Groundwater Status Report

The Iowa Department of Natural Resources (DNR) is providing this report in fulfillment of Section 455B.263.1 of the Iowa Code, which states:

> The commission shall deliver to the general assembly by January 15, 1987, a plan embodying a general groundwater protection strategy for this state which considers the effects of potential sources of groundwater contaminations on groundwater quality. The plan shall evaluate the ability of existing laws and programs to protect groundwater quality and recommend any necessary additional or alternative laws and programs. The department shall develop the plan with the assistance of and in consultation with representatives of agriculture, industry, and public and other interests. **The commission shall report to the general assembly on the status and implementation of the plan on a biennial basis.** This section does not preclude the implementation of existing or new laws or programs which may protect groundwater quality.

This report is intended to serve as the current report on the status of groundwater in Iowa.

Introduction and Overview

Within the DNR there are many different programs that study, regulate, and manage resources with the goal of understanding and protecting groundwater. This report is divided into two sections – the first providing an overview of the status of the DNR's understanding of groundwater quantity, and the second providing an overview of the status of programs which play a significant role in protecting the quality of Iowa's groundwater.

Understanding groundwater quantity and groundwater availability is an important responsibility of the DNR. Beginning in 2007 a long-term project was undertaken to model major aquifers of the state, and these efforts continue. During the drought of 2012 the entire state has experienced varying degrees of drought, and the DNR has applied these models (along with other information and expertise) to assist communities in preparing for and responding to groundwater shortages.

Another important element of the DNR's understanding and management of groundwater involves the protection of groundwater from sources of contamination. In some cases, after groundwater contamination has occurred, the DNR has the responsibility for investigation, monitoring, and cleanup of groundwater. Three of the programs that are most directly involved in these activities are in the Contaminated Sites Program, the Landfill Permitting program, and the Underground Storage Tank Program. The Contaminated Sites Program responds to instances of groundwater contamination by virtually any chemical, e.g., solvents, heavy metals, and petroleum compounds. The program works to identify sources of contamination and the party responsible. Typical program responses involve characterization of the nature and extent of contamination, the associated risks, and identification of the appropriate remedy. The Landfill Permitting program administers a comprehensive set of regulations for the design, construction, operation, and monitoring of landfills in Iowa. If monitoring indicates that groundwater contamination has occurred, the program works with landfill owners to investigate and clean up contamination. The Underground Storage Tank Program regulates operating underground fuel tanks to minimize the potential for leaks and spills, and administers a program to investigate and clean up spills and contamination when they occur. Each of these programs will be discussed in more detail in the following sections of the report.

Groundwater Quantity and Groundwater Availability

Within the DNR there are many areas of investigation, data collection, data evaluation and interpretation, and technical assistance related to groundwater quantity and groundwater availability. The DNR analyzes geologic and hydrogeologic conditions, water resources budget relationships between supply and demand, and the impact of local and/or regional water development. The DNR responds to requests for groundwater information from other government agencies, businesses, and the general public. The DNR is involved in comprehensive mapping, data collection, and investigative programs to enhance the state's geologic and water resources databases. The DNR provides site specific and general information to well contractors, engineering firms, municipalities, and the private sector for groundwater supply development and management, and makes regulatory decisions relative to groundwater withdrawal permits, and groundwater well-interference situations.

The following sections provide specific examples of efforts, programs, or products related to groundwater quantity and availability.

1. **Drought Response:** The DNR has responded to the drought by supplying information, expertise, and guidance to public and private water interests, both for particular water supplies and for critical planning in case the drought proves to be long-lived. While the immediate, and observable, effect of drought is its impact on crops and pastures, the drying up of groundwater supply sources is a slower, less noticeable occurrence. However, those impacts are becoming apparent, and just as they are slow to develop, they are also slow to respond to rains when they come. The DNR is leading efforts to routinely provide an update on the state's water supply conditions.

   The DNR is also providing technical and organizational leadership to the newly established Hydrology Working Group, which is charged with bringing the state's technical knowledge – from state, federal, private sector, and university organizations – to bear on water-related issues.

2. **Hydrology Work Group**: The prolonged flooding on the Missouri River in 2011 and associated damages led to conversations about Iowa's hydrology expertise among state leaders. These discussions underscored the importance of our rivers and the significant impacts that flow from droughts and floods. The State Interagency Missouri River Authority formed a working group, under the coordination and leadership of the DNR to analyze the State of Iowa's hydrology expertise, better understand stakeholder needs, and devise recommendations to fully leverage existing expertise.

   The DNR's IGWS Bureau Chief was asked by the Governor to serve as the Hydrology Coordinator, and the Hydrology Work Group first met in the fall of 2012. In its initial meetings, the Hydrology Work Group developed a mission statement:

- The Hydrology Work Group's mission is to assist agencies of the State of Iowa in protecting the health of our citizens, and to protect and enhance the economic value of our resources by providing expertise to decision-makers in the state of Iowa so that they can better understand existing hydrologic data and information, and to provide recommendations on ways to improve and enhance Iowa's hydrologic data and information.
- The Hydrology Work Group recognizes the need to address the State's water challenges ranging from flood to drought by making sure that policy makers have access to correct, consistent, and current data and information.

In 2013 the Hydrology Work Group will be working 1) to provide expertise in the review and interpretation of reports and documents related to hydrologic issues, 2) in understanding current data collection networks, and identify future needs for enhanced and improved data collection, 3) to analyze hydrologic data and information and provide interpretation, predictions, and modeling to make the information useable, and 4) to provide one single information center that makes data, interpretations and model predictions available to all Iowans.

The Hydrology Work Group is prepared to call on specialists within state government, and from our federal partners, to address specific issues that might become critical at any given time (flood conditions, drought conditions, water quality emergencies, etc). These issues should include the investigation of water related issues which are beyond the borders of Iowa, but which may have an impact on our water supply or quality.

3. **Geologic Mapping for Groundwater Resources:** Geologic mapping of surficial deposits, the bedrock surface, and bedrock aquifers is a step in understanding groundwater resources in Iowa. During 2010, the first regional-scale remapping of the state's bedrock surface since 1969 was completed, incorporating 40 years of new information and geologic interpretations. This effort also included mapping the elevation of the bedrock surface and the depth to bedrock. Products are available online as GIS data layers and as paper products. This mapping is a major asset for forecasting water supplies, and groundwater vulnerability. An additional new tool acquired and put into use in 2011 is a multi-channel resistivity unit to perform geophysical surveys in conjunction with various mapping projects. Already, this new mapping tool has proven itself extremely useful in assessing the underlying geology of river valleys, identifying karst areas, as well as the thickness, extent, and integrity of various aggregate deposits. Such mapping tools are critical for Iowa to develop new strategies for assessing water supply sustainability, and in assessing aquifer vulnerability.

4. **Drought Assistance**: Severe to exceptional drought conditions persisted in Iowa throughout most of 2012. The drought had an impact on Iowa's agricultural economy, but it also placed tremendous stress on water supplies throughout the state. To assist communities with the management of their water resources, IGWS monitored shallow groundwater at 15 different locations. Wells at eleven locations monitored shallow sand and gravel aquifers, and four locations monitored shallow groundwater in limestone aquifers in north-central and northeast Iowa. Most of the wells had groundwater levels at or near historic lows for most of the summer and fall of 2012. Record water usage was recorded at Cedar Rapids, Des Moines Water Works, West Des Moines, Le Mars, and

many other systems. Numerous public water systems implemented voluntary and mandatory water conservation measures. Municipal and rural water systems along the Rock, Floyd, Ocheyedan, and West Nishnabotna rivers in western Iowa were especially impacted by low groundwater levels and record usage.

Dry conditions have continued into 2013, and the DNR will continue to evaluate the state's water resources. Several discussion sessions are being planned in 2013 by the DNR to encourage public water systems to communicate and share drought strategies.

5. **Water Resources - Information and Coordination**: The DNR began coordinated discussions between the DNR, IDALS, IGOV, Homeland Security, and the US Geological Survey (USGS) relative to drought observations and data, and to discuss how the information could be used and distributed. The group came up with the idea of a regularly produced and distributed "Water Summary Update" (WSU) that includes information on precipitation, stream flow, groundwater levels, and statewide drought conditions. With the assistance of DNR Communications staff, and a large group of technical staff from across state government, an updated WSU was issued every other Thursday throughout most of 2012. Each WSU includes a mix of data and observations from across the state, and allowed state agencies to be out ahead of drought concerns and to prepare for other issues as they develop. This has been a widely accepted way of communicating important information to a broad range of Iowans, and is the product of great collaboration between staff at many agencies.

6. **Geophysical Surveys of the Floyd River Alluvial Aquifer**: As drought conditions engulfed much of Iowa in 2012, concerns of shallow groundwater availability surfaced. The DNR has placed an emphasis on studying shallow groundwater availability in northwest Iowa, a region hit especially hard by a lack of precipitation and aquifer recharge. An effort to incorporate geophysical surveys into groundwater availability mapping was implemented in 2012. Electrical Resistivity (ER) geophysics is helpful in identifying aquifer parameters that assist in groundwater modeling efforts. A preliminary ER survey was completed near the town of Sheldon, Iowa, as part of a Floyd River alluvial aquifer characterization and assessment. Results from the survey outlined areas of anticipated groundwater-bearing sands and gravels.

7. **Groundwater Models**: In 2012, the DNR completed a detailed geologic description and predictive groundwater model for the shallow sand and gravel aquifer associated with the lower reach of the Raccoon River near Des Moines. The groundwater model was used to estimate maximum sustainable pumping rates under severe drought conditions. A hydrogeologic study was also completed for the Floyd River alluvial aquifer. A groundwater flow model for the Floyd River aquifer near Sheldon was used to simulate a severe drought. During previous years the DNR has developed groundwater models for the Dakota Aquifer in northwest Iowa, the Jordan Aquifer, the West Nishnabotna Alluvial Aquifer, the Des Moines River Alluvial Aquifer (Palo Alto and Emmet Counties), and the Silurian Aquifer. Each of these models represent extensive technical efforts, and the models are regularly used to simulate water use from these aquifers under various scenarios and for various lengths of time – allowing communities and water operators to better understand sustainable groundwater supplies for their systems.

8. **<u>Source Water Protection for Iowans Drinking Water</u>**: Iowa's Source Water (a.k.a. drinking water) Protection program helps public water systems protect their wells or surface water intakes from natural and human contamination. The DNR plays a key role in interpreting geologic and contaminant information to help communities proactively protect both water quality and quantity issues, and reactively address well construction or contamination problems.

   This past year the Source Water program did an extensive overhaul of both the inventory application (Source Water Tracker) and our 'Phase 1' assessments. Source Water tracker was modified to integrate with our online mapping application (Source Water Mapper), and be a more user-friendly searching tool. Now all a community needs to know is its name to access all of the digital information gathered over the years, from old wells drilled a century ago to a site visit completed just months ago.

   Additionally, every Iowa community using groundwater as a drinking source received an updated assessment with many new features, including a time-plot of nitrate-nitrogen (to help spot trends in water quality), hyperlinked wells and contaminants (to help research potential issues), and an updated map using the latest 2011 land cover information. These reports are all publically accessible through Source Water Tracker.

   Finally, the Source Water Program completed an intensive three-day training program on understanding the Source Water fundamentals through the use of GIS. These training sessions were designed to help smaller communities in the State of Iowa collect, create, and integrate spatial data into their everyday duties. Over 60 attendees from more than 20 communities attended the training sessions, and learned about contaminants, wells, GIS, and the basics of the Source Water Program.

9. **<u>Groundwater Monitoring</u>**: The DNR (in collaboration with the USGS) maintained a groundwater monitoring network from 1982 to 2006 that collected raw, untreated, water from municipalities across the state. A network of 90 "core" wells was identified in 2002 and monitored yearly thereafter. All wells in the network were components of public water supplies (no irrigation or private wells were utilized) and are completed in one of the major aquifers of Iowa. Budgetary prioritization forced the suspension of the network in 2006.

   In 2012 the IGWS coordinated the collection of samples from the "core" wells that were available. Samples were analyzed for a wide range of parameters, including general water chemistry, nutrients, ions, pesticides, metals, and volatile organic compounds. The data will be used to develop a proposed monitoring schedule that can be sustained into the future. A report on the current water quality in these wells and trends through time will be completed in 2013.

   Historically, the IGWS and U.S. Geological Survey coordinated a groundwater level network to measure water levels in aquifers across Iowa. Up until 2007, water levels were measured at 160 wells on a quarterly basis. In 2007 due to funding issues, the network was discontinued.

10. **<u>Assessing Groundwater Quality around Iowa's Great Lakes</u>**: DNR staff are working with local partners to evaluate groundwater flow and quality in the West Lake Okoboji watershed. In November 2011, in cooperation with the Natural Resources Conservation Service, 21 shallow monitoring wells were installed around the watershed to assess groundwater conditions under representative land cover types, including cropped fields, wetlands, perennial grassland, forest, golf course, and urban settings in a variety of landscape positions. Water levels are being measured in all the wells on a monthly basis by local partners and water level recorders were placed in six representative wells to measure water table fluctuations on a continuous basis. Water quality samples are being collected on a quarterly basis for field water quality indicators and laboratory analysis of nitrogen and phosphorus concentrations. DNR will continue to monitor water levels and quality in 2013.

Contaminated Sites Program

One of the important DNR programs related to groundwater protection and groundwater quality is the Contaminated Sites Program (CSP). This program relies on a complex combination of funding sources and regulatory authorities to address environmental contamination, including groundwater, that is not covered by other state or federal programs involving groundwater contamination.

State/Federal Superfund Cooperative Efforts
A substantial portion of the CSP involves a Federal (EPA) and State (CSP) cooperative but undelegated effort under Federal CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) statutes, including the original Superfund and more recent Brownfield amendments. Actions under this cooperative effort are widely varied, ranging from screening to identify potential groundwater contamination concerns to very involved Superfund Remedial actions involving NPL (National Priorities List) sites, including some very expensive groundwater cleanup or protection efforts. In the Superfund Remedial category most sites are managed by EPA, with the CSP functioning in a support role, but for a number of sites these roles are reversed. Screening functions are performed under both CERCLA Superfund and Brownfield programs. The purpose of the screening is to determine whether there is a cause for concern with respect to groundwater and to identify the most appropriate authority under which to address an apparent concern. These screening functions are funded largely through federal grants (Superfund and Brownfield) but also make use of state authorities under Chapter 133 and Chapter 137.

State Authority
The various state authorities under which the CSP operates derive from the Code of Iowa including portions of 455B Division IV, Parts 4 and 5 (Jurisdiction of DNR), portions of 455E (Groundwater Protection), 455H (Land Recycling and Environmental Standards), and 455I (Uniform Environmental Covenants). Chapter 567-133 of the Iowa Administrative Code "Rules for Determining Cleanup Actions and Responsible Parties" was written in response to 455E and is the chief state authority under which the CSP operates. It provides far-reaching authority for the investigation, characterization, and cleanup of contaminated groundwater and to require

responsible parties to do the work. The rule also sets the contaminant standards that function as a starting point for determination of what constitutes problem contamination. To a lesser degree Chapter 567-137 “Iowa Land Recycling Program and Response Action Standards”, written to implement 455H, also provides for protection/cleanup of groundwater. It is a voluntary program. Groundwater protection efforts carried out by the CSP involve largely cooperative efforts on the part of responsible parties with CSP oversight, though the CSP is also well-equipped and conducts considerable investigative effort in-house.

Groundwater Contamination Issues

The types of groundwater contamination situations with which the CSP is involved under any of its authorities are very diverse. They range from large disposal sites to the very widespread instances of small-scale groundwater contamination that simply reflect the fact that we live in a society that uses or handles chemicals everywhere for many purposes. Some of the more commonly encountered sources include: petroleum handling, dry cleaning, plating, printing, foundries, manufacturing, agricultural chemical manufacturing and retailing, automotive servicing, and wood treating. This is not exhaustive and it is in no particular order. The list of potential groundwater contaminants themselves is far larger ranging from exotic chemicals to those that are regularly encountered in daily life. More regularly encountered groundwater contaminants include: petroleum (gasoline, diesel, oil); heavy metals (lead, arsenic, etc.); solvents (toluene, xylene, and mixtures); chlorinated solvents (degreasers, dry cleaning solvent); and agricultural chemicals (pesticides and fertilizers). The means by which contamination occurred and the behaviors and risks posed by the contaminants are equally diverse. Similarly the means by which the CSP becomes aware of groundwater contamination are varied. It may involve citizen complaints of disposal, appearance of contaminants in public or private wells or self-reporting by industries. Beginning in the 1990s the overwhelming majority of contamination reports started coming from environmental assessments conducted for commercial property purchasers or their lending institutions.

The CSP has steadily evolved over the more than twenty five years of its existence. This reflects changes in regulations and developments in the science related to groundwater contamination that are themselves interrelated. These changes are in many respects consistent with changes on a national basis while also reflective of specific Iowa regulatory changes and the general regulatory climate of Iowa. Early efforts in the groundwater contamination arena could be characterized as overly optimistic. The reality that has been encountered is that groundwater contamination, particularly at lesser levels, is probably more widespread than anticipated and cleanup has been far more problematic from both technological and cost prohibitive respects. In both practice and subsequent regulatory development there has been a decided shift in favor of risk-based approaches in order to focus attention on more serious contamination problems, since there are simply not enough available resources to do it all. A comparison of 455E to the later 455H illustrates this shift as do the corresponding rules, Chapter 133 vs. Chapter 137. In part, 455I also reflects this shift. Both 455H and 455I involve institutional controls that may be used to preclude the use of and exposure to contaminated groundwater that may or may not be cleaned up in the foreseeable future.

Landfill Program

One of the important DNR programs related to groundwater protection and groundwater quality is the Municipal Landfill Permitting Program. Landfills are a potential source of groundwater contamination as many of the components of the wastes disposed of produce liquids that can leach into surrounding groundwater sources. The state's municipal landfill permitting program is administered through Iowa Administrative Code 567-Chapter 113. It was revised in 2007 in an effort to fully implement the minimum federal standards promulgated by the U.S. Environmental Protection Agency (EPA) on October 9, 1991. Under the authority of Subtitle D of the Resource Conservation and Recovery Act (RCRA), EPA sets environmental standards to be met by municipal solid waste (MSW) landfills. Subtitle D establishes technical design and operating criteria for MSW landfills, which, at a minimum, must be included in each state's regulations. These criteria include specific requirements for landfill location, operation, design (liner, leachate collection, run-off controls, etc.), groundwater monitoring, corrective action, closure and postclosure care, and financial assurance responsibility. Under Subtitle D, state and local governments are the primary planning, permitting, regulating, implementing, and enforcement agencies for management and disposal of solid wastes.

Liner Design

Initially, cities and counties deposited their solid wastes on nearby low-value lands, creating a waste dump. Often the wastes in the dump were burned to reduce volume and some other adverse impacts. Eventually, it was determined that there was need to cover the daily deposited wastes with a layer of soil to reduce odors and access to wastes by vermin, flies, birds, etc. This approach led to the development of the "sanitary" landfill and the closure of many town dumps in Iowa.

MSW landfills today are based on the concept of isolating the waste from water that can generate leachate (garbage juice) that can in turn lead to groundwater pollution by constituents leached from the solid waste. Today's landfill design approach, as recommended by the EPA, is based on the use of a relatively thin plastic sheeting (high-density polyethylene – HDPE) layer and a compacted soil/clay layer to form what is called a "composite" liner. This approach greatly decreases the rate of leakage through the plastic sheeting liner if the clay and the plastic sheeting layers are in intimate contact.

Up until the 2007 landfill rule revision, only about half of Iowa's 62 MSW landfills had approved liner systems. Of the 44 landfills still in operation today, all have an approved liner system. Most use the EPA recommended liner and a few have used state approved "alternative" liner systems consisting of clay only and no HDPE plastic or the HDPE plastic in direct contact with a geosynthetic liner consisting of a thin veneer of bentonite clay sandwiched between woven fabric-like material.

Leachate Collection and Removal System

The key to preventing groundwater pollution by a landfill is the ability to collect all leachate that is generated in the landfill in the leachate collection and removal system. The leachate collection system consists of gravel or some other porous medium that is placed just above the liner system at the bottom of the landfill. It is designed to allow leachate to flow rapidly across the top of the liner to a collection pipe where it is then pumped away from the landfill. By maintaining a very low level of leachate within the landfill, less then 1-foot of depth over the liner according to regulations, the potential for leachate to leak through the liner system is minimized.

Groundwater Monitoring
Even the best liner systems can develop cracks, holes, rips, or tears. When the leachate that is passing over the liner reaches one of these points, it starts to pass through the liner into the underlying clay layer and eventually into the groundwater below. To determine whether this is occurring, a system of groundwater monitoring wells are placed upgradient and downgradient of the landfill. The samples from the upgradient wells show the background concentrations of constituents in the groundwater, while the downgradient wells show the extent of groundwater contamination caused by the landfill. The required number of wells, spacing, and depth of wells is determined on a site-specific basis based on the aquifer thickness, groundwater flow rate and direction, and the other geologic and hydrogeologic characteristics of the site.

During the detection monitoring phase, landfill owners monitor for 62 constituents that are good indicators of landfill leachate. This consists of sampling at least semiannually throughout the facility's active life and for 30 more years after the landfill closes. If at any time during the detection monitoring phase, a constituent(s) is detected at a statistically significant higher level than the established background level, the landfill owner must notify the DNR. The facility must then establish an assessment monitoring program unless it can be that the detection of the constituent(s) was the result of a sampling, analysis, or statistical evaluation error (i.e., a false positive result); a natural fluctuation in groundwater quality; or caused by another source.

As a first step in an assessment monitoring program, samples must be taken from all wells and analyzed for the presence of an even larger list of 214 constituents. If any of the constituents are detected, the landfill owner must establish a groundwater protection standard (GWPS) for each. The GWPS represents the maximum allowable constituent level (MCL) in the groundwater for that constituent, or the background level of the groundwater at the site if no MCL exists. If any of the constituents are detected at a statistically significant level higher than the GWPS, the landfill owner must characterize the nature of the release, determine if the contamination has migrated beyond the facility boundary, and begin assessing corrective measures.

Based upon the assessment of corrective measures, a remedy is selected and corrective action begins. The facility must continue these remedial actions until it has complied with the GWPS for three consecutive years and can demonstrate that all required actions have been completed.

Underground Storage Tank Program

The DNR's Underground Storage Tank (UST) program and corresponding regulations are designed to promote safe storage and handling of fuel, provide for optimal public health and safety, and protect groundwater and surface water resources.

Authorities & Funding
The authority for UST regulations starts at the federal level - 40 CFR Parts 280 and 281 contain the technical standards for operating USTs, and corrective action requirements for releases. These federal rules also define a process for delegating oversight authority to the states, if states

can establish they can meet the federal UST requirements. The DNR applied for and received State Program Approval in 1995. As part of this process the DNR receives federal grants for program administration, and has obligations to report back to EPA on program statistics and work efforts conducted to assist site owners in achieving compliance.

The DNR's UST program is funded almost entirely through federal grants. However, additional revenue for program administration also comes from collection of UST registration fees, as well as licensing and certification fees for UST professionals and groundwater professionals. The DNR also receives an annual appropriation from the state's Comprehensive Petroleum UST Fund Board. These revenues are used to meet the federal grant matching obligations.

The state authorities are contained in Iowa Code section 455B.474 Duties of commission –rules, which is quite extensive but begins by stating: "The commission shall adopt rules pursuant to chapter 17A relating to: 1.a Release detection, prevention, and correction as may be necessary to protect human health and the environment, applicable to all owners and operators of underground storage tanks. The rules shall include but are not limited to requirements for (1) Maintaining a leak detection system, an inventory control system with a tank testing, or a comparable system or method designed to identify releases in a manner consistent with the protection of human health and the environment; (2) Maintaining records of any monitoring or leak detection system, inventory control system, tank testing or comparable system, and periodic underground storage tank facility compliance inspections conducted by inspectors certified by the department; (3) Reporting of any releases and corrective action taken in response to a release from an underground storage tank; (4) Establishing criteria for classifying sites according to the release of a regulated substance in connection with an underground storage tank…(5) The closure of tanks to prevent any future release of a regulated substance…(6) Establishing corrective action response requirements for the release of a regulated substance in connection with an underground storage tank..."

Three administrative rule chapters were promulgated by the Environmental Protection Commission to implement requirements of 455B.474:

IAC 567--Chapter 134 – Underground Storage Tank Licensing and Certification Programs
IAC 567--Chapter 135 – Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
IAC 567--Chapter 136 – Financial Responsibility for Underground Storage Tanks

The UST Section of the DNR oversees three primary functional areas: 1) operational standards for regulated UST systems (safe handling & dispensing of fuel/ release prevention); 2) assessment and corrective actions for releases; and 3) certification and licensing of professionals who work with USTs or conduct release investigations and remediation.

UST Operations

Most, if not all of the requirements for operating fuel dispensing facilities are intended to prevent and minimize the effect releases of petroleum to the environment. Certainly there are economic incentives for owners and operators to keep fuel properly contained. But should a release occur, the costs to environment and potential risks to public health and safety can be substantial, given the toxicity and flammability of petroleum compounds, as well as their mobility when mixed with groundwater.

DNR personnel oversee UST registration, installations, inspections, testing, repairs, and removals. Additionally owners must adhere to strict operational standards regarding leak detection, spill and overfill prevention, and record keeping. All regulated, active UST facilities are also required by law to maintain a mechanism of financial responsibility. Obviously the purpose of financial responsibility is to pay for any needed assessment, corrective action, or emergency response in the event of a release.

The federal Energy Policy Act of 2005 went further to strengthen UST release prevention measures. States were required to implement provisions for fuel delivery prohibition (for non-compliant facilities), secondary containment requirements at new facilities (e.g., double-walled tanks and piping, under dispenser containment/sumps), inspections of facilities on a 3-yr cycle (Iowa requires inspections every two years), and mandatory operator training. These are relatively new requirements, but the expectation is they will have a significant positive effect on preventing future releases from USTs.

Leaking Underground Storage Tanks (LUST) – Assessment and Corrective Action
When a release from an UST is identified, an assessment of risks posed by the petroleum contamination must be completed. LUST regulations have evolved over the past few decades, but have always considered some type of evaluation of risk to public health and safety, and the environment. The responsible party is required to work with a certified groundwater professional to complete an investigation and risk evaluation of their site.

The current Iowa regulations define a risk-based corrective action (RBCA) approach for LUST sites. Conceptually, RBCA was designed so that limited resources could be used to target the more severe problems (high risk sites). In practice, RBCA utilizes a site-specific risk classification scheme and allows for the determination of site-specific cleanup or target levels (vs. the former 'one-size-fits-all' standards for LUST site closure, which in practice were difficult and costly to meet in many cases).

Simply put, risk evaluations account for not only the toxicity of the chemicals being regulated, but also the likelihood of human exposure to the chemicals or environmental impacts. If a mechanism or pathway for exposure is not present, then risk is deemed minimal or non-existent. Iowa's LUST RBCA evaluation process is prescribed in rule, and considers the likelihood of petroleum impact to surface waters and groundwater, or human exposure to chemicals either through ingestion or vapor inhalation. Future exposures scenarios are also considered.

A typical assessment will include defining the extent of soil and groundwater contamination, using predictive models to project where the contaminants may move, and identification of exposure pathways and receptors within the projected affected area (receptors are defined as drinking and non-drinking water wells, protected groundwater sources that may be used for drinking water, water transmission lines, sewer lines, basements, and surface waters). At completion of the evaluation, the site will be classified as high risk, low risk or no action required. Per rule, monitoring is all that is required at low risk sites; corrective actions must be taken at high risk sites.

Corrective actions can target the contaminants (i.e., removal, remediation or cleanup) or they can focus on severing an exposure pathway or eliminating a receptor – for example, plugging a drinking water well. Future risks can be managed by implementing property use restrictions that carry with the deed – for example, filing an environmental covenant which prohibits the installation of drinking water wells, basements, or utilities within the contaminant plume area. There obviously are benefits, shortcomings, and trade offs to each corrective action approach, in terms of cost savings, feasibility of implementation, groundwater protection and future resource use limitations.

UST Professional Licensing & Certifications

Increasing the presence of trained professionals in the field can go far to improve UST compliance, prevent releases, and expedite mitigation of contamination impacts. Nearly every stage of UST operation and LUST site management requires involvement of a certified or licensed UST professional (people who install, inspect, test, repair or remove USTs, as well as certified groundwater professionals who must oversee assessment and cleanup of LUSTs).

All professionals must meet basic qualifying criteria, take an introductory course and pass an exam, and complete continuing education in order to maintain their license. IAC 567-Chapter 134 contains provisions for professional certification qualification, application process, disciplinary actions, and expectations and standards for professional conduct.