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Preliminary Data Summary for the Coastal, Onshore and Stripper Subcategories of the Oil Gas Extraction Point Source Category

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PRELIMINARY DATA SUMMARY
FOR THE
COASTAL, ONSHORE AND STRIPPER SUBCATEGORIES
OF THE
OIL AND GAS EXTRACTION
POINT SOURCE CATEGORY

Office of Water Regulations and Standards
Office of Water
United States Environmental Protection Agency
Washington, D.C.

September, 1989

PREFACE

This is one of a series of Preliminary Data Summaries prepared by the Office of Water Regulations and Standards of the U.S. Environmental Protection Agency. The Summaries contain engineering, economic and environmental data that pertain to whether the industrial facilities in various industries discharge pollutants in their wastewaters and whether the EPA should pursue regulations to control such discharges. The summaries were prepared in order to allow EPA to respond to the mandate of section 304(m) of the Clean Water Act, which requires the Agency to develop plans to regulate industrial categories that contribute to pollution of the Nation's surface waters.

The Summaries vary in terms of the amount and nature of the data presented. This variation reflects several factors, including the overall size of the category (number of dischargers), the amount of sampling and analytical work performed by EPA in developing the Summary, the amount of relevant secondary data that exists for the various categories, whether the industry had been the subject of previous studies (by EPA or other parties), and whether or not the Agency was already committed to a regulation for the industry. With respect to the last factor, the pattern is for categories that are already the subject of regulatory activity (e.g., Pesticides, Pulp and Paper) to have relatively short Summaries. This is because the Summaries are intended primarily to assist EPA management in designating industry categories for rulemaking. Summaries for categories already subject to rulemaking were developed for comparison purposes and contain only the minimal amount of data needed to provide some perspective on the relative magnitude of the pollution problems created across the categories.

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RULEMAKING HISTORY

COASTAL SUBCATEGORY

- BPT effluent limitations guidelines were promulgated on April 13, 1979. Allow for a discharge of oil and grease in the produced water of 72 mg/L (maximum for any one day) and 48 mg/L (avg. of values for 30 days).

- **1976 Geographical Area**: Established as all land and water areas landward of the inner boundary of the territorial seas and bounded inland by a series of longitude and lattitude points in Louisiana and Texas (the Chapman line).

- **1979 Geographical Area**: Revised to be any body of water or wetlands adjacent to such waters landward of the inner boundary of the territorial seas. This stands as the current geographical area of the coastal subcategory. Court decision *(API v. EPA, 1981)* invalidated the reclassification of approximately 1200 on land facilities as coastal. (See Related Regulatory Background section for more details).

- **1989 Notice**: Considering modification of the coastal subcategory geographical area to include only those facilities in saline water (> 0.5 parts per thousand) landward of the inner boundary of the territorial seas. (This would reclassify facilities located inland over saline and fresh water areas to the onshore or another separate subcategory).

ONSHORE SUBCATEGORY

- BPT effluent limitations guidelines were promulgated on April 13, 1979. Imposed a zero discharge requirement for waste water pollutants.

- **1976 Geographical Area**: Established as all land and water areas landward from the inner boundary of the territorial seas (including the Great Lakes). Excluded those facilities located in the coastal, beneficial use and stripper subcategories.

- **1979 Geographical Area**: Revised to include facilities located landward of the inner boundary of the territorial seas and not included in the coastal, agricultural and wildlife water use, or stripper subcategories.

- **1989**: If the coastal subcategory were modified, those facilities in freshwater (and inland saline water) would be reclassified as onshore or possibly placed in another separate subcategory. Additionally, any facilities currently located on land but classified as "coastal" as a result of the 1981 court decision would be reclassified to the onshore subcategory.

STRIPPER SUBCATEGORY

- No effluent limitations guidelines have ever been established for "onshore" stripper facilities and the subcategory remains as reserved.

- **1976 Geographical Area**: Established to include those facilities producing 10 barrels per day or less of crude oil located onshore. Onshore was defined as all land and water areas landward from the inner boundary of the territorial seas including the Great Lakes.

- **1979 Geographical Area**: Onshore was redefined as all land areas landward of the inner boundary of the territorial seas.

- **1989**: The proper subcategory classification needs to be addressed, i.e., classifying and regulating stripper oil wells in the stripper subcategory regardless of where they are geographically located; eliminating the stripper subcategory and classifying and regulating stripper oil wells in each individual subcategory (onshore, coastal and agricultural and wildlife water use) or retaining the present classification and reserved status for the onshore stripper subcategory and clarifying that coastal stripper facilities are not reserved but are covered by the coastal subcategory.

RELATED REGULATORY BACKGROUND

SUSPENSION OF REGULATIONS

- Due to the 1979 change in definition of coastal to be facilities in water landward of the inner boundary of the territorial seas, approximately 1200 facilities (which were located on land but considered to be coastal in 1976) were reclassified as onshore and were to achieve the zero discharge requirement.

- In response to the decision in *American Petroleum Institute v. EPA, (5th Cir., 1981)*, EPA suspended the applicability of the zero discharge requirement (onshore subcategory) for those 1200 wells and any other wells in the 1976 coastal geograpical area that came into existence after issuance of the 1979 regulations so as to treat all wells in this geographcial area the same.

- The Agency is again considering the modification of the definition of coastal which may cause the original 1200 facilities and additional facilities in fresh water to be reclassified to the onshore or another subcategory.

- The 1981 court decision also said that the Agency should re-examine the problems of marginal gas wells: 1) to develop an appropriate definition for marginal gas wells; and 2) to consider treating marginal gas wells similarly to stripper oil wells. In the July 21, 1982 Federal Register (47 FR 31555), the Agency set forth a list of issues to examine applicable to marginal gas wells, but no additional work was conducted.

PETITION TO THE ADMINISTRATOR FROM THE OIL AND GAS INDUSTRY

- The BPT effluent limitations guidelines in the onshore, coastal and agricultural and wildlife water use subcategories are applicable to marginal gas wells as no distinction has ever been made by the Agency between full size gas production facilities and marginal gas wells. (The stripper subcategory does not include marginal gas wells).

- The oil and gas industry has petitioned the Agency to re-examine the applicablility of the zero discharge requirement to onshore marginal gas wells and to consider treating such facilities in a manner similar to stripper oil wells, e.g., development of a separate subcategory or inclusion in the stripper subcategory.

- In the same petition, the Agency is requested to re-examine the applicability of the zero discharge requirement for full size oil and gas gacilities in the onshore subcategory due to treatment technologies and regional factors not considered in the development of onshore BPT regulations. State permit writers have also sent information on present practices and problems of implementing the BPT zero discharge regulations.

DESCRIPTION OF THE INDUSTRY

EXPLORATION AND DEVELOPMENT OPERATIONS

- Exploration and development activities for the extraction of oil and gas include work necessary to locate, drill and complete wells. The waste streams associated with drilling operations are drilling muds, fracturing fluids, and other well stimulation fluids. These waste streams are typically disposed into onsite earthen pits.

- Pits are constructed for the receipt of wastes. These wastes are generated regardless of whether the well becomes a full size producer, a stripper, or a dry hole. Pit dimensions vary from 10 ft by 30 ft for certain air drilling operations and up to several acres for a single mud drilling operation.

PRODUCTION OPERATIONS

- Production operations include all post-completion work necessary to bring hydrocarbon reserves from the producing formation to the point of transmission. For the onshore facilities produced water is reinjected, stored in earthen pits for evaporation or percolation, or is sent to centralized treatment facilities for treatment and discharge. In coastal areas, produced waters are discharged into rivers, streams, lakes and coastal wetlands following compliance with BPT oil and grease limitations.

- In addition, drilling muds and cuttings are stored in pits (and buried during site reclamation); and combinations of drilling wastes and produced waters are treated by mobile treatment operations and the effluents discharged both from onshore and coastal facilities.

COASTAL PROFILE

- The Agency's initial analysis of the coastal subcategory has involved the identification of oil and gas extraction fields in the coastal counties of states which border the Atlantic, Pacific and Gulf coasts and includes Alaska through the use of a data base purchased from Petroleum Information Inc.

- This preliminary profile indicated that there are 23,891 oil wells and 6,777 gas wells in coastal counties. This county-by-county analysis does not differentiate between onshore, fresh water, marine water, estuarine water, stripper oil wells or marginal gas wells as this information is not available in the Petroleum Information data base.

ONSHORE PROFILE

- The onshore subcategory was profiled through the use of Petroleum Independent, Sept., 1988. The total number of producing oil wells for 1987 was 620,181 of which 451,787 were stripper oil wells (National Stripper Well Survey). This left 168,394 as full-size producing oil wells for that year.

- The total number of gas wells was reported to be 253,856. However, there was no information as to how many of these gas wells were marginal gas wells.

STRIPPER PROFILE

- The National Stripper Well Association publishes an annual stripper oil well survey which represents on a state-by-state basis the number of stripper oil wells, production statistics, reserve statistics, and the previous ten years of the same information. There is no distinction of where the stripper oil wells exist in within the state in terms of subcategories, e.g., onshroe, coastal or agricultural and wildlife water use.

- The most recent survey indicates that there were 451,787 stripper oil wells in the United States during the year of 1987.

ISSUES RELATING TO THESE SUBCATEGORIES

ISSUE 1 - NRDC Intent to Sue

- NRDC has listed the coastal subcategory in its notice of citizen's suit under Section 304(m).

ISSUE 2 - API v. EPA (1981)

- The 5th Circuit decision said that EPA should re-examine the problems of marginal gas wells and consider adding them to the final guidelines for stripper oil wells.

ISSUE 3 - July 21, 1982 Federal Register Notice (47 FR 31555)

- The Agency set forth a list of issues regarding marginal gas wells which it was examining and solicited public comment on such issues.

ISSUE 4 - July 14, 1987 Petition from Industry

- Petition requests 1) EPA to revise effluent guidelines applicable to the onshore oil and gas industry located in Kentucky, New York, Ohio, Pennsylvania, Tennessee, Virginia and West Virginia; and 2) Reconsideration of the appropriateness of the zero discharge requirement to marginal gas wells.

RANKING OF PRIORITY POLLUTANT LOADINGS FOR REGULATED INDUSTRIES

VS. DRUM RECONDITIONING

DIRECT DISCHARGERS

TOTAL PRIORITY ORGANICS

	INDUSTRY	RAW LOADING (lbs/day)
	ORGANICS/PS&SF*	483,546
Coastal 41,417* →	IRON & STEEL	105,296
	LEACHATES(HWT)	35,408
	PULP & PAPER	32,794
	PETROLEUM REFINING	17,119
	METAL FINISHING	9,343
	PHARMACEUTICALS**	6,425
	TEXTILES	3,656
	FOUNDRIES	2,248
	AQUEOUS(HWT)	1,274
	COPPER FORMING	858
	NONFERROUS METALS	495
	ELECTRICAL	409
	COAL MINING	400
	DRUM RECONDITIONING	339
	LEATHER TANNING	303
	SCRUBBERS(HWT)	151
	COIL COATING	16
	ALUMINUM FORMING	9
	NONFERROUS FORMING	6
	PORCELAIN	-
	OREMINING	-
	BATTERIES	-
	INORGANIC CHEM.	-
	PESTICIDES	-

TOTAL PRIORITY INORGANICS

	INDUSTRY	RAW LOADING (lbs/day)
	IRON & STEEL	917,027
	METAL FINISHING	240,178
	ORE MINING	166,723
	COAL MINING	134,373
	AQUEOUS(HWT)	100,396
	ORGANICS /P&SF*	83,304
	FOUNDRIES	51,307
	COPPER FORMING	41,813
	INORGANIC CHEM.	21,958
	SCRUBBERS(HWT)	20,429
	PULP & PAPER	8,501
	PETROLEUM REF.	4,077
	LEATHER TANNING	3,595
	NONFERROUS FORMING	3,033
	ALUMINUM FORMING	2,943
	NONFERROUS FORMING	2,525
	TEXTILES	2,358
	LEACHATES(HWT)	2,279
	BATTERIES	2,265
Coastal 1,558* →	PORCELAIN	1,109
	COAL COATING	968
	ELECTRICAL	250
	PHARMACEUTICALS**	229
	PLASTICS	135
	PESTICIDES	-
	DRUM RECONDITIONING	61

Source : Industry Status Sheet Report (ISS).
* Loadings based on ITD information (3/87).
** Loadings based in ITD information (10/87).

* Indicates that loadings for the Coastal Subcategory were calculated after BPT treatment.

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loadings Using US EPA Onshore Data Base in Produced Water Waste Stream

Population and Production (1986)

Total Number of Facilities	30,668
Total Number of Oil Wells	23,891
Total Number of Gas Wells	6,777

Inorganics	lbs/yr
Barium	12,745,587
Fluoride	1,424,482
Chromium	96,816*
Nickel	19,221*
Cadmium	4,983*
Lead	71,900*
Arsenic	196,480*
Boron	8,557,568
Chloride	6,906,634,840
Sodium	3,082,206,830
Total Inorganics	10,011,958,000 lbs/yr
Total *Priority* Inorganics	389,400 lbs/yr

Organics	
Toluene	192,209*
Benzene	344,125*
2-Butanone	277,208
Phenol	54,601*
Phenanthrene	17,868*
Total Organics	886,011 lbs/yr
Total *Priority* Organics	608,803* lbs/yr
Total Inorganic and Organics	10,120,466,000 lbs/yr
Total *Priority* Inorganics and Organics	998,203* lbs/yr

Data Sources:
- Pollutant Concentrations - US EPA Onshore Data Base
- Population - ITD Initial Profile of Coastal Subcategory
- Water Production - Petroleum Information Data Base

Onshore, Coastal and Stripper Subcategories

Coastal Subcategory: Estimated Pollutant Loading Proportions
Based on the 30-Platform Offshore Study

Profile Information for Coastal Facilities

Population and Production in 1986

Total Number of Facilities	30,668
Total Number of Oil Wells	23,891
Total Number of Gas Wells	6,777

Total Annual Water Production 2,031,216,372 bbls/yr

Total Priority Organic Pollutants in Produced Water Waste Stream

	(lbs/yr)
Benzene	1,642,986
2,4-Dimethylphenol	47,993
Ethylbenzene	452,030
Naphthalene	91,832
Phenol	619,321
Toluene	1,215,154
Benzo-a-pyrene	834
Total	4,070,150

Total Priority Inorganic Pollutants in Produced Water Waste Stream

Zinc 123,862 lbs/yr

Total Priority Organic and Inorganic Pollutants in Produced Water Waste Stream 4,194,012 lbs/yr

Data Sources:
Pollutant Concentrations - 30-Platform Offshore Study
Population - ITD Initial Profile of Coastal Subcategory
Water Production - Petroleum Information Data Base

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loading Information for Coastal Facilities (continued)

Muds

Priority Organics and Metals	6,902 lbs/well
Other Organics	1,125 lbs/well
Number of wells drilled per year	1,347
Industrywide Priority Organics and Metals	9,296,994 lbs/yr
Industrywide Other Organics	1,515,375 lbs/yr

Cuttings

Priority Organics and Metals	333 lbs/well
Other Organics	1,313 lbs/well
Number of wells drilled per year	1,347
Industrywide Priority Organics and Metals	448,551 lbs/yr
Industrywide Other Organics	1,768,611 lbs/yr

Total Muds and Cuttings

Industrywide Priority Organics and Metals	9,745,545 lbs/yr
Industrywide Other Organics	3,283,986 lbs/yr

Data Sources:
Priority Organics, Metals and Other Organics - Offshore Data
Number of Wells Drilled in 1986 - ITD estimation based upon API report submitted for offshore

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loadings Using US EPA Onshore Data Base in Produced Water Waste Stream

Population and Production (1987)

Total Number of Facilities	422,250
Total Number of Oil Wells	168,394
Total Number of Gas Wells	253,856

Inorganics	lbs/yr
Barium	130,544,147
Fluoride	14,589,971
Chromium	991,622*
Nickel	196,866*
Cadmium	51,039*
Lead	736,425*
Arsenic	2,012,410*
Boron	87,649,195
Chloride	70,739,834,000
Sodium	31,568,890,000
Total Inorganics	102,545,490,000 lbs/yr
Total *Priority* Inorganics	398,362* lbs/yr

Organics	
Toluene	1,968,662*
Benzene	3,524,634*
2-Butanone	2,839,248
Phenol	559,246*
Phenanthrene	183,013*
Total Organics	9,074,803 lbs/yr
Total *Priority* Organics	6,235,555* lbs/yr
Total Inorganics and Organics	102,554,560,000 lbs/yr
Total *Priority* Inorganics and Organics	6,633,917* lbs/yr

Data Sources:
Population and Production - Petroleum Independent, Sept. 1988 and National Stripper Well Survey, 1988
Pollutant Concentrations - US EPA onshore data base

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loadings Using 30-Platform Offshore Study in Produced Water Waste Stream

Population and Production (1987)

Total Number of Facilities	422,250
Total Number of Oil Wells	168,394
Total Number of Gas Wells	253,856

Total Annual Water Production: 20,804,329,000 bbls/yr

Total Priority Organic Pollutants

	(lbs/yr)
Benzene	1,682,412
2,4-Dimethylphenol	481,228
Ethylbenzene	4,630,000
Naphthalene	940,582
Phenol	6,343,465
Toluene	12,446,316
Benzo-a-pyrene	8,530
Total	26,532,533

Total Priority Inorganic Pollutants

Zinc	1,268,693 lbs/yr

Total Priority Organic and Inorganic Pollutants	27,801,226 lbs/yr

Onshore, Coastal and Stripper Subcategories

1987 Estimated Pollutant Loadings Using 30-Platform Offshore Study (continued)

Muds

Priority Organics and Metals	6,902 lbs/well
Other Organics	1,125 lbs/well
Number of wells drilled per year	33,031
Industrywide Priority Organics and Metals	227,979,962 lbs/yr
Industrywide Other Organics	37,159,875 lbs/yr

Cuttings

Priority Organics and Metals	333 lbs/well
Other Organics	1,313 lbs/well
Number of wells drilled per year	33,031
Industrywide Priority Organics and Metals	10,999,323 lbs/well
Industrywide Other Organics	43,369,703 lbs/well

Total Muds and Cuttings

Industrywide Priority Organics and Metals	238,979,285 lbs/yr
Industrywide Other Organics	80,529,578 lbs/yr

Data Sources:
Priority Organics, Metals and Other Organics - Offshore Data
Number of Wells Drilled - *Petroleum Independent, Sept. 1988*

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loadings Using US EPA Onshore Data Base in Produced Water Waste Stream

Population and Production (1987)

Total Number of Facilities	451,787
Total Annual Water Production:	4,021,530,849 bbls/yr

Inorganics	lbs/yr
Barium	25,234,522
Fluoride	2,820,279
Chromium	191,683*
Nickel	38,055*
Cadmium	9,866*
Lead	142,353*
Arsenic	389,004*
Boron	16,942,816
Chloride	13,674,193,000
Sodium	6,102,348,337
Total Inorganics	19,822,309,000 lbs/yr
Total *Priority* Inorganics	770,961* lbs/yr

Organics	
Toluene	380,547*
Benzene	681,320*
2-Butanone	548,834
Phenol	108,104*
Phenanthrene	35,377*
Total Organics	1,754,182 lbs/yr
Total *Priority* Organics	1,205,348* lbs/yr
Total Inorganics and Organics	19,824,064,000 lbs/yr
Total *Priority* Inorganics and Organics	1,976,309 lbs/yr

Data Sources:
Population and Production - *National Stripper Well Survey, 1988*
Pollutant Concentrations - US EPA Onshore Data Base

Onshore, Coastal and Stripper Subcategories

Estimated Pollutant Loadings Using 30-Platform Offshore Study in Produced Water Waste Stream

Population and Production (1987)

Total Number of Facilities 451,787

Total Annual Water Production: 4,021,530,849 bbls/yr

Total Priority Organic Pollutants in Produced Water Waste Stream

	(lbs/yr)
Benzene	1,471,983
2,4-Dimethylphenol	102,337
Ethylbenzene	107,945
Naphthalene	165,422
Phenol	1,366,841
Toluene	1,007,458
Benzo-a-pyrene	0
Total	4,221,986

Total Priority Inorganic Pollutants in Produced Water Waste Stream

Zinc 197,666 lbs/yr

Total Priority Organic and Inorganic Pollutants in Produced Water Waste Stream

4,419,652 lbs/yr

Data Sources:

Population and Production - *National Stripper Well Survey, 1988*
Pollutant Concentrations - 30-Platform Offshore Study

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