California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

26 August 2010

CERTIFIED MAIL
7009 1410 0002 1422 1345

Mr. Henry Thatcher
Site Manager – Antioch Properties
Forestar (USA) Real Estate Group Inc.
PO Box 10
2301 Wilbur Avenue
Antioch, CA 94509

NOTICE OF APPLICABILITY OF GENERAL ORDER NO. R5-2008-0149-009 – FORMER GAYLORD CONTAINER CORPORATION FACILITY, 2603 WILBUR AVENUE, ANTIOCH, IN-SITU REMEDIATION OF TETRACHLOROETHENE, CONTRA COSTA COUNTY

Forestar Real Estate Group (Discharger) submitted a Notice of Intent, dated 28 January 2010, requesting coverage under General Order No. R5-2008-0149, General Waste Discharge Requirements for In-situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds and/or Petroleum Compounds. Based on information in your submittal, it is our determination that this project meets the required conditions to be approved under Order No. R5-2008-0149. All of the requirements contained in the general order are applicable to your project. You are assigned Order No. R5-2008-0149-009.

Project Location:

The project is in the City of Antioch in Contra Costa County, California.
Township 2N; Range 2E; Section 16,17,20,21; Assessor's Parcel No. 051031005.
Latitude 38° 00' N; Longitude 121°46'

Project Description:

Operations at the former Gaylord Container Corporation Facility, East Mill at 2603 Wilbur Avenue in Antioch caused pollution of the soil and groundwater. The primary pollutant of concern is tetrachloroethylene (PCE). Between 1947 and 1991, the site operated as a virgin paper and pulp facility. The facility used the Kraft process to manufacture finished paper products.

In May 2008, injection well IW-1 and monitoring wells MW-20 and MW-21, located upgradient of well MW-13, were installed. A hydraulic pumping test on well IW-1 was performed, with

water level monitoring of wells MW-13, MW-20 and MW-21. The hydraulic study showed favorable results.

In October, 2008, a draft In-Situ Chemical Oxidation (ISCO) pilot study work plan was prepared. This work plan indicated that groundwater sampling would be performed at additional locations during ISCO full scale system installation to confirm the extent of the treatment area, and subsequent to treatment to confirm success of the treatment. The proposed work included the installation of three additional monitoring wells and procedures for conducting the ISCO pilot studies using persulphate activated with sodium hydroxide.

Two chemical oxidants, potassium permanganate and Klozur (sodium persulfate manufactured by FMC) activated by sodium hydroxide (NaOH) were considered for ISCO treatment, and were assessed by ARCADIS using bench-scale tests to determine if ISCO treatment could work on the groundwater pollution at the site. Bench scale testing measured the soil oxidant demand (SOD) for potassium permanganate and NaOH-activated sodium persufate. Dissolved metals (arsenic, chromium, iron, and manganese), cations (calcium, managanese, potassium, and sodium), and anions (bromide, chloride, fluoride, nitrate, and sulfate) were also measured during the bench scale tests. Manganese and potassium concentrations increased for the potassium permanganate bench scale test and the sodium concentrations increased during the persulfate test. The dissolved arsenic, chromium, and calcium concentrations measured during the bench scale tests were noticeably lower for sodium hydroxide activated persulfate than for permanganate. Because the bench scale test indicated that changes to dissolved metals were less with persulfate than with permanganate, NaOH-activated sodium persufate was selected by ARCADIS for the pilot study.

In January 2010, PES Environmental, Inc. (PES) revisited the selection of the ISCO reagent and proposed using permanganate rather than NaOH-activated sodium persulfate. This selection was based on additional bench-scale testing of the SOD for potassium permanganate, the fact that pH effects may have influenced ARCADIS' bench scale dissolved metals results for the NaOH-activated sodium persulfate, the ease of field application with the use of only one reagent, and the fact that persulfate is less stable than permanganate and will not persist as long in the subsurface. Permanganate can be transported a larger distance and thus a larger radius of influence (ROI) can be achieved.

PES completed additional hydrogeological investigations in 2009; the results of these investigations indicated the consistent presence of a fine-grained unit (consisting of sandy silts, clayey silts, and silt clays) that separates an upper and lower water-bearing zone. In August 2009, existing wells in the pilot study area screened across the fine-grained zone were abandoned and new groundwater monitoring well pairs with screen intervals in the upper and lower zones were installed. New injection wells were also installed with the upper zone injection well (IW-1U) screened from 19.5 feet below ground surface (bgs) to 29.5 feet bgs and the lower zone injection well (IW-1L) screened from 36 to 46 feet bgs.

Other wells installed for this project include: a well pair upgradient of the pilot study area (MW-25U/25L); four well pairs within a 40 foot radius from the injection wells (MW-20U/20L, MW-21U/MW-21L, MW-22U/22L, and MW-24UI/24L); two well pairs located cross-gradient (to the east and west) of the pilot study area (MW-27U/27L and MW-26U/26L, respectively); a well pair screened across upper and lower intervals in the lower zone (MW-23L/23L2) and an upper zone well (MW-23U) at the perimeter of the pilot study area; and a well pair further downgradient of the pilot study area (MW-13U/MW-13L).

The new wells within the pilot study area will be monitored to access reagent distribution during the ISCO pilot study and to confirm the estimated 20 foot radius of influence..

The Discharger will also be conducting sampling and reporting the results as described in the attached Groundwater Monitoring and Reporting Program (MRP). If the Discharger desires to conduct longer-term in-situ remediation of the groundwater, a revised Notice of Intent must be submitted and a new Notice of Applicability received prior to proceeding with the additional remediation.

No comments were received on the draft Notice of Applicability and Monitoring and Reporting Program during the 30-day public comment period ending date 20 August 2010.

General Information:

1. The project will be operated in accordance with the requirements contained in the General Order and in accordance with the information submitted in the Notice of Intent, and *Addendum to ISCO Pilot Study Work Plan* dated January 27, 2010.

2. The required annual fee (as specified in the annual billing you will receive from the State Water Resources Control Board) shall be submitted until this Notice of Applicability is rescinded.

3. Injection of materials other than potassium permanganate or sodium permanganate into the subsurface is prohibited.

4. Failure to abide by the conditions of the General Order could result in an enforcement action as authorized by provisions of the California Water Code.

5. The project will implement the final contingency plan included as part of the Notice of Intent within 30-days of it being triggered. The General Order requires a contingency plan for corrective actions should water quality exceed the requirements of the Order at the point of compliance. The general order prohibits concentrations of metals, TDS, or electrical conductivity 20% greater than their respective background concentrations. As a contingency plan, the Discharger will cease potassium permanganate additions, implement more frequent monitoring to confirm results, and if declining trends are not noted, submit a NOI to inject a neutralizing solution or reducing agent.

6. The Discharger shall comply with the attached Monitoring and Reporting Program, Order No. R5-2008-0149-009, and any revisions thereto as ordered by the Executive Officer.

If you have any questions regarding this matter, please call Siddharth Sewalia at (916) 464-4658 or contact him at ssewalia@waterboards.ca.gov.

Original Signed by Fredrick Ross for,

PAMELA C. CREEDON
Executive Officer

Attachment: Monitoring and Reporting program Order No. R5-2008-0149-009

cc: Della Kramer, Regional Water Quality Control Board, Sacramento
Katherine Hilf, DTSC, Berkeley, California
Kate Burger, DTSC, Sacramento, California
Susan Gahry, PES Environmental, Inc., Novato, California
William Goodrum, Forestar Real Estate Group, Austin, Texas

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2008-0149-009

FOR
IN-SITU GROUNDWATER REMEDIATION AT SITES WITH VOLATILE ORGANIC COMPOUNDS, NITROGEN COMPOUNDS, PERCHLORATE, PESTICIDES, SEMI-VOLATILE COMPOUNDS AND/OR PETROLEUM HYDROCARBONS

FORMER GAYLORD CONTAINER CORPORATION FACILITY, EAST MILL
CONTRA COSTA COUNTY

The former Gaylord Container Corporation Facility, East Mill (Site) is located at 2603 Wilbur Avenue in Antioch, California (Figure 1). The groundwater at the Site has been affected by tetrachloroethene (PCE).

This Monitoring and Reporting Program (MRP) describes requirements for monitoring the progress of the potassium or sodium permanganate injection as an in-situ application to remove volatile organic compounds. 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. As appropriate, California Regional Water Quality Control Board, Central Valley Region (Central Valley Water 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.

GROUNDWATER MONITORING

As shown in Figure 1 and 2, there are 19 monitoring wells, and two injection wells associated with the in-situ chemical oxidation (ISCO) Pilot Study at this site. The groundwater monitoring program for these wells and any treatment system wells installed subsequent to the issuance of this MRP, shall follow the schedule below. Sample collection and analysis shall follow standard EPA protocol and sample analyses shall be completed by California State certified laboratory.

The monitor wells and injection wells shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 2, as shown below. However, for monitoring the upper zone injection activities, the lower zone well monitoring will include only wells MW-23L and MW-24L. If adverse water quality changes are observed in wells MW-23L or MW-24L within six months of injection, wells MW-20L, MW-21L, and/or MW-22L shall also be monitored. Monitoring and reporting of constituents other than volatile organic compounds shall cease from all monitoring wells when the impacts of the injection activities are no longer noted.

Table 1: Sampling Frequency and Constituent Suite

Well Number[1]	Frequency	Monitoring Objective
MW-13U, MW-13L, MW-23U, MW-23L, MW-23L2, MW-25U, MW-25L, MW-26U, MW-26L, MW-27U, MW-27L	Quarterly	Compliance[2]
IW-1U, IW-1L, MW-22U, MW-22L, MW-24U, MW-24L	Quarterly	Treatment Zone[3]
MW-20U, MW-20L, MW-21U, MW-21L	Quarterly	Transition Zone[4]
MW-13U, MW-13L, MW-23U, MW-23L, MW-23L2, MW-25U, MW-25L, MW-26U, MW-26L, MW-27U, MW-27L, IW-1U, IW-1L, MW-22U, MW-22L, MW-24U, MW-24L, MW-20U, MW-20L, MW-21U, MW-21L	Prior to Injection	Background

[1] Well numbers as shown on Figure 1 and Figure 2.
[2] Wells used to determine compliance with water groundwater limitation.
[3] Wells sampled to evaluate in-situ remediation progress inside the treatment zone (20-foot radius).
[4] Wells sampled to evaluate migration of pollutants within the treatment zone (39.5 foot radius).

Table 2: Analytical Methods

Constituent	EPA Analytical Method[1]	Maximum Practical Quantitation Limit [2]
Volatile organic compounds	EPA 8260B	0.5 µg/L
Cations [3]	EPA Method 6010B/300.0	0.5 mg/L
Anions [4]	EPA Method 6010B/300.0	200-300 µg/L
Nitrate	EPA 300.0	300 µg/L
Iron, total and dissolved	EPA 200.7	100 µg/L
Total dissolved solids	EPA 160.1	50 mg/L
Ammonia	SM 4500D	0.1 mg/L
Chemical oxygen demand (COD)	5220D	10 mg/L
Ferrous and ferric iron	EPA 200, 6020 or SM 3000	100 µg/L
Total phosphate	SM 4500P	0.03 mg/L
Metals, total and dissolved [5]	EPA 200.7, 200.8	Various
Hexavalent chromium	EPA Method 7196	0.50 µg/L

[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 as an estimated value.
[3] Cations include calcium, magnesium, sodium, and potassium.
[4] Anions includes chloride and sulphate.
[5] Metals include barium cadmium, total chromium, copper, lead, manganese, mercury, molybdenum, nickel and silica (dissolved only).

FIELD SAMPLING

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

Table 3: Field Sampling Requirements

Parameters	Units	Type of Sample
Groundwater elevation	Feet, Mean Sea Level	Measurement
Oxidation-reduction potential	Millivolts	Grab
Electrical conductivity	µhmos/cm	Grab
Dissolved oxygen	mg/L	Grab
pH	pH Units (to 0.1 units)	Grab
Temperature	^{o}C	Grab
Volume purged	Gallons	Measurement

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 item (b) of the “Reporting” section of this MRP.

DISCHARGE MONITORING

The Discharger shall monitor daily the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 4. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the aquifer.

Table 4: Discharge Monitoring Requirements

Parameters	Units	Type of Sample
Injected volume	gallons per day	Meter
Amendment(s) added	kilograms per day	Measured

AMENDMENT ANALYSIS

Prior to use, amendments shall be analyzed for the constituents listed in Table 5. The analysis should be done on a mixture of the amendment and deionized water at the estimated concentration that would be injected during the pilot project.

Table 5: Amendment Analytical Requirements

Constituent	EPA Analytical Method[1]	Maximum Practical Quantitation Limit (µg/L)[2]
Volatile organic compounds	EPA 8260B	0.5
General minerals[3]	Various	Various
Metals, total and dissolved[4]	EPA 200.7, 200.8	Various
Semi-volatile organic Compounds	EPA Method 8270	5.0
Total dissolved solids	EPA 160.1	10,000
pH	meter	NA
Electrical conductivity	meter	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] Alkalinity, bicarbonate, potassium, chloride, sulfate, total hardness, nitrate, nitrite, ammonia.
[4] 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 PCE, dissolved iron, dissolved manganese, arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium, silica, total dissolved solids and electrical conductivity in groundwater following the procedures found in CCR Section 20415(e) (10). The Discharger shall complete a baseline monitoring event to establish background concentrations values prior to the implementation of the pilot test.

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. 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 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.

Hard copies of quarterly reports shall be submitted to the Central Valley Water 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, by-products of the injectant, how and when samples were collected, and whether the pollutant plume(s) is delineated;

(b) field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, and groundwater elevations in the wells, etc.;

(c) groundwater contour maps for all groundwater zones, if applicable;

(d) 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 report, which may be submitted in an electronic format;

(i) the status of remediation, operating time, effectiveness of the treatment, and prediction of when water quality objectives will be met; and

(j) a description of amendment analysis and injection activities including quantities of water and amendments injected into the groundwater, along with time period over which the amendments were injected into the aquifer.

An Annual Report shall be submitted to the Central Valley Water Board by **1 February** 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 fourth quarter 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 effectively treated;

(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 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 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: Original Signed by Fredrick Moss, for
PAMELA C. CREEDON, Executive Officer

August 26, 2010
(Date)