materials, or by-products created by the facility.

This section does not cover storm water discharges from inactive oil and gas extraction facilities located on Federal lands, unless an operator of the activity can be identified. These discharges are more appropriately covered under a permit currently being developed by EPA.

When an industrial facility, described by the above coverage provisions of this section, has industrial activities being conducted onsite that meet the description(s) of industrial activities in another section(s), that industrial facility shall comply with any and all applicable monitoring and pollution prevention plan requirements of the other section(s) in addition to all applicable requirements in this section. The monitoring and pollution prevention plan terms and conditions of this multi-sector permit are additive for industrial activities being conducted at the same industrial facility (co-located industrial activities). The operator of the facility shall determine which other monitoring and pollution prevention plan section(s) of this permit (if any) are applicable to the facility.

Oil and gas exploration and production includes all activities related to the search for, and extraction of, liquid and gas petroleum from beneath the earth's surface. Found almost exclusively in sedimentary rocks, oil and natural gas accumulate in geologic confinements called traps which, by virtue of an impermeable overlying layer, have stopped the migration of the fluid. The volume of petroleum contained in a trap can vary from negligible to billions of barrels.

Though at one time such traps may have been close enough to the surface to allow easy detection (i.e., surface seepage), modern exploration relies on sophisticated geophysical testing techniques to locate potentially producible formations. Gravitational and seismic surveys of subsurface geology provide indirect indications of the likelihood of finding promising geological formations. This process is complicated by the fact that, at least in the U.S., the average depth at which one may reasonably expect to find oil is increasing since many of the largest shallow formations are assumed to have been found already.

Drilling operations require construction of access roads, drill pads, mud pits, and possibly work camps or temporary trailers. Drill pads are areas used to stage the drilling operation and generally range from 2 to 5 acres. The pad accommodates the drilling rig and associated operations including pumps, reserve pits, and mud tanks.

Modern well drilling involves the use of a rotary drill to bore through soil and rock to the desired well depth. The drill bit is constantly washed with a circulating drilling fluid, or "mud," which serves to cool and lubricate the bit and remove the cuttings to the surface. The drilling mud also serves to prevent "blowouts" from overpressured water and gas bearing formations. If the drill reaches the desired depth and fails to locate a producible deposit of oil or gas, the well must be plugged and the site abandoned. Even if oil and/or gas is found the well may not be producible. If the formation fails to exhibit the right combination of expected volume, porosity, and permeability, the costs of extraction would be prohibitive.

After a well has been drilled, it is "completed" if well logging data indicate that the well is capable of producing commercial quantities of oil or gas. Completion includes a number of operations that may be necessary to allow the well to produce oil or gas. These include installing and cementing casing, installing the production tubing and downhole equipment, repairing damage that drilling may have caused to the formation, and possibly stimulating the well. During a well's active life, periodic "workovers" are necessary. Workovers can include a number of procedures intended to maintain or enhance production. These can include repairing or replacing downhole equipment, removing accumulated scale or paraffin from tubing or casing, and stimulating the formation to restore or enhance production. Wells are stimulated, whether by treating with acid or fracturing, during completion or workover or both: it is common for wells to be stimulated at completion and then periodically throughout their lives

Acid stimulation involves introducing an acid solution to the formation. The acid dissolves the rock, thus creating or enlarging flow path openings. Acids are also used to repair damage to formations caused by drilling or other operations. In addition, they may be used for scale removal and other purposes. Fracturing by hydraulic pressure is achieved by pumping fluids at high pressure (i.e., at high rates) into the well, thereby causing material failure of the rock in the formation of interest (i.e., fractures). Fracturing is also done using explosive devices to fire projectiles into the formation of interest. The fractures induced in the formations serve as flow paths for hydrocarbons.

In instances where the reservoir is sufficiently large, "delineation" wells

are drilled to determine the boundary of the reservoir and additional "development" wells are drilled to increase the rate of production from the "field." Because few new wells in the U.S. have sufficient energy (pressure) to force oil all the way to the surface, surface or submersible pumps are placed at the wells and production begins.

This first phase of production, primary production, may continue for several to many years, requiring only routine maintenance to the wells as they channel oil to the surface for delivery to refineries. However, as the oil is removed from the formation, the formation pressure decreases until the wells will no longer produce. Because 70 percent of the total recoverable oil may remain in the formation, additional energy may be supplied by the controlled injection of water from the surface into the formation. The injected water acts to push the oil toward the well bores. Such secondary recovery or "water flooding" projects may employ hundreds of injection wells throughout a field to extend the life of the wells. Much of the water used for injection is pumped along with oil from the producing well, separated from the oil, and then reinjected.

Produced fluid, as pumped from a well, is sent through one or more process units to separate the waste fractions (e.g., produced water, emulsions, scale, and produced sand) from the salable hydrocarbon.

As oil and gas are recovered from wells, they are collected or gathered in pipelines for transport to produced fluid treatment facilities. These facilities separate marketable gas and crude oil from water and sand.

Often, service companies are hired by the oil company to perform many of the activities described above. Typically these contractors drill the wells and perform other specific tasks such as installing casing, conducting formation tests, and managing wastes, etc. When a well or field ceases to produce oil or gas at an economically feasible rate, the field must be abandoned and reclaimed.

2. Pollutants in Storm Water Discharges Associated with Oil and Gas Facilities

Exploration and production techniques will vary depending on the type and characteristics of formations, pollutants present, and waste management controls. Therefore, impacts associated with storm water discharges from oil and gas facilities will vary. Several other factors influence to what extent significant materials from these types of facilities and processing operations can affect water quality.