

USEPA's Produced Water Permitting Requirements

a report by

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The US National Pollutant Discharge Elimination System (NPDES) permitting programme was established by the US Clean Water Act. The Clean Water Act prohibits all discharges of pollutants to surface waters of the US unless they are authorised by NPDES permits.

NPDES permits are required to contain limits and monitoring requirements that ensure that appropriate treatment technology is applied to discharges and the water quality of the receiving water is protected. The regulations require that technology-based limits are consistent with the best available treatment technology economically achievable (BAT). After BAT-based limits are established, additional limits and conditions are often included in permits to afford additional protection for the receiving water.

Technology-Based Limitations

For the oil and gas extraction industry EPA has issued Effluent Limitations Guidelines that establish technology-based limits for produced water (see 40 CFR Part 435). These Guidelines are divided into sub-categories to account for wellhead location and economic factors associated with the operation. The Effluent Limitations Guidelines for the oil and gas extraction industry are divided into five sub-categories based on location. These sub-categories are: Offshore, Coastal, Onshore, Agricultural and Wildlife Use and Stripper. Wells located in the open ocean are covered under the Offshore sub-category. Coastal sub-category wells are those located in bays and estuaries. Three sub-categories, onshore, stripper and agriculture and wildlife, cover wells located on land.

Re-injection has been established as BAT Effluent Guidelines for the Onshore and Coastal sub-category produced water discharges in most cases. As a result, the discharge of produced water from Coastal and Onshore sub-category wells is prohibited except in Cook Inlet, Alaska. Due to a lack of disposal capability and the adverse conditions in Cook Inlet, Offshore sub-category produced water limits were determined to be appropriate for facilities in that location.

The Stripper sub-category covers wells that are located onshore and produce less than 10 barrels per day when operating at a maximum feasible production rate. The national Effluent Limitations Guidelines

did not establish technology-based limits for produced water from Stripper sub-category wells. Instead, EPA Region 6 established technology based limits for Stripper sub-category wells located in Texas east of the 98th meridian. Produced water from those wells is authorised to be discharged; however, the oil and grease concentration is limited to a monthly average of 25mg/l and a maximum of 35mg/l. Additional limits, required to protect water quality, are applied to those discharges and are discussed later in this paper.

In some cases produced water from wells located onshore, west of the 98th meridian, can be authorised to be discharged under the Agricultural and Wildlife Use sub-category. In order to be covered under that sub-category, the produced water must be of good enough quality to be used for wildlife or livestock watering or irrigation and must be used for at least one of those uses. The technology-based oil and grease limit established by the Effluent Limitations Guidelines for Agricultural and Wildlife Use sub-category produced water is a maximum oil and grease concentration of 35mg/l. EPA does not currently have any permits authorising discharges from Agricultural and Wildlife Use sub-category wells. However, a permit authorising a discharge would need to include limits to ensure that the produced water is of good enough quality to be used by wildlife or livestock watering or for irrigation. To meet that requirement permits will contain limits for total dissolved solids in discharges as well as applicable water quality criteria.

The Offshore sub-category Effluent Guidelines limit oil and grease in produced water discharges to an average of 29mg/l and a maximum of 42mg/l. Those limits are based on dissolved gas floatation technology. The oil and grease limits have been difficult to achieve in some cases where dissolved oil is present in the produced water. Operators have resolved that issue by adjusting the pH of produced water prior to treatment. The same oil and grease limits apply to Coastal sub-category produced water discharges in Cook Inlet.

The transfer of produced water between different sub-categories is also addressed by the Effluent Limitations Guidelines (see 40 CFR Part 435, Subpart G). The more stringent of the technology-based limits for either the location of the well head or the location where produced water is disposed of apply. An example is produced water originating from an offshore well which is transported to shore for disposal. In that case, the more stringent discharge prohibition of the Onshore sub-category Effluent Guidelines would apply. Likewise, if



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Onshore or Coastal sub-category produced water were transferred offshore, the discharge prohibition applying to the 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 waters and extend to the outer boundary of the territorial seas, three miles offshore. The EPA has issued two general permits for 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 also includes several limits based on state water quality standards for lead, phenols, thallium and benzene. Those standards were developed to protect aquatic life and human health.

If permits are issued that authorise discharges from the Stripper or Agriculture and Wildlife Use sub-categories, state water quality standards will need to be addressed. For Stripper sub-category wells, those standards will typically be applied based on in-stream dilution at the edge of a mixing zone or a zone of initial dilution. Since Agriculture and Wildlife Use sub-category produced water must be good enough to be used for irrigation or watering, the water quality standards will be applied at the end of the pipe, without taking into account in-stream dilution.

Discharges to the oceans are required to contain conditions that ensure compliance with Federal Ocean Discharge Criteria (Clean

should be finalised during the summer of 2007.

Western Gulf of Mexico Outer Continental Shelf General Permit

The Outer Continental Shelf (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 29mg/l and 42mg/l. 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 metre mixing zone. The OCS general permit expires 7 November 2007. A reissued permit was proposed on 21 December 2006 with a comment period which expired on 19 February 2007. Whole effluent toxicity testing requirements for produced water discharges are proposed to be changed to include compliance with sub-lethal effects. A two-year compliance schedule is included to accommodate changes that operators may need to make. No other changes to produced water limitations are proposed.

Other EPA Oil and Gas Permitting Actions

EPA Region 10 proposed a general permit for Cook Inlet in Alaska during April 2006 and is expected to be finalised by July 2007. That proposed general permit contains state water quality standards based limits for metals, hydrocarbons and whole effluent toxicity. The permit authorises produced water discharges from six discharging facilities and four facilities that may discharge on an intermittent basis. The permit does not authorise produced water

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Water Act section 403(c) and 40 CFR Part 125). EPA has traditionally relied on whole effluent toxicity limits to ensure compliance with Ocean Discharge Criteria.

Current Permitting Actions

Texas Coastal General Permit

The coastal oil and gas general permit for Texas expired on 15 December 2006. A reissued permit was proposed on 28 December 2006. The only change proposed for the permit is the addition of monitoring for total dissolved solids is required. The expired permit authorised discharges of non-saline produced water from several formations and limited total dissolved solids to 3,000mg/l in the discharges. It did not, however, require monitoring to ensure compliance with that water quality based limit. To be consistent with regulations requiring that NPDES permits require monitoring at a minimum frequency of once per year, monitoring for total dissolved solids is proposed to be required at a frequency of once per year. The comment period for the permit closed 27 February 2007. The permit

discharges from new facilities. Several new companies have expressed an interest in exploring in Cook Inlet in the near future; however, 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 discharge, so authorisation of new produced water discharges in the coastal portion of Cook Inlet is difficult under an existing general permit.

A new Louisiana Territorial Seas general permit has been drafted by the Louisiana Department of Environmental Quality to replace the current expired permit. That permit should be proposed during the spring of 2007 and is not expected to contain significant changes from the current permit.

There are no other on-going EPA permitting actions for oil and gas produced water discharges. EPA Headquarters is, however, exploring the need for a new Effluent Guideline sub-category to address discharges from coal bed methane extraction. ■