STREAMLINING THE PERMIT PROCESS FOR OCEAN DISCHARGES

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Abstract--Nation is accelerating its schedule for leasing offshore land for oil/gas operations. Over the next few years, about one billion acres of seabed will open up for sale. To discharge wastes during oil/gas operations, drillers must acquire permits from the U.S. Environmental Protection Agency, which will issue them with conditions appropriate to protecting the environment of the lease sites. Permit writing is an arduous and time consuming task. To react in a timely fashion, Agency is devising an automated way to quickly obtain the needed data for permits, and for cutting down on the time taken for preparing them. Final product will allow a permit writer to input the latitudes and longitudes of ocean discharges and their characteristics. He will receive as an output the suggested conditions for drilling permits.

Introduction

Operators often bid large amounts of money to lease tracts on the outer continental shelf as sites for drilling for oil/gas. The size of the bids reflects not only the perceived potential of the area for mineral recovery but also the cost of operations including governmental restrictions. If these last are not known at the time of bidding, then operators often take a conservative view and bid lower than they otherwise would. The government suffers a loss in revenue.

The loss is likewise the operator's if he has not properly judged the restrictions. In addition, the operator sees the cost of his lease plus that of his rig and supporting equipment becoming increasingly large investments with remote returns unless he can begin his drilling soon after the government accepts his bid.

The task for permit-writing, governmental agencies becomes difficult in view of their limited resources, regulations requiring thorough analyses within a short period, and in the face of about one billion of acres of seabed opening up for oil/gas leasing over the next few years. The problem for the agencies involves obtaining and analyzing a vast amount of oceanographic data, toxicity data, and operational data; then using this information to support reasonable conditions under which the operators may discharge. One way that the EPA is studying involves automating a large part of the process.

Background

Anybody disposing of wastes into the waters of the United States must have a permit to do so. The U.S. Environmental Protection Agency (EPA) issues it. Two types of permits govern: those for (1) point-source discharges, which might come from industrial discharges at sea, or from outfalls into navigable waters from operations such as industrial and municipal; and (2) dumping wastes into marine waters.

Point-source discharges at sea include re-leasing drilling fluids, cuttings and production water from oil/gas drilling rigs and platforms; sediments from deep-sea activities such as manganese-nodule recovery; and thermal plumes from installations such as powerplants of the type of OTEC (ocean thermal energy conversion).

This paper concentrates on point-source discharges, especially from oil/gas operations. However, permit writers can use the same approach and techniques for any point-source discharge. Different types of discharges would require changes only in the criteria for defining the environmental effects.

To write permits for point-source discharges into the marine environment, the EPA must consider many factors: these include the provisions of a number of laws and regulations; nature of the discharges; value, ecology and oceanography of the areas into which the discharge go, their fates and effects; and for oil/gas drilling, the schedule under which the Department of the Interior (DOI) and the oil/gas operators are working.

Laws and Regulations

Although the Clean Water Act (CWA) ¹ stipulates the conditions under which the EPA may issue permits for point-source discharges, other legislation affecting other agencies must also be considered. The most pertinent for our purposes are those laws protecting rare and endangered species of marine life, and possibly areas of concern such as marine sanctuaries. Any discharges that the EPA permits must provide such protection.

For point-source discharges, the EPA issues National Pollutant Discharge Elimination System (NPDES) permits. If the discharges go into marine waters, the pollutants must not degrade them unreasonably. To this end, the CWA stipulates factors the agency shall consider. These seven factors necessarily become the underpinning for an automated permit system based on the NPDES. When other factors are involved, then as we noted earlier the environmental criteria are simply changed.

Congress drew most of the factors quite broadly. They become open to interpretation, which Congress recognized when it recommended that EPA write appropriate guidelines ² for determining the degradation of the waters. These guidelines, as well as the automated system, stem from the factors for conservation that the CWA in Section 403(c) says EPA shall consider:

- the effect on human health and welfare of discharging pollutants, including their effect on marine organisms;
- the effect on marine life of the dispersal of pollutants, or their byproducts, through various physical chemical or biological processes;

- the effect of the disposal of pollutants on esthetic, recreational and economic values;
- how persistent will be the various effects;
- what results from changing the manner of disposal of pollutants, either the rate, volume or concentration;
- alternatives to ocean discharges; and,
- how disposals might affect other constructive uses of the ocean including mining and scientific studies.

These factors, plus the guidelines and applicable legislation, have to be quantified before an automated system can use them.

Leasing Schedule

The oil/gas leasing schedule tells the permit writer how much time he has to gather information, analyze it, fill in the gaps either for data or scientific understanding, and recommend valid and defensible permit conditions. Barring legal restraint, the full schedule takes about a year and a half. In this time, the Department of the Interior identifies the lease area containing the sale tracts, writes a draft environmental impact statement (EIS), holds a public hearing, publishes the final EIS, receives the affected governor's comments, posts the notice of sale, holds the sale, and announces the winning bids.

For a new lease sale area, potential bidders want to learn as quickly as possible the NPDES permit conditions EPA might impose. One timetable the agency is studying calls for its releasing the conditions for its draft general NPDES permit at the same time that the DOI releases its draft EIS. Then public hearings on the draft EIS and on draft NPDES conditions could occur together. The two agencies could similarly issue at the same time the final EIS and the final general NPDES permit conditions.

This timetable would give EPA about nine months to analyze a sale area and arrive at draft NPDES conditions; and another six to make them final.

Drilling Discharges

In drilling a well, the operator discharges the debris or cuttings he takes out and also portions of the drilling mud he compounded to ease the drilling action. When the well is completed and producing, he discharges formation water, which occupied some of the same strata as the oil or gas. The problem with these discharges is they may contain heavy metals or other toxic ingredients in concentrations sufficient to cause unreasonable degradation of the marine environment.

The discharges form a plume of complex nature, which several models seek to describe. Knowing the nature and contents of the plume, a permit writer can determine the concentration of ingredients anywhere along its path. If certain concentrations are expected to unreasonably affect important marine organisms, then he can prescribe appropriate conditions for the NPDES permit.

Automating the Permit Process

Government and private files are filled with technical information that NPDES permit writers might need. To determine the NPDES conditions for drilling in a particular sale area, the first step seemingly is to gather all the biological and oceanographic data. This becomes not only a formidable but also a near useless task. For efficiency, the task becomes one of centering only on those data that provide a direct path to somebody's making decisions on permit conditions.

The permit writer wants to input the latitude and longitude of a lease tract, or the boundaries of a sale area, and receive from his computer suggested NPDES permit conditions. He also wants to see the assumptions, analyses, and data that give legitimacy to these conditions. He wants to know whether the lease sale area, or a lease tract, supports rare or endangered species or commercial fish stocks, or anything else of high human value.

To prepare for talks with applicants for permits, he wants to know what changes in permit conditions will not adversely affect the marine environment but might make drilling less costly. If permit conditions are not prescribed, then he wants to know what data he must have to get the conditions.

To get answers, the permit writer needs a model based on the CWA and the guidelines derived from it. We designed the present model as a decision-making one, distinct from an archive for abundant marine data. The model prescribes criteria, which are mostly quantified, flexible and easily changed. For economy reasons, it puts its greater efforts on analyzing marine areas of greater human value, and lesser efforts elsewhere. While including several sub-models, for example, a discharge-plume model, the automated model can easily replace these by improved ones as they come along.

The Section 403(c) Process

Large areas of the seabed are fairly homogeneous in structure and in the communities of organisms living there. Even unique habitats, such as submarine canyons, diverse as they may seem upon individual study, may in a given geographic area have degrees of sameness. This fact could lead to EPA's writing a "general" NPDES permit containing highly protective conditions for the canyons with respect to any nearby discharge of pollutants.

The general permit allows operators drilling in the same geographic vicinity to discharge pollutants of similar nature into areas of similar kind. Permit conditions in the general permit will usually run stricter for areas of higher value than for the usual seabed. Where conditions surrounding a discharge are unique, such as the nearness of the discharge to particularly valuable marine organisms, or the discharge of unusual pollutants, EPA could issue a "site-specific" NPDES permit.

The general permit clearly saves time and can adequately protect the marine environment. To confirm such protection, the agency makes the

Section 403(c) determination as required in the CWA, and follows the guidelines the agency wrote to implement the determination.

The flow diagram (Fig. 1) shows the questions a permit writer asks in making the Section 403(c) determination, which leads directly to NPDES permit conditions. The diagram was devised to include precisely the requirements written in the CWA and the guidelines.

be no unreasonable degradation of the environment.

At this point, if the permit writer is still uncertain whether the discharge will cause unreasonable degradation, he can determine that the discharge will not cause "irreparable harm." Then he must impose a monitoring program during drilling operations that will resolve the uncertainty about causing unreasonable degradation.

Figure 1. Procedure for making analysis for point-source discharge permits

In following the diagram, the permit writer, or the automated process, concentrates its efforts on the permits required for discharges into areas of high human value. For lesser causes, it expends lesser energies. It would not go through the entire procedure in Fig. 1 if clearly the proposed discharges could cause no significant harm to the marine environment. An extreme example would be the discharge of a benign drilling mud into a marine environment of relatively low value. The automated process would dispense with this case by suggesting a permit with minimum conditions. Typically, these among other conditions would not allow the discharge of oil-based drilling muds, or the use of highly toxic additives such as halogenated phenol compounds.

The automated process would recommend conditions for general as opposed to site-specific NPDES permits, wherever possible.

A permit writer following along the pathways of Fig. 1 would first consider whether a proposed discharge would threaten the health of a discharge area. If he believes that it might, then he has to decide whether it will cause "unreasonable degradation." If it will not, then he can write his permit; otherwise, he will have to impose mitigating measures. These must be sufficient for him to be able to assert that there will

On the other hand, if unreasonable degradation or irreparable harm is anticipated, then EPA will not allow an operator to discharge pollutants.

The Sieve Approach

The process for making a Section 403(c) determination can take a long time, depending on the amount and quality of data the permit writer has. Too often there is much data, very little of it pertinent. He needs ecological and oceanographic information about the area where the discharges will occur, estimates of the value of the area, knowledge about the characteristics of the proposed discharge and its plume, and criteria about which to judge effects.

The automated system described here seeks to provide immediate access to relevant data; to the extent possible, quantified criteria. The data and criteria, plus information about the nature of the discharge, are inputs to the model. Outputs include NPDES permit conditions recommended for the discharger.

The model uses a logical decision tree, which looks more like a series of horizontal sieves (Fig. 2). This approach, suggested in an EPA draft report³, subjects a discharge to progressively finer criteria, depending on the

toxicity of the discharge and the value of its target area.

In the illustration, each ball represents a given discharge. Each sieve represents a set of criteria. A ball's falling through a particular sieve signifies a discharge's failure to pass the criteria. When a ball remains on a sieve, this signals that a permit can be written.

Figure 2. Increasingly fine sieves match point-source discharges against environmental criteria

Criteria. The top sieve examines a discharge for threats to important water uses; the next one, for causing unreasonable degradation; the next one prescribes mitigating measures; and the last sieve holds the criteria for irreparable harm.

Here are some of the criteria we used in the various sieves:

For the upper or first sieve--

- Are the dispersion characteristics of the discharge or the oceanographic characteristics of the area such that the discharge will reach an area of important water use in concentrations exceeding the water quality criteria⁴ for priority pollutants?

- Does the discharge have a 96-hour LC50 more toxic than 100,000 ppm (later changed to 10,000 ppm) on appropriate marine life? (96-hour LC50 is the concentration of the discharge that will kill 50% of exposed organisms within 96 hours.) By "appropriate marine life" we mean the dominant or commercially important species, or a species of particular concern. Preferably, the species would be an indigenous one, but it could also be a representative species exhibiting the same sensitivity.

If the answer to either question is "yes," then the discharge could threaten an important water use. Had the answers been "no" and several other conditions satisfied, then the analysis could stop here and permits written.

For the second sieve, the discharge must satisfy water column and benthic criteria. One water-column criterion for oil/gas drilling approves any discharges whose concentration at points outside of a specified mixing zone is less than 0.01 of the 96-hour LC50 for the most sensitive appropriate species.

For the third sieve, we prescribe mitigating measures to lessen the effects of a discharge expected to cause unreasonable degradation of the environment. For oil/gas operations, such measures include changing some ingredients in the drilling fluid, changing the rate of discharge, prediluting, time-phasing bulk discharges of the drilling fluids, or shunting the drilling fluids to an appropriate depth.

The last sieve is the most difficult to handle because of the problem in defining "irreparable harm" in quantitative terms. Agreement is far easier to get on measures of "unreasonable degradation." Although we have included a quantitative definition of irreparable harm elsewhere³, what appears practical is using precedents as a means for gauging the possibilities of irreparable harm's occurring. The model could include a list of such precedents for easy referral and comparison.

Models. To describe the concentration of pollutants in a discharge plume of drilling muds, we are turning to complex mathematical models such as those^{5,6} devised by Donald Baumgartner et al at EPA's Corvallis Research Laboratory, and by the intensive efforts of Robert Ayers, Jr., through the Offshore Operators Committee and Exxon Production Research Company. We are planning to compare the results we get from each model in terms of outputted NPDES conditions for given discharges into given marine areas.

We have already included in the sieve model some of the work and formulas suggested at the Adaptive Environmental Assessment Workshop⁷ held at EPA's Gulf Breeze Laboratory, Florida. These workshops are a continuing effort from which we expect to draw important new sub-models.

Data Segment. In order for the formulas and criteria in the model to work, we have to know the character of the areas of discharge. The temperature, current patterns, depth of water and presence of pycnoclines help define the discharge plumes. These oceanographic factors, except perhaps depth of water, often vary with the seasons. Therefore, temporal data would be best.

Habitat information helps define an area's value. Just about every important water use that is highlighted in the CWA and guidelines reflects this fact. Especially named in the references are:

- Breeding, spawning and feeding grounds for marine fish and shellfish.

- Uses identified with high productivity of marine biomass.

- Commercial and sport fishing uses.

- Habitat of threatened, rare, or endangered marine life.

-Distinctive habitats of limited distribution, e.g., coral reefs, seagrass meadows, and kelp beds.

-Marine aquatic life migration routes, which item may not necessarily define a habitat.

Agencies such as the National Oceanic and Atmospheric Administration, and the Minerals Management Service have accumulated, evaluated, digitized and mapped some of this information. The National Marine Fisheries Service is continuing to collect and supply living resource data, especially about fish catches.

Habitat information not only helps tell us the value of marine areas but also their geographic boundaries, thereby defining "areas of biological concern." These data provide inputs vital to an automated permit system. EPA is working with the named agencies in order to acquire such data on a continuing basis.

Conclusions

We have made a number of runs on a DEC-20 computer involving two standard drilling muds and three geographic areas. These were simulation runs to test the concepts. The system was interactive, giving the operator his choice of which mud to use in which geographic area. One mud was almost benign; the other, relatively toxic. One of the geographic areas was similar to the highly productive fishing area in Georges Bank; the second, similar to the area that includes the Gulf's Flower Garden Banks of coral; and the third, typical of the Gulf of Mexico less its topographic highs and Flower Gardens. The operator, at his choosing, could access the following files and analyses:

-History of the area.

-Analysis for determining threats to water uses (sieve 1).

-Analysis for determining "unreasonable degradation" (sieve 2).

-Analysis for determining mitigating measures (sieve 3).

-Analysis for determining "irreparable harm" (sieve 4).

-Recommended permit conditions.

The analyses, including their print-outs, took about 20 minutes.

EPA is presently studying the costs and benefits of a complete operational system, including the type of hardware involved and the cost of keeping the system current. The design envisioned would be a highly economical one, deriving its data from existing banks. Such a system, once on-line, appears to offer a fast, dependable and coordinated way to make NPDES determinations, and suggest corresponding permit conditions.

References

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- 2) "Ocean Discharge Criteria," Environmental Protection Agency, 40 CFR Part 125.
- 3) "Handbook for Applying Section 403(c) Criteria of the Clean Water Act," (in draft), 1982, Ocean Programs Branch, Environmental Protection Agency, Washington, D.C.
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- 5) Ozretich, R.J.; and Baumgartner, D.J.: "The Utility of Buoyant Plume Models in Predicting the Initial Dilution of Drilling Fluids" (in preparation), Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon.
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