



Soil Treatability Study

Energy Technology Engineering Center • U.S. Department of Energy

Soil Treatability Investigation Group July 19, 2012 Draft Group Memory

Logistics

The Soil Treatability Investigation Group met on Thursday, July 19, 2012 from 5:30 – 9:00 p.m. in the conference room at Corporate Point, located at 8411 Fallbrook in West Hills, California.

Participants

The following STIG members participated in the meeting in person: William Preston Bowling, Rick Brandlin, Margery Brown, Diana Dixon-Davis, Sharon Lee Ford, Holly Huff, Christian Killkka, Bonnie Klea, Dawn Kowalski, Betsey Landis, Marie Mason, Mark Osokow, Chris Rowe, Teena Takata, Barbara Tejada, Christina Walsh, and Ronald Ziman.

STIG members who did not attend included: Gloria Bowman, Jackie Curry, John Detwiler, Wayne Fishback, Barbara Johnson, David Karchem, John Luker, Jim McElvaney, Lissa Miller, Noa Rishe, Brian Rogers, Alan Salazar, Brian Sujata, Alec Uzemeck, Abraham Weitzberg, Rosemarie White, PhD, Jacquie Young, and Joanne Yvanek-Garb.

Observers/agency representatives included: Jazmin Bell (US Department of Energy [DOE]), Dixie Hambrick (MWH), Stephanie Jennings (DOE), Patricia Johnson (Sandia National Laboratories [SNL]), John Jones (DOE), Debbie Kramer (Chenega), Yvette LaDuke (California Department of Toxic Substances Control [DTSC]), Christi Leigh (SNL), Roger Paulson (DTSC), Laura Rainey (DTSC), Janis Trone (SNL), and John Wondolleck (CDM Federal).

Objectives

The July 19th meeting was designed to support discussion about the following topics:

- Study boundaries and objectives
- The final results from the soil remediation technology screening exercise; what technologies have been eliminated and what technologies are still under consideration for soil remediation
- The concept of uncertainty, where uncertainties regarding soil remediation lie, and research in the form of treatability studies is used to resolve uncertainty
- Preliminary list of possible treatability studies that could be used to address identified uncertainties, how that list is being developed, and how the list will be prioritized
- Next steps.

Welcome and Introductions

Stephanie Jennings (DOE) welcomed everyone and thanked them for their willingness to participate in the Soil Treatability Investigation Group (STIG). She introduced Wendy Lowe (P2 Solutions) as the meeting facilitator. All others in attendance introduced themselves.

Review of Study Boundaries and Objectives

Christi Leigh (SNL) reviewed what the SNL team has done to date for the Soil Treatability Study and the study boundaries and objectives. She explained that SNL started with a literature review of the many technologies that are available and consulted with a panel of experts. Next they established study boundaries and objectives to “down select” from the universe of technologies to those that would be most appropriate at ETEC.

The study boundaries were developed based on the Administrative Order on Consent (AOC) and include:

- The goal of the chosen remediation alternatives will be to meet the established cleanup levels or reduce the contaminant concentrations/volume of soil to be excavated
- There will be no "leave in place" or on site burial/land filling of contaminated soils
- Remediation alternatives will be in place by 2017
- Incineration (burning that forms an ash) will not be used as a remediation alternative
- Remediation alternatives will not exacerbate existing contamination issues or create new contamination problems
- Treatability studies being conducted for groundwater and unweathered bedrock are ongoing and will not be duplicated
- Plants that are not native or not naturalized to SSFL will not be considered as part of phytoremediation technologies (native plants will be considered first, as applicable).

The objectives are consistent with the AOC and reflect the expressed concerns of the STIG members. They include:

- Dig-and-haul/excavation will be minimized as much as possible
- Remediation alternatives will be designed to consider the wild fires, native vegetation, and natural environment as much as possible
- Land and site disturbance will be minimized as much as possible
- Green and innovative/cutting edge technologies will be assessed as much as possible.

Questions asked by the STIG members in response to the presentation included:

- What do the terms “native” and “naturalized” mean in reference to plants that would be used? Naturalized plants are non-native plants that are already found on the site and they would only be used if it were determined that they have already effectively taken up contaminants or could potentially take up contaminants when a truly native plant cannot.
- Would DOE consider using invasive and/or unmanageable plants? No.
- Won't plants used during remediation be disposed? Any plants that are determined to contain contaminants would be harvested and disposed.
- How will DOE distinguish between invasive plants, introduced “naturalized” plants and native plants. California botanists will be employed to assist in this determination.
- How will plants be harvested? Portions of plants may be cut during remediation, but when remediation has been completed, the entire plant will be removed.

- Will it be possible to achieve clean-up by 2017 and phytoremediation simply be disposing plants instead of soil? It is hard to say right now how long any remedial technologies will take. The treatability studies will provide a better understanding of that. Plants would be disposed instead of soil, but a considerably smaller volume would require disposal.
- Why wouldn't the DOE consider using something non-native or non-naturalized? Because the DOE shares the concern expressed by many members of the STIG, namely, bringing non-native or non-naturalized plants into the region could possibly be more destructive to the native environment at ETEC than other treatment remedies.
- Are there any areas of the site that won't grow anything? No.

STIG reactions and responses included:

- Betsey Landis – DOE could use the Santa Monica Mountains National Recreation Area list of invasive plants as a reference. She would prefer to say that only native plants and plants already growing on the site will be used for phytoremediation purposes.
- Mark Osokow – Non-native plants that won't reproduce might be acceptable. DOE might also want to consider sequences of plants that would work.
- Chris Rowe – Consider breaking up area IV into the separate areas (Historical Site Assessment areas) and look at each area to find which plants are growing there and how to control them. Also, DOE should consider whether the plants will be harvested or left in place.
- Christian Killkka noted that the California National Park Service website has a list of invasive species.

Eliminated Technologies and Screened-In Technologies

Christi Leigh provided a presentation explaining the way SNL is selecting remediation strategies for further consideration. Some strategies are active and will take a short amount of time to implement. Two longer term, passive strategies (phytoremediation and an engineered barrier) could be implemented following active strategies. The engineered barrier would not be considered for sites with remaining contamination; rather a barrier could be employed to protect cleaned areas from potential recontamination by soil vapors or contamination by groundwater.

She provided information about each of the active strategies and which contaminants they might prove effective in addressing. This information was provided in great detail in a memorandum that had been provided to STIG members (July 10, 2012 memo titled [ds](#) "Soil Remediation Technology Screening Update") via email.

Questions asked by the STIG members in response to the presentation included:

- Would fertilizers be used to help grow plants used in remediation? Some supplements might be needed, but sometimes fertilizers will stress the plants.
- Could the active phase entail more than one technology, employed sequentially? Yes, that is what is meant by the term "treatment train."
- Why is it better to move the contamination from the soil to a plant? What would happen to the contamination in the event of a wildfire? Would consumption of the plants be harmful to wildlife? All of that needs to be considered. Access to the plants would be controlled during remediation.
- What is an engineered barrier; could dense plant roots serve as an engineered barrier? That is an interesting suggestion.
- Would DOE consider using fungus or mushrooms? Yes

- Are there a lot of uncertainties in using nano-technology? There are uncertainties involved in all of the technologies being considered. That's why a treatability study is needed.

STIG reactions and responses included:

- Christina -Walsh – DOE should consider using plants with dense root systems to function as barriers to help avoid recontamination.
- Rick Brandlin – DOE should evaluate the potential negative impacts of using nano-particles.
- Mark Osokow mentioned that President Clinton signed an Executive Order requiring federal agencies to eliminate use of invasive plants from federal sites. It may still be relevant.
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Defining Uncertainty with Regard to Soil Remediation at ETEC

Christi Leigh began her presentation with an explanation of the concept of uncertainty and provided an example. Three kinds of uncertainties exist regarding potential use of on-site soil remediation technologies:

- Uncertainties about treatment technologies – including uncertainties about the feasibility of the available technologies, uncertainties about the applicability of available technologies, and uncertainties about the optimum way to implement the various alternative technologies
- Uncertainties about specific contaminants - uncertainties about the chemical and physical form of the contamination and the current rate of natural degradation (attenuation) that is already occurring
- Uncertainties about specific clearly contaminated areas (CCA) - uncertainties regarding communication between soil and groundwater, uncertainties about the accessibility of the CCAs, and uncertainties about the contaminant mix that must be addressed.

The studies that will be recommended for inclusion in the Soil Treatability Study will be designed to address uncertainties. The treatability studies will not necessarily require full-fledged demonstration. Options that are being considered at this point include:

- Laboratory testing under controlled conditions could be used to prove the principles and would be most appropriate for technologies that have not been tested in the field or for unproven applications.
- Field testing would be conducted at the ETEC site and could also be used as a proof of principle test; such tests are appropriate for technologies that have worked in similar situations elsewhere.
- On-site “as is” testing would help identify the chemical form of the contamination, determine how much contamination has been taken up into plants already, and answer questions like how much clay is in the soil
- Modeling studies or simulations could help determine the level of communication between the soil and groundwater as well as how long the CCAs will stay contaminated without intervention
- Additional literature and historical data studies could help determine if any natural attenuation has already occurred

Christi shared a few examples of uncertainties and provided a memo addressing the uncertainties identified to date as well as a list of studies that could be conducted to address those uncertainties.

Questions from the STIG members included the following:

- What is background and how does DOE know what to clean to? This is challenging and will be until DTSC approves the Look-up Table that will dictate how clean the site must be before the cleanup can be considered complete.
- Will DOE compare the uptake of on-site to that of off-site plants? Uptake at ETEC is what matters.
- What level of confidence is needed to consider a technology viable? That is a design question.
- Is it possible that some of the studies may have already been done? The studies that have been identified address what is not currently known.
- Should a plant survey be completed? A plant survey has already been completed.
- Is it safe to assume that all of the technologies will reduce the contamination adequately to meet the look-up table numbers? No, it is not safe to assume that.
- Are there different levels and rates of degradation? Yes

STIG reactions and responses included:

- Betsey Landis – The look up table numbers are another form of uncertainty
- Christian Killkkaa – DOE should consider whether a species is invasive as an uncertainty about the applicability of phytoremediation
- Diana Dixon-Davis – DOE should compare on-site and off-site plants to support any conclusions about the effectiveness of phytoremediation
- Betsey Landis – Milkvetch is consumed by animals and should not be removed. Also, the health of the “bug” populations should be considered as introduced bugs won’t be successful if the existing populations are well established.
- Mark Osokow – There are opportunities to test vegetation as it has been removed during the investigations. Efforts should be made to understand how much contamination has been taken up since that vegetation was mowed.

Preliminary List of Possible Treatability Studies

Finally, Christi Leigh reviewed the preliminary list of possible treatability studies that has been identified; they are listed in Tables 7 and 8 in a memorandum that was passed out (titled July 19, 2012 “Identification of Uncertainties Regarding Selection of Soil Remediation Technologies at ETEC”). The list of proposed studies is organized into groups, studies to address technology specific uncertainties (Table 7) and studies to address contaminant-specific uncertainties (Table 8). She briefly reviewed the tables.

The next steps in the process will include:

- DOE and Sandia will accept input from the STIG regarding
 - the uncertainties identified
 - the studies suggested

DOE and Sandia will then work together to prioritize the suggested studies to resolve the most important uncertainties so that DOE and DTSC can select the most effective remediation strategies. Questions from the STIG members included the following:

- Will the extent of contamination drive prioritization of studies? This has yet to be determined.
- Will soil washing occur off-site? Will it involve transportation off-site? When will the community be notified of how much of the site will be treated by what technology? Soil washing will occur on site.
- Will the DOE solicit universities and colleges for participation in the proposed studies? How does the DOE propose to advertise? Yes, DOE is going to solicit help from universities for the studies.

STIG reactions and responses included:

- Margery Brown – DOE should consider the costs of the remedial technologies as well as how long they would take to implement.
- Diana Dixon-Davis – Suggested a cost-benefit analysis be utilized.
- Chris Rowe – Some sites should not be disturbed at all as they have archaeological remains. She is also concerned about the risks and benefits of nano-technology.
- Sharon Ford – Thanks to SNL for considering the possibility of studying how well on-site plants are up-taking contamination.

Group Memories from Prior Meetings

Wendy Lowe noted that she has not received any comments on the Draft Group Memory for the April meeting. The documents are intended to support the STIG members' needs. All are invited to submit corrections every time a group memory is distributed.

Next Steps

The following next steps were noted:

- The STIG members will provide input to SNL on the list of uncertainties and the studies that could be conducted to address the uncertainties by August 3, 2012.
- SNL will develop a final set of recommendations for soil treatability studies that would be most helpful to DOE going forward. That list will be shared at the next meeting.
- The next meeting will be scheduled for Thursday, September 27, 2012.
- Wendy Lowe reminded STIG members can view materials from prior meetings at www.etec.energy.gov.