Maryland
Department of
the Environment

Larry Hogan, Governor
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September 2, 2020

Mr. Joseph Ogren
Project Manager
ExxonMobil Environmental Services
38 Varick Street
Brooklyn, NY 11222

RE: BIOSPARGE MW-91C - APPROVAL
     Case No. 2006-0303-BA
     Former Exxon R/S No. 2-8077
     14258 Jarrettsville Pike, Phoenix
     Baltimore County, Maryland

Dear Mr. Ogren:

The Maryland Department of the Environment's (MDE) Oil Control Program (OCP) completed a review of the *Biosparge Pilot Test Report and Work Plan,* dated July 30, 2020. The report provides the results of data collected during a 6-month biosparge pilot test performed to further evaluate if subsurface conditions are conducive to natural attenuation and biodegradation of residual petroleum contamination in the project study area. The study was performed in accordance with the *Proposal for Monitored Natural Attenuation Study*, dated July 25, 2019; the *Proposal for Monitored Natural Attenuation Study Addendum*, dated September 26, 2019, and MDE's *Approval for Monitored Natural Attenuation Study*, dated October 25, 2019.

A total of 40 monitoring wells (MWs) were selected throughout the study to evaluate conditions for natural attenuation and biodegradation. Samples were collected to evaluate the presence of microbes that can degrade gasoline constituents, including methyl tertiary-butyl ether (MTBE) and, if present, evaluate if the microbes are active. Geochemical data, including dissolved oxygen (DO), pH, temperature, oxidation reduction potential (ORP), nitrate, sulfate, ferrous iron, methane, and orthophosphate were collected via field instruments and test kits for laboratory analysis. Microbial testing was conducted using Biotrap samplers and QuantArray analyses as well as performing isotopic fractionation testing to assess microbial existence, specific microbial contaminant degraders, and to demonstrate biodegradation. Based on the data evaluation, ExxonMobil concluded that biodegradation is occurring and the potential for continued natural attenuation of petroleum contamination exists.

Site-wide ORP data were also collected from all monitoring wells throughout the Jacksonville study area. The data showed discrete areas of low ORP values occurring in the deep portion of the aquifer at 3501 Hampshire Glen Court, which also corresponded to residual petroleum concentrations observed in this area. This indicates that biodegradation may be enhanced with additional dissolved oxygen.

Based on the findings of the previous natural attenuation data collection, a biosparge pilot test was performed that introduced ambient air into the subsurface to stimulate aerobic biodegradation by increasing dissolved oxygen. The pilot test was conducted over a 6-month period (November 5, 2019 through April 20, 2020) at MW-91C. Ambient air was injected (sparged) at a low flow rate into MW-91C at a depth of approximately 150 feet below ground surface (bgs) to target the fracture previously identified at 145 feet. Monitoring of geochemical parameters, water levels, and biodegradation testing was performed at select monitoring wells and transducers were deployed in MW-91 and MW-185 to collect temperature, pH, ORP, specific conductivity, and depth to water continuously throughout the test. In addition, monthly groundwater gauging and sampling were conducted at select wells and, after the pilot test was completed (shut off air to MW-91C), groundwater samples were collected at select wells for up to one week.

The findings of the pilot test showed favorable results. Most notably, down-gradient well MW-136C [R] showed overall decreasing trends in MTBE concentrations (from a baseline concentration of 340 parts per billion [ppb] to 3 ppb near the end of the biosparge test) and overall increasing ORP levels. Results of the biosparge pilot test also showed increases in MTBE concentrations in two monitoring wells at the end of the test. Specifically, MW-183 reported a pre-test MTBE concentration of 1 ppb and a post-test concentration of 66 ppb near the end of the biosparge event. MW-184 reported a pre-test MTBE concentration of 1 ppb and a post-test concentration of 24 ppb near the end of the pilot test.

Overall, the results of the biosparge pilot test showed that natural attenuation and biodegradation are occurring, which indicates that subsurface conditions are favorable for enhanced biodegradation. In order to further enhance and stimulate biodegradation, Kleinfelder, on behalf of ExxonMobil, proposes to initiate and continue biosparge in MW-91C. Monthly sampling for DO, ORP, temperature, and pH will be collected from monitoring wells MW-91, MW-183[R], MW-184[R], MW-185[R], MW-138D [R], MW-176 [R], and MW-168. Groundwater gauging and sampling will be performed on the current sampling frequency (i.e., quarterly for these wells except for MW-91 and MW-168, which are semi-annually). Data and interpretation will be included with the quarterly *Remedial Action Progress Reports*.

The MDE approves the proposal to initiate continued biosparging at MW-91C. Kleinfelder must report any changes in data trends of dissolved concentration levels in any nearby monitoring/recovery wells or private supply wells, petroleum constituents at or above groundwater standards in monitoring wells, or other unanticipated results to OCP immediately, via email.

If you have any questions, please contact Ms. Ellen Jackson at 410-537-3482 (ellen.jackson@ maryland.gov) or me at 410-537-3389 (andrew.miller@maryland.gov).

Sincerely,

Andrew B. Miller, Chief
Remediation Division
Oil Control Program

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cc: Joseph P. Perez, Esquire, ExxonMobil Corporation
       Mr. Mark Schaaf, Kleinfelder East, Inc.
       Mr. Kevin Koepenick, Manager, Groundwater Management Section, Baltimore County DEPS
       Ms. Julie Kuspa, Office of Attorney General
       Mr. Christopher H. Ralston, Program Manager, Oil Control Program