

## Soil, Sediment, Bedrock and Sludge

### Excavation, Retrieval, and Off-Site

#### Introduction:

Contaminated material is excavated and transported to legal off-site treatment and disposal facilities. Pre-treatment might be necessary in order to meet land disposal margins.

#### Description:

Confined disposal facilities (CDFs) are engineered structure enclosed by barriers and designed to retain materials. A selection of linings has been made use of to prevent seepage through to groundwater. The most successful are clay or bentonite-cement slurries, but sand, soil, and sediment linings have also been used.

The location and design are two important considerations. Conditions to take into account are the physical aspects such as size and proximity to ground/surface water, the design/construction (geology/hydrology), and the environmental effects. The most important goal of a CDF design is preventing contaminant loss. Caps are the most effectual way to minimise contaminant loss from CDFs, but choice of a proper liner material is vital. Finally, CDFs require continuous monitoring to guarantee structural integrity and the duration of operation and maintenance is the length of the facilities life.

#### Applicability:

Excavation and off-site disposal is suitable for a variety of contaminants with no specific target group.

#### Limitations:

- Generation of fugitive emissions might be a problem during operations.
- The distance from the contaminated site to the closest disposal facility with the required permit(s) will affect cost.
- Depth and composition of the media requiring excavation should be considered.
- Transportation of the soil through inhabited areas may affect community acceptability.
- Disposal options for certain waste (e.g., mixed waste or transuranic waste) may be limited. There are at present only a few licensed disposal facilities for radioactive waste.
- Contaminants can migrate from CDF through several pathways, consisting of effluent discharge to surface water, rainfall surface runoff, leachate into ground water, and volatilisation to the atmosphere.
- CDFs can develop odour problems as well as mosquito and insect problems without proper design and maintenance.

#### Data Needs:

The type of contaminant and concentration will impact off-site disposal needs. Soil characterisation as dictated by land disposal restrictions (LDRs) is needed. On the whole hazardous wastes have to be treated to meet either RCRA or non-RCRA treatment standards before disposal to landfill. Radioactive wastes would have to meet disposal facility waste requirements based on waste classification.

#### Performance Data:

Excavation and off-site disposal is an established and readily implementable technology. Before 1984, it was the most frequent method for treating hazardous waste. Excavation is the first part in all *ex situ* processes. The pace of excavation is governed by a number of factors such as the number of loaders and trucks operating. The excavation of 18,200 tonnes of contaminated soil would on average necessitate 2 months. Disposal of the contaminated

material depends on the availability of suitable containers to transport the hazardous waste to a permitted facility.

**Cost:**

Cost approximation for excavation and disposal range from £ 200 to £ 320 per tonne depending on the type of hazardous material and method of excavation. This estimate includes excavation/removal, transportation, and disposal at a permitted facility.

Excavation and off-site disposal is a fairly simple process, with established procedures. It is a labour-intensive exercise with little potential for more automation. Supplementary costs may include soil characterisation.