

Current Trends in U.S. Regulation of Produced Water

The Clean Water Act prohibits all discharges of pollutants unless they are authorized by National Pollutant Discharge Elimination System (NPDES) permits. The Act also requires that NPDES permits first limit pollutants based on economically achievable treatment technologies and then include additional limits as needed to protect water quality.

Technology Based Limitations

Technology based limitations which apply to the oil and gas extraction industry were established by EPA under the national Effluent Limitations Guidelines program. Those regulations can be found in the Code of Federal Regulations at 40 CFR Part 435. The Effluent Limitations Guidelines are developed after extensive study of available treatment technologies and the economics of operating in different locations. As a result, the technology based limits established under the guidelines are divided into subcategories that account for wellhead location and economic factors associated with operations. Currently those subcategories include: Offshore, Coastal, Onshore, Agricultural and Wildlife Use, and Stripper. The Offshore Subcategory covers wells located in the open ocean. Coastal Subcategory wells are those located in bays and estuaries. Wells which are located on land fall under one of three subcategories, onshore, stripper, or agriculture and wildlife. EPA Headquarters is examining the need for an additional subcategory to address coal bed methane production.

In most cases the Effluent Limitations Guidelines for the Onshore and Coastal Subcategories prohibit the discharge of produced water. That prohibition, established as best available technology economically achievable (BAT), is based on re-injection as the model means for disposal. Cook Inlet Coastal Subcategory wells are exempt from the discharge prohibition. When the Coastal Subcategory Effluent Limitations Guidelines were issued, EPA decided that re-injection was not economically feasible for Cook Inlet produced water. The producing wells in Cook Inlet are older wells which are declining in production. There was also thought to be inadequate injection capability to economically achieve zero discharge. EPA has since found that the fields are not declining as rapidly as previously thought and new exploration is planned for Cook Inlet. New information has also demonstrated that additional injection capacity is available. If the Effluent Limitations Guidelines are reopened to address coal bed methane production, EPA is also considering revisiting the Cook Inlet exemption for produced water.

The Stripper Subcategory covers wells which are located onshore and produce less than 10 barrels per day when operating at a maximum feasible production rate. No technology based limits were established under the Stripper Subcategory Effluent Limitations Guidelines. EPA Region 6 established technology based limits for Stripper Subcategory Wells located in Texas east of the 98th meridian. Oil and grease is limited in those produced water discharges to a monthly average of 25 mg/l and a maximum of 35 mg/l. Additional water quality based limits for those discharges are described later in this

paper. Discharges from Stripper Subcategory wells in Texas are authorized by the General Permit for Oil and Gas Extraction in Coastal Waters of Texas.

Agricultural and Wildlife Use Subcategory wells are those located onshore west of the 98th meridian. In order to be covered under that subcategory, the produced water must be of good enough quality to be used for watering wildlife or livestock or for irrigation and it must actually be put to one of those uses. The oil and grease limit established by the Effluent Guidelines for produced water in this subcategory is a maximum of 35 mg/l. EPA does not presently have any permits authorizing discharges from Agricultural or Wildlife Use Subcategory wells. Several states (WY, MT, and CO) have permitted discharges in the Agricultural and Wildlife Use Subcategory. If discharges in this subcategory are authorized in the future, permits will need to include limits ensuring that the water is of good enough quality to be used for water wildlife or livestock or for irrigation. The question of what is good enough quality will most likely be addressed through water quality based limits.

BAT oil and grease limits for Offshore Subcategory produced water were established under the Effluent Limitations Guidelines based on the dissolved gas floatation technology. Those produced water discharges are limited a monthly average of 29 mg/l and a daily maximum of 42 mg/l. The oil and grease limits have been difficult to achieve in some cases where dissolved oil is present in the produced water. In many cases operators have resolved that issue by adjusting the pH of produced water prior to treatment. The same oil and grease limits apply to produced water discharges in Cook Inlet.

Situations where wastes are transferred from one subcategory to an area subject to another subcategory have also been addressed by the Effluent Limitations Guidelines (see 40 CFR Part 435, Subpart G). The applicable technology based limits for produced water that is transferred between subcategories is the most stringent of either the location of the well head or the location of disposal. Produced water originating from an offshore well which is transported to shore for disposal is a common example under Subpart G. The discharge prohibition of the Onshore Subcategory Effluent Guidelines would apply in that case. Likewise, if Onshore or Coastal Subcategory produced water were transferred offshore, the discharge prohibition applying to the Coastal Subcategory location of the wellhead would apply.

Water Quality Based Limitations

When discharges are made to State waters, permits must contain limits necessary to ensure that State Water Quality Standards are met. State waters include all inland surface waters and extend three miles offshore to the outer boundary of the territorial seas. EPA Region 6 has issued two general permits for produced water discharges from facilities located in the territorial seas of Louisiana and Texas. The Texas permit includes whole effluent toxicity limits to comply with the Texas standards for acute and chronic toxicity. The Louisiana permit includes toxicity limits as well as several limits based on numeric State Water Quality Standards for lead, phenols, thallium, and benzene.

If new permits authorizing discharges from the Stripper or Agriculture and Wildlife Use Subcategories, they will also need to address State Water Quality Standards. Those standards will typically be applied based on in-stream dilution at the edge of a mixing zone or a zone of initial dilution.

Discharges to the oceans are required to contain conditions which ensure compliance with Federal Ocean Discharge Criteria (Clean Water Act section 403(c) and 40 CFR Part 125). Since there are no chemical specific numeric standards for Federal waters, EPA has traditionally relied on whole effluent toxicity limits to protect aquatic life and ensure compliance with Ocean Discharge Criteria.

Recent Permitting Actions

Texas Coastal General Permit

The Coastal Oil and Gas general permit for Texas was reissued on May 31, 2007. The only change from the previous permit is the addition of monitoring requirements for total dissolved solids in produced water discharges. Although that permit prohibits the discharge of produced water in most cases, the discharge of non-saline produced water from several formations is authorized from Stripper Subcategory wells. The previous permit authorized those same produced water discharges and limited total dissolved solids to 3,000 mg/l; however, it did not require monitoring to ensure compliance with that water quality based limit. Regulations dictate that NPDES permits require monitoring at a minimum frequency of once per year for any limited parameter. Monitoring for total dissolved solids is required by the new permit at a frequency of once per year. No comments were received during the public comment period on the permit.

Western Gulf of Mexico Outer Continental Shelf (OCS) General Permit

The OCS general permit authorizes discharges from over 12,000 leases located greater than three miles offshore of Texas and Louisiana. Based on BAT, produced water discharges are limited to an average and maximum oil and grease concentration of 29 mg/l and 42 mg/l, respectively. Whole effluent toxicity limits are also included in the permit based on Ocean Discharge Criteria. The limits were derived based on the calculated dilution at the edge of a 100 meter mixing zone. A study on the effects of produced water discharges to the hypoxic zone in the northern Gulf of Mexico was completed under the previous permit, issued in 2004. The study found that there probably is a potential impact; however, it is minor and within the margin of error of the data and the hypoxia models. The current OCS general permit was issued on May 31, 2007 and became effective October 1. Whole effluent toxicity testing requirements for produced water discharges were changed to include compliance with sub-lethal effects. A two year compliance schedule was included to accommodate changes that operators may need to make. No other changes to produced water limitations were made.

Eastern Gulf of Mexico OCS General Permit

The Eastern Gulf of Mexico general permit was reissued March 15, 2010. The permit is very similar to the Western Gulf of Mexico general permit except for application and reporting requirements, which are more extensive.

Other EPA Oil and Gas Permitting Actions

EPA Region 10 proposed a general permit for Cook Inlet in Alaska during April, 2006 and issued that final permit in May, 2007. The general permit contains State Water Quality Standards based limits for metals, hydrocarbons, and whole effluent toxicity. Produced water discharges from six discharging facilities and four facilities which may discharge on an intermittent basis are authorized by the Cook Inlet general permit. The permit does not authorize produced water discharges from new facilities. Although several new companies have expressed an interest to conduct exploration in Cook Inlet, they are not expected to need to discharge produced water during the term of the new permit. The State of Alaska develops different mixing zones for each pollutant and each discharge, so authorization of new produced water discharges in the coastal portion of Cook Inlet is difficult under an existing general permit. Both industry and the environmental community filed an appeal on the permit. Presently the permit is stayed. Industry wishes to be able to commingle produced water and other discharges prior to treatment.

EPA Region 10 expects to propose reissuance of their Arctic general permit this spring. The permit is complicated by the complex issues associated with the Arctic. Issues regarding impacts of spills in the Arctic will present challenges during that permit issuance process.