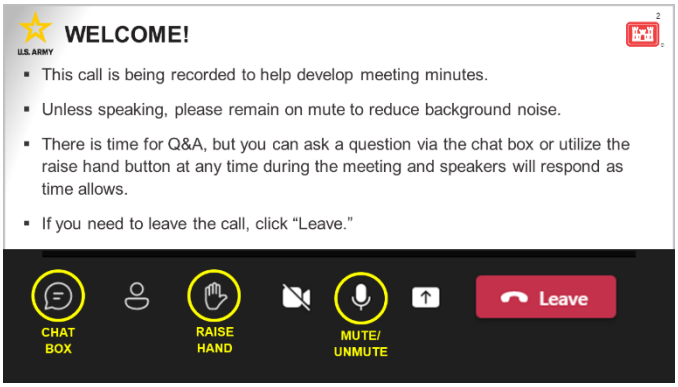
RAB MEETING MINUTES

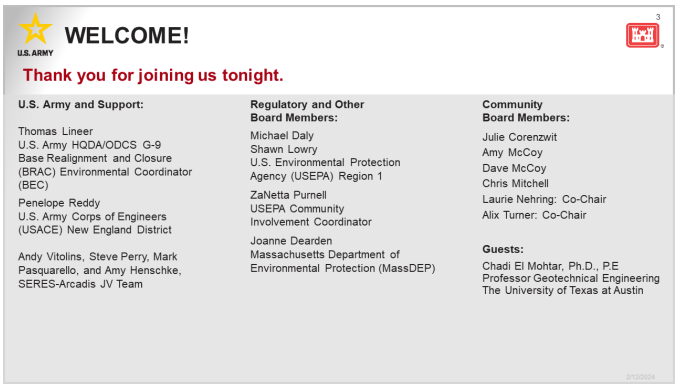
Date/Time:	Thursday, February 8, 2024, 6:30 p.m. to 8:30 p.m.
Location:	Virtual meeting via Microsoft Teams
Attendees:	Restoration Advisory Board (RAB) Community Co-Chair: Laurie Nehring RAB Community Members: Julie Corenzwit, Amy McCoy Thomas Lineer, Steve Cardon, Mark Leeper, Dick Ramsdell (U.S. Army) Penny Reddy (U.S. Army Corps of Engineers [USACE]) Michael Daly, Shawn Lowry, Robert Ford, ZaNetta Purnell (U.S. Environmental Protection Agency [USEPA]) Joanne Dearden (Massachusetts Department of Environmental Protection [MassDEP]) Meg Delorier, Anne-Marie Dowd (Massachusetts Development Finance Agency [MassDevelopment]) Neil Angus (Devens Enterprise Commission) Hagai Nassau, Brian Younkin (Skeo Solutions, Inc.) Chadi El Mohtar (University of Texas at Austin) Andy Vitolins, Steven Perry, Mark Pasquarello, Amy Henschke (SERES-Arcadis Joint Venture [S-A JV]) Chris Turner, Cole Worthy (Haley & Aldrich, Inc.) Libby Levison (Harvard Board of Health) Martha Morgan (Nashua River Watershed Association) Madelyn Bedard (Legislative Aide to State Rep. Meghan Kilcoyne) Dale Levandier, Amanda Kasa, Edith Stephen, Bill Duston, and other attendees participating by phone or are otherwise not able to be identified (community and guests)
Slides:	RAB meeting slides are available on the project website at: https://www.nae.usace.army.mil/missions/projects-topics/former-fort-devens-environmental-cleanup/.
Please Note:	Discussions described in these minutes have been paraphrased as needed for clarity. The invitation for this meeting is provided for reference at the end of these meeting minutes.

WELCOME & OPENING COMMENTS

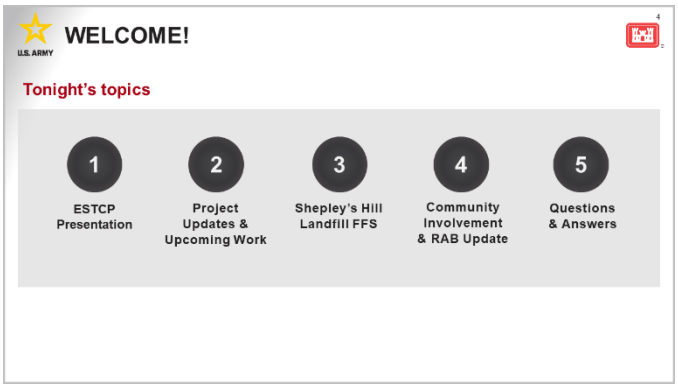
Steven Perry (S-A JV Community Involvement Specialist) opened the meeting and welcomed the attendees.



Steven Perry informed attendees that the meeting was being recorded to generate minutes, which will be available after the meeting. He reminded everyone online that microphones will be muted to avoid background noise. He noted that attendees can use the mute/unmute button at the bottom of their screen to talk or they can enter questions in the chat box.

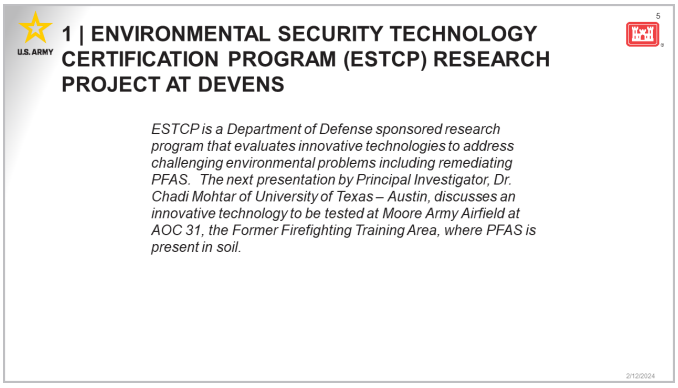


Steven Perry led introductions for attendees. Leaders and contributors for the call included Tom Lineer (U.S. Army); Penny Reddy (USACE); Steven Perry (S-A JV); Andy Vitolins (S-A JV); Mark Pasquarello (S-A JV); Amy Henschke (S-A JV); Mike Daly (USEPA); Shawn Lowry (USEPA); ZaNetta Purnell (USEPA); Joanne Dearden (MassDEP); Chadi El Mohtar (University of Texas at Austin); and RAB members Julie Corenzwit, Amy McCoy, Dave McCoy (unable to attend), Chris Mitchell (unable to attend), Laurie Nehring, and Alix Turner (unable to attend).

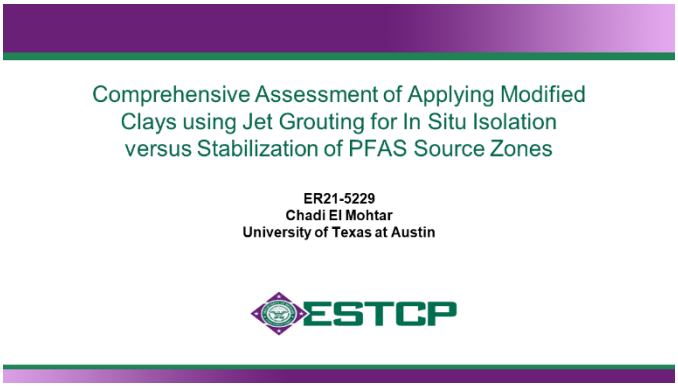


Steven Perry announced the topics for the call.

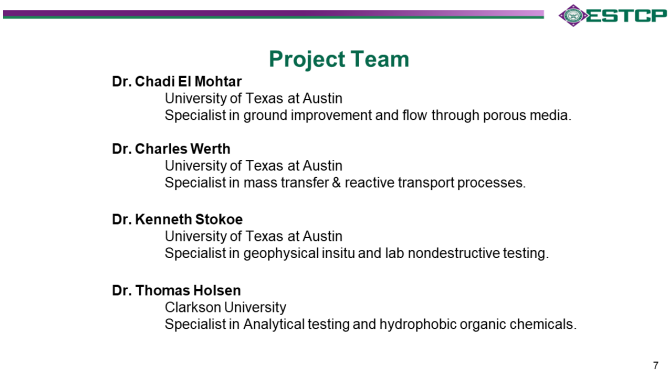
- Remedial technology pilot project that may apply to Devens;
- Update on ongoing project work;
- Focused feasibility study (FFS) for Shepley's Hill Landfill (SHL); and
- Update on community engagement.



Steven Perry introduced Chadi El Mohtar, a principal investigator from University of Texas at Austin who is working within the Department of Defense (DoD) Environmental Security Technology Certification Program (ESTCP).

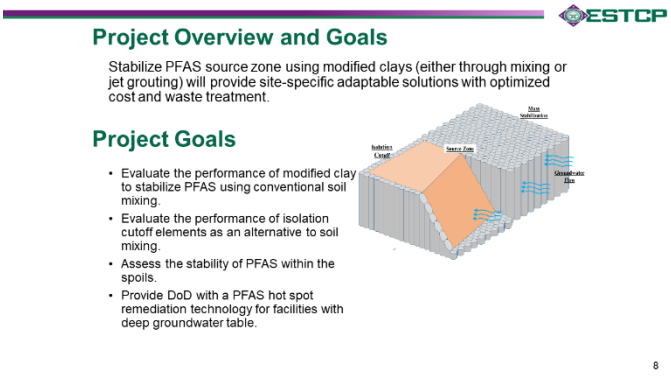


Chadi El Mohtar explained that the potential ESTCP project that may be implemented at Former Fort Devens was funded by the DoD to implement well-established technologies in the field at full scale. This project uses modified clays with jet grouting for in situ isolation of a source zone instead of traditional in situ (in place) stabilization. The modified clay is called FLUORO-SORB, which is a newer version of ORGANOCLAY that has been modified to absorb per-and polyfluoroalkyl substances (PFAS). Jet grouting is a well-established technology, but it has not been used in this kind of application before. The project brings together these two technologies for a new way of isolating PFAS hotspots and reducing potential side effects of in situ stabilization.

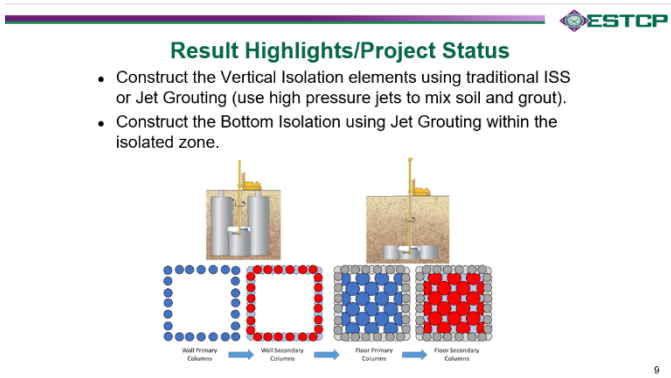


Chadi El Mohtar introduced himself as a professor of geotechnical engineering with a specialty in ground improvement and flow through porous media. He noted the other members of the project team:

- Dr. Charlie Werth, an environmental researcher with a specialization in mass transfer and reactive transport processes;
- Dr. Ken Stokoe, an expert in geophysical and non-destructive testing for field and lab scale studies; and
- Dr. Tom Holsen, a specialist in analytical testing.



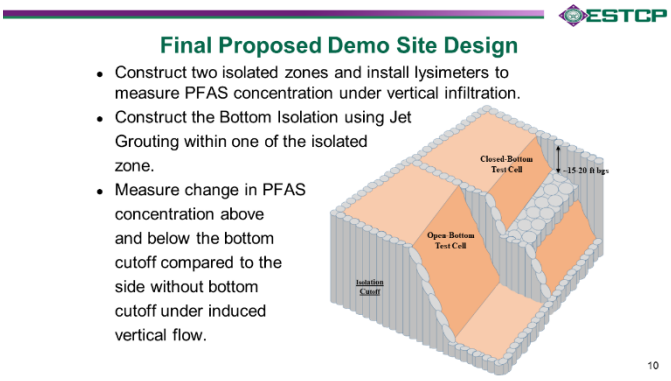
Chadi El Mohtar explained that the project will compare conventional stabilization of PFAS versus isolation. The right side of the figure shows stabilization being used by adding an absorbent material mixed with cement to the pilot-scale area to create a block of treated soils. This method is very effective; however, it requires a lot of material, produces a lot of spoils (especially in saturated ground conditions), and can impact the hydrology and groundwater flow in the region. On the left side of the figure, isolation cutoff is being used by creating walls and a bottom for the treatment cell with the FLUORO-SORB material, which will act like a filter as water flows through, capturing PFAS and preventing PFAS from leaching out. For this project, mass source stabilization (right side of figure) will not be demonstrated because it has already been demonstrated in many other applications. Chadi noted that the isolation technology (left side of the figure), unlike some other technologies, can be applied at sites that have a very deep groundwater table. This technology may be a good option at Devens because the PFAS contamination at the Former Fire Training Area (FFTA) is on top of an elevated area and 60 to 70 feet above the groundwater table.



Chadi El Mohtar described the steps of the project. The first step is to create the walls using jet grouting technology (traditional mixing could also be used). A series of primary columns are installed first, followed by secondary columns in between to ensure continuity. With jet grouting, there are no blades or mixing tools as there are with traditional mixing. Instead, there is a small hole about 6 inches in diameter through which the jet grouting head is lowered. The grout is then injected at a high pressure at the bottom of the hole while the head is spinning and mixes with the soil, creating treated soil at any depth. This allows for the creation of the cell bottom without treating all the soil on top of it.

Chadi noted that, at Devens, the highest contamination levels are from 8 to 12 feet below ground surface. The bottom of the test cell will be created about 15 to 20 feet deep, below the level of the high contamination, to serve as a filter zone. When water passes through this layer, PFAS will get filtered out and captured before it goes down (leaches) to the strata below the test cell.

Steven Perry clarified that the squares on the bottom of the slide show the walls of the test cell if looking down from above. He noted that the grout creates boxes of a cement-like material, which filter the water as it percolates down through the PFAS zone. He also clarified that the diagrams above the boxes on the slide show the machinery that is used from a cross-section perspective, looking through the sides of the test cell walls. Steven asked for the size of the boxes. Chadi replied that they are about 30 feet by 30 feet or 30 feet by 15 feet.



Chadi El Mohtar continued to describe the test that will take place. He noted that two adjacent cells will be created, and lysimeters will be installed to collect water samples. At first, neither cell will have a bottom so that the current level of contamination passing through in the water can be measured. Water will be introduced to the cells, and water samples will be collected and recorded as a baseline. Monitoring will continue for about 6 months. Then, the bottom element will be installed in one of the two cells. Monitoring will continue, and the contamination in the water will be compared between the cells. There is no cross-contamination between the cells. Chadi noted that lab tests showed a reduction of more than 99% of contaminants. The bottom element will be designed to absorb all the PFAS that is in the soil above it.

Chadi El Mohtar presented the general schedule for the project. He noted that there is a technical advisory board that reviews every step of the process. A site selection memo was submitted, and final approval of that is pending. Then, construction plans will be submitted and reviewed by a panel of environmental experts and the DoD. Once approved, the project will be executed and another technical panel will review results.

Installation of the vertical walls and the lysimeters is planned for spring, and monitoring is planned for summer and fall. In fall or early winter, the bottom element will be installed and monitoring will continue.

Chadi noted that one of the biggest advantages with this technology is that it decreases the amount of spoils (soil displaced by the operation) that are produced. Jet grouting generates more spoils than soil stabilization, but since only a perimeter is created, the total amount of spoils will be much less. Also, the spoils will have a high percentage of FLUORO-SORB in them (about 15 to 20%), so they may not have environmental impacts because they have already been treated.

Andy Vitolins (S-A JV Project Manager) further explained that the spoils are the material that is displaced when the grout is injected and returns up through the hole that was used for the jet grouting head. Chadi noted that the treatment is going to occur above the groundwater table in a very sandy material, which is not saturated. This means there should be less spoils generated.

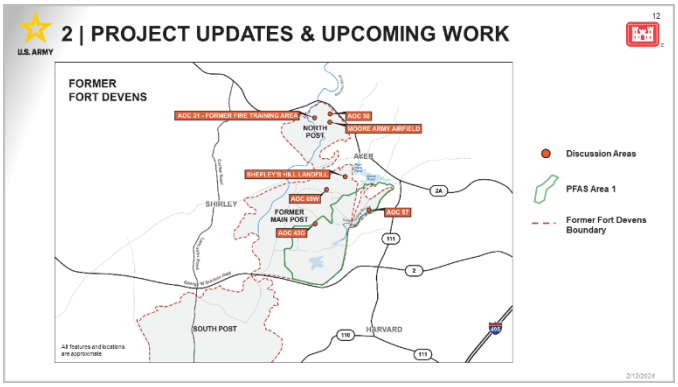
Libby Levison (Harvard Board of Health) asked if there is a maximum amount of PFAS that each box can absorb. Chadi replied that they will calculate the leachable PFAS in the soil, and the bottom will be designed with enough adsorbent material and enough residency time for the water passing through the material for all the PFAS to be absorbed. He noted that in full-scale applications, the walls would be permeable, but for purposes of this pilot test the walls will be impervious. This is to prevent water from entering the cell from the sides.

Laurie Nehring (PACE) asked if the project will put material beneath the plume of PFAS and if it will collect the groundwater in a permanent way. Andy replied that it is meant to contain, stabilize, and isolate PFAS in place (in situ), meaning it will stay in the ground permanently.

Dale Levandier asked via the chat how stable the FLUORO-SORB is and if it will degrade and enter the environment. Chadi replied that the FLUORO-SORB is intended to be installed permanently and does not need to be replaced. It is not expected that the PFAS absorbed in the FLUORO-SORB will be released later; it will be designed to only saturate the material to about 10 to 15% of its full absorptive capacity.

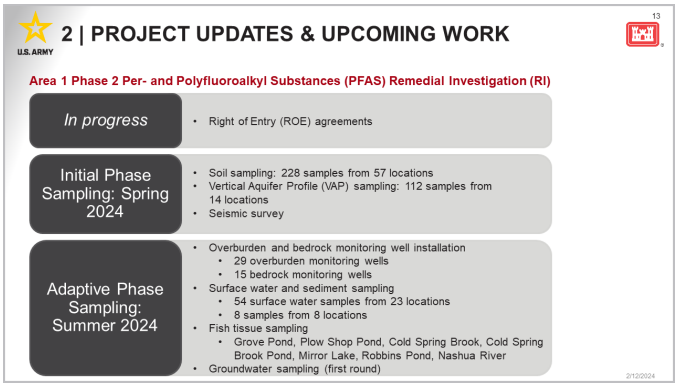
Mike Daly (USEPA) asked if there was a reason that the vertical wall design uses FLUORO-SORB rather than something like sheet pilings. Chadi replied that they wanted to use the same material that would eventually be used in a mass production scenario, which would involve the walls being made of the same material as the bottom to increase the surface area and reduce the chances of impoundment of water. Therefore, they will use the same material for the walls but add a little bit more cement than normal so that they will be impervious.

Steven Perry added that if there are documents or a work plan available, the RAB may be interested in seeing those. He noted Chadi could come back and give an update as things progress, or they could try to organize a site visit. Chadi replied that he would share the field demonstration plans once they are finalized, which would show details of the scale, location, and instrumentation and monitoring.



Andy Vitolins showed on a map where ongoing work is occurring and described the areas that would be discussed during the meeting:

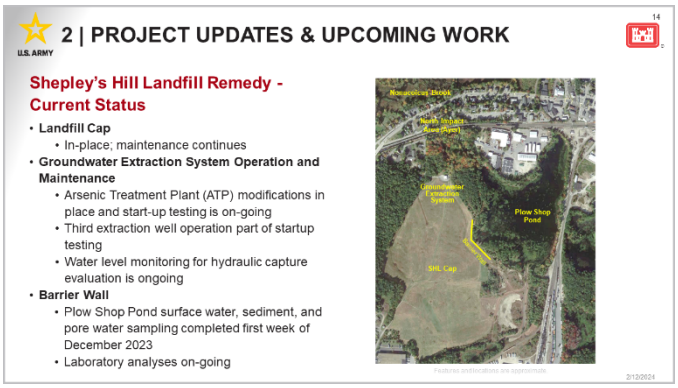
- FFTA, Area of Contamination (AOC) 31;
- SHL;
- PFAS Area 1; and
- Legacy petroleum sites: AOCs 69W, 57, and 43G.



Andy Vitolins discussed the Area 1 Phase 2 PFAS remedial investigation. Field work will start in the spring. The process to get right of entry agreements for properties on site and off site is ongoing.

The initial phase (prescriptive phase) of sampling will include soil sampling and vertical aquifer profile (VAP) sampling from temporary groundwater points at multiple locations. Soil sampling will occur at 57 locations at multiple depths for a total of 228 samples. VAP sampling will occur at 14 locations for a total of 112 samples. These are in addition to hundreds of VAP samples or borings already completed at Devens. There will be a seismic survey using sound waves to map the surface and depth of the bedrock.

The adaptive phase will follow and will use previous data and data from the initial phase. There are plans for 29 overburden monitoring wells and 15 bedrock monitoring wells. Each will be sampled, with the bedrock wells being sampled from multiple depths. There will be 54 surface water samples from 23 locations and 8 sediment samples from 8 locations. There will also be fish tissue sampling from the edible portions of the fish at all water bodies that either are encompassed by or border the former Fort Devens. There will also be two rounds of groundwater sampling at all the newly installed wells and at several existing wells. The first round will begin in summer or fall of this year.

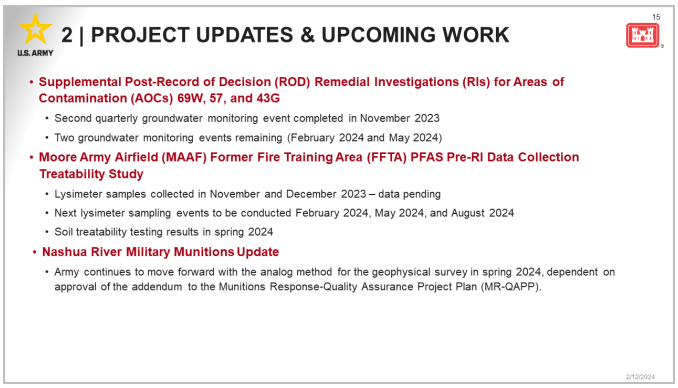


Andy Vitolins pointed out the major features on the SHL map and discussed the status of the remedies that are in place:

- Landfill cap—in place and maintained when needed.
- Groundwater extraction system—continuing to operate. The new ATP treatment modifications are in place and being tested. A third extraction well was recently installed, and water-level monitoring is ongoing.
- Barrier wall—undergoing a performance evaluation. More than 400 samples of surface water, sediment, and pore water were collected in December, and laboratory analysis is ongoing.

Martha Morgan asked if modeling had been done for the scenario of the Plow Shop Pond dam being removed and if the removal would affect the barrier wall or the extraction system. Andy stated that scenario had not been modeled and that the main affect would be increase in the groundwater flow gradient at the wall. Mike Daly asked if the dam removal is under serious consideration. Martha added that the Nashua River Watershed Association had an inquiry from the dam owner about removing it.

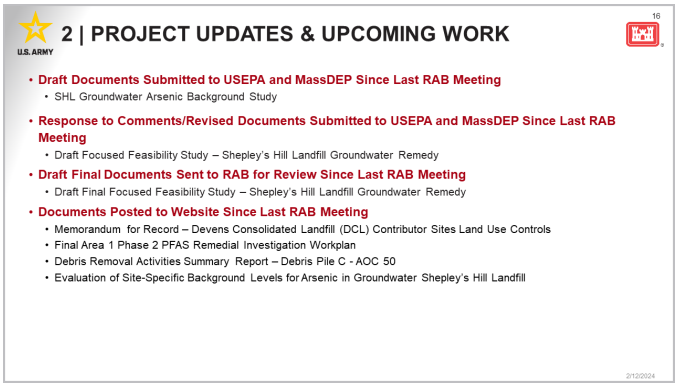
Laurie Nehring asked if the Army could take possession of the dam, if removed, would have detrimental effects because of the contamination. Andy replied that there had been a removal action in Plow Shop Pond to remove sediments containing arsenic associated with SHL, so it may not be an issue if the dam were to be removed. Tom Lineer added that he does not know that the Army has the legal authority to assume ownership or liability of the dam. Tom noted that Martha had asked some questions about the dam, and Penny Reddy and the USACE provided some information on state programs. Martha noted that some of that funding is for ecological restoration of high-value, cold-water, fish resource streams, which is not applicable here. Mike added that the dam was not an essential component of the remedy operation or protectiveness.



Andy Vitolins gave some general updates on other ongoing work:

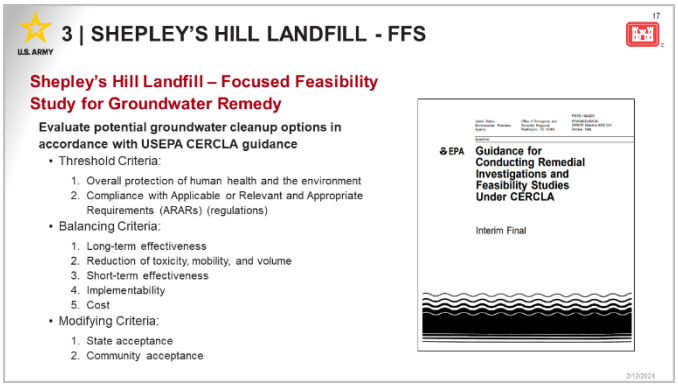
- Supplemental investigations for the legacy petroleum sites, AOCs 69W (charter school, former Devens Elementary), 57 (former outfall), and 43G (former gas station)—there were new well installations and new groundwater and soil sampling as well as two quarterly monitoring events. The data will be used to evaluate the remedies for those AOCs.
- Moore Army Airfield treatability study—lysimeter sampling (capturing water that is infiltrating through the ground before it gets to the groundwater) has been ongoing for several months. There has also been soil treatability bench-scale testing for stabilization of the soil, which will complement the proposed ESTCP study.
- Nashua River military munitions investigation—in summer and fall 2023, a survey was attempted to evaluate whether there were military munitions still present in portions of the Nashua River. Because of obstructions interfering with the digital equipment being used, the survey will move forward using analog (manual) methods in the spring. The plan is under review.

Julie Corenzwit asked why the analog method is expected to be easier. Andy replied that the debris (e.g. fallen trees) in the river was obstructing the boat-towed sonar array. The analog method uses divers and handheld instruments that don't have the same limitations.

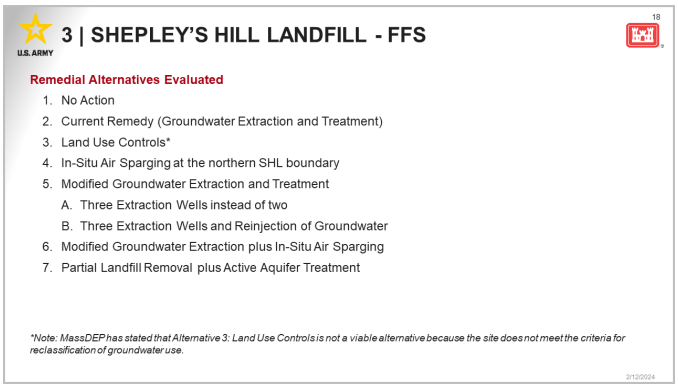


Andy Vitolins discussed status of the following documents:

- SHL Background Study for arsenic concentrations in groundwater—submitted to USEPA and MassDEP for review;
- SHL FFS—comments received and draft final version issued to the agencies and the RAB for review;
- Memorandum for Record for the Devens Consolidated Landfill Contributor Sites Land Use Controls—uploaded to website;
- Final Area 1 Phase 2 PFAS Remedial Investigation Work Plan—uploaded to website;
- Debris Removal Activities report—uploaded to website; and
- SHL Evaluation of Background Levels report—uploaded to website.

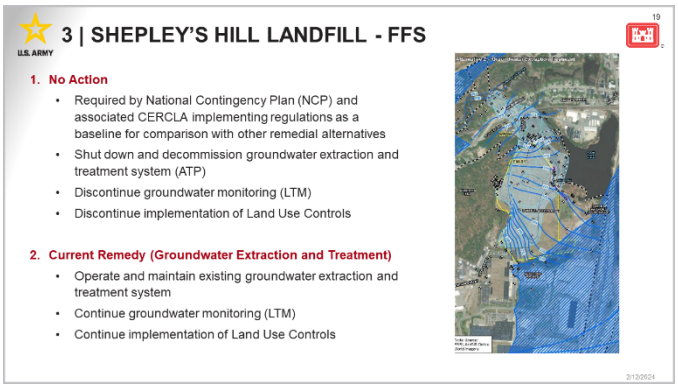


Andy Vitolins discussed the SHL FFS. The FFS follows USEPA guidance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It evaluates whether there are potential cleanup options that could work better at the landfill than the current remedy. As part of the FFS, alternatives are evaluated based on three sets of criteria. The first set is the threshold criteria: overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements (the laws and regulations that apply to the remedy). The balancing criteria compare how the alternatives perform in the long term, how well they address contaminants, how feasible their implementation is, and how much they cost. The modifying criteria are state and community acceptance.



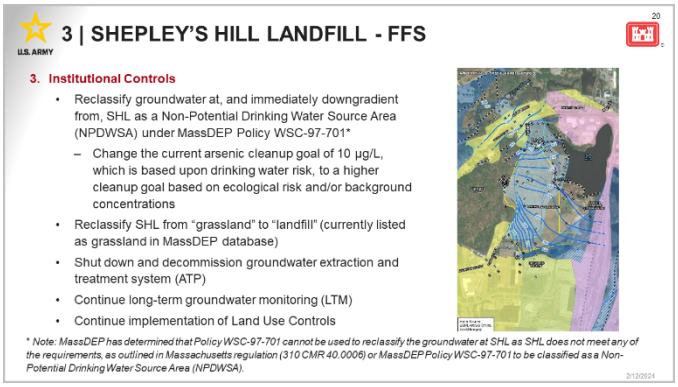
Andy Vitolins described the remedial alternatives. The first is the no action alternative. CERCLA requires this alternative to serve as a baseline. Second is the current remedy—groundwater extraction and treatment using two wells. The third is Land Use Controls (LUCs) prohibiting the use of groundwater for drinking water and potentially reclassifying it as a non-drinking water source aquifer. Andy noted that MassDEP does not believe this alternative is viable based on the regulations. The fourth is in situ air sparging, which would introduce oxygen into the groundwater through air injection and cause the dissolved arsenic to come out of solution. The fifth is modified groundwater extraction and treatment, which would add a third extraction well, with an option to reinject the extracted groundwater to

increase oxygen levels. The sixth combines Alternatives 4 and 5 by having three extraction wells and doing air sparging. The seventh would involve digging up most of the landfill and using active aquifer treatment.



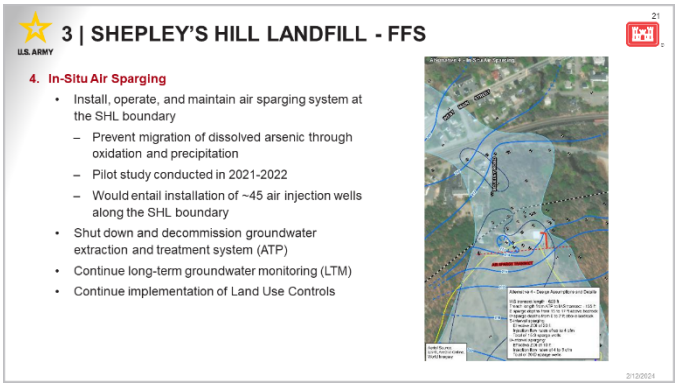
Andy Vitolins began discussing each of the alternatives in more detail:

- Alternative 1—the baseline. The existing groundwater treatment system would be shut down, and all groundwater monitoring and LUCs would be discontinued. The cost to implement it would be the cost to abandon all the wells in the existing system.
- Alternative 2—the current remedy. The existing system would keep operating with two wells, groundwater monitoring twice a year would continue, and LUCs would be enforced.



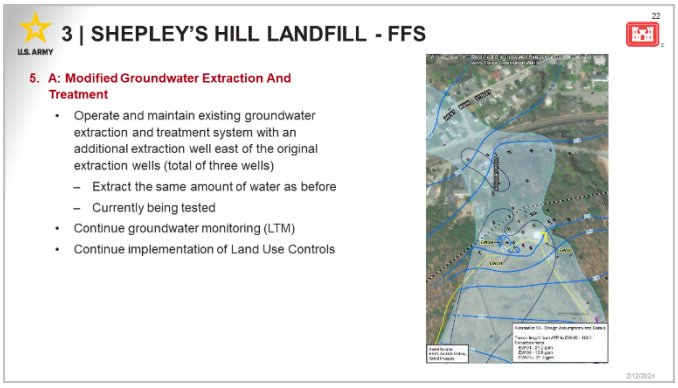
Andy Vitolins continued discussing the alternatives:

Alternative 3—institutional controls. MassDEP does not agree that this would apply to SHL. But if it could be implemented, it would change the classification of the groundwater from a potential drinking water source area to a non-potential drinking water source area. The arsenic cleanup goal for the site would no longer be the drinking water limit, which is currently 10 micrograms per liter (µg/L). It would be based on an ecological risk or a background concentration instead, which would be higher than 10 µg/L. SHL would be reclassified from a grassland to a landfill. The groundwater extraction and treatment system would not be required, but the long-term monitoring and LUCs would remain.



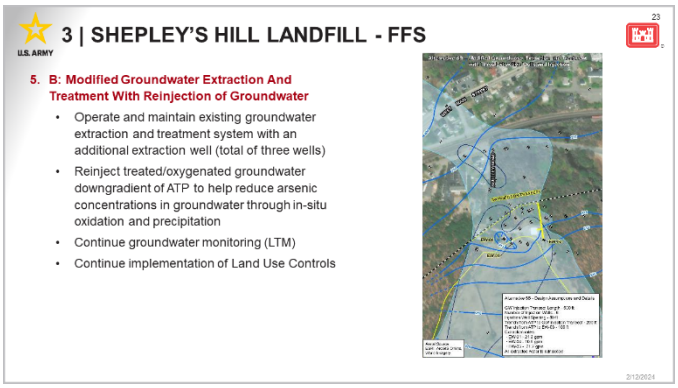
Andy Vitolins continued discussing the alternatives:

Alternative 4—in situ air sparging. This alternative would replace the current groundwater extraction and treatment system with in-situ air sparging. Air sparging would treat arsenic before it migrates out of the landfill by introducing oxygen through the injection of air, which causes arsenic to come out of solution and bind to soil. There was a pilot study for this technology in 2021 and 2022 that found arsenic would come out of solution easier in the shallower areas than in the deeper aquifer. There would be 40 to 50 injection wells placed on the SHL boundary (red line on the image). Groundwater extraction would be replaced by continuous air injection. Groundwater monitoring and LUCs would continue.



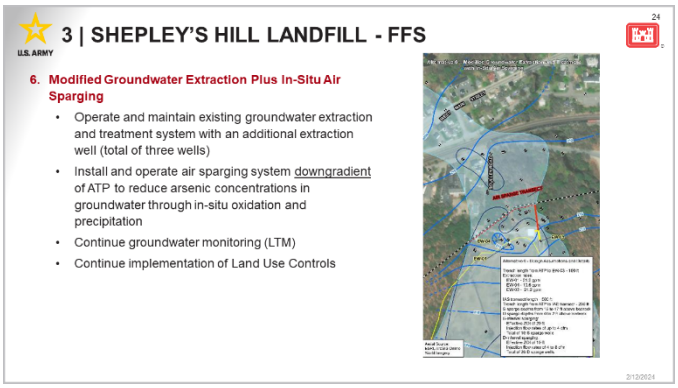
Andy Vitolins continued discussing the alternatives:

Alternative 5a—existing remedy with the addition of a third extraction well. The third well has been installed already and is being tested. The amount of water extracted would be the same, but the distribution of the extraction wells and areas/extent of groundwater capture would be optimized. Groundwater monitoring and LUCs would continue.



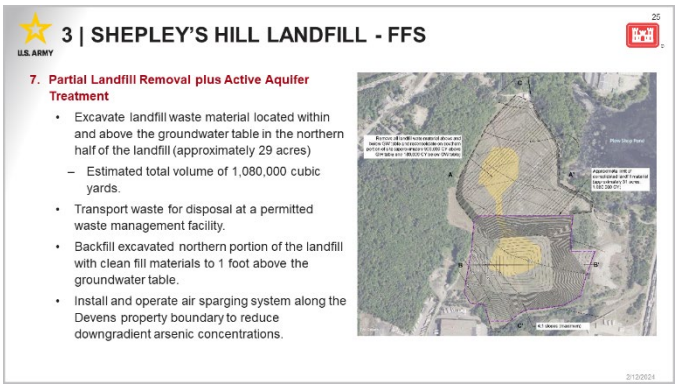
Andy Vitolins continued discussing the alternatives:

Alternative 5b—the existing remedy with the addition of a third extraction well and reinjection of groundwater. The water would continue to be treated like it is currently, but the water would be oxygenated through its treatment and then reinjected downgradient of SHL. On the map, the blue lines are contours that show the groundwater elevations. The direction of the groundwater flow (the gradient) is from south to north. The shaded area is the area of arsenic in groundwater that exceeds the current cleanup level of 10 µg/L. Groundwater monitoring and LUCs would continue.



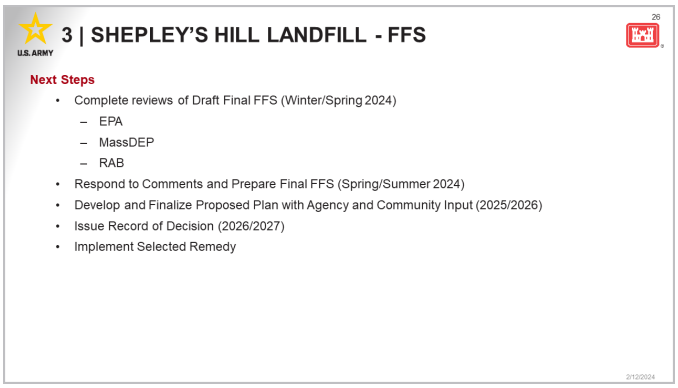
Andy Vitolins continued discussing the alternatives:

Alternative 6—the existing remedy with the addition of a third extraction well and air sparging. The groundwater would continue to be treated like it is currently but would not be reinjected like in Alternative 5b. Instead, air sparging would be performed downgradient, or north, of the treatment plant. The objective would be to contain the arsenic while at the same time adding oxygen downgradient of the landfill to help promote arsenic reduction. Groundwater monitoring and LUCs would continue.



Andy Vitolins continued discussing the alternatives:

Alternative 7—a return to pre-disposal conditions to the extent possible. This would involve removal of the part of the landfill that has a portion located below the water table (the north end of the landfill)—about 1.1 million cubic yards or 29 acres of material. All of that material would be transported for disposal at a permitted waste management facility. The northern portion of landfill would be regraded to 1 foot above the water table, and the cap would be reinstalled on the south end. After the material is removed, there would still be naturally occurring arsenic in groundwater exceeding the drinking water level. There would also be an air sparging system near where the arsenic treatment plant is now.



Andy Vitolins explained the next steps in the SHL FFS process:

- Draft final FFS review by USEPA, MassDEP, and the RAB;
- Response to comments and final FFS in the spring and summer;
- Selection of proposed alternative and draft the Proposed Plan;
- Official agency and community input on Proposed Plan;
- Issuance of a Record of Decision; and
- Design and implementation of the remedy.

Laurie Nehring asked if the northern part of the landfill that is dug up in Alternative 7 could be put on top of the southern part of the landfill. Andy replied that the Army is not allowed to build a new landfill; they can only modify the landfill. Also, it might not be geotechnically feasible because of the higher elevation and much steeper grades involved.

Laurie commented that black lines on the images are areas where the arsenic concentrations are much greater than 10 µg/L. She asked what the blue hatched area represents. Andy replied that it represents the area where the groundwater elevation is being lowered by the pumping of the two existing extraction wells. She commented that the hatching is shown for alternatives where the existing extraction wells are not going to be operating. Andy replied that the figures show a base of the existing conditions that is then modified.

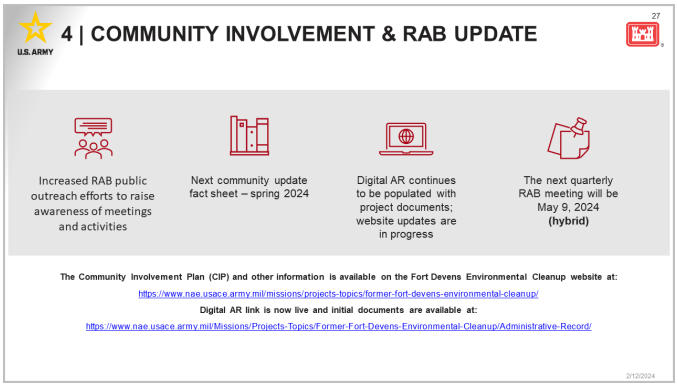
Laurie asked about oxygenation of the groundwater and whether it would turn the Nonacoicus Brook water red (like at Red Cove) when the arsenic precipitates out. Andy replied that the dissolved arsenic plume does not make it to Nonacoicus Brook, so there are not impacts to the brook. Also, the red or orange color is mostly from the dissolved iron, which also comes out of solution when arsenic does.

Laurie asked where the arsenic goes after it precipitates out. Andy replied that it would precipitate out in the pore spaces of the overburden aquifer. He noted that if too much oxygen is introduced all at once in one place, the minerals that precipitate out can clog the sparging wells or the formation. That was studied as part of the pilot study for air sparging.

Laurie commented that the FFS report states that the Army is meeting with the Ayer Board of Health annually regarding the LUCs, but they have no records of that. Andy replied that there are letters that are sent out annually to everyone in that area. Penny Reddy (USACE) added that they confirm with the town of Ayer that the addresses and names of owners or renters are current for the properties, and they reach out to the Board of Health via letter and email. Penny noted she could set up a meeting with them as well.

Julie Corenzwit commented via the chat that she thought the water from the arsenic treatment plant went to the Devens treatment plant, not Ayer. Laurie commented that it does go to the Devens treatment plant.

Chris Turner asked if the FFS would address arsenic in groundwater in the North Impact Area. Andy replied that, for the alternatives with groundwater reinjection or air sparging, the treatment would happen to the north of the existing treatment plant. Although it would not be done in the North Impact Area, the added oxygen may allow the rest of the arsenic to flush out of solution.

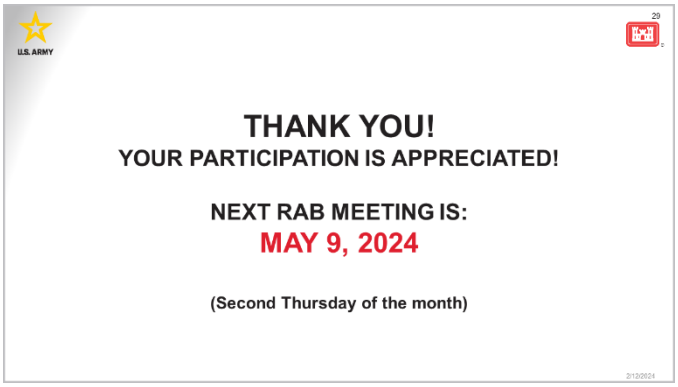


Mark Pasquarello (S-A JV) gave the community involvement update. He noted that there have been efforts to increase awareness and advertising to reach more people and organizations about the RAB and project. He noted that the next community update fact sheet is expected to come out in the spring.

Mark stated that progress is still being made with the digital Administrative Record and a solution is being developed to help with navigation on the website. He noted that the next RAB meeting will be May 9, 2024, and it will be a hybrid in-person/online meeting. Details on the location will be provided. Laurie asked if the digital Administrative Record would be searchable. Mark replied that the intention is to provide an index that will be searchable.

Hagai Nassau gave an update on the status of Skeo's technical assistance to PACE. He noted that they are reviewing the Draft Final SHL FFS and are planning to send a copy of their report to interested community members soon. They are hoping to set up a virtual meeting for the community the week of February 20, 2024. He put his email address (hnassau@skeo.com) in the chat for community members to sign up for the emails from Skeo.

Steven Perry commented that they could spend a few minutes at the next meeting for Skeo and PACE to talk about this technical support and the community outreach that is being done so that all parties stay informed and can better coordinate public outreach efforts.



Steven Perry thanked all presenters, RAB members, and participants for attending and noted that the next RAB meeting is May 9, 2024.

Question	Answer
N/A	N/A

RAB MEETING INVITE

Former Fort Devens Army Installation Notification

Please join us for the next Former Fort Devens RAB Meeting, Thursday, February 8, 2024, at 6:30 p.m.

Our next RAB meeting will be held via Microsoft Teams. Please join by clicking this link:

Click here to join the meeting

Or you can call in to hear the audio only:
+1 213-379-9608
Phone Conference ID:
473 892 551#

We hope you will join us to actively discuss the following topics and share your ideas:

- Welcome to Existing Members and New Participants!
- Project Updates & Upcoming Work
- Shepley's Hill Landfill Focused Feasibility Study
- Environmental Security Technology Certification Program Presentation
- Questions & Answers
- Community Involvement & RAB Board Updates
- Next Steps & Meeting

Bring your thoughts about the RAB and questions about the project. This meeting will be recorded and a meeting summary will be posted on the project website at:
https://www.nae.usace.army.mil/missions/projects-topics/former-fort-devens-environmental-cleanup/

If you have any questions, please send an email to:
FormerFortDevensRAB@arcadis.com