146388

# Geology

## Site Geology

The eleven borings made by Ecology & Environment, Inc. (EEI), Appendix I indicate that Chemical Recovery Systems, Inc. (CRSI) is situated on a thin cover of unconsolidated, heterogenous, Man-made Fill predominantly composed of clay, sand, and gravel (including bricks, cinders, slag etc...). The Fill thickness ranges from approximately four feet near Locust St. to twenty-eight feet at the western edge of the site near the river.

The Fill at the site is underlain by the Berea Sandstone Formation (probably the Blanket Sandstone Lithosome). This is a fine grained, arenitic sandstone, that is poorly indurated and lithified by silica cement. The Black River has formed a large meander loop in the vicinity of the site (Plate 1) and has downcut and entrenched itself into this weakly resistant sandstone (Plate 2, cross-section A-A'). Generally, these plates show the river to be flanked by a sandstone cut scarp to the west, and a terrace fill bank composed of unconsolidated deposits to the east.

# Ground Water

Four monitoring wells installed by EEI into the sandstone and unconsolidated fill deposits at the site indicate that ground water is present in these units and that they are hydrologically connected and constitute a water table aquifer (Plate 2).

## Ground Water Flow

Plate 1 shows the location of the wells and borings at the site, as well as, cross-section locations. Cross-sections with potentiometric surface indicated appear on Plate 2, and a potentiometric surface map with direction of ground water flow indicated appears on Plate 3.

The ground water flow direction, as seen from Plate 3, is to the west toward the Black River with a gradient of 10'/200' or 0.05. As discussed previously, approximately 34 inches of precipitation occur annually. It can be assumed that at least 50 percent of this figure infiltrates to recharge the ground water aquifer (Hughes et. al., 1971). Therefore one-half of the yearly precipitation, 17.0 inches, infiltrates and leaches the soils of organic and inorganic contaminants. Since the size of the area affected by the CRSI operation is approximately 3 acres, it can be assumed that approximately 185,000 cubic feet or 1,388,000 gallons of leachate (of unknown quality) is generated at the site each year by precipitation. Upon encountering the water table, this leachate moves to the west toward the river with the rest of ground water movement.

## Site Hydrology

Since no laboratory analyses were performed on soils or bedrock at the site to determine permeability a figure of $1 \times 10^{-4}$ cm/sec is assigned. This figure is felt to be, if anything, low. Therefore, if analyses were performed the results could be expected to be greater

in magnitude. A typical figure for effective porosity, given this permeability, is 15% or .15.

With these assumptions available, the flow rate and velocity of ground water can be calculated. The area perpendicular to flow that intersects the river is approximately 8' (river depth) by 200' (width of dumping activity) or 1600 square feet. Calculation of flow rate from Darcy's Equation is then as follows:

$$Q = (K) \times \left(\frac{dh}{dl}\right) \times (A)$$

where, $Q$ = flow rate

$\frac{dh}{dl}$ = hydraulic gradient, or 0.05

$A$ = cross-sectional area perpendicular to flow, or 1600 $ft^2$

$K$ = permeability, $1 \times 10^{-4}$ cm/sec or 100 $ft^2/yr$

based on the above data:

$$Q = (100\ ft^2/yr) \times (0.05) \times (1600\ ft^2)$$

$$Q = 8{,}000\ ft^3/yr \text{ or } 59{,}800\ gal/yr$$

This is the flow rate of ground water entering into the Black River from that portion of the CRSI site affected by dumping.

A similar calculation for ground water velocity, V, can be made with the following equation:

$$V = (K) \times \left(\frac{dh}{dl}\right) \times \frac{1}{N_e}$$

where, $V$ = velocity

$N_e$ = effective porosity, or .15

this yields,

$$V = (100\ ft/yr) \times (0.05) \times (1/.15)$$

$$V = 33\ ft/yr$$

This is the velocity at which ground water moves at the site.