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**Central Valley Regional Water Quality Control Board**

4 April 2014

Larry Bright
Valley Water Management Company
7500 Meany Avenue
Bakersfield, CA 93308

**REVIEW OF PHASE 1 WORK PLAN FOR SUBSURFACE INVESTIGATIONS, VALLEY WATER MANAGEMENT COMPANY, FEE 34 FACILITY AND RACE TRACK HILL AREA, EDISON, KERN COUNTY**

Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff (Staff) received a report entitled *Phase 1 Work Plan for Subsurface Investigations at the Fee 34 Facility and Race Track Hill Area, (Work Plan)*, dated 13 March 2014. The Work Plan was prepared by Kennedy/Jenks Consultants (Kennedy/Jenks) on behalf of Valley Water Management Company (VWMC). Additionally, Staff received a revision by email on 2 April 2014, from Stuart Childs of Kennedy/Jenks, outlining changes to proposed boring locations in the Work Plan. The Work Plan describes initial proposed site investigation activities for characterizing vadose zone and groundwater conditions beneath the Race Track Hill discharge area and the Fee 34 wastewater collection and oil separation facility. The Phase 1 investigation is intended to provide an initial assessment of potential impacts of oil field produced water storage and discharge on underlying soil and groundwater. Staff's comments are presented in the enclosed memorandum.

The proposed Phase 1 Work Plan appears adequate for a preliminary evaluation of the vadose zone and perched groundwater zones that may be present beneath the Fee 34 and Race Track Hill facilities at the boring locations. Site specific groundwater characterization of the regional groundwater aquifer beneath the Fee 34 and Race Track Hill facilities, and what impacts the discharge of wastewater may have had on the groundwater at both facilities, needs to be conducted. Additionally, an appropriate number of shallow soil borings need to be advanced and sampled within the 94-acres of irrigated land at the Race Track Hill facility to determine whether salinity impacts to soil have occurred as a result of irrigation practices. Additional investigations will be necessary. For example, a site specific characterization of the regional groundwater aquifer beneath each facility, and an evaluation of the 94-acres of irrigated land at the Race Track Hill facility. The specifics of subsequent work plan phases could be influenced by the results of the Phase 1 investigation.

Please submit a report documenting Phase 1 assessment within 45 days of completing the Phase 1 field activities. If you have any questions, please contact Ryan West at (559) 445-6188 or by email at Ryan.West@waterboards.ca.gov

DANE S. JOHNSON
Senior Engineering Geologist
PG No. 4239

Enclosure: Memorandum

cc: Mike Toland, CDOGGR, Bakersfield

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**Central Valley Regional Water Quality Control Board**

**TO:** Dane S. Johnson
Senior Engineering Geologist
Professional Geologist No. 4239

**FROM:** Ryan K. West
Engineering Geologist

**DATE:** 4 April 2014

**SUBJECT:** **REVIEW OF PHASE 1 WORK PLAN FOR SUBSURFACE INVESTIGATIONS, VALLEY WATER MANAGEMENT COMPANY, FEE 34 FACILITY AND RACE TRACK HILL AREA, EDISON, KERN COUNTY**

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## Fee 34 Facility

The Fee 34 facility is located in the Edison Oil Field, approximately one mile northeast of the community of Edison, in the SW ¼ of the SW ¼ of Section 34, T29S, R29E, MDB&M, Kern County (see Figure 1). Disposal operations at the facility are regulated by Waste Discharge Requirements Order Nos. 92-110 and 92-11037.

The Fee 34 facility contains seven surface impoundments (sumps) at the facility and one storm water basin. Five of the sumps are gunite-lined and two of the sumps are unlined. Land surrounding the facility is used for agricultural production, primarily grapes. Many of the crops are irrigated, at least in part, with groundwater from local supply wells. Groundwater in the Edison area is reported to be approximately 350 to 400 feet below ground surface (bgs) and flows to the southwest.

Produced wastewater is transported to the facility by pipeline from various small, independent oil leases throughout the Edison Oil Field. Approximately 4.5 million barrels per year (189 million gallons per year) of wastewater are received at the facility. A wastewater sample from the Fee 34 facility was analyzed

on 23 July 2013. The analyzed wastewater had an electrical conductivity (EC) of 5,700 micromhos per centimeter (µmhos/cm), a chloride concentration of 1,800 milligrams per liter (mg/L), and a boron concentration of 14 mg/L (VWMC, 2013 Monitoring Report).

The proposed Phase 1 investigation at the Fee 34 facility would include the following:

1. A leak test to determine whether produced water may be seeping through the gunite-lined sumps. The Lundorff and Scalmanini (2012) procedure is proposed to be used. The Lundorff and Scalmanini procedure makes use of precision monitoring of water levels in the sumps at two locations and monitoring microclimate variables required to calculate pond evaporation rate. An individual leak test would be conducted by eliminating inflows to the sump for a five-day period. Water and microclimate data (precipitation, air temperature and relative humidity, wind speed and direction, and the surface temperature of water in the sumps would be collected every 15 seconds and summarized, averaged, and stored every 30 minutes for each 24-hour period. Results would be evaluated based on the entire five-day period. Evaluation of leakage is most sensitive when evaporation is low.

   Separate tests would be run on each of the three sumps to maintain produced water flows during the leak testing procedure. At the two oil skimming sumps, one sump would remain in service while the other sump is isolated and tested. When the shipping sump is tested, additional storage or pumping capacity may be required so that the flows from the skimming sumps can be routed away from the shipping sump so that it can be isolated without process water inputs for a five day period. Sump leakage would be calculated as: Leakage = pond water level decline – evaporation.

2. One soil boring would be advanced to assess potential impacts below the two unlined sumps (see Figure 1 for proposed boring location). The boring would be advanced to a maximum depth of 200 feet bgs. If groundwater is encountered at a lesser depth (<200 feet), the soil boring would be terminated at a depth of five feet below the top of groundwater. Soil samples would be collected at five-foot intervals to a depth of 50 feet and at ten-foot intervals for the remainder of the boring. A maximum of 25 samples would be submitted to a California ELAP-certified laboratory for analysis of EC, chloride, boron, pH, Total Petroleum Hydrocarbons as crude oil (TPHc), and moisture content.

**Race Track Hill Facility**

The Race Track Hill facility is located approximately five miles northeast of the community of Edison, in the western half of Section 24, T29S, R29E, MDB&M, Kern County (see Figure 2). Disposal operations at Race Track Hill are regulated by Waste Discharge Requirements Resolution No. 58-349.

The facility contains 27 unlined sumps that are used for wastewater percolation and evaporation. Wastewater is also applied to approximately 94 acres of land via a sprinkler irrigation system. Salt tolerant local grasses and some shrubs are present in the irrigated areas.

Produced wastewater is transported to the Race Track Hill facility by pipeline from the Fee 34 facility. Wastewater received at Race Track Hill has the same quality as at the Fee 34 facility (EC 5,700 µmhos/cm, chloride 1,800 mg/L, and boron 14 mg/L).

The Proposed Phase 1 investigation at the Race Track Hill facility would include the following:

1. Two borings would be advanced near an irrigated area at the western portion of the central drainage canyon to assess potential impacts (see Figure 2 for proposed boring locations). The central drainage canyon flows eastward and connects several of the largest sumps. Boring #1 would be completed on the fringe of an irrigated area to a depth of up to 100 feet bgs to determine whether there is shallow groundwater at this location. Boring #2 would be completed in an adjacent, unirrigated background area, to a depth of 50 feet bgs or auger refusal, whichever is shallower. Soil samples collected from Borings #1 and #2 would be collected at one-foot, two-feet, three-feet, and five-feet bgs, then at five-foot intervals to the total depth of the boring. A maximum of 13 samples from each boring would be submitted to a California ELAP-certified laboratory for analysis of EC, chloride, boron, pH, and TPHc.

2. Boring #3 would be would be completed to a depth of 50 feet bgs downgradient of the sprinkler irrigated area between the northern and central drainage canyons, near the eastern property boundary, to assess potential impacts of percolation and evaporation (see Figure 2 for proposed boring locations). Boring #4 would be completed to a maximum depth of 150 feet bgs down-gradient of the northern drainage canyon, near the northeastern property boundary of the facility. Boring #4 should intercept shallow groundwater at the base of the northern drainage canyon. Soil samples would be collected from Borings #3 and #4 at five-foot intervals to a depth of 50 feet; samples would be collected at ten-foot intervals for the remainder of Boring #4. Samples would be submitted to a California ELAP-certified laboratory for analysis of EC, chloride, boron, and pH.

Soil borings at both sites would be advanced using a hollow-stem auger drill rig. Continuous core would be collected for lithologic determination. The soil produced during drilling would be logged under the supervision of a professional geologist or engineer. A flame ionization detector (FID) would be used to check for hydrocarbon vapors in the soil core and breathing zone during drilling.

**Groundwater Sampling and Analysis**

A reconnaissance groundwater sample would be collected from the Fee 34 facility boring or any of the Race Track Hill facility borings, if groundwater is encountered during drilling.

If groundwater is encountered, a temporary boring would be advanced approximately five feet below groundwater. New two-inch diameter Schedule 40 polyvinyl chloride (PVC) casing would be inserted into the augers; the bottom ten feet would be 0.010-inch machine-slotted screen and the remainder would be blank casing. Three-to-four feet of Cemex #2/12 or equivalent filter pack sand would be added to the annulus around the screen to reduce turbidity. Disposable bailers would be used to obtain groundwater samples. Groundwater samples would be analyzed for EC, chloride, boron, and pH. The water to be analyzed for boron would be field-filtered with a 0.45-micron filter prior to containerization.

If groundwater is not considered to be a constantly saturated zone, then the temporary well would be removed and the boring would be advanced to the planned depth for soil sampling. A permanent monitoring well may be installed in any borehole if the amount of water appears to be part of a constantly saturated zone or the underlying regional groundwater. Construction details for installation of permanent groundwater monitoring wells and well development details were provided in the Work Plan (Appendix B, Standard Operating Guidelines).

The location and well casing elevations of monitoring wells would be horizontally and vertically surveyed by a licensed land surveyor.

**Proposed Implementation Schedule**

The proposed field investigations would commence within 30 days of submission of the Phase 1 Work Plan (the 2 April 2014 email states that VWMC currently plans to commence the investigation on 7 April 2014). Within 45 days of completion of Phase 1 field activities, an initial written report on findings of the Phase 1 field investigation would be submitted to Central Valley Water Board staff.

**Phase 1 Investigation Report**

Kennedy/Jenks would prepare a report summarizing and documenting the field activities at both the Fee 34 and Race Track Hill facilities. The report proposes to assess whether there are indications of produced water effects on soil or groundwater beneath the sumps or irrigation areas and would provide recommendations for the next phase of work (if any) at the Fee 34 and Race Track Hill facilities.

The report is intended to inform VWMC and the Central Valley Water Board in a timely manner about potential impacts for the Fee 34 and Race Track Hill facilities. The contents of a preliminary draft of the report may be presented and discussed in a meeting with Central Valley Water Board staff to facilitate timely evaluation of the preliminary results and development of the scope for any further phases of investigation required, or whether a salinity exception is needed or warranted. Following review and comment on the Phase 1 results by Central Valley Water Board staff, a proposal and time schedule for additional site characterization would be submitted as needed.

**Central Valley Water Board staff comments**

- Assessment activities proposed in the Work Plan appear adequate for a preliminary evaluation of the vadose zone and possible perched groundwater zones that may be present beneath the Fee 34 and Race Track Hill facilities at the boring locations.

- Site specific groundwater characterization of the regional groundwater aquifer beneath the Fee 34 and Race Track Hill facilities, and what impacts the discharge of wastewater may have had on the groundwater at both facilities, needs to be conducted. A subsequent phase of investigation needs to address site specific characterization of the regional groundwater aquifer beneath each facility.

- An appropriate number of shallow soil borings need to be advanced and sampled within the 94-acres of irrigated land at the Race Track Hill facility. This work needs to be incorporated into a subsequent phase of the investigation to determine whether salinity impacts to soil have occurred as a result of irrigation practices.


Explanation

Potential Soil Boring Location for Phase 1 Investigation

*Only one soil boring will be advanced. The location will be dependent on the accessibility of the drill rig on the site.

Map Source:
ESRI's ArcGIS Online Premium Services
Section 34, T29S, R29E, MDB&M

SCALE IN FEET
0 50 100

## SITE MAP

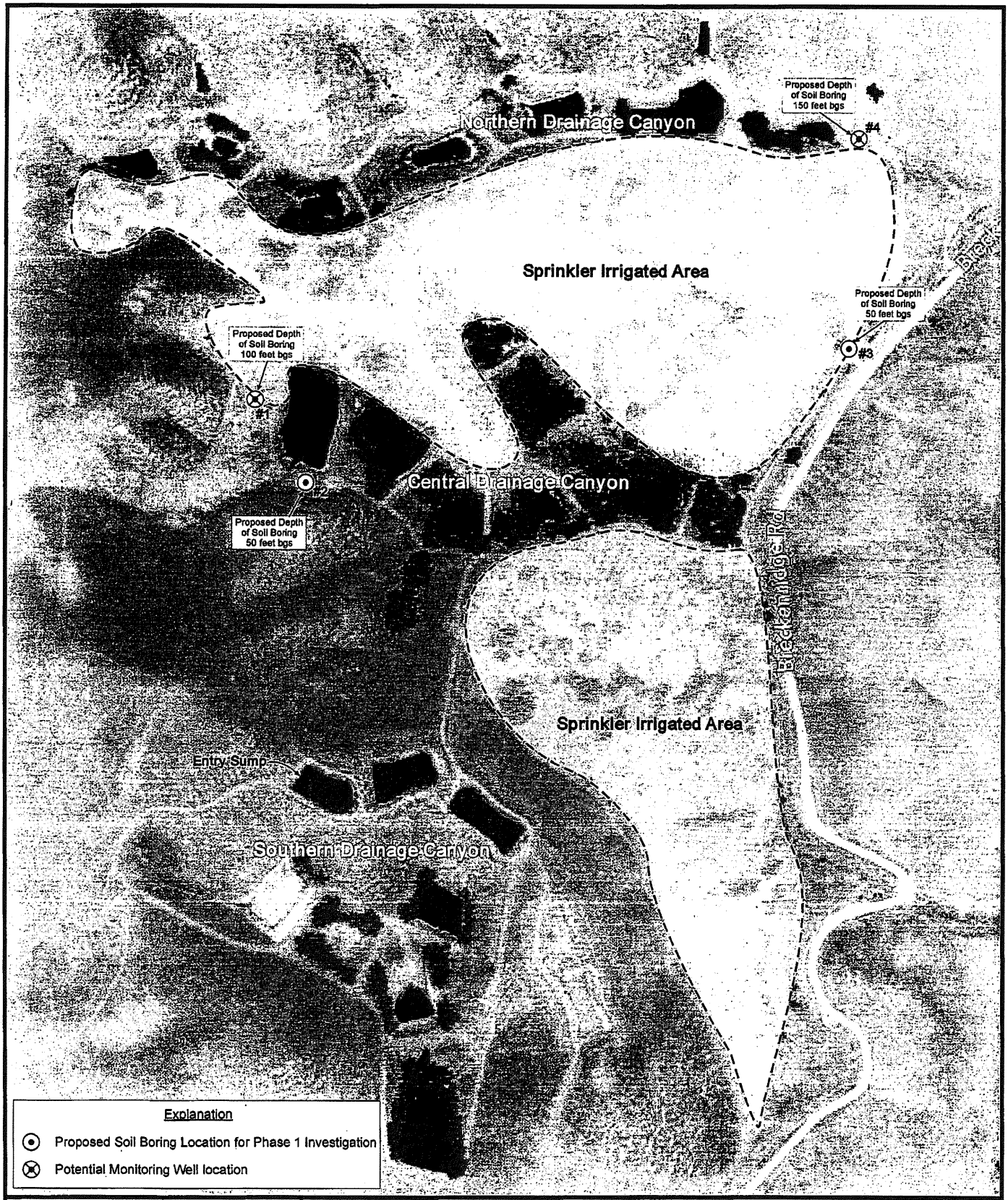
VALLEY WATER MANAGEMENT COMPANY

FEE 34 FACILITY

EDISON OIL FIELD

EDISON, KERN COUNTY

**FIGURE 1**




Map Source:
ESRI's ArcGIS Online Premium Services
Section 24, T29S, R29E, MDB&M

SCALE IN FEET
0 200 400

## SITE MAP

VALLEY WATER MANAGEMENT COMPANY

RACETRACK HILL FACILITY

EDISON, KERN COUNTY

**FIGURE 2**