WILDLIFE HABITAT COUNCIL

Case Study 26

Milan Army Ammunition Plant	
Name and Location	**Site Name:** Milan Army Ammunition Plant (MAAP) **Site Location:** Milan, Tennessee
Ecological Enhancement	Phytoremediation of explosives contaminated groundwater.
Site Description	MAAP is an active U.S. Army munitions production facility located on 22,436 acres of land in Milan, Tennessee. MAAP was constructed during World War II for the purposes of loading, assembling, packing, and shipping bombs, and other conventional munitions. MAAP also maintains and renovates munitions items and, when necessary, conducts demilitarization activities. There are nine Load-Assemble-Pack (LAP) lines, a test area, storage areas, demolition and burning grounds area and various administrative, housing and recreational areas. LAP area is where munitions were loaded, assembled, and packaged for shipping.
Site Reuse Description	MAAP will remain an active Army munitions loading facility into the foreseeable future. MAAP was used as a demonstration site for an Army innovative remediation project to test the utility of phytoremediation to treat groundwater contaminated with explosives constituents including TNT, RDX, HMX, 24DNT and 26DNT.
Stakeholder Involvement	Stakeholders at the site are the US Army, US EPA, the Tennessee Department of Environmental Quality, and the public. The demonstration project was conducted by the US Army Environmental Center with the cooperation of the installation, the Tennessee Valley Authority and the US Army Waterways Experiment Station. Because this was a demonstration project there was little concern on the part of the regulatory community except to ensure the health and safety of those involved and to ensure that site conditions were not harmed as a result of the experiment.
Site Assessment Approach and Cleanup	The contamination at MAAP consists primarily of explosives constituents including trinitrotoluene, dinitrotoluene, trinitrobenzene, RDX and HMX and metals including lead, arsenic, cadmium, zinc, and chromium. MAAP is an NPL site. The cleanup is, therefore, being performed under CERCLA. The MAAP demonstration consisted of two wetland system designs – a subsurface flow gravel-bed wetland and a surface flow lagoon wetland. Overall, the gravel-bed wetland performance proved superior in degrading

	all explosives and their byproducts compared to limited degradation by the lagoon system. Demonstration goals were to reduce TNT to concentrations less than 2 ppb and other total nitrobodies, including RDX, HMX, and the DNTs to less than 50 ppb. Influent concentrations averaged 4,000ppb each for TNT and RDX, with total nitrobodies averaging 9,000ppb. The gravel-bed system met these goals, except for low-level explosives concentrations releases during the cold winter months. The lagoon system only reduced TNT to 2ppb during the initial demonstration stages, with no RDX degradation.
Reuse	MAAP is expected to remain an active Army munitions LAP facilities into the foreseeable future.
Obstacles	The primary obstacle associated with this project was the weather. Weather proved to be a main factor in degradation efficiency for phytoremediation. Explosives compounds tended to degrade more during warmer temperatures.
Costs and Funding	Congress and the taxpayers, through the Defense Environmental Restoration Account, are funding this project. More than 6.5 million gallons of explosives-contaminated groundwater were remediated at MAAP during the demonstration. The treatment cost for constructed wetlands is approximately $1.80 per 1000 gallons compared to almost $4.00 per 1000 gallons for granular activated carbon systems.
Economic and Other Incentives	The cost of constructed wetlands phytoremediation technology appears to be less than half the cost of more traditional treatment technologies.
Time	Work has been ongoing at MAAP since the early 1980s. The treatment times/retention times in the first and second cells of the gravel-bed system were 7.5 and 1.6 days, respectively, for a total of 9.1 days.
Other	
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