**Massachusetts Military Reservation Cleanup Team (MMRCT)**
**Building 1805, Camp Edwards, MA**
**March 11, 2009**
**6:00 – 8:30 p.m.**

## Meeting Minutes

| **Member:** | **Organization:** | **Telephone:** | **E-mail:** |
|---|---|---|---|
| | | | |
| Jon Davis | AFCEE/MMR | 508-968-4670 | jon.davis@brooks.af.mil |
| Mike Minior | AFCEE/MMR | 508-968-4670 | mike.minior@brooks.af.mil |
| Ben Gregson | IAGWSP | 508-968-5821 | Benjamin.p.gregson@us.army.mil |
| Lynne Jennings | US EPA | 617-918-1210 | Jennings.lynne@epa.gov |
| Paul Marchessault | US EPA | 617-918-1388 | Marchessault.paul@epa.gov |
| Leonard Pinaud | MassDEP | 508-946-2871 | Leonard.Pinaud@state.ma.us |
| Ellie Grillo | MassDEP | 508-946-2866 | ellie.grillo@state.ma.us |
| Tom Cambareri | Cape Cod Commission | 508-744-1234 | tcambareri@capecodcommission.org |
| Steve Hurley | MDFW | 508-759-3406 | steve.hurley@state.ma.us |
| Phil Goddard | MMRCT/Bourne | 508-759-3043 | pgoddard@aol.com |
| Charles LoGiudice | MMRCT/Falmouth | 508-563-7737 | irextut@msn.com |
| Greg Taylor | MMRCT/Sandwich | | gregtaylor1@prodigy.net |
| | | | |
| **Facilitator:** | **Organization:** | **Telephone:** | **E-mail:** |
| | | | |
| Patrick Field | CBI | 617-492-1414 | pfield@igc.org |
| | | | |
| **Attendee:** | **Organization:** | **Telephone:** | **E-mail:** |
| | | | |
| Pam Richardson | IAGWSP | 508-968-5630 | Pamela.richardson@us.army.mil |
| Dave Hill | IAGWSP | 508-968-5621 | dave.hill@us.army.mil |
| Bill Sullivan | E&RC | 508-968-5147 | William.g.sullivan@us.army.mil |
| Denis LeBlanc | USGS | 508-490-5030 | dleblanc@usgs.gov |
| Tim McCobb | USGS | 508-490-5016 | tmccobb@usgs.gov |
| Jim Murphy | US EPA | 617-918-1028 | murphy.jim@epa.gov |
| Bob Lim | US EPA | 617-918-1392 | lim.robert@epa.gov |
| Jeanethe Falvey | US EPA | 617-918-1020 | Falvey.jeanethe@epa.gov |
| Jane Dolan | US EPA | 617-918-1272 | dolan.jane@epa.gov |
| Henry Cui | MassDEP | 508-946-2889 | henry.cui@state.ma.us |
| Mark Panni | MassDEP | 508-946-2898 | mark.panni@state.ma.us |
| David Dow | Sierra Club | 508-540-7142 | ddow420@comcast.net |
| Jane Gasper | Innovar | 508-759-9114 | jgasper@innovar-env.com |

### Action Items:

1. At the April MMRCT meeting, the IAGWSP will provide clarity on the process for going forward at L Range.

2. The IAGWSP will provide a follow-up Tungsten Update at the May MMRCT meeting (including any information on epi studies).

3. The IRP will provide the MMRCT with the link to Denis LeBlanc's presentation on MMR groundwater.

**Handouts Distributed at Meeting:**

1. Responses to Action Items from the February 11, 2009 MMRCT Meeting
2. Presentation handout: CS-18 Source Area Update Time-Critical Removal Action
3. Presentation handout: L Range Soil Update
4. Presentation handout: Tungsten Overview & Update
5. Presentation handout: Natural Restoration of a Treated-Wastewater Plume, Cape Cod, MA
6. 3/9/09 IAGWSP letter to Lynne Jennings and Leonard Pinaud re: Groundwater Sampling Results DNT Isomers

**Agenda Item #1. Introduction, Agenda Review, Action Items Review, Approval of 2/11/09 MMRCT Meeting Minutes**

Mr. Field convened the meeting at 6:06 p.m., reviewed the agenda, and asked if there were any corrections or additions to the February 11, 2009 Massachusetts Military Reservation Cleanup Team (MMRCT) minutes. No comments were offered and the minutes were approved as written. The MMRCT members introduced themselves.

**Agenda Item #2. CS-18 Actions Update**

Mr. Minior reported that after consulting with the regulatory agencies, the Air Force Center for Engineering and the Environment (AFCEE) decided to approach the Chemical Spill 18 (CS-18) Source Area site as a Time-Critical Removal Action in order to move forward quickly. This means that there will be no Engineering Evaluation/Cost Analysis (EE/CA) and associated formal public comment period. Rather, AFCEE will update the MMRCT, remove the DNT-contaminated soil to the state's S1-GW1 standard of 700 parts per billion (ppb), and produce a Remedial Action Report.

Mr. Minior explained that the CS-18 site is actually Gun Position 9 (GP-9), one of the most frequently used gun positions, from which mortars and artillery were fired into the Impact Area. He also noted that excess propellant bags were routinely burned at the site.

Mr. Minior then reviewed steps taken with respect to CS-18: an MMRCT presentation was given in October 2008; DNT-contaminated soil exceeding 700 ppb was removed during November, December, and January; confirmation sampling was performed for explosives, semi-volatile organic compounds (SVOCs), and perchlorate; and a draft Time-Critical Removal Action Memorandum was drafted and submitted to the agencies on February 20, 2009. The MMRCT is being briefed again tonight, and the Removal Action Report is due to be submitted this summer.

Mr. Minior also spoke about CS-18 Groundwater, noting that only one monitoring well (MW-1) has had any detections since 2002. He noted that the detections, which were of perchlorate, began at 2 ppb, then 4 ppb, and have been less than 2 ppb since the state promulgated its 2 ppb perchlorate standard. The most recent perchlorate detection at MW-1 was 0.77 ppb, less than half the state standard. Mr. Minior further noted that the two downgradient monitoring wells, MW-5 and MW-6, test nondetect for perchlorate. He also reported that AFCEE will be documenting all groundwater results since 2002 (for pesticides, dioxins, furans, SVOCs, perchlorate, and explosives) in a Project Note, with the goal of preparing a CS-18 Groundwater No-Further-Action Decision Document late this summer – assuming that all goes well with removal of the DNT-contaminated soil at the source area.

Mr. Taylor inquired about the location of the monitoring wells in relation to the source area. Mr. Minior referred to a map and noted that the wells are right on top of the source area. Mr. Taylor also asked when use of GP-9 ended. Mr. Minior replied that it hasn't been used since at least 1997, when the Administrative Orders went into effect. Mr. Taylor suggested that after 12 years of groundwater flow, one wouldn't expect to find much in the groundwater. Mr. Minor agreed, but also pointed out that the compounds being found in soil have not been seen in groundwater.

Mr. Minior then showed a 1994 figure depicting contaminant concentrations detected during one of the first CS-18 source area investigations, conducted by the Army. He pointed out the location of the highest DNT concentration at that time, 13,000 ppb, as well as locations where DNT was detected at 7,900 ppb and 4,000 ppb. He also said that in 2000 AFCEE conducted additional sampling, and he showed an aerial view of the site, pointing out the location of an old airplane fuselage that had been used in detonation training. The scrap from the fuselage was removed by the Army several years ago, but DNT exceeding 700 ppb still remains in the soil there.

Mr. Minior also showed a 2008 figure entitled "CS-18 (GP-9) Proposed Sampling and Soil Removal Areas," noting that the red colored areas were excavated from a one- to two-foot depth, while the green colored areas recently underwent surface soil sampling. He then showed an EM-61 survey map from 2008 for a survey conducted after the excavation work began, looking for ferrous and nonferrous metal. He mentioned that the EM-61 survey conducted in 2000 had looked only for ferrous metal. He also pointed out several areas where the map indicates the presence of metal that has since been removed, including the airplane fuselage.

Mr. Minior then showed a photograph of the site and pointed out the piles from the excavation, which are being screened to remove metallic debris. He also said that the area shown is believed to be clean down to the bottom; however, there are some areas at the site where DNT in excess of 700 ppb was detected in the top three inches of surface soil. Therefore, AFCEE is going to have to do more excavation in areas that were not expected to present a problem. Mr. Minior also noted that the MMRCT will be updated on results from the additional work, and that the Removal Action Report, which is due this summer, would close out the entire site.

Mr. Cambareri inquired about the EE/CA process. Mr. Minior explained that the normal process is to put forth an EE/CA document that undergoes a formal public comment period, after which the document is finalized based on comments received, and an Action Memorandum is produced. In order to move forward on the CS-18 site, however, the EE/CA document was eliminated, and AFCEE is proceeding with the Action Memorandum, which is basically an agreement to excavate the site of all DNT-contaminated soil (the only risk driver at this time) down to 700 ppb. Mr. Cambareri asked if AFCEE had gotten buy-in from the regulators on this approach, and Mr. Minior confirmed that it had. He also noted that AFCEE is keeping the MMRCT updated on results and what's being done.

Mr. Cambareri then asked if AFCEE has to comply with Massachusetts Contingency Plan (MCP) with respect to CS-18. Mr. Pinaud clarified that the site is covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), but the Massachusetts Department of Environmental Protection's (MassDEP's) concurrence satisfies compliance with state regulations. He further noted, however, that the other gun positions are covered under the Administrative Orders and the MCP.

Ms. Jennings added that the Removal Action regulations under the National Contingency Plan (NCP) address both time-critical and non-time-critical pathways. If the lead agency(ies) decide on a Time-Critical Removal Action, they can proceed by issuing an action memo without doing an evaluation of alternatives and an EE/CA. In the case of CS-18, it was agreed collectively that a Time-Critical Removal Action made sense, for the following reasons: there were limited alternatives to consider, and AFCEE was choosing the "Cadillac" alternative – to dig up the contaminated soil and take it off site; an effort is being made to reach ultimate closure on Superfund sites at MMR as quickly as possible; and nothing seemed to warrant taking the Non-Time-Critical pathway. Ms. Jennings further noted that AFCEE has been providing public presentations on CS-18 and achieving adequate community involvement in the process.

Ms. Jennings also made a point of noting that GP-9 is one of 37 gun positions. And the evaluations of the other 36, which are covered under the Administrative Orders, could quite possibly lead to a different decision. She said that she thinks the other gun positions will be evaluated to an EE/CA-like of Feasibility Study (FS)-like process, and an effort will be made to complete investigation of the gun positions in the next year. She reiterated that the Time-Critical Removal Action at GP-9 (CS-18) was "kind of a quick way to get this one gun position done, which happens to be on the Superfund side of the house."

Mr. Goddard asked if it's correct that groundwater concentrations are decreasing and there's no plume to address. Mr. Minior confirmed that this is correct.

Regarding time-critical versus non-time-critical, Ms. Grillo reiterated that with a Time-Critical action, the work can be done quickly and can proceed without a formal public comment period. She also said that the decision to do a Time-Critical Removal Action at CS-18 was made after the October MMRCT meeting, which is why Mr. Cambareri might have been a little surprised by it. Ms. Jennings added that there's a lot of latitude in the NCP regulations as to when or when not to use the authority for a time-critical action. Mr. Davis indicated that the similar situation at CS-19 also supports doing a time-critical action at CS-18. He explained that EE/CA alternatives for CS-19 were to either do nothing or to excavate the soil and treat it or transport it off site – the EE/CA was written and went out for public comment, no comments were received, and the plan was presented to the MMRCT, which also had no comments.

Mr. Dow asked why DNT isn't being detected in CS-18 groundwater. Mr. Minior replied that the DNT hasn't leached out of the soil matrix in order to reach groundwater, which AFCEE has been sampling since before 1994. Ms. Jennings added that the mobility of DNT is currently under a lot scrutiny and debate among the regulators. She explained that DNT doesn't seem to behave as one would predict, but some studies are being done through the Impact Area Groundwater Study Program (IAGWSP) to try to get a better understanding of the fate & transport of DNT. She further explained that AFCEE decided to go forward with what she thinks everyone would agree is a conservative cleanup level (700 ppb), although once the IAGWSP's evaluation is completed, it might be found that 700 ppb was far more stringent than necessary.

Mr. Dow said that he believes that there's a DNT groundwater plume at the Badger Ammunition Plant in Wisconsin. Ms. Jennings replied "right" and added that DNT has been detected at other locations in groundwater at MMR, such as Demolition Area 1, but not at CS-18. Mr. Dow said that one would think, given the sandy soil with low levels of organic carbon on Cape Cod, that if DNT were to move from soil to groundwater anywhere, it would be at MMR.

Mr. Goddard inquired about any plan to continue to sample the CS-18 monitoring wells. Mr. Davis replied that currently the indication is that no long-term monitoring program will be required, since AFCEE is removing the contaminated soil to 700 ppb, which already is a conservative number. He also said that in the upcoming months the MMRCT will be hearing more about the IAGWSP's studies, and added that the preliminary report that he read indicates that the number will be much higher than 700 ppb.

**Agenda Item #3. Wastewater Plume Ongoing Research & Investigation**

Mr. LeBlanc of the U.S. Geological Survey (USGS) stated that he would be presenting ongoing results from a USGS investigation of the natural restoration of the treated-wastewater plume that emanates from the old wastewater infiltration beds that served MMR from 1936 to 1995. He noted that the study, which is funded by USGS through its Toxic Substances Hydrology Research Program, has many co-authors (Larry Barber, Doug Kent, Ron Harvey, Dick Smith, and Tim McCobb) as well as a huge team of individuals who have been involved with collecting water samples for the past 15 to 20 years.

Mr. LeBlanc showed a map of Western Cape Cod and pointed out MMR, the groundwater plumes being addressed by AFCEE's Installation Restoration Program (IRP), the groundwater plumes being addressed by the IAGWSP, the water table contours, and the top of the water table mound, from which groundwater flows radially toward the coast, causing the plumes to be oriented like petals on a flower. He also pointed out the treated-wastewater plume and the approximate location of the old wastewater treatment plant, which he described as a typical secondary municipal treatment plant, whose effluent was discharged onto rectangular infiltration beds and percolated rapidly into the ground about 20 feet to where it recharged the aquifer. Mr. LeBlanc reported that it's believed that over the history of the treatment plant, about 6 billion gallons of municipal sewage was treated. He also noted that the aquifer that received the treated wastewater is sand and gravel glacial outwash – "an outstanding aquifer."

Mr. LeBlanc explained that 60 years of disposal created a very large contaminant plume that differs from other MMR plumes, which are basically rainwater that's dissolved some contaminant in soil, percolated down, and formed a plume. In the case of the wastewater plume, however, many hundreds of thousands of gallons of water were added at the source location. Mr. LeBlanc then displayed a figure of the plume as it was mapped in 1994, pointed out Ashumet Pond, Johns Pond, Coonamessett Pond, and the water table contours, and noted that the figure shows the plume constituent boron. He also explained that unlike other contaminant plumes at MMR, the wastewater plume contains a real mixture of contaminants, including chlorides, sodium, calcium, magnesium, nutrients, nitrates, phosphates, metals (from plumbing), bacteria, viruses, and organic compounds as well. He further noted that because boron, a common component of detergents, is present in wastewater, and occurs at very low concentrations naturally in the Cape Cod aquifer, it's a very good indicator of where the contaminant plume is. He also mentioned that the maximum boron concentration is about 500 ppb, and that the boron shows the plume to be several kilometers long.

Mr. LeBlanc showed a cross-section of the boron and pointed out the classic plume shape, the wastewater disposal beds to the right, and bedrock, located about 40 to 50 meters below sea level. He also noted that the groundwater travels about one to two feet per day, and that there's a zone of uncontaminated water above the plume from clean water coming in as recharge. He further noted that the plume gets increasing deeper farther from its source as the clean rainwater comes in on top of it. Mr. LeBlanc also pointed out that although the figure is vertically exaggerated, the plume is actually about 23 meters thick and about 6,000 meters long.

Mr. LeBlanc stated that the USGS research site, which is just downgradient of the old wastewater treatment plant, has many multi-level wells, and therefore a great deal of data to define the plume in three dimensions. He also noted that the old plant was turned off at exactly 4:00 p.m. on December 13, 1995, which provided a unique opportunity in terms of knowing exactly when the wastewater load was terminated and determining how long it will take for the plume to clean up naturally. Mr. LeBlanc also noted that for the past 13 years the USGS has been focusing primarily on what's occurring from near the old disposal beds to Ashumet Pond, and added that it will probably take 70 years or more for the entire plume to flush out.

Mr. LeBlanc showed an aerial photograph and pointed out Ashumet Pond, the old disposal beds, the base boundary, the USGS research area, and Fisherman's Cove at the boat ramp. He also displayed a figure indicating the locations of the USGS's well clusters and multilevel samplers, and a line representing cross-section A-A', which runs in the direction of groundwater flow. He then showed the 1996 cross-section A-A' for boron, pointed out the water table and the infiltration beds, and noted that each dot represents a sampling point on the multilevel samplers. He said that there are hundreds of sampling points along the cross-section, which provide a very detailed view of what's happening within the plume. Me. LeBlanc also said that the addition of water in the infiltration beds was almost the opposite of a pumping well – in that water was being injected, forcing the treated wastewater down into the aquifer, where it began to move with regional flow. He then pointed out that even within a few hundred meters of the edge of the disposal beds, clean water develops above the plume because of the rainfall recharge. He also noted that the plume has very sharp boundaries in the vertical because there's very little mixing perpendicular to the direction of groundwater flow, and added that the 1996 figure was made about six months after the wastewater treatment plant ceased operating – in other words, it represents starting conditions after 60 years of disposal.

Mr. LeBlanc continued by showing "snapshot" cross-section figures of boron from 1998, 2000, 2002, 2005 and 2006, noting that boron is considered a conservative species, relatively non-reactive in the aquifer, and therefore a good indicator of water flow. By looking at the trailing edge of the boron over time, as it naturally flushes away from the system, it was possible to do a rough calculation and come up with a groundwater velocity of about 29 feet per day. Mr. LeBlanc also reminded the group that the plume is more complex than just boron, however, and said that he would now discuss the geochemical environment of the plume.

Mr. LeBlanc explained that a theme of the USGS research has been to develop an understanding that the groundwater system is really a complex geochemical and biological environment – an ecosystem with a very active microbial community that lives off of the nutrients and the food source, the organic carbon in the wastewaters.

Mr. LeBlanc then displayed the same 1996 cross-section, but for dissolved oxygen (DO) in milligrams per liter (mg/L), noting that the saturation level for DO in groundwater in this area (given the temperature, atmospheric pressure, and the clean aquifer with very little organic carbon), is about 12 mg/L, which is not typical of groundwaters everywhere. He referred to the figure, pointed out the highest DO saturation level areas, the groundwater coming in from upgradient being pushed out of the way by the incoming wastewater, the clean water above the plume, and the absence of DO in the core of the plume. Mr. LeBlanc explained that wastewater treatment plants were designed to remove solids and decrease the biological oxygen demand of the wastewater before dumping it into a river (as was the case with many of the plants) in order to prevent the river from becoming anaerobic and killing the fish. The MMR plant was quite efficient in that it removed about 95% of the biological oxygen demand, but it still left about 10 to 20 mg/L of dissolved organic carbon in the water, some of which was non-biodegradable (such as non-biodegradable detergents), but much of which was biodegradable (such as urea, organic acids, and nitrogen compounds). When the wastewater was discharged to the aquifer, the bacterial community burned the organic material for food, using oxygen and breaking down the material, thereby depleting the oxygen in the water such that the core of the plume became anoxic. And because of the very limited vertical mixing, oxygen wasn't reintroduced into the plume, and in fact the zero DO zone can be traced almost all the way to Carriage Shop Road, several miles downgradient from the disposal site.

Mr. LeBlanc stated that as the bacteria are removing all the oxygen, nitrate, which is a major component of the wastewater, comes in. He referred to the 1996 cross-section figure for nitrate and pointed out the very high nitrate levels at the top of the plume, as well as the location right at the edge of the disposal beds where the nitrate disappears. Mr. LeBlanc explained that there are bacteria that degrade organic carbon by using nitrogen as their oxygen source – this process, called denitrification, degrades the organic materials, results in the byproduct of nitrogen gas, and leaves the core of the plume nitrate free.

Mr. LeBlanc further noted that as the nitrate eventually disappears and goes to zero, some organic material still remains, and there are bacteria that begin to take the oxidized iron and manganese that are part of the oxide coatings on the sediments and use them to reduce the iron in order to oxidize the organic carbon. In this case, they begin to reduce the iron oxide coatings from a +3 ferric iron to a +2 ferric iron. Therefore, when the nitrate disappears, dissolved iron begins to show up in the water as the iron on the coatings is being converted to a soluble form. Mr. LeBlanc also mentioned that this is typical of landfills where there's a lot of organic carbon. In addition, he noted that the manganese oxide coatings on the sediments are nowhere near as prevalent as the iron oxide coatings, and the manganese "actually goes out first, gets stripped away, and moves away."

Mr. LeBlanc also reported that it's been discovered that as the iron begins to migrate away (because it's been reduced) and encounters parts of the aquifer farther downgradient, it's likely to want to precipitate out of solution, and when it encounters manganese, the manganese will become reduced and the iron will precipitate. He then described that iron front as a snowplow that moves ahead and begins to actually strip out manganese. He called the process of the oxygen going away, the nitrate going away, the iron showing up, the iron going away, and the manganese showing up an amazing sequence, which gives rise to the manganese detections seen in the Ashumet Valley plume. Mr. LeBlanc also referred to the cross-section figure showing manganese and noted that the source of the upgradient high-level manganese area is not known. Ms. Jennings said that she'd noticed on one of the previous slides that there was something to the left feeding in to the plume. Mr. LeBlanc replied that after the wastewater loading stopped, the USGS saw "other little interesting bits of things begin to slide by," such as a large sodium chloride pulse from some unknown upgradient source. He also explained that part of the study's limitations is the lack of samples from the area upgradient of the old beds. Mr. LeBlanc then showed a map view depicting the iron/manganese relationship, based on 2007 data. He pointed out that where the iron zone ends the manganese zone begins to pick up, and also noted that the manganese discharge into Ashumet Pond is what made the famous "black rocks" associated with the phosphorus plume.

Mr. LoGiudice asked if it's correct that the wastewater treatment plant didn't address nitrogen, iron, or manganese. Mr. LeBlanc clarified that the geochemical environment causes the iron and manganese to dissolve off the sediments naturally. He also confirmed that the treatment plant was not designed to remove nitrate, but it's his understanding that the current treatment plant does include a denitrification process.

Mr. LeBlanc continued his presentation by displaying a series of DO cross-sections (1996, 1998, 2000, 2002, 2004, and 2006). He explained that since the source has been shut off, over time the plume begins to shrink, and by 2006 oxygen has reintroduced itself beneath the old beds, except at the location right on the edge of the old beds. He also noted that even though the boron flushed away fairly quickly, a sediment-bound oxygen demand remains from years of loading the aquifer with "all this stuff that has to be consumed." Mr. LeBlanc said that it's believed that the oxygen front will migrate very slowly, probably speed up as it gets farther into "this area," and then farther down in the aquifer where there's "less stuff loaded on." He said that after 15 years the oxygen front has migrated only about 150 feet. He also explained that his point is that while a conservative species flushes away rather quickly, anything having to do with sediment/water interactions slows it down dramatically.

Mr. LeBlanc also displayed a slide that showed two cross-section views (1996 and 2004) of each of three species: dissolved organic carbon, nitrate, and ammonium (in micromoles [µM]). He noted that dissolved organic carbon concentrations have dropped dramatically over time. However, he also pointed out a zone where they have stayed elevated, explaining that rainwater has continued to leach organic materials from the beds themselves, from sediments between the land surface and the water table. Mr. LeBlanc also noted that there's a small amount of nitrate "right along the top" of the water table from nitrogen compounds degrading in the unsaturated zone. He also spoke about ammonium, the inorganic form of nitrogen, noting that the wastewater plant put out both nitrate and ammonium, and that ammonium tends to stick to the sediments a little bit (retarded by about a factor of 2 relative to flow.) He also referred to the cross-sections and noted that ammonium has gradually migrated away, although some remnants are still seen in 2004. Mr. LeBlanc further stated that, interestingly, if the oxygen caught up with the ammonium it would oxidize it to nitrate. The ammonium is outrunning the oxygen front, and it's difficult to predict whether the front will ever catch up.

Mr. LeBlanc continued by displaying a slide that showed three views of the plume (1996, 2002, and 2007) relative to pH and zinc. He noted that background pHs in the Cape Cod aquifer are generally around 5, which is fairly acidic for groundwaters. This is because the aquifer is basically quartz sand. Mr. LeBlanc also noted that the wastewater was buffered to prevent pipe erosion and that the geochemical processes tend to raise the pH within the plume to close to neutral (6 to 7). He said that there's a definite zone of elevated pH in the core of the plume, but decreasing pH levels are seen right beneath the beds by 2007. He also said that pH levels are critical for contaminants that sorb, and said that one particularly interesting one is zinc, a bivalent cation. He referred to the zinc figures and pointed out that even when the treatment plant was still being loaded, there was a small area of zinc that appeared to be deep in the aquifer and a thin projection forward of elevated zinc levels, but it only reached about 300 to 400 meters away from the beds, and there was no zinc in the core of the plume. He also noted that the zinc appears to be deeper in the 2002 figure than in the 1996 figure and explained that this was because an additional well was drilled, what he calls "transport by drilling." Mr. LeBlanc pointed out that the zinc migrates about 30 to 40 meters down into that aquifer beneath the beds, but also projects out at the top of the plume. He explained that zinc transport is very pH dependent – it transports most easily at low pHs and becomes very immobile at high pHs – and the pH in the core of the plume it too high for the zinc to be able to move. Mr. LeBlanc stated that this small zinc plume (which extends only about 400 meters from the beds after 60 years of loading) exists only "in that exact perfect geochemical balance lower pH…" He further noted that copper is even more affected by pH and has hardly moved from the beds at all, and that lead isn't seen anywhere.

Mr. LeBlanc went on to show 1996, 2002, and 2007 figures for phosphate, noting that although there were some changes internally within the plume, flushing away of the phosphate is not seen. He reported that the phosphate area of the plume has only moved a couple thousand feet in 60 years. He then explained that 99% of the phosphorus is sitting on the sediments – only a very small amount migrates, but it's enough to raise concentrations to around 4 to 6 mg/L. Mr. LeBlanc said that while phosphate is very strongly sorbed, it's mobile enough that it reached Ashumet Pond. And had the beds been loaded farther west, the phosphate plume wouldn't have intersected Ashumet Pond and would have been a non-issue. Mr. LeBlanc then informed the group that the state is developing guidelines for land disposal of treated wastewater and is looking at the USGS's results at MMR to specify distances to the nearest water body in order to ensure that the distance is great enough that the phosphorus "can be stored in the aquifer basically forever."

Mr. LeBlanc then showed the phosphorus contamination in map view based on 1999 data and pointed out the discharge footprint along Fisherman's Cove in Ashumet Pond. He also showed a photo of the shore of the pond where the phosphorus discharges, noting that the discharge kept the pond from freezing along the shoreline. He also noted that he'd been informed about the team's questions about the phosphate maps presented at the February MMRCT meeting, and showed three maps of the plume – one from 1993, one from 1999 and one from 2007 – which, he noted, demonstrate how the phosphate plume evolved largely through "sampling density and contouring artistic license." Mr. LeBlanc also said that it's instructive to keep in mind that plume contour maps are modeled interpretation of data, which really come only from individual sampling points. Therefore, plumes can appear to change because of the contouring and the data that were available. He noted, for example, that a lobe of the plume shown in the 1993 map extends to Currier Road, but it doesn't appear in the 1999 map, but then seems to reappear in 2007, because the sampling points in that area had been added back into the sampling program. He said that "to some degree probably this actually was drawn to make it look more like the others." Mr. LeBlanc also noted that the phosphorus concentrations bounce around quite a bit. He further noted, however, that there is evidence of the phosphorus plume migrating into "this area to the south," and missing the pond, which is to be expected. He also said that the fact that the plume is moving in that direction is a good thing, and it would have been ideal if the entire plume had migrated there, in which case phosphorus upwelling into Ashumet Pond would not be an issue today.

Mr. LeBlanc then reviewed a “Final Thoughts” slide, by noting the following: limited dispersion in the aquifer results in very steep geochemical gradients, such that a very complicated geochemical environment exists; the oxygen demand creates persistent, complex, interrelated geochemical zones; only by looking at these zones with spatially and temporally dense sampling can the system be understood – for example, why the manganese is there, why the phosphorus is where it is, and so forth; additional species coming off the sediments, such as arsenic, as well as microbial populations, both bacteria and protozoa, have also been studied; and the ongoing research is focused on measuring the rate of re-oxygenation and simulation of plume-scale restoration. Mr. LeBlanc also made a point of noting that this plume was created by a permitted wastewater treatment facility, which is typical of land disposal of wastewater nationally. He said that it’s by looking at a plume like this in great detail that one can begin to understand what is happening and then be able to understand what is being seen elsewhere, but with much less data.

Mr. Goddard asked Mr. LeBlanc to explain the difference between phosphate and phosphorus. Mr. LeBlanc replied that phosphorus, the element, occurs in a variety of different forms, and the predominant inorganic form of phosphorus in the aquifer is phosphate – phosphorus with four oxygens attached. Mr. Goddard noted that the problem at Ashumet Pond then is phosphate. Mr. LeBlanc confirmed that that is correct.

Mr. Goddard also inquired about the meaning of µM. Mr. LeBlanc replied that it represents “micromole” which is a unit of concentration. He also explained the problem with units of measure such as mg/L is that it’s a weight, or mass per volume, and therefore can’t be used to compare two different species, as they have different atomic weight. Mr. LeBlanc noted that for this reason, chemists despise the use of ppm and ppb, for example, and instead always look at things in terms of a mole, which is a number of atoms.

Mr. Goddard then asked if the organisms involved in the denitrification process occurring below the surface could be applied to wastewater treatment plants for natural denitrification. Mr. LeBlanc clarified that this is exactly what is done at wastewater plants – the wastewater is inoculated with the right bacteria in order to have a population that denitrifies. He further noted that there’s ongoing research where DNA are being examined in order to determine which actual bacteria are doing the denitrification.

Mr. Goddard also suggested that the situation in Ashumet Pond would be much worse if more than 90% of the phosphate hadn’t sorbed to the sediments. Mr. LeBlanc replied that the aquifer, which can almost be thought of as an extension of the treatment, sorbed and reduced the amount of phosphate that could be moving through it. He also noted that there’s some debate as to whether the phosphate will gradually combine with iron to form insoluble iron phosphate minerals like imenite and become permanently bound up – and a USGS chemist is currently trying to simulate reactions in the wastewater plume to predict whether that will happen.

Mr. Goddard then asked if the anoxic zone is causing other impacts to the ecology, and whether it could be remedied by injecting highly-oxygenated water as an infiltration. Mr. LeBlanc replied that while it’s possible to engineer a system to inject oxygen, the process is happening naturally because the water coming into the aquifer contains DO; the natural restoration of the plume should take care of it. Mr. Goddard asked if it’s correct that the anoxic zone is not detrimental enough to be a concern. Mr. LeBlanc replied that the only issue would be the fact that it’s mobilizing the iron and manganese, “but it’s pretty innocuous.”

Mr. Dow referred to the “little plumelet” of zinc, which has not traveled far because of the pH levels. He then asked how much of that change in the pH or acidity of groundwater comes from infiltration from above as opposed to something that happens on a horizontal basis. Mr. LeBlanc said that he can’t answer this question absolutely, but his impression is that the elevated pH is greatly affected by the denitrification, and it only occurs in the very core of the plume. He also said that he could send Mr. Dow a paper by Doug Kent who did an actual simulation of the zinc zone. Mr. Dow said that he has a vague recollection that Ivan Valiela spoke about infiltration from above playing an important role in nitrogen chemistry "at the boundary where the sewage treatment plume is and the water is infiltrating from above."

Mr. Dow then said that Mr. LeBlanc had mentioned that recent study has found some areas where the low-oxygen zone is being infiltrated by water with slightly higher oxygen levels, and that this could accelerate downgradient movement of the low-oxygen zone that's currently trapping the phosphorus. He then asked if the USGS has made any calculations of how long it would take that plug of phosphorus to reach Ashumet Pond and whether it would reach the pond in a time period that would make the iron-filings trap there ineffective or entirely saturated. Mr. LeBlanc replied that some back-of-the-envelope calculations have been made. He also noted that tracer experiments are being conducted, but the USGS is not ready to make a prediction yet.

Mr. Dow stated that Mr. LeBlanc's presentation was based on geochemistry, and no biology was discussed. He then asked if Mr. LeBlanc thinks that the nematodes, protozoa, and bacteria that can withstand low oxygen levels could alter the geochemistry. Mr. LeBlanc replied yes, and said that many of the bacteria operating in the core of the plume live in an anaerobic zone, and are basically able to use the nitrate, iron, and manganese. He also said that bacteria are very adaptable; there are entire consortiums of bacteria that live without oxygen. Mr. LeBlanc also noted that microbiologists are just beginning to really understand these populations, but geochemically it's understood what's going on in the plume. Mr. Dow stated that in marine sediments the bioturbation greatly affects the boundary between the aerobic sediment layer and the anaerobic and the resultant biogeochemistry. Mr. LeBlanc indicated that the same occurs in the case of the wastewater plume.

Mr. Cambareri thanked Mr. LeBlanc for the presentation and indicated that he was pleased that this science could be used at other places on Cape Cod, nationally, and globally. He noted that 10 of the 15 Cape Cod towns are involved with wastewater planning and will eventually be looking for new discharge sites, so it's very important to be able to choose the best sites – obviously not near a pond or in a wellhead protection area. Mr. LeBlanc agreed and said that it's also important to know what to treat for. He mentioned, for example, that the USGS had begun to look at pharmaceuticals in the wastewater plume. Mr. LeBlanc also noted that the USGS first became involved in this study because of a 1970s Department of Environmental Quality Engineering (DEQE)-funded study that was undertaken because towns across the state were talking about land disposal of wastewater.

Mr. Cambareri said that he wonders about the impact of future discharges that will be treated to "a much higher level of treatment." Mr. LeBlanc noted that some would argue that the aquifer should be thought of as an extension of a treatment plant. In other words, the next 1,000 feet of aquifer are part of the plant and it's absurd to treat the water to such an extreme level above ground when such tremendous biological processes occur in the ground.

**Agenda Item #4. L Range Soil Update**

Mr. Gregson reminded the group that a lot time last year was spent using various robotic mechanisms to remove 40mm grenades from L Range. Once those fairly dangerous rounds were removed, the IAGWSP decided to collect soil data from the range and determine its existing conditions. Thirty-seven multi-increment soil samples were collected from 23 decision units, and explosives and low levels of perchlorate were detected. RDX was detected at eight decision units at concentrations up to 9.2 parts per million (ppm), while the state cleanup standard for RDX in soil is 1 ppm. HMX was detected up to 9.7 ppm, and the state cleanup standard is 2 ppm. TNT, for which there is currently no cleanup standard, was detected at 450 ppm at one location. Mr. Gregson also noted that all of the detections occurred in the mid-range area, while the up-range area (near the firing points) and down-range area (beyond the targets) were clean. He said that because of the levels of explosive contaminants seen in soil, the IAGWSP is recommending that a remedial action take place.

Mr. Gregson displayed an L Range figure and referred to the firing point area, the targets in mid-range, and the down-range area. He explained that the rectangles on the figure represent the decision units (from which 100-point composite samples were collected, ground together, and analyzed) and the color-coding indicates areas with no exceedances of standards, with RDX, HMX, and TNT concentrations above standards, with RDX and HMX above standards, with RDX only above standards, and with TNT above standards. He also noted that the circled sample areas were around targets, to see if there was any difference between that and the rectangular grid setup. He further noted that the RDX soil contamination is probably the biggest concern since many of the groundwater plumes being addressed by the IAGWSP are RDX plumes.

Ms. Jennings asked Mr. Gregson to clarify which are the eight decision units that require remediation. Mr. Gregson pointed out the areas and noted that any area colored other than green is targeted for cleanup.

Mr. Gregson then stated that five of the seven treatment alternatives being considered for L Range soil include an excavation component, while the other two involve treating the soil in place. He then reviewed the alternatives: excavation (0.5 to 1 foot depth) and offsite disposal of an estimated 3,200 tons of soil; excavation and onsite asphalt batching; excavation and onsite thermal desorption; excavation and onsite treatment of stockpiles with DARAmend (a treatment additive that is a mixture of zero valent iron and a carbon source for bacteria); excavation and onsite treatment of stockpiles with lime (to drive the pH up to around 10 and cause a chemical reaction called alkaline hydrolysis, which breaks down the explosives); in-situ treatment with DARAmend; and in-situ treatment with lime.

Mr. Gregson then talked about the pros and cons associated with the alternatives. For excavation and disposal – a tried and true technology, cost of about $1 million, soil would be transported by truck to either a New Hampshire or Maine landfill for disposal (causing significant air emissions), doesn't destroy the contaminants. For excavation and onsite asphalt batching – cost of about $600K or more, encapsulates but does not destroy the contaminant and keeps it on base, long-term worry about what happens when the asphalt breaks down. For excavation and onsite thermal desorption – destroys the contaminants, used successfully for Demolition Area 1, most expensive at $2 million, enormous carbon footprint, as Demo 1 and associated work went through about 17,000 gallons of propane per day to fire the thermal treatment unit. For excavation and onsite treatment using DARAmend or lime – relatively low cost, shown to be effective at breaking down contaminants at other sites. For in-situ treatment with DARAmend or lime – similar to excavation and onsite treatment, but requires more monitoring either through lysimeters to monitor leachate or groundwater wells to ensure effectiveness of treatment. Mr. Gregson also noted that the alternatives that involve excavation all offer one last chance to remove any remaining UXO through a screening process, an opportunity that doesn't necessarily exist with in-situ treatment.

Ms. Grillo asked if the L Range soil work would be done as a Rapid Response Action (RRA) or as part of a Remedial Investigation/Feasibility Study (RI/FS) for soil and groundwater. Mr. Gregson replied that he doesn't have an exact answer at this time. He said that the IAGWSP would like to have the work done as quickly as possible, but is also in the middle of writing the L Range RI/FS (which includes discussion about the soil alternatives), so much depends on the timing of that document versus timing of workplans. He then asked if the regulators have any opinion on this.

Ms. Jennings said that she thinks the work could be done as an RRA if excavation and disposal is the selected alternative and agreement is reached on a cleanup level. If some other option is being put forth, however, she thinks the regulators would require a full evaluation of alternatives. She also noted that some of the alternatives have been discussed in the past for other operable units, and the regulators had a substantial number of comments on implementability, especially with respect to the application of lime. Ms. Jennings added that she thinks the agencies' preference is for the alternatives to be more fully evaluated in the RI/FS, but is willing to continue to talk about them so that a quicker decision can be reached by the time the RI/FS is issued. She also said that she doesn't think she is ready to endorse any of the decisions that involve the more innovative technologies.

Mr. Goddard inquired about a plume component to the L Range site. Mr. Gregson replied that there are a couple of plumes of RDX and perchlorate downgradient of L Range. He also noted that the plumes have low ppb levels and appear to be disconnected from the source so may be from some earlier activities on the range. Mr. Goddard then asked about the amount of time needed to get a thermal desorption unit up and running. Mr. Gregson replied that if the decision were made today to go that route, it would probably take four to six months. Mr. Goddard asked if soil from other sites would also be treated if the thermal unit was at MMR. Mr. Gregson replied that the IAGWSP is looking at a number of other soil sites, so perhaps there could be some economies of scale. He also said that the cost to treat soil in the unit is about $140 per ton. Mr. Goddard asked how much additional soil requires treatment. Mr. Gregson said that he thinks all of the projects together involve about 30,000 tons of soil. Mr. Goddard also referred to the asphalt batching alternative and suggested that the IAGWSP consider placing a lining of some sort (a clay layer or flexible membrane) underneath where the asphalt is used in order to prevent any leaching.

Mr. Taylor remarked that *encapsulate* is an "endearing term," but "it won't really happen…" He also said that only a very small percentage per ton of asphalt would be the contaminant because it's tied up in fines, it's not an aggregate, and generally fines aren't used in asphalt. He also indicated that the perception some people have that asphalt doesn't crack and water doesn't go through it is a false perception. Mr. Taylor then mentioned that Massachusetts sends wood chips to Maine, because it's been legislated by the state that they're not recyclable, and he would not be opposed to sending the excavated soil to Maine as well.

Mr. Dow asked if there's an operational procedure to test whether soil that's been treated is safe to put back in the environment. He noted that the Army Corps of Engineers has an operational procedure for deciding whether dredge spoils can be dumped in the ocean or have to be placed in confined disposal sites in the harbor under clay layers. Mr. Gregson replied that the IAGWSP would have to come up with a suite of analytes to ensure that the cleanup process was complete – which would be specific to the contaminants and the treatment method that's ultimately chosen.

Mr. Cambareri remarked that while he agrees that the effectiveness of a tried-and-true option "can't be beat," given the amount of soil that needs to be treated overall, he thinks it's worthwhile to more fully evaluate the excavation and onsite treatment or in-situ treatment alternatives. He said that it was noted that these technologies were used successfully at other sites, but he'd like to know more about the conditions at these sites, the performance standards for measuring that success, and so forth. He also suggested that use of these technologies at L Range might be a pilot for use at other MMR sites.

Mr. Field recommended that an April MMRCT update on the L Range process going forward should be noted as an action item.

**Agenda Item #5. Tungsten Overview & Update**

Mr. Gregson reminded that group that when the use of tungsten-nylon bullets was suspended several years ago, the Massachusetts Army National Guard (the Guard) took an action to remove 7,000 tons of tungsten-contaminated soil to 150 ppm from the Small Arms Ranges, stockpiled the soil at Charlie and KD Ranges, covered the stockpiles with plastic, and is monitoring them. The questions that remain unanswered is whether cleaning up to 150 ppm was adequate to prevent risk either through direct contact or leaching to groundwater, and what is the ultimate disposition of the stockpiled soil.

Mr. Gregson also noted that when training occurred with tungsten-nylon bullets from 1999 to 2006, it was thought that tungsten would be insoluble. He also showed a list of ranges where the tungsten-nylon bullets were used. Ms. Jennings noted that the list includes only eight ranges, and that three are missing, which she believes might be Sierra West, Sierra East, and Echo or Tango Ranges. Mr. Gregson then continued by reporting that around 2004, the Army started looking into whether the tungsten-nylon bullets might be causing any environmental problems, and subsequent studies showed that the when the bullets were fired they fragmented into very small particles that dissolved and became mobile in the environment. A 2005 – 2006 study conducted at Camp Edwards detected tungstate in soil, pore water, and in one of three groundwater monitoring wells that were sampled. MW-72, at Bravo Range, showed the highest tungstate concentrations (as high as 560 ppb). Results from this study led to the suspension of tungsten/nylon bullets at the Small Arms Ranges.

Mr. Gregson then displayed a figure that showed some of the sampling areas that were part of the initial study, and another figure that showed lysimeters locations that were part of the study at Bravo Range. He noted that the 2007 Phase I report concluded that the tungsten in the bullets appeared to be soluble and mobile to groundwater in the sandy soil at Camp Edwards. Tungsten was found in surface soils up to 2,080 ppm, in lysimeters up to 400 ppm, and was detected in groundwater in four rounds at one of the three wells sampled.

Mr. Gregson stated that a supplemental study was proposed: to help determine how tungsten was migrating from surface soils to groundwater; to determine tungsten background levels in Camp Edwards' soil and groundwater; to obtain information on how quickly tungsten in tungsten-nylon bullets dissolves/moves through soil; and to look at the type of tungsten present in the environment at Camp Edwards. He explained that tungsten occurs as tungstate and as poly-tungstate anions or molecules. He also reported that the Phase II study involved additional groundwater sampling in fall 2006, batch & column tests conducted in 2008, and speciation work to determine the type of tungsten being detected, which is ongoing.

Mr. Gregson stated that Phase II groundwater monitoring found tungsten at around 1 ppb in a drive-point at Sierra West Range and low-level tungsten detections at other locations. In spring 2007, the IAGWSP took a closer look at the sampling & analysis protocol and refined the method in an effort to achieve better results. From spring 2007 to the present all the wells were resampled – consistent detections continue to be seen at MW-72, but all other wells are nondetect at this point. Mr. Gregson noted that the Phase II results are expected to be released in a report this spring. He also displayed a map that showed the sampling points at the ranges.

Mr. Gregson also discussed other actions, noting that the toxicity of tungsten needs be understood. He reported that the Army's Center for Health Promotion and Preventive Medicine (CHPPM) conducted some rat studies that looked at doses from 0.2 to 200 milligrams per kilogram per day (mg/Kg/day), and is currently completing a follow-up rat study looking at doses of 10, 75, 125, and 200 mg/Kg/day. Also, in December 2008 the Navy conducted a study on neurobehavioral effects of sodium tungstate, but the results were inconclusive. In addition, in 2008 the National Institute of Health (NIH) began planning for a two-year carcinogenic study in rats, but results aren't expected for several years.

Mr. Gregson then reviewed a Next Steps slide: finalize report on completed phases of Phase II fate & transport study – spring 2009; finalize speciation portion of Phase II fate & transport study – spring 2009; complete agency review of fate & transport/health studies; and determine if any action is necessary to address stockpile soil from Small Arms Ranges and soil remaining at the ranges.

Mr. Goddard asked if the Army has suspended use of tungsten-nylon bullets nationally. Mr Gregson said that he believes that it has. Mr. Goddard then said that he's surprised that the tungsten mobility problem wasn't anticipated. Mr. Gregson explained that tungsten was believed to be insoluble. Mr.

Goddard also asked if it's correct that there's no action pending for a plume. Mr. Gregson clarified that currently tungsten is being seen in just one monitoring well, so there is no mappable plume.

Mr. Cambareri asked if the stockpiles are subject to any monitoring. Mr. Gregson replied that the tarps are monitored to ensure that they are sound, and the IAGWSP is looking at sampling some downgradient monitoring wells to ensure that there are no issues with the stockpiles and the underlying groundwater. Mr. Cambareri also asked if it's correct that any action on the stockpiled soil will be decided based on the results of fate & transport studies. Mr. Gregson replied it is, and added that the disposition of the stockpiled soil is an important question because it's a very large amount.

Ms. Jennings requested that an update on tungsten be added to the May MMRCT meeting agenda. She also noted that the Phase I investigation showed that there are high levels of tungsten in the soil and fairly high levels in the pore water, and the CHPPM toxicology study provided some information on what could be used to calculate a safe level. Ms. Jennings also said that it's uncertain if there should be concern about "the mobility of that pore water into groundwater" and although a lot of soil has been stockpiled, there's a great deal of soil that hasn't been stockpiled. She then explained that the effort to excavate and stockpile the tungsten-contaminated soil involved digging up the "hottest pockets" of the berms, using a 150 ppm cleanup level, which was the detection limit of the x-ray fluorescence (XRF) device. Ms. Jennings said that she thinks that tungsten needs to be managed more closely, and added that the fate & transport studies have not been going as quickly as the regulators would have liked. She also said that she thinks that the report, which the regulators haven't seen yet, may not be conclusive enough for any decisions to be made. She further noted that she wants to keep this issue on the front burner because she doesn't think answers have been provided that are appropriate, given the two-years worth of work. She also said that she wants the regulators and the IAGWSP to work together over the next month and come to the MMRCT with action items for future phases of study, or perhaps some key monitoring of the pore water and the berms themselves.

Mr. Pinaud stated that MassDEP's Office of Research & Standards has been tasked with drafting tungsten soil and groundwater cleanup numbers, and in particular a guideline for soil disposal to help determine how much of the stockpiles should be disposed of, and if some can be used on site. He said that the studies discussed tonight are fairly critical to MassDEP's understanding in trying to develop these numbers.

Mr. Dow said that he recalls that when the tungsten issue was first raised there were some communities in New Mexico or Arizona that had high levels of tungsten in the drinking water. He said that he wonders whether an epidemiological study of those populations was ever conducted, which might be used in conjunction with the rat studies. Mr. Gregson said that he doesn't know, but would check on it. Ms. Jennings added that she remembers studies conducted in Nevada, although she doesn't know if they were epidemiological studies. She said that the Nevada studies were considered by CHPPM when it was scoping out its study. She also noted, however, that she thinks the CHPPM study might be one step closer to providing the answers. Mr. Field recommended including information about the Nevada studies in the next Tungsten Update.

Mr. Dow also spoke about a past discussion about fate & transport when the idea was put forth that the tungsten in pore water accumulated between major rainstorms, so there wasn't a direct relationship between the plume water concentrations and what was found in the underlying groundwater. He then said that if there's such a dynamic process going on, it seems to him that there should be a dynamic fate & transport model, rather than the typical model that assumes a steady state or some kind of equilibrium condition.

**Agenda Item #6. Community Involvement Brief Update**

Mr. Murphy reported that the community involvement representatives from AFCEE, MassDEP, the U.S. Environmental Protection Agency (EPA), and the IAGWSP met today to discuss a way forward, including whether it's time to update a Community Involvement Plan (CIP), and the group made plans to meet two more times over the next couple of months for further discussion. He also noted that the group did agree to move forward with the development of an approximately eight-page joint fact sheet that would be based on the groundwater findings map, supplemented by a look-ahead from both cleanup programs. Later, the group will look at whether it's appropriate or necessary to produce some kind of bigger product at the end of the year. Mr. Murphy noted that the goal would be to have the fact sheet available to the public by June, and distribution of the document, possibly through the newspapers, will be discussed further. He also mentioned that with respect to an overall CIP, the group also talked about the idea of conducting community surveys or interviews to obtain information about the public's wants with regard to the base programs.

Mr. Goddard said that this approach sounds reasonable to him. He also said that he thinks a joint document should clarify what the cleanup programs are doing and how the various base-related teams fit in. He also suggested having the document available as a PDF that could be distributed to realtors, Boards of Health, and so forth. He then noted that summer is when the biggest audience is available for this type of information. Mr. Murphy said that the MMRCT would be provided with a one- or two-page write-up about the Community Involvement Group's plans. Mr. Goddard then recommended that the group consider a sit-down media information session to get the word out about the progress that's been made so that the public understands what's going on.

Mr. Minior announced that within a week MMRCT members would be receiving copies of the CS-19 Proposed Plan for groundwater. He noted that the document will be discussed at the April MMRCT meeting, which will kick off the public comment period that will lead to a final Record of Decision.

Mr. Murphy informed the group that he will be continuing his work at MMR a little longer than expected, as his successor, Jeanethe Flavey, will not be available to take over for about three more months. He then introduced Ms. Flavey, who was in the audience.

Mr. Cambareri mentioned that he put together some slides of old plume maps as part of a talk he gave recently to Americorps people interested in citizen activism. He said that he thinks that the story of the evolution of the plumes is fascinating and could be helpful in getting more people interested in community involvement. Ms. Jennings asked if Mr. Cambareri is asking for a history of the evolution of the plumes. Mr. Minior noted that a couple years ago Mr. LeBlanc put together a presentation that looked at plume maps through the years. Mr. Field asked if Mr. Cambareri would find that type of thing useful, and Mr. Cambareri replied that he would. Mr. Field confirmed that the IRP would post a link to Mr. LeBlanc's presentation on its website.

**Agenda Item #7. Adjourn**

Mr. Field stated that the MMRCT would meet next on Wednesday, April 8, 2009. He then adjourned the meeting at 8:37 p.m.