

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2011-0006
SOIL REMEDIATION
WASTE DISCHARGE REQUIREMENTS

FOR
TRACK FOUR, INC.
(A WHOLLY OWNED SUBSIDIARY OF AMSTED INDUSTRIES INC.),
AND
MERCK & CO., INC.,
FORMER BALTIMORE AIRCOIL COMPANY FACILITY

MERCED COUNTY

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

1. The former Baltimore Aircoil Company (BAC) facility occupies 40.5 acres, two miles northwest of Merced, where from 1961 to 1994 the site was used for manufacturing cooling towers. In 1969, a wood treatment system was installed at the facility that used treatment solutions containing arsenic, copper, and hexavalent chromium. During the operations of the wood treatment system, waste treatment solution was discharged to soils and groundwater at the facility, creating a condition of pollution or nuisance. A diagram showing the location of the BAC site at 3058 Beachwood Drive is included with these Waste Discharge Requirements as Attachment A.
2. The Pritchard Company originally owned and operated the site until 1975, when BAC, a subsidiary of Merck & Co., Inc. (Merck) acquired the facility. Merck later sold BAC to Amsted Industries, Inc. (Amsted), in 1985. Amsted ceased cooling tower manufacturing operations and closed the facility in February 1994. Track Four, Inc., a wholly owned subsidiary of Amsted, also owned the property. Track Four, Inc., Amsted and Merck are hereafter collectively referred to as the Discharger.
3. Chromium is the primary constituent of concern at the facility. Chromium primarily exists in two different forms; as trivalent chromium (chromium 3) and as hexavalent chromium (chromium 6). Trivalent chromium is generally insoluble, not typically a groundwater pollutant, and at low doses is an essential nutrient. Hexavalent chromium, the form of chromium used at the site, is a carcinogen and can cause adverse health effects. Hexavalent chromium is very mobile and soluble in groundwater.
4. Geology at the facility consists of Older Alluvium underlain by a topmost clay unit of the Upper Turlock Lake Formation. Sediments of the Older Alluvium are present from about zero to 90 feet below ground surface (bgs). These sediments consist of inter-bedded alluvial deposits, which are composed of clay, silty clay, silt, silty sand, and gravelly sand. Iron-silica-cemented layers form thin, discontinuous hardpan locally within the upper 40 feet bgs and below 55 feet bgs. A shallow aquifer lies within the Older Alluvium from about 40 to 50 feet bgs to about 90 feet bgs. The shallow aquifer consists of two water-

bearing units; an upper sand unit and a lower sand unit, separated by a silt/hardpan interval located from about 55 to 80 feet bgs.

Groundwater Remediation

5. Groundwater remediation at the facility began in 1994, when the discharger began operating a groundwater extraction and treatment system. During its operation through 2008, the system extracted over 220 million gallons of groundwater and removed over 5,400 pounds of hexavalent chromium from the extracted water.
6. In 2006, the discharger proposed implementation of a new clean up method to expedite remediation of the remaining groundwater pollution at the site. Under the appropriate conditions, hexavalent chromium can be converted to trivalent chromium. Trivalent chromium is stable and is practically immobile in the environment due to its low solubility. The discharger successfully field-tested a new cleanup method using the injection of alcohol to the groundwater. The alcohol biodegrades in the subsurface environment to create reducing conditions, characterized by low dissolved oxygen and low oxidation-reduction potential. Under reducing conditions chemical and biological processes permanently change hexavalent chromium to trivalent chromium. Due to its low solubility, trivalent chromium becomes fixed to the soil through which the groundwater flows, thereby no longer polluting the groundwater.
7. Full-scale implementation of the alcohol injection began at the site in April 2008 and is being conducted in accordance with Waste Discharge Requirements Order No. R5-2008-0047. Three phases of injection well installation and operation have been completed and those efforts have been successful in reducing hexavalent chromium pollution where implemented. The fourth phase of injection is currently being implemented and it targets all remaining groundwater pollution at the site. Based on the success of the previous phases, it is anticipated that full-scale groundwater cleanup will be completed in 2011.

Soil Remediation

8. Cleanup of polluted soils from which hexavalent chromium could leach to the groundwater began in 1991 with excavation and off-site disposal of sediments from a storm water retention pond and drainage gully located on the southeastern corner of the facility.
9. In 1996, the concrete-walled pressure treating sump was demolished and the surrounding soils (approximately 3,400 tons of concrete and soil) were excavated to approximately 15 feet below ground surface, thereby removing the most heavily contaminated soil. The excavation was then backfilled with gravel and infiltration wells were installed within the former excavation (Infiltration Gallery No. 1). The infiltration wells were used to inject treated groundwater from the groundwater pump and treat system back into the shallow aquifer. Water disposal in this area was also intended to flush remaining soil contaminants to groundwater for capture and treatment by the groundwater pump and treat system.
10. In late 2007 and early 2008, the discharger removed Infiltration Gallery No. 1 and associated infiltration wells and additional soil was excavated from the area including

beneath the former drip pad to maximum depths of 15 feet below ground surface. This second excavation removed approximately 7,000 cubic yards of soil, eliminating shallow soil contamination at the site that could pose a risk to human health through direct exposure and surface water from future runoff.

11. About 30,000 cubic yards of polluted soil beneath an area of approximately 0.6 acres remains at the site. This soil is located in the wood treatment area beneath the previous excavations at depths between 15 feet to 40 feet below ground surface. This area of soil is defined by concentrations of leachable hexavalent chromium that could potentially migrate to and adversely impact groundwater quality.

Deep Soil In-situ Treatment Pilot Studies

12. The discharger has proposed to clean up the deep soil by treating it in place (in-situ) in a manner similar to the program that has been implemented successfully on a much larger scale for the groundwater. Creating the conditions that convert hexavalent chromium to trivalent chromium in soils depends upon sustaining a high moisture content and the alcohol levels for a relatively long period of time. Therefore, the deeper soil at the site must be treated by slowly injecting the treatment solution over a period of weeks.
13. Two pilot tests for in situ remediation of the deep soil have been completed at the site. The first injection test was conducted in April 2008 using 22,000 gallons of water amended with methyl alcohol, ferrous sulfate, and tracer dye. Hexavalent chromium reduction was observed in the pilot test area but residual amounts of hexavalent chromium remained. Because the reactions are aqueous-phase based, the treatment ceased when the soil moisture returned to baseline levels.
14. The second pilot test injections were completed between August and December 2009 using 90,000 gallons of water containing 0.7 percent by weight methyl alcohol and 2 percent by weight corn syrup. The purpose of the greater volume and longer injection period was to increase the time available for aqueous reactions in the vadose zone. Corn syrup was added because it is a slower degrading carbon source than the alcohol, which should support greater distribution of organic carbon in the vadose zone.
15. The pilot tests generally achieved cleanup goals within most of the target vertical interval to at least a 12-foot radial distance within 6 months of the start of the second injection event. Post-injection soil borings indicated DI WET hexavalent chromium reductions of:
 - a) 99 percent at a distance of 6 feet;
 - b) 95 percent at distance of 12 feet from the injection well; and
 - c) post injection hexavalent chromium DI WET concentrations ranging from 25 to 102 µg/L.

While the post-injection soil boring concentrations of hexavalent chromium were still above desired levels, observed sustained soil moisture and elevated organic carbon

concentrations are expected to continue reducing the hexavalent chromium concentrations in the pilot test area.

16. Persistent moisture was distributed to at least a radial distance of 20 feet. Based on the evidence of lateral hydraulic communication, the discharger estimates that full-scale operation will be able to treat a radial distance of 20 feet around each injection well although contingencies are included to add additional injection wells where necessary if adequate distribution is not achieved. This Order authorizes the implementation of full-scale in situ soil treatment for chromium.

Full-Scale Deep Soil In-situ Treatment Implementation Plan

17. The full-scale in situ treatment remedy is to be implemented in a phased approach starting with the perimeter of the treatment area and then proceeding to the interior. When performance monitoring indicates distribution along the perimeter, the injections will then proceed within the core of the treatment area. It is expected that the 30,000 cubic yards of deep soil will require approximately 4,500,000 gallons (approximately 1.5 pore volumes) of amended injection water to achieve the cleanup goals. The layout of the injection wells is shown in Attachment B and is described as follows:
 - a) The first phase will involve installation of about 20 amendment injection wells at about 30-foot intervals, in locations that target the perimeter of the deep soil treatment area (approximately 0.6 acres).
 - b) The second phase will involve installation of about 12 amendment injection wells at about 40-foot intervals, and in locations that target the core of the deep soil treatment area.
 - c) About 28 of the 32 proposed injection wells will be installed as dual screened wells to separately target different depth intervals.
 - d) As part of an optional third phase additional injection wells may be installed for the delivery of amendment to areas within the deep soil area that require more treatment.
18. The injection solution will consist of potable water with a total organic carbon concentration of approximately 2 grams per liter (g/L), which may be adjusted to between 1 and 10 g/L. Organic carbon would be composed of corn syrup (75 percent by weight) and methyl alcohol (25 percent by weight). Ferrous sulfate up to 6 g/L may be added to achieve a target concentration of up to 1 g/L of ferrous iron.
19. During full-scale deep soil in-situ treatment implementation, groundwater in specified monitoring wells will be monitored for total organic carbon, total dissolved solids, total chromium, total arsenic, and sulfate by laboratory analysis. Electrical conductivity, pH, temperature, turbidity, and water level will be measured in the field. Monitoring specific to the full-scale treatment implementation will begin prior to amendment injection, and will continue monthly during injection, quarterly for one year following injections and semiannually thereafter if necessary (in accordance with the attached Monitoring and Reporting Program No. R5-2011-0006).

20. Background groundwater concentrations for key parameters were established using data from up-gradient monitoring wells. These background values have previously been established pursuant to Cleanup and Abatement Order No. 5-00-709 and Waste Discharge Requirements R5-2008-0047. The established background values are:

Constituent	Units	Concentration
Arsenic	µg/l	4
Chromium (total)	µg/l	6
Chromium (hexavalent)	µg/l	2.84
Copper	µg/l	6
Total Dissolved Solids	mg/l	500
Dissolved Iron	µg/l	52
Total Organic Carbon	mg/l	3.4
Sulfate	mg/l	121
Dissolved Oxygen	mg/l	10.8
Oxidation-reduction Potential	millivolts	279.0

Since groundwater beneath the deep soil treatment area has already been treated by in-situ remediation and may still be affected by the treatment, the Discharger will perform additional monitoring to establish baseline concentrations for total organic carbon, total dissolved solids, total chromium, total arsenic, and sulfate. Field measurements for pH, specific conductivity, temperature, turbidity, and water levels will also be collected.

Basin Plan, Beneficial Uses, and Regulatory Considerations

21. *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.
22. The Basin Plan designates the beneficial uses of the groundwater underlying the former BAC facility as municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.
23. The Basin Plan establishes numerical and narrative WQOs for surface and groundwater within the basin, and recognizes that WQOs are achieved primarily through the Regional Water Board's adoption of waste discharge requirements and enforcement orders. Where numerical WQOs are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative WQOs is

required, the Regional Water 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.

24. The Basin Plan identifies numerical WQOs 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 Regional Water Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.
25. The Basin Plan contains narrative WQOs 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. State Board Resolution No. 92-49 (hereafter Resolution No. 92-49) requires the Regional Water 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 Water 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.
26. Section 13241 of the Water Code requires the Regional Water Board to consider various factors, including economic considerations, when adopting WQOs into its Basin Plan. Water Code Section 13263 requires the Regional Water Board to address the factors in Section 13241 in adopting waste discharge requirements. The State Board, however, has held that a Regional Water Board need not specifically address the Section 13241 factors when implementing existing WQOs in waste discharge requirements because the factors were already considered in adopting WQOs. These waste discharge requirements implement adopted WQOs. Therefore, no additional analysis of Section 13241 factors is required.
27. Resolution No. 68-16 requires the Regional Water 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).

Temporal degradation of groundwater may occur at this site within the defined treatment zone due to the injection of the amendments and resulting reactions. The temporary degradation 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 beyond the treatment zone. A slight residual increase in TDS, iron, and manganese may occur, but will be limited to concentrations defined in the Groundwater Limitations of this Order.

28. These waste discharge requirements deal with water quality as it relates to the chemicals being injected, as well as the byproducts and breakdown products produced by the reactions of the amendments, chemicals being treated and geological materials. As discussed above, chemicals are injected to stimulate reduction in concentrations of the target pollutant. The injected chemical itself may leave residuals of its components or cause changes in groundwater chemistry that liberate metals found in the formation materials. Background/baseline concentrations of metals and total dissolved solids have been established or will be established pursuant to the attached MRP No. **R5-2010-0006**. 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 that may be byproducts of the full-scale deep soil treatment:

Constituent	WQO (µg/l)	Reference
Arsenic	4	Background concentration
Copper	170	CA public health goal
Iron	300	CA secondary MCL
Total Dissolved Solids	450,000	CA agricultural water quality goal
Sulfate	250,000	CA secondary MCL

29. Section 13267(b) of California Water Code provides that: “In conducting an investigation specified in subdivision (a), the Regional Water Board may require that any person who has discharged, discharges, or is suspected of 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 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 Water 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 those reports, the Regional Water 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-**

2011-0006 are necessary to assure compliance with these waste discharge requirements.

30. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981). These standards, and any more stringent standards adopted by the Discharger or county pursuant to CWC Section 13801, apply to all extraction and monitoring wells.
31. Central Valley Water Board Staff prepared a California Environmental Quality Act (CEQA) Initial Study and Negative Declaration and submitted them along with a CEQA Notice of Completion to the State Clearinghouse on 30 December 2010 for review and comment by interested parties. The comment period ended on 31 January 2011. The Central Valley Water Board submitted the finalized Negative Declaration along with the CEQA Notice of Determination to the State Clearinghouse on 8 February 2011.
32. This discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste*, as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq., (hereafter Title 27). The exemption pursuant to Section 20090(b), is based on the following:
 - a) The Regional Water Board is issuing waste discharge requirements,
 - b) The requirements implement the Basin Plan, and
 - c) The wastewater does not need to be managed according to Title 22 CCR, 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) The discharge of amendments to groundwater is at the direction of the Regional Water Board to cleanup and abate conditions of pollution or nuisance resulting from the unauthorized release of pollutants.
 - e) Wastes removed from the immediate place of release will be discharged according to the Title 27 regulations; and
 - f) The remedial actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.
33. 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 re-injection, 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 complies with Section 3020(2)(b) of RCRA.31.

34. The injection of corn syrup, methanol, and ferrous sulfate into the groundwater is a discharge of waste as defined by the California Water Code.
35. 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

36. The Central Valley Water Board considered all the above and the supplemental information and details in the attached Information Sheet, which is incorporated by reference herein, in establishing the following conditions of discharge.
37. The Central Valley Water Board has notified the Discharger and interested persons of its intent to prescribe waste discharge requirements for this discharge, and has provided them with an opportunity to submit their written views and comments.
38. The Central Valley Water Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, that Track Four, Inc., Amsted Industries, Inc. and Merck and Company, Inc., their agents, successors and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted there under, shall comply with the following:

[Note: Other prohibitions, conditions, definitions, and some methods of determining compliance are contained in the attached “Standard Provisions and Reporting Requirements for Waste Discharge Requirements” dated 1 March 1991, incorporated herein.]

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.
2. 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.
3. The discharge of waste at any location or in a manner different from that described in Findings 17 through 19, above, is prohibited.
4. The discharge of amendments or wastes to surface water or surface water drainage courses is prohibited.

5. The discharge of materials into the deep soil is prohibited, except for the following: corn syrup; methanol; ferrous sulfate; and water.
6. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.

B. Discharge Specifications

1. The Discharger shall not cause the permeability of the underlying aquifer, either inside or outside of the in situ treatment area, to be affected to such a degree that the Discharger is unable to effectively operate extraction wells for the purpose of containing the amendment(s) or its byproducts.
2. The Discharger will limit the injection of amendments to the extent practicable.
3. The discharge shall not cause the high quality groundwater unaffected by the current plume under going cleanup to be degraded by the treatment amendments listed in Discharge Prohibition A.5 or their byproducts.

C. Groundwater Limitations:

1. The Discharger shall not cause the groundwater to contain taste and odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses.
2. The discharge shall not cause the groundwater at the compliance wells listed in the attached MRP No. R5-2010-0006 to contain concentrations of chemical constituents (i.e., the amendments and by-products of the in-situ treatment process, including arsenic, total dissolved solids, total organic carbon, total chromium and sulfate in amounts that exceed 120 percent of the background, baseline concentrations or the WQOs listed in Finding 20, whichever is higher.
3. Within one year of the conclusion of the in-situ treatment, the Discharger shall not cause the groundwater to contain concentrations of chemical constituents, including the injected substances, and any breakdown products or by-products of the in-situ treatment process, in amounts that adversely affect beneficial uses, exceed the Water Quality Objectives listed in Finding 20, nor exceed more than 120 percent of their respective background concentrations.

D. Provisions:

1. The Discharger shall notify the Central Valley Water Board a minimum of two weeks prior to the start of full-scale injection of chemical amendments.
2. The Discharger shall comply with the attached MRP No. R5-2010-0006, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.

3. The Discharger shall provide an alternate water supply source for any municipal, domestic or other water use affected by the Discharger's wastes.
4. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements," dated 1 March 1991, which are by reference, a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."
5. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Central Valley Water Board or court order requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.
6. 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.
7. 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.
8. Should the evaluation of the implementation data for the full-scale deep soil treatment reveal adverse effects on groundwater quality at the points of compliance due to chemical amendment injection, the Discharger shall notify the Central Valley Water Board within 24 hours, followed by a written summary within two weeks. Within 60 days following notification, the Discharger shall submit a corrective action plan, including a time schedule for implementation, for Executive Officer approval. The corrective action plan shall detail how the Discharger will clean up and abate these effects, including extraction of any byproducts.
9. 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.
10. The Discharger shall maintain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records

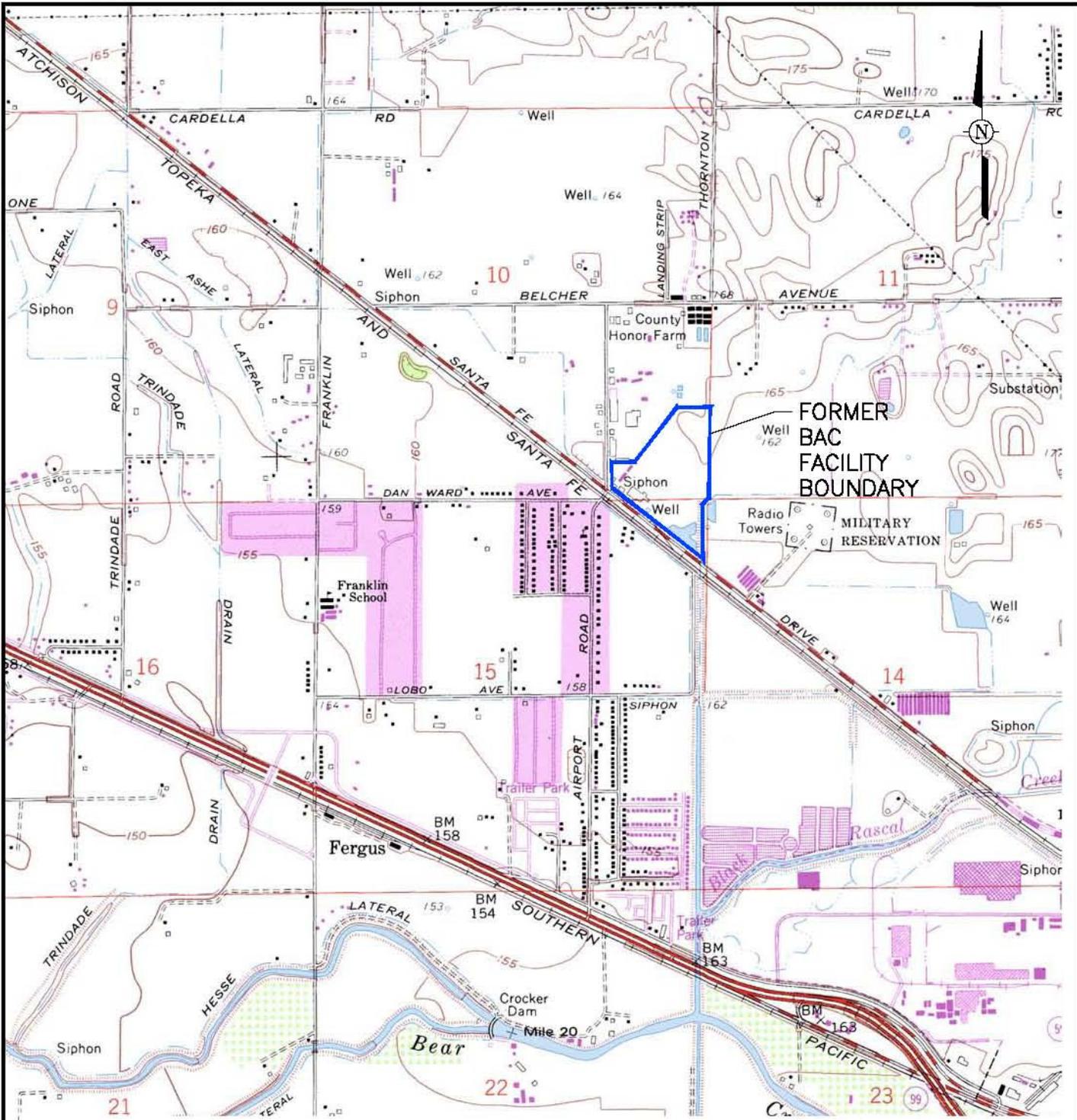
shall be maintained for a minimum of three years from the date of the sample, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer.

11. While this Order is in effect, and prior to any change in ownership of the Site or management of this operation, the Discharger shall transmit a copy of this Order to the succeeding Owner/Operator, and forward a copy of the transmittal letter and proof of transmittal to the Central Valley Water Board.
12. The Discharger shall allow the Central Valley Water Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:
 - A) Enter upon the premises regulated by the Central Valley Water Board, or the place where records must be kept under the conditions of this Order;
 - b) Have access to and copy, at reasonable times, any records that shall be kept under the conditions of this Order;
 - c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and
 - d) Sample or monitor, at reasonable times, for the purpose of assuring compliance with this Order or as otherwise authorized by the California Water Code, any substances or parameters at this Site.
13. A copy of this Order shall be kept at the discharger facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.
14. The Central Valley Water Board may review this Order periodically and may revise requirements when necessary.

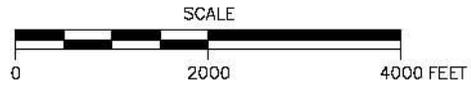
I, PAMELA C. CREEDON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 3 February 2011.

PAMELA C. CREEDON, Executive Officer

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Reference: U.S.G.S. 7.5-minute Quadrangle, Atwater, California, 1960 photorevised 1987.



FORMER BALTIMORE AIRCOIL COMPANY FACILITY MERCED, CALIFORNIA
SITE LOCATION MAP
Attachment A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2011-0006

FOR
TRACK FOUR, INC.
(A WHOLLY OWNED SUBSIDIARY OF AMSTED INDUSTRIES INC.),
AND
FORMER OWNER, MERCK & CO., INC.,
FORMER BALTIMORE AIRCOIL COMPANY FACILITY
MERCED COUNTY

This monitoring and reporting program (MRP) is issued by the Executive Officer of the California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) pursuant to California Water Code Section 13267. Former facility owners Amsted Industries, Inc., Track Four, Inc., and Merck & Co., Inc., (hereafter collectively referred to as the Discharger) are required to comply with this MRP, which contains the minimum monitoring and reporting requirements necessary to determine compliance with Waste Discharge Requirements Order No. R5-2011-0006. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is approved in writing by Executive Officer of the Central Valley Water Board.

The following MRP is designed to determine the effectiveness of the full-scale in-situ soil remediation effort at the former Baltimore Aircoil Company (BAC) facility. A separate MRP, Order No. R5-2007-0830, specifies comprehensive long-term facility monitoring that goes beyond the scope of the subject MRP. MRP Order No. R5-2008-0047 specifies monitoring associated with ongoing in-situ groundwater remediation at the site.

Prior to construction of any new groundwater monitoring or extraction wells, the Discharger shall submit plans and specifications to the Central Valley Water Board for review and approval. Once installed, all new wells shall be added to the monitoring program and shall be sampled and analyzed according to the schedule provided herein.

All monitoring wells shall be purged using micro-purging methodology with the use of dedicated bladder pumps in all monitoring wells, as necessary. This approach will increase consistency in sample collection, and produce analytical results that are more representative of actual groundwater conditions. Selected parameters including pH, conductivity, turbidity, and temperature of the pump discharge water shall be monitored during micro-purging until they have stabilized. Solid and liquid wastes, principally water resulting from equipment decontamination, well development, and formation water generated during drilling, and purge or sampling water, shall be collected and disposed of pursuant to applicable requirements.

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

I. GROUNDWATER MONITORING UPON INITIATION OF FULL-SCALE IN-SITU TREATMENT REMEDY

The Discharger has proposed full-scale in-situ deep soil treatment to chemically transform the hexavalent chromium pollution to trivalent chromium. Trivalent chromium is insoluble and would not cause further degradation of the groundwater. The full-scale in-situ treatment remedy includes injecting chemical amendments into the deep soil within the former wood treatment area associated with the former BAC facility. The Order for this MRP provides Central Valley Water Board approval for the full-scale in-situ treatment remedy. Groundwater monitoring associated with this remedy is specified below.

A. Groundwater Monitoring for Full-Scale In situ Treatment - Wells and Sampling Schedule

Existing monitoring wells will be used for monitoring the progress of the full-scale in-situ deep soil treatment. The approximate locations of these wells are shown in Attachment A of this MRP.

The following wells shall be monitored prior to, during, and following amendment injection activities and continuing until the Central Valley Water Board notifies the discharger that sampling is no longer needed: **IW-L2-02, MW-64, EW-1A, and MW-70.**

During injections, these well will be monitored monthly. Following the completion of the injections, these wells will be monitored quarterly for one year, and then semi-annually thereafter. If concentrations at any of the four monitoring wells, **IW-L2-02, MW-64, EW-1A, and MW-70** exceed the higher of water quality objectives, background concentration values, or baseline concentrations by 20 percent, the compliance wells MW-26 and EW-8 will also be included in the monitoring for monthly sampling during injections, quarterly for one year after completing injections, and semi-annually thereafter.

B. Groundwater Monitoring for Full-Scale In situ Treatment - Laboratory and Field Analysis

All groundwater samples shall be grab samples. Samples from the wells used for groundwater monitoring during full-scale in-situ treatment shall be analyzed pursuant to the following table:

Parameter	Method¹	Unit	Maximum Detection Limit²
Total Chromium	EPA 200.8, 6010B	µg/L	3 µg/L
Arsenic	EPA 200.8, 6010B	µg/L	2 µg/L
Sulfate	EPA 300.0	µg/L	1 mg/L
Total Dissolved Solids	EPA 160.1, 2540	mg/L	10 mg/L
Total Organic Carbon	EPA 415.1	mg/L	2 mg/l
Temperature	Field Meter	deg C	--
Electrical Conductivity	Field Meter	µmhos/cm	--
Turbidity	Field Meter	NTU	--
pH	Field Meter	pH units	--
Water Level	Field Meter	ft-MSL	--

¹ If necessary, equivalent analytical methods may be used. The Discharger shall provide written justification.

² For non-detectable results

II. AMENDMENT DISCHARGE MONITORING

Discharger shall monitor daily the injection of water and amendments into the soil. This monitoring shall include, at a minimum, recording of injected water and amendment locations and volumes in gallons per day, and monitoring of amendment(s) added. Each amendment addition shall be recorded individually, along with information regarding the time over which the amendment was injected into the vadose zone.

III. QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) shall be performed to ensure precision and accuracy for groundwater sampling activities. Minimum QA/QC requirements are as follows:

A. Duplicate Samples

One duplicate groundwater sample shall be collected for every ten groundwater samples collected during each groundwater monitoring event.

B. Chain-of-Custody Forms

Completed chain-of-custody forms shall be provided with the final laboratory reports.

C. Field Meters

Field testing instruments shall be used by an operator trained in proper use and maintenance of the instruments. All field instruments shall be calibrated prior to each monitoring event. In addition, field parameter instruments shall be serviced or calibrated by the manufacturer at the recommended frequency. Field calibration reports shall be included in the semiannual groundwater monitoring reports.

IV. REPORTING

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, sample type (e.g., influent, effluent, groundwater, etc.), and reported analytical result for each sample are readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with waste discharge requirements and spatial or temporal trends, as applicable. 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 Central Valley Water Board.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all Reports shall be prepared under the direct supervision of a Registered Engineer or Geologist and signed by the registered professional.

A **Deep Soil Remediation Completion Report** shall be submitted to the Central Valley Water Board by the Discharger within 60 days of completion of the full-scale deep soil remediation. On-going groundwater monitoring that may continue past the completion of the deep soil remedy implementation shall be submitted as part of on-going semiannual reporting as discussed below.

Semiannual reports shall be submitted to the Central Valley Water Board by the Discharger to assess long-term effects of vadose zone injected amendments on aquifer geochemistry until such time as the Executive Officer determines that the reports are no longer necessary. Semiannual monitoring shall be conducted in the second and fourth quarters of the calendar year, with monitoring reports due to the Central Valley Water Board by **1 August** and **1 February**. Each semiannual report shall include the following minimum information:

1. Depths-to-water measurements and corresponding groundwater elevations for all monitoring wells and extraction wells, extraction rates and total volume extracted from each active extraction well, and groundwater analytical results for all wells sampled. This data shall be presented in tabular format;
2. Copies of all final laboratory analytical reports, including QA/QC (electronic copies are encouraged and preferred);
3. Field logs containing, at a minimum, water quality parameters measured before, during, and after well purging, method of purging, depth of water, volume of water purged, etc.;

4. A calibration log verifying calibration of any field monitoring instrument (e.g., pH, temperature, electrical conductivity, and turbidity meters) used to measure parameters during well purging;
5. Groundwater elevation contour maps for all groundwater zones, including estimated direction flow;
6. Calculated hydraulic gradients and estimated average linear velocities for all groundwater zones;
7. Isoconcentration maps for total dissolved chromium for the shallow aquifer;
8. Water level and water quality hydrographs showing historical data for each well; and
9. Any proposed changes in the extraction well network with justification for the change.
10. 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.
11. A comparison of water quality results for the compliance wells with background concentrations established for the former BAC facility, including a discussion of compliance with Groundwater Limitation C.2 of Order No. R5-2011-0006.

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 (if applicable), 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 statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

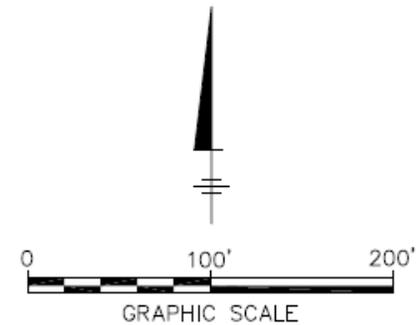
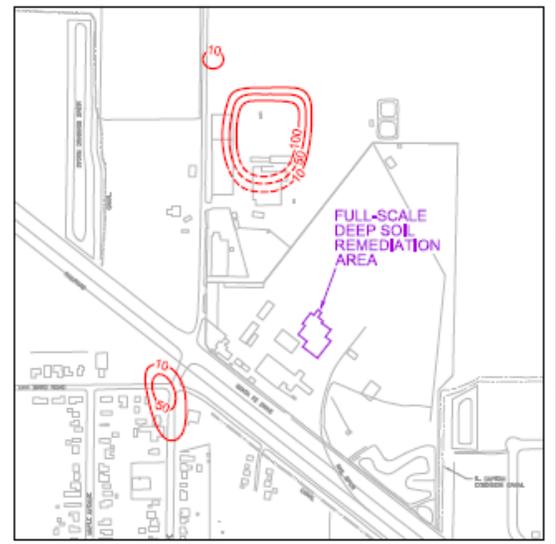
The results of any monitoring done more frequently than required at the locations specified in the MRP also shall be reported to the Central Valley Water Board. The Discharger shall implement the above monitoring program as of the date of the Order.

Ordered by:

PAMELA C. CREEDON, Executive Officer

Date

XREFS: IMAGES: PROJECTNAME: _____



LEGEND

- MW-26  MONITORING WELL
- PZ-33  PIEZOMETER
- 10  --- HEXAVALENT CHROMIUM CONCENTRATION CONTOUR, µg/L, SEPTEMBER 2009 (DASHED WHERE INFERRED)
-  APPROXIMATE EXTENT OF FULL-SCALE DEEP SOIL REMEDIATION AREA
- µg/L MICROGRAMS PER LITER

- NOTES:**
- PRIMARY FULL-SCALE DEEP SOIL REMEDIATION GROUNDWATER MONITORING WELLS INDICATED IN BLUE.
 - SECONDARY FULL-SCALE DEEP SOIL REMEDIATION GROUNDWATER MONITORING WELLS INDICATED IN GREEN.

FORMER BALTIMORE AIRCOIL COMPANY FACILITY MERCED, CALIFORNIA DEEP SOIL REMEDIATION FULL-SCALE WORK PLAN AND FIELD TEST SUMMARY
PROPOSED FULL-SCALE DEEP SOIL REMEDIATION GROUNDWATER MONITORING WELL NETWORK
Monitoring and Reporting Order Attachment A

INFORMATION SHEET

WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2011-0006
TRACK FOUR, INC., AND MERCK AND COMPANY, INC.
FORMER BALTIMORE AIRCOIL COMPANY FACILITY, MERCED
FULL-SCALE IN-SITU DEEP SOIL REMEDIATION
MERCED COUNTY

The 40.5-acre former Baltimore Aircoil Company (BAC) facility is located at 3058 Beachwood Drive, two miles northwest of Merced. The former BAC facility was used from 1961 to 1994 for cooling tower fabrication. In 1969, a wood treatment system, which used treatment solutions containing arsenic, copper, and chromium, was installed at the facility. During operations of the wood treatment system, waste treatment solution was discharged to soils and groundwater at the facility, creating a condition of pollution or nuisance. In 1975, BAC, then a subsidiary of Merck & Co., Inc. (Merck), purchased the cooling tower fabrication operation. Merck sold BAC to Amsted Industries, Inc. (Amsted), in 1985. Amsted ceased cooling tower manufacturing operations and closed the facility in February 1994. Merck and Company, Inc., Amsted Industries, Inc., and Track Four, Inc. are collectively the Dischargers.

Hexavalent chromium, the form of chromium found beneath the site, is of concern because it is a carcinogen and can cause adverse health effects. Hexavalent chromium is soluble in groundwater.

To the extent feasible, the discharger has excavated and properly disposed of soils and materials at the site which contained hexavalent chromium contamination. Since 1994, the discharger also operated a groundwater extraction and treatment system which treated over 220 million gallons of water and removed over 5,400 pounds of chromium.

In 2008, in accordance with Waste Discharge Requirements issued by the Central Valley Regional Water Quality Control Board, the Dischargers began implementing a new groundwater cleanup method that converts the soluble hexavalent chromium to the insoluble trivalent form. The method uses injection into the groundwater of dilute alcohol, which stimulates biological and chemical processes that permanently fix the chromium to the soil and eliminate the potential to dissolve in groundwater. It is anticipated that full-scale groundwater cleanup will be completed in 2011.

Soil located in the former wood treatment area, beneath the previous excavations, at depths between 15 feet and 40 feet below ground surface, remain contaminated with hexavalent chromium. That soil contains concentrations of leachable hexavalent chromium that could potentially migrate to, and impact groundwater. The Dischargers have conducted studies which show that this deeper soil could also be effectively remediated by injecting a dilute mix of alcohol and corn syrup.

These Waste Discharge Requirements are being issued for the full-scale implementation of in situ treatment for the deeper soil in the former wood treatment area. The first phase of the project involves installing 20 injection wells that target the perimeter of the deep soil treatment area. The second phase will involve installation of 12 injection wells that target

the core of the deep soil treatment area. Most of injection wells will be installed as dual screened wells to separately target different depth intervals. An optional third phase may be implemented if there are areas that require more treatment.

During full-scale deep soil in situ treatment implementation, groundwater in specified monitoring wells will be monitored for total organic carbon, total dissolved solids, total chromium, total arsenic, and sulfate by laboratory analysis. Electrical conductivity, pH, temperature, turbidity, and water level will be measured in the field. Monitoring specific to the full-scale treatment implementation will begin prior to amendment injection, and will continue monthly during injections, quarterly for one year following injections and semiannually thereafter if necessary.

Temporal, short-term degradation of the underlying groundwater by corn syrup, methanol or ferrous sulfate injection may occur in a limited portion of the aquifer near the injection points. Such degradation is consistent with Resolution 68-16 since (a) the purpose of the discharge is to implement the cleanup of groundwater pollution and such remediation will benefit the people of the State; (b) this Order requires use of best practicable treatment, including adequate monitoring and contingency plans to assure protection of water quality; and (c) this Order does not allow discharges of waste to exceed water quality objectives other than those temporarily permitted by these WDRs.

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. The beneficial uses for the groundwater at the site are municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.

The proposed Order prohibits the discharge of wastes in any manner other than that described in the Findings of the Order, including prohibiting discharge of waste to surface waters or discharge of hazardous waste.