

**U.S. Army Corps of Engineers – New England District
Cold Regions Research and Engineering Laboratory (CRREL)
Restoration Advisory Board**

Minutes of Meeting #15

**Wednesday, June 22, 2016
Richmond Middle School (RMS) Library**

Attending: Darrell Moore, USACE-NAE, Co-Chair
Kristine McDermott, Citizen Volunteer Absent
Tony Daigle, Dresden School Dist.
Roelof Versteeg, Citizen Volunteer
Tim McNamara, Dartmouth College, Co-Chair
Martin McMillan, Hanover Fire Chief
Ken Richards, NHDES
Scott Calkin, Amec Foster Wheeler
Rod Rustad, Amec Foster Wheeler
Glen Gordon, Amec Foster Wheeler
Wolf Calicchio, Amec Foster Wheeler

Observing: Terry Harwood, ERDC
Keith Hoddinot, USA PHC
Jeff Pickett, Amec Foster Wheeler
Bryan Ambrust, ERDC-CRREL
Larry Cain, USACE-NAE
Gary Pasternak, ERDC
Dan Groher USACE-NAE

Agenda:

Introductions

- 1) Review Meeting Minutes from March 16th, 2016.
 - 2) Battelle 10th International Conference on Remediation of Chlorinated and Recalcitrant Compounds – CRREL Session Summary.
 - 3) Soil Vapor Extraction Pilot Update.
 - 4) Magnetometer and Sub-bottom profiling draft results and Connecticut River Sampling Rationale.
 - 5) Remedial Investigation Report Update.
 - 6) RMS April Vacation Indoor Air Sampling Results.
 - 7) Comments from the Public.
 - 8) Schedule next meeting.
 - 9) Adjourn.
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- 1) Introductions and sign in for the RAB members and attendees.
 - 2) Welcome from Darrell Moore co-Chair and with COE NAE
 - 3) Review and acceptance of the meeting minutes of March 16, 2016.
 - 4) Meeting minutes were accepted as presented.

- 5) Review overall Agenda for June 22, 2016.
- 6) Review the agenda Battelle Conference the presentations being given by Rod and Wolf are very similar to presentations that were give and a couple of papers that were given at the Battelle conference session hosted by the COE NAE in May 2016.
- 7) Rod is doing a presentation of the site conceptual model. It is not common in the NE to see soil vapor issue similar to CRREL site. This presentation will also tie the soil vapor issues at the site to the groundwater problem at CRREL.
 - a) Rod reviews the history of TCE use and the discovery of TCE in GW at CRREL.
 - b) A large data set was used to further develop the Conceptual Site Model (CSM) and to come up with a list of site data gaps. This list of data gaps was used to design the Remedial Investigation (RI) and we used and refined the model during the field investigation of the CRREL facility as new data was added from the field investigation efforts.
 - c) A key data gap problem was we could not identify where all the TCE was coming from in the esker extraction wells.
 - d) We were not sure how much TCE was lost but the concentrations that were or are being extracted by the current groundwater treatment system have not declined in 20 years since the pump and treat system went on line. This indicated that there was a constant source of TCE being added to the groundwater somewhere up gradient of the extraction wells
 - e) Rod reviews and describes the onsite and the likely source areas, he also reviews the lake deposited geology of the site. He further shows where the 5 extraction wells are located in the esker deposit. Rod provides an overall review of the geology and groundwater model of the site as we currently understand it post phase III remedial investigation.
 - f) The site generally consists of silty layered silts and clays which overlie fine to med sands.
 - g) In the area of AOC 2 groundwater is approximately 130 feet deep below existing ground surface. Bedrock is generally encountered up to 200 feet below the site ground surface.
 - h) Rod zooms in on the site figures and cross sections and shows the historical soils and more recent RI soil chemical results for various explorations at the site. Typically we saw decreasing concentrations of TCE in soils with increasing depth at the AOC 2 and AOC 9. We also decreasing concentrations as we sampled deeper into the groundwater. In our recent RI investigations of shallow and deep soils and groundwater, we did not see evidence of Dense Non Aqueous Phase Liquids (DNAPL) and currently do not believe the RI data supports the migration of TCE DNAPL into the groundwater at the CRREL site.

- i) During the RI Field investigations Amec Foster Wheeler in conjunction with reviews by COE NAE personnel, used an Iterative approach to place RI investigations. The iterative approach allowed us to continual update and review the site conceptual model on a nearly real time basis with the COE and USACE NAE.
- j) Rod reviews with the group some of the deeper data that shows decreasing soil concentrations and decreasing in the ground water with increasing depth below ground surface.
- k) Rod provides a description of how we determined that there was a second highly contaminated groundwater plume core emanating from AOC 2 and the definition of this second core allowed us to calculate the max flux into the esker that we have seen extracted via the 5 pumping wells in the esker materials. This as well as bedrock core data seems to indicate that bedrock is likely not contributing to the max flux of TCE to the esker and extraction wells. Lastly it is likely that there are no other source areas at CRREL other than AOC 2 and 9.
- l) Rod moves into the soil vapor investigation iterative process that started with utility corridors on site then moved off site as we added data to the CSM. Rod shows a couple of years' worth of soil gas data. Rod shows various plots of the soil gas data in 3 dimensions. In the review he shows figures >5000ug/M3 then lays the groundwater TCE contaminate cores of the figures to show the tie back to the source areas.
- m) Rod then moves into the discussion of the SVE pilot test which in 6 months has removed >350 gallons of pure TCE product.
- n) Rod then provides a discussion of MW-14-107 with a graph of GW sampling superimposed on the time frame of SVE operations. In summary the concentrations in this well have decrease dramatically several orders of magnitude since the SVE Pilot went on line in June 2015. This drop in TCE concertation is likely influenced by the operation of the SVE pilot system.
- o) A RAB member describes the process that we are seeing and Rod agrees with the description
- p) There is a lengthy discussion of the effectiveness of removal of TCE via groundwater pumping vs removal with the current SVE Pilot system. It appears the SVE pilot extraction is much more effective.
- q) There is another general discussion of why SVE may not have been considered in the past.
- r) Rod reviews the groundwater sampling results for MW CECRL 08 superimposed on the operations history of the SVE Pilot System the data appears to indicate that The SVE Pilot syste as currently configured is likely pulling (advectively) pulling contamination from AOC9 over to AOC2.

- s) There is additional general discussion that it is likely better to remove source material rather than capture it only with groundwater pumping.
 - t) SVE Pilot system is likely reaching out pulling TCE from over 200 feet in the deeper more permeable fine to medium sand at the CRREL site.
 - u) Rod then shows the SVE operational history and current observed effects on the operation of the of the sub slab depressurization system. Appears the SVE Pilot system has decreased the concentrations of TCE entering.
 - v) How much mass do we think will be pulled out by an expanded system over the next 3 to 5 years? Very hard to determine as over time the concentrations will drop as more TCE is pulled from the unsaturated zones.
 - w) Where do we stop the SVE system extraction? Response from COENAE is the the SVE Pilot system is not the final remedy. There is a Feasibility study to be completed that will help to determine a final remedy or remedies for the site.
- 8) Wolf Calicchio provides overview of the Hapsite unit and how we are using the Hapsite unit at CRREL
- a) Wolf provides and overview of the various sampling techniques that can be used with the hapsite and then goes on to describe some of the uniques applications and ways that the hapsite is being used at CRREL
 - b) Very high use of Hapsite at CRREL very useful for gathering real time data and lots of data over a short period of time. Up to 20 to 30 samples per day.
 - c) See Slides of wolf presentation Note taker had some computer issues and had to reboot.
- 9) Wolf wraps Up and Glen Gordon begins with an update of the SVE Pilot system.
- a) Review the locations and operation of the SVE pilot system.
 - b) Have removed somewhere between 300 and 400 gallons since last January have removed approximately 75 gallons
 - c) Plan to operate the system until we get new interim system designed and installed in 2017.
 - d) Glen review how the system seems to be affecting the Groundwater.
 - e) Based on SVE Extraction data and the GW data we are tweaking the design to work off the lessons learned. We know it is very effective at removing mass and we are

seeing effects farther out than what we expected affects may be reaching out as far as 250 feet.

- f) What we are design is an interim measure with the following goals:
 - Reduce vapor contribution to GW
 - Prevent off post migration
 - Reduce TCE vapor intrusion
 - Provide additionalSee Glen's slides.
 - g) Need to follow the CERCLA process even with the interim Measure.
 - h) Glen reviews the areas that we will target with an interim measure.
 - i) We are currently in the 30% design stage which is very conceptual.
- 10) Scott presents the Bathymetry Survey and sub bottom profiling of the CT River.
- a) Scott provides and overview of the river depths the deepest area is approximately 40 feet deep.
 - b) We did side scan work which will show what may be on the bottom and may show that there is potentially bedrock exposed in the bottom of the CT River.
 - c) Scott shows some of the sub bottom profiles that were collected in the CT river.
 - d) Scott points out where the potential bedrock holes may be located.
 - e) Scott shows where some of the surface water samples may be collected.
 - f) Why are we looking at Bedrock. We are looking for TCE in bedrock fractures and we are looking for TCE in the bedrock matrix.
- 11) Need to select a new date for meetings in the Fall likely 3rd week of September if it works for most Rab members. Amec foster Wheeler of the USACE NAE will send out an email to tighten up on the schedule for next RAB meeting.
- 12) RAB meeting was adjourned at approximately 1800 hours.