



Joint Base Lewis-McChord

Environmental Restoration - Team

Introduction

Located in the heart of the Pacific Northwest's Puget Sound region, Joint Base Lewis-McChord (JBLM) is the Defense Department's premiere West Coast military installation. JBLM provides world-class installation support to more than 40,000 active, Guard and Reserve service members and about 15,000 civilian workers. The base supports 60,000 family members who live on and outside the base, and nearly 30,000 military retirees living within 50 miles. JBLM encompasses approximately 90,000 acres. Yakima Training Center (YTC), an active sub-installation of JBLM located in eastern Washington, encompasses an additional 300,000 acres.

On Oct. 1, 2010, JBLM was formally established as one of 12 joint bases worldwide. The merger of the former Fort Lewis (est. 1917) and McChord Air Force Base (est. 1947) was directed by the 2005 Base Realignment and Closure Commission.

JBLM's mission is to:

- Provide state-of-the-art training and infrastructure, responsive quality-of-life programs, and fully-capable mobilization and deployment operations for Army, Navy, Air Force, and Marines
- Manage resources efficiently and equitably to support mission readiness and execution, and the well-being of Service members, Families, and civilians
- Sustain and protect the environment as a fully-integrated community partner in the lower Puget Sound, with a highly-trained and motivated workforce

YTC's mission is to provide a quality training facility for military artillery, infantry, and engineering units. YTC has been active since 1941.



JUDGING CRITERIA



Program Management



Technical Merit



Orientation to Mission



Transferability



Stakeholder Interaction



Impact/Outcome

Background

The Installation Restoration Program (IRP) manages and mitigates hazardous substance release sites including: former landfills, former small arms ranges, underground storage tanks, disposal pits, industrial yards, and historical petroleum or hazardous waste spill sites at JBLM and YTC. Site Investigations and closures, groundwater treatment, and long-term monitoring projects are the integral parts of the program.

Since the early 1980s, hundreds of sites have been evaluated and more than 180 sites were physically investigated. The former Fort Lewis (now Lewis Main and Lewis North) and McChord Air Force Base (AFB) (now McChord Field) combined had four sites listed on the National Priority List (NPL): the Logistics Center and Landfill 5 (Fort Lewis), and American Lake Garden Tract (ALGT) and the Washrack Treatment Area (WTA) (McChord AFB). Only two sites remain on the NPL (Logistics Center and ALGT) as Fort Lewis and McChord AFB achieved EPA delisting of the other two. Formal completion of investigated NPL sites was executed with the help of EPA Region 10 and the Washington State Department of Ecology (Ecology) personnel.

The Logistics Center and ALGT have post Record of Decision (ROD) on-going remediation and monitoring. Fifteen additional Federal Facility Agreement (FFA), Washington State Agreed Order, Washington State Consent Decree, and voluntary cleanup program sites require long-term monitoring to ensure public health and safety are maintained. A system of groundwater monitoring wells is maintained for this purpose.

In 1992 McChord AFB and Ecology entered into a Consent Decree (CD) whereby Ecology determined that 29 sites where toxic chemicals had been released to the environment needed to be mitigated. All but three sites have been granted no further action status.

In 2001, Fort Lewis entered into an Agreed Order with Ecology. Of the original 20 areas, of which some are made up of multiple sites, none require any further action. Currently only one site (AOC 9-2) is actively being remediated. Three additional sites are being monitored.

Currently there are four sites undergoing active remediation at JBLM: the Logistics Center (Landfill 2 (LF2)) on Lewis Main, Fort Lewis Agreed Order (FLAO) site AOC 9-2 on Lewis North, the American Lake Garden Tract (ALGT), and Consent Decree Site SS-34N on McChord Field. The contaminant of concern at LF2, ALGT, and site SS-34N is Trichloroethylene (TCE). Gasoline and its constituents associated with a leaking underground storage tank (LUST) are the contaminants of concern at site AOC 9-2. The LUST was removed during the 1990s.

RODs for the Logistics Center (including LF2) and the ALGT were signed and implemented in September 1990 and September 1991, respectively. The selected remedy for both sites was groundwater extraction and treatment using pump and treat facilities. Ongoing groundwater treatment began in the early 1990s. The Logistics Center has three pump and treat systems and ALGT has one. Groundwater is pumped from contaminated aquifers (Upper and Lower aquifer), passed through air strippers to remove TCE and then returned to the groundwater system. In the ALGT

system, groundwater is passed through activated carbon before its return to the upper aquifer. An air sparge /soil vapor extraction (AS/SVE) system is operating at FLAO site AOC 9-2 to mitigate gasoline and gasoline vapors in groundwater and soil. At site SS-34N, a non-toxic oxidant was injected into groundwater to chemically break down TCE into harmless products.

The advanced progress of the IRP translates to a reduced need for staffing



Sea Level Aquifer Pump and Treat system at JBLM

 and contract management by JBLM personnel. Currently there is one full time civilian program manager assisted by one onsite contractor managing the IRP. Costly required scientific studies and initiatives are complete. Focus is now on  optimizing LTM to reduce operating costs. Such progress paved the way for Army Environmental Command (AEC) to award a professional performance-based contract in 2014 for managing and maintaining the existing remediation systems and performing  long-term monitoring and reporting, until cleanup objectives are achieved.

The EPA requires responsible parties of CERCLA cleanup sites to periodically keep the general public informed of

cleanup efforts. Since 2005, JBLM has held five open houses to inform the public; the most recent was held in April 2014. Newsletters mailed in advance of each open house, invite citizens from surrounding communities to attend. Additionally, surveys are mailed to a number of households regarding community interest in establishing a Restoration Advisory Board (RAB). Thought JBLM continues to solicit public involvement, to date the public has not expressed an interest in establishing a RAB.



Accomplishments

Performance Assessment Case Study

Three groundwater pump and treat systems are operating in the Logistics Center: LF2, the Interstate 5 barrier (I-5), and the Sea Level Aquifer Pump and Treat (SLAPT). These systems are in place to mitigate a TCE plume in two aquifers originating from a closed landfill (LF2). JBLM's Logistics Center and its three systems were the case study for a performance assessment in a pump and treat closure study conducted by Pacific Northwest National Laboratory (PNNL). The Department of Energy published the study in a report for nation-wide use on evaluating pump and treat systems. The report, completed in September 2015, is intended to provide resources and guidance relevant to conducting assessments on other pump and treat systems.



Geothermal Source for Heating and Cooling Systems

The original cleanup operation for the three systems was to pump and treat groundwater, and then infiltrate the water back into the upper aquifer. All three systems have been repurposed to



be clean water sources supporting facility heating and cooling systems. The three treatment systems became models of water conservation and are contributing to the net-zero goals of JBLM's sustainability program. After reaching cleanup objectives and formally concluding environmental cleanup, the LF2 pump and treat systems will continue to be used as groundwater extraction systems for building heating and cooling systems.

Sea Level Aquifer Pump and Treat (SLAPT) system sustainability

 A joint effort between IRP staff and the Army Medical Command  repurposed the SLAPT to serve two critical needs: to treat groundwater containing TCE for the Logistics Center; and to meet the water supply needs of the Madigan Army Medical Center (MAMC) Heating, Ventilation and Air Conditioning (HVAC) system.

- Additional water was needed to meet MAMC's increased cooling load from a recent hospital expansion.  Approximately 1,800 gallons per minute (gpm) of clean water from the SLAPT system provides 90% of MAMC's cooling requirements.
- Using discharge from the TCE treatment system for cooling saved



Partnership with MAMC provided an estimated \$1 million in cost savings.

approximately \$1 million by eliminating the need for a separate water supply system for cooling.

- Water is discharged from the MAMC cooling system into decorative ponds, which flow to groundwater infiltration galleries.  Groundwater discharge supports the water flow of nearby Murray Creek, which provides habitat for various species.
- MAMC received Practice Green-health's "Partners for Change" with distinction award for, among other things, using the pump and treat system as the primary source of water



The I-5 pump & treat system provides heating for two TEMFs.

for the HVAC system.

I-5 pump & treat system sustainability

The I-5 system was reconfigured to provide water for ground source heat pumps for two recently constructed buildings.

Approximately 800 gpm is diverted from the I-5 system discharge pipe and used as a geothermal source for heating two buildings. The water provides 5.6 million British thermal units per hour (BTU/h) of heat during the winter for two tactical equipment maintenance facilities (TEMFs). Each building is approximately 60,000 square feet. The system uses an

estimated 62% less energy annually compared to conventional HVAC systems. The estimated annual savings in energy cost is approximately \$50,000. In addition, this effort made construction of separate groundwater supply wells and a water delivery system for the new facilities unnecessary.



In order to deliver a reliable source of water to the TEMFs buildings, worn out and inefficient flow control valves on the I-5 discharge pumps were replaced with variable frequency drives (VFDs).



VFDs are able to match the entire system discharge rate to the sum of the individual extraction well discharge rates, allowing the system to run more consistently and efficiently. Electricity savings per year averaged \$8,000. In addition, the VFDs allow the system to be a more reliable source of groundwater for the TEMF building heating systems.

LF2 pump & treat system sustainability

The LF-2 system was reconfigured in 2014 to provide water for ground source heat pumps for an Army Reserve Center constructed nearby the same year. Approximately 400 gpm of treated groundwater is pumped from the LF2 system and used as a geothermal heat source for the building. Currently the system is in a startup cycle scheduled to be fully operational by the end of CY 2015. Energy and cost savings similar to the I-5 system and TEMF facilities are expected. In addition, VFDs were added to the LF2 system discharge pumps in 2014 to help the system run more efficiently and consistently like the I-5 system mentioned above.

Logistics Center Preliminary Close Out Report (PCOR)

In 2015, the EPA completed a PCOR documenting JBLM's efforts to complete construction activities at four sites including the Logistics Center. Ten other sites under a 1990 Federal Facilities Agreement (FFA) between JBLM and the EPA either were granted No Further Action (NFA) status or only have institutional controls with or without monitoring associated with them.



On 1 October 2015 the JBLM Joint Base Commander and the EPA Region 10 Director received a letter of appreciation from the EPA acting director of the Federal Facilities Restoration and Reuse Office for completing construction at the Logistics Center. This accomplishment puts JBLM one step closer to delisting the site.



A vacant lot historically used as a gas station on Lewis North was developed into a restaurant and bank because of the AS/SVE system installed under the building.

Air Sparge/Soil Vapor Extraction (AS/SVE) System site AOC 9-2

The IRP staff coordinated with a design engineer to facilitate construction of a credit union and pizza parlor on a JBLM brownfield site (a former gas station). The staff collaborated with the contractor in design



and construction of a system for in situ remediation of gasoline-contaminated soil and groundwater under the building. A sub-slab depressurization, air sparge and soil vapor extraction system was integrated into site development.



Because the property is in a very desirable location, the using agency absorbed all costs of the remediation construction. The result is a highly successful new facility on the brownfield site that allowed business and site restoration to thrive together with no detriment to either function.

Benefits of this project include:

- A former unusable but strategic property was returned to usefulness.
- The system successfully protects building occupants from vapor intrusion and simultaneously removes petroleum hydrocarbons from underlying soil and groundwater.



Groundwater Monitoring Using Passive Diffusion Bags



TCE is the hazardous substance of concern for six sites being remediated on JBLM and YTC. Passive Diffusion Bags (PDBs) are used to sample four of these sites. PDBs



Less waste is generated using a passive diffusion bag (in left hand) than either a disposable bailer or disposable tubing associated with using a pump.

are an innovative technology that reduces costs over using a disposable, polyethylene bailer or mechanical pumps, conventional sampling methods that require:

- Maintenance and labor costs (pumps)
- Added labor costs for set up, sampling, and tear down time (bailers and pumps)
- Added labor and materials costs for decontamination of equipment (pumps)
- Added labor and equipment costs to measure groundwater field parameters while purging sample point prior to collecting sample (bailers and pumps)
- Decontamination and purge water management costs (bailers and pumps)



In 2015, 135 of the 167 active monitoring wells on JBLM and YTC were sampled using PDBs to maximize the fiscal benefit of this technology.

Landfill 9: The Final Cleanup Site

Landfill 9 is a former solid waste landfill that was used for disposal of vegetation, construction debris, and municipal and medical waste from 1917 to the late 1940s. Most of the waste was incinerated prior to disposal and does not pose a significant risk to the environment. The landfill covers approximately 16 acres and is within the boundary of an active training area. The agreed remedial action was to cover the existing landfill area with additional clean material such that the depth of clean fill over the waste is a minimum of six feet. Approximately 67,000 cubic yards of clean fill was hauled and spread on Landfill 9 to complete the cap. No costs were incurred by the Department of Defense for placement of the extensive soil cap.



- Approximately 20,000 cubic yards of clean fill was hauled from a construction project on JBLM to Landfill 9 in 2012. The soil was unsuitable for construction purposes but ideal for soil cover. Soil was tested for arsenic and lead prior to use.
- An additional 47,000 cubic yards of soil was hauled from two construction sites in the neighboring community of DuPont, Washington in 2014 and 2015. The construction contractor assisted at no cost to the Army by leveling the delivered soils on site.
- It is estimated the IRP saved over \$1,000,000 in engineering, hauling and grading costs that otherwise would have been required for the cleanup effort.
- The soil cap was completed in May 2015. The completion report for Landfill 9 is currently under regulatory review. Verbal concurrence was received from the regulator.
- JBLM will mark completion of all requirements of the Fort Lewis Agreed Order after approval of the Landfill 9 completion report.
- Landfill 9 was returned to Range Support in 2015 and can be used for limited training purposes.



YTC RCRA Corrective Action Completion Report

In 2015, the final draft of a RCRA Corrective Action Completion Report was submitted to Ecology. This report documents the completion of recommendations made in a RCRA Facility Assessment (RFA) from 1995. In the RFA, 22 solid waste management units (SWMUs) and 38 Areas of Concern (AOCs) were identified for further investigation or corrective actions. The final site requiring an investigation

(SWMU 76) was completed in 2014.

Ecology issued a No Further Action decision for SWMU 76 in 2015. Only nine sites require long-term management of land use controls. Only two sites require long term groundwater monitoring. As of 2015 all sites managed by JBLM at YTC have reached remedy in place status and require no further investigations.



Conclusion

The program is very close to being completed as all site restoration is determined, implemented and either underway or finished. Innovative engineering converted active groundwater treatment facilities into facilities promoting and accomplishing sustainability through water and energy conservation. The additional benefit of these creative engineering practices is considerable fiscal savings. JBLM IRP staff maintained a positive and beneficial working relationship with both their state and federal regulators resulting in moving sites toward quicker closure.



Overall, the JBLM IRP personnel achieved remedy-in-place status with respect to both the EPA and Ecology. All requirements of the original Fort Lewis Agreed Order are satisfied and the final site investigation at YTC completed. The program is one that may be emulated by other installations with the potential to significantly benefit the environmental stature and economic status of the Department of Defense.

