

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2010-0069

WASTE DISCHARGE REQUIREMENTS
AEROJET-GENERAL CORPORATION
PROPELLANT BURN AREA AND GET F SPRAYFIELD
GROUNDWATER REMEDIATION PROJECT
INACTIVE RANCHO CORDOVA TEST SITE
SACRAMENTO COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

1. On 22 February 2010, the Aerojet-General Corporation (hereafter Discharger) submitted a Report of Waste Discharge (RWD) for groundwater remediation project to address volatile organic contaminants (VOCs) and perchlorate at the Propellant Burn Area (PBA) and GET F Sprayfield at the Inactive Rancho Cordova Test Site (IRCTS). The Discharger also submitted additional information on 12 April 2010. The Discharger also is the current owner on which the project will take place.
2. The project site location is shown on Attachment A, which is attached hereto and made part of this Order by reference.
3. The project is located in the northwestern portion of the IRCSTS property in Rancho Cordova, in Section 32, T9N, R7E MDB&M (latitude 38°35'32"N, longitude 121°14'17") Agricultural and light industrial activities border the project location. The project site plan is shown on Attachments B and C, which are attached hereto and made part of this Order by reference.
4. The project is on Assessor's Parcel No. 072-0370-105.
5. The objectives of the project are to implement a portion of the groundwater remedy on the IRCSTS required pursuant to the Remedial Action Plan (RAP) - *Remediation of Organic Compounds in Soil and Groundwater at the Inactive Rancho Cordova Test Site and Mather Field, Sacramento County* (January 2008). Under the RAP, groundwater at the site is to be cleaned up to 0.8 micrograms per liter ($\mu\text{g/L}$) trichloroethylene (TCE) and 6.0 $\mu\text{g/L}$ perchlorate.
6. Aerojet-General Corporation has previously conducted several pilot studies using similar processes as that proposed at its Superfund site to the north of the IRCSTS and along the western boundary of the IRCSTS. Those pilot studies have shown that remediation of perchlorate in the manner proposed successfully reduced perchlorate concentrations in treated groundwater to less than 4 $\mu\text{g/L}$ and TCE to less than 0.5 $\mu\text{g/L}$.

Project Layout and Operation

7. Groundwater beneath the IRCSTS contains the pollutants perchlorate and TCE. Perchlorate is a component of solid rocket propellant and has a Maximum Contaminant Level (MCL), or Primary Drinking Water Standard, of 6 $\mu\text{g/L}$. TCE is a solvent used primarily in cleaning

operations and has an MCL of 5 µg/L. In addition, the California Office of Environmental Health Hazard Assessment has established Public Health Goals (PHG) for TCE and perchlorate in water of 1.7 µg/L and 6 µg/L, respectively. The PHG for TCE was 0.8 µg/L at the time of issuance of the RAP.

8. The project will be targeting groundwater in the uppermost water-bearing zones. These unconfined to semi-confined water-bearing zones consist of sands and gravels extending from approximately 100-250 feet below ground surface. Depth to groundwater varied from approximately 100 to 160 feet below ground surface during late 2009. These variabilities are due to the high relief of the rugged, dredge-tailings terrain. The groundwater is flowing west to southwest underneath the project area. The estimated groundwater velocity is 300 to 500 feet per year.
9. Groundwater will initially be extracted at one extraction well at the PBA. Additional extraction wells will be added pending evaluation of the effectiveness of the initial system. It is estimated that a total extraction of 500 gallons per minute (gpm) will be needed to control the plume of pollutants in the vicinity of the PBA and Sprayfield requiring 5 to 10 extraction wells.
10. The extracted groundwater will be passed through two granular activated carbon (GAC) vessels to remove VOCs and then through a modular biotreatment cell (MBC) to remove perchlorate. It is estimated that the maximum flow rate will be no more than 100 gpm per MBC. The flow that could be placed through each box is dependent on the concentration as the higher the concentration, the greater retention time is needed to completely remove the perchlorate. The total number of MBCs required will therefore be dependent on flow produced by the each extraction well and the concentration of the perchlorate in each extraction well. As the MBC units are of consistent size, the MBC units may be operated in parallel or in series depending on flow, concentration and relative closeness of the extraction wells to each other.
11. The MBC consists of a geomembrane-lined 8-foot by 8-foot by 40-foot long steel container. The container is filled with approximately 95 cubic yards of ¾-inch crushed rock. The crushed rock serves as a media to support the growth of indigenous bacteria. Influent piping and a water level probe will be installed in the container; and an oxidation-reduction potential (ORP) probe will be installed in the effluent piping prior to the aeration system. The ORP probe will be used for process control. A 50% solution of citric acid will be used as the electron donor for the biodegradaton of perchlorate and will be metered into the influent piping after the GAC vessels. The daily quantity of citric acid will likely be less than one gallon per day for each MBC to yield an ORP value of approximately -200 millivolts. . The volume could be as much as 10 gallons per day for maximum flow and potential maximum concentrations of electron acceptors (dissolved oxygen, nitrate, perchlorate). The actual amount of citric acid used is dependent on the concentrations of dissolved oxygen, nitrate and perchlorate in the groundwater and the flow from the extraction well. Soybean oil methyl ester (biodiesel) is an acceptable alternate electron donor to the citric acid. The biodiesel is a more efficient donor and less expensive than

citric acid. Other electron donors could be acceptable with advanced notification and approval by staff of the Regional Water Board.

12. Effluent from the MBC will be discharged over an aeration system to oxygenate the water prior to its discharge to cobbly dredge tailings to infiltrate into the ground. Alternately, the water could be discharged to existing monitor wells constructed in the unsaturated zone and/or discharged via a drip or sprinkler irrigation system to help flush perchlorate from the near surface soils to the groundwater where it can be picked up by the extraction well(s).
13. Based on data from existing groundwater monitor wells in the area, the extraction wells are likely to produce water with a pH of 6.5 to 7.5 with a total dissolved solids concentration of less than 200 milligrams per liter (mg/L). Perchlorate concentrations in the groundwater range between 10 and 6200 µg/L, to go along with up to 70 µg/L TCE.
14. The MBC will remove the concentrations of perchlorate and nitrate in the extracted groundwater. It will also reduce the pH to between 6.5 to 7.0, decrease sulfate from 7 mg/L to 5 mg/L, increase chloride from 8 mg/L to 10 mg/L and slightly increase the concentrations of iron and manganese from the crushed rock until the exposed minerals are depleted. The iron and manganese will decrease after aeration and discharge of the water into the unsaturated zone.
15. During the initial operation of a new MBC, the water will be circualted for approximately two weeks within the MBC to establish the biomass needed for perchlorate removal. During the first three months the discharge from the MBCs will initially be limited to the soils within the Propellant Burn Area and GET F Sprayfield (shown on Attachment B) where the soils already contain elevated concentrations of perchlorate. The treatment system may take this short period of time to come to steady-state operations and achieve sufficient perchlorate removal. Operational testing will also be conducted during this short period of time to refine the operation and maintenance procedures, to optimize the pumping rate and electron donor addition, and complete two tracer dye tests of the MBC internal flow character. The discharge water will help remediate the soils by flushing the residual perchlorate to the groundwater where it will be extracted and removed by the extraction and treatment system.

REGULATORY CONSIDERATIONS

16. *The Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins, Fourth Edition*, (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives (WQOs), contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Board). Pursuant to Section 13263(a) of the California Water Code (CWC), waste discharge requirements must implement the Basin Plan.
17. Surface water drainage currently is internal to the dredge tailings. Future development of the area will establish drainage to Morrison Creek, tributary to Stone Lakes, tributary to the

Sacramento River. The beneficial uses of the Sacramento River are municipal and domestic supply; agricultural irrigation and stock watering supply; process and service industrial supply; contact recreation, other noncontact recreation; warm and cold freshwater habitat; warm and cold migration; warm water spawning; wildlife habitat; and navigation.

18. The designated beneficial uses of underlying groundwater include:
 - a. Municipal and domestic water supply (MUN);
 - b. Agricultural water supply (AGR);
 - c. Industrial service supply (IND); and
 - d. Industrial process supply (PRO).
19. The Basin Plan establishes numerical and narrative water quality objectives for surface and groundwater within the basin, and recognizes that water quality objectives are achieved primarily through the Board's adoption of waste discharge requirements and enforcement orders. Where numerical water quality objectives are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative water quality objectives is required, the Board will, on a case-by-case basis, adopt numerical limitations in orders, which will implement the narrative objectives to protect beneficial uses of the waters of the state.
20. The Basin Plan identifies numerical water quality objectives for waters designated as municipal supply. These are the maximum contaminant levels (MCLs) specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) of Section 64449. The Basin Plan's incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plan recognizes that the Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.
21. The Basin Plan contains narrative water quality objectives for chemical constituents, tastes and odors, and toxicity. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants or animals. The chemical constituent objective requires that groundwater shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The tastes and odors objective requires that groundwater shall not contain tastes or odors producing substances in concentrations that cause nuisance or adversely affect beneficial uses.
22. Section 13241 of the Water Code requires the Regional Board to consider various factors, including economic considerations, when adopting water quality objectives into its Basin

Plan. Water Code Section 13263 requires the Regional Board to address the factors in Section 13241 in adopting waste discharge requirements. The State Board, however, has held that a Regional Board need not specifically address the Section 13241 factors when implementing existing water quality objectives in waste discharge requirements because the factors were already considered in adopting water quality objectives. These waste discharge requirements implement adopted water quality objectives. Therefore, no additional analysis of Section 13241 factors is required.

23. State Board Resolution No. 92-49 (hereafter Resolution No. 92-49) requires the Regional Board to require actions for cleanup and abatement of discharges that cause or threaten to cause pollution or nuisance to conform to the provisions of State Board Resolution No. 68-16 (hereafter Resolution No. 68-16) and the Basin Plan. Pursuant to Resolution No. 92-49, the Regional Board shall ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality, or if background levels of water quality cannot be restored, the best water quality which is reasonable and which complies with the Basin Plan including applicable WQOs.
24. Resolution No. 68-16 requires the Board in regulating discharges to maintain high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses, and will not result in water quality less than that described in plans and policies (e.g., quality that exceeds WQOs). There could be a slight increase in chlorides in the groundwater as a residual leftover from the breakdown of perchlorate. However, the process will remove perchlorate, TCE, nitrate and sulfate from the groundwater and restore the groundwater to beneficial uses. The slight increase in chloride allowed by this Order is consistent with Resolution No. 68-16 since (1) the purpose is to accelerate and enhance remediation of groundwater pollution and such remediation will benefit the people of the State; (2) the discharge facilitates a project to evaluate the effectiveness of cleanup technology in accord with Resolution No. 92-49; (3) the degradation is limited in scope and duration; (4) best practicable treatment and control, including adequate monitoring and hydraulic control to assure protection of water quality, are required; and (5) the discharge will not cause WQOs to be exceeded in the groundwater.
25. These Waste Discharge Requirements deal with water quality as to the discharge from the treatment system. Cleanup criteria for groundwater at this site have been established in the RAP and are not discussed further as a part of this order. Background/baseline concentrations of metals and total dissolved solids will be established pursuant to the attached Monitoring and Reporting Program. The applicable WQOs are the narrative toxicity objective, Primary and Secondary Maximum Contaminant Levels, and the taste and odor objective as found in the Basin Plan. Numerical limits in this Order implement those Objectives. The following are the numerical WQOs for potential pollutants of concern at the site:

Constituent	WQO	Reference
perchlorate	6 µg/L	Maximum Contaminant Level
trichloroethylene	1.7 µg/L	Public Health Goal
chloroform	1.0 µg/L	Draft Public Health Goal
iron	300 µg/L	Secondary Maximum Contaminant Level
manganese	50 µg/L	Secondary Maximum Contaminant Level
total dissolved solids	450 mg/L	Food and Agricultural Organization – Sensitive Crop Protection

26. The action to adopt these Waste Discharge Requirements for the Aerojet-General Corporation is exempt from the provisions of the California Environmental Quality Act (Public Resources Code Section 21000, et seq.) (CEQA) because it: (1) authorizes activity that will result in a minor modification to land pursuant to Title 14, California Code of Regulations, Section 15304; (2) consists of an action by a regulatory agency authorizing actions for the protection of the environment pursuant to Title 14, California Code of Regulations, Section 15308; and (3) authorizes minor cleanup actions costing \$1.5 million or less that are taken to prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of a hazardous waste or substance pursuant to Title 14, California Code of Regulations, Section 15330. In addition, as part of the RAP process, the Department of Toxic Substances Control determined that the RAP project of which this a component, would not have a significant effect on the environment and certified a Negative Declaration on 22 January 2008.
27. The discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste*, set forth in the Title 27, California Code of Regulations (CCR), section 20005 et seq. (hereafter Title 27), which allows a conditional exemption from some or all of the provisions of Title 27. The exemption, pursuant to Title 27 CCR Section 20090(b), is based on the following:
- a. The Regional Water Board is issuing Waste Discharge Requirements.
 - b. The discharge is in compliance with the applicable Basin Plan.
 - c. The wastewater does not need to be managed according to Title 22CCR, Division 4.5 and Chapter 11 as a hazardous waste.

Section 20090(d) allows exemption for a project to cleanup a condition of pollution that resulted from an unauthorized release of waste based on the following:

- d. Wastes removed from the immediate place of release will be discharged according to the Title 27 regulations; and
- e. The remedial actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.

28. Section 13267(b) of the California Water Code provides that:

“In conducting an investigation specified in subdivision (a), the Regional Board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste outside of its region that could affect the quality of the waters of the state 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 reports and the benefits to be obtained from the reports. In requiring these 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.”

The technical reports required by this Order and the attached MRP No. R5-2010-xxxx are necessary to assure compliance with these WDRs. The Discharger operates the facility that discharges the waste subject to this Order.

29. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells, as described in *California Well Standards Bulletin No. 74-90* (June 1991) and *Water Well Standards: State of California Bulletin No. 94-81* (December 1981). These standards, and any more stringent standards implemented by the Regional Water Board or adopted by Sacramento County pursuant to California Water Code Section 13801 apply to all monitor, extraction and injection wells.
30. Section 3020(b)(2) of the Resource Conservation and Recovery Act (RCRA) states that prior to injection into or above an underground source of drinking water, contaminated groundwater shall be “...treated to substantially reduce hazardous constituents prior to such injection.” In a letter dated 10 December 1999, the United States Environmental Protection Agency, Office of Solid Waste and Emergency Response (OSWER) states, “if extracted groundwater is amended at the surface (i.e., “treated”) before reinjection, and the subsequent in-situ bioremediation achieves a substantial reduction of hazardous constituents the remedy would satisfy Section 3020(b)(2).” Therefore, the injection of groundwater within the treatment zone at this site, with or without the treatment for VOCs, complies with Section 3020(2) (b) of RCRA.
31. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

Public Notice

32. All the above and the supplemental data and information and details in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge.
33. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the treatment technology discussed in this Order, and has provided them with an opportunity to submit their written comments and recommendations.
34. In a public meeting, all comments pertaining to these Waste Discharge Requirements were heard and considered.

IT IS HEREBY ORDERED that, pursuant to Sections 13263 and 13267 of the California Water Code, the Aerojet-General Corporation, in order to meet the provisions contained in Division 7 of the California Water Code, and regulations and guidelines adopted thereunder, shall comply with the following:

A. DISCHARGE PROHIBITIONS

1. The discharge of any waste or other materials not specifically regulated by this Order is prohibited.
2. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.
3. The discharge of wastes to surface water or surface water drainage courses is prohibited.
4. Discharge of waste classified as 'hazardous' under Section 2521, Chapter 15 of Title 23 or 'designated', as defined in Section 13173 of California Water Code is prohibited.

B. DISCHARGE SPECIFICATIONS

1. The flow through each MBC shall not exceed 100 gallons per minute (gpm).
2. The discharge shall not cause pollution or nuisance as defined by the California Water Code.
3. The discharge of treated groundwater shall be only to those areas shown on Attachment B, a part of this Order.

4. During the first three months of operation, the discharge is only permitted to the area shown in Attachment B for the Propellant Burn Area and GET F Sprayfield, areas where soils already contain elevated concentrations of perchlorate. During that time the effluent shall not contain perchlorate greater than 40 µg/L, TCE greater than 0.5 µg/L and chloroform above 1 µg/L. An exception to the perchlorate effluent limitation is allowed during short-term operations testing. During those days of testing, the discharge shall be terminated when the effluent is found to exceed 500 mg/L under the increased monitoring required by Monitoring and Reporting Program No. R5-2010-0069. Only four such days of operations testing is allowed during the first three months of operation.
5. After the first three months of operation, the effluent shall not contain concentrations of perchlorate greater than 4 µg/L, TCE greater than 0.5 µg/L and chloroform above 1 µg/L. Discharge is restricted to the shaded area depicted on Attachment B.

C. GROUNDWATER LIMITATIONS

1. The discharge shall not cause the groundwater at the compliance wells listed in Table 1 of Monitoring and Reporting Program No. R5-2010-0069 to contain concentrations of chemical constituents in amounts that exceed the Water Quality Objectives listed in Finding No. 25.
2. The discharge shall not cause the groundwater at the compliance monitor wells to contain concentrations of metals, total dissolved solids, and electrical conductivity that are more than 20% greater than their respective background concentrations, as established by Monitoring and Reporting Program No. R5-2010-0069.
3. The discharge shall not cause the groundwater to contain taste and odor producing substances that cause nuisance or adversely affect beneficial uses at the compliance monitor points designated in Table 1 of Monitoring and Reporting Program No. R5-2010-0069.

D. PROVISIONS

1. The Discharger shall comply with all applicable Standard provisions and Reporting Requirements for Waste Discharge Requirements, dated 1 March 1991, which are attached hereto and by reference are a part of this Order. This attachment and its individual paragraphs are commonly referenced as Standard Provisions.
2. The Discharger may be required to submit technical reports pursuant to California Water Code Section 13267 as directed by the executive Officer. The technical reports required by this Order are necessary to assure compliance with this Order.

3. All technical reports required herein that involve planning, investigation, evaluation, or design or other work requiring interpretation or proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code, sections 6735, 7835 and 7835.1. To demonstrate compliance with Title 16, CCR, Sections 415 and 3065, all technical reports must contain a statement of the qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.
4. **At least 15 days prior to the commencement of operation**, the Discharger shall submit an Operation and Maintenance (O&M) Plan for the groundwater treatment facilities. The O&M Plan shall instruct field personnel on how to manage the day-to-day discharge operations to comply with the terms and conditions of this Order and how to make field adjustments, as necessary. A copy of the O&M Plan shall be kept at the facility for reference by operating personnel. Key personnel shall be familiar with its contents. The O&M plan shall be modified as needed to respond to changes in system operations.
5. The Discharger shall comply with the Monitoring and Reporting Program No. R5-2010-0069, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.
6. A copy of this Order shall be maintained at the project site and be available at all times to operating personnel.
7. The discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed by the discharger to achieve compliance with these Waste Discharge Requirements.
8. The discharger shall promptly report to the Regional Water Board any violation of this Order, material change in the character, location, or volume of the discharge.
9. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharger shall notify the succeeding owner or operator of the following items by letter, in advance of the transfer of ownership or control, and a copy of the notice must be forwarded to the Regional Water Board:
 - a. existence of this Order; and
 - b. the status of the dischargers' annual fee account

10. This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the discharger from his liability under Federal, State, or Local laws, nor create a vested right for the discharger to continue the waste discharge.
11. Chemical, bacteriological, and bioassay analyses must be conducted at a laboratory certified for such analyses by the State Department of Health Services.
12. All reports, or other documents required by these WDRs, and other information requested by the Regional Board shall be signed by a person described below or by a duly authorized representative of that person.
 - a. for a corporation: by a responsible corporate officer such as: (a) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; (b) any other person who performs similar policy or decision making functions for the corporation; or (c) the manager of one or more manufacturing, production, or operating facilities if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - b. Reports required by this Order, and other information requested by the Regional Water Board may be signed by a duly authorized representative provided:
 - i. the authorization is made in writing by a person described in paragraph (a) of this provision;
 - ii. 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 well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and
 - iii. the written authorization is submitted to the Regional Water Board prior to or together with any reports, information, or applications signed by the authorized representative.
 - c. Any person signing a document under paragraph (a) or (b) of this provision shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of

the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

13. The discharger shall permit authorized staff of the Regional Water Board:
 - a. entry to the project site covered by these Waste Discharge Requirements or in which any required records are kept;
 - b. access to copy any records required to be kept under terms and conditions of this Order;
 - c. inspection of monitoring equipment or records; and
 - d. sampling of any discharge.

14. In the event the discharger is unable to comply with any of the conditions of this Order due to:
 - a. breakdown of any facility or control system or monitoring equipment installed by the Discharger to achieve compliance with this Order;
 - b. migration or application of substances, pollutants or byproducts outside the specified treatment area;
 - c. accidents caused by human error or negligence; or
 - d. other causes such as acts of nature;

the discharger shall notify the Regional Water Board by telephone as soon as he or his agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring.

15. The Regional Water Board may review this Order periodically and may revise requirements when necessary. In addition, the discharger shall file a report of waste discharge with the Executive Officer at least 120 days before making any material change or proposed change in the character, location, or volume of the discharge.

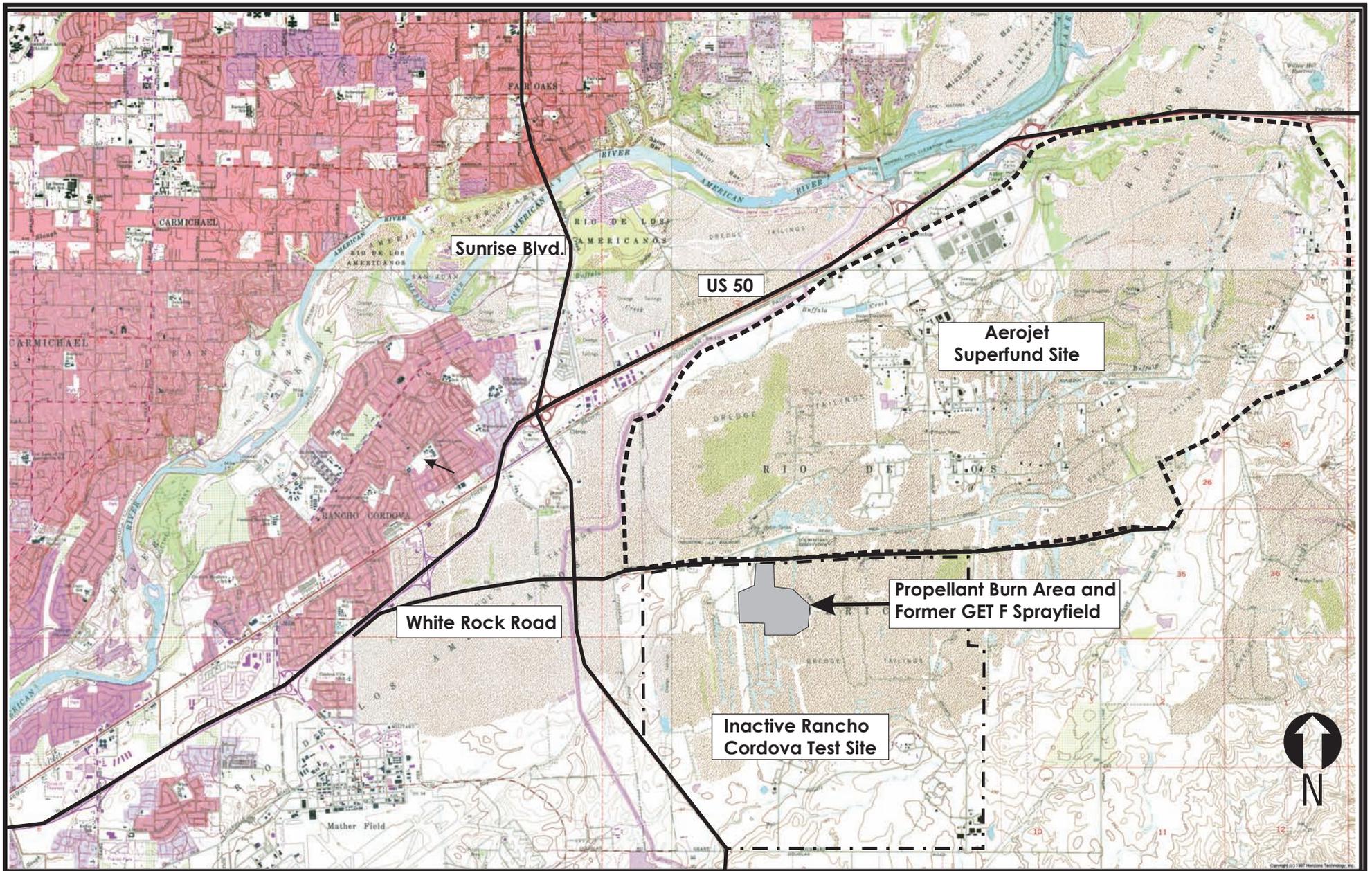
16. Project coverage under these Waste Discharge Requirements may be terminated, by the Executive Officer at any time upon giving reasonable notice to the Discharger.

I, Pamela C. Creedon, 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 27 May 2010.

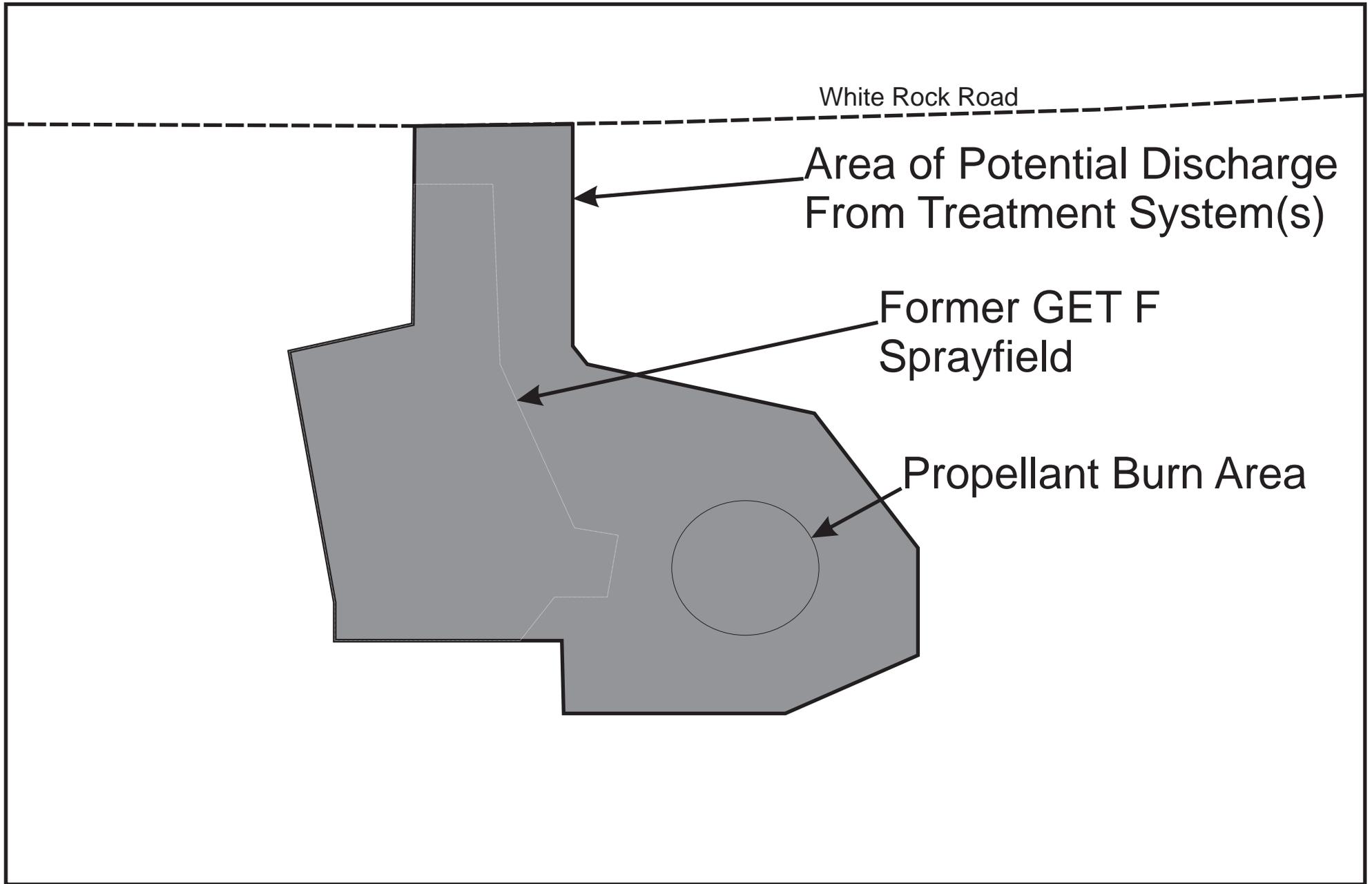
Original Signed by:

PAMELA C. CREEDON, Executive Officer

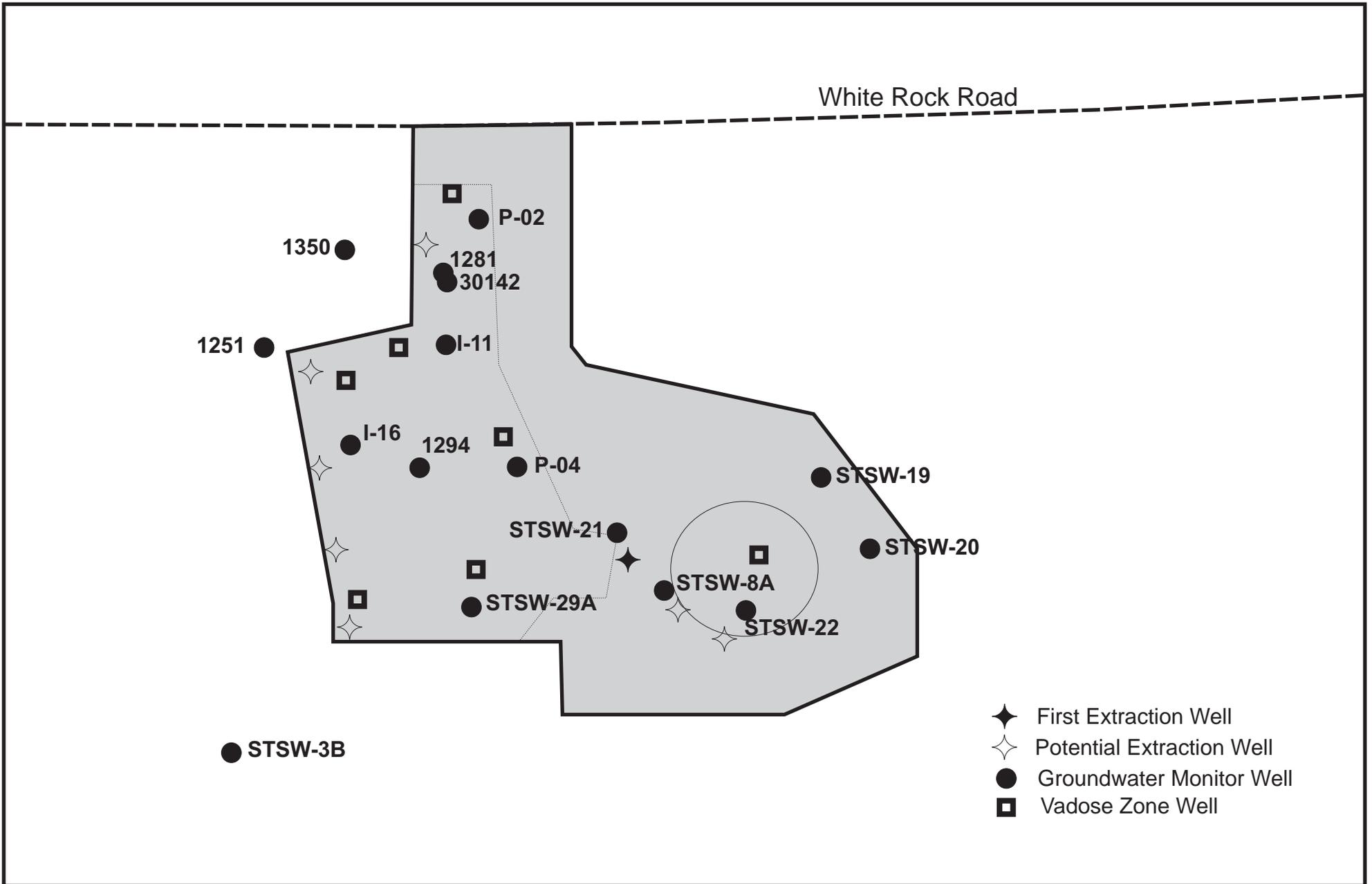
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Attachment A
AEROJET-GENERAL CORPORATION
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**Attachment B
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Attachment C
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INFORMATION SHEET

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Background

The Aerojet-General Corporation (Aerojet), along with the Boeing Company (Boeing), as directed by the Central Valley Regional Water Quality Control Board (Regional Board) and the Department of Toxic Substances Control (DTSC), are initiating cleanup of groundwater beneath the Inactive Rancho Cordova Test Site (IRCTS). The IRCSTS consists of approximately 4000 acres in eastern Sacramento County to the east of Sunrise Boulevard, south of White Rock Road, and north of Douglas Road. Past rocket-testing operations and disposal practices by The McDonnell-Douglas Corporation and/or Aerojet have caused the groundwater beneath the IRCSTS to have become polluted with volatile organic contaminants (VOCs) and perchlorate. Several plumes of contaminants originate on the IRCSTS with the largest plume extending approximately 2.7 miles west of the IRCSTS.

Groundwater beneath the IRCSTS is contaminated by VOCs and perchlorate. The primary VOCs in the groundwater are trichloroethylene (TCE) and cis-1,2-Dichloroethylene (cis-1,2-DCE) at concentrations up to 710 micrograms per liter ($\mu\text{g/L}$) and 25 $\mu\text{g/l}$, respectively. Concentrations of perchlorate have been measured up to 32,000 $\mu\text{g/L}$. Aerojet and Boeing have completed an Engineering Evaluation/Cost Analysis (EE/CA) for the containment of the plume of perchlorate contaminated groundwater extending west from the IRCSTS and across Mather Field. Aerojet and Boeing are in the process of constructing facilities to control the plume by extracting groundwater at the plume boundaries, treating the extracted water to remove the pollutants, and discharging the treated water. In addition, Aerojet and Boeing are evaluating alternatives for remediation of the contaminant plumes, both on and off of the IRCSTS.

Groundwater Remediation Project

One of the alternatives being evaluated by Aerojet and Boeing for cleaning up the contaminated groundwater is controlling and remediating the groundwater pollution at the Propellant Burn Area and GET F Sprayfield source areas. The groundwater at these two sites contains elevated concentrations of perchlorate and low concentrations of TCE. The project is designed to operate with minimal intrusion on future development of the IRCSTS. The project proposes to extract groundwater using up to nine extraction wells. The water is passed through vessels filled with granular activated carbon (if needed for VOC removal). The flow then proceeds to a modular biotreatment cell (MBC) to remove perchlorate. The MBC consists of a geomembrane-lined 8-foot by 8-foot by 40-foot long steel container. The container is filled with approximately 95 cubic yards of $\frac{3}{4}$ -inch crushed rock. The crushed rock serves as a media to support the growth of indigenous bacteria. Influent and effluent piping, and a water level probe and an oxidation-reduction potential (ORP) probe will be installed in the effluent piping prior to discharge to an aeration system. The ORP probe will be used for process

control. A 50% solution of citric acid will be used as the electron donor for the biodegradation of perchlorate and will be metered into the influent piping after the GAC vessels. The daily quantity of citric acid will likely be less than one gallon per day for each MBC to yield an ORP value of approximately -200 millivolts. . The volume of citric acid could be as much as 10 gallons per day for maximum flow and potential maximum concentrations of electron acceptors (dissolved oxygen, nitrate, perchlorate). The actual amount of citric acid used is dependent on the concentrations of dissolved oxygen, nitrate and perchlorate in the groundwater and the flow from the extraction well. Aerojet may switch citric acid with soybean oil methyl ester (biodiesel) or similar donor. The biodiesel is a more efficient donor and less expensive than citric acid. Other electron donors could be acceptable with advanced notification and approval by staff of the Regional Water Board.

It is estimated that the maximum flow rate will be no more than 100 gpm per MBC. The flow that could be placed through each box is dependent on the concentration as the higher the concentration, the greater retention time is needed to completely remove the perchlorate. The total number of MBCs required will therefore be dependent on flow produced by the each extraction well and the concentration of the perchlorate in each extraction well. As the MBC units are of consistent size, the MBC units may be operated in parallel or in series depending on flow, concentration and relative closeness of the extraction wells to each other.

Aerojet will initially be installing a single extraction well and treatment system at the Propellant Burn Area. The MBC will be checked for appropriate flow distribution using Rhodamine WT or Fluorescein dye at a maximum concentration of 100 µg/L and then fed with electron donor to commence buildup of the biomass. The system will be in a recirculation mode during the period of biomass development. Initial discharge of the system will be to areas of elevated perchlorate concentrations in soil at the Propellant Burn Area. This will help flush the perchlorate to the groundwater for subsequent capture by the extraction well(s) and not place residual perchlorate on clean soils while the treatment system comes to steady-state operation. If the system proves viable for long-term operation, additional extraction wells and treatment systems will be added until plume capture is achieved.

Basin Plan, Beneficial Uses, and Regulatory Considerations

Surface water drainage from the project area is to Morrison Creek, tributary to the Sacramento River. The *Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition* (Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin. Beneficial uses often determine the water quality objectives that apply to a water body. For example, waters designated as municipal and domestic supply must meet the maximum contaminant levels (MCLs) for drinking waters. The Basin Plan sets forth the applicable beneficial uses (industrial, agricultural, and domestic supply in this instance) of groundwater, procedure for application of water quality objectives, and the process for and factors to consider in allocating waste assimilation capacity.

Antidegradation

The antidegradation directives of Section 13000 of the California Water Code require that waters of the State that are better in quality than established water quality objectives be maintained "consistent with the maximum benefit to the people of the State." Waters can be of high quality for some constituents or beneficial uses and not others. Policies and procedures for complying with this directive are set forth in the Basin Plan (including by reference State Water Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality Waters in California," or "Antidegradation" Policy).

Resolution 68-16 is applied on a case-by-case, constituent-by-constituent basis in determining whether a certain degree of degradation can be justified. It is incumbent upon the Discharger to provide technical information for the Board to evaluate that fully characterizes:

- All waste constituents to be discharged;
- The background quality of the uppermost layer of the uppermost aquifer;
- The background quality of other waters that may be affected;
- The underlying hydrogeologic conditions;
- Waste treatment and control measures;
- How treatment and control measures are justified as best practicable treatment and control;
- The extent the discharge will impact the quality of each aquifer; and
- The expected degradation to water quality objectives.

In allowing a discharge, the Board must comply with CWC section 13263 in setting appropriate conditions. The Board is required, relative to the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Board need not authorize the full utilization of the waste assimilation capacity of the groundwater (CWC 13263(b)) and must consider other waste discharges and factors that affect that capacity.

As stated above, groundwater will be extracted, treated and recharged through the vadose zone and eventually recharge the aquifer. Groundwater quality will be monitored to assess the impacts due to the project. The groundwater flowing from the project area will be captured by the extraction system being installed by Aerojet. No degradation should occur as a result of the discharge.

Title 27

Title 27, CCR, section 20380 et seq. ("Title 27"), contains regulations to address certain discharges to land. Title 27 establishes a waste classification system, specifies siting and construction standards for containment of classified waste, requires extensive monitoring of groundwater and the unsaturated zone for any indication of failure of containment, and specifies closure and post-closure maintenance requirements. Generally, no degradation of groundwater quality by any waste constituent is acceptable. The proposed discharge will not degrade groundwater quality. The project will be removing perchlorate and VOCs from the groundwater.

Proposed Order Terms and Conditions

Discharge Prohibitions and Specifications

The proposed Order establishes a discharge flow limit of 144,000 gallons per day per treatment system. The proposed Order's discharge specifications for the electron donor are designed to minimize residual salts and to maintain all beneficial uses of the groundwater.

Monitoring Requirements

Section 13267 of the CWC authorizes the Board to require monitoring and technical reports as necessary to investigate the impact of a waste discharge on waters of the state. In recent years there has been increased emphasis on obtaining all necessary information, assuring the information is timely as well as representative and accurate, and thereby improving accountability of any discharger for meeting the conditions of discharge. Section 13268 of the CWC authorizes assessment civil administrative liability where appropriate.

This Order requires effluent and groundwater monitoring requirements, including flow rates. In order to adequately characterize its discharge, Aerojet is required to monitor for VOCs, perchlorate, electron donor, dissolved metals, dissolved oxygen, total dissolved solids and pH.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2010-0069

FOR
WASTE DISCHARGE REQUIREMENTS
AEROJET-GENERAL CORPORATION
PROPELLANT BURN AREA AND FORMER GET F SPRAYFIELD
GROUNDWATER REMEDIATION PROJECT
INACTIVE RANCHO CORDOVA TEST SITE
SACRAMENTO COUNTY

This Monitoring and Reporting Program (MRP) describes requirements for monitoring a groundwater extraction and treatment system. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. Regional Board staff shall approve specific sample station locations prior to implementation of sampling activities.

All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

TREATMENT SYSTEM MONITORING

Each treatment system consisting of granular activated carbon (if volatile organics are present), a modular treatment cell (MBC) for perchlorate removal and an aeration system to re-oxygenate the water is required to be monitored to assure compliance with effluent limitations. Each treatment system shall be sampled as follows using the analytical methods found in Table 3:

**Table 1: SAMPLING FREQUENCY AND
CONSTITUENT SUITE FOR TREATMENT SYSTEMS**

Monitor Point	Units	Frequency
Influent Monitoring- Extraction Wells		
Perchlorate	µg/L	Monthly
Volatile Organics	µg/L	Monthly
Total Dissolved Solids	µg/L	Monthly
Effluent Monitoring		
Perchlorate	µg/L	Monthly ¹
Volatile Organics	µg/L	Monthly
Chloride	mg/L	Monthly
Total Dissolved Solids	mg/L	Monthly
Dissolved Oxygen ²	mg/L	Monthly
Total Organic Carbon	mg/L	Monthly
Oxidation/Reduction Potential ³	millivolts	Monthly
Electrical Conductivity ²	µmhos/cm	Monthly
Flow - average	gallons per minute	Monthly
Flow – cumulative	total gallons per month	Monthly

Monitor Point	Units	Frequency
Electron Donor - cumulative	total gallons per month	Monthly
Location of Discharge	NA	Monthly

- ¹ During operations testing, sampling is done hourly using a perchlorate-specific probe.
² Field measurements.
³ As ORP is data is being collected frequently, the range of ORP measurements should be reported.

GROUNDWATER MONITORING

As shown on Attachment B, there are numerous existing groundwater monitor wells and up to nine groundwater extraction wells that may be installed for the project. The groundwater monitoring program for these wells and any wells installed subsequent to the issuance of this MRP, shall follow the schedule below. The volume of extracted groundwater shall also be provided in quarterly monitoring reports. Sample collection and analysis shall follow standard EPA protocol.

The monitor wells, extraction wells and/or injection wells shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 3, as follows:

Table 2: SAMPLING FREQUENCY AND CONSTITUENT SUITE¹

Well ¹ Number	Quarterly Sampling ²	Monitoring Objective
STSW-29A	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
STSW-3B	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
1251	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
1350	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
1294	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
I-16	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Compliance
New Wells	Perchlorate, Total Dissolved Solids, Dissolved Iron, Dissolved Manganese	Various

- ¹ Well numbers as shown on Attachment C.
² Wells shall be sampled quarterly. Sampling shall initially be only on well number STSW-29A and other wells will be added as needed upon request of Regional Board staff. Additional monitoring will be conducted according to the program approved to establish background values as required below.

Table 3: ANALYTICAL METHODS

Constituent	Method¹	Maximum Practical Quantitation Limit (µg/L)²
Perchlorate	EPA 314.1	4.0
Total Dissolved Solids	EPA 160.1	10,000
Total Organic Carbon	EPA 415	300
Chloride	EPA 6500	300
Iron, Total and Dissolved	EPA 200.7	100
Manganese, Total and Dissolved	EPA 200.7	25

¹ Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit.

² All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported, and reported as an estimated value.

FIELD SAMPLING

In addition to the above sampling and analysis, field sampling and analysis shall be conducted each time a monitor well or extraction well is sampled. The sampling and analysis of field parameters shall be as specified in Table 3.

Table 4: FIELD SAMPLING REQUIREMENTS

Parameters	Units	Type of Sample
Groundwater Elevation	Feet, Mean Sea Level	Grab
Electrical Conductivity	µmhos	Grab
Dissolved Oxygen	mg/L	Grab
pH	pH Units (to 0.1 units)	Grab

Field test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in the "Reporting" section of this MRP.

Electron Donor Analysis

Prior to use, the electron donor shall be analyzed for the constituents listed in Table 5. The analysis should be done on the pure donor, to the extent feasible, or as a mixture with deionized water at a concentration that would be used in the project.

Table 5: ELECTRON DONOR ANALYTICAL REQUIREMENTS

Constituent	Method ¹	Maximum Practical Quantitation Limit (µg/L) ²
Volatile Organic Compounds	EPA 8020 or 8260B	0.5
General Minerals		
Metals, Total and Dissolved ³	EPA 200.7, 200.8	Various
Semi-Volatile Organic Compounds	EPA Method 8270	5.0
Total Dissolved Solids	EPA 160.1	10,000
pH	EPA 9040	NA
Electrical Conductivity	EPA 120.1	NA

- ¹ Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit.
² All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported, and reported as an estimated value.
³ Metals include arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium and silica.

Establishment of Background Concentration Values

The Discharger shall develop background values for concentrations of dissolved iron, dissolved manganese, total dissolved solids and electrical conductivity in groundwater following the procedures found in CCR Section 20415(e)(10). The Discharger shall submit a proposal to develop the background concentrations by **no later than 30 days prior to commencement of operation.**

REPORTING

When reporting the data, the Discharger shall arrange the information in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner as to illustrate clearly the compliance with this Order. In addition, the Discharger shall notify the Regional Board within 48 hours of any unscheduled shutdown of a groundwater extraction system. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Regional Board.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional or their subordinate and signed by the registered professional.

The Discharger shall submit quarterly electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The quarterly reports shall be submitted electronically over the internet to the Geotracker database system by the 1st day of the second month following the end of each calendar quarter by **1 February, 1 May, 1 August, and 1 November** until such time as the Executive Officer determines that the reports are no longer necessary.

Quarterly reports shall be submitted to the Regional Board by the **1st day of the second month following the end of each calendar quarter (i.e., by 1 February, 1 May, 1 August, and 1 November)**. Each quarterly report shall include the following minimum information:

- (a) a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;
- (b) field logs that contain, at a minimum, sampling method, water quality parameters measured during purging (if purging is necessary for the sample method) or sampling, method of purging, depth of water, volume of water purged, etc.;
- (c) groundwater contour maps for all groundwater zones, if applicable;
- (d) isocontour pollutant concentration maps for all groundwater zones, if applicable;
- (e) a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;
- (f) a table showing historical lateral and vertical (if applicable) flow directions and gradients;
- (g) cumulative data tables containing the water quality analytical results and depth to groundwater;
- (h) a copy of the laboratory analytical data reports;
- (i) if applicable, the status of any ongoing remediation, including cumulative information on the mass of pollutant removed from the subsurface, system operating time, the effectiveness of

the remediation system, and any field notes pertaining to the operation and maintenance of the system; and

- (j) if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions; and
- (k) A log of GAC replacement, if applicable along with transportation date(s) and destination of disposal.

An Annual Report shall be submitted to the Regional Board by **1 May (1 August for semi-annual monitoring)** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation, and may be substituted for the concurrent quarterly report (**or second semi-annual**) monitoring report. The Annual Report shall contain the following minimum information:

- (a) both tabular and graphical summaries of all data obtained during the year;
- (b) groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;
- (c) a discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;
- (d) an analysis of whether the pollutant plume is being captured by an extraction system or is continuing to spread;
- (e) a description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;
- (f) an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and
- (g) if desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury

MONITORING AND REPORTING PROGRAM ORDER NO. R5-2010-0069
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statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by:

PAMELA C. CREEDON Executive Officer

27 May 2010

(Date)

3/24/2010:AMM