**Former Twin Cities Army Ammunition Plant (TCAAP)**

**Restoration Advisory Board (RAB) Meeting**

**Microsoft Teams**

**February 20, 2024**

**Date/Time**: February 20, 2024, at 7:00 pm

**Place:** Virtually on Microsoft Teams meeting.­­­­­­

**Attendees:** Approximately 31 people attended the meeting including six Community Restoration Advisory Board (RAB) Members and six Government RAB Members. See Attachment A.

**Agenda:** Old Business, Cleanup Status Update, New Business, Next Meeting Agenda and Public Comments.

**Introduction:** The RAB Community Co-Chair called the meeting to order. The Army Co-Chair provided plans for the evening.

Old Business (Thomas Toudouze, USAEC (US Army Environmental Command))

* Draft minutes from the previous RAB meeting were sent to RAB members. No comments were submitted to the US Army Environmental Command (USAEC).
* The meeting minutes were accepted as final.
* The Contract for Round Lake construction was awarded in August 2023.
* The Date for the next Round Lake Technical Working Group (TWG) is pending. The Army aims to hold the TWG meeting in the Spring of 2024, but the timing will depend on the design process progress.
* The Preliminary Assessment/Site Investigation (PA/SI) was completed for Per- and Polyfluorinated Substances (PFAS) September 2023.

TCAAP Cleanup Status (Art Peitsch, EA Engineering andLisa Poole, GHD)

* The hydraulic evaluation of the TCAAP Groundwater Recovery System (TGRS) is in progress.
* The annual groundwater sampling and land use control inspections are complete. The draft final Fiscal Year (FY) 2023 annual performance report was submitted to the regulators for review.

**Groundwater Sampling Update**

Groundwater sampling was completed in August 2023. The groundwater data has been validated and incorporated into the Draft Final FY 2023 Annual Performance Review (APR) [the FY 2023 sampling plan included a select number of wells; many wells sampled in FY 2022 were excluded in FY 2023 due to it being a minor sampling year].

* Annual plume maps are available in their respective APRs, which have been updated in the Draft Final FY 2023 APR.
* A statistical evaluation of the monitoring well network will be completed in FY 2024.

**FY 2023 Prairie du Chien Plume Map**

* The plume is relatively stable compared to FY 2022 results.
* Minor decreases in Trichloroethene (TCE) are spread throughout the plume. High concentration areas (greater than > 100ug/L of TCE) remain as two distinct lobes.

**FY 2023 – Jordan Plume Map**

The main plume is relatively stable compared to FY 2022 results. Some downgradient wells were non-detect for TCE in FY 2022.

**FY 2023 – Operable Unit 2 (OU2) Unconsolidated Sediments Plume Map**

* The main plume is relatively stable compared to FY 2022 results, including the higher concentration area.

**Operable Unit 1 (OU1) Optimization**

* No change since the last meeting.
* The Army continues working to install a new well in New Brighton more central to the plume area to optimize contaminant removal. The Army’s Environmental Law Division is finalizing a decision on the new well installation.

**OU2 Site A Monitored Natural Attenuation**

* The main plume is relatively stable compared to FY 2022 results.
* The higher contaminant concentration area continues to decrease. Contaminant concentrations in the center of the smaller plume have decreased since FY 2022.

**OU2 Site C Monitored Natural Attenuation**

* Three locations exceed the cleanup level compared to one location in FY 2022. The plume has also rebounded compared to FY 2022; however, new exceedances are localized.

**OU2 Site K Pump and Treat**

* The plume is relatively stable compared to FY 2022 results.
* The groundwater collection system continues to provide TCE plume containment.
* Pump and treat operations will continue.
* The Site K groundwater extraction, trench and treatment system continue to operate as designed. In FY 2023, the system captured and treated over 2,000,000 gallons of water and maintained a continuous zone of capture. Four pounds of volatile organic compounds (VOCs) were removed during FY 2023 downgradient of former building 103. The quarterly site K treatment system effluent samples met each analytes designated effluent limits.
* Sample results from the nine wells sampled in FY 2023 show a gradual decrease in TCE concentrations, indicating relative stability over the last 20+ years of sampling.

**OU1 and OU2 Well Abandonment and Reinstallation**

* The Army is abandoning three industrial wells in OU1 and 42 monitoring wells in OU2. Four wells in OU1 and one in OU2 will be removed and reinstalled. These activities will be completed in FY2024.

**Operable Unit 3 (OU3)**

* The plume is relatively stable compared to FY 2022 results. Statistical evaluation of groundwater data collected in FY 2023 indicates stable to declining concentration trends at the center and edge of the plume. Sampling for 14 dioxane continued in FY 2023 with results similar to those reported over the last six years.

Deep Groundwater TCAAP Groundwater Recovery System (TGRS) (Lisa Poole, GHD)

* TCE Concentrations were detected at or above 1000 micrograms per liter in the Site D source area, with lower concentrations between 5 and 1000 micrograms per liter in the Site G and Site I source areas.
* The optimization of the TGRS included implementing a second groundwater treatment system into full operation in February of 2023. This new system is the Source Groundwater Recovery System (SGRS) which recovers and treats high concentrations of VOCs and 1,4 Dioxane in the source areas at Sites D, G, and I.
* The Boundary Groundwater Recovery System (BGRS) remains in operation and is used to treat VOCs in deep groundwater collected from the southwest boundary of OU2. The treated groundwater from the SGRS and the BGRS combine to discharge to the onsite sand and gravel pit.
* SGRS began full operation in February 2023 and has met all discharge criteria.
* Monthly samples are collected from the BGRS and SGRS effluent according to the Record of Decision to ensure discharge standards are met.
* Both systems continue to meet the applicable discharge limits. Air sampling and modeling will be completed for Building 115 emissions once new TGRS operational flow rates are established and a hydraulic capture analysis of the SGRS is complete.
* The Source Area Hydraulic Evaluation Report and modified operating strategy for the TGRS is expected to be finalized during FY 2024.
* The TCE plume has decreased in width by about 17%. Data indicates that the SGRS is efficiently extracting and treating VOCs and 1,4 Dioxane from the source areas, with removal totals for VOCs at levels not seen since 2004.
* During FY 2023, three source control wells (SC1, SC5 and SC6) accounted for over 84% of the VOC mass removal while accounting for only 7% of the water pumped by the treatment system. A pumping test was completed for the SGRS extraction wells in April 2023. The test was used to determine the extent of hydraulic capture created by each of the source areas. The results of this hydraulic evaluation and recommendations for a modified operating strategy were provided to the Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) on September 7, 2023, and are currently in review.
* Based on the FY 2022 and 2023 TCE contours, the estimated width of the source area TCE Plume has decreased approximately 17% from 3600 feet to 3000 feet.
* The operation of the SGRS extraction wells in the sites D, G and I source areas, is expected to significantly increase mass removal, and accelerate the shrinking of the TCE plume.
* Prior to the construction of the SGRS, air emissions sampling and modeling was completed at the BGRS. Since then, there has been a significant reduction in TCE concentrations in the BGRS influent. Two wells previously associated with the BGRS treatment system have been rerouted to the SGRS treatment system.
* Once the new BGRS operating strategy is approved, an air sampling work plan will be prepared and submitted to EPA and MPCA for review.

**What’s Next?**

* OU1 – The Army continues to secure a new well installation in New Brighton. The Army is planning to begin the industrial well abandonment of three wells and begin installation of four monitoring wells.
* OU2 – The Army will abandon 42 monitoring wells and install one, after which the monitoring well network optimization will be initiated. The Army will also begin work on the Risk Assessment, with a goal of unrestricted land use.
* OU3 – The Army will continue groundwater monitoring.
* The Army will continue the remedial design at Round Lake.
* The Army is working with Arden Hills Training Site to increase storage space at TCAAP for additional Administrative Record/Information Repository storage.

Round Lake (Thomas Toudouze, USAEC)

* The Project Management Plan (PMP) and the Quality Assurance Plan have been finalized. Both are internal documents. The PMP includes a schedule of events.
* The Army planned field work in February to complete confirmation sampling around the lake, but the conditions were not favorable for safe work. The Army plans to complete sampling once the lake fully thaws. Sampling will potentially occur in April 2024.
* The Army will work on the Remedial Design and complete the final design in early [calendar year] 2026. The 30% remedial design phase is expected to be completed in the fall of 2024 with additional steps before the final design is complete.
* Jacobs will provide a presentation and Round Lake project update at the next RAB meeting.

New Business (Thomas Toudouze, USAEC)

* The Army proposed 17 September 2024 for the next RAB meeting. A RAB member suggested the proposed date be tentative and requested the Army send out a notice to RAB members to determine if any members have objections to the date.
* The Army presented the agenda for the next meeting.
* A participant commented that the RAB minutes are not available on the website.
* A RAB member commented the website needs frequent updates.

Bioaugmented Phytoremediation to Treat 1,4 Dioxane Contaminated Groundwater (Jerald Schnoor, University of Iowa)

* The University of Iowa has a project at TCAAP to introduce phytoremediation that treats 1,4 Dioxane and other chlorinated solvents at Site G.
* An aboveground demonstration of phytoremediation was installed in May of 2023 and the first year of data is available for review.
* The system will operate in-series without producing discharge.

Old Business

* **Q:** **Who was awarded the contract?**

**A:** Jacobs Engineering (Jacobs) received the award (Thomas Toudouze, USAEC).

* **Q:** **Is this for the design or construction?**

**A:** The award is for both design and construction. Jacobs is subcontracting the construction to a company that specializes in dredging. Currently they are in the 30% design phase, and this will be the topic of the next TWG meeting. This design phase is anticipated to continue through the end of the [calendar] year [2024] (Thomas Toudouze, USAEC).

TCAAP Cleanup Status (Art Peitsch, EA Engineering andLisa Poole, GHD)

* **Q**: **Any guesses as to why [contaminants in the OU2 Site C plume] increased?**

**A**: A lot of things can impact the concentration of metals in a sample, particularly turbidity. It can fluctuate from year to year (Art Peitsch, EA Engineering).

Deep Groundwater TCAAP Groundwater Recovery System (TGRS) (Lisa Poole, GHD)

* **Q**: **You mentioned a modified operation for the boundary BGRS, can you explain why that is and how it might be modified?**

**A**: From the beginning, the goal was to focus the pumping and treatment on the source area of the contaminants at the TGRS area. With the installation of the SGRS system, the extraction and treatment has been very efficient. At the boundary wells, a lot of water is being pumped, but it has very little TCE and VOCs. The Army is determining how to efficiently extract the groundwater and treat it, rather than simply pumping clean water to the treatment system. This [modified operation] is currently in review with the EPA and MPCA (Lisa Poole, GHD).

* **Q:** **What was Site G?**

**A:** The Army provided a Site G description from the TCAAP website through the chat feature of MS Teams: “Site G is a deep soil and groundwater impact site; its primary contaminants of concern (COCs) are VOCs (including TCE) for both soil and groundwater. Ongoing groundwater cleanup actions include hydraulic containment and contaminant removal from the source area, groundwater treatment, treated water discharge, institutional controls, review of new technologies and groundwater monitoring. Completed soil cleanup actions include restricted site access, soil vapor extraction E system treatment, maintenance of existing site caps, maintenance of surface water drainage and characterization of shallow soils. Ongoing groundwater monitoring is being implemented as a part of sitewide OU2 deep groundwater monitoring.”

* **Q:** **What was being treated for at the BGRS that was being pumped to the gravel pit?**

**A:** 1,4 Dioxane. When the BGRS was originally designed, 1,4 Dioxane was an emerging contaminant and pumped but not treated for many years. This was one thing that prompted the building of the SGRS, and advanced oxidation treatment method because it destroys 1,4 Dioxane (Lisa Poole, GHD).

* **Q:** **Can you please explain more about the Risk Assessment mentioned [in OU2]?**

**A1**: The idea was additional soil sampling in areas that do not have a landfill cover. This will help confirm or deny that those areas can be moved to an unrestricted land use scenario. A complete list of sites can be provided [following the meeting] (Art Peitsch, EA Engineering).

**A2:** The risk assessment is being performed to clarify where land use controls are required within the National Guard-controlled areas. This will help define restricted boundaries and provide more land for National Guard training. The land has been released [from restricted land use] on the County side (Linda Albrecht, USAEC).

* **Q:** **Who purchased the Primer Tracer Area?**

**A:** Maplewood Development Company (Mary Lee, Minnesota Army National Guard).

* **Q**: **Who is the subcontractor conducting the dredging [at Round Lake]?**

**A:** The Army will follow up with the RAB after the meeting and provide the contractor's name (Thomas Toudouze, USAEC).

Bioaugmented Phytoremediation to Treat 1,4 Dioxane Contaminated Groundwater (Jerald Schnoor, University of Iowa)

* **Q:** **Can you do this [phytoremediation] with plants in situ, or will a container system be required? Additionally, this will not operate during the winter [how will this be addressed]**

**A:** An acre plantation was initially proposed. However, it was agreed that a demonstration in an above ground system would be completed because there was no wait time for the trees to grow. If the demonstration shows that it works, then an in-ground plantation would be ideal. The winter is challenging; however, installation in cold climates has also shown that when the plume moves past the trees in the winter, the trees can pull up enough water to bring the plume back. There is also microbial action in the subsurface below the frost line. These factors are being evaluated. An alternative may be to install a greenhouse as a controlled solution (Jerald Schnoor, University of Iowa)?

* **Q: What is the function of the biochar?**

**A:** The biochar allows for the bacteria to colonize the porous material. It is also a soil amendment for the trees (Jerald Schnoor, University of Iowa).

* **Q**: **What is the scalability [of the phytoremediation]? Are there plans for a larger application?**

**A:** Eight more units will be brought on in 2024. A larger installation will be dependent on funding and performance during the two-year demonstration. Although the team is well positioned to scale-up, it does take a large footprint to match the gallons per day of the advanced oxidation system (Jerald Schnoor, University of Iowa).

* **Q:** **Is there any bioaccumulation of the contaminants in the trees?**

**A:** The compounds (1,4 Dioxane) are very soluble in water; it does not stick in the trees. The plants also have enzymes that break down chlorinated solvents, so secondary contamination is not observed in the plant material with this suite of contaminants (Jerald Schnoor, University of Iowa).

* **Q: My understanding is that the contamination is too deep at TCAAP for this type of system to work. The University can conduct the phytoremediation test at TCAAP because contaminated water is already being pumped out of the ground that can be used, so is the intent to install the system at TCAAP, or to test and prove the research?**
* **A:** In situations where there are plumes like at TCAAP it would still be a sort of pump and treat system. But it would then be irrigated back onto the plantation. It can treat without irrigation in shallow plumes, but it can easily treat through a pump and treat system with irrigation [in deeper plumes] (Jerald Schnoor, University of Iowa).
* **Q:** **What would be the advantage of that [phytoremediation] over the system currently in use?**

**A:** It is not a one-site solution. Yes, TCAAP had a system in place, but this is a demonstration for many different army sites (Jerald Schnoor, University of Iowa).

* **Q: Is there a particular type of tree that works best?**

**A:** In phytoremediation, Poplar and Willow are commonly used because they grow quite rapidly, they transpire a lot of water and have a large root system that can reach down to the water table. They are also clonally propagated, meaning that the are grown from cuttings, which makes it very easy science. However, one path of the research could be to evaluate other trees (Jerald Schnoor, University of Iowa).

**ATTENDEES**

**Government RAB Members Present**

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| --- |
| 1. Brigitte Hays (MPCA)
2. Thomas Toudouze (Army Co-Chair)
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| 1. Mary Lee (MN ARNG)
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| 1. Melissa Collins (MDNR)
2. Bridgette Hay (MPCA)
3. Larina Dewalt (Ramsey County)
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**Community RAB Members Present**

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| 1. Forrest Kelley (Community Co-Chair)
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| 1. Paul Bloom
2. Tim Donakowski
3. Kristine Poelzer
4. Matt Kocian
5. Keith Maile
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**Army and Army Contractors Present**

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| 1. Quang Nguyen (USAEC)
2. Linda Albrecht (USAEC)
3. Cathy Kropp (USAEC)
4. Paul Muething (HQDA)
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| 1. Kay Toye (ERG)
2. Art Peitsch (EA Engineering)
3. Shawn Horn (GHD)
4. Lisa Poole (Jacobs)
5. Jennifer Wilkie (Jacobs)
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**Visitors**

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| 1. Susan Johnson (MPCA)
2. Leaf Andrew
3. Mike Madcharo
4. Brendon Holdon (Arden Hills City Councilmember)
5. Jerald Schnoor (University of Iowa)
6. Eric Fosmo
7. Andrew Leaf
8. Jennifer Wilkie
9. Rich Straumann
10. Reide Simmer (University of Iowa)
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