

**CE 5364 Groundwater Transport Phenomena
Exercise Set 5**

Exercises

1. (Problem 11-1, pg. 594)

A contaminated site has been surveyed and a contaminated region $100 \text{ ft.} \times 150 \text{ ft.} \times 15 \text{ ft.}$ was delineated. The average concentration of total petroleum hydrocarbons (TPH) in soil is $10,000 \frac{\text{mg}}{\text{Kg}}$

Determine:

- (a) The total mass of contaminants at the site in kilograms. Assume the soil has a specific gravity, $SG_{soil} \approx 2.0$
- (b) Estimate total volume of petroleum hydrocarbons released assuming 50% of the hydrocarbins are lost to volatization, biodegradation, and dissolution (report the answer in gallons). Assume the hydrocarbons were gasoline with a constant specific gravity, $SG_{gasoline} \approx 0.8$
- (c) Estimate the residual saturation of the hydrocarbon-soil system. Assume soil porosity is, $n = 0.35$

2. (Problem 11-2, pg. 594) A sampling program at a Superfund site indicated the following DNAPL zones:

- A pool of free phase DNAPL in a stratigraphic depression in an unfractured clay. The pool is 200 ft^2 in area and 5 ft thick.
- A zone of residual DNAPL extending directly underneath an old disposal pit 100 ft^2 in area. The residual zone extends through the 5 ft thick unsaturated zone and 15 ft through the saturated zone until it reaches the DNAPL pool.

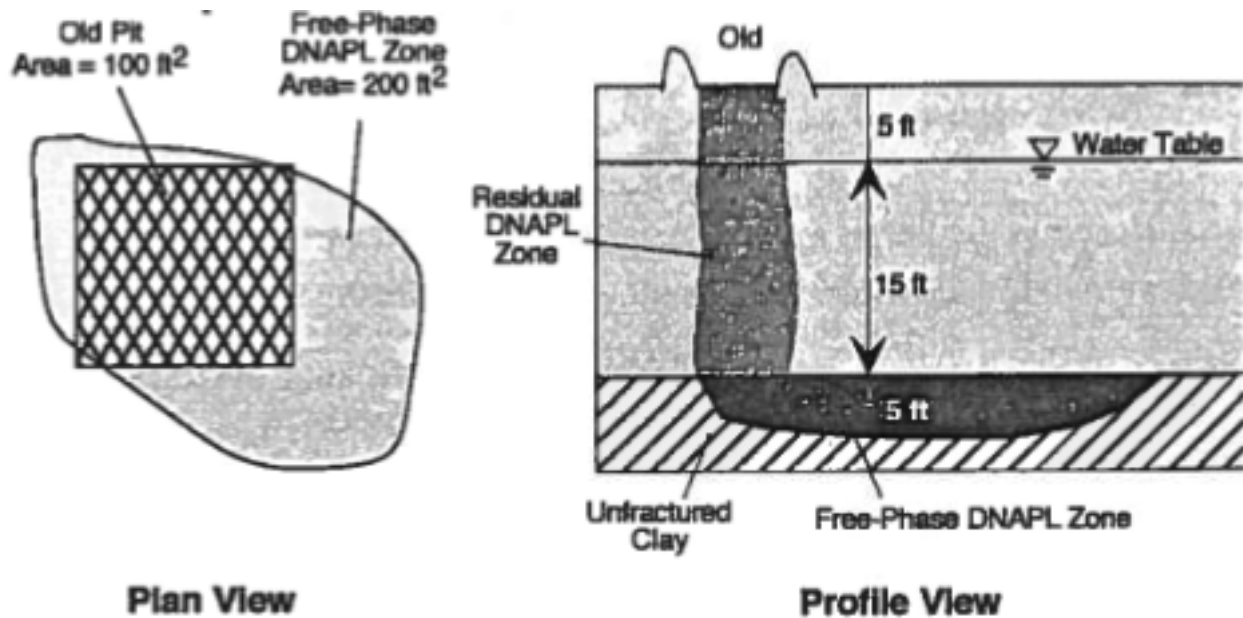


Figure 1: Schematic of Contamination Scenario

Table 1: Supporting Data

Item	Value
Residual saturation in the unsaturated zone:	0.10
Residual saturation in the saturated zone:	0.35
Saturation in the free-phase zone:	0.70
Average porosity in water zone:	0.30

Determine:

- (a) The total volume of DNAPL at the site
- (b) The recoverable volume using ordinary pumping.

3. (Problem 11-4, pg. 595)

Gasoline is found in a monitoring well with $SG = 0.80$. A total depth of 6 *ft* of gasoline is found in the well.

Determine:

- (a) Estimated thickness of free-phase LNAPL in the formation.