3R - 425

WORKPLAN AMENDMENT

11/28/2011

CONESTOGA-ROVERS
& ASSOCIATES

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December 2, 2011

Reference No. 075034

Mr. Glenn von Gonten
New Mexico Oil Conservation Division
1220 South Saint Francis Dr.
Santa Fe, NM 87505

Dear Mr. von Gonten:

Re: ConocoPhillips San Juan 29-7 Unit 37 Subsurface Remediation Work Plan
Replacement Pages with NMOCD-Requested Modifications
API No. 30-039-07643
NMOCD No. 3R-425
CRA Project No. 075034

Enclosed please find a copy of the replacement pages for the ConocoPhillips San Juan 29-7 Unit 37 Subsurface Remediation Work Plan as compiled by Conestoga-Rovers and Associates, Inc. (CRA) in response to the December 1, 2011 letter issued by the New Mexico Oil Conservation Division (NMOCD) conditionally approving the San Juan 29-7 Unit 37 Site Characterization Report and Subsurface Remediation Work Plan, which were submitted to the NMOCD on November 28, 2011 on behalf of ConocoPhillips by Conestoga-Rovers and Associates (CRA).

Changes have been made to the following sections of the referenced work plan as follows:

1. On Page 9, Section 3.4, Second Paragraph: "Approximately 90 to 93 injection points (IPs), depending on Site surface and subsurface structures, will be used to inject an estimated 60,000 gallons of *Cool-Ox*™ solution over an approximate area of 5,950 ft^2 (70 ft x 85 ft) to treat approximately 8,815 yd^3 of impacted soil (Figures 6 and 7)."

2. On Page 11, Section 3.6: "Groundwater samples from all Site monitoring wells will be analyzed for BTEX by EPA Method 8260B, HPC by Method 9215, dissolved manganese and selenium by Method 6010B, nitrate and sulfate by Method 300.0, and total dissolved solids (TDS) by Method SM2540C. Groundwater samples will be collected quarterly for at least one year from MW-4 and a nearby water supply well and analyzed for nitrate, sulfate, and TDS in order to attempt to demonstrate those constituents are at background levels at the Site. Confirmation soil samples will be analyzed for TPH-GRO and TPH-DRO by Method SW8015B or 8260B and BTEX by EPA Method 8260B."

CONESTOGA-ROVERS
& ASSOCIATES

September 8, 2011 Reference No. 075040

If you have any questions or require additional information, please contact me at (505) 884-0672 or keblanchard@craworld.com.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Kelly E. Blanchard

Kelly E. Blanchard
Project Manager

KB/cd/1
Encl.

cc: Richard Hodgson, Referenced Property Owner
Terry Lauck, ConocoPhillips (Electronic Only)
Brandon Powell, NMOCD

patented solution of calcium peroxide that generates hydrogen peroxide slowly and facilitates the oxidation of petroleum hydrocarbons. A simple stoichiometric diagram for the reaction is included as Appendix A. The Material Safety Data Sheet (MSDS) for *Cool-Ox*™ is included as Appendix B. The *Cool-Ox*™ treatment facilitates an accelerated biodegradation of petroleum hydrocarbons following the oxidation phase by releasing nutrients without any exothermic reaction and reduces the mobility, toxicity and volume of the hydrocarbon impacts. The process is based on using hydrogen peroxide as the generator of the oxidizing radicals; however, unlike the traditional Fenton Reaction, or Fenton-like processes that use liquid hydrogen peroxide, the *Cool-Ox*™ process generates hydrogen peroxide from solid, food-grade, peroxygens that are injected into the soil and/or groundwater in an aqueous suspension. Once in place, the peroxygens react to produce hydrogen peroxide without an exothermic reaction as would occur with a Fenton-like process. The *Cool-Ox*™ process eliminates Fenton-like problems because the peroxygens employed are only sparingly soluble in aqueous solutions, and thus, the dissolution rate is quite slow. Once injected, they remain in the impacted media for an extended period of time before undergoing hydrolysis. The low solubility coupled with the buffered solution and the process taking place at a slightly basic pH eliminates the need to inject iron salts and results in greater control over the process. The *Cool-Ox*™ process treats a wide range of chemicals due to the controlled nature of the process and the slightly alkaline pH of 8 and also works well in calcareous soils.

The *Cool-Ox*™ process to treat the subsurface soil and groundwater impacts at the site will utilize a small probe, direct push technology (DPT) drill rig supported by DTI's mixing and injection trailer (the Deep-Shot-Rig™) to advance temporary 1.5-inch diameter injection points on 8-foot spacings in the area shown in Figure 8. Approximately 90 to 93 injection points (IPs), depending on Site surface and subsurface structures, will be used to inject an estimated 60,000 gallons of *Cool-Ox*™ solution over an approximate area of 5,950 ft^2 (70 ft x 85 ft) to treat approximately 8,815 yd^3 of impacted soil (Figures 6 and 7). In the area that was excavated, the injection process will begin at 30 ft-bgs and continue to the depth that was assessed during the investigative phase (Figures 6 and 7). The depth of vadose zone soil impacts that were delineated during the investigative phase varied from 40 ft-bgs to top of groundwater, which was encountered at approximately 110 ft-bgs. Therefore, on the edges of the soil impacts the injection will be from near surface to 40 ft-bgs and near the center of the impacts or near the release point from 30 ft-bgs to a depth of 110 ft-bgs. In addition, Monitoring Wells MW-1, MW-6, MW-7 and MW-8 will be used to inject *Cool-Ox*™ into groundwater.

The reaction of the injected *Cool-Ox*™ with the hydrocarbons will be expressed if impacts are encountered and noted in the site logbook. A characteristic of the *Cool-Ox*™

technology is the production of a lather (resembling dirty shaving cream), when the reagent reacts with hydrocarbon impacts. However, at depths greater than 30 feet, the reaction may not be observed on the surface. If impacts are present at the IPs and visible on the surface, the evolution of foam reveals impacts. During the treatment process it is quite normal to adjust the injection technique and IP spacing to compensate for varying site conditions or impacts. Each temporary injection point will be sealed using hydrated bentonite.

3.5 CONFIRMATION SAMPLING

To evaluate the effectiveness of the *Cool-Ox*™ treatment of soil and groundwater at the site, groundwater will be monitored on a quarterly basis following the completion of the injection of the *Cool-Ox*™ for one year. After one year, the monitoring program and the analytical program will be revaluated and appropriately amended, if necessary.

Groundwater samples will be collected for analysis of BTEX and heterotrophic plate count (HPC) analysis, as well as dissolved manganese and dissolved selenium, the only NMWQCC regulated metals that were discovered above their respective standards during the initial baseline sampling event in March 2011. The HPC data will be collected to verify biodegradation (i.e. increased hydrocarbon-degrading microbe populations) after the *Cool-Ox*™ treatment. In addition, field parameters to include dissolved oxygen (DO), pH, temperature, oxidation reduction potential (ORP) and specific conductance will be measured and recorded. Groundwater samples will be collected using a disposable bailer and placed into the appropriate laboratory-provided containers following field parameter measurements.

Approximately four months after the completion of the *Cool-Ox*™ treatment, subsurface soil samples will be acquired at the site from five (5) borings that will be located within the treatment area. Subsurface soil samples in the affected areas will be collected either continuously or at a minimum of every five (5) feet depending on subsurface conditions, such as staining, using a hollow-stem auger (HSA) drill rig in conjunction with a split-spoon sampler. The split-spoon samples will be screened using the PID, which will be calibrated daily and samples selected for analyses by the site geologist will be placed into an appropriate sample container for submission to the laboratory. The samples selected for laboratory analyses will be determined based on the olfactory, visual evidence and head space analysis using the PID. At a minimum, the soil sample with either the highest head space concentration per boring and at the total depth of the boring will be submitted for laboratory analysis. For head space analysis, a portion of the soil sample interval will be placed into a clean Ziploc bag, allowed to warm for 30

minutes and then screened using the PID. The data will be recorded in the site logbook and on the lithologic log form.

Each sample for laboratory analysis will be identified by the soil boring number, depth of the sample, date and time of the sample collection, requested analyses and initials of the sampler. The samples will be placed in an ice-chilled cooler immediately for transport under chain-of-custody protocol to the laboratory.

The split spoon sampler will be decontaminated prior to the collection of each sample. Drilling and sampling equipment will be thoroughly cleaned prior to initiation of drilling activities and in between each boring location at the site. Decontamination procedures for the split-spoon sampler will include a wash with an Alconox (or similar) detergent solution, a fresh water rinse, and air-drying if possible. The drilling equipment will be cleaned between each boring with a high-pressure steam cleaner. All soil borings will be sealed and plugged with hydrated bentonite chips upon completion of each boring. CRA Standard Operating Procedures will be followed as in Appendix C.

3.6 ANALYTICAL PROGRAM

Groundwater samples from all Site monitoring wells will be analyzed for BTEX by EPA Method 8260B, HPC by Method 9215, dissolved manganese and selenium by Method 6010B, nitrate and sulfate by Method 300.0, and total dissolved solids (TDS) by Method SM2540C. Groundwater samples will be collected quarterly for at least one year from MW-4 and a nearby water supply well and analyzed for nitrate, sulfate, and TDS in order to attempt to demonstrate those constituents are at background levels at the Site. Confirmation soil samples will be analyzed for TPH-GRO and TPH-DRO by Method SW8015B or 8260B and BTEX by EPA Method 8260B.

3.7 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control measures will be followed according to industry accepted standards. One duplicate groundwater sample will be collected for each sampling event and one duplicate soil sample will be collected during the confirmation soil sampling. A trip blank will be included in each cooler shipped to the laboratory. The trip blanks will be analyzed for BTEX. A temperature trip blank will be included with each submitted cooler and used to determine temperature at the time of submission to the lab.