

INDUSTRIAL STORMWATER

FACT SHEET SERIES

Sector I: Oil and Gas Extraction Facilities



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What is the NPDES stormwater permitting program for industrial activity?

Activities, such as material handling and storage, equipment maintenance and cleaning, industrial processing or other operations that occur at industrial facilities are often exposed to stormwater. The runoff from these areas may discharge pollutants directly into nearby waterbodies or indirectly via storm sewer systems, thereby degrading water quality.

In 1990, the U.S. Environmental Protection Agency (EPA) developed permitting regulations under the National Pollutant Discharge Elimination System (NPDES) to control stormwater discharges associated with eleven categories of industrial activity. As a result, NPDES permitting authorities, which may be either EPA or a state environmental agency, issue stormwater permits to control runoff from these industrial facilities.

What types of industrial facilities are required to obtain permit coverage?

This fact sheet specifically discusses stormwater discharges from oil and gas extraction facilities as defined by Standard Industrial Classification (SIC) Major Group 13. This includes oil and gas exploration, production, processing or treatment operations, or transmission facilities that discharge stormwater that has been contaminated by contact with raw material, intermediate products, finished products, by-products, or waste products. Facilities and products in this group fall under the following categories, which require coverage under an industrial stormwater permit with some exceptions:

- ◆ Crude petroleum and natural gas (SIC 1311)
- ◆ Natural gas liquids (SIC 1321)
- ◆ Drilling oil and gas wells (SIC 1381)
- ◆ Oil and gas field exploration services (SIC 1382)
- ◆ Oil and gas field services, not elsewhere classified (SIC 1389)

EPA defines contaminated stormwater discharges from these oil and gas field activities or operations generally to include discharges (1) resulting in the discharge of a reportable quantity for which notification is or was required or (2) that contributes to a violation of a water quality standard. Field activities or operations that can contribute to contamination of stormwater include, but are not limited to:

- ◆ Drilling and production equipment and other machinery
- ◆ Raw materials
- ◆ Waste products and by-products
- ◆ Oil and gas treatment units
- ◆ Finished products
- ◆ Storage areas
- ◆ Fuels and lubricants
- ◆ Waste treatment areas

This also includes stormwater discharges from access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste materials, or by-products created by the facility.

What does an industrial stormwater permit require?

Common requirements for coverage under an industrial stormwater permit include development of a written stormwater pollution prevention plan (SWPPP), implementation of control measures, and submittal of a request for permit coverage, usually referred to as the Notice of Intent or NOI. The SWPPP is a written assessment of potential sources of pollutants in stormwater runoff and measures that will be implemented at your facility to minimize the discharge of these pollutants in runoff from the site. These measures include site-specific best management practices (BMPs), maintenance plans, inspections, employee training, and reporting. The procedures detailed in the SWPPP must be implemented by the facility and updated as necessary, with a copy of the SWPPP kept on-site. The industrial stormwater permit also requires collection of visual, analytical, and/or compliance monitoring data to determine the effectiveness of implemented BMPs. For more information on EPA’s industrial stormwater permit and links to State stormwater permits, go to www.epa.gov/npdes/stormwater and click on “Industrial Activity.”

What pollutants are associated with activities at my facility?

Pollutants conveyed in stormwater discharges from facilities involved with the exploration and production techniques will vary depending on the type and characteristics of formations, pollutants present, and waste management controls. Therefore, impacts associated with stormwater discharges from oil and gas extraction facilities will vary from site to site. There are a number of factors that influence to what extent industrial activities and significant materials can affect water quality.

- ◆ Geographic location
- ◆ Hydrogeology
- ◆ Topography
- ◆ Type of ground cover (e.g., vegetation, caliche, crushed stone, or dirt)
- ◆ Outdoor activities (e.g., material storage, loading/unloading, vehicle maintenance)
- ◆ Size of the operation
- ◆ Type, duration, and intensity of precipitation events
- ◆ Historical activities (e.g., past oil and gas operations).

The activities, pollutant sources, and pollutants detailed in Table 1 are commonly found at oil and gas extraction facilities.

Table 1. Common Activities, Pollutant Sources, and Associated Pollutants at Oil and Gas Extraction Facilities

| Activity | Pollutant Source | Pollutant |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Construction of: Access roads Drill pads Mud/Reserve pits Personnel quarters Surface impoundments Storage tanks Pipelines | Soil/dirt, leaking equipment, and vehicles | Total suspended solids (TSS), Total dissolved solids (TDS), oil and grease |
| Well drilling | Drilling fluid*, lubricants, mud, cuttings, and produced water | TSS, TDS, oil and grease, chemical oxygen demand (COD), chlorides, barium, naphthalene, benzene, lead, arsenic, fluoride |
| Well completion/ stimulation | Fluids (used to control pressure in well), cement, residual oil, acids, surfactants, solvents, produced water, and sand | TSS, TDS, oil and grease, COD, acid, acetone, toluene, ethanol, xylenes |

Table 1. Common Activities, Pollutant Sources, and Associated Pollutants at Oil and Gas Extraction Facilities (continued)

| Activity | Pollutant Source | Pollutant |
|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Production | Produced water, oil, waste sludge, tank bottoms, acids, oily debris, and emulsions | Chlorides, TDS, oil and grease, TSS, pH, benzene, phenanthrene, barium, arsenic, lead, antimony |
| Vehicle and equipment cleaning and repairing | Cleaning solvents, lubricants, and chemical additives | TSS, TDS, oil and grease, pH |
| Site closures | Residual muds and oily debris | TSS, TDS, oil and grease, pH |
| Vehicle fueling | Diesel fuel | TSS, TDS, oil and grease |

** The potential contaminants to be found in drilling fluid varies from site to site, depending on the components of the fluid and any pollutants added due to use of the fluid. Stormwater discharges that come into contact with used drilling fluids may include the following pollutants, among others: toluene, ethyl benzene, xylene, phenol, benzene, and phenanthrene. Used drilling fluids may also contain inorganic pollutants from additives or downhole exposure, such as arsenic, chromium, lead, aluminum, sulfur, and sulfate salts.*

Note: Activities may have additional pollutant sources that contain PFAS and can come into contact with stormwater discharges. Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that include PFOA, PFOS, GenX, and many other chemicals.

What BMPs can be used to minimize contact between stormwater and potential pollutants at my facility?

A variety of BMP options may be applicable to eliminate or minimize the presence of pollutants in stormwater discharges from oil and gas extraction facilities. You will likely need to implement a combination or suite of BMPs to address stormwater runoff at your facility. Your first consideration should be for pollution prevention BMPs, which are designed to prevent or minimize pollutants from entering stormwater runoff and/or reduce the volume of stormwater requiring management. Prevention BMPs can include regular cleanup, collection and containment of debris in storage areas, and other housekeeping practices, spill control, and employee training. It may also be necessary to implement treatment BMPs, which are engineered structures intended to treat stormwater runoff and/or mitigate the effects of increased stormwater runoff peak rate, volume, and velocity. Treatment BMPs are generally more expensive to install and maintain and include oil-water separators, wet ponds, and proprietary filter devices.

The types of BMPs used may depend upon the methods of waste management utilized at a facility. Waste management and disposal practices at oil and gas extraction facilities may vary significantly. For example, techniques for disposal of produced water and associated wastes include the following:

- ◆ Landfarming/spreading (spreading wastes on land surfaces to stimulate biological degradation)
- ◆ Backfilling (storing wastes in a pit and then covering with dirt or other materials)
- ◆ Evaporation (in more arid parts of the country, liquid wastes are left exposed and eventually evaporate or percolate into the ground)
- ◆ Discharging wastes (sometimes treated) to waters of the United States (NPDES permits are required for such discharges)
- ◆ Injection (injecting wastes back into the ground for disposal)
- ◆ Offsite disposal (wastes are taken offsite to a commercial facility for disposal)

The pollutants of concern and the BMPs employed at an oil and gas extraction facility depend upon which, if any, of the disposal techniques listed above are utilized. Where wastes are land applied, for example, all pollutant constituents of that waste need to be considered a potential contributor to contaminated stormwater discharges. In addition, BMPs must be implemented in the areas at the facility where road application occurs.

BMPs must be selected and implemented to address the following:

Good Housekeeping Practices

Good housekeeping is a practical, cost-effective way to maintain a clean and orderly facility to prevent potential pollution sources from coming into contact with stormwater. It includes establishing

protocols to reduce the possibility of mishandling materials or equipment and training employees in good housekeeping techniques. Common areas where good housekeeping practices should be followed include trash containers and adjacent areas, material storage areas, vehicle and equipment maintenance areas, and material loading/unloading areas. Good housekeeping practices must include a schedule for regular pickup and disposal of garbage and waste materials and routine inspections of drums, tanks, and containers for leaks and structural conditions. Practices also include containing and covering garbage, waste materials, and debris. Involving employees in routine monitoring of housekeeping practices has proven to be an effective means of ensuring the continued implementation of these measures.

Specific good housekeeping practices that should be implemented include:

- ◆ Confining vehicles and equipment awaiting or having undergone maintenance to designated areas.
- ◆ Implementing measures to minimize contaminants from these maintenance areas (such as drip pans, indoor storage, etc.).
- ◆ Maintaining material and chemical storage areas in good condition.
- ◆ Labeling all hazardous materials clearly.
- ◆ Implementing measures that prevent or minimize contamination of stormwater runoff from chemical mixing areas.

Industrial facilities can conduct activities that use, store, manufacture, transfer, and/or dispose of PFAS containing materials. Successful good housekeeping practices to minimize PFAS exposure to stormwater could include inventorying the location, quantity, and method of storage; using properly designed storage and transfer techniques; providing secondary containment around chemical storage areas; and using proper techniques for cleaning or replacement of production systems or equipment.

Minimizing Exposure

Where feasible, minimizing exposure of potential pollutant sources to precipitation is an important control option. Minimizing exposure prevents pollutants, including debris, from coming into contact with precipitation and can reduce the need for BMPs to treat contaminated stormwater runoff. It can also prevent debris from being picked up by stormwater and carried into drains and surface waters. Examples of BMPs for exposure minimization include covering materials or activities with temporary structures (e.g., tarps) when wet weather is expected or moving materials or activities to existing or new permanent structures (e.g., buildings, silos, sheds). Even the simple practice of keeping a dumpster lid closed can be a very effective pollution prevention measure. Another example could include locating PFAS-containing materials and residues away from drainage pathways and surface waters.

Erosion and Sediment Control

BMPs must be selected and implemented to limit erosion on areas of your site that, due to topography, activities, soils, cover, materials, or other factors are likely to experience erosion. Erosion control BMPs such as seeding, mulching, and sodding prevent soil from becoming dislodged and should be considered first. Sediment control BMPs such as silt fences, sediment ponds, and stabilized entrances trap sediment after it has eroded. Sediment control BMPs should be used to back-up erosion control BMPs.

Unless covered under a stormwater permit for construction activity, specific sediment and erosion control practices that should be implemented include:

- ◆ Implementing vegetative practices designed to preserve existing vegetation where attainable
- ◆ Re-vegetating open areas as soon as practicable after grade-drilling
- ◆ Maintaining a vegetated buffer around well pads, roads, and other industrial areas

- ◆ Beginning the implementation of appropriate vegetative practices on all disturbed areas within 14 days following the last activity in that area
- ◆ Inspecting all sediment and erosion control measures once every seven days

Management of Runoff

Your SWPPP must contain a narrative evaluation of the appropriateness of stormwater management practices that divert, infiltrate, reuse, or otherwise manage stormwater runoff so as to reduce the discharge of pollutants. Appropriate measures are highly site-specific, but may include, among others, vegetative swales, collection and reuse of stormwater, inlet controls, snow management, infiltration devices, and wet retention measures. Incorporating treatment like granular activated carbon may be helpful to remove certain pollutants like PFAS.

A combination of preventive and treatment BMPs will yield the most effective stormwater management for minimizing the offsite discharge of pollutants via stormwater runoff. Though not specifically outlined in this fact sheet, BMPs must also address preventive maintenance records or logbooks, regular facility inspections, spill prevention and response, and employee training.

All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements, others are quite involved. You must regularly inspect all BMPs to ensure they are operating properly, including during runoff events. As soon as a problem is found, action to resolve it should be initiated immediately.

Implement BMPs, such as those listed below in Table 2 for the control of pollutants at oil and gas extraction facilities, to minimize and prevent the discharge of pollutants in stormwater. Identifying weaknesses in current facility practices will aid the permittee in determining appropriate BMPs that will achieve a reduction in pollutant loadings. BMPs listed in Table 2 are broadly applicable to oil and gas extraction facilities; however, this is not a complete list and you are recommended to consult with regulatory agencies or a stormwater engineer/consultant to identify appropriate BMPs for your facility.

Table 2. BMPS for Potential Pollutant Sources at Oil and Gas Extraction Facilities

| Pollutant Source | BMPs |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction | <ul style="list-style-type: none"> <input type="checkbox"/> Limit the amount of land disturbed during construction of access roads and facilities and preserve existing vegetation. <input type="checkbox"/> Implement erosion and sediment controls such as vegetated swales, diversion berms, or dikes to limit or isolate land disturbance and process areas to retain/detain flows and limit stormwater run-on in these areas. <input type="checkbox"/> Divert stormwater away from contaminated areas. <input type="checkbox"/> Inspect the area regularly to ensure BMPs are implemented and maintained. |
| Well drilling | <ul style="list-style-type: none"> <input type="checkbox"/> Use diking and other forms of containment and diversion around storage tanks, oil drums, acid, production chemicals and liquids, reserve pits, and impoundments. <input type="checkbox"/> Use diking and other forms of containment and diversion around material handling and processing areas. <input type="checkbox"/> Use porous pads under drum and tank storage areas. <input type="checkbox"/> Use covers and/or lining for waste reserve and sludge pits to avoid overflows and leaks. <input type="checkbox"/> Use drip pans, catch basins, or liners during handling of materials such as tank bottoms. <input type="checkbox"/> Re-use collected stormwater for industrial process or as an irrigation source. <input type="checkbox"/> Develop and implement spill plans for pipelines, tanks, drums, etc. <input type="checkbox"/> Recycle oily wastes, drilling fluids and other materials on-site, or dispose offsite. <input type="checkbox"/> Use oil - water separators. <input type="checkbox"/> Inspect the area regularly to ensure BMPs are implemented and maintained. |

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Table 2. BMPS for Potential Pollutant Sources at Oil and Gas Extraction Facilities (continued)

| Pollutant Source | BMPS |
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| Well completion | <ul style="list-style-type: none"> <input type="checkbox"/> Utilize diking and other forms of containment and diversion around storage tanks, oil drums, acid, production chemicals and liquids, reserve pits, and impoundments. <input type="checkbox"/> Use diking and other forms of containment and diversion around material handling and processing areas. <input type="checkbox"/> Use porous pads under drum and tank storage areas. <input type="checkbox"/> Use covers and/or lining for waste reserve and sludge pits to avoid overflows and leaks. <input type="checkbox"/> Use drip pans, catch basins, or liners during handling of materials such as tank bottoms. <input type="checkbox"/> Reinject or treat produced water instead of discharging it. <input type="checkbox"/> Re-use collected stormwater for industrial process or as an irrigation source. <input type="checkbox"/> Develop and implement spill plans for pipelines, tanks, drums, etc. <input type="checkbox"/> Recycle oily wastes, drilling fluids and other materials on-site, or dispose of offsite. <input type="checkbox"/> Use oil water separators. <input type="checkbox"/> Inspect the area regularly to ensure BMPS are implemented and maintained. |
| Vehicle and equipment cleaning and maintenance | <p>Good Housekeeping</p> <ul style="list-style-type: none"> <input type="checkbox"/> Eliminate floor drains that are connected to the storm or sanitary sewer; if necessary, install a sump that is pumped regularly. Collected wastes should be properly treated or disposed of by a licensed waste disposal company. <input type="checkbox"/> Prevent and contain spills and drips. <input type="checkbox"/> Do all cleaning at a centralized station so the solvents stay in one area. <input type="checkbox"/> If parts are dipped in liquid, remove them slowly to avoid spills. <input type="checkbox"/> Use drip pans, drain boards, and drying racks to direct drips back into a fluid holding tank for reuse. <input type="checkbox"/> Drain all parts of fluids prior to disposal. Oil filters can be crushed and recycled. <input type="checkbox"/> Promptly transfer used fluids to the proper container; do not leave full drip pans or other open containers around the shop. Empty and clean drip pans and containers. <input type="checkbox"/> Clean up leaks, drips, and other spills without using large amounts of water. Use absorbents for dry cleanup whenever possible. <input type="checkbox"/> Prohibit the practice of hosing down an area where the practice would result in the discharge of pollutants to a stormwater system. <input type="checkbox"/> Do not pour liquid waste into floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections. <input type="checkbox"/> Maintain an organized inventory of materials. <input type="checkbox"/> Eliminate or reduce the number and amount of hazardous materials and waste by substituting nonhazardous or less hazardous materials. <input type="checkbox"/> Label and track the recycling of waste material (e.g., used oil, spent solvents, batteries). <input type="checkbox"/> Store batteries and other significant materials inside. <input type="checkbox"/> Dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers in compliance with RCRA regulations. <p>Minimizing Exposure</p> <ul style="list-style-type: none"> <input type="checkbox"/> Perform all cleaning operations indoors or under covering when possible. Conduct the cleaning operations in an area with a concrete floor with no floor drainage other than to sanitary sewers or treatment facilities. <input type="checkbox"/> If operations are uncovered, perform them on a concrete pad that is impervious and contained. <input type="checkbox"/> Park vehicles and equipment indoors or under a roof whenever possible and maintain proper control of oil leaks/spills. <input type="checkbox"/> Check vehicles closely for leaks and use pans to collect fluid when leaks occur. |

Table 2. BMPs for Potential Pollutant Sources at Oil and Gas Extraction Facilities (continued)

| Pollutant Source | BMPs |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vehicle and equipment cleaning and maintenance (continued) | <p>Management of Runoff</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use berms, curbs, or grassed swales other diversion measures to ensure that stormwater runoff from other parts of the facility does not flow over the maintenance area. <input type="checkbox"/> Collect the stormwater runoff from the cleaning area and provide treatment or recycling. <input type="checkbox"/> Discharge vehicle wash or rinse water to the sanitary sewer (if allowed by sewer authority), wastewater treatment, a land application site, or recycle on-site. DO NOT discharge washwater to a storm drain or to surface water. <p>Inspections and Training</p> <ul style="list-style-type: none"> <input type="checkbox"/> Inspect the maintenance area regularly to ensure BMPs are implemented. <input type="checkbox"/> Train employees on waste control and disposal procedures. |
| Vehicle fueling | <p>Stationary fueling areas</p> <ul style="list-style-type: none"> <input type="checkbox"/> Conduct fueling operations (including the transfer of fuel from tank trucks) on an impervious or contained pad and under a roof or canopy where possible. Covering should extend beyond spill containment pad to prevent rain from entering. <input type="checkbox"/> When fueling in uncovered area, use concrete pad (asphalt is not chemically resistant to the fuels being handled). <input type="checkbox"/> Use drip pans where leaks or spills of fuel can occur and where making and breaking hose connections. <input type="checkbox"/> Use fueling hoses with check valves to prevent hose drainage after filling. <input type="checkbox"/> Keep spill cleanup materials readily available. <input type="checkbox"/> Clean up spills and leaks immediately. <input type="checkbox"/> Use dry cleanup methods for fuel area rather than hosing down the fuel area. Sweep up absorbents as soon as spilled substances have been absorbed. <input type="checkbox"/> Do not "top-off" fuel tanks. <input type="checkbox"/> Use spill and overflow protection devices. <input type="checkbox"/> Minimize/eliminate run-on into fueling areas with diversion dikes, berms, curbing, surface grading or other equivalent measures. <input type="checkbox"/> Collect stormwater runoff and provide treatment or recycling. <input type="checkbox"/> Provide curbing or posts around fuel pumps to prevent collisions from vehicles. <input type="checkbox"/> Regularly inspect and perform preventive maintenance on fuel storage tanks to detect potential leaks before they occur. <input type="checkbox"/> Inspect the fueling area for leaks and spills. <input type="checkbox"/> Train personnel on vehicle fueling BMPs. <p>Mobile fueling areas</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use drip pan under the transfer hose. <input type="checkbox"/> Use fueling hoses with check valves to prevent hose drainage after filling. <input type="checkbox"/> Ensure the fueling vehicle is equipped with a manual shutoff valve. <input type="checkbox"/> Do not allow topping off of the fuel in the receiving equipment. <input type="checkbox"/> Train personnel on vehicle fueling BMPs. |

What if activities and materials at my facility are not exposed to precipitation?

The industrial stormwater program requires permit coverage for a number of specified types of industrial activities. However, when a facility is able to prevent the exposure of ALL relevant activities and materials to precipitation, it may be eligible to claim no exposure and qualify for a waiver from permit coverage.

If you are regulated under the industrial permitting program, you must either obtain permit coverage or submit a no exposure certification form, if available. Check with your permitting authority for additional information as not every permitting authority program provides no exposure exemptions.

Where do I get more information?

For additional information on the industrial stormwater program see www.epa.gov/npdes/stormwater/msgp.

A list of names and telephone numbers for each EPA Region or state NPDES permitting authority can be found at www.epa.gov/npdes/stormwatercontacts.

References

Information contained in this Fact Sheet was compiled from EPA's past and current Multi-Sector General Permits and from the following sources:

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