

DISPOSAL OF OIL SPILL DEBRIS

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ABSTRACT

A landfill was designed and constructed for the disposal of approximately 8,500 yards of debris collected in the cleanup of a major pollution incident in Narragansett Bay, Rhode Island. The debris primarily consisted of sand and gravel, but also included logs, large rocks, and tires picked up during the beach cleanup. The landfill was constructed as a single cell with a sandy-silt base and cover with monitoring wells to sample the groundwater. The debris was layered in alternate layers of one foot of debris and six inches of clean fill within the cell. The results of the analysis of samples of the groundwater, to date, indicate no increase in the total organic carbon or phenolic content.

Background

On April 9, 1973, the Liberian tanker *Pennant* grounded in Narragansett Bay while enroute to the Port of Providence, Rhode Island. This casualty resulted in severe damage to the vessel and a major oil spill estimated at 6,000 barrels. Sea and weather conditions prevented the containment or removal of the oil from the water, and by the next morning, the oil had commenced washing ashore over much of upper Narragansett Bay.

Approximately 22 miles of beach was cleaned by raking the oil into windrows and then picking it up with either shovels or front-end loaders. The use of heavy equipment was limited by the generally short beaches broken up by private docks and breakwaters. The beaches were primarily composed of coarse sand and gravel with some large rocks.

The material collected from the beach cleanup was temporarily stored on the parking lot of a city bathing beach until a final disposal site could be located. By the time the cleanup was completed, there was approximately 8,500 yards of debris, mostly sand and gravel, but also telephone pole size logs, 40 automobile and truck tires, 50 oil drums, and some rocks weighing upwards of 1,000 pounds.

As soon as the nature of the disposal problem was realized, personnel from the Environmental Protection Agency and Rhode Island Department of Health commenced working on a final disposal plan. Due to state laws prohibiting or restricting the importation of solid wastes from another state, it was decided that disposal must take place in the State of Rhode Island.

Initial consideration was given to incineration to remove the oil and thus permit conventional disposal. The only incinerator large enough to take the material was located in the city of Pawtucket. Due to the high percentage of sand in the debris and the design of the incinerator, problems would arise in the incinerator grates and sifting conveyors beneath the grates. In addition, the sand-oil mixture would drop to the bottom of the refuse mixture as it was discharged onto the drying grates. The temperature in this section would not be great enough for incineration. A rotary kiln incinerator would probably have been able to handle the material, but there are none in New England.

It was therefore decided to use a landfill for disposal. High-water tables throughout the region and potential leaching problems

associated with improperly operated landfills made it necessary to design and construct a landfill specifically for this material.

As a result of the grounding of the Norwegian tanker *Tomano* in Portland, Maine, during July of 1972, the Regional Response Team had been working on possible landfill methods for oil spill debris. A system using Kraft paper processing sludge had been proposed for spills in Maine, where this material is readily available (figure 1). It was now necessary to find a suitable site in Rhode Island and modify the Maine proposal for local conditions.

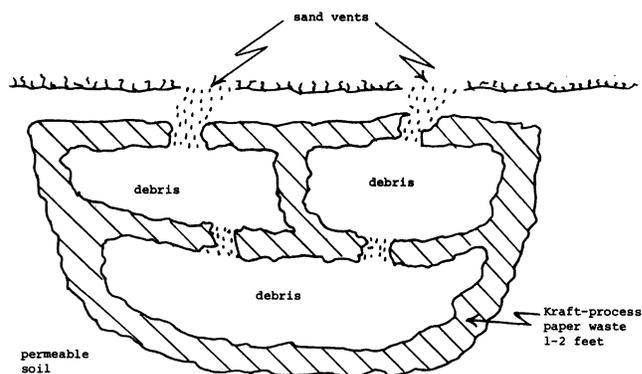


Figure 1. Disposal of oil-spill debris in permeable soil using Kraft-process paper sludge developed by the Greater Portland Council of Governments

Site selection

The most severe difficulty encountered in disposal problems is often overcoming the nontechnical barriers which impede the acquisition of an acceptable site. Citizen opposition prevented the use of an existing commercial facility, even after all the technical problems had been solved.

In selecting a site for oil-spill debris, the area should be located where wells and other water supplies would not be affected by the possible release of contaminants. The soils should be adequate to prevent rapid percolation of the leachates into the groundwater. Soil particle size is significant, in that it not only determines the volume of material potentially reaching the groundwater, but it also is some measure of the soil's attenuating capacity.

Specific criteria applied to the site selection in this case included: the area must be free of other refuse; other refuse may not be placed in the area without the prior permission of the Rhode Island Department of Health; the area must be free from surface flooding; and the base of the disposal area must be at least four feet above the groundwater table.

The primary consideration in providing a separate disposal area for the oil-spill debris was the concern that differential settling, common to most landfill surfaces, would ultimately result in the rupturing of the impervious bottom liner and/or the surface cover of the debris disposal area.

Areas subject to surface flooding were avoided for two reasons. The first, and most obvious, is to keep the disposal area as dry as possible, therefore minimizing leachate production. The second is to avoid the high potential for surface water contamination associated with such areas.

The four-foot minimum distance between the base of the disposal area and the groundwater table is to insure the physical separation of the oily debris and the groundwater.

The site finally selected was located on state land, scheduled for future industrial park development. As part of the industrial park plan, core samples and a large scale map were available of the area. The core samples indicated that the surface materials were primarily sand with a minimum thickness of 6 to 15 feet. Prior to construction of the disposal site, five groundwater monitoring wells were established. These wells not only confirmed the depth of the groundwater, but also would be used later in the monitoring program by the Environmental Protection Agency.

Disposal area construction

The selected disposal area of approximately 37,000 square feet was excavated to an average depth of three feet and graded to a common drainage point. Excavation, rather than above-ground disposal, was required so that the finished project would be compatible with the future industrial park development. The excavation was then lined with two feet of sandy silt obtained from the gravel washings of a local sand and gravel company.

The oil-spill debris was then placed in the area in alternate layers of one foot of debris and six inches of clean fill (obtained from the excavation) (figure 2). The purpose of the intermediate layers of

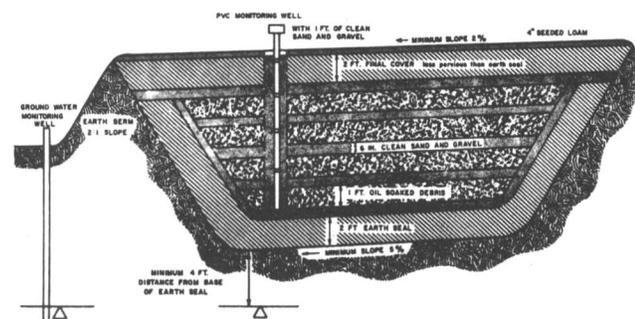


Figure 2. Cross section of a typical cell for oil soaked debris as per EPA guidelines

clean fill was twofold. First, it provided a surface upon which the equipment could operate; and second, it provided an adsorptive media to capture and potentially hold any free oil. Material-handling problems prevented strict adherence to the one-foot layers, and during construction, it was found that the debris layers actually provided a better working surface than the clean fill.

Prior to placing the final two-foot sandy-silt surface cover layer, a perforated PVC monitoring well was installed at the low point of the disposal area. This well would serve the dual purpose of providing a vent and allow the monitoring of any liquid which might accumulate at this point.

The entire area was covered with a two-foot layer of sandy-silt, with a higher silt content than that used for the base sealer. Thus, the accumulation of infiltrating rainwater within the disposal area would be prevented. The project was finally covered with four inches of loam and seeded.

Monitoring

As part of the project, the Environmental Protection Agency will maintain a program of monitoring samples taken from the groundwater observation wells for a period of five years. These samples will be analyzed primarily for phenolics. Total organic carbon and gas chromatography tests will be conducted periodically to develop additional information. The results of the monitoring program through June of 1974 are listed in figure 3.

Groundwater Phenolic Analysis in micrograms/liter

Sampling Date	well number				
	1	2	3	4	5
18 October 1973	> 20	> 22	> 20	> 20	> 20
28 January 1974	10	7	16	2	11
26 March 1974	*	*	5	> 5	*
18 April 1974	*	*	*	*	*
28 May 1974	*	*	*	> 10	*
27 June 1974	> 5	*	*	> 5	*

* indicates that no sample was taken due to insufficient water in the well

Figure 3. Results of groundwater monitoring by the Environmental Protection Agency through June 1974