

and Louisiana to gather operating and cost information regarding produced water injection and to collect samples of produced water and miscellaneous wastes. Samples were analyzed for a variety of analytes in the categories of organic chemicals, metals, conventional and non-conventional pollutants, and radionuclides. Sampling at each site was conducted for one day over a span of eight hours. Technical and cost data were collected in addition to the production waste samples.

EPA was careful, in its selection of Gulf Coast sites, to visit facilities that (1) were located in both Texas and Louisiana, (2) were located in different wetland situations (wetlands, or inland bays), and (3) that ranged in operator size (major to small independent). Nine of the ten facilities visited utilized injection wells for produced water disposal and one utilized surface discharge.

A focus of this site visit program was to investigate the technologies used to treat produced waters prior to injection. Several of the facilities employed cartridge filtration subsequent to BPT treatment (gravity separation sometimes assisted by heat or chemicals).

Aqueous samples were collected from settling tank effluent at all ten facilities, as well as the influent (settling effluent) and effluent of all four filtration systems. Samples were analyzed for the following analytes:

- TSS
- Oil and Grease
- Volatile Organics
- Semi-volatile Organics
- Metals
- Conventional Parameters
- Non-conventional Parameters
- Radionuclides

Cartridge filters were also collected at all the facilities that utilized them, and were analyzed for radionuclides concentrations. Samples of produced sands were also collected where available and analyzed for the same pollutants as for produced water.

In addition to the sampling activities, technical and cost information was collected on the following topics:

- Separator and treatment system technologies and configuration.
- Equipment space requirements.
- Support structures.
- Miscellaneous waste volumes treatment and disposal methods.
- Produced water volumes and disposal methods.
- Energy requirements.
- Injection well remedial work requirements.
- Ancillary equipment requirements (besides the injection well) for injection.

- Injection well design and operation.
- Production data.

The results from this study, together with data from the EPA 1993 Coastal Oil and Gas Questionnaire and state permit data, discussed below, formed the basis for EPA's produced water treatment and disposal cost analyses discussed later in Section VI.B. The analytical data was used to characterize produced water effluent characteristics from BPT treatment systems.

E. State Discharge Monitoring Reports

EPA obtained detailed information on produced water discharges from state discharge permits for operators in Texas and Louisiana. The Louisiana Department of Environmental Quality (LADEQ) and the Texas Railroad Commission (TRC) supplied EPA with state permits for all known dischargers in the coastal areas. The state permit information identifies the operator, the name of the producing field, the location of the production facility, the volume of produced water discharged, the location and permit number of the outfall, and in Louisiana only, the compliance date by which the discharge must cease. From these data, EPA estimated that 216 production facilities in both the Texas and Louisiana coastal region will be discharging after July 1996 (the projected date of issuance of this regulation). The list of these facilities is presented in the record for the rulemaking. From this list EPA estimated costs of produced water treatment and disposal on a per facility basis.

F. Commercial Disposal Operations

In May 1992, EPA visited two non hazardous oil and gas waste land treatment facilities and two waste transfer stations in Louisiana. The purpose of these visits was to investigate the transportation, handling, disposal methods employed and associated costs of these operations. Detailed information was gathered concerning the operation of the landfarm treatment process used for the disposal of non-hazardous oil field wastes, transportation equipment, transfer equipment, equipment fuel requirements and costs incurred by the facilities and costs charged to the customers. The information was used in the development of compliance costs and the non-water quality environmental impacts for the various regulatory options under consideration.

In March 1992, EPA visited two commercial produced water injection facilities in Louisiana. The purpose of the visits was to collect information regarding costs of produced water

disposal and other operating costs as well as to collect samples of produced water, filter solids, used filters and tank bottoms solids for radioactivity analysis. Both facilities utilized sedimentation and filtration as treatment processes for produced water followed by underground injection. The technical information gathered at these sites was used in developing compliance costs and the non-water quality impacts for the various regulatory options under consideration. The results of the radioactivity analyses were used in an evaluation of radioactivity concentrations in oil and gas wastes.

G. Evaluation of NORM in Produced Waters

EPA reviewed all known data regarding the presence of naturally occurring radioactive materials (NORM) found in discharge of produced water and associated with scales and sludges on oil and gas production equipment.

EPA summarized produced water radioactivity data from 22 available studies focusing on data from coastal sites. Each of these 22 studies was summarized according to the location of the sites, sampling plans, and analytical methods used to measure the radionuclides. This information was used in characterizing NORM in produced water discharges in the Gulf Coast.

H. Alaska Operation

In August 1993, EPA embarked on a fact-finding mission regarding drilling and production operations and practices in both regions of Alaska, Cook Inlet and the North Slope. Information and data were obtained by direct visits to these areas, and by contacting the Alaska Oil and Gas Association (AOGA), state regulatory authorities, and individual operators. In addition, AOGA and individual operators submitted to EPA information on projects and technologies currently being developed and used in Cook Inlet and on the North Slope to dispose of drilling and production wastes, and the costs associated with these projects. Specific operating and cost information was obtained on zero discharge technologies including grinding and injection systems for drilling fluids and drill cuttings as well as produced water injection. EPA used the information obtained during this data gathering effort to estimate costs of treatment and control options for Alaska coastal facilities.

In March 1994, Cook Inlet Alaska oil and gas operators submitted to EPA information on drilling waste disposal alternatives and their costs and on