Former Badger Army Ammunition Plant (BAAP)
Restoration Advisory Board Meeting
Sauk Prairie High School River Arts Center
October 19, 2023

Time: 6:30 pm, October 19, 2023

Place: Conducted in-person at Sauk Prairie High School River Arts Center and virtually using Microsoft Teams

Attendees: Thirty-two people attended the meeting, including 13 Restoration Advisory Board (RAB) members. Attendees are included in the attachment.

Introduction: Mr. Dwight Hollon, US Army Environmental Command (USAEC), provided the agenda and plans for the evening followed by roll call.

Review/Approve Minutes of Last Meeting

- Meeting minutes were not reviewed and approved during the RAB meeting.

Proposed Plan Response to Comments (Dwight Hollon, USAEC)

- The Army submitted the Draft Proposed Plan (PP) [for Site-Wide Groundwater] with Army response to Wisconsin Department of Natural Resources (WDNR) comments to the WDNR for review in August 2023. RAB presentation slides four (4) through five (5) include a table with nine (9) WDNR Proposed Plan comments and the Army's Response to Comments.
- Comment #1 states the WDNR requests involvement with the pilot scale testing [injection of amendments into subsurface], to which the Army agreed.
- The Army is proposing using emulsified vegetable oil (EVO) to address Dinitrotoluene (DNT) groundwater contamination at Badger Army Ammunition Plant (BAAP). EVO is currently used at the Cornhusker Army Ammunition Plant (CHAAP) in Nebraska which has similar subsurface geologic and groundwater aerobic conditions. The Army will provide analytical data to indicate if anaerobic bioremediation is potentially an effective remedy given site conditions.
- WDNR recommended amending on-site contaminants of concern (COCs) for all groundwater plumes using a $1x10^{-6}$ cancer risk threshold. WDNR and the Army are discussing solutions for technical questions related to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and WDNR requirements for cancer risk thresholds.
- WDNR asked the Army to provide data supporting monitored natural attenuation (MNA) as an effective remedy and to consider groundwater analysis for additional geochemical parameters supporting MNA effectiveness (parameters that may not have been taken in the past). The Army is working with WDNR to address MNA and develop an effective plan forward.
- WDNR asked the Army to address continued elevated groundwater concentrations of DNT within the Propellant Burning Ground (PBG) plume source areas. The Army proposes to install wells around the PBG plume area and introducing EVO amendments as treatment.

- A RAB member expressed support for WDNR's recommendation to have cleanup as protective offsite as onsite [referring to WDNR's recommendation for the Army to amend onsite contaminants of concern (COCs) for all groundwater plumes using a $1x10^{-6}$ cancer risk threshold].
- A RAB member commented that lesser DNT isomers have shown not to biodegrade and are equally or more toxic than 2,4 and 2,6 DNT. The same RAB member disagreed with the Army calculating risk and efficacy of the remediation [EVO bioremediation] without addressing the lesser DNT isomers. The RAB member noted the Army must first identify the isomers in the source area.
- A RAB member commented that groundwater flow does not simulate contaminant flow, noting that a contaminant transport model is needed to simulate contaminant flow direction. The Army explained that the US Geological Survey (USGS) is considering contaminant transport in their modeling efforts.
- A RAB member explained other sites in the state conducted soil analysis for all isomers of DNT.
- The Army commented they have discussed all six DNT isomers with the state and the pilot test effort will identify the best DNT remediation method.
- The Army informed the WDNR they will use the Wisconsin groundwater enforcement standard [as a cleanup goal] for DNT onsite including the Deterrent Burning Ground (DBG) plume, the Central Plume, and the PBG plume. The Army and WDNR have also discussed including the Nitrocellulose Plume (NC). The groundwater remediation of DNT will be to the enforcement standard for total DNT which includes all six isomers.
- The WDNR requested the Army evaluate the need to modify the groundwater sampling program for the PBG plume. The Army plans to develop a comprehensive groundwater sampling plan. The sampling plan will include evaluating the PBG plume shift towards the east. The Army anticipates the sampling plan will include additional monitoring of already existing monitoring and residential wells.
- The WDNR requested the Army evaluate the need for additional monitoring wells compliant with their regulations, to accurately define the nature and extent of DNT impacted groundwater associated with the NC Plume.
- The Army plans to develop a comprehensive groundwater sampling plan that may potentially include additional wells to characterize the NC Plume. The Army plans to reevaluate risk at the NC plume and work with the Ho-Chunk Nation to meet their requirements as landowners within the NC plume.
- The Army acknowledged WDNR's comment that PP acceptance will be determined after the PP public comment period ends and included in the Record of Decision (ROD).
- Most WDNR and Army comments are resolved, but some items remain in discussion.
- The Army described how EVO bioremediation works and described the success of EVO bioremediation at CHAAP. Mr. Hollon noted that due to similar site conditions, EVO bioremediation at BAAP may produce a similar result to those observed at CHAAP (USAEC presentation, slides 6-9).
- The Army plans to conduct an EVO bioremediation pilot test at BAAP.
- A RAB member commented that the materials presented [during the RAB meeting] regarding EVO bioremediation, were subjective and lacked analytical results explaining timelines, geology, statistical analysis of contaminant reduction at CHAAP and the potential cost to taxpayers.

- The Army explained the PP includes conducting a pilot study [for the EVO bioremediation], implement the scientific process and work closely with the US Army Corps of Engineers (USACE) to demonstrate the EVO bioremediation pilot study results prove effective at BAAP.
- The Army explained the timeframe to complete the process of finalizing the PP and the decision document will take up to the end of next year (2024). The Army will then proceed to the next phase of remedial design which includes the pilot study. The Army will implement the full-scale remedy if the pilot study demonstrates efficacy. Full scale implementation includes multiple sampling events, quarterly or semiannually. It may take three years of full implementation to determine if the remedy is working. The RAB will be continually updated throughout the process.
- A RAB member commented the remedy [EVO bioremediation] appears to be a preselected alternative and noted that a formal selection has not been made. The same RAB member also explained that no information on the remedy at CHAAP is included in the analysis presented in the BAAP Remedial Investigation/ Feasibility Study [for Site-Wide Groundwater] or the PP to demonstrate the success at CHAAP and to bring the parallel forward.
- The Army explained that the correlation between CHAAP and BAAP cannot be precisely made, because the conditions are not identical. The Army would like to try the same technology in a pilot study to verify the assumption that it will be successful at BAAP, and if it does not work, then the Army will need to evaluate other alternatives. The proposed alternative chosen has been screened and compared to other alternatives. The screening pertains to multiple criteria, including public and regulatory acceptance. Through all the screening and rankings, alternative four was the highest on the list.

<u>Groundwater Sampling Update (Joel Janssen, Spec Pro Services)</u>

- The Army sampled 62 residential wells in August 2023 during the annual sampling event with data submission to WDNR in September 2023.
- DNT was not detected in the 62 wells. One residential well could not be sampled due to a lack of power. Carbon tetrachloride (CTET) exceeded the WDNR Chapter NR 140 [Groundwater Quality] Preventive Action Limit (PAL) in two wells and chloroform exceeded NR 140 PAL in two wells.
- Semi-annual groundwater sampling was completed in September of 2023 for 126 monitoring wells. Sampling was conducted in the DBG, NC and PBG plumes. The Army is analyzing the results. The Army anticipates submitting results to the WDNR in early November 2023.
- In November, the Army will test some Central Plume wells in the GGB area, and wells in the DBG plume will be sampled quarterly.
- A RAB member stated the Army should be vigilant about drinking water quality both onsite and offsite.
- The Army noted that if wells upgradient from residential wells were high, then a consideration would be made to test the residential wells.

Optimization Update: Monitoring Wells

- The Army completed a PBG well nest of three wells near the Great Sauk State Trail. The three wells in the PBG plume show no contamination of DNT or Volatile Organic Compounds (VOCs) above drinking water enforcement standards.

- Two wells were installed in the DBG plume on 28 September 2023. The Army plans to sample these wells in November.
- Three wells were installed to help monitor the Central Plume on October 5, 2023. The Army would like to sample these wells in November.
- The Army is in negotiation with the Wisconsin Power and Light Company (WPLC) legal team about real estate rights. USACE-Omaha is working to secure property right-of-entry (ROE) for additional PBG monitoring wells on the property controlled by WPLC. Well installation is targeted for FY24 pending ROE agreements and funding.
- A RAB member requested answers to the following questions be presented at the next RAB meeting:
    1. A list of all the degradation products [from DNT].
    2. Which products have standards?
    3. Which ones are the Army testing for?
- The Army explained that sampling for DNT degradation products is not currently required. The WDNR removed DNT degradation products from the sampling program. [Newly installed wells will be sampled for VOCs and DNT].
- A RAB member commented that standards for degradation products have changed over the years.

Gruber's Grove Bay (GGB) Update (Tat Ebihara, AECOM)

Human Health and Ecological Risk Assessment

The risk assessment was performed utilizing EPA-accepted protocols and WDNR criteria.

- The human health effects assessment represents residents around the bay, recreational users and anglers.
- The assessment considers different types of contact that users might have with mercury impacted media, and mercury bioaccumulation within different levels of ecology.
- The main finding shows no human health risks above the effects for acute or chronic health risk. The one possible exception is human consumption of sportfish with mercury accumulation.
- The risk assumptions consider conservative assumptions and methodologies.
- With pathways for mercury accounted for, the bottom dwelling benthic species represent risks above acute or chronic standards (aquatic insects or larvae that develop and grow within the sediments). The impacts for sportfish were also above the standards.
- Approximately 100 samples of sediments were characterized throughout GGB which identified hotspot areas. Additional sampling is recommended to further delineate the hotspot areas.
- Sediment management tests are recommended to identify efficacy and feasibility of potential future remedial actions.
- Characterization of the bottom-dwelling benthic invertebrates in gelatinous sediments is recommended.
- The draft RI is under WDNR review. When comments and discussions are ready, all comments will be addressed and associated report changes will be completed before finalizing.

Groundwater Flow and Transport Model Update (USGS Team)

- USGS provided a brief overview of BAAP groundwater flow and transport model in development.
- USGS is currently using real data to compare model outputs to reality to verify the model's historical accuracy.
- USGS is developing the base model to match the site history. The tool [model] can then be used to answer a variety of questions such as, how the footprint of the plume will change over time if current conditions are projected into the future. Additionally, if bioremediation is implemented to treat DNT, what might those changes look like?
- The model can be used to evaluate the uncertainty and assess the range of outcomes that are likely given that uncertainty. The tool may also be used to inform which information might be best to evaluate as part of the pilot study and which information will be most useful for the model.
- The contaminant transport model will be a useful tool that can be refined with additional data produced by the pilot study.
- USGS can analyze factors such as optimal placement of wells for a remediation system, and the adequate number of wells required to produce certain outputs.
- A RAB member asked the USGS to consider how modeling and mapping of DNT isomers other than 2,4 DNT and 2,6 DNT might occur.

Project Management Update (Dwight Hollon, USAEC)

- The PP sitewide groundwater strategy is to install injection wells for introduction of EVO at locations along the plumes to reduce VOC and DNT concentrations.
- The Draft Final PP with Army responses was sent to the WDNR on August 8, 2023. Once the PP is accepted by WDNR, a public notification and a 60-day public comment period will begin as defined by the CERCLA process.
- The second Five-Year Review (draft final) was delivered to USACE on September 11, 2023. The plan is currently undergoing internal review.
- The second Five-Year Review is anticipated to be published and available to the RAB and community in November 2023.
- The BAAP Installation Action Plan has been finalized and was published on the BAAP website on September 20, 2023.
- Settling Pond Expanded Site Inspection project is anticipated to be awarded in the fall of 2023, which includes the Site-Wide Groundwater Monitoring Plan.
- A multi-site PFAS Performance Work Statement (PWS) for the PFAS Remedial Investigation for PBG completed internal review September 27, 2023. Questions and clarifications to the proposal are currently being addressed by USAEC. The Army anticipates an award in FY 2024.
- The Army completed Landfill #5 repairs, which included surface grading and hydroseeding.

Future Meetings

- January 18, 2024
- April 18, 2024
- July 18, 2024
- October 17, 2024

Closing Remarks

- A RAB member explained the Army's plan to update the tables and figures in the PP with current groundwater data in a separate report [in response to WDNR's request to update] is not sufficient, as it is unfair and unprofessional for the community or the WDNR to be expected to comment on a plan when it is incomplete and relying on old data.
- The Army noted it will work with WDNR to address the tables and figures in the PP.

Questions and Answers

Proposed Plan Response to Comments (Dwight Hollon, USAEC, unless otherwise indicated)

- **Q: Can you explain why the Army would not have to accomplish the same protective cancer risk onsite versus offsite? What does it mean when the Army does not have control over the use of groundwater, since it ebbs and flows and is not static?**
  A: The Army does not have legal control over the use of groundwater offsite. Onsite CERCLA and EPA guidelines defines $1x10^{-4}$ as the value and that is what is used it in the feasibility study. On post there are land use controls. Offsite is in the public sector.
- **Q: Is the Army leaving more contamination in onsite groundwater because if someone tries to use it and it is contaminated the Army can preclude that use?**
  A: There are land use controls for the site. Before any intrusive work or any type of use of the groundwater can occur authorization from the landowner and the Army must occur. The site is monitored by the Army subcontractor for compliance to any land use control prescribed for the site.
- **Q: How long does the Army expect the [EVO bioremediation] pilot study to last and how often will the Army be in touch with the RAB throughout the process?**
  A: At CHAAP, injections are typically conducted in the spring/early summer. In the fall, post injection sampling occurs. Over years, degradation was observed at CHAAP. Within three to six months the anaerobic environmental at CHAAP was able to produce quantifiable results. There is no guarantee that the timeline will be the same at BAAP, however, it should take three to six months (Ryan Tefft, USACE).
- **Q: Who is AECOM and what is their role?**
  A: They work with the USACE on GGB. They are a large, effective, and efficient consulting company.
- Mr. Tefft, Project Manager at CHAAP, explained that concrete numbers that show DNT and RDX (hexahydro-1, 3, 5-trinitro-1, 3, 5 -triazine) degradation from 2007 to 2021 are available for review. There are several figures available that show how effective the treatment has been.
- **Q: This [EVO Bioremediation pilot study] will not occur until the PP is completed and there is an agreement that this is what the Army will pursue, and the beginning of this may not start until after next spring, is that correct?**
- **A:** The decision document still must be written and signed by the Army at the highest level so it will still take some time (Joel Janssen, Spec Pro Services).

Groundwater Sampling Update (Joel Janssen, Spec Pro Services)

- **Q: Does CTET breakdown to vinyl chloride under certain conditions and is this being tracked in offsite wells?**

Commented [GLMMCIUEC1]: Why is this noted here when above attribution is provided above? See "Proposed Plan Response to Comments (Dwight Hollon, USAEC).

Commented [D2R1]: I agree and I have not seen minutes like this where specific questions were separated out into another section. However, this is the format that the RAB appears to recommend and has been the standard since I have been the ESM for the past year.

Commented [GLMMCIUEC3]: Same comment as above

Commented [D4R3]: I agree and I have not seen minutes like this where specific questions were separated out into another section. However, this is the format that the RAB appears to recommend and has been the standard since I have been the ESM for the past year.

A: Vinyl chloride has not been detected but it is sampled for in every VOC sample that the Army has been collecting.

- **Q: Is the Army tracking nitrates [in the groundwater]?**
  A: The Army continues to do nitrate testing around the PBG waste pits but there are very low nitrates. The Army will continue to sample and probably increase sampling for nitrate in the PBG, especially if there is an injection program implemented. Nitrate and nitrite would be high on the list for testing. However, before this testing occurs, there will likely be more work performed to evaluate where high nitrates could exist already in the water table. The plume itself does not currently have a lot of nitrates onsite.
- **Q: Is the Army testing for nitrates at the private residential wells along Keller Road to get a baseline if nothing else?**
  A: Currently, there is no plume with nitrate. In the past (2000s) there was nitrate testing and it did not show anything at that time.

Gruber's Grove Bay (GGB) Update (Tat Ebihara, AECOM)

- **Q: Mercury is not the only contaminant of concern in the sediments, and it is listed on the impaired waters 303-D list by EPA, due to the presence of lead, copper, arsenic, ammonia, nitroglycerine, polychlorinated biphenyls (PCBs) and methyl mercury. How is the Army incorporating risk posed by these other contaminants in the study?**
- **A:** AECOM was tasked to look at mercury specifically. The risk driver is mercury in this case. With the anticipated potential future scope, in terms of addressing sediments, it [how the Army is incorporating risk posed by other contaminants] can be presented more clearly in future scopes.

Groundwater Flow and Transport Model Update (USGS Team)

- **Q: Is USGS able to do the modeling and mapping of the other isomers of DNT (besides the 2,4 and 2,6)?**
  A: USGS is somewhat limited by how much data is available further into the past. Modeling started in 2001 and at that time 2,4 DNT and 2,6 DNT and TCE were the primary COCs being sampled. In 2001, only those COCs had enough data to initialize the plumes in a meaningful way. It is possible that USGS could simulate other isomers of DNT, but the length of time that USGS would be able to go back would be much shorter. Also, to simulate the movement of the COCs there has to be at least some information about how they interact with organic content in the aquifers, and how they move and decay over time. There is more information available for 2,4 DNT, 2,6 DNT and TCE than what is available for the other isomers. Perhaps in the future when the pilot study provides more information, that kind of analysis could be completed.

Closing Remarks

- **Q: Is there any thought on looking at whether the landfill is contributing to PFAS?**
  A: The Army sampled the groundwater wells around the landfill and did not find detections above the limit for PFAS (Dwight Hollon, USAEC). [[Clarification: This question was intended to address the groundwater PFAS contamination as part of the PFAS SI. It was not intended to apply to any leachate sampling derived from the landfills. Landfill 3646 PFAS detections were either non-detect or below the risk value of 6 parts per trillion (ppt) The only detection of PFAS above was approximately 4,500 ft

south of the PBG. Groundwater wells sampled closer to and downgradient of Landfill 3646 were less than 6 ppt]

Attachment

ATTENDEES

RAB Members Present

1.	Chris Hanson	At Large Member
2.	Curtis Hedman	WDHS
~~3.~~	Laura Olah	Citizens for Safe Water Around Badger (CSWAB)
4.	Grace Vosen	Sauk Prairie Conservation Alliance
5.	Randy Poelma	Ho-Chunk Nation
6.	Valerie McAuliffe	Sauk County Board
7.	Craig Walsh	Town of Prairie du Sac
8.	Doug Gjerston	Town of Sumpter
9.	Robin Meier	Bluffview Sanitary District
10.	Luke Lampo	WDNR
11.	Mike Gleason	Lake Wisconsin
12.	John Ellington	At Large
13.	Stephanie Brensike	Town of Merrimac

Army and Army Contractors

1.	Joel Janssen	SpecPro Services
2.	Kay Toye	Environmental Research Group
3.	Dwight Hollon	USAEC
4.	Sergio Celis	Environmental Research Group
5.	Heather McNabnay	Environmental Research Group
6.	Tat Ebihara	AECOM
7.	Quang Nguyen	USAEC
8.	Cathy Kropp	USAEC
9.	Ryan Tefft	USACE

Visitors

1.	James Tinjum	Guest
2.	Xiaochun Zhang	DNR
3.	Jeremiah Yee	DHS
4.	Wendy Carlson	RAB Alternate (CSWAB)
5.	Meg Haserodt	USGS
6.	Joe Block	Star News
7.	Unknown	Guest
8.	Unknown	Guest
9.	Nick Corson	USACE
10.	Marti Prorok	Guest
11.	Jelena Banks	Guest
12.	Mathew Pajerowski	USGS