Massachusetts Military Reservation Cleanup Team (MMRCT)
Building 1805, Camp Edwards, MA
December 10, 2008
6:00 – 8:00 p.m.

Meeting Minutes

Member:	**Organization:**	**Telephone:**	**E-mail:**
Jon Davis	AFCEE/MMR	508-968-4670	jon.davis@brooks.af.mil
Hap Gonser	IAGWSP	508-968-5107	kent.gonser@us.army.mil
Ben Gregson	IAGWSP	508-968-5821	Benjamin.p.gregson@us.army.mil
Bryan Olson (sitting in for Lynne Jennings)	US EPA	617-918-1365	olson.bryan@epa.gov
Bob Lim	US EPA	617-918-1392	lim.robert@epa.gov
Paul Marchessault	US EPA	617-918-1388	Marchessault.paul@epa.gov
Leonard Pinaud	MassDEP	508-946-2871	Leonard.Pinaud@state.ma.us
Jean Crocker	MMRCT/Cotuit	508-428-4283	jhccotuit@comcast.net
Steve Hurley	MMRCT/MDFW	508-759-3406	steve.hurley@state.ma.us
Phil Goddard	MMRCT/Bourne	508-759-3043	pgoddard@aol.com
Harold Foster	MMRCT/Falmouth	508-968-4818	
Charles LoGiudice		508-563-7737	irextut@msn.com
Diane Rielinger	MMRCT/ Falmouth	508-563-7533	one-brain@verizon.net
Facilitator:	**Organization:**	**Telephone:**	**E-mail:**
Doug Karson	AFCEE/MMR	508-968-4670	doug.karson@brooks.af.mil
Attendee:	**Organization:**	**Telephone:**	**E-mail:**
Rose Forbes	AFCEE/MMR	508-968-4670	rose.forbes@brooks.af.mil
Paul Nixon	IAGWSP	508-968-5620	paul.nixon@us.army.mil
Bill Gallagher	IAGWSP	508-968-5826	William.gallagher@us.army.mil
John McDonagh	IAGWSP	508-968-5636	john.mcdonagh@us.army.mil
Lori Boghdan	IAGWSP	508-968-5635	lori.boghdan1@us.army.mil
Kris Curley	IAGWSP	508-968-5626	Kristina.curley@us.army.mil
Bill Sullivan	E&RC	508-968-5147	William.g.sullivan@us.army.mil
Mark Panni	MassDEP	508-946-2898	mark.panni@state.ma.us
David Dow	Sierra Club	508-540-7142	ddow420@comcast.net
Nigel Tindall	CH2M Hill	508-968-4670	ntindall@ch2m.com
Rick Carr	TA	781-455-0653	rick.carr@testamericainc.com
Jane Gasper	Innovar	508-759-9114	jgasper@innovar-env.com

Action Items:

1. Mr. Goddard requested that the issue of team merger be scheduled for a future MMRCT/SMB joint meeting.

2. Mr. Goddard asked for information regarding all the advisory teams that exist, in terms of their purpose and membership.

Handouts Distributed at Meeting:

1. Presentation handout: BA-4 Site Overview
2. Presentation handout: Demolition Area 1 Source Area Overview

3. Presentation handout: AFCEE Wind Turbine Project
4. Presentation handout: Fuel Spill 28 Plume Update
5. Maps/Figures to accompany Fuel Spill 28 Plume Update
6. Summary fact sheet: Five-Year Review Report Summary

Agenda Item #1. Introduction, Agenda Review, Action Item Review

Mr. Karson convened the meeting at 6:07 p.m. and reviewed the agenda. He then asked if there were any comments on the action item from the 11/19/08 Senior Management Board (SMB)/Massachusetts Military Reservation Cleanup Team (MMRCT) combined meeting. No comments were offered on the item; however, Mr. Goddard said that he thought that his request for a community involvement update at a future MMRCT meeting would have been recorded as an action item from that meeting. Mr. Karson explained that the request was not recorded as a formal action item, but he and Ms. Curley of the Impact Area Groundwater Study Program (IAGWSP) are putting together a six-month look-ahead document, to be presented at the January MMRCT meeting.

Agenda Item #2. Brief Updates, and Reflections on Joint Meeting

Mr. Karson noted that he had not gone to the 11/19/08 joint SMB/MMRCT, but understands that only two selectmen, both fairly new to the SMB, were in attendance. He then asked if any MMRCT members wanted to share their thoughts on the joint meeting.

Ms. Crocker remarked that in general it seems that as citizens in the community become convinced that the cleanup/restoration is going well, meeting attendance drops off. She also said that it takes a great deal of money to run the team meetings, and if they aren't being well attended, she thinks it's time to cut back.

Mr. Goddard said that he has the sense that very little occurs at SMB meetings that's different from what occurs at MMRCT meetings. He also noted that other MMR-related advisory groups exist, which perhaps would satisfy the additional information needs of the elected officials on the SMB. Mr. Goddard said that he'd like to see a list of these other groups and their purposes. He also suggested that if the MMRCT remains a cleanup team, and the other base forums fulfill the selectmen's needs, perhaps the SMB is no longer necessary.

Mr. Karson noted that at the combined SMB/Impact Area Review Team (IART)/Plume Cleanup Team (PCT) meeting earlier this year (when it was determined that the IART and PCT would combine to become the MMRCT), SMB members indicated that they wanted to remain a separate group, but meet periodically with the MMRCT. He also noted that information about the missions of the other MMR-related groups that Mr. Goddard mentioned can be found on the Environmental & Readiness Center (E&RC) website. He also said that he believes that these other groups deal with other issues, such as preservation of the northern 15,000 acres of MMR. Mr. Goddard said that he would ask that the next joint SMB/MMRCT meeting include a discussion about the frequency of SMB agenda items that are truly unique to that group, in order to determine if SMB members really require a separate forum, or instead could satisfy their information needs by being part of the MMRCT and perhaps having MMR representatives provide briefings at selectmen's meetings.

Mr. Dow, who noted that he's attended SMB meetings in the past, said that the SMB generally receives less-technically-detailed presentations from the cleanup programs, and also addresses other topics such as the Natural Resource Damages Assessment (NRDA) process, PAVE PAWS updates, and health studies. He also said that he thinks it most important that the SMB is made up of elected officials who actually represent a large number of stakeholders, so SMB members are "probably taken more seriously" than the volunteer citizens.

Mr. Pinaud asked Mr. Goddard to summarize his comments as an action item. Mr. Goddard said that he's requesting that the next joint SMB/MMRCT meeting include a discussion point regarding what the SMB thinks about combining the teams. He also noted that he's interested in hearing what the program managers think about merging the two groups, and whether it's really worthwhile to fund two separate meetings. He also questioned whether the SMB selectmen take votes on cleanup plans, as PCT members have done in the past.

Mr. Davis said that after the last meeting, he thinks it's fairly clear that many people question whether there's much value added by having two teams. He also suggested that some SMB members have indicated a preference for maintaining a separate forum and not comingling with (the volunteer citizens of the MMRCT). Mr. Davis also said that he was asked whether the SMB serves the Installation Restoration Program (IRP) in any way, and replied no, it doesn't. Rather, the IRP gets everything it needs from an advisory group from the MMRCT. He also noted, however, that the IRP is certainly obligated to provide presentations to the SMB if it wants to remain separate, and mentioned that in addition the IRP addresses specific issues with particular towns by going before the individual boards of selectmen. Mr. Davis then told Mr. Goddard that the SMB is not asked to take votes on proposed plans, and added that the SMB membership consists of not only elected officials, but also representatives of the Wampanoag tribe, the Department of Public Health, the Massachusetts Department of Environmental Protection (MassDEP), the U.S. Environmental Protection Agency (EPA), and the military services at MMR. He further stated if the towns want to weigh in on a proposed plan, comments are submitted as part of the regular proposed plan process. He also said that he thinks that some kind of change to the team structure is likely to happen within a year.

Mr. Goddard remarked that he thinks that the elected officials could join the MMRCT and have "the elected officials' voice." He also said that he believes that the MMRCT serves as the Restoration Advisory Board (RAB) that the IRP requires and that's required under the Safe Drinking Water Act (SDWA). Mr. Davis clarified that the SMB is actually considered the RAB because its membership includes base officials and elected officials; whereas the MMRCT is more a technical advisory team. Mr. Goddard noted that this is something to consider. Mr. Davis agreed and said that he'd certainly want some of the SMB members to remain part of the group, whether it's a board or a team.

Mr. Gonser said that the IAGWSP sees a considerable amount of value in the SMB because it wants to maintain those contacts with the community, and it doesn't require much extra effort to provide the SMB with briefings. He noted that it's beneficial to have someone from the town who is familiar with the cleanup program and staff, as this enhances the program's ability to execute activities out in the communities more quickly and easily.

Mr. Olson said that he thinks that EPA agrees with Mr. Davis that a change in the teams will occur at some point over the next year, and he believes that EPA thinks that the two groups should merge. He also agreed with Mr. Gonser about the importance of having regular contact with the elected officials, noting that he would like to "get them all at the same meeting," "get a lot of things done," and not have "two separate meetings doing almost the same thing."

Agenda Item #3. Impact Area Groundwater Study Program Updates

BA-4 Removal Action, Investigation, Completion of Work

Mr. Gregson noted that the IAGWSP would be presenting updates on two sites headed for final closure – the Bivouac Area 4 (BA-4) site, by way of a no-further-action letter, and the Demolition Area 1 (Demo 1) site, by way of an addendum to the Demo 1 Groundwater Decision Document. The public comment period on the documents will run from mid-March to mid-April of 2009, and tonight's presentations will provide background information for the public comment period. Mr. Gonser added that because the IAGWSP wanted to move more quickly on these sites than is outlined in the regular

cleanup process, cleanup actions have already been taken and the program is now trying to catch up with the associated paperwork.

Mr. Gallagher stated that BA-4 is a campsite/training area within Camp Edwards. Mr. Gonser clarified that the actual BA-4 site is a burial site that wasn't associated with the bivouac area, but was named as such because of its location on the map. Mr. Gallagher also noted that BA-4 is located southwest of the Impact Area.

Mr. Gallagher then reported that the BA-4 site investigation began in 2001 under Phase 2 of the Munitions Survey Program (MSP), the purpose of which was to identify potential disposal sites using historical aerial photographs, maps, witness interviews, site reconnaissance, and geophysics. He noted that ground-based geophysical surveys were conducted over five areas at BA-4, labeled A, B, C, D, and E. Two disposal sites were uncovered: one in Area A, where 342 expended jet-engine starter cartridges and igniter tubes were found, and one in Area E, where a crushed 55-gallon drum containing ash, burned small arms ammunition, and pyrotechnics were found. A groundwater investigation involving the installation of two drive-points and two permanent monitoring wells was conducted in 2006, and samples were also collected from a couple of existing downgradient "far-field" wells. Mr. Gallagher also noted that two Rapid Response Actions (RRAs) were conducted at BA-4 – one at Area A and the other at Area E.

Mr. Gallagher noted that soil investigation results showed lead concentrations as high as 461 parts per million (ppm) at Area A, and dioxin concentrations above screening levels at Area E. He also spoke about groundwater investigation results, noting that initially lead was detected at a maximum concentration of 53 parts per billion (ppb) in a pumping well that supplied water to a base building, and the maximum contaminant level (MCL) for lead is 15 ppb. He then reported that lead concentrations decreased significantly after that metal well was replaced with a PVC well, that replacement having been done because of the high lead detections and because the water table had dropped below the well screen. That well has tested nondetect for lead since 2003. Mr. Gallagher also noted that the drive-points that were put in before permanent monitoring wells were installed at the two disposal areas showed somewhat elevated lead concentrations, believed to be due to the general high turbidity in drive-point samples. Lead was not detected in the permanent well installed at the same location and depth as drive-point 463 (DP-463), and no perchlorate or explosives were detected in the downgradient monitoring wells, MW-83 and MW-84.

Regarding the BA-4 RRA, Mr. Gallagher reported that 85 tons of soil was removed from Area A, where the jet-engine starter cartridges were found and 10.5 tons of soil was removed from Area E, where the crushed drum was found. He also noted that post-excavation sampling generally confirmed that the impacted soil had been removed, and all of the excavated soil was transported off site for disposal.

Mr. Gallagher then reviewed the BA-4 summary slide and made the following statements: the contaminated soil was removed and sampling confirmed that no further removal was necessary; post-RRA confirmation sampling indicated that minor residual contamination remained at both Areas A and E, but all contaminants were below state cleanup levels; leaching analysis indicated that the remaining contamination at BA-4 poses no significant risk to groundwater now or in the future; the RRAs conducted at the site are believed to be protective of human health, the environment, and the aquifer underlying and downgradient of BA-4; the lead detections in groundwater were likely the result of well construction material and/or high turbidity in the sample; and the site is scheduled for closure in May 2009.

Ms. Crocker inquired about the destination of materials that are transported off site for disposal. Mr. Gallagher replied that a waste manifest is created, and the destination of the material is determined based on its content. He also said that he doesn't recall exactly where the BA-4 soil went, but it

probably went to a permitted landfill. Mr. Gregson added that the IAGWSP generally sends the soil that it transports off site to a landfill in New Hampshire or a waste management facility in Maine. Ms. Crocker asked why those places accept the soil. Mr. Gregson replied that they are permitted to accept these types of soil, and are specifically designed to do so.

Mr. Foster inquired about the criteria that need to be met before the site is officially closed. Mr. Gallagher replied that, as noted in his summary, there's no risk to the underlying aquifer or the environment, and added that there are standards to be met to achieve closure. Mr. Foster clarified that his question pertains to ruling out the well construction materials and turbidity in the samples. Mr. Gallagher informed him that the a new monitoring well was installed at the production well, and the monitoring well, which is made of PVC and has a fine-sand filter, tested nondetect for lead. He said that the IAGWSP is quite confident that the lead results were either the well material (in the 1950s-era well) or turbidity.

Mr. Lim further explained that when a site is being closed, an important thing that EPA considers is how the soil results compare to levels deemed safe with respect to leaching to groundwater. He said that this one of the key issues for SDWA sites. Mr. Pinaud added that for MassDEP to concur, it would be looking to ensure that post-excavation samples and groundwater samples meet state risk-based cleanup standards. If they do, by default the site is considered clean and can be closed. Mr. Gallagher confirmed that the BA-4 site has met state standards for any residual contamination.

In response to Ms. Crocker's earlier question, Mr. Gregson said that he just confirmed that the soil from BA-4 was sent to a permitted lined landfill in Taunton, Massachusetts, as the soil had met MassDEP levels for disposal.

Ms. Crocker then inquired about the timeframe associated with the RRA. Mr. Gallagher replied that there were actually two RRAs – one was conducted in 2006 to remove lead-contaminated soil that exceeded the state standard, and the other was conducted in 2007 to remove some residual dioxins that the risk assessors suggested might prevent the IAGWSP from being able to achieve closure.

Mr. Dow asked if the groundwater was tested for volatile organic compounds (VOCs) after the old piping was replaced with PVC piping. Mr. Gallagher replied that he does not think that the well was sampled for VOCs recently; however, in the past all water supply wells on the base were periodically sampled for VOCs and no VOCs were identified as a potential contaminant of concern (COC) in that well. Mr. Dow explained that he asked about VOCs because a new PVC pipe that was installed at his home when he recently had his gas-fired boiler replaced gave off some toxic VOCs for a couple of months, as well as a toxic semi-volatile organic compound (SVOC). Mr. Gallagher assured him that the well construction material is high-density polyethylene, a standard well construction material that has been tested many times. He also said that the IAGWSP generally doesn't see those types of compounds unless they're in the environment.

Demolition Area 1 Removal Action, Investigation, Completion of Work

Mr. Nixon stated that the IAGWSP is working toward an addendum to the Demo 1 Groundwater Decision Document, to encompass the soil work and close out the source area. He then showed a map and pointed out the Demo 1 source area, a former demolition area used for training and demolition/disposal of explosive materials, propellants, and so forth. He also pointed out the plume that resulted from these activities, noting that it is being contained with a five-extraction-well treatment system that's pumping about 900 gallons per minute (gpm), or about 1.3 million gallons per day.

Mr. Nixon also showed an aerial photograph of the Demo 1 source area, described it as a glacial kettle hole, and pointed out the perimeter road around the area. He noted that most of the activity at Demo 1 occurred inside the "bowl" (the hole or depression at the site), and he mentioned that the IAGWSP removed a nearby concrete bunker that had been used to observe activities in the bowl. Mr. Nixon

further noted that the COCs at the site were primarily explosives (RDX, TNT, 2-4-DNT) and perchlorate. He also explained that over the years that the site was being used, about eight feet of soil was built up in the bottom of the bowl from periodically scraping down the sides and filling in the bottom to make the area safer for future users.

Mr. Nixon then noted that the Demo 1 Groundwater Decision document, which was signed in 2006, laid out that the treatment system would be built on the existing RRA system (a two-well system that operated from 2003 to 2007) and include additional wells to raise the flow rate to 908 gpm. The expanded system has been operating since June 2007 and is treating about 1.3 million gallons per day. The Demo 1 source area was not included in the decision document. Mr. Nixon also mentioned that the Demo 1 site was used from the 1970s until 1997 for the destruction of munitions, fireworks, and other items, and for demolition training. He further noted that 950 soil samples were collected inside the perimeter road, with test results showing explosives (which were co-located) and perchlorate, which was fairly depleted because of its high solubility. The Post-Screening investigation and the Supplemental Post-Screening investigation were conducted outside the perimeter road to determine whether the road was an effective limit of what needed to be excavated.

Mr. Nixon reported that the objective of the Demo 1 Soil RRA was to eliminate potential sources that would contaminate the groundwater further. He also mentioned that a public comment period was held on the RRA plan and that the IART and SMB were regularly provided with updates on the work. He then reviewed the steps associated with the source area work: metal/unexploded ordnance (UXO) clearance, which involved the investigation and removal of 70,000 magnetic anomalies, of which only about 15 needed to be blown-in-place; soil excavation, which involved the removal of 27,000 tons of soil (excavation to a one-foot depth at the outer rim of the site, to a two-foot depth closer to the center, and to an eight-foot depth, all the way to undisturbed soil, at the center); excavation of burn pit soil, which was transported off site to an out-of-state hazardous waste landfill; post-excavation soil sampling, with the goal of reaching RDX and perchlorate levels below reporting limits; screening and treatment of the 27,000 tons of soil from Demo 1 (plus additional soil from other source area sites) at the thermal treatment unit and transport off site of the burn pit soil; a post-soil-excavation geophysical investigation, which involved resurveying 25 areas as a quality assurance check; and return of the treated soil to the Demo 1 site, in order to backfill the bottom of the bowl and leave the site in a more natural state.

Mr. Nixon then showed several photographs of the Demo 1 source area work in progress, noting that much of the work was done during the winter, that the thermal treatment unit used to treat the excavated soil heated the soil to 850ºF, and that the treated soil was stockpiled before being returned to the hole. He also pointed out: the one-foot excavation area, which was next to the perimeter road; the two-foot excavation area, which he described as a “sort of donut”; and the eight-foot excavation area, in the center. He further noted that an additional four-foot trench was dug in the center to ensure that natural, undisturbed soil had been reached.

Mr. Nixon also reported that the post-screening investigation in 2002 looked at three areas outside the perimeter road to ensure that the extent of contamination was known. Geophysical surveys were conducted at the areas, and while no UXO was really found, some small arms ammunition, one inert round, and some scrap metal were discovered. The supplemental post-screening investigation in 2003 involved collecting 73 soil samples at 22 locations outside the perimeter road, with test results yielding some small locations of contamination (including RDX, TNT, and 2,4-DNT), which, upon evaluation, were not predicted to ever impact the groundwater. In addition, a study conducted with the U.S. Army Corps of Engineers to see what happens to 2,4-DNT in propellant fibers when exposed to precipitation found that the 2,4-DNT would “stay put for the most part” and not impact the groundwater. Also, a risk analysis determined that there would be no concern associated with direct contact with the soil, as the contamination levels were so low.

Mr. Nixon then stated that it was concluded that the RRA removed areas of significant contamination inside the perimeter road, and that the residual contamination outside the perimeter road poses no significant threat to the aquifer or public health. He also reviewed a "next steps" slide: finalize the Completion of Work Report for the Demo 1 RRA and Supplemental Post-Screening Investigation Report by mid-February 2009; present the Draft Final Decision Document Addendum to the MMRCT in March/April 2009; hold a public comment period on the document from mid-March to mid-April 2009; and issue the Final Decision Document Addendum in May 2009.

Mr. Gonser summarized Mr. Nixon's presentation by noting that the Demo 1 bowl where munitions were used was excavated and sampled to ensure there was no more contamination; the outside area was checked and very little was found except for some 2,4-DNT; and the 2,4-DNT is not expected to impact groundwater, but a monitoring program is in place to alleviate any uncertainty about that, and a groundwater treatment system is in place downgradient.

Mr. Dow asked if the amount of RDX and perchlorate mass removed from the soil was compared with the amount in the plume, as an indicator of how far the plume will travel. Mr. Nixon replied that he thinks that the contaminant concentrations in the groundwater are more useful in terms of that prediction, adding that there's a "pretty extensive monitoring system for the groundwater." Mr. Dow noted that most of the perchlorate must be in the groundwater, as there's very little in the soil. Mr. Nixon said that he couldn't qualify the amount, but perchlorate concentrations in the "few hundred ppb" range are being seen in the groundwater. He further noted, however, that the source area is now clean; the groundwater wells there are completely free of perchlorate, although a little bit of RDX remains. The maximum contaminant concentrations, however, are well downgradient of the source area and are being captured. Mr. Gonser added that it's very difficult to calculate how much contaminant exists at this type of source area because it isn't a uniform distribution (as an oil-tank spill would be). Therefore, it's much more effective to calculate mass from the groundwater detections.

Mr. Dow said that his concern is that perhaps the IAGWSP hasn't actually identified where all the contaminants are and there could be buried items that haven't been detected. Mr. Nixon replied that there's very little possibility that anything is left within Demo 1, since it was excavated down to native soil. Mr. Gonser also reminded Mr. Dow of the downgradient monitoring system that would pick up anything that might not have been seen. He further noted that the treatment systems are downgradient.

Ms. Crocker asked about any plantings to help return the site to its natural habitat. Mr. Nixon replied that the bottom of the bowl was backfilled with the treated soil, three to five inches of topsoil (which he believes was acquired from the Bourne landfill) was put down over the entire area, and native vegetation was transplanted into the slopes of the bowl and the irrigation system, which has been running for the past three years to help support reestablishment of native vegetation. Ms. Crocker said that she would have liked to have seen a photograph of the site today. Mr. Goddard, who works for the Town of Bourne, clarified that the topsoil used at the Demo 1 site was not from the landfill itself, but was excess loam that had been stripped for construction of landfill-associated buildings on land that abuts the base. Ms. Crocker mentioned that George Seaver, who recently spoke to the Three Bays Natural Resource Committee, said that it's very fortunate that the MMR "has all the trees and the good land" and therefore "a lot less pollution" than some places in the town of Barnstable.

Agenda Item #4. Installation Restoration Program Updates

Wind Turbine Update

Ms. Forbes reminded the group that the Air Force Center for Engineering and the Environment (AFCEE) cleanup program, the IRP, operates eight pump-and-treat systems, which are remediating 15 to 16 million gallons of contaminated water per day. Because the systems are powered by conventional power plants that use fossil fuels to produce energy, they are indirectly producing air emissions, which,

along with the high cost of electricity, was the impetus behind the IRP's effort to look into renewable energy and build a wind turbine. She then displayed a figure showing the AFCEE treatment systems and noted that the permeable reactive barrier at Ashumet Pond is the only one that doesn't have any energy operations requirements associated with it. She also noted that the wind turbine will be located behind the Landfill 1 (LF-1) plume treatment plant.

Ms. Forbes then reported that from 2001 to 2007 the IRP spent nearly $10 million on electricity, with about $2 million spent in 2007. She also showed a bar graph illustrating the air emissions, including greenhouse gases, which were produced as a result of the IRP's commercial electricity consumption, and reiterated that the main concerns with respect to electricity are cost and air emissions. She further noted that the wind turbine – a 1.5 megawatt Fuhrlander – is expected to reduce the IRP's electricity costs by 25% to 30%.

Ms. Forbes stated that a $4.6 million wind turbine construction contract was awarded in September 2007, and the turbine is expected to produce about 3,800 megawatt hours of electricity per year, based on a 29% capacity factor. The energy produced by the wind turbine will offset about 100% of the energy consumed by the LF-1 and Hunter Avenue treatment plants, or about 30% of the IRP's total electricity requirement. Ms. Forbes also reported that the payback on the project is six to eight years and explained that she's quoting a range because it's not yet known whether the IRP will be selling the renewable energy credits, or how much the operations & maintenance (O&M) will cost, although it's estimated to be approximately $50,000 to $60,000. She further noted that the IRP worked with the Massachusetts Technology Collaborate and received a $300,000 grant toward the construction project. She also showed a map and pointed out the power line, which was installed when the LF-1 treatment plant was first built and later extended to the Hunter Avenue treatment plant, and the wind turbine location.

Ms. Forbes then stated that: the turbine will be 390 feet tall, from the ground to the tip of the blade at twelve o'clock; the rotor diameter will be 77 meters; the required wind speed for the turbine to begin turning is 3 meters per second, or 6.7 miles per hour; the wind turbine will shut itself down at a wind speed of 45 miles per hour; its survival speed is within the range of a Category 3 hurricane; and the insert for the turbine, which the IRP recently received, weighs about 18,000 pounds or nine tons.

Ms. Forbes showed a slide listing all the "upfront" work associated with the wind turbine, such as the design work, the wind resource analysis, and the notifications. She also noted that since the last MMRCT meeting, the IRP received the insert, which was brought through Connery Avenue and down the LF-1 treatment plant access road. She then explained that the insert is the piece that goes into the concrete foundation, upon which the tower is placed. She also noted that construction of the foundation is expected to begin in the spring, power is schedule to be delivered in the spring, the nacelle and blades should be delivered in the summer, and the turbine should be up and running in August/September. She also showed a photograph of the foundation for a different wind turbine project, noting that it's made up of about 600 yards of concrete.

Mr. Goddard asked Ms. Forbes about the nacelle. Ms. Forbes replied that the nacelle is the unit that houses the generator. Mr. Goddard also asked if the IRP is looking into selling carbon credits as an income stream, and Ms. Forbes replied that that hasn't yet been decided. Mr. Goddard noted that there are markets for that, such as the Chicago Climate Exchange and the local Regional Greenhouse Gas Initiative.

Mr. Foster asked if Ms. Forbes knows what would happen if the turbine encountered hurricane-force winds. Ms. Forbes replied that she does not, but has viewed wind turbine failures on the Internet that occurred because of improper maintenance, lightning strikes, and so forth. She also said that she doesn't know of any cases where a turbine was hit by a hurricane, but imagines that it would fall over.

Mr. Dow inquired whether it would be difficult to get parts for the wind turbine, if needed. Ms. Forbes said she doesn't think it would be, since spare parts are generally ordered ahead of time. She also noted that the companies that perform O&M on the turbines should have spare parts available as well. Mr. Dow asked if it's correct then that a contractor will perform the O&M on the IRP's turbine, and Ms. Forbes confirmed that it is.

Mr. Davis stated that with the term "green" or "sustainable remediation" having been coined over the past year or so, the IRP's wind turbine project has received a lot of attention. In fact, he received a message today that originated at the Pentagon, and the IRP is scheduled again to provide a briefing on the project this May in Denver. Mr. Davis explained that the project is unusual because it's solely for remediation purposes. Ms. Forbes added that even the turbine manufacturer, Fuhrlander, liked the IRP's particular application, which he thought was very unique, and asked for additional information about it.

Mr. Olson remarked that the Air Force "deserves a huge amount of credit for this project" as it was "way out ahead of the rest of the country on this issue." He noted that not only did the Air Force come up with the idea, but also went forward with implementing it right away. Mr. Olson said that he thinks everyone should feel good about the project, which he described as "a real model for the rest of the country." Mr. Goddard echoed Mr. Olson's remarks.

FS-28 Update

Mr. Tindall showed a map of IRP plumes and pointed out the FS-28 plume, located south of MMR in the town of Falmouth. He noted that the plume extends below the western arm of Coonamessett Pond and below the Coonamessett River in the southern portion. He then showed a figure of the main, northern section of the plume, noting that it's being remediated through operation of extraction well 1 (EW-1), that EW-2 was installed about a year ago to remediate the deeper leading edge plume lobe, and that a shallow well-point extraction system has been operating in a location adjacent to the Coonamessett River.

Mr. Tindall stated that the FS-28 plume is detached from unknown sources at MMR. The COC associated with the plume is ethylene dibromide (EDB), which has a very low Massachusetts Maximum Contaminant Level (MMCL) of 0.02 micrograms per liter (µg/L). Recent maximum EDB concentrations seen in the plume are around 2.5 µg/L, while concentrations seen in the past (the late 1990s) have been as high as 15 µg/L. Mr. Tindall also reported that EW-1 came on line in October 1997, the shallow-well point system came on line in 1999, and EW-2 came on line in December 2007. He also noted that the remedy for the other leading edge lobe, which is shallower in the aquifer and has lower contamination concentrations (around the MMCL or lower), is long-term monitoring. He further noted that there's no current risk of exposure to the plume and that residences in the immediate vicinity of the plume were connected to town water in 1997. In addition, he noted that sampling of Coonamessett River surface water over the past two years has yielded no EDB detections.

Mr. Tindall then showed a cross-section of the northern part of the plume and pointed out bedrock, the ground surface, the water table, and EW-1. He noted that this portion of the plume is fairly deep in the aquifer, is believed to be riding along the top of bedrock, and, based on some fairly good evidence, is being cut off through operation of EW-1. He also showed a cross-section of the southern part of the plume and pointed out the deep leading edge lobe and all the vertical lines representing drilling locations installed over the past several years to characterize the area. He noted that the plume lobe is relatively deep, about 80 feet thick in the aquifer, and only about 200 to 250 feet wide. He also pointed out EW-2, which is believed to be capturing and cutting off that part of the plume, and the small part of the plume that appears to have broken off, is upwelling toward the Coonamessett River, and is supposed be addressed by the shallow well-point system. In addition, Mr. Tindall pointed out the shallow leading edge lobe where no active treatment is occurring.

Mr. Tindall then stated that EW-1 is pumping at 550 gpm, the shallow well-points are pumping at 100 gpm, EW-2 is pumping at 50 gpm, and the extracted water is being treated at a treatment plant and then discharged to the Coonamessett River through surface water discharge bubblers. He also reported that from October 2007 through September 2008, the FS-28 treatment system has treated about 330 million gallons of water and removed about half a pound of EDB (enough to put about 4,500 Olympic-size swimming pools at the MMCL, or about one year's worth of the Upper Cape's water demand). Since startup in 1997 through September 2008, the system has treated nearly four billion gallons of water and removed 13.7 pounds of EBD (enough to put about 124,000 Olympic-size swimming pools at the MMCL, or about 26 years' worth of the Upper Cape's water demand).

Mr. Tindall also showed several photographs, including: the FS-28 treatment plant, which he noted is accessible off of Hatchville Road and is next to the cranberry bogs and the headwaters of the Coonamessett River; the shallow well-points, which he said collectively operate through a vacuum system to extract shallow groundwater; and one of the two discharge bubblers in the headwaters of the Coonamessett River. He also reviewed costs associated with the FS-28 system: $900,000 for fiscal year 2008; $49 million for 1997 to 2008; and an estimated $20.2 million for the next 30 years of O&M.

Mr. Tindall then began discussing FS-28 System Performance and Ecological Impact Monitoring (SPEIM) highlights, starting with characterization/remediation of the leading edge lobes. He explained that the re-characterization of the uncaptured portion of the plume, which occurred from May 2004 through September 2007, came about in response to some increasing concentrations that didn't match the conceptual model. He also noted that a comprehensive update on the plume was provided to the former PCT in June 2006, and that a number of brief updates were provided over the past 18 months. He then reported that since June 2006, the following work was done: 12 direct-push borings were installed; eight monitoring wells were installed; 20 shallow groundwater (push-point) samples were taken; and EW-2 and its associated infrastructure was installed, with the well becoming operational on December 11, 2007.

Mr. Tindall continued by displaying an FS-28 "hits map," which, he explained, uses color coding to identify locations (based on 2007 data) that tested nondetect, that had EDB detections below the MMCL, and that had EDB detections above the MMCL. He also noted that most of the color-coded dots represent either well samples or borings that were installed, while the inset on the figure shows shallow groundwater samples collected below the bottom of Pond 14, at what is believed to be the leading edge of that plume lobe. He pointed out that all of the shallow groundwater samples tested nondetect; however the flow field and conceptual model indicate that the lobe is migrating south in the aquifer and upwelling and discharging into Pond 14 – but clearly not at levels that are detectable.

Mr. Tindall then discussed FS-28 remedial system and network optimizations, beginning with the optimization approach for EW-1. He noted that the first step was to review the performance monitoring data. He then showed a figure entitled "FS-28 Remedial System Influent EDB Concentration Trends," and noted that the blue line represents influent concentration trends at EW-1, which have progressively decreased to the point that they are now around 0.2 µg/L. Mr. Tindall said that this was the first line of evidence to show that there may be an optimization opportunity at EW-1.

Mr. Tindall displayed a figure known as a "spider diagram," which shows contaminant concentration trends in key monitoring wells around the plume, noting that the next step in the systematic approach to remediation/optimization is to look closely at the contaminant concentrations in order to understand what's happening near the extraction well. He also reported that, in the case of EW-1, the IRP had the luxury of a fairly good three-dimensional groundwater model that had been used in the design and investigation stages. Using the model, the IRP was able to run a number of different simulations and decided to use the optimization technique of packering off the well screen (shortening the screen in order to focus extraction stress to where the plume exists) while continuing to pump at 550 gpm, and improve the performance of the extraction well.

Mr. Tindall then spoke about EW-2, noting that the approach there differed because, due to the complex hydrogeology, the narrowness of the plume lobe, and the abundance of private property in the area, there's no three-dimensional groundwater model for that part of the plume. Consequently, the IRP opted to take a more observational approach and "apply some of the principles of hydrogeology in a more straightforward fashion." He again showed the influent concentration trends graph, pointed out the line representing EW-2, and noted that the well had fairly high concentrations at startup. He also noted that performance monitoring data were reviewed and showed that the plume, through operation of the new extraction well, was starting to contract and was being captured. He further noted that in March 2008, a traditional aquifer pump test was conducted – using two flow rates (50 gpm and 160 gpm) – and a simple two-dimensional model was used to compare what was observed against what the model might predict. He also showed a figure depicting the observed data capture zone and the two-dimensional modeled capture zone, noting that they "match up quite well," especially given that the plume in that area is only about 200 feet wide. Mr. Tindall stated that the indication is that 50 gpm is an appropriate pumping rate for EW-2 to cut off and capture the plume in that area. He also showed capture zones with the well pumping at 160 gpm and noted that, again, there is a fairly good match, which builds confidence that the situation is quite well understood.

Mr. Tindall continued by discussing the optimization approach for the shallow well-point system, which he acknowledged has not behaved exactly as expected or desired over the past few years. Once again he displayed the influent EDB concentration trends figure, pointed out the line representing the shallow well-point system, and noted that there were fairly high concentrations at startup in 1999, which progressively decreased to very low concentrations and even nondetect by 2007. He also remarked that everyone would agree that pumping water with no contamination in it is not a good course of action.

Mr. Tindall then stated that periodic, very low detections of EDB were seen in the surface water in the ditch around the shallow well-points, which was a bit puzzling, the indication being that some contamination remained but the shallow well-point system was unable to capture it, or at least not capture it at detectable levels. In order to determine whether the system was still able to capture the contamination, and if so, how it could be made to operate better, the IRP used push-point samplers to collect about 110 shallow groundwater samples (just before discharge to surface water) within the footprint of that area. Test results shows only one drinking water exceedance, in a corner of the bog, and a few sporadic low detections "right in here" – the indication being "that the remnants of the plume seem to want to be discharging up in this area." However, after a reconfiguration of the well-point system, there was still no contamination being seen in the influent. The system was then reconfigured again, based on the idea that "the flow field may be preferring to discharge down in this area," and six well-points were run for a couple of weeks – each at two different flow rates (50 gpm and 100 gpm), but still nothing was seen in the influent. The next step was to resample the locations and it was found that concentrations had been decreasing, which made one wonder whether that was truly the last part of the plume discharging to that area. Then, in an effort to gather additional information and get a better understanding of what's happening in the subsurface, some direct-push borings were installed in the area north of where the plume was last seen discharging. Results from those samples will be used to make a determination as to whether the shallow well-point can be effective and whether it requires modification of some kind, or whether that's "really the last gasp of this plume" and no further action is needed in that area. Mr. Tindall then displayed a figure that showed the proposed direct-push locations near the shallow well-points as well as a photograph of the direct-push rig, taken at the first location, on the corner of the bog.

Mr. Tindall then went on to discuss SPEIM chemical network optimization, noting that it begins with a qualitative optimization approach, the overall purpose of which is to reanalyze the network that's being sampled. He explained that a spatial analysis is done, to identify optimal locations to provide appropriate spatial distribution of the data, and a temporal analysis is done, to identify appropriate

sampling frequencies. He also referred to a slide that noted that 66 locations were formerly monitored at FS-28 (two monthly, three quarterly, 37 semiannually, 10 annually, and 14 biennially – 83 samples per year), and after the monitoring network evaluation, which involved eliminating some locations (where the plume is shrinking, to the north) and adding others (where new characterization work was done, and for performance monitoring for EW-2), 63 locations are being sampled (0 monthly, two quarterly, six semiannually, 24 annually, and 31 triennially – 54 samples per year.) Mr. Tindall also mentioned that the same types of principles are used to optimize surface water and hydraulic monitoring.

Mr. Tindall concluded his presentation by reviewing the recommendations/next steps slide: optimize the remedial system – with EW-1 to pump at the same flow rate (550 gpm) but with a shortened well screen, and EW-2 to continue operating at 50 gpm, but with the installation of a shallower downgradient monitoring well to confirm plume capture; continue the investigation at the shallow well-point system, and in the meantime keep the well points shut down; assess whether the shallow well-point system can be effective in remediating the remnants of the EDB plume in that area; and implement the optimized SPEIM monitoring networks.

Mr. Goddard asked why the EW-1 well screen didn't reach the "bottom where the high concentration was." Mr. Tindall explained that a pumping well will pull water up towards it. Mr. Goddard asked if it's correct that the EW-1 well screen is going to be shortened. Mr. Tindall confirmed that it will be shortened such that the well pumps from the bottom 20 feet of the screen.

Mr. Goddard then asked how it's known that the plume is upwelling into Pond 14 if no detections were seen in the shallow groundwater samples there. Mr. Tindall showed a cross-section figure and pointed out that the leading edge lobe is rising in the aquifer, as was determined by results from two direct-push locations. He also noted that hydraulic monitoring data in that area show an upward flow toward Pond 14. Mr. Tindall then stated that either the plume has not yet reached Pond 14 or it's becoming so dilute that it can't be detected.

Mr. Goddard also asked if capture zone models are recalibrated using observed data. Mr. Tindall replied that recalibration is done occasionally for some plumes. Mr. Goddard asked, in the case of EW-2 at FS-28, whether the IRP would go back and adjust the model to reflect the observed capture zone. Mr. Tindall replied that doing so is not necessary in this particular case because of the margin of error, which is a matter of tens of feet in that area, and it's believed that there's "good enough verification for matching the observed data."

Ms. Rielinger inquired about plans for future monitoring at Pond 14. Mr. Tindall noted that there's a perfectly-located monitoring well just upgradient of the pond that will be sampled, and the one sampling round subsequent to the installation of the well shows that concentrations have gone down to below the drinking water standard. He also mentioned that surface water samples are collected from Pond 14 three times a year.

Mr. Dow asked about the effect on cleanup time caused by the "large area of impermeable sediments," as seen in the cross-section Figure 4. Mr. Tindall replied that those sediments are classified as a silt or silty sand, which is not hard silt that causes a "really very, very low flow rate." He also said that he thinks it would take about 10 to 15 years for the contamination in the sandy silt to make it down to EW-2, adding that this is truly a ballpark figure since there's no contaminant fate & transport model for that area.

Agenda Item #5. Adjourn

Mr. Karson made several announcements: that team members are encouraged to fill out and submit the meeting evaluation form; that he has with him a limited number of copies of the E&RC's recent MMR groundwater findings map for those who might like one; that MMRCT comments on the draft Chemical Spill 10 (CS-10) Proposed Plan are due to be submitted to him by December 15, 2008; that the MMRCT will have an opportunity to comment on the draft CS-10 Proposed Plan at the January MMRCT meeting – either as a group or as individuals; that the public comment period on the document runs from January 8 to February 6, 2009; and that the next MMRCT meeting, which is to take place on January 14, 2009, will include IAGWSP presentations on the Western Boundary, Northwest Corner, Demo Area 2 Feasibility Studies, and Six-Month Look-Ahead.

Mr. Karson then adjourned the meeting at 8:12 p.m.