100ths, M.S.L	Quarterly	Semiannual
Temperature	TEMP	oF	Semiannual	Semiannual
Electrical Conductivity	SC	umhos/cm	Semiannual	Semiannual
pH	PH	pH units	Semiannual	Semiannual
Turbidity	TURB	Turbidity units	Semiannual	Semiannual
Monitoring Parameters¹				
Total Dissolved Solids (TDS)	TDS	mg/L ²	Semiannual	Semiannual
Boron	B	mg/L	Semiannual	Semiannual
Chloride	CL	mg/L	Semiannual	Semiannual
Carbonate	CACO3	mg/L	Semiannual	Semiannual
Bicarbonate	BICACO3	mg/L	Semiannual	Semiannual
Nitrate - Nitrogen	NO3N	mg/L	Semiannual	Semiannual
Sulfate	SO4	mg/L	Semiannual	Semiannual
Calcium	CA	mg/L	Semiannual	Semiannual
Magnesium	MG	mg/L	Semiannual	Semiannual
Potassium	K	mg/L	Semiannual	Semiannual
Sodium	NA	mg/L	Semiannual	Semiannual
Selected Metals (See Table II)				Semiannual following sampling event
Arsenic	AS	mg/L	2 years ^{1, 3}	
Barium	BA	mg/L	2 years ^{1, 3}	
Chromium	CR	mg/L	2 years ^{1, 3}	
Nickel	NI	mg/L	2 years ^{1, 3}	
Selenium	SE	mg/L	2 years ^{1, 3}	

Parameter	GeoTracker Code	Units	Sampling Frequency	Reporting Frequency
Vanadium	V	mg/L	2 years ^{1, 3}	
Zinc	ZN	mg/L	2 years ^{1, 3}	
5-Year Constituents of Concern (see Table II)				2020 first semiannual and every 5 years thereafter
Total Organic Carbon	TOC	mg/L	5 years ⁴	
Inorganics (dissolved)		ug/L	5 years ^{1, 3}	
Volatile Organic Compounds (USEPA Method 8260B, extended list)		ug/L	5 years ⁴	
Semi-Volatile Organic Compounds (USEPA Method 8270C or D)		ug/L	5 years ⁴	

1. Semiannual surface water monitoring is required twice per year when there is water present at the designated surface water monitoring point any time during the reporting period (1 January to 30 June or 1 July to 31 December). Reporting shall include whether there was flow from the facility to waters of the U.S. when the samples were collected.

2. Milligrams per liter

3. Every five years during wet season

4. For groundwater monitoring only (every five years during the wet season beginning the first half of 2020)

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS

Inorganics (dissolved)	USEPA Method	GeoTracker Code
Aluminum	6010	AL
Antimony	7041	SB
Barium	6010	BA
Beryllium	6010	BE
Cadmium	7131A	CD
Chromium	6010	CR
Chromium (VI)	7196	CR6
Cobalt	6010	CO
Copper	6010	CU
Silver	6010	AG
Tin	6010	SN
Vanadium	6010	V
Zinc	6010	ZN
Iron	6010	FE
Manganese	6010	MN
Arsenic	7062	AS
Lead	7421	PB
Mercury	7470A	HG
Nickel	7521	NI
Selenium	7742	SE
Thallium	7841	TL
Cyanide	9010C	CN
Sulfide	9030B	S

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

Volatile Organic Compounds, extended list (USEPA Method 8260B):

COC Description	GeoTracker Code
Acetone	ACE
Acetonitrile (Methyl cyanide)	ACCN
Acrolein	ACRL
Acrylonitrile	ACRAMD
Allyl chloride (3 Chloropropene)	CLPE3
Benzene	BZ
Bromochloromethane (Chlorobromomethane)	BRCLME
Bromodichloromethane (Dibromochloromethane)	DBCME
Bromoform (Tribromomethane)	TBME
Carbon disulfide	CDS
Carbon tetrachloride	CTCL
Chlorobenzene	CLBZ
Chloroethane (Ethyl chloride)	CLEA
Chloroform (Trichloromethane)	TCLME
Chloroprene	CHLOROPRENE
Dibromochloromethane (Chlorodibromomethane)	DBCME
1,2 Dibromo 3 chloropropane (DBCP)	DBCP
1,2 Dibromoethane (Ethylene dibromide; EDB)	EDB
o Dichlorobenzene (1,2 Dichlorobenzene)	DCBZ12
m Dichlorobenzene(1,3 Dichlorobenzene)	DCBZ13
p Dichlorobenzene (1,4 Dichlorobenzene)	DCBZ14
trans 1,4 Dichloro 2 butene	DCBE14T
Dichlorodifluoromethane (CFC 12)	FC12
1,1 Dichloroethane (Ethylidene chloride)	DCA11
1,2 Dichloroethane (Ethylene dichloride)	DCA12
1,1 Dichloroethylene (1, I Dichloroethene; Vinylidene chloride)	DCE11

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
cis 1,2 Dichloroethylene (cis 1,2 Dichloroethene)	DCE12C
trans 1,2 Dichloroethylene (trans 1,2 Dichloroethene)	DCE12T
1,2 Dichloropropane (Propylene dichloride)	DCPA12
1,3 Dichloropropane (Trimethylene dichloride)	DCPA13
2,2 Dichloropropane (Isopropylidene chloride)	DCPA22
1,1 Dichloropropene	DCP11
cis 1,3 Dichloropropene	DCP13C
trans 1,3 Dichloropropene	DCP13T
Di-isopropylether (DIPE)	DIPE
Ethanol	ETHANOL
Ethyltertiary butyl ether	ETBE
Ethylbenzene	EBZ
Ethyl methacrylate	EMETHACRY
Hexachlorobutadiene	HCBU
2 Hexanone (Methyl butyl ketone)	HXO2
Isobutyl alcohol	ISOBTOH
Methacrylonitrile	METHACRN
Methyl bromide (Bromomethane)	BRME
Methyl chloride (Chloromethane)	CLME
Methyl ethyl ketone (MEK; 2 Butanone)	MEK
Methyl iodide (Iodomethane)	IME
Methyl t-butyl ether	MTBE
Methyl methacrylate	MMTHACRY
4 Methyl 2 pentanone (Methyl isobutyl ketone)	MIBK
Methylene bromide (Dibromomethane)	DBMA
Methylene chloride (Dichloromethane)	DCMA
Naphthalene	NAPH
Propionitrile (Ethyl cyanide)	PACN

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
Styrene	STY
Tertiary amyl methyl ether	TAME
Tertiary butyl alcohol	TBA
1,1,1,2 Tetrachloroethane	TC1112
1,1,2,2 Tetrachloroethane	PCA
Tetrachloroethylene (Tetrachloroethene; Perchloroethylene; PCE)	PCE
Toluene	BZME
1,2,4 Trichlorobenzene	TCB124
1,1,1 Trichloroethane (Methylchloroform)	TCA111
1,1,2 Trichloroethane	TCA112
Trichloroethylene (Trichloroethene; TCE)	TCE
Trichlorofluoromethane (CFC 11)	FC11
1,2,3 Trichloropropane	TCPR123
Vinyl acetate	VA
Vinyl chloride (Chloroethene)	VC
Xylene (total)	XYLENES

Semi-Volatile Organic Compounds USEPA Methods 8270C or 8270D (Base, Neutral & Acid Extractables)

COC Description	GeoTracker Code
Acenaphthene	ACNP
Acenaphthylene	ACNPY
Acetophenone	ACPHN
2 Acetylaminofluorene (2 AAF)	ACAMFL2
Aldrin	ALDRIN
4 Aminobiphenyl	AMINOBP4
Anthracene	ANTH

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
Benzo[a]anthracene (Benzanthracene)	BZAA
Benzo[b]fluoranthene	BZBF
Benzo[k]fluoranthene	BZKF
Benzo[g,h,i]perylene	BZGHIP
Benzo[a]pyrene	BZAP
Benzyl alcohol	BZLAL
Bis(2 ethylhexyl) phthalate	BIS2EHP
alpha BHC	BHCALPHA
beta BHC	BHCBETA
delta BHC	BHCDELTA
gamma BHC (Lindane)	BHCGAMMA
Bis(2 chloroethoxy) methane	BECEM
Bis(2 chloroethyl) ether (Dichloroethyl ether)	BIS2CEE
Bis(2 chloro 1 methylethyl) ether (Bis(2 chloroisopropyl) ether; DCIP)	BIS2CIE
4 Bromophenyl phenyl ether	BPPE4
Butyl benzyl phthalate (Benzyl butyl phthalate)	BBP
Chlordane	CHLORDANE
p Chloroaniline	CLANIL4
Chlorobenzilate	CLBZLATE
p Chloro m cresol (4 Chloro 3 methylphenol)	C4M3PH
2 Chloronaphthalene	CNPH2
2 Chlorophenol	CLPH2
4 Chlorophenyl phenyl ether	CPPE4
Chrysene	CHRYSENE
o Cresol (2 methylphenol)	MEPH2
m Cresol (3 methylphenol)	MEPH3
p Cresol (4 methylphenol)	MEPH4
4,4' DDD	DDD44

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
4,4' DDE	DDE44
4,4' DDT	DDT44
Diallate	DIALLATE
Dibenz[a,h]anthracene	DBAHA
Dibenzofuran	DBF
Di n butyl phthalate	DNBP
3,3' Dichlorobenzidine	DBZD33
2,4 Dichlorophenol	DCP24
2,6 Dichlorophenol	DCP26
Dieldrin	DIELDRIN
Diethyl phthalate	DEPH
p (Dimethylamino) azobenzene	PDMAABZ
7,12 Dimethylbenz[a]anthracene	DMBZA712
3,3' Dimethylbenzidine	DMBZD33
2,4 Dimehtylphenol (m Xylenol)	DMP24
Dimethyl phthalate	DMPH
m Dinitrobenzene	DNB13
4,6 Dinitro o cresol (4,6 Dinitro 2 methylphenol)	DN46M
2,4 Dinitrophenol	DNP24
2,4 Dinitrotoluene	DNT24
2,6 Dinitrotoluene	DNT26
Di n octyl phthalate	DNOP
Diphenylamine	DPA
Endosulfan I	ENDOSULFANA
Endosulfan II	ENDOSULFANB
Endosulfan sulfate	ENDOSULFANS
Endrin	ENDRIN
Endrin aldehyde	ENDRINALD

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
Ethyl methanesulfonate	EMSULFN
Famphur	FAMPHUR
Fluoranthene	FLA
Fluorene	FL
Heptachlor	HEPTACHLOR
Heptachlor epoxide	HEPT-EPOX
Hexachlorobenzene	HCLBZ
Hexachlorocyclopentadiene	HCCP
Hexachloroethane	HCLEA
Hexachloropropene	HCPR
Indeno(1,2,3 c,d) pyrene	INP123
Isodrin	ISODRIN
Isophorone	ISOP
Isosafrole	ISOSAFR
Kepone	KEP
Methapyrilene	MTPYRLN
Methoxychlor	MTXYCL
3 Methylcholanthrene	MECHLAN3
Methyl methanesulfonate	MMSULFN
2 Methylnaphthalene	MTNPH2
1,4 Naphthoquinone	NAPHQ14
1 Naphthylamine	AMINONAPH1
2 Naphthylamine	AMINONAPH2
o Nitroaniline (2 Nitroaniline)	NO2ANIL2
m Nitroaniline (3 Nitroaniline)	NO2ANIL3
p Nitroaniline (4 Nitroaniline)	NO2ANIL4
Nitrobenzene	NO2BZ
o Nitrophenol (2 Nitrophenol)	NTPH2

TABLE II
2-YEARS AND 5-YEAR COCs, AND APPROVED USEPA ANALYTICAL METHODS
Continued

COC Description	GeoTracker Code
p Nitrophenol (4 Nitrophenol)	NTPH4
N Nitrosodi n butylamine (Di n butylNitrosamine)	NNSBU
N Nitrosodiethylamine (DiethylNitrosamine)	NNSE
N Nitrosodimethylamine (DimethylNitrosamine)	NNSM
N Nitrosodiphenylamine (DiphenylNitrosamine)	NNSPH
N Nitrosodipropylamine (N Nitroso N dipropylamine; Di n propylNitrosamine)	NNSPR
N Nitrosomethylethylamine (MethylethylNitrosamine)	NNSME
N Nitrosopiperidine	NNSPPRD
N Nitrosospyrrolidine	NNSPYRL
5 Nitro o toluidine	TLDNONT5
Pentachlorobenzene	PECLBZ
Pentachloronitrobenzene (PCNB)	PECLNO2BZ
Pentachlorophenol	PCP
Phenacetin	PHNACTN
Phenanthrene	PHAN
Phenol	PHENOL
p Phenylenediamine	ANLNAM4
Polychlorinated biphenyls (PCBs; Aroclors)	PCBS
Pronamide	PRONAMD
Pyrene	PYR
Safrole	SAFROLE
1,2,4,5 Tetrachlorobenzene	C4BZ1245
2,3,4,6 Tetrachlorophenol	TCP2346
o Toluidine	TLDNO
Toxaphene	TOXAP
2,4,5 Trichlorophenol	TCP245
0,0,0 Triethyl phosphorothioate	TEPTH
sym Trinitrobenzene	TNB135

ORDER NO. R5-2019-0076
LAKE COUNTY
PACIFIC GAS AND ELECTRIC COMPANY
GEOTHERMAL INC. LANDFILL FACILITY
CLASS II LANDFILL
POST-CLOSURE MAINTENANCE AND CORRECTIVE ACTION
LAKE COUNTY

INFORMATION SHEET

In Order No. R5-2019-0076 and its associated Monitoring and Reporting Program (MRP), the Central Valley Regional Water Quality Control Board prescribes new waste discharge requirements (WDRs) for the Geothermal Inc. Landfill Facility (Facility) in Lake County, situated approximately 2.5 mile southeast of Middletown.

The 15-acre Facility is part of the former 40-acre waste disposal area and consists of an unlined closed landfill surrounded by tree plantations on three sides. The Facility is located within an approximately 460 acres of property (site) which is composed of original 360-acre Geothermal Inc landfill property and the approximately 100-acre former Freeman Ranch property, owned by Pacific Gas and Electric Company (PG&E). The site contains a small man-made lake commonly known as Freeman Lake.

Pursuant to Title 27 of the California Code of Regulations (Title 27), the unlined closed landfill has been classified as a "Class II" unit. The Facility was not previously assessed for an overall Threat to Water Quality (TTWQ) and Complexity (CPLX) rating. This order continues the waste management unit classification for the closed landfill and assigns threat and complexity rating of 2B to the Facility.

The Facility was regulated by Cleanup and Abatement (CAO) Order No. R5-2002-0204 which required the Discharger to close all the waste management units in accordance with the requirements of Title 27 and the CAO Order, and submit a final closure report by 1 February 2006. The Discharger closed all units at the Facility in 2006 and complied with all requirements of the CAO except maintaining 5-feet of separation between the waste and underlying groundwater per the Closure Evaluation Report submitted in 2012. These new waste discharge requirements rescind the CAO and require post-closure maintenance of the closed landfill, additional corrective action for the impacted groundwater and financial assurances.

Owner/Operator

PG&E is currently owns and operates the facility. Formerly, the facility was owned and operated by Geothermal Inc. When Geothermal Inc. filed for reorganization under Chapter 11 of the U.S. Bankruptcy Code, Central Valley Water Board Executive Officer pursued enforcement action against all potentially responsible parties (PRPs), including generators of the waste received at the facility and Geothermal Inc. per the Resolution No. 91-200 adopted on 6 September 1991. Waste generators were identified as PRPs from Geothermal Inc. waste disposal records. On 8 May 1992, the Attorney General sent a letter to a list of eight PRPs, including companies or entities that later acquired the environmental liability for waste at the facility from a waste generator, to inform about Resolution 91-200 for enforcement action, but preference to secure voluntary corporation in cleanup and closure of the Facility.

Following a meeting between the Central Valley Water Board, the Attorney General, and the PRPs on 4 June 1992, the PRPs formed a Technical Committee (TC) consisting of representatives from Pacific Gas and Electric Company, Northern California Power Agency, Unocal, and Santa Fe Geothermal/Occidental Petroleum Geothermal, Shell, SMUD, Freeport McMoran, and Thermal, to develop a technical basis for PRP allocation of costs. Subsequent to the completion of that task on April 14, 1993, a five-member Management Committee (MC) was formed by the PRPs to provide technical oversight for the site cleanup and closure. PG&E has served as the main contact for the MC. After establishment of a Qualified Settlement Fund for the site into which PRPs paid their allocated share of cleanup, PG&E purchased and took title of the entirety of the former Geothermal Inc. property as of 16 August 2004.

Facility Description

The former waste disposal site, consisted of seven unlined surface impoundments (Ponds 1 through 7), three unlined disposal trenches and two unlined unused ponds, was operated by Geothermal Inc. between 1976 and 1987. It accepted liquid and solid wastes produced by geothermal exploratory drilling, steam power generation, and other activities at the Geysers Energy Field located approximately 15 miles west of the site. The liquid and solid wastes were placed in seven unlined ponds. In the early years, once the liquids had evaporated, the solids were placed in three disposal trenches. In later years, the solids were left in the ponds.

Ponds 5 and 6 were clean closed during 1985 prior to being retrofitted with double clay liners. Pond 5 was subsequently taken out of use when the leachate collection and removal system (LCRS) filled with rainwater. Pond 5 did not receive any waste after being clean closed and lined. Pond 2 and Pond 3 received interim closure during 1996 by transferring remaining water in those ponds to Ponds 1 and 7, stabilizing the wastes with clean soil and covering the wastes with a 20-mil high density polyethylene (HDPE) geomembrane. Ponds 1 and 2 contain low pH hydrogen sulfide scrubber wastes generated from the Stretford process.

In accordance with the CAO Order No. R5-2002-0204, the waste from Ponds 1 and 7, and the disposal trenches were removed, stabilized and consolidated in Ponds 4 and 6. Ponds 1 and 7, and the disposal trenches were backfilled with clean soil to the extent needed and graded for positive drainage. Ponds 2, 3, 4 and 6 received engineered alternative final cover in 2006. Currently the facility consists of a 15-acre closed landfill surrounded on three sides by tree plantations.

Corrective Action

As reported in the *Groundwater Corrective Action Plan* report (CAP, November 2005), the first impacts to groundwater were noted during the operation of the ponds in the early 1980s. On 22 June 1984, the Regional Board issued Cease and Desist (C&D) Order No. 84-076 requiring Geothermal Inc. to retrofit all surface impoundments with double liners and leachate collection systems, identify all areas of surface water and groundwater pollution, and to submit cleanup or containment plans.

The documents submitted by the MC between 1994 and 1996 brought the Facility through investigation, waste characterization, remedial investigation and alternatives, and conceptual closure. The conceptual closure proposed to excavate the wastes (clean closure) and place

them in a constructed on-site landfill with a composite liner and a composite final cover (closure cell). In 1998, the MC proposed a demonstration study to evaluate the effectiveness of using a phyto-cover over the waste instead of the conceptual landfill closure cell in a document entitled *Technical Evaluation of Phytoremediation and Work Plan for Demonstration Study*, dated August 1998, which was approved by the Central Valley Water Board.

The April 2002 Amendment to the 1995 Remedial Action Alternative Evaluation report presented the results from phytoremediation study and included a recommendation for the closure of the Facility utilizing an evapotranspiration (ET) cover which would consist of four feet of clean soil, eucalyptus trees and grass, to be placed over the waste once the pond water is treated and removed. Additionally, the proposed closure plan included eucalyptus trees in areas surrounding the ponds to lower groundwater levels in order to maintain 5-foot separation. In response to Water Board staff's concerns about groundwater separation from waste, trees in the cover, and the possibility of percolate contacting the waste and leaching from the edge of the proposed cover, the MC eliminated trees from the final cover above waste material and proposed a final cover with a geomembrane and a geocomposite drainage layer with two feet of cover soil and more trees around the perimeter of the waste. In 2006, all the units at the Facility were closed as described in the WDRs.

The investigations and feasibility studies performed from 1996 through 2005 recommended to implement the approved closure plan with institutional controls as the corrective action, and to evaluate contingency remedial actions if groundwater conditions did not improve after 5 to 7 years of unit closure. The Discharger submitted a Closure Evaluation Report on 28 February 2012. The report concluded that the facility complies with all CAO Order requirements with one exception: a minimum of 5-feet of separation between groundwater and waste. The closure evaluation report stated that the Discharger plans to prepare an engineering feasibility study to evaluate potential corrective measures that could increase the likelihood of achieving 5-feet of separation.

The Discharger performed feasibility studies for additional corrective actions and additional investigations and field data collection to refine the site conceptual model from 2012 through 2017; and submitted the Corrective Action Plan for Waste Separation Engineered Alternative and Groundwater Cleanup report on 16 June 2017. The recent corrective action report and site conceptual model update and plume delineation report found that the Discharger's groundwater model is not sensitive enough to provide an acceptable level of certainty for the evaluation of waste separation alternatives relative to the 5-ft separation goal. All feasibility studies conducted to evaluate the alternatives to create and maintain five-ft separation between the bottom of waste to underlying groundwater since 2002, concluded that it is not technically or economically feasible to achieve 5-ft separation due to geologic and hydrogeologic conditions at the Facility.

New waste discharge requirements are required for the facility's post-closure maintenance and corrective action.

New WDR Development

This Order implements post-closure maintenance and corrective action requirements for the existing closed Class II landfill. The Facility's WDRs include:

- a. A summary of work completed at the facility since the time of adoption of CAO R5-2002-0204;
- b. A summary of CAO R5-2002-0204 requirements and compliance;
- c. An update to current understanding of site geology and hydrogeology, and the site conceptual model;
- d. Requirements for additional corrective action for waste/groundwater separation and impacted groundwater;
- e. Requirements for an updated water quality protection standard; and
- f. Requirements for the facility's monitoring network
- g. Requirements for the post-closure maintenance and additional corrective action financial assurances
- h. Expanded surface and groundwater analytical suites

mp/bss

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

STANDARD PROVISIONS AND REPORTING REQUIREMENTS
FOR
WASTE DISCHARGE REQUIREMENTS
FOR
NONHAZARDOUS SOLID WASTE DISCHARGES
REGULATED BY SUBTITLE D AND/OR TITLE 27
(40 C.F.R. section 258 and Title 27, § 20005 et seq.)

December 2015

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A. APPLICABILITY

1. These Standard Provisions and Reporting Requirements (SPRRs) are applicable to nonhazardous solid waste disposal sites that are regulated by the Central Valley Regional Water Quality Control Board (hereafter, Central Valley Water Board) pursuant to the provisions of California Code of Regulations, title 27 ("Title 27"), section 20005 et seq., and municipal solid waste (MSW) landfills that are subject to the Federal Subtitle D regulations contained in 40 Code of Federal Regulations section 258 (hereafter, "Subtitle D" or "40 C.F.R. § 258.XX") in accordance with State Water Resources Control Board (State Water Board) Resolution 93-62. The Subtitle D regulations are only applicable to MSW landfills and therefore any requirements in these SPRRs that are referenced as coming from Subtitle D are not applicable to non-MSW waste management units such as Class II surface impoundments, Class II waste piles, and non-MSW landfill units. All Subtitle D requirements in these SPRRs are referenced with "[40 C.F.R. § 258.XX]" after the requirement.
2. "Order," as used throughout this document, means the Waste Discharge Requirements (WDRs) to which these SPRRs are incorporated.
3. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, and do not protect the Discharger from liabilities under federal, state, or local laws. This Order does not convey any property rights or exclusive privileges.
4. The provisions of this Order are severable. If any provision of this Order is held invalid, the remainder of this Order shall not be affected.
5. If there is any conflicting or contradictory language between the WDRs, the Monitoring and Reporting Program (MRP), or the SPRRs, then language in the WDRs shall govern over either the MRP or the SPRRs, and language in the MRP shall govern over the SPRRs.
6. If there is a site-specific need to change a requirement in these SPRRs for a particular landfill facility, the altered requirement shall be placed in the appropriate section of the WDRs and will supersede the corresponding SPRRs requirement. These SPRRs are standard and cannot be changed as part of the permit writing process or in response to comments, but they will be periodically updated on an as-needed basis.
7. Unless otherwise stated, all terms are as defined in Water Code section 13050 and in Title 27, section 20164.

B. TERMS AND CONDITIONS

1. Failure to comply with any waste discharge requirement, monitoring and reporting requirement, or Standard Provisions and Reporting Requirement, or

- other order or prohibition issued, reissued, or amended by the Central Valley Water Board or the State Water Board, or intentionally or negligently discharging waste, or causing or permitting waste to be deposited where it is discharged into the waters of the state and creates a condition of pollution or nuisance, is a violation of this Order and the Water Code, which can result in the imposition of civil monetary liability [Wat. Code, § 13350(a)]
2. After notice and opportunity for a hearing, this Order may be terminated or modified for cause, including, but not limited to [Wat. Code, § 13381]:
 - a. Violation of any term or condition contained in this Order;
 - b. Obtaining this Order by misrepresentation, or failure to disclose fully all relevant facts;
 - c. A change in any condition that results in either a temporary or permanent need to reduce or eliminate the authorized discharge; or
 - d. A material change in the character, location, or volume of discharge.
 3. Before initiating a new discharge or making a material change in the character, location, or volume of an existing discharge, the Discharger shall file a new report of waste discharge (ROWD), or other appropriate joint technical document (JTD), with the Central Valley Water Board [Wat. Code, § 13260(c) and § 13264(a)]. A material change includes, but is not limited to, the following:
 - a. An increase in area or depth to be used for solid waste disposal beyond that specified in waste discharge requirements;
 - b. A significant change in disposal method, location, or volume (e.g., change from land disposal to land treatment);
 - c. A change in the type of waste being accepted for disposal; or
 - d. A change to previously-approved liner systems or final cover systems that would eliminate components or reduce the engineering properties of components.
 4. Representatives of the Central Valley Water Board may inspect the facilities to ascertain compliance with the waste discharge requirements. The inspection shall be made with the consent of the owner or possessor of the facilities or, if the consent is refused, with a duly issued warrant. However, in the event of an emergency affecting the public health or safety, an inspection may be made without consent or the issuance of a warrant [Wat. Code, §13267(c)].

5. The Central Valley Water Board will review this Order periodically and will revise these waste discharge requirements when necessary [Wat. Code, § 13263(e) and Title 27, § 21720(b)].
6. Except for material determined to be confidential in accordance with California law and regulations, all reports prepared in accordance with terms of this Order shall be available for public inspection at the offices of the Central Valley Water Board [Wat. Code, § 13267(b)]. Data on waste discharges, water quality, geology, and hydrogeology shall not be considered confidential.
7. A discharge of waste into the waters of the state is a privilege, not a right. No discharge of waste into waters of the state, whether or not the discharge is made pursuant to waste discharge requirements, shall create a vested right to continue the discharge [Wat. Code, § 13263(g)].
8. Technical and monitoring reports specified in this Order are requested pursuant to the Water Code [§13267(b)]. Failure to furnish the reports by the specified deadlines or falsifying information in the reports, are misdemeanors that may be liable civilly in accordance with §13268(b) of the Water Code [Wat. Code, §13268(a)].

C. STANDARD PROHIBITIONS

1. The discharge of liquid or semi-solid waste (waste containing less than 50 percent solids) is prohibited, except for the following when proposed in the ROWD/JTD and approved by this Order:
 - a. Dewatered sewage or water treatment sludge as described in Title 27, section 20220(c) provided it is discharged above a composite liner with a leachate collection and removal system (LCRS) [Title 27, § 20200(d)(3)].
 - b. Leachate and/or landfill gas condensate that is returned to the composite-lined waste management unit (with an LCRS) from which it came [Title 27, § 20340(g) and 40 C.F.R. § 258.28].
2. The discharge of wastes which have the potential to reduce or impair the integrity of containment structures or which, if commingled with other wastes in the waste management unit, could produce violent reaction, heat or pressure, fire or explosion, toxic by-products, or reaction products, which, in turn:
 - a. require a higher level of containment than provided by the unit; or
 - b. are 'restricted wastes'; or
 - c. impair the integrity of containment structures;is prohibited [Title 27, § 20200(b)].

3. The discharge of wastes outside of a waste management unit or portions of a unit specifically designed for their containment is prohibited.
4. The discharge of solid waste containing free liquid or which may contain liquid in excess of the moisture holding capacity as a result of waste management operations, compaction or settlement is prohibited.
5. The discharge of waste to a closed landfill unit is prohibited.
6. The discharge of waste constituents to the unsaturated zone or to groundwater is prohibited.
7. The discharge of solid or liquid waste or leachate to surface waters, surface water drainage courses, or groundwater is prohibited.

D. STANDARD DISCHARGE SPECIFICATIONS

1. The Discharger is responsible for accurate characterization of wastes, including a determination of whether or not wastes will be compatible with containment features and other wastes at the waste management unit and whether or not the wastes are required to be managed as a hazardous waste [Title 27, § 20200(c)] or designated waste [Title 27, § 20210].
2. Leachate and landfill gas condensate collected from a waste management unit shall be discharged to the unit from which it came, or discharged to an appropriate waste management unit in accordance with Title 27 and in a manner consistent with the waste classification of the liquid [Title 27, § 20200(d) and § 20340(g)].
3. The discharge of leachate or landfill gas condensate is restricted to those portions of a waste management unit that has a composite liner system and LCRS meeting the Federal Subtitle D requirements [40 C.F.R. § 258.28].
4. Leachate and condensate returned to a composite-lined landfill unit (when approved by this Order) shall be discharged and managed such that it does not cause instability of the waste, does not cause leachate seeps, does not generate additional landfill gas that is not extracted from the landfill by an active landfill gas extraction system, does not cause contaminants to enter surface water runoff, and does not cause leachate volumes to exceed the maximum capacity of the LCRS.
5. Any discharge of waste outside the portion of the landfill that was already covered with waste as of the landfill unit's respective Federal Deadline constitutes a "lateral expansion" and requires the installation of an approved composite liner system and LCRS [40 C.F.R. § 258.40(b)].

6. Wastes shall be discharged only into waste management units specifically designed for their containment and/or treatment, as described in this Order.
7. The discharge shall remain within the designated disposal area at all times.
8. The discharge of waste shall not cause a nuisance condition [Wat. Code, § 13050(m)].

E. STANDARD FACILITY SPECIFICATIONS

1. All waste management units shall be designed, constructed, and operated to ensure that wastes, including leachate, will be a minimum of 5 feet above the highest anticipated elevation of underlying groundwater [Title 27, § 20240(c)], including the capillary fringe.
2. Surface and subsurface drainage from outside of a waste management unit shall be diverted from the unit [Title 27, § 20365(e)].
3. Interim cover is daily and intermediate cover [Title 27, § 20750(a)]. Interim cover over wastes discharged to a landfill shall be designed and constructed to minimize percolation of liquids through the wastes [Title 27, § 20705(b)].
4. Intermediate cover consisting of compacted earthen material of at least twelve (12) inches shall be placed on all surfaces of the fill where no additional solid waste will be deposited within **180 days** [Title 27, § 20700(a)].
5. During wet weather conditions, the facility shall be operated and graded to minimize leachate generation.
6. The Discharger shall **immediately** notify the Central Valley Water Board staff of any slope failure occurring at a waste management unit. Any failure which threatens the integrity of containment features or the waste management unit shall be promptly corrected in accordance with an approved method [Title 27, § 21710(c)(2)].
7. The Discharger shall **immediately** notify Central Valley Water Board staff of any flooding, unpermitted discharge of waste off-site or outside of waste management units, equipment failure, or other change in site conditions which could impair the integrity of waste or leachate containment facilities or precipitation and drainage control structures.
8. The Discharger shall limit water used for facility maintenance within landfill areas to the minimum amount necessary for dust control and construction.
9. The Discharger shall maintain in good working order any facility, control system, or monitoring device installed to achieve compliance with the waste discharge requirements.

10. The Discharger shall lock all groundwater monitoring wells with a lock on the well cap or monitoring well box. All monitoring devices shall be clearly labeled with their designation including all monitoring wells, LCRS risers, and lysimeter risers and shall be easily accessible for required monitoring by authorized personnel. Each monitoring device shall be clearly visible and be protected from damage by equipment or vehicles.
11. The Discharger shall ensure that methane and other landfill gases are adequately vented, removed from landfill units, or otherwise controlled to prevent the danger of adverse health effects, nuisance conditions, degradation, or the impairment of the beneficial uses of surface water or groundwater due to migration through the unsaturated zone.
12. The Discharger shall maintain the depth of the fluid in the sump of each landfill unit at the minimum needed for efficient pump operation (the depth at which the pump turns on given the pump intake height and maximum pump cycle frequency).
13. The depth of fluid on the landfill liner shall not exceed **30 centimeters** (cm) [40 C.F.R. § 258.40(a)(2)]. This regulation is interpreted by the Central Valley Water Board to exclude the leachate sump. The Discharger shall **immediately** notify the Central Valley Water Board staff by telephone, and follow up in writing within **seven** days if monitoring reveals that the depth of fluid on any portion of the liner (excluding the sump) exceeds 30 cm (approximately 12 inches). The written notification shall include a timetable for remedial or corrective action necessary to achieve compliance with the leachate depth limitation.
14. Each LCRS shall be tested at least annually to demonstrate proper operation. The results of the tests shall be compared with earlier tests made under comparable conditions [Title 27, § 20340(d)].
15. The Discharger shall maintain a *Storm Water Pollution Prevention Plan and Monitoring Program and Reporting Requirements* in accordance with State Water Board Order No. 2014-0057-DWQ (Industrial General Permit) or most recent general industrial storm water permit), or retain all storm water on-site.
16. Internal site drainage from surface or subsurface sources shall not contact or percolate through wastes.
17. New MSW landfill units or lateral expansions of existing units shall not be sited in a "wetland" [as defined in 40 C.F.R. § 232.29(r)] unless there is no practical alternative; steps have been taken to assure no net loss of wetland; the landfill unit will not degrade the wetland; the unit will not jeopardize threatened or endangered species or produce adverse modification of a critical habitat or violate any requirement of the Marine Protection, Research, and Sanctuaries Act of 1972 [40 C.F.R. § 258.12].

F. STANDARD CONSTRUCTION SPECIFICATIONS

1. The Discharger shall submit for review and approval at least **90 days** prior to proposed construction, design plans and specifications for new landfill modules that include the following:
 - a. Detailed construction drawings showing all required liner system components, the LCRS, leachate sump, unsaturated zone monitoring system, any proposed landfill gas monitoring and extraction points, and access to the LCRS for required annual testing.
 - b. A Construction Quality Assurance (CQA) Plan prepared by a California-registered civil engineer or certified engineering geologist, and that meets the requirements of Title 27, section 20324.
 - c. A geotechnical evaluation of the area soils, evaluating their use as the base layer or reference to the location of this information in the ROWD/JTD [Title 27, § 21750(f)(4)].
 - d. Information about the seismic design of the proposed new module (or reference to the location of this information in the ROWD/JTD) in accordance with Title 27, section 20370.
 - e. A revised water quality monitoring plan for groundwater detection monitoring (or information showing the existing plan is adequate) in accordance with Title 27, section 20415.
 - f. An Operation Plan (or reference to the location of this information in the ROWD/JTD) meeting the requirements of Title 27, section 21760(b).
2. All containment structures shall be designed by, and construction shall be supervised by, a California registered civil engineer or a certified engineering geologist, and shall be certified by that individual as meeting the prescriptive standards, or approved engineered alternative design, in accordance with this Order prior to waste discharge.
3. The Discharger shall not proceed with construction until the construction plans, specifications, and all applicable construction quality assurance plans have been approved. Waste management units shall receive a final inspection and approval of the construction by Central Valley Water Board staff before use of the unit commences [Title 27, § 20310(e)].
4. Any report, or any amendment or revision of a report, that proposes a design or design change that might affect a waste management unit's containment features or monitoring systems shall be approved by a California registered civil engineer or a certified engineering geologist [Title 27, § 21710(d)].

5. Materials used in containment structures shall have appropriate chemical and physical properties to ensure that such structures do not fail to contain waste because of pressure gradients, physical contact with waste or leachate, chemical reactions with soil or rock, climatic conditions, the stress of installation, or because of the stress of daily operations [Title 27, § 20320(a)].
6. Waste management units and their respective containment structures shall be designed and constructed to limit, to the greatest extent possible, ponding, infiltration, inundation, erosion, slope failure, washout, and overtopping [Title 27, § 20365(a)].
7. The Discharger shall design storm water conveyance systems for Class III units for a 100-year, 24-hour storm event, and shall design storm water conveyance systems for Class II units for a 1,000-year, 24-hour storm event [Title 27, § 21750(e)(3)].
8. All Class III landfill units shall be designed to withstand the maximum probable earthquake and Class II waste management units shall be designed to withstand maximum credible earthquake without damage to the foundation or to the structures that control leachate, or surface drainage, or erosion, or gas [Title 27, § 20370(a)].
9. The Discharger shall perform stability analyses that include components to demonstrate the integrity of the landfill foundation, final slopes, and containment systems under both static and dynamic conditions throughout the landfill's life including the closure period and post-closure maintenance period [Title 27, § 21750(f)(5)].
10. New waste management units and expansions of existing units shall not be located on a known Holocene fault [Title 27, § 20260(d)].
11. Liners shall be designed and constructed to contain the fluid, including landfill gas, waste, and leachate [Title 27, § 20330(a)].
12. Hydraulic conductivities shall be determined primarily by appropriate field test methods in accordance with accepted civil engineering practice. The results of laboratory tests with both water and leachate, and field tests with water, shall be compared to evaluate how the field permeabilities will be affected by leachate. It is acceptable for the Discharger to use appropriate compaction tests in conjunction with laboratory hydraulic conductivity tests to determine field permeabilities as long as a reasonable number of field hydraulic conductivity tests are also conducted [Title 27, § 20320(c)].
13. Hydraulic conductivities specified for containment structures other than the final cover shall be relative to the fluids (leachate) to be contained. Hydraulic conductivities for the final cover shall be relative to water [Title 27, § 20320(b)].

14. A test pad for each barrier layer and final cover shall be constructed in a manner duplicating the field construction. Test pad construction methods, with the designated equipment, shall be used to determine if the specified density/moisture-content/hydraulic conductivity relationships determined in the laboratory can be achieved in the field with the compaction equipment to be used and at the specified lift thickness [Title 27, § 20324(g)(1)(A)].
15. Performance requirements for geosynthetic membranes shall include, but are not limited to, a need to limit infiltration of water, to the greatest extent possible; a need to control landfill gas emissions; mechanical compatibility with stresses caused by equipment traffic, and for final covers the result of differential settlement over time and durability throughout the post-closure maintenance period [Title 27, § 20324(i)(1)].
16. The Discharger shall ensure proper preparation of the subgrade for any liner system that includes a GCL so as to provide a smooth surface that is free from rocks, sticks, or other debris that could damage or otherwise limit the performance of the GCL.
17. The Discharger shall propose an electronic leak location survey of the top liner for any new landfill module in the construction quality assurance plan unless the Discharger demonstrates that a leak location survey is not needed.
18. Leachate collection and removal systems are required for Class II landfills and surface impoundments, MSW landfills, and for Class III landfills which have a liner or which accept sewage or water treatment sludge [Title 27, § 20340(a)].
19. All new landfill units or lateral expansions of existing units that require a LCRS shall have a blanket-type LCRS that covers the bottom of the unit and extends as far up the sides as possible. The LCRS shall be of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the unit [Title 27, § 20340(e)].
20. The LCRS shall be designed, constructed, maintained, and operated to collect and remove twice the maximum anticipated daily volume of leachate from the waste management unit [Title 27, § 20340(b)].
21. Leachate collection and removal systems shall be designed and operated to function without clogging through the scheduled closure of the landfill unit and during the post-closure maintenance period.
22. The LCRS shall be designed to maintain the depth of fluid over any portion of the LCRS of no greater than 30 cm [40 C.F.R. § 258.40(a)(2)], excluding the leachate sump. The leachate sump, leachate removal pump, and pump controls shall be designed and set to maintain a fluid depth no greater than the minimum needed for efficient pump operation [Title 27, § 20340(c)].

23. All construction of liner systems and final cover systems shall be performed in accordance with a Construction Quality Assurance Plan certified by a registered civil engineer or a certified engineering geologist [Title 27, § 20323].
24. The Construction Quality Assurance program shall be supervised by a registered civil engineer or a certified engineering geologist who shall be designated the CQA officer [Title 27, § 20324(b)(2)].
25. The Discharger shall ensure that a third party independent of both the Discharger and the construction contractor performs all of the construction quality assurance monitoring and testing during the construction of a liner system.
26. The Discharger shall notify Central Valley Water Board staff at least **14 days** prior to commencing field construction activities including construction of a new lined cell or module, construction of a final cover, or any other construction that requires Central Valley Water Board staff approval under this Order.
27. The Discharger shall submit for review and approval at least **60 days** prior to proposed discharge, final documentation required in Title 27 Section 20324(d)(1)(C) following the completion of construction of a new lined landfill module. The report shall be certified by a registered civil engineer or a certified engineering geologist and include a statement that the liner system was constructed in accordance with the approved design plans and specifications, the CQA Plan, the requirements of the WDRs, and that it meets the performance goals of Title 27. The report shall contain sufficient information and test results to verify that construction was in accordance with the design plans and specifications, the construction quality assurance plan, and the performance goals of Title 27.
28. The Discharger shall not discharge waste onto a newly constructed liner system until the final documentation report has been reviewed and an acceptance letter has been received.
29. Prior to placement of waste in a new landfill unit, the Discharger shall monitor any pan lysimeter for the unit that has received enough rainfall to flood the LCRS sump. If liquid is detected in the pan lysimeter, the Discharger shall verify that the liquid is not from a leak in the primary liner system before waste can be accepted to the new module.

G. STANDARD CLOSURE AND POST-CLOSURE SPECIFICATIONS

1. The Discharger shall submit a final or partial final closure and post-closure maintenance plan at least **two years** prior to the anticipated date of closure [Title 27, § 21780(d)(1)].

2. The Discharger shall notify the Central Valley Water Board in writing that a landfill unit or portion of a unit is to be closed either at the same time that the California Department of Resources Recycling and Recovery (CalRecycle) is notified or **180 days** prior to beginning any final closure activities, whichever is sooner [Title 27, § 21710(c)(5)(A)]. The notice shall include a statement that all closure activities will conform to the most recently approved final or partial final closure plan and that the plan provides for site closure in compliance with all applicable federal and state regulations [Title 27, § 21710(c)(5)(C)].
3. Initiation of closure activities shall begin within **30 days** of final waste receipt, or within **one year** of receipt of most recent waste if additional capacity remains [40 C.F.R. § 258.60(f)].
4. Closure activities shall be completed within **180 days** of the beginning of closure activities unless an extension is granted by the Executive Officer [40 C.F.R. § 258.60(g)].
5. The Discharger shall carry out both mandatory closure and normal closure of a waste management unit or a portion of a unit in accordance with a closure and post-closure maintenance plan approved by the Central Valley Water Board [Title 27, § 20950(a)(1)] through the issuance of closure waste discharge requirements.
6. The Discharger shall notify the Central Valley Water Board that a preliminary closure and post-closure maintenance plan has been prepared and placed in the operating record by the date of initial receipt of waste at any new MSW landfill unit or lateral expansion of any existing unit [40 C.F.R. § 258.60(d)]. This notification shall be included in the cover letter transmitting the preliminary closure and post-closure maintenance plan.
7. In addition to the applicable provisions of Title 27, the preliminary closure and/or the post-closure maintenance plans for MSW landfill units shall include the following:
 - a. A description of the steps necessary to close all MSW landfill units at any point during their active life in accordance with the cover design requirements [40 C.F.R. § 258.60(c)];
 - b. An estimate of the largest area of the landfill unit(s) ever requiring a final cover at any time during the active life of the unit(s) [40 C.F.R. § 258.60(c)(2)];
 - c. An estimate of the maximum inventory of wastes ever on-site over the active life of the waste management facility [40 C.F.R. § 258.60(c)(3)]; and
 - d. A schedule for completing all activities necessary to satisfy the closure criteria in 40 C.F.R. section 258.60 [40 C.F.R. § 258.60(c)(4)].

8. The final closure and post-closure maintenance plan for the waste management unit shall include at least the following: an itemized cost analysis, closure schedule, any proposed final treatment procedures, map, changes to the unit description presented in the most recent ROWD, federal requirements for a MSW facility, land use of the closed unit, and a construction quality assurance plan [Title 27, § 21769(c) & (d)].
9. Closure of each waste management unit shall be under the direct supervision of a registered civil engineer or certified engineering geologist [Title 27, § 20950(b)].
10. The final cover of closed landfills shall be designed, graded, and maintained to prevent ponding and soil erosion due to high run-off velocities [Title 27, § 21090(b)(1)(A)].
11. The final grading design shall be designed and approved by a registered civil engineer or certified engineering geologist [Title 27, § 21090(b)(1)(C)].
12. All final cover designs shall include a minimum 1-foot thick erosion resistant layer [Title 27, § 21090(a)(3)(A)].
13. The Discharger shall close the landfill with minimum 15-foot wide benches every 50 vertical feet [Title 27, § 21090(a)].
14. Final cover slopes shall not be steeper than a horizontal to vertical ratio of one and three quarters to one and designs having any slopes steeper than a horizontal to vertical ratio of three to one, or having a geosynthetic component, shall have these aspects of their design specifically supported in the slope stability report required in Title 27, section 21750(f)(5) [Title 27, § 21090(a)].
15. For any portions of the final cover installed after July 18, 1997, for which the Central Valley Water Board has not approved a slope and foundation stability report on or before that date, the Discharger shall meet the requirements of Title 27, section 21750(f)(5) [Title 27, § 21090(a)(6)].
16. Areas with slopes greater than ten percent, surface drainage courses, and areas subject to erosion by wind or water shall be designed and constructed to prevent such erosion [Title 27, § 21090(b)(2)].
17. The Discharger shall design storm water conveyance systems for closed Class III units for a 100-year, 24-hour storm event, and shall design storm water conveyance systems for closed Class II units for a 1,000-year, 24-hour storm event [Title 27, § 21750(e)(3)].
18. Closed landfill units shall be provided with at least two permanent surveying monuments, installed by a licensed land surveyor or by a registered civil engineer, from which the location and elevation of all wastes, containment

structures, and monitoring facilities can be determined throughout the post-closure maintenance period [Title 27, § 20950(d)].

19. Following closure of any MSW landfill units, the Discharger shall notify the Executive Officer that the deed to the landfill facility property, or some other instrument that is normally examined during a title search, has been recorded and a copy placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that the land has been used as a landfill facility and that use of the land is restricted to the planned use described in the post-closure maintenance plan [Title 27, § 20515(a)(4) and §21170, and 40 C.F.R. § 258.60(i)].
20. Construction or repair of the final cover system's low-hydraulic conductivity layer is to be carried out in accordance with an approved construction quality assurance plan [Title 27, § 21090(b)(1)(E)].
21. The Discharger shall incorporate into the closure and post-closure maintenance plan a cover-integrity monitoring and maintenance program which includes at least the following: a periodic leak search, periodic identification of other problem areas, prompt cover repair, and vegetation maintenance [Title 27, § 21090(a)(4)].
22. The Discharger shall complete a final cover survey upon completion of closure activities for that portion of the landfill. The final cover surveys shall include an initial survey and map [Title 27, § 21090(e)(1). Every **five years**, the Discharger shall conduct a survey of the closed landfill cover and submit an iso-settlement map accurately depicting the estimated total change in elevation of each portion of the final cover's low-hydraulic-conductivity layer [Title 27, § 21090(e)(2)].
23. Within **30 days** of completion of all closure activities, the Discharger shall certify that all closure activities were performed in accordance with the most recently approved final closure plan and CQA Plan, and in accordance with all applicable regulations. The Discharger shall also certify that closed landfill units shall be maintained in accordance with and approved post-closure maintenance plan [Title 27, § 21710(c)(6)].
24. Within **180 days** of completion of closure construction activities, the Discharger shall submit final documentation of closure, including the Certification of Closure. The closure documents shall include a final construction quality assurance report and any other documents necessary to support the certification [Title 27, § 21880].
25. The post-closure maintenance period shall continue until the Central Valley Water Board determines that wastes remaining in the landfill unit(s) no longer pose a threat to water quality [Title 27, § 20950(a)(1)].

26. The Discharger shall conduct a periodic leak search to monitor of the integrity of the final cover in accordance with the schedule in the approved final post-closure maintenance plan [Title 27, § 21090(a)(4)(A)].
27. The Discharger shall periodically inspect and identify problems with the final cover including areas that require replanting, erosion, areas lacking free drainage, areas damaged by equipment operations, and localized areas identified in the required five-year iso-settlement survey [Title 27, § 21090(a)(4)(B)].
28. The Discharger shall repair the cover promptly in accordance with a cover repair plan to be included in the final post-closure maintenance plan [Title 27, § 21090(a)(4)(C)].
29. Throughout the post-closure maintenance period, the Discharger shall maintain the structural integrity and effectiveness of all containment structures, maintain the final cover as necessary to correct the effects of settlement and other adverse factors, continue to operate the LCRS as long as leachate is generated and detected, maintain the monitoring systems, prevent erosion and related damage of the final cover due to drainage, and protect and maintain surveyed monuments [Title 27, § 21090(c)].
30. Post-closure maintenance shall be conducted for a minimum period of **30 years** or until the waste no longer poses a threat to environmental quality, whichever is greater [Title 27, § 21180(a) and Title 27, § 21900(a)].

H. STANDARD FINANCIAL ASSURANCE PROVISIONS

1. The Discharger shall establish an irrevocable fund for closure and post-closure maintenance to ensure closure and post-closure maintenance of each classified unit in accordance with an approved closure and post-closure maintenance plan [Title 27, § 20950(f) and § 22207(a)].
2. The Discharger shall obtain and maintain assurances of financial responsibility for initiating and completing corrective action for all known and reasonably foreseeable releases from the waste management unit [Title 27, §20380(b), § 22221, and § 22222].

I. STANDARD MONITORING SPECIFICATIONS

1. The water quality monitoring program shall include appropriate and consistent sampling and analytical procedures and methods designed to ensure that monitoring results provide a reliable indication of water quality at all monitoring points and background monitoring points [Title 27, § 20415(e)(4) and 40 C.F.R. § 258.53(b)].

2. All monitoring systems shall be designed and certified by a registered geologist or a registered civil engineer [Title 27, § 20415(e)(1)].
3. All monitoring wells shall be cased and constructed in a manner that maintains the integrity of the monitoring well bore hole and prevents the bore hole from acting as a conduit for contaminant transport [Title 27, § 20415(b)(4)(A)].
4. All sample chemical analyses of any material shall be performed by a laboratory certified by the California Department of Health Services [Wat. Code, § 13176(a)].
5. A Detection Monitoring Program for a new landfill facility shall be installed, operational, and one year of monitoring data collected from background monitoring points prior to the discharge of wastes [Title 27, § 20415(e)(6)].
6. Background for water samples or soil-pore gas samples shall be represented by the data from all samples taken from applicable background monitoring points during that reporting period (at least one sample from each background monitoring point).
7. The Discharger shall submit for approval, establish, and maintain an approved Sample Collection and Analysis Plan. The Sample Collection and Analysis Plan shall at a minimum include:
 - a. Sample collection procedures describing purging techniques, sampling equipment, and decontamination of sampling equipment;
 - b. Sample preservation information and shipment procedures;
 - c. Sample analytical methods and procedures;
 - d. Sample quality assurance/quality control (QA/QC) procedures;
 - e. Chain of Custody control; and
 - f. Sample analysis information including sample preparation techniques to avoid matrix interferences, method detection limits (MDLs), practical quantitation limits (PQLs) and reporting limits (RLs), and procedures for reporting trace results between the MDL and PQL.

If required by the Executive Officer, the Discharger shall modify the Sample Collection and Analysis Plan to conform with this Order.

8. For any given monitored medium, the samples taken from all monitoring points and background monitoring points to satisfy the data analysis requirements for a given reporting period shall all be taken **within a span not to exceed 30 days**, unless a longer time period is approved, and shall be taken in a manner that

ensures sample independence to the greatest extent feasible. Specific methods of collection and analysis must be identified. Sample collection, storage, and analysis shall be performed according to the most recent version of USEPA Methods, such as the latest editions, as applicable, of: (1) Methods for the Analysis of Organics in Water and Wastewater (USEPA 600 Series), (2) Test Methods for Evaluating Solid Waste (SW-846, latest edition), and (3) Methods for Chemical Analysis of Water and Wastes (USEPA 600/4-79-020), and in accordance with the approved Sample Collection and Analysis Plan. Appropriate sample preparation techniques shall be used to minimize matrix interferences.

9. If methods other than USEPA-approved methods or Standard Methods are used, or there is a proposed alternant USEPA method than the one listed in the MRP, the proposed methodology shall be submitted for review and approval prior to use, including information showing its equivalence to the required method.
10. The **methods of analysis and the detection limits** used must be appropriate for the expected concentrations. For the monitoring of any constituent or parameter that is found in concentrations which produce more than 90% non-numerical determinations (i.e., "trace" or "ND") in data from background monitoring points for that medium, the analytical method having the lowest MDL shall be selected from among those methods which would provide valid results in light of any matrix effects or interferences.
11. The laboratory reporting limit (RL) for all reported monitoring data shall be set no greater than the practical quantitation limit (PQL).
12. **"Trace" results** - results falling between the MDL and the PQL - shall be reported as such, and shall be accompanied both by the estimated MDL and PQL values for that analytical run.
13. Laboratory data shall not be altered or revised by the Discharger. If the Discharger observes potential lab errors, it shall identify the issue in the monitoring report and shall describe steps that will be taken to prevent similar errors in the future.
14. **MDLs and PQLs** shall be derived by the laboratory for each analytical procedure, according to State of California laboratory accreditation procedures. These MDLs and PQLs shall reflect the detection and quantitation capabilities of the specific analytical procedure and equipment used by the lab, rather than simply being quoted from USEPA analytical method manuals. In relatively interference-free water, laboratory-derived MDLs and PQLs are expected to closely agree with published USEPA MDLs and PQLs. MDLs and PQLs shall be reported.

15. If the laboratory suspects that, due to a change in matrix or other effects, the true detection limit or quantitation limit for a particular analytical run differs significantly from the laboratory-derived MDL/PQL values, the results shall be flagged in the laboratory report accordingly, along with estimates of the detection limit and quantitation limit actually achieved. The **MDL shall always be calculated such that it represents the lowest achievable concentration associated with a 99% reliability of a nonzero result.** The PQL shall always be calculated such that it represents the lowest constituent concentration at which a numerical value can be assigned with reasonable certainty that it represents the constituent's actual concentration in the sample. Normally, PQLs should be set equal to the concentration of the lowest standard used to calibrate the analytical procedure.
16. All **QA/QC data** shall be reported, along with the sample results to which they apply, including the method, equipment, analytical detection and quantitation limits, the percent recovery, an explanation for any recovery that falls outside the QC limits, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name and signature of a responsible person from the laboratory. **Sample results shall be reported unadjusted for blank results or spike recoveries.** In cases where contaminants are detected in QA/QC samples (i.e., field, trip, or lab blanks), the accompanying sample results shall be appropriately flagged, but the analytical results shall not be adjusted.
17. Unknown chromatographic peaks shall be reported, flagged, and tracked for potential comparison to subsequent unknown peaks that may be observed in future sampling events. Identification of unknown chromatographic peaks that recur in subsequent sampling events may be required.
18. The sampling interval of each monitoring well shall be appropriately screened and fitted with an appropriate filter pack to enable collection of representative groundwater samples [Title 27, § 20415(b)(4)(B)]. Groundwater samples shall not be field-filtered prior to laboratory analysis [40 C.F.R. § 258.53(b)]. Groundwater samples needing filtering (e.g., samples to be analyzed for dissolved metals) shall be filtered by the laboratory prior to analysis.
19. Groundwater elevations shall be measured in each well immediately prior to purging, each time groundwater is sampled. The owner or operator shall determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells which monitor the same waste management area shall be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction [40 C.F.R. § 258.53(d)].
20. Monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to design

specifications throughout the life of the monitoring program [40 C.F.R. § 258.51(c)(2)]. Monitoring devices that cannot be operated and maintained to perform to design specifications shall be replaced after review and approval of a report (i.e., work plan) for the proposed replacement devices.

21. All borings are to be logged during drilling under the direct supervision of a registered geologist or registered civil engineer with expertise in stratigraphic well logging [Title 27, § 20415(e)(2)].
22. Soils are to be described according to the Unified Soil Classification System [Title 27, § 20415(e)(2)(A)]. Rock is to be described in a manner appropriate for the purpose of the investigation [Title 27, § 20415(e)(2)(B)].
23. The Discharger shall submit a work plan for review and approval at least **60 days** prior to installation or abandonment of groundwater monitoring wells.
24. The Discharger shall provide Central Valley Water Board staff a minimum of **one week** notification prior to commencing any field activities related to the installation or abandonment of monitoring devices.
25. The water quality protection standard shall consist of the constituents of concern (COC), concentration limits, and the point of compliance. The water quality protection standard shall apply during the active life of the waste management unit, closure period, post-closure maintenance period, and any compliance period under Title 27, section 20410 [Title 27, § 20390].
26. The point of compliance at which the water quality protection standard applies is a vertical surface located at the hydraulically downgradient limit of the waste management unit that extends through the uppermost aquifer underlying the unit [Title 27, § 20405].
27. The compliance period is the minimum period of time during which the Discharger shall conduct a water quality monitoring program and is the number of years equal to the active life of the waste management unit plus the closure period [Title 27, § 20410(a)].
28. The groundwater monitoring system shall include a sufficient number of monitoring points, installed at appropriate locations, to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by a release from the waste management unit [Title 27, § 20415(b)(1)(A)].
29. The Detection Monitoring Program shall include a sufficient number of monitoring points, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of

groundwater passing the point of compliance to allow the detection of a release from the waste management unit [Title 27, § 20415(b)(1)(B)1.].

30. Additional monitoring points shall be added as necessary to provide the best assurance of the **earliest possible detection** of a release from the waste management unit [Title 27, § 20415(b)(1)(B)2.].
31. The Detection Monitoring Program shall also include a sufficient number of monitoring points installed at appropriate depths and locations to yield groundwater samples from other aquifers or perched zones not already monitored to provide the **earliest possible detection** of a release from the waste management unit [Title 27, § 20415(b)(1)(B)3. and 4., and §20420(b)].
32. A surface water monitoring system shall be established to monitor each surface water body that could be affected by a release from the waste management unit [Title 27, § 20415(c)].
33. An unsaturated zone monitoring system shall be established for each waste management unit [Title 27, § 20415(d)].
34. The Discharger shall notify Central Valley Water Board staff within **seven days** if fluid is detected in a previously dry LCRS, unsaturated zone monitoring system, or if a progressive increase is detected in the volume of fluid in a LCRS [Title 27, § 21710(c)(3)].
35. Driller's logs for all monitoring wells shall to be submitted to the Central Valley Water Board and the Department of Water Resources [Wat. Code, § 13751 and Title 27, § 20415(b)(3)].
36. Groundwater elevation, temperature, electrical conductivity, turbidity, and pH are to be accurately measured at each well each time groundwater is sampled [Title 27, § 21415(e)(13)].
37. The groundwater flow rate and direction in the uppermost aquifer and in any zones of perched water and in any additional portions of the zone of saturation being monitored shall be determined at least quarterly [Title 27, § 20415(e)(15)].
38. The Discharger shall graph all analytical data from each monitoring point and background monitoring point and shall submit the graphs to the Central Valley Water Board annually [Title 27, § 20415(e)(14)].
39. For each waste management unit, the Discharger shall collect all data necessary for selecting appropriate data analysis methods for establishing background values for each constituent of concern and for each monitoring parameter [Title 27, § 20420(c)]. The Discharger shall propose a data analysis method that includes a detailed description of the criteria to be used for

determining “measurably significant” (as defined in Title 27, section 20164) evidence of a release from the waste management unit and determining compliance with the water quality protection standard [Title 27, § 20415(e)(6) and (7)].

40. For statistical analysis of data, the Discharger shall use one of the methods described in Title 27, section 20415(e)(8)(A)-(E). A non-statistical data analysis method can be used if the method can achieve the goal of the particular monitoring program at least as well as the most appropriate statistical method [Title 27, § 20415(e)(8)]. The Discharger shall use a statistical or nonstatistical data analysis method that complies with Title 27, section 20415(e)(7, 8, 9, and 10), to compare the concentration of each constituent of concern or monitoring parameter with its respective background concentration to determine whether there has been a measurably significant evidence of a release from the waste management unit. For any given monitoring point at which a given constituent has already exhibited a measurably significant indication of a release at that monitoring point, the Discharger may propose to monitor the constituent, at that well, using a concentration-versus-time plot.
41. The Discharger may propose an alternate statistical method [to the methods listed under Title 27, section 20415(e)(8)(A-D)] in accordance with Title 27, section 20415(e)(8)(E), for review and approval.
42. The statistical method shall account for data below the practical quantitation limit (PQL) with one or more statistical procedures that are protective of human health and the environment. Any PQL validated pursuant to Title 27, section 20415(e)(7) that is used in the statistical method shall be **the lowest concentration (or value) that can be reliably achieved** within limits of precision and accuracy specified in the WDRs or an approved Sample Collection and Analysis Plan for routine laboratory operating conditions that are available to the facility. The Discharger’s technical report (Sample Collection and Analysis Plan and/or Water Quality Protection Standard Report), pursuant to Title 27, section 20415(e)(7), shall consider the PQLs listed in Appendix IX to Chapter 14 of Division 4.5 of Title 22, CCR, for guidance when specifying limits of precision and accuracy. For any given constituent monitored at a background or downgradient monitoring point, an indication that falls between the MDL and the PQL for that constituent (hereinafter called a “trace” detection) shall be identified and used in appropriate statistical or non-statistical tests. Nevertheless, for a statistical method that is compatible with the proportion of censored data (trace and ND indications) in the data set, the Discharger can use the laboratory’s concentration estimates in the trace range (if available) for statistical analysis, in order to increase the statistical power by decreasing the number of “ties”.
43. The water quality protection standard for organic compounds which are not naturally occurring and not detected in background groundwater samples shall

be taken as the detection limit of the analytical method used (e.g., USEPA methods 8260 and 8270).

44. Alternate statistical procedures may be used for determining the significance of analytical results for common laboratory contaminants (i.e., methylene chloride, acetone, diethylhexyl phthalate, and di-n-octyl phthalate) if part of an approved water quality protection standard. Nevertheless, analytical results involving detection of these analytes in any background or downgradient sample shall be reported and flagged for easy reference by Central Valley Water Board staff.
45. **Confirmation of Measurably Significant Evidence of a Release.** Whenever a constituent is detected at a detection monitoring point at a concentration that exceeds the concentration limit from the water quality protection standard, the Discharger shall conduct verification sampling to confirm if the exceedance is due to a release or if it is a false-positive (unless previous monitoring has already confirmed a release for that constituent at that monitoring point). An exceedance of the concentration limit from the water quality protection standard is considered measurably significant evidence of a release that must be either confirmed or denied. There are two separate verification testing procedures:
- a. Standard Monitoring Specification I.46 provides the procedure for analytes that are detected in less than 10% of the background samples such as non-naturally occurring constituents like volatile organic compounds; and
 - b. Standard Monitoring Specification I.47 provides the procedure for analytes that are detected in 10% or greater of the background samples such as naturally occurring constituents like chloride.
46. **Verification Procedure for Analytes Detected in Less than 10% of Background Samples.** The Discharger shall use the following non-statistical method for all analytes that are detected in less than 10% of the background samples. The non-statistical method shall be implemented as follows:
- a. **Initial Determination of Measurably Significant Evidence of a Release.** Identify each analyte in the **current** detection monitoring point sample that exceeds either its respective MDL or PQL, and for which a release has not been previously confirmed. The Discharger shall conclude that the exceedance provides a preliminary indication of a release or a change in the nature or extent of the release, at that monitoring point, if **either**:
 - 1) The data contains two or more analytes that equal or exceed their respective MDLs; or
 - 2) The data contains one or more analyte that equals or exceeds its PQL.

b. **Discrete Retest** [Title 27, § 20415(e)(8)(E) and § 20420(j)(1-3)]:

- 1) In the event that the Discharger or Central Valley Water Board staff concludes (pursuant to paragraph I.46.a., above) that there is a preliminary indication of a release, then the Discharger shall **immediately** notify Central Valley Water Board staff by phone or e-mail and, within **30 days** of such indication, shall collect two new (retest) samples from the monitoring point where the release is preliminarily indicated and analyze them for the constituents that caused the need for the retest.
- 2) **Confirmation of a Release.** As soon as the retest data are available, the Discharger shall conclude that measurably significant evidence of a release is confirmed if (not including the original sample) two or more analytes equal or exceed their respective MDLs or if one or more analyte equals or exceeds its PQL. The Discharger shall then:
 - a) **Immediately** verbally notify the Central Valley Water Board whether or not the retest confirmed measurably significant evidence of a release for the analyte at the monitoring point, and follow up with written notification submitted by certified mail **within seven days** of the verbal notification; and
 - b) Carry out the requirements of Section J, **RESPONSE TO A RELEASE** if a release has been confirmed.
 - c) Add any five-year analyte that is confirmed per this method to the monitoring parameter list such that it is monitored during each regular monitoring event.

47. **Verification Procedure for Analytes Detected in 10% or Greater of the Background Samples.** The Discharger shall use either a statistical or non-statistical method pursuant to Title 27, section 20415(e)(8)(E) for all analytes that are detected in 10% or greater of the background samples. The Discharger shall use one of the statistical methods required in Title 27, section 20415(e)(8)(E) unless another method has been proposed by the Discharger in a Water Quality Protection Standard Report (or equivalent report) and approved by the Central Valley Water Board in a Monitoring and Reporting Program pursuant to Title 27, section 20415(e)(8)(A-D)] or section 20415(e)(8)(E). The method shall be implemented as follows:

- a. **Initial Determination of Measurably Significant Evidence of a Release.** The Discharger shall compare the value reported by the laboratory for each analyte to the statistically-derived concentration limit from the most recent report (Annual Monitoring Report or Water Quality Protection Standard Report) that uses the approved statistical procedure. If the value exceeds the concentration limit for that constituent, the Discharger shall conclude that there is measurably significant evidence of a release [Title 27, § 20420(i)].

b. **Retest Method** [Title 27, § 20415(e)(8)(E) and § 20420(j)(1-3)].

- 1) In the event that the Discharger or Central Valley Water Board staff concludes (pursuant to paragraph I.47.a., above) that there is a preliminary indication of a release, then the Discharger shall **immediately** notify Central Valley Water Board staff by phone or e-mail and, within **30 days** [Title 27, § 20415(e)(3)] of such indication, the Discharger shall implement a verification procedure/retest option, in accordance with Title 27, sections 20415(e)(8)(E) and 20420(j)(2). The verification procedure shall include either a single “composite” retest (i.e., a statistical analysis that augments and reanalyzes the data from the monitoring point that indicated a release) or shall consist of at least two “discrete” retests (i.e., statistical analyses each of which analyzes only newly-acquired data from the monitoring point that indicated a release) [Title 27, § 20415(e)(8)(E)]. The Discharger may use an alternate method previously approved by the Central Valley Water Board and included in the Monitoring and Reporting Program. The verification procedure shall comply with the requirements of Title 27, section 20415(e)(8)(E) in addition to the performance standards of Title 27, section 20415(e)(9). The retest samples shall be collected from the monitoring point where the release is preliminarily indicated and shall be analyzed for the constituents that caused the need for the retest. For any indicated monitoring parameter or constituent of concern, if the retest results of one or more of the retest data suites confirm the original indication, the Discharger shall conclude that measurably significant evidence of a release has been confirmed.
- 2) **Confirmation of a Release.** As soon as the retest data are available, the Discharger shall evaluate the results pursuant to paragraph I.47.b.1, above and shall:
 - a) **Immediately** verbally notify the Central Valley Water Board whether or not the retest confirmed measurably significant evidence of a release for the analyte at the monitoring point, and follow up with written notification submitted by certified mail **within seven days** of the verbal notification; and
 - b) Carry out the requirements of Section J, **RESPONSE TO A RELEASE** if a release has been confirmed.
 - c) Add any five-year analyte that is confirmed per this method to the monitoring parameter list such that it is monitored during each regular monitoring event.

48. **Physical Evidence of a Release.** If the Discharger determines that there is a significant **physical** evidence of a release, the Discharger shall immediately

verbally notify Central Valley Water Board staff and provide written notification **by certified mail within 7 days** of such determination, and within **90 days** shall submit an amended report of waste discharge to establish an Evaluation Monitoring Program [Title 27, § 20385(a)(3) and § 20420(l)(1) & (2)].

J. RESPONSE TO A RELEASE

1. Measurably Significant Evidence of a Release Has Been Confirmed. If the Discharger has confirmed that there is measurably significant evidence of a release from a waste management unit pursuant to Standard Monitoring Specification I.46 or I.47, then the Discharger shall:
 - a. **Immediately** sample all monitoring points in the affected medium at that waste management unit and determine the concentration of all monitoring parameters and constituents of concern for comparison with established concentration limits. Because this constituent of concern scan does not involve statistical testing, the Discharger will need to collect and analyze only a single water sample from each monitoring point in the affected medium [Title 27, § 20420(k)(1)].
 - b. **Within 14 days** of confirming measurably significant evidence of a release, the Discharger shall (for releases from MSW landfill units) notify all persons who own the land or reside on the land that directly overlies any portion of the plume of contamination if contaminants have migrated off-site if indicated by sampling of detection monitoring wells [40 C.F.R. § 258.55(g)(1)(iii)].
 - c. **Within 90 days** of confirming measurably significant evidence of a release, the Discharger shall submit an amended report of waste discharge to establish an Evaluation Monitoring Program meeting the requirements of Title 27, sections 20420(k)(5)(A-D), including but not limited to the results of sampling pursuant to paragraph J.1.a, above. The Evaluation Monitoring Program shall be designed for the collection and analysis of all data necessary to assess the nature and extent of the release and to determine the spatial distribution and concentration of each constituent throughout the zone affected by the release [Title 27, § 20420(k)(5) and § 20425(b)]. For releases from MSW landfill units, the Evaluation Monitoring Program shall also include any additional proposals necessary to comply with 40 C.F.R. § 258.55, particularly the additional monitoring well required by 40 C.F.R. § 258.55(g)(1)(ii).
 - d. **Within 180 days** of confirming measurably significant evidence of a release, the Discharger shall submit to the Central Valley Water Board an initial engineering feasibility study for a Corrective Action Program necessary to meet the requirements of Title 27, section 20430. At a minimum, the initial engineering feasibility study shall contain a detailed

description of the corrective action measures that could be taken to achieve background concentrations for all constituents of concern [Title 27, § 20420(k)(6)].

- e. If the Discharger confirms that there is measurably significant evidence of a release from the waste management unit at any monitoring point, the Discharger may attempt to demonstrate that a source other than the waste management unit caused the evidence of a release or that the evidence is an artifact caused by an error in sampling, analysis, or statistical evaluation or by natural variation in groundwater, surface water, or the unsaturated zone. The Discharger may make a demonstration pursuant to Title 27, section 20420(k)(7) in addition to or in lieu of submitting both an amended report of waste discharge or an engineering feasibility study; however, the Discharger is not relieved of the requirements and due dates of Title 27, sections 20420(k)(6) & (7) unless Central Valley Water Board staff agree that the demonstration successfully shows that a source other than the waste management unit caused the evidence of a release or that the evidence resulted from error in sampling, analysis, or statistical evaluation or from natural variation in groundwater, surface water, or the unsaturated zone. In order to make this demonstration, the Discharger shall notify the Central Valley Water Board by certified mail of the intent to make the demonstration **within seven days** of determining measurably significant evidence of a release, and shall submit a report **within 90 days** of determining measurably significant evidence of a release [Title 27, § 20420(k)(7)].
- f. **Within 90 days** of the date that the Evaluation Monitoring Program from paragraph J.1.c is approved (the date is it established), the Discharger shall complete and submit the following:
 - i) **Results and Assessment for the Evaluation Monitoring Program.** A report with the results and assessment based on the approved Evaluation Monitoring Program [Title 27, § 20425(b)].
 - ii) **Updated Engineering Feasibility Study.** An updated engineering feasibility study for corrective action based on the data collected to delineate the release and data from the ongoing monitoring program required under Title 27, section 20425(e) [Title 27, § 20425(c)].
 - iii) **Amended ROWD for a Corrective Action Program.** An amended report of waste discharge to establish a Corrective Action Program meeting the requirements of Title 27, section 20430 based on the data collected to delineate the release and based on the updated engineering feasibility study [Title 27, § 20425(d)].

- g. The Discharger shall (for releases from MSW landfill units) discuss the results of the updated engineering feasibility study, prior to the final selection of a remedy, in a public meeting with interested and affected parties [40 C.F.R. § 258.56(d)].

K. GENERAL PROVISIONS

1. In the event the Discharger does not comply or will be unable to comply with any prohibition or limitation of this Order for any reason, the Discharger shall notify the appropriate Central Valley Water Board office by telephone **as soon as** it or its agents have knowledge of such noncompliance or potential for noncompliance, and shall confirm this notification in writing **within two weeks**. The written notification shall state the nature, time, and cause of noncompliance, and shall describe the measures being taken to prevent recurrences and shall include a timetable for corrective actions.
2. All reports and transmittal letters shall be signed by persons identified below:
 - a. For a corporation: by a principal executive officer of at least the level of senior vice-president.
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor.
 - c. For a municipality, state, federal or other public agency: by either a principal executive officer or ranking elected or appointed official.
 - d. A duly authorized representative of a person designated in a, b or c above if:
 - 1) The authorization is made in writing by a person described in a, b, or c of this provision;
 - 2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a Unit, superintendent, or position of equivalent responsibility (a duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - 3) The written authorization is submitted to the Central Valley Water Board.

- e. Any person signing a document under this Section shall make the following certification:

“I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.”

3. The Discharger shall take all reasonable steps to minimize any adverse impact to the waters of the State resulting from noncompliance with this Order. Such steps shall include accelerated or additional monitoring as necessary to determine the nature, extent, and impact of the noncompliance.
4. The owner of the waste management facility shall have the continuing responsibility to assure protection of waters of the state from discharged wastes and from gases and leachate generated by discharged waste during the active life, closure, and post-closure maintenance period of the waste management units and during subsequent use of the property for other purposes.
5. The fact that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with this Order shall not be regarded as a defense for the Discharger’s violations of this Order.
6. The Discharger shall notify the Central Valley Water Board of a material change in; the types, quantity, or concentrations of wastes discharged; site operations and features; or proposed closure procedures, including changes in cost estimates. This notification shall be given a reasonable time before the changes are made or become effective. No changes shall be made without Central Valley Water Board approval following authorization for closure pursuant to the site Notification of Closure [Title 27, § 21710(a)(4)].
7. The Discharger shall maintain legible records of the volume and type of each waste discharged at each waste management unit or portion of a unit, and the manner and location of discharge. Such records shall be maintained by the Discharger until the beginning of the post-closure maintenance period. These records shall be on forms approved by the State Water Board or Central Valley Water Board and shall be maintained at the waste management facility until the beginning of the post-closure maintenance period. These records shall be available for review by representatives of the State Water Board or Central Valley Water Board at any time during normal business hours. At the beginning of the post-closure maintenance period, copies of these records shall be sent to the Central Valley Water Board [Title 27, § 21720(f)].
8. In the event of any change in landowner or the operator of the waste management facility, the Discharger shall notify the succeeding owner or

operator in writing of the existence of this Order. A copy of that notification shall be sent to the Central Valley Water Board.

9. In the event of any change of ownership or responsibility for construction, operation, closure, or post-closure maintenance of the waste discharge facilities described in this Order, the Discharger shall notify the Central Valley Water Board prior to the effective date of the change and shall include a statement by the new Discharger that construction, operation, closure, or post-closure maintenance will be in compliance with this Order and any revisions thereof [Title 27, § 21710(c)(1)].
10. To assume ownership or operation under this Order, the succeeding owner or operator must apply in writing to the Central Valley Water Board requesting transfer of the Order within **14 days** of assuming ownership or operation of this facility. The request must contain the requesting entity's full legal name, the State of incorporation if a corporation, the name and address and telephone number of the persons responsible for contact with the Central Valley Water Board, and a statement. The statement shall comply with the signatory requirements contained in General Provision K.2 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the Water Code. Transfer of this Order shall be approved or disapproved by the Central Valley Water Board.

L. STORM WATER PROVISIONS

1. New and existing Class III landfills shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return period [Title 27, § 20260(c)].
2. New and existing Class II landfills shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return period [Title 27, § 20250(c)].
3. The Discharger shall design storm water conveyance systems for Class III units for a 100-year, 24-hour storm event, and shall design storm water conveyance systems for Class II units for a 1,000-year, 24-hour storm event [Title 27, § 21750(e)(3)].
4. MSW landfills located in a 100-year floodplain shall demonstrate that the landfill unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health or the environment [40 C.F.R. § 258.11(a)].
5. Waste management units and their respective containment structures shall be designed and constructed to limit, to the greatest extent possible, ponding,

infiltration, inundation, erosion, slope failure, washout, and overtopping under the precipitation conditions for the unit [Title 27, § 20365(a)].

6. Precipitation on landfills or waste piles which is not diverted by covers or drainage control systems shall be collected and managed through the LCRS, which shall be designed and constructed to accommodate the precipitation conditions for each class unit [Title 27, § 20365(b)].
7. Diversion and drainage facilities shall be designed, constructed, and maintained to [Title 27, § 20365(c)]:
 - a. accommodate the anticipated volume of precipitation and peak flows from surface runoff and under the precipitation conditions for the waste management unit:
 - b. effectively divert sheet flow runoff laterally, via the shortest distance, into the drainage and collection facilities;
 - c. prevent surface erosion;
 - d. control and intercept run-on, in order to isolate uncontaminated surface waters from water that might have come into contact with waste;
 - e. take into account:
 - i) for closed waste management units and for closed portions of units, the expected final contours of the closed unit, including its planned drainage pattern;
 - ii) for operating portions of waste management units other than surface impoundments, the unit's drainage pattern at any given time;
 - iii) the possible effects of the waste management unit's drainage pattern on and by the regional watershed;
 - iv) the design capacity of drainage systems of downstream and adjacent properties by providing for the gradual release of retained water downstream in a manner which does not exceed the expected peak flow rate at the point of discharge if there were no waste management facility; and
 - f. preserve the system's function. The Discharger shall periodically remove accumulated sediment from the sedimentation or detention basins as needed to preserve the design capacity of the system.
8. Collection and holding facilities associated with precipitation and drainage control systems shall be emptied immediately following each storm or otherwise managed to maintain the design capacity of the system [Title 27, § 20365(d)].

9. Surface and subsurface drainage from outside of a waste management unit shall be diverted from the unit [Title 27, § 20365(e)].
10. Cover materials shall be graded to divert precipitation from the waste management unit, to prevent ponding of surface water over wastes, and to resist erosion as a result of precipitation [Title 27, § 20365(f)].
11. Any drainage layer in the final cover shall be designed and constructed to intersect with the final drainage system for the waste management unit in a manner promoting free drainage from all portions of the drainage layer [Title 27, §20365(f)].