ROCKY FLATS SITE
REGULATORY CONTACT RECORD

Purpose: Phase II and III Upgrades to Solar Ponds Plume Treatment System

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Discussion: As approved in Rocky Flats Legacy Management Agreement (RFLMA) Contact Record 2008-07, installation of a collection sump, solar powered pumping system and effluent piping upgrade to the Solar Ponds Plume Treatment System (SPPTS) was completed in October 2008. That upgrade is referred to as the SPPTS Phase I upgrade. Data collected subsequent to Phase I are intended to inform further SPPTS upgrades, and this Contact Record documents the plans for the Phase II and Phase III upgrades. The data collection associated with these phases is intended to inform evaluation of alternatives for final system upgrades, referred to as Phase IV.

The Phase I upgrade has been successful in capturing additional contaminated groundwater for treatment. The system influent flow increased by about a factor of 2 (in late October through December, 2008), to approximately 0.8 gallons per minute. Analytical data from samples collected after completion of the Phase I upgrade show that the SPPTS Discharge Gallery (DG) and the SPPTS treated effluent now have very similar concentrations, indicating that the new effluent discharge line installed as part of the Phase I upgrades is successfully limiting the commingling of contaminated groundwater with SPPTS treated effluent. These data also show a reduction in nitrate and uranium concentrations at the DG since the completion of Phase I. Analytical results to date for nitrate contamination at various SPPTS sampling points are shown in Figures 1 and 2. These figures incorporate analytical data reported by contract laboratories, as well as by in-house analyses. The in-house analyses cost less and give quicker results than analyses performed by contract laboratories, but are not suitable for compliance reporting. As indicated, following completion of the Phase I upgrades, the concentration of nitrate in untreated influent increased by about a factor of 2 to 3, to approximately 650 milligrams per liter (mg/L) nitrate (as nitrogen [N]). These figures show that the effluent concentrations of nitrate have increased as well. (To a lesser extent, this is also true for uranium: influent concentrations of uranium increased by about one-half, to about 55 micrograms per liter [ug/L], while effluent concentrations have increased to about 15 ug/L.) (Note that the new RFLMA SPPTS effluent monitoring point, SPOUT, is located in the equipment vault near the collection sump installed during the Phase I upgrade, and replaces former effluent monitoring location SPPMM01 as approved in Contact Record 2008-08. Location ITSS represents water collected in the Phase I collection sump; other locations are defined in the RFLMA.)

The current nitrate standard for North Walnut Creek is 100 mg/L as N, based on the surface water standard temporary modification (TM) for this portion of Segment 5 of Big Dry Creek. The TM is set to expire on December 31, 2009, after which the underlying water supply standard of 10 mg/L nitrate as N will apply. (See RFLMA Attachment 2, Table 1.) RFLMA Attachment 2, Figure 11,

"Groundwater Treatment Systems", provides the criteria for evaluating routine analytical results for the treatment system sampling locations specified in RFLMA Attachment 2, Table 2. For the SPPTS, nitrite/nitrate (as N) and uranium are monitored under RFLMA. The evaluation is applicable to the influent (SPIN), effluent (SPOUT), and performance (GS13) locations. If routine RFLMA compliance sampling produces results that cause the 85th percentile of data to exceed the corresponding value specified in RFLMA Attachment 2, Table 1, then the RFLMA consultative process is initiated to determine if actions should be implemented. While the data currently being collected from post-Phase I monitoring are more extensive than the RFLMA required routine monitoring, and although the data include in-house analyses that are not used for determining compliance with the RFLMA, it is clear from Figures 1 and 2 that contaminant concentrations at the influent, effluent, and surface water performance location have increased. If these conditions were to continue, the 85th percentile concentrations of nitrate and uranium in the effluent and at the surface water performance location would eventually exceed the corresponding Table 1 values. The goal of the proposed Phases II, III, and IV is to optimize treatment so that the underlying water supply standard of 10 mg/L can be met.

Construction of Phase II and III is scheduled to begin in the spring of 2009. The RFLMA consultative process has been initiated to describe the corresponding plans and to determine whether and to what extent actions should be implemented. The U.S. Department of Energy (DOE) and the Colorado Department of Public Health and Environment (CDPHE) consulted on January 15, 2009 to review DOE's conceptual plans for Phases II and III of the SPPTS upgrades.

The Phase II objective is to install a new uranium treatment cell upstream of the two existing treatment cells. Currently, the second of the two existing treatment cells (Cell 2; downstream of Cell 1) is designed to remove uranium (predominantly through precipitation reactions occurring within the zero valent iron [ZVI] media), though some ZVI is also mixed in the nitrate-treating media of Cell 1. Routing untreated water through the ZVI for uranium removal prior to the nitrate treatment media is anticipated to allow future disposal of the nitrate media as non-radioactive waste. The new ZVI cell location and design will also allow for easier periodic replacement of the ZVI media without impacting the nitrate treatment media. The actual uranium treatment method using ZVI will remain unchanged.

The Phase III objective is to install pilot-scale nitrate treatment cells to evaluate improved nitrate bio-treatment technologies. In this case, Phase III will evaluate an inert substrate with the metered addition of nutrients, and a mixture of organic material combined with vegetable oil; both media types should provide enhanced biological denitrification. Again, the actual treatment method using biological denitrification will remain unchanged.

Pursuant to RFLMA paragraph 34, DOE may implement field modifications that are consistent with the intent of the approved response action, after receiving oral approval from CDPHE, and documented in a Contact Record. Upon approval, DOE may implement the SPPTS modifications as documented in this Contact Record. In addition, pursuant to RFLMA paragraph 66, DOE and CDPHE do not consider addition of the Phase II uranium treatment cell, the Phase III pilot-scale nitrate treatment cells, or a subsequent Phase IV upgrade based on the proposed Phase III pilot-scale tests, separately or collectively, to constitute a significant change from RFLMA's existing requirements. This is because the actual treatment methods used are not changed via the installation of Phases II or III (or, by extension, Phase IV). This Contact Record shall be used to provide public notice of these modifications to the SPPTS.

DOE has prepared an evaluation of the proposed nitrate treatment approach, *SPPTS Phase III: Pilot-Scale Optimization of Nitrate Treatment*, which is included as Attachment 1 to this Contact Record.

CDPHE has reviewed the DOE evaluation and has determined that it provides sufficient information to justify the installation of the Phase III pilot scale cells. Also, CDPHE agrees with DOE that the Phase II ZVI cell installation upgrade is likely to make future uranium treatment media replacement easier while improving performance and simplifying disposal of the nitrate media.

Over the longer term, the proposed SPPTS Phases II, III, and IV will address the effluent contaminant concentrations currently observed, but for the short term rejuvenation of the existing media may warrant consideration. While replacement and/or rejuvenation of the current SPPTS media would be expected to reduce the effluent nitrate concentrations, current information suggests such actions would not reliably reduce concentrations to target levels, given the higher contaminant loads resulting from the Phase 1 upgrades. Furthermore, current information suggests the SPPTS effluent nitrate concentrations may continue to negatively impact water quality in portions of North Walnut Creek downstream of the SPPTS (as reflected at performance monitoring point GS13) despite replacement/rejuvenation of the existing media. Even if the existing 10-year old nitrate media was fresh, the volume of media is insufficient to provide adequate treatment given current contaminant loads. Therefore, media replacement is not seen as a reasonable response, over either the short term or long term, to these conditions. Instead, the system upgrades are most appropriate for the long term, but media rejuvenation remains worthy of consideration for the short term.

CDPHE also agrees that prior to deciding whether and when the existing SPPTS media should be rejuvenated, DOE may perform tracer tests to determine if media "short-circuiting" or water channeling is contributing to apparent reduced nitrate removal. The tracer to be used, currently anticipated to be sodium bromide, and the field procedure for conducting the tracer test will be submitted to CDPHE prior to conducting the test. The tracer test shall be conducted to comply with the remedy Applicable or Relevant and Appropriate Requirements (ARARs) for groundwater and surface water for the tracer chemical (note that there is no Colorado surface water or groundwater standards promulgated for sodium bromide). The test will be designed to limit the amount of tracer substance used, to achieve ARARs for surface water and groundwater. An appropriate sampling frequency and analyte suite for comparison to ARARs will be described in the tracer test plan.

If the tracer test indicates satisfactory flow (i.e., minimal channeling), rejuvenation of the existing nitrate media, which is predominantly sawdust with a small amount of ZVI mixed in, will be proposed. The rejuvenation method currently envisioned involves injecting emulsified vegetable oil into the media, thereby adding a readily-available carbon source to the relatively depleted carbon of the sawdust, providing additional nutrients to the bacteria currently present and stimulating bacterial denitrification. If channeling is indicated, media rejuvenation would have limited or negligible effect and rejuvenation will likely not be attempted.

The Phase II upgrade includes the addition of a commonly used water softener chemical, currently expected to be sodium citrate, to reduce iron scale buildup in the downstream system components, including the pilot-scale nitrate treatment cells. The Phase III upgrade includes the addition of a food-grade nutrient carbon source to the influent water. The treatment will be designed to control the amount of additive used. The use of these additives will be conducted to meet the remedy ARARs for groundwater and surface water.

While the proposed Phase II and III upgrades do not involve any construction within habitat of the threatened Prebles Meadow Jumping Mouse, DOE will also inform the US Fish and Wildlife Service (USFWS) regarding the proposed use of the tracer chemical and treatment additives. Small concentrations of these substances may be expected in the SPPTS effluent and in the downstream

surface water that is within mouse habitat. This notification will facilitate an evaluation, if needed, of any potential impacts to the mouse or its habitat for these compounds to determine whether a biological assessment (BA) is needed for the project. The USFWS must approve the BA.

The conceptual design for Phases II and III is included in Figure 3. The construction involves excavation prohibited by the institutional controls (ICs) incorporated in RFLMA. The excavation work will exceed the 3-foot-depth limit specified by ICs (RFLMA, Attachment 2, Table 4, Control 2 [IC 2]) and thus requires pre-approved procedures. Specifically, this work will entail excavation to maximum excavation depths of approximately 10 feet below ground surface (10 ft. bgs) for most of the construction, with new pipe connections made at the influent to existing Cell 1 at a depth of approximately 15 ft. bgs.

The objective of IC 2 regarding excavations with a depth that exceeds 3 feet is to maintain the current depth to subsurface contamination or contaminated structures. This IC also results in achieving compliance with the CDPHE risk management policy of ensuring that residual risks to the site user are at or below 1×10^{-6}. As discussed below, the proposed work achieves the risk management policy goal.

Excavation will be reduced to the extent feasible. This will reduce both the size of the disturbed area and the volume of materials and supplies consumed for the project. The best management practices in the *Erosion Control Plan for Rocky Flats Property Central Operable Unit, DOE-LM/1497-2007*, July 2007 will also be implemented to provide erosion controls for the excavated materials so that run-on and runoff will be minimized.

CDPHE has requested that the following information be included in contact records that include soil excavation:

1 - Provide information about any remaining subsurface structures in the vicinity so that the minimum cover assumption won't be violated (or state that there are none if that is the case)-

There are no remaining subsurface structures in the vicinity, so cover assumptions will not be violated.

2 - Provide information about any former Individual hazardous Substance Sites/Potential Areas of Concern (IHSSs/PACs) or other known soil or groundwater contamination in the vicinity (or state that there is no known contamination)-

This construction area was not an IHSS. The *RI/FS Nature and Extent of Soil Contamination* figures do not indicate soil contamination in this area. Groundwater in the vicinity is impacted by the Solar Ponds Plume. Any groundwater that is encountered will be collected from the excavation, if necessary, to conduct the construction work. If excessive amounts of groundwater are intercepted in the excavation, the water will either be pumped from the excavation to the surface generally southwest (upgradient) of the SPPTS to allow this water to seep back into the ground, as approved in Contact Record 2008-06, or will be containerized and transported to the SPPTS for treatment, at the discretion of the field crew.

3 - Resurvey any new surface established in subsurface soil, unless sufficient existing data is available to characterize the surface (or state that the excavated soil will be replaced and the original contours restored)

Portions of the Phase II ZVI cell, the Phase III pilot scale cells, and equipment vaults will be above the ground surface. A solar power system for powering pumps, instrumentation, and controls will also be above ground. Otherwise, the final ground contours will approximate the pre-excavation contours. Excess soils generated from the excavation will be used generally for revegetation in the construction area and on-site as available. An as-built survey will be performed after construction is completed.

Closeout of Contact Record: This contact record will be closed when the as-built survey is completed and when post-construction revegetation and erosion controls are in place.

Resolution: The installation of the SPPTS Phase II and Phase III upgrades will be conducted as described in this Contact Record. The tracer test plan will also be provided to CDPHE.

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