FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
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April 6, 2015

Mr. Scott Miller
Remedial Project Manger
EPA- Region IV
Superfund North Florida Section
61 Forsyth Street, SW
Atlanta, Georgia 30303

RE: February 2015 Pre-final ISGS Design for the Process Area at the Koppers Superfund site

Dear Scott:

Thank you for the opportunity to review the above referenced design report. We offer the following comments below as well as the enclosed comments from the DEP-Office of District & Business Support, DWM.

- Results of the pre-demo pilot indicate that there was a broad range in reduction of DNAPL recovery ranging from 40% to up to 97% within the pre-demo pilot area. Overall, response in DNAPL recovery in the pilot area suggests potential effectiveness and distribution of the ISGS reagent. However, the range in response in the TIPs, the apparent absence of unreacted permanganate in the cores, and the reduced but persistent DNAPL recovery suggests that, as noted by EPA, perhaps the pilot area or individual intervals was under-dosed using the proposed 4.5% concentration with a reagent volume design specification of 7% of the pore space. In addition, an inspection of the cores showed a wide range of contact including untreated areas of mobile DNAPL. Is the proposed injection protocol adequate to provide a consistent ROI and good sweep, effective encapsulation, and to overcome the combined pSOD of the matrix and DNAPL?
- Given the absence of unreacted reagent in the cores and the variability in DNAPL recovery in the pre-demo pilot study area, we recommend that this area be included for retreatment in the upcoming full scale injection program.
- It is unclear how the ranking of reacted reagent in the cores (1-3) is represented in Figure 2-9a and 2-9b and therefore how a conclusion that the 15' effective ROI was consistently accomplished was reached. Does the ranking consider the % coverage of reacted reagent in the core interval? It might be helpful to see additional cross-sections within the pilot area to better see the variability of reagent distribution.
- Thank you for the additional Process Area cross-sections showing the range in DNAPL distribution based on 3.0 to 3.6 DNAPL ranking. It appears that applying the 3.6 criteria addresses the majority of DNAPL including residual DNAPL when compared to the proposed treatment intervals. This does not resolve the concerns expressed above

regarding sweep and distribution. We remain concerned that the surgical ISGS approach to address source may not take into account the limitations of the DNAPL characterization based on the 40' spaced soil borings.

- In all of the cross-sections, data collection appears to terminate 10-15' above the middle clay? We were of the understanding that cores obtained during the process area characterization extended to the Hawthorn middle clay, supporting the interpretation that there was less DNAPL in this lower interval.
- Available DNAPL recovery data from the pilot area to date is through January 2015. What does more recent data show? Is expected improvement (e.g. continued decline in DNAPL recovery rates) anticipated over time without retreatment? If so, what is the theoretical mechanism by which this would work without retreatment?
- The report speculates that injections resulted in displacement of some of the arsenic plume. If this is the case, how does Beazer propose to minimize lateral or vertical displacement of the COC plume or DNAPL with the broader scale injection of significant volumes of reagent over the entire process area? Perhaps consideration should be given to an injection program that sequences injections starting from the perimeter of the process area and moving toward the interior, or starting from the eastern edge of the process area and moving westward? What COC monitoring of the dissolved plume is proposed during or following the full scale treatment to evaluate this? Lower Hawthorn monitoring wells should be included to support this evaluation.
- How will the number and location of the post injections cores be selected to evaluate the effectiveness of the full scale treatment? Should locations be selected to evaluate or correlate the degree of sweep and encrustation based on the observed *range* in DNAPL recovery rate reduction across the process area?
- Commenters have requested clarification of the Criteria for success. According to the 2012 ISGS work plan, Table 1:
    - The 1st 6 months should demonstrate decline in rate of DNAPL recovery, presence of precipitate encrustation where DNAPL is present, and permanganate in contact with the majority of DNAPL in cores. A "*minimum* of 15 cores" throughout the entire treated interval is specified for confirmation in Table 1 of the work plan.
    - At the 6 month to 18 month period, "significant decline in DNAPL flow is expected" with "little or no DNAPL flow to the wells".
    - At 18-36 months, "decline in the rate of DNAPL to wells is maintained".
    - The 2012 work plan was open ended with regard to the post 5 year monitoring scope and criteria but did identify 5 criteria that would be applied at the FYR for evaluation and confirmation of the effectiveness of ISGS as the final remedy. 2012 comments from EPA and DEP requested further elaboration on how those criteria would be evaluated.
- With regard to what might trigger a reapplication of ISGS reagent either more broadly or in a more focused manner, the 2012 work plan appears to specify both at the 6-18 month period and the 18-36 month period, that a *trend* documented by the following would trigger an evaluation of the need for retreatment:

    1) An absence of material reduction in DNAPL,

    2) Appearance of recoverable DNAPL in previously unaffected monitoring wells, and/or

3) Rebound in DNAPL recovery rates.

In addition, cores installed in the first 6 months after treatment must show encrustation and contact of the permanganate injectate with the *majority* of DNAPL, indicating good sweep and distribution.

Is a temporary post-treatment spike indicative of an effectiveness issue if longer term monitoring shows decline to minimal DNAPL recovery? Could DNAPL spikes indicate DNAPL mobility?

- UIC- Table 1 of the 2012 work plan specifies that UIC criteria be met at all phases of performance monitoring, stating that there is "No unpermitted migration of ISGS components beyond the ZOD laterally or vertically" and "no ISGS solution observed beyond the ZOD laterally or vertically". Review of the results of the pre-demo pilot UIC monitoring to date indicates:
    - Apparent increases in UIC analytes were observed for As, Fe, Mn, and Na in the first 2 post injection events. Data from subsequent November and February 2015 monitoring events will be helpful to evaluate any trends, including data from the down gradient Temporary ZOD monitoring wells, HG26S and HG26D. Please provide this data when it is available.
    - Fe in M-25A and M-36B appeared to show an increasing trend. Mn did not appear to show an increasing trend in surficial compliance monitoring wells, except M-25A.
    - Elevated levels of Fe in HG-24S make it suspect as a true UIC background well and make interpretation of consistently elevated levels of Fe in HG-33S difficult. HG-34S at baseline was significantly below the GCTL but above the GCTL for Fe by the 2nd post injection sampling event. Mn was not observed above GCTL in any HG-S or HG-D compliance monitoring wells. Al, Cd and Fe in particular were above GCTLs in the UIC background well HG-22D making it suspect as a true UIC background well as well and interpretation difficult since no sample results from HG-26D have been provided to date.
    - Lithium was not detected in any post-ISGS pilot monitoring well samples, suggesting possible limited lateral migration of the ISGS reagent. Was lithium tracer of high enough concentration to be detected down gradient in the UIC compliance monitoring wells if migration occurred?
    - There was no discussion regarding observed purple or reacted reagent in groundwater samples in compliance monitoring wells, if any. Please discuss.
- UIC- DEP remains concern with the potential for lateral and vertical migration of UIC analytes as well as COCs during the full scale ISGS injection; given the much large volume of reagent that will be injected, the existing head difference across the middle clay, the potential for an increased head difference during injection, and the evidence of historic vertical DNAPL or dissolved plume migration based on offsite Lower Hawthorn wells. In the 2014 UIC authorization, DEP agreed that a Lower Hawthorn compliance well at the institutional control (IC) boundary could be installed once the location of the eastern slurry wall was known. However, it appears that a final eastern boundary may not be confirmed until after completion of the full scale Process Area ISGS treatment.

In order to ensure representative baseline water quality in the Lower Hawthorn point of compliance (POC) well and to support determination of compliance with the UIC ZOD requirements, a Lower Hawthorn compliance monitoring well must be installed prior to full scale implementation of the ISGS injections in the Process Area. This Lower Hawthorn monitoring well may be used not only for UIC compliance but as a POC well to demonstrate the progress and effectiveness of the site remedy and to confirm that GCTLs are met in offsite groundwater at the institutional control boundary as required by the 2011 Amended ROD.

We are available to discuss selection of this Lower Hawthorn well location, as well as possible background well locations, and incorporation of this compliance well(s) into the final UIC related monitoring program, prior to implementation of full scale ISGS treatment in the Process Area.

Please let us know if you have any questions or would like to discuss these comments further. We understand that a revised ISGS Design will be submitted prior to implementation.

Sincerely,

Kelsey Helton
DEP- Waste Cleanup Program

Enclosures

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JONATHAN P. STEVERSON
SECRETARY

MEMORANDUM

TO: Kelsey Helton, Professional Geologist
Waste Site Cleanup Section, Waste Cleanup Program

THROUGH: Brian Dougherty, Administrator
Office of District & Business Support, DWM

3/27/2015
X
BJD
Signed by: Brian Dougherty

FROM: Zoe Kulakowski, Professional Geologist
Office of District & Business Support, DWM

3/27/2015
X ZPK
Signed by: kulakowski_z

SUBJECT: Cabot Carbon/Koppers Superfund Site,
Gainesville, Alachua County,
Pre-Final Design for Former Process Area ISGS Remediation
WC-SF 000000007

DATE: March 27, 2015

I have reviewed the February 13, 2015 referenced document prepared by Tetra-Tech for the referenced site. The objective of the ISGS treatment is threefold: provide (1) DNAPL immobility, (2) DNAPL containment/stabilization, and (3) solute flux reduction.

The cross sections (Figures 2-9a and 2-9b) show DNAPL rated zones 4 and 5 that were incompletely treated within the Pilot-test area (see east of PT-6 at elevations 155 and 135 feet and between PT-6 and PT-7 at an elevation of 130-135 feet).) The post injection core lithologs (Appendix E) estimation of the percentage of treated NAPL ranges from zero to 100%. Many of these zones are described as "NAPL impacted clayey gravel". Full-scale injection uses the same 40-foot grid characterization data set with 20 foot injection spacing that missed significant DNAPL zones. On page 35 of 842, Section 3.2 and page 36 (top of the page), the text suggests that it is only proposed to treat at the edges (and complete the 20 foot triangular spacing) within the pilot treatment area rather than treating internal incomplete coverage discovered by post injection cores. What changes can be made to improve reagent sweep and distribution? During the March 25, 2015 teleconference, did we accurately understand that full-phase implementation will treat the pilot test partially treated areas?

The cross sections on Figures 3-3a to 3-3d show the observed extent of DNAPL and proposed location of the full implementation injection intervals. (By the way I appreciate and prefer the level of detail showing DNAPL impacts rated 3.0 and higher even if a decision is made to treat only areas rated 3.6 and higher.) This observed extent of DNAPL is based on EVS kriging of the Phase I characterization borings spaced 40 feet apart. With the results of the post ISGS injection cores showing untreated intervals of NAPL, what is the uncertainty that the DNAPL extends

deeper between the 40' characterization grid and how critical might this be to meet the objectives? Further, the 40' logs often describe gravel near the top of the Middle Clay and many of the TIPs at these locations contain recoverable NAPL (examples from the north end of the Process Area: 400N/380E, 420N/345E, and 460N/340E). The presence of gravel gives greater potential permeability for NAPL and with the observed injection pressures; these zones could be likely candidates for pressure-induced NAPL migration. Other than monitoring the TIP network for new and increased flow NAPL observations, how can we insure the NAPL stays in the Upper Hawthorn and does not migrate into the Lower Hawthorn? The Lower Hawthorn needs a down gradient monitoring network to detect water quality changes and to define the Lower Hawthorn potentiometric surface.

We need to understand the treatment zones depicted on Figures 2-9a and 2-9b. The treatment widths are narrow on some sides of the post-injection cores and thick on others. Is this due to anisotropy or the projection of nearby core information onto this cross section?

Cross sections are needed that summarize EVS projections, with injection point locations and treatment zones with the locations and NAPL observations of the post-injection cores (adding the core information to an enlarged view similar to the Figure 2-9a and 2-9b "3) cross section"). Suggested cross section slices are: PTC-8/PTC-7/PT6/PTC-6/(440N/380E)/PTC-5/PTC-4 and PT12/PTC-11/PTC-10/PT7/PTC-6 and PT12/PT9PTC-9/PTC-8/PT5/PT1PTC-2/PTC-1.

The decline in DNAPL recovery rates from the pilot injections from the two TIPs in the Pilot treatment area are not significant enough to demonstrate source control and immobilization of mobile DNAPL. For a successful implementation from the full-scale injections, DNAPL recovery should drop to very low levels or zero recovery rates.

I do not consider the three wells (for the surficial, Upper Hawthorn and Lower Hawthorn zones) selected for UIC background wells to be appropriate for establishing upgradient background water quality coming into the treatment area. Considering that the pilot test UIC permit has been issued, we can accept data from the three wells, but please note that if compliance of any parameters becomes an issue, only data from appropriately located wells will be able to resolve any background/anthropogenic source issues related to incoming groundwater quality.

If you have any questions, please contact me at (850) 245-8982.

/zpk

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MEMORANDUM

TO: Kelsey Helton, P.G.
Waste Site Cleanup Section, WCP

THROUGH: Brian Dougherty, Administrator
Office of District & Business Support, DWM

4/6/2015
X
BJD
Signed by: Brian Dougherty

FROM: Lanita L. Walker, PE III
Office of District & Business Support, DWM

4/6/2015
X Lanita L Walker
LLW
Signed by: Walker LL

SUBJECT: Cabot/Koppers Superfund Site
Gainesville, Alachua County
Pre-Final Design for Former Process Area In-Situ Geochemical Stabilization Remediation, dated February 13, 2015
Site ID: 000000007

DATE: April 6, 2015

I have reviewed the referenced report.

A minor spelling error on Page 22; "Exceptions are areas where the ~~IGSS~~ (ISGS) injections".

The report states, "The final ISGS reagent will be a 4.5 percent-weight solution of RemOx® EC. KMnO4/kg for the UH. The pSOD for the DNAPL-rich samples for the Surficial Aquifer ranged from 24.24 and 26.68 g KMnO4/kg in the former Process Area and former North Lagoon, respectively. The pSOD for the DNAPL-rich samples in the UH were 34.77 and 39.83 g KMnO4/kg in the former Process Area and former North Lagoon, respectively."
How does the 4.5 percent-weight solution of RemOx® EC compare to the concentration of KMnO4 needed to overcome the naturally occurring demand?

The teleconference with EPA, client representation, GRU and FDEP was held on March 25, 2015 to discuss the project. Many of the FDEP's questions and comments duplicate those of the EPA and GRU; and therefore where not included in this memo. A majority of the questions and comments were resolved during the discussion and will be documented in project correspondence.

If you have any questions, please contact me at (850) 245-7502.

Lanita L. Walker