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DEPT OF ENVIRONMENTAL QUALITY
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MAY 28 2010
NORTHWEST REGION

Ms. Erin McDonnell
Oregon Department of Environmental Quality
Cleanup and Environmental Response
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201

Dear Ms. McDonnell:

Re: Source Area Treatment Plan for Groundwater Cleanup
Intel Corporation
3585 SW 198th Avenue
Aloha, Oregon

On behalf of Intel Corporation (Intel), AMEC Earth & Environmental, Inc. (AMEC) is submitting this source area treatment plan. To take advantage of favorable pricing, Intel has purchased and stockpiled the treatment material and is looking forward to implementing this plan.

BACKGROUND AND PURPOSE

Full-scale groundwater remediation began in August 2007 by means of repeatedly injecting a lactate solution into injection wells completed in the shallow (Willamette Silt) aquifer to stimulate natural bioremediation of chlorinated solvents.

As was originally described in the Remedial Action Work Plan (dated July 2006), repeated injections of lactate solution near the historical source area, inside the service courtyard, are not feasible because injection hoses and manifolds would conflict with heavy vehicle traffic. Instead, the plan proposed a one-time injection of a longer-lasting carbon source into temporary injection wells.

The originally planned carbon source was emulsified vegetable oil, but after gaining operational experience injecting the lactate solution into the site's low-permeability silty soils, it was realized that it would not be feasible to inject the emulsified vegetable oil beyond only a few feet into the aquifer.

The untreated gaps between wells would result in insufficient treatment, unless many more temporary wells were installed close together. Because this would increase project costs, Intel now plans to use a different carbon source that can be injected into a wider area, thus requiring fewer injection wells. The alternate carbon source is 3DMeTRADEMARK, manufactured by Regenesis Corporation. The plan for this work is described below.

DESIGN

Rationale. Key product details are described in manufacturer literature provided in Attachment 1. The key idea is that 3DMe provides controlled-release of three different electron donors that operate in sequence over time: lactic acid, polylactate esters, and free fatty acids and fatty acid esters. Collectively, the product is effective over a two to five year timeframe. Upon injection, the carbon source migrates downgradient through the aquifer. Estimated groundwater velocities in the treatment area are slow enough (0.1 to 0.2 feet per day, or 35 to 70 feet per year) to allow the material to provide the hydrogen needed for enhanced biodegradation as the material migrates through the 20- to 50-foot-long treatment area. Migration of the treatment compound is anticipated to be retarded by sorption, followed by release, such that the bulk of the injected material will move slower than that of the encompassing groundwater. The chemical basis for this behavior is described in manufacturer information provided in Attachment 1.

Permits and Utility Checks. Before beginning drilling activities, proposed well locations will be checked for public and private underground utilities. The drilling contractor will file start cards and reports for the injection wells with the Oregon Water Resources Department (WRD). Before drilling, the injection wells will be registered with the DEQ's underground injection control program as remediation injection wells. After coring access holes through the pavement, a vacuum knife will be used to clear the well boreholes for underground utilities to a depth of 5 feet.

Well Locations and Design. The planned locations of the temporary injection wells are shown in Figure 1. As described above, the wells are located "shoulder to shoulder" at the upgradient side of the treatment area so that the treatment solution will migrate uniformly through it. The horizontal distance between adjacent wells is 10 feet, for an injection radius of 5 feet. As explained in Appendix D the RAWP, this spacing minimizes the number of wells while still allowing for injection to completely fill the soil cylinder around each well within one work day while using injection pressures that are low enough to avoid hydrofracturing the soil.

The injection wells will be 30 feet deep, with screens extending between depths of 10 and 30 feet. This injection interval is the same as in the other injection wells. The source-area injection wells will also be constructed in the same manner as the existing injection wells - after using a core barrel to advance the boreholes, prepack-screen injection wells will be completed in direct-push boreholes and foam bridges, bentonite packers, and granular bentonite will be used to seal the wells to the ground surface where flush-mounted protective well covers will be cemented into the ground. The well component information is found in Appendix F in the RAWP. The soil core from two of the boreholes will be sampled for possible bioavailable ferric iron assays; these tests are used to help evaluate the role that ferric iron may play in biodegradation. Information about the assay may be found at http://www.estcp.org/viewfile.cfm?Doc=ER-0009-C%26P-FerricIron.pdf .

Dose. The amount of 3dMe product needed was conservatively estimated to be 127 4.25-gallons buckets (3,810 pounds net weight), based on an estimate developed by Regenesis using conservative input data from AMEC. The information is conservative, because it is based on historical (high) as well as more recent (2003) (lower) concentrations reported in the "Groundwater Characterization for Expanded Pilot Lactate Injection Study" report submitted to the DEQ on August 11, 2003. For example, the dose was calculated using the following concentrations: 200 µg/L for 1,1-trichloroethane, 14 µg/L for 1,1-dichloroethane , 120 µg/L for trichloroethene, 200 µg/L for 1,1-dichloroethene, 150 µg/L for cis-1,2-dichloroethene, and 40 µg/L for vinyl chloride. This information is provided in Attachment 2.

Injection Volumes. The injection wells will be 30 feet deep, with screens extending between depths of 10 and 30 feet. Into these 20-foot-high columns, approximately 2,000 gallons of treatment solution mixed to a 30:1 ratio of water to 3DMe will be injected into each of the seven temporary injection wells, to form a laterally continuous injection front that will move advectively through the treatment area.

Treatment Solution Mixing and Delivery. The 3DMe will be mixed with water according to manufacturer instructions, which are provided in Attachment C. Briefly, the product will be warmed if the temperature is less than 50 degrees Fahrenheit, mechanically stirred, and then added, one bucket at a time, to ten times the bucket volume of water, followed by the use of a high-shear pump to recirculate and mix the product with the water. Mixing will originally occur in a 10:1 water:product ratio, after which additional water will be added to form a 30:1 ratio. The makeup water will be obtained from an onsite supply.

After mixing is completed, the treatment solution will be pumped from one or more mixing tanks near the groundwater treatment building through the existing buried lactate-distribution piping to either vault A or vault B3. Using the same procedures and equipment that are currently used for lactate injection, quick-connect hose will then be attached to the piping, and the hose will be used to convey the solution to a manifold, from which smaller distribution hoses will lead to the individual injection well. The manifold will contain pressure gauges, flow meters, and valves to control the injection process.

Secondary Containment. Accidental spillage of the treatment material and solution during transfer and mixing could result in the spilled liquids entering the Intel storm water system, the same system to which treated groundwater discharge is regulated under NPDES point source and industrial activity permits. Because the permits regulate TDS, it is important to prevent the accidental spillage of emulsified oil or lactate from entering the storm water system. To prevent accidental spillage, AMEC will set up a mobile secondary containment unit around mixing and pumping equipment.

Well Decommissioning. After injection is completed, each injection well will be decommissioned by removing the well screen and casing from the borehole, advancing a soil core barrel to the original depth of the borehole to remove backfill materials, and then sealing the borehole to the ground surface with low-permeability high-solids bentonite grout placed via a tremie pipe inside the cased borehole. The casing will be withdrawn as the grout is placed. The pavement subgrade and pavement will then be replaced. Decommissioning reports will be filed with the WRD.

Remediation-Derived Waste. Soil removed from well boreholes (pavement and soil cuttings) will be containerized pending chemical profiling and disposal. Profiling will consist of obtaining a composite sample for VOCs using U. S. Environmental Protection Agency (USEPA) method 8260B. The laboratory results will be compared with USEPA characteristic hazardous waste criteria and Oregon DEQ Risk-Based Concentrations. Experience suggests that it will be possible to dispose of the cuttings as solid waste at Hillsboro Landfill, but this decision will be determined by the test data.

SAFETY PLANS

The existing site-specific health and safety plan (HASP) for AMEC personnel consists of modules developed for routine groundwater monitoring, ongoing operation and maintenance of the IRAM system, and lactate-solution injection. The HASP will be updated to address the planned source area work (well installation and decommissioning, and operation of the injection system). Before undertaking drilling or construction, AMEC will also complete the Intel-specific Safety Improvement Process Plan (SIPP) for review and approval by Intel.

REPORTING

After completing the planned injection (including decommissioning the injection wells), AMEC will document construction and operational details in the next regularly scheduled semiannual progress report. The information to be presented will include the following:

- Summary narrative description of all completed work.
- Detailed description of injection system (wells, mixing, and pumping equipment).
- Explanation of modifications to plans and reasons for modifications.
- Final as-built drawing of well layout.
- Well logs.
- Permits (UIC and wells).
- Photographic log of work.
- Field records documenting injection volumes.
- RDW profiles and disposal records.
- Surveyor report.

SCHEDULE

Intel would like to implement this plan in June or July 2010, depending on receipt of plan approval. To minimize conflicts with site traffic, the work would take place on three successive weekends. The wells will be installed on the first weekend. The injections will occur on the second weekend. The wells will be decommissioned on the third weekend.

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If you have questions, please contact Stephanie Shanley of Intel or the undersigned at (503) 639-3400.

Sincerely,

AMEC Earth & Environmental, Inc.

Russell A. Bunker

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Associate Geologist

John L. Kuiper

John L. Kuiper, R.G.
Vice President

Attachments: Figure 1
Attachment 1: 3DMe Product Information
Attachment 2: 3DMe Dose Estimate
Attachment 3: 3DMe Mixing Instructions

RB/jm

c: Stephanie Shanley; Intel, Hillsboro, Oregon
Tom Cooper; Intel, Santa Clara, California
Ralph Moon; HSA Engineers and Scientists