

# Hazardous Waste Management Commission Report

April - June 2016

Quarterly Report



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES

## Hazardous Waste Management Commissioners

Elizabeth Aull, Chair

James "Jamie" Frakes, Vice Chair

Charles "Eddie" Adams

Michael Foresman

Mark E. Jordan

*"The goal of the Hazardous Waste Program is to protect human health and the environment from threats posed by hazardous waste."*

### For more information:

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Past issues of the Hazardous Waste Management Commission Report are available online at [dnr.mo.gov/env/hwp/commission/quarterlyreport.htm](http://dnr.mo.gov/env/hwp/commission/quarterlyreport.htm).



Missouri Department of Natural Resources  
Hazardous Waste Program

### Letter from the Director

Dear Commissioners:

This edition of the quarterly covers the second quarter of the year from April 1st through June 30th. As spring gave way to the summer months, this quarter also brought with it a number of other changes as the program continued its efforts to protect the environment.

The quarter saw the departure of David J. Lamb as the Staff Director, and my certification as the new Staff Director. I am sure you will join me in thanking Dave for his service. I look forward to working with each of you on the many issues that are faced by the Hazardous Waste Program (HWP) and the Hazardous Waste Management Commission. Although I have worked with the program in the past, much has changed in the last fifteen years; but, I am confident we will continue the good work this program does, with a smooth transition.

This quarter also saw a change within the structure of the commission itself, with the election of Commissioner Elizabeth Aull to the position of chairman, and the election of Commissioner James Frakes to the position of vice-chairman. I wish to personally extend my thanks to Commissioner Charles Adams as he steps down from the position of chairman, and am confident he will continue to support the mission of the commission as a member.

The culmination of the past couple of years' efforts was reached this quarter with the finalization of the Generator Fee Rule. With the end of the 60 day legislative review period, the rule cleared its final hurdle and will go into effect with its publication in the Code of State Regulations.

Staff has also been working diligently on the new Underground Storage Tank (UST) rule package, which is the state's counterpart to the new U.S. Environmental Protection Agency (EPA) regulations. The Regulatory Impact Report will soon be published, initiating a 60 day comment period. As always, staff will address all comments and make any appropriate changes to rule language.

Our Pesticide Collection Program is in full swing for 2016, with four collection events taking place in Fairfax, Canton, Montgomery City and Bolivar. These are the final four scheduled for this year. Planning for the 2017 events will start soon.

I look forward to working with each of you as you bring your individual knowledge and experience to bear on the issues brought before you; and I want to thank all of you again for everything you do as commissioners and for your continued service to the state of Missouri.

Sincerely,



Steve Sturgess  
Director

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## Brownfields/Voluntary Cleanup Program Certificates of Completion

Brownfields are real property where the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight and takes development pressures off greenspaces and working lands. Through this program, private parties agree to clean up a contaminated site and are offered some protection from future state and federal enforcement action at the site in the form of a “no further action” letter or “certificate of completion” from the state.

The Brownfields/Voluntary Cleanup Program (BVCP) issued 17 certificates of completion (COCs) for various sites from April through June 2016. This brings the total number of COCs issued to 821.

### Crown Cork & Seal Company, Inc. (former) - St. Louis

The Crown Cork & Seal Company Inc. (former) site is located at 7140 N. Broadway in St. Louis. The site was previously regulated by the tanks section. Past letters from the Tanks Section indicated since toluene is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) substance, the site did not belong with Tanks. Subsequently, Crown Cork & Seal Company Inc.’s consultant requested the site be moved from the Tanks Section to the BVCP. The site is approximately 17.5 acres in size. The current size of the site’s building is approximately 456,000 square feet. Crown Cork & Seal Company Inc. manufactured three-piece steel cans for commercial clients. A variety of varnishes, lacquers, enamels and solvents were historically used in the can manufacturing process. According to past reports there were nine USTs at the site in four separate UST pits. After removal of the USTs, one of the pits had soil levels above applicable guidelines. The soil was removed from the pit and disposed. Eight monitoring wells were installed after the UST excavation, and two additional wells were installed later. The groundwater was found to be impacted with toluene at concentrations up to 450 parts per million. A groundwater pump and treat system was installed in 1993 and continues to operate to this date. The system treats approximately 150,000 to 500,000 gallons of impacted water every six months.

Stability analysis indicated the remaining contamination was either stable or decreasing below default target levels (DTLs). Additionally, the memorandum of agreement between the department and the city of Saint Louis restricts the domestic use of any groundwater within city limits. The site therefore qualifies for unrestricted use.

The BVCP oversight for work at this site pertains only to the tank release related to “Tank Pit B” and does not address activities for other UST removals addressed by the tanks section at the time of closure in the early 1990’s. The department determined the site is safe for its intended use.

### Cabool Wood Treating Site - Cabool

The Cabool Wood Treating site is located at 14233 Highway 60 in Cabool. It is a family-owned business with roots in southern Missouri dating back to the 1920s. The site was used for wood treating with pentachlorophenol (PCP) and copper naphthenate between 1970 and 1988. PCP and polychlorinated dibenzodioxins (dioxins, trace contaminants in PCP products) were detected in soil during a site investigation in 2002, and PCP was detected in groundwater.

Site investigations revealed the presence of PCP, diesel fuel (total petroleum hydrocarbons and diesel range organics [TPH-DRO]) and dioxins in soil and/or groundwater resulting from historic wood treating operations at the site. Contaminated soil, totaling 900 cubic yards, was excavated and bio-remediated onsite. Levels of PCP and TPH-DRO in the treated soil were below the department’s standards for surface soil for unrestricted (residential) use. The treated soil contained dioxin toxic equivalents totaling 1.2 µg/kg, exceeding the department’s target level of 1.0 µg/kg for surface soil for unrestricted use. The

soil was returned to the onsite excavation, covered with a clean soil cap, and revegetated. Groundwater investigations in soil and shallow bedrock determined contamination was not migrating offsite at levels exceeding domestic use target levels, and the residual groundwater plume was stable or shrinking. The facility's deep water supply well was properly abandoned.

An environmental covenant was filed in the property chain of title to prohibit residential use of the soil repository area of the site, require inspection and maintenance of the soil cap, and to make certain requirements on drilling and use of groundwater at the site. A site management plan was attached to the covenant to guide inspection and maintenance of the site.

A risk assessment was performed using the Missouri Risk-Based Corrective Action (MRBCA) guidance. The department determined the site is safe for its intended use.

### West Pine Lofts - St. Louis

The West Pine Lofts site is located at 4050 W. Pine Blvd., in St. Louis. Originally, this site was comprised of over 150,000 square feet of floor space, serving as various warehouses and manufacturing facilities from the 1930s through the 1970s. The site first enrolled in the BVCP, in 1999, as "Beverage Concepts," to address fuel oil tanks on the site, and received a certificate of completion, with no restrictions, on March 1, 2002. Gasoline tanks were removed from the site in 1998, under the purview of the tanks section. With a No Further Action (NFA) letter issued by the Tanks Section on June 26, 1998. Current recognized environmental conditions (RECs) for the site were remaining impacted soil and groundwater from the former fuel oil tanks, and urban fill containing polynuclear aromatic hydrocarbons.

Petroleum contamination was limited to a small area in the eastern half of the building near the north wall. Representative concentrations of soil and groundwater contamination were below the residential indoor-air inhalation pathway target levels. In addition, a soil gas sample taken in this area showed no vapors in excess of residential levels. Engineered hard surfaces and soil caps have eliminated the exposure pathways for polynuclear aromatic hydrocarbons in the surficial soil. An environmental covenant is in place to ensure the integrity of these caps is maintained. The original buildings on site have been razed and an apartment building has been erected. The department determined the site is safe for its intended use.



### Dollar General, Troost Ave. - Kansas City

The Dollar General - Troost Ave. site is located at 4229 Troost Ave., in Kansas City. The 0.98 acre site served as a former gas station and auto repair station since the late 1930s. Two single story buildings and a dilapidated wood shed exist on the property. A UST removal was completed through the Tanks section in August of 2013.

A 2014 Phase II investigation identified arsenic and lead impact to soil in relation to past site use. The site was subsequently graded as a part of development and excess soil was sampled prior to proper disposal. In December 2014, the site was resampled to determine the impact of site grading on both contaminant concentration and depth. A Tier I Risk Assessment was conducted in January 2015 using MRBCA. The risk assessment found one previously sampled area along the eastern parking lot border contained contamination above residential target levels. This area was excavated in May-June 2015

with the removal and proper disposal of approximately 9.83 tons of soil. The site therefore qualifies for unrestricted use under the BVCP.

Certain areas of this site were remediated under the purview of the tanks section. This work was not subject to BVCP oversight and therefore any qualifications under the BVCP do not excuse the site from the conclusions stated in the 2014 NFA letter issued by Tanks, which limit the site to non-residential use. The department determined the site is safe for its intended use.

The site is currently unoccupied however, the owner intends to develop the site for use as a Dollar General store.

## Solar Transport Tanker Release - Brookline

The Solar Transport Tanker Release - Brookline site is located at 2804 N. Brookline Ave., in Brookline. On Nov. 29, 2014, a tanker truck hauling 7,204 gallons of gasoline and 801 gallons of ethanol overturned into a roadside ditch within Missouri Department of Transportation (MoDOT) right-of-way. The amount of gasoline and ethanol released onto the east shoulder of Highway MM totaled 2,505 gallons. The released fuel pooled directly beneath the tanker and traveled 100 feet to the north and south of the point of release. The release was reported to the department.



Site investigation activities included the installation of soil borings and groundwater monitoring wells within the highway right-of-way. Soil sample results indicated chemicals of concern (unleaded gasoline consisting of benzene, toluene, ethylbenzene and xylene [BTEX]), did not exceed MRBCA. Groundwater samples also did not exceed the MRBCA delineation criteria protective of the construction worker. The extent of petroleum impact has been delineated to site specific criteria and the release area is delineated within the MoDOT right-of-way. No chemicals of concern were noted above the applicable Risk-Based Target Levels (RBTLs). The department determined the site is safe for its intended use.

## Two Light Luxury Apartments - Kansas City

The Two Light Luxury Apartments site is located at 150 E. Truman Road in Kansas City. The site is currently utilized as a municipal parking lot with an unmanned metal security booth and self-pay kiosk. Based on prior environmental reports by the city, the property, identified as Block 140, was part of a larger area referred to as Kansas City (KC) Live, which consisted of multiple adjoining blocks. The KC Live area underwent environmental assessment and remediation activities under the direction of the city in the late 1990s and early 2000s. The subject property is referred to as Block 140 in the historical records prepared for the city and generally encompasses the entire block.

Benzene and naphthalene have been detected in the groundwater above the DTL, but there were no soil detections above the DTL. Groundwater monitoring and a Tier 1 Risk Assessment were performed to address the chemicals of concern in accordance with a department-approved risk management plan. The groundwater analytical results remain below the residential MRBCA Target Levels. The department determined that the site is safe for its intended use.

The proposed Two Light Luxury Apartment Development of a 24-story, 296-unit multi-family apartment building is planned for the southern half of the block.

### Ford St. Louis Assembly Plant - Hazelwood

The Ford St. Louis Assembly Plant site is located at 6250 N. Lindbergh Blvd., in Hazelwood. The Ford St. Louis Assembly Plant site consists of 119 acres, with three million square feet under roof. Numerous RECs included aboveground storage tanks, USTs, painting facilities, chemical and waste storage areas, asbestos and lead paint building components, polychlorinated biphenyl electrical transformers, buried solid paint sludges and other solid wastes.

Remedial actions included removal and offsite disposal of building debris; testing and disposal or reuse of concrete and masonry; excavation and disposal of contaminated soil; and treatment and disposal of wastewater and wastewater treatment sludge. Trace levels of groundwater contamination were detected and no remediation of groundwater was determined to be necessary. The site meets target levels suitable for non-residential use according to MRBCA. The department determined the site is safe for its intended use.



### East Locust Creek Reservoir - Milan

The eight East Locust Creek Reservoir Sites are located in Milan. Multiple parcels of land are being addressed and are located along the East Locust Creek in Sullivan County. The sites have historically been used for residential, agricultural and commercial purposes and currently are vacant. The site was enrolled in the BVCP to address the contamination in the structures at the site including asbestos, lead-based paint, metals and household hazardous waste (HHW).

Site investigations indicated the presence of asbestos-containing materials and HHW in the structures. Asbestos abatement included the removal of floor tile with associated mastic, ceiling texture and window caulk from these structures. The HHW was packaged and transported off-site for proper disposal or recycling. Demolition of the buildings is required by the department prior to the construction of the reservoir.

Analysis of the results indicate gasoline range organics, DROs, oil range organics, BTEX, poly-nuclear aromatic hydrocarbons and lead were detected in soil and groundwater below DTLs. This conclusion does not dismiss or overrule any determinations stated in the tanks section NFA letter issued regarding cleanup activities related to the previously unknown UST. The department determined the sites are safe for their intended use.

This land is expected to be part of the future 2,235-acre East Locust Creek Reservoir. The East Locust Creek Reservoir will be designed to address an acute water shortage in north central Missouri, as well as provide for flood prevention and mitigation, recreational opportunities and economic development. The reservoir, to be owned and operated by the North Central Missouri Regional Water Commission, will cost approximately \$49 million to construct.

### **Bond Farm Release - Columbia**

The Bond Farm Release site is located at 7301 E. Turner Farm Road in Columbia. In 1973, a mixed petroleum product release occurred from a pipeline located five miles east of Columbia. The release area now includes a house and two storage buildings. Initial recovery operations captured 105 barrels out of an estimated 150 barrels released from the pipeline. An initial site assessment confirmed the presence of BTEX, naphthalene and TPH in soil and groundwater.

Groundwater, soil and soil vapor were sampled and the contaminants found were BTEX; naphthalene; fuel additives 1,2-dichloroethane and 1,2-dibromoethane; and TPH - gasoline range. These contaminants were delineated on the former Bond Farm Property and on adjacent properties to the north and east. Groundwater monitoring was conducted from 1998 to 2014, and recovery of light, non-aqueous phase liquid (LNAPL) from near the pipeline was conducted on a monthly basis. Bailing, sorbent socks and high vacuum extraction were used to recover LNAPL until it was determined all the LNAPL that was practicable to recover had been recovered. Tier 1 and Tier 2 risk assessments were conducted for soil, groundwater, soil vapor and LNAPL in accordance with the 2006 MRBCA guidance. It was determined that the site met risk targets for current and future potential receptors. Although some LNAPL may still be present in the subsurface, it is not considered a risk due to the depth of groundwater and the anticipated depth of construction in the event pipeline repairs are required. BVCP determined the site is safe for its intended use.

### **Altus Office Building, Ladue Road - St. Louis**

The Altus Office Building - Ladue Road site is located at 8820 Ladue Road in St. Louis. The site is currently developed as paved parking lot with an associated two-story office building. Historical use included a gas station along the northern boundary of the property and an asphalt plant on the southern extent of the property. A 2015 Limited Phase II report did not reveal the presence of any USTs; however, petroleum impact was detected in soil within the vicinity of the former gas station.

Maintenance activities in the late 1990s revealed the presence of a previously unknown UST. Environmental assessments following this discovery identified the historical presence of a gas station and asphalt plant within the boundaries of the current site. The tanks section issued an NFA letter following the removal of the previously unknown UST.

Additional investigations were conducted in 2014 to identify other areas of potential contamination not addressed by the tanks section. Initial soil and groundwater investigations revealed petroleum and lead impact to soil and groundwater down gradient of the former tank pit. Additional investigations were conducted in January 2016 to further delineate areas of impact and evaluate the former asphalt plant. Analysis of the results indicate gasoline range organics, DROs, oil range organics, BTEX, poly-nuclear aromatic hydrocarbons and lead were detected in soil and groundwater below DTLs. The site therefore qualifies for unrestricted use.

This conclusion does not dismiss or overrule any determinations stated in the tanks section NFA letter issued regarding cleanup activities related to the previously unknown UST. The department determined the site is safe for its intended use.

Sites in Brownfields/Voluntary Cleanup Program

Month	Active	Completed	Total
April 2016	212	816	1028
May 2016	213	817	1030
June 2016	217	821	1038

**New Sites Received: 17**

**April**

- North Incinerator and Maintenance Garage Site (former), St. Louis
- Warsaw Maintenance Shed, Warsaw
- Troostwood Auto Repair, Kansas City
- BIA Air Cargo Site, Hazelwood
- CVS Pharmacy #10334, Kirkwood
- CVS Pharmacy #10171, Florissant
- Hallmark Cards (former), Kansas City

**May**

- Lee’s Summit Hospital (former), Lee’s Summit
- Puleo Holding Company, Richmond Heights

**June**

- Negro Leagues Baseball Museum (former Paseo YMCA), Kansas City
- United Methodist North Parking Lot, Kansas City
- Harcros Chemicals Inc., St. Louis
- Gerbes - Eldon, Eldon
- Tip Top Cleaners - Market Street, St. Louis
- International Shoe Building - St. Louis, St. Louis
- South Kingshighway Warehouse, St. Louis
- Dial Dry Cleaner (former), Sappington

**Sites Closed: 17**

**April**

- Bond Farm Release, Columbia
- Ford St. Louis Assembly Plant, Hazelwood
- Dollar General - Troost Avenue, Kansas City
- Solar Transport Tanker Release - Brookline, Brookline
- P Grgurich Parcel Building 3E17-A, Milan
- B Campbel Parcel Residence Building 1W07-A, Milan
- B Jensen Building 1W02-B, Milan
- L Stewart Parcel Building 1W12-A, Milan
- C Kain Parcel Buildings 2E02-A and B, Milan
- D Smith-Elder Parcel Building 3E02-A, Milan
- J Harrelson Parcel Building 3E03-A and B, Milan
- E J Smith Parcel Building 3E16-A, Milan

**May**

- West Pine Lofts, St. Louis

**June**

- Cabool Wood Treating, Cabool
- Crown Cork & Seal Company, Inc. (former), St. Louis
- Altus Office Building - Ladue Road, St. Louis
- Two Light Luxury Apartments, Kansas City

## Drycleaning Environmental Response Trust Fund

HWP’s Drycleaning Environmental Response Trust (DERT) Fund provides funding for the investigation, assessment and cleanup of releases of chlorinated solvents from drycleaning facilities. The two main sources of revenue for the fund are the drycleaning facility annual registration surcharge and the quarterly solvent surcharge.

### Registrations

The registration surcharges are due by April 1 of each calendar year for solvent used during the previous calendar year. The solvent surcharges are due 30 days after each quarterly reporting period.

Calendar Year 2015	Active Drycleaning Facilities	Facilities Paid	Facilities in Compliance
January - March 2016	122	59	47.97%
April - June 2016	122	102	83.61%

Calendar Year 2016	Active Solvent Suppliers	Suppliers Paid	Suppliers in Compliance
January - March 2016	11	8	72.73%
April - June 2016	12	8	66.67%

### Cleanup Oversight

Calendar Year 2016	Active Sites	Completed Sites	Total
January - March 2016	19	16	35
April - June 2016	19	16	35

**New Sites Received: 0**

**Sites Closed: 0**

**Reimbursement Claims**

The applicant may submit a reimbursement claim after all work approved in the work plan is complete and the DERT Fund project manager has reviewed and approved the final completion report for that work. The DERT Fund applicant is liable for the first \$25,000 of corrective action costs incurred.

Month	Received	Under Review	Processed
April	4	3	0
May	0	9	3
June	0	2	1

Month	Received	Under Review	Processed
April	\$32,533.00	\$27,380.50	\$0.00
May	\$0.00	\$77,020.00	\$49,227.42
June	\$0.00	\$15,456.85	\$14,659.70

Three reimbursement claims were processed during this period:

A G Cleaners	Kirkwood	\$12,780.50
Bright and Free Laundry & Dry Cleaners	St. Louis	\$2,681.25
U.S. Cleaners (Lindbergh Blvd.)	St. Louis	\$48,425.37

Total reimbursements as of June 30, 2016: \$2,925,691.77

DERT Fund Balance as of June 30, 2016: \$241,815.75

## Plume Stability

### Background

It is an unfortunate reality that industrial and commercial activities often result in the release of contaminants into the environment. Dumping, leaking or spilling contaminants was common before the advent of modern environmental regulations. Nowadays, most businesses utilize practices to minimize new releases, although problems still arise. The department has different programs that respond to both old and new contaminant releases, depending on site risk, contaminant type, and facility type. However, the issues confronted in each remediation program often are similar. Assessing the stability of contaminant plumes is a major issue at hazardous waste treatment, storage and disposal (TSD) facilities, and the balance of this article will focus on this issue from a TSD perspective; however, many of the basic concepts apply to other remediation programs.

Hazardous waste or chemicals released to the ground can move through soil and rock, either on its own or with the help of infiltrating precipitation, and can end up in the groundwater. Contaminated, shallow groundwater can then migrate to deeper groundwater aquifers, which may supply groundwater to wells and springs. Groundwater aquifers offering a sufficient amount and quality of water, if not impacted by contamination, are often the main source of drinking water for humans and can be used for irrigation. When hazardous waste or chemicals contaminate an aquifer, the contaminated groundwater can potentially harm human health and the environment.

According to the Resource Conservation and Recovery Act of 1976 (RCRA) and the Missouri Hazardous Waste Management Law, owners or operators of hazardous waste TSD facilities are required to investigate and remediate releases of hazardous waste and hazardous constituents to the environment at their facility, regardless of when those releases occurred. These activities, known as corrective action, are designed to investigate and ultimately take actions to reduce risks to human health and the environment.

### What is a groundwater contamination plume?

When hazardous waste or chemicals enter groundwater due to a release, it can form a plume, similar to when smoke rises out of an industrial smokestack into the atmosphere. The smoke can be viewed spreading out in a shape similar to a feather. The contamination concentration is the greatest at the point where it enters into the environment, whether into the atmosphere or the groundwater, and lessens as it spreads downward and outward from the point of entry. Factors such as the structure of the soil and bedrock, rate of groundwater flow, groundwater chemistry and the amount and type of contaminant affect the shape and movement of the groundwater contamination plumes. These factors also affect the rate at which the contaminants degrade, or break down in toxicity, and attenuate in concentration.

### What is plume stability?

Evaluating the rate contamination degrades in the groundwater, either naturally or with help from corrective action activities, helps us understand whether the plume is stable, expanding or shrinking. A plume is “stable” when it is no longer expanding in size (mass or area) and the overall contaminant concentrations are not increasing. An “expanding” plume is where either the plume size or contaminant concentrations are increasing. A “shrinking” plume is where the plume size and contaminant concentrations are decreasing.

### Why analyze plume stability?

Facilities must know whether the corrective action activities they are performing are effectively removing or controlling the migration of the contamination. Determining a plume’s stability is a way of measuring that effectiveness and the related remedial progress. An expanding plume indicates ongoing contaminant

migration, which could lead to human or environmental exposure, beyond those associated with a stable or shrinking plume.

The department also analyzes plume stability as a way to meet the RCRA Corrective Action Environmental Indicator CA 750 - Migration of Contaminated Groundwater Under Control. EPA and the states jointly developed the environmental indicator evaluation process as a way to measure short-term progress in protecting human health and the environment and to meet the performance and results objectives of the 1993 Government Performance and Results Act.

### How to determine plume stability?

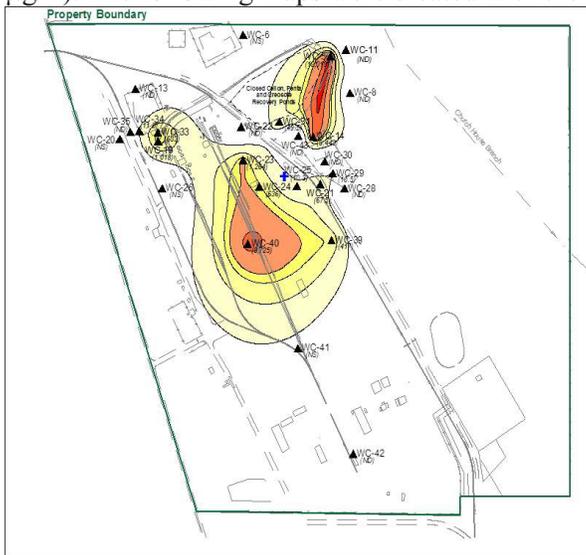
There are several methods available to determine plume stability:

- *Qualitative Methods:* This method uses graphs to plot the contaminant concentration against time or distance. The graphs provide visual evidence of increasing, decreasing or stable concentration trends. Concentration contour maps plotted for several sampling events can also be used to visually compare the plume over several sampling events.
- *Statistical Methods:* This method uses statistical calculations to evaluate data trends and if the trends are increasing or decreasing. Two popular methods used by many statisticians are the Linear Regression and Mann-Kendall Trend. Linear Regression evaluates the contaminant concentrations over time. Mann Kendall assesses the stability of contaminant concentrations against time.
- *Plume-Based Methods:* This method analyzes the plume area, plume mass, plume center of mass and mass flux of the contaminant.
  - The contaminant plume area, or footprint, is calculated using contour maps from several sampling events. Trends in the plume area are assessed to determine if the plume area is increasing or decreasing.
  - Plume mass is calculated using dissolved contaminant concentration contour maps. Changes in plume mass are analyzed over time, which is then used as an indicator of plume stability.
  - Plume center of mass is calculated using contour maps or other techniques such as Monitoring and Remediation Optimization System or MAROS. The plume's center of mass location along the plume centerline can change over time. This change can be used to make inferences regarding the plume's stability.
  - Mass flux is assessed across a plume or a recovery well and calculated across several transects. Plume stability can then be determined by comparing the calculated mass flux across each transect.
- *Ricker Plume Stability Analysis Method:* This method evaluates trends in plume characteristics using visual and statistical methods to calculate the average concentration, area, mass, location of plume center of mass and mass flux. The analysis is performed with established groundwater monitoring well networks and several years of groundwater chemistry data. Computational software, such as Golden Software Surfer and Microsoft Excel, are used to eliminate any human bias or error in the analysis. This analysis can be used to support reduction, modification or termination of groundwater remediation programs, including sites using a monitored natural attenuation approach. However, this method cannot be used at sites where groundwater contamination is present in karst or fractured bedrock settings. This method also does not account for the presence of NAPLs that may be present in addition to dissolved phase contamination.

## Case Study

The Ricker Plume Stability Analysis Method has been used to evaluate plume stability at a large wood treating facility. A contaminant-by-contaminant, well-by-well analysis was performed. The main contaminants of concern at the site were chlorophenols and polynuclear aromatic hydrocarbons (PAHs). For this analysis, naphthalene was selected as the compound most representative of the contaminant plume. The average concentration of naphthalene was tabulated from 1992 to 2004. Grid files were created for each well using Surfer software. These grid files were then used to create concentration contour maps.

The plume area was calculated using the volume calculation utility in Surfer. A grid volume report was created, which included the plume volume and the planar area. Values were entered for the aquifer thickness (30 feet), effective porosity (20% or 0.20) and contaminant clean-up level for naphthalene (10 µg/L). The plume center of mass was calculated in order to provide a better understanding of the overall plume shape while evaluating the stability of the plume. The grid files used to calculate the center of mass were filtered to include values greater than the specified contaminant clean-up level for naphthalene (10 µg/L). The following maps were created with the X and Y coordinates of the center of plume.



1992 Naphthalene Plume Map



2004 Naphthalene Plume Map

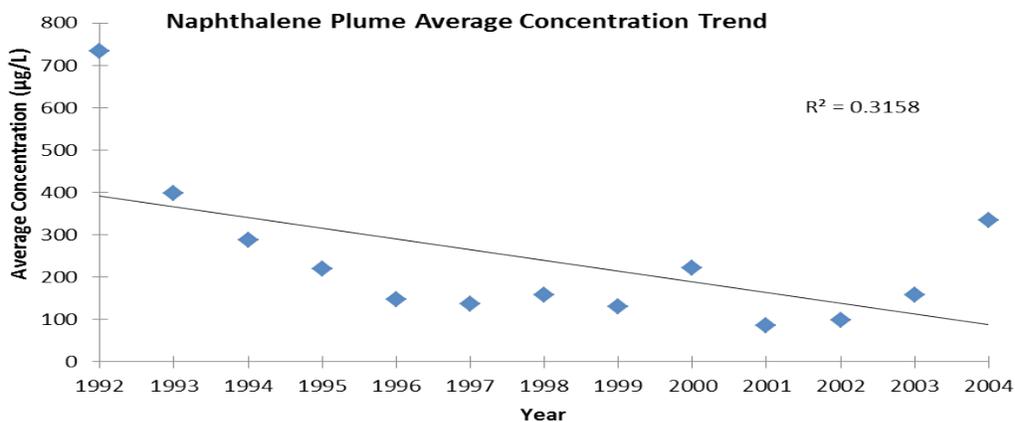
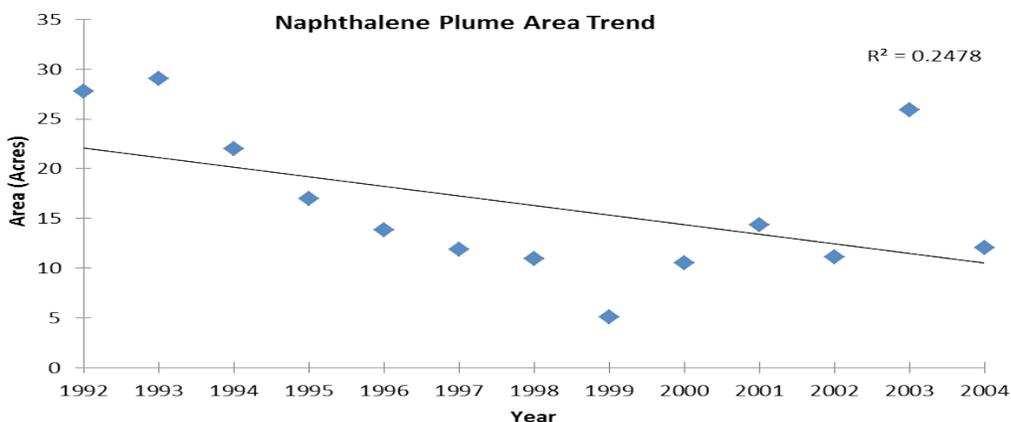
The calculated naphthalene plume characteristics from 1992 to 2004 are shown in the table below.

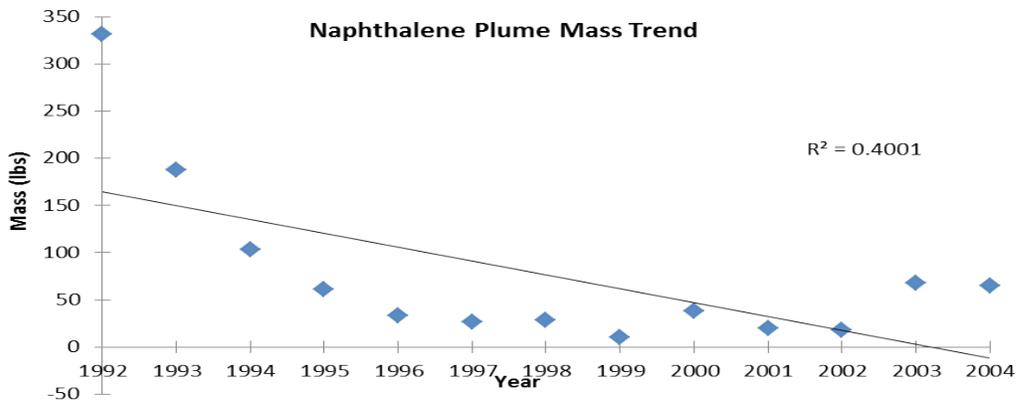
**Naphthalene Plume Characteristics**

Year	Area	Average Concentration (µg/L)	Mass (lbs)
1992	27.8	733	332
1993	29.0	398	188
1994	22.0	287	103
1995	17.0	219	60.7
1996	13.8	147	33.0
1997	11.9	137	26.7
1998	10.9	159	28.2

Year (cont.)	Area (Acres) (cont.)	Average Concentration (µg/L) (cont.)	Mass (lbs) (cont.)
1999	5.1	130	10.7
2000	10.5	221	37.9
2001	14.3	85.6	19.9
2002	11.1	99.4	18.0
2003	25.9	159	67.4
2004	12.0	334	65.3

Trend graphs were created for the size of the impacted area versus the year, average naphthalene concentration versus the year, and dissolved mass of naphthalene versus the year. The trend analyses were conducted using the regression analysis utility in Excel. It appears the plume characteristics have a decreasing trend.

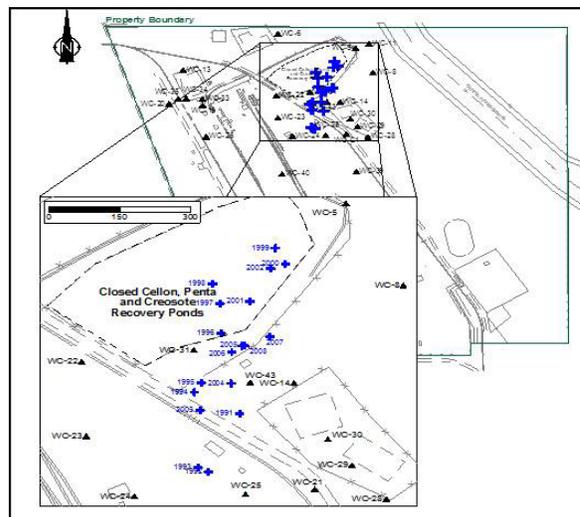




Summary of Linear Regression Analysis

Parameter	R <sup>2</sup>	Regression Line Slope	Conclusion
Area	0.25	1.0	Decreasing trend
Average Concentration	29.0	398	Decreasing trend
Mass	22.0	287	Decreasing trend

The center of the plume mass was also analyzed as a final means of evaluating the stability of the naphthalene plume. The figure below shows the location of the plume center of mass over several years. The plume center migrated approximately 558 ft upgradient from 1991 to 2000, 422 ft downgradient from 2000 to 2003, and 234 ft upgradient in 2004. It appears the naphthalene plume has not migrated significantly between 1992 and 2004.



Overall, the plume stability analysis indicates the naphthalene plume is stable. The trends show a significant decrease in concentration, area and mass.

### **Conclusion**

In summary, many approaches can be used to evaluate contaminated groundwater plume stability. Each approach has its strengths and limitations. The choice and application of each approach should consider the geologic and hydrologic setting of the facility to be evaluated, as well as the contaminant- and time-specific factors associated with the release(s) that caused the groundwater to be impacted. Ultimately, plume stability evaluations should be supported by the use of several approaches to reach the best technically defensible conclusion.

### Regional Office Hazardous Waste Compliance Efforts

- Conducted 123 hazardous waste generator compliance inspections:
  - 21 large quantity generators
  - 54 small quantity generators
  - 32 conditionally exempt small quantity generators
  - Four focused compliance inspections
  - Seven E-waste facilities
  - Five resource recovery facilities
- Issued 46 letters of warning and four notices of violation requiring actions to correct violations cited during the 123 inspections conducted
- Conducted four compliance assistance visits at hazardous waste generators
- Received 58 citizen concerns regarding hazardous waste issues and conducted field investigations on 46 citizen concerns

### Underground Storage Tank (UST) Compliance and Technology Unit (CTU)

**Federal rule changes** – In 2011, EPA proposed significant changes to the UST regulations. The final version of those federal rules was published in July 2015 and became effective Oct. 13, 2015. Please note, these rules are not yet effective in Missouri; they will not be effective in Missouri until the department promulgates Missouri’s regulations or EPA follows its procedures for withdrawal of our state program approval. The rule includes new testing requirements for release detection equipment; overfill prevention equipment (e.g., flapper valves, ball float valves and alarms), spill buckets, and containment sumps. Previously deferred airport fuel hydrant systems and field constructed tanks will now be regulated. Missouri must also include a new requirement for all new systems installed after July 1, 2017, to be double walled with enhanced leak monitoring.

The UST/CTU staff met with the regulated community to discuss these upcoming rule changes at the Missouri Petroleum Marketers and Convenience Store Association Board meeting on June 13, 2016 and the Petroleum Storage Tank Insurance Fund’s (PSTIF) advisory committee meeting on June 14, 2016. The UST/CTU will host a public outreach meeting on July 21, 2016, about the rule changes. In addition, information will be presented about these rules at the Missouri Waste Control Coalition (MWCC) Conference, at Tan-Tar-A, on July 12, 2016.

For updates and information on these upcoming rule changes, please visit our webpage: [dnr.mo.gov/env/hwp/ustchanges.htm](http://dnr.mo.gov/env/hwp/ustchanges.htm).

**Operator Training** – Operator training is available online. Class A/B operator training and Class C operator training are both available, as well as a “test only” option. The rule is also available online, which includes a compliance deadline of July 1, 2016. The department and PSTIF will also be accepting reciprocity from some of our neighboring states. The training program may be found on the Fund’s webpage: [optraining.pstif.org/intro/](http://optraining.pstif.org/intro/).

**Tank inspections** – State Fiscal Year (FY) 2016 contract inspections are complete. The department inspections continue, especially the new installation inspections during this busy construction time of year. As seen in previous years, Missouri owners, operators and contractors continue to demonstrate their

proactive compliance by being responsive to issues when found, demonstrating a willingness to be a partner in ensuring all Missouri USTs are in compliance. The department is maintaining compliance with the EPA requirement of inspecting all regulated facilities at least every three years. The department must also demonstrate all facilities are either in compliance or are moving to gain compliance. This goal is much easier to accomplish when owners, operators, contractors and regulators are all working together.

**Financial Responsibility** - Efforts continue to resolve violations with facilities not maintaining a financial responsibility mechanism to address releases and to protect third parties. Because of these efforts by the UST/CTU staff and the AGO, the number of facilities without a verified financial responsibility mechanism is 1.6 percent.

**Enforcement Efforts** - In this time period, one case was referred to the Attorney General’s Office for enforcement action.

The following enforcement actions were taken in this quarter:

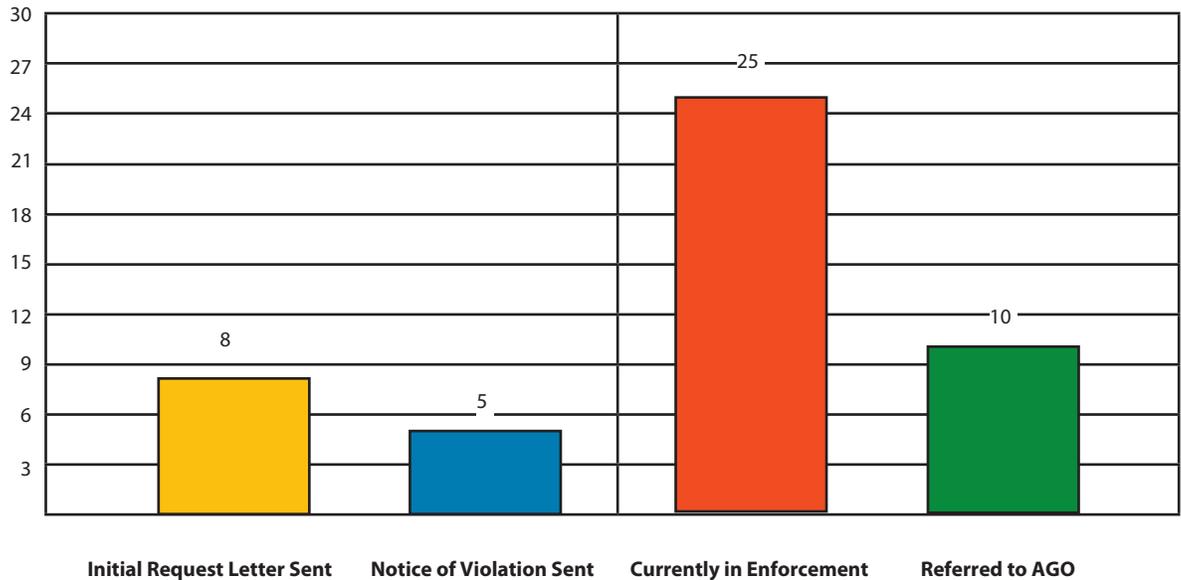
Facility/Responsible Party	Summary of Violation	Resolution Summary and Compliance Status
AALIM Inc. (formerly US Oil) 200 S. Connecticut King City, Mo	Failure to have financial responsibility assurance, failure to comply with registration requirements, and failure to pay registration fees.	Consent judgment entered May 13, 2016. Civil penalty of \$10,000 assessed with \$5,000 suspended pending five years compliance. Case transferred to AGO’s Financial Services Division for collection of penalty.
CITGO Service Station 2609 Dunn Road St. Louis, Mo	Failure to have financial responsibility assurance.	Consent judgment entered on Oct. 19, 2015. Civil penalty of \$1,500 assessed. Case transferred to AGO’s Financial Services Division for collection of penalty.
Claire’s Market 101 Boone St. Ash Grove, Mo	Failure to have financial responsibility assurance and failure to comply with registration requirements.	Case referred to AGO for legal pursuit on April 15, 2016. Summons and petition served to a facility representative.
East Prairie Location (former Winks) 826 W. Washington East Prairie, Mo	Failure to conduct permanent closure of USTs.	Consent judgment entered on Sept. 9, 2014. Civil penalty of \$50,000 assessed with \$45,000 suspended pending compliance with Injunctive Relief. Case transferred to AGO’s Financial Services Division for collection of penalty. Responsible party is out of state and site remains out of compliance with completion of remedial actions.
Jefferson CITGO 505 Jefferson St. Charles, Mo	Failure to conduct permanent closure of USTs.	Consent judgment on entered May 13, 2016. Civil penalty of \$10,000 assessed with \$5,000 suspended pending five years compliance. Case transferred to AGO’s Financial Services Division for collection of penalty.
Jefferson CITGO 505 Jefferson St. Charles, Mo	Failure to permanently close.	Consent judgment entered on Sept. 10, 2003. Civil penalty of \$16,000 assessed with \$8,000 suspended pending compliance with closure. USTs closed and NFA letter issued by the department.

Facility/Responsible Party (cont.)	Summary of Violation (cont.)	Resolution Summary and Compliance Status (cont.)
Natural Bridge Phillips 8835 Natural Bridge Road St. Louis, Mo	Failure to have financial responsibility assurance.	Settlement agreement entered on April 28, 2016. Civil penalty of \$4,000 assessed with \$3,000 suspended pending two years compliance. Case transferred to AGO's Financial Services Division for collection of penalty.
CITGO Service Station 2609 Dunn Road St. Louis, Mo	Failure to have financial responsibility assurance.	Consent Judgment entered on Oct. 19, 2015. Civil penalty of \$1,500 assessed. Case transferred to AGO's Financial Services Division for collection of penalty.
Plaza Petroleum 11747 St. Charles Rock Road Bridgeton, Mo	Failure to have financial responsibility assurance.	Case closed by AGO due to change in ownership of facility.
Robison McIvor Grocery & Package 22249 Hwy 51 Qulin, Mo	Failure to have financial responsibility assurance.	Consent judgment entered on May 31, 2016. Civil penalty of \$5,000 assessed and paid in full. UST removed and NFA letter issued by department.
Vitran Express Inc. 4232 Planned Industrial Drive St. Louis, Mo	Failure to have financial responsibility assurance.	Consent judgment entered on May 31, 2016. Civil penalty of \$5,000 assessed and paid in full. UST removed and NFA letter issued by department.

## Underground Storage Tank Facilities with Unknown Financial Responsibility Status Report

Financial Responsibility Status	Number of Facilities
Initial Request Letter Sent	8
Notice of Violation Sent	5
Currently in Enforcement	25
Referred to Attorney General's Office	10
<b>Total Number of Facilities with Unknown Financial Responsibility</b>	<b>48</b>

**Number of Facilities in Each Financial Responsibility Step**



**Special Facilities Unit**

*Commercial facility inspectors* - Special facilities’ inspectors conducted 13 inspections of commercial hazardous waste TSD facilities.

*PCB inspector* - The inspector conducted 27 compliance inspections at various types of facilities throughout the state. The inspector’s reports are forwarded to EPA Region 7, which has authority for taking any necessary enforcement action regarding PCBs according to the Toxic Substances Control Act.

*Hazardous waste transporters* - More than 48 hazardous waste transporter license compliance background checks were completed. In addition, staff updated Missouri’s List of Licensed Hazardous Waste Transporters along with the key to services. The list includes transporters licensed to haul hazardous waste, infectious waste and used oil in Missouri and it can be accessed on our webpage: [dnr.mo.gov/env/hwp/transporters.php](http://dnr.mo.gov/env/hwp/transporters.php).

**Hazardous Waste Enforcement Unit**

**Enforcement Efforts**

- Resolved one hazardous waste enforcement case
- Received 23 new enforcement cases

## Pesticide Collection Program Events

The Pesticide Collection Program conducted the last four pesticide collection events of calendar year 2016. The third event of the year was on April 9, at the University of Missouri's Graves-Chapple Research Center, near Fairfax, collecting 3,389 pounds of waste pesticide from 13 participants. The fourth event was on May 21, at the Canton Recycling Center, in Canton, collecting 4,450 pounds of waste pesticide from 31 participants. The fifth event was on June 4, at the Montgomery County Road and Bridge Facility, in Montgomery City, collecting 4,274 pounds of waste pesticide from 21 participants. The sixth and final event for calendar year 2016 took place June 25, at C & C Farm & Home, in Bolivar, collecting 2,161 pounds of waste pesticide from 45 participants.

In looking ahead to 2017, the program plans to conduct another five to six free collection events for Missouri farmers and households.

### Petroleum Storage Tank Statistics

During State FY16, the department accomplished the following work related to petroleum storage tanks:

- Regulated 3,427 facilities with 8,923 active USTs
- Properly closed 417 tanks
- Reviewed 132 closure reports
- Approved 122 closure notices
- Conducted 3 site investigations
- Responded to 16 emergencies involving petroleum releases
- Oversaw completion of 148 remediation sites
- Issued 657 certificates of registration
- A total of 101 new releases were reported
- Department staff was notified of 71 new installations at tank sites and received 57 new site registrations
- The Compliance and Enforcement Section staff resolved 54 cases involving violations
- At the end of FY16, there were 139 active enforcement cases.

Financial responsibility compliance was at 98.4 percent. This number reflects insurance coverage from both the Missouri Petroleum Storage Tank Insurance Fund and other private policies and statements. There were 52 state and federal exempt sites. This number does not include out-of-use tanks, which are not required to have financial responsibility.

### Tanks Section Will Hold Workshop at the Missouri Waste Control Coalition Conference

The tanks section will hold a Tanks Workshop on July 12, 2016, as part of the MWCC Conference, at the Tan-Tar-A Resort, at the Lake of the Ozarks. This will be the ninth annual workshop in conjunction with MWCC events. This conference is targeted toward environmental consultants who provide services to tank owners and operators. The conference will provide consultants with information and training regarding free product recovery and LNAPL conceptual site models, groundwater plume stability evaluations, and investigating diving methyl tertiary butyl ether plumes in alluvium in the bootheel.

# Missouri Department of Natural Resources - Hazardous Waste Program

TANKS

## Petroleum Storage Tanks Regulation June 2016

<b>Staff Productivity</b>	<b>Jul-15</b>	<b>Aug-15</b>	<b>Sep-15</b>	<b>Oct-15</b>	<b>Nov-15</b>	<b>Dec-15</b>	<b>Jan-16</b>	<b>Feb-16</b>	<b>Mar-16</b>	<b>Apr-16</b>	<b>May-16</b>	<b>Jun-16</b>	<b>TOTAL</b>
Documents received for review	197	213	220	206	166	185	196	190	224	177	187	191	2,352
Remediation documents processed	152	146	151	156	98	211	152	140	223	115	173	111	1,828
Closure reports processed	16	7	15	17	11	13	22	8	11	3	5	4	132
Closure notices approved	12	13	12	12	7	7	6	9	12	11	7	14	122
Tank installation notices received	5	7	9	5	0	10	5	6	7	6	7	4	71
New site registrations	8	4	11	3	9	6	5	1	1	6	2	1	57
<b>Facility Data</b>	<b>Jul-15</b>	<b>Aug-15</b>	<b>Sep-15</b>	<b>Oct-15</b>	<b>Nov-15</b>	<b>Dec-15</b>	<b>Jan-16</b>	<b>Feb-16</b>	<b>Mar-16</b>	<b>Apr-16</b>	<b>May-16</b>	<b>Jun-16</b>	<b>TOTAL</b>
Total in use, out of use and closed USTs	40,929	40,950	40,963	40,971	41,003	41,022	41,042	41,064	41,084	41,103	41,113	41,135	
Total permanently closed USTs	31,970	31,979	32,014	32,040	32,061	32,084	32,134	32,150	32,179	32,182	32,194	32,212	
In use and out of use USTs	8,955	8,967	8,945	8,927	8,938	8,934	8,903	8,909	8,900	8,916	8,919	8,923	
Out of use USTs	664	668	681	685	681	680	664	659	654	703	703	707	
Total hazardous substance USTs	403	403	405	405	405	405	405	405	405	405	405	405	
Facilities with in use and out of use USTs	3,441	3,444	3,441	3,438	3,440	3,438	3,426	3,428	3,422	3,428	3,426	3,427	
Facilities with one or more tank in use	3,209	3,210	3,203	3,199	3,203	3,201	3,194	3,197	3,191	3,181	3,178	3,178	

## Closures

<b>Underground Storage Tanks</b>	<b>Jul-15</b>	<b>Aug-15</b>	<b>Sep-15</b>	<b>Oct-15</b>	<b>Nov-15</b>	<b>Dec-15</b>	<b>Jan-16</b>	<b>Feb-16</b>	<b>Mar-16</b>	<b>Apr-16</b>	<b>May-16</b>	<b>Jun-16</b>	<b>TOTAL</b>	<b>All Yrs</b>
Closure Reports Reviewed	16	7	15	17	11	13	22	8	11	3	5	4	132	
Closure Notices Approved	12	13	12	12	7	7	6	9	12	11	7	14	122	
Number of Tanks Closed (Closure NFA)	32	23	38	22	20	45	51	39	74	22	26	25	417	

## Cleanup

<b>Underground Storage Tanks</b>													<b>TOTAL</b>	<b>All Yrs</b>
UST release files opened this month	6	9	9	6	6	8	7	9	13	3	4	2	82	6,773
UST cleanups completed this month	9	6	13	7	6	14	9	14	21	9	11	11	130	5,978
Ongoing UST cleanups	831	833	833	833	833	827	826	824	816	811	805	795		
<b>Aboveground Storage Tanks</b>														
AST release files opened this month	0	0	0	1	2	4	3	1	1	0	0	1	13	487
AST cleanups completed this month	2	0	1	1	0	0	1	0	1	2	3	0	11	309
Ongoing AST cleanups	175	175	174	174	176	179	181	182	182	179	177	178		
<b>Both UST and AST</b>														
Total release files-both UST & AST	0	0	0	0	0	0	0	0	0	2	0	0	2	82
Cleanups completed-both UST & AST	0	0	0	0	0	0	0	0	2	0	0	0	2	54
Ongoing cleanups-both UST & AST	27	27	27	27	27	28	28	28	26	28	28	28		
<b>Unknown Source</b>														
Total release files-unknown source	1	0	0	2	0	0	1	0	0	0	0	0	4	228
Cleanups completed-unknown source	1	0	0	1	1	0	1	0	0	1	0	0	5	214
Ongoing cleanups-unknown source	18	18	17	18	17	17	17	15	16	15	14	14		
Documents Processed	152	146	151	156	98	211	152	140	223	115	173	111	1,828	
*Reopened Remediation Cases	0	0	0	1	0	2	0	0	0	0	0	0	3	83

\* Reopened Remediation Cases was added Nov. 18, 2009 - the cumulative total has been queried and a running total will be tracked/reported with the FY 2010 Tanks Section Monthly Reports.

Effective December 2008 tanks with unknown substance will be included in total figures. Some measures are re-calculated each month for all previous months to reflect items added or edited after the end of the previous reporting period.