Massachusetts Military Reservation Cleanup Team (MMRCT)
Building 1805, Camp Edwards, MA
September 10, 2008
6:00 – 9:00 p.m.

Meeting Minutes

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Handouts Distributed at Meeting:

1. Responses to Action Items from the July 9, 2008 PCT/IART Meeting
2. Presentation handout: Southwest Plumes Update
3. Figures to accompany Southwest Plumes Update

4. Presentation handout: CS-19 Source Area Update
5. Figures to accompany CS-19 Source Area Update
6. Presentation: Construction Update
7. Figures to accompany Construction Update
8. Presentation handout: Remediation & Investigation Update
9. Presentation handout: Camp Edwards Small Arms Range Update: Tango and Juliet & Kilo Ranges
10. Presentation handout: Central Impact Area Overview

Agenda Item #1. Introduction, Agenda Review, and Approval of 7/9/08 PCT/IART Meeting Minutes

Mr. Field convened the meeting at 6:05 p.m. and reviewed the agenda. Mr. Field asked if there were any changes or additions to the July 9, 2008 Plume Cleanup Team (PCT)/Impact Area Review Team (IART) meeting minutes. No changes were offered and the minutes were approved as written.

Agenda Item #2. Team Name Review, and Joint MMRCT/SMB Meeting

Mr. Field asked if there were any objections to the proposed new team name, Massachusetts Military Reservation Cleanup Team (MMRCT). No objections were noted and Mr. Field confirmed that the PCT/IART is now known as the MMRCT.

Mr. Field then reminded the group of the team review recommendation to hold a joint MMRCT/Senior Management Board (SMB) meeting once or twice a year, and noted that there's a proposal for the first MMRCT/SMB meeting to occur on November 12, 2008. Mr. Field said that, once it's developed, a draft agenda for this meeting would be distributed to team members for review. He also put forth the idea of including on the agenda a time for discussion among MMRCT and SMB members. Ms. Jennings suggested that it would be helpful if at the October MMRCT meeting the group determined what it would like to say to the SMB at the November meeting, if there should be a spokesperson, and so forth.

Mr. Goddard noted that he hadn't received the emailed meeting package that includes the meeting agenda, minutes from the last meeting, etc. Ms. Boghdan replied that Mr. Goddard's name is on the email distribution list, and noted that she would confirm that the email address is correct.

Agenda Item #3. IRP Updates

Southwest Plumes Update

Mr. Davis pointed out the Southwest Plumes on the overall plume map and on the Installation Restoration Program (IRP) plume map, noting that the plumes are primarily off base and detached from their source areas. He also mentioned that the Fuel Spill 29 (FS-29), Chemical Spill 20 (CS-20), and CS-21 plumes were discovered in the late 1990s, while the other Southwest Plume, CS-4, was discovered in the late 1980s/early 1990s. He also reviewed the contaminants of concern (COCs) at each of the four plumes: CS-4 – tetrachloroethene (PCE), trichloroethylene (TCE), 1,1,2,2-tetrachloroethane (1,1,2,2-TeCA), and ethylene dibromide (EDB); CS-20 – PCE; CS-21 – TCE; and FS-29 – EDB and carbon tetrachloride (CCl_4). Mr. Davis then displayed a table that showed for each of the plumes the maximum COC concentrations during the reporting period (July 2007 to July 2008), the maximum historical concentrations (since 1996), and the maximum contaminant level (MCL) for each COC. He noted that all of the recent maximum concentrations are less than the historic concentrations, with the exception of the historical maximum at CS-21, which occurred during the recent reporting period, TCE at 93 parts per billion (ppb).

Mr. Davis reported that the CS-4 and CS-20 treatment systems began operating in December 2005, while the CS-21 and FS-29 systems began operating in September 2006. Water extracted from the Southwest Plumes systems is piped to the on-base Hunter Avenue treatment plant, which also receives groundwater from the CS-23 plume extraction wells and two of the Landfill 1 (LF-1) plume extraction wells. Mr. Davis then explained the system layout, referring to a figure and pointing out the treatment plant along the base boundary, the wellfield in Falmouth, the central pipeline that runs through the Crane Wildlife Management Area, and the reinjection wells, infiltration gallery, and infiltration trench. He also mentioned that the Hunter Avenue treatment plant is the IRP's largest, processing more gallons of water per day than any other IRP plant. Mr. Davis then reported that the fiscal year 2008 (FY'08) operation & maintenance (O&M) cost associated with the Southwest Plumes was $1.44

million; the amount spent on the plumes from 1997 to 2008 was $48 million, including remedial investigation and conversions from private wells to municipal water; and the estimated cost for 2009 to 2030 is $7.8 million, although only the CS-21 system is expected to operate into the 2030 timeframe.

Mr. Davis then displayed a figure that showed concentration trends at selected CS-4 monitoring locations, mentioned that this type of figure is known as a "spider diagram," and pointed out the general downward trend in concentrations. He also said that the decreasing concentrations at the trailing edge of the plume indicate that there's no additional mass feeding into the plume, and it's going down to the extraction wells. In addition, Mr. Davis pointed out that the CS-4 plume boundary was "bumped out" to encompass monitoring well 1265 (MW-1265), which had traditionally tested nondetect or below reporting limit (BRL), but then had one PCE detection above the MCL. He also said that he would be showing modeling animations for each of the Southwest Plumes, noting that they're not based on the newest data, but on data collected over the last couple of years. He then showed the CS-4 animation, said that the estimated cleanup year for the plume is 2014/2015, and also mentioned that most of the plumes will have some lingering contaminants that are caught up in low-conductivity silts and will become part of the monitoring program.

Mr. Field suggested that at some point the team might be interested in learning about how the modeling compares to how the plumes are actually behaving. Mr. Davis replied that any plume could serve as an example for understanding how field data affects the model. He also said that it might make sense to add this topic to the list of potential future MMRCT agenda items.

Mr. Davis continued with his presentation by showing the CS-20 spider diagram, pointing out the extraction wells, and reminding the group that the IRP had been unable to install the planned leading edge extraction well due to access issues, as described in an upcoming Explanation of Significant Differences (ESD) document. He then pointed out the monitoring well that's located beyond the CS-20 plume capture zone and said that the model predicted that detections there would stay low and then start to increase; however, concentrations have been a little higher than expected – 15 ppb rather than the predicted 10 ppb – although the most recent detection dropped to 11 ppb. He also pointed out another monitoring well near the leading edge, which tested at 7 ppb, and said that the IRP has presented the regulators with an updated plume depiction that extends the leading edge of the CS-20 plume. Mr. Davis then pointed out the extraction well causing plume cutoff, pointed out the location where the uncaptured portion of the plume is expected to drop to below-MCL levels, and also pointed out a monitoring well with a 1.8 ppb detection, near Deep Pond.

Mr. Goddard asked why the uncaptured portion of the plume isn't expected to travel farther. Mr. Davis replied that there's not enough mass behind it; therefore, that part of the plume is expected to attenuate, primarily through dilution. Mr. Goddard asked if it's correct then that the plume isn't anticipated to reach Deep Pond. Mr. Davis confirmed that it isn't and added that even if it did reach Deep Pond, which is part of the IRP's monitoring program, concentrations would be diluted immediately to the point that they couldn't be detected. Mr. Davis then ran the CS-20 animation, referred to the location where the plume is predicted to dissipate, noted that the IRP today reached agreement with the regulators to add another monitoring well screen in that area this fall, and said that the anticipated cleanup year for the plume is about 2016.

Mr. Davis showed the CS-21 spider diagram and pointed out MW-12, the monitoring well with the new historical high of 96 ppb, noting that it's fortunate that this contamination is upgradient of two extraction wells. He also referred to the monitoring well at the trailing edge of the plume, where, unlike at CS-4, concentration trends have been increasing over the past couple of years. He explained that this indicates that, contrary to what was previously understood about the plume, there is still more mass coming, and something to consider as part of the optimization of the treatment system is whether it makes more sense to allow that contamination to reach the existing downgradient extraction or install a new, upgradient extraction well. Mr. Davis stated that concentrations in other parts of the plume are staying flat or decreasing, adding that concentrations are just above 1 ppb at the extraction well in the middle of the golf course. He then ran the CS-21 animation and reminded the group that it needs to be updated to reflect the most recent field data, including the 96-ppb detection.

Mr. Davis then showed the FS-29 spider diagram, and noted there are only two monitoring wells in the network that still have EDB concentrations above the Massachusetts MCL, which is 0.02 ppb. He also noted, however, that it's possible that higher concentrations exist in the plume, but not in that portion that has monitoring, which is "pretty sparse" due to the topography and the location of the golf course. He then ran the FS-29 animation,

noted that it shows higher concentrations than are currently seen in the plume, and also pointed out that the southern extraction well, extraction well (EW-2), "isn't helping us much."

Mr. Davis then displayed a figure showing the pumping rates at the CS-4 and CS-20 extraction wells: for CS-4 – EW-14 design rate of 160 gallons per minutes (gpm) / optimized rate of 100 gpm, EW-15 design rate of 160 gpm / optimized rate of 99 gpm, and EW-16 design rate of 300 gpm / optimized rate of 199 gpm; and for CS-20 – EW-1 design rate of 425 gpm and EW-2 design rate of 350 gpm, neither of which required optimizing. He also displayed a figure showing the pumping rates at the CS-21 and FS-29 extraction wells: for CS-21 – EW-1 design rate of 500 gpm, EW-2 design rate of 275 gpm, EW-3 design rate of 275 gpm, and EW-4 design rate of 350 gpm, none of which were optimized; and for FS-29 – EW-1 design rate of 225 gpm, and EW-2 design rate of 300 gpm and optimized rate of 150 gpm. Mr. Davis noted that the pumping rate at EW-2 was lowered this past spring and the IRP plans to shut that well off altogether as it's no longer pulling in any EDB contamination.

Mr. Davis also showed slides entitled "Overview of Remediation," which noted the following accomplishments: the CS-4 system treated 302 million gallons of groundwater, removed three pounds of PCE, one pound of TCE, and ½ pound of 1,1,2,2-TeCA during the recent reporting period, and removed 15 pounds of total COCs since system startup; the CS-20 system treated 414 million gallons of groundwater, removed 18 pounds of PCE during the reporting period, and removed 53 pounds of PCE since system startup; the CS-21 system treated 720 million gallons of groundwater, removed 30 pounds of TCE during the reporting period, and removed 65 pounds of TCE since startup; and the FS-29 system treated 260 million gallons of groundwater, removed 0.06 pounds of EDB and two pounds of CCl_4 during the reporting period, and removed six pounds of $CC1_4$ and EDB (0.01 pounds) since system startup. Mr. Davis also noted that FS-29 is the IRP's lowest concentration EDB plume, and does not compare to the FS-1 and FS-28 EDB plumes.

Mr. Davis then showed "Treatment System Performance" tables and noted that after the first sampling event, EW-2 at FS-29 has never had a detectable concentration of EDB, such that it has tested nondetect for EDB for the past three years. He explained that this information, along with the plume data, indicate that the FS-29 plume can still be remediated without EW-2 running. He also said that the plan is to conduct quarterly monitoring at EW-2 to see if the plume starts to reappear in that area. In this way data from EW-2, along with upgradient data, will be used to determine if that well should be brought back on line.

Mr. Davis concluded his presentation by reviewing recommendations and next steps: leave EW-2 at FS-29 off unless sampling results indicate that the plum has migrated to the extraction well; add additional downgradient monitoring at CS-20; operate the remedial system at optimized flow rates and monitor performance; and conduct the annual monitoring event in March 2009.

Mr. Goddard referred to the trailing edge of the CS-21 plume and asked if the model is going to be updated. Mr. Davis replied that it will be updated after some drive-point data are collected. Mr. Goddard observed that it would take only a short pipeline run to connect an extraction well in that area to the Hunter Avenue treatment plant. Mr. Davis agreed. Mr. Goddard then inquired about the possibility of using EW-2 from FS-29 at CS-21, should an additional extraction well there be needed. Mr. Davis replied that the well vault itself could be relocated, although the biggest expense associated with a well is drilling it and installing the well screen. He also noted that the IRP has other mothballed wells at this time, and that the idea is to keep EW-2 ready for use in the event that it needs to be restarted. Mr. Goddard then asked when the IRP expects to decide whether an additional CS-21 extraction well is needed. Mr. Davis replied that that decision would be made over the next eight to ten months.

CS-19 Source Area Update

Mr. Davis pointed out CS-19 on the overall plume map and on an IRP plume map, noting that the source area, which is located in the Impact Area, has an RDX groundwater plume emanating from it. He also showed a 2002 aerial photograph of the source area and pointed out the perimeter road, in the center of which was an unexploded ordnance (UXO) disposal area.

Mr. Davis then provided a review of the "original" CS-19 disposal area cleanup: an initial removal action was conducted from August 2004 to December 2006, the objective of which was to remove the source of the RDX groundwater plume; 2,000 cubic yards of soil was treated at the thermal treatment operation that was on base at that time; another 28 tons of lead-contaminated soil was shipped off site; more than 27, 000 pounds of munitions debris was removed from the site; 96 blow-in-place (BIP) events were conducted to destroy munitions of concern (MEC) considered unsafe to move; and more than 8,500 safe-to-move items were sent to the confined detonation

chamber (CDC) to be destroyed. Mr. Davis noted that quite a large amount of debris was found at this fairly small site, about one acre in size.

Mr. Davis also spoke about the soil sampling conducted in summer 2007, reminding the group that: the site was divided into 50' x 50' grids; 50-point composite samples were done at each grid; the grinding method was used at the laboratory; samples were taken from 0" to 6" in all the grids and from 9" to 12" and 21" to 24" in grids outside the perimeter road (as it had been learned that the disposal area was not confined by the perimeter road); the soil samples were analyzed for explosives, perchlorate, and metals; and the Massachusetts Department of Environmental Protection (MassDEP) RDX soil standard of 1,000 ppb was applied.

Mr. Davis then displayed a map pertaining to explosives in CS-19 source area soil, which highlighted grids where soil removal has been completed and grids where soil removal, to address TNT-contaminated soil, is yet to be done. He explained that there isn't a cleanup number for TNT, and rather than spend the resources to establish one, the IRP decided to move forward with this action. He also pointed out an area of RDX-contaminated soil where no removal will occur because it's below the cleanup standard, and also made note that the site ultimately expanded beyond the original perimeter road, with some of the highest concentrations found outside of the road.

Mr. Davis also displayed a map pertaining just to nitroglycerin (NG) at the original CS-19 source area, noting that two grids, which also contained RDX, had already been removed and the IRP is contracting to remove a third grid with NG at 12 parts per million (ppm). He further noted, however, that the regulators also want the IRP to take a closer look at another grid with NG at 8 ppm. Mr. Davis informed the group that NG has never been detected in groundwater at CS-19. He also displayed a slide showing soil stockpiles. He then reported that 980 tons of soil from the grids was excavated and transported for disposal. In addition, a little more than 1,000 tons of stockpiled soil (generated while removing UXO, munitions debris, and so forth) was also transported for disposal.

Mr. Davis stated that remaining work at the original CS-19 source area includes excavating, transporting, and disposing of approximately 724 tons of TNT- and NG-contaminated soil this winter, conducting confirmation sampling that will include analysis for semi-volatile organic compounds (SVOCs), and issuing a closure report in spring 2009.

Mr. Davis continued by discussing the expanded CS-19 area, including a bunker (600 feet north of the "original" disposal area) that was used to support munitions testing. He then showed a photograph of the bunker and a geophysical survey map of the bunker area, and said that transects were run through the expanded area and an EM-61 survey was conducted. The only thing of interest that was found was a burn pit, which is going to be removed. The IRP now plans to grid off the expanded area into 50' x 50' grids and conduct an EM-61 survey over all the grids to see what else might be there.

Mr. Goddard inquired about the geophysical signal on the lower left part of the geophysical survey map. Mr. Gallagher of the Impact Area Groundwater Study Program (IAGWSP) replied that it is a target within the Central Impact Area.

Mr. Davis then reviewed next steps at the CS-19 expanded study area: excavate and remove the burn pit, which has exceedances of metals and dioxins; conduct an EM-61 survey over all the grids; investigate anomalies, looking for non-training activities such as munitions testing/burial/burning; sample soil in each grid (surface and subsurface) and analyze for explosives, perchlorate, SVOCs, and metals; and conducted any additional removal deemed necessary based on results of the investigation. Mr. Davis also reviewed the CS-19 summary slide: the CS-19 plume is stable, does not appear to be migrating, and has a maximum RDX concentration of about 15 ppb; removal at the original CS-19 source area will be completed and confirmation sampling conducted; and investigation of the CS-19 expanded area will be completed, and the burial pit removed.

Ms. Rielinger asked if the IRP feels certain that no additional investigation is needed west of grid D-0 at the original CS-19 area. Mr. Davis replied that the field crew reported having reached native soil when that grid was excavated, and didn't see any munitions debris. He also noted, however, that the IRP is still awaiting confirmation sampling results, which will indicate whether full removal of the grid was achieved.

Ms. Grillo inquired about the status of the CDC. Mr. Davis replied that the CDC is currently not on the base, but may be coming back in October. Ms. Grillo then asked if the safe-to-move items Mr. Davis mentioned are

currently being stockpiled. Mr. Davis clarified that those items already were destroyed in the CDC the last time it was on the base.

Mr. Gonser inquired about the size of the bunker area. Mr. Davis replied that it is about one and one-third acres in size.

Ms. Crocker said that years ago parts of the Impact Area were "completed cleaned of everything" and then asked about the recovery of the local habitat since that time. Mr. Davis replied that no vegetation grew back at the original CS-19 area after it was used and allowed to sit for 20 years. Mr. Gonser told Ms. Crocker that recovery really depends on the type of clearance that's done; for example, if the root stock is left the vegetation could come back in a matter of months or years. Mr. Davis added that vegetation already has grown where transects were cut just over a year ago.

Mr. Dow asked if DNT was detected in the groundwater beneath the original CS-19 area, where both RDX and DNT were detected in soil. Mr. Davis replied that DNT was not detected in groundwater. Mr. Dow then inquired about the level of RDX in the groundwater. Mr. Davis reiterated that the maximum RDX concentration in the plume is 15 ppb.

Mr. Dow also asked if the IRP had looked at levels of heavy metals or perchlorate in the vegetation leaves or needles in the area outside of the original CS-19 source area. Mr. Davis replied that such an effort has not been made. Mr. Dow explained that he's making the suggestion because, especially with regard to metals, it is easier to detect low levels in plants than it is to detect them in soil.

Mr. Goddard mentioned that the Town of Bourne had worked with the Army to donate thousands of cubic yards of indigenous topsoil taken from projects abutting the base, to be used for restoration work conducted by the Army. Ms. Crocker said that she loves to hear that type of thing.

Brief Construction Updates

Mr. Davis stated that the IRP Is going to install a new extraction well in the southern part of the Ashumet Valley plume, with piping to a small mobile treatment unit (MTU) on private property (for which the easement appraisal is still being worked), and discharge into the Backus River. He noted that sonic drilling for the new well began today and the contract was awarded last week.

Mr. Goddard inquired about any neighborhood reaction to the construction work. Mr. Karson reported that he had delivered neighborhood notices in August before the drive-point work was done, and again last Friday, in advance of the sonic drilling that started today. He noted that he delivered notices to about 30 homes and spoke with many of the residents, who were very receptive to the work and speeding up the cleanup. He also mentioned having talked with those whose homes abut the drill rig setup and the future treatment plant location, and they are well aware of the current activities and the upcoming piping run and treatment plant installation. Mr. Karson further noted that he already has delivered one neighborhood notice pertaining to CS-10 construction work and anticipates delivering another notice on Friday.

Mr. Pinaud asked if the IRP plans to have a tree line of some kind to shield the MTU. Mr. Davis replied that there is good vegetation on both sides, so the nearby homes will be well protected. Mr. Pinaud asked if the MTU could be brought in via the bog road, which would be less disruptive to the trees. Mr. Davis explained that because of its poor condition, the IRP would not want the bog road to be the long-term O&M access road, nor would it want to disrupt cranberry operations.

Mr. Davis then stated that the CS-10 project also involves the installation of a single extraction well, but with a longer pipeline run to tie in with the Sandwich Road treatment system, and a new reinjection well to tie in with the southern trench reinjection line. He also noted that there are no property access issues as the entire project will be done on public or MMR property. He further noted that the sonic drilling has been completed and the dual-rotary rig is now starting the work for the actual installation of the extraction well.

Mr. Davis concluded his presentation by reviewing a construction status slide: for Ashumet Valley – a $930K contract was awarded on September 3, 2008; sonic drilling for the extraction well began on September 10, 2008; and the remainder of the schedule is dependent on property access; and for CS-10 – a $1.4M contract was

awarded on September 3, 2008, dual-rotary rig for the extraction well begins in mid-September; and project completion is estimated for spring 2009, before the CS-10 Record of Decision (ROD) is signed.

Agenda Item #4. IAGWSP Updates

Remediation & Investigation Updates

Mr. Gregson noted that tonight's presentation handout includes word slides, which, although they won't be shown on the screen, can be used by team members as a reference later. Ms. Jennings asked if for future meetings the IAGWSP could also include large copies of key maps and figures, as the IRP did. Mr. Gregson agreed to this request.

Mr. Gregson then showed a map of the J-2 East plume, which contains both RDX and perchlorate and is one of two plumes migrating north from the J-2 Range, a former defense contractor test range. He said that the J-2 East system, which is expected to become completely operational tomorrow, includes three extraction wells down the center of the plume, four MTUs (one to the south, two in the center, and one to the north) where the groundwater will be treated with granular activated carbon (GAC) and ion exchange resin, and two infiltration trenches to return the treated water to the aquifer. He noted that the J-2 East system will treat about 612,000 gallons of water per day (gpd), bringing the total amount of water being treated by the IAGWSP to about 2.8 million gpd. Mr. Gregson further stated that the J-2 North system, which was installed a couple years ago, pumps 375 gpm and includes MTUs and a small treatment plant building. He said that the two systems together will operate to clean up the J-2 Range plumes in an estimated 12 to 16 years. Mr. Gregson then showed several photographs of the J-2 East system construction activity.

Mr. Gregson showed a map of the J-1 South plume, on the base border with the Forestdale neighborhood of Sandwich. He noted that the investigation of this plume, the source of which is located at the southern end of the J-1 Range, began in 2005 with a drive-point program. He also referred to the point at the base boundary where RDX was detected at 120 ppb at a depth of about 140 to 180 feet below ground surface, adding that all the homes in the area are on town water and no current drinking water supplies are threatened by the plume. Mr. Gregson reported that the IAGWSP had moved quickly to install an extraction well (pumping 75 gpm) at the base boundary. He also mentioned that the J-1 South plume is a little different from the other Southeast Range plumes in that it contains RDX but no perchlorate.

Mr. Gregson then spoke about the portion of the plume that has migrated south/southeast across the base boundary, noting that there had been a 1 ppb RDX detection in MW-402. He also reported that, after having coordinated with town officials and the regulators, the IAGWSP is conducting a drive-point investigation in that area to help better define the southern edge of the plume, and just recently completed drive-point location A, which showed a 1.7 ppb detection, location B, which showed detections ranging from 3.4 to 5.3 ppb and location C, which showed no detections throughout the water column. He noted that the plume outline should go a little farther south, and added there are a few more locations to drill to fine-tune the plume depiction, evaluate the results, and consider the potential need for active treatment in that part of the plume, where access issues are quite difficult. Mr. Gregson said that so far no homeowners in that area are willing to host an extraction well on their property, but if it is deemed necessary to install an extraction well the IAGWSP will look at other options such as public roads.

Ms. Crocker asked how the IAGWSP came to discover the J-1 South plume. Mr. Gregson explained that the discovery came about during the IAGWSP's effort to better define some of the plumes to the north. He reminded her of the perchlorate detection in the Peters Pond area and said that the decision was made to install a fence of drive-point wells along the base boundary, which led to a detection south of the J-1 Range. He also said that the potential for L Range to be a potential source area also prompted the idea to look in that area.

Robotics Update

Mr. Gregson reminded the group that the IAGWSP has been working with the Air Force Research Laboratory (AFRL) Robotics Group on a technology demonstration to test UXO detection and removal techniques at MMR. He noted that one team has been working to remove vegetation and targets from about eight acres at L Range, a former 40mm grenade range. The equipment used includes the All Purpose Transport System (ARTS) with various attachments, including a brush-cutter, a power rake, a beach cleaner, and a robotic arm to consolidate

munitions in a location where they can be safely detonated. In addition, robotic equipment was used to conduct an EM-61 survey of the area.

Mr. Gregson reported that a second team has been working at the Central Impact Area, using a Caterpillar 325 excavator with a Brontosaurus attachment to clear brush there, as the terrain is quite hummocky and would be difficult to negotiate with a Bobcat and brush-cutter attachment. Once the brush is removed, the team is using an electromagnet to try to pick up munitions debris from the cleared area, and UXO technicians have been surveying the area and marking any potential UXO.

Mr. Gregson also spoke about other areas where the robotics equipment has been used: at the Former K Range, to cut some lanes for transects; at the J-1 Range, to remove munitions from target berms; at the BA-1 Grenade Court, to clear vegetation in preparation for a magnetic survey; and at the Former A Range, to clear munitions from a former target area.

Mr. Gregson said that the robotics equipment is expected to be at MMR through September, and then reviewed the ongoing and future projects: at L Range – complete activities with the power rake and beach cleaner; at the Central Impact Area – clear about 20 acres using the Brontosaurus attachment and remove munitions and debris using the electromagnet; at the Former A Range – continue work at one of the lower berms to remove projectiles; at the BA-1 Grenade Court – conduct an EM-61 survey; at the J-3 Range – clear some vegetation using the brush-cutter or tree-cutters for a survey; and cut firebreaks for Natural Resources if time allows.

Mr. Gregson also talked about values and challenges observed during the robotics demonstration so far. He first reviewed the values associated with using the robotics technology: reduced worker exposure/increased safety; reduced time, manpower, and cost; increased quality of work, particularly with regard to EM-61 surveys and munitions recovery; ability to work in a variety of weather conditions, including snow; and flexibility, in that commercially available attachments can be used. Mr. Gregson then reviewed the challenges: line-of-sight limitations; terrain limitations; difficulty using sifting technology in wet soil conditions; need to manage material streams; and equipment availability (the technology demonstration won't last forever).

Mr. LoGiudice referred to the cleared area at the Central Impact Area and asked if the munition debris is buried or just lying on the ground. Mr. Gregson replied "both." Mr. LoGiudice then asked if the electromagnet attachment is able to pick up buried items. Mr. Gregson said that the thought is that it will be possible to use the electromagnet to pick up items buried at some distance below the ground surface; however, it's not yet know exactly what that distance is. He also mentioned other factors, such as tree roots that might have grown around buried items. Mr. LoGiudice asked if the area will be checked again after the electromagnet is used. Mr. Gregson confirmed that it will.

Mr. Dow asked if the areas where the explosive-detecting dogs did their work last summer were compared to the same areas where robotics have been used. Mr. Gregson replied he doesn't think any of those areas have coincided at this point. Mr. Dow said that it seems the dogs would be more effective than robots. Mr. Gonser replied that because the dogs need a fairly cleared area to do their work, as they are on leashes, it's been thought that robotics could be used to remove vegetation, which would then allow better use of the dogs. He also said it might make sense to use the dogs in combination with EM-61 surveys, as they can tell if explosive compounds are present in the metallic anomalies. Mr. Dow remarked that that could save a lot time in removing items that are basically inert.

Former B & D Range Field Delineation Results

Mr. Gregson stated that in 2001/2002 the IAGWSP conducted investigations at the Former B & D Ranges, inactive Small Arms Ranges that were not part of the 1998 Berm Maintenance Program. He noted that the two ranges are located on the western edge of MMR, near the boundary with Bourne. He also reported that soil sampling at the ranges found some elevated lead concentrations, but monitoring wells installed downgradient have consistently been nondetect for lead. Mr. Gregson then mentioned that because these are older ranges, tungsten-nylon bullets were never used there, so the question that remains is how much lead is there and can anything be done to remove it effectively and recycle it.

Mr. Gregson stated that Former B Range, where training activity began in 1935, used a natural hillside as a backstop. Over time the range was used for machinegun training, pistol training, and for a while as a mortar firing position. The 2001/2002 investigation found lead levels at the back end of the range up to 2,200 ppm. The

Former D Range, where training activity also began in 1935, was used for a variety of small arms training, and lead levels detected there were as high as 10,100 ppm.

Ms. Crocker asked when land in the Impact Area would be available for use by foot soldiers. Mr. Gregson replied that that area is off limits now and for the foreseeable future because of the UXO issue. Mr. Gonser further explained that the surrounding ranges fire into the Impact Area, so it would not be used for maneuvers anyway. Ms. Crocker then asked why deer that go into the Impact Area during hunting season aren't harmed by UXO. Mr. Gonser indicated that although it's important to be cautious, it's not likely that UXO will detonate randomly or without being significantly disturbed.

Mr. Gregson showed 1950s photographs of Former B Range North, Former B Range South, and Former D Range and pointed out the areas that are the focus of the investigation in each of the photos. He then stated that for the recent investigation of the ranges, the IAGWSP decided to rely primarily on an x-ray fluorescence (XRF) meter, a quick, effective, accurate methodology to determine the extent of lead in soil. He said that the idea was to define the extent of contamination, determine how much lead was in the soil, and determine the value of a removal action and whether the lead could be sent off for recycling and the sifted soil reused on base for constructing berms at other Small Arms Ranges. Mr. Gregson also reported that: the XRF meter is capable of detecting lead down to 9 ppm; about 5% of the samples were sent out for laboratory analysis to confirm the XRF results; actual soil samples were collected at a number of locations and screened to measure the number of bullets and weight of the metal in order to get an estimate of total weight across the ranges; and additional samples were collected to fill data gaps.

Mr. Gregson then showed figures that summarized the investigation results by delineating areas where lead levels were greater than 300 ppm, the state's residential cleanup standard for lead in soil. He pointed out the area of lead levels greater than 300 ppm at Former B Range North, noted that very little lead above 300 ppm was found at Former B Range South (which matched the 2001/2002 soil sampling results), and he pointed out the number of different areas at Former D Range where levels exceeded 300 ppm, including the berm locations.

Mr. Gregson said that it was determined that 705 cubic yards of soil need to be removed from Former B Range North and Former B Range South, and 2,400 pounds of metal could be recovered for recycling. At Former D Range, 3,000 cubic yards of soil and need to be removed, and nearly 7,000 pounds of metal could be recovered for recycling. He also noted that the IAGWSP is reviewing the investigation results with the regulators and, based on those discussions, will determine whether this is valuable project to move forward. He also said that the workplan is being prepared and will be submitted by the end of the month.

The team had no questions for Mr. Gregson at this time. However, Ms. Rielinger took this opportunity to note that a member of the public seeking to attend this meeting had been turned away at the guard gate earlier this evening. She said that she knows that cleanup program staff have been working diligently to make sure this kind of thing doesn't happen, but she thinks it would be a good idea, as they come through the gate for future meetings, for MMRCT members to make sure the guards are aware that members of the public should be allowed access to attend these meetings. Ms. Boghdan informed Ms. Rielinger that the person who was initially turned away was escorted onto the base for the meeting. She also mentioned having visited the guard gate shortly before the start of the meeting to remind the guards about access to the meeting, but, unfortunately, there was a guard change-over not long after. Ms. Grillo asked if this should be brought to the attention of the Environmental & Readiness Center (E&RC). Ms. Boghdan clarified that it is her responsibility and she will remind the chief of security that individuals whose names do not appear on a prepared list can still gain access by providing a driver's license.

Agenda Item #5. MAARNG Small Arms Ranges Update

Mr. Cody reminded the group that Tango Range is north of the Impact Area and Juliet & Kilo Ranges are south of it. He also explained to Ms. Crocker that the ranges are arranged in a ring around the Impact Area, which used to receive artillery and mortar fire, and now serves as a safety distance zone for the slight chance that someone fires above a backstop berm or a bullet ricochets. The safety distance zone comes out as inverted funnel into the Impact Area, and for that reason, no one is allowed to traverse the area.

Mr. Cody then stated that when he last briefed the team in July, approximately 63,000 rounds had been fired at Tango Range. Since that time, an additional 13,000 rounds or so have been fired, bringing the total to 76,080

rounds fired on Tango Range since the 18-month trial period approval from the U.S. Environmental Protection Agency (EPA), MassDEP, and Environmental Management Commission (EMC) to fire lead ammunition on the range. Mr. Cody also mentioned the types of handgun and rifle ammunition fired at Tango Range.

Mr. Cody then reported that since the July briefing, a new backstop berm was created on Kilo Range to parallel the Juliet Range backstop berm, for safety reasons. He then noted that soil sampling at the berm face on Juliet Range showed tungsten detections, a total of 24 inches of soil has been removed, and remaining tungsten concentrations are about 1.1 ppm. He said that a STAPP bullet-catcher system is going to be installed on the Juliet Range berm. He also noted that soil sampling was conducted at the site of the berm construction at Kilo Range, nitroglycerin was detected, six inches of soil was removed, and subsequent sampling showed the soil to be nondetect for nitroglycerin at the site of the berm construction. Mr. Cody said that the goal was to ensure that the entire area was below 5 ppm of nitroglycerin, as that is the action level in the Tango Range Operation, Maintenance, and Management Plan (OMMP).

Mr. Cody then showed some photographs of the Kilo Range STAPP system being installed, which, he noted, will support 29 lanes. He also noted that the Tango Range STAPP system supports 15 lanes, and the Juliet Range STAPP system, when completed, will support 17 lanes.

Mr. Cody stated that the Massachusetts Army National Guard (MAARNG) is looking for approval to fire lead on Juliet & Kilo Ranges in late October/early November 2008. He noted the Guard will submit a petition to EPA and a letter to the EMC requesting approval to fire lead at Juliet & Kilo Ranges. That letter will also include a request for approval to continue to fire at Tango Range after the end of the 18-month trial period, without interruption, before the final report is issued. He also mentioned that there will likely be a public meeting after the petition has been submitted to EPA.

Mr. Bostwick inquired about upkeep of the STAPP systems. Mr. Cody replied that visual inspections, which are routinely audited by the EMC and occasionally by EPA, are conducted before and after the ranges are used. He explained that holes larger than 2 square inches are repaired by gluing STAPP rubber over the hole. Mr. Cody also mentioned that water has been getting into the Tango Range system, whose seams have been re-glued. The water is pumped out, however, and disposed of properly at the water treatment plant on the base.

Agenda Item #6. Central Impact Area Overview

Mr. Gallagher displayed a map and pointed out the Impact Area – the main target area for artillery and mortar firing from the 1930s to 1997 – a 2,200-acre area centrally located in the northern 15,000 acres of MMR. He also pointed out the Central Impact Area, a roughly rectangular 330-acre area located within the Impact Area. He said that the Central Impact Area has been identified as a significant source of groundwater contamination based on historical site use, groundwater plumes and particle backtracks, artillery and mortar firing fans, and land-based and airborne magnetometer results.

Mr. Gallagher then showed the conceptual site model for explosives compounds in the Central Impact Area. He noted that explosives exist or have existed in several different forms in the Central Impact Area, including fine particulates from high-order detonations, larger particles from low-order detonations, residual explosives and the remnant casings from low-order detonations, and intact UXO (which are not considered a current source of contamination). He then explained that precipitation passes through the first couple of feet of soil and dissolves the explosives particulate and residual explosives in the remnant casings, migrates down to the water table, and then flows downgradient toward the Cape Cod Canal. He also pointed out on the conceptual site model that the source material is not uniformly distributed and therefore has created many small plumelets of contamination.

Mr. Gallagher reported that the Central Impact Area groundwater investigation has been ongoing since 1997. Groundwater profile samples were collected in well borings and analyzed for explosives compounds, and for perchlorate (starting in 2002), and 138 well clusters with 332 individual wells have been installed. Mr. Gallagher noted that RDX is the most widespread contaminant in the Central Impact Area, and showed a map of the RDX plume, noting that in fact the plume is comprised of multiple parallel and overlapping plumelets, which in plan view appear to be contiguous. He also said that RDX concentrations in the plume range from the method detection limit to 44 ppb, although most of the values are below 10 ppb, and the overall average of current detectable concentrations is approximately 3 ppb. Mr. Gallagher also noted that EPA's health advisory for RDX

is 2 ppb, the state's GW-1 standard is 1 ppb, and the estimated mass of RDX in the Central Impact Area plume is approximately 50 pounds.

Mr. Gallagher continued by displaying a map of the Central Impact Area perchlorate plume, noting that it shows the extent of perchlorate contamination above 2 ppb, the state MCL. He also mentioned that the EPA drinking water level equivalent (DWEL) for perchlorate is currently 24.5 ppb, and pointed out that only a few areas are above the state MCL. Mr. Gallagher also informed the group that HMX has also been detected in monitoring wells, but not as extensively as RDX or perchlorate. The remaining COCs – TNT and its breakdown products 2A-DNT and 2,4-DNT – were detected intermittently in isolated wells with no identifiable plumes.

Mr. Gallagher then began discussing source area investigation at the Central Impact Area, beginning with the land features investigation conducted in the year 2000 and involving the investigation of 20 land features such as trenches, pits, excavations, bunkers, former buildings, and ground scars, which were identified through aerial photograph analysis. He noted that soil samples (both 5-point composite and discrete samples at depths of 0" to 6" and 18" to 24" inches below ground surface) were collected from six of the features and UXO surveys were conducted at the 14 remaining features. The purpose of the land features investigation was to determine if soil at these disturbed areas was contaminated with explosives compounds. Results of the soil sampling indicated the presence of RDX at one location, Ground Scar 7, at a single grid point, at both sampling depths. The shallow detection was 4,900 ppb, the deeper detection was 470 ppb, and as Mr. Davis mentioned earlier, the state standard for RDX in soil is 1,000 ppb or 1 ppm.

Mr. Gallagher then reported that 37 targets for artillery and mortar firing were investigated in 2000, with 17 additional targets investigated in 2002. At most of the targets, soil samples were collected from two concentric ring grids (8 samples per grid), and four discrete samples also were collected from each ring. Sampling depths were 0" to 3", 3" to 6", and 6" to 12" below ground surface for the full Phase I suite of parameters (explosives, volatile organic compounds [VOCs], SVOCs, pesticides/PCBs, herbicides, and metals.) Explosives were sporadically and heterogeneously detected, primarily in the top six inches of soil, and some targets had no detections at all. RDX, the most frequently detected explosives compound, ranged from 18 ppb to 38,000 ppb. TNT detections ranged from 140 ppb to 42,000 ppb, and the state standard for TNT is 100,000 ppb or 100 ppm.

Mr. Gallagher also reported that air magnetometry (air mag) surveys were conducted over the entire Impact Area and 4,462 anomalies were identified. Field verification was performed at 134 anomalies, 23 of those were excavated, and no burial pits were identified during the excavations. Using field verification, aerial photography, and other methods, most of the anomalies were categorized as cultural, geologic, target-related, signal noise, or unknown. Ninety-eight were categorized as related to UXO. Mr. Gallagher then displayed a figure showing the results of the air mag survey, noting that the highest signal strengths are along Tank Alley and Turpentine Road. He also mentioned that there's potential for anomalies to be masked beneath larger metallic objects. He further noted that based on the air mag survey and a review of historical information, additional investigations were conducted to characterize soil contamination and the physical distribution and condition of UXO. He then provided details on those investigations, beginning with the investigation of High Use Target Area (HUTA) I.

Mr. Gallagher noted that HUTA I, a four-acre area located within the Central Impact Area, was chosen for investigation based on air mag results. The objective of the investigation was to characterize soil contamination and the physical distribution and condition of UXO. Six 15x60 meter test plots were selected to represent low air mag signal strengths (Test Plots 1 through 3) and high air mag signal strengths (Test Plots 3 through 6). Successive one-meter lifts of soil were removed at each of the six text plots and UXO and fragmentation/scrap were catalogued, photographed, and weighed. Both five-point composite samples and discrete samples were collected in each test plot and analyzed for explosives, VOCs, SVOCs, pesticides/PCBs, and metals. Mr. Gallagher noted the following: explosives compounds were detected in approximately 10% of the discrete samples collected at HUTA I, and in only one of the 40 composite samples; TNT was the most frequently detected explosives compound, with concentrations ranging from 106 ppb to 110,000 ppb; RDX detections ranged from 100 ppb to 26,000 ppb; the highest explosives concentrations were generally detected beneath UXO identified as packed and with exposed filler material; the average UXO density was 54 items per acre for Test Plots 1 and 2, and 78 items per acre for Test Plots 3 through 6; the UXO most commonly discovered were 61mm mortars, 81mm mortars, and 105mm, 155mm, and 4.2-inch projectiles; and 95% of the UXO were found in the top three feet of soil.

Mr. Gallagher then noted that the HUTA II investigation consisted of five 7x200 meter test plots, some located within and some located outside of the Impact Area, and generally not where the highest density of UXO was thought to exist. Each transect was broken up into 7x7 meter grids for soil sampling and UXO surveys. Similar to HUTA 1, the objectives of the HUTA II investigation were to characterize soil contamination, determine UXO density near targets, and determine attenuation away from targets. Sampling and survey methods were similar to those used at HUTA I, but the soil was not excavated at the transects. RDX was detected in 3% of the samples collected, with concentrations ranging from 690 to 920 ppb. The most commonly detected UXO were 81mm mortars and 105mm and 155mm projectiles.

Mr. Gallagher reported that the Sub-caliber Aircraft Rocket (SCAR) site included a 9.6-acre area where inert SCARs were fired and a half-acre area thought to have been used for ordnance disposal. Investigations included geophysical surveys, excavation of 15 anomalies, and soil sampling at 31 locations. Soil samples were collected from select anomalies and analyzed for SVOCs, VOCs, metals, PCNs, and perchlorate. Samples referred to as pre-BIP samples were also collected from near or beneath UXO that were later blown in place. Mr. Goddard inquired about PCNs. Mr. Gallagher explained that PCN stands for polychlorinated naphthalene, and added that some inert training rounds contain PCNs so that they have a ballistic weight similar to a live round. He then reported the following: TNT, the most frequently detected explosive, was detected in seven samples at concentrations ranging from 53 ppb to 11,900 ppb; RDX was detected in two samples at concentrations ranging from 38 ppb to 182 ppb; PCN and perchlorate were not detected in the soil samples; inert 2.25-inch SCAR rockets were the most common item discovered; and projectiles and mortars were also observed in the area during the initial reconnaissance, consistent with items found at other sites in the Impact Area.

Mr. Gallagher went on to discuss the Eastern Test Site, which appeared as a cleared area in a 1960s aerial photograph, is located east of Turpentine Road, and whose exact historical use is unknown. He also noted that a 2.7-acre area at the site was cleared and surveyed, and nine anomalies were selected for subsurface investigation. Soil samples were collected from pre-BIP locations and analyzed for explosives, SVOCs, VOCs, perchlorate, metals, and PCNs. He then reported that: one pre-BIP sample showed TNT at 169 ppb and HMX at 232 ppb; the majority of surface items discovered were 155mm training rounds; and a few 81mm mortar rounds were also discovered.

Mr. LoGiudice asked why historical use of the Eastern Test Site is unknown. Mr. Gallagher replied that the Archive Search Report showed no clear designation of the site's use. However, it was believed that something must have occurred in the cleared area that showed up in aerial photographs from the 1960s, which is why it was thought to warrant investigation. Ms. Crocker added that she doesn't find it difficult to understand that no records were found because it's likely, given the long historical use of MMR lands, that at one time no records were kept. Mr. LoGiudice then asked if the discoveries at the site indicate what its use might have been. Mr. Gallagher replied that the indication is that the site is "really no different than the rest of the Central Impact Area," although he doesn't think any activities such as burial or open burning/open detonation occurred there.

Mr. Gallagher then continued with his presentation by discussing the 2004 Focused Target Investigation at Targets 23 and 42, the purpose of which was to assess the concentrations of contaminants leaching from soil into groundwater around a target. He explained that Targets 23 and 42 were chosen because they had somewhat higher explosives concentrations and a higher frequency of detections, and because they were located away from other targets. The focused investigation included: soil sampling to determine contaminant concentrations and how far contamination extends from a target; munitions surveys to determine the prevalence of low-order UXO (UXO that don't function as designed, such that there isn't 100% consumption of the explosive material, and residual explosives are left in the environment); and to determine the drop-off of UXO density with distance from a target. The investigation also involved the installation of lysimeters to determine concentrations of dissolved explosives and perchlorate in soil pore water. Mr. Gallagher explained that a lysimeter is a small screen installed in the shallow vadose zone (the unsaturated zone) to collect precipitation as it moves through the soil column.

Mr. Gallagher then reviewed the results of the Focused Target Investigation: no explosives compounds were detected near Target 23, although earlier sampling conducted in 2000 showed some relatively high concentrations, indicated that the distribution of explosives in soil is quite heterogeneous; RDX was detected at 11% of the samples collected at Target 42, with a maximum concentration of 15,000 ppb; explosives detections generally were no deeper than 3" below ground surface; and perchlorate was not detected in soil samples at either location. He also noted that: the lysimeters proved effective in characterizing explosives contamination in soil pore water; RDX and HMX were the most commonly detected explosives compounds in pore water; the highest

RDX concentration was 230 ppb and highest HMX concentration was 69 ppb, although most of the RDX pore water detections not associated with low-order UXO were 10 ppb or less; and the detections of explosives in lysimeters provided a baseline comparison for soil pore water samples that would be collected after soil was removed from these two targets as part of a subsequent Rapid Response Action (RRA).

Mr. Gallagher then stated that investigation and soil removal actions were conducted at Targets 23 and 42, which were investigated previously as part of the Focused Target Investigation. He noted that UXO within a 52-foot radius around the targets was removed, and more than 1,300 tons of soil within a 50-foot radius of the targets down to a depth varying from two to three feet was removed and treated in a low-temperature thermal desorption unit that was already on site for the Demolition Area 1 effort. Mr. Gallagher then said that this project allowed the IAGWSP to examine the effect of soil removal on soil pore water concentrations and determine UXO density around the targets. He noted that the pore water generally decreased in concentration after the soil removal action. However, RDX concentrations were still being detected in the lysimeters as late as October 2005 (roughly a full year after the soil removal action) and at relatively high, although decreased, concentrations. Mr. Gallagher also mentioned that it's important to keep in mind that the radius of influence of a lysimeter is quite small, somewhat analogous to a discrete soil sample. He further noted that the UXO density that was determined by doing the clearance around the targets was recorded for use in the UXO density estimation model.

Mr. Gallagher spoke about the UXO density estimation model, which was part of the UXO investigation. He explained that in order to extend the utility of the air mag data, ground-based geophysical surveys, and intrusive investigation, a numeric model was created to estimate UXO density throughout the Central Impact Area. The data sets utilized included the proximity of grids to know targets, air mag signal strength intensity, and areas that were visibly cleared or disturbed in historical aerial photographs. Mr. Gallagher then displayed a figure that showed the initial results of the model predictions, noting that the areas predicted to have the highest UXO densities for a one-acre grid were along Turpentine Road and Tank Alley, which correlates to where most of the artillery and mortar targets were. He said that additional investigations were conducted to validate the UXO density estimation model, which he would discuss later in his presentation.

Mr. Gallagher next discussed the corrosion studies that were part of the UXO investigation, explaining that because intact UXO could represent a future threat to groundwater, the idea was to determine how quickly intact UXO would corrode. He noted that in 2006, sixty-one ordnance items from HUTA II were evaluated specifically for their degree of corrosion. The evaluation, which was conducted by the Army Environmental Command (AEC) as a nationwide study, used the age of ordnance and the maximum pit depth to estimate in-ground corrosion rate. Measurements included eleven 155mm low-intensity training rounds (LITRs) that were less than 22 years old, nine 155mm LITRs that were 10 to 17 years old, and the nose cone from a 155mm projectile believed to have been on the ground surface for 46 to 56 years. The study concluded that the approximate time to perforation for a 0.5 inch steel casing (the thickness of a 155mm projectile) would be approximately 170 years. Mr. Gallagher further noted that additional metallurgical studies were conducted in 2007 to evaluate: the type of corrosion (pit versus generalized); pit dimension and abundance; and soil conditions pertinent to corrosion. The 2007 study indicated that corrosion is a relatively slow process at MMR, primarily due to the well-drained soil, and the time to perforation is dependent on wall thickness, anywhere from 100 to 662 years for the items that were measured.

Mr. Gallagher then spoke about the final part of the UXO investigation, the leaching evaluation, noting that UXO that are cracked or visibly leaking solid explosive filler are likely a significant current source to groundwater contamination. He reported that in 2006 a workplan was developed to evaluate the flux of explosives from a breached item (a low-order round that was discovered at Target 42) to soil pore water. The round was relocated from Target 42 and partially buried in local sandy soil within a container designed to collect rain water infiltration and sampling of the resulting leachate. The study found that the average annual release rate for RDX is approximately 0.42 grams per year, and that the annual TNT release rate is 0.32 grams per year. Mr. Gallagher also made a point of noting that these conclusions pertained just to that particular round, and added that releases from a low-order round really depend on a number of factors such as the amount of exposed surface area, the orientation of the round, and the amount of time it's been on the ground. He also said that sometimes the round can build up a passivation layer that slows down the dissolution of high explosives, and the filler material becomes enriched with RDX, with the RDX controlling future releases of TNT because it's trapped behind the RDX.

Mr. Gallagher went on to discuss the data gap investigation, noting that in 2006, during preparation of the Central Impact Area Feasibility Study Screening Report, five tasks were identified to fill data gaps: a soil sample preparation study to evaluate the Cold Regions Research and Engineering Laboratory (CRREL) multi-increment sampling (MIS) technique for use in the Central Impact Area; soil sampling at HUTA II and the SCAR site to supplement previous soil investigations; a particulate distribution evaluation to measure the size and abundance of different high-explosive particles in the environment; the installation of direct-push wells to delineate the current source area by measuring current contaminant concentrations at the water table (believed to be an indicator of a current source); and the completion of nine additional UXO test plots to validate the UXO density estimation model.

Mr. Gallagher reviewed results of the data gap investigation: the direct-push wells were effective at delineating the extent of water-table contamination in the Central Impact Area; the detection of explosives at the water table located within the Central Impact Area are evidence of currently active sources; conversely, explosives compounds were not detected in the MIS soil samples collected upgradient of the direct-push wells; and thus it appears that shallow groundwater detections are the best indicator of current active source areas. He also noted that data from the UXO test plots were used to validate and refine the UXO density estimation model, and the model proved to be a reasonably good predictor of UXO density in the Central Impact Area.

Mr. Gallaher then reviewed soil conclusions: the most frequently detected explosives were RDX, TNT, HMX, and TNT breakdown products 2A-DNT and 4A-DNT; the explosive compounds in soil are heterogeneously distributed; the highest concentrations are in shallow soil near targets; concentrations and the frequency of detections decrease with depth; small particles from high-order detonations are believed to be depleted and no longer represent a contribution to the groundwater plumes; and the current source likely consists of large particles/chunks of high-explosives and breached UXO that contain residual explosives.

Mr. Gallagher also reviewed UXO conclusions: the most common UXO encountered during the surveys were 60mm and 81mm mortars and 105mm and 155mm projectiles; most items were detected within three feet of ground surface with an average of 23 items per acre; the average depth of the items was 11 inches below ground surface; 4% of the high-explosive items were observed to have exposed filler; the density estimation model is a reasonably good predictor of UXO in low-density areas, however, it seems to over-predict UXO density in high-density areas, so the IAGWSP plans to update and refine the model using some of the AFRL's ongoing work; and intact UXO are not thought to be an existing threat to groundwater, and although eventually they could corrode and release their contents, the corrosion process is very slow.

Mr. Gallagher then returned to the slide of the conceptual site model, which he noted is a simplified depiction of what's believed to be happening at the Central Impact Area, and reminded the group that there is low-level contamination in the groundwater and that the plume is dilute and is a dispersed set of plumelets. He also noted that: the Central Impact Area plumes are likely the result of both high-order and low-order detonations; the small particles from high-order detonations are believed to be depleted; larger particles are likely continuing to contribute to groundwater contamination; soil data are inconsistent (even using the MIS technique) and therefore it's believed that shallow groundwater detections are the best indicator of current source areas; and intact UXO are not a current source of groundwater contamination, but will eventually corrode over a long period of time, potentially releasing their contents.

Mr. Gallagher completed his presentation by reviewing the next steps that the IAGWSP will undertake: finalize plume depictions; estimate the extent of the active source area; estimate the current release rate, predict changes to the release rate, and predict the time period over which the changes may occur; establish how to address potential long-term impacts from currently intact UXO and how this issue should be addressed in the feasibility study; determine an approach for simulation of a leaching mechanism and establish COCs for groundwater; and determine a subset of alternatives to carry forward for evaluation in the feasibility study, which is scheduled to be published in 2009 and will be submitted for public comment, after which the process will continue through the Remedy Selection Plan and the Decision Document.

Mr. Goddard asked for another explanation of low-order detonation versus high-order detonation. Mr. Gallagher replied that a high-order detonation, which is when an ordnance item functions as designed, consumes almost 100% of the high explosives, with perhaps just some aerosol sized particles distributed in a smoke cloud. A low-order detonation is when an item doesn't function as designed and there is only partial detonation, which could

mean almost no consumption of the explosives, leaving residual explosives both in the casing and in the environment.

Mr. Goddard then said that when he visited the Central Impact Area ten years ago, the vegetation was mainly low scrub oak, but this summer when he was there he was stunned by the amount of growth that had occurred. He then asked if there's any intention to use the robotics technology (the Brontosaurus) to level those trees. Mr. Gallagher replied that, as Mr. Gregson indicated, the current proposal is to cut 20 acres, adding that at this time the pitch pine is "kind of choking out" the scrub oak. He further noted that the Guard would like to do controlled burns in that area, but this is, of course, an issue since it is quite heavily contaminated with UXO. The hope is that once 20 acres have been cleared and the risk of UXO decreased, the Guard might be able to access the area, control the growth of the pitch pine, and try to maintain the scrub oak habitat, which is the Guard's ultimate goal. Mr. Gallagher also mentioned that the IAGWSP has been working with the Guard with respect to cutting firebreaks.

Ms. Crocker inquired about the objective of maintaining the scrub oak habitat, given that pitch pine was part of the cultural history of Cape Cod. Mr. Gonser explained that the fires that occurred in the past because of artillery firing created an ecological system that was based on burning – the pitch pine was burned down and the scrub oak moved in. Then, certain species began living there, and now there's an ecosystem that enjoys the scrub oak, which includes some rare moth species. Therefore the idea is not to go back to a pitch pine habitat, but instead maintain the scrub oak habitat where these moths and other animals and plants live. Mr. Gonser also mentioned the "sizable amount" of pine in other areas. Mr. Gallagher added that it's his understanding that the scrub oak habitat at MMR is one of the largest contiguous scrub oak habitats in the world.

Mr. Bostwick asked if there's been an assessment of the species that live in the scrub oak habitat. Mr. Gallagher replied that there has. Mr. Bostwick asked if the assessment is available to the public. Mr. Cody replied that it is available on the E&RC website.

Mr. Cambareri noted that Mr. Gallagher had referred to 23 UXO items per acre. Mr. Gallagher clarified that the 23 items pertain just to the 9.3 acres that were intrusively cleared, but that number was not extrapolated over the entire Central Impact Area. Mr. Cambareri asked if it is correct that 4% of the 23 items were observed to have exposed filler. Mr. Gallagher confirmed that it is. Mr. Cambareri then mentioned high-order explosive particles, which are no longer being generated. Mr. Gallagher said that it's believed that the residual explosives from high-order detonations quickly went into solution and are partially responsible for the existing Central Impact Area plumes, but are not thought to be currently contributing to the plume.

Ms. Jennings stated that trying to characterize the source in the Central Impact Area has been complicated, unlike any other source the IAGWSP has addressed. She mentioned the fine particulates, the low-order detonations, and also "the chunks that blow off" and land on the ground, which are very hard to characterize. She then explained that when soil sampling is done, these "chunks" are sifted out and not analyzed, and so they aren't factored in to the overall mass balance – and it might be that these chunks are contributing to some shallow groundwater contamination. Mr. Gallagher said that he thinks the chunks are pretty randomly distributed. He also said that he thinks that the CRREL method is a very good sampling technique. In addition, he noted that it's been about 11 years since firing was last done; therefore, high-order residuals are no longer being seen in the soil, and the IAGWSP is now looking for "randomly distributed broken-open casings" and particles that may have been ejected from them, which are not "the easiest thing to find." Ms. Jennings remarked that "low-order is the needle in the haystack, and this is smaller than that. Mr. Gallagher added that the low-order still has some kind of magnetic signature, which makes them a little easier to find.

Mr. Goddard questioned whether it might be time for the IRP and the IAGWSP to begin producing a combined Annual Report, thereby saving money for both programs. Mr. Karson informed him that the plan is to do just that – issue a joint plume booklet next year and then issue a joint booklet every two years thereafter. Mr. Goddard asked if the MMRCT members would have the opportunity to review the draft, and Mr. Karson replied "absolutely."

Agenda Item #7. Adjourn

Mr. Field noted that the MMRCT would meet next on October 8, 2008, and the meeting adjourned at 9:03 p.m.