THINK TANK

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Changes to the Corrective Action Process

Tripp Fischer

One of the most obvious changes when reading through Part E of the revised *Regulations Governing Underground Storage Tank Systems* (UST Regulations) will be the replacement of the term "Corrective Action" with "Remedial Action" when referring to "active" remediation. Corrective Action now refers to the entire process of reporting, investigating, remediating and closing a site, while Remedial Action pertains only to active remediation. As a result, the former "Corrective Action Work Plan" has been renamed "Remedial Action Work Plan" (RAWP).

One new requirement for the RAWP will be that the Responsible Parties must now include, in addition to sufficient design information, an estimated time to cleanup completion for the remedial method that is being proposed as well as a process by which the success or failure of the method will be measured. In addition, the RAWP must also include a summary of past remedial efforts and a description of any new or continued efforts to recover light non-aqueous phase liquid (LNAPL).

In addition to a site-specific health and safety plan, the RAWP must also include a detailed Quality Assurance and Quality Control Plan (QA/QC) for the activities to be carried out during implementation of the RAWP. The Responsible Party (RP) must also monitor, evaluate and report to the Department the status of the remedial effort, in report form, at a minimum of once every three (3) calendar months.

At a minimum of once every twelve (12) months, the RP must submit a Remedial Action progress report that includes an evaluation of the effectiveness of the Remedial Action with respect to the initial expectations of the design (i.e. the initial goals submitted with the RAWP). Most importantly, in the progress report, if remedial goals are not being met, the RP must now submit recommendations for optimization and improvement as needed to achieve the cleanup goals established in the RAWP.

It is encouraged that all parties affected by these changes read the language in the revised UST Regulations for the exact requirements, or call the office for guidance and assistance.

Inside

This Spring edition of *Think Tank* deals entirely with cleanup issues

New Requirements for sites with LNAPL

Tripp Fischer

Historically, measurable quantities of Light Non-Aqueous Phase Liquid (LNAPL) existing in monitoring wells were commonly referred to as "free product." In fact, the previous version of Delaware's Regulations Governing Underground Storage Tank Systems (the UST Regulations) dealt specifically with the term "free product" by stating that it should be removed to the "maximum extent practicable" when it exists on site. There was, however, no guidance for managing "free product" nor was there a definition for determining the "maximum extent practicable".

As a result, sites with "free product" were often times inadequately characterized, poorly conceptualized and ineffectively remediated. The revised UST Regulations introduce new terminology and requirements for managing sites with LNAPL. The primary goals of the new LNAPL Corrective Action Requirements are to:

- Achieve accurate and complete LNAPL Conceptual Site Models;
- Improve LNAPL Remedial decision making;
- Expedite LNAPL Remedial efforts; and
- Eliminate wasteful and ineffective remedial efforts.

Upon discovery of LNAPL at a site, LNAPL Corrective Action (section 3.3 of the UST Regulations) shall begin immediately. The first step is to begin formulating a LNAPL Conceptual Site Model (LCSM) "to determine the most efficient and environmentally protective remedial approach for addressing the Release". The Responsible Parties are then required to communicate the initial LCSM to the DNREC-TMB within 48 hours of discovering the LNAPL.

Initially, the LCSM will likely be a mental exercise that involves collecting as much information about the Release as possible and communicating whatever is known about the Release to the DNREC-TMB. Later, the LCSM will likely evolve and become more detailed and be included in subsequent reporting or remedial action plans.

A catastrophic release from an operating facility may require a different approach than an abandoned property where LNAPL is discovered during a round of monitoring. In both cases, however, the LCSM must be communicated to the DNREC-TMB within 48 hours and it should include as much information that is known about the release. Examples of information that must be in the short and/or long term LCSM are:

- The feasibility and necessity of an immediate response;
- Direct and potential impacts to human health and the environment;
- The type and estimated volume that was released;
- Occurrence of the LNAPL (i.e. Free LNAPL in a well that is stable, Mobile LNAPL that is not stable, Residual LNAPL, LNAPL floating on water in an excavation);
- Potential recoverability;
- Age of the release; and
- Characteristics of the sub surface.

...sites with "free product" were often times inadequately characterized, poorly conceptualized and ineffectively remediated.

Responsible Parties must then base all short and long term remedial action decisions upon the LCSM which must be updated, in writing, a minimum of once every three (3) calendar months. The LNAPL LCSM and remedial updates must include performance criteria and statements regarding the success or failure of the remedial efforts. If LNAPL remediation is not practicable and does not support Remedial Action objectives, the Responsible Parties may submit a written request for DNREC-TMB approval to discontinue LNAPL recovery. Refer to the UST Regulations for the requirements of such a request.

New Policy Requires Well Permits and Permit Numbers in Reports

Aaron R. Siegel

The *Policy for Correlating Well Sampling Results to Department of Natural Resources and Environmental Control (DNREC) Well ID Numbers* was signed into effect on July 23, 2007. This policy states that, "…the DNREC water well permit identification number (DNREC ID) shall be used for forms and databases which house data obtained from water wells."

tified this as a key reason that more data were not available for project findings. The report recommends that, "From this point forward, well permit numbers should be required elements of the sampling and analysis records for each and every sample collected from wells for all state, county, and local programs." Consistent use of DNREC ID numbers in reports will greatly increase the utility of that data in the future.

Please contact the DNREC-TMB if you have any questions.

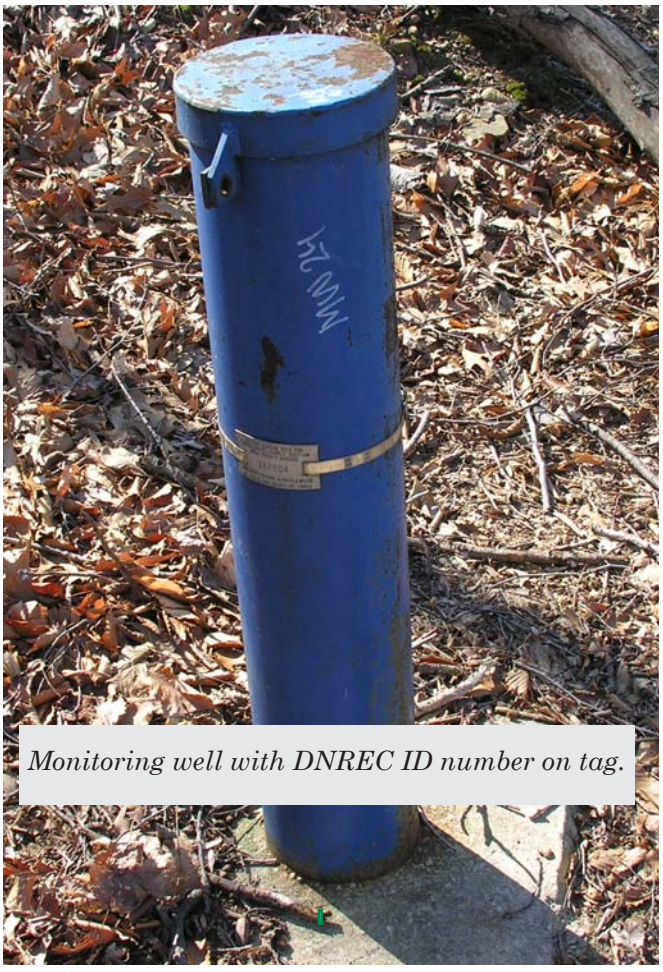
Local ID	DNREC ID	RBSLs				
MW-1	123456	<50				
Analyte (RBSL)			Ethylbenzene (3,700)	Total Xylenes (73,000)	Cumene (3,700)	MTBE (180)
DATE	Benzene (29)	Toluene (7,300)				

Reports must include DNREC ID

The DNREC ID is the only statewide water well numbering system that is unique to each well permit issued in Delaware. Consistent use of the DNREC ID when reporting all sampling activities associated with water wells will greatly increase the utility of that data.

In accordance with this policy, the DNREC Tank Management Branch (DNREC-TMB) now requires that a DNREC ID accompany a local ID (such as MW-1, SB-1, etc.) in all tables corresponding to a particular well or group of wells (see sample above). This includes any domestic wells sampled as part of a site investigation. In addition, copies of well permits must be included in all reports pertaining to well installation. Note that, while one-time direct-push grab samples receive a DNREC ID, you are not required to submit permit numbers while reporting on them. The *Policy for Correlating Well Sampling Results to DNREC Well ID Numbers* was developed in response to a domestic well water quality study conducted by the Delaware Cancer Consortium (DCC) in cooperation with the Delaware Geological Survey (DGS). The DCC conducted a review of groundwater quality data from DNREC and other state agencies in order to determine the extent to which toxic and carcinogenic compounds are present in domestic water supply wells. Their report was published in 2006.

One conclusion that was derived from the study is that the data management systems used by DNREC were poorly suited for review. The DCC report iden-



Monitoring well with DNREC ID number on tag.

Remedial Action Progress Reports

Patrick Boettcher

Part E, Section 5.5.3 of Delaware's revised *Regulations Governing Underground Storage Tank Systems* requires that a Remedial Action Progress Report (RAPR) be submitted to the DNREC-TMB once every twelve (12) months. The RAPR must include an evaluation of the effectiveness of the Remedial Action to determine whether additional measures must be implemented to meet the cleanup goals established in the Remedial Action Work Plan (RAWP). The purpose in requiring the submittal of this type of report is to reduce the amount of time it takes to reach closure of a LUST project by identifying problems and inefficiencies in a remedial action. Thorough yearly evaluations of a site's chosen remedial action will reduce time and money wasted on an ineffective cleanup strategy. Responsible Parties will be issued a letter requiring the submittal of a RAPR for any site where remedial action is ongoing, including monitored natural attenuation. Listed below is the type of information that DNREC-TMB LUST project officers are looking for to evaluate a remedial action's effectiveness. They are broken down by general requirements for all remedial actions along with requirements for some common remedial actions:

General requirements for all remedial actions:

- General summary description of the type of remediation in progress at the site (including natural attenuation);
- Discussion of contaminant concentrations trends over the previous twelve (12) months of monitoring;
- Discussion of contaminant concentration trends for project history, clearly defining beginning and ending of each (all) remedial action(s);
- Include graphs of concentration trends over time for contaminants of concern that exceed action levels;
- Figures depicting contaminant plume size and concentration through remedial action process;
- Details of the site conceptual model as it pertains to any contributing source of contamination and to the selection and/or design of the current remedial action and any future optimization. If residual, measurable, and/or mobile LNAPL is present, it must be addressed in accordance with Part E, §3.3 of the UST Regulations;
- A schedule that includes an estimated time until all established cleanup goals are met as well as intermediate milestones (i.e. percent reduction or specific concentrations) that will be measured against to evaluate whether cleanup is progressing as planned;
- Discussion of monitoring of all points of exposure including monitoring data and correspondence with owners of affected properties; and
- Recommendations for NFA, continued path, optimizing the remedial action, or new approach including an explanation as to why the recommended path forward is the best path forward for moving the site towards closure.

Remedial Action Specific Requirements:

Requirements for Air Sparge/Soil Vapor Extraction:

- Discussion of downtime (why, when, percentage of total time) for the past year and from system startup;
- Discussion of all upgrades, modification, and repairs to the system;
- Interpretation of system readings for all AS/SVE wells including pressures and air flow;
- Interpretation of vacuum readings on each monitoring well;
- Interpretation of any groundwater mounding;
- Discussion of estimated/observed radius of influence over time;
- Total contamination (lbs) volatilized over last year and history (show calculations); and
- Discussion of total carbon used over the last year and submit any new documentation of carbon disposal, if applicable.

Requirements for Chemical Oxidation:

- Interpretation of dissolved oxygen levels, oxidation-reduction potential, temperature and pH in each monitoring well;
- Discussion of downtime for the past year and since system start-up for continuous injection systems;
- Discussion of the quantity of chemical oxidant(s) introduced in each injection point and/or monitoring well;
- Discussion of estimated/observed radius of influence over time;
- Description of any areas which appear to be responding differently following the injections; and
- Descriptions of any problems encountered during injections, and the troubleshooting that resolved those problems.

Requirements for Monitored Natural Attenuation:

- Discussion of the potential for biological activity through hydrocarbon degrading bacteria plate counts;
- Interpretation of dissolved oxygen, oxidation-reduction potential, temperature and pH in each monitoring well; and
- Interpretation of biological conditions and collected field measurements up gradient of the source zone, in the source zone, and down gradient.

Requirements for Dissolved Oxygen producers:

- Discussion of the potential for biological activity through hydrocarbon degrading bacteria plate counts;
- Interpretation of dissolved oxygen in each monitoring well;
- Interpretation of oxidation-reduction potential, temperature and pH in each monitoring well;
- Discussion of downtime (why, when, percentage of total time) for the past year and from system startup;
- Interpretation of biological conditions and collected field measurements up gradient of the source zone, in the source zone, and down gradient (i.e. discussion of radius of influence); and
- Discussion of any problems encountered with the system, as well as, all upgrades, modifications, and repairs made to the system to correct the problems.

Requirements for Biological Enhancement:

- Discussion of the quantity of each injectate introduced in each monitoring well;
- Discussion of the potential for biological activity through hydrocarbon degrading bacteria plate counts;
- Interpretation of dissolved oxygen, oxidation-reduction potential, temperature, pH, nitrate, nitrite, sulfate and sulfite on each monitoring well;
- Evaluation of well integrity and hydraulic connectivity following injections; and
- Interpretation of biological conditions and collected field measurements up gradient of the source zone, the source zone, and down gradient (i.e. discussion of radius of influence).

Requirements for "Multiphase Extraction:"

- Discussion of quantity removed and documentation of any events not previously reported;
- Interpretation of radius of influence through well gauging results conducted at time of extraction;
- Discussion of time spent on each well and approximate quantity removed from each well; and
- Description of any areas which appear to be responding differently following extraction events.

Requirements for Pump & Treat:

- Discussion of downtime (why, when, percentage of total time) for the past year and from system startup;
- Discussion of quantities of light non-aqueous phase liquid and contaminated groundwater extracted;
- Discussion of effluent water quality;
- Discussion of total carbon used over the last year and submit any new documentation of carbon disposal, if applicable;
- Discussion of the effective capture zone, draw down, and mounding (if discharging in subsurface); and
- Discussion of all upgrades, modification, and repairs to the system.

The DNREC-TMB is aware that some data will not be available when the Responsible Party receives the letter requiring the submission of the RAPR. If this is the case, one would be required to immediately begin collecting the appropriate data. In the interim, a RAPR addressing the general requirements must be submitted to the DNREC-TMB for review. An addendum to the RAPR detailing the additional data collected will then be required to be submitted for review within six months (i.e. after two quarters of data collection).

If you have any questions with the RAPR and how it pertains to a particular facility, please contact the assigned project officer or the Program Manager.

Delivery Prohibition

Delivery Prohibition (DP) was addressed in last month's special "Operational Compliance" issue of *Think Tank*. However, DP doesn't just apply to operational issues at active facilities. It can also be used for cleanup-related violations at release sites.

DP is an enforcement tool that can be utilized by state regulators to prohibit delivery of product to an underground storage tank (UST) that has been classified as ineligible to receive product due to noncompliance with state regulations. The Federal Energy Policy Act of 2005 (the Energy Act) mandated several significant changes for state UST programs, including the implementation of a DP program.

The revised UST Regulations describe three different categories of violations that can result in prohibition of delivery to a tank:

(1) Imminent threat violations requiring immediate tagging
(2) Imminent threat violations with non-immediate tagging
(3) Non-imminent threat violations with non-immediate tagging

"Violations that pose an imminent threat" are violations that pose a serious risk to the environment, human health, or public safety. Most violations of the UST Regulations fall into this category. There are some "imminent threat" violations that are so dangerous that the Energy Act requires State personnel to immediately attach a delivery prohibition tag to the tank. These include failure to perform emergency response or abatement activities when a threat to health or the environment exists.

The other "imminent threat" violations do not require immediate prohibition of deliveries, but still have the potential to cause or contribute to a release of regulated substance. Any violation of hydrologic investigation or corrective action requirements or missed deadlines is an "imminent threat" violation, as the continued existence of contamination is a serious risk to human health and the environment.

Regardless of the type of violations present, the tags will remain on the tanks until *all* of the violations are corrected. During this time, any product in the tank at the time the tag was applied may be pumped, but *no deliveries may be accepted*. To have the tags removed, the owner or operator, or their consultant or contractor, must notify the DNREC-TMB that the violations have been resolved and submit proof of such. Once the return to compliance is confirmed, the project officer will return to remove the tags, or will authorize the owner or operator in writing to remove the tags and mail them back to the DNREC-TMB.

PETROLEUM
DELIVERY
PROHIBITED

No person shall remove, deface,
Alter or otherwise tamper with
This Delivery Prohibition Tag.

This Delivery Prohibition Tag is
affixed by the Tank Management
Branch, Delaware Department of Natural
Resources and
Environmental Control, pursuant to
Part A, §§9.1.1. — 9.1.15. of the
Regulations Governing
Underground Storage Tank
Systems, as amended.

Violators are subject to civil and
criminal penalties pursuant to
7 Del.C §§6005, 6013 and 7411.

DELAWARE DEPARTMENT OF
NATURAL RESOURCES AND
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TANK MANAGEMENT BRANCH

391 Lukens Drive
New Castle, DE 19720

Phone: 302-395-2500
Fax: 302-395-2555

Facility ID: _____
Effective Date/Time: _____
Project Officer:
_____

2007 Field Report

Patrick Boettcher

In 2007, the DNREC-TMB had a greater presence in the field than in some previous years. This is due to an increase in state-lead investigations, thanks to the LUST Special Project (LSP) Program (see Think Tank #52) and the FIRST Fund Program. Over 17 site assessments were conducted last year by the DNREC-TMB. These assessments generally consisted of installing soil borings with our direct-push drill rig (Geoprobe — see photo below), collecting groundwater samples from monitoring wells and temporary points, and collecting soil samples.

Over 25 soil samples and 100 groundwater samples were collected during the investigations. Over a quarter mile of drilling was conducted using our direct push rig to collect groundwater and soil samples. In addition to sample collection, the DNREC-TMB also used its newly-acquired electrical conductivity probe to aid in site characterization. Electrical conductivity readings are correlated with the grain size of the material surrounding the probe. This information is very useful in identifying preferential flow conduits. Below is a sample of the read-out from the electrical conductivity probe.

All information gathered for each project is used to determine what action, if any, action is warranted. About half of these site assessments have resulted in the DNREC-TMB issuing a no further action letter.

The increase in field work has been used as training for DNREC-TMB staff as well as members of other DNREC branches, including the Site Investigation and Restoration Branch and the Solid and Hazardous Waste Management Branch.

Planning has already begun for sampling activities in 2008 and we expect to further increase our presence in the field. Please note that it is not the intention of the DNREC-TMB to keep all investigations in-house. However, in some cases, it makes economical sense and allows for a quicker investigation and determination of risk.

Materials consumed in 2007:
Several hundred pounds of bentonite
~70 expendable points
~2000 feet of tubing
~90 acetate sleeves

THINK TANK

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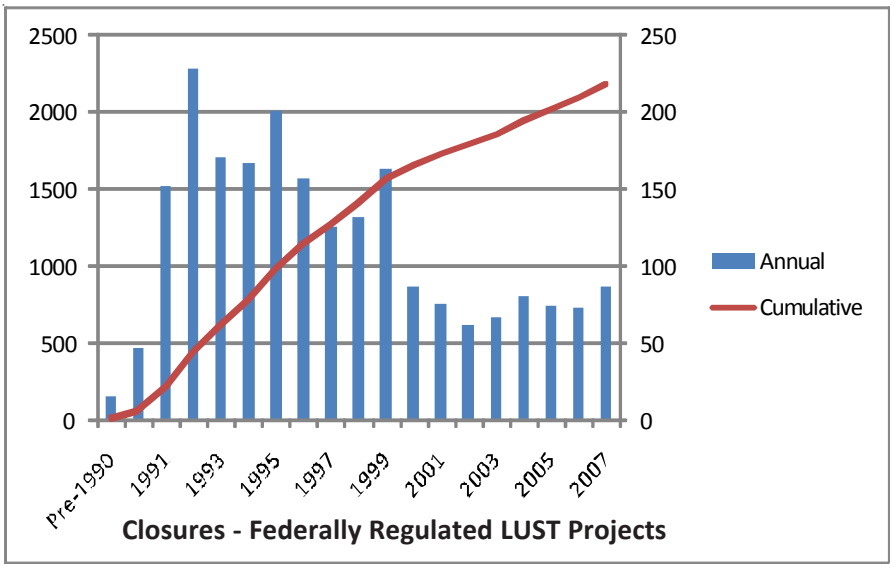
Announcements

Erin Lee McEnaney — was hired in February as an Environmental Scientist. Erin graduated from the University of Delaware with a B.S. in wildlife conservation and previously worked in DNREC's Division of Parks and Recreation with the Environmental Stewardship Program.

Jesse Fernandes — was hired in February 2008 as an Environmental Scientist. Jesse graduated this past December from the University of Delaware with a B.S. in environmental science, and a concentration in marine studies.

LUST Closures

The graph below depicts the number of closures per year of LUST sites, identified as resulting from federally regulated USTs, since the TMB started keeping records in the late 1980s. To date, 2179 closures of releases from federally regulated USTs have occurred.



http://www.dnrec.state.de.us/dnrec2000/Divisions/AWM/ust/

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