# Environmental Assessment

# Groundwater Remediation Field Laboratory at Dover AFB

Department of the Air Force
Armstrong Laboratory Environics Directorate

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# Executive Summary

The proposed action establishes a Groundwater Remediation Field Laboratory (GRFL) at Dover Air Force Base (AFB), Delaware to demonstrate and compare in-situ detection, monitoring, and remediation technologies designed for dense non-aqueous phase liquid (DNAPL) contamination. This environmental assessment (EA) evaluates the potential impacts to the environment that may result from constructing and operating the GRFL.

DNAPL contamination poses one of the most challenging problems facing the Department of Defense (DOD) in its attempt to comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). DNAPL is a term used to describe a number of materials which are relatively immiscible with, and denser than, water. As a result of these properties, they migrate downward when spilled on the ground, and can migrate below the water table. Especially once below the water table, they are difficult to locate and remove. For the Air Force, the term DNAPL is virtually synonymous with chlorinated solvents, used for years as industrial cleaners and degreasers, and responsible for the dissolved phase and DNAPL contamination at approximately one third of all Air Force contaminated sites. Currently there are no acceptable, cost effective methods for removing or treating the bulk solvent material that sinks into aquifers or is trapped within the soil interstices. These technologies must be developed to protect the public from any health risks associated with DNAPLs and the associated dissolved phase which are found in the subsurface at a large number of Air Force bases as well as hundreds of other public and private contaminated waste sites.

The Air Force, through the Armstrong Laboratory Environics Directorate (AL/EQ), Tyndall AFB, Florida, proposes to develop the GRFL as part of the joint DOD/National Environmental Technology Demonstration Program [D/NETDP] which is funded through the Congressionally-established, Tri-Service Strategic Environmental Research and Development Program (SERDP). SERDP was begun in 1990 by Sen. Sam Nunn, former Sen. Al Gore and others through Public Law 101-510 (10U.S.C.2901-2904). The purpose of the program is to "harness some of the resources of the defense establishment...to confront the massive environmental problems facing our nation and the world today," (Sam Nunn: Senate Floor Speach, June 28, 1990). It is a multi-agency program funded through DoD and designed to respond to the environmental requirements of the military and those problems that the DoD shares with Department of Energy and Environmental Protection Agency. If developed, the GRFL will become one of the D/NETDP's National Test Sites for field demonstration of innovative remediation technologies.

The GRFL differs from other technology demonstration programs in its use of a mass balance design. This design allows for a known, experimental quantity of DNAPL to be emplaced in a test cell prior to a technology demonstration. The test cells are constructed of two concentric rectangles made of steel sheet piling sections. Remedial, or monitoring/detection technologies can be demonstrated side-by-side in the same soil matrix and be evaluated for their effectiveness in removing the emplaced DNAPL.

The proposed action consists of a series of construction and operations activities. Construction involves installing tests cells and monitoring wells, temporary buildings, and fencing. Operations will consist of emplacing the DNAPL, demonstrating and evaluating innovative technologies, monitoring for DNAPL containment integrity, and properly treating and disposing of wastes.

The most common DNAPLs encountered as environmental contaminants throughout the Air Force are tetrachloroethylene (PCE), trichloroethylene (TCE) and other chlorinated compounds. The compound of most concern, due to its pervasiveness and high toxicity, is TCE. For this reason, this E.A. was prepared using TCE as the DNAPL to evaluate a worst case scenario.

The worst case scenario estimates the possible environmental impacts for activities during the test cell construction and for release of 15 liters of TCE in each of five test cells. Overall, this environmental assessment indicates that emplacement of DNAPL in the subsurface would have insignificant impacts to human health and the environment even if one wall of proposed containment were eliminated, the primary containment layer were ruptured by a catastrophic event, a proposed vapor barrier were not in place, proposed monitoring were not conducted, and proposed remediation of plume and source were not carried out as planned. The following sections provide a summary of these worst case impacts, and Chapter 4 discusses them in more detail.

### Air Resources

The GRFL will not significantly impact ambient air quality (i.e., particulate or volatiles). Insignificant particulate air quality impacts could result from the movement of approximately three construction vehicles on the site for a maximum period of 6 months. This activity could result in the equivalent emission of approximately 0.142 tons of particulate matter with particle diameter less than 10 micrometers in size ($PM_{10}$). $PM_{10}$ generated by the GRFL construction would increase the annual $PM_{10}$ from Dover AFB stationary sources (11.3 tons in 1993) by less than one-tenth of 1 percent (USAF, 1994).

As part of the environmental assessment, volatization of TCE at the surface of the GRFL was calculated after a shallow release. To make this scenario as conservative as possible we artificially assumed no vapor cover on the surface, release of TCE 1 foot below the surface, and subsequent steady diffusion of TCE to the surface. The threshold limit value published by the American Conference of Governmental Industrial Hygienists for exposure to TCE in a normal 8-hour workday and 40-hour workweek is 50 ppm. Using a box model on the surface, with a less-than-average local wind speed, yields a surface air concentration of 0.047 $g/m^3$ or 8.4 parts per million (ppm) per test cell. This conservative estimate is well below the 50 ppm threshold limit. Operations at the GRFL will use a polyethylene vapor cover to control vapor emissions, so design exposures will be near zero.

### Water Resources

Three engineered barriers will be employed to contain the TCE, so the GRFL is not expected to impact groundwater resources outside of the test site under any proposed circumstances. The risk assessment was performed to estimate the most severe groundwater impacts that could result from a catastrophic breach in one containment system with no redundant containment and no remediation of plume or source. The assessment considers two hazards: vertical infiltration of TCE into the confining aquitard, and failure of the test cell joints with flow through the cell and horizonal propogation of a dissolved TCE plume in groundwater.

Two release scenarios were considered for analysing the risks of subsurface migration after release. In one, soil that has been carefully mixed, but not saturated with TCE is carefully emplaced in the soil below the water table. Under these conditions the soil holds solvent much like a sponge, so that no further migration of the liquid will occur. (See Exhibit 3-3, page 3-5).

The horizonal worst case scenario estimates the dissolved TCE concentration in the uppermost waterbearing strata one mile from the GRFL site would be no more than 0.0033mg/L. This is the of potential concentration at the nearest existing water wells, assuming catastrophic failure of two levels of containment, failure of a backup pump-and-treat system, and failure of the responsible party to excavate the source of the contamination. It also neglects the fact that the contamination would be fully captured by the St Jones river, located one half mile away. The modeled concentration is well below the MCL of 0.005mg/L for groundwater, in any event.

Similar risk analysis shows the GRFL will have no significant impacts to surface water resources. In the most extreme scenario, the peak concentration of contaminated groundwater mixing completely with the river at its lowest recorded flow rate, resulted in a peak TCE concentration of 0.001 mg/L. This is below the TCE surface water limit for Delaware, 0.016mg/L.

**Surface Resources**

Insignificant impacts to the many biological resources will result from the construction and operation of the GRFL. There are no Federally listed threatened or endangered plant or animal species on Dover AFB. Several species of plant or animal that are of State Special Concern exist on Dover AFB, but none are in or near the GRFL site. The proposed GRFL site is a frequently mowed field providing minimal existing wildlife habitat to be impacted by construction or operation of the GRFL.

Similarly, the Delaware State Historic Preservation Office has concluded that there are no cultural resources on the proposed GRFL site. See Appendix F for a copy of the letter of approval from the Delaware State Historic Preservation Office.

Best management practices will be followed during construction, including periodic watering of disturbed soils. No wetlands or floodplains will be affected during construction and operation associated with the proposed action.

**Noise Resources**

Neither the construction (normally limited to daylight hours) nor the operation of the GRFL will generate noise greater than 70 dBA (noise of a face-to-face conversation) at any sensitive receptor. Thus, noise impacts associated with the construction and the operation of the GRFL will be insignificant.

**Visual Resources**

The visual impacts to Dover AFB and community associated with the GRFL will be insignificant. The proposed GRFL construction and operation will be consistent with base appearance standards and the site chosen has a row of trees between the proposed GRFL and Highway 113.

**Socioeconomic Resources**

Money spent on construction payrolls and for purchase of construction material will generate a slight local cycle of induced commercial and industrial activity. Construction will be intermittent for approximately 6 months necessitating food and lodging for workers. The associated impacts on the hotel and restaurant industry, and the construction supply industry would be positive yet fairly minimal in extent. Similar impacts to the hotel and restaurant industries will result from the operation of the GRFL. Because of the

minimal extent of the construction and operation activities, there will be no negative impacts to the population or employment in the vicinity of Dover due to fluctuations in demand for materials or services.

**Health, Safety, and Waste Management**

Because the proposed GRFL design minimizes any adverse effects to the health and safety of workers on Dover AFB, the construction or operation of the proposed GRFL will have insignificant impacts to the health and safety of workers. Any wastes generated during operation of the GRFL will be disposed of in the same manner as required for all investigation derived wastes at Dover AFB.

Further, additional measures will be taken to minimize any potential impacts to the GRFL environs including developing a spill control and countermeasures plan (SCCP) to be consistent with and appended to the existing base-wide SCCP, a groundwater monitoring plan to be in place and approved by the Delaware Department of Natural Resources and Environmental Control (DNREC) prior to any proposed experiment. Similarly, the basic design of the GRFL minimizes the potential of adverse affects to human health and safety. It consists of engineered barriers, an inward hydraulic gradient between the outer and inner test cell, and monitoring wells which can be converted to capture (pump and treat) wells in the unlikely event of a release.

Construction and operation of the GRFL will fully comply with the occupational safety and health program in force at Dover AFB. OSHA compliance is assured under such a program.