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BENEFICIAL USE OF DRILLING WASTE - A WETLAND RESTORATION TECHNOLOGY

Annual Report
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National Petroleum Technology Office
U.S. DEPARTMENT OF ENERGY
Tulsa, Oklahoma

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YEARLY TECHNICAL REPORT
Reporting Period January 25, 1997 thru January 26, 1998

In 1996, the U.S. Department of Energy (DOE) awarded an unsolicited grant to Greenhill Petroleum Corporation (GPC) to demonstrate that treated drill cuttings derived from oil and gas operations could be used as source material for rebuilding eroding wetlands in Louisiana. Greenhill planned to supply a restoration site, drill a source well, and provide part of the funding. Scientists from Southeastern Louisiana University's (SLU) Wetland Biology Department were to contracted by GPC to conduct the proposed field research and to perform mesocosm studies on the SLU campus. Plans were to use and abandoned open water drill slip as a restoration site. Dredged material was to be used to create berms to form an isolated cell that would then be filled with a blend of dredged material and drill cuttings. Three elevations would be used to test the substrates ability to support various alternative types of marsh vegetation, i.e., submergent, emergent, and upland. The drill cuttings would not be raw cuttings, but would be treated by either a dewatering process (performed by Cameron, Inc.) or by a stabilization process to encapsulate undesirable constituents (performed by SWACO, Division of Smith International).

Under the Clean Water Act (CWA), GPC applied to the Corps of Engineers (COE) for a Section 404 permit to conduct the required dredge and fill activities. As part of the 404 review process, various agencies were provided an opportunity to comment on the application. The Louisiana Department of Environmental Quality, Water Quality Division cited CWA Section 402 national effluent guidelines and commented that the activity of discharging drill cuttings to waters of the United States is not permitted without an exception from the U.S. Environmental Protection Agency (EPA) Region 6 office.

In their comments to the COE, the U.S. EPA's Region 6, Marine and Wetlands Section stated, "Although the discharge may be permitted as the discharge of 'fill material' for the purpose of creating marsh, the EPA is concerned that there is not sufficient information to make a reasonable judgement as to whether or not the proposed discharge will comply with EPA's 404(b)(1) Guidelines." GPC was not deterred by these remarks but encouraged to proceed with mesocosm studies at SLU that would demonstrate that treated drill cuttings mixed with dredged materials could support plant growth without leaching harmful contaminants into interstitial waters.

The Fish and Wildlife Service (FWS) also submitted comments on the application. In its comments to the COE, the FWS objected to the placement of drill cuttings into open slip unless the permit required metals analyses of site sediments before fill emplacement and of drill cuttings before and after blending with sediments. In response to these concerns, Greenhill informed the COE and thus the FWS, that if granted a permit, it would in deed meet these requirements.

After the public notice expired and all comments were received, the COE wrote to the NPDES Permits Branch, EPA Region 6 office and asked EPA to "determine if you concur with our assessment of the application being subject to Section 402 jurisdiction (NPDES program)". EPA concurred with the COE's position that Greenhill's proposed project "is subject to Section 402 jurisdiction". EPA further noted that "cuttings from wells adjacent to the site of the proposed project would be covered by NPDES General Permit LAG330000 which prohibits the discharge of drill cuttings to Waters of the U.S." The COE wrote GPC and advised them of their verdict.

In dispute of their ruling, GPC retained the law services of Liskow & Lewis to research Sections 402 and Sections 404 of the Act and to render a legal opinion on the matter. Section 402 is intended to regulate point source, overboard disposal of pollutants to waters of the United States. National effluent guidelines strictly prohibit the discharge of drilling muds and cuttings. Section 404, on the other hand provides very clearly for the reuse of recycled materials such as those proposed in the project for construction (dredge and fill) activities. During Year 1 of the grant, GPC with its legal representative and researchers from SLU met on numerous occasions with federal and state governing authorities to debate this issue and to garner support for the project.

Little progress was made in the first year to resolve the legal issues. EPA's NPDES Permits Branch believes that the proposed activity must be covered under an NPDES permit. If permitting must be done through the NPDES program, there may be a problem because the current EPA effluent guidelines prohibit discharge of drill cuttings to coastal waters; the marsh areas where the site is located is considered coastal waters. At one point the district supervisor for the COE New Orleans District Office said he would consider the proposed project as a 404 project as long as EPA would make a statement that, at least for this one project, the process could be considered as a pilot study under the 404 program.

The Louisiana Department of Environmental Quality (LADEQ) received NPDES program delegation on August 27, 1996. Greenhill hoped that LADEQ would be more receptive to the 404 permit idea than EPA had been. LADEQ indicated that it supported the wetlands restoration project but that it would follow EPA's position. In a may 29, 1997 letter from the U.S. EPA to the LADEQ, the agency reiterated its position that NPDES Permit LAG330000 prohibited the discharge of drill cuttings and that the proposed GPCl project constituted a discharge of drill cuttings. On June 19, 1997, the LADEQ notified GPC that the proposed discharge of drill cuttings could not be authorized by her office.

During 1997 a number of critical events occurred which impacted continued progress on the project. First of all Greenhill was acquired by another oil and gas operator and became Pioneer Natural Resources (GPC) Inc. Oil and gas prices began to weaken and by year's end drilling prospects upon which source materials were so critically dependent had all but dried up. In 1997, DOE asked Argonne National Laboratory to become involved to see if there were any opportunities to get past the

regulatory barriers that had stalled the project. John Veil of Argonne made contact with EPA's Office of Reinvention to see if any relief could be found. Through his efforts, critical contacts have been made that could lead to a resolution of the legal debate and set the stage for the field project.

Due to the regulatory constraints previously cited, research has been limited to the mesocosm studies conducted by SLU. While findings of that work will be submitted in future technical reports the following a list of frequently asked questions and answers we've learned to date.

1. What does the university's research show about the ability of treated drill cuttings and sediment to sustain growth of marsh vegetation?

   Dredged material and cuttings treated by the dewatering process support comparable growth. Cuttings treated by the first stabilization process doesn't support good growth, largely due to high pH. Note that SWACO has the ability to provide various other levels of cuttings treatment, including dewatering. Depending on how clean the cuttings need to be to meet regulatory standards, SWACO can include additional treatment steps, including pH adjustment, to meet these criteria.

2. What other work is planned under the existing university contract and when will it be finished?

   The salinity in the current mesocosm study is being increased. Bioaccumulation of contaminants will be measured in plants and animals in the mesocosms. The work should be finished by the end of summer 1999.

3. What other types of field or laboratory studies are recommended?

   The current tests have used a variety of wetland plant species and, for several species, multiple genotypes. It would be useful to assess a wide variety of restored drill cuttings from different wells in different geological settings and processed in different ways. These different restored cuttings will be assessed in terms of functional plant response, potential leaching of contaminants into the floodwater, and possible bioaccumulation in plant and animal tissues.

4. Can the SWACO treatment process in treated cuttings that are clean enough to meet U.S. Fish and Wildlife and EPA criteria?

   As noted previously, SWACO can utilize additional treatment steps to make the treated cuttings clean enough to meet criteria.

5. What are the initial costs for treating the cuttings and restoring the wetlands?

   SWACO estimates that it will cost $7/bbl to treat the cuttings to meet acceptable criteria. There is no current information on the cost of emplacing the solids, planting vegetation, and monitoring.

6. What are the long-term costs associated with monitoring and repairing remediated sites?

   Unknown and variable. This will vary on how frequently monitoring is required, what parameters must be monitored each time, and how long monitoring must continue before the site is released from monitoring.

7. What are the current costs experienced by operators for disposing of cuttings?

   For offshore operators, actual disposal costs for muds and cuttings that must be hauled back to shore are typically in the range of $25-30/bbl. Disposal costs for coastal and marsh operators are probably slightly lower, but no information is available.

8. Will the proposed restoration process be less costly than conventional land disposal?

   There is a reasonable chance that it will be significantly less costly. However, the cost for the restoration process is not known. The nature of the regulatory requirements (permitting costs, monitoring costs, etc.) placed on the pilot project as well as any future application of the process will determine how costly the restoration process is. It is important to note that current wetlands rules require restoration of marsh sites, thereby imposing some restoration costs on the operator.

9. How many acres of wetlands can be restored from one typical well?

   The volume of cuttings generated will depend upon the depth and size of the hole. Other factors relative to the location such as water depth and the density of the substrate will also determine the acreage.

10. Does the proposed process have widespread applicability, and if so, how many acres per year of wetlands might be restored?

    There are probably hundreds of wells along the Gulf coast that could take advantage of this process, if it is approved. There are probably hundreds of sites that could benefit from restoration using this process. Assuming there are between 10 and 100 wells per year that will use weltands restoration cuttings disposal, approximately 15-150 acres per year could be restored. This can be compared to Louisiana's federally funded efforts to restore, create, and protect wetlands using tens of millions of dollars per year. On average, roughly $10,000 is required to restore or create one acre of

wetlands in Louisiana. Since the inception of CWPRA in 1990 until May 1997, $226,759,067 has been spent on wetland restoration/creation in Louisiana.