



Underground Storage Tank **FLOOD GUIDE**



Underground Storage Tank Flood Guide

DISCLAIMER

EPA wrote this guide to provide information for underground storage tank (UST) owners and operators in the event of a threatened or actual flood. This guide does not replace existing federal or state laws or regulations, nor does this impose legally binding requirements. The word *should* as used in this guide, is intended solely to recommend or suggest and does not connote a requirement.

For regulatory requirements regarding UST systems, refer to [40 CFR Part 280](#) and corresponding state regulations.

Pictured on Cover: Vehicles nearly submerged by flood waters at a gas station in Rushford, MN on August 19, 2007. Credit: National Weather Service

CONTENTS

Disclaimer.....ii

About This Guide.....1

Types of Flooding.....2

Effects Of Flooding On UST Systems.....3

Planning Before A Flood.....4

UST Flood Checklist.....7

Responding To An UST Emergency..... 11

Financial Assistance..... 12

Aboveground Storage Tanks At UST Facilities 14

Useful Resources And Links..... 18

Photo Gallery 21

ABOUT THIS GUIDE

Flooding is a common natural disaster that affects communities across the United States. When flooding occurs, an UST system is susceptible to damage that may lead to a release of its contents into the environment.

The U.S. Environmental Protection Agency (EPA) developed this guide as a resource for UST owners and operators in the event of a threatened or actual flood. This guide may help UST owners and operators prepare and respond to the catastrophic effects and environmental harm that may occur as a result of flooded UST systems, and help return an UST system to service as soon as possible. State, local, and tribal UST program implementers may also find this guide useful.

This guide consolidates federal, state, non-governmental, and UST industry resources. However, many communities develop their own strategies and resources to reduce the effects of flooding on their citizens, businesses, and environment.

Although this guide mainly addresses USTs affected by flooding, some elements of the checklists may apply to other natural disasters and USTs systems.

TYPES OF FLOODING

Coastal flooding occurs when higher than average tides engulf the adjacent land.

Storm surge is also a coastal flood that occurs when tides force water onshore.

River (fluvial) flooding occurs when a river's capacity is overwhelmed and its water overflows onto surrounding banks.

Groundwater flooding occurs when the ground becomes saturated with water and sub-surface water rises to the surface or into structures.

Flash flooding occurs when excessive amounts of water cause a rise in water in a short period of time due to:

- An overwhelmed sewer system
- Heavy or extended rain
- Rapid snowmelt
- Dam or levee failure
- A sudden release of water

Learn the difference between a flood watch and a flood warning from the [National Weather Service](#).



Flooded gas station after Hurricane Florence. Credit: EPA

EFFECTS OF FLOODING ON UST SYSTEMS

Factors such as location, water flow, and extent of flooding influence how a flood impacts an UST system. Taking actions before, during, and after flooding events may decrease damage to the UST system and help protect human health and the environment when a flood occurs.

Buoyancy

An UST surrounded by floodwaters or saturated soil is subjected to buoyant forces that could push the tank upward, offsetting the restraints of backfill, pavement, or hold-down straps. Once displaced, the tank could rupture or disconnect from connected piping, vent lines, and other components, releasing product into the environment.

Erosion And Scour

Floodwater can erode the soil and backfill material or scour the soil that surrounds an UST system. Loss of the surrounding soil and scour may expose the UST system to damage, for example buckling and detached piping, that could lead to a release of product into the environment. Additionally, scouring may compromise the integrity of the concrete pad on top of the UST, causing the tank to buckle, collapse, or float.

Product Displacement

Floodwater or debris entering through UST openings can push product up and out of the UST into the environment.

Electrical System Damage And Corrosion

Extended contact with floodwaters can damage and corrode UST systems equipment including piping, automatic tank gauging systems, electrical panel boxes, shutoff switches, submersible turbine pumps, dispensers, motors, and cathodic protection.

Inability To Locate The UST

Areas affected by a flood are often left covered with debris and mud, making it extremely difficult to locate the UST.

PLANNING BEFORE A FLOOD

Understand The Risk

In order to help improve a UST's resilience during a flood, it is important to know the potential for a flood, and its possible impacts on the UST facility and surrounding sites. There are a variety of methods for reducing a flood's impact. However, the most effective methods take into consideration the specifics of the site and its location. UST owners and operators may do the following to help them better understand and assess the threat of flooding:

- Several federal websites offer flood maps:
 - [FEMA's Flood Map Service Center \(MSC\)](#) website provides information on flood hazards in the community.
 - EPA's [EnviroAtlas](#) website provides information on flood hazards in your community.
 - [National Oceanic and Atmospheric Administration's \(NOAA\) Coastal Flood Exposure Mapper](#) provides information on coastal flooding and hazards for the East Coast, West Coast, Gulf of Mexico, and islands in the Pacific Ocean and Caribbean Sea.
 - NOAA's [Inundation Dashboard](#) provides real-time and historic coastal flooding information at water level stations.
- Collect previous flooding data on how past flooding events threatened or impacted the UST facility.
- Complete a sensitive receptor survey of potential sites that may be affected if a release occurs.
- Determine the potential sources of flooding that could impact the UST facility, such as swollen rivers or streams, flash floods, levee or dam failure, spring thaw, coastal or urban locales.

Installation Practices To Help Reduce Flooding Impact

Owners and operators may consider using the measures below prior to installing a UST.

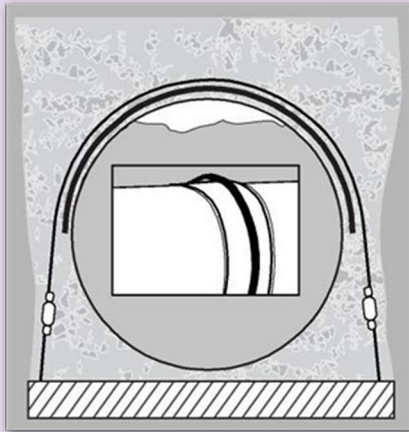
- Federal Emergency Management Agency's (FEMA) P-348, [Protecting Building Utility Systems From Flood Damage \(2017\)](#) illustrates design and construction of new utility systems and structures in flood-prone areas. It also addresses evaluating structures undergoing substantial improvement and includes information on handling installation of tanks in high groundwater areas. FEMA's [building code resources](#) provides guidance on the hazard-resistant provisions in the building codes.
- Owners and operators may consider installing shut-off valves below the flood elevation level on fuel lines and tank vents.
- Owners and operators may consider extending the vent pipe above flood levels to help prevent floodwaters from entering the vent line and tank.

- Offset UST Buoyancy - the following methods may prevent the UST from floating:
 - Add a restraining force by increasing the burial depth or the amount of pavement on top of the tank, or both. The burial depth should not exceed the manufacturer's recommendation.
 - Anchor the tank to a reinforced concrete pad with non-corrosive hold-down straps.
 - Install deadman anchors with straps attached, outside the tank diameter alongside the tank.
- Develop a contingency plan that includes, but is not limited to:
 - A facility diagram identifying all UST locations and active remediation systems
 - Emergency contact information and notification procedures
 - Checklist and inventory of items needed to maintain a minimum level of service after a flood
 - A list of UST contractors and testers
 - A list of funding resources for facility restoration
 - UST flood preparation and facility restoration checklists
- [Useful Resources And Links](#) section of this guide to access real-time interactive information on emerging flood threats

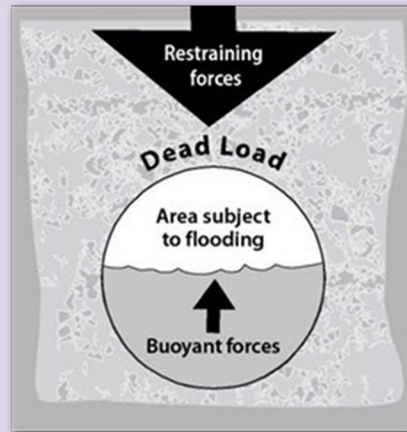


FEMA's [Ready Business Hurricane Toolkit](#) provides information on taking action to protect employees, protect customers, and help ensure business continuity for hurricanes and tropical storms.

Examples Of Offsetting Buoyancy When Installing An UST



A reinforced bottom hold-down pad provides a firm bed for the tank and adds resistance to flotation. Credit: EPA



The extra weight of the backfill and pavement over the tank may be enough to keep the tank from floating. Credit: EPA



UST with hold down straps on a concrete pad. Credit: EPA



UST deadmen installation. Credit: ZCL Composites

Read more information on properly anchoring an UST in:

- National Fire Protection Association (NFPA) 30 Flammable Combustible Liquids Code
- Petroleum Equipment Institute's (PEI) Recommended Practice 100
- American Petroleum Institute's (API) Recommended Practice 1615
- Federal Emergency Management Agency (FEMA) P-348
- FEMA's [Compilation of Flood Resistant Provisions](#) contain excerpts from 2018 international building codes

Refer to the tank manufacturer's instructions for details on bottom hold-down pad construction, installing tank straps, and deadman construction.

UST FLOOD CHECKLIST

Using this checklist may help address an UST in the event of a flood. Owners and operators must follow requirements established by their UST implementing agency for:

- Emergency response
- Restarting an UST system
- UST system removal and release cleanup
- Waste disposal
- UST system component testing
- UST system installation

Before The Flood

- Conduct an inspection of the entire facility to determine areas susceptible to flooding and the potential consequences if a flood happens.
- Assess the extent and duration of predicted flooding.
- Turn off power to all UST system including STPs, pumps, and dispensers.
 - Keep the release detection system on as long as power is available.
- Take product inventory and water level readings of all tanks.
- Reduce the chance of a tank rise.
 - Place heavy objects, for example dumpster, sandbags, or large containers full of sand or rock, over the tank.
 - Fill the tank with fuel to decrease buoyancy by weighing down the tank so it will not float out of the ground.
 - If the predicted flood extent and duration is excessive, owners and operators may want to instead consider minimizing the amount of fuel to lessen the likelihood of a release into the environment.
 - Do not fill tanks with water due to additional costs for disposing contaminated water and possible corrosion to the tank system.
- Make sure fill caps are operable and secure.
- Place sand bags on top of the spill catch basin and tank top sump lids to minimize the amount of water entering each tank
- Make sure the seal on spill bucket plungers are operational to keep water out of the tank.
- If possible, have an UST technician drain all product lines back into each tank.
- Close flow restrictors and manually trip shear valves on pressurized piping to prevent product releases from dispenser lines.
- Temporarily cap off vent pipes to prevent water from entering the tank and displacing product.
- Protect fuel pump and controls to prevent damage from flooding.
 - Secure dispensers with plastic, tarps or plywood.
 - If time allows, consider removing dispensers, and storing them safely.
 - Remember to also protect aboveground components from floating debris or floodwater.

-
- ❑ Check the remediation system, if applicable.
 - Shut off power to the remediation system.
 - Disconnect all wiring and piping to remediation trailers and remove portable equipment trailers from the flood hazard area.
 - Cap and secure remediation wells to prevent floodwaters from entering.
 - Store remediation equipment away from the flood hazard area.
 - If possible, close all control valves to isolate the remediation system.

After The Flood

Take the following actions after the water recedes and local officials allow re-entry. Remember that every situation is different and site-specific issues will dictate the proper course of action.

Before bringing an UST system back into service:

- ❑ Make sure the power is off.
- ❑ Remove all debris and water from the concrete pad.
- ❑ Inspect the concrete pad for any indication of tank movement or shifting.
 - If the pad has been damaged, have a contractor evaluate the entire UST system to determine its suitability to receive product.
- ❑ Inspect UST system components, such as secondary and under-dispenser containment and sumps for leaks.
 - Have a technician check the connections and verify that all dry secondary containment areas are still dry.
 - Ensure that the isolation boot under the dispenser is working properly. Loose or defective boots may allow water seepage into the piping secondary containment.
- ❑ Measure the product and water levels in each tank.
 - If there is a discrepancy in pre and post flood levels, follow the UST implementing agency requirements for release notification and response.
- ❑ Remove any debris from each tank.
- ❑ Remove any water from the tank according to implementing agency requirements.

- ❑ Make sure that the remaining product is suitable for use.
 - The owner or operator should consider not using the product if there is greater than 2” of water on the bottom of the tank.
 - A tank with ethanol blended gasoline should not have any water on the bottom (and the product is not usable if water has caused phase separation or fuel degradation from its quality specification).
 - In emergency situations, a diesel tank or a non-ethanol gasoline tank may be used with up to 2” of water on the bottom of the tank¹.
 - Remove any unusable product from each UST in accordance with the UST implementing agency requirements.

Bringing an UST system back into service.

- ❑ Return power and have a technician inspect for proper operation.
 - Check all UST system electrical equipment for proper operation.
 - Ensure that leak detection equipment is operational as soon as practically possible; however, certain leak detection methods may not be viable.
 - Contact the UST implementing agency if the leak detection system is not working properly or found to be inoperable.
- ❑ Inspect vent lines for movement and cracking.
 - Ensure that the vent is working properly.
- ❑ If installed, test the cathodic protection system for proper operation.
- ❑ Clean and empty all spill buckets, under dispenser containment, and containment sumps.
 - Test and replace all damaged or inoperable spill buckets and sumps.
- ❑ Clean and lubricate shear valves before resetting them.
- ❑ Be alert for unusual operating conditions such as slow dispensing of fuel, frequent alarms, customer complaints, or equipment shutdowns.
 - If product loss has occurred, immediately notify implementing agency requirements for release notification and response.

What If An On-Site Remediation System Is Affected By A Flood?

- ❑ Have a qualified electrician or technician check the motors and controls for damage and presence of moisture or silt and verify proper operation.
- ❑ Notify the implementing agency of any damage that occurred.
- ❑ Return power to the remediation system.
- ❑ Reconnect the remediation system to the power and piping system.
- ❑ Have a qualified professional clear water and silt that may have collected and disinfect system components.
 - Replace system components that cannot be effectively cleaned and disinfected.
- ❑ Check the piping system valves for proper operation.

¹ However, during normal operating conditions, some management practices advise a regular check of the tank to ensure that the water layer is less than 1” on the bottom of the tank. Minimizing water in tank bottoms will help minimize fuel quality problems or corrosion risks due to microbial growth.

- Inspect monitoring wells for damage.
 - Check for water and silt entering monitoring, extraction, or injection wells.
- Reassess the site characterization to determine if the extent of contamination has changed.

What If An UST Floated Out Of Its Excavation?

- Turn off any power in the vicinity of the UST system, and immediately call the electric company if any power lines are down in the area.
- Notify the appropriate authorities according to applicable policies, if there is any evidence of spilled product.
- Notify the local fire department.
- Rope off the area and keep people away from the affected area.
- If it is safe to do so, remove all contents of the tank.
- Perform initial leak mitigation and release reporting, if necessary.
- Obtain a contractor to dismantle any piping and dispensers and remove the piping and tank properly.

RESPONDING TO AN UST EMERGENCY

UST owners and operators are expected to be the first responders to handle most UST emergencies. They are primarily responsible for initial response and cleanup of UST system releases. Because initial response actions to an UST emergency is critical, it is important that initial responders understand the risks and are properly trained on the procedures to take in order to assess a situation and safely and efficiently respond to an UST emergency.

In the event of an emergency, owners and operators may use the following information to help them perform actions to recover and effectively restart their facilities.

- Some UST facilities maintain site specific contingency plans that provide internal and external notifications and actions to take when responding to different types of emergencies. Facility personnel should obtain and follow procedures in that plan.
- If applicable, notify the on-call emergency response contractor to provide on-call and immediate emergency response services.
- Owners and operators may also contact their local fire department.
- In Indian country, notify local and tribal officials as the first responders. EPA is available for further assistance.
- State and local emergency management agencies plan initial response actions for emergencies within their jurisdiction. They may not perform actual incident response, but do attempt to identify potential hazards, find available resources, and write emergency response plans. However, they are not available in every locality. FEMA provides [contact information for emergency agencies and offices](#).
- The federal government generally becomes involved when local and state resources are exhausted, or when incidents occur in Indian country.

FINANCIAL ASSISTANCE

The availability of funds sometimes determine the priority of efforts UST owners and operators can take for flood recovery and bringing an UST system back into operation. Funds may be provided for prompt immediate actions that must be taken to protect health, safety, and the environment. Funds may also be available for longer term cleanup and site recovery.

- State financial assurance programs may provide loans and grants to eligible owners and operators for corrective actions, where applicable. You can find more information on UST state financial assurance funds on [EPA's website](#).
- State trust funds may reimburse responsible parties or third parties for corrective actions related to UST releases if certain prerequisites for coverage are met.
- In an emergency, states may [use Leaking Underground Storage Tank \(LUST\) Trust Fund](#) money to conduct emergency responses, site assessments, or corrective actions. In non-emergency situations, states may use LUST Trust Fund money to conduct site assessments or corrective actions where the responsible party is unknown, unwilling, or unable to respond.

Owners and operators should contact their financial responsibility or insurance provider to file a notice or claim and determine minimum requirements necessary for continuing coverage. Failure to do so could jeopardize coverage in the event of a subsequent release.

Other Types Of Financial Assistance Available To UST Owners And Operators

Various sources, including non-profits, private, local, state, and federal may provide financial assistance for business recovery.

- [USA.gov](#) is the federal government's official online guide to government resources and services. For information on receiving emergency individual financial assistance after a disaster visit [Disaster Financial Assistance](#).
- Visit [benefits.gov](#) to learn about applying for disaster relief benefits.
- FEMA's [Public Assistance Program](#) support communities' recovery from major disasters by providing grant assistance. Local governments, states, tribes, territories and certain private nonprofit organizations are eligible to apply.
- [Disasterassistance.gov](#) is a joint data-sharing effort between federal, tribal, state, local, and private sector partners. At this site, UST owners and operators can:
 - Find disaster assistance that meets personal needs.
 - Learn about more than 70 forms of assistance from 17 [federal agencies](#).
 - Apply for disaster assistance online.
 - Find a FEMA [Disaster Recovery Center](#) (DRC).
 - Learn about Small Business Administration (SBA) loans for homeowners, renters, and businesses.

- Small Business Administration (SBA), offers low interest loans for businesses if their insurance and funding from the FEMA doesn't fully cover the needed disaster assistance. Learn more about the disaster business loan application process [here](#).
- During some disasters, states may also request that FEMA assign and fund EPA to provide direct assistance with oil and hazardous materials cleanup. This is accomplished under the Oil and Hazardous Materials Response section, that is, Emergency Support Function 10 [ESF-10] of the National Response Framework.
 - UST facility owners do not request ESF-10 assistance directly from FEMA or EPA. Only a state can request assistance under this mechanism, and FEMA may require a state to contribute a percentage of the ESF-10 costs. More information can be found on the [National Response Framework](#) and ESF-10.

ABOVEGROUND STORAGE TANKS AT UST FACILITIES

Owners and operators may have concerns about flooding effects on an aboveground storage tank (AST) located at an UST facility. An AST is extremely vulnerable to damage and a potential threat to human health and the environment when exposed to a flood. Below are some of the ways ASTs are affected by flooding and selected practices on how to manage them if a flood is threatened or occurs.

Tank Flotation And Displacement

Floodwater pressure can dislodge anchor bolts and lift the tank off its foundation and disconnect the hoses and piping that are attached to the tank. An AST lifted off its foundation may float to a different location. A lifted tank can block the flow of water if it becomes lodged to another object, resulting in damming of the water. A floating AST may also cause damage by crashing into objects in its path.

Loss Of Product

Moving floodwaters may push the contents out of the AST and its openings into the environment. Product loss may also occur when the tank lifts and disconnects from attached hoses or piping, or when the AST floats along a water pathway.

System And Structural Damage

The following damages may occur as a result of flooding:

- AST shell buckling or collapsing from moving floodwater.
- Soil erosion and scour beneath the tank's concrete slab, undermining its ability to adequately support the tank.
- Prolonged contact with floodwater increasing the risk of corroding the AST bottom and shell joints.
- Damaged AST containment reducing its ability to contain spilled product.
- Contact with floodwaters affecting electrical and system component connections, for example release detection, cathodic protection, switches, meters, motors, alarm systems, lightning protection and grounding.

Reducing And Managing Risks

Owners and operators of ASTs must follow all applicable regulations when installing and designing aboveground storage tanks in flood-prone areas. Several design and installation codes and recommended practices are available, and some are listed below.

According to the National Institute for Storage Tank Management (NISTM), flood depths of a half a meter (1.5 ft.) will float most large diameter storage tanks when they are empty.

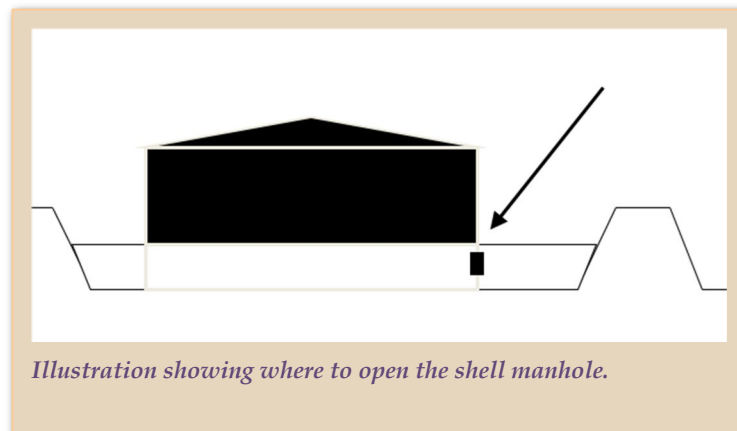
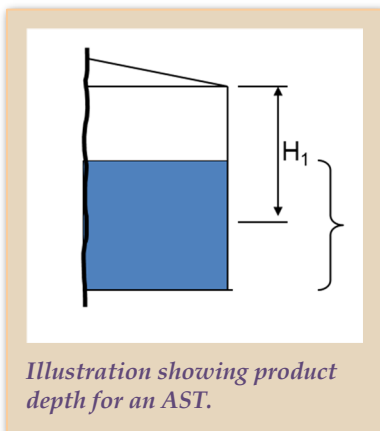
NISTM's presentation on hazard management of ASTs, including floods, can be found [here](#).

Selected AST Design And Installation Codes

- **NFPA 30** provides safeguards to reduce hazards associated with the storage, handling and use of flammable and combustible liquids.
- **API 650** includes the minimum requirements for ASTs with internal pressures not exceeding the weight of the roof plates. Applies only to tanks whose entire bottom is uniformly supported and tanks in non-refrigerated service that have a maximum design temperature of 93°C (200°F) or less.
- **API 653** covers the inspection, repair, alteration, and reconstruction of steel aboveground storage tanks.
- **PEI RP200** provides reference to preferred practices and procedures for the installation of ASTs at service stations, marinas and other fueling sites.
- Federal Emergency Management Agency's P-348, [Protecting Building Utility Systems From Flood Damage \(2017\)](#) illustrates design and construction of new utility systems and structures in flood-prone areas.
- FEMA's [Compilation of Flood Resistant Provisions](#) contain excerpts from 2018 international building codes.

The National Institute for Storage Tank Management (NISTM) suggests the following practices to reduce flood impacts.

- Make sure that the AST is anchored properly.
- Consult an AST engineering professional to determine a recommended product depth that increases shell stability to prevent buckling, and, stabilize the tank to prevent tank flotation.
- If tank is empty and clean, leave the shell manholes open.
- Drain diked areas.



EPA's [Flood \(Hurricane\) Preparedness, Recommended Best Practices fact sheet](#) provides information on preparing an AST before a flood, and how to return it back to service after a flood. The checklist below includes information from NFPA 30 and the best practices fact sheet section.

Preparing An AST Before A Flood

- Use a dependable water supply to fill empty or partially filled tanks.
 - If filling with water is impractical or hazardous because of the contents, use other means to protect tanks against movement or collapse.
- Close valves associated with piping and dispensing.
- Anchor tanks and all piping to prevent uplift or floatation.
- Use stiffener rings to prevent buckling from storm surge and wind loads.
- To the greatest extent possible, remove or secure all possible projectile hazards from the facility grounds.
- Ensure all storm drains and dewatering intakes are clear and free of debris.
- Shut off the power to the fuel system.
- Record the product level in each tank to account for loss or water entry.
- Conduct a detailed risk assessment of the facility and evaluate the impact of mitigation strategies; include these assessments in the Spill Prevention, Control and Countermeasure Plan, Facility Response Plan, Risk Management Plan or other pollution prevention plan, as applicable.
- Develop a detailed timeline for preparing tanks in advance of an event.

Consider taking these additional steps:

- Extend tank vent lines and other openings that are not liquid-tight above the flood stage water level.
- Move product out of the flood location; sell product from those stock tanks which are accessible by truck.
- Seal thief hatches with locks and sandbags.
- Place a check valve at exit points on vent lines so flow can only go inward.

Keep All Facility Plans Current

Certain facilities are required to develop Spill Prevention, Control, and Countermeasure (SPCC) Plans². SPCC plans describe equipment, workforce, training, and countermeasures to prevent, control, and respond to a discharge of oil.

Although each SPCC Plan is unique to the facility³, certain elements that must be described in every plan include:

- Operating procedures to prevent oil discharges and spills;
- Control measures, such as secondary containment, installed to prevent oil spills from entering navigable waters or adjoining shorelines; and,
- Countermeasures to contain, clean up, and mitigate oil spill impacted navigable waters or adjoining shorelines.

Review Facility Diagrams and Checklists

- Ensure that facility diagrams include all fixed ASTs and their contents and locations. This will help determine if an AST has floated after a flood event.
- Review facility inspection checklists and resolve deficiencies to decrease the likelihood of an oil discharge from the AST. The SPCC rule inspection requirements are designed to detect leaks, spills, or identify issues to prevent a discharge of oil. [EPA's Office of Emergency Management](#) provides information on those requirements.

Know What Is Stored

Keep a log of what is stored in each tank at the facility. Make sure that safety data sheets (SDS) and records are on file and kept in an easily accessible location. It is pertinent that response officials know what was stored in the AST in case of a release or threat of a release into the environment.

Occupational Safety and Health Administration's (OSHA) provides a [chemical database for occupational chemical information](#). It compiles information from several government agencies and organizations and includes information on:

- Chemical identification and physical properties
- Exposure limits
- Sampling information, and additional resources.

Under the authority of the Clean Water Act, the Oil Pollution Prevention regulations at 40 CFR part 112 specifies requirements for prevention of oil discharges from reaching navigable waters or adjoining shorelines.

EPA's oil spill prevention program includes the Spill Prevention, Control, and Countermeasure (SPCC) and the Facility Response Plan (FRP) rules.

The SPCC rule helps facilities prevent a discharge of oil into navigable waters or adjoining shorelines.

The FRP rule requires certain facilities to submit a response plan and prepare to respond to a worst-case oil discharge or threat of a discharge.

Learn more about the requirements for ASTs and oil pollution prevention [here](#).

USEFUL RESOURCES AND LINKS

- **If there is a threat of a flood**, the following websites developed by federal agencies provide specific locational real-time flood information.
 - [U.S. Geological Survey's Flood Information](#) website provides information on hourly flood conditions.
 - [NOAA's - Hydrologic Conditions and Forecasts](#) web page provides information on hydrologic conditions and forecasts.
 - [National Weather Service Interactive Flood Map](#) provides information on state-wide flooding and how residents can protect their lives and property.
 - [Department of Homeland Security's Ready.gov](#) provides information on flooding, how to get emergency alerts, and where to evacuate.
- Additional information to prepare for and respond to a flood, may be found on these websites developed by EPA, other federal agencies, states, and industry.
 - [EPA's Office of Emergency Management](#) web page provides information on EPA response to oil spills, chemical, biological, radiological releases, and large-scale national emergencies.
 - [EPA's Planning for Natural Disaster Debris](#) guidance is designed to help communities create disaster debris management plans before a disaster occurs and is intended to increase preparedness and resiliency.
 - [EPA's Area Contingency Planning](#) web page provides guidance on facility contingency plans to address incidents by helping identify and coordinate activities of the different government agencies and private organizations involved in a response.
 - [EPA's Tribal Emergency Preparedness and Response Coordination](#) document summarizes the national and regional response organizations that prepare for and respond to oil, chemical, radiological, and biological emergencies. It also covers tribal roles in an emergency response.
 - [EPA's UST Contacts](#) web page provides links to regional, state, tribal, and other UST program contacts and web pages.

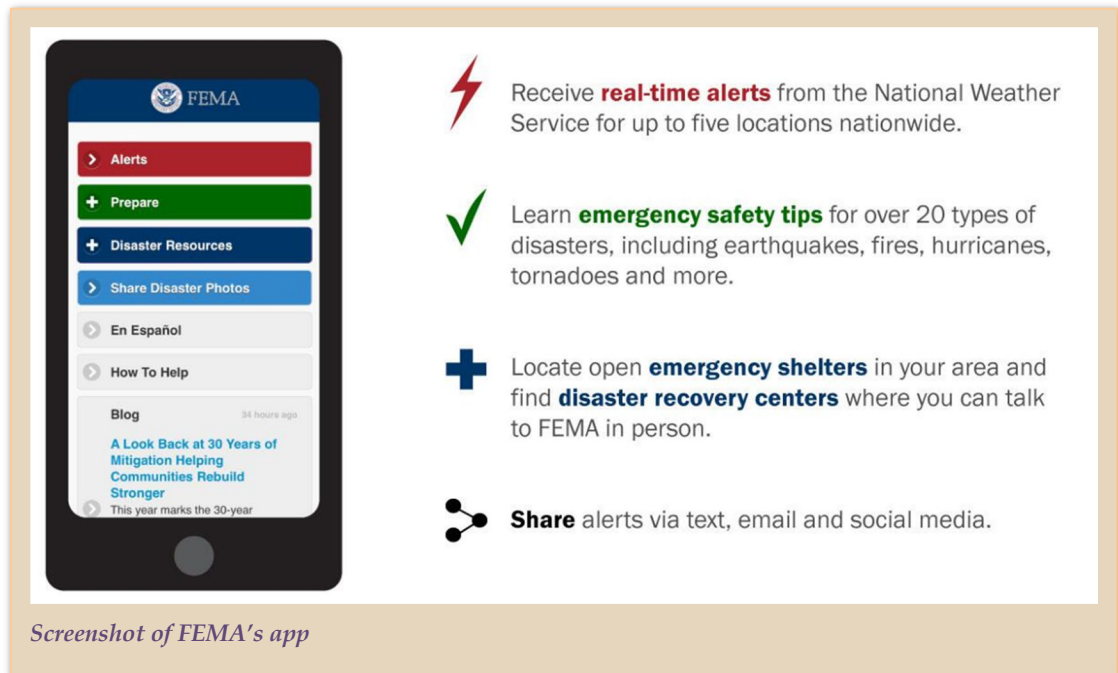
If there is a confirmed release, visible free product, or a substantial threat of a release, owners and operators must immediately contain the leak and notify appropriate local and state authorities. If the release may reach or has reached surface water or shoreline, contact the National Response Center (NRC) at 800-424-8802.

The NRC is not a response agency. It serves as an emergency call center that fields initial reports and forwards that information to appropriate federal or state agencies for response.

² A general overview of the SPCC rule can be found [here](#).

³ Detailed guidance on SPCC plan can be found at [here](#).

- [EPA's Natural Disasters and Underground Storage Tanks](#) web page provides resources to help UST owners and operators prepare for, prevent, or lessen effects and environmental harm from natural disasters.
- [EPA's Power Resilience Guide for Water and Wastewater Utilities](#) provides water and wastewater utilities with information on increasing their resilience to power outages and includes tips on fuel supply planning.
- [Centers for Disease Control and Prevention's Natural Disasters and Awareness](#) provides information on preparing for a flood, safety during a flood, and protecting health after returning from a flood.
- [Occupational Safety and Health Administration's Hurricane Preparedness and Response](#) web page provides information on hurricane warnings, hazards, and precautions that workers and employers should take after a hurricane has occurred. The response and recovery page features a link to [OSHA's Hurricane eMatrix](#), which features information on hazard exposures and risk assessments for hurricane response and recovery work.
- Download [FEMA's App](#).



- Chemical Safety and Hazard Investigation Board's (CSB) [video](#) and [safety alert](#) titled "2020 Hurricane Season: Guidance for Chemical Plants During Extreme Weather Events," highlights recent actions by the Center for Chemical Process Safety (CCPS) to produce guidance meant to help hazardous chemical facilities better prepare for extreme weather events.
- The CSB 's [Assessment of and Planning for Natural Hazards](#), provides information on assessing, addressing, and emergency planning.
- [National Association of Convenience Stores \(NACS\) Emergency Planning Resources](#) web page provides resources to help convenience retailers develop or enhance their disaster planning procedures.

-
- [American Petroleum Institute \(API\) Oil and Natural Gas Industry Preparedness Handbook](#) – highlights information exchange between levels of the government and industry, and how that flow can be managed to facilitate appropriate disaster response.
 - [International Code Council \(ICC\) Disaster Response Alliance](#) provides a national database of skilled volunteers willing to assist with response and recovery activities, including post-disaster safety assessments, building damage assessments, inspections and other code-related functions in the aftermath of a disaster.
 - PEI Recommended Practices
 - [RP100: Installation of Underground Liquid Storage Systems](#)
 - [RP200: Installation of Aboveground Storage Systems for Motor Vehicle Fueling](#)
 - [RP300: Installation and Testing of Vapor Recovery Systems at Vehicle Fueling Sites](#)
 - [RP 400: Testing Electrical Continuity of Fuel Dispensing Hanging Hardware](#)
 - [RP500: Inspection and Maintenance of Motor Fuel Dispensing Equipment](#)
 - [RP 800: Design and Installation of Bulk Storage Plants](#)
 - [RP900: Inspection and Maintenance of UST Systems](#)
 - [RP 1000: Marina Fueling Systems](#)
 - [RP1200: Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities](#)
 - [RP 1300 Aviation Fueling Systems](#)
 - [RP1400: Design and Installation of Fueling Systems for Emergency Generators, Stationary Diesel Engines and Oil Burner Systems](#)
 - [RP1700: Closure of Underground Storage Tank and Shop-Fabricated Aboveground Storage Tank Systems](#)

PHOTO GALLERY

Flooding is a common natural disaster that affects communities across the United States. When flooding occurs, an UST system is susceptible to damage that may lead to a release of its contents into the environment. The following photographs illustrate the devastating effects of flooding on UST systems.



Aerial view of flooding in Lumberton, NC. Hurricane Matthew - 2016, Credit: North Carolina Department of Environmental Quality (NCDEQ)



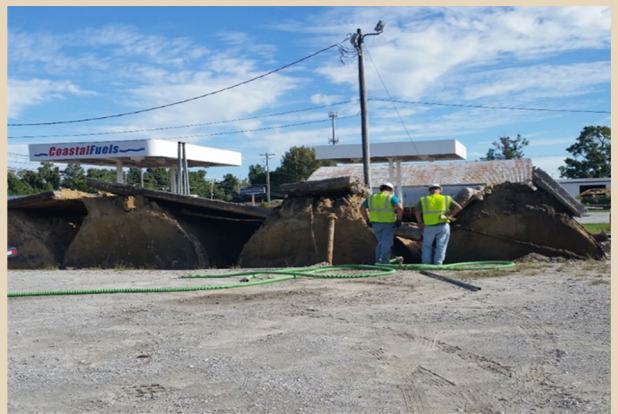
Flooded gas station. Hurricane Matthew, 2016 Credit: NCDEQ



Flash flooding at JC's Corner Store, Elk City, OK. May 23, 2015. Credit: Latia Murray



JC's after the flood. Credit: Google, 1193 OK-6, Elk City, Oklahoma, [View on Google Maps](#).

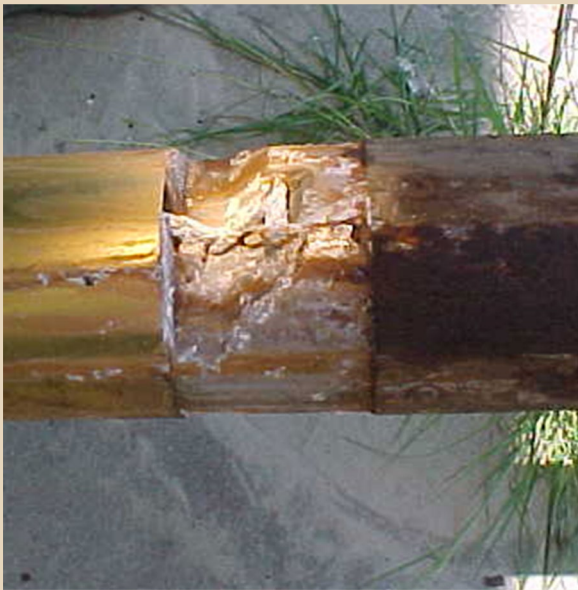


Examples of USTs affected by buoyancy. Hurricane Katrina, 2008. Credit: EPA

Examples of USTs affected by buoyancy. Hurricane Matthew, 2016. Credit: NCDEQ



Blackie's General Store - Soil erosion and scour from Ottaquehee River flooding. Tropical Storm Irene - August 2011. Credit: New England Interstate Water Pollution Control Commission



Saltwater corrosion of fiberglass piping. Credit: EPA



Digging to locate USTs after Hurricane Katrina. Credit: EPA



Aerial view of petroleum displaced by floodwaters. Hurricane Matthew - 2016. Credit: NCDEQ



Gas station "debris field" after a flood. Credit: EPA



Destroyed dispensers after Hurricane Maria, 2016. Credit: EPA



A properly functioning shear valve mechanism that closed completely after a tornado leveled a gas station and blew away the dispenser. Credit: EPA



Facility with displaced ASTs, product release, and fuel containment – Hurricane Matthew, 2018. Credit: NCDEQ



Flooded gas station with USTs and ASTs. Credit: EPA



420,000-gallon tank floated out of a containment berm. Credit: NISTM



United States Environmental Protection Agency
5401R
Washington, DC 20460
EPA 510-B-20-001
August 2020